02 September 2016

Planning Panels Victoria Hearing in relation to Melton Planning Scheme Amendment C162: Mt Atkinson and Tarneit Plains Precinct Structure Plan (PSP)

Statement of:

Anthony Paul Kortegast

This witness statement has been requested by Norton Rose Fulbright on behalf of Landfill Operations Pty Ltd.

Report Reference: 5377

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1 PRELIMINARIES

1.1 General

1 My name is Anthony Paul Kortegast. I am a senior consultant and Director of Tonkin & Taylor Pty Ltd, 95 Coventry Street, South Melbourne, VIC 3205.

2 My formal qualifications, professional affiliations and experience are set out in my CV, included as Appendix A. I am an environmental engineer, with a career specialisation in landfill and industrial engineering. I am an accredited EPA Environmental Auditor (Industrial Facilities) in Victoria.

3 My experience in the solid waste field spans almost 30 years and covers the design and construction of landfills, waste transfer stations, hazardous waste containment facilities, compost facilities, industrial waste fills, and recycling and materials recovery facilities. These include some of the largest and most modern landfills in the Asia-Pacific region such as the award-winning Redvale, Silverstream and Kate Valley landfills in New Zealand and the Bukit Tagar mega-landfill in Malaysia.

4 I have been involved with all aspects of landfill development and licensing, operations, lateral and vertical expansion, closure and aftercare. I have carried many projects related to waste facility waste planning and disposal economics, as well as landfill and waste facility concept planning, though to detailed design and peer review. Altogether I have been involved with more than 150 waste projects throughout Australia and New Zealand, as well as with landfill and solid waste projects in Malaysia, the Philippines, Tuvalu, Fiji, Hong Kong and Vietnam.

5 I have acted as a guest lecturer in solid waste and landfill engineering at the Universities of Auckland and Canterbury and I have authored a number of technical papers in the field of solid waste and landfill engineering (refer CV). Over my career I have visited solid and liquid waste treatment facilities throughout Europe, the USA, Australia, the Pacific Islands, New Zealand and Asia, including a large number of both conventional and specialist solid inert, putrescible and industrial landfills, Materials Recovery Facilities and compost facilities. I have visited many of the world's large, referenced waste facilities and hence have a good understanding of international "benchmarks" in terms of landfill design and operation.

6 In Australia I have worked on landfill and waste projects for more than 15 years and have provided design, environmental audit and strategic advice in relation to landfills in Western Australia, South Australia, New South Wales, Queensland, and Victoria.

7 In the earlier part of my career in New Zealand, I was the principal designer or principal reviewer for more than 20 significant landfill developments, and I have been involved in consent reviews, design, or advisory roles for many others. I have assisted the NZ Ministry for the Environment (MfE) with the preparation of key landfill technical publications, acting as principal author for the revised design section of the Centre for Advanced Engineering 2000 Landfill Guidelines (CAE Guidelines).

1.2 Expertise relevant to this report

8 I have been involved in a senior review or advisory capacity on a number of waste projects where buffer, amenity, odour or landfill gas (LFG) issues were key considerations and I have presented evidence in relation to such issues in a variety of forums. Significant projects where I have been responsible for assessing and dealing with buffer and related issues include:

- Transpacific Waste Management Fraser Road Landfill, Clayton
- SUEZ, Hallam Road Landfill
- Waste Disposal Services, Whitford Landfill
- Waste Management Ltd, Redvale Landfill
- Hutt City Council, Silverstream Landfill
- Marlborough District Council, Bluegums Landfill
- Hastings District Council, Omarunui Landfill
- Canterbury Waste Services, Kate Valley Landfill
- Timaru District Council, Redruth Landfill
- Porirua City Council, PCC Landfill
- Hamilton City Council, Horotiu Landfill.

9 My involvement in these projects has often included strategic advice in relation to landfill siting, buffer zone and separation distance issues, and related mitigation of potential LFG hazard as well as assessments of landfill odour and amenity impacts. I have investigated many odour and LFG migration issues, and have carried out the design of LFG extraction and flaring systems, as well as LFG modelling, the design and review of odour modelling programmes, interpretation of odour and amenity complaints data, troubleshooting of odour and LFG issues, and the design of odour and LFG mitigation programmes.

10 I have particular knowledge of the MRL site as I was retained as the Landfill Operations Auditor and in 2013 and 2014 I prepared two environmental audit reports for the site

under S53V of the Environment Protection Act. I inspected the site again in July 2016 and later in this report I will comment on the "progress" that has been achieved at the site in relation to good landfill operations practice.

2 PURPOSE AND SCOPE OF EVIDENCE

11 My instructions are to prepare an expert witness statement in relation to the appropriateness of the landfill buffer that is proposed for the MRL extension, in the context of the Planning Scheme Amendment. Specifically, I have been asked to address two main questions:

- Is the proposed 'buffer' in the northwest appropriate?
- Is the proposed 'buffer' in the southwest appropriate?

3 AREAS CONSIDERED

12 The proposed area of the MRL extension and the 'buffer zone' that is proposed in relation to it, together with the proposed land development west of Hopkins Road and the subject of PSP Amendment C162, are all shown on Figure 1. On Figure 1, I have shaded in pink the area of proposed sensitive use development. This is the area to which a buffer is provided to the northwest of the MRL site, and that I have been asked to consider. I have shaded in blue, land that is generally proposed to be developed as "industrial" and which is classified as non-sensitive in the context of regulatory and other guidance provided in relation to 'buffer'. This is the area to which a buffer is provided to the southwest of the MRL site, and that I have been asked to consider.

13 In preparing this Statement I have reviewed and relied on the following information:

- Relevant legislative and policy background in relation to landfill buffers and amenity management, as well as EPA Victoria guidelines and other information, most importantly EPA Publications:
  - Assessing planning proposals near landfills [Draft], EPA Publication 1625, June 2016
  - Best Practice Siting, Design, Operation and Rehabilitation of Landfills, EPA Publication 788.3, August 2015 (the current Landfill BPEM)
  - Licence Management, EPA Publication 1322.6, May 2015
  - Recommended separation distances for industrial residual air emissions, EPA Publication 1518, March 2013

  - Closed Landfill Guidelines, EPA Publication 1490, December 2012
  - Landfill Licensing Guidelines, EPA Publication 1323.2, August 2011
  - State Environmental Protection Policy (Air Quality Management), Victoria Government Gazette, December 2001.

- The Works Approval application for the proposed landfill extension, and in particular the February 2016 report by Golder Associates which forms part of the MRL application package, and which provides the engineering and landfill development information related to the proposed future landfill development.

14 A list of all the documents I have taken into account is included as Appendix B.

15 This report was prepared by me and there are no provisional opinions held in relation to it. I have not addressed issues that are outside my areas of expertise and I have used my significant experience as a landfill engineer to draw conclusions from available information and regulatory guidance, in respect of the brief given to me. I have made all the inquiries that I believe are appropriate and no matters of significance which I regard as relevant have to my knowledge been withheld or omitted from my report.

4 LANDFILL BUFFER CONSIDERATIONS

16 The purpose of a landfill buffer is to protect receptors from any impacts resulting from a failure of landfill design, management or abnormal weather conditions. Assessment of the adequacy of landfill buffer requires consideration of a range of factors:

- The nature of the potential receptor (sensitive or non-sensitive);
- Regulatory guidance and best practice requirements;
- The effects to be managed;
- The actual buffer being provided;
- The temporal aspects of landfill activity in relation to any particular receptor;
- The specific control measures applied - most importantly, LFG source control;
- The geology and its effect on the continuity of LFG migration pathways; and
- The monitoring, management and contingency measures available to mitigate effects in the areas of landfilling near the boundary.

17 The key issues that I consider in this context are:

- LFG risk[1] – the primary driver, due to the potential for hazard;
- Landfill odour; and
- Other potential (non-visual) amenity effects (dust, birds and litter).

18 Managing LFG risk in relation to neighbouring development is a partial driver for establishing the buffer distance set out in the Landfill BPEM, but the 500m buffer figure is a guidance number only. The 500m figure recognises that in the absence of other controls the risk of a significant LFG risk beyond that distance is quite low.

19 Where sensitive uses are more than several hundred metres away from the landfill footprint and good LFG control[2] is in place, it would be rare for a LFG risk to exist unless a specific flow pathway was inadvertently introduced.

4.1 Regulatory Background

20 In Victoria, EPA Publication 788.3 (August 2015), ***Best Practice Environmental Management: Siting, design, operation and rehabilitation of landfills*** (referred to herein as the Landfill BPEM), provides the definitive guidance in relation to landfill buffer. In Appendix C, I have provided a summary of the BPEM guidance. The Landfill BPEM focusses on buffer requirements in relation to neighbouring land uses that are **sensitive**. There is reference in the Landfill BPEM to the potential for impact on non-sensitive uses such as industrial or rural land, but this relates mainly to managing LFG hazard and to a lesser extent, odour.

21 The Landfill BPEM specifically provides for the potential to develop non-sensitive uses (industrial or rural activities), within a landfill buffer zone. It states that while it is better that buffer zone land is owned or at least under the control of the landfill operator, this is not essential.

22 Context guidance is also provided in EPA Publication 1518, March 2013, ***Recommended separation distances for industrial residual air emissions***. Publication 1518 is specific in

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[1] Landfill gas (LFG) is a mix of predominantly carbon dioxide and methane (approximately 50/50), with a range of other minor non-methane organic compounds, including some minor amounts of highly odorous organic components such as mercaptans. LFG is an asphyxiant and is also flammable. LFG forms an explosive mixture when combined with air at concentrations above the Lower Explosive Limit (LEL) of 5% by volume in air, and below the Upper Explosive Limit (UEL) 15%. It is evident from field observations that at Type 2 landfill sites LFG generation typically starts within weeks to months of waste placement and continues for at least 30 years post-closure as organic material within the landfill slowly degrades.

[2] Through a combination of a BPEM compliant liner and an effective LFG extraction system

describing recommended separation distances, from industrial activities to sensitive users. This includes landfills, in relation to which Publication 1518 defers to the Landfill BPEM for specific guidance.

23 In June 2016, EPA produced Draft Publication 1625, ***Assessing planning proposals near landfills***[3]. The aim of this publication is to provide guidance to planning authorities and developers of land near existing or closed landfills, in relation to managing LFG risk. There is nothing in Publication 1625 which conflicts with, or adds to the Landfill BPEM guidance in relation to landfill buffer. The flow chart presented as Figure 1 in Publication 1625 highlights that because there is the potential for buildings and structures to be developed within 500m of a landfill, then that circumstance needs to be taken account of. Publication 1625 provides specific guidance as to how to assess LFG risk in this context.

4.2 Sensitive and Non-Sensitive Land use

24 All the relevant guidance documents distinguish between sensitive and non-sensitive land uses in terms of assessing the potential impacts of air emissions.

25 At section 13 'Definitions', Publication 1518 defines a sensitive land use as:

> *Any land use which requires a particular focus on protecting the beneficial uses of the air environment relating to human health and wellbeing, local amenity and aesthetic enjoyment, for example residential premises, child care centres, pre-schools, primary schools, education centres or informal outdoor recreation sites.*

26 In the context of the PSP, the sensitive use focus is on the land to the northwest where future housing, educational facilities and public open space recreational areas are proposed.

27 Publication 1518 indicates that within industrial zones there will be impacts that are not appropriate where sensitive uses are present.

4.3 Northwest Area: Future Sensitive Land Uses

28 In the area to the west and northwest of Hopkins Road, the expansion of the MRL has been planned with a 1000m buffer, as shown on Figure 1.

29 In this area the buffer distance has been increased to 1 km by Landfill Ops, which represents a doubling of the EPA recommended minimum. Half of this buffer is internal to the site and half is over adjacent rural land that is potentially to be future commercial land.

[3] Referred to herein as Publication 1625

30 I am instructed that the Metropolitan Planning Authority and Landfill Ops reached an agreement on setting a 1000m buffer at an earlier stage in the MRL application process and in my view this is a very positive step. It represents prudent long term land use planning in relation to minimising the potential for dust and odour impacts on the sensitive land uses planned to the west of the north-western zone of landfilling.

31 This approach was adopted based on the precautionary principle, noting experience at large regional landfills where amenity upset conditions can and do occur. In my experience this increase to 1000m minimum buffer and effective 'separation', simply represents good practice in light of expressed community concerns and to an extent will "future-proof" development of the north-western part of the MRL site.

4.4 Southwest Area: Proposed Industrial Land Uses West of Hopkins Road

32 For this area much of the buffer extends over land that currently is rural, but that is planned as future industrial. In this regard, the timing of development, together with a range of restrictions on the land and the nature of the likely receptors that may ultimately establish there all need to be considered in the context of providing 'buffer'.

33 In relation to neighbouring non-sensitive land uses, the key issues are:

- The Licence Holder effectively managing amenity impacts, including odour, within the boundary of the site; and
- Managing the risk associated with LFG hazard.

34 All landfills in Victoria now operate under a suite of standardised EPA Licence conditions. A high level of compliance with usual EPA Licence requirements for a landfill such as MRL should result in only occasional IRAEs[4] (in relation to dust and odour). With appropriate control methods other amenity effects should be able to be controlled largely within the MRL site boundary.

35 The key buffer consideration to the southwest relates to LFG risk. In this regard, assuming that Publication 1625 does not change from the draft, it adopts a precautionary approach in relation to assessing the LFG risk associated with any development within 500m of the outer extent of any proposed or historic landfilling. Publication 1625 states that for a new structure or industrial building[5], a determination needs to be made of the level of (risk) assessment needed in relation to LFG. Under Publication 1625, for most new future

[4] IRAE – Industrial Residual Air Emission as defined in EPA Publication 1518
[5] (or alteration to one)

industrial developments that might be contemplated within the landfill buffer zone, either a LFGRA[6] or a 53V audit would be required.

36 The usual approach taken to assessing LFG migration risk is based on what is referred to as the source-pathway-receptor model, which is also referred to in Appendix 1 of EPA Publication 1625. For a significant LFG risk to exist there must be a source of LFG, a pathway for its migration, and a receptor where a physical risk can occur. If any of the three elements is missing, then the risk is generally low.

37 At the MRL, current and future cells are constructed using a Landfill BPEM – compliant, Type 2 landfill liner. The liner design is performance based, but in essence to meet the Landfill BPEM performance requirements the liner system must include a geomembrane in order to be able to meet all performance objectives. This type of design is a very effective leachate and LFG barrier and effectively interrupts any potential LFG migration pathway by blocking it and containing the LFG 'source'.

38 When this type of liner is combined with early installation of LFG extraction (what is referred to as bottom – up capture), very good LFG source control is achieved and hence the first of the three main LFG risk factors (i.e., a viable 'source') is effectively negated. This alone hugely reduces the offsite LFG risk, even for such a large site and means that the risk of significant LFG migration beyond the edge of the landfill liner system will be low.

39 For a significant LFG risk to exist, a continuous migration pathway also needs to be present. In the context of the MRL site, which has permeable site geology, there is a very low risk of a LFG migration pathway developing that has the potential to result in LFG impacting on adjacent buildings or structures located beyond the western site boundary.

40 In the southwestern quadrant of the landfill east of Hopkins Road and north of Middle Road, the landfill will not directly abut the quarry wall and this zone of the site is effectively 'vented to atmosphere'. Hence the risk of fugitive LFG migration is thus even lower there, than elsewhere.

41 Along the western boundary adjacent to Hopkins Road, there is generally a minimum of 80-100m internal buffer from the proposed western limit of the landfill cell footprint to the western site boundary, and some 140m overall to any potential development to the west. By adopting a best practice approach, LFG from the proposed landfill development can be readily managed within that distance. Within the intervening (internal) buffer, LFG monitoring wells can be established at a range of depths to confirm whether and

[6] Landfill Gas Risk Assessment (LFGRA)

unexpected lateral migration of LFG is occurring. Such monitoring along the western boundary would provide early warning of any increased risk in relation to LFG, albeit some monitoring of service pits or the like offsite may be warranted in the unlikely event that the western monitoring bores ever showed signs of LFG presence.

42 The backup to all of this are the measures shown on Figure 1 of EPA Publication 1625, namely conducting a LFGRA in relation to any new building or structure, or a Section 53V audit. Given the design and operational controls available, the timeframes involved, and the ability to undertake perimeter monitoring and initiate mitigation, it appears that steps beyond a simple LFGRA for any new industrial structure are unlikely to be necessary.

5 COMMENT ON SUBMISSIONS

5.1 Mt Atkinson Holdings Pty Ltd

43 Mt Atkinson Holdings (MAH) seeks to have all buffer associated with the landfill expansion, including any buffer related to odour, internalised to the MRL site. I have described in my statement the precautionary approach that is proposed in relation to the proposed sensitive land use northwest of the future landfill. To the west and southwest of the site there is a zone where the buffer as defined in the Landfill BPEM will in part be over land west of Hopkins Road that is proposed as future industrial. This has two key implications for the proposed development in that area which I will now discuss.

44 Firstly, there will be relatively short periods of time when, in relation to any possible non-sensitive receptor located on industrially zoned land, not all of the separation to landfill operations can be provided internal to the MRL site. This is something that was always envisaged in relation to the landfill, which was planned to generally mirror the extent of quarrying. This will result in periods of time when in relation to a particular receptor the landfill is operating within 500m it. After that, the landfill operations will move more than 500m away from the receptor: sufficient at a well-managed landfill operation to manage odour and general nuisance effects under most circumstances, even in relation to a sensitive receptor. For an adjacent industrial land use, the relatively short period of time during which the landfill is closer than 500m to that receptor should be manageable in relation to amenity effects such as odour, dust and litter, provided site management practices are robust and landfill Licence conditions are complied with.

45 The second point is that LFG risk will need to be managed in relation to any future industrial development or structure established within 500m of the ultimate landfill footprint. The Landfill BPEM envisages the establishment of industrial uses within the

landfill buffer, as does EPA Publication 1625. As I have described in my statement, the risk of LFG impacting on any future development is low and the landfill practices and monitoring regime now being adopted are such that it will remain low. At this point Publication 1625 would require a risk-based approach to be adopted to assessing any constraints on future industrial development on the adjacent land to the west and southwest, but as I have shown, even before the landfill moves into that area the risk can be shown as likely being very low.

5.2 Melton City Council

46 The Melton City Council submission in relation to buffer is generic and focusses on LFG migration risk in relation to any potential receptor, sensitive or non-sensitive. The submission similarly seeks to have all buffer internalised to the MRL site. So my response to this submission is the same as I have summarised in relation to the MAH submission. The only point to add is that in relation to potential future sensitive use receptors to the northwest, the LFG migration risk at 1km or more from the proposed landfill footprint in the context of the proposed development and its geological setting, is demonstrably very low.

5.3 Metropolitan Waste and Resource Recovery Group

47 In relation to providing future landfill disposal capacity for metropolitan Melbourne, the Metropolitan Waste and Resource Recovery Group (MWRRG) is responsible for planning, waste and resource recovery for the metropolitan area. The MWRRG's submission emphasises the importance of the proposed MRL expansion in relation to the community and hence supports protection of the buffer necessary to enable the future landfill to be developed. The MWRRG submission supports establishing the 1000m buffer (as proposed) to protect future amenity in relation to future sensitive uses. The MWRRG submission adopts a precautionary approach to managing LFG migration risk consistent with EPA Publication 1625, but supports the provision of buffer over industrial land, specifically the land south of Riding Boundary Road. The MWRRG submission aligns with my findings, and supports them.

5.4 Sustainability Victoria

48 In relation to buffer, the Sustainability Victoria (SV) submission recognises the landfill site and its associated waste and resource recovery functions as being a hub of state importance, as delineated in the relevant waste planning documents. The SV submission aligns with that of the MWRRG and simply requests that the importance of establishing

and maintaining the 1000m buffer to sensitive uses and the 500m buffer in relation to LFG risk (in relation to any future land use), be clearly reflected in the PSP.

5.5 Environment Protection Authority

49 The Victoria Environment Protection Authority (EPA) submission aligns with that of SV and confirms the EPA's involvement in and agreement to extending the buffer in relation to potential future sensitive receptors in the northwest to 1km. The submission seeks to ensure that all relevant sensitive uses are excluded from this zone, which was always the intent, consistent with the definition of sensitive uses included in the Landfill BPEM. My interpretation of the EPA submission is that it aligns with that of the MWRRG and my findings in relation to the provision of a LFG migration buffer of 500m in areas where sensitive uses are excluded.

5.6 Australian Council of Concerned Residents/Western Hills Informed Parents

50 This submission focusses on concerns related to the PSP potentially allowing for school facilities to be sited within the 1km buffer zone proposed to sensitive uses to the northwest. It aligns in principle with the EPA submission and I support it. The 1km buffer zone to the northwest should apply in relation to any sensitive use as set out in the Landfill BPEM and set out in the EPA submission.

5.7 Metropolitan Planning Authority

51 I have been provided with a copy of the Metropolitan Planning Authority (MPA) response to the submission on the PSP lodged by Tract Consultants on behalf of Landfill Ops and I have been asked to comment on it, specifically in relation to item 1.1. I have included a copy of the MPA response letter as Appendix D.

52 The MPA response was to decline the request to align buffer requirements with the Landfill BPEM provisions. This is stated to be on the basis that the landfill extension has yet to be approved and hence it is implied that the proposed extension needs to be considered in the context of a "new" facility in accordance with the Landfill BPEM provisions associated with a new site adjacent to a developed land use of state-wide significance in the case of the land covered by the PSP. Essentially the MPA response assumes the existence of the proposed development in its final form and places the onus on the MRL extension to "fit in" with it.

53 In the circumstances, given the long recognised potential for the MRL to expand to provide future landfill capacity for metropolitan Melbourne as a waste and resource recovery hub

of state-wide significance in its own right, the response appears conservative and appears not to balance the considerations of both key facilities. The response fails to consider the nature of the proposed adjacent industrial land use and its compatibility with a well-managed neighbouring industrial use, which happens to be a landfill. In effect, the MPA response reflects a perspective in terms of reverse sensitivity on the basis that the development that is subject to the PSP has already occurred without any consideration of timeframes, risk or land use compatibility.

6 SUMMARY OF OPINION

54 I conclude that development of the footprint as shown on Figure 1 is viable from a landfill buffer perspective. I have reviewed the main issues that need to be considered in relation to the availability of buffer, both internal to the site and across adjacent rural land that is potentially to be zoned future industrial or sensitive use (residential), and all appear manageable.

55 By agreement with the MPA, the buffer distance to sensitive land uses proposed northwest of the site has been increased to 1000m to provide an additional "margin of safety" in relation to managing odour and amenity impacts. I consider this to be a prudent long term management precaution and that buffer should not be intruded upon in the future through subsequently altered land use. This position is supported by SV and the MWRRG in recognition of the importance of the MRL site as a waste and resource recovery hub of state significance. I support the EPA submission to ensure the PSP provides for this buffer not to be intruded on in the future by any sensitive land use.

56 The 500m buffer recommended in the Landfill BPEM for a site of the type proposed will not all be provided over land internal to the site. However, the derivation of this buffer distance recommendation is driven principally by concerns related to odour and LFG management, neither of which is likely to be a significant issue in relation to development of adjacent land for industrial use.

57 For most of the time the separation provided to landfill operations in relation to managing amenity effects within the 500m buffer should be readily met by the landfill operator. However, there will be periods of time when earthworks or landfill operations will be closer than 500m to industrially zoned land. In that situation a range of management measures is available to the landfill operator to limit amenity effects. These can be applied as part of good site management practice and are likely to be necessary in order to meet License conditions.

58 The key risk issue for non-sensitive industrial receptors that may locate on that land within 500m of the edge of the ultimate waste footprint, is LFG. However, the improved design, management, Licensing and operational controls now mandated by the EPA, along with compliance audits and related monitoring and reporting, are such that the site landfill expansion will very likely present a very low offsite LFG risk in the future.

59 In relation to any future industrial development, EPA Publication 1625 sets out a process for carrying out a LFGRA or a 53V audit based on an assessment of the degree of risk. Significant lead time will be available to assess the performance of LFG control in the new cells at MRL as it moves west towards Hopkins Road and I believe it is quite likely that further EPA guidance may emerge in relation to assessing LFG risk within industrial buffer zones for future development near cells constructed in compliance with BPEM requirements. Even if nothing changes in the next 10 or more years, the current and proposed controls provided by both Publication 1625 and the revised EPA Landfill licence conditions are sufficient to ensure there will not be any unmanaged LFG risk in relation to neighbouring land.

60 I am confident that with close attention to cell engineering and site management practices, the landfill can be developed as proposed with minimal amenity impacts on industrially zoned land west of Hopkins Road.

7 DECLARATION

61 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 Panel.

Anthony Kortegast

02 September 2016

Appendix A: CV

Tony Kortegast – Project Director

Tony has extensive consent and environmental court experience and is known for his industry expertise, consultation skills, design expertise and strategic thinking. He is Managing Director of Tonkin & Taylor International division and regional business entities, with a total of staff of some 600 people.

Tony has more than 30 years national and international experience in environmental and solid waste engineering. His work covers the whole range of project inputs from concept development and public and consent processes, to detailed design and construction management.

Tony is at the forefront of solid waste engineering in New Zealand. With work experience in more than a dozen countries, he has provided specialist services to public and private sector clients as well as Asian Development Bank, World Bank, UNCHS (Habitat), UNDP, NZMfE and NZ Aid. He has authored more than 20 technical papers and lectures and is currently the convenor for the landfill Technical Working Group for WasteMINZ and is the Australasian contributor to the ISWA International Landfill Working Group.

Expertise

Core competencies include:

- Environmental auditing, municipal solid waste, water and wastewater treatment, landfill design and construction, landfill operations, landfill gas management, closed landfill remediation and redevelopment, environmental risk assessment, financial assurance planning and modelling for landfills and hazardous waste facilities, chemical/industrial wastes, geohydrology, consent processes, developing country waste management planning and training, project management.
- Mediation processes related to consents and contract management, audit processes,
- Engineer to Contract, contract management, expert witness.

Experience

Examples of relevant projects:

Expert Support and litigation Roles – Australia

- Expert review and VCAT evidence in relation to a proposed quarry expansionin western Victoria
- Expert review Class IV private sector landfill development in WesternAustralia
- Peer review and VCAT evidence in relation to proposed solid inert landfill inan existing quarry operation, Sunshine, Victoria
- EPA liaison in relation to several closed landfill sites, Heatherton, Victoria
- Expert support in relation to peer review of landfill re-development, Victoria
- Technical expert for review of landfill litigation proceedings, High Court,Victoria.
- Project Director and technical reviewer for closure activity at 30 formerservice station sites in Victoria, Southern NSW and Tasmania.

Current 53V Audits

- TWM Brooklyn Landfill closure and capping VCAR
- Grosvenor Lodge – Cell 3A, 3B sidewall liner CAR

Completed 53V Audits

- TWM – Carroll Road, Stage 5 – Cell 1 (upper) – CAR Addendum
- Sunshine Groupe - Bunting Road Cell 5 CAR
- City of Greater Geelong - Drysdale Landfill, Operational 53V audit
- Boral - Deer Park Landfill, Operational 53V audits 2012, 2014

- Transpacific Waste Management (TWM) - Tullamarine Landfill, Mounds 1 & 2 cap construction audit
- TWM – Fraser Road Waste Landfill, Cell 5C-2 – CAR
- TWM – Carroll Road, Stage 5 – Cell 1 – CAR

Other Audit Roles & EMS Auditor Inputs

- Yarra Glen EMP Audit - Process and report review for a detailed EMS audit for VicRoads, against Contractor's EMP. Audit tasks:
  - Review against VicRoads checklists for operations
  - Review of EMP Checklist
  - Site inspection and assessment of practical compliance with EMP
  - Cut and fill EMP compliance review reporting
  - Springvale Bypass EMP Audit - Process and report review for a detailed EMS audit for VicRoads, against Contractor's EMP. Audit tasks:
  - Review against VicRoads checklists for operations
  - Review of EMP Checklist
  - Assessment of on-site compliance with EMP reporting
  - Review of findings related to audit of Total Petroleum Fiji operations aimed at ISO14001 awareness-raising, and preparation of a road map for development and implementation of an ISO14001 EMS.
  - EMS gap assessment for Vector Energy, Auckland.
  - Telarc laboratory auditor experience assessing NZS, AS and ASTM compliance of several registered soils laboratories for Telarc registration or reregistration.

Audit Expert Support Roles

- Support to TWM – Henry Street Solid Inert Landfill, Heatherton
- Cell 6-1 (South) –Construction Audit Report – (CAR)
- Stage 4 Cell 2 – CAR
- Stage 6-1 (North Wall) – CAR
- Stage 4 Cell 2 (upper sidewall) – CAR
- SITA Stevensons Rd Landfill – Cell 12B, Victoria 53V audit – technical reviews and technical overview of construction audit process as landfill expert
- Theiss Services – Rochdale Landfill Cell 5A Development – Project Director and technical overview input on site to quality management of cell construction involving a geocomposite liner system and production of CQA report
- Devilbend Solid Inert Landfill
  - Cell 3A – CAR
  - Cell 3B – CAR
- Landfill 53V audit with a focus on groundwater impacts for Braithwaite St Landfill, Warranmbool, Victoria
- Kilmany Landfill Cell 1 Extension – CAR
- Hyland Landfill Cell 3 – CAR
- Drysdale Landfill Audit Report, City of Greater Geelong, 2011 – Expert review, evaluation of leachate impacts, audit report review
- Former Clarke Road Landfill, Heatherton – Project Director for Audit – format quantitative assessment of closed landfill cap quality, related BPEM compliance and environmental risk including assistance with preparation of Auditor report and discussions with EPA and third party auditor. Assessment of remedial options and related recommendations.
- Pasminco Smelter closure, Newcastle – expert support to W Ryall (Auditor, NSW) on all aspects of closure works, including an engineered waste containment cell and managing related amenity, groundwater and surface water protection works.
- Incitec Pivot site closure, Newcastle – expert support to A Lau (Auditor, NSW) on proposed closure works and on-site landfill and containment cell design.
- Camdenville Park Landfill closure, Sydney – Expert audit support in relation to DSI, SAQP, RAP and other related site closure documentation.
- Proposed landfill extension, Sydney – analysis of viability of expansion of airspace envelope to create 5 Mm3 of additional void (client confidential).

- Bunting Road landfill, Brooklyn – design review and amendment to upgrade to a geocomposite liner design.
- Trafalgar Landfill, Baw Baw Shire (TWM) – development of conceptual closure drainage concept, preparation of pre- and post-settlement contours, drainage attenuation structure design, and reporting.
- Clarinda Landfill (TWM) – preparation of pre- and post-settlement contour plans for Licence approval.
- Brooklyn Landfill (TWM, Victoria) – expert support to Auditor, review of cap drainage concepts, development of alternate cap drainage solutions, and EPA reporting.
- Darwin and Howard Peninsula Strategic Waste Study – technical manager for landfill and waste facility siting and permit study (current).
- Brooklyn Landfill, Victoria - advice on steep wall liner design options and construction methods.
- Quarry re-development, Victoria (client confidential) - development of long term quarry redevelopment plans and cost model to enable permit preparation for a new landfill site featuring an innovative steep wall liner system.

Director of Environmental Engineering, Tonkin & Taylor Ltd

Selected environmental and engineering assignments undertaken, include:

- Project Director and lead consultant roles for a range of landfill development and consent projects:
  - Silverstream Landfill Stage 2, Phase 1 development
  - Porirua Spicer Landfill extension
  - Omaranui Landfill Area D development
  - Omaranui Landfill Areas B, C investigation
  - Whitford Landfill Steep wall liner review
  - Baw Baw Sire (Trafalgar Landfill) stability review
  - Bluegums Landfill Stage 6 and LFG system development (Engineer to Contract)
  - NZ Steel Site 1 Landfill Development
  - Kate Valley Landfill future phasing study
- Project Consultant with principal responsibility for the following design, CQA and other audit-like reports:
  - Kate Valley Stage 1A-1, 1A-2, 2A-1, 2C Design Reports
  - Kate Valley Stage 1A-1, 1A-2, 2A-1, 2C Construction Reports (essentially CQA Audit reports)
  - Waireka secure landfill performance assessment and environmental Bond formulation
  - Kate Valley Landfill performance bond development, including risk assessment
  - NZ Steel Site 1 Landfill Bond development and risk assessment
- Principal author and project director for NZ Landfill Full Cost Accounting Model, 2004. http://mfe.govt.nz/publications/waste/landfill-full-cost-accounting-guidemar04/fce-gvide.pdf
- Landfill risk assessments and financial Bond formulation for the Redvale, Whitford, Kate Valley and Waireka landfills.
- Team Leader and principal waste consultant for NZODA funded capacity building and review study for infrastructure development in the city of Thanh Hoa, Vietnam. Inputs included a review of local infrastructure planning for water supply, wastewater and solid waste, as well as urban design. Training was also developed and provided in solid waste infrastructure needs and options assessment.
- Pacific Waste Sector CDM Project - Team Leader for the MfE strategic evaluation of potential CDM projects in the waste sector in the Pacific aimed at developing potential CDM project initiatives and identifying institutional constraints related to project implementation.
- Waste Acquisition – Australia (client confidential) – detailed review of due diligence issues related to prescribed waste landfill facility, technical review and analysis and development of options and

costings for long term facility management and closure.

- Management of UNDP institutional strengthening and water resources planning project, Papua New Guinea. Work included evaluation of water quality issues and sector-based industry and agricultural impacts in selected catchments, together with environmental and permit-related training and capacity building.
- Hazardous Waste Facility Closure (client confidential) – Principal consultant for development of an environmental risk model for a closed chemical waste landfill and development of a related aftercare financial assurance model, together with negotiation of the structure of the financial assurance package.
- Preparation of risk model for Whitford Landfill expansion (Footprint T) including assessment of seismic risk related to the Waikopua Fault and ongoing quarry operation.
- Omarunui Landfill: Preparation of conceptual final grades and liner grades to combine existing partially filled Area A valley and proposed Area D. Together with hydrogeological assessment and consents for landfill expansion.
- Project Director, Mindanao Critical Coastal Management Study for NZODA. (1998).
- Design review of a commercial sewage treatment plant in relation to ammonia and total biological loadings, for Auckland City Council.
- Lead engineering consultant for re-design and air discharge permit processes for Whitford Landfill and quarry for Waste Disposal Services Ltd.
- Principal engineer and engineer to contract for Bluegums landfill liner failure investigation, design and reconstruction stages 2, 2a, 3, 4.
- Development of consent discharge monitoring programme and discharge plume modelling field studies for ocean discharges from a 150MW gas-fired thermal power station, New Plymouth, for ECNZ (1994).
- Project Director for NZMfE project to develop hazardous waste guidelines and waste screening procedures for New Zealand.
- Project Manager for evaluation of hazardous waste disposal options for a major pulp and paper mill complex. Work involved evaluation of waste streams, review of existing disposal sites and development of waste treatment and disposal options (2002).
- Project Director for design and construction of two 6 ha polishing wetlands utilising HDPE liner, Tauranga (1997).
- Project Director for $45m SH20 motorway design and construction project, Auckland. Work included 7 km highway, four major bridges and ancillary works (1997-1998).

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Project Director/Technical author for preparation of the NZ Resource Recovery Park Guide http://wasteminz.org.nz/The-NZ-Resource-Recovery-Park-Design- Guide-June-2008.pdf

- Waste Specialist for development of solid waste masterplan for the Thu Thiem urban redevelopment project in south east Ho Chi Minh City for Sasaki Associates and Parsons Brinkerhoff International. Responsible for all aspects of waste system concept planning, economic and feasibility assessments, and system design (ongoing).
- Team Leader, Principal Consultant and Trainer for preparation of a solid waste master plan and development of pilot composting plant technology for the city of Hanoi, Vietnam (population 3 million) for United Nations Development Programme. Work included development of solid waste masterplan and strategic assessment of future waste disposal facility needs.
- Landfill Specialist for a preliminary regional landfill siting study in the Bandar Seri Begawan area of Brunei for a private consortium.
- Team Leader, Principal Consultant, Course Developer and Trainer for NZODA funded capacity building in solid waste management and landfill

siting and design, Hanoi where some 30 participants from Hanoi and surrounding provinces were trained in waste disposal technology over a period of 1 month.

- ADB AOTA 4214: Effective Solid Waste Management and Recycling in Tuvalu - Team leader over an 18 month TA to assess, plan and implement solid waste system improvements in Tuvalu. Key issues include planning, training and community processes related to solid waste collection, waste separation, compositing and disposal. Recycling options were examined in detail as were waste minimisation and waste re-use options. Landfill upgrading and management training were undertaken along with a comprehensive solid waste-planning programme. Total input 3.5 mm.
- Preparation of bid documentation for new regional strategic waste project for the City of Guangzhou, China for private bid consortium.
- Review of strategic landfill, expansion and related development issues for major Hong Kong landfill, 2006 (client confidential).
- Project Director for regional waste study and landfill siting and design programme for Batangas Province, Philippines (2001). Work involved a waste stream assessment, assessing siting restrictions and protocols, site selection and concept design.
- Bukit Tagar Landfill, Kuala Lumpur - Project Director responsible for concept development, engineering design and financial assessment of a 150 M m3 mega-landfill to service the city of Kuala Lumpur and the Klang Valley region of Malaysia, with a design waste input of 4500 tpd.
- Whangae Landfill – Project Manager for landfill consent and closure programme involving consent review, AEE and consent applications, closure works, design and capping assessment.
- CHBDC Farm Road Landfill – Landfill Engineer responsible for landfill management overview, expansion option development and related consent and engineering programmes.
- Provision of project scoping and preliminary design inputs for Puchong landfill, Kuala Lumpur as a sub-consultant to Waste Management Incorporated, UK.
- Lead engineering consultant for the location study, consent processes anddesign for 13Mm3 Canterbury Regional Landfill (1999 - ongoing).
- Design review and strategy development for ongoing works and upgrading for 10 Mm3 Silverstream Landfill, Wellington for Hutt City Council (1998).
- Initial concept review and consent assessment, Wainuiomata Landfill, Wellington, for Hutt City Council.
- Landfill siting options review and financial modelling of disposal options for Far North District Council.
- Engineering and consent advice in relation to upgrade and extension of Hunua Gorge Landfill for Manco Ltd.
- Lead engineering consultant for siting, design and consent processes for Puwera Landfill, Whangarei for Whangarei District Council (1997 – ongoing).
- Development of technical training programmes in landfill technology for the NZ Government and provision of in-country seminars related to solid waste management, landfill siting, appropriate technology and construction in northern Vietnam. Environmental Management Systems
- Kate Valley Landfill – Development of environmental risk model, contingent risk costs, closure costs, and aftercare requirements and costs, together with preparation of a financial assurance model for this newly commissioned regional landfill.
- Naboro Landfill, Suva – Project Manager for review of management and operations contract, environmental management plan – in particular leachate management impacts, leachate management proposals and general site management.
- Whitford Landfill Expansion, Project Director/Technical Manager for proposed 6 Mm3 expansion of landfill info quarry void. Work included

planning and coordination of groundwater, engineering, phasing, liner and final closure/landscape assessments. Preparation of concept designs and related design report and consent applications.

- Management of consent process and EIA preparation for a major sewage sludge and greenwaste composting plant, Wellington (1998).
- Technical reviewer and advisor for the development of the Taranaki regional solid waste strategy, 2003.
- Preparation of early closure scenarios and related risk profiles (landslide, earthquake, other) for Redvale Landfill, Auckland. Development of remediation options and related costs and formulation of financial bond model for ARC and RDC approval to cover contingent events and early closure.
- External review/auditor for financial model and bond fund for Waste Management NZ Ltd, Redvale Landfill. Following on from the bond formulation work, this role is as an independent assessor of the scope and adequacy of internal cost allocation, risk profiles and ongoing bond provision.
- Organochlorine landfill risk assessment (client confidential). Preparation of long-term landfill performance and risk profile. Quantitative assessment of facility risk and security and recommendations related to long-term management options and costs.
- Preparation of development risk model for the proposed Silverstream Landfill expansion with a focus on amenity management, seismic stability and risk and development of contingency plans, as well as formulation of specific design elements to address seismic and groundwater risk contamination and preparation of cost models for these scenarios.
- Preparation of financial and landfill aftercare funding models for several major landfills including Puwera, Bluegums, Bukit Tagar (Malaysia).
- Principal author/designer of the MfE Landfill Full Cost Accounting Guide.
- Preparation of preliminary risk model related to the Kate Valley site including issues such as seismic profile/risk, groundwater contamination risk and contingent events.
- Omarunui Landfill: Preparation of conceptual final grades and liner grades to combine existing partially filled Area A valley and proposed Area D. Together with hydrogeological assessment and consents for landfill expansion.
- CAE Guidelines: Task group member and technical author for the preparation of the revised Landfill Guidelines document published by CAE in April 2000 – responsible for the Landfill Siting and Design sections and peer review of the document.

Senior Geo-Environmental Engineer

- Evaluation of two existing municipal waste dumps, an asbestos dump and several ash dump areas and design of closure and environmental mitigation measures, for ECNZ, New Zealand.
- Review of the hydrogeology of the Las Pinas area, Manila, Philippines, in a study for Rohm and Haas on groundwater contamination.
- Investigation, design of remedial works and supervision of a M$1.5 site rehabilitation programme, for a chemically contaminated industrial site, Auckland, New Zealand.
- Hydrogeology review, field investigations, seepage analysis and detailed design for tailings impoundment and embankment underdrainage systems, together with review of leachate chemistry, design of laboratory test programme, analysis and reporting on drainage and construction material durability for Cyprus, Golden Cross Goldmining Project, Waihi, New Zealand.
- Project Manager for surface and groundwater hydrological investigation of the Chatham Islands peat deposits (15000 ha) for the Liquid Fuels Trust Board. Work involved surface hydrology network setup, surface and groundwater quality monitoring and evaluation, peat system hydrogeology evaluation, and reporting in relation to resource development.

- Hydrogeological investigations review of village well and sanitation systems, well design, infiltration gallery design and reporting on two 50,000 ha water supply schemes in the Tenghilan and Kemabong areas of Sabah, East Malaysia.
- Hydrogeological review and assessment of shallow wellfield capacity and water quality issues for new water supply assessment at DB Central Brewery, Maingatainoka.
- Programme Manager for hydrogeological investigation, analysis and computer modelling of nitrate and ammonia contamination of groundwater, Taranaki. Responsible for the design of groundwater contamination mitigation and monitoring programmes.
- Project Manager for hydrogeological investigation, analysis, and reporting on groundwater contamination for a major industrial site, South Auckland.
- Hydrogeological investigation, modelling and recommendations on remedial drainage works for a 35,000 irrigation scheme at Waiau, North Canterbury.
- Design of site investigation programme, groundwater monitoring and chemical testing to locate buried water dumps for an industrial site in Auckland. Design of contamination mitigation programme, waste recovery procedures and final disposal.
- Manager for surface water studies, analysis and reporting for opencast mining pre-feasibility/site ranking studies for three major lignite deposits in the South island, N.Z. Work involved design of sampling network, sampling programme management, data analysis and reporting.
- Design of 40,000 m3 capacity anaerobic waste stream treatment lagoons for AFFCO Ltd, Whangarei including water right and seepage assessments.
- Assessment of industrial contamination problems for several major industrial sites including evaluation of environmental impacts from heavy metals and timber treatment chemicals.

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- Evaluation of leaking chemical waste site and design of mitigation measures, Waikato (client confidential).
- Evaluation of containment options and development of the design for a secure waste containment cell for disposal of 14,000 tonnes of pre-treated chemical processing waste, New Zealand.
- Site selection studies and design of a 1mm3 sanitary landfill including site investigation, geohydrological studies and consent processes, Central Hawkes Bay, New Zealand.
- Regional site selection studies and feasibility design of a 12mm3 solid waste landfill, New Zealand.
- Design review, subconsultant co-ordination and preparation of development proposals and water right applications for an 80 ha, 21m m3 sanitary landfill for Waste Management Ltd. Work included all aspects of preliminary design, leading into final design detailing, together with preparation of all engineering, amenity management assessment, monitoring plan development and related evidentiary material and provision of expert witness on landfill design and construction (1985-1991).
- Hydrogeology review and preparation of evidence for tribunal hearings related to a proposed 15 mm3 sanitary landfill at Peach Hill, Drury.
- Engineering site selection, design of engineering works and leachate control measures for a 6mm3 industrial waste fill, N.Z. Steel Ltd, Glenbrook. Work included waste stream analysis, design of landfill layouts, preparation of a landfill management plan, design of surface water and groundwater protection measures and preparation of water right documentation.
- Project Director for a number of landfill closure studies including Barrys Point Landfill, 85 closed landfill sites for Auckland City Council and several closed sites in the Wellington Region.

Environmental Management Systems

Preparation of management plans for several landfills and for preparation of and comment on technical management guidelines for clean waste fill operations in the Auckland Region.

Geotechnics Ltd - QA/QC Contract Manager, Marsden Point Refinery Expansion Project

- Responsible for on-site management of a $2.5m engineering and testing contract. Work included specialist engineering advice and provision of investigation and testing services for materials, foundations and groundwater contamination problems. This included specialist input on exploration, testing and construction of 30 m deep bentonite - cement groundwater cutoff walls and dewatering product recovery measures.
- Responsible for detailed investigations into petrochemical seepage into underground structures including all aspects of safety procedures and permitting both within the operating refinery and on the expansion site.
- Design and operation of petroleum recovery system and monitoring procedures.
- Responsible for the subcontract administration and direct supervision of up to twenty scientists and technicians. Responsible for the programme of laboratory preparation leading to TELARC registration of the site laboratory.

Civil/Materials Engineer – Tonkin & Taylor Ltd

- Responsible for the detailed on-site management of the $6M site development contract relating to the expansion of the N.Z. Steel Mill at Glenbrook. Responsible for all construction supervision, and for the direction of 8 staff involved in technical aspects of contract management. Work supervised under this contract included 1 Mm3 cut/fill, extensive drainage, armco culverts, concrete box culvert construction, and construction of heavy duty roads, rail formations and hard-standing areas. Responsible for claims preparation and checking, contractor co-ordination, site safety, environmental management, and design change processes.
- Telarc Laboratory audit assessment responsible for compliance and system audits for a number of civil engineering testing laboratories throughout New Zealand.

Geotechnical Engineer – Tonkin & Taylor Ltd

- Direction of investigation, laboratory testing programme, material resource evaluation and geotechnical appraisal for water supply reservoir projects at Te Marua (Wellington) and Maitai (Nelson).
- Planning and supervision of installation of instrumentation for the Vaturu Dam, Fiji. Training of local technician staff in long term monitoring techniques.
- Design of hydraulic structures for the Kerikeri Irrigation Scheme, New Zealand, including spillways, weirs and intakes.
- Responsible for the supervision and quality control testing of earthworks and construction monitoring of settlement of a 5000 tonne fuel tank for BP (N.Z.) Ltd.
- Geotechnical investigations for the Aniwhenua Hydroelectric Scheme, Bay of Plenty including supervision of comprehensive laboratory testing of cement treated ash for canal lining including stress/strain and strength measurements, weathering resistance and freeze/thaw tests to USBR methods, scale tests on erosion properties and the evaluation and reporting on test results.
- Civil works design for a $0.5 m site development contract for Nissan Datsun at Wiri.
- Investigation for Waipori Falls powerhouse, Whangarei Port Development, Fergusson Wharf Extension and Reserve Bank Building.

Field Engineer/Technician - Geotechnics Ltd

- Responsible for supervision of technician and drilling staff and planning and direction of field investigation and laboratory testing programmes. Field assignments include the supervision and testing for several industrial site development contracts and the control of various site investigations throughout the North and South

Islands. Wide experience in many special types of field testing procedures including downhole permeability, well testing, Menard pressuremeter and nuclear density methods. Organisation of pile driving contracts, pile load testing and plate bearing tests.

- Extensive soils laboratory testing experience.

Qualifications

BSc, (Geology) (University of Auckland)
BE (Hons), Civil (University of Auckland)
Master of Environmental Eng. Sc. (UNSW)

CoP MSc Course, Public Health Engineering
NZIM Advanced Executive Programme 1995
APESA Short Course on Risk Management 1998
Contract Management and Legal Aspects of Contracts (IPENZ) 1999
EMS Auditor Training 2011
Proteus Leadership Programme, London University, 2011

Memberships

- Fellow, Institute of Engineers Australia
- Fellow, Institute of Professional Engineers, New Zealand
- Environmental Auditor – Industrial Facilities, Victoria (appointed until Dec 2018)
- Chartered Professional Engineer
- Registered International Professional Engineer
- Member, N.Z. Geotechnical Society
- National Vice President & member, Waste Management Association of Australia
- Life Member, Waste Management Institute of NZ (WasteMINZ)
- Member, Institute of Water and Environmental Management
- Member, Solid Waste Association of North America (SWANA)
- Member, International Solid Waste Association (ISWA)
- Member, Australian Institute of Company Directors
- Member, NZ Institute of Directors.

Publications

1. Eldridge S., Kortegast A.P., Bryce A., Peng S.F., *Key Considerations in Developing Effective Leachate Management Strategies,* WMAA 5th Landfill & Transfer Station Conference, Gold Coast, 2013.
2. Kortegast A.P., Shallard A., Eldridge S., Bryce A., Kavazanjian Jr E., *Landfill Cap Design for Runoff and Infiltration Control – An Innovative Solution,* ISWA World Congress, Florence 2011.
3. Eldridge S., Kortegast A.P.K, *Steep Wall Liner Systems*, WMAA Landfill Symposium, Adelaide 2011
4. Eldridge S., Eldridge J.J., Kortegast A.P., *Steep Wall Liner System Design*, Twelfth International Waste Management and Landfill Symposium, Sardinia, October 2009.
5. Eldridge S., Simpson J.M., Kortegast A.P., *Potential for Clean Development Mechanism and Voluntary Emission Reduction Projects within the Waste Sector in South Pacific Nations*, Twelfth International Waste Management and Landfill Symposium, Sardinia, October 2009.
6. Kortegast A. P., Eldridge S., Richards B.A, Yong S., Chock E., Bryce. A., Robinson H., Carville M., *The Bukit Tagar Sanitary Landfill, Malaysia – A Successful Model*, Proceedings of the ISWA World Congress, Singapore, November 2008.
7. Kortegast A.P., Eldridge S., Richards B., Yong S., Chock E., Bryce. A., Robinson H., Carville M., *Leachate Generation Analysis and Treatment at the Bukit Tagar Landfill, Malaysia*, Proceedings of the International Solid Waste Symposium, Sardinia, October 2007.
8. Eldridge J.J., Knox K., Chock E.T., Eldridge S., Richards B.A., Kortegast A.P., *Leachate*

Management Strategies at Large Tropical Landfills – A Case Study, Proceedings of the International Solid Waste Symposium, Sardinia, October 2007.

9. Kavazanjian, E. Jr., Dixon N., Katsumi T., Kortegast A.P., Legg P., Zanzinger H., *The Performance of Geosynthetic Barrier Systems for Landfills*, Keynote Paper to the 6th IGC International Conference on Geosynthetics, Yokohama 2006.
10. Kortegast A.P, Amputch A.R., Pinkham M., 2004; *Achieving a Regional Waste Disposal Solution – the Path to Opening Kate Valley Landfill*, Proceedings of Waste MINZ 2004 Conference, Auckland.
11. Kortegast A.P, Amputch A.R., Purchas C., 2003; *The MfE Landfill Full Cost Accounting Model – A Key Tool For Landfill Management*, Proceedings of the International Solid Waste Symposium, Sardinia, November 2003.
12. Kortegast A.P, Khire M.V, Rollan R.R, 2000; *Key Success Factors for Solid Waste Disposal Projects in the Philippines*, IWEM Conference on Waste Disposal in Asia, Manila, November 2000.
13. Kortegast A.P, Amputch A.R, Khire M.V, 1999; *Financial Modelling for Landfill Management*, Proceedings of Waste MINZ Conference, Queenstown 1999
14. Khire M.V, Kortegast A.P, Amputch A.R, *Field Data and Modelling of Leachate Generation Rates for Landfills*, Proceedings of WMINZ Conference, 1999.

For more information contact Tony Kortegast
Tel: +64 9 3556048
Email: tkortegast@tonkintaylor.co.nz

Appendix B: Documents Taken Into Account

- Waste Management Policy (Siting, Design and Management of Landfills), 14 December 2004
- Metropolitan Waste and Resource Management Recovery Strategic Plan, March 2009
- Draft Statewide Waste and Resource Recovery Infrastructure Plan 2013-2043, Victoria, September 2013
- Draft 2013 Consultation Draft Metropolitan Waste and Resource Recovery Strategic Plan, October 2013
- Statewide Waste and Resource Recovery Infrastructure Plan: Victoria 2015-44, released 12 June 2015
- Draft Metropolitan Waste and Resource Recovery Implementation Plan, December 2015
- EPA Publication 1518, Recommended separation distances for industrial residual air emissions, March 2013
- EPA Publication 788.3, Best Practice Environmental Management: Siting, Design, Operation and Rehabilitation of Landfills, August 2015
- EPA Publication 1625, Draft Guideline Assessing planning proposals near landfills, June 2016
- Golder Associates, Information to Support Works Approval Application, February 2016
- Appendix B – Figures, 4 February 2016
- Appendix H – Landfill Gas Management Plan, February 2016
- Appendix J – Air Quality Assessment, 18 February 2016
- Pacific Environment, Melbourne Regional Landfill Air Quality Assessment, 18 February 2016
- Pacific Environment, Melbourne Regional Landfill Addendum, 18 February 2016
- AECOM, Hydrogeological Assessment, 11 February 2016
- Request for further information from EPA Victoria, 18 March 2016
- Response to EPA Victoria RFI prepared by Golder Associates, 10 May 2016
- Updated Air Quality Assessment prepared by Pacific Environment, 13 May 2016
- Melton Planning Scheme Amendment C162: Mt Atkinson and Tarneit Plains Precinct Structure Plan
- Precinct structure plan (proposed incorporated document), April 2016

Appendix C: Landfill BPEM Guidance on Buffer Requirements

The relevant EPA guidance document related to landfill buffer requirements that links to EPA Publication 1518, is the Landfill BPEM. The Landfill BPEM is aimed at supporting the achievement of best practice landfill operation and management outcomes, with the aim of keeping landfill impacts on the receiving environment and communities within acceptable levels.

The Landfill BPEM) states at Section 5.1.5:

> *"…. Appropriate buffer distance must be maintained between the landfill and sensitive land uses (receptors) to protect those receptors from any impacts resulting from a failure of landfill design or management or abnormal weather conditions. These failures might constitute discharge from the site of potentially explosive landfill gas, offensive odours, noise, litter and dust. Features that could be adversely affected by landfilling operations include surface waters, buildings and structures and airports…."*

In Table 5.2, the Landfill BPEM addresses buffer requirements for Type 2 landfills, and subsequently states:

> *"….(The buffer is) set to manage:*
>
> - *Odour, which is of most concern during landfill operation*
> - *Landfill gas impacts, including the risk of explosion and/or asphyxiation. Landfill gas potential risk remain (sic) post closure and for at least 30 years post-closure.*
> - *While other potential impacts such as fire, litter, noise and safety risks exist, the buffers required for protection from these impacts fall within the buffer required for odour and landfill gas."*
>
> **[Added commentary - it is noted here that while the statement above refers to sensitive use. However, in relation to LFG, in practical terms it relates to any use involving buildings or structures]**
>
> *Buffers are measured from the sensitive land use to the edge of the closest cells.*

And in relation to the development of non-sensitive uses within the buffer zone:

> - *Proposed developments and any works within the recommended landfill buffer can pose a safety risk by potentially providing preferential pathways for landfill gas migration, or providing an environment where landfill gases can accumulate to dangerous levels. All buildings and structures should be considered, including:*
> - *buildings or structures used for sensitive or non-sensitive uses*
> - *change of use*
> - *infrastructure installation*
> - *installation of pipelines*
>
> **(emphasis added)**

Responsible planning authorities need to be provided with sufficient information by the proponent to satisfy them that the proposed development or rezoning will not be adversely affected by its proximity to the landfill site.

Where the proposed development or planning scheme amendment would have the effect of allowing development that encroaches into the recommended landfill buffer area……., EPA recommends that the planning or responsible authority require an environmental audit be conducted under Section 53V of the EP Act. The audit must assess the risk of harm to the proposed development posed by the potential offsite migration of landfill gas and amenity impacts resulting from the landfill.

Land within buffer areas may be used for <u>non-sensitive uses</u> provided that the use is not adversely affected by landfilling.

(emphasis added)

Land within buffer areas may be used for non-sensitive uses provided that the use is not adversely affected by landfilling. Therefore it is <u>better</u> that this land is owned or at least under the control of the landfill operator….

(emphasis added)

Landfill operators should develop contingency plans to show how the landfill could be developed and operated to ensure that the safety and amenity of the affected land would still be preserved, should the buffer be encroached.

<u>The buildings and structures buffer distance applies to any building or structure</u> (including subsurface structures such as stormwater drains or service trenches) located near a landfill and is there to provide a protection zone around a landfill for subsurface landfill gas migration.

(emphasis added)

<u>In the event that a building or structure is located within the recommended buffer, monitoring will be required in accordance with EPA landfill gas risk assessment requirements. An environmental audit is recommended where buildings with enclosed spaces that people will enter are proposed to be constructed within the buffer</u>.

(emphasis added)

Appendix D: MPA response to PSP Submission prepared by Tract Consultants

METROPOLITAN PLANNING AUTHORITY

partners in planning and infrastructure coordination

11 August 2016 Ref: COR/16/8117

Adam Terrill
Tract Consultants
PO Box 181
Richmond Vic 3121

Dear Adam,

Re: Amendment C162 to the Melton Planning Scheme – Mt Atkinson and Tarneit Plains Precinct Structure Plan

Thank you for your submission received on 30 May 2016, in regards to the abovementioned amendment. We are currently in the process of reviewing each submission received.

The MPA has considered your submission and provided a detailed summary and the MPA's response and actions attached to this letter.

If you would like to meet with the MPA to further discuss your submission and the MPA response, please contact Ben Hawkins (ben.hawkins@mpa.vic.gov.au), Senior Structure Planner or Nick Power (nicholas.power@mpa.vic.gov.au) Senior Urban Planner on (03) 9651 9600.

If you consider the issues raised in your submission to be resolved, please inform the MPA using the contact details provided.

If you wish to have your submission referred to Planning Panels Victoria, please contact the MPA using the contact details provided.

Yours faithfully,

Martina Johnson
Director Greenfields

State Government Victoria

AMENDMENT C162 - 1082 Mt Atkinson 1085 Tarneit Plains. Version: 1 - Public Exhibition - closing date 30/05/16					
Item	Affected PSP Property/properties	Issue raised	Change to the amendment requested?	MPA response	Action August 2016
PSP					
1					
1.1	All relevant properties	Request that the last paragraph of Section 2.2 referring to landfills gas is removed and replaced with specific provision in the UGZ9 addressing potential landfill gas migration in accordance with BPEM 'Siting, Design, Operation and Rehabilitation of Landfills (EPA,2015) modelled on the Woollert PSP.	Yes	Disagree – the landfill expansion is yet to be approved. In accordance with the BPEM Best Practice Siting Considerations, the Required Outcomes of the BEPM include: Consider the most appropriate landfilling type to meet the requirements imposed by local conditions (Appendix C of BPEM 5.1 – Screening for Potential Landfill Sites). The MPA considers that putrescible waste is not the most appropriate landfilling type immediately adjacent to the PSP area, which is within a State significant industrial area (Plan Melbourne). As noted in the BEPM, it is better for land within a buffer to be owned or controlled by the landfill operator and the MPA considers that greater importance should be placed on achieving a solution that avoids putrescible fill adjacent to the Hopkins Rd boundary. In the event that putrescible fill is approved adjacent to the boundary, the MPA would expect that the approval should be conditional on the operator of the landfill satisfying the EPA through a risk assessment and risk management approach that a lesser buffer which doesn't encroach on the PSP land, is appropriate. The BEPM notes at 5.1.5 (buffer distances) that lesser buffer distances may be applied, i.e. lesser than the 500m 'off the shelf' landfill gas buffer, "Subject to an evaluation demonstrating that the environment will be protected and the amenity of the sensitive areas will not be adversely affected, lesser buffer distances may be applied subject to a risk assessment that considers design and operational measures. As part of a risk management approach, additional design or operational measures will be required to ameliorate the risks associated with a reduction of the buffer distances identified in Table 5.2."	Not agreed to make change to amendment documentation
1.2	All relevant properties	Request that R36 be edited so that the operator of the landfill and the EPA must be consulted during the preparation of the Hopkins Road UDF	Yes	Don't agree to this point as the extent of the landfill is unknown. Regardless, the Urban Design Framework will establish the urban design responses to the PSP and the planning controls established in the schedule to the Urban Growth Zone. Please specify what input the landfill operator or the EPA would have to the urban design framework? At this stage the MPA do not agree to formalising notice provisions	Not agreed to make change to amendment documentation
1.3	All relevant properties	Propose that Hopkins Road be widened on the west side of the existing road	Yes	Hopkins Road will be delivered within the exiting road reserve in the interim. When the ultimate cross section is required, it will be delivered by VicRoads, noting that one of the key considerations for the timing of delivery will be the quarry operations as land within the Deer Park quarry will be required to facilitate the future road widening.	Not agreed to make change to amendment documentation
1.4	All relevant properties	Request that the quarry sensitive use buffer as shown on various plans in the PSP be renamed 'quarry and landfill sensitive use buffer.'	Yes	The quarry buffer is taken from the extent of the quarry works approval. The extent of the works approval for the landfill is unknowns so any future buffer extent may differ.	Not agreed to make change to amendment documentation

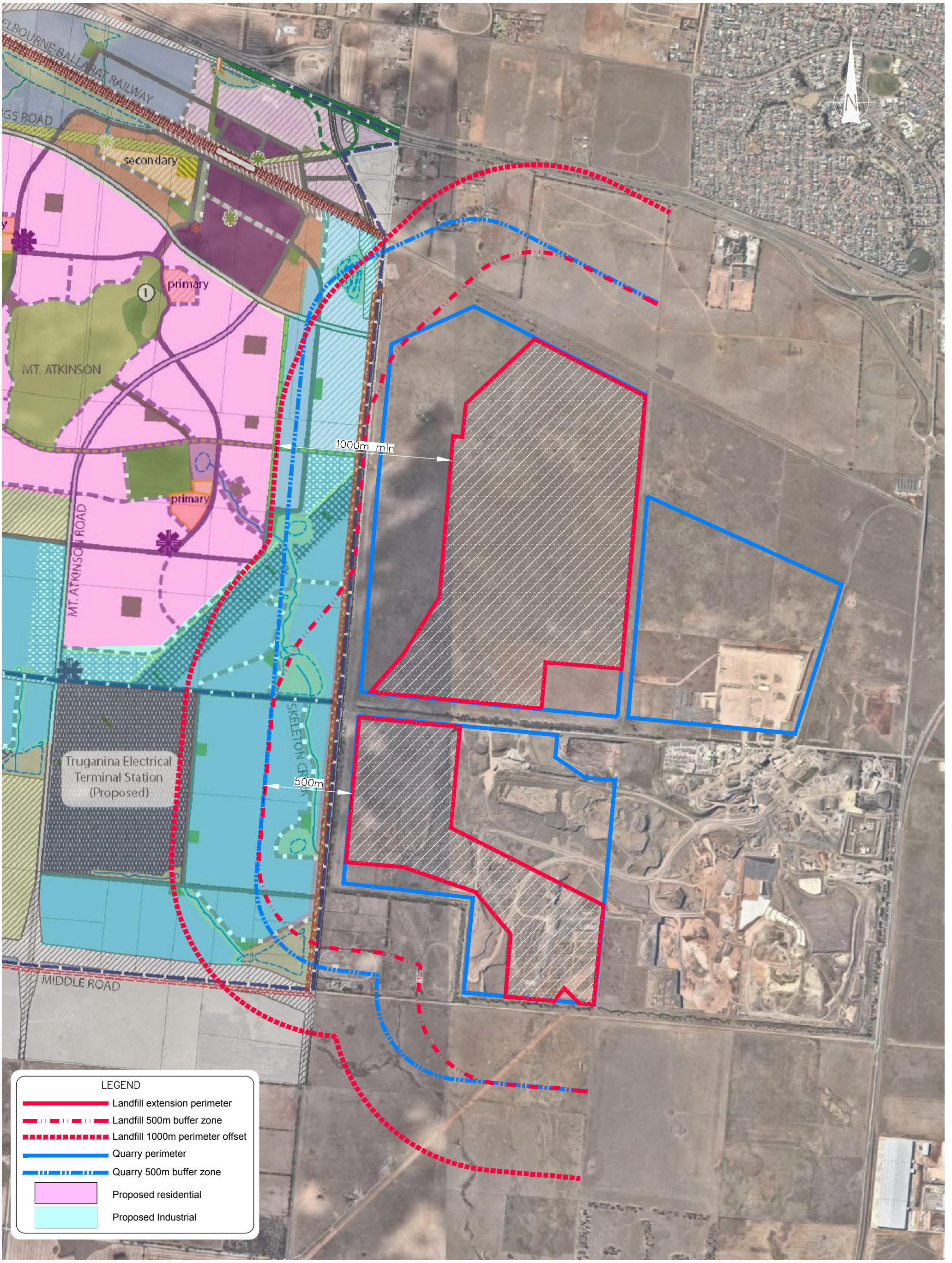
State Government Victoria

Level 25, 35 Collins Street
Melbourne Victoria 3000
Australia

Telephone: 03 9651 9600
Facsimile: 03 9651 9623

AMENDMENT C162 - 1082 Mt Atkinson 1085 Tarneit Plains. Version: 1 - Public Exhibition - closing date 30/05/16					
Item	Affected PSP Property/properties	Issue raised	Change to the amendment requested?	MPA response	Action August 2016
1.5	All relevant properties	Add new requirement at section 3.2.3 to require greater consideration of landfill "*Allocation of land uses, building design and interface treatments must have regard to potential amenity impacts of the landfill on the proposed use or development and the potential for the proposed use or development to impact on the operation of the landfill*"	Yes	Until the extent of the landfill is known, the MPA don't agreed with additional requirements to address it,	Not agreed to make change to amendment documentation
Background Report					
2					
Schedule 9 to the Urban Growth Zone					
3					
3.1	All relevant properties	Request that Table 2 of the UGZ9 be amended to add missing sensitive uses to the list of prohibited uses for land within the sensitive use buffer	Yes	Until the extent of the landfill is known, the MPA would not consider amending planning controls to respond to amenity impacts from the landfill.	Not agreed to make change to amendment documentation
3.2	All relevant properties	Request that a new Specific Provision is added to UGZ9 to trigger a planning permit for use of land (food preparation, manufacturing or warehousing, office, food & drink premises, office, retail, shop) within the sensitive use buffer with an application requirement for a reverse amenity and buffer assessment	Yes	Until the extent of the landfill is known, the MPA would not consider amending planning controls to respond to amenity impacts from the landfill.	Not agreed to make change to amendment documentation
3.3	All relevant properties	Add the EPA and the Department administering the Environmental Protection Act 1970 (Department) to clause 2.10 of the UGZ9 Specific Provision - referral of applications- Ravenhall Quarry- and add the use of land to the application types.	Yes	Until the extent of the landfill is known, the MPA would not consider amending planning controls to respond to amenity impacts from the landfill.	Not agreed to make change to amendment documentation
3.4	All relevant properties	proposes the removal of normal notice and review rights be reversed proximate to the landfill so that the operator of the landfill is made aware of applications, and has access to appeal rights	Yes	Disagree. Until the extent of the landfill is known, the MPA would not consider providing notice provisions to respond to amenity impacts from the landfill.	Not agreed to make change to amendment documentation

Appendix E: Figures



SCALE 1: 20,000

0 200 400 600 800 1000 (m)

Aerial photo sourced from Nearmaps

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SCALES (AT A3 SIZE) 1: 20,000		
PROJECT No. 5377		

CLEANAWAY

MELTON PLANNING SCHEME AMENDMENT C 162: BUFFER ZONE ASSESSMENT

Buffer Zones and Neighbouring Land Uses

FIG. No. Figure 1

REV. 0