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17 August 2017

The Hon Paul Green MLC
Planning and Environment Committee
NSW Legislative Council
Parliament House
6 Macquarie Street
Sydney NSW 2000

Dear Sir

NSW Parliamentary Inquiry - 'Energy from Waste' Technology
Supplementary Submission on behalf of Jacfin Pty Ltd

We refer to Submission No. 173 by Jacfin Pty Ltd (***Jacfin***) to the Committee dated 28 May 2017.

Jacfin was invited by the Committee to make a supplementary written submission after notice was given that Richard Lancaster SC could not appear on behalf of Jacfin at the public hearing on 7 August 2017.

The supplementary submission follows.

Terms of Reference

1 The Terms of Reference dated 6 April 2017 state that the Committee is to inquire into and report on matters relating to the waste disposal industry in New South Wales, with particular reference to 'energy from waste' technology. Jacfin's submissions focus on:

- *factors which need to be taken into account within regulatory and other processes for approval and operation of 'energy from waste' plants – term of reference (d)*
- *any other related matter – term of reference (e)*

Jacfin Pty Ltd

2 Jacfin is a family owned Australian proprietary company that owns and develops land in Western Sydney.

3 Jacfin owns land immediately adjacent to the site of the proposed Next Gen energy from waste facility at Eastern Creek (***Proposed EfW Facility***). The Proposed EfW Facility was referred to in the Honourable Penny Sharpe MLC's media release dated 6 April 2017 regarding the Inquiry. The relevant land owned by Jacfin and the location of the Proposed EfW Facility is shown on the map in the Attachment E, p 2.

4 Jacfin made a submission to the Committee on 28 May 2017 (Submission No 173), which attached earlier submissions Jacfin had made to the Greater Sydney Commission (about land use planning in the Western Sydney Employment Area) and to the Department of Planning (about the Proposed EfW Facility). For convenience, that submission and its annexures are reproduced at Attachment A.

5 The other attachments are identified and explained in this submission, for the assistance and information of the Committee.

Summary

6 In summary:

(a) The NSW statutory assessment process and regulatory framework for 'energy from waste' facilities is deficient by international standards. The potential for serious environmental harm from such facilities warrants extreme caution. Approval of such development would be premature before the introduction of an appropriate statutory framework.

(b) Careful identification of areas appropriate for energy from waste plants is required to avoid serious land use planning conflicts. In the case of the Proposed EfW Facility at Eastern Creek, the location is inconsistent with decades of careful planning for the use of this part of Western Sydney as employment lands.

(c) In particular, the Proposed EfW Facility:

(i) is prohibited development in the IN1 General Industrial zone under the State *Environmental Planning Policy (Western Sydney Employment Area) 2009* (**WSEA SEPP**);

(ii) would be inconsistent with the objectives of the WSEA SEPP and with long-standing land use planning in the Eastern Creek area;

(iii) is of unprecedented scale in Australia and proposes the use of feedstock for which there is no precedent;

(iv) the assessment reports upon which the Next Gen proposal relies are inadequate; and

(v) has consistently been opposed on environmental, health and planning grounds not only by concerned individual and corporate neighbours, but also by the Environment Protection Authority and Health NSW.

(d) Jacfin submits that the Committee should consider making recommendations for the implementation of the following planning controls:

(i) specific prohibition of energy from waste facilities in residential, commercial and employment land zones;

(ii) specific prohibition of energy from waste facilities within a certain distance of the boundary of any existing residential, commercial and employment land zones;

(iii) restriction of energy from waste facilities to areas zoned for 'Heavy Industry' (IN3 Standard Instrument) or, alternatively, allow such facilities only in special use zoning areas outside of the Sydney air shed that may be more appropriate for waste to energy facilities; and

(iv) requiring a Level 3 Preliminary Hazard Analysis under SEPP 33 to be undertaken in all applications in relation to any energy from waste facility.

Energy from Waste Technology

7 The term 'Energy from Waste' is a generic descriptor for industry which extracts energy from waste utilising different technological processes. The technologies differ in terms of age, efficiency and environmental impact. The impacts of each vary significantly.

8 The technologies currently employed in EfW facilities worldwide include: gasification; pyrolysis; anaerobic digestion; incineration; and landfill.

9 Incineration is the process to be employed by the Proposed EfW Facility. Incineration is not novel and has long been associated with unacceptable environmental impacts capable of significant harm to human health. Of the available technologies, incineration has a low energy recovery rate of around 30%, being only marginally better than that achieved by landfill.

10 The scale of the Proposed EfW Facility is very significant and of itself a cause for concern. It will have a capacity of approximately 1,105,000 tonnes per annum, making it by far the largest such facility in (or proposed for) Australia and approximately equal in capacity to the largest waste incinerator in the world (the AEB facility in the Netherlands).

11 The Proposed EfW Facility intends to operate by accepting and incinerating waste from a unique and untested combination of waste sources. That is, the "feedstock" for the facility is unlike that utilised by any other energy from waste plant referenced by the proponent: see the summary in the GHD report at Attachment I, pp 7-8.

12 The GHD Report (Table 1 on p 7) shows that unlike the 11 reference sites used for analysis by Next Gen's consultants, the Proposed EfW Facility has a very different mix of sources of waste. Many of those other sources of waste have, for example, higher concentrations of chlorine than municipal solid waste. GHD concludes in section 3.5.2 on p 8 that "*there is no common link between the feedstock of the reference sites and the proposed facility. Concentration estimates for the proposed facility are based on stack testing data for existing reference facilities. This is not an 'apples to apples' assessment as indicated by the table above. This is considered a major downfall in the assessment*."

13 In other words, because of the unique feedstock mix, there is no reliable international reference point from which one can reliably predict the actual emission concentrations of chemicals from the exhaust stacks. In the face of such uncertainty and given the potential injury to the environment and human health, no sound planning process could allow the development of the Proposed EfW Facility to proceed at the present time.

Environmental Assessment Regime – Prohibited Development

The current regime

14 For the purposes of environmental impact assessment in New South Wales, energy from waste plants, such as the Proposed EfW Facility, are assessed as (potentially) offensive or hazardous industries. Under the current planning controls, detailed assessment of these activities is necessary to determine whether classification as offensive or hazardous industry is appropriate.

15 Offensive industries and hazardous industries are prohibited development in the majority of the land use zones established under environmental planning instruments (LEPs and SEPPs) across NSW. It has long been acknowledged that offensive and hazardous industries should not be proximate to residential areas, commercial areas, retail precincts and any other area in which significant numbers of people live or work.

16 This general assessment regime applies in the case of the Proposed EfW Facility at Eastern Creek. Offensive and hazardous industries are prohibited in the IN1 General Industrial Zone of the Western Sydney Employment Area, being the zoning applicable for the site of the Proposed EfW Facility. Jacfin considers that it is very important to acknowledge and respect the Aims of the *Western Sydney Employment Area SEPP* and the zoning controls for "*General Industrial*" employment lands: see Attachment C, pp 2-5, which shows:

(a) The Aims of the WSEA SEPP are set out in clause 3 (p 2). Clause 3(1) states that the aim is to "*protect and enhance*" the land to which the SEPP applies "*for employment purposes*";

(b) Clause 3(2) sets out six important particular aims. The WSEA SEPP aims to promote economic development and the creation of employment "*by providing for development including major warehousing, distribution, freight transport, industrial, high technology and research facilities*" (clause 3(2)(a));

(c) The Land Use Table for zone IN1 General Industrial is set out on pp 4-5. The six bullet-point objectives are important, emphasising the need to ensure the development and sustainability of other land uses and the environment. Item 3 of the land use table shows the uses that are permitted with consent, which include "*Industries (other than offensive or hazardous industries)*". "*Industry*" is defined on p 20 of Attachment C. Item 4 on p 5 states that development not specified in Item 2 or 3 is prohibited;

(d) Accordingly, "*offensive or hazardous industries*" are prohibited in zone IN1; so too are types of industry that do not fall within the SEPP's definition of industry.

17 The relevant definitions in the WSEA SEPP (Attachment C, pp 19-20) reflect the definitions in *State Environmental Planning Policy No 33—Hazardous and Offensive Development* (**SEPP 33**) (Attachment C, p 3). These are the definitions:

> ***hazardous industry*** means development for the purpose of an industry that, when the development is in operation and when all measures proposed to reduce or minimise its impact on the locality have been employed (including, for example, measures to isolate the development from existing or likely future development on other land in the locality), would pose a significant risk in the locality:
>
> (a) to human health, life or property, or
>
> (b) to the biophysical environment.

and

> ***offensive industry*** means any development for the purpose of an industry that would, when the development is in operation and when all measures proposed to reduce or minimise its impact on the locality have been employed (including, for example, measures to isolate the development from existing or likely future development on other land in the locality), emit a polluting discharge (including, for example, noise) in a manner that would have a significant adverse impact in the locality or on the existing or likely future development on other land in the locality.

Problems with the current regime

18 Under the current regime, deciding whether an energy from waste facility is defined as a hazardous or offensive industry requires an assessment of the proposal and what its impact will be when "*all measures proposed*" by the proponent are taken into account. This requires a complex, time consuming and expensive assessment of a proposal before it is known whether or not that proposal is prohibited. Usually particular land uses are prohibited by reference to the description of the land use, precisely because it is much more straightforward, clear and predictable for regulators, developers and members of the community.

19 The current regime also means that any person who wishes to object to an energy from waste proposal on the ground that it is prohibited must undertake a full assessment of the proposal. Such a requirement is neither realistic nor feasible for a person or company of ordinary means, particularly because it requires an assessment by a range of scientific and technical experts. It is also wasteful of public resources to require government regulators to undertake a full assessment simply to determine whether the proposal is prohibited.

20 Regulation of energy from waste facilities should acknowledge that they are known to involve a particularly intense use of land that is offensive and potentially hazardous accordingly to ordinary community standards. It is not an appropriate way to plan for the development of energy from waste facilities simply to include them in a catch-all 'industrial' category, which includes a very wide range of development.

21 Energy from waste facilities should be specifically regulated and should be expressly prohibited in or near employment lands, commercial land and residential land.

Proposed EfW Facility

Proposed EfW Facility at Eastern Creek – inconsistent with land use planning

22 The Eastern Creek area of Western Sydney has for a long time been earmarked for urban development as employment lands – that is, a variety of land uses that can satisfy demand for job-generating developments.

23 The area was included within the area of *State Environmental Planning Policy No 59—Central Western Sydney Economic and Employment Area* (**SEPP 59**), which was introduced in 2000. SEPP 59 has since been repealed – it was replaced in 2009 by the WSEA SEPP.

24 It is useful to understand the broader context of the land on which the Next Gen facility is proposed. The maps at Attachment E show the area of the Western Sydney Employment Lands and nearby areas of Western Sydney, as follows:

(a) Page 1 is the map of the area of the area of the Western Sydney Employment Lands. It is divided into 11 precincts. Precinct 2 is the Eastern Creek, which has its northern boundary at the M4 Motorway and its eastern boundary at Wallgrove Road;

(b) Page 2 is the zoning map for the northern precincts of the WSEA. As marked on the map, each of the Proposed EfW Facility and Jacfin's land is zoned IN1 General Industrial;

(c) Page 3 is a land zoning map published under the *Blacktown Local Environmental Plan 2015*. That LEP does not apply to Eastern Creek, but the map shows the close proximity of very substantial areas of residential development (zone R2 – Low Density Residential) and areas zoned B5 Business Development immediately to the north of the motorway in Minchinbury and Mount Druitt;

(d) Page 4 is a land zoning map published under the *Penrith Local Environmental Plan 2010*. That LEP does not apply to Eastern Creek but, again, it shows the close proximity of very substantial areas of residential development (zone R2)in Erskine Park and St Clair; and also public recreation land (zone RE1) and environmental conservation land (zone E2).

25 Under SEPP 59 planning for the Eastern Creek Precinct was described in an "*Employment Lands Precinct Plan – Eastern Creek Precinct*": Attachment D. The area is shown in Figures 3 and 4 of the Plan. That document also describes the development of the area for employment uses in stages (including after rehabilitation of quarry sites): see section 2.4. The economic context and employment focus is emphasized in section 3.1 of the Plan.

26 The WSEA SEPP further developed those plans in and after 2009, as set out in the Aims and zoning controls referred to above.

27 The location of the Proposed EfW Facility at Eastern Creek would be inconsistent with many years of careful planning for use of this part of Western Sydney as employment lands. Contrary to the objectives of the IN1 General Industrial zone, an energy from waste facility would prejudice the development and sustainability of other employment-generating enterprises in the area. One objective of the zone is to "*minimise any adverse effect of industry on other land uses*", which clearly

indicates a hierarchy in which industrial uses in the area are permitted only if entirely consistent with other employment-generating development.

28 No energy from waste plant should be permitted in an employment lands precinct because of the likelihood of land use conflict and prejudice to other forms of urban development. The community, developers and regulators have all come to expect some level of predictability and certainty in the planning and development of this part of Western Sydney. The Proposed EfW Facility is a wild card that will defeat the careful planning of the region over the last two decades.

29 Land that is set aside and intended to be used for urban development must be protected from present and future incursions by development that is incompatible with environmental and human health and contrary to years of planning. The Proposed EfW Facility is a prominent and concerning example. The land in Eastern Creek has been specifically set aside as employment land, recognising the need to address the growth in the population and workforce in the future development of Western Sydney.

30 Many people live and wish to work in Western Sydney and they deserve well-planned development that does not pose unnecessary risks to environmental and human health.

31 However, facilities such as the Proposed EfW Facility are still proposed to be developed within close proximity of residential and employment areas. The inadequacy of the current regulatory framework is demonstrated by the Proposed EfW Facility, which, despite the sustained objection of local councils and the NSW Environment Protection Agency and NSW Health, remains under consideration and assessment. Jacfin notes the evidence given by representatives of the Department of Planning and Environment to the Committee in response to Questions on Notice, that the Department has not recommended a development for approval where the EPA and NSW Health have maintained objections – those bodies maintain their objection to the proposal.

Environmental Planning and Assessment Act 1979 – Draft Bill

32 Jacfin understands that notice of a Bill to amend the *Environmental Planning and Assessment Act 1979* (NSW) has been put forward in the Legislative Council. We have not reviewed the Bill, but understand that it proposes the imposition of a 15 kilometre buffer between energy from waste facilities and residential development. Jacfin considers that the intent of the Bill – separation of energy from waste facilities from urban residential development – is necessary and appropriate.

33 However, Jacfin respectfully submits that a 15km buffer is not sufficiently targeted so as to manage the risks associated with these facilities. Rather, Jacfin submits that the Committee should consider making recommendations for the following controls:

(a) specific prohibition of energy from waste facilities in residential, commercial and employment land zones;

(b) specific prohibition of energy from waste facilities within a certain distance of the boundary of any existing residential, commercial and employment land zones;

(c) restriction of energy from waste facilities to areas zoned for 'Heavy Industry' (IN3 Standard Instrument) or, alternatively, allow such facilities only in special use zoning areas outside of the Sydney air shed that may be more appropriate for waste to energy facilities; and

(d) requiring a Level 3 Preliminary Hazard Analysis under SEPP 33 to be undertaken in all applications in relation to any energy from waste facility.

Proposed EfW Facility – size and components

34 Jacfin's previous submission addressed the extravagant bulk and scale of the facility, which will be over 60m high in parts, with exhaust stacks over 100m high. It will be prominent and clearly visible from many locations in the region.

35 Two particular matters are added in this submission.

36 First, the components of the facility are shown in two pages at Attachment F that have their source in documents of the proponent. It clearly should be regarded as a form of heavy industry, with the added challenge of the 'product' for incineration being a wide range of waste, including plastics and general building and construction waste.

37 Secondly, Jacfin has retained a consultant to examine the visual impact of the Proposed EfW Facility. A series of visual montages has been prepared from the perspective of Jacfin's land: Attachment G. Even though the visual montages are from a perspective that is hundreds of metres away, the proposal looms very large and would visually dominate the locality.

38 During the preparation of the visual montages, it was revealed that Next Gen's montages are very inaccurate in many respects. Examples of the proponent's inaccurate and unreliable montages are included in Attachment H. As the legends in the montages indicate, the orange forms are the outline of the proposed development in montages prepared for and submitted by Next Gen. The green forms are the montages prepared by Urbaine for Jacfin, which are aligned to the site plan and verified to prominent local trees and landmarks. There are very substantial differences, with the images submitted by the proponent consistently erring in a way that significantly understates the visual effect of the proposal.

Proposed EfW Facility – environmental and health impacts

39 Jacfin considers that its objection to the Proposed EfW Facility is soundly based on impartial advice from expert consultants. The particular example at Eastern Creek also provides more general information about the risks to the environment and human health from such facilities.

40 Jacfin provides for the Committee's consideration the assessments of the following independent experts which assess the impacts of the Proposed EfW Facility to:

(a) human health risk – **GHD HHRR report** at Attachment I, including:

(i) the air modelling carried out by the proponent's consultants is based on assumptions about the process and input of waste that are drawn from overseas reference sites that operate very differently, in particular because the 'feedstock' is so different (pp 1-2 and 8-9).

(ii) Because of the "*substantially different profile*" of waste to be incinerated in the Proposed EfW Facility, with potentially more chlorine, the production of dioxins and furans in the omissions could be higher than presently estimated (p 2 and see the table on p 7 and analysis on pp 8-9);

(iii) modelled deposition rates (from stack emissions) appear to have been underestimated by Next Gen's consultants by a factor of 365 (pp 2 and 11-12);

(iv) there should be a revised health risk assessment prepared by Next Gen (pp 18-19) if the application is to go forward.

(b) hazards risk (including fire and explosion) – **Systra report** at Attachment J, including:

(i) applying the Department of Planning's multi-level risk assessment methodology, and given the location and nature of the Proposed EfW Facility, the proposal should be assessed after a Level 3 – Quantitative Risk Analysis has been undertaken (see Conclusion [1] on p 3 and the Conclusions at pp 33-34);

(ii) the proponent's consultants have only prepared a Level 2 analysis, which is insufficient because "*all potential risks … have not been considered, let alone quantified*" (p 10);

(iii) there are serious risks and hazards that are not addressed at all, or not considered sufficiently, in the consultant's work (pp 3-4) including waste stockpile fires (see p 5);

(iv) there are key risks that are unacceptable and require the proposal to be rejected on risk grounds (see pp 4 and the section at pp 30-32), including

(A) individual fatality risk;

(B) heat flux risk (waste fires on the hardstand areas); and

(C) toxicity risk from waste stockpiles.

(c) odour emissions – **GHD Odour report** at Attachment K:

(i) GHD undertook its own odour dispersion modelling;

(ii) GHD predict exceedance of the NSW EPA odour criteria at numerous sensitive receptors (see pp 7-9, in particular, the shaded boxes in Table 3 that show where the exceedances occur). The location of the receptor numbers in the Table is shown on the marked-up aerial photograph on p 9. For example, receptors 15, 16 and 17 are on the boundary of Jacfin's land and each of those receptors will have one or more significant odour exceedances;

(iii) GHD concludes that "*the Next Gen Facility (if approved) would not achieve compliance with the odour impact assessment criteria*" (as set out in the second last paragraph on p 10)

(d) visual impact – visual montages at Attachments G and H.

41 In summary, the expert assessments show that:

(a) the risks associated with the Proposed EfW Facility are very serious, but not fully or accurately assessed by the proponent;

(b) those risks are incapable of being 'managed', such that the proposal presents an unacceptable risk to human health and the environment; and

(c) the development is prohibited as an offensive or hazardous industry.

42 In the broader context, the expert assessments also highlight the inadequacies of the current statutory assessment regime and evince the need for regulatory reform.

Jacfin thanks the Committee for its consideration of its submissions.

Yours faithfully

[redacted]

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Atts.

Attachment A – Submission No. 173 to the Parliamentary Inquiry dated 28 May 2017. Comprising 89 pages.

Attachment B – *State Environmental Planning Policy (Western Sydney Employment Area) 2009* (NSW). Comprising 23 pages.

Attachment C – *State Environmental Planning Policy No 33 – Hazardous and Offensive Development*. Comprising 5 pages.

Attachment D – Blacktown City Council Employment Lands Precinct Plan – Eastern Creek Precinct (extract only). Comprising 28 pages.

Attachment E – Maps of the Western Sydney Employment Area and surrounds. Comprising 4 pages.

Attachment F – Site Layout Plans of the Proposed Eastern Creek EfW Facility. Comprising 2 pages.

Attachment G – Visual Montages of Proposed Eastern Creek EfW Facility by Urbaine. Comprising 6 pages.

Attachment H – Analysis of Visual Impact Assessment for Proposed Eastern Creek EfW Facility by Urbaine. Comprising 7 pages.

Attachment I – Human Health Risk Review by GHD (3 August 2017). Comprising 37 pages.

Attachment J – Hazards Risk Review by Systra Scott Lister (3 August 2017). Comprising 42 pages.

Attachment K – Odour Review Addendum by GHD (3 August 2017). Comprising 17 pages.

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28 May 2017

Planning and Environment Committee
NSW Legislative Council
Parliament House
6 Macquarie Street
Sydney NSW 2000

Dear Committee

NSW Parliamentary Inquiry - 'Energy from Waste' Technology
Submission on behalf of Jacfin Pty Ltd

We refer to the Terms of Reference of the Committee's inquiry dated 6 April 2017 and make this submission on behalf of our client, Jacfin Pty Ltd (***Jacfin***).

Jacfin's submission primarily relates to Term of Reference (d), namely, the factors which need to be taken into account within regulatory and other processes for approval and operation of 'energy to waste' facilities.

Jacfin is the owner of approximately 100 hectares of land at Eastern Creek in the Western Sydney Employment Area (***WSEA***) and is progressively developing that land for employment purposes consistent with the zoning under *State Environmental Planning Policy (Western Sydney Employment Area) 2009* (***WSEA SEPP***).

A development application has been made to establish a new 'waste to energy' facility immediately adjacent to Jacfin's land (***Next Gen Proposal***).

The assessment process for the Next Gen Proposal has highlighted a number of issues associated with the current regulatory framework:

- First, as an "offensive industry" for the purposes of the *Environment & Planning & Assessment Act* (***EP&A Act***), the Next Gen Proposal is prohibited under the IN1 General Industrial Zone applicable to the land. The Next Gen Proposal is also broadly inconsistent with the objectives for the zone under the WSEA SEPP, in that the proposed facility may prejudice the sustainability and viability of other enterprises and development in the WSEA and the environment.

  Notwithstanding the prohibition and the inconsistency with zoning objectives, the Next Gen Proposal continues to be subject of assessment by government consent authorities and related approval agencies. That assessment has necessitated the authorities engaging consultant experts to provide independent advice on how to assess the impacts of the Next Gen Proposal.

- Secondly, the quality of the environmental impact statement and other materials supporting the application has left the authorities and community with insufficient information to enable informed consideration of the impacts of the Next Gen Proposal.

  These deficiencies are presumably the reason why Government decided it was necessary to engage independent experts to advise on the assessment of the Next Gen Proposal. It also illustrates that

the existing regulatory framework does not adequately identify the impacts and other factors against which such a proposal should be assessed (for example, in regulatory standards, guidelines and policy statements regarding 'energy from waste' technology).

Jacfin has made submissions to the Department of Planning (***Department***) raising concerns about the potential adverse environmental impacts of the Next Gen Proposal and the inappropriateness of such use on the subject land. Copies of those submissions are ***attached*** (see Attachments A & B) and are supported by independent technical reports relating to air emissions, noise impacts and potential human health risks.

In addition to the impacts of the proposal on the environment and surrounding land uses, Jacfin believes the factors which should be given determinative weight when assessing 'waste to energy' facilities are:

- consistency of the proposal with the mandated or preferred land uses and strategic objectives for the area, as articulated in relevant planning instruments; and
- the impact of the proposal on the long term sustainability and viability of other existing and preferred future 'higher' land uses in the area.

Jacfin recently made a submission to the Greater Sydney Commission (***Commission***) about the proposed *Towards our Greater Sydney 2056,* the Draft West Central District Plan and Draft West District Plan (***attached***; see Attachment C).

Relevantly, the Commission's draft documents advocate the concept of the '30-minute city' and locating housing closer to employment areas like the WSEA. The draft documents also acknowledge the changing nature of development in employment areas and implies zoning in employment areas should support a greater diversity of land uses and preserve 'upzoning' opportunities for the future.

Jacfin is concerned that the location of the Next Gen Proposal at Eastern Creek will compromise the strategic planning objectives of the WSEA under the WSEA SEPP and the Commission's draft documents. This, in turn, has the very real potential to undermine investor confidence to the determent of Western Sydney.

More generally, the location of 'waste to energy' facilities in areas earmarked for employment purposes, or areas capable of supporting employment or residential uses in the future, could compromise the strategic planning objectives for the Greater Sydney Region and otherwise give rise to land use conflicts. This outcome would not promote the orderly and economic development of land, which is a fundamental tenant of NSW planning legislation.

Jacfin is also concerned to ensure that the environmental benefits claimed by such facilities are properly assessed and verified. Essentially, the Next Gen Proposal is a 'waste incinerator' which generally are the least efficient and environmentally unsound means of deriving energy from waste:

- Waste incinerators produce large amounts of toxic air pollution that impact on the environment and human health. These emissions include carcinogenic persistent organic pollutants such as dioxins and furans (PCDD and PCDF), hexachlorobenzene (HC) and PCBs;
- Waste incinerators generate ash that is contaminated with toxic heavy metals and persistent organic pollutants, typically generating 1 tonne of contaminated ash for every 4 tonne of waste burned;
- Waste burning facilities generally produce more carbon dioxide per unit of energy generated than coal, oil or gas fired power stations.

It follows that 'waste to energy' facilities should not be located in areas zoned, or capable of being zoned, for employment or residential purposes. Further, applications for such facilities are premature and should not be approved pending the preparation of robust assessment guidelines.

Jacfin wishes to thank the Committee for its consideration of this submission and would welcome the opportunity to address any hearing held by the Committee.

Yours sincerely

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Atts.

Attachment A – Submission by Jacfin to Department in relation to the Environmental Impact Statement for the proposed Energy from Waste Facility at Eastern Creek (SSD 6236) dated 27 July 2015. Comprising 12 pages.

Attachment B - Submission by Jacfin to Department in relation to the Amended Environmental Impact Statement for the proposed Energy from Waste Facility at Eastern Creek (SSD 6236) dated 10 March 2017. 60 pages.

Attachment C – Submission by Jacfin by the Commission in relation to *Towards our Greater Sydney 2056*, the Draft West Central District Plan and the Draft West District Plan dated 31 March 2017. Comprising 14 pages.

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ATTACHMENT A

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27 July 2015

The Secretary
Department of Planning and Environment
GPO Box 39
Sydney NSW 2001

Attention: Manager – Industry Assessments

Via Online Portal

Dear Mr Ritchie

Submission on behalf of Jacfin Pty Limited
Energy from Waste Facility (SSD 6236)
Premises: Lots 1, 2, 3 and 4 in DP 1145808, Eastern Creek

We act for Jacfin Pty Limited (***Jacfin***). This submission is made on behalf of our client.

Jacfin **objects** to the development application for the proposed 'Energy from Waste Facility' (the ***Facility***) by The Next Generation (NSW) Pty Limited at the Premises, for the reasons outlined in this letter and in the enclosed review undertaken by leading town planning experts, JBA Urban Planning Consultants Pty Limited (***JBA Report***).

Our client submits:

- That no decision-maker acting reasonably would be in a position to determine the development application on the basis of the limited information base presently exhibited in the Environmental Impact Statement (Urbis, April 2005) (***EIS***), which is inadequate in a number of material respects, and therefore approval of the Facility ought be refused by the Minister in making a determination on the application under section 89E of the *Environmental Planning and Assessment Act 1979* (NSW); and
- Even if the Minister proposes to approve the development application in reliance on the information base presented in the EIS, there are a number of critical matters of public health and likely environmental impact that require significant conditioning on any approval or partial approval.

We set out below the basis for these submissions.

1 Background

Our client, Jacfin, is the owner and developer of adjoining land to the south of the Premises (Lot 20 in DP1206129), and for other proximate lands within the Western Sydney Employment Area.

For over a decade Jacfin has made a substantial investment in the development of a high quality business park on the adjacent land, attracting premium tenants such as Fujitsu and DATS to purpose-built high quality warehouse and distribution facilities. The quality of Jacfin's developments

at its Eastern Creek property has been recognised by the Urban Taskforce, naming Jacfin as the winner of the Development Excellence Award for Industrial Development in 2014 for the Ricoh Distribution Centre, being the first 5 star Green Star industrial development in NSW.

While that part of Jacfin's Eastern Creek property that immediately abuts the Premises is currently used for cattle operations, our client anticipates continuing its investment in and the development of the business park into that part of its property in conjunction with the future extension of Eastern Creek Drive to the south of the Premises.

2 Inappropriate use for site

In view of the projected air emissions, noise impacts and potential health risks associated with the intended operation of a waste incinerator, Jacfin is concerned that the proposed Facility is fundamentally an inappropriate development for the Premises given its location in a highly developed area proximate to existing residential areas and the increasing density of surrounding business park developments being delivered by the strategic planning for the Western Sydney Employment Area.

Notwithstanding the contended synergy for the common corporate owner[1] in locating the Facility adjacent to the existing Genesis xero waste facility and landfill, the Energy from Waste power generation introduces a new heavy industrial, potentially hazardous use[2] into the midst of existing residential and business park estates with a large population at risk of exposure to potential health impacts. Importantly, the Human Health Risk Assessment identifies cancer risk and annualised cancer risk associated with emissions from the Facility will exceed the 1 in a million adult lifetime cancer risks guidance from the National Health and Medical Research Council.[3]

In considering the merits of locating the Facility at the Premises, it is submitted that the Minister ought investigate closely the extent to which the potential adverse health risks associated with the use extend beyond the boundaries of the Premises. Our client considers that such a use would ordinarily seek to retain a buffer area within the development site to ensure sufficient set backs from sensitive receptors and areas that would place a significant population at risk of affectation in the event of abnormal / upset operations or emergency conditions.

While the need for separation distances and buffers appears to be accepted by the EIS, it wrongly conceives the presence of the surrounding industrial zoned land uses to fulfil that buffer role[4]. This is unacceptable to our client and it is submitted that it is not an appropriate approach for a 'greenfield' development to introduce a health risk to occupants of existing and planned developments on surrounding land. In that regard, the Eastern Creek Precinct Stage 3 in which the Facility and our client's land is located has a minimum employment density target of 45 persons per hectare. A substantial number of workers in the Eastern Creek Business Park will be readily exposed to air emissions from the Facility.

Our client is concerned that the EIS fails to present a clear assessment of the level of risk to which our client's employees, contractors or future tenants, employees, contractors and visiting members of the public will be exposed by the Facility if approved.

3 Failure to assess alternative locations

The JBA Report notes that development of facilities of this nature would normally be located in low density or rural areas with the potential for substantial set-backs and buffer zones. Against this

[1] EIS, s4.1, p49

[2] EIS, s8.7.3, p95

[3] EIS, Human Health Risk Assessment, Table 7.4; JBA Report, s4.0, p3: (cites 1.09 to 2.53 in a million)

[4] EIS, s4.2, p50

backdrop, it is a fundamental omission by the EIS to assess the availability of alternative locations that may be available for the introduction of this technology and that may present a more acceptable solution in relation to population at risk and a less constrained air shed.

The EIS is clear that "no alternative sites were considered for the Proposed Development"[5]. This is a defect that infects the entirety of the assessment process for the Facility, as no attempt has been made to comparatively assess the extent to which similar benefits might be secured through selection of an alternative site. No assessment has been presented in relation to any other site that might provide a more suitable location for the waste incinerator, nor of any additional technical measures that might be deployed within the Facility to remove or further reduce potential risks to human health.

4 Whole / partial approval

The EIS acknowledges that the development approval that is sought is for the whole development, yet the EIS states that it will be developed in two phases[6].

Our client submits that seeking approval for the whole development is therefore premature and, for the reasons supported by the JBA Report enclosed, it is submitted that approval should only be given for the first phase so that the ability of the operator to manage and operate the facility to the best available technology standards proposed can be tested and proven before the second phase commences.

If this submission seeking partial approval only is not accepted and the Minister intends to grant approval to the whole Facility, it is submitted that it would be prudent to require as a condition of that development approval that an assessment of the performance of the first phase be undertaken (once commissioned and in operation for a suitable period) in order to obtain confirmation as to the adequacy of the projected environmental impacts and verification of the accuracy of the impacts modelling, including air quality at stack release points and emission dispersion from the stacks, prior to the commencement of construction for the second phase of the Facility.

5 Proposed Development Control Plan

The EIS acknowledges in several locations that a site specific Development Control Plan is in preparation concurrently with the EIS, however there is no draft exhibited with the EIS materials[7].

The content of the proposed DCP is material to a proper understanding of the future development of the Premises. The ability of the public to understand the proposed development form of the Facility and respond is prejudiced by the failure to exhibit even a draft DCP with the EIS. Importantly, the site specific DCP must demonstrate the manner in which the Premises will integrate into the planning for the whole of the Eastern Creek Precinct and take into account the Eastern Creek Stage 3 Precinct Plan (now DCP).

It is submitted that the public exhibition of the EIS is compromised by the failure to provide the DCP so that intending submitters have all relevant information available during the limited period of statutory exhibition.

[5] EIS, s4.1, p50

[6] EIS, Executive Summary, p.iii

[7] EIS, eg s7.3.1, p71

6 Noise impacts

The Premises is located within Noise Emission Zone 4 of the Eastern Creek Stage 3 Precinct Plan and our client's land is within Noise Emission Zone 5.[8] Each zone is required to meet noise levels as extracted below:

> (e) The optimised noise level goals for the Precinct are outlined in Table 1. These goals will provide adequate protection to the noise amenity of residential areas surrounding the Precinct without unduly restricting the operation of development.

Period	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Zone 6
Day	57 dBA	54 dBA	56 dBA	54 dBA	49 dBA	52 dBA
Evening	47 dBA	44 dBA	46 dBA	44 dBA	39 dBA	42 dBA
Night	42 dBA	40 dBA	40dBA	39 dBA	34 dBA	37 dBA

Table 1 – Optimum Noise Level Goals

The EIS does not address the noise requirements of the Precinct Plan in any depth or detail. No assessment has been provided as to whether the relevant Zone 4 noise level goals will be met once the proposed Facility is operational. Further, our client is concerned that the impact of the Facility on the overall noise goals for Zone 4 will be to cause the goals to be exceeded and therefore to place undue pressure on development in adjoining zones to minimise noise emissions to avoid cumulative exceedances in residential receptor areas.

Further, the noise assessment focus is only on the residential receptors and no consideration has been given to the occupants of our client's business park.

It is therefore submitted that:

- The proponent should provide further information and assessment of the impact of the development on the Zone 4 noise goals and the impact on the achievement of goals in adjoining zones;
- Further assessment should be carried out to ensure an appropriate level of amenity is achieved at the commercial receptors on our client's site;
- Depending upon the results of the further assessment, requirements should be imposed for additional noise mitigation measures to be incorporated into the Facility to minimise noise emissions beyond the boundary of the Premises.

7 Odour impacts

While the predicted odour concentration in the EIS materials for the southern boundary of the Premises is less than the allowable level of detection, there is no sensitivity testing to identify how robust the results are to the various assumptions in the odour modelling.

It is therefore submitted that:

- The proponent should provide further modelling to ensure the robustness of the results at the southern boundary;

[8] Eastern Creek Stage 3 Precinct Plan, p7-9 and 7-10

- Conditions should be imposed on any development approval requiring no odour to be emitted beyond the boundary of the Premises so as to protect the amenity of the current and future occupants of the adjacent business park.

8 Air emissions / health impacts

As noted in the JBA Report enclosed:

> It is acknowledged that the facility will incorporate Best-Available-Technology in relation to the treatment of air emissions during normal operations, as required under the EPA's *Energy from Waste Policy Statement*. However, the proponent has not demonstrated that it has the experience or the capability to match the Best-Available-Technology with the necessary management and governance systems to ensure the facility can be operated in accordance with best practices. Given the size and scale of the proposed energy-from-waste facility and its location within the centre of Sydney's heavily constrained metropolitan air shed, there must be suitable interrogation of the proponents proposed management systems and the proponent's capability (both financial and technical) in operating the facility in accordance with best practice techniques.

Our client is concerned that the ability of the applicant to operate the facility is unproven and, as noted in the JBA assessment, there is uncertainty about how the applicant will manage the need to adjust the operational parameters (particularly temperature) depending upon the characteristics of the waste materials (particularly halogenated organic substances containing chlorine) while still ensuring acceptable ambient air quality standards are met. In this regard, note that the Human Health Risk Assessment is based on modelling for residential receptors only.

Our client's concern is heightened as the EIS materials do not include plots with contour lines to be able to assess the impact on our client's land during upset or emergency conditions at which times significant exceedances of the Regulation discharge limits for particulate matter, mercury and cadmium are predicted, including at ground level.

Additionally, there is a need to ensure appropriate communication protocols are implemented to inform occupants on nearby land, including our client's business park, of any emergency events.

It is therefore submitted that:

- Approval should only be given for the first stage so that the applicant's ability to adequately manage the facility can be tested (as noted above);
- Further air quality data (and associated human health risk assessment) should be provided in the form of predicted contours for upset and emergency conditions extending to surrounding sites including our client's land and its commercial occupants (not just the residential receptors);
- Conditions imposing a requirement to prepare and comply with an approved Emergency Management Plan need to be included in any development approval including obligations to notify nearby occupants and visitors if evacuation or other recommended action (such as remaining indoors) is required; and
- Operational conditions need to be developed to govern the operational parameters to identify types of wastes (eg chlorinated wastes) and ability to adjust temperature of the burn.

9 Visual impacts

The Visual Impact Assessment in the EIS has given no consideration to the impact on our client's land. While Viewpoint 7 is from broadly the same southerly direction, it is substantially further away from the Premises than our client's site. At the boundary, the proposed development height will be some 60m from the ground and the stacks will rise over 107m above the common boundary levels. These heights are significantly above other industrial buildings in the area and will have a significant

visual impact likely to affect the potential development of the remaining vacant land on our client's property.

It is submitted that:

- Additional planting along the southern boundary of the Premises (to the south of the bio-retention basin) be included as a requirement of a Landscaping Plan. This should be consistent with maintaining the vegetation visual catchment indicated under the Eastern Creek Stage 3 Precinct Plan[9].

10 Power supply and connection

The EIS indicates that the power to be generated at the Facility will be transmitted via underground 132kV cables within a 4 metre wide trench collocated in an existing TransGrid transmission line easement to the Sydney West 330kV substation.[10]

The EIS omits any proper description, map or assessment of these proposed works. This is a key component of the proposal which is omitted from the EIS. If the cable is not to be installed by the applicant, it remains a facilitated impact of the development that should be assessed in conjunction with the Facility. Any other approach would be to accept a piecemeal assessment process by default.

Jacfin is concerned that any such cables are wholly located within the Premises and the parcel immediately adjoining the Premises on its western boundary, owned by the Ministerial for Planning and administered by the Department of Planning and Environment.

11 Regional transport infrastructure contributions

The EIS fails to indicate what provision will be made by the applicant for regional transport infrastructure contributions.[11]

The usual requirement for development governed by the Western Sydney Employment Area SEPP for contributions (monetary, works in kind and/or land dedication) to the value of $180,000 per net developable hectare should be noted, with delivery pursuant to the terms of a voluntary planning agreement.

It is submitted that the level of contributions to be made to regional transport infrastructure in connection with the Facility is a matter of public interest that should be clearly indicated in the EIS.

12 Laydown areas

The EIS does not clearly explain the proposed use of the laydown areas.

While the EIS states that all waste will be received and unloaded inside the tipping hall buildings, Jacfin is concerned that these hardstand areas may become temporary storage areas for waste received onsite and have the potential for associated odour and noise emissions.

It is submitted that appropriate approval conditions governing the loading and unloading of deliveries of waste at the Premises are warranted, prohibiting the use of the laydown areas for such purposes.

[9] Eastern Creek Stage 3 Precinct Plan, Figure 7, p2-7

[10] EIS, s3.17.8, p47

[11] EIS, s8.6, p94

13 Bio-retention pond and riparian area

The EIS does not contain any detailed information about the bio-retention pond located on proposed Lot 4 and close to the boundary of our client's site. Similarly, there is little information regarding the treatment of the area within the riparian setback to the Ropes Creek Tributary near the southern boundary of the Premises.[12]

It is submitted that:

- Further information is required about the construction and proposed operation of the bio-retention pond to ensure it does not become a source of odour or pollution; and
- Further information is required on the establishment and management of the area within the riparian setback and the land between the southern boundary and the riparian area.

Yours sincerely

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Encl

[12] EIS, s3.3, Figure 16 – Site Master Plan, p27

TW/JB
15494
27 July 2015

The Secretary
Department of Planning and Environment
GPO Box 39
SYDNEY NSW 2001

Attention: David Mooney

Dear Mr Mooney

EASTERN CREEK ENERGY FROM WASTE FACILITY, JACFIN SUBMISSION
HONEYCOMB DRIVE, EASTERN CREEK

This submission relates to State Significant Development SSD 6236 for an energy-from-waste facility at Honeycomb Drive, Eastern Creek. It has been prepared by JBA on behalf of Jacfin. Jacfin is the owner of land immediately to the south and south-east of the site, being Lot 20 in DP1206129, which is identified in the Environmental Impact Statement as being partially within the Eastern Creek Business Park.

1.0 JACFIN'S EASTERN CREEK ESTATE

Jacfin has been developing its Eastern Creek estate for over 10 years, and has secured high-profile tenants such as fujitsu and DATS for high-quality purpose-built warehouse and distribution facilities. The facilities are accompanied by ancillary office areas, and are intended to provide high-quality commercial space in support of the warehousing and distribution function.

Jacfin's principal concerns in relation to the adjacent energy-from-waste facility is to ensure the amenity of its Eastern Creek estate is sufficiently protected in order to ensure the high level of worker amenity is maintained. With this in mind we note that the Environmental Impact Statement (EIS) for the proposed energy-from-waste facility provides limited assessment on the local amenity, in relation to air quality, odour, noise, visual and transport impacts. It is requested that the proponent consider in more detail the implications of the proposed energy-from-waste facility in relation to the worker's amenity within the adjoining Eastern Creek Business Park, including the Jacfin estate.

Key issues raised in the submission below are:

- Electricity transmission.
- Noise.
- Air quality.
- Health impacts.
- Visual.

2.0 ELECTRICITY TRANSMISSION

The EIS states that the offtake power from the energy-from-waste facility will be transferred via 132kV underground cable from the on-site electrical substation to the existing Transgrid easement that runs on the western boundary of the site. The 132kV underground cable will be housed in a 4m wide trench. The underground cable continues within the existing Transgrid easement heading south east into the Sydney West 330kV substation, which is located approximately 2km to the south-east of the site.

However, the EIS provides no details of the location of the 132kV underground cables or the associated trench, and no assessment of the works associated with installation or operation of the infrastructure. A comprehensive and robust assessment of the environmental impacts of the proposed energy-from-waste facility cannot be carried out unless the 132kV underground cables and the associated trench infrastructure are included.

Given the above, the proponent should provide details of the 132kV underground cables and the associated trench in terms of its location, the nature of the works required for its installation and the ongoing maintenance requirements. Further environmental impact assessment of the underground cables and the associated trench is also required. We would expect that additional environmental impact assessment should include, as a minimum, the ground-level implications of the trench in relation to:

- Access to properties underneath and/or adjacent to the easement – including temporary impacts during works, as well as permanent impacts.
- Implications or limitations on operational activities for properties underneath and/or adjacent to the easement.
- Electromagnetic radiation impacts on people and property underneath and/or adjacent to the easement.

Jacfin is unable to complete its assessment of the proposed energy-from waste facility until this additional information and assessment has been provided.

3.0 NOISE

The Noise Impact Assessment for the proposed energy-from-waste facility identifies the Eastern Creek Business Park, but does not provide any assessment of noise impacts from the facility on the business park. It is requested that the proponent provide an assessment of the likely noise impacts of the facility on the business park. In this regard, we would recommended that the Eastern Creek Business Park be treated as a commercial receiver (due to the significance of the ancillary commercial space adjoining each warehouse), in order to determine whether any specific noise mitigation measures are warranted for noise impacts to the south and south-east.

The requested assessment of noise impacts should also consider cumulative noise impacts on the Eastern Creek Business Park, with particular reference to the Genesis Xero Waste Materials Processing Centre and Landfill, and the Hanson Asphalt Batching Plant.

Finally, it is also highlighted that the Eastern Creek Precinct Plan (Stage 3) provides noise level goals for 'zones' within the precinct (the proposed energy-from-waste facility is within Zone 4). No assessment has been provided in the Noise Impact Assessment as to whether the relevant Zone 4 noise level goals will be met once the proposed energy-from-waste facility is operational. It is noted that if the facility would cause Zone 4 noise level goals to be exceeded, then that will place undue pressure on development within adjoining Zones (including the Eastern Creek Business Park) to contribute noise levels below those established in the Precinct Plan. Additional noise mitigation measures may need to be implemented at the proposed energy-from-waste in order to appropriately share the noise mitigation burden, rather than expecting development within other Zones to compensate for the noisy activities in Zone 4.

4.0 AIR QUALITY

It is acknowledged that the facility will incorporate Best-Available-Technology in relation to the treatment of air emissions during normal operations, as required under the EPA's *Energy from Waste Policy Statement*. However, the proponent has not demonstrated that it has the experience or the capability to match the Best-Available-Technology with the necessary management and governance systems to ensure the facility can be operated in accordance with best practices. Given the size and scale of the proposed energy-from-waste facility and its location within the centre of Sydney's heavily constrained metropolitan air shed, there must be suitable interrogation of the proponents proposed management systems and the proponent's capability (both financial and technical) in operating the facility in accordance with best practice techniques.

The energy-from-waste facility will potentially operate for short periods of time in either an 'upset' state or an 'emergency' state. During 'upset' conditions significant exceedances of the POEO Regulation discharge limits for particulate matter, mercury and cadmium are predicted, resulting in exceedances of the ground level concentrations of cadmium and mercury. But, the Air Quality Assessment does not provide contours so that neighbours can determine where these exceedances are predicted to occur. Given the predicted exceedances, and that these pollutants are toxic and subject to short-term 1-hour averaging periods (commensurate with the short-term nature of the 'upset' conditions periods) it is considered that these contour plots should be provided and that further assessment of the potential impacts should be provided.

During 'emergency' conditions the Air Quality Assessment has not carried out quantitative analysis on the basis of the infrequent occurrence and the distance to sensitive receptors. However, it is unclear whether 'emergency' conditions might occur simultaneously with normal or 'upset' operating conditions of the main turbines. If these scenarios can occur simultaneously, then a more likely worst-case scenario would be the combined emissions from the 'upset' operation conditions of the main turbines, combined with the 'emergency' conditions derived from the use of emergency diesel-powered generators. The proponent should clarify whether this scenario if foreseeable, and if so, provide further assessment of the combined impact.

We note that the EIS identifies a contradiction between the design standards of the facility (in terms of complying with European Union Directives) and the *Energy from Waste Policy Statement* in relation to how halogenated organic substances (containing chlorine) are treated, and how the operational parameters of the facility are amended to reflect the characteristic of the waste material (i.e. higher burn temperatures are required). Given the importance of destroying toxic materials contained in the flue gas emissions in ensuring acceptable ambient air quality standards are met, we would suggest that the facility avoid burning high proportions of halogenated organic substances (such as poly-vinyl chloride or PVC) until such time as the facility has proven that it can destroy the toxic materials in the flue gas emissions at the lower burn temperature.

It is also noted that there is a foreseeable risk of waste igniting either in the bunker or in a truck (as described in the Preliminary Hazard Analysis &Fire Risk Assessment). Given the possibility of uncontrolled burning of waste that would undoubtedly lead to short term exceedances of the EPA's ground level air quality criteria, it is requested that suitable advisory and notification measures be conditioned to ensure short-term air quality impacts from toxic pollutants on nearby workers is avoided.

5.0 HEALTH

The Human Health Risk Assessment identifies lifetime cancer risk and annualised cancer risk associated with emissions from the facility. It states that the lifetime cancer risk is less than 1 in a million. However, Table 7.4 of the Human Health Risk Assessment includes adult lifetime cancer risks of $1.09\text{-}2.53 \times 10^{-6}$. We understand that this constitutes more than a 1 in a million risk (i.e. a 1.09 to 2.53 in a million). Clarification from the proponent is required as to whether the facility will actually result in less than 1 in a million lifetime cancer risk, given the risk outputs provided in Table 7.4.

Further to this, we note that the Human Health Risk Assessment does not provide any assessment of the Eastern Creek Business Park. It is requested that the lifetime cancer risk and annualised cancer risk be calculated for receptors in the Eastern Creek Business Park in order to demonstrate that the risk is below the NHMRC guidance of 1 in a million.

It is also noted that there is a foreseeable risk of waste igniting either in the bunker or in a truck (as described in the Preliminary Hazard Analysis &Fire Risk Assessment), which would lead to substantial short term emission of pollutants. Given this possibility, a quantitative analysis of the possible implications of waste fires on lifetime cancer risk would be appropriate, to ensure the assessment is sufficiently conservative. This could be by way of additional scenarios in the health impact assessment or by way of a sensitivity analysis, and should include the Eastern Creek Business Park as a receptor.

6.0 VISUAL

The Visual Impact Assessment provides view impacts from a number of locations around the site. Viewpoint 7 (see image reproduced below) from Old Wallgrove Road provides the best indication of the energy-from-waste facility from parts of the Eastern Creek Business Park, and in particular from Jacfin's Eastern Creek industrial estate. It is highlighted that Jacfin's Eastern Creek industrial estate is substantially closer than Viewpoint 7, and so the energy-from-waste facility would be larger in bulk and scale than what the image conveys.

Given the heavy industry nature of the proposed energy-from-waste facility and its bulk and scale as viewed from the south, in comparison to the pre-existing nature of development within the Eastern Creek Business Park, it is requested that the proponent provide extensive planting along the southern boundary (i.e. south of the bio-retention basin). Extensive boundary planting on the southern boundary would be appropriate to screen the energy-from-waste facility from the Eastern Creek Business Park, as well as from further afield in the Western Sydney Employment Area.

Figure 1 – View of the facility from viewpoint 7 – Old Wallgrove Road, south-east of the site
Visual Impact Assessment

7.0 CONCLUSION

Jacfin has significant concerns relating to the intended 132kV underground power lines and associated 4m wide trench – for which no detailed description, plans or assessment has been provided in the EIS. We do not consider that a suitably comprehensive environmental impact assessment of the proposed energy-from waste facility can be completed until this additional information and assessment has been provided by the proponent.

Jacfin has an interest in maintaining suitable amenity within its Eastern Creek estate, in order to continue developing high-quality warehouse and distribution facilities with ancillary commercial offices. The nature of the proposed energy-from-waste facility represents a significance risk to the amenity of the estate, and health of workers, by way of noise and air emissions during normal and abnormal operating conditions.

Additional assessments are required by the proponent in order to demonstrate that noise and air quality impacts can be controlled to acceptable levels within the Eastern Creek Business Park under all foreseeable scenarios, and to inform an updated health impact assessment that takes the Eastern Creek Business Park into account. Further, extensive planting is warranted along the southern boundary of the energy-from-waste site (i.e. the shared boundary with the Jacfin estate), in order to screen the facility from the estate.

Whilst it is acknowledged that the facility will incorporate Best-Available-Technology in relation to the treatment of air emissions, the proponent has not demonstrated that it has the experience or the capability to match the Best-Available-Technology with the necessary management and governance systems to ensure the facility can be operated in accordance with best practice techniques.

With consideration of the above issues, we note that the development of facilities of this nature would normally be located in low density or rural areas with the potential for substantial set-backs and buffer zones. Given the nature of development already occurring around the site, and its pre-existing proximity to residential areas such an opportunity is not available at this site. Whilst there are obvious synergies in co-location of the energy-from-waste facility with the Genesis Xero Waste Materials Processing Centre and Landfill, it is requested that the appropriate regulatory authorities consider whether such a facility is suitably located in such a heavily developed part of the metropolitan area and within Sydney's heavily constrained air shed.

Should you have any queries about this matter, please do not hesitate to contact me on 9409 4962 or tward@jbaurban.com.au.

Yours faithfully

[redacted]

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ATTACHMENT B

Allens › ‹ Linklaters

10 March 2017

Department of Planning and Environment
Level 22, 320 Pitt Street
Sydney NSW 2000

Attention: Chris Ritchie / Sally Munk

Dear Chris and Sally

The Next Generation Energy from Waste Facility – SSD 6236
Submission on behalf of Jacfin Pty Ltd

We act for Jacfin Pty Ltd (***Jacfin***), the owner of Lot 20 in DP1206129, being land comprising the Eastern Creek Business Park.

This submission is made on behalf of Jacfin in relation to the amended Environmental Impact Statement (***Amended EIS***) for the proposed Next Generation Energy from Waste Facility (***EfW Facility***) (Development Application No. SSD 6236). Our client's land immediately adjoins the site of the proposed EfW Facility to the south and south-east.

Jacfin has commissioned independent peer reviews of the air quality, human health, odour and noise impact assessments exhibited with the Amended EIS, as well as an expert town planning assessment of the proposal by JBA (***JBA Report***). Copies of the assessments undertaken by Katestone (air quality, odour and human health), GHD (odour) and Wilkinson Murray (noise), and the JBA Report are ***attached*** to this submission.

We note that this submission has been prepared in consultation with Noel Hemmings QC and that Mr Hemmings QC supports the views and conclusions expressed in this submission.

1 Summary of Submission

Jacfin submits that the proposed EfW Facility is an offensive industry and is therefore prohibited in the IN1 General Industrial Zone which applies to the site. There is therefore no power for the consent authority to grant approval to the EfW Facility in its current form.

Jacfin further submits in the alternative that no decision-maker acting reasonably would be in a position to approve the EfW Facility on the basis of the information presented in the Amended EIS. While the Amended EIS includes a more detailed assessment of the proposed EfW Facility than the EIS exhibited in July 2015, Jacfin submits that there is still inadequate assessment of the potentially serious health, air quality, odour and noise impacts of the EfW Facility. Accordingly, the consent authority is not in a positon to properly consider and take into account all relevant matters in its assessment of the proposed EfW Facility. In the circumstances, it is submitted that approval for the EfW Facility must be refused.

Jacfin submits that the Amended EIS and accompanying technical studies are deficient in the following respects:

(a) The Amended EIS does not include an adequate assessment of alternative locations or consider likely future land uses surrounding the development, as is legally required in relation to the assessment of potentially offensive development.

(b) With the exception of air quality and human health impacts, the Proponent has not undertaken any genuine re-assessment of the impacts of the proposed EfW Facility, including noise, odour and traffic impacts.

(c) The Amended EIS does not provide sufficient justification for the development, which is entirely out of character with the surrounding development and inconsistent with the employment generation targets for the area.

(d) The conclusions presented in the Amended EIS and accompanying technical reports are reliant on very specific assumptions about the volumes of particular waste making up the final waste feedstock and the ability of a crane driver on the sorting floor to deliver a specific waste mix. These assumptions are inherently unsafe.

(e) The Air Quality Assessment and Human Health Risk Assessment Report do not account for the expected 60 hours of upset conditions per year and rely on potentially unrealistic meteorological assumptions, and are therefore likely to have underestimated the annual average concentrations of air pollutants and the health risks associated with the EfW Facility.

(f) The Odour Impact Assessment Report fails to assess a number of relevant odour sources, uses a form of modelling that is not approved for the meteorological conditions at the site and does not assess odour impacts during upset conditions or the 760 hours per year that the facility will not be operational.

(g) The noise modelling presented in the Amended EIS and Noise Impact Assessment relies on unreliable background levels, does not include relevant low frequency octave bands and noise from key noise generating plant and does not adequately assess impacts on the Eastern Creek Business Park.

The Amended EIS does not adequately address a number of additional matters as noted in this submission and the JBA Report, including visual and traffic impacts, adequate arrangements for services, stormwater management and management of liquid waste.

Jacfin makes the following detailed comments in relation to the Amended EIS.

2 Offensive Industry

2.1 Prohibited development

As noted in the JBA Report, the proposed EfW Facility is a potentially offensive industry within the meaning of *State Environmental Planning Policy No 33 – Hazardous and Offensive Development* (***SEPP 33***), since the development would have a significant adverse impact in the locality or on existing or likely future development on other land if operated without employing any mitigation measures.

Offensive industries are prohibited within the IN1 General Industrial Zone under *State Environmental Planning Policy (Western Sydney Employment Area) 2009* (***WSEA SEPP***) and accordingly are prohibited on the proposed site for the EfW Facility.

The Hazardous and Offensive Development Guidelines – Applying SEPP 33 (Department of Planning, January 2011) provide that:

> For developments identified as 'potentially offensive industry', the minimum test for such developments is meeting the requirements for licensing by the DECCW or other relevant authority. If a development cannot obtain the necessary pollution control licences or other permits, then it may be classified as 'offensive industry', and may not be permissible in most zonings.

The EfW Facility will require an environment protection licence to authorise the processing of waste at the facility and the associated stack emissions. As indicated in the JBA Report, the EPA has expressed serious concerns in relation to the proposed EfW Facility and has concluded that it should not be approved due to the inherent uncertainties associated with the characteristics of the waste feedstock. Accordingly, the development as proposed will not be able to obtain the necessary environment protection licence from the EPA and should be classified as an offensive industry.

As offensive industry is prohibited on the site, there is no power under the *Environmental Planning and Assessment Act 1979* to approve the development.

2.2 SEPP 33 requirements

SEPP 33 prescribes mandatory considerations for a consent authority when determining an application for offensive development, including a requirement for a consent authority to consider:

- any feasible alternatives to the carrying out of the development and the reasons for choosing the development the subject of the application (including any feasible alternatives for the location of the development and the reasons for choosing the location the subject of the application); and
- any likely future use of the land surrounding the development.

The Amended EIS does not include any genuine consideration of alternative locations for the EfW Facility, with the result that the consent authority is not in a position to discharge its obligation to consider this matter in assessing the proposal, as required by SEPP 33. As noted by JBA, the analysis of feasible project alternatives is a critical part of the planning assessment process and must be addressed in the EIS.

Section 5.3.2 of the Amended EIS, which purports to assess alternative plant locations, merely provides a list of reasons why the selected site is preferred, without identifying or considering any other locations. The Amended EIS dismisses all other (unidentified) locations on the basis that they would lack the opportunity for synergies with the Genesis MPC and thus result in greater traffic impacts.

The Amended EIS overstates the advantages associated with potential synergies between the Genesis MPC and the EfW Facility. The Amended EIS indicates that only 23% of the waste to be processed at the EfW Facility will be supplied by the Genesis MPC, with the vast majority of waste (approximately 77%) to be sourced from other sites. The locations of these other sites are not identified and there is therefore no opportunity to assess whether a facility in an alternate location may in fact be more proximate to other significant waste operations that will be supplying the EfW Facility, thereby reducing traffic impacts associated with the delivery of waste for processing.

In addition, the Genesis MPC does not currently have approval to transport waste offsite. A key assumption made by the Amended EIS, being the sourcing of 23% of waste materials from the Genesis MPC, is therefore not guaranteed and would require an amendment to the existing development consent for the Genesis MPC. The Genesis MPC is also not licensed to receive contaminated waste such as the ash residue that will be generated by the EfW Facility. This also

reduces the potential synergies between the EfW Facility and the Genesis MPC, as bottom ash and other ash residue will need to be transported to appropriately licenced third party landfills, rather than to the Genesis MPC as suggested by the Amended EIS.

In the circumstances, and particularly given the requirements of SEPP 33, the failure of the Amended EIS to consider alternative locations for the facility is unsatisfactory. The failure to consider alternative locations is also contrary to the requirements of the Director-General's Environmental Assessment Requirements (***DGRs***) for the development, which require the EIS to include a detailed description of alternatives considered.

It is submitted that any advantages arising from potential synergies with the Genesis MPC are completely outweighed by the risks associated with the carrying out of an offensive development in the middle of the Sydney metropolitan area, in close proximity to residential and commercial land uses.

The Amended EIS has also not properly considered the likely future use of our client's land south of the development site, as required by SEPP 33. The Amended EIS does not take into consideration the close proximity of existing employment uses within the Eastern Creek Business Park and the planned future development of that site for employment uses. The Amended EIS has therefore failed to take into consideration a relevant matter, as prescribed by SEPP 33, in the assessment of the proposal. In the circumstances, the consent authority does not have sufficient information to lawfully determine the application.

3 Inadequate Assessment

The Amended EIS includes a new project definition brief, which adopts a new design capacity, amended design fuel profile and composition, amended waste volume outputs and refined technology design. The Amended EIS rightly acknowledges the need for a number of technical reports to be updated to reflect the changes to the design brief. As noted by Jacfin in its July 2015 submission in relation to the Proponent's previous EIS, there was also a need for a number of the technical studies to be revised to address major deficiencies in those studies.

The Amended EIS asserts that a detailed re-assessment of the potential environmental and social impacts of the EfW Facility has been undertaken and that, in particular, the following technical reports have been amended:

(a) Air Quality and Greenhouse Gas Report;

(b) Ozone Report;

(c) Odour Impact Assessment Report;

(d) Noise and Vibration Report;

(e) Human Health Risk Assessment Report; and

(f) Traffic Impact Statement.

With the exception of the Air Quality and Human Health Risk Assessment Reports, the above reports exhibited with the Amended EIS do not include any substantive re-assessment of the impacts of the EfW Facility.

The Proponent has not undertaken any additional noise or odour modelling to take into account the changes to the design brief for the project. Other than acknowledging the change to design capacity and proposal for construction to occur in two phases, the Odour Impact Assessment Report is essentially the same as the odour assessment exhibited in 2015.

As noted by Wilkinson Murray and detailed further below, the revised noise assessment report has also not provided any new information and remains deficient.

4 Project Objectives and Justification

The DGRs require the EIS to include a justification for the development taking into consideration its location, environmental impacts and the suitability of the site. The proposed site for the EfW Facility is within the Western Sydney Employment Area. The creation of employment is a key objective of the WSEA SEPP, which applies to the site. The Eastern Creek Precinct Plan (Stage 3) (***Precinct Plan***) also applies to the site and sets a minimum employment density target of 45 jobs per hectare for the site.

The Amended EIS asserts that the project will constitute a significant employment generating land use, consistent with the objectives and intentions of the Eastern Creek Precinct within the broader Western Sydney Employment Area. However, based on the size of the proposed site for the EfW Facility, being 20.55 hectares, the development will produce less than 6% of the employment density target set by the Precinct Plan. The Amended EIS indicates that the EfW Facility will generate only 55 permanent jobs. This is grossly short of the target of 925 jobs for the site, based on the size of the site and target under the Precinct Plan.

Jacfin submits that the development is not consistent with the objectives of either the WSEA SEPP or the Precinct Plan as it does not significantly contribute to job creation in the Western Sydney area.

As noted in the JBA Report, the proposed EfW Facility is also inconsistent with the character of surrounding development, including the Eastern Creek Business Park. The Eastern Creek Business Park is a premium employment area comprising logistics and distribution facilities, with associated offices. For over a decade, our client has made a substantial investment in the development of the Eastern Creek Business Park as a high quality employment area, attracting premium tenants such as Fujitsu, Ricoh and DATS to purpose-built, high quality facilities.

A significant number of people are currently employed at the facilities within the Eastern Creek Business Park. The number of persons employed at the Eastern Creek Business Park is only going to increase as our client continues to develop its land for high employment generating uses, as is consistent with and supported by the WSEA SEPP and Precinct Plan.

The essential character of the proposed EfW Facility is a waste incinerator. This type of land use is inconsistent and incompatible with the nature of surrounding developments and likely future developments in the Eastern Creek Precinct. As discussed below, the air quality, human health, odour, visual and noise impacts of the facility render it entirely inappropriate for the proposed location in the middle of the Sydney metropolitan area, proximate to residential and commercial land uses. The Amended EIS has not adequately addressed these issues or adequately justified the selection of the site or its suitability for this type of development, as required by the DGRs.

The Amended EIS seeks to justify the proposed EfW Facility on the basis that it will create a consistent source of 'green' energy. The burning of waste in an incinerator can hardly be equated to renewable energy sources. The characterisation of the EfW Facility in this way overlooks the significant air quality impacts that the facility will have, including higher average nitrogen and sulfur oxide emissions than the generation of energy from natural gas.

The attached report by Katestone notes that even with selective non-catalytic reduction, the EfW Facility would be the seventh greatest emitter of nitrogen oxides in Sydney, contributing an additional 5% of nitrogen oxide emissions into the Sydney airshed. The significant health and amenity impacts of the EfW Facility therefore cannot be justified on environmental grounds.

5 Unsafe Assumptions

5.1 Composition of waste feedstock

The conclusions presented in the Amended EIS and accompanying technical reports with respect to the impacts of the proposed EfW Facility are reliant on very specific assumptions about the types and volumes of particular waste streams making up the waste feedstock to be treated at the EfW Facility.

Section 4.4.2 of the Amended EIS details the classes of waste proposed to be treated. Those classes include construction and demolition waste, and commercial and industrial waste. The Amended EIS does not specify the types of waste that will be included in these classes. The composition of construction and demolition waste could be highly variable depending on what type of building or structure is being constructed or demolished. Construction and demolition waste could also contain treated timbers and plastics. This is not considered in the Amended EIS. Likewise, the specific types of waste that will be included in the commercial and industrial waste stream are not specified and could be highly variable, depending on what commercial and industrial operations the waste is sourced from.

The Amended EIS indicates that the waste feedstock will contain floc waste, including PVCs, plastics and rubber. The feedstock will also contain wood waste, including timbers impregnated with creosote and other chemicals. The Amended EIS does not indicate the percentage of wood waste that will be included in the feedstock or properly assess the impact of burning treated timbers. The Amended EIS also identifies garden organics and 'Alternative Waste Treatment Residuals', being residual waste after the processing of domestic (red bin) waste, as proposed waste streams. Both of these waste streams have the potential to include putrescible waste. However, the Amended EIS and supporting studies assume that the EfW Facility will not be receiving and processing putrescible waste.

A number of unrealistically precise assumptions are presented in Section 4.4.3 of the Amended EIS regarding the design fuel mix, including that it will comprise 23.37% 'Residual Chute Waste' from the Genesis facility, 28.69% construction and demolition waste, 16.84% commercial and industrial waste, 14.34% floc waste, 4.81% paper pulp, 1.72% glass recovery, as well as a number of other types of waste.

The Amended EIS provides no details regarding the types of waste that will be included in the 'Chute Residual Waste'. The remaining 77% of waste is to be provided by various, unidentified third parties. The assumptions made in the Amended EIS regarding the percentages of different types of waste that will be received and processed by the EfW Facility are fundamentally unsafe given that the operator will have no control over what waste streams are available or may be delivered by third parties at any one time. In addition, the operator will not be able to guarantee what types of waste are included in the Chute Residual Waste from time to time, as this is dependent on the types of waste being received at the Genesis facility, a matter over which the operator of the EfW Facility will have no control.

5.2 Process for identifying, sorting and mixing waste

The Amended EIS indicates that the preliminary classification of waste received at the Genesis MPC is based on advice from the carrier. The Amended EIS asserts that the information provided by the carrier is verified by way of visual inspection, however in circumstances where waste deliveries to the Genesis MPC can be up to 40 tonnes in size, it is not practically possible for the specific composition of waste deliveries to be properly verified. This is concerning given 23% of the waste to be processed at the EfW Facility is to be sourced from the Genesis MPC.

The Amended EIS indicates that all waste received at the EfW Facility will be visually inspected to confirm that there is no deviation from the fuel specification. The Amended EIS assumes that all deliveries to the EfW Facility will be nominally 22 tonnes for all waste types. It is submitted that it will be impossible for the actual composition of such quantities of waste to be ascertained by visual inspection only. Accordingly, the operator of the EfW Facility will essentially be reliant on the descriptions of the waste provided by the carrier. There is an inherent risk that large deliveries of waste may contain elements of unacceptable and dangerous waste materials that may not be disclosed by the third party supplier or carrier.

The NSW Energy from Waste Policy Statement published by the EPA provides that waste streams should not contain contaminants such as batteries, light bulbs or other electrical or hazardous wastes. There is a reasonable likelihood of these types of waste being included in building and demolition waste. Small items such as batteries and light bulbs will be nearly impossible to detect in a 22 tonne load of waste based on visual inspection only.

As noted in the Amended EIS, the mixing of the various types of waste to be received at the EfW Facility is critical to controlling 'special fraction' materials, including PVC waste, floc, wood and plastics. Exceedances of the design levels for these types of substances will have serious human health consequences. As noted below, the burning of PVC waste produces dioxins which are a known cause of cancer, as well as reproductive and developmental problems and damage to the immune system. The design fuel mix is also critical to ensuring a specific net calorific value to maintain adequate temperatures to ensure the destruction of harmful pollutants in the flue gases.

The Amended EIS indicates that sorting and mixing of waste streams will occur within the waste bunker inside the tipping hall and will be undertaken by a crane driver picking up and dropping waste in different places of the storage area. The Proponent is asking the consent authority to trust the judgment of a crane driver, based on visual observation only, to achieve the precise waste mix presented in the Amended EIS, including ensuring safe percentages of PVCs and other special fraction materials in the waste feedstock (see the precise assumptions with respect to chemical composition of the waste feedstock in Section 4.4.4 of the Amended EIS). The proposition that a crane driver could properly ascertain the nature of different waste types by way of visual inspection and deliver the required waste mix is fundamentally unrealistic.

It is submitted that the process proposed for sorting and mixing waste is inherently unreliable and that it will be practically impossible for a crane driver to effectively identify and separate different waste types into the percentages indicated in the Amended EIS, and ensure the specific chemical profile of the design fuel mix assumed in the assessments of air quality, human health and odour. In addition, the particular design fuel mix presented in the Amended EIS is not mandatory but is merely assumed. There will be no controls to ensure this precise design mix is achieved.

5.3 Unreliable assessment

The assumptions made by the Amended EIS and the accompanying technical studies are therefore unsound. The Proponent has not demonstrated that there will be an adequate process to ensure a safe fuel mix. As noted in the JBA Report, the process proposed by the Proponent can only be expected to achieve a highly variable mix of materials for input into the combustion system. There is a substantial risk that the quantities of certain waste materials in the feedstock, such as PVCs, will exceed the design criteria and safe levels for incineration.

The NSW Energy from Waste Policy Statement states that energy recovery facilities:

> must use technologies that are proven, well understood and capable of handling the expected variability and type of waste feedstock. This must be demonstrated through reference to fully

operational plants using the same technologies and treating like waste streams in other similar jurisdictions.

The Proponent has not presented data from similar operational plants to establish that it can safely process the highly variable waste feedstock that is likely to be received and processed by the EfW Facility.

Given the significant health risks associated with the burning of materials such as PVCs (as detailed below and in the report by Katestone), Jacfin submits that the inability of the Proponent to guarantee the composition of the waste feedstock presents an unacceptable risk and that the consent authority must refuse to approve the EfW Facility on this basis.

6 Air Quality and Human Health Impacts

The Amended EIS includes a new Air Quality and Greenhouse Gas Assessment and Human Health Risk Assessment, which seek to address the significant deficiencies identified in the previous assessments undertaken by the Proponent. However, these new assessments are inherently unreliable since they assume a specific design fuel mix which cannot practically be achieved. Given the inadequacies in the waste sorting process identified above and the inability of the Proponent to control the mix of waste types in the feedstock, Jacfin submits that no reasonable decision-maker could have confidence in the results of the updated air quality and human health impact assessments undertaken by the Proponent.

This submission is supported by the JBA Report, which concludes that 'there can be no certainty in relation to the outcomes of the air quality and human health impact assessments.' JBA further opines that the substantial uncertainties make it likely that the proposal in its current form will not be able to demonstrate that air quality impacts can be controlled to acceptable levels.

6.1 Air Quality Assessment

Katestone has reviewed the Air Quality Impact and Greenhouse Gas Assessment, as well as the Ozone Impact Assessment exhibited with the Amended EIS. Katestone has identified a number of deficiencies in these assessments, including:

(a) failure to account for the 60 hours of upset conditions that are expected to occur per annum, and associated underestimation of the ground-level concentrations and deposition rates of air pollutants;

(b) selection of only a small number of sparsely distributed receptor locations on the Jacfin land, which are not necessarily representative of the maximum impact of the EfW Facility on that land;

(c) unrealistic characterisation of the meteorological conditions at the site; and

(d) inconsistencies in the data presented.

See attached report by Katestone for further details.

Jacfin submits that the deficiencies identified by Katestone in the air quality assessment undertaken by the Proponent raise serious doubts as to the reliability of the conclusions presented, such that a reasonable decision-maker could not have any confidence based on that assessment that the air quality impacts of the EfW Facility will not present a significant risk to human health.

6.2 Non-compliance with Clean Air Regulation

The Amended EIS indicates that concentrations of solid particles, oxides of nitrogen and carbon monoxide from the EfW Facility will exceed the prescribed limits under the *Protection of the*

Environment Operations (Clean Air) Regulation 2010 (***Clean Air Regulation***) during upset conditions. It is an offence under section 128 of the *Protection of the Environment Operations Act 1997* to exceed the prescribed limits under the Clean Air Regulation.

The Amended EIS attempts to divert attention from these exceedances of the Clean Air Regulation prescribed concentrations by indicating that the EfW Facility will meet the 'more stringent limits' prescribed in the EU IED. It is patently obvious that, at least in respect of prescribed concentrations of solid particles, oxides of nitrogen and carbon monoxide, that the EU IED limits are not more stringent than the Clean Air Regulation, since the proposed EfW Facility is able to comply with the EU IED limits and not the Clean Air Regulation prescribed limits.

In any event, the air quality assessment indicates that emissions from the EfW Facility will also exceed the IED limits for a number of elements during upset conditions. Accordingly, whichever standard is adopted, the Proponent has not demonstrated that it can comply with safe emissions limits.

In the case of chlorine, the Amended EIS states that the Clean Air Regulation limit (200 mg/m^3) is considered inapplicable (overly high) and that the EU IED limit for hydrogen chloride (60 mg/m^3) is considered a more appropriate in-stack concentration upper limit for chlorine. The Proponent appears to be picking and choosing standards based on its own convenience. The EfW Facility will be located in NSW and is subject to NSW law, including the Clean Air Regulation. Accordingly, the Proponent must demonstrate compliance with the Clean Air Regulation.

If the EfW Facility is approved in its current form, the Proponent would be committing an offence under the Clean Air Regulation by operating the EfW Facility under upset conditions. It is submitted that no reasonable decision-maker could approve an operation that will not comply with the requirements of NSW law.

6.3 Human health risk

The NSW Energy from Waste Policy Statement published by the EPA states that energy from waste facilities must be achieved 'with no increase in the risk of harm to human health or the environment.' The Human Health Risk Assessment undertaken by AECOM concludes that the risk to human health as a result of the EfW Facility is low and acceptable. Leaving aside the reliability of this conclusion (discussed below), it is evident from the conclusions of the AECOM report that there is an increased risk to human health as a result of the EfW Facility, contrary to the requirements of the Energy from Waste Policy.

Given the deficiencies in the air quality modelling and the unsound assumptions on which the modelling is based, there are significant uncertainties in relation to the likely human health impacts of the EfW Facility. Katestone has expressed the view that there could be substantially higher annual loads of air pollutants than predicted by the Proponent and that the Proponent has likely underestimated the potential health risks associated with the EfW Facility.

The Amended EIS and Air Quality Assessment indicate that the air emissions from the EfW Facility will include dioxins, furans, heavy metals, PAHs, VOCs and other toxic substances. Katestone has considered the potential impacts of these emissions on human health and notes that dioxins are a known cause of cancer, as well as a number of other serious health conditions. Jacfin submits that any increase in the concentrations of dioxins, furans, heavy metals, PAHs or VOCs in the air presents an increased risk to human health and is therefore contrary to the NSW Energy from Waste Policy Statement.

While the risk of dioxins being emitted from the EfW Facility could be counteracted by maintaining a temperature of 1100ºC, the Proponent has refused to commit to this measure.

Jacfin submits that there is insufficient information in the Amended EIS for the consent authority to properly assess the human health impacts of the EfW Facility. The information that has been provided indicates that there are significant risks to human health associated with the air emissions from the EfW Facility. It is submitted that any risk to human health is unacceptable and that the proposed EfW Facility must therefore be refused.

6.4 Emergency situations

The proximity of the proposed EfW Facility to sensitive receivers, including the Eastern Creek Business Park where numerous people are employed on a daily basis, makes the proper management of emergency situations critical. As noted in the JBA Report, given the proposed location of the facility, the avoidance of catastrophic human health impacts will require immediate and complex intervention in the event of an emergency situation. Furthermore, even immediate intervention may not be able to prevent serious impacts to human health where toxic air pollutants have already been emitted by the time they are identified by the in-stack monitoring system.

The Proponent has not demonstrated that it has the experience or capability to appropriately manage the facility, noting that the facility is proposed to operate 24 hours a day and is susceptible to various types of emergency situations. Even if the Proponent is able to demonstrate that the facility will be appropriately managed by an experienced operator, there are some situations beyond the control of even the most experienced operator, such as power failure or equipment failure, which could have catastrophic impacts.

The risks associated with the EfW Facility in an emergency situation highlight the inappropriateness of locating a facility of this nature in close proximity to residences and workplaces. As submitted by JBA, the EfW Facility should be located in a low density or rural area where a substantial buffer zone can be established between the facility and sensitive land uses. This is necessary to ensure that emergency situations at the EfW Facility do not result in serious health impacts.

6.5 Fire risk

The JBA Report also notes the foreseeable risk of waste igniting in the waste bunker or in a truck. Two separate fires have broken out at the Veolia Recycling Centre in Chullora since December 2016. The second fire, which started on 23 February 2017, had the potential to burn for multiple days given the extent of potential fuel sources at the facility. The cause of this fire is unknown but it is noted that the facility contained a number of highly flammable materials, including carpet, plastic, cardboard and paper. Similar materials will be stored in the waste bunkers within the EfW Facility.

The risk of fire at facilities like the proposed EfW Facility is a serious risk. Such fires are extremely difficult to control given the extent of fuel available for burning. As noted in the JBA Report, uncontrolled burning of waste at the EfW Facility would undoubtedly lead to substantial exceedances of the EPA's ground level air quality criteria for toxic air pollutants.

7 Odour

The Odour Impact Assessment undertaken by the Proponent is affected by the same issues as the air quality assessment. The uncertainties in relation to the nature and composition of the waste feedstock and the inability of the Proponent to control and guarantee a particular waste mix renders the odour assessment similarly unreliable.

The submission on behalf of Jacfin in relation to the 2015 EIS called for sensitivity testing to identify how robust the results of the odour impact assessment for the EfW Facility are to the various assumptions in the modelling. Sensitivity testing has not been undertaken. As noted above, the

'updated' Odour Impact Assessment Report at Appendix L of the Amended EIS is in all relevant respects identical to the original odour assessment report submitted by the Proponent.

7.1 Deficiencies in assessment

The Odour Impact Assessment Report has been reviewed by both GHD and Katestone. The following significant deficiencies have been identified:

(a) failure to address the likely variability in odour emissions from the waste fuel;

(b) failure to consider and/or quantify a number of key odour sources, including:

  (i) emissions from the stacks;

  (ii) odour from the transport of waste (trucks and conveyor); and

  (iii) odour from the Genesis Waste Transfer Centre and Materials Processing Centre, capped areas of the landfill, covered tip face and greenwaste composting area;

(c) use of unreliable odour emission data (single sample of tip face emissions from the Genesis facility) to estimate the tipping hall fugitive emissions, which do not account for emissions from tipping, moving and compacting of waste, being activities that will be carried on at the EfW Facility;

(d) omission of critical information including the calculations and data used to determine the odour emission rates from the sampling and the method used to sample odour;

(e) omission of information regarding how negative pressure conditions will be achieved and maintained in the tipping hall building and failure to evaluate the impact of upset conditions on the maintenance of negative pressure conditions;

(f) failure to realistically characterise the atmospheric structure and meteorological conditions at the site;

(g) use of a form of modelling that is not approved for use in the meteorological conditions occurring at the site and which may provide erroneous results; and

(h) failure to provide odour predictions at discrete receptor locations within the Eastern Creek Business Park.

GHD concludes that the odour predictions presented in the Odour Impact Assessment Report cannot be relied upon given the deficiencies identified above. GHD further indicates that there is a risk of nearby sensitive receptors/premises experiencing excessive odour should the EfW Facility be approved based on the current Odour Impact Assessment Report.

Katestone concludes that the deficiencies identified in the Odour Impact Assessment Report make it likely that odour levels have been significantly underestimated. Katestone indicates that based on the degree of underestimation, actual odour concentrations could be double those predicted by the Proponent and likely exceed the EPA's odour criterion of 2 ou in parts of the Jacfin land.

It is evident that the Odour Impact Assessment falls significantly short of a competent and comprehensive assessment and does not provide sufficient information to enable the consent authority to consider all relevant matters required to properly assess the proposed development.

7.2 Assessment of fugitive emissions

Katestone indicates that the Proponent has underestimated the odour emission rate from the tipping hall building, which will be the key source of odour at the EfW Facility. This is because the Odour

Impact Assessment Report relies on a single sample from the tip face at the Genesis facility to predict odour emissions from the EfW Facility.

Even if 100% of the waste to be processed at the EfW Facility was to be sourced from the Genesis facility, the use of a single tip face sample to predict odour emissions would be inappropriate for the reasons identified by both Katestone and GHD, namely:

(a) active tip face emissions are variable;

(b) the type of sampling undertaken by the Proponent does not take into account emissions caused by tipping, moving and compacting waste; and

(c) the EfW Facility will receive a selection of organic material diverted from the Genesis Facility tipping face.

The Amended EIS indicates that only 23% of waste (rather than 100%) will be sourced from the Genesis facility, with 77% coming from other sources. As Katestone rightly points out, the odour emission rates measured from the Genesis facility may not accurately represent the types of wastes or the likely variability of wastes to be received at the EfW Facility. While appropriate odour data could have been sourced by the Proponent from similar facilities overseas, this has not been done. This is a significant omission which calls into question the conclusions presented by the Proponent in relation to fugitive emissions.

The conditions in the tipping hall and the ability of the Proponent to properly manage the negative pressure conditions will significantly influence the extent of fugitive emissions release and off-site impacts from the tipping hall during operation. The Proponent has not demonstrated that the achievement of negative pressure conditions in the tipping hall is feasible under ordinary conditions, let alone upset conditions. In particular, there is no indication whether the extraction rate required from the tipping hall building will match the excess air requirements of the boilers.

Katestone indicates that odour levels may have been significantly underestimated as a result of the failure to address waste fuel variability and upset conditions, noting that air extraction from the tipping hall is likely to cease during upset conditions. Katestone also notes that there may be times when the EfW Facility is not operating at full capacity, and that the air extraction rate from the tipping hall building would be lower and less effective at controlling leakage during these times.

These observations raise serious questions about the adequacy of the assessment undertaken by the Proponent and the ability of the Proponent to manage odour impacts from the EfW Facility.

7.3 Failure to consider impacts on Eastern Creek Business Park

The Odour Impact Assessment Report does not consider impacts on existing and likely future sensitive receptors within the Eastern Creek Business Park. As noted by Katestone, the Jacfin land is not identified as a sensitive receiver for odour and odour predictions have not been made at discrete receptor locations on the Jacfin land.

The relevant EPA guidelines identify sensitive receivers as including places where people work. A number of people are currently employed at the Eastern Creek Business Park and the number of employees at this location is only going to increase as this land is further developed over time, consistent with its zoning for employment uses.

The failure to consider odour impacts on the Eastern Creek Business Park amounts to a failure to take into account a key relevant consideration in the assessment of the likely impacts of the proposed EfW Facility. Jacfin therefore submits that the Amended EIS does not provide sufficient information for a decision-maker to determine the application in its current form.

8 Noise

A peer review of the Applicant's Noise Impact Assessment has been undertaken by Wilkinson Murray on behalf of Jacfin. Wilkinson Murray concludes that the revised Noise Impact Assessment remains deficient and that 'there is still no clear demonstration that noise impacts from the EfW Facility could be managed to an appropriate level.' Of particular concern, Wilkinson Murray considers that there is a high risk that the noise impacts of the EfW Facility on neighbouring areas have been underestimated by the Proponent.

In the circumstances, it is considered that a reasonable decision-maker could not conclude on the basis of the revised Noise Impact Assessment that the noise impacts of the proposed EfW Facility will be acceptable.

8.1 Deficiencies in noise assessment

Wilkinson Murray has identified a number of areas of deficiency in the Noise Impact Assessment:

(a) Only two locations have been monitored in order to establish background noise levels, one of which is acknowledged to have been affected by extraneous noise. Additional noise monitoring is required in order to ensure appropriate intrusive noise criteria can be developed.

(b) There is a lack of detail in the assessment concerning the calculation procedure used to estimate façade element sound power levels and the orientation of the façade elements used in the modelling. It is therefore not possible to confirm whether noise levels have been accurately predicted at relevant receivers.

(c) A range of plant, including roller doors, mobile plant and the proposed conveyor from the Genesis MPC to the facility, which would reasonably be regarded as significant operational noise sources, have either not been included in the noise modelling or Wilkinson Murray cannot confirm whether they have been appropriately modelled, since the assumptions adopted in the modelling are not clear.

(d) Low frequency noise modelling has not been undertaken for octave band frequencies 16Hz and 31.5Hz, which are the frequencies within which intrusive and annoying noise typically falls. Low frequency noise has therefore been underestimated and is likely to exceed the EPA low frequency noise criterion, with the result that noise levels at Erskine Park will exceed the EPA's intrusive noise criterion.

Wilkinson Murray notes that the type of low frequency noise which has been omitted from the Noise Impact Assessment could result in rattling of building elements within the Eastern Creek Business Park and annoyance to occupants. Jacfin submits that any such impact beyond the boundaries of the EfW site would be entirely unacceptable. The potential for such impacts reinforces the inappropriateness of the selected location for this facility in the middle of metropolitan Sydney and the fact that this type of facility ought to be located where an appropriate buffer to adjoining residential and commercial land uses can be provided.

Given the deficiencies in the noise modelling undertaken by the Proponent, it is submitted that the consent authority cannot be satisfied that the EfW Facility will have acceptable noise impacts and is not in a position to properly assess whether the EfW Facility will result in unacceptable low frequency noise.

8.2 Precinct Plan noise levels

The Precinct Plan sets noise level goals for land within the Eastern Creek Precinct to ensure the noise amenity of surrounding residential areas is protected. The EfW Facility will be within Zone 4 of the Precinct, which has a noise goal of 54 dBA during the day, 44 dBA during the evening and 39 dBA at night.

The Noise Impact Assessment predicts a 1 to 2dB exceedance of each of the daytime, evening and night time Zone 4 cumulative noise goals under the Precinct Plan. Such an exceedance is unacceptable. In cases where such exceedances are permitted, Wilkinson Murray indicates that they are limited to a 15 minute duration and the Proponent must demonstrate that all reasonable and feasible measures have been applied to reduce noise levels. The Proponent has not demonstrated that all reasonable and feasible measures have been applied to mitigate noise impacts and is proposing an exceedance of the noise goals for the entire daytime, evening and night time period.

Further, in circumstances where Wilkinson Murray concludes that noise impacts have been underestimated, the extent of the exceedance of the Zone 4 cumulative noise goals could in fact be greater than the 1 to 2dB exceedance predicted in the Noise Impact Assessment.

The purpose of establishing noise goals for particular zones within the Precinct is to share the burden of mitigating noise between different operations and ensure appropriate noise levels are maintained at sensitive receivers. Sharing of the mitigation burden is important to ensure that no single operation takes up too much of the available headroom for noise emissions, thereby constraining other uses.

If the EfW Facility is permitted to exceed the Zone 4 noise goals, this could significantly constrain other future employment uses in the Precinct, as these other operations will need to achieve more stringent noise levels in order to preserve amenity at nearby residences. Other operations may in fact have to achieve noise levels below the applicable zone noise goals in order to compensate for the exceedance caused by the EfW Facility. This will impose a significant cost burden on future employment uses, or in some cases may prevent other industrial and commercial uses from proceeding, which will represent a lost opportunity to generate much needed employment in the Precinct.

It is submitted that it would be inequitable for the EfW Facility to be permitted to exceed the Zone 4 noise limits and detrimental to the future development of the surrounding employment zoned lands.

8.3 Lack of assessment of Eastern Creek Business Park

As noted above, the amended Noise Impact Assessment Report does not adequately assess noise impacts on the Eastern Creek Business Park. The amended assessment includes two additional, cursory references to impacts on the Eastern Creek Business Park. However, no modelling of noise impacts on this site has been undertaken.

Section 6.5 of the Noise Report states that noise levels at the southern boundary of the facility are predicted to be between 50 and 55 dBA under worst case conditions. Section 6.8 states that cumulative noise impacts on the Eastern Creek Business Park were considered as part of the Response to Submissions (October 2015). It is unclear what document Section 6.8 is referring to. The Amended EIS makes reference to a Response to Submissions Report dated November 2015. This report has not been made available on the Department of Planning and Environment website. Accordingly, there is no assessment that adequately addresses impacts on the Eastern Creek Business Park amongst the materials currently on exhibition.

Table 6-2 of the updated Noise Impact Assessment includes predicted operational noise levels for a number of industrial and commercial receivers, some of which are further from the proposed EfW site than our client's business park. There is no explanation as to why operational noise levels have not been considered at the Eastern Creek Business Park.

The Amended EIS asserts that operational noise emissions will comply with the most stringent criteria under both neutral and adverse meteorological conditions. It then goes on to identify exceedances of applicable noise criteria at the Hanson Facility and residential receivers in Erskine Park. It is stated that a construction noise management plan will be developed to mitigate these exceedances (page xiv). As these exceedances are identified as occurring during the operational phase of the project, this is not an adequate response to managing these impacts.

9 Visual Impact

As indicated by JBA, the bulk and scale of the proposed EfW Facility is out of character with surrounding development and will have a significant and unacceptable visual impact on the Eastern Creek Business Park.

The proposed development includes a number of buildings over 30 metres in height, including the Boiler House (52 metres), Waste Bunker (43 metres), Control Room (38 metres) and Flue Gas Treatment facility (37 metres). In contrast, the maximum building height at the adjoining Eastern Creek Business Park is 15 metres. Accordingly, there will be four buildings at the EfW Facility that are more than double the height of the buildings at the Eastern Creek Business Park.

The Amended EIS asserts that from most locations, the lower parts of the EfW Facility will be totally obscured from view. It is unclear what is considered to constitute the 'lower parts' of the facility. Given the excessive height of the facility, the majority of the facility will be highly visible from a number of surrounding locations.

The Amended EIS states that proposed landscaping will assist in softening the appearance of the facility. It is difficult to see how landscaping will have any significant mitigating effect on the visual impact of buildings up to 50 metres in height and 100 metre high stacks. It is submitted that no amount of landscaping treatment will be sufficient to mitigate the visual impact of these buildings on the Eastern Creek Business Park and nearby residences. In addition, the majority of the proposed landscaping is proposed on adjoining future lots, raising serious questions about the future maintenance of this landscaping.

10 Vehicle Movements and Traffic Impact

As noted in Section 2 above, the updated Traffic Impact Assessment does not include any substantive re-assessment of the traffic impacts of the development.

The Traffic Impact Assessment indicates that the EfW Facility will generate an additional 614 vehicle movements per day on the external road network. This is based on an assumption that all deliveries to the EfW Facility will be nominally 22 tonnes for all waste types. This assumption is not correct. The Amended EIS indicates that deliveries to the Genesis MPC are currently undertaken by a combination of light, medium and heavy vehicles, with some loads as small as one tonne. Deliveries to the EfW Facility are certain to include the same variety of sizes, with the result that there are likely to be substantially more vehicle movements to and from the facility than assumed by the Proponent.

The Traffic Impact Assessment assumes that the additional vehicles movements created by the facility will be 'dispersed over operating hours' and concludes that the overall impact of the EfW Facility will be the addition of 65 vehicle movements per hour. While the EfW Facility is proposed to

operate 24 hours per day, it cannot be assumed that deliveries to the site will be evenly dispersed over each 24 hour period.

The Amended EIS indicates that 77% of waste will be supplied to the facility by third parties, with 29% of waste expected to be construction and demolition waste and 14% expected to be floc waste. Except in limited cases, approved hours of construction are limited to 7am to 6pm, meaning that the generation of construction and demolition waste is likely to be concentrated during this time period. In addition, facilities generating floc waste typically have limited hours of operation, with waste likely to be generated during business hours only. Accordingly, deliveries to the site will not be evenly distributed across the day.

Further, the Amended EIS expressly states that waste will only be delivered to the site at the operator's specified times. The Amended EIS does not state what those specified times will be. Without this information, it is not possible to assess the true traffic impact of the development. It is reasonable to assume that the operator's specified times for delivery will be a subset of normal business hours, meaning that the delivery of waste will not be evenly distributed across even the daytime period. Rather there will be a significant concentration of trucks at certain stipulated time periods during the day.

The unreliability of the assumptions made in the Amended EIS with respect to the number of additional traffic movements and the timing of those movements also has implications for the veracity of the noise impact assessment undertaken by the Proponent.

JBA has also identified that the proposed site layout presents a poor traffic safety outcome due to the failure to separate access for light and heavy vehicles. JBA notes that the requirement for light vehicles to navigate along the internal heavy vehicle route represents a clear safety issue. This aspect of the proposed development is also unacceptable.

11 Services

11.1 Water

As noted in the JBA Report, the EfW will require very large volumes of potable water. The Amended EIS does not demonstrate that there is sufficient water supply for the EfW and does not include any confirmation from Sydney Water as to the sufficiency of supply from existing water mains and reservoirs in the vicinity of the proposed development. In the absence of such information, it is not possible to assess whether the EfW will compromise the supply of water to existing and future surrounding industrial land uses.

11.2 Electricity

The EfW will rely on a new 132kV transmission line to transfer electricity generated by the facility to the Sydney West Substation. The Amended EIS asserts that the transmission line will be located within the existing TransGrid easement west of the site. However, as noted by JBA, the Amended EIS does not provide any detailed description, plans or assessment of the proposed transmission line.

Insufficient environmental impact assessment has been undertaken in relation to the proposed 132kV cables and 4 metre trench. In particular, matters such as access to properties underneath and/or adjacent to the transmission line and electromagnetic radiation impacts have not been assessed.

It is also noted that the transmission line will pass through land not controlled by TransGrid north of the Sydney West Substation. The feasibility of the power line is therefore not established by the Amended EIS.

12 Stormwater

The Amended EIS indicates that the Proponent will provide a 10,000m^3 detention basin onsite. However, the assessment materials do not demonstrate that there will be sufficient capacity to detain runoff up to the design storm. The size of the detention capacity to be provided onsite is inconsistently referenced in the exhibited materials, ranging from 10,000m^3 to 20,000m^3. The Proponent should be required to confirm the required detention capacity and demonstrate that this is provided for by the proposed detention basin onsite.

As noted in the JBA Report, the sufficiency of the size of the proposed bioretention basin is dependent on the runoff water quality. The Amended EIS does not indicate what water quality values have been assumed in the assessments. It is important that the correct values are used in order to assess the sufficiency of the bioretention basin, noting that the values used should not be those used for general runoff from industrial properties, given the potential for runoff from the EfW Facility to contain significantly higher levels of contamination.

There is also insufficient assessment of the potential impact of runoff on groundwater. There is potential for infiltration of groundwater from surface runoff to occur at the detention basin and in the bunker sections of the development. Given the potential toxicity of contaminants in runoff from the site, potential impacts on groundwater are a serious concern. The Proponent has not demonstrated that these impacts will be adequately managed.

13 Management of Wastewater

As noted above, the wastes received and processed by the EfW Facility will contain a number of toxic substances. Those wastes will be tipped onto the sorting floor upon receipt at the EfW Facility. Residue wastes on the tipping floor will be washed into a sump during or at the end of each day.

Water from wash down areas and the sorting floor is likely to contain high levels of varying contaminants, which will not be capable of discharge to sewer. It is proposed that this liquid waste be evaporated via thermal treatment processes. As noted in the JBA Report, no assessment of the impacts of wastewater disposal has been undertaken. The feasibility of the EfW Facility has not been established and a suitably comprehensive environmental impact assessment of the proposed facility has not been undertaken in this regard.

14 Submission

The EfW Facility is an offensive industry and is therefore prohibited on the proposed site. The consent authority does not have power to approve the EfW Facility.

Even if the proposed EfW Facility were permissible, Jacfin submits that on the basis of the information provided in the Amended EIS, which has been identified by JBA, Katestone, GHD and Wilkinson Murray as:

(a) insufficient;

(b) based on inaccurate or unrealistic assumptions;

(c) containing significant errors and/or inconsistencies; and

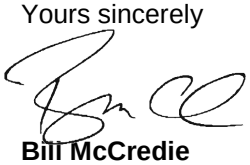
(d) failing to take into consideration relevant information, including the close proximity of the proposed EfW Facility to the Eastern Creek Business Park,

no reasonable decision-maker could properly assess the impacts of the EfW Facility or have any confidence that the conclusions presented in the Amended EIS in relation to the impacts of the proposed facility are reliable.

It is submitted that any doubt as to the reliability of the assessments undertaken by the Proponent and the impacts of the EfW Facility, in circumstances where those impacts include the emission of toxic substances which present a significant risk to human health, must cause the consent authority to conclude that the proposed location for the EfW Facility is manifestly inappropriate and refuse consent for the development.

The inadequate information presented in the Amended EIS does not enable the consent authority to discharge its statutory duty to take all relevant matters into account in the assessment of the EfW Facility. It is submitted that as a matter of law, consent must therefore be refused.

Yours sincerely



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Attach.

1. JBA, 'Eastern Creek Energy from Waste Facility, Jacfin Submission', 10 March 2017
2. Katestone, 'Review of Air Quality, Odour and Health Aspects of the Next Generation Energy from Waste Facility, Eastern Creek', 10 March 2017
3. GHD, 'Energy from Waste Submission – Odour Review', 10 March 2017
4. Wilkinson Murray, 'Energy from Waste Facility – State Significant Development SSD 6236 – Noise Peer Review on behalf of Jacfin', 28 February 2017

TW/JB
15494
10 March 2017

The Secretary
Department of Planning and Environment
GPO Box 39
SYDNEY NSW 2001

Attention: Sally Munk

Dear Ms Munk

EASTERN CREEK ENERGY FROM WASTE FACILITY, JACFIN SUBMISSION
HONEYCOMB DRIVE, EASTERN CREEK

This submission relates to the Amended Environmental Impact Statement (Amended EIS) for State Significant Development SSD 6236 for an energy-from-waste facility at Honeycomb Drive, Eastern Creek. It has been prepared by JBA on behalf of Jacfin. Jacfin is the owner of land immediately to the south and south-east of the site of the proposed energy-from-waste facility, being Lot 20 in DP1206129 which is within the Eastern Creek Business Park.

This submission should be read in conjunction with the previous submission prepared by JBA on behalf of Jacfin submitted during the exhibition of the original EIS, and dated 27 July 2015. It should also be read in conjunction with the specialist assessment reports prepared by Jacfin's experts in relation to the proposal. In particular, specialist assessment reports have been prepared in relation to:

- Noise.
- Air quality.
- Odour.
- Health impacts.

Key issues raised in this submission and detailed below are:

- Inaccurate or unrealistic assessment assumptions.
- Not permissible development.
- Visual impacts.
- Inconsistency with the character of the Eastern Creek Business Hub.
- Amenity impacts for workers in the Eastern Creek Business Hub.

1.0 ASSESSMENT ASSUMPTIONS

The proposed energy-from-waste facility is a hugely complex industrial activity which involves a number of inherently variable, imprecise and inaccurate processes.

In particular:

- Fuel sources derived from waste materials are highly variable by their very nature – within and between loads. The variability relates both to the calorific value of the waste, which is critical to ensuring suitable combustion processes, as well as the levels of pollution-causing contaminants in the feedstock.
- The methods and procedures for mixing the waste materials are imprecise and inaccurate, as they rely on the use of mechanical mixing equipment operated manually on the floor of the storage shed – meaning the process is reliant on the judgement of equipment operators. This approach is imprecise, and can only be expected to achieve a highly variable mix of materials for input into the turbines.

The proposed energy-from-waste facility will rely on the calorific value of the waste to generate suitable temperatures for destruction of air pollutants in the flue gases. However, whilst the turbines rely on relatively standardised materials in order to achieve adequate combustion conditions for pollutant reduction, the nature of the waste feedstock is highly variable – leading to potential risk for ongoing inadequate pollutant destruction rates and unacceptable risks of air pollution impacts.

The Amended EIS has sought to address this inherent uncertainty with the process by developing a suite of assumptions in relation to waste feedstock calorific and contaminant levels. However, these assumptions are based on flawed assumptions regarding the relationships between existing incoming waste streams at the Genesis Xero Waste Materials Processing Centre and the future waste streams that will feed the energy-from-waste facility, and are therefore considered to be arbitrary and unsuitable.

Given the above, there can be no certainty in relation to the outcomes of the air quality and human health impact assessments. It is considered that the facility presents a significant and unacceptable risk to the workers located in the adjacent commercial and industrial facilities as well as the nearby residential areas, and that this unacceptable risk is unable to be addressed by the proposal in its current format.

Further, in the event of 'upset conditions' or an emergency, the proximity to sensitive receptors means that avoiding catastrophic human health impacts will require immediate and complex intervention by the facility's management. Given the size and scale of the proposed energy-from-waste facility and its location in close proximity to a range of sensitive receptors, there can be no confidence for regulators or neighbours that adequate management controls and governance systems would be able to be implemented to ensure the facility can avoid off-site impacts to sensitive receivers – including workers within the Eastern Creek Business Hub. In particular, our review of the Human Health Risk Assessment identifies that 'upset conditions' emissions could result in significantly greater annual ground-level concentrations and deposition rates of air pollutants – including for dioxins and carcinogenic pollutants.

It is also noted that there is a foreseeable risk of waste igniting either in the bunker or in a truck (as described in the Preliminary Hazard Analysis & Fire Risk Assessment). Uncontrolled burning of waste would undoubtedly lead to substantial exceedances of the EPA's ground level air quality criteria for toxic air pollutants and related human health impacts.

2.0 NOT PERMISSIBLE

The proposed energy-from-waste facility is potentially offensive industry under *State Environmental Planning Policy No. 33 – Hazardous and Offensive Development* (SEPP 33). Based on the Department of Planning and Environment's *Applying SEPP 33: Hazardous and Offensive Development Application Guidelines* one of the key measures by which offensiveness is measured under SEPP 33 is whether the Environment Protection Authority (EPA) is able to issue an Environment Protection Licence. The EPA has raised extensive issues with the proposed facility, including inherent uncertainties associated with the characteristics of the waste feedstock, and concluded that it should be rejected in its current form.

The Amended EIS does not involve substantial changes to the proposed facility to address the reasons for the EPA's recommendation to reject this proposal.

It is therefore submitted that the energy-from-waste facility as described in the Amended EIS remains incapable of achieving the requisite certainty to achieve the issue of a Licence from the EPA, and so should be characterised as an Offensive Industry.

Offensive Industries are prohibited in the IN1 General Industrial Zone of *State Environmental Planning Policy (Western Sydney Employment Area) 2009*. As such, the proposed energy-from-waste facility is prohibited development.

3.0 VISUAL IMPACT

Jacfin's Eastern Creek industrial estate adjoins the site on its southern boundary. The prevailing building height within the Eastern Creek industrial area is approximately 15m, which is generally suitable for accommodating warehouse and distribution facilitates. The proposed energy-from-waste facility will include 6 buildings well above his height, including a boiler house at 52m high and a waste bunker at 43m high. The facility will also include 100m high vent stacks. These buildings and structures represent a significant increase in the predominant height, bulk and scale for development in the area and will result in significant visual impacts to surrounding areas from where they would be visible.

Given the heavy industry nature of the proposed energy-from-waste facility and its bulk and scale as viewed from the south, the proposed energy-from-waste facility will have a significant and unacceptable visual impact on the industrial areas within the Western Sydney Employment Park bordering the site, including Jacfin's Eastern Creek industrial estate.

The Amended EIS does not include any meaningful attempt to mitigate this visual impact by landscape planting.

4.0 CHARACTER AND CONTEXT

The proposed energy-from-waste facility is out of character with the nature of development that is envisaged in the Eastern Creek Stage 3 Precinct Plan and that has occurred throughout the Eastern Creek Business Hub. The Eastern Creek Business Hub has developed as a premier location for logistics and distribution related facilities, that contain significant commercial components. Developers within the Business Hub are creating a well-landscaped, attractive and interesting locality which appeals to prominent and high quality end-users and tenants. Under this development model the Business Hub is generating a significant number of new jobs for Western Sydney, including a large proportion of higher paid higher order jobs.

Whilst the proposed facility is characterised as a Waste Management Facility, it is consistent in size, scale and potential impacts with a heavy industry. Facilities of this nature would normally be located in low density or rural areas with the potential for substantial set-backs and buffer zones to be established – commensurate with the magnitude of potential impacts and the level of uncertainty in the magnitude of these impacts. Given the nature of development already occurring around the site, and its proximity to pre-existing residential areas such an opportunity is not

available at this site. The facility is clearly not suitable for a site located in such a heavily developed part of the metropolitan area and within Sydney's heavily constrained air shed.

It is also highlighted that the site layout represents a poor urban design and traffic safety outcome, as it does not provide for the separation of light and heavy vehicles. Light vehicles are expected to navigate along the internal heavy vehicle route, and past the heavy turning and drop-off zone, representing a clear safety issue for light vehicle drivers who may not be suitably experienced in dealing with on-site heavy vehicles.

Overall the proposed energy-from-waste facility is out of character with the Stage 3 Precinct of Eastern Creek and is inconsistent with the development objectives of the Eastern Creek Stage 3 Precinct Plan. In particular, the proposed energy-from-waste facility represents a significant increase in bulk and scale compared to the prevailing buildings within the Eastern Creek industrial area. It undermines the urban design objectives of the Eastern Creek Stage 3 Precinct Plan. Its inconsistency with existing development outcomes being achieved within the Eastern Creek Stage 3 Precinct reinforces the clear conclusion that the site is not suitable for the proposed facility.

It is also noted that the Amended EIS for the proposal does not consider alternative site locations for the facility. Analysing feasible project alternatives is a critical part of the assessment process, and must be presented in the EIS. Given the inconsistency of the proposed facility with the character of the Stage 3 Precinct of Eastern Creek, the development objectives of the Eastern Creek Stage 3 Precinct Plan, and the substantial noise, odour and public health impacts on the nearby residential, commercial and industrial lands, the proposed facility is not suitable for the subject site.

5.0 AIR QUALITY AND ODOUR

A detailed assessment of the air quality and odour assessment reports attached to the Amended EIS have been undertaken and are attached to Jacfin's submission.

The air quality review particularly concludes that the air quality assessment has:

- Not adequately assessed air quality impacts, including ozone impacts, of the proposed facility as it has not included emissions from upset conditions.
- Not adequately assessed the impacts on the Jacfin Eastern Creek industrial estate.
- Not used suitable meteorological data.
- Contains inconsistencies that undermine the veracity and reliability of the assessment results.

The odour review particularly concludes that the odour assessment:

- Does not adequately characterise all the potential odour emissions from the waste fuels to be received at the facility or the background sources of odour from the Genesis facility.
- Does not adequately assess the odour emissions during upset conditions when the air extraction from the Tipping Hall building ceases.
- Does not adequately assess the potential odour concentrations across the Jacfin Eastern Creek industrial estate.

6.0 PUBLIC HEALTH

A detailed assessment of the Human Health Risk Assessment attached to the Amended EIS has been undertaken and is attached to Jacfin's submission.

The Human Health Risk Assessment relies on the air quality assessment, which is identified above (and in the attached specialist's submission) as being inadequate and containing unacceptable

inconsistencies. Ground-level concentrations and deposition rates of air pollutants could be significantly higher, resulting in higher human health impacts on surrounding residents and workers.

7.0 AMENITY OF BUSINESS HUB

Jacfin has an interest in maintaining suitable amenity within its Eastern Creek estate, in order to continue developing high-quality warehouse and distribution facilities with ancillary commercial offices. The nature of the proposed energy-from-waste facility represents a significant impact on the amenity of the estate, and health of workers, by way of noise and air emissions during normal and abnormal operating conditions.

The attached assessments of odour, air quality and human health demonstrate that there will impacts on the amenity within the Jacfin Eastern Creek industrial estate.

Additional assessments are required by the proponent in order to demonstrate that air quality, noise and odour impacts can be controlled to acceptable levels within the Eastern Creek Business Park under all foreseeable scenarios, and to inform an updated health impact assessment that takes the Eastern Creek Business Park into account. In particular, with the substantial uncertainties set out in Section 1 above, it is likely that in its current form the proposal will not be able to demonstrate that air quality, noise and odour impacts can be controlled to acceptable levels.

The amenity impacts caused by the proposed energy-from-waste facility, as well as the level of uncertainty in relation to these impacts, reinforce the conclusion that the site is not suitable for the proposed facility.

8.0 OTHER ISSUES

8.1 Electricity Transmission

Jacfin has significant concerns relating to the intended 132kV underground power lines and associated 4m wide trench – for which no detailed description, plans or assessment of impacts has been provided in the Amended EIS.

The proponent should provide details and assessment of the 132kV underground cables and the associated trench in terms of its location, the nature of the works required for its installation and the ongoing maintenance requirements.

We do not consider that a suitably comprehensive environmental impact assessment of the proposed energy-from waste facility has been undertaken in this regard and the proposal should therefore be refused.

We also note that the transmission line is intended to pass through land not controlled by Transgrid just north of the Sydney West substation. As such, the feasibility of this power line has not been established.

8.2 Ash Disposal

Ash from the air pollution control equipment is identified as being classified as Hazardous Waste. No assessment of the impacts from ash disposal has been provided. As such, a suitably comprehensive environmental impact assessment of the proposed energy-from-waste facility has not been undertaken in this regard and the proposal should therefore be refused.

8.3 Water Supply

The facility will be a very large user of potable water, but there is no confirmation from Sydney Water that there is sufficient supply for the development from existing water mains and reservoirs. There is also no confirmation as to whether this facility would compromise the supply to the

already extensively developed areas of the Eastern Creek Business Hub. As such, the feasibility of the energy-from-waste facility has not been established.

8.4 Wastewater

It is understood that toxic liquid waste arising from within the waste storage and handling buildings will be disposed of via evaporation in a thermal processing system, however, this system is not adequately described in terms of process, volumes, storage and disposal.

The Amended EIS provides no description of methods for cleaning the sheds and conveyors of the proposed energy-from-waste facility. It is assumed that the cleaning process will generate significant volumes of contaminated wastewater. There is no detail provided on the waste products quantities, levels of contamination or treatment processes.

Wastewater from the facility will contain a range of highly contaminating materials. As such, wastewater from the facility would not be able to be discharged to the sewer under a Trade Waste Agreement because of the potential levels of contamination.

No assessment of the impacts from wastewater disposal has been provided, including details of all wastewater streams, wash down processes, measures for collecting, storing, treating and disposing of this wastewater. As such, the feasibility of the energy-from-waste facility has not been established and a suitably comprehensive environmental impact assessment of the proposed energy-from-waste facility has not been undertaken in this regard. The proposal should therefore be refused.

8.5 Stormwater

There is insufficient information and justification of parameter values, assumptions and modelling results to assess the specified runoff rates, volumes and water quality outcomes. Further, the area of impervious surfaces is estimated using an inappropriate generalised method. As such, the volume of detention storage and the area of bio-retention basins cannot be confirmed.

The area of a bio-retention basin required is very dependent on the runoff water quality. There is no detail provided in the Amended EIS to determine if the proposed area of bio-retention basins is adequate. Importantly, the water quality values should not be those used for general runoff from industrial properties. Runoff from the proposed energy-from-waste facility has the potential to contain much higher levels of contaminants, which would greatly influence the size and type of treatment required.

There is also insufficient assessment of the potential impact of contaminated runoff to infiltrate into groundwater.

The insufficient assessment of the impact of runoff on receiving water quality means that the feasibility of the energy-from-waste facility has not been established and a suitably comprehensive environmental impact assessment of the proposed energy-from-waste facility has not been undertaken in this regard. The proposal should therefore be refused.

9.0 CONCLUSION

The proposed energy-from-waste facility is a hugely complex industrial activity which should not be located in close proximity to adjacent commercial and industrial facilities or nearby residential areas. It will be a significant new contributor of air pollution within the metropolitan air shed, including heavy metals, dioxins and furans, PAHs and other toxic or carcinogenic pollutants.

The nature of the facility is inherently risky, in that it relies on imprecise procedures for managing a highly variable fuel source for the turbines, which require relatively standardised materials in order to achieve adequate burn times for pollutant reduction in the flue gases. Further, in the event of 'upset conditions' or an emergency, the proximity to sensitive receptors means that avoiding catastrophic human health impacts will require immediate and complex intervention by the facility's

management (indeed, intervention may not even be able to prevent impacts if the waste mix is unsuitable and toxic air pollutants have already been emitted by the time they are identified by in-stack monitoring). The proponent has not demonstrated that it has the experience or the capability to implement the necessary management and governance systems to ensure the facility can avoid off-site impacts to sensitive receivers – including workers within the Eastern Creek Business Hub.

Overall the proposed energy-from-waste facility is out of character with the Stage 3 Precinct of Eastern Creek and is inconsistent with the development objectives of the Eastern Creek Stage 3 Precinct Plan.

Further, the EPA has raised extensive issues with the proposed facility and concluded that it cannot be licenced in its current form. The Amended EIS does not involve substantial changes to the proposed facility so it should still be considered incapable of achieving the requisite certainty to achieve the issue of a Licence from the EPA. This means the proposed facility should be considered to be an Offensive Industry, which is prohibited at the site.

Given its nature the energy-from-waste facility is consistent in scale, complexity and potential impacts with a heavy industry and should be located in low density or rural areas with a substantial buffer zone established.

Given the nature of development already occurring around the site, and its proximity to pre-existing residential areas such an opportunity is not available at this site. As such, the risk is simply too great for such a large and complex facility to be located at the proposed site.

It is therefore incumbent on the Department of Planning and Environment to recommend refusal of the proposed energy-from-waste facility as a result of its unacceptable risk to human health and amenity of the surrounding community.

Should you have any queries about this matter, please do not hesitate to contact me on 9409 4962 or tward@jbaurban.com.au.

Yours faithfully

[redacted]

Tim Ward
Associate

[redacted]

Julie Bindon
Director

katestone
www.katestone.com.au

10 March 2017

Attn: Bill McCredie

Allens
Deutsche Bank Place
Corner of Hunter & Phillip Streets
Sydney NSW 2000 Australia

Email: Bill.McCredie@allens.com.au

Re: Peer Review of Air Quality, Odour and Health Aspects of the Next Generation Energy from Waste Facility, Eastern Creek

Dear Bill,

Katestone has conducted a peer review of the air quality and health aspects of the Amended Environmental Impact Statement (AEIS) that was prepared for the Next Generation Energy from Waste Facility (EfW), Eastern Creek. The peer review of the AEIS has also had regard to the submission made by Jacfin Pty Limited (dated 27 July 2015) to the Department of Planning and Environment in relation to the proposed facility.

In particular, Katestone has completed the following works:

- Reviewed relevant AEIS documents including:
  - Appendix K: Air Quality Impact and Greenhouse Gas Assessment
  - Appendix L: Odour Assessment
  - Appendix M: Ozone Impact Assessment
  - Appendix N: Human Health Risk Assessment
- Conducted a preliminary evaluation of whether the above studies adequately address the issues raised in Jacfin's submission
- Conducted a preliminary evaluation of whether the above studies adequately assess the potential impacts of the proposal.

This letter summarises the results of Katestone's review of the relevant documents. Attached to this letter is a more detailed evaluation of each of the technical appendices of the AEIS.

In summary Katestone's review has identified the following in relation to Appendix K, Appendix L, Appendix M and Appendix N:

- The proposed EfW will have the potential to generate many toxic and odorous compounds including: heavy metals, volatile organic compounds, dioxins and furans and polycyclic aromatic hydrocarbons (PAHs). Many of these compounds are known human carcinogens. Appendix K, L, M and N have not demonstrated with sufficient certainty that the EfW Facility can be operated without causing adverse impacts on human health and amenity. It is critical that any such facility is subjected to rigorous

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management of waste fuel quality and emissions control to ensure that the pollutants that are generated are captured and, where possible, to avoid generation of air pollutants.

- There is a significant degree of uncertainty associated with the potential impacts of the EfW Facility. The AEIS states that there will be up 60 hours of upset conditions per year with a maximum duration of 4 hours per upset. These upset conditions have not been appropriately accounted for in the air quality and human health risk assessment (HHRA). As a consequence, the air quality assessment and HHRA are likely to have underestimated the potential health risk associated with the EfW Facility.

- In relation to the Clean Air Regulation, emissions from the EfW Facility would exceed the standards of concentration for solid particles, oxides of nitrogen (NOx) and carbon monoxide (CO) during upset conditions. In the case of NOx, emissions exceed the standard of concentration by more than a factor of three. It is an offence under the *Protection of the Environment Operations Act 1997* to exceed the limits specified in the Clean Air Regulation.

- Appendix L has not addressed the likely variability in odour emissions from the waste fuel. It has relied upon data from the Genesis Facility, whereas, the EfW Facility will receive a concentrated organic waste stream from the Genesis Facility and wastes from other facilities. Additionally, the odour assessment has assumed that air will be extracted from the Tipping Hall Building at all times and the extracted air passed to the boilers. No evaluation has been made of upset conditions where the boilers cease operation and, therefore, air extraction from the Tipping Hall Building ceases also. In these circumstances, the odour emission rate may increase by a factor of two or more depending on the nature of the wastes in the building.

- The tabulated predictions have been presented in Appendix K and M for a small number of sparsely distributed sensitive receptors on the Jacfin land. The discrete receptor predictions on the Jacfin land do not necessarily represent the maximum impact of the proposed EfW Facility. Appendix L (the Odour Assessment) has not provided predictions at discrete locations on the Jacfin land.

- There is no clear characterisation of the proposed waste fuels as eligible under the requirements of the NSW Energy from Waste Policy Statement. Some of the wastes that are proposed to be used are ineligible under the NSW Energy from Waste Policy Statement.

- The EfW is proposed to operate at 850 degrees as the average chlorine content is intended to be less than 1%. Appendix K states that the chlorine content of less than 1% will be achieved through mixing of the waste using a crane before feeding it to the combustion process. This approach to the quality assurance of waste fuel is insufficient. In particular, it provides no quantitative record of waste fuel quality. As a consequence, there will be no way of detecting a failure to manage chlorine levels to below 1%. Continuous monitoring for dioxins and metals is not feasible, therefore it will generally not be possible to know if a spike in emissions has occurred.

- Annual average concentrations of air pollutants have not included the potential effect of upset conditions. Upset conditions may occur for up to 60 hours per year. Appendix K suggests that solid particle emissions may be up to 150 times normal operational emissions during upset conditions. At this rate, annual emissions of solid particles would be more than double as a result of upset conditions. This could result in a doubling of predicted ground-level concentrations of air pollutants.

- Appendix K assumes that other air pollutants would increase by a factor of ten because of upset conditions. This difference in assumption for solid particles vs other pollutants that may be in the particulate phase or bound to particulate matter is illogical. The assumptions and emissions used for upset conditions in the air quality study are inconsistent with the supporting information provided at page B-6 of Appendix K.

- The approach that has been used to characterise meteorological conditions at the site is unlikely to realistically characterise the atmospheric structure. It is possible that the modelling has not realistically dealt with convective atmospheric conditions and fumigation events. These circumstances are important for potential near-field effects of tall stacks such as is proposed for the EfW. It is also possible that the modelling approach has resulted in an under-estimation of annual average concentrations of air pollutants.

- Appendix L used AERMOD to make predictions of odour concentrations. This model is not suitable for the light wind conditions that have been shown to occur at the subject site.

- Upset emissions of NOx and cadmium are predicted to exceed the criteria specified in the Approved Methods on the Jacfin land.

- If it is assumed that the emission concentration of cadmium from the EfW is equal to the standard of concentration specified in the Clean Air Regulation, the ground-level concentrations of cadmium are predicted to exceed the ambient air quality criterion specified in the Approved Methods on the Jacfin land.

- With the adoption of NOx control technology (selective non-catalytic reduction – SNCR), the EfW would be the seventh greatest emitter of NOx in Sydney. Even with SNCR, the EfW represents an additional 5% of NOx emissions into the Sydney airshed based on 2008 Inventory data. Upset emissions would represent a considerably greater emission rate. However, the ozone assessment has not considered upset emissions.

- Annual average concentrations of air pollutants during normal operations are likely to have been underestimated because they have not accounted for upset emissions that could occur for up to 60 hours per year. As detailed above, 60 hours per year of upset emissions could result in significantly greater emission rates of air pollutants and, therefore, ground-level concentrations and deposition rates of air pollutants. This underestimation of ground-level concentrations and deposition rates of air pollutants indicates that the chronic carcinogenic and non-carcinogenic risks are likely to also have been underestimated by the HHRA.

- It is possible that odour levels have been significantly underestimated as a result of Appendix L's failure to address waste fuel variability and upset conditions, for example, in the event that air extraction from the Tipping Hall Building ceases. This degree of underestimation in odour emission rates would lead to a doubling of predicted concentrations and, likely exceedance of EPA's odour criterion of 2 ou in parts of the Jacfin land.

- Several of the contour plots shown in Appendix K are inconsistent with the tabulated data shown in Appendix K.

- There are several inconsistencies between Appendix N and Appendix K that cannot be explained.

- The AEIS did not consider alternative sites as a means of minimising the potential health and amenity risks associated with the EfW Facility. A key feature of the proposed site of the EfW is its relatively close proximity to future commercial activities on adjoining land to the east, south and west.

- The AEIS has failed to demonstrate that the proposed EfW Facility can be operated and maintained so as not to cause adverse impacts on human health and amenity in the surrounding areas.

Please contact me if you would like to discuss.

Yours sincerely,

Simon Welchman

A. REVIEW OF APPENDIX K: AIR QUALITY IMPACT AND GREENHOUSE GAS ASSESSMENT

Katestone has reviewed the air quality impact assessment aspects of Appendix K. The findings of the review are discussed below. Katestone has not evaluated the robustness of the Greenhouse Gas Assessment.

The Director-General's Environmental Assessment Requirements require that an air quality assessment of the EfW is conducted in accordance with the Environment Protection Authority's *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW* (DEC, 2005) (Approved Methods).

A.1 Sensitive Receptors

The Approved Methods defines a sensitive receptor as follows:

> *A location where people are likely to work or reside; this may include a dwelling, school, hospital, office or public recreational area. An air quality impact assessment should also consider the location of known or likely future sensitive receptors.*

Appendix K has identified sensitive receptors in accordance with this definition. In terms of workplace receptors, dispersion modelling has been conducted across a cartersian receptor grid as well as at a number of discrete points within the land owned by Jacfin that covers existing premises as well as possible future locations. Predicted ground-level concentrations of air pollutants have been tabulated in Appendix K at the discrete receptor locations. These predictions are reproduced in Table 3, Table 4 and Table 5. The discrete receptor locations are relatively sparsely distributed across the Jacfin land and, consequently, do not necessarily provide an indication of the maximum impact of the EfW on the Jacfin land.

A.2 Emissions inventory

Emission scenarios

Appendix K provides three emission scenarios, namely:

- Scenario 1 – normal operating conditions
- Scenario 2 – *Protection of the Environment Operations (Clean Air) Regulation 2010* limits as operating conditions
- Scenario 3 – upset operating conditions.

NSW Energy From Waste Policy

The EPA's policy is detailed in the document: NSW Energy from Waste Policy Statement (EPA, 2015). This policy statement is referenced throughout the AEIS and Appendix K.

In relation to eligible waste fuels, the NSW Energy from Waste Policy Statement identifies various wastes that are categorised by the EPA as eligible waste fuels. They are:

1. *biomass from agriculture*
2. *forestry and sawmilling residues*
3. *uncontaminated wood waste*
4. *recovered waste oil*
5. *organic residues from virgin paper pulp activities*
6. *landfill gas and biogas*

7. source-separated green waste (used only in processes to produce char)

8. tyres (used only in approved cement kilns).

Appendix K identifies the following as the main sources of fuel for the EfW Facility:

- Chute residual waste (CRW) from the Genesis MPC
- Commercial and industrial (C&I)
- Construction and demolition (C&D)
- Floc waste from car and metal shredding
- Paper pulp
- Glass recovery
- Garden organics
- Alternative waste treatment
- Material recovery facility waste residual.

Appendix K has not placed the proposed fuels within the context of eligible waste fuels under the NSW Energy from Waste Policy Statement. Some wastes that are proposed to be used are ineligible e.g. source-separated green waste is only to be used to produce char. The EPA's eligibility criteria are:

Facilities proposing to use eligible waste fuels must meet the following criteria:

- *ability to demonstrate to the EPA that the proposed waste consistently meets the definition of an EPA-approved eligible waste fuel*
- *confirm there are no practical, higher order reuse opportunities for the waste*
- *fully characterise the waste and/or undertake proof of performance*
- *meet the relevant emission standards as set out in the Protection of the Environment Operations (Clean Air) Regulation 2010.*

In relation to minimising emissions the NSW Energy from Waste Policy Statement states:

To ensure emissions are below levels that may pose a risk of harm to the community, facilities proposing to recover energy from waste will need to meet current international best practice techniques, particularly with respect to:

- *process design and control*
- *emission control equipment design and control*
- *emission monitoring with real-time feedback to the controls of the process.*

The EfW Facility proposes to adopt emission controls and management practices that are consistent with the European Industrial Emissions Directive (IED). In broad terms, this is a reasonable benchmark for best practice. The EfW Facility will not receive waste that has a chlorine content that is greater than 1%. Consequently, Appendix K argues that the following provisions of the NSW Energy from Waste Policy Statement are not triggered:

If a waste has a content of more than 1% of halogenated organic substances, expressed as chlorine, the temperature should be raised to 1100°C for at least 2 seconds after the last injection of air.

Within Appendix K and the various submissions in response to the EIS, there is discussion about whether the waste fuel that will be used in the EfW Facility will contain greater than 1% chlorine. However, the AEIS and Appendix K provide little information that demonstrates that the 1% chlorine limit can be achieved in practice.

Appendix K states that the chlorine content of less than 1% will be achieved through extensive mixing of the waste using a crane before feeding it to the combustion process. The waste will be homogenised by using a crane. This approach to the quality assurance of waste fuel is insufficient. In particular, it provides no quantitative record of waste fuel quality. As a consequence, there will be no way of detecting a failure to manage chlorine levels to less than 1%. If the proposed approach fails and the waste fuel chlorine content exceeds 1%, dioxin emissions could be elevated. There is no continuous monitoring for dioxins or metals available, therefore it will not generally be possible to know if a spike in emissions has occurred.

Regulatory compliance

Section 128 of the *Protection of the Environment Operations Act 1997* (the Act) makes it an offence to emit air pollutants in excess of the standard of concentration specified in a regulation made under the Act. Section 128 states:

> ***128 Standards of air impurities not to be exceeded***
>
> *(1) The occupier of any premises must not carry on any activity, or operate any plant, in or on the premises in such a manner as to cause or permit the emission at any point specified in or determined in accordance with the regulations of air impurities in excess of:*
>
> *(a) the standard of concentration and the rate, or*
>
> *(b) the standard of concentration or the rate,*
>
> *prescribed by the regulations in respect of any such activity or any such plant.*
>
> *(1A) Subsection (1) applies only to emissions (point source emissions) released from a chimney, stack, pipe, vent or other similar kind of opening or release point.*
>
> *(2) The occupier of any premises must carry on any activity, or operate any plant, in or on the premises by such practicable means as may be necessary to prevent or minimise air pollution if:*
>
> *(a) in the case of point source emissions—neither a standard of concentration nor a rate has been prescribed for the emissions for the purposes of subsection (1), or*
>
> *(b) the emissions are not point source emissions.*
>
> *(3) A person who contravenes this section is guilty of an offence.*

The *Protection of the Environment Operations (Clean Air) Regulation 2010* (Clean Air Regulation) specifies standards of concentration that are relevant to Section 128 of the Act and the proposed EfW. Table 1 compares the EfW emissions for normal and upset conditions with the standards of concentration specified in the Clean Air Regulation. Table 1 also compares the EfW emissions with the IED that is referenced in the AEIS as the best practice design basis for the EfW.

In relation to the Clean Air Regulation, Table 1 shows that emissions from the EfW would exceed the standards of concentration for solid particles, oxides of nitrogen (NOx) and carbon monoxide (CO) during upset conditions. In the case of NOx, emissions exceed the standard of concentration by more than a factor of three. Whilst the Clean Air Regulation makes start up and shut down emissions exempt from compliance, it is clear from Appendix K that the upset conditions will occur outside of start up and shut down.

Similarly, Table 1 shows that emissions from the EfW would exceed the IED limits for solid particles, NOx, hydrogen chloride (HCl), hydrogen fluoride (HF), cadmium (Cd) and CO during upset conditions. The IED states

that incineration of waste should not occur for a period of more than 4 hours uninterrupted where emission limits are exceeded and that the cumulative duration of such operations over one year shall not exceed 60 hours. Appendix K states that the cumulative duration of such exceedances would not occur for more than 60 hours over one year.

In relation to upset conditions, Appendix K, page 38 states:

> "…*Very high emission rates would occur rarely and for short time because plant shutdown would likely be an imminent consequence, whereas slightly elevated levels could occur occasionally and for some length of time until necessary actions are put into force.*"

Table 1 Comparison of EfW emissions with Clean Air Regulation standards of concentration and IED limits

Pollutant	Concentration limit (mg/Nm³)				EfW Normal Operations	EfW Upset
	Clean Air Regulation	IED Daily Avg	IED 30min Avg 100%	IED 30min avg 97%		
	App K p14: Table 4-2	App K p15: Table 4-3			App K p37: Table 7-4	App K p38: Table 7-5
Solid particles	50	10	30	10	1	**150**
HCl	100	10	60	10	9	**90**
HF	50	1	4	2	4	**40**
NOx as NO_2	500	200	400	200	188	**1880**
Type 1 and 2	1	0.5				
Cd	0.2	0.05			0.009	**0.09**
Hg	0.2	0.05			0.004	0.013
Dioxins/Furans	1.00E-07	1.00E-07			1.00E-08	
VOC	40					
CO	125	50			23	**230**
Cl2	200				9	
H_2S	5				5	
TOC	40	10	20	10	0.015	0.15
SO_2		50	200	50	27	**270**
Thallium		0.05				
NH_3					2	20
PAHs					0.0005	

Upset emissions have been assumed to be ten times greater than normal emissions for most pollutants except for solid particles, which have been assumed to be 150 times greater than normal emissions. The following points are relevant:

- If solid particle emissions did increase by 150 times, it would be logical to expect that all air pollutants in the solid phase or bound to particles would also increase by a similar amount rather than by the factor of 10 that has been assumed.
- The upset emissions that have been used in Appendix K are in some cases inconsistent with the information provided in the appendices to Appendix K. For example, in a memo from Rosalind Flavell to Damon Roddis dated 29 January 2015, a plausible upset emission concentration for cadmium and mercury was stated to be 0.75 mg/m³ (Appendix K, page B-6), whereas, Appendix K applied emission concentrations for cadmium and mercury during upset conditions of 0.09 mg/m³ and 0.013 mg/m³, respectively (Appendix K, page 38, Table 7-5).

- Appendix K has assessed potential impacts on air quality over short-term averaging periods on the basis that upsets would have no consequences to long term averages. However, in terms of total mass emissions, upset conditions are significant and, therefore annual averages should have been estimated accounting for upset conditions.

- For example, if solid particle emissions were 150 times normal operational emissions for 60 hours per year, the EfW would emit more particles in those 60 hours than it would for the remainder of the year. Consequently, annual average concentrations of particles may have been underestimated by a factor of two by not including upset conditions. If cadmium emissions were 0.75 mg/m³ for 60 hours and 0.009 mg/m³ for the remaining hours of the year, cadmium emissions would be higher by 1.6 times. If mercury emissions were 0.75 mg/m³ for 60 hours and 0.004 mg/m³ for the remaining hours of the year, mercury emissions would be higher by 2.3 times.

Dioxin and furan emissions

Section 7.9 of Appendix K discusses dioxin and furan emissions from the EfW. In particular, it states:

> "*…The total dioxin emission from the TNG EfW facility is estimated to be around 0.02% of the Australian inventory, and 0.05% of the contribution from Australian backyard incineration activities.*"

The scale of this comparison is misleading because dioxins and furans will have a potential impact on local and near regional air quality, so the proportion of emissions relative to Australia is not relevant. It is also notable that backyard burning and unauthorised incineration are prohibited at all times in all council areas in the Sydney, Wollongong and Newcastle regions, and in other NSW council areas listed in Schedule 8 of the Clean Air Regulation.

A.3 Meteorological data

The requirements for preparing meteorological data for air quality studies are detailed in the Approved Methods. The description of the meteorology is contained in Section 5 of Appendix K.

Of the nearby meteorological monitoring stations (Horsley Park [BoM], St. Marys and Prospect [OEH]), the data from St. Marys was chosen as the most representative in terms of land use and surface roughness. The representative year was identified as 2013 from five years of data as required by the Approved Methods.

Comparisons of modelling results using St. Marys and Horsley Park were discussed, concluding that St. Marys data results in more conservative results.

Cloud cover and cloud height were obtained from the closest meteorological station that recorded these parameters, namely the Bureau of Meteorology's Bankstown Airport AWS, located approximately 19 km southeast of the EfW Facility.

The Lakes AERMOD View GUI "upper air estimator" (UAE) was used to generate upper air data because temperature soundings are not available that are representative of the site. UAE has been criticised by regulators and experts. Essentially, the UAE extrapolates upper air data from surface measurements. Consequently, this approach is unlikely to realistically characterise the atmospheric structure. It is possible that the modelling has not realistically dealt with convective atmospheric conditions and fumigation events. These circumstances are important for potential near-field effects of tall stacks such as is proposed for the EfW. It is also possible that the modelling approach has resulted in an under-estimation of annual average concentrations of air pollutants.

A.4 Dispersion modelling

Modelling was conducted using the AERMOD dispersion model. This model, if configured correctly, is suitable for the application to an elevated stack emission source. Noting comments in Appendix B, that AERMOD is unsuitable for ground-level fugitive releases of odour.

The contour plots that are shown in Appendix K do not match the tabulated data in Appendix K.

Table 2 Comparison of contour plots with tabulated data in Appendix K

Figure	Pollutant	Does Figure Match Tabulated Data in Appendix K?	Does Figure Match Tabulated Data in Appendices to Appendix K?
9-1	PM_{10} 24hr	**No**	**No**
	PM_{10} Annual	Yes	Yes
9-2	$PM_{2.5}$ 24hr	**No**	**No**
	$PM_{2\,5}$ Annual	Yes	Yes
9-3	NO_2 1hr	Yes	No
	NO_2 Annual	Yes	Yes
9-4	SO_2 10min	**No**	**No**
	SO_2 1hr	**No**	**No**
9-5	SO_2 24hr	**No**	**No**
	SO_2 Annual	Yes	Yes
9-6	CO 15min	**No**	**No**
	CO 1hr	**No**	**No**

A.5 Assessment results on land owned by Jacfin

The results of the air quality assessment have been reproduced from Appendix K of the AEIS in Table 3, Table 4 and Table 5. The results show the following:

- Upset emissions of oxides of nitrogen, cadmium and chromium are predicted to exceed the criteria specified in the Approved Methods on the Jacfin land.
- If it is assumed that the emission concentration of cadmium from the EfW is equal to the standard of concentration specified in the Clean Air Regulation, the ground-level concentrations of cadmium are predicted to exceed the ambient air quality criterion specified in the Approved Methods on the Jacfin land.
- Annual average concentrations of air pollutants during normal operations are likely to have been underestimated because they have not accounted for upset emissions that could occur for up to 60 hours per year. As detailed above, 60 hours per year of upset emissions could result in significantly greater ground-level concentrations of a number of air pollutants.
- The predicted concentrations of hydrogen sulfide that are presented in the appendices to Appendix K appear to be erroneous.

Table 3 Results of Appendix K, predicted ground-level concentrations of selected air pollutants on Jacfin land due to normal operations of the EfW

Pollutant	Averaging period	Units	Normal Operations			Criteria
			Commercial Land (Dept of Planning) (298470, 6257372)	Commercial Land (Dept of Planning) (298746, 6257137)	Industrial Facility (Jacfin)	
NO_2	1hr	µg/m³	39	43	46	246
	Annual	µg/m³	2.7	3.2	2.3	62
SO_2	10min	µg/m³	8	8.7	9.4	712

Pollutant	Averaging period	Units	Normal Operations			Criteria
			Commercial Land (Dept of Planning) (298470, 6257372)	Commercial Land (Dept of Planning) (298746, 6257137)	Industrial Facility (Jacfin)	
	1hr	µg/m³	5.6	6.1	6.6	570
	24hr	µg/m³	1.2	1.2	0.78	228
	Annual	µg/m³	0.39	0.45	0.33	60
$PM_{2.5}$	1hr	µg/m³	0.21	0.23	0.24	
	24hr	µg/m³	0.043	0.046	0.029	25
	Annual	µg/m³	0.14	0.18	0.2	8
H_2S	1hr 99th	µg/m³	Contours: > 1; Appendix - data appears erroneous			1.38
CO	15min	mg/m³	0.0063	0.0069	0.0074	100
	1hr	mg/m³	0.0048	0.0052	0.0056	30
	8hr	mg/m³	0.00012	0.00017	0.000099	10
HF	24hr	µg/m³	0.14	0.18	0.2	2.9
	7 day	µg/m³	0.12	0.17	0.099	1.7
	30 day	µg/m³	0.089	0.11	0.076	0.84
	90 day	µg/m³	0.072	0.083	0.072	0.5
HCl	1hr	mg/m³	0.0019	0.002	0.0022	0.114
Cd	1hr 99.9th	mg/m³	0.0000017	0.000002	0.0000019	0.000018
Hg	1hr 99.9th	mg/m³	0.00000078	0.00000087	0.00000083	0.0018
Dioxins/Furans	1hr 99.9th	mg/m³	1.9E-12	2.2E-12	2.1E-12	2.00E-09
TOC (as benzene)	1hr 99.9th	mg/m³	0.0000029	0.0000033	0.0000031	0.029
NH_3	1hr 99.9th	mg/m³	0.00039	0.00043	0.00041	0.33
PAH (as BaP)	1hr 99.9th	mg/m³	0.000000097	1.1	0.0000001	0.0004
Cr (Scaled)	1hr 99.9th	mg/m³	0.0000091	0.0000102	0.0000097	0.00009

Note:
Cells shaded yellow appear to be incorrect. Considering other results that have been provided, it is likely that the annual average and 24-hour averages have been inadvertently swapped.

Chromium estimated based on emission rates and assuming 100% of Cr is Cr(VI)

Table 4 **Results of Appendix K, predicted ground-level concentrations of selected air pollutants on Jacfin land due to upset operations of the EfW**

Pollutant	Averaging period	Units	Upset Conditions			Criteria
			Commercial Land (Dept of Planning) (298470, 6257372)	Commercial Land (Dept of Planning) (298746, 6257137)	Industrial Facility (Jacfin)	
NO_2	1hr	µg/m³	**390**	**430**	**460**	246
	Annual	µg/m³	27.2	31.6	23.3	62
SO_2	10min	µg/m³	80	88	94	712
	1hr	µg/m³	56	61	66	570
	24hr	µg/m³	13.7	17.2	12.3	228
	Annual	µg/m³	3.9	4.54	3.34	60
$PM_{2.5}$	1hr	µg/m³	31	34	37	

Pollutant	Averaging period	Units	Upset Conditions			Criteria
			Commercial Land (Dept of Planning) (298470, 6257372)	Commercial Land (Dept of Planning) (298746, 6257137)	Industrial Facility (Jacfin)	
	24hr	µg/m³	7.63	9.58	6.85	25
	Annual	µg/m³	2.17	2.52	1.86	8
H_2S	1hr 99th	µg/m³	7.2	9.6	7.4	1.38
CO	15min	mg/m³	0.063	0.069	0.074	100
	1hr	mg/m³	0.048	0.052	0.056	30
	8hr	mg/m³	0.0307	0.0721	0.0491	10
HF	24hr	µg/m³	2.04	2.55	1.83	2.9
	7 day	µg/m³	1.22	1.66	0.992	1.7
	30 day	µg/m³	0.888	1.09	0.759	0.84
	90 day	µg/m³	0.717	0.831	0.723	0.5
HCl	1hr	mg/m³	0.019	0.02	0.022	0.114
Cd	1hr 99.9th	mg/m³	**0.000017**	**0.00002**	**0.000019**	0.000018
Hg	1hr 99.9th	mg/m³	0.0000025	0.0000028	0.0000027	0.0018
Dioxins/Furans	1hr 99.9th	mg/m³	9.7E-11	1.1E-10	1E-10	2.00E-09
TOC (as benzene)	1hr 99.9th	mg/m³	0.000029	0.000033	0.000031	0.029
NH_3	1hr 99.9th	mg/m³	0.0039	0.0043	0.0041	0.33
PAH (as BaP)	1hr 99.9th	mg/m³	0.00000097	0.0000011	0.000001	0.0004
Cr (Scaled)	1hr 99.9th	mg/m³	0.0000898	**0.0001006**	**0.0000970**	0.00009
Note: Chromium estimated based on emission rates and assuming 100% of Cr is Cr(VI)						

Table 5 **Results of Appendix K, predicted ground-level concentrations of selected air pollutants on Jacfin land due to operations of the EfW at Clean Air Regulation Limits**

Pollutant	Averaging period	Units	POEO Emissions Limits			Criteria
			Commercial Land (Dept of Planning) (298470, 6257372)	Commercial Land (Dept of Planning) (298746, 6257137)	Industrial Facility (Jacfin)	
NO_2	1hr	µg/m³	100	110	120	246
	Annual	µg/m³	7.2	8.4	6.2	62
SO_2	10min	µg/m³	NP	NP	NP	712
	1hr	µg/m³	NP	NP	NP	570
	24hr	µg/m³	NP	NP	NP	228
	Annual	µg/m³	NP	NP	NP	60
$PM_{2.5}$	1hr	µg/m³	10	11	12	-
	24hr	µg/m³	2.5	3.2	2.3	25
	Annual	µg/m³	0.72	0.84	0.62	8
H_2S	1hr 99th	µg/m³	0.72	0.96	0.74	1.38
CO	15min	mg/m³	-	-	-	100
	1hr	mg/m³	0.026	0.028	0.03	30
	8hr	mg/m³	0.017	0.039	0.027	10

Pollutant	Averaging period	Units	POEO Emissions Limits			Criteria
			Commercial Land (Dept of Planning) (298470, 6257372)	Commercial Land (Dept of Planning) (298746, 6257137)	Industrial Facility (Jacfin)	
HF	24hr	µg/m³	-	-	-	2.9
	7 day	µg/m³	-	-	-	1.7
	30 day	µg/m³	-	-	-	0.84
	90 day	µg/m³	-	-	-	0.5
HCl	1hr	mg/m³	-	-	-	0.114
Cd	1hr 99.9th	mg/m³	**0.000039**	**0.000043**	**0.000041**	0.000018
Hg	1hr 99.9th	mg/m³	0.000039	0.000043	0.000041	0.0018
Dioxins/Furans	1hr 99.9th	mg/m³	1.9E-11	2.2E-11	2.1E-11	2.00E-09
TOC (as benzene)	1hr 99.9th	mg/m³	0.0078	0.0087	0.0083	0.029
NH_3	1hr 99.9th	mg/m³	NP	NP	NP	0.33
PAH (as BaP)	1hr 99.9th	mg/m³	NP	NP	NP	0.0004
Cr (Scaled)	1hr 99.9th	mg/m³	NP	NP	NP	0.00009

Note:
NP No Clean Air Regulation limit
Chromium estimated based on emission rates and assuming 100% of Cr is Cr(VI)

B. REVIEW OF APPENDIX L: ODOUR ASSESSMENT

Katestone has reviewed the odour assessment contained in Appendix L. The EPA requires that an odour assessment is conducted in accordance with the *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW* (DEC, 2005) (Approved Methods).

B1. Receptors

Appendix L has not identified the Jacfin land as potentially sensitive for odour as required by the Approved Methods. Whilst odour contours have been provided that cover the Jacfin land, predictions have not been made at discrete receptor locations on the Jacfin land.

B2. Emissions sources

Appendix L has identified the following odour emission sources:

- EfW: Fugitive emissions from the Tipping Hall
- Genesis Facility:
    - Active Tip Face
    - Leachate Tank x 4
    - Leachate Riser.

Appendix L states:

> "…*No odorous emissions would be released from the stack and the odorous compounds would have undergone chemical decomposition.*"

However, it is likely that there are other sources of odour in close proximity to the EfW Facility.

The neighbouring Genesis Facility is one such source and is licenced for the following:

- To receive up to 50,000 tonnes per annum of organics for composting (EPL 20121).
- To receive waste for disposal with no annual capacity limit. The scale in the licence is stated to be "any annual capacity" and for waste storage the scale is stated to be "> 0 tonnes received" (EPL 13426).

In 2008, Holmes Air Sciences (HAS, 2008) prepared an odour assessment report as part of the approval of the Genesis Facility. In that report, the following odour sources were identified in addition to the emission sources shown above:

- Waste Transfer Station (WTS) and Material Processing Centre (MPC)
- The 20,000 tonnes of greenwaste composting windrows.
- Capped areas of the landfill
- Covered tip face
- A larger open area of open tipping face in the event that a greater volume of waste material is received.

All potential sources of odour at the Genesis Facility have not been incorporated into the odour assessment.

In addition to the above, Appendix L has not addressed odour emissions from the following aspects of the EfW Facility:

- Upset conditions, when the boilers are offline and the tipping hall is not under negative pressure.
- The possibility that the organic waste fuels will be variable in their odour emissions and more odorous than the materials at the tipping face of the Genesis Facility.
- The laydown areas in the vicinity of the EfW Facility shown in the appendices of Appendix L. It is unclear whether the laydown areas will be used to stockpile odorous material.

Consequently, the odour assessment has under estimated the potential impact of the EfW Facility on sensitive receptors.

B.3 Fugitive emissions from the Tipping Hall Building when EfW is operational

The odour emission rate from the Tipping Hall Building has been underestimated.

Appendix L has estimated the odour emission rate from the tipping hall building using the following assumptions:

- Air leakage rate through the door of 0.1 m/s x a door area of 25 m^2 = 2.5m^3/s.
- Odour concentration of the leaked air of 558 ou, which was taken from measurements at the active tipping face of the Genesis Facility.

The odour concentration is an underestimate of the Tipping Hall Building because it relies on the tipping face of the Genesis Facility, which will contain a range of materials that are currently landfilled, whereas, the EfW Facility will receive a selection of organic material diverted from the Genesis Facility tipping face. This will be a more concentrated stream of organic matter rather than a mix of organics and non-organics that would be landfilled at the Genesis Facility. It is also relevant to note that the EfW Facility will receive waste materials from facilities other than the Genesis Facility. Consequently, the odour emission rate measured from the Genesis Facility is likely to underestimate emissions from the Tipping Hall Building and may not accurately represent the types of wastes or the likely variability of wastes to be received at the EfW Facility.

B.4 Fugitive emissions from the Tipping Hall Building when EfW is not operational (upset)

The odour emission rate that has been estimated for the Tipping Hall Building has assumed that the building will be maintained under negative pressure with the extracted air being used as excess air in the boilers. Given that the EfW Facility is anticipated to operate for 8,000 hours per year, it is likely that negative pressure would not be applied to the Tipping Hall Building for at least 760 hours per year. It is also likely that, at times, the EfW Facility would not be operating at full load and, therefore, the air extraction rate from the Tipping Hall Building would be lower and less effective at controlling leakage.

Based on the areas of the tipping floor and waste bunkers and the odour emission rate from the active tipping face at the Genesis Facility, the odour emission rate from the Tipping Hall Building would be at least twice that assumed in Appendix L, if there was no air extraction from the building.

B.5 Maintaining negative pressure in the Tipping Hall

Appendix L provides no information on whether the extraction rate from the Tipping Hall Building will match the excess air requirement of the boilers. Appendix L includes no discussion or analysis of circumstances where the extracted rate of air from the Tipping Hall Building exceeds the air requirements of the boilers.

B.6 Odour emissions - The Genesis Facility

Appendix L has quantified odour concentrations and emission rates from the Genesis Facility as follows:

- Active Tip Face - 558 ou - 0.3 ou.$m^3/m^2/s$
- Leachate Tank x 4 - 362 ou - 0.2 ou.$m^3/m^2/s$
- Leachate Riser - 19,500 ou - 10.3 ou.$m^3/m^2/s$.

Appendix L omits critical information in relation to this information including:

- The calculations and data used to determine the odour emission rates from the sampling
- The method used to sample odour.

In previous assessments, Katestone is aware that The Odour Unit has determined emission rates using an isolation flux chamber with the following parameters:

- Cross sectional area (m^2) = 0.126
- Chamber flow rate (m^3/s) = 8.3E-05.

If these values are adopted, the following odour emission rates are calculated:

- Active Tip Face - 558 ou - 0.37 ou.$m^3/m^2/s$ - 18% higher than the value adopted in Appendix L
- Leachate Tank x 4 - 362 ou - 0.24 ou.$m^3/m^2/s$ - 16% higher than the value adopted in Appendix L
- Leachate Riser - 19,500 ou - 12.9 ou.$m^3/m^2/s$ - 20% higher than the value adopted in Appendix L.

Appendix L lacks transparency in the quantification of the base odour emission rates from the Genesis Facility. The odour emission rates that have been applied to the Genesis Facility have been underestimated.

B.7 Choice of Dispersion Model

Appendix L has used the AERMOD dispersion model to predicted ground-level concentrations of odour associated with the proposed EfW Facility and the Genesis Facility. AERMOD is not suitable for this application for the following reasons:

- AERMOD is not recommended in locations where light winds are likely to be important
- The meteorological data shows a high frequency of calms are likely at the site (30.9% calms measured at the St. Mary's Meteorological Station)
- Inadequacies in the AERMET/AERMOD modelling approach in odour assessments.

The Approved Methods recommends against using Gaussian models such as AUSPLUME (and AERMOD) in instances where light wind conditions may be important, such as for the subject site.

B.8 Modelled source parameters

The Approved Methods provides guidance on the information that should be included in an air quality report. Appendix L provides insufficient detail to allow a thorough review of the odour assessment.

B.9 Estimated odour concentrations on the Jacfin land

The odour levels have been underestimated by a factor of more than 2 as a result of Appendix L's failure to address variability in waste fuel, concentration of organics in the waste fuel stream relative to the Genesis Facility and upset conditions, where air extraction from the Tipping Hall Building ceases. A factor of 2 underestimation in odour emission rates would lead to a doubling of predicted concentrations and, likely exceedance of EPA's odour criterion of 2 ou on parts of the Jacfin land.

C. REVIEW OF APPENDIX M: OZONE IMPACT ASSESSMENT

Katestone has reviewed the ozone impact assessment contained in Appendix M. The findings of the review are discussed below.

- The ozone assessment has adopted the ozone assessment framework set out in the NSW EPA's Tiered Procedure for estimating ground-level ozone impacts from stationary sources.
- Base case emissions were based on the GMR inventory 2008.
- Case days for 2009 were selected based on the number of days with 1-hour and 4-hour ozone concentrations exceeding the air quality criterion from 2009 to 2013.
- The emissions scenario that was modelled was the IED Directive (200mg/Nm^3 of NOx). A screening assessment was also conducted to estimate ozone if SNCR was used to reduce NOx to 120 mg/Nm^3.
- Model performance for case days indicate average, but acceptable performance for meteorology and air pollutants. Note that the meteorological approach in the ozone assessment is different to that used in Appendix K. The ozone assessment used the TAPM-CTM model rather than AERMOD. These models adopt different approaches to characterising meteorological conditions.
- The ozone modelling was found to under predict the magnitude of ozone peaks by up to 40%. However, the ozone modelling did correctly predict some other attributes of ozone levels on selected case days, for example, the ozone modelling correctly predicted that there was a single peak or a double peak on given case days. This finding indicates that the ozone modelling was correctly characterising the formation processes.
- The maximum increase in 1-hour average ozone concentration was predicted to be 5.7 ppb due to the EfW Facility. The background ozone level at the time of the maximum increase in 1-hour ozone concentrations was 60ppb. So, the cumulative ozone level was below the relevant criterion. However, it is difficult to know whether the background concentration is reliable given that the ozone model was found to under predict peak concentrations. It is possible that the cumulative ozone concentrations due to the EfW Facility and background have been under estimated.
- When 1-hour average background ozone was at its maximum, the maximum incremental contribution from the facility was 0.7 ppb.
- The plots of ozone difference contained in Appendix M show that there is a potential for concentrations on the Jacfin land to increase by 1 to 2 ppb. Given the uncertainties detailed above, the increases may be under predicted.
- Figure 1 compares NOx emissions from EfW with highest existing NOx sources in Sydney based on NPI 2014/15. Figure 1 shows that, with the adoption of SNCR, the EfW would be the seventh highest emitter of NOx.
- Even with SNCR, the EfW represents an additional 5% of NOx emissions into the Sydney airshed based on 2008 Inventory data. Upset emissions would represent a considerably greater emission rate.
- The ozone assessment did not consider higher emission scenarios, such as due to upset conditions. The lack of assessment of upset conditions was explained in Appendix M as due to upset conditions being of short duration. However, given that emissions during upset were estimated to be ten times higher than normal operational emissions and that upset conditions could occur for up to 4 hours and for a total of 60 hours per year, the impact of upset conditions is likely to have been significantly underestimated.

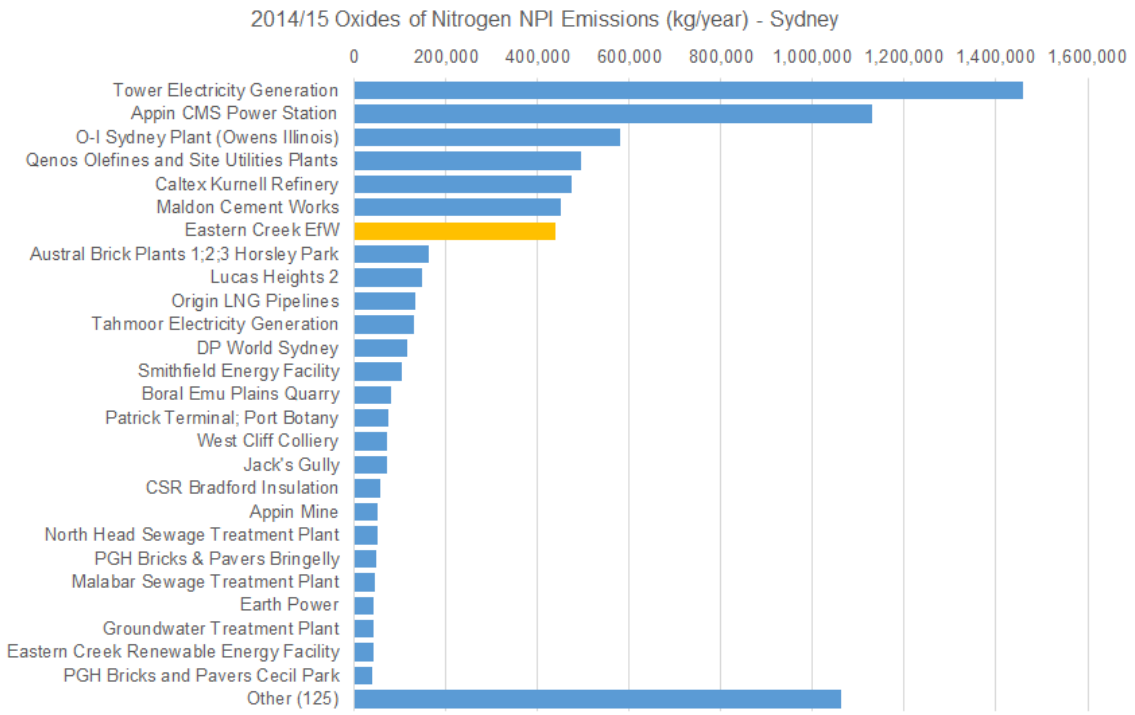

Figure 1 **Comparison of NOx emissions from EfW with highest existing NOx sources in Sydney based on NPI 2014/15**

D. REVIEW OF APPENDIX N: HUMAN HEALTH RISK ASSESSMENT

Appendix N of the AEIS is the human health risk assessment (HHRA). The HHRA appears to have followed the general methodology outlined in enHealth Environmental Health Risk Assessment; Guidelines for assessing human health risks from environmental hazards (2012).

The HHRA has considered comments from the Independent Review conducted by EnRisks on behalf of the EPA of the HHRA that was submitted with the original EIS for the EfW Facility. Appendix N appears to address these comments.

D.1 Scenarios

The following scenarios were considered in the HHRA:

- Scenario 1 – normal operating conditions:
    - Proposed EfW using emission rates prescribed by the Industrial Emissions Directive (IED; Directive 2010/75/EU).
    - Scenario 1 is described as being representative of future operating conditions.
- Scenario 2 – Clean Air Regulation limit operating conditions:
    - Proposed EfW Facility operating using emission rates set to ensure current emission limits prescribed by the Clean Air Regulations are satisfied except for cadmium (discussed in Section 3.4 of Appendix N).
    - Scenario 2 is representative of theoretical worst case emissions that would be compliant with the Clean Air Regulation limits.
- Scenario 3 – upset operating conditions:
    - Proposed EfW operating during upset conditions (as described in Section 2.5.4 of Appendix N).
    - Mass emission rates used in the dispersion modelled as provided to Pacific Environment by Ramboll.
    - Scenario 3 is considered to be most representative of potential upset operating conditions. In accordance with the requirements of the IED, Appendix N states that such upset conditions will not occur for more than four hours uninterrupted where the emission values exceed the limits and no more than 60 hours per year.

As detailed above in relation to Appendix K, the normal operations scenario has not accounted for upset emissions in determining annual average ground-level concentrations of air pollutants and deposition rates. Relative to normal emissions, upset emissions are significantly higher and could contribute to substantially higher annual loads of air pollutants. Consequently, upset conditions should be accounted for in determining annual average ground-level concentrations and dust deposition rates. The HHRA has underestimated the potential impact of the EfW Facility.

The HHRA has been conducted because the proposed EfW will have the potential to generate many toxic compounds including: heavy metals, volatile organic compounds, dioxins and furans and polycyclic aromatic hydrocarbons (PAHs). These compounds are known human carcinogens.

The AEIS did not consider alternative sites as a means of minimising the potential health risk associated with the EfW Facility. A key feature of the proposed site of the EfW is its relatively close proximity to future commercial activities on adjoining land to the east, south and west.

D.2 Tier 1 screening criteria

- For the chronic health assessment, compounds of principal concern (CoPC) were assessed by screening the annual average ground level concentrations at each receptor and the grid maximum concentration against the following enHealth (2012a) hierarchy of ambient air criteria:
    - NEPC, 2011. National Environment Protection (Air Toxics) Measure 2004, as amended 2011. National Environment Protection Council. 16 September 2011.
    - NEPC, 2003. National Environment Protection (Ambient Air Quality) Measure, as amended 2003. National Environment Protection Council. 16 September 2011. 7 July 2003.
    - WHO, 2010. WHO Guidelines for Indoor Air Quality, Selected Pollutants. World Health Organisation. Geneva 2010.
    - WHO, 2005. Air Quality Guidelines – Global Update, Particulate Matter, Ozone, Nitrogen Dioxide and Sulfur Dioxide. Europe. World Health Organisation. 2005.
    - WHO, 2000a. Guidelines for Air Quality. Geneva. World Health Organisation. 2000.
    - US EPA, 2016. Regional Screening Levels for Chemical Contaminants at Superfund Sites – Residential Air and Industrial Air. United States Environmental Protection Authority. May 2016.
- The modelled emissions of CO, SO_2, NOx, lead, heavy metals, PM_{10} and $PM_{2.5}$, HCl, HF, H_2S, Cl_2, NH_3, PCDD and PCDF, PAHs as benzo(a)pyrene, PCBs, hexachlorobenzene and TOC (i.e. toluene, phthalates, dichloromethane, acetone, benzene, acetonitrile, xylene, trichlorophenol, methylhexane, trichloroethylene, heptane, benzoic acid, hexadecanoic acid, ethyl benzoic acid and tetradecanoic acid) from the EFW Facility under normal operating conditions and at Clean Air Regulation limits are below the selected Tier 1 screening criteria, further assessment of these CoPC was not required. However, if upset conditions were considered, higher ground-level concentrations would have been predicted and, as a consequence, the Tier 1 screening criteria may be exceeded.
- It should be noted that the annual average concentrations of chromium were above the WHO (2000a) criteria; however, not commented on within the Tier 1 section of the HHRA.
- EnHealth (2012) discusses the tiered approaches. It does state that in Australia there is no clear break between the different tiers and that it is common in most health risk assessments to have a screening step and detailed assessment regardless of the tier. In the case of the EfW, both a screening assessment and detailed assessment were conducted. However, as detailed at D.1 and below, there are a number of problems the HHRA.

D.3 Mutliple pathway assessment

- The multi pathway assessment has not accounted for higher emissions associated with upset conditions.

D.4 Chronic health assessment

- The chronic health assessment has not accounted for higher emissions associated with upset conditions.

D.5 Acute health assessment

- The acute health assessment has not accounted for cadmium and mercury for the “plausible” upset emission scenario that is contained at page B-6 of Appendix K. Emissions of cadmium and mercury under this scenario are higher by more than 80 and 180 times, respectively.

- NOx and ozone were identified as exceeding screening level criteria. However, 100% of NOx has been assumed to convert to NO_2, which will overestimate the affect of NO_2. The ozone assessment indicated levels less than 1% of criteria due to the facility therefore concluded risk low and acceptable. However, in the case of ozone, the increment has not accounted for upset emissions of NOx. Consequently, the effect of ozone may be under predicted.

- No CoPC required further assessment with regard to acute inhalation exposures. This conclusion requires reconsideration as a result of addressing under prediction of ozone.

D.6 Acceptable level of risk

- The HHRA that was conducted for the EIS used an acceptable risk level of 1×10^{-6}, where as, Appendix N has applied an acceptable risk level of 1×10^{-5}. The former is ten times more stringent and is consistent with the EPA's Approved Methods recommendations.

D.7 Inconsistencies

- Stack parameters - Table 7 of Appendix N refers to stack parameters used for the dispersion modelling. This table is not consistent with the stack parameters provided in Table 7-8 of Appendix K.

- Normal operating conditions – Wording in Appendix N for normal operating conditions suggests that emission rates were based on the IED; however, Appendix K states:

  > *Emission rates for modelling are estimated based on the EfW facility meeting the more stringent limits prescribed in the IED, as outlined in Table 4-3. In October 2015, Ramboll, the owner's engineers, updated the in-stack concentration estimates for all air quality parameters. These updated concentration estimates are based on stack testing data for existing reference facilities. More information is provided in the technical memorandum provided by Ramboll in Appendix C.*

- It is not clear whether the HHRA used the IED or the updated emission concentrations provided by Ramboll and contained in Appendix K.

- Section 4.3.3 of Appendix N presents the location of grid maximums.

  - The locations of the maximum annual average for scenario 1 and scenario 2 are different. This does not make sense as the only difference between the two scenarios is the emission concentration. Other stack release parameters are the same, consequently, maximum ground-level concentrations should occur in the same location.

  - The location of the maximum annual for scenario 2 is in the same location as the maximum 1-hour for scenario 3. This does not make sense as you are comparing 1-hour with annual and you would expect these to occur in different locations.

- Exposure point concentrations – the ratio of cadmium concentrations between scenario 1 and scenario 2 is a factor of 4, which agrees with the ratio between IED and Clean Air Regulation for cadmium. However, for mercury and benzene the ratio of concentrations for scenario 1 and scenario 2 is equivalent to that for Appendix K normal operations (i.e. revised Ramboll concentrations) and scenario 2. The reason for this inconsistency is unclear, but suggest some underlying error in application of the described methodology.

D.8 Results

- Appendix N has predicted the carcinogenic inhalation health risk for a commercial worker at the most affected existing or potential future offsite commercial receptor as follows:

  - Scenario 1 = 9.3×10^{-8}

  - Scenario 2 = 5.1×10^{-7}

- These do not account for upset conditions.
- There is a significant degree of uncertainty associated with the potential impacts of the EfW Facility. In particular, this is because the expected 60 hours of upset conditions have not been appropriately accounted for in the human health risk assessment (HHRA). As a consequence, the HHRA is likely to have underestimated the potential health risk associated with the EfW Facility.

10 March 2017

Michael Zissis
Senior Associate
Allens
GPO Box 50
SYDNEY NSW 2001

Our ref: 2126281-75302
Your ref:

Dear Mr Zissis

Energy from Waste Facility - Odour Review

1 Introduction

The Next Generation (NSW) Pty Ltd is seeking planning approval for the development of an energy from waste facility (the 'Project') at Eastern Creek.

As stated on the Department of Planning and Environment's Web site:

The Next Generation NSW Pty Ltd (the Applicant) has submitted an amended Environmental Impact Statement (EIS) for the proposed Energy from Waste Facility at Eastern Creek. The amended EIS includes a Response to Submissions report which addresses the issues raised in submissions received during the public exhibition of the Applicant's original EIS.

The amended proposal retains the same development description, being construction and operation of an energy from waste facility with an engineering design capacity to thermally treat up to 1.35 million tonnes of residual waste per year, including a boiler house, steam turbines for electricity generation and air emissions stacks.

The Project would be located on Pt Lot 1, Lots 2 and 3, in DP 1145808 on Honeycomb Dr, Eastern Creek. The Site forms part of a larger area of land which comprises the Genesis Xero Waste Facility (Genesis Facility) and landfill ('broader site'). The broader site is described as lots 1, 2 and 3 in DP 1145808 and Lot 8 in DP 1200048. It appears that a subdivision of the broader site has occurred since the development application was first submitted as the property descriptions have changed in the amended EIS.

The development application (Phase 1) is seeking approval to incinerate initially up to 552,500 tonne per annum (tpa) of residual waste and subject to obtaining a subsequent approval from the EPA (via potentially an amendment to the Environment Protection Licence) a further 552,500 tpa bringing the sought input capacity for incineration to 1,105,000 tpa. That is, the development application is seeking development consent for an input capacity of up to 1,105,000 tpa of waste.

The documentation also states that the Project has a design capacity to process up to 1.35 Million tpa.

The EIS documentation is based on assessing the Project assuming the Project receives and processes up to 1.35 million tpa, even though the development application is seeking approval to process up to 1,105,000 tpa of waste.

GHD was engaged by Allens Lawyers to undertake a technical review of the Odour Assessment of the EIS (Appendix L) on behalf of Jacfin Pty Ltd. Jacfin is the owner of Lot 20 in DP1206129, which is the land immediately south of the proposed Next Generation Energy from Waste Facility at Eastern Creek. Jacfin has previously made a submission in relation to the proposed development.

The objective of the engagement is to provide a review of the approach and key technical findings of the assessment in terms of potential impacts on the Jacfin property, with relation to odour.

GHD's review follows the key section headings in the Odour Assessment and conclusions are provided in this letter.

2 Overview of the facility

The Project is seeking to receive a range of non-putrescible waste types for incineration and energy recovery. Non-putrescible waste has generally a lower odour potential than putrescible waste. Some of the waste types which are proposed to be received may be derived from putrescible waste and as such may be more odorous than considered by the Odour Assessment. This issue is considered further in Section 8 below.

Section 2 states that waste material will be delivered to the Project directly via truck and also from the Genesis Facility via either truck or a covered conveyor belt. The details on how the trucks would be covered and the covering for the conveyor belt are not provided. This level of information is important to know in terms of assessing whether the modes of delivery of large volumes of waste may also be a source of odour which should be addressed in the Odour Assessment.

The assessment in Section 2 also states that the facility would be operational for 8,000 hours as an annual average. This assumes that there would be 760 hours in a year where the facility is not operating or approximately one (1) month a year. Also in the Air Assessment (Appendix K) upset conditions are identified to potentially occur up to 60 hours per year. The Odour Assessment does not consider the impact of the non-operational hours or upset conditions on the predicted odour emissions.

Comment

The exclusion of not assessing the proposed waste to be received at the site, possible waste delivery source emissions and the impact of the operational shutdown and upset conditions are significant deficiencies in the Odour Assessment. Accordingly, the Odour Assessment does not properly consider or quantify the impacts of the Project.

3 Local setting

No comment.

4 Legislative setting

The Approved Methods state that a sensitive receptor in NSW includes "a location where people are likely to work". An air quality assessment should also consider the location of known or likely future sensitive receptors. This would include the land surrounding the Next Generation site including Lot 20 in DP1206129, land owned by Jacfin.

The criterion to apply for an industrial site would depend on the number of staff/and type of occupancy. Furthermore, GHD understands the land immediately to the south of the subject site, which Jacfin intends to develop, is zoned General Industrial (IN1) and is able to be developed for landuses other than industrial. This, for example includes "*to provide for small-scale local services such as commercial, retail and community facilities (including child care facilities) that service or support the needs of employment-generating uses in the zone".*

The Odour Assessment in Section 4.1.2.2 suggests that any areas around the site which are "built up" would have an odour criterion of 2 OU, including any future commercial development on the Jacfin site.

Comment

The odour assessment criteria of 2 OU in the Odour Assessment for the Jacfin land is the lowest assessment criteria for odour impact assessment.

5 Existing environment

The dispersion meteorology section of the Odour Assessment discusses the various meteorological stations surrounding the site and determined that the NSW Office of Environmental Heritage (OEH) station at St Marys would be most representative for use in the dispersion modelling. The representative year was identified as 2013 from five years of data reviewed as required by the Approved Methods for the Modelling and Assessment of Air Pollutants in NSW (NSW DEC 2005) ('the Approved Methods'). The report states that the percentage of calms (defined as wind speeds less than 0.5 m/s) are around 30.9% for 2013. The winter windrose provided in the report shows the percentage of calms is 40.5%. The number of calms at the site are therefore occurring for a large percentage of the time, an important factor that influences how odour from the site disperses and also the choice of dispersion model for use in the assessment.

Atmospheric stability (another factor which influences dispersion of odour) is discussed in the Air Quality Assessment (Appendix K)[1]. The Air Quality Assessment (Appendix K) states that stable and very stable conditions (which can result in odour impacts extending over a larger area) occur for about 50% of the time.

The NSW Approved Methods, specifically Section 6.2. states that Gaussian plume models such as Ausplume (which AERMOD is a more recent Gaussian plume model) are not approved in situations where there is a high frequency of stable calm night-time atmospheric stability conditions or a high frequency of calm wind conditions. It follows that AERMOD should not of been used for the assessment and may of provided erroneous results. Calpuff is the NSW EPA's recommended atmospheric dispersion

[1] We note that the Odour Assessment refers to an earlier version of the Air Quality Assessment dated February 2015 which we don't have access to or it may be a typo error.

model at site with these meteorological conditions and locations that have complex terrain, such as the Genesis Facility that has a deep void.

The Odour Assessment states in Section 5.2 that odour from the Genesis Facility would have a similar odour character to the Next Generation proposal. This enforces the need for any odour assessment to assess the total or cumulative odour in the project area. This section of the report identifies the most significant odour sources but does not provide any justification for ruling out other odour sources at the Genesis Facility. For example, it does not consider the odour coming from the Genesis recycling building, outdoor waste storage and processing areas, daily and intermediate covered waste, the waste chute delivering waste into the void and the approved composting operation.

Comments

The Odour Assessment is deficient in our view as it does not consider all odour sources (including the Genesis Facility as approved) and quantify them using the EPA Approved model for the meteorological conditions at Eastern Creek. As a result, the odour predictions and potential impact may have been underestimated.

6 Odour emissions

The Odour Assessment in Section 6 suggests that the Project will have a lower odour emitting potential than the currently approved Genesis Facility, but states this opinion is not quantified as part of the assessment. It bases this opinion on the odorous air from the waste would be mostly diverted through the thermal treatment process with the odours then being combusted and less waste going to landfill. Further comment on this on this is provided in Section 8 as it appears that the model predictions contradict this opinion.

This opinion is not backed up by a quantitative assessment as required by the EPA's Approved Methods and using representative odour emission data. An inventory of all the existing and potential odours sources should have been provided in the Odour Assessment and the odour emission rates should have been justified.

The Odour Assessment identifies that fugitive odour from the 'fast-response' roller doors to the waste receival hall is the main source of odour from the Project itself, as the high temperatures of the incinerator otherwise destroy odorous material. The facility will be under negative pressure (except when trucks accessing a 'fast-response' roller door).

An odour emission rate from the roller doors is assumed based on the odour measured from one sample of the active tipping face from the Genesis landfill. The use of this data is not justified in the Odour Assessment, nor is the assumed fugitive exit rate from the roller doors. Furthermore, no consideration is provided to the odour emission rate from the building during the 760 hours of the year when the facility may not be operational, or during the upset conditions.

As stated above, there is no inclusion of odour from the transport of waste to the Project which would potentially be a significant source over a large area. Conveyors are generally covered to keep rain off the conveyed material, to increase the life of the conveyor and reduce maintenance requirements. Covered conveyors are mostly not fully enclosed and airtight. In the case of conveying waste, wind stripping of

odour from the fast moving waste would occur. If the waste is transported by truck, significant odour can be generated by the loading, transport and unloading of waste. These odour sources are excluded, without justification from this assessment and therefore the total odour impact cannot be adequately assessed.

Similarly, potential odour emissions from the Genesis Building and outside waste storage and approved composting area has not been quantified to assess the odour contribution from these sources with regard to the odour predictions.

The odour emission rates utilised in the assessment are based on three odour samples undertaken by The Odour Unit at the Genesis Facility located adjacent to the site. No details are provided how the odour samples were taken. Odour samples in NSW need to be undertaken with the Isolation Flux Chamber (IFC) technique unless otherwise justified.

In GHD's experience, direct methods of odour emission rate (OER) measurement for large area sources (such as use of flow-through hoods and isolation flux chambers) may not accurately measure representative odour emissions from a landfill tipping face due to the following:

- the operations of delivering waste to the tipping face via a chute and the moving of waste to the tipping face by dozer and compacting is not capable of being measured by the approach used in the Odour Assessment; and
- the emitting surface is highly heterogeneous and uneven, making the placement and sealing of hoods or chambers difficult

Where a large area source is to be sampled, a greater number of samples should be taken to take into account the variability in the odour emission over the area. This should include more than one odour sample as was undertaken in the Odour Assessment for the landfilling area.

GHD notes that the original EIS air quality assessment (2008) used an Specific Odour Emission Rate (SOER) for the tipping face of 3.83 $OU.m^3/m^2/s$, a number more than 10 fold the emission rate used in this Odour Assessment of 0.3 $OU.m^3/m^2/s$. One odour sample was taken of the landill tipping face, and due to this lack of data and the potential variability of the source, this is another reason why there is a low level of confidence in the odour predictions.

A more substantial odour dataset is needed to adequately assess the odour impact of the Genesis Facility and the odour from the waste proposed to be received and emitted from the Project.

For example, it is unclear whether in future only ash from the Project would be landfilled in the Genesis Facility landfill, or a mixture of ash and currently landfilled waste. It is expected that it will be a combination of materials, particularly as the Project is stated as being potentially non-operational for on average one (1) month a year and the unburnt waste would be landfilled in this time. The Odour Assessment does not take this situation into account and the potential odour emissions from the combined landfilled waste.

Comments

A comprehensive odour sampling program in accordance with the Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales (NSW DEC, 2006), namely OM-7 (AS4323.3-2001) and OM-8 (Odour sampling from diffuse sources USEPA (1986) EPA/600/8-8E/008), has not been undertaken.

Since the Approved Methods were published a new Australian Standard has been released (AS4323.4:2009 Stationary source emissions Method 4: Area source sampling – Flux Chamber technique). Further odour sampling using alternate techniques referred to in AS4323.4:2009 such as downwind sampling/modelling techniques has not been undertaken to verify the IFC data, including sampling of the following sources from the Genesis Facility:

- Existing landfill tipping face
- Emissions from the landfill waste delivery chute and movement of waste from the chute's exit to the active landfill face
- Daily cover and intermediate covered landfill surfaces
- Areas around the void where waste settles and odorous landfill gas could potentially escape
- Leachate infrastructure
- Existing receivals hall including waste unloading and loading
- Existing and approved waste stockpiles
- Approved composting operation

GHD have successfully undertaken indirect methods of odour measurement on landfill tipping faces by concurrently measuring odour up and down wind during operation. These odour measurements have been accepted by the NSW EPA as the odour levels were found to be greater than corresponding IFC odour measurements.

The Odour Assessment does not justify odour emission rates from the following sources from the Project:

- Waste being transported to the Project in trucks and on conveyors
- Receivals hall
- Odour sources during the 760 hours in the year on average when the Project would not be operational. For example, it is unclear where the waste is proposed to be stored in the receivals hall when waste is not being combusted and if the building would be kept at negative pressure. It is also unclear whether the air would still be treated to remove odour before being emitted from the building.
- During the 60 hours of upset conditions that are expected to occur annually.

The Odour Assessment does not discuss the following issues which may have a significant influence on the odour levels used in the assessment:

- We note that there are scrubbers and other processes to further remove contaminants of the flu gases after combustion. These processes may introduce odours to the air stream and has not been adequately described and justified as not being an odour source in final stack discharge.
- The odour assessment does not justify that the thermal processing facility has the capacity to combust all of the air that is drawn in from the waste receival building needed to keep it under negative pressure. There is no contingency measure proposed to treat this air before it is discharged, if this is not possible.

In the absence of having undertaken a robust program to quantify the odour emissions of the Genesis Facility and the proposed Project the odour predictions and potential impact may have been underestimated.

7 Modelling approach

GHD's comments on the modelling approach and our recommendations are addressed above in Sections 5 and 6.

8 Results

The odour contour plots (Figure 8-1 and 8-1 of the Odour Assessment) suggest that compliance would be achieved with the odour impact assessment criteria (2 OU) including at the Jacfin site, however these predictions cannot be relied upon given the deficiencies of the assessment identified above.

The Odour Assessment states that the Project would be the greatest contributor to offsite odour emissions, and not the existing Genesis Facility. This contradicts the opinion stated in Section 6 of the Odour Assessment.

It is important to note that the Genesis Facility and the Project combined would see an input rate of waste in the order up to 3.1 million tonnes to the broader site. Although this waste is proposed to be non-putrescible, non-putrescible wastes includes organic material some of which may be derived from putrescible waste (e.g. AWT fuel), which has the potential to be odorous. In such large quantities the Project presents a considerable risk of nearby sensitive receptors/premises experiencing excessive odour should the project be approved based on the current Odour Assessment.

9 Summary and conclusion

GHD has conducted a review of the odour impact assessment. In summary GHD is of the opinion that the current Odour Assessment is deficient and therefore should not be accepted by the Department of Planning and Environment as an adequate assessment of the Project.

Sincerely
GHD Pty Ltd

Evan Smith
Senior Environmental Engineer - Air and Noise Assessments
[redacted]

Anthony Dixon
Principal Environmental Engineer
Service Group Manager Waste Management
[redacted]

WILKINSON MURRAY

28 February 2017

WM Project Number: 17084
Our Ref: A17084ltr27022017
Email: naomi.bergman@allens.com.au

Ms Naomi Bergman
Allens Linklater
Corner of Hunter & Phillip Streets
SYDNEY NSW 2000

Dear Naomi

Re: Energy from Waste Facility - State Significant Development SSD 6236 - Noise Peer Review on behalf of Jacfin

Wilkinson Murray has been engaged by Allens, on behalf of Jacfin Pty Ltd, to conduct a peer review of the noise assessment relating to State Significant Development SSD 6236 for an Energy from Waste (EFW) facility at Honeycomb Drive, Eastern Creek.

Jacfin is the owner of land immediately to the south and south-east of the site, being Lot 20 in DP1206129. Jacfin is concerned that the noise impacts to its site and neighbouring land has been underestimated.

This review has been conducted with respect to the following documentation:

- Environmental Impact Statement, The Next Generation: Energy From Waste Honeycomb Drive, Eastern Creek prepared by Urbis, November 1016.
- Energy from Waste Facility, Eastern Creek (SSD 6236) – Noise Impact Assessment prepared by Pacific Environment Limited, dated 31 March 2015.
- Energy from Waste Facility, Eastern Creek (SSD 6236) – Noise Impact Assessment prepared by Pacific Environment Limited, dated 31 October 2016.
- Letter from JBA to The Department of Planning and Environment, dated 27 July 2015, regarding Eastern Creek Energy from Waste Facility, Jacfin Submission Honeycomb Drive, Eastern Creek.
- Letter from Allens to The Department of Planning and Environment, dated 27 July 2015, regarding Submission on behalf of Jacfin Pty Limited Energy from Waste Facility (SSD 6236) Premises: Lots 1, 2, 3 and 4 in DP 1145808, Eastern Creek.

With regard to noise impacts from the proposed EFW facility, the previous Jacfin submissions raised concerns that the noise assessment did not address noise impacts from the EFW facility on land owned by Jacfin, and has not considered the recommended noise emission levels from the Eastern Creek Precinct Plan (Stage 3) and cumulative impacts.

The revised assessment has not provided any new information compared to the original noise assessment. The revised noise assessment has considered the Jacfin comments in part, however remains deficient. There is still no clear demonstration that noise impacts from the EFW facility could be managed to an appropriate level.

SUMMARY OF NOISE FINDINGS

Based on a review of the revised noise assessment Wilkinson Murray have determined the following:

Noise Monitoring

Background noise levels are an essential part of a noise assessment. Under the NSW Industrial Noise Policy (INP) they are the basis for establishing the intrusive noise criteria. Therefore, it is very important that the correct background noise levels be identified during noise monitoring surveys.

The noise assessment presented results from background noise monitoring conducted at only two locations. The monitoring was conducted in early March 2014.

The monitoring location in Erskine Park was identified as having been affected by extraneous noise in the form of insect and frog noise. Consistent with EPA recommendations, Pacific Environment Limited filtered the extraneous noise by cutting out the frequency bands that were affected. However, an alternative method that would have resulted in a more reliable estimate of the background noise levels would have been to monitor at a similar location not affected by the extraneous noise.

Background noise levels may vary due to seasonal changes in weather conditions and also as a result of changes in operational activities on surrounding developments. These potential changes should be considered and addressed in a qualitative manner in the noise assessment report to ensure that noise impacts during other seasons are not ignored.

Wilkinson Murray Pty Ltd considers the noise monitoring is not sufficient for the proposed development. The rigor applied to establishing the existing ambient background noise levels should be commensurate with the potential for a development to cause noise impacts at sensitive receivers. Considering the scale of the proposed development, which has been declared as State Significant, the proximity of the residential receivers to the proposed EFW facility and the fact that the noise monitoring data from 2014 included only two monitoring locations one of which has been identified as being affected by extraneous noise, additional noise monitoring should be conducted. The ideal time for any additional noise monitoring would be in winter to ensure that seasonal variations in the background noise levels are identified as required by the INP.

Noise Sources, Noise Source Locations and Sound Power Levels

The noise assessment presents noise source levels in Table 6-1. Appendix E presents spectra and transmission loss of building façade elements.

The noise assessment does not provide clear information for noise sources, noise source locations and sound power levels, for example:

- The noise assessment does not show the noise calculation procedure used to estimate the façade element sound power levels and the orientation of the façade elements used in the modelling.
- There are no diagrams showing the location of the noise sources on site used for the noise modelling.
- It is unclear whether openings in the building, such as large roller doors, were included in the model.
- Directivity of noise sources was not discussed in the noise assessment. Orientation and directivity of noise sources for this type of plant is very important to accurately predict noise levels.
- The noise assessment identified a number of mobile plant, such as forklifts and cranes, that would operate on the site, however it is unclear if the operation of this plant would be limited to inside the building, and whether the assumed internal reverberant noise level in the building accounted for these noise sources.
- The conveyor that runs between the project site and the Genesis MPC site has not been included in the noise modelling. Whist the length of the conveyor is not specified in the EIS it would be several hundred metres and therefore a significant noise source.
- There appears to be a difference between the truck movements in the Traffic report (Traffic Impact Assessment, The Next Generation NSW Pty Ltd Energy from Waste Facility, Eastern Creek (SSD 6236) Reference: 13.519r01v11, prepared by Traffix in November 2016) and the noise assessment.
- The noise assessment does not consider car movements. There are a significant number of car movements on site, up to 37 vehicles per hour.

Based on the information provided Wilkinson Murray can't verify and/ or confirm that the noise modelling has been conducted at an appropriate level of detail to accurately predict noise levels at potentially impacted receivers.

Low Frequency Noise

Where a noise source contains certain characteristics, such as dominant low-frequency content, there is evidence to suggest that it can cause greater annoyance than other noise at the same noise level.

The INP outlines correction factors to be applied to the predicted noise levels at the receiver before comparison with the noise criteria to account for the additional annoyance caused by these modifying factors.

For low frequency noise the EPA's current policy is that a +5dB correction be added to the predicted noise level if the assessed C and A weighted difference over the same time period is greater than 15dB.

The noise assessment presented low frequency noise predictions in the form of differences between dBC and dBA levels. The outcome of the noise predictions were that the dBC-dBA levels were just below (1dB at Erskine Park) 15dB and therefore the predicted level did not require a +5dB correction.

The EFW facility is made up of industrial sources such as fans and combustion systems and large rotating equipment which can produce a significant contribution of low frequency noise, particularly in octave band frequencies of 16 and 31.5 Hz. The frequency range of the sound power levels used for the noise modelling presented in Appendix E is only from 63Hz to 8kHz.

To estimate low frequency noise, it is important to model 16Hz and 31.5Hz octave bands because the low frequency noise energy that is intrusive and annoying is typically in those frequencies. As these frequencies have not been modelled, Wilkinson Murray considers that the low frequency noise has been underestimated and it is likely to exceed current EPA low frequency noise test (dBC-dBA<15dB) and therefore the predicted noise levels would require a +5dB correction. The addition of a +5dB correction of the predicted noise level at Erskine Park would result in the predicted noise level from the EFW plant exceeding the EPA's intrusive noise criterion.

Low frequency noise at closer commercial buildings that are proposed in the Eastern Creek Business Park may result in rattling of building elements and annoyance to occupants.

Wilkinson Murray recommends that the low frequency noise assessment is revised, and accounts for all significant noise emissions in the 16 Hz and 31.5 Hz octave bands.

Cumulative/ Precinct Plan Goal / Amenity Criteria

The noise assessment considered the recommended noise emission levels from Eastern Creek Precinct Plan (Stage 3). The EFW facility is in Zone 4. The Zone 4 goals at Erskine Park are:

- Day – 54 $L_{Aeq,period}$;
- Evening – 44 $L_{Aeq,period}$; and
- Night – 39 $L_{Aeq,period}$.

The conclusion of the noise assessment presented in Section 6.8 states that the cumulative noise from the EFW facility and the Hanson development would exceed the amenity criterion by 1dB and the Zone 4 Precinct Plan goal by 2 dB.

The noise assessment states that a 1 to 2dB exceedance is marginal with the implication being that it is not important and no additional mitigation is required.

It is generally accepted that 1-2 dB exceedances of $L_{Aeq,15min}$ intrusive noise criteria may be acceptable, where proponents can demonstrate that all reasonable and feasible measures to mitigate noise levels have been applied. The noise assessment does not demonstrate that all reasonable and feasible noise mitigation has been considered. In addition, the noise assessment is proposing an exceedance for the entire day, evening or night time period rather than a 15-minute duration. For example, this could equate to the level being exceeded for every hour for the night time period between 10pm and 7am.

If the EFW facility is allowed to exceed the precinct plan noise goals, two outcomes could result:

- the closest residential receivers would have a higher noise level than what was recommended in the Precinct Plan and thus could cause higher noise impacts; or
- a greater burden would be placed on other industrial noise sources in other zones to have lower noise criteria than would otherwise be allowed in those zones resulting in more noise mitigation and cost.

Conclusion

Wilkinson Murray has reviewed noise aspects of the State Significant Development SSD 6236 for the Energy from Waste Facility at Honeycomb Drive, Eastern Creek.

The review has found that the noise assessment is deficient in four critical areas, namely:

- Noise Monitoring;
- Noise Sources, Noise Source Locations and Sound Power Levels;
- Low Frequency Noise; and
- Cumulative/ Precinct Plan Noise Goal / Amenity Criteria.

In considering all the issues together, it is Wilkinson Murray's opinion that there is a high risk that the Energy from Waste facility has underestimated its noise impacts to its neighbouring area and therefore may have an adverse impact on residential areas or may constrain future employment uses on adjoining employment zoned land.

I trust this information is sufficient. Please contact us if you have any further queries.

Yours faithfully
WILKINSON MURRAY

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Director

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ATTACHMENT C

Allens › ‹ Linklaters

31 March 2017

Greater Sydney Commission
PO Box 257
Parramatta NSW 2124

By Email

Dear Commissioner

Draft West Central District Plan and Draft West District Plan – Submission on behalf of Jacfin Pty Ltd

We act for Jacfin Pty Ltd (***Jacfin***).

This submission in made on behalf of Jacfin in relation to:

(a) *Towards our Greater Sydney 2056;*

(b) the Draft West Central District Plan; and

(c) the Draft West District Plan,

which are currently on exhibition.

Jacfin has also engaged JBA Urban Planning Consultants (***JBA***) to review the materials on exhibition and prepare a submission on its behalf. A copy of the submission prepared by JBA on behalf of Jacfin is ***attached*** to this submission (***JBA Submission***).

2 Jacfin

Jacfin is the owner of significant land within the Western Sydney Employment Area (***WSEA***). Jacfin owns large parcels of land at:

(a) Eastern Creek (Lot 20 in DP 1206129) (***Eastern Creek Land***);

(b) Horsley Park (Lot A in DP 392643) (***Horsley Park Land***); and

(c) Ropes Creek (Lot 121 in DP 1175762 and Part Lot 15 in DP 1157491) (***Ropes Creek Land***).

Jacfin is in the process of developing its land for employment purposes, consistent with the zoning of the land under *State Environmental Planning Policy (Western Sydney Employment Area) 2009*.

There are a number of existing warehouse and distribution developments on the Eastern Creek Land, as well as a number of development applications currently before Blacktown City Council seeking consent for further developments on that land.

As noted in the JBA Submission, Jacfin also has concept plan approval for the development of employment precincts on the Horsley Park Land and Ropes Creek Land, and project approval for Stage 1 of those developments.

3 *Towards our Greater Sydney 2056*

Jacfin generally supports the principles set out in *Towards our Greater Sydney 2056*.

Jacfin supports the concept of the 30-minute city and the location of housing close to the places where people work. Jacfin notes the significant opportunities that exist in connection with the development of employment precincts and creation of new jobs in Western Sydney to increase housing supply in close proximity to these employment precincts, particularly the WSEA. This also takes advantages of the proximity of this employment land to regional transport infrastructure, and the services that are already being provided in order to facilitate the development of this land for employment generating uses.

As noted in the JBA Submission, Jacfin also supports the need for a sustainable transport network to support economic activity around the Western Sydney Airport and within the emerging Western City, and the move towards a smart city with greater knowledge-intensive jobs.

4 Flexibility in range of land uses for employment lands

Whilst Jacfin considers the principles in *Towards our Greater Sydney 2056* to be a step in the right direction, we note that there remains inflexibility in the standard land use zones provided for in the *Standard Instrument – Principal Local Environmental Plan*, and consequently in the types of land uses that can be undertaken within employment lands.

The Draft District Plans encourage a diverse range of employment opportunities to maximise job creation and recognise the 'smart jobs' which are being generated in an ever increasing technological age. The current inflexibility in the standard land use zones has the potential to hinder the development of the knowledge intensive jobs of the future.

It is difficult to predict the new types of industries that may emerge in the next ten years as technologies continue to change and develop, and even more difficult to predict the developments that will take place in this regard in the next thirty years. The best way to support and maximise the employment opportunities that will emerge as a result of these developments is to permit a diverse range of land uses within key employment lands.

Over many years, Jacfin has observed other trends within the WSEA which also necessitate a greater range of allowable uses in that area than are currently permissible in the IN1 General Industrial zone, in order to maximise the employment potential of the area. These trends are as follows:

(a) Companies that historically had numerous facilities located throughout the Sydney metropolitan area are rationalising those facilities into single, purpose designed facilities in the WSEA.

(b) These rationalised facilities create demand for:

  (i) Company head offices to be co-located with industrial and distribution facilities;

  (ii) Increased housing supply in proximity to employment areas, catering for a range of household types and budgets; and

  (iii) Retail, hotels and associated services hubs.

(c) Many of the companies that are relocating their businesses to the WSEA are large international corporations whose businesses require support facilities such as data centres, high speed internet, etc.

(d) The transformation of the WSEA from an industrial area to a mixed employment precinct and business centre is occurring over a shorter timeframe compared to other established business centres such as North Ryde.

Jacfin submits that the above trends need to be encouraged to maximise employment opportunities in the WSEA. These trends point to the need for a more diverse and flexible range of allowable land uses in the WSEA to support and drive an ever increasing range of employment types.

Jacfin submits that *Towards our Greater Sydney 2056* and the Draft District Plans should support the introduction of new enterprise zones, which would enable a wide range of commercial activities to be undertaken in employment areas such as the WSEA and provide the required flexibility in land uses. Alternatively, if the introduction of a new enterprise zone is not supported, it is submitted that a wider range of land uses should be permissible within the IN1 and IN2 zones that currently apply within the WSEA.

5 Western Sydney Intermodal Terminal

The Draft West Central District Plan and Draft West District Plan make a number of references to the Western Sydney Intermodal Terminal, which is said to be currently under investigation. Figure 3-15 of the Draft West Central District Plan and Figure 3-10 of the Draft West District Plan (see ***attached***) show an indicative location for the Intermodal Terminal on or in close proximity to Jacfin's Eastern Creek Land.

The location of the Western Sydney Intermodal Terminal shown in the Draft District Plans is consistent with recommendations initially made by the Freight Infrastructure Advisory Board and later in the *NSW Long Term Transport Masterplan* (2012), the *Broader Western Sydney Employment Area Draft Structure Plan* (2013) (***Draft Structure Plan***), the *NSW Freight and Ports Strategy* (2013) and the *NSW State Infrastructure Strategy* (2014). The *NSW Freight and Ports Strategy* is referred to in the Draft West District Plan in relation to the proposed Intermodal Terminal.

The Draft Structure Plan contemplated a future intermodal facility within the Eastern Creek Precinct of the WSEA. The indicative location of the intermodal facility shown in the maps and described in the Draft Structure Plan was Jacfin's Eastern Creek Land. The indicative location of the Western Sydney Intermodal Terminal shown in the Draft District Plans is consistent with the location in the Draft Structure Plan.

It is also noted that a draft Development Control Plan (***DCP***) for land owned by the Department of Planning and Environment at Ropes Creek (***DPE Land***), immediately west of the Eastern Creek Land, was exhibited in November and December 2016. The Traffic and Transport Assessment exhibited with the draft DCP noted that the DPE Land is located directly to the west of the proposed future Western Sydney Intermodal Terminal, reaffirming the NSW Government's intention to redevelop its own land and impose the intermodal facility on Jacfin's Eastern Creek Land.

Jacfin has repeatedly opposed the location of an intermodal facility on its Eastern Creek Land, including in submissions in relation to the Draft Structure Plan and the draft DCP for the DPE Land. Jacfin submits that it would be entirely unreasonable for the NSW Government to acquire part of the Eastern Creek Land for the purpose of constructing an intermodal facility, when it already owns a substantial parcel of vacant land immediately adjacent to the Eastern Creek Land and in close proximity to the proposed Western Sydney Freight Line.

As noted by JBA, since the Western Sydney Intermodal Terminal was first proposed, the Eastern Creek Land has been developed in a way that severely compromises it as an appropriate location for the terminal. There is significant existing development on the Eastern Creek Land and significant proposed development that is currently the subject of development applications to Blacktown City Council. Jacfin therefore submits that the DPE Land is the most suitable site for the Intermodal Terminal.

Whilst an indicative location for the Western Sydney Intermodal Terminal is shown in the Draft District Plans, it is Jacfin's understanding that there has not been any planning assessment in

relation to the location of the facility. This is a significant failing in circumstances where a proposed location for the Intermodal Terminal has been shown in numerous plans released by the NSW Government over a period of more than 10 years, the Draft District Plans being the latest in this long line of plans.

In circumstances where no proper assessment or investigation has been undertaken in relation to the proposed location for the Western Sydney Intermodal Terminal, Jacfin submits that it is premature and inappropriate to show an indicative location for the Western Sydney Intermodal Terminal in the Draft District Plans.

Jacfin further submits that it would be premature for the NSW Government to develop or dispose of the DPE Land until the location for the intermodal facility has been finalised. Jacfin contends that the appropriate location for the intermodal terminal is the DPE Land.

6 Development of Transitional Lands

Increased housing supply and affordability is a key objective of the NSW Government. As noted above, *Towards our Greater Sydney 2056* recognises that new housing should be located close to the places where people work, to support the goal of the 30-minute city.

In that context, Jacfin submits that the Draft District Plans should recognise the opportunity to locate housing on 'transitional lands' between employment precincts and lower density residential areas. The development of appropriate density housing on these transitional lands represents an efficient use of land, taking advantage of the close proximity of these lands to employment and regional transport infrastructure.

In addition, as noted by JBA, the new employment precincts in Western Sydney are being serviced with new trunk infrastructure for water, sewer, telecommunications and electricity. These new services create a significant opportunity for the development of housing on transitional lands adjacent to the WSEA.

Jacfin's Horsley Park Land is subject to the Draft West District Plan. In granting Concept Plan Approval for the development of the Horsley Park Land for employment purposes in 2013, the Planning Assessment Commission was of the view that the south-east corner of the land should be rezoned to enable it to be developed for residential purposes. This rezoning has now taken place however, contrary to the Liveability Priorities of the Draft West District Plan, an inappropriately high minimum lot size of 2 hectares has been imposed on the rezoned portion of the Horsley Park Land.

As noted by JBA, the 2 hectare minimum lot size is incongruous with the density of development permissible on land immediately adjoining the Horsley Park Land, which is subject to a 1 hectare minimum lot size and is not currently sewered. The Jacfin Horsley Park Land, including the future residential part of the land, will be sewered in the near future, clearing justifying a higher density of development than that permissible on the unsewered neighbouring land.

The minimum lot size imposed on the Horsley Park Land prevents the efficient development of this land and represents a missed opportunity to take advantage of the servicing of this site that will occur in the near future and its proximity to regional infrastructure and future jobs.

Whilst acknowledging that the Draft West District Plan is not intended to address site level planning issues, Jacfin submits that there is an opportunity for the Draft West District Plan to promote the leveraging of opportunities for higher density residential development on transitional lands in close proximity to the WSEA and other employment precincts within the Western City.

The adoption of clear principles in the Draft West District Plan relating to the important role of transitional lands in the delivery of housing for Western Sydney, and the consequent need to encourage appropriate density development on transitional lands, will help ensure that opportunities

to provide diverse and affordable housing in close proximity to employment are not missed. Jacfin therefore submits that the Draft West District Plan should clearly support higher density residential developments on transitional lands, where this is can be demonstrated to be appropriate.

7 Submission

Jacfin submits that:

(a) *Towards our Greater Sydney 2056* and the Draft District Plans should support the introduction of new enterprise zones, or the expansion of permissible uses within the IN1 and IN2 zones, to enable a wide range of commercial activities to be undertaken in employment areas such as the WSEA and provide the required flexibility in land uses.

(b) The Draft West Central District Plan and Draft West District Plan should not show an indicative location for the Western Sydney Intermodal Terminal until a proper planning assessment of the appropriate location of that facility has been undertaken. It would be premature for the NSW Government to develop or dispose of the DPE Land until the location for the intermodal facility has been finalised. Jacfin contends that the appropriate location for the intermodal terminal is the DPE Land.

(c) The Draft West District Plan should clearly support higher density residential developments on transitional lands, where appropriate, to take advantage of services and the close proximity of these lands to employment and regional transport infrastructure. This would facilitate the appropriate development of transitional lands such as the residential portion of Jacfin's Horsley Park Land, which should be subject to a higher density given that it will be sewered, unlike the adjoining 1 hectare residential lots.

Yours faithfully

[redacted]

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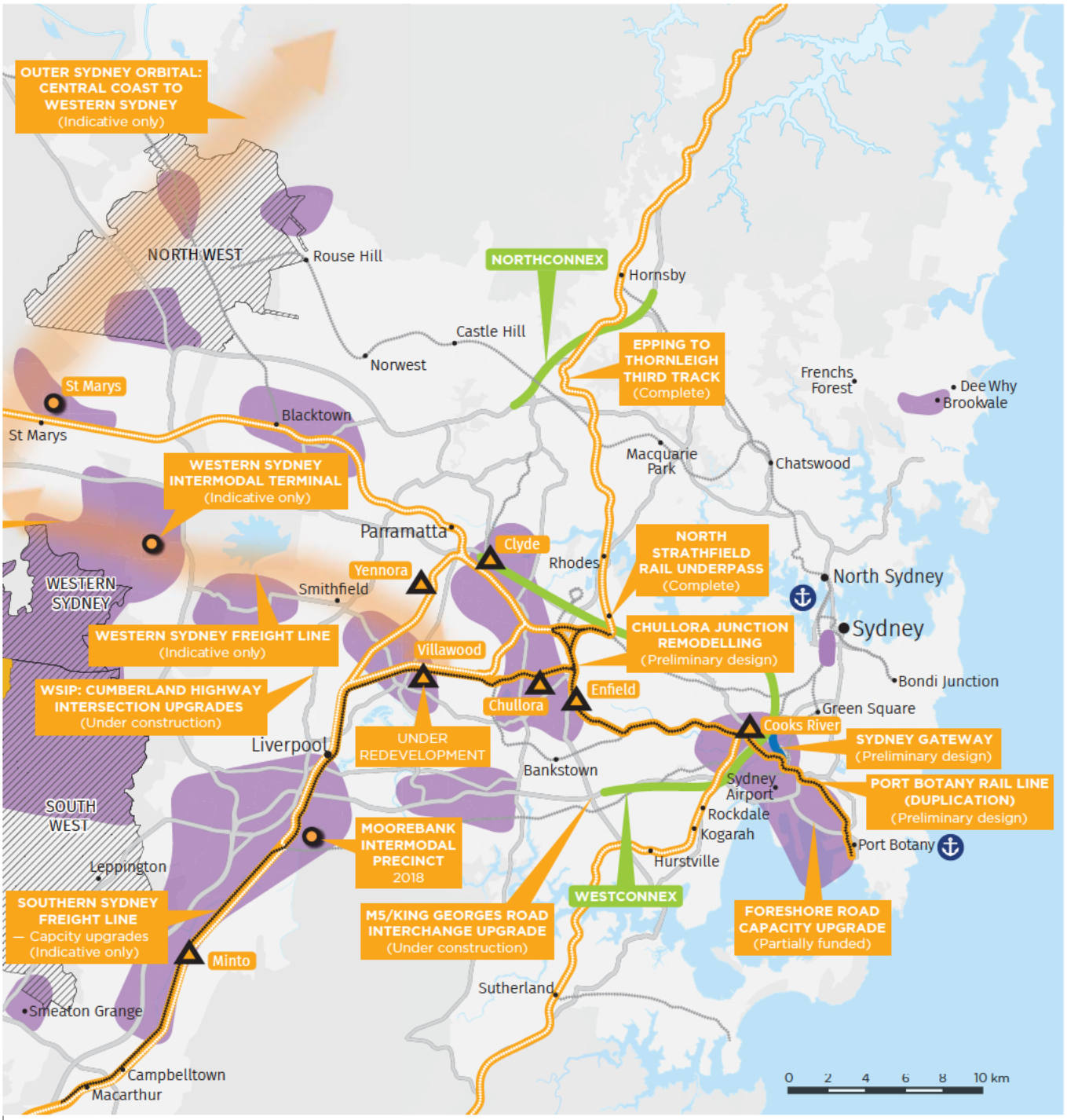
OUTER SYDNEY ORBITAL: CENTRAL COAST TO WESTERN SYDNEY
(Indicative only)
NORTH WEST
Rouse Hill
NORTHCONNEX
Hornsby
Castle Hill
Norwest
EPPING TO THORNLEIGH THIRD TRACK
(Complete)
Frenchs Forest
Dee Why
Brookvale
St Marys
St Marys
Blacktown
Macquarie Park
Chatswood
WESTERN SYDNEY INTERMODAL TERMINAL
(Indicative only)
Parramatta
Clyde
Rhodes
NORTH STRATHFIELD RAIL UNDERPASS
(Complete)
North Sydney
Yennora
Smithfield
WESTERN SYDNEY
WESTERN SYDNEY FREIGHT LINE
(Indicative only)
CHULLORA JUNCTION REMODELLING
(Preliminary design)
Sydney
Villawood
Enfield
Chullora
Bondi Junction
WSIP: CUMBERLAND HIGHWAY INTERSECTION UPGRADES
(Under construction)
Green Square
Cooks River
SYDNEY GATEWAY
(Preliminary design)
Liverpool
UNDER REDEVELOPMENT
Bankstown
Sydney Airport
PORT BOTANY RAIL LINE (DUPLICATION)
(Preliminary design)
SOUTH WEST
Rockdale
Kogarah
Port Botany
MOOREBANK INTERMODAL PRECINCT
2018
Leppington
Hurstville
WESTCONNEX
SOUTHERN SYDNEY FREIGHT LINE
– Capcity upgrades
(Indicative only)
M5/KING GEORGES ROAD INTERCHANGE UPGRADE
(Under construction)
FORESHORE ROAD CAPACITY UPGRADE
(Partially funded)
Minto
Sutherland
Smeaton Grange
Campbelltown
Macarthur
0 2 4 6 8 10 km
Dedicated freight rail
Shared freight rail
Sydney Trains network
Major freight road
Proposed intermodal terminal
Existing intermodal terminal
Freight activity precincts
Priority Growth Area
Proposed Transport Corridors
(indicative only)

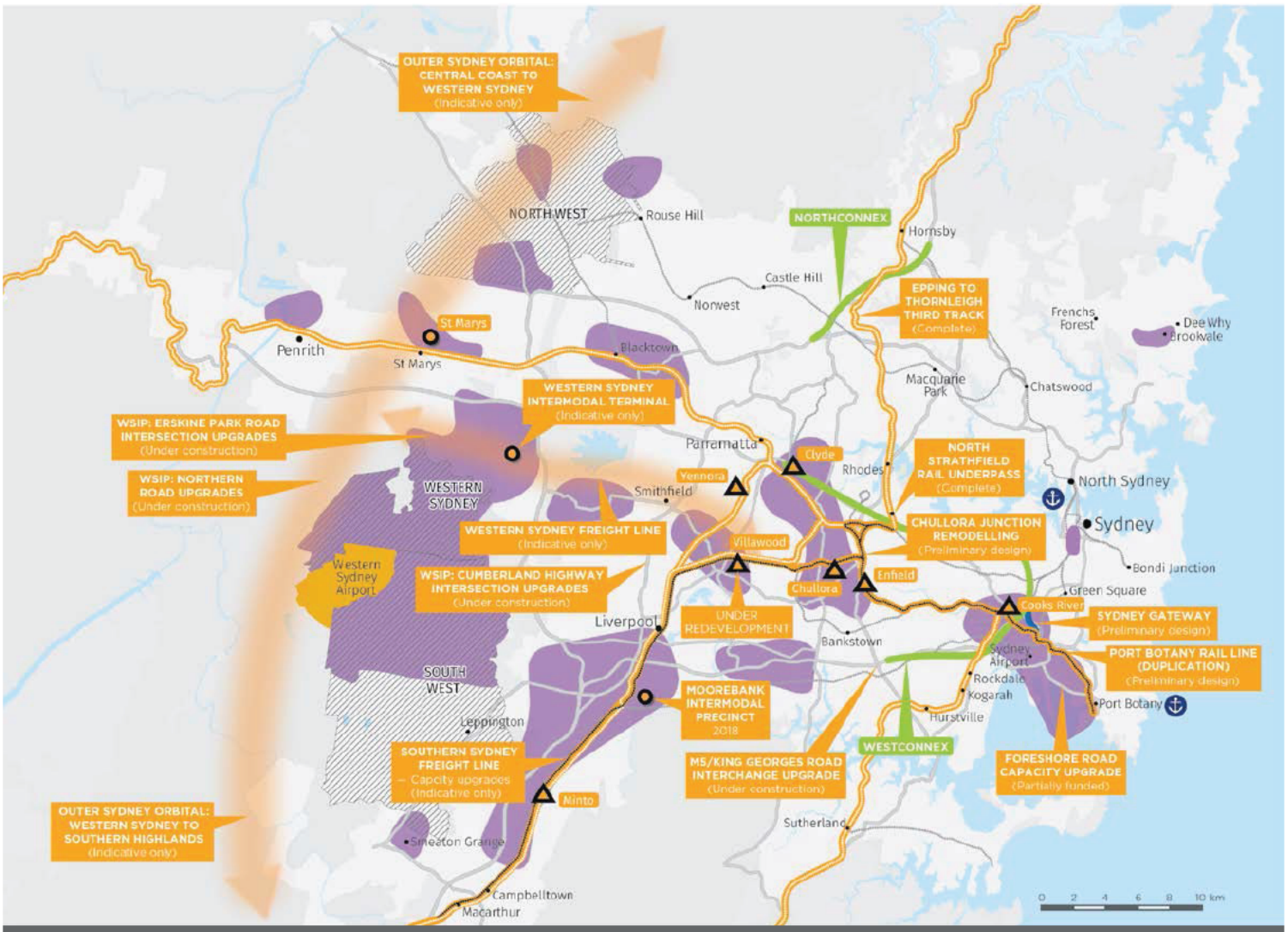

Figure 3-15 Greater Sydney's freight assets

Dedicated freight rail		Existing intermodal terminal	
Shared freight rail		Freight activity precincts	
Sydney Trains network		Priority Growth Areas	
Major freight road		Proposed Transport corridors (indicative only)	
Proposed intermodal terminal			

Source: Transport for NSW (2016)

13449
31 March 2017

The Greater Sydney Commission
By email: engagement@gsc.nsw.gov.au

Dear Commissioner,

DRAFT WEST CENTRAL DISTRICT PLAN AND DRAFT WEST DISTRICT PLAN
JACFIN SUBMISSION

JBA has been engaged by Jacfin Pty Ltd (Jacfin) to make a submission in relation to the Draft District Plans for the following districts:

- West Central.
- West.

1.0 INTRODUCTION AND BACKGROUND

Jacfin owns land at Ropes Creek, Horsley Park and Eastern Creek, as shown in **Figure 1**. This land is located within the Western Sydney Employment Area (WSEA).

As can be seen in **Figure 1** the Eastern Creek Land is currently being developed for a range of industrial and warehousing uses.

The Ropes Creek site is subject of a Part 3A Concept Plan approval (granted in 2011) and a Part 3A Stage 1 Project Approval for development as an employment precinct (details can be found at the Department of Planning and Environment's website under project numbers MP10_0127 and MP10_0128).

The Horsley Park site is subject of a Part 3A Concept Plan approval (granted in 2013) and Stage 1 Project Approval for development as an employment precinct (details can be found at the Department of Planning and Environment's website under project numbers MP10_0129 and MP10_0130). In order to address boundary and transition issues between the employment area and the surrounding rural residential areas, the south-east corner of the Jacfin Horsley Park site was rezoned in October 2016 as RU4 – Primary Production Small Lots to enable residential development to be carried out on this portion of the land.

Figure 1 – Jacfin WSEA Lands

2.0 SUBMISSION

Jacfin generally supports the importance which the Greater Sydney Commission places on the employment lands, including those within the WSEA – which is evident through the amendments to *A Plan for Growing Sydney* set out in *Towards our Greater Sydney 2056*, as well as through the Draft District Plans.

In particular, we note and support the following principles set out in *Towards our Greater Sydney 2056:*

- The principle of the 30-minute city, where more people work closer to where they live, especially as the Western City grows in population and function.
- Planning for a sustainable transport network that will support economic activity around the Western Sydney Airport and the emergence of the Western City.
- Moving towards a smart city that enables and increases knowledge-intensive jobs.

In terms of delivering the Sydney of the future envisaged in *Towards our Greater Sydney 2056* there is a need to re-imagine the role of industrial areas. Indeed, this is explicitly identified in the Draft District Plans which include the following:

- the "nature of industrial land is changing, with a greater diversity of activities" and "new models are emerging for businesses locating in industrial precincts that require different planning and infrastructure responses". (Draft West District Plan, Section 3.10, p. 62).
- "The nature of employment and urban services land precincts is changing as technologies and new industries emerge. Many precincts are evolving into complex employment lands distinct from industrial land" and, "a broader range of businesses may establish in these areas than was historically the case." (Draft West Central District Plan, Section 3.7, p. 73).

As an organisation building the employment precincts of the future at Eastern Creek, Ropes Creek and Horsley Park, Jacfin supports the Commission in:

- Seeking to better understand the value and operation of employment and urban services land.
- Its Productivity Priority to protect, support and enhance the economic function of employment and urban services lands.

We encourage the Commission to work with the Department of Planning and Environment and councils to ensure that land use planning controls for employment and urban services land is suitably flexible to accommodate this greater diversity in employment generating development. An appropriately flexible land use planning framework will encourage investment to support the new models of employment generating activities, ensuring that the employment and urban services land precincts can accommodate the knowledge intensive jobs of the future smart city.

We particularly note that the current suite of land use zones provided for under the *Standard Instrument – Principal Local Environmental Plan* do not allow for this flexibility. It is considered that the IN1 and IN2 zones within the WSEA should provide for a wider range of allowable land uses, or, new enterprise zones should be developed, to support a modern diverse range of land uses appropriate for present and future trends. Indeed, *A Plan for Growing Sydney* already identified a need for 'enterprise corridors' to provide a "flexible and innovative regulatory environment … to enable a wide range of commercial activities to take advantage of transport access". This should be a broad principle that applies to all regionally significant employment precincts, especially the WSEA.

In addition to the above, there are two aspects of the Draft District Plans that impact directly on Jacfin land, and which are further addressed in this submission:

- The identification of an intermodal terminal located on the Jacfin Eastern Creek land (Draft West Central District Plan).
- The treatment of Employment Precinct boundary / transition lands.

2.1 Intermodal Terminal

Figure 3-15 of the Draft West Central District Plan (and Figure 3-10 of the Draft West District Plan) provide a Greater Sydney's freight assets map that shows an indicative Western Sydney Freight Line and Western Sydney Intermodal Terminal. Whilst these are identified as indicative only, they indicate that the corridor would travel through heavily developed parts of Eastern Creek, with the Western Sydney Intermodal Terminal located in or around Eastern Creek.

The location of the possible future Western Sydney Intermodal Terminal at Eastern Creek seems to be based predominantly on the recommendations of the Freight Infrastructure Advisory Board (Railing Port Botany's Containers 2005), which recommends that:

> *"… a large private land holding at Eastern Creek as the best of the available sites…"*

> *"… the Eastern Creek site should be reserved for the development of an intermodal terminal to service Western Sydney. Unless the site is protected, there is a significant risk that it may be developed in a way that compromises its use as an intermodal terminal servicing the Western Sydney industrial markets."*
>
> *"Accordingly, it is the Advisory Board's view that the Eastern Creek site should be reserved, consolidated and then made available on suitable terms to the private sector for development as an intermodal terminal."*

The 2005 Freight Infrastructure Advisory Board recommendations have been reiterated in the NSW Long Term Transport Masterplan (December 2012), the Broader Western Sydney Employment Area Draft Structure Plan (June 2013), the NSW Freight and Ports Strategy (November 2013) and the NSW State Infrastructure Strategy 2014, and are now referenced in the Draft District Plans.

To varying degrees, these strategic documents identified the preferred location for the intermodal terminal as the Jacfin Eastern Creek site. However, in the intervening 12 years since the Freight Infrastructure Advisory Board recommendations were first made, a site at Eastern Creek has not been reserved for the development of an intermodal terminal and the Jacfin land has been developed in a way that severely compromises its use as an intermodal terminal.

Jacfin has objected multiple times to the unnecessary uncertainty in relation to the development potential of its Eastern Creek land that has resulted from the indicative identification of the Western Sydney Freight Line and Western Sydney Intermodal Terminal.

No analysis provided in the above documents, or in the Draft West Central District Plan, provides any basis for considering that the intermodal terminal or the Western Sydney Freight Line are any more feasible or likely to be implemented today than in 2005.

Indeed, development throughout the Eastern Creek precinct of the WSEA has progressed substantially in recent years, and the precinct is even more severely compromised in relation to its capacity to accommodate an intermodal terminal.

Further, it is highlighted that the NSW Government owns a parcel of currently undeveloped land located adjacent to Ropes Creek which was the subject of a draft Development Control Plan exhibited in November/December 2016. The indicative location of this land is shown in **Figure 2** below, against the background of the Greater Sydney's freight assets map. This is the most suitable site for the location of the Eastern Creek Intermodal Terminal, and should be the basis for further studies and investigations. On this basis, the Department should not sell or develop its own lands at Eastern Creek / Ropes Creek, until the intermodal terminal investigations have been completed and a preferred site identified.

The Greater Sydney's freight assets map (Figure 3-15 of the Draft West Central District Plan and Figure 3-10 of the Draft West District Plan) should be amended to remove the location of the Western Sydney Intermodal Terminal at Eastern Creek until further strategic studies and investigations have been carried out to confirm the viability of the freight line and to identify a preferred location for the Western Sydney Intermodal Terminal.

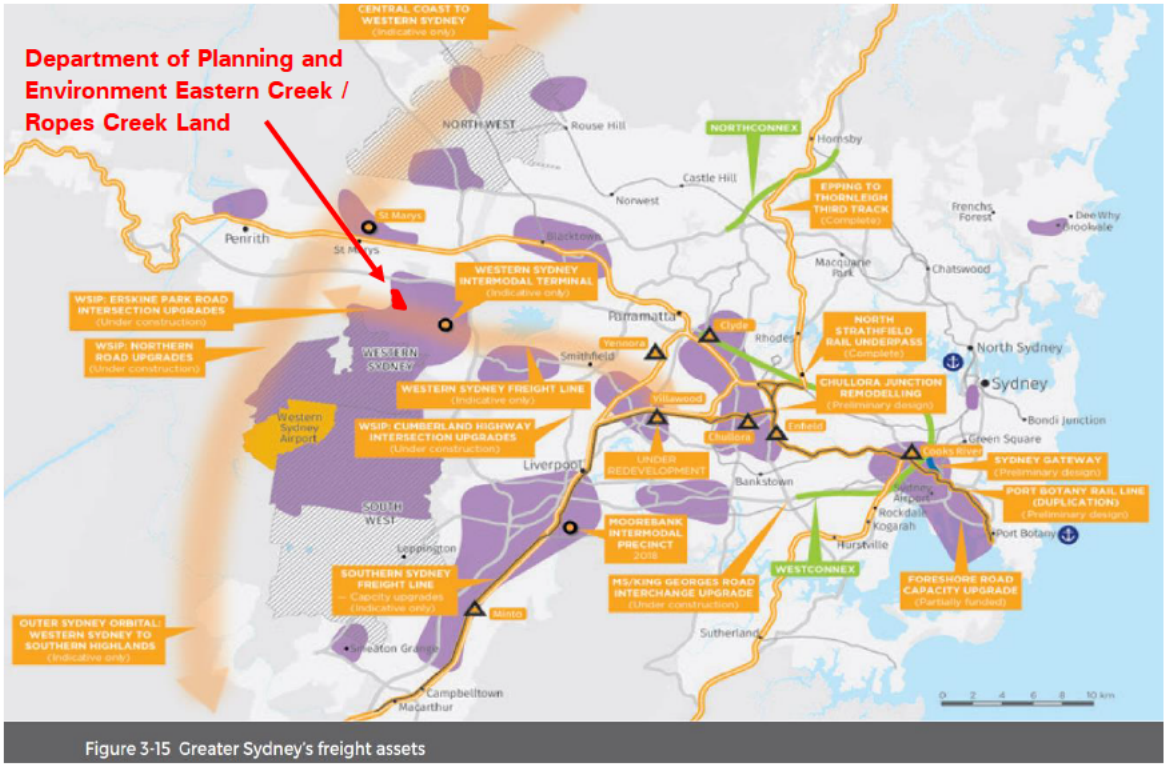

Figure 2 – NSW Government Owned Land at Eastern Creek / Ropes Creek

2.2 Employment Precinct Boundary / Transition Lands

One of the key objectives of the Draft West District Plan is to ensure that there is capacity for new housing that responds to local needs and housing market characteristics and provides proximity to public transport, health, education, infrastructure and services. The Draft West District Plan specifies a 5-year housing target for the Penrith local government area of 6,600 new dwellings, and a 20-year district-wide target of 41,500 new dwellings. The Penrith local government area would likely be expected to accommodate the majority of the 20-year target. In delivering on these housing targets, the Draft District Plan's Liveability Priorities are:

- Improve Housing Choice; and
- Improve Housing Diversity and Affordability.

The Draft Plan identifies that the accommodation of future homes is linked to planning for, and integration with, new infrastructure and services – and nominates three main opportunities for achieving this: Urban renewal; Medium density infill development; and New communities in land release areas.

One overlooked aspect of the integration of new infrastructure and services with future housing delivery, is the land adjacent to the new employment areas. The employment areas will be serviced with new trunk infrastructure for water, sewer, telecommunications and electricity. They are also very well connected to the regional transport network, and are subject of ongoing investment in this regard.

In some cases, these well-serviced locations have been subject of an appropriate density of development, efficiently leveraging the regional infrastructure. Existing examples where this has already occurred are at Erskine Park and Minchinbury.

Another current example of this is the Marsden Park industrial area, within the North-West Priority Growth Area, where the industrial area is surrounded by business zones and light industrial zones, followed by medium density residential zones, before the low density residential areas. This approach to land use transitions, where the level of intensity of development steps down from urban or industrial areas towards areas that are low density residential or of a more rural character, ensures the most efficient use of land, since roads and services taken to the industrial area are also available for the land within the 'transitional' area. Further afield the level of development intensity can be reduced consistent with the lower servicing and access arrangements.

However, at Horsley Park, Council has sought to limit the transitional areas adjacent to the WSEA (in the south-east corner of the Jacfin Horsley Park site) to 2ha lots. At 2ha, the transitional land is incongruously of a lower density than the pre-existing rural residential areas further afield that comprise 1ha minimum lot sizes on land not serviced with sewer. The Jacfin 'transitional' land is close to the state road network, will be fully serviced, and forms the amenity boundary between the pre-existing rural residential areas, and the new employment areas. In this case a minimum lot size of 1ha or smaller would be more appropriate. As such, the current minimum lot size development standard represents a lost opportunity to leverage the trunk services of the industrial area, which would enable more efficient development of the adjoining 'transitional' lands, and provide for additional and more diverse housing options in close proximity to employment lands.

It is therefore requested that the Draft West District Plan:

- Support the principle for transitional lands that the level of intensity of development should step down from urban or industrial areas towards areas that are low density residential or of a more rural character.
- Identify that well serviced transitional land can play an important role in the delivery of housing choice, and housing diversity and affordability.
- Specify that opportunities to leverage regional infrastructure in transitional land areas should be maximised, and support higher density residential development adjacent to employment areas, subject to satisfactorily addressing local access and amenity constraints.

3.0 CONCLUSION

Jacfin generally supports the importance which the Greater Sydney Commission places on the employment lands, including those within the WSEA. However, there are three matters which should be further addressed prior to the finalisation of the Draft District Plans:

- Development of suitably flexible enterprise zones that provide for a greater diversity of employment generating development, and the new models of employment generating activities, ensuring that the employment and urban services land precincts can accommodate the knowledge intensive jobs of the future smart city.
- Acknowledge that the Eastern Creek Precinct of the WSEA has developed substantially in recent years, to the point where it is severely compromised in relation to its capacity to accommodate an intermodal terminal. If a site at Eastern Creek is to be pursued, then the NSW Government should focus studies and investigations on vacant land that it already owns at Ropes Creek and the Greater Sydney's freight assets map (Figure 3-15 of the Draft West Central District Plan and Figure 3-10 of the Draft West District Plan) should be amended to remove the location of the Western Sydney Intermodal Terminal at Eastern Creek until further strategic studies and investigations have been carried out.
- Provide a strategic framework for ensuring a rational approach to the development of transitional lands where the level of intensity of development should step down from urban or industrial areas towards areas that are low density residential or of a more rural character. The framework should support a higher density of residential development adjacent to employment areas, in order to leverage regional and trunk infrastructure in the adjoining areas.

We would be very happy to provide further details in relation to the above issues. Otherwise, should you have any queries about these matters, please do not hesitate to contact me on 9409 4962 or tward@jbaplanning.com.au.

Yours faithfully

[redacted]

[redacted]

Tim Ward
Associate

Julie Bindon
Director

3 August 2017

Jacfin Pty Ltd C/O Allens
Deutsche Bank Place
126 Phillip St, Sydney NSW 2000

Our ref: 2126648-45452
Your ref:

Dear Sir/Madam

Next Gen - Proposed WtE Facility
Human Health Risk Review

1 Introduction

GHD Pty Ltd was engaged by Jacfin Pty Ltd (Jacfin) to undertake a review of the human health risk assessment (HRA) prepared by AECOM in 2016 (*Energy from Waste Facility, Human Health Risk Assessment, Honeycomb Drive, Eastern Creek* dated 23 November 2016*)* as part of an amended Environmental Impact Statement (EIS) for a proposed waste to energy facility (Next Generation) in western Sydney. As part of the scope of work, the Pacific Environment Limited (PEL) Report (*Energy from Waste Facility – Air Quality and Greenhouse Gas Assessment*, dated 31 October 2016) was also reviewed.

GHD's scope of work comprised the following:

- Peer review of the air dispersion modelling carried out by PEL (2016) as presented in Appendix K of the amended EIS
- Peer review of the AECOM (2016) HRA presented as Appendix N of the amended EIS
- Assess potential deficiencies in relation to any controls proposed by the proponent to reduce the potential health risk posed by emissions from the proposed WtE facility.
- Semi-quantitative sensitivity analysis on the health risk assessment in respect of any deficiencies / potential underestimates of risk identified.
- Identification of the potential health risks from the key contaminants of potential concern.
- Preparation of this letter style report, documenting the outcome of the scope items above.

2 Summary of findings

Key findings of this review are as follows:

- Concerning the air modelling carried out by PEL (2016), the modelling is accurate enough based on the modelling procedure and input parameters used. However, there are issues in respect of the reliability of the input assumptions related to feedstock type, and the adoption of Best Available Technologies (BAT). The proponent claims that the WtE facility will incorporate BAT for flue gas treatment; but it is not clear how this is the case given the limited detail provided on how sufficiently

high combustion temperatures will be achieved to fully dissociate chlorine atoms which have the potential to form dioxins and furans, and whether subsequent temperature reduction will be rapid enough to minimise de novo synthesis of dioxins and furans.

- Given that the feedstock for the proposed facility has a substantially different profile compared to those benchmarked overseas (and potentially a higher chlorine content) the production of dioxins and furans in the facility emissions could be higher than assumed.
- Concerning the HRA, there are a number of potential issues or exposure scenarios which don't appear to have been considered. In addition potential error was identified in the use of modelled deposition rates, in which modelled results with units of mg/m^2/day appear to have been used in risk calculations based on mg/m^2/year thereby potentially underestimating deposition by a factor of 365.
- The combined effect of these discrepancies could result in health risk estimates which exceed that considered acceptable by health regulators in Australia, by more than an order of magnitude for some scenarios.
- GHD considers that Next Gen should revise the air quality modelling and health risk assessment reports addressing the issues identified during this review.

This report is subject to, and must be read in conjunction with, the limitations in Section 6.

3 Air Modelling Review

We have undertaken a review of the Energy from Waste Facility – Air Quality and Greenhouse Gas Assessment report written by Pacific Environment Limited (PEL) - Rev 5 of AQU-NS-001-21292C, 31 October 2016.

The report follows the methodology set out by the Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales (DEH, 2005[1]) – 'Approved Methods'. Relevant topics covered are:

- Project description
- Assessment criteria (legislated)
- Dispersion meteorology
- Background air quality
- Emission inventory
- Impact assessment (modelling).

3.1 Project description

The PEL report has assessed the project with details prepared by the proponent. The preferred technology for incineration is a moving grate system with water and air cooled grate bars. This can be considered a well-established incinerator technology. The project overview describes that the

[1] The Approved Methods (August 2005) where updated with minor revisions November 2016 and published by the Environment Protection Authority on January 2017. The only material changes are to Particulate Matter concentrations in Table 7.1. The annual average PM_{10} criterion is now lower at 25 µg/m^3 and $PM_{2.5}$ criteria have been added.

temperature of the gases is reduced from over 850°C to around 150°C via the heat recovery boiler. This is how the facility achieves the waste being converted to energy. Flue gas treatment is installed so as to meet in-stack concentration limits consisting of:

- Selective Non-Catalytic Reduction (SNCR)
- Dry lime scrubbing
- Activated carbon injection before fabric filters (baghouse).

Emissions are then dispersed through a 100 m high stack. This is at a height that is considered the boundary to a 'tall stack'. Typical sources with 'tall stacks', such as power stations, refineries or large smelters, should be modelled using a convective plume rise option to account for the impact of emitted buoyant plumes. The AUSPLUME dispersion model as specified in the Approved Methods has such an option that applies to stacks higher than 100 m.

An apparent weakness in the technology chosen for the proposed scheme is that there is no clear indication of having a secondary combustion chamber to achieve 1100°C to 1200°C for a residence time of two seconds. The proponent's engineer, Ramboll, has provided details that the grate furnace temperature, also known as flame temperature, is 'around' 1100°C. However, while the flame temperature and combusting material may be 'around 1100°C, the primary chamber air ,introduced material and the air leaving the primary chamber into the secondary chamber is to be 850°C only. This is considered acceptable for feedstock low in chlorines such as coal or municipal wastes (recyclables separated at source). However, several of the feedstock streams involve high percentages of hard (and soft) plastics with a chlorine content above 1%. It is necessary to heat the flue gases in the secondary (afterburning) chamber above 850°C for at least two seconds (PEL, 2016, p.5). The higher temperature, to achieve combustion to a fuller extent, is considered best available 'technology' as it is commonly used for medical waste incineration. This is used so as to dissociate the chlorine atoms that have potential to form dioxins and furans. The thermal oxidation of the material destroys any toxic material already in the feedstock and allows for best available technology to lower the risk of (re)formation of persistent organic pollutants such as dioxins and furans.

A secondary weakness in the process is that the heat recovery boiler, the principal reason for the use of an incinerator so as to produce steam for electrical generation, has temperature reduction from over 850°C to around 150°C across an unknown time period. Where there are considerable chlorine atoms in the feedstock, it is best available 'technology', particularly in the medical waste incineration and Municipal Solid Waste incineration industry, to produce a rapid temperature reduction, as quickly as possible. This is so as to avoid the de novo synthesis of dioxin and furans. De novo synthesis is a Latin phrase[2] and refers to the synthesis of complex molecules from simple molecules (i.e. the reformation of dioxins and furans).This is especially so through the temperature range where the synthesis rate of dioxins and furans rises rapidly as the temperature falls from 300°C to 250°C (for example, Hattori et al., 2007[3]). Avoiding the reformation of dioxins and furans from the dissociated chlorine atoms reduces risks as avoidance in the waste hierarchy is better than treatment/containment/disposal. If less dioxins and

[2] Literally translating to "from the new," but implying "anew," "from scratch," or "from the beginning."

[3] Hattori S, Takaoka M, Matsumoto T, Oshita K, Takeda N, Tejima H, Nakatsuka D, Fujita Y, Matsumoto A. 2007. Effect of de novo dioxin synthesis from boiler dust on dioxins emission from irregular operation of MSW incinerator. Organohalogen Compounds Vol 69. pp 2423-2426. http://www.ejnet.org/toxics/cems/2007_Hattori_dioxins_irregular_operation_MSWIs.pdf

furans are produced by a process, the risk to environmental exposure, either as an exit out a stack after pollution control equipment (for example, fly ash) or captured by-products (such as bottom ash and filter dust), is minimised (maximum extent achievable).

The fuel source is a mixture of waste streams that are not usually associated with Municipal Solid Waste incineration. The main known waste types are Commercial and Industrial (C&I) and Construction and Demolition (C&D) wastes. Issues arising from this are further discussed in the emission inventory section below.

3.2 Assessment criteria

Assessment criteria are discussed in Section 4 of the PEL report under the heading of 'Legislative Setting'. The primary emissions identified are consistent with pollutants usually associated with combustion sources involving incineration. Particulate matter is "assumed to be emitted as PM_{10} and $PM_{2\,5}$" (PEL, 2016, p.12). Total Suspended Particulate (TSP) should be considered – both for in-stack limits and ground level concentration. This is because TSP has an impact assessment criterion in the Approved Methods (albeit for an annual average). PEL have ignored TSP.

The New South Wales Energy from Waste (EfW) Policy requires a (primary) chamber temperature of at least 850˚C. There is no technical requirement for a secondary chamber. However, where the chlorine content is greater than (a nominal) 1%, this secondary chamber is important to assist in minimising the risk of dioxin and furans from being in fly or collected ash. The proposal does include a secondary chamber, but no detail could be found in the PEL (2016) report on why it is needed, what temperature it will achieve or whether/how, if any, 'combustion' will occur in the secondary chamber. So why is there a secondary chamber?

The Protection of the Environment Operations (Clean Air) Regulation 2010 ('Clean Air Regulation') sets relevant standards for in-stack concentrations. The proposal aims to go beyond these standards and use European guidance for more stringent exit conditions of some substances (or others that are not prescribed in the Clean Air Regulation). This is a good thing if it can be achieved and demonstrated during commission testing.

Ambient (ground level design) air quality criteria are from the Approved Methods. These are all standard as reported. However, Particulate Matter is only dealt with by consideration of PM_{10}. At the time of writing the EIS, PM_{10} only had design Ground Level Concentration (GLC) criteria for 24-hour and annual averaging periods and an annual Total Suspended Particles (TSP) criterion. It did not have any values at all for $PM_{2.5}$ (both annual and daily consistent with the National Environment Protection Measure or hourly consistent with the Victorian Policy used to define principle toxic air pollutants in the Approved Methods). TSP is not included in the assessment – but it can be reasonably assumed that if the PM_{10} criteria are met then the TSP annual criterion would also be conforming. $PM_{2.5}$ criteria for 24-hour and annual averaging time have been included (Table 4-5, PEL, 2016, p.17). These were derived from the National Environment Protection Measure (Ambient Air Quality) advisory reporting standards. These pre-empt the update to the Approved Methods of January 2017 which now include $PM_{2.5}$ criteria. It is then curious as to why these additional criteria were applied in the assessment. The assumed annual and daily $PM_{2.5}$ criteria match with the now updated NEPM which have also been updated in the newer Approved Methods (albeit after the EIS publication). The assessment goes to the extent of including a

non-Approved Methods pollutant from a separate non-binding pair of criteria. For completeness, why not include hourly averaged criteria for PM_{10} and $PM_{2.5}$ that apply to point sources? These can be found in the Victorian State environment protection policy (Ambient Air Quality). This is where the Approved Methods have obtained the impact assessment criteria for principal and individual toxic air pollutants (but did not 'copy across' the PM_{10} and $PM_{2.5}$ short term criteria[4]). Shorter time-period impact assessment criteria are always more difficult to achieve than daily or annual time period averaging. All of the 'principal toxic air pollutants' (Table 7.2a of Approved Methods; all at 1-hour averaging time) were obtained from this source.

3.3 Dispersion meteorology

The dispersion meteorology datasets were compiled using the relevant principles from the Approved Methods. Since the stack point source is 100 m high, it is the upper air conditions that are more important than boundary layer meteorology. This is discussed in Section 5.2 of the PEL (2016) report. Moreover, the latest report has changed the dispersion model to the USEPA AERMET/AERMOD due to its recognised capabilities. This includes the use of cloud data from the 19 km distant Bankstown Airport. But when it comes to profile (upper air) data, the Sydney airport data was considered "*subject to very different influences on the boundary layer meteorology*" (PEL, 2016, p.20). Hence, the 'upper air estimator' (which is a projection of surface winds to higher levels; irrespective of layers involving wind shear or temperature variations) was used to avoid inconsistency with prognostic (synthetic) meteorological fields. This is standard practice if you don't have data – but Sydney Basin upper air data from Sydney Kingsford Smith International Airport are available. The dismissing of the Sydney Airport pre-dawn balloon-borne measurement as "*there are no temperature and dew point temperature data for nearly all upper air sounding data taken in Australia*" (ibid.) is factually wrong. The PTU (pressure, temperature and humidity) Radiosonde performed by the Bureau of Meteorology every morning has the required data – as well as a GPS chip to enable wind determination (all at 2-second intervals).

The PEL (2016) report states that "*Values of surface roughness, albedo and Bowen ratio were determined based on a review of aerial photography for a radius of 3 km centred on the EPA St Marys station*" (PEL, 2016, p.25). This is contradictory to USEPA modelling guidance[5], which states that:

- "*Site-specific meteorological data are assumed by definition to be representative of the application site*";
- "*however, the determination of representativeness of site-specific data for AERMOD applications should also include an assessment of surface characteristics of the measurement and source locations and cannot be based solely on proximity*."

This leads to the recommendation that (author emphasis) "*However, a domain representative of the application site may be more appropriate for some applications, particularly if the majority of sources are elevated releases" (USEPA, 2015, p.6)*. Therefore, the USEPA are of the opinion that modelling accuracy will be improved (for a stack of 100 m) by the use of land use categories from the actual

[4] PM_{10} have daily and annual criteria only as does the latest Approved Methods for $PM_{2.5}$.(but none at all for $PM_{2.5}$ in the October 2016 Approved Methods)

[5] AERMOD IMPLEMENTATION GUIDE, Last Revised: August 3, 2015. https://www3.epa.gov/ttn/scram/7thconf/aermod/aermod_implmtn_guide_3August2015.pdf

assessment site than the measurement site. Differences will be unknown depending on how the surface roughness, albedo and Bowen ratio change. This is a problem when choosing an "*advanced dispersion model for specialist application*" (Approved Methods, DEC, 2005, p.22). "*However only experienced and appropriately trained professionals should use them*" (ibid.).

3.4 Background air quality

There is enough high quality information from the metropolitan Sydney-wide air quality monitoring network for this to not be an issue.

3.5 Emission inventory

3.5.1 Benchmarking

"The proposed technology is based on existing facilities operated throughout Europe, which are designed to meet the IED limits" (PEL, 2016, p.14).

PEL (2016) are reliant on information provided by the proponent's engineer (PEL, 2016, p.33):

- Ramboll, has produced a technical memorandum that attempts to address 'real world' in-stack concentrations.
- A review of existing EfW facilities "mostly in the UK and Europe" is provided in Table 7-3.

None of the UK or European reference sites have annual tonnage throughput at the rate of the proposal. The proposal is of a greater scale. Further, all but one of the reference sites involve municipal solid waste of some form whereas the feedstock proposed will consist mainly of construction, demolition, commercial and industrial waste with no municipal waste. The Mainz, Germany facility has some "bulky waste and commercial waste" but this is mixed with "household waste". Similarly for AEB, Amsterdam, The Netherlands where "municipal" is mixed with "industrial waste". Garden Organics (GO) in the proposed feedstock is the closest classification found to municipal solid waste. It is an unknown how this will 'mix' with the other waste streams by simply picking up and dropping from a 'crane'. A comparison of feedstock types at overseas reference sites and the proposed Next Generation facility is summarised in Table 1.

Table 1 Feedstock comparison between reference sites and proposed facility.

Facility	Municipal Solid Waste (MSW)	Chute Residual Waste (CRW)	Construction & Demolition (C&D)	Commercial & Industrial (C&I)	Flock Waste	Paper Pulp	Glass Residual	Garden organics (GO) Residual	Alternative Waste Treatment (AWT) Residual	Material Recovery Facility (MRF) Residual
Lakeside, UK	✓ + 'Household'	✗	✗	✗	✗	✗	✗	✗	✗	✗
Issy Les Moulineaux, France	✓	✗	✗	✗	✗	✗	✗	✗	✗	✗
Riverside, UK	✓	✗	✗	✗	✗	✗	✗	✗	✗	✗
Mainz, Germany	Household waste	✗	✗	bulky & commercial waste.	✗	✗	✗	✗	✗	✗
AEB, The Netherlands	Municipal	✗	✗	Industrial	✗	✗	✗	✗	✗	✗
Spitteleu, Austria	✓	✗	✗	✗	✗	✗	✗	✗	✗	✗
Kwinana Facility, Western Australia	✓	✗	✗	✗	✗	✗	✗	✗	✗	✗
Greatmore Facility, UK	✓	✗	✗	✗	✗	✗	✗	✗	✗	✗
Newhaven Facility, UK	✓ 'Mixed'	✗	✗	✗	✗	✗	✗	✗	✗	✗
Worcestershire EfW facility, UK	✓ + 'Household'	✗	✗	✗	✗	✗	✗	✗	✗	✗
Montgomery County, USA	✓	✗	✗	✗	✗	✗	✗	✗	✗	✗
THE NEXT GENERATION	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓

3.5.2 *Feedstock and waste hierarchy*

As can be seen in Table 1, there is no common link between the feedstock of the reference sites and the proposed facility. Concentration estimates for the proposed facility are based on stack testing data for existing reference facilities. This is not an 'apples to apples' assessment as indicated by the table above. This is considered a major downfall in the assessment. Because the emissions data are not comparable, actual emission concentrations will ultimately only be fully determined if and when the plant is commissioned and stack testing results are made available.

It can be an interpretation that incineration of waste streams (Municipal Solid Waste, Medical, Customs and Quarantine, Pharmaceutical and Waste to Energy) involving any forms of plastic (chlorine) is a primary reason for the Stockholm Convention[6] to specifically mention the best available techniques for dioxin control to include:

- "*Use of improved methods for flue-gas cleaning such as thermal or catalytic oxidation, dust precipitation, or adsorption*" (PEL, 2016, p.41).

As an example of the Stockholm Convention identifying the threats posed by mercury and dioxin emission, the US EPA in the 1990s enacted the Maximum Achievable Control Technology (MACT) regulations[7]. As a result, most existing MSW waste to energy incineration facilities (emitting 4,400 grams per year dioxin and furans (g-Toxic Equivalents) in 1990), to avoid shut down, were retrofitted with air pollution control systems (dioxin emissions reduced to 15 g-TEQ in 2005 and then 3.4 g-TEQ by 2012)[8]. This is MACT (equivalent to BACT in Australia) in action on a feedstock which is lower in chlorine content than that proposed.

While dust precipitation and adsorption (dry lime scrubbing and activated carbon injection before fabric filters) are part of the flue gas scrubbing in the proposed facility, thermal oxidation via a secondary combustion chamber to 1100ºC is not included. Further, the heat exchange between incinerator exit (850˚C) to below the de novo temperature range for dioxin/furan formation at entry to the pollution control equipment is the opposite of catalytic control. The use of a secondary chamber above 850ºC at 1100-1200˚C for two seconds is how thermal oxidation is achieved fully. Further, the de novo synthesis of dioxins and furans on particles attached to boiler tubes and fly-ash is a catalytic reaction which is the opposite of oxidation to reduce toxic dioxins and furans. When choosing not to use thermal/catalytic reduction, a lower order within the waste hierarchy then falls on 'dust precipitation or adsorption'.

It is not reported in the PEL (2016) report but the Ramboll (2016, p.29) report states "The furnace and secondary combustion chamber shall comply with the 2 s retention time and 850°C temperature requirements of the IED and be equipped with auxiliary burners." While flame temperature in the primary furnace may reach 1100˚C, not all material will come in contact with that temperature and hence the

[6] The provisions of the Convention (to which Australia is a signatory) require each party to: Prohibit and/or eliminate the production and use; Restrict the production and use; and Reduce or eliminate releases from unintentionally produced persistent organic pollutants (POPs). Overview. http://chm.pops.int/TheConvention/Overview/tabid/3351/Default.aspx

[7] "The facility transports the ash residue to an enclosed building where it is loaded into covered, leak-proof trucks and taken to a landfill designed to protect against groundwater contamination." Energy Recovery from the Combustion of Municipal Solid Waste (MSW). https://www.epa.gov/smm/energy-recovery-combustion-municipal-solid-waste-msw#03

[8] 2016 Directory of waste-to-energy facilities. Energy Recovery Council. http://energyrecoverycouncil.org/wp-content/uploads/2016/05/ERC-2016-directory.pdf

need for 'thermal technology' to treat to a known temperature in a secondary chamber. This can only be achieved by use of another fuel (other than the furnace feedstock) and is most often natural gas. The European Union directive relied upon by PEL is concerned with '*hazardous waste with a content of more than 1 % of halogenated organic substances*' (for example, PEL, 2016, section 4.2). This can be compared to the NSW EfW policy only where "*If a waste has a content of more than 1% of halogenated organic substances*..." (see Ramboll, 2016, p.11). Ramboll (2016) then go on to claim "*Nevertheless PVC is not considered a hazardous material*." One could argue that once PVC is burned and the precursors of dioxin and furan are generated, than the flue gas and bottom/boiler ash are then sufficiently laced with dioxins and furans to be considered hazardous. Hence, the waste hierarchy placing greater emphasis on avoidance rather than treatment.

PEL (2016) say that the concentration of chlorine in the feedstock will be less than 1%. However, the fuel mix for the proposed facility (PEL, 2016, p.G-2) is made up of an estimated, in substantial (60%) part, 29% of construction and demolition (C&D), 17% of Commercial and Industrial (C&I) and 14% Flock Waste. C&I and flock waste have a percentage chlorine component of greater than 1% (1.15% and 1.78% respectively). Fitchner (2015, p.15) report that "*CRW and C&I waste can be quite aggressive due to relatively large amounts of organic chlorine in the waste*". The glass residual feedstock that comprises 2% of the feedstock has a relatively high chloride content of 3.27% while the higher tonnage throughput (7% of feedstock) Alternative Waste Treatment (AWT) Residual has a chloride content of 2.18%. It appears that the proponent is relying on the mixture of materials to bring the average chlorine content of the fuel feedstock to below the technical requirement of 1%.

3.5.3 Waste streams (other than stack emissions)

The original EIS was accompanied by a report by Fitchner. This was replaced by the Ramboll report for the amended EIS. Fitchner (2015, p.46) report claims that the fly ash captured through the control equipment will be considered 'hazardous' due to its high alkaline nature. The later Ramboll (2016, p.37) report classifies the fly ash collected by the control equipment as "restricted solid waste". Fitchner (2015, p.23) claim that "*Bottom ash will either be landfilled or recycled as an aggregate*" as it is "a non-hazardous waste" (Fitchner, 2015, p.iii). Ramboll (2016) simply say that bottom ash will be disposed of via road transport. Leachate from Municipal Solid Waste incinerator residues is considered a significant problem in the USA[7] with mercury and dioxin/furans the major concern.

Due to the assumptions of the proponents engineers on how much that the bottom ash gains additional weight due to water absorbed (a nominal 25%), feedstock ash content and actual throughput, the facility would generate up to 321,000 tonnes per annum (tpa) of wet bottom ash (Fitchner, 2015, p.23). Ramboll (2016, p.37) provides a range of possible wet bottom ash annual tonnes generated - 293,166 to 400,000 tpa. Both engineering consultants estimate that the Facility will generate approximately 51,700 tpa of Air Pollution Control (APC) residue.

3.6 Impact assessment

The proposed stack, at 100 m, provides an advantage compared a stack closer to the ground, say a (metal tube) flue at 10-20 m that does not require a chimney (wind sock), when dispersing in-stack concentrations to ground level impacts. The PEL (2016) results appear to be accurate based on the

modelling procedure used and the input parameters used. However, as discussed above, questions remain on the reliability of the input assumptions.

PEL (2016) claims, without details, that the height of the stack was chosen based on a sensitivity of decreasing the ground level concentrations. Maximum downwind impacts are most often experienced, for the short-term averaging periods of 1-hour and 10-minutes, at ten times the stack height (i.e. 1 km). This appears to be the result reflected in the contour plots within the report (see blue 'X marks the spot' in Figure 1). This includes the residential receives identified on a grid to the west of the proposed facility (and a little further beyond to the north-east).

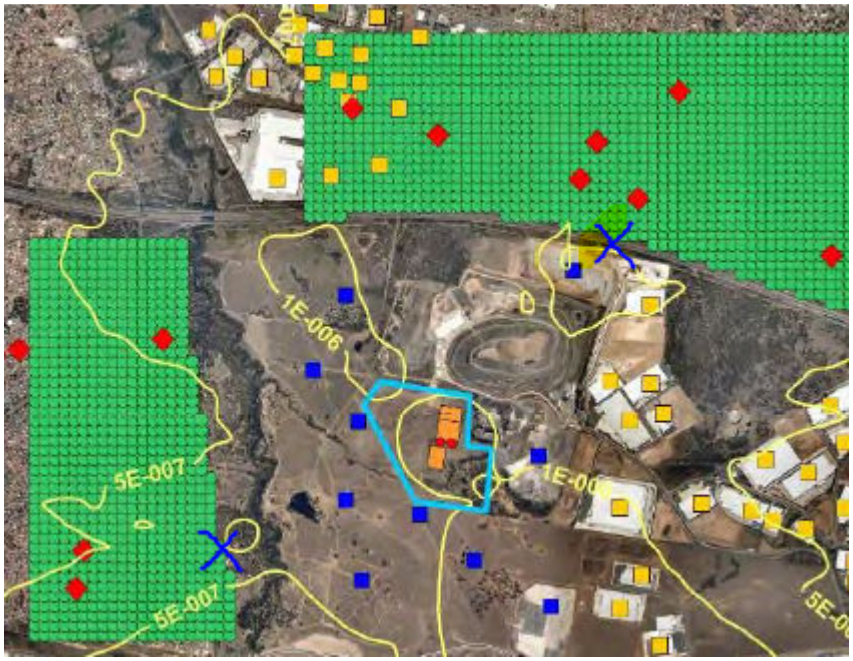

Figure 1 Predicted ground level concentrations – detail from PEL (2016).

3.7 Summary of air quality issues

The major concern is that the reporting on the emission factors used by the air quality dispersion consultants relies on technical and engineering work by others. The emission factors, including capture efficiency of pollution control equipment, relies on data for facilities that are not comparable to that proposed. The dispersion modelling, inclusive of meteorology, ambient concentrations and the technical aspects of the chosen dispersion model, calculates the dilution from the exit point at 100 m height to the resultant ground level concentrations and dust (attached with metals, dioxins and furans) deposition. "*The EPA's preferred methods (estimating emission rates) are direct measurement for existing sources and manufacturers' design specifications for proposed sources*" (Approved Methods, EPA, 2017, p.5). As the proponent does not have direct measurements, they have estimated emission factors indirectly based on manufacturers' design specifications. The generation of dioxins and furans may be higher than predicted due to feedstock variation which contains more chlorine than the facilities which have been

benchmarked for estimating of emission rates. Another contributing factor is due to not applying the principles of Maximum Achievable Control Technology (MACT) available from secondary combustion temperature and controlling the reformation of dioxins and furans through the de novo temperature range. It is noted that the benchmarked Kwinana Facility in Western Australia uses twelve Ultra High Temperature Combustors (UHTCs) when treating Municipal Solid Waste (MSW).

4 Health Risk Assessment Review

GHD has undertaken a review of the human health risk assessment (HRA) report prepared by AECOM (Rev 1, 23 November 2016).

Overall the report is comprehensive and is considered to follow the methodology set out by EnHealth (2012) for assessing human health risks and also incorporates health risk assessment for contaminated land through the National Environment Protection Measure (Assessment of Site Contamination) (NEPM ASC) as updated 2013.

The assessment of health risks to surrounding sensitive receptors predominantly adopts air dispersion modelling results provided by PEL (2016). Annual ground level concentrations (GLC) for chemicals of potential concern (COPC) and deposition rates (DR) have been adopted from PEL (2016) for each sensitive receptor, and used in the chronic health risk estimates. The ground level concentrations (GLC) and deposition rates (DR) are presented in Appendix C of the HRA. It is noted that, given the issues identified in Section 3, the modelled emission rates and hence DR and GLC estimates may be underestimated in respect of dioxins and furans.

GHD has identified certain discrepancies in the HRA, with the result that the estimated risk levels for human health have the potential to exceed acceptable thresholds in some scenarios.

The key potential issues identified from the review of the HRA report and potential effect on the health risk estimates are summarised in the following sections. A summary of the potential health effects of identified COPC is provided in Attachment 1.

4.1 Deposition rates used in risk calculations

The term “exposure pathway” relates to the transport of chemical from source to receptor and the intake route of the chemical by receptors. There are two primary transport mechanisms considered. The first is air dispersion of gases and fine particulates from the facility to the surrounding residents, which is then inhaled. The second is deposition of all particulates from the facility into the surrounding surface soil, which builds up over time. Multiple routes of exposure to soil contamination and deposited contaminants are considered, including incidental ingestion (oral), skin absorption (dermal), uptake in the food chain followed by consumption (produce, chickens and cattle). A secondary exposure pathway considered is maternal milk, where an infant is exposed through breastfeeding, and the mother has been exposed to chemicals known to bioaccumulate (e.g. lead).

There is a potential error in the predicted soil concentrations at the receptors as a result of deposition over time. The AECOM HRA states that the annual dust deposition rate (mg/m^2/year) is used to calculate the soil concentrations (refer Table 18 of the HRA). The calculations in Appendix E of the HRA show that a first-order decay calculation is used over an assumed 25 years of accumulation (the stated assumed

lifespan of the facility). The maximum deposition rates used in the calculation are seen in the Appendix C tables. However there may be a unit conversion issue as the numerical values are identical between the Appendix C tables and the calculations in Appendix E, and the calculations use deposition rates in units of mg/m^2/year, whereas Appendix C table headers present the deposition rates as mg/m^2/day. It follows that the deposition rates used in the risk calculations are potentially underestimated by a factor of 365. It has not been possible to confirm whether this is in fact an error in calculation or whether the tables in Appendix C are incorrectly labelled, as the calculated deposition rates provided by Pacific Environment Limited are not actually presented in the PEL report. It is also noted in the text in Section 4.8 of the report that 100 years duration was assumed to be a conservative estimate of the lifetime of the project, but the risk calculations in Appendix E refer to 25 years of accumulation time. If the facility operates for more than 25 years this has the potential to increase health risk from chemicals that do not degrade with time, with lead considered to be the most significant chemical with respect to this assessment (refer to Section 4.6 on issues related to lead exposure).

The potential for human health risk is measured in two ways. Incremental Lifetime Cancer Risk (ILCR) which is the increased risk of cancer over a lifetime, has an acceptable limit of 1 x 10^{-5} (equals one in 100,000 probability). Other health related endpoints are captured by a Hazard Index (HI) which is a measure of exposure compared to allowable exposure. The acceptable HI limit in Australia is one (for example an HI of two means exposure is twice the allowable level).

The effect of increasing the deposition rate by a factor of 365 on the estimated risk could be significant. It affects all the exposure pathways that are based on soil concentration and deposition, effectively all pathways excluding inhalation. For Scenario 1 (defined by AECOM in the HRA as the facility emissions which are considered most representative of future operating conditions) the highest resulting threshold HI presented in the HRA is for the infant ingestion of breastmilk pathway (Table 24) with a HI of 0.19 (grid maximum, which includes current residential and non-residential locations). This is below the acceptable risk level of one. The infant ingestion of breastmilk scenario is based on a correlation between infant ingestion of milk, and mother (adult) exposure primarily to dioxins, lead and cadmium. The maximum grid concentration adult HI for all pathways in Scenario 1 was estimated by AECOM to be 0.0966, with inhalation comprising 0.0958. This means that the non-inhalation HI contribution is 0.00087. If the non-inhalation HI was increased by a factor of 365 to account for the potential unit error in dust deposition rates (0.317), then the total HI could increase to 0.413, a four-fold increase. Correspondingly, the infant ingestion of breastmilk pathway HI of 0.19 could increase to 0.812 (assuming the same fourfold increase as per mother's exposure). Note this is for Scenario 1, the expected emissions.

For Scenario 2 (defined by AECOM as where emission rates are set at the emission limits prescribed in the Protection Of the Environment Operations (Clean Air) Regulations 2010 and is the theoretical worst case impacts using the POEO emission limits), the highest estimated HI was 0.8 for infant ingestion of breastmilk pathway (where the mother (adult) HI was 0.263). Applying a similar logic described for Scenario 1, the adult mother HI for non-inhalation exposure (0.0052) would increase by a factor of 365 to equal 1.90 and result in an HI of 2.16 inclusive of inhalation risk. This exceeds the acceptable risk level of one for the adult HI. The overall increase factor of 8.23 to the mother's HI would also potentially increase the infant ingestion of breastmilk HI to around 6.6, which also exceeds the acceptable level of one.

Note that these health risk estimates could also increase given the uncertainties in the feedstock and emission modelling discussed in Section 3.

4.2 Water tanks

Deposition of dust on to house rooftops and subsequent collection into water tanks could be a potentially significant exposure pathway that does not appear to have been considered by AECOM in the HRA. Generally in urban suburbs, drinking water would be sourced from a reticulated water supply, but garden irrigation may be from tank water. Contamination from aerial dust deposition on house roofs could be washed into tanks and used subsequently on produce in vegetable gardens. For example, a 200 m^2 roof could concentrate contaminants from deposition onto, say a 20 m^2 vegetable garden (assuming steady state – chemical mass into tank equals mass out of tank). This potentially increases the deposition rate over edible produce by an order of magnitude.

Ingestion of home-grown produce was estimated by AECOM (2016) to be the most significant contributor to non-inhalation risk. For Scenario 1 (Table 24) the non-inhalation contribution to HI for adults was 0.0008 whereas the contribution from home-grown produce to the HI was 0.00075, i.e. 93% of the total risk. Therefore using tank water for vegetable gardens has the potential to increase non-inhalation risk by an order of magnitude. Alone, this would not necessarily be a significant concern, but in combination with the potential error in deposition rates discussed above, the significance increases, potentially resulting in the Scenario 1 (infant ingestion of breastmilk pathway) HI exceeding the acceptable level.

It should be noted that GHD has not undertaken inspection of the houses in the impact zone to verify if this is of issue. Irrespective of whether properties have water tanks or not, this resource should be protected in case residences decide to install tanks in the future.

4.3 Plant uptake

Uptake of chemicals by plants is based on deposition and uptake through leaves over a growing season. While we agree with the calculations presented in Appendix E of the AECOM report (aerial dust deposition onto leaves), the modelled plant uptake does not appear to include uptake of chemical by plant through roots resulting from build-up of contaminants in the soil over years of deposition. The model of root uptake is described in the NEPM (Assessment of Site Contamination) and is included in the derivations of health investigation level (HIL)-A (low density residential) for numerous chemicals with adequate data. For bioaccumulative chemicals this exposure pathway can be significant enough that the risk through this pathway is higher than other pathways including incidental soil ingestion For example, for the pesticide DDX, the plant uptake pathway is an order of magnitude more significant than soil ingestion in terms of contribution to overall risk.

That said, the health risk estimates in the AECOM HRA indicate that inhalation pathway is 100 fold higher than the consumption of produce pathway and therefore the potential increase in overall risk may not be significant, but this has not been confirmed by the modelling.

4.4 Soil mixing zone

Soil concentration of contamination from aerial dust deposition build-up was calculated by AECOM for two mixing depths. Surface soil (0.01 m) and shallow plant root soils (0.15 m). Effectively the surface soil concentration is 15 times higher than that of shallow root soils (that is, the mass of contaminant in the top 1 cm of soil is diluted by mixing into the top 15 cm of soil for the vegetable garden). Contaminant concentrations in the shallow root soil depth are considered appropriate for vegetable gardens as soil is dug and turned between planting, but may not be in areas used for chicken or cattle grazing where predominantly grass is grazed and surface soil is incidentally ingested. It is unlikely that chickens would be located within the vegetable area as they tend to destroy crops. This would result in a 15 fold increase in risk for chicken egg and beef consumption scenarios compared to what has been modelled. Noting that these estimated risks are low, being less than an order of magnitude below produce consumption, an increase in the contribution of this pathway may not be significant in the context of the overall risk, but the current modelling has not confirmed this.

4.5 Early lifetime exposure

AECOM's assessment of risks posed by benzo(a)pyrene (BaP) does not appear to have included early lifetime exposure factors for protection of developmental issues in children, as per the recommended USEPA methodology published in 2005. The recommendation from USEPA is to apply a 10 fold factor to risk for the first two years of life, and a factor of three for the next four years. This approach has also been adopted in the NEPM ASC for the derivation of the BaP soil Health Investigation Levels (HIL)[9]. Overall this has the effect of increasing cancer risk by a factor of three for a 35 year risk (NEPM ASC). This approach only applies to a few chemicals, of which BaP is one. It is noted that the overall cancer risk is more than an order of magnitude below the acceptable level of 1×10^{-5}. Therefore, a three-fold increase in the contribution for this contaminant is not anticipated to result in unacceptable risk, although this may be significant when combined with the other discrepancies discussed in this review.

4.6 Lead toxicity

The lead toxicity value adopted in the HRA was withdrawn by WHO in 2010. Currently the accepted approach to assessing lead exposure is to use the USEPA lead biokinetics model. This has been presented in the NEPM ASC for the development of HILs. Of more significance, in May 2015 the National Health and Medical Research Council (NHRMC) published a statement: *Evidence on the Effects of Lead on Human Health*. In this statement NHMRC recommends a blood lead guideline of 5 µg/dL (previously 10 µg/dL). Based on GHD's experience this new lead guideline is equivalent to a third of the threshold toxicity guideline adopted in the AECOM HRA (i.e. risks increase by a factor of 3). This has potential significance to the risk estimates for the infant ingestion of milk exposure scenario, where in Scenario 1 AECOM has calculated that lead makes up 70% of the risk. While alone the increase of HI from 0.19 to 0.274 (accounting for three-fold increase of 70% of the exposure) is within acceptable levels, the combined effect with the other discrepancies discussed in this review could be very

[9] Health Investigation Levels are values published in the National Environment Protection (Assessment of Site Contamination) Measure (ASC NEPM) Amendment No 1, 2013. They are defined as concentrations above which further appropriate investigation and evaluation will be required.

significant, with the HI exceeding 10 using maximum grid concentrations, leading to the conclusion that health risks are potentially unacceptable for this scenario.

4.7 Acute scenario – no deposition

The acute health assessment (Scenario 3) carried out by AECOM correctly assesses potential inhalation risks associated with short term increase in airborne contaminants as a result of plant failure. However, increased deposition rates as a result of the short term increase in emissions was not considered for the failure scenario. One of the failure scenarios discussed was failure of the emission control system, and temperature control failure. While increased deposition rate may not pose an acute risk to sensitive receptors, the emission control failure could have long term (chronic) impact as a result of increased deposition in surrounding soil.

A failure scenario of four hours maximum (per year) was discussed in the report. If the emissions control system removed 99.9% (assumed) of all aerial deposition, then a total failure has the potential to increase the deposition rate a thousand-fold. Over a four hour period the annual deposition rate could increase by a factor of (4 hrs x 1000 + 8756 hrs x 1) / 8760 hrs = 1.45 (increase in annual deposition), which is of low significance on its own but could be significant if combined with the other discrepancies discussed above.

4.8 Estimated combined effects

The sensitivity of each of the above issues and the potential combined effects on risk is shown in Table 2 and Table 3 for Scenario 1 and Scenario 2 respectively.

Table 2 Risk sensitivity assessment, Scenario 1

Exposure Scenario	AECOM 2014		Deposition unit error		Water tanks		Soil mixing zone		Plant uptake through soil		BaP Early lifetime exposure	Blood lead	Potential combined risk scaling	
	ILCR	HI (child)	ILCR	HI (child)	ILCR	HI (child)	ILCR	HI (child)	ILCR	HI (child)	ILCR	HI (child)	ILCR	HI (child)
Max Annual Average GLCs (resident multiple exposure)	2.26E-07	0.0604	5.37E-07	0.465	2.28E-07	0.0691	2.34E-07	0.0621	2.26E-07	0.0604	6.78E-07	-	**1.02E-05**	**4.16**
Max Annual Average GLCs (infant breastmilk)	1.99E-12	0.114	7.94E-12	0.455	2.12E-12	0.121	2.02E-12	0.116	1.99E-12	0.114	1.99E-11	0.274	1.51E-09	**8.66**
Grid Max GLCs (resident multiple exposure)	3.65E-07	0.0977	9.13E-07	0.811	3.70E-07	0.113	3.80E-07	0.101	3.66E-07	0.0978	1.10E-06	-	**1.79E-05**	**7.33**
Grid Max GLCs (infant breastmilk)	3.39E-12	0.190	1.45E-11	0.812	3.63E-12	0.203	3.45E-12	0.193	3.39E-12	0.190	3.39E-11	0.456	2.81E-09	**15.8**

Notes:

1) Acceptable risk levels defined as $1x10^{-5}$ for Incremental Lifetime Cancer Risk (ILCR) and 1.0 for Hazard Index (HI)
2) Exceedances of acceptable risk levels highlighted in green.
3) Max Annual Average GLC relates to risk in locations of current residential houses, Grid Max GLCs relate to all modelled locations including outside current residential areas where future development may occur.

Table 3 Risk sensitivity assessment, Scenario 2

Exposure Scenario	AECOM 2014		Deposition unit error		Water tanks		Soil mixing zone		Plant uptake through soil		BaP Early lifetime exposure	Blood lead	Potential combined risk scaling	
	ILCR	HI (child)	ILCR	HI (child)	ILCR	HI (child)	ILCR	HI (child)	ILCR	HI (child)	ILCR	HI (child)	ILCR	HI (child)
Max Annual Average GLCs (resident multiple exposure)	1.24E-06	0.166	1.24E-06	**2.49**	1.24E-06	0.208	1.24E-06	0.189	1.24E-06	0.167	-	-	1.24E-06	**24.4**
Max Annual Average GLCs (infant breastmilk)	-	0.480	-	**3.64**	-	0.534	-	0.517	-	0.480	-	-	-	**33.7**
Grid Max GLCs (resident multiple exposure)	2.00E-6	0.267	2.00E-06	**4.38**	2.00E-06	0.343	2.00E-06	0.310	2.00E-06	0.270	-	-	2.00E-06	**43.1**
Grid Max GLCs (infant breastmilk)	-	0.800	-	**6.57**	-	0.899	-	0.868	-	0.801	-	-	-	**61.5**

1) Acceptable risk levels defined as $1x10^{-5}$ for Incremental Lifetime Cancer Risk (ILCR) and 1.0 for Hazard Index (HI)
2) Exceedances of acceptable risk levels highlighted in green.
3) Max Annual Average GLC relates to risk in locations of current residential houses, Grid Max GLCs relate to all modelled locations including outside current residential areas where future development may occur.

The analysis presented in Tables 1 and 2 show that while individual discrepancies have mostly small effects on risk individually, when combined, the overall effect could be significant. For Scenario 1, the significant compounding effect of increasing the soil concentration results in an incremental lifetime cancer risk just above the acceptable risk of 1 x 10^{-5} (1 in 100,000). The infant breast milk exposure pathway is further compounded, resulting in a HI of 8 for the maximum annual GLC and 15 for the maximum grid GLC. For scenario 2 the increase is more significant with the infant ingestion of breast milk HI above 30. This level of exceedance constitutes a significant risk to human health.

4.9 Summary of health risk assessment

GHD has undertaken a review of the AECOM HRA. Potentially significant omissions or discrepancies identified include the units error in deposition rates, capture of rain water in tanks used for irrigation, mixing zone for deposition in surface soil and toxicity of lead and benzo(a)pyrene in children. Many of the contaminants identified are carcinogenic, and some like lead, can have developmental impacts on children. GHD considers that the issues identified should be addressed in a revised HRA. Based on these discrepancies, the level of risk for some scenarios could exceed that considered acceptable by health regulators in Australia by more than an order of magnitude. The highest hazard index (HI) estimated for Scenario 1 (assumed likely emission scenario) was 8.66 for breastfed infants in current residential areas and 4.16 for young children (less than 6 years old). For scenario 2 (assumed likely worst case) the HI for breastfed infants in current residential areas was 33.7, and 24.4 for young children. These HIs are higher in potential future development areas which are not currently residential (Grid Max). As such the proposed development could present a potentially unacceptable risk to human health in the surrounding residential community.

5 Conclusions

Key findings of this review are as follows:

- Concerning the air modelling carried out by PEL (2016), the modelling is accurate enough based on the modelling procedure and input parameters used. However, there are issues in respect of the reliability of the input assumptions related to feedstock type, and the adoption of Best Available Technologies (BAT). The proponent claims that the EfW facility will incorporate BAT for flue gas treatment; but it is not clear how this is the case given the limited detail provided on how sufficiently high combustion temperatures will be achieved to fully dissociate chlorine atoms which have the potential to form dioxins and furans, and whether subsequent temperature reduction will be rapid enough to minimise de novo synthesis of dioxins and furans.
- Given that the feedstock for the proposed facility has a substantially different profile compared to those benchmarked overseas (and potentially a higher chlorine content) the production of dioxins and furans in the facility emissions could be higher than assumed.
- Concerning the HRA, there are a number of potential issues or exposure scenarios which don't appear to have been considered. In addition, a potential error was identified in the use of modelled deposition rates, in which modelled results with units of mg/m^2/day appear to have been used in risk calculations based on mg/m^2/year thereby potentially underestimating deposition by a factor of 365.
- The combined effect of these discrepancies or omissions could result in health risk estimates which exceed that considered acceptable by health regulators in Australia, by more than an order of magnitude for some scenarios.

- GHD considers that the air quality modelling and health risk assessment reports should be revised by Next Gen to address the issues identified during this review.

This report is subject to, and must be read in conjunction with, the limitations in Section 6.

6 Limitations

This report: has been prepared by GHD for Jacfin Pty Ltd and may only be used and relied on by Jacfin Pty Ltd for the purpose agreed between GHD and Jacfin Pty Ltd as set out in section 1 of this report.

GHD otherwise disclaims responsibility to any person other than Jacfin Pty Ltd arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report. GHD disclaims liability arising from any of the assumptions being incorrect.

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We thank you for this opportunity to assist Jacfin Pty Ltd on this project. Please do not hesitate to contact the undersigned with any queries.

Sincerely
GHD Pty Ltd

Eric Friebel
Principal Risk Assessor

Barry Cook
Principal Meteorologist

Attachment 1 - Summary Health Effects of Contaminants of Potential Concern.

The AECOM (2016) HRA documents contaminants of potential concern associated with stack emissions, which were reported to be selected based on an EU Industrial Emissions Directive (2010/75/EU). The potential health effects of the COPC identified have been summarised from the United States Department of Health website www.atsdr.cdc.gov (Agency for Toxic Substances and Disease Registry) unless otherwise specified.

Lead

The effects of lead are the same whether it enters the body through breathing or swallowing. Lead can affect almost every organ and system in your body. The main target for lead toxicity is the nervous system, both in adults and children. Long-term exposure of adults can result in decreased performance in some tests that measure functions of the nervous system. It may also cause weakness in fingers, wrists, or ankles. Lead exposure also causes small increases in blood pressure, particularly in middle-aged and older people and can cause anemia. Exposure to high lead levels can severely damage the brain and kidneys in adults or children and ultimately cause death. In pregnant women, high levels of exposure to lead may cause miscarriage. High level exposure in men can damage the organs responsible for sperm production.

Carbon monoxide

Acute carbon monoxide poisoning is largely the result of tissue hypoxia. Signs and symptoms of carbon monoxide toxicity, in order of increasing severity include: (1) headache, nausea, dilation of cutaneous vasculature, vomiting, dizziness, and blurred vision; (2) confusion, syncope, chest pain, dyspnea, weakness, tachycardia, and tachypnea rhabdomyolysis; and (3) palpitations, cardiac dysrhythmias, hypotension, myocardial ischemia, cardiac arrest, respiratory arrest, pulmonary edema, seizures, and coma (Kao and Nañagas 2006). t

Sulphur Dioxide

There have been several case reports of human deaths following acute exposure to high concentrations of sulphur dioxide (Atkinson et al. 1993; Charan et al. 1979; Harkonen et al. 1983; Huber and Loving 1991; Rabinovitch et al. 1989). In most studies, concentrations were not measured. In one study, analysis of gas samples at the time of rescue showed sulphur dioxide concentrations greater than 40 ppm (Rabinovitch et al. 1989). A sulphur dioxide level of 150 ppm was measured during the reenactment of an incident in which a 76 year-old asthmatic woman died of an asthma attack after inhaling vapours from a sulphite-based derusting agent used in her dishwasher (Huber and Loving 1991) Actual sulphur dioxide levels were probably higher since the quantity of derusting agent used in the investigation was approximately 7-10% of the amount originally used by the woman. A concentration of 100 ppm is considered immediately dangerous to life and health (HSDB 1998)

Respiratory Effects. In humans, and in particular asthmatics, respiratory changes are a primary response following acute exposure to sulphur dioxide.

Cardiovascular Effects. Human, non-asthmatic subjects (n=≤14) exposed to 1-8 ppm sulphur dioxide showed increased pulse rate (Amdur et al. 1953).

Gastrointestinal Effects. Nausea and vomiting were observed in 3 humans exposed to >40 ppm sulphur dioxide during an accident at a copper mine (Rabinovitch et al. 1989).

Ocular Effects. In a case report of a paper mill accident in which five persons were exposed to high concentrations (not specified) of sulphur dioxide for less than 5 minutes, reversible conjunctivitis and superficial cornea burns were noted (Charan et al. 1979). In another case report dealing with a pyrite dust explosion that resulted in nine persons being exposed to high levels of sulphur dioxide, conjunctival irritation and cornea erosion were observed (Harkonen et al. 1983).

Nitrogen Oxide

Low levels of nitrogen oxides in the air can irritate your eyes, nose, throat, and lungs, possibly causing you to cough and experience shortness of breath, tiredness, and nausea. Exposure to low levels can also result in fluid build-up in the lungs 1 or 2 days after exposure. Breathing high levels of nitrogen oxides can cause rapid burning, spasms, and swelling of tissues in the throat and upper respiratory tract, reduced oxygenation of body tissues, a build-up of fluid in your lungs, and death. If you were to come into skin or eye contact with high concentrations of nitrogen oxide gases or nitrogen dioxide liquid, you would likely experience serious burns. It is not known if exposure to nitrogen oxides will result in reproductive effects in humans.

Particulate Matter

Particulate matter is the general term used for a mixture of solid particles and liquid droplets found in the air. Some particles are large or dark enough to be seen as soot or smoke. Others are so small they can be detected only with an electron microscope. When particulate matter is breathed in, it can irritate and damage the lungs causing breathing problems. Fine particles are easily inhaled deeply into the lungs where they can be absorbed into the blood stream or remain embedded for long periods of time.

Hydrogen Chloride

Hydrogen chloride is irritating and corrosive to any tissue it contacts. Brief exposure to low levels causes throat irritation. Exposure to higher levels can result in rapid breathing, narrowing of the bronchioles, blue colouring of the skin, accumulation of fluid in the lungs, and even death. Exposure to even higher levels can cause swelling and spasm of the throat and suffocation. Some people may develop an inflammatory reaction to hydrogen chloride. This condition is called reactive airways dysfunction syndrome (RADS), a type of asthma caused by some irritating or corrosive substances.

Depending on the concentration, hydrogen chloride can produce from mild irritation to severe burns of the eyes and skin. Long-term exposure to low levels can cause respiratory problems, eye and skin irritation, and discoloration of the teeth.

Swallowing concentrated hydrochloric acid will cause severe corrosive injury to the lips, mouth, throat, oesophagus, and stomach.

It is not known if exposure to hydrogen chloride can result in reproductive effects.

Hydrogen Fluoride

Hydrogen fluoride is a very irritating gas. Hydrogen fluoride is not as dangerous as fluorine, but large amounts of it can also cause death. People breathing hydrogen fluoride have complained of eye, nose, and skin irritation. Breathing in a large amount of hydrogen fluoride with air can also harm the lungs and heart. Kidney and testes damage have been observed in animals breathing hydrogen fluoride.

Hydrogen Sulphide

You can have respiratory and neurological effects if you are exposed to higher concentrations of hydrogen sulphide, at least 100 times higher than typical environmental levels. The effects can include:

- Eye irritation
- Nose irritation
- Throat irritation
- Difficulty breathing in people with asthma
- Headaches
- Poor memory
- Tiredness
- Balance problems

If you are exposed to very high concentrations of hydrogen sulphide, you may have severe problems breathing even if you do not have a pre-existing respiratory condition. You could lose consciousness if you are briefly exposed to very high concentrations (more than 1 million times higher than the amount typically found in the environment). If this happens, you may regain consciousness without any other effects. However, some people may have longer lasting effects such as headaches, poor attention span, poor memory, and poor motor function. Hydrogen sulphide has not been shown to cause cancer in humans, and its possible ability to cause cancer in animals has not been studied thoroughly. The Department of Health and Human Services (HHS) and the International Agency for Research on Cancer (IARC) have not classified hydrogen sulphide as to its carcinogenicity. EPA has determined that data for hydrogen sulphide are inadequate for carcinogenic assessment.

Chlorine

The principal targets of toxicity to chlorine gas are the respiratory airways and the eyes. The toxicity of chlorine appears to be dependent on the duration of exposure and exposure concentration, and the moisture content of the surface contacted by the gas (e.g., the respiratory epithelium or conjunctivae). DHHS, IARC, and EPA have not classified chlorine gas as to its human carcinogenicity.

There is extensive information regarding the lethal effects of exposure to high concentrations of chlorine. Much of the information available is derived from the use of chlorine gas as a chemical weapon at the battle of Ypres, Belgium, during World War I. Approximately 150 tons of chlorine released from 6,000 cylinders killed, by some accounts, 800 soldiers and incapacitated 2,500–3,000 (Joy 1997. The causes of death were broncho-pneumonia, lobar pneumonia, purulent pleurisy, and tuberculous meningitis.

Ammonia

Ammonia is a corrosive substance and the main toxic effects are restricted to the sites of direct contact with ammonia (i.e., skin, eyes, respiratory tract, mouth, and digestive tract). For example, if you spilled a bottle of concentrated ammonia on the floor, you would smell a strong ammonia odour; you might cough, and your eyes might water because of irritation. If you were exposed to very high levels of ammonia, you would experience more harmful effects. For example, if you walked into a dense cloud of ammonia or if your skin comes in contact with concentrated ammonia, your skin, eyes, throat, or lungs may be severely burned. These burns might be serious enough to cause permanent blindness, lung disease, or death. Likewise, if you accidentally ate or drank concentrated

ammonia, you might experience burns in your mouth, throat, and stomach. There is no evidence that ammonia causes cancer.

Arsenic (NEPM – Schedule B7 Appendix A1)

Arsenic is a known human carcinogen, based on human epidemiological studies that show skin and internal cancers; in particular, bladder, liver and lung, associated with chronic exposures to arsenic in drinking water. The research available on arsenic carcinogenicity is dominated by epidemiological studies (which have limitations) rather than animal studies which differs from carcinogenic assessments undertaken on many other chemicals.

Antimony (NEPM – Schedule B7 Appendix A1)

Studies of workers exposed to antimony compounds (primarily antimony trioxide) have reported upper and lower respiratory effects. Upper respiratory effects included soreness and bleeding of the nose, rhinitis, and laryngitis in workers at an antimony smelter (Renes 1953).

Lower respiratory effects include, pneumoconiosis in workers involved in extraction of antimony trioxide from antimony ores and smelters, as well as chronic coughing, upper airway inflammation, and chronic bronchitis.

Beryllium (NEPM – Schedule B7 Appendix A1)

Occupational exposure to beryllium has been associated with acute and chronic lung diseases. The acute disease is normally associated with inhalation exposures to high levels of soluble beryllium salts (for example, sulphate, chloride) and BeO, and may lead to chronic disease. The chronic disease is associated with long-term inhalation exposures to dust particles containing beryllium, has an immunological component and a latent period which varies depending on the beryllium species. Dermatological effects may also occur on skin contact (Di Marco & Buckett 1996).

Cadmium (NEPM – Schedule B7 Appendix A1)

Cadmium is toxic to a wide range of organs and tissues, and a variety of toxicological endpoints (reproductive toxicity, neurotoxicity, carcinogenicity) have been observed in experimental animals and subsequently investigated in human populations (MfE 2010).

The following has been summarised from the review of cadmium presented by MfE (2010):

• Cadmium is primarily toxic to the kidney, especially to the proximal tubular cells where it accumulates over time and may cause renal dysfunction. Loss of calcium from the bone and increased urinary excretion of calcium are also associated with chronic cadmium exposure. Recent studies have reported the potential for endocrine disruption in humans as a result of exposure to cadmium. Notably, depending on the dosage, cadmium exposure may either enhance or inhibit the biosynthesis of progesterone, a hormone linked to both normal ovarian cyclicity and maintenance of pregnancy. Exposure to cadmium during human pregnancy has also been linked to decreased birth weight and premature birth.

• While cadmium has been classified as known human carcinogen (based on inhalation data from occupational inhalation data), there is no evidence of carcinogenicity via the oral route of exposure.

• There is conflicting data on the genotoxicity of cadmium. Some studies indicate that chromosomal aberrations occur as a result of oral or inhalation exposures in humans, while others do not (ATSDR 2008). Studies in prokaryotic organisms largely indicate that cadmium is weakly mutagenic. In animal studies genetic damage has been reported, including DNA strand breaks, chromosomal damage, mutations and cell transformations (ATSDR 2008). IARC (1993) concluded that ionic cadmium causes

genotoxic effects in a variety of eukaryotic cells, including human cells, although positive results were often weak and/or seen at high concentrations that also caused cytotoxicity. Based on the weight of evidence MfE considered there to be weak evidence for the genotoxicity of cadmium.

Chromium VI (NEPM – Schedule B7 Appendix A1)

IARC (2012) has classified Cr VI compounds as Group 1 carcinogens—carcinogenic to humans based on: sufficient evidence in humans for the carcinogenicity of Cr VI compounds as encountered in the chromate production, chromate pigment production and chromium plating industries.

Chromium is classified by the US EPA as a Group A (known human carcinogen by the inhalation route), with carcinogenicity by the oral route of exposure noted to be Group D (not classified).

Cr VI can readily pass through cell membranes and be absorbed by the body. Inside the body, Cr VI is rapidly reduced to Cr III. This reduction reaction can act as a detoxification process when it occurs at a distance from the target site for toxic or genotoxic effect. Similarly, if Cr VI is reduced to Cr III extracellularly, this form of the metal is not readily transported into cells and so toxicity is not observed (ATSDR 1997). However, if Cr VI is transported into cells, and close to the target site for toxic effect, under physiological conditions it can be reduced. This reduction reaction produces reactive intermediates, which can attack DNA, proteins, and membrane lipids, thereby disrupting cellular integrity and functions (ATSDR 1997).

Cobalt (NEPM – Schedule B7 Appendix A1)

Excess amounts of cobalt may also have harmful effects in humans. Inhaled cobalt primarily targets the respiratory tract. From the respiratory tract, cobalt particles may be absorbed into the blood via dissolution or transported to the gastrointestinal tract with mucous when swallowing. Gastrointestinal cobalt absorption rates are reported to vary greatly in humans, with some studies associating iron deficiencies with increased cobalt absorption rates (ATSDR 2004). Cobalt in the body partakes in reactions which generate oxidants and free radicals capable of deoxyribonucleic acid (DNA) damage and other deleterious effects (ATSDR 2004).

The International Agency for Research on Cancer (IARC 1991) has classified cobalt metal, cobalt sulphate and other soluble cobalt (II) salts as Group 2B: possible human carcinogen. IARC provided further review in 2006 classifying cobalt sulphate and other soluble cobalt (II) salts as Group 2B, cobalt metal without tungsten carbide as Group 2B and cobalt metal with tungsten carbide as Group 2A.

It is noted that the US EPA has not evaluated cobalt.

Copper (NEPM – Schedule B7 Appendix A1)

The International Agency for Research on Cancer (IARC) has not classified copper and copper compounds, however copper 8-hydroxyquinoline has been classified (IARC 1977) as Group 3: not classifiable. It is noted that the US EPA has assessed copper as Group D: not classified.

Copper is not considered to be carcinogenic. ATSDR (2004) states that long-term exposure to copper dust can irritate your nose, mouth, and eyes, and cause headaches, dizziness, nausea, and diarrhoea. If you drink water that contains higher than normal levels of copper, you may experience nausea, vomiting, stomach cramps, or diarrhoea. Intentionally high intakes of copper can cause liver and kidney damage and even death.

Manganese (NEPM – Schedule B7 Appendix A1)

The most common health problems in workers exposed by inhalation to high levels of manganese involve the nervous system. These health effects include behavioural changes and other nervous system effects, which include movements that may become slow and clumsy. This combination of symptoms when sufficiently severe is referred to as "manganism." Other less severe nervous system effects such as slowed hand movements have been observed in some workers exposed to lower concentrations in the work place.

The inhalation of a large quantity of dust or fumes containing manganese may cause irritation of the lungs which could lead to pneumonia.

Loss of sex drive and sperm damage has also been observed in men exposed to high levels of manganese in workplace air.

The manganese concentrations that cause effects such as slowed hand movements in some workers are approximately twenty thousand times higher than the concentrations normally found in the environment. Manganism has been found in some workers exposed to manganese concentrations about a million times higher than normal air concentrations of manganese.

Insufficient data is available to assess whether manganese is carcinogenic to humans. Some in vitro and in vivo assays are available for manganese, with studies providing conflicting results. Overall review of the data shows that some chemical forms of manganese have mutagenic potential, however most results are inconsistent and hence no overall conclusion as to the genotoxic potential associated with exposure to manganese can be determined (ATSDR 2008).

Molybdenum

Exposure to high levels of molybdenum can be harmful. Long-term exposure of rats and mice to molybdenum dust in the air can cause damage to the nasal cavity, epiglottis, and lungs. Studies in animals suggested that ingesting large amounts of molybdenum, at least 1,000 times higher than needed for health may damage the male and female reproductive system and might cause kidney and liver damage. A study in mice provides some evidence that exposure to inhaled molybdenum can result in lung cancer. Molybdenum has not been classified as to carcinogenicity by the Department of Health and Human Services (HHS), the International Agency for Research on Cancer (IARC), or US EPA.

Mercury (NEPM – Schedule B7 Appendix A1)

The relative toxicity of mercury is also dependent on the form in which it occurs, which is dependent on: biogeochemical processes, partitioning between solids, and complexation with dissolved organic and inorganic ligands.

The International Agency for Research on Cancer (IARC) has classified methyl mercury as Group 2B: possibly carcinogenic to humans. IARC has classified metallic mercury and inorganic mercury compounds as Group 3: not classifiable.

It is noted that the US EPA has classified methyl mercury as Class C: possible human carcinogen. In addition, the US EPA has classified mercuric chloride as Group C: possible human carcinogen, based on increased incidence of squamous cell papillomas of the forestomach and marginally increased incidence of thyroid follicular cell adenomas and carcinomas from long term oral studies in rats

Inorganic Mercury

Carcinogenicity studies in experimental animals are available for mercuric chloride where no carcinogenic effect was observed in mice or female rats; however, marginal increases in the incidence of thyroid follicular adenomas and carcinomas and forestomach papillomas were observed in male rats exposed orally. Mercuric chloride binds to DNA and induces clastogenic effects in vitro; in vivo, both positive and negative results have been reported, without a clear-cut explanation of the discrepancy. The overall weight of evidence is that mercuric chloride possesses weak genotoxic activity but does not cause point mutations (WHO DWG). The US EPA (IRIS 2010) evaluation of mercuric chloride indicates that a linear low-dose extrapolation is not appropriate as kidney tumour seen in mice occurred at doses that were also nephrotoxic.

Methyl-Mercury

Long-term exposure to methyl mercury has induced renal tumours in mice, but only at doses at which significant nephropathy was also evident (JECFA 2004). Review by the US EPA (IRIS) concluded that methyl mercury is not a potent genotoxic agent and that methyl mercury induced tumours in mice were likely to have a non-genotoxic mode of action.

Nickel (NEPM – Schedule B7 Appendix A1)

Nickel is a potent skin sensitiser, and as many as 1–4% of men and 8–20% of women in the general population may be nickel-sensitive. Both oral and dermal exposures to nickel can cause hypersensitivity reactions of the skin.

The International Agency for Research on Cancer (IARC 1990) classified nickel compounds a Group 1: carcinogenic to humans, and metallic nickel as Group 2B: possible human carcinogen. The IARC working group noted that the overall evaluation of nickel compounds as a group was undertaken on the basis of the combined results of epidemiological studies, carcinogenicity studies in experimental animals, and several types of other relevant data supported by the underlying assumption that nickel compounds can generate nickel ions at critical sites in their target cells. It is noted that the US EPA has classified nickel refinery dust as Group A: human carcinogenic. Inhalation exposures to nickel are complex, with the toxicity dependent on the form of nickel present. The most recent review of nickel toxicity by the UK (EA 2009b) indicates the following with respect to the consideration of inhalation exposures:

• Nickel and compounds are established carcinogens via the inhalation route with tumours of the respiratory tract a consequence of occupational exposure to both soluble and insoluble nickel salts.

• Nickel compounds are generally considered to be genotoxic; however, the mechanism of action associated is not well understood. The lack of understanding has resulted in a conservative approach that genotoxicity is critical in the development of tumours and that a non-threshold may be appropriate.

• Non-threshold assessments of inhalation cancer risk have relied on occupational studies to derive a quantitative value (unit risk). These occupational studies relate to specific nickel compounds in the occupational environment including nickel subsulphide (WHO 2000) and nickel refinery dusts (US EPA [IRIS] 2010).

• The WHO (1991) note that very high concentrations of nickel are required to produce teratogenic and genotoxic effects.

• Review by RIVM (2001) suggested the mechanism of action suggests a cytotoxic effects and that a threshold was appropriate for inhalation exposure to nickel. Review by EPAQS (2008, as referenced by UK EA 2009b) also suggested a non-genotoxic threshold mechanism of action and that a threshold can be considered.

Selenium (NEPM – Schedule B7 Appendix A1)

Insufficient information is available to adequately assess selenium for carcinogenicity. Review by CCME (2007) notes that the available carcinogenicity studies with selenates, selenites and organic selenium compounds have shown negative results. The only selenium compound found to be carcinogenic to experimental animals is selenium sulphide, noted to be not readily present in food of the environment. Selenium supplementation has been shown to significantly inhibit tumours inducted by chemicals, viruses and UV radiation.

Reviews on genotoxicity are mixed. Review by CCME (2007) and ATSDR (2003) suggests the available data on genotoxicity of selenium compounds are inconclusive, with studies showing inorganic selenium compounds having both genotoxic and anti-genotoxic effects, with antigenotoxic effects generally occurring at lower exposure levels than the genotoxic effects. Review by the UK (EA 2009a) suggests that some selenium compounds have given indications of genotoxic effects when administered orally to laboratory animals. However, there is evidence that selenium compounds have given rise to genotoxicity by the production of reactive oxygen species; thus, it has been concluded that the genotoxic effect of selenium is likely to have a threshold.

Silver

Since at least the early part of this century, doctors have known that silver compounds can cause some areas of the skin and other body tissues to turn grey or blue-grey. Doctors call this condition "argyria." Argyria occurs in people who eat or breathe in silver compounds over a long period (several months to many years). A single exposure to a silver compound may also cause silver to be deposited in the skin and in other parts of the body; however, this is not known to be harmful. It is likely that many exposures to silver are necessary to develop argyria. Once you have argyria, it is permanent. However, the condition is thought to be only a "cosmetic" problem. Most doctors and scientists believe that the discoloration of the skin seen in argyria is the most serious health effect of silver.

Exposure to dust containing relatively high levels of silver compounds such as silver nitrate or silver oxide may cause breathing problems, lung and throat irritation and stomach pain. These effects have been seen in workers in chemical manufacturing facilities that make silver nitrate and silver oxide. One man developed severe breathing problems shortly after working with molten silver. Skin contact with silver compounds has been found to cause mild allergic reactions, such as rash, swelling, and inflammation, in some people.

No studies of cancer or birth defects in animals from eating, drinking, or breathing in silver compounds were found. Therefore, it is not known if these effects would occur in humans.

Tin

Because inorganic tin compounds usually enter and leave your body rapidly after you breathe or eat them, they do not usually cause harmful effects. However, humans who swallowed large amounts of inorganic tin in research studies suffered stomach-aches, anaemia, and liver and

kidney problems. Studies with inorganic tin in animals have shown similar effects to those observed in humans. There is no evidence that inorganic tin compounds affect reproductive functions, produce birth defects, or cause genetic changes. Inorganic tin compounds are not known to cause cancer.

Inhalation (breathing in), oral (eating or drinking), or dermal exposure (skin contact) to some organotin compounds has been shown to cause harmful effects in humans, but the main effect will depend on the particular organotin compound. There have been reports of skin and eye irritation, respiratory irritation, gastrointestinal effects, and neurological problems in humans exposed for a short period of time to high amounts of certain organotin compounds. Some neurological problems have persisted for years after the poisoning occurred. Lethal cases have been reported following ingestion of very high amounts. Studies in animals have shown that certain organotins mainly affect the immune system, but a different type primarily affects the nervous system. Yet, there are some organotins that exhibit very low toxicity. Exposure of pregnant rats and mice to some organotin compounds has reduced fertility and caused stillbirth, but scientists still are not sure whether this occurs only with doses that are also toxic to the mother. Some animal studies also suggested that reproductive organs of males may be affected. There are no studies of cancer in humans exposed to organotin compounds. Studies of a few organotins in animals suggest that some organotin compounds can produce cancer. On the basis of no data in humans and questionable data from a study in rats, EPA has determined that one specific organotin, tributyltin oxide, is not classifiable as to human carcinogenicity; that is, it is not known whether or not it causes cancer in humans.

Titanium

Titanium tetrachloride can be very irritating to the skin, eyes, mucous membranes, and the lungs. Titanium tetrachloride is corrosive because it reacts strongly with water to produce hydrochloric acid. The reaction products, especially hydrochloric acid, cause the harmful health effects and burns that can occur after exposure to titanium tetrachloride. Breathing in large amounts of titanium tetrachloride can injure the lungs seriously enough to cause death. We do not know how much of the compound is necessary to cause death. After short-term exposure to titanium tetrachloride, less serious respiratory system effects can include coughing and tightness in the chest. More severe effects can include chemical bronchitis or pneumonia, and congestion of the mucous membranes of the upper respiratory tract. These effects can cause long-term effects such as the narrowing of the vocal cords, windpipe, and upper airways. Although there are no data on swallowing titanium tetrachloride, it is likely that eating large amounts of this chemical could also cause death. Accidental exposure to liquid titanium tetrachloride can result in skin burns and can cause permanent damage to the eyes if they are not protected. Some laboratory animals that breathed titanium tetrachloride fumes for 2 years developed lung tumours of a special type. However, there is no evidence that chronic exposure to titanium tetrachloride causes cancer in humans. There is not enough information to determine if titanium tetrachloride causes birth defects or affects reproduction. Titanium tetrachloride has not been classified for its carcinogenic properties.

Vanadium

Workers • **Inhalation**	Breathing air with vanadium pentoxide can result in coughing which can last a number of days after exposure.

Laboratory animal • **Inhalation**	Damage to the lungs, throat, and nose have been observed in rats and mice exposed to vanadium pentoxide.
Humans • **Oral**	Nausea, mild diarrhoea, and stomach cramps have been reported in people taking sodium metavanadate or vanadyl sulphate for the experimental treatment of diabetes. Stomach cramps were also reported in a study of people taking about 13 mg vanadium/day.
Laboratory animals • **Oral**	A number of effects have been found in rats and mice ingesting several vanadium compounds. The effects include: • Decreases in number of red blood cells • Increased blood pressure • Mild neurological effects • Developmental effects in animals
Cancer	Lung cancer has been found in mice exposed to vanadium pentoxide. The International Agency for Research on Cancer (IARC) has determined that vanadium is possibly carcinogenic to humans.

Zinc (NEPM – Schedule B7 Appendix A1)

The International Agency for Research on Cancer (IARC) has not evaluated zinc with respect to human carcinogenicity.

It is noted that the US EPA has evaluated zinc in the more recent 2005 review (available on IRIS). The evaluation notes 'there is inadequate information to assess carcinogenic potential of zinc' because studies of humans occupationally-exposed to zinc are inadequate or inconclusive, adequate animal bioassays of the possible carcinogenicity of zinc are not available, and results of genotoxic tests of zinc have been equivocal.

Insufficient information is available to adequately assess zinc for carcinogenicity. The WHO (2001) notes that the weight of evidence supports the conclusion that zinc is not genotoxic or teratogenic. At high concentrations zinc can be cytotoxic. More recent reviews of genotoxicity studies for zinc by EU (2003) and US EPA (2005) are equivocal. The EU (2003) review concluded that: in vitro tests indicated that zinc has a genotoxic potential, while the in vivo studies as presented are inconclusive, with sometimes contradictory results.

However, there are indications of some weak clastogenic, and possibly aneugenic effects following zinc exposure. The relevance of these findings needs to be clarified.

Dioxins – PCDD and PCDF (NEPM 2013)

The dioxins group comprises 75 polychlorinated dibenzo-p-dioxin (PCDD) congeners and 135 polychlorinated dibenzofuran (PCDF) congeners. There are no known technical uses for PCDD and PCDF (WHO 1989).

The World Health Organization (Van den Berg et al. 2006) identified 29 dioxins and dioxin-like compounds of environmental concern based on similar toxicological profiles. These include 7 PCDD, 10 PCDF and 12 co-planar 'dioxin-like' PCBs. While these substances have similar toxicological profiles, they have differing toxicological potencies. Thus, their concentrations in environmental and biological media are reported using toxicity equivalence (TEQ) relative to a reference compound, which in this case is 2,3,7,8-tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD). The relative toxicity of each compound is expressed as a toxicity equivalency factor (TEF) and the product of the concentration and the TEF for each substance in the mixture results in a TEQ concentration relative to 2,3,7,8-TCDD. The sum of the resultant TEQ for each substance yields a single concentration for the TEQ of the mixture.

The health effects of dioxins include death, systemic, immunological, neurological, developmental, reproductive, genotoxic, and carcinogenic effects (see specific studies – effects are varied and complex).

PAHs and benzo(a)pyrene (NEPM, 2013)

The assessment of the health risk posed by polycyclic aromatic hydrocarbons (PAHs) is complicated by the large number of individual PAHs and the complex mixtures that exist in the environment. The major approach advocated by regulatory agencies such as the NEPC for assessing the human health risks of PAH-containing mixtures involves the use of toxicity equivalence factors (TEFs). This approach relates the toxicity of other (potentially carcinogenic) individual PAHs to that of BaP, the most widely studied PAH.

Naphthalene, the most significant volatile PAH, requires separate assessment, as the vapour inhalation pathway is of greater significance.

The International Agency for Research on Cancer (IARC 1987) has classified benzo(a)pyrene (BaP) as 2A: probable human carcinogen. The US EPA has classified BaP as B2: probable human carcinogen

BaP has been shown to be carcinogenic via all routes of exposure. BaP is an indirect carcinogen, that is, its carcinogenicity results from its metabolites, primarily various epoxides, as opposed to BaP itself. Several different types of tumours have been observed as a result of exposure to BaP, although tumour development is closely related to route of administration, that is, dermal application induces skin tumours and oral administration induces gastric tumours. Exposure to BaP causes disruption to cellular genetic material; in particular, DNA adducts are formed as a result of exposure and BaP is considered to be a genotoxic carcinogen (WHO 1998). In addition, BaP has been demonstrated to be a skin irritant and dermal sensitiser (WHO 1998).

The US EPA (2005) has identified that BaP (and carcinogenic PAHs assessed on the basis of a TEF) are considered to act via a mutagenic mode of action and recommends that susceptibility associated with early lifetime exposures be addressed.

PCBs (NEPM)

The International Agency for Research on Cancer (IARC 1987) has classified PCBs as Group 2A: probably carcinogenic to humans.

This evaluation is based on limited evidence in humans (occupational studies) and sufficient evidence in experimental animals where some PCBs (particularly those with greater than 50% chlorination) produced liver neoplasms in mice and rats after oral administration.

PCBs have been associated with carcinogenic effects (in particular, hepatocarcinogenic effects have been seen in animals for PCBs with higher levels of chlorination);

Hexachlorobenzene

Exposure to very high levels of hexachlorobenzene for short periods caused effects on the nervous system such as weakness, tremors, and convulsions; skin sores; liver effects such as porphyria, which is a decrease in the production of the heme (iron-protein) portion of red blood cell haemoglobin that carries oxygen to cells; and thyroid effects such as decreased thyroid hormones. These types of effects were seen in some people in Turkey who were exposed to high levels of hexachlorobenzene in bread made from grain that had been treated with the chemical as a pesticide.

Long-term exposure to hexachlorobenzene can cause effects similar to those from short-term exposure. Because hexachlorobenzene accumulates in fat (including breast tissue) where it can remain for long periods, long-term exposure can result in a build-up of hexachlorobenzene in the body. Therefore, long-term exposure may be more serious than acute or short-term exposure.

Studies in animals suggest that eating foods with hexachlorobenzene for months or years can cause cancer of the liver, kidney, and thyroid.

The U.S. Department of Health and Human Services (DHHS) considers hexachlorobenzene as reasonably anticipated to be a human carcinogen. The U.S. EPA says that hexachlorobenzene is a probable human carcinogen. The International Agency for Research on Cancer (IARC) says that hexachlorobenzene is possibly carcinogenic to humans.

Benzene

Eating foods or drinking liquids containing high levels of benzene can cause vomiting, irritation of the stomach, dizziness, sleepiness, convulsions, rapid heart rate, coma, and death. The health effects that may result from eating foods or drinking liquids containing lower levels of benzene are not known. If you spill benzene on your skin, it may cause redness and sores. Benzene in your eyes may cause general irritation and damage to your cornea.

Benzene causes problems in the blood. People who breathe benzene for long periods may experience harmful effects in the tissues that form blood cells, especially the bone marrow. These effects can disrupt normal blood production and cause a decrease in important blood components. A decrease in red blood cells can lead to anaemia. Reduction in other components in the blood can cause excessive bleeding. Blood production may return to normal after exposure to benzene stops. Excessive exposure to benzene can be harmful to the immune system, increasing the chance for infection and perhaps lowering the body's defence against cancer.

Long-term exposure to benzene can cause cancer of the blood-forming organs. This condition is called leukaemia. Exposure to benzene has been associated with development of a particular type of leukaemia called acute myeloid leukaemia (AML). The Department of Health and Human

Services has determined that benzene is a known carcinogen (can cause cancer). Both the International Agency for Cancer Research and the EPA have determined that benzene is carcinogenic to humans.

Exposure to benzene may be harmful to the reproductive organs. Some women workers who breathed high levels of benzene for many months had irregular menstrual periods. When examined, these women showed a decrease in the size of their ovaries. However, exact exposure levels were unknown, and the studies of these women did not prove that benzene caused these effects. It is not known what effects exposure to benzene might have on the developing foetus in pregnant women or on fertility in men. Studies with pregnant animals show that breathing benzene has harmful effects on the developing foetus. These effects include low birth weight, delayed bone formation, and bone marrow damage.

We do not know what human health effects might occur after long-term exposure to food and water contaminated with benzene. In animals, exposure to food or water contaminated with benzene can damage the blood and the immune system and can cause cancer.

Dichloromethane (methylene chloride)

Breathing methylene chloride may cause changes in the liver and kidney in animals, but similar effects have not been observed in humans. Animal studies indicate that should you be exposed to high levels of vapours of methylene chloride in air, the vapours may irritate your eyes and affect your cornea. One study reported these effects at concentrations of 490 ppm; however, the effects usually disappeared within a few days.

In humans, direct skin contact with large amounts of methylene chloride causes intense burning and mild redness of the skin. In a workplace accident in which a person was found to have lost consciousness and partly fallen into an open vat of methylene chloride, extended direct contact with the liquid caused severe burns of the skin and eyes (cornea); these conditions were treatable. In rabbits, effects were observed on the eyes (e.g., cornea), but they were reversible within a few days.

People can smell methylene chloride at about 200 ppm in air. After about 3 hours of exposure at this level, a person will become less attentive and less accurate in tasks that require hand-eye coordination. Because people differ in their ability to smell various chemicals, odours may not be helpful in avoiding over-exposure to methylene chloride.

There is not clear evidence that methylene chloride causes cancer in humans exposed to vapours in the workplace. However, breathing high concentrations of methylene chloride for long periods of time did increase the incidence of cancer in mice. No information was found regarding the cancer-causing effects of methylene chloride in humans after oral exposure. The Department of Health and Human Services (DHHS) has determined that methylene chloride may reasonably be anticipated to be a cancer-causing chemical. The International Agency for Research on Cancer (IARC) has classified methylene chloride in Group 2B, possibly causing cancer in humans. The USEPA has determined that methylene chloride is a probable cancer-causing agent in humans.

Trichloroethylene (trichloroethene)

Trichloroethylene health effects	The health effects of trichloroethylene depend on how much trichloroethylene you are exposed to and the length of that exposure. Environmental monitoring data suggest that trichloroethylene levels the public might encounter by direct contact or through air, water, food, or soil, are generally much lower than the levels at which adverse effects are elicited in animal studies. However, some drinking water sources and working environments have been found to contain levels of trichloroethylene that may cause health problems.
Short-term exposure effects	Trichloroethylene was once used as an aesthetic for surgery. People who are overexposed to moderate amounts of trichloroethylene may experience headaches, dizziness, and sleepiness; large amounts of trichloroethylene may cause coma and even death. Some people who breathe high levels of trichloroethylene may develop damage to some of the nerves in the face. Other effects seen in people exposed to high levels of trichloroethylene include evidence of nervous system effects related to hearing, seeing, and balance, changes in the rhythm of the heartbeat, liver damage, and evidence of kidney damage. Some people who get concentrated solutions of trichloroethylene on their skin develop rashes. Relatively short-term exposure of animals to trichloroethylene resulted in harmful effects on the nervous system, liver, respiratory system, kidneys, blood, immune system, heart, and body weight.
Long-term exposure effects	Exposure to trichloroethylene in the workplace may cause scleroderma (a systemic autoimmune disease) in some people. Some men occupationally-exposed to trichloroethylene and other chemicals showed decreases in sex drive, sperm quality, and reproductive hormone levels. Long-term exposure studies in animals have mainly focused on carcinogenicity and relatively insensitive non-cancer end points following oral exposure; these studies are not helpful in defining non-cancer end points in humans following long-term exposure. However, depressed body weight and evidence of effects on the thymus were reported in one recent study of mice exposed to trichloroethylene via their mothers during gestation and lactation and via the drinking water for up to 12 months thereafter.
Trichloroethylene and cancer	There is strong evidence that trichloroethylene can cause kidney cancer in people and some evidence that it causes liver cancer and malignant lymphoma (a blood cancer). Lifetime exposure to trichloroethylene

	resulted in increased liver cancer in mice and increased kidney cancer in rats at relatively high exposure levels. There is some evidence for trichloroethylene-induced testicular cancer and leukaemia in rats and lymphomas and lung tumours in mice. The National Toxicology Program (NTP) has determined that trichloroethylene is a "known human carcinogen". The EPA and the International Agency for Research on Cancer (IARC) have determined that trichloroethylene is "carcinogenic to humans."

Heptane

There is limited available information on health effects from n-heptane. NIOSH reports that 5-minute exposure to 5,000 ppm produced a state of intoxication characterized by uncontrolled hilarity in some individuals and in others a stupor lasting for 30 minutes after the exposure [Patty and Yant 1929]. According to Patty [1963], a 4-minute exposure to this same concentration produces vertigo and incoordination [Patty and Yant 1929].
The only people known to have been affected by exposure to related compound *n*-hexane used it at work. Breathing large amounts caused numbness in the feet and hands, followed by muscle weakness in the feet and lower legs. Continued exposure led to paralysis of the arms and legs. If removed from the exposure, the workers recovered in 6 months to a year.
In laboratory studies, animals exposed to high levels of *n*-hexane in air had signs of nerve damage. Some animals also had lung damage. In other studies, rats exposed to very high levels of *n*-hexane had damage to sperm-forming cells.

Toluene – ATSDR

Toluene may affect the nervous system. Low to moderate levels can cause tiredness, confusion, weakness, drunken-type actions, memory loss, nausea, and loss of appetite. These symptoms usually disappear when exposure stops.

Long-term daily inhalation exposure to toluene in the workplace may cause some hearing and colour vision loss. Repeatedly breathing toluene from glue or paint thinners may permanently damage the brain.

The effects of toluene in animals are similar to those seen in humans.

Phthalates (as bis-2-ethylhexyl phthalate (DEHP))

DEHP, at the levels found in the environment, is not expected to cause adverse health effects in humans. A man who voluntarily swallowed 10 g (approximately 0.4 ounces) of DEHP had stomach irritation and diarrhoea. Most of what we know about the health effects of DEHP comes from studies of rats and mice that were given DEHP in their food, or the DEHP was placed in their stomach with the aid of a tube through their mouth. In most of these studies, the amounts of DEHP given to the animals were much higher than the amounts found in the environment. Rats and mice appear to be particularly sensitive to some of the effects of DEHP. Thus, because certain

animal models may not apply to humans, it is more difficult to predict some of the health effects of DEHP in humans using information from these studies.

Breathing DEHP does not appear to have serious harmful effects. Studies in rats have shown that DEHP in the air has no effect on lifespan or the ability to reproduce. As mentioned previously, almost no DEHP evaporates into air. You probably will not have any health effects from skin contact with DEHP because it cannot be taken up easily through the skin.

Short-term oral exposures to levels of DEHP much higher than those found in the environment interfered with sperm formation in mice and rats. These effects were reversible, but sexual maturity was delayed when the animals were exposed before puberty. Short-term exposures to low levels of DEHP appeared to have no effect on male fertility.

Studies of long-term exposures in rats and mice have shown that high oral doses of DEHP caused health effects mainly in the liver and testes. These effects were induced by levels of DEHP that are much higher than those received by humans from environmental exposures. Toxicity of DEHP in other tissues is less well characterized, although effects in the thyroid, ovaries, kidneys, and blood have been reported in a few animal studies. The potential for kidney effects is a particular concern for humans because this organ is exposed to DEHP during dialysis and because structural and functional kidney changes have been observed in some exposed rats. Since changes in the kidneys of long-term dialysis patients might be due to the underlying kidney disease, and kidney changes have not been consistently seen in animals exposed to DEHP, the significance of the rat kidney changes is not clear.

Humans absorb and breakdown DEHP in the body differently than rats and mice. Therefore, many of the effects seen in rats and mice after exposures to DEHP might not occur in humans and higher animals like monkeys (primates). More information on the health effects of DEHP is found in Chapters 2 and 3.

No studies have evaluated the potential for DEHP to cause cancer in humans. Eating high doses of DEHP for a long time resulted in liver cancer in rats and mice.

The Department of Health and Human Services (DHHS) has determined that DEHP may reasonably be anticipated to be a human carcinogen. EPA has determined that DEHP is a probable human carcinogen. These determinations were based entirely on liver cancer in rats and mice. The International Agency for Research on Cancer (IARC) has recently changed its classification for DEHP from "possibly carcinogenic to humans" to "cannot be classified as to its carcinogenicity to humans," because of the differences in how the livers of humans and primates respond to DEHP as compared with the livers of rats and mice.

Acetone (propanone)

If you are exposed to acetone, it goes into your blood which then carries it to all the organs in your body. If it is a small amount, the liver breaks it down to chemicals that are not harmful and uses these chemicals to make energy for normal body functions. Breathing moderate- to-high levels of acetone for short periods of time, however, can cause nose, throat, lung, and eye

irritation; headaches; light-headedness; confusion; increased pulse rate; effects on blood; nausea; vomiting; unconsciousness and possibly coma; and shortening of the menstrual cycle in women.

Swallowing very high levels of acetone can result in unconsciousness and damage to the skin in your mouth. Skin contact can result in irritation and damage to your skin.

The smell and respiratory irritation or burning eyes that occur from moderate levels are excellent warning signs that can help you avoid breathing damaging levels of acetone.

Health effects from long-term exposures are known mostly from animal studies. Kidney, liver, and nerve damage, increased birth defects, and lowered ability to reproduce (males only) occurred in animals exposed long-term. It is

Xylene

No health effects have been noted at the background levels that people are exposed to on a daily basis.

High levels of exposure for short or long periods can cause headaches, lack of muscle coordination, dizziness, confusion, and changes in one's sense of balance. Exposure of people to high levels of xylene for short periods can also cause irritation of the skin, eyes, nose, and throat; difficulty in breathing; problems with the lungs; delayed reaction time; memory difficulties; stomach discomfort; and possibly changes in the liver and kidneys. It can cause unconsciousness and even death at very high levels.

Trichlorophenol – (as chlorophenols)

One man who splashed pure 2,4-dichlorophenol on his arm and leg died shortly after the accident. Workers who made pesticides from chlorophenols and were exposed to chlorophenols as well as other chemicals through breathing and through the skin developed acne and mild injury to their livers. According to some studies, the risk of cancer was also slightly higher among workers who had made pesticides for a long time. These workers were exposed to very high levels of other chemicals as well as chlorophenols, so it is not certain whether the effects were caused by the chlorophenols or the other chemicals. Animals that were given food or drinking water containing chlorophenols at high levels developed adverse or negative health effects. The major effects with exposure to high levels of chlorophenols were on the liver and the immune system. Also, the animals that ate or drank chlorophenols did not gain as much weight as the animals that ate food and drank water not containing chlorophenols.

Feeding rats and mice high doses of 2,4-dichlorophenol for a long time did not cause cancer. However, long-term treatment of rats and mice with high doses of 2,4,6-trichlorophenol in food caused leukaemia in rats and liver cancer in mice, suggesting that 2,4,6-trichlorophenol may be a carcinogen. The Department of Health and Human Services has determined that 2,4,6-trichlorophenol may reasonably be anticipated to be a carcinogen. The International Agency for Research on Cancer (IARC) has determined that the chlorophenols as a group, are possibly carcinogenic to man. The US Environmental Protection Agency (USEPA) has determined that 2,4,6-trichlorophenol is a probable carcinogen.

THE NEXT GENERATION

03/08/2017

RISK REVIEW – QRA

THE NEXT GENERATION

RISK REVIEW

IDENTIFICATION TABLE	
Client/Project owner	Jacfin
Project	Waste Incineration and Energy Generation
Study	Risk review
Type of document	Final
Date	03/08/2017
File name	
Framework	
Reference number	LG20170803
Confidentiality	
Language	English
Number of pages	42

APPROVAL

Version	Name		Position	Date	Signature	Modifications
FINAL Rev 1	Leonard Gawecki		Author	03/08/2017		
	Simon Meiers		Reviewer	03/08/2017		
	Howard Lister		Approved	03/08/2017		

Executive Summary

Background

A development application has been made by The Next Generation Pty Ltd (Next-Gen) to establish a new waste to energy (WtE) facility at Eastern Creek, in Sydney's western suburbs.

As part of WtE operations at Next-Gen, the facility will store, handle, and use a number of Dangerous Goods on-site, apart from the waste processing. In that regard RawRisk has been commissioned by Next-Gen to undertake a Preliminary Hazard Analysis of the WtE facility.

Jacfin own land adjacent to the proposal, and object to the siting of the Next-Gen facility adjacent, and have engaged Systra Scott Lister to conduct a critique of the RawRisk PHA study, and prepare a preliminary Level 3 QRA of the WtE facility to determine the risk levels at the site boundary.

The risk review uses QRA computer models available to Scott Lister, namely SAFETI V7.2.1, and refers to extracts from the RawRisk PHA and Risk Assessment Study (Reference 8).

In short, the SSL study shows that the risk assessment is deficient and that a full Level 3 Quantified risk assessment is justified.

SSL also finds that preliminary risk modelling finds that the boundary risk levels exceed the NSW DP&E individual risk criteria of 50 in a million per annum, which is a basis for rejection of the Next-Gen proposal.

Conclusion and Findings for Next-Gen Development

The PHA report presented by RawRisk is deficient in a number of areas, these are summarised below.

1. Given the location, nature of proposal, and risks a Level 3 – Quantitative Risk Analysis is justified, and has not been undertaken by RawRisk. SSL has undertaken a Level 3 QRA based on the information available. Further, there are numerous risk issues that are still to be addressed, for e.g. the downwind dispersion of toxic combustion products from waste storage fires and their effects
2. Modelling of consequences has not been done using validated computer risk software (e.g., SAFETI or TNO Effects) nor has RawRisk undertaken a full quantification of risk events.
3. RawRisk does not include a SEPP33 screening analysis and there appear to be errors in the dangerous goods classifications tabled in the RawRisk PHA.

4. The activity is defined as a potentially offensive industry. If the necessary pollution licences or permits cannot be obtained the activity may be offensive industry, and therefore is a prohibited use in the current zoning (Zone INI). Further, RawRisk has not considered whether the necessary licences can be obtained.
5. SSLs Level 3 QRA finds that the boundary risk levels are above the NSW DP&E risk criteria for Industrial Land of 50 in a million per year, and by definition, is to be considered hazardous. Further, hazardous industrial development is prohibited in or on land zoned IN1.
6. RawRisk has not undertaken a sensitivity analysis for the largest consequence scenarios – such as the PAC silo dust explosion.
7. No HAZOP or rigorous HAZID has been undertaken for the WtE – this may generate further hazardous issues, or risks, that need to be considered in the PHA. Nor is one recommended by RawRisk in their conclusions and recommendations.
8. Escalation issues are not considered in the RawRisk PHA. Escalation refers to an incident causing a cascade of incidents. A good example of this is dust explosions leading to further dust explosions, and/or fire. Often the primary dust explosion is small, but leads to a second much larger and fiercer explosion.
9. The issue of a major fire in the waste bunker is covered, but not in the lay down areas which I am instructed to assume may be used for waste storage. The risk of a major fire is significant, as we saw in recent waste fires at Chullora In Sydney (Feb22, 2017), Albury in NSW (11March, 2017), and in Bristol, UK (11 July 2017) and most recently in Coolaroo, Victoria which burned for more than 2 days (Reference 9) and required downwind lock-down by residents around the Melbourne CBD area. This aspect requires further consideration, and quantification.

Key Risk Issues

1. **Individual Fatality risk -** Risks from the Next-Gen proposal exceed the NSW DP&E criteria for industrial development of 50 in a million per annum, as shown in our Individual risk contour plot (Appendix C**). As such the proposal may be rejected on risk grounds.**

2. **Injury Risk – Heat Flux -** Heat flux results for waste fires on hard stand areas exceed 4.7kw/m2 at frequencies of more than 50 in a million per year. And hence are deemed unacceptable**.**

3. **Injury Risk – Toxicity -** The proposed development may not be capable of meeting the injury risk criteria for toxic exposure laid down by the NSW DP&E. The main reason for this is that waste stockpiles are a feature of all waste recycling facilities,

and to suggest that the large laydown areas shown in the Next-Gen site plan will not be used as such is illogical, and does not reflect current industry practice. Hence modelling of waste stockpile fires is required for completeness.

Potential fire sources to be modelled include the truck themselves, the waste bunker, and the hard stand areas. These aspects have not been covered in the EIS nor in the RawRisk PHA, and for that reason the current EIS and PHA are deficient, and do not supply the decision makers with sufficient information on these critical risk issues.

The two main consequence effects that are required to be modelled for all such waste stockpile fires, include the following;

1. The heat radiation effects at distance, and
2. The downwind dispersion of toxic combustion products and their effects on the downwind populations in terms of injury risk criteria and societal risk results.

These matters have not been considered by RawRisk.

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1. INTRODUCTION

1.1 Background

A development application has been made by The Next Generation Pty Ltd (Next-Gen) to establish a new waste to energy (WtE) facility at Eastern Creek, in Sydney's western suburbs.

The Planning and Environment Committee of the NSW Legislative Council has established an inquiry to examine and report on the waste disposal industry in NSW, with a particular focus on waste to energy (WtE) technology.

As part of WtE operations at Next-Gen, the facility will store, handle, and use a number of Dangerous Goods that are classified by the Australian Dangerous Goods Code (Ref. 7). Hence, under the requirements of State Environmental Planning Policy (SEPP) No.33, a Preliminary Hazard Analysis (PHA) is required to determine whether the proposed facility is hazardous. In that regard RawRisk has been commissioned by Next-Gen to undertake a Preliminary Hazard Analysis of the WtE facility.

Jacfin own land adjacent to the proposal, and object to the siting of the Next-Gen facility adjacent, and have engaged Systra Scott Lister (SSL) to conduct a critique of the RawRisk PHA study, and report on any safety deficiencies or risk issues. SSL has prepared a report on the hazards associated with the proposed Next-Gen WtE facility and its impacts on Jacfin's land.

This preliminary risk review by Systra Scott Lister considers the RawRisk PHA study, and comments on its assumptions, methodology and findings.

This discusses:

- the hazards associated with these types of facilities generally, and the risks associated with those hazards;
- the hazards associated with the proposed Next-Gen facility, and the risks associated with those hazards;
- any deficiencies in the measures proposed by Next Gen to manage or reduce the hazards associated with the facility and manage or reduce the risks associated with those hazards.

RawRisk Engineering has undertaken the Preliminary Hazard Analysis (PHA) and Fire Risk Assessment commissioned by Next-Gen as part of its amended EIS (Appendix Y of the amended EIS). SSL has conducted a general review of this documentation, with a focus on the hazards associated with the proposed Next-Gen WtE facility.

2. METHODOLOGY

2.1 Multi-Level Risk Assessment Approach

The NSW Department of Planning) Multi Level Risk Assessment (Reference 1) approach was used for this review study by SSL. The approach considered the development in context of its location and its technical and safety management controls set out in the EIS and in the PHA prepared by RawRisk.

The Multi-Level Risk Assessment approach is summarised in Figure 1. There are three levels of assessment, depending on the outcome of preliminary screening. These are:

- **Level 1** – **Qualitative Analysis**, primarily based on the hazard identification techniques and qualitative risk assessment of consequences, frequency and risk;
- **Level 2** – **Partially Quantitative Analysis**, using hazard identification and the focused quantification of key potential offsite risks; and
- **Level 3** – **Quantitative Risk Analysis (QRA)**, based on the full detailed quantification of risks, consistent with Hazardous Industry Planning Advisory Paper No.6 – Guidelines for Hazard Analysis.

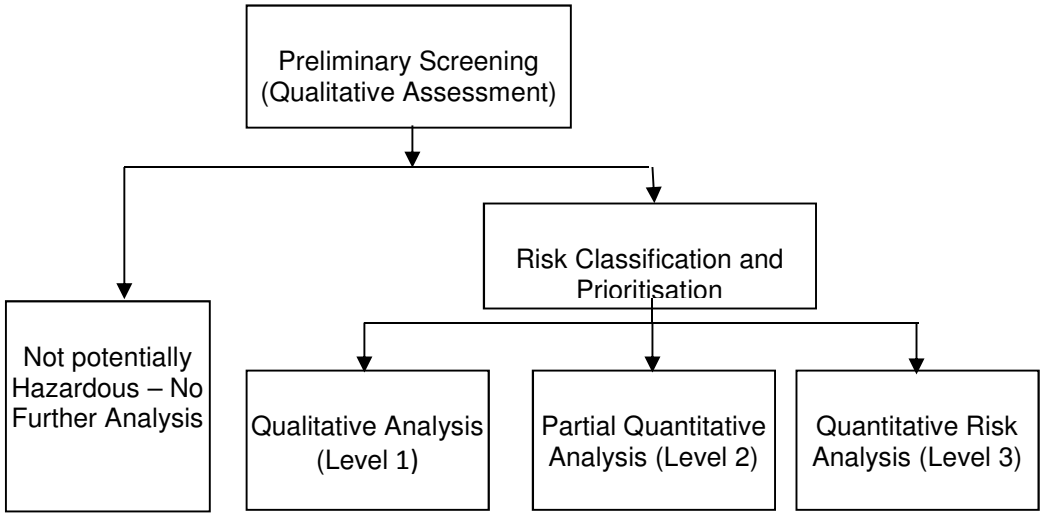

FIGURE 1 - THE MULTI LEVEL RISK ASSESSMENT APPROACH

The Multi-Level Risk Assessment Guidelines are intended to assist industry, consultants, and the consent authorities to carry out and evaluate risk assessments at an appropriate level for the facility being studied.

To determine the appropriate level of study the consultant is required to undertake a SEPP 33 screening study, and to determine if SEPP 33 applies to the proposal. The screening method is set out in Applying SEPP 33 (Department of Planning & Infrastructure, 2017 – Reference 2) and provides the first step in the analysis. The screening method, is based on broad estimates of the possible off-site effects or consequences from hazardous materials present on site, considering locational characteristics. If the quantity is less than the screening threshold, then no further analysis is necessary. The safety management regime in this case relies on observance of the requirements of engineering codes and standards. If the quantities exceed the screening threshold, further analysis is necessary. (See item 2.2 – Screening Analysis)

The multi-level approach is built around a consequence-based screening method set out in these guidelines and a rapid risk classification technique described in the United Nations Manual for the classification and prioritization of risks due to major accidents in process and related industries (the IAEA method). However, the NSW DP&E also states that Partial quantification would normally be applied to developments where screening, hazard identification and/or risk classification and prioritisation has identified one or more risk contributors with consequences beyond the site boundaries but with a low frequency of occurrence. However, the risk of waste stockpile fires is not a low frequency risk. As we have found in Section 6 – Frequency Analysis of this report. Hence, a full Level 3 quantitative analysis should be carried out.

Further, given the scale, location, and nature of the Next-Gen WtE facility, a Level 3 – or fully quantified risk analysis is justified.

RawRisk have only provided a Level 2 – or semi- quantitative risk assessment study for the proposal, which we consider in-sufficient, as all potential risks, e.g. hard-stand waste stockpile fires, have not been considered, let alone quantified.

2.2 SEPP 33 Screening Analysis

The SEPP33 screening analysis is required to be conducted for potentially hazardous industry to verify whether SEPP 33 applies to the proposal. (Reference 2).

There are 2 issues here:

1. The Dangerous Goods stored or handled at the site – A SEPP 33 screening process has not been undertaken by RawRisk. This process flags whether the dangerous goods stored could be considered potentially hazardous in the location selected, and confirms whether the SEPP 33 policy applies to the proposal.

2. Once SEPP 33 is triggered then the development is identified as 'potentially offensive industry. The minimum test for such developments to proceed is meeting the requirements for licensing by the DECCW (now the NSW EPA) or other relevant authority. If a development cannot obtain the necessary pollution control licences or other permits, then it may be classified as 'offensive industry'. If this occurs then the activity will not be permitted in most zonings, including the land proposed which is zoned IN1 and prohibits" offensive industries ". It should also be noted here that should the development exceed the NSW DP& E risk criteria, then this also is a basis for rejection.

2.2.1 Dangerous Goods – Incorrect Classification

The following table is presented by RawRisk for the quantities of dangerous goods stored on the Next-Gen site. This is reproduced here as Table 1, with the DG class corrected.

Material	RawRisk DG Class	DG Class	Quantity (m3)
Ammonium Hydroxide	8 Pg III	8 Pg III	80
Diesel	Not defined	C1	320
PAC	Flammable solid - 4.2	Flammable solid - 4.2	208
Transformer Oil	Not defined	Probably C2	85
Calcium Hydroxide	NDG	8 Pg III	1052
Residue	Not defined	Probably C2	1518

Table 1 – Dangerous Goods Stored

A number of the dangerous goods table entries used by RawRisk appear to be in-correct, for instance Diesel Fuel has a wide range chemical constituents, but is generally considered a dangerous good of class C1 or class C2 depending on Diesel type and flash point. If the flash point is 63 deg C as stated by Raw Risk then the Diesel fuel is classed as C1 (Note: Class C1 - a combustible liquid that has a flashpoint of 150℃ or less, i.e. >60℃, <150℃ according to the ADG 7 Code). The flash points of transformer oil and residue should also be given for completeness.

Also, both Ammonium hydroxide and Calcium hydroxide are class 8 Pg III, corrosive liquids as per the manufacturers own material safety data sheets.

SEPP 33 requires that like classes be added together, and checked against the NSW DP&E threshold quantities. This has been computed in Table 2.

Material	DG Class	Quantity (m3)	SEPP33 Qty	Comment
Ammonium Hydroxide & calcium Hydroxide	8 Pg III	1052 + 80 = 1132 m3 or MT	50 MT	Exceeds threshold – facility is subject to SEPP33
Diesel & oils	C1 or C2	320 + 85 + 1518 = 1923 m3 or MT	No limit applies	NA
PAC	Flammable solid - 4.2	208 M3 or MT	1 MT	Exceeds threshold – facility is subject to SEPP33
FGT Residue	9 – Miscellaneous	1518	No Limit	Environmental issue

Table 2 – SEPP 33 screening analysis

As the analysis in Table 2 shows, SEPP 33 applies to the proposal and a preliminary risk analysis is required, and as suggested a full Level 3 – or quantified risk analysis is considered justified for this proposal.

As the activity is identified as a potentially offensive industry, it must meet the requirements of the NSW EPA (POEO Act and regulations) or other relevant authority in relation to the

necessary pollution control licences or permits. If this cannot be met then the activity may be classified as offensive industry, and as such is prohibited development on land Zoned INI – as is the case here.

2.3 Level 3 QRA Approach

The detailed study approach follows that recommended in the Hazardous Industry Advisory Paper (HIPAP) No.6, “Hazard Analysis Guidelines” (Ref.1) for a Level 3 Quantitative Risk Analysis (QRA) where the incident frequency and consequence of selected incidents are quantified, and cumulatively combined to give risk contours. SSL have used SAFETI Version 7.2.1.to undertake the analysis.

The results are expressed as individual risk contours. The risk levels achieved at the site boundaries are then compared to the risk criteria published in HIPAP No.4 (Ref 1).

3. HAZARD IDENTIFICATION

3.1 General Hazards

A hazard identification table has been developed by RawRisk and is presented at **Appendix B**. Those hazards emanate from the following 13 incidents;

1. Ammonium hydroxide tank leak, spill, and release to environment;
2. Diesel tank leak, spill, and release to environment;
3. Diesel tank leak, spill, immediate ignition, and bund fire;
4. Diesel tank leak, spill, unconfined, delayed ignition, and flash fire;
5. Diesel tank leak, spill, confined, delayed ignition and vapour cloud explosion;
6. PAC dust liberation, ignition, and explosion (storage silo, residue silo, waste gas process building);
7. Ignition of waste in bunker and full bunker fire;
8. Emission of combustion by-products;
9. Transformer oil spill, ignition, and bund fire;
10. PAC dust cloud explosion within residue silo;
11. Turbine fire;
12. Release of calcium hydroxide and
13. Ignition of waste in truck and truck fire.

In addition to these incidents, research conducted by SSL of existing waste recycling stations in Australia and the UK has shown that significantly large hard-stand areas are required for storage and sorting of waste at these centres. Such hard-stand areas are clearly shown in the Next-Gen site plan (refer Appendix A), and it is reasonable to assume will be used for the storage and sorting of waste. Ignition of waste in any of the 3 stockpile and sorting areas (based on hard stand areas) and fire should therefore be included as a hazardous incident. Refer also to the recent Coolaroo Fire in Melbourne - incident details can be found from reference 9.

3.2 Hazardous Properties of Materials Stored and Used

Table 3 lists the type and classes of Dangerous Goods proposed for storage and use at the Next-Gen WtE facility.

Material	DG Class	Quantity (m3)	Tank size
Ammonium Hydroxide	8 Pg III	80	2 x 40m3
Diesel	C1	320	4 x 80 m3
PAC	Flammable solid - 4.2	208	2 x 104 m3 silos
Transformer Oil	Probably C2	85	2 units
Calcium Hydroxide	8 Pg III	1052	unknown
Residue	9 – Miscellaneous	1518	6 x silos

TABLE 3 - DANGEROUS GOODS STORED AND USED AT THE WtE STATION

Potential hazards associated with the handling and storage of each dangerous good are detailed below.

3.2.1 Ammonium Hydroxide

Ammonium Hydroxide (NH4OH) is a Class 8 Pg III corrosive liquid, and is typically dissolved in water to form solutions of 10-30% ammonia. However, if heated, Ammonium Hydroxide solutions will give off ammonia vapor, which is a strong irritant to the eye, skin, and respiratory tract.

Outdoors, ammonia is not generally a fire hazard. Indoors, in confined areas, ammonia vapours may be a fire hazard, especially if oil or other combustible materials are present. Combustion may form toxic nitrogen oxides (NOx). As shown in the current site layout plan the tanks are located adjacent to the Diesel Fuel tanks, and this gives rise to the potential for a large tank or fuel fire in the Diesel tank bund that could impact the ammonium hydroxide tanks, i.e. heat the tank and contents sufficiently to generate ammonia vapours. Hence any major Diesel fire scenario could also result in an ammonia vapour release also.

3.2.2 Diesel Fuel

Diesel fuel is classified by ADG (Ref 7) as a C1 combustible liquid. A combustible liquid will burn if the temperature of the liquid exceeds the flash point and the vapour generated at the liquid surface is ignited. The resultant incident is a pool fire that radiates heat to the surrounding area resulting in potential equipment damage and or injury/fatality.

3.2.3 PAC

Powdered Activated Carbons (PAC) are made from a wide array of organic materials, ranging from coal to peach pits. Activated carbon is available in powdered (PAC), granulated (GAC), and pellet forms. The type of activated carbon chosen will likely depend on its intended application. An activated carbon with large holes is best suited at picking up heavy organic chemicals, such as benzene, while smaller pores would catch the lighter, sometimes more gaseous pollutants.

In PAC or powdered form, activated carbon is extremely fine, with an average particle size of only 20 microns and a bulk density of 21.5 lb/cu ft (34.4 kg/cu m). It is extremely aeratable, meaning the slightest air movement may cause the activated carbon powder to take flight and settle as dust. This dust fluidizes, or takes on the properties of a liquid. Activated carbon dust will coat nearly anything it lands on, including machinery, clothing, and skin. In powder form, some activated carbons can create a dust explosion.

In activated-charcoal form, as is the case here, activated carbons typically carry an HMIS fire rating of 3, indicating high flammability in the presence of open flames, sparks, or heat. An activated charcoal blaze may reignite after the fire has been extinguished. Freshly prepared activated charcoal may be exothermic. However, all powdered activated carbons are classified as weakly explosive (Dust explosion class St1). Given the necessary conditions of a strong ignition source (these are present on site and includes the waste furnace itself), the right concentrations of airborne carbon dust, adequate oxygen levels, and confinement, the potential for a deflagration (explosion in the open air) event exists, with overpressures reported between 6 – 8 bars (7.7 bar as per NFPA – Reference 11)

3.2.4 Transformer Oil

Contained in the 2 power transformers. Estimated at around 42,500 litres / unit.

3.2.5 Calcium Hydroxide

Calcium Hydroxide is a corrosive solid, but when mixed with water is an also Class 8 Pg III corrosive liquid, and hence is added to the SEPP 33 screening analysis for Class 8 materials.

3.2.6 Residue

The flue gas treatment (FGT) residues comprise fine particles of ash and residues from the flue gas treatment process, which are collected in the bag filters. It is estimated that the facility will generated approximately 45,000 tpa at the design waste composition. The FGT residue will be stored in sealed silos adjacent to the flue gas treatment facility. Due to the alkaline nature of the FGT residues, they are classified as a Class 9 – Miscellaneous / hazardous waste. As a result, the residues will be transported by road in a sealed tanker to an appropriate treatment facility.

3.2.7 Solid Waste Stockpile

It is understood that the waste will be sourced from the Genesis Materials Processing Centre (MPC) and other licensed facilities, and comprises;

- Chute Residual Waste (CRW) from the Genesis MPC
- Commercial & Industrial (C&I)
- Construction and demolition (C&D) waste
- Floc waste from car and metal shredding
- Paper pulp
- Glass recovery
- Garden organics(GO)
- Alternate waste Treatment (AWT), and
- Metal Recovery Facility Waste (MRF waste) residue

3.3 Modelling Assumptions

Sections 4 & 5 constitutes a detailed quantitative hazard identification for those incidents listed in **Appendix B**, and for fire in the lay-down areas. The detailed hazard identification table (HAZID) is based on the RawRisk HAZID. In addition to this a review of waste recycling facilities worldwide was conducted by SYSTRA, which has resulted in the addition of fire incidents within the waste stockpiles assumed to be developed over time in the 3 laydown or hardstand areas shown as an additional potential incident.

As the QRA study is preliminary in nature, many of the detailed designs are not yet complete. Hence, a number of assumptions are needed to complete the QRA, including;

3.3.1 Storage of Diesel fuel

The Diesel tanks are assumed to be 80m3 each, with a diameter of 3m, and a height of 9.5m. Bund size is taken as 25 m2.

3.3.2 Tank is overfilled

During the tank filling process, there is the potential for the storage tank to be overfilled, resulting in fuel spill to surrounding area. The tanks will be supplied with dipsticks for measuring liquid level prior to filling of tanks. Also, tanks will be designed as per requirements of AS1940.

3.3.3 Solid Waste Stockpile

The average design fuel load of the waste stream is assumed to be 12.3 MJ / kg, as given in Table 4.4.4. Diesel fuel: Typical Profile, as given in the EIS of November 2016.

4. CONSEQUENCE ANALYSIS

4.1 Incidents Carried Forward for Consequence Analysis

The hazard analysis conducted in **Section 3** identified several hazards that have the potential to impact adjacent offsite areas. Those incidents carried forward for consequence analysis are:

- Diesel Bund Fire
- PAC silo explosion
- Waste fires in truck, waste bunker, and the 3 laydown areas shown in Figure 3-3 of the RawRisk PHA and reproduced in Appendix A.

A summary of each incident, including assessment results, is presented in the following sections.

4.2 Diesel Bund fire

Leaking of Diesel fuel can occur from any of the tank system components, however tank overfill and fire are significant risk contributors historically. In the event of a fire in the Diesel bund the heat radiation would impact the surrounding areas. A summary of the analysis results is presented in **Table 4**, showing the heat radiation impact from the fire versus the distance from the fire. This is based on a Diesel bund area of 5m x 5m or 25m2, and an 80 m3 Diesel tank would have a diameter of 3.5 m, and a height of 10.5 m. These are essentially the same as the RawRisk results.

Heat Radiation Impact (kW/m^2)	Distance from Bund centre (m)
35	6
23	7
12.6	10
4.7	15
2.1	25

TABLE 4 - Diesel Tank Bund Fire - Heat radiation at distance

HIPAP No.4 (Ref.1) indicates that heat radiation exceeding $4.7kW/m^2$ should not impact beyond the site boundary, which is the case here. For the pool fire method used refer Appendix D.

4.3 PAC Silo Explosion

Data presented by RawRisk gives the overpressure from an explosion of 7kPa at a distance of around 45m, however the volume used for the explosion calculation is only 25% of the silo volume. The reason for this is not clear, and indeed the worst case would be a near empty silo as the ullage volume is greatest. Indeed, further calculations should be done for 95% ullage or near empty silo to determine the worst-case distance. In such a case, with the vapour space full of PAC dust this would give approximately 4x the quantity of dust, and TNT equivalent mass of 92 kg and not 23 kg, as assumed by RawRisk. Hence the revised explosion distances estimated would be approximately those shown in Table 5 below. For TNT equivalence method refer Appendix E.

Explosion Overpressure (kPa) - TNT Equivalence	Distance (m) Eff = 0.03
70	16
35	25
14	45
7	69
4	98

Table 5 – PAC Dust Explosion – Distance to overpressure

Depending on silo location (appears to be approximately 75 m from the eastern boundary adjoining the Fulton Hogan Asphalt facility) then overpressures of around 7kPa reach this site boundary and hence further risk computations are required. If consequence effects do extend to the site boundary then quantification of risk, or a Level 3 risk analysis is justified.

Note also dust explosions can be created by the dust handling equipment, including ductwork, separators, baghouses, and if these are located indoors then there is a possibility of an indoor explosion within the plantroom. Often these initial explosions are followed by larger secondary explosion. These aspects have not been considered in the PHA report by RawRisk.

RawRisk have used the TNT equivalence method, we have also used the TNT equivalence method to compute the distance to overpressures.

4.4 Solid waste fires

RawRisk have considered waste fires for the B-double truck, and the waste bunker area in the context of heat flux only.

There are 2 aspects of the waste fires that need to be modelled to gauge the risk impacts.

1. The heat flux at the boundary, and
2. The effects of the combustion products dispersing downwind under "cold – fire conditions", i.e. a smouldering fire, where combustion is incomplete and smoke combustion products will include NOx, SOx, HCl, COCL2 (phosgene) as well as CO, and CO2.

Raw risk has not considered the effects of combustion products downwind, which is a potentially great risk then heat flux, and could have potential wide-ranging risk implications for populations located in the greater Sydney Air-shed. By Sydney Air-Shed we mean the circulation of air pollution in the Sydney Air-shed. The Sydney air-shed is defined by its boundaries: the higher ground to the north, the mountains to the west and south and the onshore winds at the coast. The air of Sydney's Air-shed will not travel past these boundaries. the effect of this is to trap air pollution, which may recirculate for several days before it is dispersed.

RawRisk also have not considered the hard stand areas.

It is noted that the operation of such waste handling and recycling plants worldwide it is reasonable to consider that these areas will be used for waste storage and sorting operations. Solid waste fires are postulated for each area, using the average design fuel load of 12.3 MJ / kg for the waste solids and assuming a waste density of 10 kg / m3, and a stack height of 2m. This gives the equivalent mass of waste that may be combusted in a waste fire for each area, as shown in Table 6. For modelling assumptions see Note 2.

Waste location #	Area (m2)	Volume (m3)	MT
Laydown Area 2	17961	35922	360
Laydown Area 3	16789	33578	336
Laydown Area 4	42764	85528	855
Total	77514	155028	1551

Table 6 – Waste Storage – Hard Stand Areas

Notes to Table 6:

Note 1: The current limit for waste storage at a waste recycling centre in NSW, according to the NSW EPA is 1000 MT or 1000m3, and would have the effect of reducing the site storage capacity from 1550 MT to 1000 MT. However, this still represents a large stockpile of waste on site.

Note 2: As SAFETI does not model solid fires, a surrogate is used. In this case Vinyl chloride. The burning characteristics of solid waste and Vinyl chloride are provided in Table 7 below;

Characteristic	Solid Waste	Vinyl chloride
Heat of Combustion (Hc)	12.3 Mj / kg	11.8 Mj/kg
Laminar Burn Rate m/s	0.1 – 0.5	0.52
Surface flux	30 - 50 kW/m2	170 kw /m2

Table 7 – Burning Characteristics

Whilst the Heat of Combustion are similar for both solid waste and vinyl chloride the radiant heat fluxes are markedly different, and to compensate we have dropped the radiant heat fraction from 0.4 for hydrocarbon fires to 0.25 for sooty or smouldering flames which are typical for large waste fires.

All data sourced from NFPA – Fire Protection Handbook, or from the SAFETI Materials database.

5. FREQUENCY ANALYSIS

5.1 Failure Rates for Equipment Failures

Generalised Probability/Frequency data is given in Table 8 – Generalised Frequency Data for the potential events that may have offsite effects. The data is generally expressed on a per annum basis. The reference sources for all data used in this study, is also given in the table.

Event	Item	Failure Possibility	Name /Reference #
Diesel Leakage into Bund due to tank failure	Fixed Storage Tank Tank Overfill	3 x 10-6/ yr. 1 x 10-4 / yr	RAAD Study (OGP) / Ref 5 OGP data
Diesel Road tanker	Flexible hose failure	4 x 10-5 / yr	HSE Failure rates / Ref 8
Waste Stockpile fires (small)	stockpile	1 / yr / site or stockpile Note 1.	Ref 4, 5.
Waste Stockpile fires (large)	stockpile	0.04 / yr /site or stockpile	Ref 4, 5.
Dust Explosion	PAC Silo (2)	1.4 x 10-5	Ref 6

TABLE 8 - GENERALISED FREQUENCY DATA

The above failure rates for equipment items are provided to illustrate their reliability, and facilitate the QRA.

Notes to Table 8

Note 1. The number of waste recycling sites in the UK is estimated at 260 (HWRC sites) + private and other operators. For simplicity assume 300 sites (Ref 4). Based on 300 fire incidents in recycling centres per annum this gives frequency for small fires of 1 /annum per site. Of these fire services are called to attend larger fires approximately 1 / month or 12 times a year, giving a large fire incident rate per site of around 12/ 300 = 0.04.(Ref 5).

Note 2. Dust explosion frequency is taken from Reference 6, and provides a value of 2 x 10-2 per 10^6 tonnes processed (1 million tonnes). In the case of PAC based on 100 MT stored over 2

silos, and assuming these are filled monthly, then the potential failure frequency for dust explosion is 2 x 10-2 x 1200 / 10^6 = 2.8 x 10-5 pa in total, or 1.4 x 10-5 per silo. Both the silos and baghouse are collection points, however for risk assessment purposes the dust explosion is centred at each silo.

6. RISK ASSESSMENT CRITERIA

6.1 NSW Risk Criteria for Hazardous Industries

To keep communities and hazardous industry sufficiently separated the NSW Department of Planning & Environment (NSW DP&E) has developed planning controls based on an assessment of hazards and risks. The NSW DP&E has formulated and implemented risk assessment and land use safety planning processes that account for both the technical and the broader locational safety aspects of potentially hazardous industry. These processes are implemented as part of the environmental impact assessment procedures under the Environmental Planning and Assessment Act 1979 and include the following planning guidelines:

- State Environmental Planning Policy (SEPP) 33 provides an approach to determine whether industries are to be considered hazardous or offensive, and the level of information required to be submitted to planning authorities to allow a suitable determination to accept or reject the proposal.
- HIPAP Series of documents (1 through 10) – In particular HIPAP 4 sets out the individual and societal risk criteria relevant to hazardous industries and surrounding land uses.
- Multilevel risk assessment – sets out the appropriate level of detail for a risk assessment study.

6.2 Individual Risk

HIPAP 4 (Ref 1) sets out the Individual and Societal risk criteria relevant to hazardous industries and surrounding land uses. 'Individual fatality risk' is the risk of death to a person at a particular point if they were to remain there for a year. Consideration of such risks led the NSW DP&E to conclude that if a risk from a potentially hazardous installation is below most risks being experienced by the community, then that risk may be tolerated. This is consistent with the basis of criteria setting used in HIPAP 4, as well as those adopted by most authorities nationally and internationally.

The NSW DP&E has adopted a fatality risk level of one in a million per year (1 x 10.6 per year) as the limit for risk acceptability for residential area exposure.

Experience with implementation indicates that the criteria is practical and appropriate, and as such should be maintained. It is necessary, however, to account for variations in the duration of exposure to that risk at any particular point by anyone individual. It is also necessary to

account for variations in people's vulnerability to the hazard and their ability to take evasive action when exposed to the hazard. Land uses such as commercial and open space do not involve continuous occupancy by the same people. The individual's occupancy of these areas is on an intermittent basis and the people present are generally mobile. As such, a higher level of risk (relative to the permanent housing occupancy exposure) may be tolerated. A higher level of risk still is generally considered acceptable in industrial areas.

In this context we note that RawRisk have not considered the effect of the scenarios on the surrounding populations.

The following risk assessment criteria are used by the NSW DP&E and planning authorities for the assessment of the safety of location of a proposed development of a potentially hazardous nature, or the land use planning in the vicinity of existing hazardous installations.

(a) Hospitals, schools, child-care facilities and old age housing development should not be exposed to individual fatality risk levels in excess of half in one million per year (0.5 x 10-6 per year).

(b) Residential developments and places of continuous occupancy, such as hotels and tourist resorts, should not be exposed to individual fatality risk levels in excess of one in a million per year (1 x 10-6 per year).

(c) Commercial developments, including offices, retail centres, warehouses with showrooms, restaurants and entertainment centres, should not be exposed to individual fatality risk levels in excess of five in a million per year (5 x 10-6 per year).

(d) Sporting complexes and active open space areas should not be exposed to individual fatality risk levels in excess of ten in a million per year (10 x 10-6 per year).

(e) Individual fatality risk levels for industrial sites at levels of 50 in a million per year (50 x 10-6 per year) should, as a target, be contained within the boundaries of the site where applicable.

Table 9 summarises the preceding criteria for the various categories of land use.

Land Use	NSW DP&E Criteria (risk in a million per year)	Legend for Appendix C
Hospitals, school, and sensitive land uses	0.5	5E-7
Residential areas, including hotels and tourist resorts	1	1E-6
Commercial Developments, including retail centres and offices	5	5E-6
Sorting complexes and open space	10	1E-5
Industrial development	50	5E-5

Table 9 – Individual Risk Criteria

6.3 Injury & Irritation Criteria

Relying entirely upon fatality risk criteria may not account for the following factors:

- Society is concerned about risk of injury as well as risk of death.
- Fatality risk levels may not entirely reflect variations in people's vulnerability to risk.

Some people may be affected at a lower level of hazard exposure than others. It is therefore appropriate that risk criteria also be set in terms of injury, i.e. in terms of levels of effects that may cause injury to people but will not necessarily cause fatality. The suggested injury risk criteria from HIPAP 10 of the NSW DP&E are:

- Incident heat flux radiation at residential and sensitive use areas should not exceed 4.7 kW/m2 at a frequency of more than 50 chances in a million per year.
- Incident explosion overpressure at residential and sensitive use areas should not exceed 7 kPa at frequencies of more than 50 chances in a million per year.
- Toxic concentrations in residential and sensitive use areas should not exceed a level which would be seriously injurious to sensitive members of the community following a relatively short period of exposure at a maximum frequency of 10 in a million per year.

• Toxic concentrations in residential and sensitive use areas should not cause irritation to eyes or throat, coughing or other acute physiological responses in sensitive members of the community over a maximum frequency of 50 in a million per year.

6.4 Societal Risk

Developing criteria on tolerability of risks for hazards giving rise to societal concerns is difficult. Hazards giving rise to such concerns often involve a wide range of events with a range of possible outcomes. The summing or integration of such risks, or their mutual comparison, may call for the attribution of weighting factors for which, at present, no generally agreed values exist as, for example, the death of a child as opposed to an elderly person, dying from a dreaded cause, e.g., cancer, or the fear of affecting future generations in an irreversible way.

Nevertheless, the NSW DP&E has provisionally adopted indicative criteria as shown in Figure 2 for addressing societal concerns arising when there is a risk of multiple fatalities occurring in one event. These were developed through the use of so-called FN-curves (obtained by plotting the frequency at which such events might kill N or more people, against N). The technique provides a useful means of comparing the impact profiles of man-made accidents with the equivalent profiles for natural disasters with which society has to live. The suggested criteria take into account the fact that society is particularly intolerant of accidents, which though infrequent, have a potential to create multiple fatalities. The indicative societal risk criteria reflect these areas as three societal risk bands: negligible, As Low As Reasonably Practicable (ALARP) and intolerable.

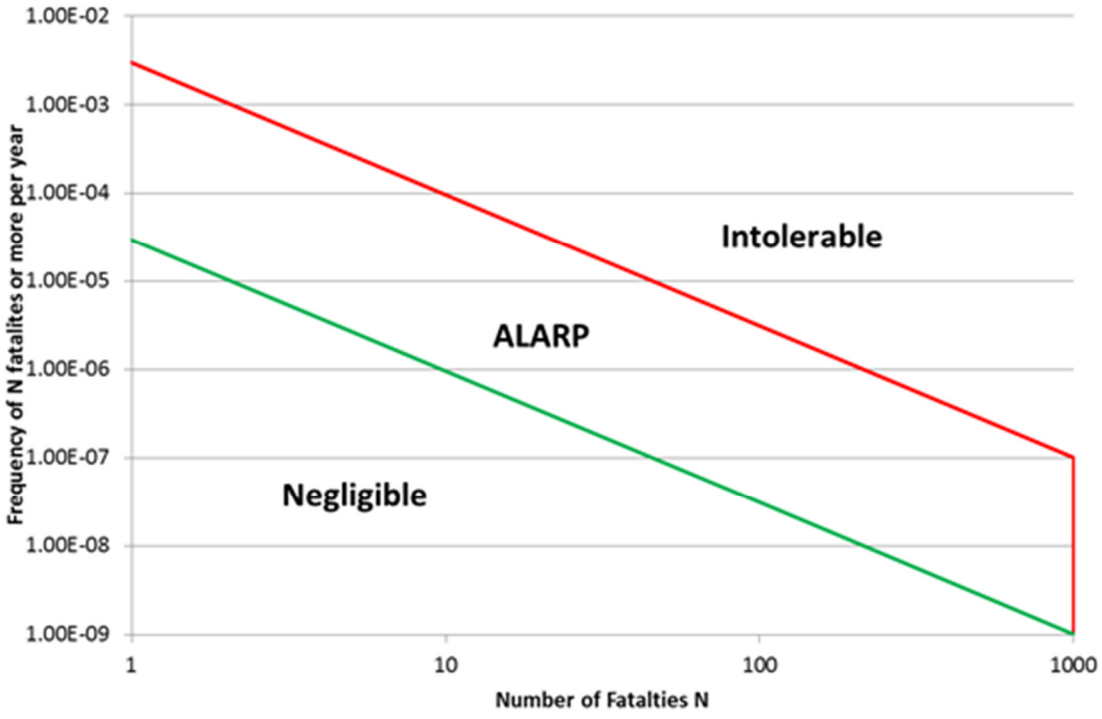

Figure 2 – Societal Risk Criteria

Below the negligible line, provided other individual criteria are met, societal risk is not considered significant. Above the intolerable level, an activity is considered undesirable, even if individual risk criteria are met. Within the ALARP region, the emphasis is on reducing risks as far as possible towards the negligible line. Provided other quantitative and qualitative criteria of HIPAP 4 are met, the risks from the activity would be considered tolerable in the ALARP region.

6.5 Relevant Criteria

In summary, this PHA quantifies individual risk according to the above criteria.

Injury and irritation criteria have also been considered, and for the reasons annunciated in Section 7 – Risk results, and Section 8 - Conclusions, require further investigation.

7. RISK ANALYSIS RESULTS

Based on the likelihood and consequences of the events described in this analysis, the individual risks have been cumulatively combined using SAFETI Version 7.2.1.

Individual Fatality Risk

The Individual risk contour for the Next-Gen site is depicted in Appendix C, and shows that the boundary risk levels exceed the NSW DP&E risk criteria of 50 x 10-6 pa. These boundary risks are driven by the high likelihood of a solids waste fire on the laydown areas, and resultant heat flux.

While the land is zoned IN1 Industrial, many of the adjoining development have commercial activities, including offices and retail areas. As such it could be argued that the boundary risk levels adopted should be 5 in a million per annum, and not 50 in a million per year to reflect the changing land use demographics. This would result in even greater risk level exceedances than those described earlier.

These individual risk results do not include the dispersion effects of toxic combustion products that would emanate from such fires, and their short – term inhalation and injury effects on the surrounding industrial and residential areas. This aspect requires further study and quantification.

Land Use	NSW DP&E Criteria (risk in a million per year)	Findings / Comments
Industrial development	50	Risk levels exceed at the boundary of the Next-Gen Site and Fulton Hogan

Table 10 – Individual Fatality Risk Results

Injury Risk

NSW DP&E Injury Criteria	Findings / Comments
Incident heat flux radiation at residential and sensitive use areas should not exceed 4.7 kW/m2 at a frequency of more than 50 chances in a million per year.	Heat flux results for waste fires on hard stand areas exceed 4.7kw/m2 at frequencies of more than 50 in a million per year. And hence are deemed unacceptable.
Incident explosion overpressure at residential and sensitive use areas should not exceed 7 kPa at frequencies of more than 50 chances in a million per year.	Overpressures greater than 7kPa are exceeded at the boundary with Fulton Hogan Asphalts. If such an event results in frequencies > 50 x 10-6 then the NSW DP&E criteria for explosion overpressure effects will be exceeded.
Toxic concentrations in residential and sensitive use areas should not exceed a level which would be seriously injurious to sensitive members of the community following a relatively short period of exposure at a maximum frequency of 10 in a million per year.	Noting that the irritation or injury effects of waste fire and the dispersion of toxic combustion products may extend several kilometres, then this aspect must be considered to quantify the downwind exposure.
Toxic concentrations in residential and sensitive use areas should not cause irritation to eyes or throat, coughing or other acute physiological responses in sensitive members of the community over a maximum frequency of 50 in a million per year.	

Table 11 – Injury Risk Results

Summary of Risk Issues

1. **Individual Fatality Risk -** Risks from the Next-Gen proposal exceed the NSW DP&E criteria for industrial development of 50 in a million per annum, as shown in the Individual risk contour plot (Appendix C**). As such, the proposal may be rejected on risk grounds.**

2. **Injury Risk – Heat Flux-** Heat flux results for waste fires on hard stand areas exceed 4.7kw/m2 at frequencies of more than 50 in a million per year, and hence are deemed unacceptable**.**

3. **Injury Risk – Toxicity -** The proposed development may not be capable of meeting the injury risk criteria for toxicity. The main reason for this is that the waste stockpiles are a feature of all waste recycling facilities, and to suggest that the large laydown areas shown in the Next-Gen site plan will not be used as such is illogical. Hence modelling of waste stockpile fires is required for completeness.

Potential fire sources to be modelled include the truck itself, the waste bunker, and the hard stand areas. This aspect has not been covered in the EIS nor in the RawRisk PHA, and for that reason the current EIS and PHA is deficient. The two main consequence effects that are required to be modelled for all such waste stockpile fires, include the following;

1. The heat radiation effects at distance, and
2. The downwind dispersion of toxic combustion products and their effects on the downwind populations in term of injury risk criteria

In that regard, further QRA study is required to fully address the issues raised in this QRA review to demonstrate compliance with the NSW DP&E Risk Criteria for potential hazardous development.

8. CONCLUSIONS AND RECOMMENDATIONS

Jacfin have engaged Systra Scott Lister to undertake a quantitative risk review (Level 3) of the proposed Next-Gen development, based on available information.

The risk review uses QRA computer models available to Scott Lister, namely SAFETI V7.2.1, and refers to extracts from the RawRisk PHA and Risk assessment study (Reference 8).

In short, the SSL study shows that the risk assessment is deficient and that a full Level 3 Quantified risk assessment is justified.

SSL also finds that preliminary risk modelling finds that the boundary risk levels exceed the NSW DP&E individual risk criteria of 50 in a million per annum. This is a basis for rejection of the proposal.

Conclusion and Findings for Next-Gen Development

The PHA report presented by RawRisk is deficient in a number of areas, these are summarised below.

1. Given the location, nature of proposal, and risks a Level 3 – Quantitative Risk Analysis is justified, and has not been undertaken by RawRisk. SSL has undertaken a Level 3 QRA. Further, there are numerous risk issues that are still to be addressed, for e.g. the downwind dispersion of toxic combustion products from waste storage fires and their effects
2. Modelling of consequences has not been done using validated computer risk software (e.g., SAFETI or TNO Effects) nor has RawRisk undertaken a full quantification of risk events.
3. RawRisk does not include a SEPP33 screening analysis and there appear to be errors in the dangerous goods classifications tabled in the RawRisk PHA.
4. The activity is defined as a potentially offensive industry. If the necessary pollution licences or permits cannot be obtained the activity may be offensive industry, and therefore is a prohibited use in the current zoning (Zone INI). Further, RawRisk has not considered whether the necessary licences can be obtained.
5. SSLs Level 3 QRA finds that the boundary risk levels are above the NSW DP&E risk criteria for Industrial Land of 50 in a million per year, and by definition, is to be considered hazardous. Further, hazardous industrial development is prohibited in or on land zoned IN1.
6. RawRisk has not undertaken a sensitivity analysis for the largest consequence scenarios – such as the PAC silo dust explosion.
7. No HAZOP or rigorous HAZID has been undertaken for the WtE – this may generate further hazardous issues, or risks, that need to be considered in the PHA. Nor is one recommended by RawRisk in their conclusions and recommendations.

8. Escalation issues are not considered in the RawRisk PHA. Escalation refers to an incident causing a cascade of incidents. A good example of this is dust explosions leading to further dust explosions, and/or fire. Often the primary dust explosion is small, but leads to a second much larger and fiercer explosion.
9. The issue of a major fire in the waste bunker is covered, but not in the lay down areas which I am instructed to assume may be used for waste storage. The risk of a major fire is significant, as we saw in recent waste fires at Chullora In Sydney (Feb22, 2017), Albury in NSW (11March, 2017), and in Bristol, UK (11 July 2017) and most recently in Coolaroo, Victoria which burned for more than 2 days (Reference 9) and required downwind lock-down by residents around the Melbourne CBD area. This aspect requires further consideration and quantification.

9. REFERENCES

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6. Frequency of Dust Explosion in Grain Storage, Vol63, No 13 TECNICAMOLITORIA10064 PINEROLO, ITALY.
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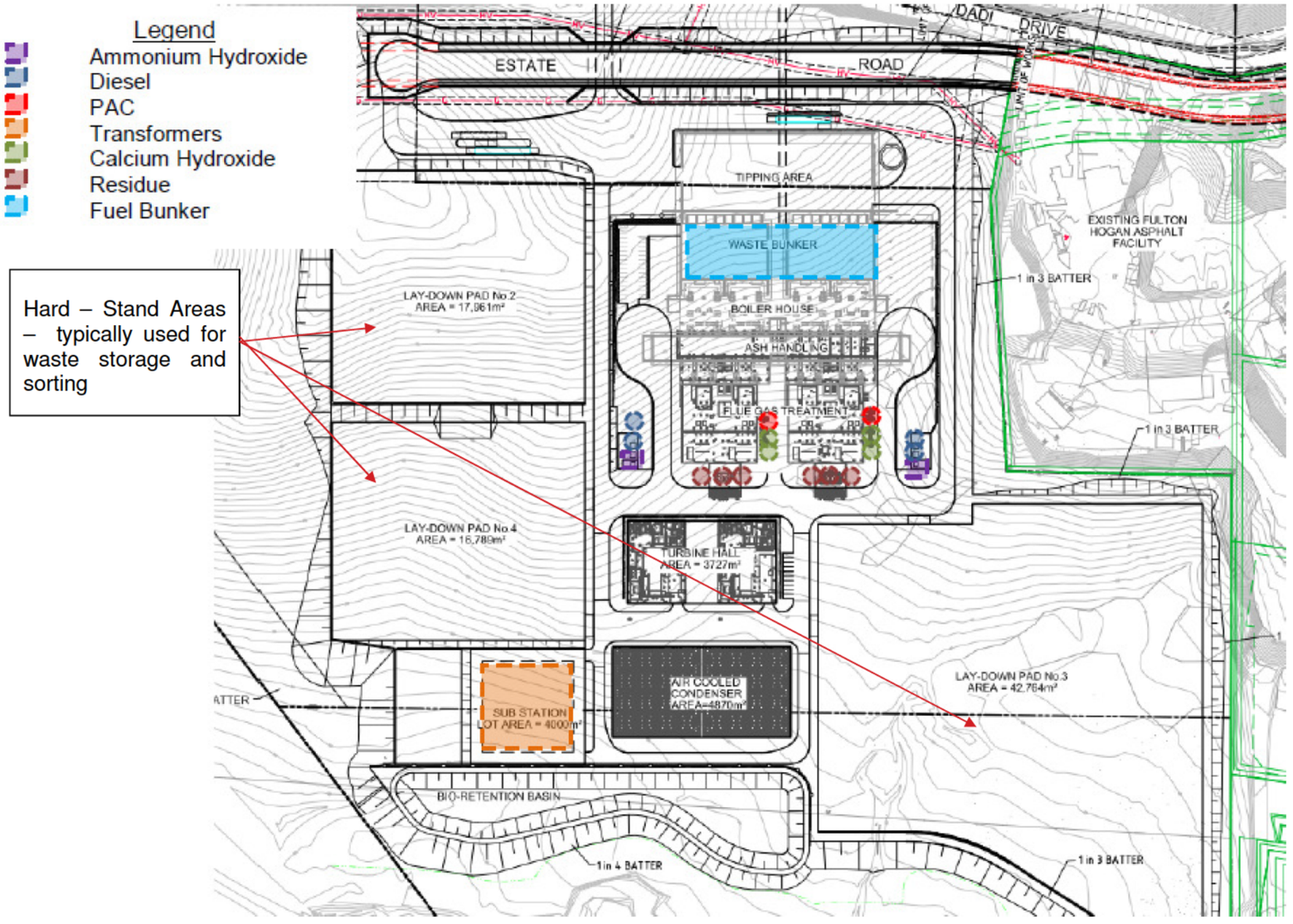
APPENDIX A – SITE LAYOUT PLAN



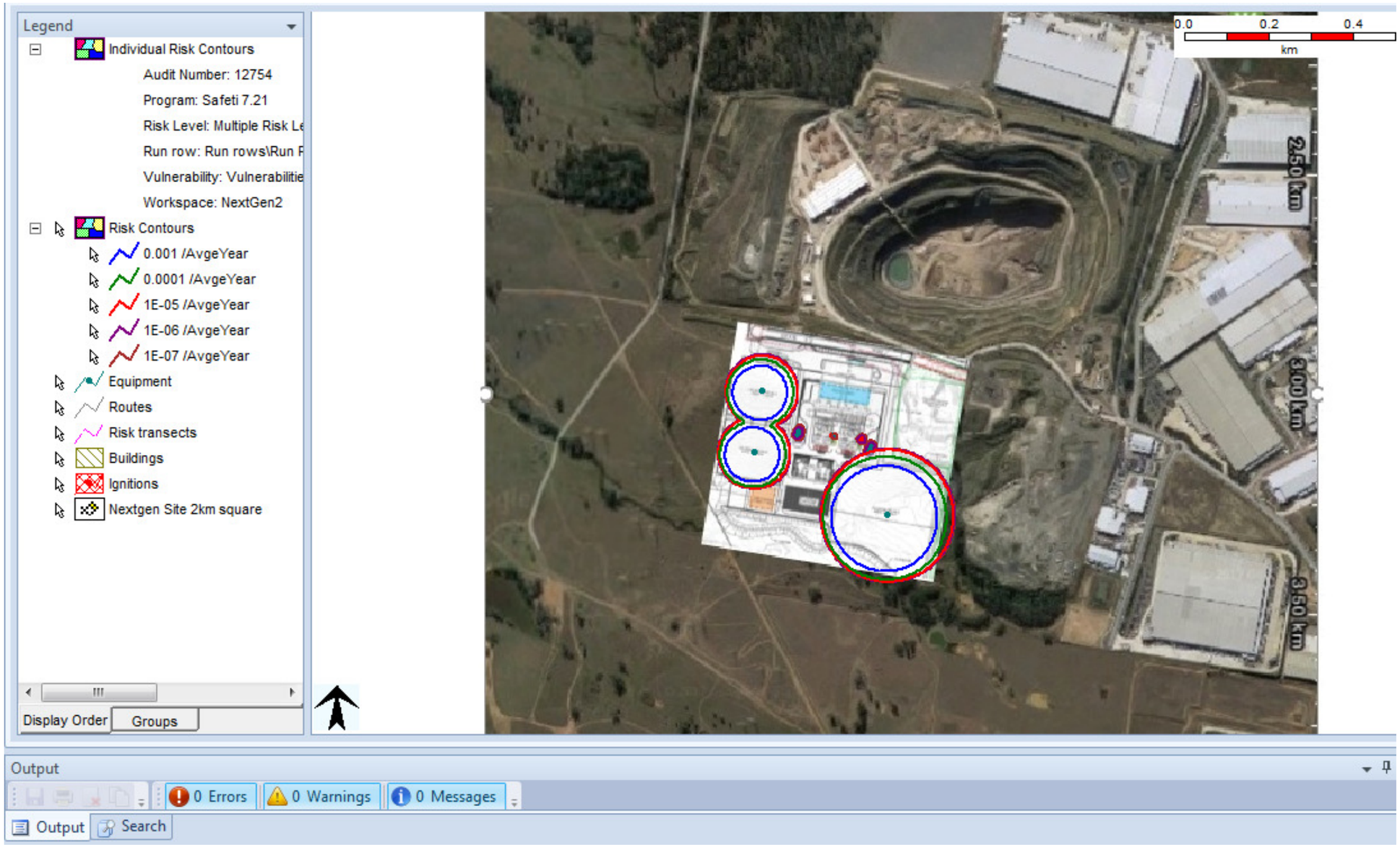
APPENDIX B – HAZID TABLE

AREA/OPERATION	HAZARD CAUSE	HAZARD CONSEQUENCE	SAFEGUARD
Ammonium Hydroxide Store	▪ Physical impact with tank or deterioration of tank resulting in a leak	▪ Spill of ammonium hydroxide to adjacent area with potential for offsite impacts washed into drains	▪ Tank bunding ▪ Regular deliveries so any leaks would be identified ▪ Bollards around bund ▪ Spill kits ▪ Site stormwater retention system
Low Sulphur Diesel	▪ Physical impact with tank or deterioration of tank resulting in a leak	▪ Spill of diesel to adjacent area with potential for offsite impacts if washed into drains ▪ Ignition of spill and pool fire ▪ Delayed ignition of unconfined vapours and flash fire ▪ Delayed ignition of confined vapours and vapour cloud explosion	▪ Tank bunding ▪ Regular deliveries so any leaks would be identified ▪ No ignition sources in diesel store as per AS1940 ▪ No smoking on the site premises ▪ Fire protection (hydrants, extinguishers) ▪ Site stormwater retention system
PAC	▪ Dust is liberated within the silo ▪ Ignition source present within the hazardous area zone ▪ Sufficient confinement within the silo	▪ Ignition of dust resulting in a dust explosion within the silo	▪ No smoking on the site premises ▪ Fire protection (hydrants, extinguishers) ▪ Controlled ignition sources within the silo (Hazardous Area)

Waste Storage Bunker	▪ Prohibited waste (DGs) unintentionally delivered to site	▪ Ignition of waste and fire within the waste bunker	▪ Bunker contained within a concrete pit within a building ▪ Waste is processed prior to delivery to site – reduced likelihood of prohibited waste being delivered into the bunker
Stack emissions	▪ Bi-products of combustion	▪ Release of gases/particles to atmosphere such as; • Carbon monoxide • Hydrogen chloride • Sulphur dioxide • Volatile organic compounds (VOC) • Particulates • Ammonia • Nitrogen oxides • Furans and dioxins	▪ Emission monitored continuously by an automatic computerised system ▪ Regular reporting of emission concentrations ▪ Ammonia injection to break down NOx compounds into nitrogen and oxygen ▪ Injection of hydrated lime to remove hydrogen chloride ▪ Injection of PAC to absorb (VOC) ▪ Combustion temperature maintained at 850°C to ensure thermal destruction of dioxins, furans and other undesirable combustion products ▪ Fabric filters to capture particulate ▪ Two counter current oxygen input streams to create turbulence and provide complete combustion to minimise carbon monoxide generation ▪ Emission from a stack to allow dispersion of products at ground level ▪ Low sulphur diesel used in combustion

Transformer	▪ Arcing within transformer, vaporisation of oil and rupture of oil reservoir	▪ Transformer oil spill in to bund and bund fire	▪ Bunded ▪ Fire protection (hydrants, extinguishers) ▪ Fire walls
Residue Silo	▪ PAC ejected within silo	▪ Ignition of dust cloud resulting in a dust cloud explosion	▪ Dilutent present (ash from combustion)
Calcium Hydroxide	▪ Damaged silo	▪ Release of calcium hydroxide	▪ Solid form - limit spread of release ▪ Isolated stormwater system at the site ▪ Not classified as a DG
Turbine	▪ Failed bearing and heating	▪ Vapourisation of turbine lubricant and ignition and turbine fire	▪ Regular vibrational analysis turbine
Truck	▪ Uncontrolled waste within delivery truck	▪ Ignition and truck fire	▪ Hydrants ▪ Hose reels ▪ Procedures

APPENDIX C – INDIVIDUAL RISK CONTOUR PLOT



APPENDIX D – POOL FIRE METHOD

SAFETI V7.2.1 utilizes the yellow book method for pool fires on land. The flame for a pool fire is assumed to be a sheared cylinder, and thus has a circular cross section in a plane parallel to the ground.

Key features of the model are summarised briefly below:

- The flame shape depends, first of all, on the mass burning rate and this is derived from the correlation of Burgess and Hertzerg (1974), based on experimental burning rate measurements.
- A correction to the heat of vaporization (used in determining the mass burning rate) is made for materials with a boiling point above ambient temperature to account for the heat required to raise the temperature of the liquid to its boiling point.
- The flame height correlation used is that derived by Thomas (1963) for the mean visible height of turbulent diffusion flames.
- The flame is assumed to be tilted from the vertical by an angle calculated using the American Gas Association (1974) correlation.
- Fuels for liquid pool fires are assumed to burn with either a luminous or a smoky flame. In general hydrocarbons lighter than pentane burn with a luminous flame and heavier hydrocarbons burn with a smoky flame. Separate correlations for the surface emissive power in each case are derived from Mudan and Croce (1988).

In the commercially available package WHAZAN another point source model has been used, derived from formulae from Yellow Book [1992] and Thomas [1963].

$$q'' = \frac{\left(\pi \times D \times L + \pi \times \frac{D^2}{4}\right) \times m'' \times F_s \times \Delta H_c}{(c_1 \times m''^{0.61} + 1) \times (4 \times \pi \times X^2)} \qquad (J/(m^2 \cdot s)) \qquad (6.6)$$

in which:

D = Pool diameter, in m

L = Average flame height, in m

m'' = Burning flux at still weather conditions, in $kg/(m^2 \cdot s)$

ΔH_c = The heat of combustion of the flammable material at its boiling point, in J/kg

F_s = Fraction of the generated heat radiated from the flame surface

X = Distance from the point source, in m

c_1 = 72 $(m^{1.22} \cdot s^{0.61})/kg^{0.61}$

APPENDIX E – TNT EQUIVALENCE METHOD

TNT Equivalent

The TNT equivalent (M_{TNT}) of an unconfined hydrocarbon vapour cloud is estimated from:

$$M_{TNT} = (alpha * H_C * V_T) / 4600$$

where

alpha	= the explosion efficiency factor - ie. the proportion of the combustion energy that appears in the shock wave
H_C	= the heat of combustion of the hydrocarbon (kJ/kg) - this is typically 46,000kJ/kg for ethylene and propylene, 21,000 kJ/kg for acetylene
V_T	= total weight of vapour in the vapour cloud

Overpressure

Overpressures are calculated by the application of a scaling law. The effects of TNT explosions are correlated against a scaled distance, lambda, defined as:

$$lambda = R / (M_{TNT})^{0.333}$$

where

R	= Distance from the centre of the cloud to the point of interest (m)
M_{TNT}	= Cloud equivalent of TNT (kg)

From the scaled distance, the overpressure can be approximated by the relationship:

$$Overpressure = 540 / lambda^{1.6}$$

Risk of Fatality

Rough graphs are available, indicating the probability of fatality for people exposed to overpressure.

For person in conventional building, an overpressure of approx 50 kPa will result in a risk of fatality of 1

For person in open in chemical plant, an overpressure of approx 70 kPa will result in a risk of fatality of 1

The rough graphs outlined in ICI Engineering Hazard Analysis Course Notes have been estimated to have the following relationships (obtained via regression analysis R^2 exceeds 0.999 in both instances)

Conventional building:	$Risk\ of\ Fatality = \lvert 0.9940711495e^{(0.0141652252390377*overpressure)} - 1\rvert^{1000/621}$
Open in chemical plant:	$Risk\ of\ Fatality = \lvert 1.003781251e^{(0.00998812538250064*overpressure)} - 1\rvert^{500/203}$

4 August 2017

Jacfin Pty Ltd
C/O Allens
GPO Box 50
SYDNEY NSW 2001

Our ref: 2126680-77019
Your ref:

Dear Sir/Madam

Energy from Waste Facility - Odour Review Addendum

1 Introduction

GHD was engaged on behalf of Jacfin to undertake a technical review of the Odour Assessment (Appendix L) of the Amended EIS for the Next Generation Energy from Waste facility[1] (the EIS Odour Assessment) on behalf of Jacfin Pty Ltd. GHD provided the result of its technical review in a letter dated 10 March 2017 (Ref: 2126281-75302) ('the Odour Review letter').

GHD has subsequently been engaged to undertake odour dispersion modelling to assess the EIS Odour Assessment results and provide an additional cumulative assessment of all approved odour sources on the Next Generation Energy from Waste site (the Next Gen site) and the operating Genesis Facility. This document is an addendum to the Odour Review letter and provides:

- An overview of the approach to the dispersion modelling
- A summary of the meteorological modelling undertaken
- Odour emissions rates and odour sources adopted for the modelling
- The results of the odour dispersion modelling.

This letter should be read in conjunction with the Odour Review letter.

Odour dispersion modelling overview

The EPA submission comments on the EIS Odour Assessment (Attachment F NSW Environment Protection Authority Review of the Air Quality and Ozone Impact Assessment, March 2017) state that that the choice of dispersion model AERMOD was not adequately justified, and that AERMOD does not explicitly treat calm conditions. To remedy this GHD has undertaken modelling using Calpuff, an EPA approved dispersion model for these situations: for use in complex terrains and when there is the presence of high frequency of stable night time conditions.

The modelling was undertaken in accordance with Generic Guidance and Optimum Model Settings for the CALPUFF Modelling System for Inclusion into the 'Approved Methods for the Modelling and

[1] Pacific Environment Limited (19 October 2016) 'Energy from Waste Facility – Odour Assessment: The Next Generation' (the EIS Odour Assessment)

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Assessments of Air Pollutants in NSW, Australia' (Jennifer Barclay and Joe Scire Atmospheric Studies Group TRC Environmental Corporation, 2011). That document was prepared for the NSW Office of Environment and Heritage and provides recommended default settings to use in the modelling that are suitable for most modelling applications.

Two non-recommended Calpuff model settings were used in the assessment and are justified as follows:

- Compute kinematic effects (IKINE) – value of 1 was chosen in order to calculate terrain forced vertical velocity in the initial guess wind field
- Minimum turbulence velocities (SVMIN) – value of 0.2 was chosen as the site has significant calm wind and stagnation events

2 Meteorological modelling

The characterisation of local wind patterns generally requires accurate site-representative hourly recordings of wind direction and speed over a period of at least a year.

Existing observational data is located at approximately 5 km to the west-northwest at St Marys and 7.5 km to the east at Prospect. The St Marys and Prospect weather stations are operated by the NSW Offie of Environment and Heritage (NSW OEH). The following hourly meteorological parameters were available in the dataset provided by the NSW OEH:

- Average Relative humidity (%);
- Average Temperature (ºC);
- Average Wind Direction (º); and
- Average Wind Speed (º).

The NSW OEH weather stations do not gather the key parameters described below. These parameters can be sourced from the Bankstown Airport Bureau of Meteorology (BOM) weather station at approximately 20 km from the subject site.

- Cloud height (m);
- Cloud amount (tenths); and
- Surface level pressure (hPa).

Given the separation distance, neither weather station can confidently be classified representative of the expected conditions at the subject site. In order to produce a representative site-specific meteorological data set the following methodology carried out:

- Production of a 3D gridded dataset with the TAPM prognostic model TAPM.
- Utilising the TAPM 3D gridded dataset as an initial guess field for the CALMET meteorological model.
- Utilising data from St Marys and Prospect for surface level observations.
- Utilising data from Bankstown Airport for surface level observations including cloud and surface pressure.

The 2013 calendar year was selected as the modelling period for the assessment in line with the previous assessment conducted by Pacific Environment Limited (19 October 2016) (PEL).

3 Odour emission rates

In order to undertake a cumulative odour assessment, GHD has reviewed the potential odour contributions from the Next Gen site and the adjacent existing Genesis Facility.

Odour emission rates used in the assessment have been sourced from the EIS Odour Assessment, however the source odour contributions and areas have been amended as follows:

- Inclusion of waste conveyor that transfers waste from the Genesis Facility to the Next Gen site
- Waste outside the Genesis Facility has been excluded from the assessment as we understand that it will be aggregates with little to no odour potential, but the outdoor approved green waste composting was included as a potential odour contributor
- Inclusion of roller doors as an odour source from the Genesis Facility
- Inclusion of waste stockpiling in the Next Gen facility laydown areas
- Not all sources emit odour 24 hours a day. The following sources have been assumed to operate between the hours listed below:
    - Tipping face an odour source between 7am and 6pm
    - Genesis AWT roller door odour emissions between 7 am and 6 pm
    - Next Gen waste conveyor odour emissions between 7 am and 6 pm
    - Laydown areas to have odour emissions in the month of July only.

These times were selected based on the requirements in the environment protection licence for the Genesis Facility and for the laydown areas the one month duration is the period when the Next Gen site may be non-operational each year.

Waste conveyor

The waste conveyor that will transfer waste to be incinerated from the Genesis Facility to the Next Gen site has been included in the model. Although drawings in the EIS do not show the entire conveyor (it stops at the Genesis Facility void), the conveyor has been assumed to run between the two facilities, supplying the constant supply of waste needed to ensure the Next Gen site can run efficiently.

An odour emission rate of 0.3 $OU.m^3/m^2/s$ has been assumed, which is the value used in the EIS Odour Assessment for waste on the active daily tipping face which may be representative of the odour emission rate for the incoming waste. Waste travelling along a conveyor will be moving at speed, and potentially subject to wind stripping of odour which may have a higher odour emission rate than static waste on the tip face (assuming the conveyor is not fully enclosed).

It is noted that some waste from external sites will be delivered via road vehicles. It is assumed the loads will be covered and delivery will occur within the Next Gen facility building and therefore vehicles transporting waste have been excluded as an odour source in this assessment.

Greenwaste composting

The approved green waste composting operations at the Genesis Facility is currently not operational, however composting is an approved activity which can be commenced at any time. It has therefore been included in the model. The licence allows for up to 20,000 tonnes of green waste onsite at any one time.

The approved composting area is shown on Site Layout Plan Green Waste Containment Walls (Drawing A 101 – 5 / F) of the Light Horse Business Centre Environmental Assessment Report (2010, ThaQuarry Pty Ltd). The area is approximately 5000 m^2, and would include all phases of composting including active composting, maturation and matured product. This area of 5,000 m^2 was also modelled in the original EIS for the facility (Holmes Air Sciences, 2008). Modification 4 included the construction of concrete bay walls within the area designated for receipt and processing of green waste. The modification states that covers would be used at any given time to reduce the potential for odour and also reduce the generation of leachate. The modification also states "In this case however the Proponent intends using airblowers to ensure that biodegradation can occur more quickly and with much less odour than otherwise might be the case. Each active windrow will have at its base a slotted pipe through which air will be pumped for not less than 4 hours per day during the initial composting period. The windrow channel will be closed during this process to exclude unnecessary wetting, to contain odours and to accelerate the process."

The assessment does not provide any detail on if the covers will be on the compost stockpiles during aeration, and if so where or how the air will be discharged. In order to model this odour source, GHD has assumed that the most odorous active composting stage will be covered, and aerated. GHD has selected odour concentrations measured at a NSW composting site that includes, aerated windrows which were covered with a biocover, in lieu of having data for the unspecified cover in the modification documentation. In order to be conservative, odour emissions rates used for the active composting stage (assumed 1.09 $OU.m^3/m^2/s$) coincide with the average of an eight day old sample and a 19 day old sample, effectively 14 days old from covered, aerated piles. Exact timeframes of the approved composting method are not known, however the modelled levels would likely coincide with odour at the end of the active composting stage when odour levels have dropped off (decreased) significantly. The odour emission rates from the maturation stage (0.54 $OU.m^3/m^2/s$) are based on the average of 19 day old and 33 day old static maturation compost piles, which is an average of 26 days aged composting piles.

Raw green waste, both unshredded and shredded, are potentially a significant source of odour. This has not been included in this assessment, as the exact location, volumes and methods used are not known. Other odour sources in greenwaste composting can include turning and moving product, leachate and upset events that can occur. Not including these sources in the odour assessment mean that potential odour impacts may be higher.

The Next Gen facility laydown area waste stockpiles

GHD was instructed to consider the stockpiling of incoming waste at the three laydown pads at the Next Gen site.

An indicative layout for stockpiling of waste on the three laydown pads was developed to inform the odour modelling. The estimated plan areas for stockpiled waste and equivalent waste tonnages were calculated based on the following parameters/assumptions:

- Each laydown area contains trapezoidal stockpiles of waste, each 2 m high with a 1 m crest and 1:2 batters.
- Space is provided around the perimeter of each laydown area and a minimum of 5 m between each stockpile for manoeuvring plant and equipment and so that in the event of a fire there is space to relocate material and extinguish the fire
- The laydown areas are used for stockpiling for four weeks of the year (in winter)

Based on this, the estimated areas and volumes of the stockpiles on each laydown pad is shown in the following table. The total volume of stockpiles is estimated to be in the order of 38,600 m^3, which is equivalent to approximately 5,000 to 7,700 tonnes of the design fuel mix (an estimated 1 to 2.5 days of fuel input).

Table 1 Estimated laydown pad* stockpile areas and volumes

Parameter	Value	Units
Area of stockpiles on laydown pad no 2	8,640	m^2
Area of stockpiles on laydown pad no 4	8,640	m^2
Area of stockpiles on laydown pad no 3	17,280	m^2
Volume of stockpiles on laydown pad no 2	9,365	m^3
Volume of stockpiles on laydown pad no 4	9,365	m^3
Volume of stockpiles on laydown pad no 3	18,848	m^3
Total volume of stockpiles	37,579	m^3
Equivalent tonnage (low-end estimate)	4,975	t
Equivalent tonnage (high-end estimate)	7,659	t

*The laydown pad numbering matches that in the amended EIS.

Summary of potential odour sources

A summary of the potential sources of odour is presented in Table 2.

Table 2 Summary of odour emissions

Source	Area (m^2)	SOER ($OU.m^3/m^2/s$)	OER ($OU.m^3/s$)
Next Generation Facility			
Tipping hall	25	-	1,395
Laydown pad no 2	8,640	0.3	2,592
Laydown pad no 4	8,640	0.3	2,592

Source	Area (m^2)	SOER ($OU.m^3/m^2/s$)	OER ($OU.m^3/s$)
Laydown pad no 3	17,280	0.3	5,184
Waste conveyor	600	0.3	180
Genesis Facility			
Active tip face	1,344	0.3	403
Capped landfill	48,938	0.00051	25
Leachate riser	177	10.3	1,823
Leachate pond	811	0.2	162
Leachate tanks	4 x 50	0.2	40
AWT roller doors	3 x 150	-	8370
Approved active greenwaste composting	1,667	1.09	1,817
Approved greenwaste maturation	1,667	0.54	900
Approved greenwaste matured product	1,667	0.19	317

The evaluation of odour impacts requires the estimation of short or peak concentrations on the time scale of less than one second. To account for this, GHD has applied peak-to-mean factors to the above odour emission rates before inputting into the dispersion model Calpuff as documented in Section 6.6 of the Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales (2016).

There are sources of odour that were identified in GHD's Odour Review letter that have not been incorporated into the odour modelling and assessment. A summary of these and why they were not incorporated is discussed below:

- Bottom ash from the incinerator has not been assessed as an odour source. The exact chemical composition of the ash is not known however is a potential odour source that needs to be described and justified.
- We note that there are scrubbers and other processes to further remove contaminants of the flue gases after combustion. These processes may introduce odours to the air stream and has not been adequately described and justified as not being an odour source in final stack discharge.
- The EIS Odour Assessment does not demonstrate vehicles coming in are contained vehicles and not going to be open vehicles that are potentially a source of odour. This is particularly in regards to refuse derived fuel that could be produced from municipal solid waste.

4 Odour dispersion modelling results

In order to compare predicted model results, a number of scenarios have been assessed as follows:

1. All Genesis Facility sources
   - Tipping face
   - Covered areas
   - Leachate riser
   - Leachate tanks
   - Leachate pond
   - AWT roller doors
2. Green waste sources
   - Composting (active, maturation, matured)
3. All Next Gen facility sources
   - Roller door
   - Conveyor
   - Laydown Area
4. Sources 1,2,3 combined
5. Sources 1,2,3 combined excluding laydown areas.

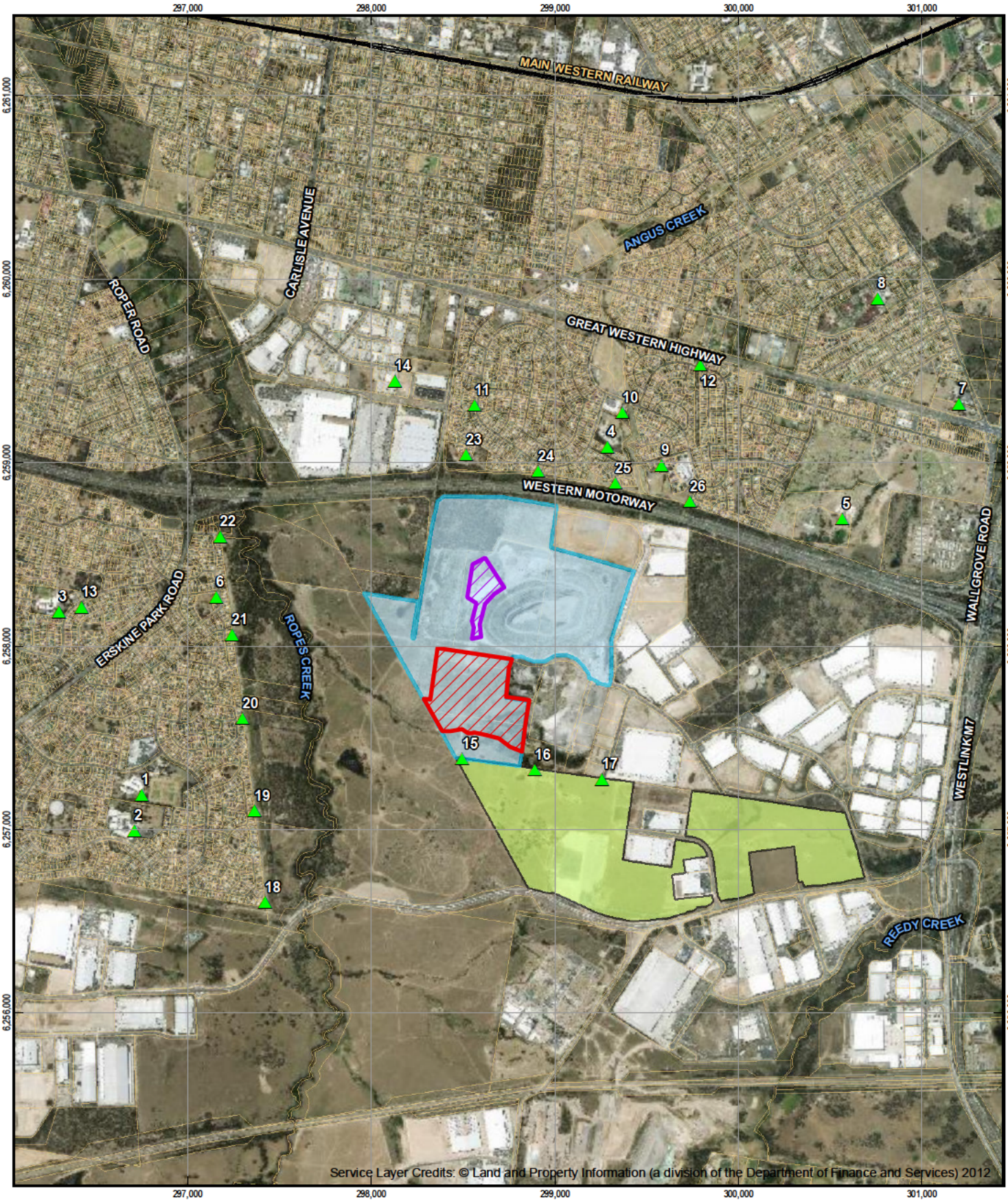
A map showing the location of the Next Gen Facility, Genesis Facility and sensitive receptors is shown in Figure 1. Additional receptors have been included in the model as the nearest receptors to the site which were not included in the EIS Odour Assessment.

Results of the modelling for the five assessed scenarios are presented in Table 3. Shaded results indicate a predicted exceedance of the NSW EPA odour criteria. Odour contour plots of each scenario are presented in Figure 2 to Figure 6, in Attachment A.

Table 3 Predicted 99th percentile peak odour impact at sensitive receptors (OU)

Receptor	X (km)	Y (km)	S1	S2	S3	S4	S5
1	296.748	6257.187	0.2	0.2	0.3	0.6	0.5
2	296.709	6256.992	0.1	0.2	0.2	0.5	0.5
3	296.299	6258.187	0.1	0.1	0.1	0.3	0.2
4	299.287	6259.084	1.2	1.3	1.3	2.4	1.8
5	300.567	6258.692	0.5	0.3	0.4	1.1	1.1
6	297.153	6258.266	0.2	0.2	0.3	0.6	0.5
7	301.201	6259.319	0.3	0.1	0.2	0.6	0.5
8	300.761	6259.894	0.4	0.3	0.3	0.9	0.8

Receptor	X (km)	Y (km)	S1	S2	S3	S4	S5
9	299.581	6258.986	1.3	0.9	1.1	2.1	1.7
10	299.370	6259.272	1.0	0.9	0.9	1.9	1.5
11	298.562	6259.310	0.7	0.8	0.7	1.8	1.6
12	299.792	6259.530	0.7	0.7	0.6	1.5	1.3
13	296.419	6258.212	0.1	0.1	0.1	0.3	0.2
14	298.128	6259.445	0.3	0.4	0.5	1.1	1.0
15	298.496	6257.386	0.8	1.1	6.1	7.2	2.7
16	298.889	6257.325	1.3	1.0	5.7	6.8	2.5
17	299.257	6257.275	1.1	0.6	1.1	2.2	1.6
18	297.420	6256.601	0.2	0.2	0.4	0.7	0.6
19	297.361	6257.100	0.2	0.2	0.4	0.8	0.7
20	297.298	6257.603	0.2	0.2	0.4	0.7	0.6
21	297.241	6258.060	0.2	0.2	0.3	0.7	0.5
22	297.174	6258.595	0.3	0.2	0.3	0.6	0.5
23	298.516	6259.042	1.0	1.2	0.9	2.4	2.3
24	298.908	6258.953	1.5	2.3	1.9	3.7	3.0
25	299.327	6258.889	1.5	1.5	1.5	2.9	2.1
26	299.734	6258.785	1.3	0.9	1.1	2.1	1.9



LEGEND

- Railway
- Sensitive Receptors
- Genesis Facility
- Next Gen Facility
- Broader Site
- Cadastral Boundaries
- Jacfin Property

Paper Size A4

0 125 250 500 750 1,000

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

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Date 04 Aug 2017

Sensitive Receptors

Figure 1

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Data source: Aerial Imagery: Sixmaps (NSW LPI 2017); General Topo: NSW LPI DTDB 2015; Cadastre: NSW LPI DCDB 2017. Created by:mking3

5 Summary and conclusion

GHD has undertaken odour dispersion modelling to assess the EIS Odour Assessment results and provide an additional cumulative assessment of the proposed odour sources on the Next Gen site, including the potential use of the laydown areas for waste storage and the approved odour sources from the operating Genesis Facility. Five scenarios were assessed. The results of the dispersion modelling indicate that the NSW EPA odour criteria will be exceeded under two scenarios:

- Scenario 2 – Green waste composting at residential receivers
- Scenario 4 – all odour sources combined at residential receivers
- Scenario 5 – all odour sources combined except the Next Gen laydown areas at residential receivers
- Impacts (over 7 OU) are also predicted at the Jacfin site to the south of the Next Gen site for Scenarios 3, 4 and 5. 7 OU is the highest reported impact assessment criteria in the NSW Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales (2016) (Approved Methods).

The Technical framework for the assessment and management of odour from stationary sources in NSW 2006 states, “In practice, ‘offensive’ odour can only be judged by public reaction to the odour, preferably under similar social and regional conditions. The nuisance level can be as low as 2 OU and as high as 10 OU for less offensive odours

An odour assessment criterion of 7 OU is likely to represent the level below which ‘offensive’ odours should not occur. Therefore, the Technical Framework recommends that, as a design criterion, no individual should be exposed to ambient odour levels of greater than 7 OU (99th percentile, nose response time average). The odour assessment criteria have been designed to take into account the range of sensitivity to odours within the community and to provide additional protection for individuals with a heightened response to odours. This is achieved by using a statistical approach, which depends upon population size. As the population density increases, the proportion of sensitive individuals is also likely to increase, indicating that more stringent criteria are necessary in these situations. The 7 OU criteria in the Approved Methods applies to one isolated residence, whereas 2 OU applies to an urban area.

There are a number of uncertainties in the Proponent’s odour impact assessment as detailed in GHD’s advice of 10 March 2017. The odour impact assessment undertaken by GHD follows the guidance in the EPA Approved Methods publication including considering a cumulative assessment of potential odour sources from the Genesis Facility and the proposed Next Gen Facility. The results presented in this letter provides an indication of the potential odour emissions which may be experienced at the receptors and based on this work GHD considers that the Next Gen Facility (if approved) would not achieve compliance with the odour impact assessment criteria.

It is recommended that before the development application (DA) for the Next Gen Facility is determined that the applicant address the matters discussed in GHD’s advice of 10 March 2017 and including undertaking a robust testing program to better quantify the odour emission rates from the existing operations at the Genesis Facility (and for the approved composting facility) and for the potential odour sources from the Next Gen Facility. This work should then be utilised by the applicant in undertaking odour dispersion modelling for all the existing and potential sources in accordance with the Approved

Methods to assess the odour impacts and be made available for consideration for the determination of the DA.

Sincerely
GHD Pty Ltd

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Anthony Dixon
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Service Group Manager Waste Management
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Attachment A – Odour contour plots

Attachment A – Odour contour plots

LEGEND

Railway

Odour Levels

- 1 OU
- 2 OU
- 5 OU
- 7 OU

Paper Size A4

0 125 250 500 750 1,000

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

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Job Number 21-26680
Revision A
Date 04 Aug 2017

Scenario 1 – Predicted 99th percentile peak odour impact

Figure 2

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Data source: Aerial Imagery: Sixmaps (NSW LPI 2017); General Topo: NSW LPI DTDB 2015. Created by:mking3

LEGEND

Railway

Odour Levels

- 1 OU
- 2 OU
- 5 OU
- 7 OU

Paper Size A4

0 125 250 500 750 1,000

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

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Date 04 Aug 2017

Scenario 2 – Predicted 99th percentile peak odour impact

Figure 3

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Data source: Aerial Imagery: Sixmaps (NSW LPI 2017); General Topo: NSW LPI DTDB 2015. Created by:mking3

LEGEND

Railway

Odour Levels

- 1 OU
- 2 OU
- 5 OU
- 7 OU

Paper Size A4

0 125 250 500 750 1,000

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

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Scenario 3 – Predicted 99th percentile peak odour impact

Figure 4

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Data source: Aerial Imagery: Sixmaps (NSW LPI 2017); General Topo: NSW LPI DTDB 2015. Created by:mking3

LEGEND

Railway

Odour Levels

- 1 OU
- 2 OU
- 5 OU
- 7 OU

Paper Size A4

0 125 250 500 750 1,000

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

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Scenario 4 – Predicted 99th percentile peak odour impact

Figure 5

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Data source: Aerial Imagery: Sixmaps (NSW LPI 2017); General Topo: NSW LPI DTDB 2015. Created by:mking3

LEGEND

Railway

Odour Levels

- 1 OU
- 2 OU
- 5 OU
- 7 OU

Paper Size A4

0 125 250 500 750 1,000

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

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Job Number 21-26680
Revision A
Date 04 Aug 2017

Scenario 5 – Predicted 99th percentile peak odour impact

Figure 6

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Data source: Aerial Imagery: Sixmaps (NSW LPI 2017); General Topo: NSW LPI DTDB 2015. Created by:mking3