5. Environmental best practice

5.1 Overview

This chapter describes how AP has demonstrated environmental best practice measures in the design of the Project, in accordance with EPA requirements. The Project is currently in the feasibility phase. In the pre-feasibility phase, a number of decisions were made with regards to the technologies to be used for the Project, taking into consideration environmental, social and economic factors.

AP has adopted best practice principles via a risk-based approach to the management of potential environmental impacts. Central to this approach has been the conduct of a Risk Assessment process that is dynamic and evolves continuously throughout the Project. This risk-based approach and AP design response to environmental risks is detailed in this chapter.

Key components of the design approach demonstrating application of best practice include:

- The adoption of environmental and sustainability principles and the use of multi-criteria assessments during the optioneering selection phase for certain processes
- Site selection workshop evaluated the positioning of the EfW Plant at the Maryvale Mill site to achieve the lowest social, environmental and economic impact
- Boiler technology optioneering study undertaken in the pre-feasibility stage which compared the comparative merits of moving grate combustion against fluidised bed combustion. This study concluded that the moving grate technology was by far the most technologically, environmentally and commercially proven technology for treating MSW and C&I waste and would offer the lowest technical and environmental risk for the Project
- Orientation of the site layout with consideration of adjoining sensitive land use and on site health and safety requirements (e.g. air and noise emissions). The Project has also been sited within the existing Maryvale Mill site, which has an existing and significant buffer zone in place, and has been in operation for 80 years.

5.2 EPA requirements

Under the *Environment Protection Act 1970* (EP Act), various state environment protection policies (SEPPs) set out what must be done to protect Victoria's environment (air, water and land) and control noise. Sources of emissions or discharges to the environment must be managed in accordance with 'best practice'. SEPP Air Quality Management (SEPP AQM) provides the following definition of best practice:

"The best combination of eco-efficient techniques, methods, processes or technology used in an industry sector or activity that demonstrably minimises the environmental impact of a generator of emissions in that industry sector or activity"

The Project aims to maximise its eco-efficiency as far as practicable. Eco-efficiency is defined as:

> *"producing more goods with less energy and fewer natural resources, resulting in less waste and pollution"*

A number of SEPPs reference the requirement to demonstrate best practice in relation to the segment of the environment that the SEPP administers. EPA Publication 1517 *Demonstrating Best Practice – Guideline* (February 2013) provides examples of best practice for the relevant SEPP, as described in Table 5.1 below.

The guideline also outlines how EPA assesses best practice, and provides guidance on how to demonstrate compliance with best practice requirements. The principle of integration of economic, social and environmental (i.e. triple bottom line) considerations (section 1B of the EP Act 1970 and as noted in the guidelines) also makes it clear that best practice needs to be cost-effective and commensurate to the significance of the environmental issues being addressed. This aligns with the risk-based approach and has been fundamental to the consideration of environmental best practice throughout the design process.

Table 5.1 : State environment protection policies (SEPPs) and best practice examples (from EPA Publication 1517 *Demonstrating Best Practice – Guideline*, February 2013)

SEPP	Clause	Emitter / Industry requirement
SEPP (Control of Noise from Commerce, Industry and Trade) N-1	Cl. 19 (Replacing or Installing New Equipment)	Use the quietest equipment available when replacing or installing new equipment
SEPP (Waters of Victoria)	Cl. 3 (in definition of 'best practice' and 'minimise') Cl. 28(3)(c) (new wastewater discharges)	New discharges require best practice
SEPP (Groundwater's of Victoria)	Cl. 12 (prevention of groundwater pollution)	Undertake all practicable measures to prevent pollution of groundwater
SEPP (Prevention and Management of Contamination of Land)	Cl. 17 (2) (Prevention of Contamination of Land)	Apply best practice to any transport, storage or handling of any chemical substance or waste

5.3 Methodology

5.3.1 Best practice assessment methodology

The methodology the Project used for assessment of best practice follows the process in the guideline and is described below:

- Conduct a Risk Assessment to determine potential environmental issues. A risk assessment of the Project's potential impacts was conducted to determine the key risks that would be the focus of best practice assessment and is described further in Chapter 3: Risk Assessment and Appendix C: Risk Assessment
- Define the scope of the best practice assessment. Using the results of the risk assessment, the scope of the best practice assessment can be defined
- Conduct a review of available options. Provide a summary of the potential options available for the Project, including the 'do nothing' option
- Best practice analysis. Conduct an analysis of the Project's emissions including referencing evidence in accordance with Table 3 of the guideline, which outlines evidence or analysis based on:
  - Literature review
  - Benchmarking
  - Application of the waste hierarchy
  - Integration of economic, social and environmental considerations
  - Integrated environmental assessment.
- Best practice assessment. Provide an integrated conclusion to the analysis and justification for the preferred design.

5.3.2 Risk assessment

A risk assessment was conducted to ensure appropriate controls were either currently implemented, or future controls would mitigate environmental risks to an acceptable level. Further details on Stage 1 (overall Project risks) and Stage 2 (environmental) risk assessments conducted are discussed in Chapter 3: Risk Assessment and Appendix C: Risk Assessment.

5.3.3 Scope of best practice assessment

The results of Stages 1 and 2 of the risk assessment enabled the best practice assessment to be focussed on the higher risk aspects. Following Stage 1 of the risk assessment process, AP worked on reducing the potential environmental impacts of the Project by developing mitigation measures that could be incorporated into the project's design. This led to most of the Medium and High operational risk items being reduced to Low risks as identified during Stage 2 of the risk assessment process.

Given that the environmental impacts due to construction would be temporary (of short duration) and that best practice construction measures are proposed to be utilised in accordance with EPA Publication 480 (*Environmental Guidelines for Major Construction Sites*), the best practice assessment focussed on the potential operational impacts of the Project and how the design could be enhanced to minimise environmental impacts.

5.4 Best practice analysis

A summary of the best practice considerations relevant to the key environmental risks are discussed below.

5.4.1 Literature review

A boiler technology optioneering study was also undertaken in the pre-feasibility work which compared the relative merits of moving grate combustion against fluidised bed combustion. The study concluded that the moving grate technology was the most commercially proven technology for treating MSW and C&I waste and would offer the lower technical and environmental risk for the project. Details on the engineering, design and technology to be used for the Project is detailed in Chapter 4: Engineering processes.

5.4.2 Application of the waste hierarchy

The waste hierarchy is one of eleven principles of environment protection contained in *the Environment Protection Act 1970*. The application of the waste hierarchy has been an active part of Project decision-making processes. The EfW feedstock would comprise primarily of municipal solid waste (MSW) which represents a relatively predictable baseload feedstock having relatively consistent compositions.

MSW waste would be supplemented with other residual waste sourced from the commercial and industrial (C&I) sector, but only from those businesses generating waste appropriate for treatment by EfW. Importantly, the Project would not negatively impact on the higher order management including recycling or reuse, as the MSW and C&I to be used is proposed to be acquired post source segregation.

The treatment of co-mingled recycling does generate a residual waste stream of approximately 10%. Diverting this residual waste stream from Disposal (landfill) to an EfW facility would indicate that the two processes are complementary.

Any ferrous metal present in input feedstocks is effectively cleaned of contaminants that could inhibit recycling processes, and will remain with the bottom ash after the combustion process. These metals will be separated and sorted from bottom ash and sent for recycling.

These actions are supportive of resource recovery options where the overall proposal provides a best practice option for waste management and environmental protection. The use of MSW and C&I wastes will divert these wastes from landfill (the current fate) and recover the energy. This will result in a higher order use of wastes according to the Waste Hierarchy, moving from "Disposal" to "Recovery of energy" and "Recycling" for metals. The development of bottom ash for beneficial use as road base would see a further transference from "Disposal" to "Re-use".

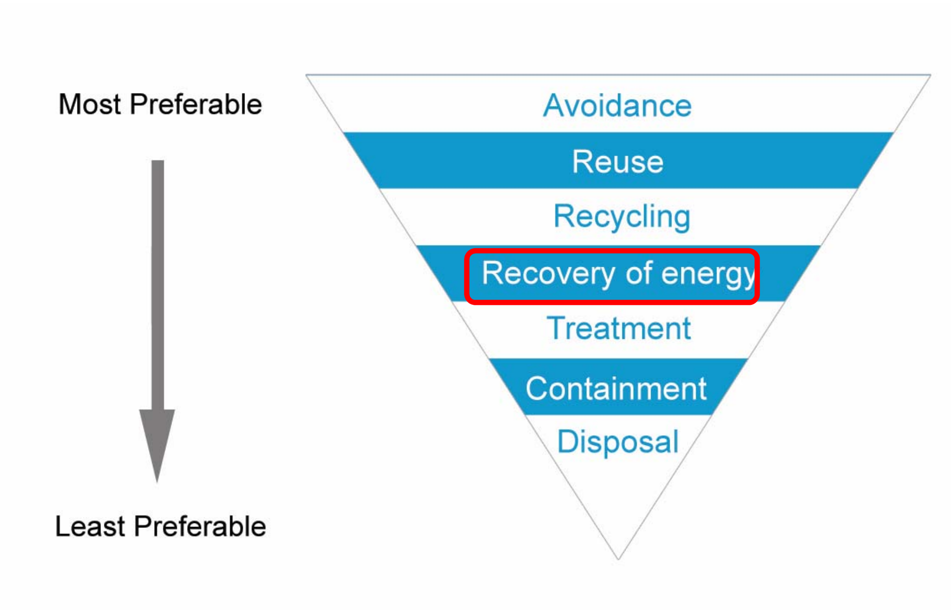

Figure 5.1 : Waste hierarchy showing the order of option of preference and EfW (EPA 2017)

5.4.3 Greenhouse gas reduction

By moving up the waste hierarchy, another significant environmental benefit is the substantial reduction in overall greenhouse gas emissions, predominately from avoidance from landfill. Although the Project will have direct emissions of approximately 350,000 tCO_2e per year, the net benefit of the Project from avoiding emissions is approximately 550,000 tCO_2e per year; (Refer to Chapter 7: Energy use and Greenhouse Gas Emission and Appendix F). By comparison, landfill of the waste alone would result in emissions of approximately 525,000 tCO_2e per year. This will be a measurable impact on Victoria's (and Australia's) emissions profile, and help to achieve requirements and targets outlined in the *Climate Change Act 2017* (VIC) and *Protocol for Environmental Management (PEM) - Greenhouse Gas Emissions and Energy Efficiency*.

The emissions profiles of Victoria and Australia (and the proportion reduction that this Project would represent) are (for 2015 – latest dataset available):

- Australia – 537,851 ktCO2e / year – 0.1% reduction
- Victoria - 119,589 ktCO2e / year – 0.4% reduction.

In line with the PEM, AP will commit to identifying and implementing best practice in relation to energy use and greenhouse gas emissions associated with the design and development of the EfW Plant.

5.4.4 Air emissions

Air emission impacts and their management are one of the key focuses of the Project and a detailed air quality impact assessment has been undertaken as part of this WAA, which is detailed in Chapter 6: Air quality. This included emissions from the now closed Hazelwood Power Station, Morwell Power Station, Energy Brix briquette factory and Carter Holt Harvey saw mill in the background assessment. It also included Hazelwood mine fire, bushfires and controlled burns. This means that the assessment is conservative in terms of cumulative effects.

Emissions to air will meet both the Victoria's *State Environment Protection Policy (Air Quality Management) 2001* and the emissions standards set in the European Union's *Waste Incineration Directive 2000/76/EC* (WID), which was recast into the *Industrial Emissions Directive 2010/75/EU* (IED).

The IED is seen as the benchmark or leading standard globally for EfW air emissions, and is considered as best practice by EPA Victoria[16]. The IED sets stringent emission limits and monitoring requirements which include continuous emissions monitoring of total particulate matter (TPM); sulfur dioxide (SO2); oxides of nitrogen (NOx); hydrogen chloride (HCl); carbon monoxide (CO); total organic carbon (TOC); and hydrogen fluoride (HF). The Continuous Emissions Monitoring System (CEMS) is a collection of sophisticated and reliable in-line instruments, located in the flue gas piping, with a computerised data acquisition and process control system. AP will commit to making the CEMS data publicly available on a quarterly basis.

There will also be non-continuous air emissions monitoring of other pollutants such as heavy metals, dioxins and furans, a minimum of two measurements per year, which will be more frequent during the initial operation of the plant. This monitoring will capture seasonal variability in waste feedstock and characteristics. Additionally, in order to guarantee complete combustion, the IED requires all plants to keep the combustion or co-combustion gases at a temperature of at least 850°C for at least two seconds after the last injection of air. This will promote complete combustion of waste and Volatile Organic Compounds (VOCs), which will mitigate the formation of dioxins and furans that could be formed in the combustion process.

All of the above measures are in accordance with the EU IED and can be considered best practice.

5.4.5 Odour

The main sources of odour from the EfW plant will be the tipping hall and waste bunker, which are the areas that will receive waste. To control fugitive odour emissions from the EfW tipping hall and waste bunker, these areas will be entirely enclosed in a building and operated under negative pressure. The outside air will be drawn into the building and air inside the building will be used as combustion air in the EfW boiler and not permitted to escape to the outside atmosphere. Odorous molecules and hydrocarbons / VOCs will be destroyed in the EfW's boiler(s). The expectation and experience from other European and Asian plants visited is there will be negligible fugitive odour emissions from the site. Additionally, the EfW Plant will be located 2-3km from the nearest sensitive receptors, providing a significant spatial buffer.

5.4.6 Selection of preferred emissions control and reduction technologies

All flue gas emission controls to be adopted for the Project have been selected based on an international Best Available Technology (BAT) review for waste incineration plants, and shall follow the guiding BAT principles of the European Commission *Integrated Pollution Prevention and Control Reference Document on BAT for Waste Incineration*, August 2006 (EC BREF). The range of best practice technologies included in the EC BREF were considered. The 2017 draft update for the EC BREF[17] was also considered in the evaluation where different to the 2006 version, to ensure the most up to date practice recommendations were considered in the assessment. This BAT assessment will likely be further refined by prospective EPC contractors during their tender stage and detailed designs.

The principal objectives of the flue gas treatment and emission control system selected for each grate combustion line were meeting the statutory compliance requirements of:

- EPA Victoria *Energy from Waste Guideline*, Publication 1559, December 2013
- European Union *Industrial Emissions Directive (IED)*, 2010/75/EU
- Victorian Government *State Environment Protection Policy (Air Quality Management)* no. S 240, December, 2001, (SEPP AQM), Schedule E (Stationary Source Emissions – Air Quality Management Regions) where it regulates additional pollutants or more stringent pollutant levels than those required under the IED. The EfW Plant is located in the Latrobe Valley Air Quality Management Region, and hence Schedule E applies
- The EPA EfW Guideline requires compliance with the European Union's IED 2010/75/EU. This includes regulations for start-up, shutdown and non-standard operation (eg equipment failure). The EPA EfW Guideline requires proponents to demonstrate how peak emissions would be minimised.

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[16] Guideline: Energy from waste. Publication 1559.1, July 2017, EPA Victoria
[17] http://eippcb.jrc.ec.europa.eu/reference/BREF/WI/WI_5_24-05-2017_web.pdf

The flue gas treatment technologies as selected by the pre-tender BAT assessment and adopted for the Project technical specification are as follows:

- Flue gas recirculation for control of oxides of nitrogen generation in the furnace and for combustion control
- Online flue gas oxygen measurement at the boiler economiser exit for controlling adequate furnace air supply for complete combustion with a design excess oxygen target of 6 vol % or greater at all times.
- Provision of a carbon monoxide analyser for combustion tuning optimisation shall also be considered on a merit basis in the design.
- Selective Non Catalytic Reduction (SNCR) using Urea solution for oxides of nitrogen control in the upper zone of the furnace
- Semi-dry or dry lime injection for acid gas adsorption, preferably with a recirculation system for APC residues to the bag filter inlet duct or sorbent reactor vessel for increasing efficiency of reagent use and for the reduction of APC residue generation. The acid gas sorbent may be burnt lime or hydrated lime
- Activated carbon injection for trace dioxin/furan and reace heavy metal reaction prior to the bag filters in the flue gas duct or sorbent reactor system adjacent to the lime dosing point
- A single stage of bag filters for fly ash particulate control and removal of all spent lime and activated carbon residues in a combined waste stream
- A National Association of Testing Authorities (NATA) and MCERTS (UK gas analyser accreditation scheme) certified Continuous Emission Monitoring System (CEMS) system for measuring all pollutant and duct process condition parameters as required for on-line measurement under the IED, and in addition, for the avoidance of doubt, to measure also ammonia (slippage) for SNCR dosing control optimisation.

5.4.7 Noise

Noise emissions from the Project during operations will occur from activities including blowers, fans, cooling towers, turbines and boilers. All of the equipment specifications will have point source noise limits (dBA) based on WorkSafe limits, and the Project will comply with *Noise from Industry in Regional Victoria (NIRV, Publication 1411, October 2011)*. Most equipment of this nature will be enclosed to minimise noise impacts.

Particular noise generating equipment includes the cooling towers. Best practice design has been incorporated and the cooling tower system will be an induced mechanical draft counter flow wet cooling tower with multiple cells, each with a low noise variable speed fan ventilator. Details of the noise assessment can be found in Chapter 8: Noise Emissions.

5.4.8 Biological control

Biocide and anti-scaling dosing systems are proposed for the cooling tower, which will help to stop growth of biological organisms or scale build-up within the cooling water system. The cooling towers shall comply with statutory requirements of the Victorian Public Health and Wellbeing Act 2008 and the Victorian Public Health and Wellbeing Regulations 2009 and the National Construction Code (NCC).

5.4.9 Energy efficiency

European Union's Waste Framework Directive 2008/98/EC provides a definition for an EfW plant to be considered recovery operations as opposed to disposal or incineration, the R1 calculated should be equal or above 0.65.

The overall Project plant efficiency and R1 calculation for two scenarios based on the current modelled waste heating value of 9.4MJ/kg (LHV), shows R1 values of 0.87 with steam and electricity generation (Combined Heat and Power – CHP) to mill, and 0.72 with no steam to mill. The preliminary calculation shows the plant will easily meet the European R1 criteria to be deemed a recovery operation in either mode of operation. It also demonstrates that the operation of the plant in CHP mode, which will be the normal condition throughout the year, allows more than twice the amount of useful energy (58%) to be produced from the waste than if the plant were a stand-alone electricity production plant with no heat demand (27%).

5.4.10 Economic, social and environmental consideration

The investigations for the design and technology used considered a range of economic, social and environmental factors in determining a preferred technical solution. These were also considered in the Stage 1 risk assessment discussed in Chapter 3: Risk Assessment. In addition to the best practice analysis described throughout this chapter, examples of broader economic, social and environmental considerations for the Project include:

- Improving energy security by returning approximately 3-4PJ of natural gas to the broader market, helping to improve energy security for the state and country
- Helping to secure the future of the AP Maryvale site and the jobs of the 850 direct employees
- Providing an additional ~800 jobs during the construction phase and ~40+ jobs during the operational phase (estimated at 1600 construction and 440 FTEs including flow on FTEs)
- Diverting nominally 650,000 tonnes (+/- 10%) of residual waste from landfill each year, to a higher order use as per the Waste Hierarchy
- A net reduction in greenhouse gas emissions of approximately 550,000 tonnes per year, the equivalent of taking more than 100,000 cars off the road.

5.5 Conclusion

There are numerous considerations for the Project that have been made in accordance with environmental best practice. The Project itself, where residual MSW and C&I wastes are diverted from landfill for a higher use on the waste hierarchy (energy recovery), can be considered best practice use of waste. Other best practice considerations which have been investigated and applied for the Project include:

- Adherence to the EU IED for air emissions from the EfW Plant – the plant design will be in accordance with these requirements
- The use of negative air pressure in the tipping hall and waste bunker to control potential odour emissions
- A NATA and MCERTS certified Continuous Emission Monitoring System (CEMS) system for measuring all pollutant and duct process condition parameters as required for on-line measurement under the EU IED
- Flue gas recirculation for control of oxides of nitrogen generation in the furnace
- Selective Non Catalytic Reduction (SNCR) using urea solution for oxides of nitrogen control in the upper zone of the furnace
- Activated carbon and lime injection prior to the bag filters in the flue gas duct or sorbent reactor system
- Energy recovery in a combined heat and power mode yielding higher energy efficiency and surpassing the IED R1 energy recovery benchmark
- Measurement and pursuit of further landfill diversion opportunities with particular focus on bottom ash recycling and re-use
- Elevation of the residual waste stream of approximately 650,000tpa +/-10% from Disposal (landfill) to higher order uses in the Waste Hierarchy including Recovery of energy and Recycling and potentially Re-use.