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6 December 2022

NSW Department of Planning and Environment
Attention: Sally Munk

Email: Via the Major Projects Portal

Dear Ms Munk

Woodlawn Advanced Energy Recovery Centre (SSD-21184278)
Additional Information required following review of Environment Impact Statement

I am writing in reply to your request for comment from the Environment Protection Authority (EPA) regarding the Woodlawn Advanced Energy Recovery Centre (SSD-21184278) Environmental Impact Statement (EIS) received via the Major Projects Portal on 21 October 2022.

The EPA has reviewed the EIS and determined that it will require further information or clarification to complete its assessment and to provide further advice on the proposal. These requirements are detailed in **Attachment A** and relate to:

- Waste and Resource Recovery
- Air Quality
- Water Quality
- Noise
- Contaminated Land Management
- Greenhouse Gas Assessment

The Department of Planning and Environment (DPE) in collaboration with the EPA has engaged a technical expert, ARUP, to undertake an independent technical assessment of the proposal against the *NSW Energy from Waste Policy Statement*. The EPA may require further information once it has reviewed the independent expert's review.

Should you require any further information, please contact Paul Wearne (02) 42244100 or email environmentprotection.planning@epa.nsw.gov.au .

Yours sincerely

Mitchell Bennett
Unit Head – Statutory Planning

Attachment A: EPA information requirements following review of Woodlawn ARC EIS

ATTACHMENT A – EPA information requirements following review of Woodlawn ARC Environmental Impact Statement

WASTE AND RESOURCE RECOVERY

1. Resource Recovery Criteria and Associated Quality

The following information and/or clarification is required:

a) Further justification of how the project will, with respect to municipal solid waste (MSW) and commercial and industrial (C&I) waste:

- **promote the source separation of waste where technically and economically achievable,**
- **drive the use of best practice materials recovery processes; and**
- **ensure only the residual material from genuine resource recovery operations are eligible for use as a feedstock for an energy recovery facility.**

Approximately 80% of Veolia's target feedstock (304,000 tonnes per annum) is expected to come from kerbside MSW i.e. red bin waste from Greater Sydney Councils. The balance is putrescible residual C&I waste (up to 20% being approximately 76,000 tpa) aggregated at the Banksmeadow and Clyde transfer terminals.

The EIS states that the 'no limit' criteria (in Table 4 of the *NSW Energy from Waste Policy Statement* titled "Resource recovery criteria for energy recovery facilities – mixed waste streams") are expected to apply to a significant proportion of the waste stream by the time commissioning of the Woodlawn Advanced Recovery Centre (ARC) commences in 2025. This is expected to apply to all residual MSW in NSW by 2030. While the balance of C&I waste is expected to meet the minimum criteria in the NSW *Energy from Waste Policy Statement*, the EIS also presents contingencies should there be any shortfall in source separated of MSW and C&I wastes.

The *NSW Energy from Waste Policy Statement* objectives in setting resource recovery criteria are broader than just satisfying the eligibility criteria. EfW proposals must also demonstrate that they:

- promote the source separation of waste where technically and economically achievable,
- drive the use of best practice materials recovery processes; and
- ensure only the residual material from genuine resource recovery operations is eligible for use as a feedstock for an energy recovery facility.

While the EIS discusses actions including government waste strategies and the sourcing of waste via contracts with suppliers that have source separation of waste, the EIS does not include information that demonstrates how the proposal will achieve the above objectives. Instead, it appears to focus on satisfying the eligibility criteria for MSW and C&I wastes.

b) Clarification on the waste types and descriptions used in the waste feedstock analysis to justify that the compositional comparison against the reference facility is reliable and appropriate.

c) Provide additional information about the chemicals and potential contaminants envisaged to constitute "organics."

The EIS summarises numerous categories of MSW and C&I wastes as potential sources of feedstock where high levels of organics has been recognised in the feedstock. Organics appears not to be defined in the EIS however the EPA considers the term 'organic" would apply to those wastes derived from a plant or animal that is biodegradable including food and garden wastes, timber and biosolids. It is unclear if the full range of organics have been considered in the waste categories used in the detailed compositional analysis from audits to demonstrate the suitability of the reference facilities.

For example, some organics may be contaminated with, for example, persistent organic pollutants which are resistant to thermal treatment and/or may decompose partially into compounds that are more toxic, such as PCBs into dioxins/furans.

d) Further identification and consideration of all potential chemical contaminant risks that may be present in MSW and C&I waste streams and measures to minimise such risks.

e) Confirmation that the feed stock will be characterised in accordance with the *NSW Waste Classification Guidelines* and how the project will ensure the feed stock quality will be suitable as a waste fuel.

The EIS presents a process of quality control of feedstock that relies on contractual arrangements for MSW and C&I wastes, visual inspections and audits. However, there is the potential risk for the MSW and C&I waste streams to be contaminated with problematic wastes. In this regard greater rigour is needed to demonstrate and provide confidence in the quality of the feedstock.

For example, waste streams may be contaminated with non-conforming items or contain or be contaminated with chemical contaminants, such as per and polyfluorinated alkyl substances (PFAS), brominated flame retardants, pesticides, and metals. These chemical contaminants have the potential to be present in organic, plastics, e-waste (approximately 1.5% of the proposed feedstock), textiles (approximately 6% of proposed feedstock) and other wastes known to be present in MSW and C&I waste streams. In addition, mixed waste streams have the potential to contain asbestos and other hazardous materials.

It should be noted that the *NSW Energy from Waste Policy Statement* states that “waste streams proposed for energy recovery should not contain contaminants such as batteries, light bulbs or other electrical or hazardous wastes”. In this regard it is important that any waste fuels to be processed are monitored and verified as suitable as waste fuel. All waste must also be characterised in accordance with the *NSW Waste Classification Guidelines.*

f) Further information on whether non-combustibles and inert materials can be excluded as potential feedstock inputs through the proposed best practice material recovery processes.

The EIS states that approximately 5% of the proposed feedstock is non-combustibles/inert. These include glass, metal, construction materials, demolition debris and other waste. In addition, approximately 6% of the feedstock is described as “Other”, however the composition of this category is not specified. Due to the potential for a significant proportion of the waste feedstock to be non-combustible or waste that is not well characterised, further information should be provided on relevant aspects such as:

- The potential for fluxes/melts to be generated with residual glass, silicates, and salts once the organics are burned off, and associated impacts on the plant and process.

- Potential chemicals, substances and contaminants that may be captured under the “Other (not specified)” waste feedstock input category.

- The screening that will be performed to ensure non-conforming waste does not enter the feedstock inventory or is minimised through the use of best practice techniques.

g) Further justification is required on the potential risks associated with the management of PFAS contaminated waste in the feedstock. This should include information on:

- **any proposed testing regime of the feedstock for PFAS; and**
- **details on whether the treatment process can thermally decompose PFAS including any implications for waste ash residues.**

The EIS states that the risks due to the presence of PFAS is expected to be very low to negligible within the feed stock. However, the EIS states that approximately 7% of the proposed feedstock is textiles. Textiles have the potential to be contain PFAS however this waste source appears not to have been identified as a product of risk in the EIS. In this regard further justification is required on the potential risk of PFAS in the feedstock, including details on any monitoring programs and performance of the treatment process to decompose PFAS.

h) Further information about feedstock acceptance limitations for the chemicals and potential contaminants associated with each waste category. Which are known to be particularly problematic, at what concentration and why?

It is important that feedstock acceptance limitations are understood for the proposal. This will help inform procedures to guide improved quality control as problematic wastes have the potential to cause exceedance of regulatory limits for air emissions, waste residues and potentially impact upon the efficiency of thermal processes (eg, refractory lining decomposition by fluoride).

i) Clarify and define what will constitute unacceptable wastes or non-compliant wastes.

The EIS states that there is potential for minor quantities of non-conforming waste to inadvertently be accepted into the ARC. However, the waste listed as unacceptable wastes or non-compliant wastes (Appendix G, Section 5.4) is not clearly defined.

j) A commitment to establish a radiation monitoring system to screen the feedstock to prevent any radioactive materials from being treated at the facility.

The EPA notes the proposal does not refer to any waste delivery monitoring system that includes radiation detection to prevent the treatment of any radioactive materials at the ARC. This requirement is consistent with *Best Available Techniques Reference Document for Waste Incineration (2019) requirement (#11)* for the monitoring of waste deliveries from municipal solid waste and other non-hazardous waste.

2. Incinerator Bottom Ash (IBA) Management

The following information and/or clarification is required:

a) Further details on the IBA maturation process and its effectiveness, including:

- **if and how frequently the stockpiles will be turned,**
- **what the optimum moisture content is and how this will be determined,**
- **details on the technique to monitor maturation to confirm it has started and is complete; and**
- **identify any potential hazards associated with the maturation process including any management and mitigation measures.**

IBA is proposed to be stockpiled at a maturation pad for up to 3 months to facilitate hydration and carbonation, which reduces the pH of IBA and reduces leachability by generation of more stable (less soluble) compounds.

The time required to stabilise the ash residues depends upon the stockpile conditions and ash composition. Periods of 3 to 6 months are often necessary before weathering reactions produce significant changes in IBA characteristics. During this time leachate containing metals is produced and must be managed. Dust impacts may also result if the stockpile is not appropriately situated and managed.

The EIS provides limited information on stockpile management and its effectiveness. For example, it is unclear if the stockpiles are required to be turned to ensure consistent and effective maturation of all the IBA prior to disposal or reuse. Quenching is required for the IBA to reduce the ambient temperature and optimise the moisture content of the IBA for further processing and handling. However, details on the optimum moisture content of the IBA have not been provided, including techniques that will be used to monitor, the progress of maturation. It will be important that excess water is not applied to the IBA which could potentially dissolve soluble metals and result in leachate.

The proposed maturation process assumes that the heavy metals will readily conjugate with the carbonate anion and there are no competing anions present such as fluoride, sulphate, or chloride. An analysis of IBA anion concentration would assist to determine the availability of anions which will inform the leachability of heavy metals.

Depending on the waste types that have been incinerated, hydrogen and phosphine may potentially be produced from the reaction of IBA with moisture and air which are potentially hazardous. The EPA notes that this is not considered in the Hazard Assessment that supports the EIS.

b) Documentation of potential contingencies in the event the IBA is not classified as GSW.

c) Provide details of the proposed leachate management of the stockpiled IBA.

There is also uncertainty on the classification of IBA because its composition depends on the quality of waste feedstock. This could also change over time due to additional recycling and resource recovery activities and varying feedstock waste characteristics. The proponent (Veolia) needs to document contingencies if the classification of IBA is classified RSW or Hazardous Waste, including storage, handling and management pathways. Ongoing testing and characterisation of waste will be needed to identify any significant changes in input feedstock as well as residual waste outputs.

d) A commitment to ongoing testing and characterisation of the IBA in accordance with NSW Waste Classification guidelines or resource recovery order and exemptions prior to any reuse or disposal.

e) Acknowledgement that a resource recovery order and exemption is required to be obtained prior to any reuse of wastes if the project is approved.

f) Provide alternative management and disposal options of IBA in the event that a resource recovery order and exemption is not approved.

The supporting Ash Management Study states that IBA will be ready for either disposal or beneficial re-use as detailed below:

- Disposal: During the initial operation phase of the plant (nominally 6 months) and once laboratory analysis confirms that the material is suitable for characterisation as GSW, the IBA will be transported by trucks to the existing Woodlawn Bioreactor landfill for disposal as required; and
- Alternative cover: After the actual physical and chemical characteristics of the material can be established, Veolia intends to seek approval for the use of the IBA as alternative cover material at the Woodlawn Bioreactor landfill and/or proposed APCr encapsulation cell.

The EPA does not generally support the following:

- use of IBA for daily cover material which has concentrations of contaminants that exceed the Contaminant Thresholds (CT1 and CT2) in the *NSW Waste Classification Guidelines*. With greater than 50% by mass having a particle size less the 1mm, the risk of mobilisation of this material containing high concentrations of lead and chromium would make this material unsuitable for use as an alternate daily cover material.
- reuse of IBA under a resource recovery order or exemption if it exceeds CT1 and CT2 thresholds.
- resource recovery orders or exemptions for RSW or hazardous waste.

g) Further justification on reuse opportunities for the IBA and the need for a review processes every 5 years.

h) An estimate of the composition of IBA on an oxide basis to help support re-use opportunities.

The supporting Ash Management Study states that IBA will be ready for either disposal or beneficial re-use. Following the initial waste characterisation phase, Veolia intends to investigate the potential for beneficial re-use of the IBA. Options for beneficial re-use of the IBA would be revisited periodically (e.g., at most 5-year intervals), once compositional data is available on the IBA and as the Australian EfW and associated resource recovery industries develop.

The EPA understands Veolia has recently received approval from the Victorian EPA for a bottom ash recycling facility at its Maryvale Energy from Waste (EfW) facility. The facility will process bottom ash and recover a range of metals before transferring them for recycling. The remaining inert materials will be suitable for processing in the manufacture of Maryvale Recycled Aggregate (MRA), a product that can be used in road construction as a sustainable alternative to traditional asphalt. The EPA is also aware of numerous examples of IBA being recovered from overseas EfW facilities and reused in the construction industry. For example, the composition of IBA on an oxide basis makes it suitable for the (UK) construction industry. In this regard further justification is sought on why the project does not include a recycling facility for the IBA and why there is a need for ongoing reviews of reuse opportunities if such a technology is currently available to the proponent.

i) Clarification if ferrous metals might require cleaning or pre-treatment prior to being transported offsite for processing, and if so, detail this process.

The EIS states IBA will be screened and separated to remove ferrous and non-ferrous metals for transport offsite for recycling at an appropriately licensed facility. However, it is unclear whether the ferrous and non-ferrous metals require cleaning or pre-treatment to remove any attached IBA prior to offsite processing. If ferrous metals do require cleaning, the facility will need to be designed to incorporate an appropriate process for this purpose.

j) Clarification of how bulky items that cannot be processed or recovered from IBA will be managed.

The EIS states oversized items from the bunker or within the IBA will be extracted and separated from other waste for storage in onsite open topped bins. However, no further information is provided on the management of these oversized or bulky items.

3. Air Pollution Control Residue (APCr) Management

The following information and/or clarification is required:

a) Details on the expected quantity and quality including likely classification of boiler ash and possible reuse options.

The EIS references ash residues obtained from similar plants in UK, France and Canada as being typical in composition and concentration to those generated at the ARC. In particular, UK plants mix boiler ash with IBA which gets repurposed for reuse in the construction industry. APCr, however, is kept separate due to it containing higher concentrations of leachable heavy metals which prevents it from being reused.

The EPA notes that where the boiler ash is segregated from the APCr (as in the UK plant design), this may offer repurposing and beneficial reuse options for the boiler ash. In addition, segregation of these waste streams may reduce the amount of hazardous waste requiring treatment and disposed to landfill. Consequently, where it is possible to separate the boiler ash from the air pollution control residue, a better environmental outcome may be achieved that is consistent with the EPA's waste hierarchy and *Waste and Sustainable Materials Strategy 2041*. with respect to prioritising and promoting reuse and resource recovery over disposal.

b) Justification of why the boiler ash and APCr are combined to form a single waste stream.

The EPA considers that the combination of APCr and boiler ash may result in dilution of the contaminant levels in the APCr unless it can be shown it has immobilising characteristics. The EPA's general classification principles states "two or more classes of waste must not be mixed in order to reduce the concentration of chemical contaminants. Dilution of contaminants is not an acceptable waste management option." In this regard justification is required on why the boiler ash and APCr are combined to form a single waste stream rather than segregating and finding a reuse opportunity for the boiler ash.

APCr is described in the EIS as "*ash and residue products from the flue gas cleaning process and are recovered in the baghouse filter system (dry and semi-dry scrubbers) and/or sludge recovered from wet scrubbing systems*." Fine, dry carbonaceous and siliceous particulates may entrap gases within their microstructure that can be liberated upon contact with water. To ensure the proposal will manage the boiler ash and APCr in accordance with best practice, further information should be provided on the following:

- the mixing or segregation of waste streams generated.
- the handling and management of waste streams, including how gas liberation will be avoided or minimised.
- the quantity of boiler ash estimated to be produced.
- the estimated composition and classification of the boiler ash.
- the pozzolanic characteristics of the boiler ash (if any) and its potential for reuse.

c) Further justification in relation to treatment options and potential reuse for the APCr.

The EIS states that the encapsulation cell is designed to be used for the disposal of stabilised air pollution control residue (APCr) material from the ARC. Following immobilisation with cement, the APCr is expected to be classified as RSW. In the absence of such treatment APCr would be classified as hazardous waste.

Table 5.1 in the supporting Treatment Options Review (Appendix E of the EIS) presents a list of potential treatment options with commentary on technology maturity, feasibility, and availability in Australia in relation to immobilising APCr. Based on these criteria, phosphate stabilisation and three matrix solidification techniques were identified: cement-based, concrete production and geopolymer.

Table 5.1 identified phosphate stabilisation and cement solidification as preferred options for APCr stabilisation. Cement solidification is the eventual method chosen, based on cost benefit analysis. However, phosphate stabilisation is a mature technology that receives widespread use for the fixation of heavy metals such as lead (Pb). This option might not be suitable where metalloids such as arsenic (As) or thermally resistant organics are present in the APCr. Based on concentrations of As in the Metro Vancouver EfW facility ash data, up to 160 mg/kg of As has been identified. In addition, no information has been presented or discussed about the presence of cyanides. If APCr is to be mixed with acidic and/or alkaline media (where water is being used that has potentially acidic qualities), there is the potential for cyanide liberation depending on its chemical form. In this regard further information is required on:

- The estimated Arsenic content in the APCr.
- The mechanism for precipitation of heavy metals as phosphates, noting the heavy metals are likely to be in a carbonated form and sparingly soluble/insoluble.
- The likelihood of cyanides being present in the APCr, and whether they might be in a form that could be liberated when mixed with acidic and/or alkaline media.
- The estimated composition of APCr on an oxide basis.

Further justification is also required in relation to potential reuse options for the APCr instead of treating and disposing the APCr to landfill. For example, heavy metal immobilisation using geopolymers is well understood, and Austroads has published guidance on the use of geopolymeric materials in civil construction projects. While dependant on the silica and alumina oxide composition of APCr, this material might have application as a geopolymer precursor where there are Australian-based companies that manufacture such geopolymeric materials.

d) Further information on the likely water/solids ratio required to ensure adequate cement hydration where solids include cement, APCr and boiler ash.

e) Further information on the heavy metal concentration(s) required to ensure effective cement-based microencapsulation fail.

The report notes that for waste treatment using cement solidification, mixing ratios for ash: cement range from 1:4 to 1:2 and suggests a microencapsulation mechanism for immobilising contaminants within the APCr. For the cement to hydrate and generate the necessary microstructure, sufficient water must be added.

Heavy metals are known to retard cement hydration particularly Pb and Zn due to their conversion to hydroxy species which consumes calcium and hydroxide ions delaying surrounding porewater supersaturation and C-S-H gel precipitation. Ordinary Portland Cement is also not considered a suitable medium to capture mercury (Hg) and arsenic (As) compared with sulphate-rich cements. Further, phosphate stabilisation is also unsuitable for arsenic as it can mimic the phosphate anion (as arsenate, AsO_4^{3-}) and form soluble metal arsenate complexes. If Hg and As are potential contaminants of concern in the APCr, the treatment technology will need careful selection (and demonstration) to immobilise them.

f) Acknowledgement that only APCr waste that is classified as RSW or GSW can be lawfully received at the encapsulation cell if approved. This will need to be achieved through a specific immobilisation approval (SIA) if the project is approved.

If the proposed development is approved, Veolia intends to seek an Environment Protection Licence for the encapsulation cell for the scheduled activity of Waste Disposal, Application to Land. Veolia should be aware that approved landfills in NSW are not permitted to receive hazardous waste. In this regard any APCr that is hazardous waste must be treated to a level that will enable the disposal at the licensed facility (if approved) as either RSW or GSW. This will need to be achieved through a specific immobilisation approval (SIA) issued by the EPA for this purpose if the ARC is approved.

Veolia is seeking an "in principle SIA approval" for cement immobilisation. It should be noted that the EPA does not grant "in principle approvals" because SIAs require robust, repeatable analytical data that justifies reclassification. However, while quantities of treated ash are produced during commissioning, Veolia may wish to seek an "interim" SIA subject to satisfying the appropriate application criteria if the project is approved. For example, an interim SIA can have the following advantages:

i. only a small volume of material is used to select the most effective treatment method and equipment without committing large stockpiles
ii. it will allow removal of successfully treated material to "clear the decks" at the proposed treatment site so that further testing/verification is not disrupted due to storage concerns
iii. the data obtained under the interim SIA can be used in part to build the scientific basis for a SIA that permits full-scale treatment works for a longer duration

The EPA would welcome the opportunity for further discussions with Veolia on such approaches if needed.

g) Contingency measures if the encapsulation cell is not approved or is unavailable to dispose of APCr.

Contingency measures must be considered and planned for, such as in case the encapsulation cell is not approved, an immobilisation approval is not forthcoming for the APCr, or if there is an issue with cell operation.

4. Encapsulation Cell Design

The following information and/or clarification is required:

a) Further details on the design of the encapsulation cell, to ensure it is consistent with the requirements for a restricted solid waste landfill outlined in the *Environmental Guidelines for Solid Waste Landfills*.

This must include:

- Further details on management of groundwater contamination and the need for a groundwater relief system.
- Further details on filling requirements to achieve subgrade levels.
- Further assessment of mining-induced subsidence risks.
- A commitment that the detailed design will ensure:
  - overtopping of evaporation dams into the encapsulation or leachate cells does not occur
  - armouring of the embankments occurs to prevent erosion.
  - the water balance ensures that the site remains zero discharge.

- Further details be provided on drainage that consider the potential for:
  - seepage from adjacent ponds to flow towards and under the Encapsulation Cell; and
  - the potential for loading from construction and filling of the Encapsulation Cell to cause consolidation settlement and water expulsion from underlying alluvial clay soils.
- A consolidated program of progressive capping and closure to minimise leachate generation, for example Cell 1A should be fully capped prior to construction of Cell 2A.
- A commitment that a certification will be sought from an appropriately qualified and experienced engineer that the slope stability will be suitable for the long-term encapsulation of the waste.
- Information on the fill materials where an operational purpose deduction will be sought
- A commitment to a financial assurance that satisfies the EPA Financial Assurance Policy (EPA 2022) for the encapsulation cell.

The EIS states that the encapsulation meets the requirements outlined in the *Environmental Guidelines for Solid Waste Landfills* (2016). It also states that it was designed based on a 25-year operational life and is to be designed and constructed in accordance with the minimum standards for restricted solid waste landfills. This includes a double composite base and side slope liner with a leak detection system.

The EIS states that the closest approach of the planned workings of the adjoining mine is approximately 150 m laterally offset from the proposed Encapsulation Cell and at a depth below ground surface in the order of 500 m. The design should document any potential risk associated with mining-induced subsidence to ensure the integrity and performance of the proposed encapsulation cell can be maintained.

The Encapsulation Cell is to be located within ED1, with the existing embankment wall separating ED1 and ED2 forming the western cell edge and a portion of the southern embankment wall of ED1 forming the southern cell edge. As these evaporation dams will continue to be operated it is essential that these embankments are structurally suitable and that provisions are made to prevent overtopping into the encapsulation and associated leachate cell, and seepage into groundwater. The detailed design of the encapsulation cell should expand on the measures to be used to manage this risk.

There will also be significant filling required to achieve subgrade levels above the groundwater levels to enable formation of the cell floor to the required geometry. Veolia proposes to import general fill materials, compliant with technical specification requirements from offsite sources to make up for any deficit of available onsite fill materials. They also propose to seek an Operational Purpose Deduction (OPD) for these imported fill materials. The EPA requires further information on the fill materials to be used and the quantities for which an operational purpose deduction will be sought.

The EIS states that a groundwater relief system will be considered during the detailed design phase. A more detailed assessment is required to address current water management issues at the site.

Sizing of the leachate collection storage has assumed measures that limit the area of leachate collection system to no greater than 6000 m^2 at any time during Encapsulation Cell operation. These measures will be critical to ensure leachate can be managed. Progressive capping is required to be undertaken to achieve this outcome. A tighter program of progressive capping and closure is sought to minimise leachate generation. For example, Cell 1A should be fully capped prior to construction of Cell 2A. This should then roll forward so that as one cell is closed, one is operational, and another is being constructed. This ensures that progressive capping and closure is undertaken in a staged approach that minimises leachate generation.

The maximum average batter slopes of the Southern and Western Batters 4.25H:1V (23.5%) exceed the 20% slope that is recommended to be avoided by the *Environmental Guidelines for Solid Waste Landfills* (2016). Slope stability will need to be addressed further during detailed design and include an engineering assessment of the proposed slopes to ensure structural stability.

If approved, the encapsulation cell will require EPA licensing and be supported by a financial assurance to secure guarantee funding for its in-perpetuity management and ongoing performance. A commitment is sought from Veolia that a financial assurance will be provided for the encapsulation cell, if approved, that satisfies the EPA Financial Assurance Policy (EPA 2022).

AIR QUALITY

1. Representativeness of emissions data from reference facility

The following information and/or clarification is required:

a) Clarification is required regarding the design and configuration of the reference facility flue gas treatment system. This should include information that demonstrates that the assumed emissions, referenced from the Staffordshire ERF, are reasonable noting any differences in the plant configuration (e.g. 1 single processing line compared with 2 processing lines) and actual mass of wastes treated.

The key reference facility used to support this project is Veolia's W2R Staffordshire ERF. This facility uses similar technologies including moving grate combustion and Selective Non-Catalytic Reduction (SNCR) for treatment of NOx emissions. However, the Staffordshire ERF operates in two lines, whereas the Woodlawn Advanced Energy Recovery Centre (ARC) is proposed as a single line.

Operational data from the Staffordshire plant for the year 2017 is provided in Appendix GG of the EIS. The operating information is provided in Section 3 and a copy of the table is provided below.

3. OPERATIONAL INFORMATION

Operational Details		
Operational hours	Line 1: 8280 Line 2: 8251	Hours
Total Waste Incinerated	337,701	Tonnes
Total Municipal Waste Incinerated	303,968	Tonnes
Total Commercial Waste Incinerated	33,733	Tonnes
Metals Recovered	3,206	Tonnes
Incinerator Bottom Ash Produced	66,518	Tonnes
APC Residues	8,267	Tonnes

Figure 1: Excerpt from Section 3 of EIS Appendix GG, Operational data from Staffordshire ERF (Four Ashes facility), 2017 Annual Report EPR/HP3431HK (26/01/2018).

From the table it is observed that each of the two lines had close to equal operating hours, with line 1 operating for 8,280 hours and line 2 operating for 8,251 hours. The total waste incinerated was 337,701 tonnes for the period. Meaning that each line processed approximately 169,000 tonnes.

It is understood that each processing line at the Staffordshire facility has its own line of pollution control. Each line would therefore be treating air emissions from the combustion of only 169,000 tonnes, opposed to the 380,000 tpa proposed for the project.

It is also noted from Appendix GG that the total commercial waste incinerated in 2017 was 33,733 tonnes (or an assumed 16,900 tpa per processing line). The ARC is expecting to process up to 76,000 tpa of C&I waste.

Furthermore, it is understood from Table 5-4 of Appendix L(i) (Woodlawn ARC BAT Assessment) that flue gas recirculation is not used at Staffordshire, however it is proposed for Woodlawn

(Section 2.2.4 of the AQIA). It is not described what effect the recirculation of exhaust gases will have on emissions nor any discussion on the representativeness of the Staffordshire data, noting the different design feature.

Therefore, further information is needed to demonstrate that the emissions data referenced from the Staffordshire plant is comparable to the ARC project. This should include information to account for any expected change in emissions due to differences identified in the plant configurations and mass of wastes incinerated.

2. Waste Profile

The following information and/or clarification is required:

a) Further information on the organic content of the waste feedstock expected at the ARC, compared with the waste feedstock of the reference facility, and discussion of the potential effects the increased organic content could have on air emissions

Figure 7.1 of the AQIA provides an indicative feedstock comparison between the ARC and the Staffordshire ERF. It is noted that there are some differences in the waste profiles of the Staffordshire ERF and the ARC. Most notably, the Woodlawn waste feedstock is expected to comprise of significantly more organics (40.5%) compared with the Staffordshire ERF (25%). The AQIA does not include any detailed discussion about the difference in organic content of the waste feedstock between the two facilities. Nor is there any detailed discussion regarding any effects the increased organic content is expected to have on air emissions.

3. Ammonia exceedances

The following information and/or clarification is required:

a) Further information on controls and measures proposed to prevent or minimise emissions of ammonia to ensure compliance with the EfW Policy emission standards.

Continuous Emission Monitoring System (CEMS) data, sourced from the Staffordshire ERF shows (Figure 7.8) a high proportion of days (approximately 30%) above the 24-hour average ammonia (NH_3) standard prescribed in the NSW EfW Policy. The elevated NH_3 concentrations are attributed to NH_3-slip associated with the SNCR technology installed for the control of NOX emissions. It is stated that the ARC would be designed to control NH_3 emissions to comply with the relevant NSW EPA EfW Policy standard. However, the AQIA does not include any emission performance guarantees nor does it describe how ammonia slip will be managed.

4. Modelling Scenarios

The following information and/or clarification is required:

a) Further information to understand the potential for air quality impacts. Specifically, an additional modelling scenario where high concentration pollutants are combined with minimum flow rates should be considered in the assessment. As a minimum, this scenario should be run for all criteria pollutants.

CALPUFF has been used to perform dispersion modelling for the project. Three scenarios have been considered to account for emissions from the ARC building stack under a range of conditions, as follows:

- **Scenario 1** – reference case emissions (expected). Scenario 1 emission rates reflect average stack emission parameters (Table 7.3) and the average measured emission concentrations from the 2017 Staffordshire ERF emissions data (Section 7.2.1i). It is argued that Scenario 1 is likely most representative of the expected achieved emission performance of the ARC.
- **Scenario 2** – reference case emissions (maximum). Scenario 2 assumes maximum stack emission parameters (Table 7.3) and maximum (100th percentile) measured emission concentrations from the 2017 Staffordshire ERF emissions data (Section 7.2.1i). The maximum

emissions have been further ‘up-scaled’ (Section 7.2.1ii) to account for interannual variability in maximum concentrations. Scenario 2 is intended to represent a conservative upper bound estimation of potential air quality impacts from the project.

- **Scenario 3** – NSW EfW Policy regulatory case emissions. Scenario 3 represents the combination of maximum stack emission parameters (Table 7.3) and the emission concentration standards prescribed in the NSW EfW Policy. Scenario 3 is intended to represent the highest potential impacts from the project if operating at the maximum allowable emission rates under the NSW EfW Policy.

While the EPA considers this approach generally appropriate, to fully understand the potential for impacts under all operating scenarios, further evaluation of impacts under high-concentration, low flow-rate conditions should also be presented. These conditions have the potential to lead to poorer dispersion and as such, impacts could differ from those modelled under average and maximum flow rates.

5. Background Data

The following information and/or clarification is required:

a) **A copy of all ambient air monitoring datasets, used for determining the background air quality, should be provided for the modelled year (2018) (in excel form or similar).**

Ambient background concentrations have been derived from the following regional monitoring sites:

- the NSW Department of Planning and Environment (DPE) air quality monitoring station (AQMS) at Goulburn (38 km north-north-east of the Eco Precinct) for PM10, PM2.5 and NO_2;
- the NSW DPE AQMS at Bargo (125 km north-east of the Eco Precinct) for SO_2 only; and
- the ACT Government AQMS sites for PM10, PM2.5, NO2, O3 and CO at:
    - Florey (52 km west-south-west of the Eco Precinct);
    - Civic (47 km west-south-west of the Eco Precinct); and
    - Monash (59 km south-west of the Eco Precinct).

A daily varying background dataset (PM10 and PM2.5) was derived for 2018 based on the average concurrent daily observations recorded at the 3 ACT sites. The same approach was used for NO_2 and CO. It is assumed that the same approach is used for ozone, however this is not explicitly stated. The NSW DPE Goulburn AQMS station only commenced monitoring in November 2019.

To illustrate the similarity in regional particulate matter concentrations, a correlation between the PM_{10} and $PM_{2.5}$ concentrations recorded at the 3 ACT Government AQMS and the Goulburn AQMS has been undertaken. Pearson’s correlation coefficient (*r*) values ranged from 0.73 to 0.82 indicating general agreement between the PM_{10} and $PM_{2.5}$ concentrations recorded at the ACT Government and Goulburn AQMS sites.

Furthermore, the ozone limiting method (OLM) has been used for evaluating predicted impacts of NO2. The calculations used in the method use the hourly-varying ozone (O_3) concentrations recorded at the ACT Government air quality monitoring stations during 2018. The adopted O3 data has not been adequately justified. Furthermore, this data has not been provided.

6. Assessed Pollutants

The following information and/or clarification is required:

a) Details on emission rates for selenium and tin.

b) Provide justification for the metal emissions speciation profiles adopted.

c) Ensure assumed emission concentrations for Type 1 and 2 substances comply with the emission standard prescribed in the NSW EfW Policy statement.

The listed metals that comprise the Type 1 and 2 substances referenced from the Staffordshire ERF test data (Table 7.2), is inconsistent with the Type 1 and 2 listed substances in the NSW EfW Policy Statement (see Table 1 below). Furthermore, the Staffordshire ERF stack sampling data does not contain emission concentrations for beryllium, selenium or tin. EMM has used the USEPA SPECIATE profiles for waste incineration to derive an emission concentration for each substance, based on the fraction of total particulate matter measured at the Staffordshire facility. Justification has not been provided for selecting the SPECIATE profile.

Table 1: List of Type 1 and 2 Substances, Staffordshire and NSW comparison table.

Staffordshire	NSW (Woodlawn)
antimony	Antimony
Arsenic	Arsenic
chromium	Chromium
Cobalt	Cobalt
Copper	Lead
Lead	Manganese
manganese	Nickel
Nickel	Vanadium
vanadium	Cadmium
	Beryllium
	Mercury
	Selenium
	Tin

The adopted emission rates are presented in Table 7.6. A specific emission rate for Type 1 and 2 substances is not included. Rather, emission rates are provided for individual substances. Emission rates for Selenium and Tin appear not to have been included in the table. Furthermore, the total emission rate for Type 1 and 2 metals is shown to be 0.026023 g/s (calculated by EPA). The maximum flow rate (for Scenario 3) is given as 83.2 Nm^3/s. This results in an assumed emission concentration of 0.313 mg/m^3, which exceeds the emission standard prescribed in the NSW EfW Policy statement of 0.3 mg/m^3.

d) An assessment of ground level impacts of selenium, cobalt, tin, vanadium and thallium.

Predicted incremental ground level concentrations ($\mu g/m^3$) for principal and individual air toxics are presented in Table 9.2 of the AQIA. The predicted ground level impacts of some type 1 and 2 substances (selenium, cobalt, tin and vanadium) are not included. Furthermore, impacts of thallium are not presented. Whilst there is no specific impact assessment criterion for these elements listed in the Approved Methods, they are identified as likely pollutants from the source and as such their impacts should be evaluated.

e) Further evaluation on VOC emissions including the adoption of more conservative assumptions (e.g., benzene as 100% of TOC) or sensitivity analysis to better understand the worst-case impacts for the proposal

Benzene has been adopted as a proxy for the assessment of VOCs, on the basis that if compliance is achieved for benzene, compliance can be assumed for other VOCs. Speciation profiles for organic species were not available from the Staffordshire ERF reference, as only total organic compounds (TOCs) are measured. As such, a speciation profile has been sourced (profile 122 for waste incineration) from SPECIATE, a US EPA repository of speciation profiles of air pollution sources. From profile 122, Benzene has a weight percent of 39.3%, which is applied to the modelling results for TOCs to predict the benzene concentration.

The EPA would expect that adopting a Benzene percentage of 100% (of TOC) would represent a more conservative approach. In this regard further work should be undertaken to better evaluate the 'worst case' impacts of total VOC's via the adoption of more conservative modelling assumptions.

f) Further justification and discussion on the use of the ozone limiting method for predicting ground level concentrations of NO2. The in-stack ratio adopted into the calculation should be derived from source-specific data where available, and adequately justified.

The Ozone Limiting Method (OLM) has been used to predict the NO2 ground level concentration. By default, the OLM assumes that approximately 10% of the initial NOX emissions are emitted as NO2 and that all of the available ozone in the atmosphere will react with NO in the plume until either all the ozone or all the NO is used up.

The equation for OLM, which has been adopted in the assessment, has a default in-stack NO2/NOx ratio of 0.1. However, the NO2/NOx ratio can vary depending on source. As such, the in-stack ratio should be derived from site-specific data (where available). All adopted values must be adequately justified.

7. Emissions Inventory

The following information and/or clarification is required:

a) The potential impacts associated with emissions from the Bio-Energy Power Station based on maximum allowed emission concentrations of 450 mg/Nm^{3}Bio-Energy power station and flares.

b) Provide further justification for all assumptions used in the AQIA.

c) Provide data, including summarised emission test data, to support all calculations in the AQIA.

d) Provide a detailed description of the steps used to calculate the total emission rates in the AQIA

Emission rates are based on annual stack testing data collected from the Bioenergy power station. Annual testing is a requirement of Environment Protection Licence (EPL) number 11436.

Annual emission rates for the BioEnergy Power Station have been derived from point source (stack testing) measurements from a single landfill gas engine (Engine 2) between 2015 and 2020. The emissions test data was not provided. There are seven gas engines currently operating, with a further 3 proposed for Hub 2. As such, it appears that equal emission performance has been assumed for all engines. This assumption has not been discussed nor justified in the assessment.

An average measured NOx concentration (355.3 mg/Nm^3) based on Engine 2 stack test data has been presented. However, the EPL specifies a limit of 450 mg/Nm^3. When the annual emission rates (for the assumed 10 landfill gas engines) are calculated using the EPL limit (see Table 2 below), the estimated annual emission rate is increased by 48% (from 147,812 kg/yr to 218,545 kg/yr)

Further work should be undertaken to better quantify the potential impacts based on approved emission limits.

Table 2: BioEnergy Landfill Gas Engine Emission Rates.

Pollutant	Measured concentration (mg/Nm^3)	Measured flow rate (Nm^3/s)	Emission rate (g/s)	Calculated emission rate	Total Emission Rate (10 engines) (g/s)	Total Emission Rate (10 engines) (g/day)	Total Emission Rate (10 engines) (kg/yr)
NOx (assumed concentration)	355.3	1.54	0.55	0.5472	5.472	472,748	172,553
NOx (EPL Limit)	450	1.54		0.693	6.930	598,752	218,544
Difference (%)							+48%

e) Further information is required to support the fuel usage rate adopted for the landfill gas engines.

Flow rate into the engine (from the landfill) is stated in the assessment to be 3,500 m^3/hour (total gas flow to the power station). However, no reference nor data is provided to support this assumption. Furthermore, information should be provided to support the adopted fuel flow rates.

f) Clarification is sought on the total approved number of landfill gas engines for the Bio-Energy facility for future operations, including Hub 2.

g) Adequate justification must be provided for the total number of engines assumed to be operating in the modelling scenarios.

It has been assumed that there will be 10 landfill gas engines operating under future scenarios comprising of 7 existing engines at Hub 1 and 3 additional future engines at Hub 2. However, it is unclear if the total approved number of engines for Hub 2 is limited to 3, or if more engines could or would be installed.

h) Emissions data presented in Table 7.2 of the AQIA be reviewed for accuracy, ensuring that the correct units of measure are being stated for all pollutants, including, but not limited to PAH's.

The average emission concentration for PAHs presented in Table 7.2 of the AQIA is 0.4175 ng/Nm^3. This concentration value does not reconcile with the emission rates presented in Table 7.6 of 2.96×10^{-5} and 1.21×10^{-4} for scenarios 1 and 2 respectively. It is suspected that a typographic error may have occurred. Notwithstanding this, the data included in Table 7.2 should be reviewed to ensure the data is accurate and that the correct units of measure are being stated for all listed pollutants.

i) Copies of referenced reports, including the Golder (2021) soil analysis report.

The haulage of APCr material from the ARC building to the encapsulation cell contributes approximately 6% to 7% of total predicted PM_{10} concentrations. Fugitive metal emissions associated with wheel generated dust from the haulage of APCr to the encapsulation cell has been assessed, based on a speciation profile derived from soil analysis presented in Golder (2021)[1]. The derived average weight percentages are shown in Table C.12. In this regard a copy of the Golder (2021) report should be provided.

j) Review of the emissions inventory tables in the AQIA for accuracy and amendment where necessary.

There appear to be some errors and anomalous figures in emissions inventory input Tables C.9 and C.10. Specific issues identified are:

- Table C.9: The list of activities and associated rates and variables appear to be repeated (i.e. all activities are listed twice)
- Table C.9: Anomalous figures appear that cannot be accounted for – see activities 'crushing UG ore' and 'Rehandle UG ore'.
- Table C.10: An anomalous value of 2.22 appears in column 12 (Conveyor/ transfer – IBA to processing pad)

Similar issues are identified in Table C.7 (see 'FEL spreading' and 'unloading at tip face'). Consequently, all tables should be thoroughly checked for similar issues.

8. Emission Sources

The following information and/or clarification is required:

a) Discussion on the design and operation of the air extraction and exhaust system proposed for the ARC tipping hall; and

b) Discussion on technology proposed for controlling odour emissions from the tipping hall.

Section 2.2.1 of the AQIA states: '*During operations, the tipping hall will be maintained under negative air pressure, with air from the hall being drawn into the furnace. The tipping hall will also be equipped with an 'odour extraction system'*. It is anticipated that the system will extract air at a rate of approximately 10,000m^3 per hour from above the waste bunker, discharging via a filtration system to a stack. However, details on the design of the air extraction system have not been provided. It is not known if engineering controls will be used to control emissions from the tipping hall via the extraction system. Furthermore, it has not been discussed how odour from the tipping hall will be controlled during periods when the furnace is not operating.

c) Details regarding the IBA quenching process and associated air emissions and controls.

d) Further discussion regarding the processing of IBA and the potential for emissions from the IBA building. Full enclosure of all waste processing activities, including incinerator bottom ash processing, should be considered to ensure compliance with the best practice requirements of the *NSW Energy from Waste Policy Statement.*

e) Further discussion on the measures proposed to prevent or minimise emissions from the storage, handling and maturation of IBA material. Proposed measures should be aligned with best practice techniques.

Incinerator bottom ash (IBA) is approximately 20% by weight of original waste (i.e. 20% of 380,000 tpa = 76,000 tpa). Following combustion, IBA will be discharged through an ash quencher. However, there is no discussion on expected emissions from the quenching process, nor any discussion on the controls used for treating emissions from the quenching process.

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[1] Golder 2021, Stage 1 – Preliminary Ground Assessment, Woodlawn Advanced Recovery Centre, 12 May 2021.

IBA processing will occur in a semi-enclosed building. Within this building screening and metals recovery operations will take place. However, there is no discussion on the potential for emissions from this building. It is not clear if air extraction and capture systems are proposed.

Following processing the IBA will be stockpiled in windrows up to 5 m in height on the maturation pad for a maturation period of at least 3 months. The IBA maturation pad will have the capacity to stockpile up to 19,000 t of IBA. There is no discussion on the proposed mitigation and management of fugitive dust emissions from the storage and handling of IBA material on the maturation pad. Furthermore, no control factors have been applied in the emissions inventory.

The particle size of > 50% of IBA material is expected to have a particle size of <1 mm diameter. Furthermore, IBA is likely to contain hazardous materials including, but not limited to, dioxins/ furans and metals (Antimony, Cadmium, Thallium, Mercury, Lead, Chromium, Copper, Manganese, Nickel, Arsenic, Cobalt, Vanadium, Zinc and their compounds). As such, best practice measures should be employed to prevent or minimise emissions from the storage, handling and maturation of IBA material.

Best practice design for waste processing facilities typically comprises of a fully enclosed building to house waste processing activities. For example, the *European Industrial Emissions Directive (IED) Best Available Techniques* conclusions (BAT-C) (November 2019) describes appropriate techniques for mitigating against fugitive dust emissions from the treatment of slags and bottom ashes such as IBA. These techniques include BAT 24 (a) *Enclose and cover equipment* and BAT 24 (f) *Operate under sub-atmospheric pressure*. BAT 26 should also be considered which states that *BAT is to treat extracted air (from the enclosed processing building (BAT 24 (f)) with a bag filter*.

Other sub-sections of BAT 24 refer to the mitigation of fugitive emissions from material handling and stockpiling slags and bottom ash. Such better practice management would also minimise any risk associated with leachate generation and runoff and erosion of the stockpiles. Where appropriate, these BAT's should be incorporated into the design of the facility and described in full in the AQIA.

f) Information on the demineralisation plant and evaluate any potential for air quality impacts from its operation.

The EIS identifies a demineralisation water treatment plant that will be located inside the ARC building. Potential air quality impacts from the demineralisation of the water have not been discussed.

9. Modelling Results

The following information and/or clarification is required:

a) Contour plots for all modelled scenarios (both incremental and cumulative) for criteria pollutants.

b) Demonstration that the modelling domain is appropriate, captures maximum impacts and plume grounding is not occurring outside the modelled domain.

c) The maximum predicted impacts occurring across the domain, in addition to the sensitive receptors currently considered. The maximum impacts should be presented for all criteria pollutants for all scenarios.

Section 9 of the AQIA includes discussion and results on the dispersion modelling. Contour plots for project-only incremental concentrations of particulate matter, NO2, SO2 and NH3 are presented in Figure 9.6 to Figure 9.15 for Scenario 1 and Figure 9.16 to Figure 9.25 for Scenario 2. Contour plots for Scenario 3 have not been included and nor have contour plots for cumulative impacts.

It is noted from the limited contour plots presented in the AQIA, that for some modelled scenarios and pollutants, the predicted contours extend beyond the mapped area shown in the figures (e.g. figure 9.10, 9.22). Furthermore, the maximum predicted impacts across the modelling domain have not been presented.

It must be adequately demonstrated that the modelling domain selected is appropriate for the project, considering the release sources. For example, the release height of the ARC building stack is 85 m (Table 7.3), the modelling domain must be appropriately sized to account for any plume grounding occurring.

d) Additional information to demonstrate that incremental impacts are being predicted and reported accurately. Where appropriate, provide detailed explanation for why there is no change in predicted impacts when annual emissions have increased.

Table 7.8 in the AQIA presents the estimated annual emissions for approved activities and each scenario. There is a noted increase in emissions for some pollutants (e.g. NOx) however, there is no corresponding change in predicted impacts (Table 9.1). Upon review of the incremental modelling results for all receptors (Table D.1 and Table D.2), it appears that there is no change in predicted impacts (at any sensitive receptor) for some pollutants including NOx.

Table 7.8 Annual emissions summary – all source categories

Air pollutant	Annual emissions by source type (kg/year)								
	Bioreactor – approved	Bioreactor - future	MBT - approved	Woodlawn Mine	BioEnergy power station	ARC fugitives	ARC building – Scenario 1	ARC building – Scenario 2	ARC building – Scenario 3
TSP	203,837.6	151,576.5	50,600.8	85,183.2	5,057.3	19,775.9	102.9	2,360.4	52,453.6
PM_{10}	55,799.7	41,577.6	13,956.3	28,295.2	5,057.3	6,057.5	102.9	2,360.4	52,453.6
$PM_{2.5}$	6,074.7	4,500.2	1,532.6	5,634.2	5,057.3	927.2	102.9	2,360.4	52,453.6
Dioxins and furans	-	-	-	-	-	-	3.7E-05	1.6E-04	2.6E-04
SO_2	-	-	-	-	75,055.7	-	54,242.4	382,789.2	262,268.1
NO_x	-	-	-	-	147,812.3	-	344,784.7	740,033.1	655,670.2
CO	-	-	-	-	414,342.0	-	5,724.6	129,341.9	209,814.5

Table 9.1 Predicted incremental ground level concentrations (µg/m³) and deposition rates (g/m²/month) for criteria air pollutants – sensitive assessment locations

Pollutant	Averaging period	Highest predicted concentration (µg/m³) /deposition rate (g/m²/month) across all sensitive assessment locations							
		Approved Eco Precinct	% of criterion	Scenario 1 + Eco Precinct	% of criterion	Scenario 2+ Eco Precinct	% of criterion	Scenario 3 + Eco Precinct	% of criterion
CO	Maximum 1 hour	241.7	0.8%	241.7	0.8%	241.7	0.8%	241.7	0.8%
	Maximum 8 hour	42.2	0.4%	42.2	0.4%	42.2	0.4%	42.2	0.4%
NO_2	Maximum 1 hour	43.6	26.6%	43.6	26.6%	43.6	26.6%	43.6	26.6%
	Annual	0.24	0.8%	0.45	1.4%	0.66	2.1%	0.61	2.0%

e) Tables showing the modelling results (both incremental and cumulative) for all modelled scenarios.

Appendix D of the AQIA includes modelling results tables for incremental impacts for scenarios 1 and 2. Incremental impacts for scenario 3 are not included, nor are the predicted cumulative impacts.

f) Details of the key settings used to configure CALPUFF. This should include justification and a sensitivity analysis where values have been adopted that are not consistent with the CALPUFF modelling system guidance document.

It is stated in Section 8.1 of the AQIA that 'CALPUFF was configured in accordance with the recommended settings of The CALPUFF Modelling System guidance document prepared by TRC Environmental (TRC, 2011) where relevant to do so. The calm wind threshold was set to 0.1 m/s, while the minimum sigma-z values were to 0.2 m/s. Dry deposition of gases was assumed when the default setting is no dry deposition of gases, only particles. No justification was provided for adopting the selected settings. Furthermore, it is not clear which settings were configured in accordance with this guidance.

10. Odour Emissions Inventory

The following information and/or clarification is required:

a) A sensitivity analysis to better understand potential for impacts associated with variable odour emission scenarios and significant odour sources excluded from the assessment.

b) An update to the odour emissions inventory to include all future odour sources associated with the project including, but not limited to, the proposed leachate evaporation pond located adjacent to the proposed APCr encapsulation cell and potential odours from the storage of waste containers on the hardstand marshalling area.

The odour emission inventory for existing operations, was derived based on the set of on-site measurements taken as part of the 2021 independent odour audit (number 9) (IOA#9) (TOU 2021). It is noted a 2022 independent odour audit (IOA#10) was completed in November 2022. In Section 8.5 of the IOA#9 (TOU 2021), Table 8.4 summarises the odour emission rates from emission sources amenable to quantitative measurements. These sources have been ranked in descending order. The results in Table 8.4 do not include potential gas pathways and other fugitive emission sources from the waste surface, due to the difficulty in assigning an appropriate emission area for these sources to calculate an OER derived from the SOER and the area. This was a similar constraint in the previous IOAs.

There is year-on-year variation in the measured odour emission rates from the Woodlawn mine. Furthermore, the IOA#9 report states that there are odour emissions not listed in this inventory, emanating mostly from sources where quantitative measurement or even estimates are difficult. These include the fugitive odour releases from the Void, previously described as potential gas pathways, arising from gas leakages from the covered areas and around the walls of the Void and the leachate recirculation air pressure relief vent.

Further evaluation of odour should be undertaken to understand the potential for impacts due to:

- variation in odour emissions from the Woodlawn site. This should consider the results of the 2022 independent odour audit (IOA#10) completed in November 2022.
- potentially significant odour sources (for example fugitive emission from the void) not being included in the assessment.
- additional sources that appear not to have been assessed. These include:
  - The proposed leachate storage and evaporation dam (adjacent to the proposed APCr encapsulation cell)
  - the storage of waste filled containers on the marshalling area.

11. Meteorology

The following information and/or clarification is required:

a) Further evaluation of CALMET model performance including consideration of other evaluation methods (i.e., statistical methods).

b) Provision of CALMET generated wind fields that capture temporal/seasonal variations in meteorological data and provide confidence that drainage flow, under low wind speed conditions, is being accurately captured by the model.

c) Demonstration that plume mixing after inversion breakup is being simulated in the model

Section 5.4 of the AQIA provides a discussion on the meteorological modelling and an evaluation of model performance. Figure 5.5 shows a comparison of wind roses generated from the CALMET data, TAPM data, and the onsite weather station. The AQIA advises that there is agreement between the three data sets based on this comparison. This comparison is not particularly robust, given that observational data from the onsite weather station has been used within CALMET and TAPM as observational data. A better indication of model performance would be provided by evaluation of model performance at a location of a meteorological station which has not been used in the meteorological data. Additionally, further evaluation of the performance of the model could be undertaken via statistical methods.

Section 5.4 of the AQIA also provides CALMET generated wind fields in Figure 5.6. A single hour of the CALMET meteorological run is depicted in the figure. Such figures can be useful in evaluating the performance of CALMET. However, a single hour of the modelling run is fairly limiting in providing an overall evaluation of model performance. Further wind fields should be included to provide confidence that the CALMET settings are accurately capturing drainage flow under low wind speed conditions. As low wind speed conditions tend to coincide with community complaints, it is important to ensure the model is capturing these conditions accurately.

The model has been configured to allow partial plume penetration of the inversion layer. Under such conditions, the pollutant plume, once entrained in the boundary layer, can travel for significance distance downwind of the source. As the inversion layer breaks up (e.g. due to convective mixing), the plume can ground, causing a fumigation event. Inversion break-up fumigation is typically associated with tall point sources located in moderate terrain experiencing calm conditions. It should be demonstrated that the model is accurately capturing these events.

d) An evaluation is required on the vertical component of meteorological modelling data. Available balloon soundings data at weather stations should be considered in the evaluation. This is to include demonstration that the number of vertical levels used in CALPUFF is sufficient to capture plum dispersion given the project includes a tall thermal buoyant source.

The proposed project relies on a thermal buoyant source with a large stack height. Upper air meteorological data is likely to have a higher degree of influence on dispersion conditions for such sources. The AQIA has provided information on the meteorological data at the surface, however an evaluation of the meteorological data in the vertical extent has not been included. Balloon soundings at airport weather stations could be a useful resource in evaluating the performance of the meteorological data in the vertical extent. It should also be demonstrated that the number of vertical levels used in CALPUFF is sufficient given the project is a tall thermal buoyant source.

e) A copy of the relevant sections of the referenced Independent Environmental Audit undertaken by Ramboll in 2021.

f) Information and/or records describing the steps taken to ensure the quality of the EP AWS data.

In Section 5.1 of the AQIA it is stated *'The Eco Precinct AWS (EP AWS) is the primary resource adopted for analysing meteorological conditions in the local area'.* It is further stated that an Independent Audit of the Eco Precinct was undertaken by Ramboll in 2021[2] which evaluated the EP AWS against the requirements of the NSW EPA Approved Methods for Sampling of Air Pollutants in New South Wales (EPA 2007). A copy of the report has not been attached.

Furthermore, there is no discussion on the operation and maintenance of the EP AWS nor any discussion on the steps taken by Veolia to ensure the data is quality assured and quality controlled. It is not known how the monitoring data is recorded or how the data is averaged.

The AQIA relies on site specific meteorological data recorded at the EP AWS. Supporting evidence should be presented to provide confidence in the quality of the data sourced from the EP AWS.

[2] *Ramboll 2021, Independent Environmental Audit Woodlawn Bioreactor and Crisps Creek Intermodal Facility May 2021*

g) **Details of all input, output and meteorological files used in the dispersion modelling supplied in a Microsoft Windows-compatible format**

The AQIA does not include the input and output files.

12. Best Practice Review

The following information and/or clarification is required:

a) **Further justification of the selected flue gas treatment technologies. Specifically, additional justification should be provided for selecting:**
- **SNCR technology instead of SCR, and**
- **a semi-dry scrubbing system instead of a wet scrubbing system.**

Ricardo Energy Environment and Planning Pty Ltd (Ricardo) has prepared a report[3] (the BAT Report) that assesses if best available techniques have been incorporated into the design of the Woodlawn Advanced Energy Recovery Centre (Woodlawn ARC). The assessment compares the key design principles of the Woodlawn ARC (detailed design not yet completed) against the "current international best practice" for "proven, well understood technology". The commentary is limited to the Industrial Emissions Directive and the Waste Incineration BAT reference document (BREF).

The BAT Report also includes limited justification of the techniques/technologies selected in comparison with other technologies. In particular, considering:

- Nitrogen oxides (NOx) abatement method (Selective Non-Catalytic Reaction-SNCR vs Selective Catalytic Reaction- SCR).
- Acid gases abatement method (semi-dry vs dry vs wet).

Appendix L (ii) of the EIS includes a reference facility assessment report[4] prepared by Fichtner (the Fichtner Report). The Fichtner Report provides a high-level comparison of the Woodlawn ARC facility design with the Reference Facility, the Staffordshire ERF and a second facility, the Greatmoor ERF.

The Fichtner Report also provides a 'snapshot' of the current technologies and flue gas treatment options employed in the EU. A summary of the data, sourced from data within Annex 8 of the BREF, is provided below:

- In Europe, of the total 470 waste incineration plants operating, 222 are processing a 'similar' waste to that proposed for the Woodlawn ARC.
- 111 of the lines utilize an SNCR system for the abatement of NOx
- 68 lines utilize a dry scrubber for the abatement of acid gases, and of these facilities 37 utilize lime as a reagent within the acid gas scrubber.
- 78 lines utilize injection of activated carbon into the flue gas stream to abate volatiles and metals
- 157 lines utilize bag filters for the abatement of pollutants in the particulate phase (i.e., dust particles)

Following consideration of the information presented in both Reports, it is recognised that the proposed technologies are widely used and compatible with the proposed design of the ARC. Overall, the proposed flue gas abatement appears to be consistent with BAT. However, it is

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[3] Appendix L (i), Ricardo Energy & Environment, Woodlawn ARC – BAT Assessment Report (Ref: ED15223205- Issue Number 4.5) prepared for Veolia Environmental Services (Australia) Pty Ltd 00288-R-02-K00-0001-B, 06 July 2022

[4] Fichtner GmbH & Co. KG, Woodlawn ARC Reference Facilities, Veolia Document number: 00288-R-06-K00-001, Revision F, (06-10-2022)

evident that each technology has benefits and that lower emissions could potentially be achieved via the application of alternative technologies (e.g., Selective Catalyst Reduction and/ or wet scrubbing technologies). Further justification of the selected technologies should be provided. Specifically, additional justification should be provided for selecting:

- SNCR technology instead of SCR, and
- a semi-dry scrubbing system instead of a wet scrubbing system

13. Health Risk Assessment

The EPA engaged the Department of Planning and Environment's Contaminants and Risk Team – Environment and Heritage Group (DPE C&R-EHG) to undertake a review of the Human Health Risk Assessment (HHRA), prepared by EnRiskS that accompanies the EIS against the requirements in the SEARs. This review identified that the following information and/or clarification is required:

a) Cross-referencing of all input concentration values used for each air pollutant considered in the HHRA against the predicted concentrations modelled in the AQIA.

EnRiskS states in the HHRA that the AQIA was used to provide predicted air concentrations at all the individual receptor locations considered, with the results averaged over various time periods for comparison to reference values. However, it is unclear if the AQIA modelled output data is used as input data to the calculations presented in the HHRA. For example, in Appendix A of the HHRA (Calculation of Risks from $PM_{2.5}$) the values considered in the HHRA are 0.002 µg/m^3 (Scenario 2) and 0.04 µg/m^3 (Scenario 3) as maximum changes in annual average air concentrations of $PM_{2.5}$. However, on cross-referencing back to the AQIA, these values cannot be verified.

WATER QUALITY

1. Surface Water

The following information and/or clarification is required:

a) Clarify how the proposal will be managed to ensure that the water management requirements for the broader precinct will be met in supporting a nil discharge site.

b) Model a range of scenarios, including worst case through to average or typical, that incorporate current operational and water management issues and include recent rainfall conditions and planned changes to the water management system for the broader precinct.

Currently there are existing operational and water management issues at the precinct scale that potentially influence water management outcomes at the proposed development. These issues do not appear to be reflected in the water balance assessment provided in the *Surface Water Impact Assessment* (SWIA) (Appendix V of the EIS) and potentially have implications for ensuring nil discharge from the proposed development and ED1. These issues include, but are not limited to:

i) The current Woodlawn Bioreactor operation is approved on the basis of a Water Balance prepared by WSP Parsons Brinkerhoff dated 28 September 2017 that assumes the entire capacity of Evaporation Dam 1 (ED1) will be available for the storage or treated landfill leachate until at least 2059.

That Water Balance assumes that:

> *"A portion of ED1 in south-east corner will house a coffer dam that will be lined for subsequent storage and loss by natural and mechanical evaporation of treated leachate. The remainder of the ED1 dam will be allowed to dry up with the use of mechanical evaporators. Once evaporated, ED1 will be relined to avoid seepage and used subsequently for leachate storage and management. ED1 will only receive runoff from its external catchment including dolerite stockpile area. It will not receive transferred flows from the waste rock seepage dam or the old plant collection dam. The water balance assessment presented in this report was required by Veolia to support an application to modify the existing ED1 as follows:*
>
> *construction of a suitable size of a lined coffer dam (referred to as ED1 Coffer Dam) to store and evaporate treated leachate from its leachate treatment plant from September 2018 the remainder of ED1 dam (referred to as ED1 North Dam) to be evaporated until dry within next 10 years so that it can be engineered for future leachate management."*

It appears all of Veolia's Leachate and Stormwater Management Plans, as currently approved for the landfill site, are based on the 2017 water balance. This is not acknowledged in the EIS which proposes to use approximately one third of the capacity of ED1 for the construction of an encapsulation cell for APCr, while surplus process waters from the demineralisation plant and excess water from the IBA pond is proposed to be discharged to ED1. The EIS states that the resulting capacity reduction will be compensated for by reduced runoff volumes to the Plant Collection Dam. This should be fully justified as the Bioreactor water balance never assumed that ED1 would receive discharges from that dam.

ii) Veolia is currently required to remedy a range of leachate and water management issues at the Woodlawn Landfill premises. Several dams (including ED1) have exceeded specified freeboard levels and diversion of stormwater between dams has resulted in breaches of conditions of consent. The volume of stormwater and leachate stored in dams at the premises (including ED1) is more than what the 2017 water balance for Woodlawn Landfill project predicted.

In response, DPE Planning (in discussion with EPA) issued Veolia with a Development Control Order (DCO) on 1 April 2022 requiring Veolia to engage an independent, suitably qualified, and experienced specialist to develop short to medium term and long-term leachate and water management strategies. The strategies must include reasonable and feasible measures to be developed and implemented to ensure compliance, an environmental impact assessment and supporting water modelling for the premises. It must include the identification and management of any environmental risks, uncertainties, and limitations. It must also include the measures and actions to be implemented and a timeframe for their implementation. The terms of the DCO were subject to specified time periods for compliance and are yet to be completed by Veolia.

The water and leachate management issues being addressed under the DCO and its implications for this project (including its intended use of ED1) does not appear to have been addressed in the SWIA.

iii) Other Matters:

- The Water Balance used to inform the SWIA assumes a leachate input into the ED1 Coffer Dam of 4L/s. It is noted that 4L/s is the minimum throughput rate currently specified in EPL 11436 and actual inputs may be higher than that, especially following high rainfall events when large volumes of leachate need to be extracted from the landfill void.

- The water balance model used to inform the SWIA assumes that the initial storage volumes of ED1, based on the predicted 1 July 2024 results, were set to 408 ML (wettest climate sequence), 1 ML (average climate sequence) and 6 ML (driest climate sequence). These assumptions may need to be reviewed. The Independent Audit of the Leachate and Water Management System submitted under the Bioreactor Project Approval in August 2022 states that the actual inputs were substantially more, and evaporation losses far less, than predicted by the water balance.
- The SWIA states that the process water system will utilise potentially contaminated stormwater runoff captured in the IBA area stormwater system and recycled process water that could comprise a mixture of raw water, brine and return water from the wash down and steam cycle systems. Under certain circumstances (such as extended wet weather) there may be surplus process water that requires management via dewatering to ED1. Transferring water to ED1 conflicts with condition 18S of the Woodlawn Bioreactor Project Approval (MP 10_0012), which requires that the volume of water stored in ED1 be no more than 10 ML by 31 December 2023.

2. Groundwater

The following information and/or clarification is required:

a) An updated groundwater assessment that addresses current issues related to potential groundwater contamination from the operation of ED1

Veolia is currently being required to address a range of issues at the Woodlawn Landfill premises to prevent pollution of waters (groundwater). These issues include the integrity of ED1 and ED2, seepage from these storages to groundwater, and their capacity. EPA regulatory actions to remedy these issues have included:

- Pollution Reduction Programs (PRPs) attached to the Woodlawn Landfill licence in 2016 and 2018 which required Veolia to investigate the integrity of the liners, assess the nature and extent of any leakage, detail the control and remediation measures proposed to prevent seepage and make good any groundwater or surface water pollution that has already occurred.
- Prevention Notice (3503885) issued to Veolia on the 24 October 2022 requiring preventative actions to address an activity that the EPA reasonably suspect has been or is being carried on in an environmentally unsatisfactory manner. Leachate from Coffer Dam 1 has been pumped into the outer ED1 where it is likely to pollute groundwater. The integrity of the liner in Coffer Dam 1 has not been maintained and/or operated in a proper and efficient manner.

Prevention of pollution of waters (including groundwater) is also required to be addressed as part of the DCO.

The assessment of ED1 in relation to its suitably for its use as an encapsulation cell and disposal of process water does not appear to have considered these matters. For example, the above PRPs issued by the EPA to address seepage from ED1 resulted in a commitment by Veolia to empty ED1 (by the end of 2023) and then ensure that any future water storage including leachate within the footprint of ED1 is done in lined coffer dams. This appears to conflict with the proposal to construct an encapsulation cell that will reduce ED1's capacity, and disposal of process water into the unlined sections of ED1.

b) Further information on the integrity and performance of ED1 including further justification on ED1's suitability for the Encapsulation Cell and storage of process and excess waters

The functioning of ED1 for the purpose of siting the encapsulation cell for immobilised APCr and storage of process water from the demineralisation plant and excess water from the IBA storage pond is a key element of the project.

However, the Encapsulation Cell Design Report (Appendix F of the EIS) states a detailed survey of ED1 has not been completed as areas of the dam were inundated at the time of the assessment. In addition, there are also operational water management issues at the site in relation to the dams functioning for its use in providing broader water management for the site. The EIS also acknowledges issues with the dam's integrity where seepage to groundwater is travelling as far as 450 m north of ED1 in the underlying colluvium/alluvium.

A groundwater monitoring report (Aecom, 2017) undertaken in response to a PRP identified that groundwater hydraulic heads have continued to increase to now artesian conditions where groundwater is expressing itself at the surface at the base of ED1, with similarly increasing concentrations of contaminants. Proposed remediation strategies agreed to by the EPA, such as the lining of coffer dams, appear not to have improved water management at the site. ED1 continues to store and seep polluted water to groundwater and to the surrounding environment.

The proposal also includes a strategy that involves the development of a trigger action response plan where contingency measures (such as seepage interceptions trenches, sumps and bores) will be required if specific levels (which are yet to be developed but would align with environmental and cultural values and Water NSW Requirements) are triggered. The need for such an approach highlights the potential risk associated with the use of reclaimed ED1 for the site of the waste encapsulation facility. In this regard it is important that information is provided that demonstrates a proposal that will not cause or contribute to water pollution and delivers a zero-discharge site.

As the existing subsurface conditions at the proposed encapsulation cell have not been investigated as part of the EIS and there is limited information presented on the integrity and performance of ED1, further information is needed on the dam's suitability. This includes its use as an Encapsulation Cell and to provide storage of process and excess waters from the ARC.

c) Clarification of the conditions of the existing groundwater environment including potential contamination of groundwater associated with seepage from ED1 and ED2

Information is needed to clarify the conditions of the existing groundwater environment in the vicinity of ED1 including potential groundwater contamination from heavy metals associated with seepage to the shallow colluvium, connected deep groundwaters, and discharge to Crisps Creek. It is unclear from the presented information if water quality in Crisps Creek is currently impacted from operations at the site.

d) Information on the integrity and performance of the Plant Collection Dam

The EIS states that the plant collection dam was originally constructed as part of mining operations and received spillage from the mine plant area. The plant collection dam is still present and continues to operate as part of the Eco Precinct's water management system.

The proposal recognises this dam to be an important element of the ARC stormwater management system, however it appears no information has been presented on the dam's integrity and environmental performance. It is also unclear if the dam needs to be upgraded to meet contemporary standards.

e) Clarification on whether discharges to groundwater have been addressed in the site water balance

The EIS should document estimated rates and volumes of seepage to groundwater through either a detailed site water balance or modelling. This should also demonstrate how this water is recovered to meet the zero discharge commitments of the existing and proposed facility. In this regard clarification is required on whether the site water balance has considered the volumetric estimation of seepage to groundwaters from ED1.

NOISE

The EPA has reviewed the Woodlawn Advanced Recovery Centre – Environmental Impacts Statement (EIS) and its supporting Noise and Vibration Assessment (NIA) prepared by EMM dated October 2022 and determined that it requires the following further information and clarification:

a) Clarification on which noise modelling algorithm was used in the assessment.

The EIS states that noise modelling was undertaken using ISO9613 (page 173), however it then states CONCAWE (page 175).

b) An assessment against the requirements of the NPfI *Fact Sheet C: Corrections for annoying noise*.

The *Noise Policy for Industry* (NPfI, EPA, 2017) and its supporting *Fact Sheet C: Corrections for annoying noise* outlines the assessment methods required to determine whether measured/ predicted noise levels from an activity require 'modifications' (i.e. adjustments) to account for potential increases in annoyance due to factors such as tonality and low frequency noise (LFN). The NPfI requires that tonality assessments are undertaken using 1/3 octaves between 25Hz to 10KHz and that the second stage of a LFN assessment considers 1/3 octaves between 10Hz to 160Hz. However, it appears the assessment has not followed this approach and has relied on noise model outputs that do not include the resolution and full frequency range required under the NPfI, Facts Sheet C. The EPA notes that the Energy Recovery Facility (ERF) noise assessment is largely based on an existing 'reference facility' located in Staffordshire, United Kingdom. On that basis full spectral data of the reference facility should be obtained to enable a more complete assessment against the NPfI, Fact Sheet C requirements. The EPA considers this assessment critical, as the facility would include a range of mechanical plant and equipment such as boilers, turbines, furnaces etc that have the potential to produce tonality and LFN issues. When preparing this information, Veolia may benefit from the example approach to assess LFN published by the EPA in *Acoustics Australia Journal Vol. 48, No.2 2020*.

c) Information to clarify whether offset distances used in the road traffic noise assessment represent to the nearest residential receivers on these roads that are potentially impacted by the proposal.

The road traffic noise assessment in the NIA indicates the assessment was undertaken at offset distances of 75 m off Collector Road and 23 m off Bungendore Road (NIA, Page 32).

d) Clarification is required on whether the noise bund on Collector Road is existing or proposed. If proposed, information should be documented on the construction and timing for its delivery.

The NIA indicates that road traffic noise modelling includes: *"a low bund was incorporated for Collector Road providing a nominal 2dB attenuation for existing and project related traffic*".

e) Clarification to demonstrate that noise from the proposal will not contribute to cumulative noise impacts

The NIA states that: "*a review of the cumulative noise level contributions confirms the project does not contribute to overall noise levels at any of the reference sensitive assessment locations and does not require further review"*. The cumulative amenity noise levels are also less than the NPfI recommended amenity level for all assessment locations". However, this is not clearly demonstrated by the information that supports these conclusions. The EPA requires the following information to support the above conclusions:

- Amend tables 6.2 to 6.3 to show the actual noise level from each noise source as opposed to "<" values so that the increase in noise, if any, due to the proposal can be determined quantitatively,
- Provide a footnote to Tables 6.2 to 6.3 to clearly show the source of information for each noise source being considered and justify why the source of information is reasonable for cumulative assessment purposes; and
- Identify how wind farm noise was considered including the integer wind speed of turbine operation and associated noise level that was used in the cumulative assessment.

CONTAMINATED LAND MANAGEMENT

1. Construction Activities

The following information and/or clarification is required:

a) An update of the "overview of construction stages and activities" to include information on the management of contaminated land.

b) An update of "overview of construction stages and activities" to include information on the management and remediation of fill sources and stockpiles of contaminated materials at the site.

The EPA concurs that a detailed site investigation (DSI) and associated remedial action plan (RAP) will need to be developed for the site and remediation completed prior to the construction phase for the proposed ARC development. It will also be important that the outcomes of any DSI and RAP are used to inform the construction phase of the ARC development if approved.

The preliminary site investigation (PSI) indicates the ARC development will be used to contain contaminated soils and fills. Table 4.6 of the EIS "*Overview of construction stages and activities*" does not include any information on the management of contaminated land.

For example, the contamination analysis in the 2021 PGA report showed that lead exceeded the adopted Health Investigation Level (HIL) of 1,500 milligrams per kilogram (mg/kg) for commercial/industrial land use in approximately a quarter of the 21 samples analysed within the proposed development footprint, with a maximum concentration of 5850 mg/kg.

The 2021 PGA report also analysed lead in various fill sources and stockpiles located at the site. The summary of this is presented below:

Location	No. of samples	Average Pb concentration (mg/kg)	Maximum Pb concentration (mg/kg)	NEPM 2013 HIL D Criteria for Pb (mg/kg)
Fill Sources (overall)	30	4,775	45,700	1500
Crusher Stockpile/Pad	23	2,680	12,300	
Temporary Stockpile	3	-	8,090	
Tipper Stockpile	2	-	45,700	

The PSI states that the containment of metal-impacted material below the ARC structures and pavements would be an appropriate form of management for contaminated material. However, it does not clarify whether it is only intended for the impacted soils to be capped, or whether the proposal involves containing the fill sources and stockpiles as well. Further information should be sought from Veolia on this matter including origins of this material and its suitability in being emplaced at the ARC site. This is due its high concentrations of lead and possible concerns with leachability and acid generating properties at the site.

c) Clarification on whether past Development Consents can deliver remediations outcomes for the project

The EIS states that the implementation of the remedial strategy will occur under the existing Eco Precinct consents (DA 31-02-99 and MP10_0012, as modified) and will be implemented prior to construction of the project. The relationship of these past consents with this proposal is unclear. Clarification is required on whether these past consents can deliver the additional investigations and remediation actions needed for the site.

d) A commitment on an unexpected finds protocol

The PSI states that "*it is expected that the construction environmental management plan required for the encapsulation cell will include an unexpected finds protocol to address the potential exposure of suspected impacted material during construction*". It is recommended that a commitment be sought from Veolia for this additional management measure.

2. Additional groundwater monitoring and assessment

The following information and/or clarification is required:

b) A commitment for further groundwater investigations be undertaken as part of the DSI in relation to the operation and performance of ED1 and need for an unexpected finds protocol

A number of groundwater investigations have been conducted at the Woodlawn Eco Precinct as part of the 2009 DSI, including an investigation into seepage from the evaporation dams in the areas known as ED1 and ED2 (AECOM, 2017) and ongoing Environment Protection Licence compliance monitoring.

Groundwater around the site has been found to display concentrations of heavy metals that exceed relevant ecological guidelines. The results for cadmium, copper, lead and zinc reported in the PSI , generally exceed the current ANZG 2018 water quality guidelines for freshwater (95% species protection) in those groundwater wells where detections were found.

The PSI notes that the Woodlawn Eco Precinct is located in a metalliferous geologic setting and background concentrations of metals are generally at or above the nominated ecological screening criteria used for the assessment. In addition, the encapsulation cell is proposed to have a double composite liner including primary and secondary geomembranes and geosynthetic clay liners, so once constructed the cell would act as a barrier to prevent surface infiltration of, and physical contact exposure to, any residual impacts found below the cell.

The PSI recommends that no additional investigations of groundwater associated with ED1 will be needed as part of the DSI. However, due to operational water management issues at the site, especially in relation to the operation of ED1, it is recommended that the DSI include additional groundwater monitoring and assessment.

The PSI states that "*it is expected that the construction environmental management plan required for the encapsulation cell will include an unexpected finds protocol to address the potential exposure of suspected impacted material during construction*". It is recommended that a commitment be sought from Veolia for this additional management measure.

3. Accredited Site Auditor

The following information and/or clarification is required:

a) A commitment that an NSW EPA accredited site auditor be engaged throughout the duration of works

The PSI report recommends that a Site Audit Statement be obtained for the development to determine site suitability. The EPA supports this recommendation, however with the proposal requiring more detailed site investigation including the development and management of a RAP, the project would benefit the engagement of an auditor throughout the duration of the project. This will ensure contamination is appropriately considered and managed throughout all phases of the development. It is recommended that a commitment be sought from Veolia to this additional management measure.

Anyone whose activities have contaminated land, or an owner of land that has been contaminated, holds a duty to report contamination if certain circumstances outlined in the EPA's *Guidelines on the Duty to Report Contamination under the Contaminated Land Management Act 1997* (2015) are met. One such circumstance is where the level of a contaminant in, or on, soil is equal to or above a level of contamination set out in Schedule B1 of the National Environment Protection (Assessment of Site Contamination) Measure 1999 (NEPC 2013) or other approved guideline value with respect to a current or approved use of the land, and people have been, or foreseeably will be, exposed to the contaminant. An auditor can also assist Veolia in helping to understand this obligation where needed.

GREENHOUSE GAS ASSESSMENT

The EPA engaged the Department of Planning and Environment's (DPEs) Net Zero Emissions Modelling (NZEM) team within DPE Science, Economics and Insights (SEI) to review of the Greenhouse gas assessment (EMM, 2022) that accompanies the EIS against the requirements in the SEARs.

1. Emission intensity of electricity generated by the project

The following information and/or clarification is required:

a) An update to the greenhouse gas assessment to compare the emission intensity of the electricity generated from the project with the projected future emission intensity of the NSW electricity grid, so that the emission intensity 'benefits' are not overstated.

The greenhouse gas assessment compares the emission intensity of electricity generated from the project (0.64 kg CO_2-e/kWh, all scopes) to the emission intensity of the NSW grid, using a current (2021) grid emissions intensity factor of 0.85 kg CO_2-e/kWh (scope 2 + scope 3).

The ARC project is expected to commence operation in 2026, with a design life of 25 years. The NSW electricity grid is undergoing rapid decarbonisation. Projections published by the Department of Climate Change, Energy, Environment and Water (DCCEEW)[5] and shown in Figure 2, indicate that, at project commencement in 2026, the emission intensity of the NSW grid will be 0.42 kg CO_2-e/kWh (53% of the current (2021) scope 2 emission intensity). Furthermore, in 2030, the NSW grid emission intensity is projected to drop to 0.18 kg CO_2-e/kWh (23% of the current scope 2 emission intensity). Further reductions in the emission intensity of the NSW grid are anticipated after 2030 given the announced closures of the remaining coal-fired power stations. Therefore, for the life of the project, the emission intensity of electricity generated from the project is likely to be higher than the emission intensity of the NSW grid, contrary to what is concluded in the greenhouse gas assessment.

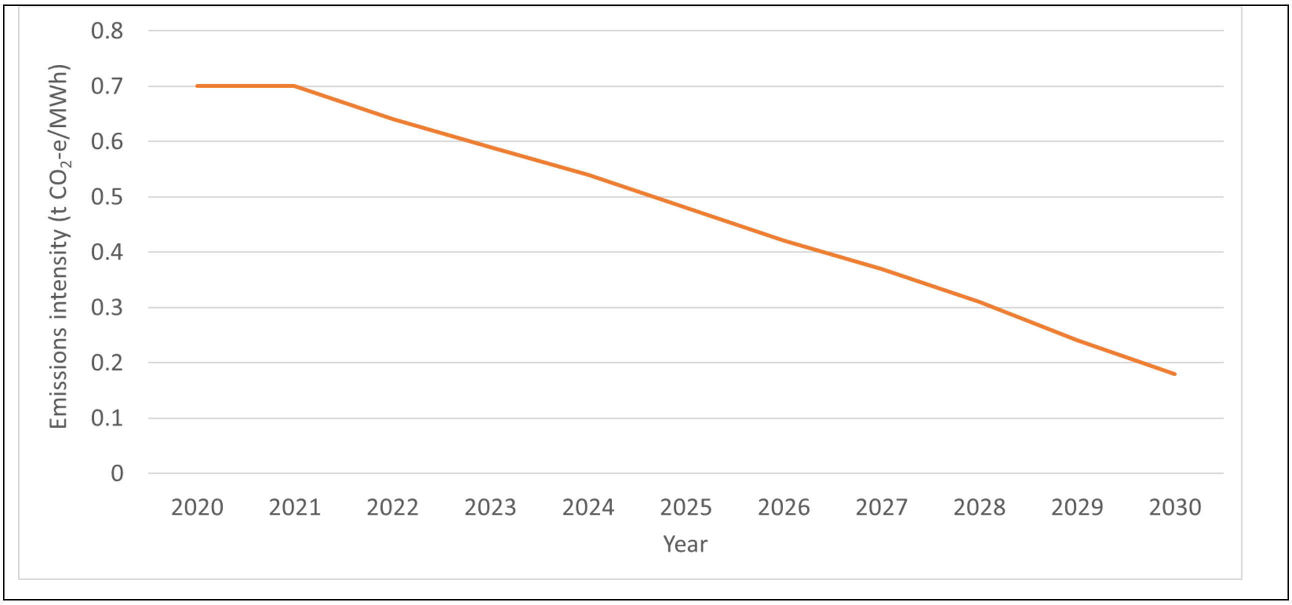

Figure 2: Projected emission intensity of the NSW grid (DCCEEW, 2021[6])

2. Emission 'savings' from substituted electricity and future electricity consumption

The following information and/or clarification is required:

a) Update to the greenhouse gas assessment using the projected future emission intensity of the NSW electricity grid, for both emission savings from substituted electricity and electricity consumption (scope 2).

Section 5.3 of the greenhouse gas assessment considers the export of electricity to the grid as an offset (negative emissions or emissions saving), as it would "*effectively substitute electricity produced from other sources*". In deriving the emissions savings from substituted electricity, the assessment applies a current (2021) emission intensity factor for the NSW grid (0.79 tCO_2-e/MWh, scope 2 only)[7] to the MWh sent out for the Bioenergy Power Station and ARC.

The use of a 2021 emission intensity factor results in future emissions 'savings' from substituted electricity being overestimated. As noted above, at project commencement the emission intensity of the NSW grid is projected to be 0.42 kg CO_2-e/kWh (53% of the current emission intensity) while in 2030 emission intensity is projected to be 0.18 kg CO_2-e/kWh (23% of the current emission intensity).

Although scope 2 emissions from electricity consumption (purchased electricity) for the whole site (Table 6.2 and Table 6.3 of the greenhouse gas assessment) will also reduce based on projected

[5] https://www.dcceew.gov.au/sites/default/files/documents/australias_emissions_projections_2021.docx

[6] https://www.dcceew.gov.au/sites/default/files/documents/australias_emissions_projections_2021.docx

[7] https://www.dcceew.gov.au/sites/default/files/documents/national-greenhouse-accounts-factors-2021.pdf

future grid intensity factors, the overall net emissions savings will decrease. This will invalidate the conclusion that the net operational emissions would be reduced as a result of the ARC. Appendix 1 illustrates likely results with projected future grid intensity factors being applied.

3. Consistency with Government policy

The following information and/or clarification is required:

a) Update to the greenhouse gas assessment to include reference to the most recent Australian and NSW targets, and the consideration of emission reduction measures. Present annual emission estimates for the project as a timeseries, taking into account the decarbonisation of the electricity grid and the potential future emissions abatement that could be achieved by implementing the emission reduction measures identified.

b) Further investigation of measures likely to reduce the greenhouse gas emissions associated with the project.

Section 3.1.4 of the greenhouse gas assessment refers an Australian target under the Paris Agreement of 26-28% below 2005 levels by 2030, set by the previous Australian Government. In June 2022, a more ambitious target of 43% below 2005 levels by 2030 was set by the new government. Section 3.2.2 of the greenhouse gas assessment provides an overview of the NSW Climate Change Policy Framework. Reference is made to the *Net Zero Plan Stage 1: 2020-2030* and an interim target for NSW of 35% cut in emissions by 2030 compared to 2005 levels. However, the *Net Zero Stage 1: 2020-2030 Implementation Update*[8] revised the State's objective to achieve a 50% cut in emissions by 2030 compared to 2005 levels.

[8] https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Climate-change/net-zero-plan-stage-1-2020-30-implementation-update-210460.pdf