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NSW Planning
320 Pitt Street
Sydney, NSW, 2001

NSW EPA
PO Box A290
Sydney South NSW 1232

Environmental Risk Sciences Pty Ltd
P.O. Box 2537
Carlingford Court, NSW 2118

Phone: +61 2 9614 0297
Fax: +61 2 8215 0657
inquiry@enrisks.com.au
www.enrisks.com.au

Attention: Deanne Pitts/ Chris Ritchie/ Sally Munk

Re: Energy from Waste Facility, Eastern Creek, NSW – Review of Health Risk Related Matters Covered in the EIS

1 Introduction

Environmental Risk Sciences Pty Ltd (enRiskS) has been commissioned by NSW Planning and NSW EPA to review the Human Health Risk Assessment (HHRA) (provided as Appendix N of a revised EIS published in November 2016), for the proposed Energy from Waste Facility, Honeycomb Drive, Eastern Creek. The report was prepared by AECOM on behalf of The Next Generation NSW Pty Ltd.

A range of other documents forming part of the EIS and the Response to Submissions have also been provided to assist in the review:

- Appendix N, Human Health Risk Assessment (prepared by AECOM, dated 23/11/16)
- Appendix K, Air Quality Response (prepared by Pacific Environment Ltd, dated 31/10/16)
- Appendix M, Ozone Impact Assessment (prepared by Pacific Environment Ltd, dated 25/10/16)
- Amended EIS, Main Report by Urbis dated November 2016

Previous versions of this risk assessment and AQIA used for input were reviewed for adequacy and while on public exhibition at various times in 2014, 2015 and 2016.

These reviews highlighted a number of issues with each of the risk assessments:

- the earlier ones were not done in accordance with Australian guidance
- the more recent ones did not provide a detailed enough explanation for the chemicals chosen to be assessed and the way concentrations were assessed

Another revision to the HHRA was prepared for the amended EIS submitted in November 2016 which was placed on public exhibition between December 2016 and March 2017. This version of the HHRA has now been reviewed and comments are provided in this letter report.

2 Overview

The assessment of the potential for health risks from this facility is based on estimating what chemicals might be emitted from the facility and what concentrations of each chemical emitted might be present at ground level around the facility where people live and breathe.

Determining which chemicals might be present in the emissions depends on:

- Types of waste proposed to be used in the plant

- How the various types of waste are combined (proportions and thoroughness of mixing)
- Controls on conditions inside the kiln
- Efficiency of the pollution control equipment to remove particular chemicals

Once the chemicals that might be present in the emissions have been identified then the concentrations of them in air at ground level around the plant need to be estimated. The concentrations depend on:

- Types of waste proposed to be used in the plant
- How the various types of waste are combined (proportions and thoroughness of mixing)
- Controls on conditions inside the kiln
- Efficiency of the pollution control equipment to remove particular chemicals
- How the stack has been engineered
- Dispersion of the stack emissions around the facility which depends on the meteorology in the area and the topography surrounding the plant

Having sufficient information about each of these aspects means that estimates of the ground level concentrations can be made with appropriate confidence for decision making. However, if there are some aspects which are not known with confidence then that limits the confidence in the estimates of the concentrations and means the human health risk assessment may not be as robust as would be normally expected.

There are aspects of each of these lists that are known with some confidence. The engineering of the different types of equipment used in the plant can be understood (kiln, pollution control equipment, stack). Air dispersion modelling of emissions from a stack is well developed and can be robust if there is sufficient understanding of the meteorological conditions and background air quality in the area. Understanding of which chemicals can be removed from the air emissions and how efficiently they can be removed by different types of pollution control devices can be estimated.

The difficult areas for this facility that limit the confidence in estimates of ground level concentrations of particular chemicals are whether or not there can be sufficient understanding at this time of:

- types of waste that will be used by this facility
- proportions of each waste type that will be included in the mix
- how the mix will vary across days, weeks, months, years
- variation in the characteristics of each type of waste processed at another facility (e.g. AWT or flock waste or chute residual waste)
- variation in the characteristics of a waste type not subjected to much processing where the mix of materials in it can vary over time (e.g. commercial/industrial waste – proportion of paper vs plastics vs other materials will vary through time or construction/demolition waste – proportion of concrete, brick, plastics, metals etc will vary through time depending on what is being demolished)
- how each waste type behaves in the kiln (in particular the more unusual waste types proposed for use in this facility)
- whether the presence of one type of waste affects the reaction of another inside the kiln or the pollution control equipment

There are plants that are similarly engineered (kiln with pollution control equipment and stack) for which information is available about the concentrations of chemicals in emissions. When a fuel source for a combustion process like this is relatively consistent (e.g. coal, gas, one type of waste that is well controlled etc), the emissions are relatively consistent and a robust assessment can be undertaken. It is normal practice for an EIS to use information about similar facilities and their emissions as the basis for understanding a new facility.

However, the mix of wastes to be used as a fuel source for this facility is quite different than the facilities which are similarly engineered in Europe. Also, the use of a mix of wastes proposed for this facility introduces a large range of variability into the process. Both of these matters make assessments (AQIA and HHRA) difficult to do with confidence.

Maintaining consistency in the feedstock is desirable for any such plant to keep it operating efficiently, however, it is very difficult to do in practice when variable waste types are mixed together in variable proportions. There are also a range of controls that can be applied to the feedstock to help increase consistency and some of these are proposed for this plant. However, the success of such controls depends on:

- waste type
- rigour of processes used by suppliers of each waste type
- whether such processes are maintained through time
- how much of each waste type is available on a particular day
- how well the wastes are mixed together.

Experience with other waste processing facilities (using a range of processes not just combustion) in New South Wales has shown that such controls may not work as well as expected.

Some facilities using waste as fuel, manage the issue of variability by using only one or a limited number of waste types, targeting waste types that are less variable or sourcing material from only one supplier who they work with to ensure consistency. They may also be able to rely on controls on the overall waste stream due to legislation controlling what can and can't be done with some types of waste materials that are more likely to cause problems (e.g. definition of hazardous materials in Europe which includes some types of treated timber or focus on ensuring maximum recycling in the construction/demolition waste stream).

The proposed facility will use a wide range of waste types from a wide range of sources and suppliers. This means it is going to be difficult to get consistency through time in feedstock and mean the controls proposed may not be sufficient. Limitations on the understanding of the makeup of the feedstock (and therefore the chemicals in it), its consistency through time and the proportions of each waste type going through the plant at any point in time make assessing potential health risks very difficult.

One way to deal with such uncertainty is if the assessment demonstrates a significant margin of safety between what an assessment estimates might happen at a facility, when considering the best information available about the nature of the feedstock, and the level of health risk which is considered acceptable when making such decisions. If there is a significant margin of safety it can be assumed that even if there is some variation in emissions through time as the nature of the waste varies, the risks should still be in the acceptable range.

Unfortunately, for this facility the assessment that has been undertaken does not provide a significant margin of safety. The estimated risks are within one order of magnitude of the acceptable risk and this is not considered to be significant.

Another way to deal with such uncertainty, if the margin of safety is not large, is to undertake various sensitivity assessments as part of the AQIA and HHRA. Such assessments undertake the same calculations as undertaken for the assumed emissions from the plant but assume what might happen if the uncommon waste types are included (i.e. use of car flock and the much greater proportion of construction and demolition waste) or if one or more of the process controls managing the feedstock fail (e.g. CCA treated timber not being removed from the waste). These sensitivity calculations can then indicate whether or not these changes in feedstock make much of a difference to the estimated risks. Such a sensitivity analysis has not been undertaken in this EIS.

Consequently, this HHRA/AQIA has not demonstrated with sufficient confidence that this facility will not pose a human health risk.

3 Modelled Scenarios

This assessment has modelled concentrations for three scenarios:

- Scenario 1 – use of measured stack concentrations from other similar facilities
- Scenario 2 – use of NSW EPA regulatory limits for stack concentrations
- Scenario 3 – upset conditions based on Scenario 1 (measured stack concentrations at other facilities)

It is normal to consider worst case input data first and assess potential risks and, if risks could be elevated, then more refined modelling using more site-specific input data is undertaken. Also, it is noted in the NSW Approved Methods for the Modelling and Assessment of Air Pollutants that:

“Emissions from the premises must be demonstrated to comply with the requirements of the Regulation before progressing through the other stages of the air quality impact assessment.”

There are issues with the modelling assessment including:

- Scenario 2
 - Uses some of the NSW EPA regulatory limits but not all of them so the assessment has not demonstrated risks are acceptable at the regulatory limits as required by the Approved Methods Manual.
 - Even if the modelling had looked at all relevant chemicals listed in the regulations, the risk assessment should also have included all the other chemicals identified as likely to be present in these emissions given the review of emissions at other facilities.
 - The risk assessment for Scenario 2 only includes 4 chemicals from the regulations so the estimated risk quotients are not relevant/appropriate.

Table 1 compares the 1 hour maximum ground level concentrations for the full set of parameters listed in the AQIA for Scenario 1 and Scenario 2. The values listed for Scenario 2 are significantly larger than those for Scenario 1 and would result in estimates of risk much greater than currently assessed.

Table 1 Comparison – Normal Operations / POEO Emission Limits – 1 hour maximums (mg/m³)

Parameter	AQIA October 2016		Increase
	Normal Operations (Scenario 1)	POEO Emission Limits (Scenario 2)	
NOx	0.077	0.205	2.7x
SOx	0.011	--	
CO	0.009	0.05	5.5x
PM10	0.00002	0.003	150x
PM2.5	0.00002	0.003	150x
HCl	0.004	--	
HF	0.0003 (24hr)	--	
NH ₃	0.0007	--	
H ₂ S	0.0012	0.0012	Same
VOCs (as benzene)	0.000006	--	
Cd	0.000004	0.00008	20x
Hg	0.000002	0.00007	35x
PCDD/Fs	4x10 ⁻¹²	4x10 ⁻¹¹	10x
PAHs	0.000002	--	

The HHRA has assessed risks for Scenario 2 and has concluded they are acceptable. However, the assessment has only included cadmium, mercury, PCDD/Fs and VOCs as benzene. As discussed above, it is

acknowledged that not all chemicals assessed for Scenario 1 are mentioned in the regulations and cannot be modelled based on regulatory limits, more than these 4 can be assessed. In particular, a 150 fold increase in the incremental increase in PM10 and PM2.5 is significant and has not been discussed at all in the HHRA.

■ Scenario 1

- Until Scenario 2 is completed in accordance with the NSW EPA guidance, Scenario 1 cannot be considered.
- Based on measured concentrations at other facilities with similar engineering but it has been acknowledged that these facilities do not use the same mix of wastes as feedstock so it cannot be known that the measured concentrations are relevant for this facility.
- This facility is much larger than the existing ones with measured emissions which may affect the concentrations in the emissions.

■ Scenario 3

- Makes some assumptions about how concentrations may change under upset conditions.
- As noted previously, for most of the chemicals this just resulted in a ten-fold change in concentration.
- A consistent ten-fold change does not make a lot of sense given that different types of failures can occur in the plant which will affect different groups of chemicals differently (e.g. baghouse failure compared to failure of SCNR etc)
- Ground level concentrations for this scenario were only assessed against acute criteria, however, these short-term increases in concentration have the potential to increase the overall annual average concentration – a worst case assessment using the upset conditions estimates for the the assumed maximum time per year the plant could operate under upset conditions and the annual average for the rest of the year to calculate a weighted annual average for assessment as for Scenario 1 and 2.

4 Specific Comments – Chemicals of Potential Concern (COPCs)

The first step in assessing the potential human health risks is to determine which chemicals might be emitted from the plant.

The list of chemicals being assessed for this facility has been based on a memo from Ramboll Environ dated 13/9/2015. This memo is quite short and does not explain in sufficient detail how and why particular chemicals have been included, particularly the list of chemicals covered under volatile organic compounds (VOCs or TOC in the AQIA, Appendix K of EIS). There are a range of chemicals in the list of COPCs which are standard for any combustion process and included in regulations such as Industrial Emissions Directive from the EU and the NSW POEO Clean Air Regulation. These are appropriate for inclusion in this assessment including metals, NO_x, SO_x, CO, PCDD/Fs, PAHs, PM10, PM2.5, Ozone.

Modelling emissions from such facilities looks at all volatile organic compounds as a group but to assess the human health risks from this group requires the identification of the individual chemicals that might be present or the use of an assumption that the estimate of VOCs concentration comes from a single chemical that is considered a good surrogate for the whole group such as benzene. The memo from 2015 uses some information to identify such a list of chemicals and the proportion each will contribute to the total VOCs estimate. Unfortunately, the information used is not readily available and appears to be in German so it cannot be reviewed. This was noted previously.

Also, as noted in previous comments provided by enRiskS (enRiskS 2016), some of the chemicals listed are not well supported. For the list of chemicals included as VOCs, some of the chemicals listed are not actually volatile so they cannot be measured by the VOCs analysis. Also, some of the chemicals listed are not named correctly so it is difficult to be confident that the correct chemical is being assessed (the names used could

refer to multiple individual chemicals). The memo also lists the proportions used to estimate the concentrations of each of the listed compounds based on the VOC concentration in the stack but without sufficient explanation and evidence.

In this most recent amended EIS, no additional information has been included in the HHRA (Appendix N) to answer these queries. Within the text of Appendix K – the Air Quality Impact Assessment (AQIA) – there was also no additional discussion in relation to these queries. In fact, throughout the text of the AQIA, VOCs are assessed assuming they are all present as benzene which is an appropriate conservative approach. However, there has been some additional discussion of these issues in a number of additional memos from Ramboll Environ included in the appendices of AQIA (dated October 2016).

The matters raised previously included:

■ Speciation of chromium

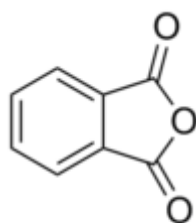
- Insufficient information had been previously provided in support of the assumption made regarding how much chromium VI would be present in the emissions
- Ramboll Environ COPC memo number 3 (19/10/16) provides some additional information using data from a range of plants in UK, France and Germany. Data on the proportion of chromium VI was only available for the ash/solid residues rather than the air emissions. The ash/solid residues at these plants were found to contain 0.1 to 0.6% chromium VI as a proportion of total chromium levels (i.e. 1-3 mg/kg in 500-1000 mg/kg). The memo states that the range in proportions is 0.1 to 0.3% (should have read 0.1-0.6%). The memo then proposes to use an average of 0.5% and a peak of 1% for the calculations.
- This is based on guidance from the UK Environment Agency – Guidance to applicants on impact assessment for group 3 metals stack – Version 3 (published 2012) – and is appropriate for use in the assessment.
- A new version of this guidance document from the UK EA (Version 4) was released in June 2016 but was not used in the Ramboll Environ memo. The new guidance indicates a similar proportion for chromium VI as the earlier guidance.
- While this approach is reasonable and has been adopted by the UK EA, there are additional uncertainties in applying it to this facility given the different mix of wastes used and the potential for higher levels of metals in such wastes. Calculations for additional scenarios should have been undertaken as part of a sensitivity analysis to determine if the assumption about the proportion of chromium VI affected the risk estimates significantly.

■ Names of individual chemicals

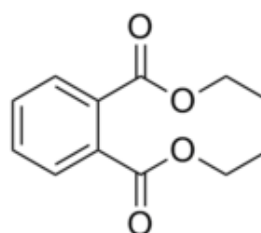
- Previous reviews identified that a number of chemicals were named incorrectly so it was not possible to be sure about which chemicals they were and whether they were appropriate for inclusion in this assessment.
- Table 16 of this revised HHRA includes relabelling of one of the incorrectly named chemicals – phthalates as phthalic anhydride. This renaming is only presented in this Table and Appendix G of the HHRA – the toxicological profiles. There is no discussion of why this chemical has been chosen from the group of chemicals that are known as phthalates. Also, this chemical is not actually a phthalate. Phthalates are formed by the reaction of phthalic anhydride (the listed chemical) with an alcohol to get a phthalate such as diethylphthalate.
- The following figures show the difference for diethylphthalate. These chemicals are related but not the same.
- Phthalates are used as plasticisers to make polymers softer and/or more flexible. They may be present in air emissions from such a facility from the breakdown/combustion of plastics. It is possible that phthalic anhydride is present in the air emissions as the first breakdown

product for phthalate plasticisers in air in the kiln from the combustion of plastics. The 2015 Ramboll Environ memo based the speciated list of volatile organic compounds on documents only available in German so it is not possible to determine which phthalate the original source document referred too.

- To address this lack of certainty about which chemicals may be present in the emissions, a sensitivity analysis should have been included in the HHRA looking at how much the risk estimates might change depending on which phthalates or related chemicals may actually be present in the air emissions.



Phthalic anhydride



Diethyl phthalate

■ Range of chemicals assumed to makeup the volatile organic compounds measured

- Previous reviews identified that there was insufficient evidence supporting the list of chemicals chosen for assessment for this facility to address VOCs.
- Ramboll Environ COPC memo number 4 (20/10/16) provides some additional consideration of the individual chemicals that could comprise VOC emissions. This additional consideration was based on a journal article reviewing a facility in Canada .
- The article lists the following chemicals as relevant for assessing risks for an energy from waste facility
 - Criteria pollutants – SO_x, NO_x, HCl, HF, PM₁₀, PM_{2.5}, NH₃
 - Chlorinated polycyclic aromatics – PCDD/Fs, PCBs
 - Metals – Sb, As, Ba, Be, B, Cd, Cr, Co, Pb, Hg, Ni, P, Ag, Se, Tl, Sn, V, Zn
 - Chlorinated monocyclic aromatics – 1,2-dichlorobenzene, 1,2,4,5-tetrachlorobenzene, 1,2,4-trichlorobenzene, pentachlorophenol, hexachlorobenzene, pentachlorobenzene, 2,3,4,6-tetrachlorophenol, 2,4,6-trichlorophenol, 2,4-dichlorophenol
 - PAHs
 - Volatile organic compounds – acetaldehyde, benzene, biphenyl, bromodichloromethane, bromomethane, dichlorodifluoromethane, formaldehyde, tetrachloroethene, toluene, trichloroethene, vinyl chloride, xylenes, bromoform, carbon tetrachloride, chloroform, dichloromethane, terphenyl, 1,1,1-trichloroethane, trichlorofluoromethane
- This list was based on Canadian guidance for municipal incinerators, the national pollutant release inventory in Canada for waste incinerators and the results of stack testing for an existing facility. So, it is based on relevant sources of information.
- The memo evaluates whether any of the volatile organic chemicals or the chlorinated monocyclic aromatics listed should be added to the evaluation of risks for this proposed facility. The memo concludes that none of the listed chemicals needed to be added to the evaluation for this facility because none contribute more than 1%.
- However, the memo doesn't add any explanation as to why the chemicals listed in the original COPC memo, that were not evaluated for the Canadian facility, still need to be

evaluated for this facility nor is any additional evidence provided to support the proportions for each of the VOCs proposed in the original COPC memo which is what had been requested.

- Some of the chemicals listed in the journal article are also much more likely to be emitted from a combustion facility (e.g. formaldehyde, ethylbenzene) than some of those listed in the original COPC memo (e.g. hexadecanoic acid, tetradecanoic acid).
- So, there is still a lack of confidence in the list of individual chemicals proposed to make up the emissions of volatile organic compounds from this facility and the proportions they contribute.
- The new information supplied in the additional Ramboll Environ memos raises some additional queries in regard to the VOCs.
- Appendix G of the AQIA lists the values identified for the in-stack concentrations for each of the individual chemicals used in the modelling in this assessment for normal and upset conditions.
- The values listed are exactly the values listed in Appendix B of Ramboll Environ COPC memo number 2 dated 19/10/2016 even though that was based on a total VOCs concentration for the reference plant(s) of 1.2 mg/m³.
- This plant is predicted to emit much lower amounts of VOCs – 0.015 mg/m³ is listed in Table 7-4 of the AQIA.
- It was assumed that the values used in this modelling would have been scaled to the total VOCs for this specific plant (i.e. VOCs emissions are estimated to be 80 times lower than the reference facility). This would have reduced the in-stack concentrations that should have been modelled in this assessment. So, this assessment is conservative in regard to this matter.
- However, in addition to this matter, the information in this memo indicates that the listed chemicals only made up about 25% of the measured concentration for total VOCs (i.e. see table below – 0.3/1.2 mg/m³). So, three quarters of the total VOCs likely to be present in the stack have not been identified and have not been included in the evaluation used in the HHRA.
- It is acknowledged that it is not possible to identify every single chemical that might be present but failing to identify chemicals that might contribute more than half of the measured VOCs emissions does mean there is uncertainty in both the mix of chemicals that might be present and the proportions each one contributes to the total VOCs. There is also no discussion about the unidentified 75% of VOCs measured in the stack of the reference facility.
- Also, some of the chemicals listed as present in the higher proportions are the chemicals that are less toxic and are, in fact, not volatile – the various acids for example – no further information has been supplied in this assessment to explain why these chemicals remain in the list at the proportions originally proposed. Using the information from the Canadian facility does tend to indicate that they may not be commonly found.

Consequently, there is limited confidence in the list of chemicals of potential concern being assessed in this HHRA and the most recent update does not allow any change to that conclusion. This issue relates to the list of chemicals being assessed as volatile organic compounds and the proportions of each present.

The rest of the list of chemicals being assessed is correct and appropriate.

5 Specific Comments – Estimates of Concentrations for Chemicals of Potential Concern

5.1 Introduction

Once the list of chemicals that might be present in the emissions has been determined, the concentration of each of them at ground level needs to be determined to allow risks to be assessed. In fact, this is the most critical input to the HHRA.

Calculating these estimates requires estimates of the concentration for each chemical in the stack, then uses the understanding of the height of the stack, the velocity of emissions from the stack and other stack parameters to estimate an emission rate for each chemical leaving the stack and then applies an understanding of the meteorological conditions, ground topography and the nature of buildings present in the vicinity of the stack via the air dispersion model to the emission rate to estimate how much of the chemical leaving the stack reaches the ground.

Air dispersion models are considered sufficiently robust for use in these types of assessments as long as they are used in accordance with relevant regulatory guidance (such as the relevant NSW Approved Methods Manual). There can be issues in obtaining sufficient information about the local meteorology which can limit confidence in the modelling. Also, if there is some flexibility in the engineering of the stack this can also lead to some issues in the modelling.

The main area of uncertainty in the modelling, however, for such a facility is the stack concentration/emission rate for each chemical. As discussed above, if there are similarly engineered facilities with similar feedstocks that are operational then measured data from their stacks can be used for this part of the assessment.

In this case, while there are similarly engineered facilities, there are no facilities that use the same mix of wastes as feedstock. Despite this, the stack concentrations and emission rates used to estimate ground level concentrations were based on the measurements at these similarly engineered facilities.

For normal operation, the Ramboll Environ COPCs memo states that real data from 4 plants was used along with information available in the literature. The maximum measured value from these other plants and/or the literature was the value used in this assessment.

Using measured data from plants that do not use the same wastes as feedstocks provides no room for understanding the variability in the emissions from this proposed plant. Such variability is likely at this facility due to the larger volumes of waste being processed at this plant and the larger amount of construction and demolition waste proposed for the mix and the inclusion of car flock which are likely to contain higher amounts of metals and some other components.

Also, the ground level concentrations estimated across the various assessments for this facility have varied quite considerably. This has led to difficulty in accepting the conclusions of the AQIAs and HHRA. The difference between some of the earlier assessments and the newer ones was a change from using 1 hour maximum values to annual averages for use in the HHRA. However, the HHRA undertaken in 2015 and in 2016 both use annual average values but the ground level concentration used in these assessments differ by approximately ten-fold.

As can be seen in **Table 2**, there were no changes to the stack engineering parameters between the update to the modelling in October 2015 and the current AQIA prepared in October 2016. So, the changes in the estimated ground level concentrations are not due to any additional refinement or optimisation of the engineering of the stack.

Table 2 Parameters regarding engineering of the stack

Parameter	AQIA (Mar 2015)	AQIA Response (Oct 2015)	AQIA (Oct 2016)
Stack location (m, MGA, Zone 56)	298632.9 (E) 6257733.5 (N) 298574.6 (E) 6257741.3 (N)		
Base Elevation (m, AHD)	~65		
Stack Height (m)	100		
Stack Diameter (m)	2.5	2.2	2.2
Temperature (°C)	120		
Flue Gas Flow (Nm ³ /s)	139.3	127.0	127.0
Gas Exit Flow Rate (Am ³ /s)	175.8	165.2	165.2
Gas Exit Velocity (m/s)	35.8	21.7	21.7

As can be seen in **Table 3**, there was also no change between 2015 and 2016 in the stack concentrations used in the air dispersion modelling. The values listed in this table were taken from Appendix G in the AQIA from 2016 and Appendix C from the Air Quality Response from October 2015. So, the changes in the estimated ground level concentrations are not due to refinement of the stack concentrations.

Table 3 In-stack concentrations used in air dispersion modelling

Chemical	Normal Conditions (mg/m ³)		Upset Conditions (mg/m ³)	
	October 2015	October 2016	October 2015	October 2016
Acetone	0.018	0.018	0.18	0.18
Acetonitrile	0.014	0.014	0.14	0.14
Ag	0.00034	0.00034	0.026	0.026
As	0.004	0.004	0.04	0.04
Be	0.000007	0.000007	0.00053	0.00053
Benzene	0.015	0.015	0.15	0.15
Benzoic acid	0.1	0.1	1	1
Cd	0.009	0.009	0.09	0.09
Carbon Monoxide (CO)	23	23	230	230
Co	0.004	0.004	0.04	0.04
Cr	0.047	0.047	0.47	0.47
Cu	0.016	0.016	0.25	0.25
Dichloromethane	0.02	0.02	0.2	0.2
Ethyl benzoic acid	0.035	0.035	0.35	0.35
H ₂ S	5	5	50	50
HCB	0.000008	0.000008	0.00008	0.00008
HCl	9	9	90	90
Heptane	0.005	0.005	0.05	0.05
Hexadecanoic acid	0.037	0.037	0.37	0.37
HF	4	4	40	40
Hg	0.004	0.004	0.013	0.013
Methyl hexane	0.006	0.006	0.06	0.06
Mn	0.037	0.037	0.46	0.46
Mo	0.000022	0.000022	0.0026	0.0026
NH ₃	2	2	20	20
Ni	0.021	0.021	0.21	0.21
NO _x	188	188	1880	1880
PAHs	0.0005	0.0005	0.005	0.005
Pb	0.17	0.17	1.7	1.7
PCBs	0.00000002	0.00000002	0.0000002	0.0000002
PCDD/F	0.00000001	0.00000001	0.0000005	0.0000005
Phthalate	0.02	0.02	0.2	0.2
PM ₁₀	1	1	150	150

Chemical	Normal Conditions (mg/m ³)		Upset Conditions (mg/m ³)	
	October 2015	October 2016	October 2015	October 2016
PM2.5	1	1	150	150
Sb	0.015	0.015	0.15	0.15
Se	0.002	0.002	0.02	0.02
Sn	0.003	0.003	0.25	0.25
SO ₂	27	27	270	270
TCE	0.005	0.005	0.05	0.05
Tetradecanoic acid	0.015	0.015	0.15	0.15
Tl	0.001	0.001	0.009	0.009
Toluene	0.03	0.03	0.3	0.3
Trichlorophenol	0.009	0.009	0.09	0.09
V	0.001	0.001	0.015	0.015
Xylenes	0.01	0.01	0.1	0.1
Zn	0.037	0.037	5.09	5.09

The only other input to the modelling calculations is the meteorological data. The reports indicate that the same/similar meteorological data was used for the various AQIAs. So, the changes in the estimated ground level concentrations are not due to changes to the understanding of climatic conditions.

Consequently, this review has not been able to determine why the ground level concentrations are ten times lower in the 2016 assessment. There is also no acknowledgement in the HHRA that there is a difference between this version and the previous one or why such a difference would have occurred.

Because it is not possible to know which version of ground level concentrations is correct without undertaking the entire modelling exercise again there is no way to know which estimate of risk is correct.

The estimated risks may be 0.1 or 1 or they could be even higher – there is no way to know.

Regardless of which estimate of the risk quotient is correct (0.1 or 1 or higher), given the uncertainties discussed above and below, this HHRA has NOT demonstrated that the facility is acceptable.

5.2 Comparison of Risk Estimates Between 2015 and 2016

Table 4 shows the grid maximum annual average ground level concentrations and the risk estimates for each of these chemicals at these concentrations for both the 2015 and 2016 values to further support this conclusion.

Table 4 Comparison of Calculated Risks between 2015 and 2016 HHRA

Chemical	Normal Conditions – Oct 2016		Normal Conditions – Oct 2015	
	Ground level concentration (µg/m ³)	Risk Quotient	Ground level concentration (µg/m ³)	Risk Quotient
Acetone	0.0004	0.00000001	0.004	0.0000001
Acetonitrile	0.0003	0.00005	0.003	0.000005
Antimony (Sb)	0.0003	0.00001	0.0003	0.0001
Arsenic (As)	0.00008	0.00008	0.0008	0.0008
Beryllium (Be)	0.0000001	0.000007	0.000001	0.00005
Benzene	0.0003	0.00001	0.003	0.0001
Benzoic acid	0.002	0.0000002	0.04	0.000003
Cadmium (Cd)	0.0002	0.045	0.002	0.4
Cobalt (Co)	0.00008	0.0008	0.0008	0.008
Chromium (Cr)	0.0009	0.009	0.009	0.099
Copper (Cu)	0.0003	0.000002	0.003	0.000006
Dichloromethane	0.0004	0.0000002	0.004	0.000001
Ethyl benzoic acid	0.0007	0.00000006	0.007	0.0000005

Chemical	Normal Conditions – Oct 2016		Normal Conditions – Oct 2015	
	Ground level concentration ($\mu\text{g}/\text{m}^3$)	Risk Quotient	Ground level concentration ($\mu\text{g}/\text{m}^3$)	Risk Quotient
Hexachlorobenzene (HCB)	0.0000002	0.000001	0.00002	0.00001
Heptane	0.0001	0.0000002	0.001	0.000001
Hexadecanoic acid	0.0007	0.00000008	0.008	0.000008
Lead (Pb)	0.003	0.007	0.07	0.14
Mercury (Hg)	0.00008	0.0004	0.0008	0.004
Methyl hexane	0.0001	0.0000002	0.001	0.000001
Manganese (Mn)	0.0007	0.006	0.008	0.05
Molybdenum (Mo)	0.0000004	0.00000004	0.000005	0.0000004
Nickel (Ni)	0.0004	0.03	0.004	0.2
PCBs	3×10^{-10}	6×10^{-10}	3×10^{-9}	6×10^{-9}
PCDD/F	2×10^{-10}	0.00006	2×10^{-9}	0.0006
Phthalate	0.0004	0.00002	0.004	0.0002
Selenium (Se)	0.00004	0.000005	0.0005	0.00002
Silver (Ag)	0.000007	0.0000004	0.000007	0.000004
Tin (Sn)	0.00007	0.0000001	0.0007	0.000001
Trichloroethene (TCE)	0.0001	0.00006	0.001	0.0005
Tetradecanoic acid	0.0003	0.0000003	0.003	0.000003
Thallium (Tl)	0.00002	0.007	0.0002	0.07
Toluene	0.0006	0.0000001	6.36	0.001
Trichlorophenol	0.0002	0.00002	0.002	0.0002
Vanadium (V)	0.00002	0.00002	0.0002	0.0002
Xylenes	0.0002	0.0000002	0.002	0.000002
Zinc (Zn)	0.0007	0.000004	0.008	0.000005
Total		0.1		1.0
Acceptable Risk		≤ 1		≤ 1

5.3 Other issues affecting the risk estimates

Some other issues, in relation to the concentrations at ground level for the chemicals of potential concern and the estimated risks shown above, include:

- HHRA refers to titanium whereas the AQIA refers to thallium. It appears there has been some confusion as to which metal has been modelled. Thallium is much more toxic than titanium so adding the risk quotient for thallium instead of titanium has increased the total risk quotient slightly.
- Only chromium III is listed in the table of risk estimates, however, the value used is for total chromium and the reference concentrations listed in Table 16 of the HHRA lists the same value for both chromium III and VI so the assessment has effectively considered all chromium being discharged from the facility is in the form chromium VI. This is conservative.
- Total VOCs modelling in the AQIA
 - Measured emission data for VOCs (total organic carbon) from the various plants listed in Appendix C of Ramboll Environ COPC memo number 2 dated 19/10/2016 ranges from 0.03 to 5 mg/m^3 . In Appendix B of this memo the VOC concentration listed for the plant from which the breakdown of individual chemicals is 1.2 mg/m^3 .
 - In Table 7-4 of the AQIA report the VOC concentration listed for in-stack for this facility that was used in modelling for normal operations is 0.015 mg/m^3 . This value is half the lowest value that was measured for any of the listed plants.
 - This extremely low value shows that the modelling has not used the maximum value measured at the reference facilities.

- It is not clear why this extremely low value was considered appropriate for this facility.
- If the higher concentrations listed in the memo are used the maximum 1 hour ground level concentration predicted from the modelling could be 0.0006 mg/m³ for normal operations or 0.006 mg/m³ for upset conditions.
- Both these maximum 1 hour values (normal and upset) are below the screening criteria for planning assessments for benzene of 0.029 mg/m³ but they are much closer to this value leaving less room for the uncertainties that exist for this facility.
- Impact of assumed proportions for VOCs
 - Comparing the in-stack concentrations with the reference/acceptable concentrations identified in the HHRA allows the chemicals to be ranked as to their contribution to health impacts. As can be seen in the **Table 5**, some of the most toxic chemicals have some of the lowest in-stack concentrations. Small changes in those concentrations could change the risk profile.

Table 5 Assessment of proportions used for individual volatile organic compounds

Chemical	Listed In-Stack Concentration in Original COPC memo	Reference Concentration (adjusted for background) from HHRA	Comparison of In-Stack Concentration with Reference Concentration to Allow Ranking
Trichloroethene	0.005 mg/m ³	0.002 mg/m ³	2.5
Phthalates (as phthalic anhydride)	0.02 mg/m ³	0.02 mg/m ³	1
Trichlorophenol	0.009 mg/m ³	0.009 mg/m ³	1
Benzene	0.015 mg/m ³	0.024 mg/m ³	0.6
Acetonitrile	0.014 mg/m ³	0.054 mg/m ³	0.3
Hexadecanoic Acid	0.037 mg/m ³	0.9 mg/m ³	0.04
Tetradecanoic Acid	0.015 mg/m ³	0.9 mg/m ³	0.02
Xylenes	0.01 mg/m ³	0.87 mg/m ³	0.01
Methylhexane	0.006 mg/m ³	0.63 mg/m ³	0.009
Benzoic Acid	0.1 mg/m ³	12.6 mg/m ³	0.008
Heptane	0.005 mg/m ³	0.63 mg/m ³	0.008
Dichloromethane	0.02 mg/m ³	2.7 mg/m ³	0.007
Toluene	0.03 mg/m ³	5 mg/m ³	0.006
Ethyl Benzoic Acid	0.035 mg/m ³	12.6 mg/m ³	0.003
Acetone	0.018 mg/m ³	27.81 mg/m ³	0.0006
Total for Identified Chemicals	0.34 mg/m ³		
Measured Total VOCs for the facility from which this data was taken	1.2 mg/m ³		
Proportion identified	Approximately 30%		

- The calculation spreadsheets for the HHRA list the risk quotients for each of the chemicals based on the annual average ground level concentration for the grid maximum. The risk quotients are listed in **Table 6**.

Table 6 Further consideration of estimated risks for VOCs

Chemical	Grid Maximum Annual Average	Risk Quotients
Trichloroethene	0.0001 µg/m ³	0.00006
Phthalates (as phthalic anhydride)	0.0004 µg/m ³	0.00002
Trichlorophenol	0.0002 µg/m ³	0.00002
Benzene	0.0003 µg/m ³	0.00001
Acetonitrile	0.0003 µg/m ³	0.000005

Chemical	Grid Maximum Annual Average	Risk Quotients
Hexadecanoic Acid	0.0007 µg/m ³	0.0000008
Tetradecanoic Acid	0.0003 µg/m ³	0.0000003
Xylenes	0.0002 µg/m ³	0.0000002
Methylhexane	0.0001 µg/m ³	0.0000002
Benzoic Acid	0.002 µg/m ³	0.0000002
Heptane	0.0001 µg/m ³	0.0000002
Dichloromethane	0.0004 µg/m ³	0.0000002
Toluene	0.0006 µg/m ³	0.0000001
Ethyl Benzoic Acid	0.0007 µg/m ³	0.00000006
Acetone	0.0004 µg/m ³	0.00000001

- While these risk quotients are all low and concentrations would have to increase by a large amount to contribute significantly to the overall inhalation risk for this facility, there is still an issue with having confidence in the estimated ground level concentrations for this facility.
- In-stack concentrations for metals based on UK Environment Agency guidance
 - The UK EA have published guidance about levels of metals in emissions from waste incineration. Version 3 of this guidance was published in 2012 and Version 4 was published in 2016. The new version of the guidance lists higher emissions for some metals.
 - **Table 7** compares the in-stack concentrations used in the assessment for this facility with the mean and maximum concentrations listed in both Versions of this guidance from the UK EA.

Table 7 Metal concentrations

Chemical	Normal Conditions (mg/m ³)	UK Environment Agency Version 3 (mg/m ³)		UK Environment Agency Version 4 (mg/m ³)	
	October 2016	Mean	Maximum	Mean	Maximum
As	0.004	0.0007	0.003	0.001	0.025
Co	0.004	0.0004	0.004	0.0011	0.0056
Cr	0.047	0.011	0.052	0.008	0.092
Cu	0.016	0.0077	0.0163	0.0075	0.029
Mn	0.037	0.017	0.037	0.0168	0.06
Ni	0.021	0.022	0.1362	0.015	0.22
Pb	0.17	0.016	0.04	0.011	0.05
Sb	0.015	0.0033	0.0115	0.0014	0.0115
Sn	0.003	--	0.0024	--	--
V	0.001	0.0003	0.001	0.0004	0.006

- This table shows that the source of metals concentrations used for this assessment is in line with the maximum value listed in the UK EA guidance from 2012 for arsenic, cobalt, chromium, copper, manganese, antimony, tin and vanadium.
- However, this table shows that the source of metals concentrations used for this assessment provides lower in-stack concentrations than the maximum value listed in the UK EA guidance from 2012 for nickel and for the UK EA guidance from 2016 for arsenic, chromium, copper, manganese, nickel, antimony, tin and vanadium.
- The in-stack concentration used in this assessment for lead is higher than that listed in the UK EA guidance.
- Using lower values for the in-stack concentrations will result in lower estimates for ground level concentrations and lower estimated risks so without any justification for

using these lower values it is possible that the estimated risks in this assessment are too low.

- This is especially the case for nickel which is one of the main drivers of risk. The in-stack concentration for nickel in the 2016 UK EA guidance is ten times higher than the concentration used in this assessment. The estimated ground level concentrations for normal operations for nickel give a risk of 0.03 or 0.2 depending on which modelling outputs are correct. If an in-stack concentration ten times higher is used this would result in a risk estimate of 0.3 or 2 just from nickel alone.

6 Conclusions

The November 2016 version of the HHRA does not provide a robust assessment of risk for this proposed facility.

Some of the matters raised previously have been addressed in this revision – including assessment of grid maximums, addition of missing persistent/bioaccumulative chemicals to the multipathway assessment and correction of toxicity reference values.

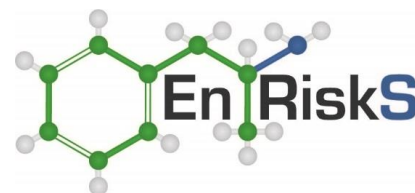
However, a number of fundamental issues still remain including

- uncertainty in the makeup of the feedstock
 - affects the understanding of what chemicals and how much of them could be present in the emissions
 - lack of a similar facility with similar feedstock to use in more realistic modelling means it is not possible to improve the confidence in the “more realistic” estimates of in-stack concentrations
 - as a result, there is a larger than usual uncertainty in the AQIA and HHRA and the estimated risks are not sufficiently low to be robust given that level of uncertainty
- comparison of modelled ground level concentrations between 2015 and 2016
 - there is a lack of transparency about why the estimated ground level concentrations are ten-fold lower in 2016 compared to the values estimated in 2015 because none of the inputs to the modelling have changed
 - this means that while the total estimated risk in 2016 is 0.1 it could actually be 1.0 depending on which is the correct modelling output
 - if the total estimated risk is 1.0 then the facility cannot be demonstrated to be acceptable
- Regulatory limits
 - the assessment of scenario 2 is not sufficient to show that the facility poses an acceptable risk at the regulatory limits

7 Limitations

Environmental Risk Sciences has prepared this report for the use of NSW Planning and NSW EPA in accordance with the usual care and thoroughness of the consulting profession. It is based on generally accepted practices and standards at the time it was prepared. No other warranty, expressed or implied, is made as to the professional advice included in this report.

The methodology adopted and sources of information used are outlined in this letter report. Environmental Risk Sciences has made no independent verification of this information beyond the agreed scope of works and assumes no responsibility for any inaccuracies or omissions.



This report was prepared in February/March 2017 and is based on the information provided and reviewed at that time. Environmental Risk Sciences disclaims responsibility for any changes that may have occurred after this time.

This report does not purport to give legal advice. Legal advice can only be given by qualified legal practitioners.

If you require any additional information or if you wish to discuss any aspect of this letter, please do not hesitate to contact Therese on (02) 9614 0297 or 0487 622 551.

Yours sincerely,

Therese Manning (Fellow ACTRA)
Principal
Environmental Risk Sciences Pty Ltd

Jackie Wright (Fellow ACTRA)
Principal/Director
Environmental Risk Sciences Pty Ltd

NSW Environment Protection Authority

Review of the Air Quality and Ozone Impact Assessment

Summary

The EPA has reviewed the amended EIS¹, AQIA² and ozone assessment³ for the EfW Facility. Not all outstanding air quality issues identified in the review of the response to submissions have been satisfactorily resolved, as detailed below. Further, additional issues with the air quality impact assessment have been identified which are also detailed below.

The ozone assessment issues identified in the exhibition review have been satisfactorily resolved (as below). The revised assessment discusses emission offsets within the Sydney basin concluding that offsetting is impractical. The revised assessment proposes optimised selective non-catalytic reduction (SNCR) as a best practice approach to reduce NO_x emissions. Sound reasoning is provided that optimised SNCR meets the requirement for best available technology. The reduction in NO_x emissions from deployment of optimised SNCR results in maximum ozone increment less than the significant impact level (0.5 ppb).

There remains considerable uncertainty surrounding the ability of the proposed EfW facility to achieve best practice emissions control. There are uncertainties regarding the sufficiency of the mixing to maintain chlorine content to less than 1% at all times, prevalence of treated wood waste in the fuel and floc waste composition. Further, as there is no suitable reference facility in terms of throughput, technology and feedstock it remains unproven that the proposed EfW Facility will achieve best practice emissions control.

Resolution of the air quality issues detailed below will not address the uncertainty regarding the ability of the proposed EfW facility to achieve best practice emissions control. Addressing the issues raised below will confirm the acceptability of the air quality of the facility emitting at a particular level but it will not confirm whether or not the plant can achieve the assumed emissions level.

Background

The Next Generation NSW Pty Ltd (TNG) is proposing to construct and operate an Energy from Waste (EfW) Facility. The facility would have a technological capacity to thermally treat up to 1.35 million tonnes of waste per annum and generate up to 137.3 MW of electrical energy (MWe) for export to the National Grid. The proposed EfW facility would be located within the Eastern Creek Industrial Estate, which is located 18 kilometres west of Parramatta and 12 kilometres east of Penrith. It will operate 24 hours a day and 7 days a week.

The project site forms part of a larger area of land which comprises the Genesis Recycling and Landfill Facility at Honeycomb Drive, Eastern Creek (EPL 20121 and EPL 13426). The nearest residential areas to the project site are Minchinbury, approximately 1 kilometre from the northern boundary of the broader site and Erskine Park, approximately 1 kilometre west of the broader site. The eastern boundary of the broader site is occupied by the Hanson Asphalt Batching Plant and the Hanson yard ('the Hanson site'). The land adjoining the broader site boundaries is owned by: The Corporate Group Alexandria Landfill Pty Ltd; ThaQuarry Pty Ltd; Australand; Hanson; Jacfin; The Department of Planning and Environment; and Sargents. The above sites are identified for potential redevelopment for higher end industrial and employment uses over the next decade under the State Environmental Planning Policy (Western Sydney Employment Area).

¹ Urbis (2016b) Amended Environmental Impact Statement, The Next Generation: Energy from Waste, Honeycomb Drive, Eastern Creek, November 2016

² PEL (2016a) Energy from Waste Facility – Air Quality and Greenhouse Gas Assessment, The Next Generation, 31 October 2016

³ PEL (2016b) Energy from Waste Facility – Ozone Impact Assessment, The Next Generation, 25 October 2016

The proposed EfW facility will source fuel from the adjoining Genesis Materials Processing Centre (MPC) and other authorised third parties. Energy will be recovered from the following residual waste fuel types: Genesis chute residual waste; commercial and industrial, construction and demolition, wood waste (treated wood), floc waste from car and metal shredding, paper pulp, glass recovery, green organics, AWT and MRF residual. Moving grate technology has been selected based on its capacity to handle a wide range of fuel types. The development will include four combustion lines and associated boilers (a four stream system), flue gas treatment systems, steam turbines and generator houses within a turbine hall and two auxiliary diesel generators each with a capacity of 2.4MWe.

TNG propose to build the facility in two phases: streams 1 and 2 in Phase 1 and streams 3 and 4 in Phase 2 when the applicant can demonstrate the required quantity of residual waste fuel is available to the facility. Each phase will comprise of two combustion grates, two boiler systems housed in one building, and each boiler has its own independent flue gas treatment system and connects to one turbine and one emission stack.

The flue gas treatment system includes:

- Optimised selective non-catalytic reduction (SNCR) for reducing emissions of oxides of nitrogen;
- dry lime scrubbing for reducing emissions of acid gases, including hydrogen chloride (HCl) and sulfur dioxide (SO₂);
- activated carbon injection for reducing emissions of dioxins and mercury (Hg); and
- fabric filters for reducing emissions of particles and metals.

The cleaned exhaust gases will be released to atmosphere via two separate 100m twin flue standalone stacks.

The EPA undertook an adequacy review of the draft air quality⁴ and ozone⁵ impact assessment for the proposed EfW Facility. Issues with the assessments were identified and it was recommended the exhibited assessments include additional information to address the outstanding issues.

The exhibited air quality impact assessment (AQIA)⁶ did not satisfactorily address all air quality issues identified in the adequacy review and additional issues were identified that need to be addressed (DOC15/289618). The exhibited ozone impact assessment⁷ was generally conducted consistent with EPA's published *Tiered Procedure for Estimating Ground-Level Ozone Impacts from Stationary Sources*. Further detail was requested on possible approaches to reducing potential ozone impacts from the proposal.

The documents to respond to agency's comments on the exhibited Environmental Impact Statement (EIS), AQIA and ozone impact assessment^{8, 9, 10} did not satisfactorily resolve all air quality issues identified in the exhibition review. Further, additional dispersion modelling was conducted as part of the response to submissions using revised stack exit parameters and lower emission concentrations. It was highlighted to the proponent that any emission limits for the project would be based on the revised modelling and the lower emission concentrations.

The ozone assessment issues identified in the exhibition review were not satisfactorily resolved in the response to submissions. This was due to the assessment of best practice to reduce NO_x emissions being based on incorrectly revised estimates of total NO_x emissions.

⁴ PEL (2014a) Energy from Waste Facility – Air Quality and Greenhouse Gas Assessment The Next Generation, 8 September 2014

⁵ PEL (2014b) Energy from Waste Facility – Ozone Impact Assessment The Next Generation, 20 June 2014

⁶ PEL (2015a) Energy from Waste Facility – Air Quality and Greenhouse Gas Assessment. The Next Generation, 26 March 2015

⁷ PEL (2015b) Energy from Waste Facility – Ozone Assessment. The Next Generation, 14 April 2015

⁸ Urbis (2015) Response to Agency and Company Submissions, November 2015

⁹ PEL (2015d) RE: Response to Submissions: TNG Energy from Wast Facility, Eastern Creek, 27 October 2015

¹⁰ Urbis (2016a) Response to Environmental Protection Agency (ARUP) Technology Assessment, 22 February 2016

ISSUES OF CONCERN

1. Insufficient information regarding the diesel generators

This issue has not been satisfactorily resolved.

The EIS and response to submissions reports were unclear regarding the proposed use of the diesel generators and the expected emissions performance. The EPA required the proponent to provide the following additional information regarding the emergency generators:

- Confirmation and further details regarding the proposed use of diesel generators and specifically whether or not they will be used to maintain the furnace temperature
- Concentration of air emissions from the diesel generators and their compliance with the relevant *Protection of the Environment Operations (Clean Air) Regulation 2010* (the Clean Air Regulation) emission standards
- Demonstration that benzene comprises 1% of the total VOC emissions from emergency diesel generators
- Revised air quality impact assessment which reflects worst case impacts from the proposed operation of the diesel generators.

Proposed Use of Diesel Generators

Urbis (2016b) and PEL (2016a) have clarified the proposed use of the two 2.4MWe emergency diesel generators as follows:

- One generator is for safe shutdown and the other is for black start
- Will not be used on a continuous basis and no more than 200 hours per year
- Emergencies such as a fire to ensure emergency lighting, fire-fighting pumps etc
- Scheduled and planned shutdowns

In events requiring a safe shutdown and black start the diesel generators will be operating for a minimum of 2 hours with a maximum of 6 hours for a black start if the plant shutdown is over a longer period.

The diesel generators will not be used to maintain furnace temperatures. The furnace design includes gas or diesel support burners. Gas is the preferred fuel and the proponent is in discussions with private gas supplier Jemena Gas Networks (Urbis, 2016b).

Compliance with the Clean Air Regulation

The emergency diesel generators must comply with all relevant Clean Air Regulation emission standards except NO_x. Clause 57A of the Clean Air Regulation exempts emergency generators operating less than 200 hours per year from the NO_x emission standards in Schedule 4.

Previous information provided by the proponent has been contradictory regarding the expected performance of the emergency diesel generators. The performance specifications for the diesel generators are in Appendix H of PEL (2016b). The performance specifications show the generators will mostly comply with the relevant Clean Air Regulation emission standards. Particulate emissions at 712kW is calculated to be 57mg/Nm³, which exceeds the Clean Air Regulation limit of 50mg/Nm³. The particulate emissions at all other power levels comply with the Clean Air Regulation.

The EPA will require that any conditions of approval include post commissioning testing of the diesel generators to demonstrate compliance with the relevant Clean Air Regulation emission limits. Installation of post combustion controls should be required if the tests indicate a non-compliance with the Clean Air Regulation.

Benzene Content of VOC Emissions

In the diesel generator dispersion modelling the proponent has assumed that benzene comprises 1% of the total VOC emissions. The EPA has undertaken a review of NPI emission factors and confirmed

it is suitable to assume benzene emissions from large diesel generators are approximately 1 % of total VOC emissions.

Impact Assessment

Dispersion modelling was undertaken to assess the ground level concentrations during the operation of the two diesel generators during emergency conditions. The results were presented in PEL (2015d) and demonstrate compliance with the EPA's impact assessment criteria.

The operation of the two diesel generators in isolation with no other sources at the EfW plant is not the worst case scenario. For example, it does not represent the scenario of monthly testing of the generators which would be operating concurrently with the EfW facility. PEL (2016a) presents the results of a worst case scenario where two diesel generators are operating concurrently with the EfW facility. The predicted concentration at the most affected sensitive receptor due to the generators is added to the maximum predicted concentration at or beyond the site boundary (stacks). The results for CO, PM₁₀ and PM_{2.5} are less than the EPA's assessment criteria. The benzene predicted concentrations also comply with the impact assessment criteria when the maximum concentration predicted at the boundary due to the generators is taken into consideration.

The compliance of the generators operating concurrently with the EfW facility with the NO₂ impact assessment criteria remains unclear. A total NO₂ concentration is not presented in Table 9-3 in PEL (2016a).

The EPA requires that the proponent is requested to provide total NO₂ concentration due to the generators and EfW facility operating concurrently.

2. No demonstration of suitability of secondary combustion chamber 850°C minimum operating temperature.

Uncertainty remains regarding the suitability of the secondary combustion chamber temperature.

The NSW Energy from Waste Policy Statement specifies a number of technical criteria for energy recovery facilities, including the minimum temperature and residence time of the gas resulting from the process:

'The gas resulting from the process should be raised after the last injection of combustion air, in a controlled and homogenous fashion and even under the most unfavourable conditions to a minimum temperature of 850°C for at least 2 seconds....If a waste has a content of more than 1% of halogenated organic substances, expressed as chlorine, the temperature should be raised to 1,100°C for at least 2 second after the last injection of air.'

The design of the proposed Energy from Waste Facility includes a secondary combustion chamber to optimise flow conditions and temperature profile, reduce CO concentration and improve burnout of the flue gas. In the secondary combustion chamber a minimum flue gas temperature of 850°C is proposed together with a residence time of 2 seconds.

During the adequacy review, the EPA requested the final EIS includes data to demonstrate that the chlorine content of the waste will be 1% at all times to confirm the suitability of the proposed secondary chamber flue gas temperature of 850°C.

Urbis (2015) and PEL (2015a) state the annual average chlorine content of the waste will be less than 1%. An annual average chlorine content is not sufficient and the proponent must commit to maintaining the chlorine content of the waste less than 1% at all times.

Another issue raised in Urbis (2015) is that a plant operating at 1100°C prevents efficient energy recovery. The EPA considers further more detailed explanation of the issues with the current technology that prevents efficient energy recovery at the higher temperatures needs to be provided

The EPA requested the proponent identify the expected chlorine content of the waste for the proposed EfW plant. This is the chlorine content that will be maintained at all times and not an annual average. Further, more detailed information must be provided regarding the issues with the current technology such that efficient energy recovery is prevented when operating at a temperature of 1100°C.

PEL (2015d) provided some information to address this outstanding issue. Reference was made to the different waste fractions in the feedstock being well known and the waste screening and sorting procedures. The memorandum on dioxin control (Appendix A.1) is also noted as is the flue gas treatment system which will ensure stack emissions will comply with in-stack emission limits.

Section 5.8 and Section 5.9 of Arup (2016)¹¹ raises related issues regarding treated wood waste and floc waste composition. These issues relate to the appropriate operating temperature of the facility and the chlorine content of the waste.

The amended EIS has provided some further information to address this issue. Urbis (2016b) states that chlorine content of the waste will be managed to be less than 1% at all times. This will be achieved by thorough mixing of the waste in the bunker by the crane driver who will pick it up and drop it in a different place of the storage area of the bunker. The EPA remains uncertain that this mixing is sufficient to maintain the chlorine content to less than 1% at all times. The issue of prevalence of treated wood waste in the fuel and floc waste composition also remain uncertain.

Therefore the ***suitability of the proposed secondary combustion chamber minimum flue gas temperature of 850°C remains uncertain.***

7. BAT for control of air emissions not demonstrated for proposed EfW plant

Uncertainty remains regarding performance of air pollution control equipment due to no reference facility.

Table 7-2 in PEL (2015a) provides an overview of Best Available Techniques (BAT) for EfW flue gas treatment and Table 7-3 provides the flue gas treatment at a selection of existing EfW facilities. This information is presented to demonstrate that existing technology can satisfy the emission limit requirements of the EU IED.

PEL (2015a) failed to consider the type of waste burnt at the existing facilities in Table 7-3. It is not highlighted whether or not these facilities are dedicated mixed municipal waste incineration facilities, hazardous waste incineration facilities or a combination. To demonstrate the proposed EfW facility will incorporate BAT for flue gas treatment, the proponent must make reference to an existing facility where the fuel mixture is identical to that for the proposed EfW facility.

The EPA recommended the proponent is requested to update Table 7-3 in PEL (2015a) to include the fuel type for the existing facilities and include additional existing facilities where the fuel mixture is identical to that for the proposed EfW facility. Should no facility exist where the fuel mixture is identical to that for the proposed EfW facility, the proponent must provide additional robust justification for the proposed plant design and technology.

PEL (2015d) provided an updated table which includes flue gas treatment and fuel type for the existing energy from waste facilities. The EPA notes Section 2.4.1 of Arup (2016)¹¹ raised similar issues regarding a suitable reference facility in terms of throughput, technology and feedstock.

The amended EIS and air quality impact assessment do not provide any further substantial information to address this issue. It is evident that there is no suitable reference facility in

¹¹ Arup (2016) NSW EPA The Next Generation (NSW) Energy from Waste Facility, Eastern Creek EIS, EIS Additional Information Gap Review, 14 June 2016

terms of throughput, technology and feedstock. It therefore remains unproven that the proposed EfW Facility will achieve best practice emissions control.

8. Revised dispersion modelling

This issue remains to be fully addressed. Progress has been made to address this issue.

The flue gas flow rates and exit parameters have been revised during the detailed design process for the project. Revised exit parameters were provided within the technical memorandum included as Appendix A.3 in PEL (2015d). The most significant change is the decrease in stack exit velocity from 35.8m/s to 21.7m/s. A decrease in stack exit velocity will result in an increase in predicted ground level concentrations.

The proponent also revised the in-stack concentration estimates based on operational emissions data from similar plant in terms of waste received and emission control system. The revised in-stack concentration estimates are provided in Appendix C of PEL (2015d) and are significantly lower than the Group 6 emission standards in the Clean Air Regulation and the emission concentrations assumed in the exhibited air quality impact assessment. A reduction in assumed emission concentration will result in a decrease in predicted ground level concentrations.

Additional dispersion modelling was conducted to determine the potential impact of the revised exit parameters combined with revised in-stack concentration estimates on predicted ground level concentrations. The results show a substantial reduction in predicted ground level concentrations for all pollutants. For example, a 97% decrease in 24 hour average PM₁₀ concentrations and a 74% decrease in cadmium ground level concentrations are predicted. Clearly, the substantial reduction in assumed emission concentrations far outweighs the potential increase in ground level concentrations that would be expected from a reduction in stack exit velocity.

The additional dispersion modelling incorporating the revised exit parameters combined with revised in-stack concentration estimates was presented in PEL (2015d) as the most up to date modelling for the project. Consequently, the proponent was advised that the EPA would use the revised in-stack concentration estimates in Appendix C of PEL (2015d) to recommend air emission limits for the project. Further, should the proponent seek emission limits different to those in Appendix C of PEL (2015d) then the dispersion modelling would need to be revised to reflect those emission limits in combination with the revised exit parameters.

PEL (2016b) includes the results of a regulatory scenario for the purposes of setting limits in the Environment Protection Licence. ***The EPA has identified issues with this scenario and all emission scenarios modelled to date which are detailed below.***

ADDITIONAL ISSUES OF CONCERN

1. Ambient impact assessment criteria are not included for all pollutants of concern

The EPA impact assessment criteria applicable for the assessment are summarised in Table 4.4 of PEL (2016a). All pollutants of concern for the project are not included in Table 4.4.

The EPA requires that the proponent update Table 4-4 to include all pollutants of concern for the proposed EfW facility.

2. Insufficient justification for the use of AERMOD

The AERMOD dispersion model was used to predict ambient concentrations of emitted pollutants from the proposed EfW Facility. PEL (2016a) does not adequately justify the choice of AERMOD for the assessment. Reference is made to validation exercises to confirm its satisfactory performance for both calm conditions and tall stack applications however the specific references are not provided. The use of AERMOD for other approved development applications is not sufficient justification for the use of

AERMOD for the proposed EfW facility. AERMOD, unlike other models such as CALPUFF, does not explicitly treat calm conditions. This is of concern due to the high percentage of calms (approximately 30%) in the meteorological data used in the air quality assessment.

The EPA requires that the proponent adequately justify the use of AERMOD to predict ambient concentrations of pollutants emitted from the proposed EfW facility. In particular, the superior performance of AERMOD for both calm conditions and tall stack applications must be discussed and reference made to other suitable models such as CALPUFF.

3. Emission rates not determined in accordance with the Approved Methods

Section 3.3 of the Approved Methods outlines the EPA's preferred methods for estimating the emission rate for each source: direct measurement and manufacturer's design specification. Emission factors are generally used when there is no other information available or when emissions can reasonably be demonstrated to be negligible.

PEL (2016a) presents a variety of emission scenarios, none of which are in accordance with the Approved Methods:

- **Emissions during normal operations:** estimated emission concentrations are based on stack testing data for existing reference facilities. Whilst the air pollution control equipment for the reference facilities is similar to that for the proposed EfW facility, there are substantial discrepancies in fuel type.
- **NSW Clean Air Regulation In stack Concentration Limits:** this scenario was presented to inform future Environment Protection Licensing of the EfW facility. It assumes in-stack concentrations at the Clean Air Regulation limits. The proposed EfW facility will clearly achieve emission concentrations less than the Clean Air Regulation limits. Ramboll (2016)¹² states that process guarantees will be set to ensure compliance with the (more stringent) Industrial Emission Directive (IED) emission limits as a minimum. The Clean Air Regulation scenario therefore does not represent the proposed operation of the EfW facility. It presents a 'pollute up to goal' scenario and is not reflective of the expected operation of the proposed EfW facility in a proper and efficient manner. The proponent is referred to Section 10.2 of the Approved Methods regarding the approach taken by the EPA to determine appropriate Environment Protection Licence emission limits.
- **Upset conditions:** expected emissions during plant upset. This does not represent the expected on-going performance of the plant.

The EPA considers PEL (2016a) does not include an emissions scenario which adequately represents the expected performance of the facility as required by the Approved Methods.

The EPA requires that the proponent present a revised assessment for the proposed EfW facility which includes an emissions scenario which adequately represents the expected performance of the facility. As there are no existing facilities using the same fuels as the proposed EfW facility, such an emissions scenario should be based on:

- ***Performance guarantee for the facility***
- ***Proposed fuel type.***

Further, emission rates and concentrations must be presented for all pollutants of concern for the proposed EfW facility and all Clean Air Regulation pollutants.

¹² Ramboll (2016) *The Next Generation NSW Pty Ltd, Project Definition Brief*, October 2016

4. Incremental and cumulative ground level concentrations not presented for all pollutants of concern

PEL (2016a) presents predicted ground level concentrations for three scenarios: normal, upset and regulatory. All pollutants of concern for the project are not included in the tabulated results. As an example, the only type 1 and type 2 substances included for normal operations is cadmium and mercury. Chlorine, a Clean Air Regulation pollutant is also excluded from the results for normal operations. The regulatory scenario excludes the following Clean Air Regulation pollutants: hydrogen chloride, chlorine, hydrogen fluoride and all type 1 and type 2 substances except cadmium and mercury.

The EPA requires that the proponent present assessment results for all pollutants of concern for the project for all modelled scenarios.

5. Control of vapour phase metals

The fuel for the proposal has the potential to contain substantial amounts of metals. This is due to the use of floc waste as a fuel and the high likelihood of treated timber being used as fuel.

The proposed air pollution control equipment, namely the baghouse, should adequately control particulate phase metals. The efficiency of the proposed air pollution control equipment for vapour phase metals is unclear.

The EPA requires that the proponent discuss how vapour phase metals will be controlled and provide manufacturers performance guarantees to demonstrate the control efficiency for vapour phase metals.

6. Assumption of 8000 hours

PEL (2016a) states that the assessment assumes the plant operates for 8000 hours per annum. The EPA is unclear where this assumption has been applied in the assessment and how it affects the assessment results. The air quality impact assessment must assume the plant operates for 8760 hours per annum.

The EPA requires that the proponent clarify the assumption of 8000 operational hours per year and how this assumption has been used in the assessment.

ODOUR IMPACT ASSESSMENT

The Approved Methods for the Modelling and Assessment of Air Pollutants in NSW defines a sensitive receptor as a location where people are likely to work or reside and should also consider the location of known or likely future sensitive receptors.

The project site is located within the Eastern Creek Precinct, in Central Western Sydney, 18 kilometres west of Parramatta and 12 kilometres east of Penrith. Land surrounding the site is owned by:

- The Corporate Group Alexandria Landfill Pty Ltd;
- ThaQuarry Pty Ltd;
- Australand;
- Hanson;
- Jacfin;
- The Department of Planning and Environment; and
- Sargents.

The above sites are identified for redevelopment for higher end industrial and employment uses over the next decade under the State Environmental Planning Policy (Western Sydney Employment Area). This land represents future sensitive receptors under the Approved Methods. There are residential areas located to the north and west of the site and existing industrial facilities are located to the east and south of the site. According to the Approved Methods the residential and industrial areas surrounding the site are also defined as sensitive receptors.

The odour impact assessment only presents the 99th percentile odour concentrations at a subset of particularly sensitive receptors (schools, child care centres etc) located within the residential areas to the north and west of the site. The proponent has not assessed the odour impact of the project at all sensitive receptors as defined in the Approved Methods. The odour impact should additionally be assessed at the existing places of work to the east and south of the site and the likely future places of work due to the re-development of the land surrounding the site.

The EPA requires that the proponent revise the odour impact assessment to include an assessment of the odour impact of the project at all existing and likely future sensitive receptors as defined in the Approved Methods for the Modelling and Assessment of Air Pollutants in NSW. This is to include locations where people reside and work.

OZONE IMPACT ASSESSMENT

Summary

The Next Generation NSW Pty Ltd (TNG) propose to establish an energy from waste (EfW) facility at Eastern Creek (the proposal).

The amended environmental impact statement finds:

- the revised proposal reduces ozone impacts below the significant impact level (SIL);
- optimised SNCR meets the criteria for best available technology to minimise NO_x emissions;
- NO_x offsetting is impractical in the Sydney basin.

The EPA finds that the amended ozone assessment meets the requirements set out in the EPA's '*Tiered Procedure for Estimating Ground-Level Ozone Impacts from Stationary Sources*':

- Level 1 screening of the revised proposal showed contribution to maximum ozone concentrations of less than the significant impact level (0.5 ppb).
- Adoption of optimised SNCR to reduce NO_x emissions meets the Procedure's requirement to consider best available technology (BAT).
- Offsetting NO_x emissions is impractical in the Sydney basin.

The EPA notes that detailed assessment of the initial proposal found ozone increments of up to 5.7 ppb whereas the amended ozone assessment determined an ozone increment of 0.47ppb. This is result of a revised proposal, namely, reduction in flue gas flow and a reduction in total NO_x emissions due to optimising the SNCR.

Documents

- '*Energy from waste facility – Ozone Impact Assessment*', Pacific Environment Limited, 14 April 2015 (PEL, 2015b)
- '*Amended Environmental Impact Statement The Next Generation: Energy from Waste Honeycomb Drive, Eastern Creek*', Urbis, November 2016 (Urbis, 2016b)
- '*Energy from waste facility – Ozone Impact Assessment The Next Generation*', Pacific Environment Limited, 25 October 2016 (PEL, 2016b) Appendix M to Urbis (2016b)
- '*Energy from waste facility – Air Quality and Greenhouse Gas Impact Assessment The Next Generation*', Pacific Environment Limited, 31 October 2016 (PEL, 2016) Appendix K to Urbis (2016b)
- '*BAT Evaluation*' Ramboll, 11 February 2016 (Ramboll, 2016b), Appendix KK to Urbis (2016b)

- *'Tiered Procedure for Estimating Ground-Level Ozone Impacts from Stationary Sources'*, Environ September 2011 available at <http://www.epa.nsw.gov.au/air/appmethods.htm>.
- *'Reference Document on the Best Available Techniques for Waste Incineration'* (BREF) European Union, August 2006.

Amended Environmental Impact Statement

An amended Environmental Impact Statement was submitted by TNG in November 2016 to support their development application (SSD 6236). This followed exhibition of the original proposal from May to July 2015, and includes a Response to Submissions addressing the issues raised in submissions on the original proposal. The proposal retains the development description, but has revised the Project Definition Brief and includes revised technical reports for air quality and greenhouse gases.

Ozone impacts – guidance, initial assessment, and issues raised

Guidance

The EPA has published a protocol for assessing potential regional ozone impacts, *'Tiered Procedure for Estimating Ground-Level Ozone Impacts from Stationary Sources'*, (Guidance) available at <http://www.epa.nsw.gov.au/air/appmethods.htm>. The EPA provided this guidance to TNG as Agency requirements.

The protocol defines a screening impact level (SIL) of 0.5 ppb. It further states that “incremental increase in excess of 1 ppb ozone has been selected as an unacceptable level within an ozone non-attainment area”.

Based on the outcomes of a screening assessment, the protocol states for a non-attainment area:

- for impacts less than the SIL, no further assessment needed, but a best management practice determination should be undertaken considering reasonably available techniques;
- for impacts greater than the SIL but less than the unacceptable level (1 ppb) no further assessment is required, but a best management practice determination should be undertaken including a cost-benefit analysis of best available technology and/or consideration of emission offsets;
- for impacts greater than the unacceptable level, the EPA may require a refined assessment.

The Sydney airshed is a non-attainment area.

Initial assessment

Assessment of the initial proposal found:

- detailed chemical transport modelling of impacts from the proposal for a period containing days reporting elevated ozone concentrations found proposal emissions increased ozone concentration by more than the threshold for impact (1 ppb) for a number of grid cells
- maximum increments were as much as 5.7 ppb, but increments greater than 1 ppb were limited to ozone concentrations less than 80 ppb and generally between 50 ppb and 70 ppb
- simulated concentrations showed that no increment resulted in an additional exceedence of the ozone impact assessment criteria (1-hour 100 ppb; 4-hour 80 ppb).

EPA review of the initial assessment

The EPA reviewed the initially exhibited EIS and found that it was generally consistent with the guidance provided. Given that the assessment found ozone concentration increases greater than the unacceptable level (1 ppb), the EPA requested:

- discussion of potential offsets
- confirmation of best available technology.

The Amended Assessment

The amended assessment contains:

- a revised screening assessment based on reduced emissions arising from modification of the proposal
- discussion of best available technology (BAT)
- discussion of potential offsets for NO_x emissions.

Discussion of BAT is based on guidance provided by the European Union.

Revised Ozone Assessment

Following comment on the initial proposal, TNG modified their proposal. The changes relevant to potential ozone impacts are:

- reduction in flue gas flow from 139.3 Nm³/s to 127 Nm³/s
- reduction in total NO_x in the flue gas from 200 mg/m³ to 120 mg/m³ from optimising the selective non-catalytic reduction (SNCR).

This reduces NO_x load by 45%.

Using these revised emissions in the screening tool results in increments less than the SIL – 0.47 ppb for 1-hour ozone, and 0.41 ppb for 4-hour ozone.

Best Available Technology

Included in the amended assessment as Appendix KK (Ramboll 2016b) is a discussion of best available technology (BAT). The discussion refers to the European Union's *Reference Document on the Best Available Techniques for Waste Incineration* published in August 2006 (BREF). It claims:

- all requirements defined by BREF regarding design are fulfilled
- the expected emissions are within the required operational values of the BREF
- the facility exceeds the requirements of the BREF.

The pollutant of concern is (total) oxides of nitrogen (NO_x).

NO_x reduction – SCR versus SNCR

Reducing emissions of NO_x is achieved from both optimised combustion conditions to minimise formation, and from reduction of NO_x in the exhaust gas stream. There are two approaches to removing NO_x from the exhaust stream, selective catalytic reduction (SCR) and selective non-catalytic reduction (SNCR).

Ramboll (2016b) includes comments from the BREF regarding SCR and SNCR. These occur for items 15, 32, 35, and 40 of BREF.

Item 40 of the BREF is quoted as:

“In general SCR is considered BAT where higher NO_x reduction efficiencies are required (i.e. raw flue-gas NO_x levels are high) and where low final flue-gas emission concentrations of NO_x are desired.”

However, item 32 notes the increased energy requirements of SCR and in particular recommends that facility design minimise the additional energy demand for reheating flue gas. The proponent notes that choosing SNCR rather than SCR avoids the need for flue gas reheating.

The proponent argues in the Executive Summary of PEL (2016b) that as overall NO_x emissions meet the SIL, higher NO_x reduction efficiencies are not required and hence SNCR qualifies as BAT.

EPA's Comment

The EPA accepts the use of BREF to define BAT. The EPA notes that both SNCR and SCR reduce NO_x emissions, with SCR generally providing greater reductions in NO_x but requiring additional energy to operate. The EPA agrees that for the proposal as described, SNCR meets the requirements set out in the Guidance.

Potential NO_x Offsets

Section 11 of PEL (2016b) discusses potential NO_x offsets by referring to the EPA's 2008 emissions inventory for the Greater Metropolitan Region. They find that NO_x offsets are problematic because of the nature of emissions sources in the Sydney basin.

Within the defined Sydney region, the top eight anthropogenic sources of NO_x are transport related. These are a very large number of small sources and not readily amenable to NO_x offsets.

The next two largest source categories are gas-fired electrical generation, and petroleum and fuel production. It is expected that gas-fired electricity generation has already been optimised for NO_x emissions so cannot provide an offset. The two petroleum refineries comprising the other source have both closed and therefore also cannot provide offsets.

The proponent argues the nature of emission within the Sydney basin – very few large discrete emission sources – makes offsetting NO_x emissions impractical.

EPA's Comment

The EPA agrees that NO_x offsetting is not practical within the Sydney basin.

Assessment outcomes

Urbis (2016b) asserts that (section 13.6, p204):

“In terms of ozone impacts, during normal operation of the plant, the emission levels are generally expected to be well within the limit value”.

EPA's Comment

The EPA finds that assessment meets the requirements set out in the EPA's *'Tiered Procedure for Estimating Ground-Level Ozone Impacts from Stationary Sources'*.

- Level 1 screening of the revised proposal showed contribution to maximum ozone concentrations of less than the significant impact level (0.5 ppb).
- Adoption of optimised SNCR to reduce NO_x emissions meets the Procedure's requirement to consider best available technology (BAT).
- Offsetting NO_x emissions is impractical in the Sydney basin.

The EPA notes that detailed assessment of the initial proposal found ozone increments of up to 5.7 ppb whereas the amended ozone assessment determined an ozone increment of 0.47ppb. This is result of a revised proposal, namely, reduction in flue gas flow and a reduction in total NO_x emissions due to optimising the SNCR.

NSW Environment Protection Authority

Review of the Soil and Water Assessment

Documents Reviewed

- Response to Agency Comments on Soil and Water Report, The Next Generation, Energy from Waste Plant, Eastern Creek.
- Letter Response 26 October 2015, Edison Environmental & Engineering

Detailed Comments

A. Document: Environmental Impact Statement: The Next Generation NSW Energy from Waste Facility, Eastern Creek, April 2015.

1. In Table 5, page 55, it is stated under column "Control Measures" row "Soils and Water" that:

"If high salinity soils are encountered, these soils will be removed for covered storage and blended with less saline soils prior to re-use as backfill."

It should be ensured that during storage and/or during blending, saline runoffs are prevented from entering the local water course (Ropes Creek tributary) if high rainfall periods are encountered. It would be advised, that salinity (EC) levels in the Creek be measured when it is flowing, and any waters (such as runoffs or groundwater dewatering) with higher salinity be prevented from entering the creek. High salinity can be toxic to aquatic organisms and plants located onsite and/or downstream from the site of development, especially if discharges contain high bicarbonate together with other toxicants.

EPA's comment: Response satisfactory

2. On page 158, section 15.4.2 "Ground Water" it is stated that:

"It is expected that seepage water will be suitable for transfer to the construction-phase stormwater management systems. Poor quality groundwater may be encountered in some areas, such as elevated salinity associated with saline soils or highly alkaline water perhaps with elevated ammonia levels associated with the volcanic breccia present beneath the hill in the northern part of the site. On-site treatment, blending with stormwater or transfer off-site to a suitable, licensed disposal site may be necessary as a last resort."

The comments in point 2 above is also relevant to this statement as any high salinity and nutrient rich water should be prevented from entering the creek. Further details are also probably required as to the method that will be employed to decide what treatment any groundwater encountered would require.

EPA's comment: Response satisfactory

B. Document: Assessment of Soil and Water Impacts: Proposed Energy from Waste Facility, Eastern Creek, April 2015

3. Page 16, section 3.7.1. It is concluded from previous reports (ADI 1995 & ADI 1998) that groundwater at the site is not contaminated, although the writer questions the validity of the analytical results. It is also stated that: *"It is further noted that low-levels of both TPH*

and PAH can occur naturally in samples of bedrock in the Wianamatta Group rocks” although a reference to this statement is not provided. Recent site contamination investigations by ADE (2014) have not analysed the ground water to verify this conclusion.

It is advised that the ADI (1995 & 1998) reports or relevant extracts be provided for verifications along with a reference that substantiates the claim that natural TPH and PAH levels occur in the bedrock.

EPA’s comment: Response satisfactory. However, the EIS still does not appear to have provided the requested reports, ADI 1995 and ADI 1998.

4. Page 25 mentions bio-retention basin, however this basin is now being used as a storage/treatment pond of runoff stormwater prior to discharge into a tributary of Ropes Creek.

Clarification is required of any water treatment that will be carried out prior to discharge. For example flocculation etc. If any treatment will be carried out, additional details of the chemicals used (eg. flocculant etc.) is required together with an explanation of dosing systems (automatic or manual) to avoid residual chemicals migrating into the creek.

EPA’s comment: Satisfactory response. However, changes and clarifications are not provided in the document itself. It is recommended that clarification be added to the Assessment of Soil and Water Impacts document.

5. Page 26, section 5.2 refers Table 5.2 for monitoring details. Table 5.2 indicates relevant sampling locations 1 to 7, however the actual locations of these sampling points are not identified in a location plan.

Provide diagrammatic locations of the proposed sampling points.

EPA’s comment: A diagrammatic location of the sampling points are not provided. Figure 3.6 shows only 3 surface water sampling points but no sampling points are stated to cross reference Table 5.1. Table 5.2 has been removed from the document. The response document provides a description of the sampling locations 1-7 from the IGGC (2015) report. This description should be included in the Assessment of Soil and Water Impacts document.

6. Page 26 refers to one of the Suite A analytes as “*total heavy metals*”.

Clarification is required as to what this “analyte” actually represents. It appears that this refers to total concentrations of individual heavy metals, however, the individual heavy metals are not specified.

EPA’s comment: The response has clarified the issue. However, it is recommended that relevant section of Assessment of Soil and Water Impacts document be amended to include the full list of heavy metal being tested. Therefore, Suite A contaminants should specify As, Cd, Cr, Cu, Hg, Ni, Pb and Zn. The term *total heavy metals* is ambiguous and should not be used. Replace it with either unfiltered heavy metals or total concentrations of heavy metals.

7. Page 27: Consider adding turbidity field measurement to suite B and suite C analytes.

EPA's comment: Response satisfactory

8. Additional information is required of the management options available if any of the Table 5.2 monitoring shows non-compliance.

EPA's comment: Response satisfactory

C. Document: Construction Environmental Management Plan: Energy from Waste Facility, Eastern Creek. Brookfield Multiplex Construction. Revision 3.

9. On page 25, second row of the table, it is stated that water carts/sprays may be used in dust control.

Consideration needs to be given to the source of water used in such spray dust control devices and any potential inhalation exposure pathway for onsite workers/visitors and any potential off-site receptors.

EPA's comment: Response satisfactory

10. Section 7.3, page 26, Table: Management Strategies. It is recommended that salinity (as electrical conductivity) be included in the list of water quality targets to be achieved prior to discharge into the creek. This is important as the groundwater is saline while the surface water creek may not be. The EC target can be established by undertaking background monitoring of EC in the creek and using ANZECC (2000) guidelines for establishing appropriate EC limit. Indicative limits for EC for different water systems are also provided in ANZECC (2000) guidelines.

EPA's comment: Response satisfactory

D. Document: Targeted Phase II Detailed Site Investigation, 6th August, 2014.

11. The detailed site investigation only investigated levels in the soils, sediments and surface waters. While the groundwater level is generally deep at the site, there are areas with perched groundwater. Generally, groundwater analysis is a good indicator of any site contamination (that can be missed by targeted soil sampling) and mobilisation of such contamination.

EPA's comment: An explanation is required to detail the reasons for not testing any groundwater and verifying the conclusions in the Assessment of Soil and Water Impacts Report, as per point 4 above.

12. Page 46, section 8.7.1 Heavy Metals. It is stated that:
"Four (4) surface water samples were analysed for heavy metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc). All of the samples returned values below the adjusted threshold criteria for 'Extremely Hard' water."

Furthermore, it is noted on page 11 of the report that the creek was not flowing during investigations and *"the water depth was no greater than 0.2 m and dry in many sections."*

It should be noted that the above scenario would have also concentrated the salts and the presence of "extremely hard water" may not be reflective of normal flow conditions during times when the creek is actually flowing. Therefore, the hardness corrected guideline values derived may not be applicable when the creek is actually flowing. For any future assessments it is recommended that the hardness of creek water be re-tested to verify hardness. Also, the

hardness correction of copper is not recommended as it has been clearly shown that hardness corrected values of copper is not protective of all aquatic species and this may be removed in the reviewed ANZECC guidelines. See paper:

Markich et al. (2005) Hardness corrections for copper are inappropriate for protecting sensitive freshwater biota. *Chemosphere* 60:1-8.

EPA comment: It is again highlighted that hardness correction of heavy metals is problematic as it does not protect all aquatic species. Hardness correction using extreme hardness is again problematic for the site as background hardness does not appear to be well established. It is recommended that hardness correction is not used for any of the heavy metals.