Noise levels from the operation of the Project have been predicted at the NSAs, during day, evening and night periods. The predictions were made for two sets of meteorological conditions:

- Scenario 1: Neutral meteorological conditions
- Scenario 2: Adverse meteorological conditions

The details of the meteorological conditions are provided in Table 13.3

Table 13.3: Meteorological conditions

Meteorological condition	Wind Speed* [m/s]	Temperature (°C)	Humidity (%)	Pasquil stability category (from CONCAWE noise propagation model)
Neutral	0	20	70	Neutral (D)
Adverse	3	15	50	Worst Case (F)

*The wind direction resulting in the highest noise level at the Noise Sensitive Areas was used in determining the impact.

13.4 Assessment results

The predicted noise levels at the nearest NSAs (for day, evening and nigh-tine periods) and their compliance with effective RMNLS are provided in Table 13.4 and shown in Figure 13.3. Predicted noise levels are in compliance with effective RMNLs at all sensitive receptor locations.

Table 13.4: Predicted noise levels and compliance with effective RMNLs under adverse meteorological conditions (with mitigations)

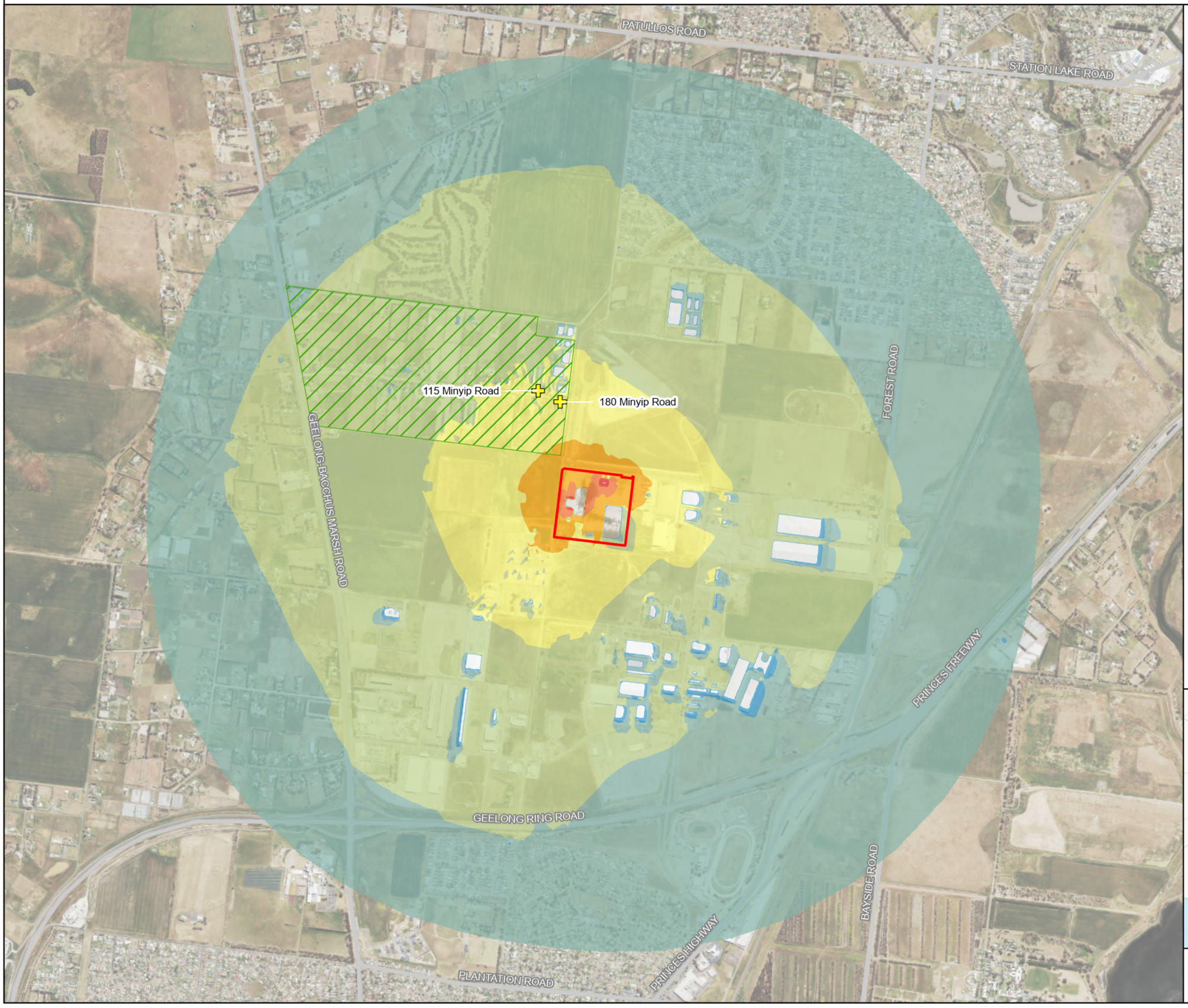
Location	Address	Effective RMNLs dB(A)			Predicted noise level dB(A)	Compliance with effective RMNLs?		
		Day	Evening	Night		Day	Evening	Night
R01	40 Minyip Rd	55	49	44	31.3	YES	YES	YES
R02	45 Minyip Rd	55	49	44	33.7	YES	YES	YES
R03	50 Minyip Rd	55	49	44	32.3	YES	YES	YES
R04	55 Minyip Rd	55	49	44	34.4	YES	YES	YES
R05	60 Minyip Rd	55	49	44	34.5	YES	YES	YES
R06	65 Minyip Rd	55	49	44	37.2	YES	YES	YES
R07	70 Gibbons Rd	55	49	44	33.4	YES	YES	YES
R08	70 Minyip Rd	55	49	44	28.2	YES	YES	YES
R09	75 Minyip Rd	55	49	44	36.4	YES	YES	YES
R10	80 Gibbons Rd	55	49	44	33.1	YES	YES	YES
R11	80 Minyip Rd	55	49	44	36	YES	YES	YES
R12	85 Minyip Rd	55	49	44	37.6	YES	YES	YES
R13	90 Gibbons Rd	55	49	44	34.7	YES	YES	YES
R14	90 Minyip Rd	55	49	44	36.4	YES	YES	YES
R15	95 Minyip Rd	55	49	44	40	YES	YES	YES
R16	99 Minyip Rd	55	49	44	38.8	YES	YES	YES

Location	Address	Effective RMNLs dB(A)			Predicted noise level dB(A)	Compliance with effective RMNLs?		
		Day	Evening	Night		Day	Evening	Night
R17	100 Minyip Rd	55	49	44	37.4	YES	YES	YES
R18	110 Gibbons Rd	55	49	44	35.8	YES	YES	YES
R19	110 Minyip Rd	55	49	44	38.3	YES	YES	YES
R20	115 Minyip Rd	55	49	44	40.5	YES	YES	YES
R21	160 Minyip Rd	55	49	44	40.7	YES	YES	YES
R22	180 Minyip Rd	55	49	44	43.2	YES	YES	YES

13.5 Potential impacts

Noise levels attributed to the Project at the nearest NSAs have been predicted for all NIRV time periods (day, evening, night) and for both neutral and adverse meteorological conditions. Predicted noise levels at all receivers comply with effective recommended noise levels, when the above-mentioned mitigation measures are applied.

Figure 13.3: Noise contour plot – adverse meteorological conditions



Project site

Noise sensitive area

Noise sensitive receiver

Noise contour, dB(A)

ISOVALUE

- 13 - 20
- 20 - 30
- 30 - 40
- 40 - 50
- 50 - 60
- 60 - 70
- >70

Figure presents predicted noise levels at 2 metres above ground level, representative of the elevation of 180 Minyip Road.

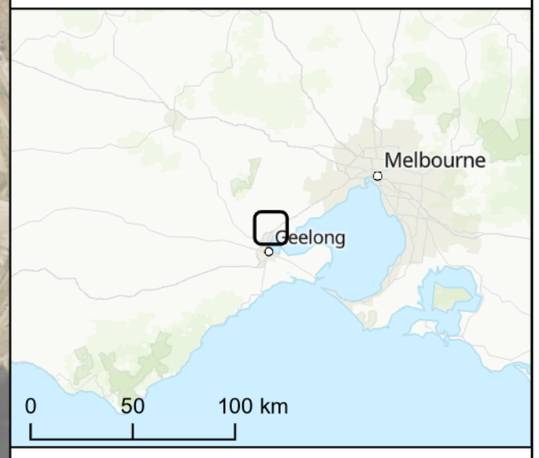
N

IS305100
GDA 1994 MGA Zone 55

A3
1:20,000

0 250 500 m

DATA SOURCES
© Commonwealth of Australia (Geoscience Australia) Geodata Topo 250k Series 3; Vicmap Data © State of Victoria; Jacobs.
Vicmap, Esri, HERE, Garmin, FAO, NOAA, USGS



Jacobs

14. Health

A comprehensive human health risk assessment (HHRA) was undertaken by Environmental Risk Sciences (EnRiskS, 2020). The assessment considered potential impacts from pollutants released in air emissions, odours, noise, economics, waste and transport. The full assessment report is presented in Appendix F.

14.1 Existing environment

The proposed site is in an area zoned IN2Z within the Greater City of Geelong. The closest residential property (maximum sensitive receptor) is approximately 0.3 m from the site in an area zoned for Rural Living. The towns of Lara and Corio are located to the northwest and south of the site respectively.

The human health risk assessment assumes that the health of the local community is similar to that reported in the larger City of Greater Geelong council area, which includes the suburbs of Lara and Corio. The key indicators of health for the population of the Greater Geelong LGA are similar to those of Victoria with none of the key indicators statistically significantly different from Victoria. Therefore, the data suggests that the population in the areas surrounding the proposed site are unlikely to be more susceptible to health-related impacts associated with the Project than the general population of Victoria.

14.2 Air quality

14.2.1 Assessment approach

A conceptual site model was developed by EnRiskS to determine the exposure pathways for chemicals emitted from the plant. The three main ways a community member can be exposed to a chemical substance emitted from the plant are:

- Inhalation (breathing it in)
- Ingestion (eating or drinking it)
- Dermally (absorbing it through the skin)

Table 14.1 lists the substances emitted from EfW plants and the exposure pathways of potential concern.

Table 14.1: Substances and routes of exposure

Substance	Route of exposure
Nitrogen dioxide	Inhalation only as these are gases
Sulfur dioxide	
Hydrogen chloride	
Hydrogen fluoride	
Carbon monoxide	
Ammonia	
PM10	Inhalation only as these particulates are very small and will remain suspended in air. It is noted that other exposure pathways have also been assessed for individual chemical substances, rather than the physical size of the particulates.
PM2.5	

Substance	Route of exposure
Cadmium	Inhalation of these pollutants adhered to fine particulates Ingestion and dermal contact with these pollutants deposited to soil Ingestion of produce grown in soil potentially impacted by these pollutants (i.e. homegrown fruit and vegetables, eggs, milk and meat products – where the pollutants can be taken up/bioaccumulated into plants and animals)
Thallium	
Mercury	
Antimony	
Arsenic	
Lead	
Chromium	
Cobalt	
Copper	
Manganese	
Nickel	
Vanadium	
Polycyclic aromatic hydrocarbons as benzo(a)pyrene	
Dioxins / furans	

The assessment of potential health impacts associated with the inhalation of substances focused on fine particulates, namely $PM_{2.5}$, which are small enough to reach deep into the lungs and have been linked with a wide ranges of health effects. For all other pollutants, inhalation exposures considered short-term/acute exposures as well as chronic exposures.

Ingestion or dermal exposures occur when pollutants are bound to particulates and bioaccumulate in plants or animals. These are known as multiple pathway exposures. Assessment of risks posed by multiple pathways have been undertaken using a deposition rate which was derived from the air modelling.

The methodology used to calculate health impacts for inhalation and multiple pathway exposures are detailed in Appendix F.

14.2.2 Assessment Results

Particulates

As detailed in Chapter 12, worst-case $PM_{2.5}$ derived from the facility makes a very small contribution to existing concentrations and only makes up a small fraction of the NEPM/SEPP guideline. It is noted that background concentrations of $PM_{2.5}$ are elevated above the NEPM guideline.

The incremental individual risk associated with the change in $PM_{2.5}$ from the facility has been calculated. For a maximum annual increase of $PM_{2.5}$ of 0.018 µg/m^3, this results in a maximum individual risk of $6x10^{-7}$. This risk level is considered to have a negligible impact on the health of the community.

Acute exposures

Table 14.2 presents a summary of the relevant health-based guideline, the predicted maximum 1-hour average concentrations, the maximum impacted receptor, and the calculated hazard index (HI) for each pollutant. Exposures at all other locations, including the other sensitive receptors will be lower than presented in Table 14.2.

Risks associated with acute exposures are considered to be acceptable where the individual and total HI's are less than or equal to one.

Table 14.2: Acute exposures and risks

Pollutants	Acute air guideline (1-hour average (mg/m)	1-hour average concentration (mg/m)		Calculated HI	
		Maximum anywhere	Maximum sensitive receptor	Maximum anywhere	Maximum sensitive receptor
Nitrogen dioxide (NO2)	0.22[1]	9.6E-02	9.6E-02	4.4E-01	4.4E-01
Sulfur dioxide (SO2)	0.5[1]	1.0E-01	7.8E-02	2.1E-01	1.6E-01
Carbon monoxide (CO)	30[1]	3.6E+00	3.6E+00	1.2E-01	1.2E-01
Hydrogen chloride (HCl)	0.66[2]	1.7E-02	8.0E-03	2.6E-02	1.2E-02
Hydrogen fluoride (HF)	0.06[2]	1.2E-03	5.3E-04	1.9E-02	8.8E-03
Ammonia	0.59[2]	8.6E-03	4.0E-03	1.5E-02	6.8E-03
VOCs and formaldehyde	0.05[2]	5.7E-03	2.5E-03	1.1E-01	5.0E-02
Cadmium	0.0054[2]	5.7E-06	2.7E-06	4.0E-04	4.9E-04
Thallium	0.0006[5]	2.9E-06	1.3E-06	4.8E-03	2.2E-03
Mercury (as elemental)	0.0006[3]	5.7E-07	2.7E-07	3.6E-04	4.4E-04
Antimony	0.001[4]	8.6E-06	4.0E-06	3.2E-03	4.0E-03
Arsenic	0.003[2]	1.7E-05	8.0E-06	2.1E-03	2.7E-03
Chromium (Cr VI assumed)	0.0013[2]	1.7E-05	8.0E-06	5.0E-03	6.1E-03
Cobalt	0.00069[2]	8.6E-07	4.0E-07	4.7E-04	5.8E-04
Copper	0.1[3]	8.6E-05	4.0E-05	3.2E-04	4.0E-04
Manganese	0.0091[2]	1.7E-05	8.0E-06	7.1E-04	8.8E-04
Nickel	0.0011[2]	1.7E-05	8.0E-06	5.9E-03	7.2E-03
Vanadium	0.03[3]	8.6E-07	4.0E-07	1.1E-05	1.3E-05
			Total HI (for other pollutants)	**0.19**	**0.10**
			Target (acceptable/negligible HI)	**≤1**	**≤1**

- References for health-based acute air guidelines (1-hour average):
- 1 = NEPM health based guideline (NEPC 2016)
- 2 = Guideline available from the Texas Commission on Environmental Quality (TCEQ, 2014; 2015a; 2015b), https://www.tceq.texas.gov/toxicology/dsd/final.html
- 3 = Guideline available from California Office of Environmental Health Hazard Assessment (OEHHA, 2019) https://oehha.ca.gov/air/general-info/oehha-acute-8-hour-and-chronic-reference-exposure-level-rel-summary
- 4 = Guideline available from the Agency for Toxic Substances and Disease Registry (ATSDR, 2018), as an acute air guideline (relevant to exposures from 1 hour to 14 days) https://www.atsdr.cdc.gov/mrls/index.html
- 5 = Guideline available from the USEPA as Protective Action Criteria (PAC), where the most conservative value has been adopted https://www.energy.gov/ehss/protective-action-criteria-pac-aegls-erpgs- teels-rev-29-chemicals-concern-may-2016 and an additional 100 fold safety factor applied to ensure the guideline is protective of all short-term health effects relevant to exposures in the community.

Chronic exposures

Table 14.3 presents the calculated individual HI and the incremental lifetime cancer risk relevant to the assessment of chronic inhalation exposures. The table presents the calculations relevant to the maximum annual average concentration predicted in the whole study area (i.e. anywhere), as well as the maximum predicted at the sensitive receptors. Risks associated with chronic exposures are considered to be negligible (or acceptable) where the individual and total HI's are less than or equal to 1.

Table 14.3: Calculated chronic risks

Pollutant	Calculated incremental lifetime risk		Calculated HI	
	Maximum anywhere	Maximum sensitive receptors	Maximum anywhere	Maximum sensitive receptors
Nitrogen dioxide (NO2)	--	--	0.22	0.22
Sulfur dioxide (SO2)	--	--	0.026	0.025
Hydrogen chloride (HCl)	--	--	0.0017	0.0010
Hydrogen fluoride (HF)	--	--	0.00024	0.00014
Ammonia	--	--	0.00023	0.00013
Cadmium	--	--	0.0068	0.0038
Thallium	--	--	0.0000049	0.0000027
Mercury (as elemental)	--	--	0.000015	0.0000085
Antimony	--	--	0.00020	0.00012
Arsenic	--	--	0.00008	0.000046
Lead	--	--	0.00082	0.00046
Chromium (Cr VI assumed)	--	--	0.00082	0.00046
Cobalt	--	--	0.000041	0.000023
Copper	--	--	0.00000084	0.00000047
Manganese	--	--	0.00068	0.00038
Nickel	--	--	0.0051	0.0029
Vanadium	--	--	0.000041	0.000023
Dioxin	--	--	0.000059	0.000033
BaP	1.5×10^{-8}	5.0×10^{-9}		
Total HI (other pollutants)			**0.017**	**0.0095**
Negligible risk	**≤1x10^{-6}**	**≤1x10^{-6}**	**≤1**	**≤1**

Multiple pathway exposure

Table 14.4 presents the calculated risks associated with these multiple pathway exposures relevant to both adults and children. These risks have been calculated on the basis of the maximum predicted deposition rate for all of the sensitive receptors in the surrounding community. This is representative of the maximum impacted rural residential location and provides a conservative estimation of risks relevant to other rural residential and urban residential areas. The table presents the total HI for each exposure pathway, calculated as the sum over all the pollutants evaluated. The table also includes the calculated risks associated with inhalation exposures, as these exposures are additive to the other exposure pathways for residential/rural residential properties.

Depending on the use of the agricultural property, the types of exposures that may occur are likely to vary. For this assessment, a number of scenarios have been considered where a range of different exposures may occur. The sum of risks associated with these multiple exposures is presented in Table 14.4.

Table 14.4: Summary of risks for multiple pathway exposures (maximum sensitive receptor)

Exposure pathway	Calculated risks (Adults)		Calculated risks (Children)	
	Non-threshold risk	HI	Non-threshold risk	HI
Individual exposure pathways				
Inhalation (I)	5.0×10^{-9}	0.0095	5.0×10^{-9}	0.0095
Soil ingestion (SI)	2.0×10^{-10}	0.0019	3.9×10^{-10}	0.018
Soil dermal contact (SD)	7.7×10^{-10}	0.00035	3.2×10^{-10}	0.00070
Ingestion of homegrown fruit and vegetables (F&V)	1.5×10^{-9}	0.0013	1.2×10^{-9}	0.0033
Ingestion of homegrown eggs (E)	3.8×10^{-13}	0.00032	1.6×10^{-13}	0.00064
Ingestion of homegrown beef (B)	2.3×10^{-9}	0.0045	1.2×10^{-9}	0.011
Ingestion of homegrown dairy milk (at property) (M)	1.9×10^{-8}	0.0085	1.5×10^{-8}	0.034
Multiple pathways (i.e. combined exposure pathways)				
I + SI + SD	5.9×10^{-9}	0.012	5.7×10^{-9}	0.028
I + SI + SD + F&V	7.5×10^{-9}	0.013	6.9×10^{-9}	0.031
I + SI + SD + E	5.9×10^{-9}	0.012	5.7×10^{-9}	0.029
I + SI + SD + F&V + E	7.5×10^{-9}	0.013	6.9×10^{-9}	0.032
I + SI + SD + B	8.2×10^{-9}	0.016	6.9×10^{-9}	0.039
I + SI + SD + M	2.5×10^{-8}	0.020	2.1×10^{-8}	0.062
I + SI + SD + F&V + E + B	9.8×10^{-9}	0.018	8.0×10^{-9}	0.043
I + SI + SD + F&V + E + M	2.6×10^{-8}	0.022	2.2×10^{-8}	0.066
Negligible risk	$\leq 1 \times 10^{-6}$	≤1	$\leq 1 \times 10^{-6}$	≤1

14.2.3 Potential impacts

The assessment results demonstrate that there are no acute or chronic inhalation exposure risks of concern and no chronic risks of concern from exposure to the pollutants from the facility via soil or ingestion of home grown produce.

14.3 Noise

Noise can have short-term and long-term adverse effects on people including sleep disturbance, annoyance, hearing impairment, interference with speech and other daily activities, impacts on memory and concentration and impacts on cardiovascular health. Different individuals have different sensitivities to types of noise and this reflects differences in expectations and attitudes more than it reflects any differences in underlying auditory physiology. A noise level that is perceived as reasonable by one person in one context may be considered completely unacceptable by that same person in another context.

The maximum expected noise levels at the nearest sensitive receptors (Chapter 13) have been assessed against criteria developed by the World Health Organisation (WHO) that have been established on the basis of the relationship between noise and health impacts. The predicted noise levels as a result of this Project are all below the WHO guideline values that are protective of adverse health effects. Therefore, it is predicted that the potential for noise impacts to result in adverse health impacts within the community is low.

14.4 Economics, waste and transport

The proposed Project will result in the direct employment of 300-400 full time staff during the construction phase and approximately 30 full time staff during the operational phase. It is expected that there will also be an increase in indirect employment. The most significant health outcomes in the community are expected to be benefits associated with job creation. While there is evidence to support that finding employment has health benefits, most studies are related to the negative impacts of unemployment. It would seem reasonable that if unemployment has a range of negative effects then finding employment would have positive effects. Health outcomes from unemployment include increases in the risk of illness and premature death and there are impacts on a range of mental health issues (anxiety, stress etc.) and social aspects of life (lower self-esteem, feelings of insecurity etc.). Finding employment is expected to be associated with improvements in these aspects of health and wellbeing. The region has higher than average unemployment therefore improvements in health and wellbeing in the local community can be enhanced by encouraging local employment at the facility.

14.5 Transport

A high-level assessment of the proposed traffic generation and traffic impacts of the proposed EfW plant has been undertaken. Construction traffic was predicted to increase vehicle movements in the local area by a peak of 400 light vehicles (for staff) and 390 heavy vehicles a day (for plant and equipment) with most movements occurring during peak hour periods. When in operation, the predicted increase is expected to be 40 light vehicles (for staff) and 93 heavy vehicles (delivering waste, consumable and chemicals, and ash and scrap metal removed). A review of the traffic movements related to the project concluded that the existing road performance would not be adversely impacts and “it is likely that the traffic generated from this project will have negligible adverse impact to traffic performance” at key intersections during construction. Further traffic impact assessment works, including the preparation of traffic management plan(s) are proposed in the next stages of the planning process for the Project.

14.6 Hazardous waste

The proposed project would not procure waste streams as feedstock that do not meet the requirements of the Victorian EPA Energy from Waste Guidelines (EPA Publication 1559.1). That is, any waste streams that can be feasibly reused or recycled will not be targeted for the purpose of recovery by thermal processing. Hence the following input types will not be targeted:

- Source separated household, C&I recycling streams
- Bulky / drop off household wastes and other municipal wastes such as street sweepings
- C&I waste types that are not considered to be appropriate feedstocks such as medical wastes
- Construction and demolition waste
- Prescribed industrial wastes (e.g. asbestos, unprocessed used cooking fats and oils)

EfW facilities operating to a temperature of 850°C must also meet with criteria which states that halogenated organic substances, expressed as chlorine, should comprise of no more than 1% of the feedstock.

Quality assurance processes will be implemented to reduce the potential for contamination or the presence of recyclable materials to be processed. Feedstock will be managed during operation of the proposed facility. The management measures will include:

- Waste Acceptance Criteria – This will detail the waste not accepted by the facility, including hazardous wastes and contaminants
- Waste inspection – This will occur at the waste transfer station as well as at the weighbridge on entry to the facility. If a problem or hazard is suspected, the material would be further inspected in a designated inspection area. Any hazardous wastes would be separated and disposed separately. The feedstock will also be inspected on tipping into the bunker
- Periodic auditing and independent auditing of feedstock to ensure incoming materials comply with EPA regulatory requirements

Where these measures are implemented, the potential for hazardous waste to be present in feedstock is low.

15. Other environmental and social considerations

15.1 Cultural heritage

A cultural heritage due diligence assessment was conducted (Appendix G) to identify key Aboriginal and historic heritage constraints in the Project area. The study consisted of both a desktop assessment and site inspection.

15.1.1 Existing environment

The project area is located on a predominantly flat plain. Sensitive landforms that are typically found to contain Aboriginal archaeological deposits such as alluvial terraces, intervening saddles and elevated landscapes are not present. An archaeological survey conducted by Debney (1998), described extensive disturbance of the Project area due to historic land-use from cultivation, and other agricultural activities, further suggesting it is unlikely that any Aboriginal cultural heritage is present. No registered Aboriginal Places within the Project area or within 200 m of the project area are recorded. The Project area is considered to be of low archaeological sensitivity, with low potential to contain Aboriginal cultural heritage.

No historical heritage places were found to be registered within the Project area, indicating a low potential for historic heritage to be present in the area.

15.1.2 Potential impacts

As the Project area has low potential to contain Aboriginal or historical cultural heritage, potential impacts to cultural heritage from the Project are considered to be highly unlikely.

15.1.3 Mitigation and management

A CEMP will be prepared for the Project and will include a procedure to manage the unexpected discovery of Aboriginal or historic cultural heritage. The procedure will detail the steps that need to be taken if cultural heritage is discovered during works.

15.2 Ecology

A flora and fauna assessment was conducted (refer Appendix H) to review the risks relating to statutory flora and fauna issues (including native vegetation) associated with the development of the Project. The assessment reviewed a number of existing databases of modelled and previously recorded species and communities from the wider landscape and considers the potential for such features to occur within the Project footprint, given site attributes and habitat apparent from the data reviewed. A site survey was undertaken to review habitat present onsite against the desktop data collated.

15.2.1 Existing environment

The desktop flora and fauna assessment found a number of native vegetation and threatened species in the vicinity of the site, according to broad government databases. However, more recent reporting, particularly that associated with the development of the Geelong Ring Road Precinct Structure Plan and the accompanying Native Vegetation Precinct Plan, had determined that native vegetation was not present onsite. Obvious site development has been undertaken further compromising the likelihood of significant statutory issues relating to flora and fauna.

The site assessment confirmed the site was highly disturbed and modified through recent site works involving the clearing and levelling of the site and removal of vegetation. The site has subsequently been used to store dry fill (dirt, bitumen, gravel, rock), which has been deposited across much of the site. Remaining vegetation is largely dominated by weed species.

A brief habitat assessment was undertaken to determine the need for any further targeted threatened species assessments. This found the site to be substantially modified and disturbed and habitat present was considered unsuitable for any of the threatened species considered as potentially relevant to the site through the desktop data review.

15.2.2 Potential impacts

Due to the lack of native vegetation and threatened species habitat on the site, potential impacts on flora and fauna as a result of the Project are assessed to be low.

15.2.3 Mitigation and management

The CEMP will include a procedure to mitigate the spread of weeds during the construction of the Project.

15.3 Contaminated land

A contaminated land assessment was conducted to assess and mitigate the potential soil and groundwater contamination risks (issues or implications) to the proposed development that may exist as a result of current and/or historical activities at or around the Project site.

The contaminated land assessment consisted of a:

- Preliminary desktop assessment (Appendix I) to identify potential soil and groundwater contamination risks (issues and implications) to the proposed development that may exist as a result of current and/or historical activities at or around the site; and present recommendations accordingly for in-field intrusive investigations
- Field Investigations (Appendix J) to inform the environmental condition of the site and its suitability for the proposed development, in the context of potential impacts on the environment or human health, during or post-construction, and to inform potential management requirements during, or post construction

15.3.1 Existing environment

The Preliminary Land and Groundwater Contamination Assessment report found that:

- Based on the site history, the Project site has never been developed and has remained vacant for over a century. It is possible the site has been used at some stage for some agricultural use (cropping and grazing) which could have included pesticide and fertiliser use. The only other potential onsite source of contamination apparent from available information may be associated with stockpiled material of unknown origin evident across the site
- Several potential offsite sources of contamination were identified in the immediate vicinity of the Project site, including two gas storage and distribution facilities, a recycling centre, a transport warehouse and shipping container yard as well as agricultural and industrial chemical manufacturing plants and prescribed industrial waste management facilities
- Aside from the stockpiles already located on the site, the most likely transport mechanism for any contamination associated with potential off-site sources to impact the Project (i.e. to be encountered at the site) is via groundwater, and for those adjoining the site, to a lesser degree via surface water transport as well. Groundwater is anticipated to flow from west to east/ southeast toward Hovells Creek and Corio Bay respectively

The field investigations included soil sampling from across the site and installation and testing of one groundwater monitoring well.

15.3.1.1 Soils

The typical stratigraphic soil profile encountered during intrusive investigations at the site is summarised in Table 15.1.

Table 15.1: Soil profile

Approximate depth metres below ground level (mbgl)	Description
0 to >2.0 m (depth is varied across site)	Fill material: consisting of grey to brown-grey, soft silty clay, with varying degrees of medium to coarse basaltic gravels and cobbles.
0.4 m to 0.8 m (depth is varied across site)	Natural soil: dry brown silt.
0.55 m to 1.95 m (depth is varied across site)	Natural soil: brown to red-brown basaltic clays.
Depth to top of basalt varied 1.0-1.95 m	Extremely weathered basalt (Newer Volcanics) with interbedded clays.

Extensive fill material was observed across the site, the origin of which is unknown. The fill material was however, generally consistent and appeared to be largely reworked, natural material from the area. Stockpiles along the northern and southern boundary contained substantial volumes of basaltic rubble.

Analytical results for sampled fill material and natural soils reported no exceedances of the adopted criteria, with the exception of nickel. Elevated nickel concentrations in soils are considered to be naturally occurring and derived from the natural basaltic soils. The overall risk of contamination issues presenting a significant issue to the proposed development is considered to be low based on the generally low concentrations of contaminants reported in the site soils. The results also indicated that the condition of soil at the site is unlikely to pose a health risk to the construction workers during the development.

15.3.1.2 Groundwater

Groundwater was measured at 9.55 mbgl within weathered basalt of the Newer Volcanics formation. Slug test analysis suggests a high hydraulic conductivity (approximately 10 m/day), however it is unclear, with only one test, whether this is representative of the aquifer. Groundwater is likely to be encountered during construction of the Project which has an anticipated excavation depth of 11 mbgl. The anticipated groundwater head above the base of the proposed excavation is on that basis 2.25 m, hence an approach to manage groundwater inflows during construction will need to be developed.

The results of the groundwater analysis are shown in Table 15.2.

Table 15.2: Summary of groundwater contaminant concentrations

Analyte Group	Analyte	Conc. (µg/L)	Beneficial Use Criteria **			
			WDES[1]	WR[2]	SW[3]	B&S[4]
Metals	Boron	1,500	370	40,000	5,000	-
	Chromium (hexavalent)	10	1	0.5	-	-
	Copper	4	1.4	1,000	1,000	-
	Nickel	16	11	200	1,000	-
	Silver	3	0.05	1,000	-	-
	Zinc	34	8	3,000	20,000	-

Analyte Group	Analyte	Conc. (µg/L)	Beneficial Use Criteria **			
			WDES[1]	WR[2]	SW[3]	B&S[4]
Inorganics	Chloride	1,680,000	-	250,000	-	1,000,000
	Nitrogen (total) as N	11,300	1,100 [5]	-	-	-
	Sodium	1,240,000	-	180,000	-	-
	Total Dissolved Solids	3,870,000	-	600,000	-	-

Notes: All values in µg/L, shading indicates exceedance of adopted beneficial use criteria.

** WDES – Water Dependent Ecosystems and Species, SW - Agriculture and Irrigation (Stock Watering), WR – Water-based Recreation, B&S – Buildings and Structures.

Dash (-) = no criteria available / adopted.

1) ANZG (2018) Australian and New Zealand Guidelines for Fresh and Marine Water Quality – 95% protection trigger value for fresh water species. Low reliability trigger value was adopted (where available) in the absence of 95% LOP criteria.
2) NHMRC (2008) Guidelines for Managing Risk in Recreational Water.
3) ANZECC/ARMCANZ (2000) National Water Quality Management Strategy. Australian and New Zealand Guidelines for Fresh and Marine Water Quality – Livestock Drinking Water Quality.
4) AS2159-2009 Protection of Concrete and Steel Piles.
5) SEPP (Waters) (2018) Guideline values

Concentrations of select metals (boron, hexavalent chromium, copper, nickel, silver and zinc), chloride, total nitrogen (as N), sodium and TDS were reported in excess of one or more adopted beneficial use criterion in groundwater beneath the site. These exceedances are discussed in Table 15.3.

Table 15.3: Groundwater monitoring results

Beneficial use criteria	Discussion
Water dependent ecosystems and species	Results of the groundwater investigations indicated concentrations of boron, hexavalent chromium, copper, nickel, silver, zinc and total nitrogen (as N) exceeded the adopted criteria for Water Dependent Ecosystems and Species. It is noted that the beneficial use Water Dependent Ecosystems and Species applies at the point of groundwater discharge, which is expected to be Hovells Creek located approximately 3 km east of the site. The site is not considered likely to be a source for metals and nitrogen species reported in excess of the beneficial use criteria for Water Dependent Ecosystems and Species in groundwater beneath the site, and the metals and nitrogen species reported in groundwater are expected to attenuate prior to discharge to the inferred receiving surface water body. Furthermore, it is possible that diffuse sources of nitrogen species may also exist between the site and Hovells Creek. As such, it is considered that the condition of groundwater underlying the site is not expected to adversely impact on the Water Dependent Ecosystems and Species.
Water-based recreation (primary contact recreation)	Results of the groundwater investigations indicated concentrations of hexavalent chromium, chloride, sodium and TDS exceeded the adopted criteria for Water-based Recreation (Primary Contact Recreation). Elevated concentrations of chloride, sodium and TDS are considered to be representative of background groundwater conditions and therefore not considered pollution. As such, it is considered that the elevated concentrations of chloride, sodium and TDS reported in groundwater underlying the site are unlikely to preclude the Water-based Recreation (Primary Contact Recreation).

Beneficial use criteria	Discussion
	Hexavalent chromium in site groundwater exceeded the adopted criterion for Water-based Recreation (Primary Contact Recreation). On this basis, it is considered that this beneficial use is potentially precluded by the elevated hexavalent chromium in site groundwater. However, further assessment is recommended to confirm the presence of hexavalent chromium pollution in groundwater underlying the site.
Agriculture and irrigation (stock watering)	There were no exceedances of the adopted groundwater quality objectives for Agriculture and Irrigation (Stock Watering). As such it is considered that the condition of groundwater underlying the site is not expected to adversely impact this beneficial use.
Buildings and structures	Concentrations of chloride indicate that the sub-surface environment is likely to be "mild" to steel piles in groundwater in accordance with Table 6.5.2(C) of AS2159 (2009) Piling – Design and Installation. However, the chloride concentration in site groundwater was primarily attributed to naturally occurring concentrations which would not be considered pollution. Nevertheless, consideration should be given to the requirements of construction materials and protection measures for steel and concrete piles per AS2159 (2009).
Industrial and commercial	Groundwater quality objectives are not available for Industrial and Commercial, as such, it has been assumed that if the objectives for other extractive beneficial uses requiring protection (i.e., Agriculture and Irrigation (Stock Watering) and Water-based Recreation (Primary Contact Recreation) are achieved, then the beneficial use Industrial and Commercial will also be protected. Concentration of hexavalent chromium in site groundwater exceeded the adopted criterion for Water-based Recreation (Primary Contact Recreation). On this basis, it is considered the beneficial use Industrial and Commercial is potentially precluded by the elevated hexavalent chromium in site groundwater, recognising that different industrial water uses will have different water quality requirements. However, further assessment is recommended to confirm the presence of hexavalent chromium pollution in groundwater underlying the site

15.3.2 Potential impacts and management measures

Potential impacts from contaminated soil and groundwater on the site and management measures to mitigate these impacts are summarised in Table 15.4.

Table 15.4: Potential impacts and management measures for contaminated soil and groundwater

Potential impact	Management measures
There is potential impact to the Project due to contaminant migration from off-site sources in the vicinity of the site (i.e. Shell liquified petroleum gas [LPG] Terminal and Elgas LPG depot, transport warehouse and container yard, recycling facility, agricultural and industrial chemical manufacturing plants, metal galvanising facility, prescribed industrial waste management facilities)	Additional groundwater monitoring wells to be installed at select locations around the site perimeter in order to assess the potential for contaminated groundwater to migrate onto the project area. The analytical suite adopted for the groundwater collection should consider contaminants of potential concern associated with those off-site land uses, and hexavalent chromium analysis to assess the potential presence of this contaminant in site groundwater

Potential impact	Management measures
Hydraulic conductivity of 10 m/day (and possibly higher) has the potential for significant implications for dewatering of the excavation, i.e. high inflow rates and associated costs of pumping and disposal of this water	Undertake additional slug tests at future groundwater monitoring wells. If high permeabilities are confirmed, conduct pumping tests (which are a more comprehensive method of testing aquifer permeability) to further inform aquifer permeability and dewatering requirements.
Potential impact on receiving environments from groundwater disposal due to criteria exceedances	CEMP to detail procedures for safe disposal of groundwater.
Contaminated soil or acid forming soils lead to adverse environmental impact during disposal	CEMP to include sampling and testing requirements for management and disposal of waste soil (including leachability testing) as well as identify an appropriate disposal facility or reuse options

15.4 Traffic

A high-level traffic impact assessment was conducted (Appendix K) to assess the potential impacts of the proposed development on the surrounding transport network. This assessment included the:

- Operational capacity of transport routes to and from the Project site
- Estimated construction and operation traffic being generated by the Project development
- Midblock performance of the existing road network with the estimated traffic demands
- Intersection performance using SIDRA at key nominated intersections based on the estimated traffic demands
- Key traffic impacts from the proposed Project
- Relevant recommendations and mitigation measures

15.4.1 Existing environment

The existing condition of the transport network surrounding the Project site was documented during a site visit undertaken in February 2020. The road network surrounding the Project site (study area) is shown in Figure 15.1 and includes:

- Princes Freeway
- Geelong Ring Road
- Bacchus Marsh Road
- Midland Highway
- Ballan Road
- Forest Road
- Heales Road
- Broderick Road
- Production Way

Data provided from the Victorian Department of Transport shows that all the above roads are classified to accommodate heavy vehicles. The largest vehicles assumed to access the site during the construction and operation phases are 26 m B-doubles.

The existing midblock traffic performance across the study area road network was assessed using the level of service (LoS) performance measure. The LoS assesses the operating conditions of roads using factors such as speed, travel time, freedom to manoeuvre, interruptions, comfort and convenience. There are six levels of service, from A to F, with LoS A representing the best operating condition and LoS F the worst. A LoS of A implies that vehicles travelling along a particular road section are experiencing free flow conditions. LoS E represents a midblock section or intersection at capacity. LoS F describes a breakdown in vehicle flow.

All roads assessed scored a LoS rating of A indicating there is currently free-flowing conditions across the study area road network.

The following intersections, not connected to major freeway links, also form the road network of interest. Due to their close proximity to the site, these four key nominated intersections were assessed using SIDRA:

- Forest Road / Heales Road
- Bacchus Marsh Road / Heales Road
- Heales Road / Broderick Road
- Broderick Road / Production Way

Turning movement survey data was not available and was not collected at any of the intersections within the nominated study area. Peak one-hour intersection volumes were derived from the existing (2020) peak hour midblock volumes, then appropriate turning assumptions were made.The SIDRA analysis of the current performance of these intersections indicated that each intersection is performing satisfactorily, with either LoS A or LoS B.

15.4.2 Potential impacts

15.4.2.1 Estimated project traffic generation

The traffic impact assessment estimated the traffic to be generated during both the construction (Table 15.5) and operation phases (Table 15.6) of the project and the potential midblock traffic impacts across the road network in the study area.

Figure 15.1: Existing road network

Prospect Hill Energy from Waste | PROSPECT HILL INTERNATIONAL

Project site

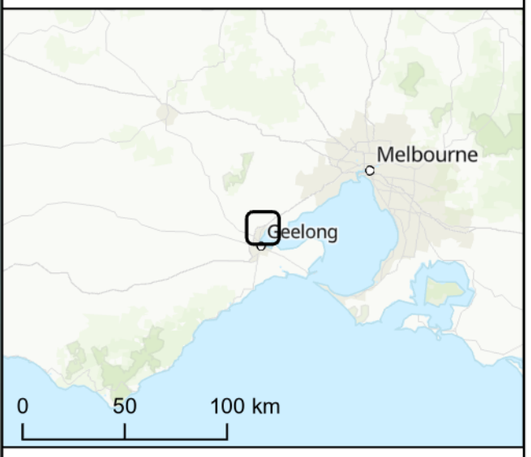
N

A3
1:75,000

IS305100
GDA 1994 MGA Zone 55

0 1 2 km

DATA SOURCES
© Commonwealth of Australia (Geoscience Australia) Geodata Topo 250k Series 3; Vicmap Data © State of Victoria; Jacobs.
Earthstar Geographics, Vicmap, Esri, HERE, Garmin, FAO, NOAA, USGS



Jacobs

Path: J:\IE\Projects\03_Southern\IS305100\Spatial\ArcPro\IS305100\IS305100_Environmental.aprx\IS305100-CRTO-000092_Figure_15_1_ExistingRoadNetwork_A3_Landscape
Created by WARDA on 17/09/2020

Table 15.5: Estimation of traffic volumes generated during peak construction (2024)

Traffic Type	Estimated traffic generated
Staff trips	400 light vehicles travelling to the site during the AM peak hour period, 800 two-way vehicle trips daily
Construction materials and/or equipment deliveries	90 heavy vehicles (180 two-way trips) travelling to/from the site during the AM peak period (30% of daily traffic volumes). 300 heavy vehicles (600 two-way trips) accessing the site daily
Total number of vehicles	580 two-way vehicle trips during the AM peak hour and 1,400 two-way vehicles trips daily

Table 15.6: Estimation of traffic volumes generated during the operation phase (2026)

Traffic type	Estimated traffic generated
Staff trips	40 light vehicles travelling to the site during the AM peak period, 80 two-way vehicle trips daily
Operation phase deliveries	8 heavy vehicles (16 two-way trips) travelling to/from the site during the AM peak period. 85 heavy vehicles* (170 two-way trips) accessing the site daily * Waste delivery trips: 70 Consumables and chemical related trips: 3 Ash and scrap metal removal related trips: 12
Total number of vehicles	56 two-way vehicle trips during the AM peak hour and 250 two-way vehicles trips daily

15.4.2.2 Key transport routes to/from site

The key transport routes to and from the site are detailed in Table 15.7 and shown on Figure 15.1.

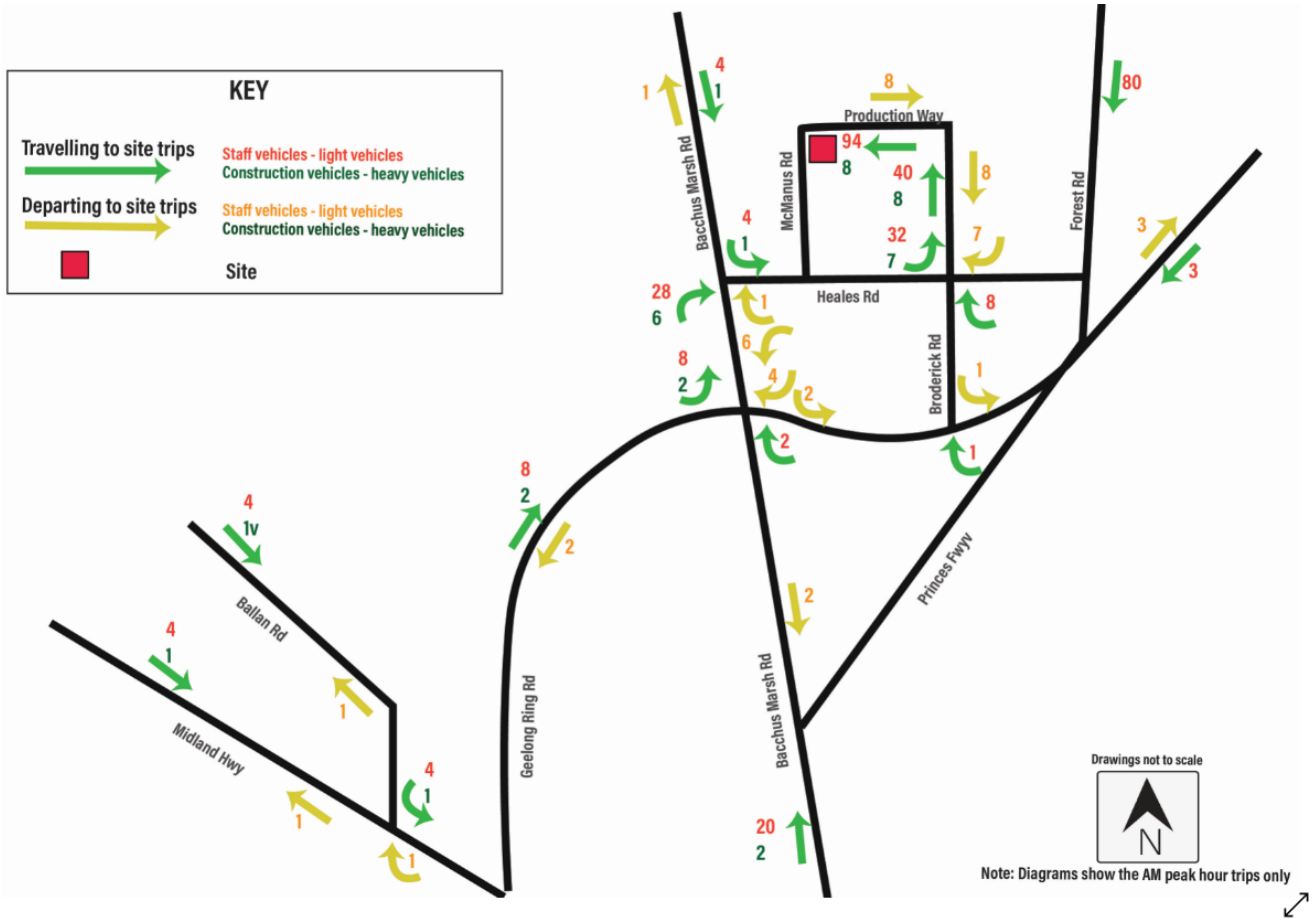
Table 15.7: Key transport routes to and from site

Route	From	Route
1A	Metropolitan Melbourne via Geelong City Centre exit	▪ Westbound on the Princes Freeway, exit the Princes Freeway via the Geelong City Centre exit ▪ Right into Broderick Road ▪ Left into Production Way
1B	Metropolitan Melbourne via Geelong Ring Road	▪ Westbound on the Princes Freeway (becomes Geelong Ring Road) ▪ Continuing westbound along Geelong Ring Road, exit Geelong Right Road via the Bacchus Marsh exit ▪ Right onto Bacchus Marsh Road ▪ Right into Heales Road ▪ Left into Broderick Road ▪ Left into Production Way

Route	From	Route
2	Wider Geelong/Surf Coast	▪ Northbound on the Princes Highway/La Trobe Terrace (becomes Bacchus Marsh Road) ▪ Continuing northbound along Bacchus Marsh Road ▪ Right into Heales Road ▪ Left into Broderick Road ▪ Left into Production Way
3	Lara	▪ Southbound on Forest Road ▪ Right into Heales Road ▪ Right into Broderick Road ▪ Left into Production Way
4	Ballarat	▪ Eastbound along Midland Highway, exit Midland Highway via the Melbourne exit, left onto Geelong Ring Road ▪ North/eastbound along Geelong Ring Road, exit Geelong Right Road via the Bacchus Marsh exit ▪ Left onto Bacchus Marsh Road ▪ Right into Heales Road ▪ Left into Broderick Road ▪ Left into Production Way
5	Ballan	▪ Southbound along Ballan Road ▪ Right onto Midland Highway, exit Midland Highway via the Melbourne exit, left onto Geelong Ring Road ▪ North/eastbound along Geelong Ring Road, exit Geelong Right Road via the Bacchus Marsh exit ▪ Left onto Bacchus Marsh Road ▪ Right into Heales Road ▪ Left into Broderick Road ▪ Left into Production Way
6	Bacchus Marsh/Melton	▪ Southbound along Bacchus Marsh Road ▪ Left into Heales Road ▪ Left into Broderick Road ▪ Left into Production Way

15.4.2.3 Predicted impact on key transport routes

A midblock traffic assessment at key roads within the study area was assessed with added construction and operation traffic. Figure 15.3 show the predicted future traffic volumes with added construction traffic during peak construction. Figure 15.4: Assumed traffic distribution (AM peak) along the study area road network during operation (2026)



From an intersection traffic performance perspective, all key nominated intersections are still expected to perform satisfactorily except for Bacchus Marsh Road / Heales Road which is expected to experience heavily congested conditions equivalent of LoS F. Bacchus Marsh Road / Heales Road is expected to experience failure due to the high proportion of construction traffic turning right into Heales Road from the south, leading to 70+ second delays and queues exceeding 500 m along the north approach.

Based on this high level Sidra assessment, the following measures are recommended for improving the traffic operation and flow at Bacchus Marsh Road / Heales Road:

- Scheduling construction vehicle trips and/or construction staff vehicle trips where possible to travel to/from the site outside the busiest peak hour period(s)
- Further investigate redistributing some of this right turning traffic so they utilise other nearby intersections with potentially spare capacity to access the site
- Further investigate potential detour short term routes for non-Project construction traffic
- Employing onsite traffic controllers to manage the intersection during the busiest periods of the peak construction phase
- Further investigate and potentially undertake short term capacity works at the intersection

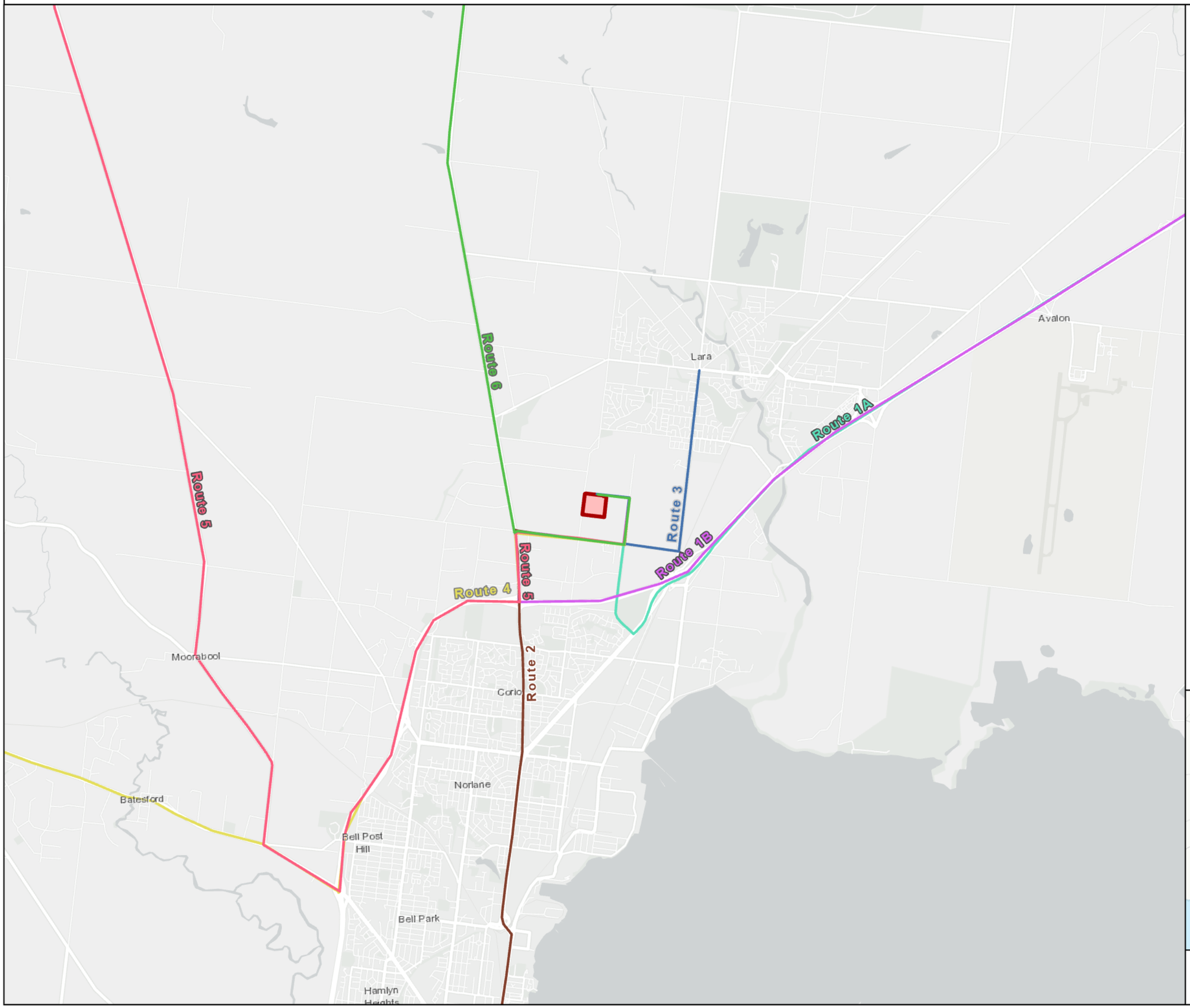
show the future traffic volumes with added operation traffic.

The assessment shows that during construction, from a midblock traffic perspective, all key road sections are expected to experience a LoS A to C. During operations, all roads are expected to experience a LoS A to B.

In regional areas, LoS C can be considered a minimum desirable standard. A deterioration of the LoS under this level would imply that mitigation measures to maintain the existing LoS would be required. With the midblock

LoS expected to remain below LoS C, during construction and operation, traffic impacts on midblock performance for the Project are predicted to be low.

Figure 15.2: Key transport routes to/from the Project site



Project site
Route 1A
Route 1B
Route 2
Route 3
Route 4
Route 5
Route 6

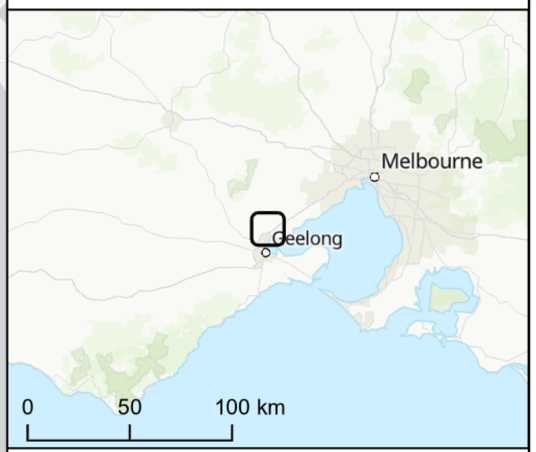
N

IS305100
GDA 1994 MGA Zone 55

A3
1:65,000

0 1 2 km

DATA SOURCES
© Commonwealth of Australia (Geoscience Australia) Geodata Topo 250k Series 3; Vicmap Data © State of Victoria; Jacobs.
Esri, HERE, Vicmap, Esri, HERE, Garmin, METI/NASA, USGS, Vicmap, Esri, HERE, Garmin, FAO, NOAA, USGS



Jacobs

Path: J:\IE\Projects\03_Southern\IS305100\Spatial\ArcPro\IS305100\IS305100_Environmental.aprx\IS305100-CRTO-000092_Figure_15_2_KeyTransportRoutes_A3_Landscape
Created by WARDA on 17/09/2020

Figure 15.3: Assumed traffic distribution (AM peak) along the study area road network during peak construction (2024)

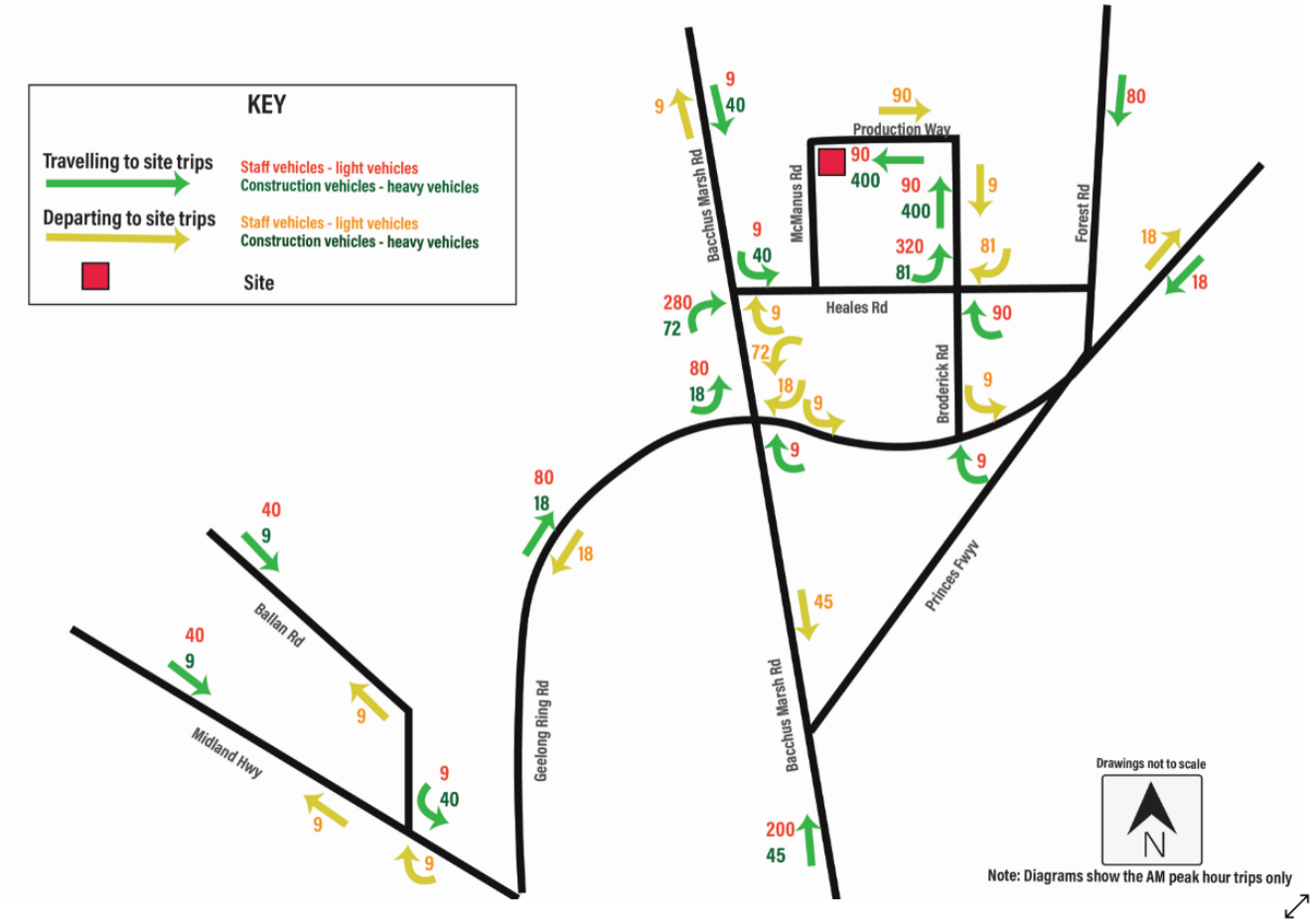
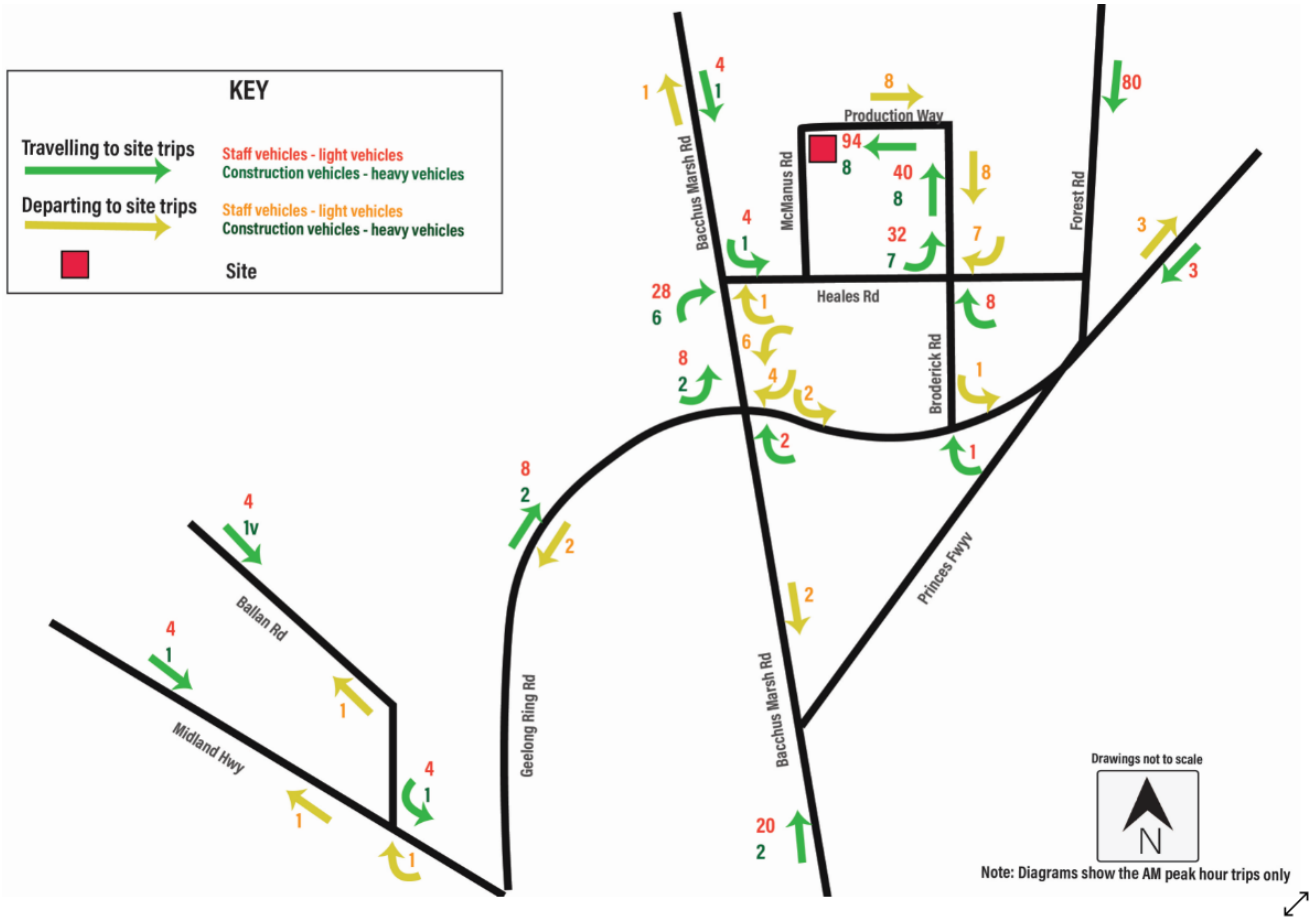


Figure 15.4: Assumed traffic distribution (AM peak) along the study area road network during operation (2026)



From an intersection traffic performance perspective, all key nominated intersections are still expected to perform satisfactorily except for Bacchus Marsh Road / Heales Road which is expected to experience heavily congested conditions equivalent of LoS F. Bacchus Marsh Road / Heales Road is expected to experience failure due to the high proportion of construction traffic turning right into Heales Road from the south, leading to 70+ second delays and queues exceeding 500 m along the north approach.

Based on this high level Sidra assessment, the following measures are recommended for improving the traffic operation and flow at Bacchus Marsh Road / Heales Road:

- Scheduling construction vehicle trips and/or construction staff vehicle trips where possible to travel to/from the site outside the busiest peak hour period(s)
- Further investigate redistributing some of this right turning traffic so they utilise other nearby intersections with potentially spare capacity to access the site
- Further investigate potential detour short term routes for non-Project construction traffic
- Employing onsite traffic controllers to manage the intersection during the busiest periods of the peak construction phase
- Further investigate and potentially undertake short term capacity works at the intersection

15.4.3 Mitigation and management

Prior to the start of construction, a Traffic Management Plan will be prepared, in consultation with the relevant road management authorities, to ensure disruption to traffic during construction and operation is minimised. The Traffic Management Plan will comply with the *Road Management Act 2004* and the codes of practice under this Act. The Traffic Management Plan will include:

- Methods for improving the traffic operation ad flow at Bacchus Marsh / Heales Road in consideration of the recommendations in Chapter 15.4.2.
- Confirmation of oversized dimensional routes from the Port of Geelong to the site to ensure compliance with horizontal, vertical and bridge clearance requirements
- Measures to minimise impacts to the community such as scheduling to avoid disrupting regular traffic activity

15.5 Landscape and visual

A Landscape and Visual Impact Assessment was conducted (Appendix L) to assesses the potential visual impacts that may result as a result of the Project.

15.5.1 Existing environment

15.5.1.1 Landscape character and sensitivity

Topography within the study area is relatively flat, with the Project site and immediately surrounding area being characterised as open plains to gently undulating. The site sits relatively low in comparison to an elevated ridgeline approximately 6.5 km west (to the west of Bacchus Marsh Road), and the You Yangs on the northern edge of the study area. Native vegetation within the study area is limited and consists of treeless vegetation, mostly less than 1 m tall, and is dominated by largely graminoid and herb life forms. Most of the study area has been modified or cleared for land uses such as industry, agriculture or urban development. There are five clear landscape character types in the study area as detailed in Table 15.8.

Table 15.8: Landscape character types in study area

Landscape Unit	Sensitivity
LU1 – Rural residential	Moderate-High - While these areas are valued for their 'natural-appearing' or rural landscape amenity, they are modified landscapes within zones that are set aside for rural related industries such as farming or extractive resources, and thus inherently contain land uses with potential off-site amenity impacts.
LU2 – Townships	Moderate - Built form and other visual elements reduce the visual sensitivity of these areas. However as these are urban areas with many houses, the landscape sensitivity is rated moderate-high.
LU3 - Cleared Flat Farmland	Low – A highly modified landscape that contains visible infrastructure, is not topographically dramatic and has been largely cleared of remnant vegetation. The clearing of vegetation has allowed long range views to distant landscape features. This landscape unit has relatively low viewer numbers.
LU4 – Industrial Areas	Low – A highly modified landscape that contains visible infrastructure, is not topographically dramatic and has been largely cleared of remnant vegetation. The clearing of vegetation has allowed long range views to distant landscape features. This landscape unit has relatively low viewer numbers.
LU5 – National or State Parks/Reserves	High - This landscape is attractive as it contains areas that are and appear pristine. Encroaching development into this landscape type has increased the rarity of this landscape.

Landscape Unit	Sensitivity
LU6 – Coastal Landscapes	High – These landscapes are highly valued for their amenity and recreation benefits, including long-range views.
LU7 – Memorial Parks	High - These landscapes hold a high amount of sentimental and visual value.

15.5.1.2 Potential impacts

Fifteen viewpoints were selected as representative of the publicly accessible locations in and around the Project site. The viewpoints and the predicted visual impact from that viewpoint are presented in Table 15.9 and shown in Figure 15.5.

Table 15.9: Predicted impact from selected viewpoints

Viewpoint	Visual Impact
VP01 – Hovells Creek Reserve	Low
VP02 – Rennie Street / Princes Highway	Low
VP03 – Rennie Street Embankment	Low
VP04 – Hendey Street Reserve	Low-Negligible
VP05 – McManus Road	Low-Negligible
VP06 – Corner McManus Road and Heales Road	Low
VP07 – Corner Bacchus Marsh Road and Heales Road	Low
VP08 – Minyip Road	Moderate-High
VP09 – Bacchus Marsh Road	Low-Moderate
VP10 – McNeil Court	Low-Moderate
VP11 – Intersection of Elcho and Bacchus Marsh Roads	Low-Negligible
VP12 – Elcho Park Golf Course	Low
VP13 – Westlakes Boulevard	Low
VP14 – Flinders Memorial Park	Low
VP 15 – You Yangs Regional Park	Low-Negligible

Figure 15.5: Location of viewpoints

Prospect Hill Energy from Waste | PROSPECT HILL INTERNATIONAL

Project site

Zone of visual influence (ZVI)

Viewpoint

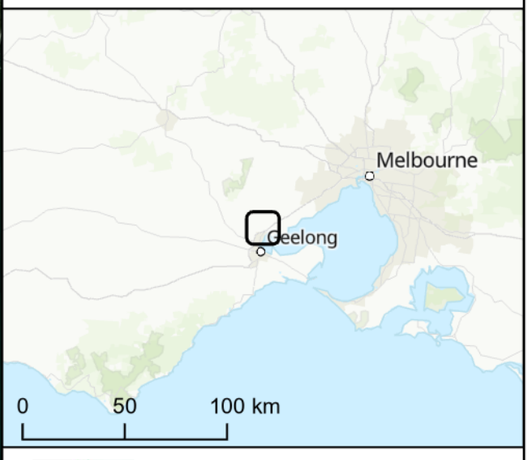
N

A3
1:75,000

IS305100
GDA 1994 MGA Zone 55

0 1 2 km

DATA SOURCES
© Commonwealth of Australia (Geoscience Australia) Geodata Topo 250k Series 3; Vicmap Data © State of Victoria; Jacobs.
Earthstar Geographics, Vicmap, Esri, HERE, Garmin, FAO, NOAA, USGS



Jacobs

Path: J:\IE\Projects\03_Southern\IS305100\Spatial\ArcPro\IS305100\IS305100_Environmental.aprx\IS305100-CRTO-000092_Figure_15_5_Location_of_Viewpoints_A3_Landscape
Created by WARDA on 17/09/2020

The Project has the potential to be noticeable in the landscape and will have the potential to be a dominant feature where clear views are permitted within close proximity to the site. These views are generally over cleared farmland or industrial areas which have a low sensitivity to visual change. These landscapes also include various infrastructure such as the existing high voltage transmission line that runs to the north west and west of the site and other industrial built form.

Many views of the project site are broken up through sporadic roadside vegetation, highlighting the effectiveness of vegetation in screening views of the project, particularly when vegetation is located closest to the viewpoint.

Viewpoints further removed from the site have the potential to see the Project, however it would not be a dominant feature in the view.

The overall visual impact of the Project has been assessed as Low-Moderate.

15.5.1.3 Management and mitigation

Mitigation of the visual impact of the Project relies on firstly the form and profile of the building, articulation of the façade and lastly materiality. The external design of the building can conceal the internal use and function of the building. Through design development have been selected that break up the bulk of the buildings, are non-reflective and avoid having large plank facades facing street frontages.

The Project will be landscaped to soften the appearance of the buildings from the surrounding viewpoints. Landscape mitigation measures can also be utilised to screen and filter views to the Project from sensitive locations.

15.6 Climate Change

The *Climate Change Act 2017* (VIC) sets out a clear policy framework and a pathway to 2050 that is consistent with the Paris Agreement to keep global temperature rise below two degrees Celsius above pre-industrial levels. It includes a long-term carbon reduction target of net zero emissions by 2050, a requirement to set five-yearly targets and strategies, frequent reporting and mitigation measures that support climate change adaptation.

Section 17 of the *Climate Change Act 2017* (VIC) states that "Decision makers must have regard to climate change" and sub sections 17(2), (3) and (4) require decision makers to have regard to greenhouse gas emissions and climate change impacts.

Climate change projections for this assessment have been derived from the DELWP 'Climate Ready Victoria' website. Of these, two documents provide specific detail on climate change projections for the Barwon South West Region, and detail what sort of impacts can be expected (and how the region can adapt). These are:

- Climate-Ready Victoria – Barwon South West – How climate change will affect the Barwon South West region and how you can be climate-ready
- Climate-Ready Victoria – Barwon South West – Climate Projections Data Sheet.

Climate projections from these sources are derived from work undertaken by the Commonwealth Science and Industry Research Organisation (CSIRO) on behalf of the Victorian Government and are based on national projections released by CSIRO and the Bureau of Meteorology. They are based on two 'representative concentration pathways' (RCPs) which link emissions projections to levels of global warming. These correlate to medium and high levels of radiative forcing (measured in watts per square metre (W/m^2)), which is a measure of increased energy derived from solar radiation as a result of trapped greenhouse gases. The representative concentration pathways include:

- RCP4.5 – A medium emissions scenario representing radiative forcing peaking at 4.5 W/m^2
- RCP8.5 – A high emissions scenario (and the current trajectory) representing radiative forcing peaking at 8.5 W/m^2.

The projections from DELWP are presented in Table 15.10. The projections are available for two time periods – 2030 and 2070. As the Project is intended to operate for 25 years from 2025, the projections for 2030 have been selected as the most relevant. The table shows:

- Average temperature is expected to increase by approximately 1 degree centigrade across all seasons (between both medium and high RCP scenarios). In addition to increases in average temperature, periods of hotter weather would also be expected to increase, with more frequent incidence of heatwaves
- Average rainfall is expected to decrease very slightly, with seasonal differences (not much change in summer, but larger decreases (~5 to 6%) in spring and winter
- Evaporation is expected to increase (in line with lower rainfall and warmer temperatures). This is fairly even across all seasons except spring, which shows a slight decrease over the others
- Wind speed shows very little change across all seasons. Note that the averages show little change, there is a slight increase in the variability in the ranges shown for each season
- Relative humidity is expected to show a very slight decrease
- Solar radiation (%) shows a slight increase, especially in autumn and winter
- Soil moisture content (%) is expected to decline (in line with increase evaporation and lower rainfall). Changes are most prominent in winter.

In addition to the above impacts, the following changes are expected:

- Extreme rainfall and flooding - climate change is expected to decrease annual average rainfall, but increase the number and intensity of extreme rainfall events (and increase maximum daily rainfall totals)
- Fire weather – lower rainfall, greater evaporation and higher average temperatures is likely to create a greater risk for forest fires. It would be expected that there would be a greater number of days where risks are 'extreme' or 'severe' as measured by the Forest Fire Danger Indices (FFDI)
- Sea Level Rise (SLR) – The range of likely SLR associated with the mid to high emissions scenarios (RCP4.5 and RCP8.5) is 0.27 to 0.66 m and 0.39 to 0.89 m, respectively (Wallis et. al., 2015).

Table 15.10: Barwon South West region climate change projections

	Climatic Parameter	2030 Low (RCP4.5)	2030 High (RCP8.5)
Annual	Average temperature (°C)	0.75 (0.32 to 0.98)	0.91 (0.45 to 1.18)
	Average rainfall (%)	–6.63 (–14.65 to 2.34)	–8.52 (–22.39 to 1.33)
	Evaporation (%)	3.57 (1.12 to 6.45)	4.45 (2.41 to 6.89)
	Wind speed (%)	–1.58 (–4.50 to 1.08)	–0.14 (–4.12 to 6.33)
	Relative humidity (% absolute)	–1.13 (–3.13 to 0.95)	–1.50 (–2.88 to 0.03)
	Solar radiation (%)	1.89 (–0.08 to 4.49)	1.95 (–0.49 to 4.43)
	Soil moisture (%)	–3.02 (–6.32 to –0.29)	–2.44 (–7.10 to –0.76)
Spring	Average temperature (°C)	0.85 (0.40 to 1.32)	0.90 (0.41 to 1.48)
	Average rainfall (%)	–4.64 (–21.18 to 18.37)	–1.33 (–21.16 to 11.29)
	Evaporation (%)	2.16 (0.32 to 4.44)	2.94 (1.10 to 5.47)
	Wind speed (%)	–0.42 (–2.73 to 1.10)	–0.08 (–1.79 to 4.44)
	Relative humidity (% absolute)	–0.35 (–1.72 to 0.76)	–0.66 (–2.40 to 0.52)
	Solar radiation (%)	0.65 (–0.74 to 2.69)	0.62 (–0.60 to 2.32)
	Soil moisture (%)	–0.59 (–4.13 to 0.73)	–1.02 (–4.42 to –0.08)
Summer	Average temperature (°C)	0.77 (0.38 to 1.09)	0.81 (0.55 to 1.24)
	Average rainfall (%)	1.34 (–22.23 to 14.76)	–3.65 (–13.64 to 17.41)
	Evaporation (%)	3.11 (0.10 to 7.02)	5.05 (1.65 to 8.04)
	Wind speed (%)	–0.89 (–3.21 to 3.13)	0.01 (–2.95 to 4.28)
	Relative humidity (% absolute)	0.12 (–2.15 to 0.98)	–0.60 (–2.16 to 1.33)
	Solar radiation (%)	0.55 (–1.35 to 2.74)	0.95 (–1.20 to 2.62)
	Soil moisture (%)	–0.73 (–4.52 to 3.13)	–1.25 (–4.01 to 4.05)
Autumn	Average temperature (°C)	0.61 (0.39 to 0.86)	0.70 (0.51 to 1.00)
	Average rainfall (%)	–4.64 (–11.56 to 8.55)	–2.60 (–11.79 to 6.10)
	Evaporation (%)	5.07 (–2.88 to 11.40)	6.02 (0.91 to 13.29)
	Wind speed (%)	0.65 (–2.09 to 4.33)	2.28 (–1.44 to 6.25)
	Relative humidity (% absolute)	–0.32 (–1.92 to 0.57)	–0.42 (–2.30 to 0.24)
	Solar radiation (%)	1.85 (–1.67 to 4.16)	1.86 (–0.51 to 4.32)
	Soil moisture (%)	–1.50 (–4.29 to 1.35)	–2.04 (–3.91 to 2.16)
Winter	Average temperature (°C)	0.75 (0.32 to 0.98)	0.91 (0.45 to 1.18)
	Average rainfall (%)	–6.63 (–14.65 to 2.34)	–8.52 (–22.39 to 1.33)
	Evaporation (%)	3.57 (1.12 to 6.45)	4.45 (2.41 to 6.89)
	Wind speed (%)	–1.58 (–4.50 to 1.08)	–0.14 (–4.12 to 6.33)
	Relative humidity (% absolute)	–1.13 (–3.13 to 0.95)	–1.50 (–2.88 to 0.03)
	Solar radiation (%)	1.89 (–0.08 to 4.49)	1.95 (–0.49 to 4.43)
	Soil moisture (%)	–3.02 (–6.32 to –0.29)	–2.44 (–7.10 to –0.76)

15.6.1 Identification and treatment of climate change risks

Based on the climatic hazards identified, the project team has identified a range of risks to the Project as a result of climate change (Table 15.11). The risks identified include a biophysical impacts, as well as other broader community impacts (including economic, community and environmental) impacts. Where relevant, positive impacts and opportunities have also been considered.

Table 15.11 also outlines the requirements for potential modification to the proposal as a result of these risks, taking into account the principles of:

- Adaptation – potential changes / modifications to the design, fitted at day 1 or retrofitted as required, which allow adaptation to a varying climate
- Resilience – the ability of the Project to cope with a range of potential climatic conditions without modification

Table 15.11: Climate change risks and proposed treatment

No	Climate variable	Project receptor	Potential risk	Proposed risk treatment
1	Average temperature and increased incidence of heatwave	Waste feedstock availability	Feedstock moisture content is lower than modelled and as a result calorific value (CV) is higher. Note that this value is likely to fluctuate naturally and will be within tolerance of plant but may reduce feedstock able to be processed. There may be a slightly lower tonnage due to drying, but effectively the same waste will be processed and will generate a similar amount of energy. Gate fees may reduce slightly due to slightly drier waste.	Waste flow modelling should be undertaken to understand waste composition at year one of the operation of the facility, alongside waste composition over the life of the plant. This should take into account potential changes as a result of climate change. Slight drying of the waste (and reduction in weight) may lead to an opportunity to process a greater volume.
2	Average temperature and increased incidence of heatwave	Incoming waste feedstock and outgoing waste residues logistics	Increased incidence of heatwaves may lead to deformation of asphalt road surfaces causing issues for larger waste delivery vehicles and requiring repairs. Delays to delivery could cause fuel shortages for the plant.	Adaptive capacity of the road network including ongoing evolution of asphalt specifications in response to changing climate. Accept risk.
3	Average temperature and increased incidence of heatwave	On site waste reception and storage prior to combustion	Waste will become more odorous during hot conditions (anaerobic conditions develop more quickly). Odours are controlled by drawing air through the tipping hall and combustion in the boiler. This will control uncontained waste odour. There is no change in the ability of the plant to fully combust the odour depending on its concentration.	Accept risk

No	Climate variable	Project receptor	Potential risk	Proposed risk treatment
4	Average temperature and increased incidence of heatwave	Operation of the EfW facility	If ambient temperatures are higher the cooling water temperatures will also be higher. The boiler is also slightly less efficient at hotter temperatures (there is an effect on turbine performance). This will make the plant slightly less efficient and power generation will be lower (generating less revenue). If the temperature exceeds the maximum operating ambient temperature for the plant, then efficiency will drop and it may have to temporarily shut down. Hotter temperatures may also provide more instances of difficult conditions for plant operators. Resulting in a need to change operational patterns.	The plant has been designed with a water-cooled condenser rather than air cooled so the plant is more tolerant to increases in ambient temperatures. Air cooled plant is much more vulnerable. The plant will be designed to operate 'reliably and continuously' up to 45°C. Plant will be derated at the higher temperatures, i.e. less output and poorer efficiency. Some equipment may trip at higher temperatures and put the plant offline. Assessments will be made at detailed design of equipment that will need thermal control. Change operational patterns / management plans to manage worker exposure to heat stress during periods of hot weather.
5	Average temperature and increased incidence of heatwave	Control of emissions to air, land and water	Unlikely to be an issue for the operation of the air pollution control system (which has to deal with 850°C exhaust gases).	Increased ambient temperature will not impact the operation of the APC residue system. No action required.
6	Average temperature and increased incidence of heatwave	Export of electricity	Potential for electricity distribution infrastructure to be negatively affected by prolonged periods of extreme heat. Potential for overhead wires to sag and reduction in ability of substations to operate in increased heat. Projections don't suggest large change over Project period so suggest risk is relatively low as long as modern design standards are followed. Opportunity – Greater demand for electricity – it is expected with hotter temperatures that there will be a greater demand for air conditioning resulting in greater power demands. As a generator (and net exporter) of electricity this will provide a greater demand for the plant's output.	Design of sub-stations to account for broad range of temperature projections. Network to maintain adaptive capacity (i.e. be upgraded as required to suit projected climate for the coming years). Greater demand for electricity may result in increased market prices, generating greater than expected revenues for the Project.
7	Average rainfall	Waste feedstock availability	See risk 1 above.	See risk 1 above

No	Climate variable	Project receptor	Potential risk	Proposed risk treatment
8	Average rainfall	Operation of the EfW facility	Water will be sourced for operation of the facility from the Barwon Water town water supply. Expected consumption is approximately 2.5 ML/day for ambient conditions, which may increase in hot weather. Reduction in water availability from the Barwon Water could mean restriction in operations at the EfW plant.	Continually review water usage to minimise use of town water. Continually review water sources and determine contingency plans.
9	Average rainfall	Control of emissions to air, land and water	An onsite cooling tower will discharge cooling water blowdown to the onsite waste neutralisation holding pond. This is subsequently discharged to the Barwon Water sewer main at a rate of approximately 0.4 ML/day. Reduction in water availability could concentrate effluent within the sewer leading to changes in costs associated with disposal.	Projected changes are not significant, and it is not expected that this will be an issue.
10	Evaporation	Waste feedstock availability	See risk 1 above.	See risk 1 above
11	Evaporation	Incoming waste feedstock and outgoing waste residues logistics	Potential for road network to be more affected by drier conditions resulting in greater risk of instability in road foundations. Greater risk of dust on local roads resulting in traffic causing nuisance to local residents.	Projected changes are not significant and it is not expected that this will be an issue. However, propose to keep a watching brief and look at dust control measures if they are an issue on local roads. Site dust can be controlled by water carts as required during very dry spells.
12	Evaporation	Operation of the EfW facility	Increased evaporation will result in the cooling tower operating more efficiently but needing slightly more water to operate. Water is sourced from the Barwon Water town water supply. Increased evaporation will reduce water availability from these sources. Stockpiles of bottom ash will be contained in covered sheds, and whilst warmer, drier weather will dry this material more than under current conditions, this is not expected to be significant and can be rectified as required with hosepipe water. Note there may be a reduction in disposal cost for this material if slightly drier.	Continually review water usage to minimise use of raw water. Continually review water sources and determine contingency plans.

No	Climate variable	Project receptor	Potential risk	Proposed risk treatment
13	Wind speed	Incoming waste feedstock and outgoing waste residues logistics	General trend is for a reduction in wind speed. Ranges suggest in some scenarios this may increase up to ~5%. Not anticipated to cause issues.	Accept risk and incorporate into EfW Plant design.
14	Wind speed	Operation of the EfW facility	Wind speed change projections do not indicate that the plant will be suffering from abnormally increased wind speeds and elements of the plant are not unusually susceptible to such changes.	EPC contractors are provided with (and invited to investigate further) maximum wind speeds that the plant must be built to withstand, with additional tolerances. No further adaptation / resilience required.
15	Wind speed	Control of emissions to air, land and water	In general material impacts on air quality occur as short term (1 hour, 24 hour) maximum impacts. While small changes in wind conditions may be expected under the climate change scenarios, the wind conditions that result in maximum air quality impacts are already occurring and will remain unchanged. Stockpiles of bottom ash are planned to be stored undercover and therefore will not be subject to erosion from wind.	The current air quality assessment includes assessment of expected EfW plant maximum air quality impacts under a wide range of meteorological conditions (including wind). It is expected that the same conditions that result in maximum impacts now, will remain unchanged in the future despite some changes in average wind speed.
16	Relative humidity	Operation of the EfW facility	See also response to risk 12. Reduction in relative humidity (given magnitude and direction) is not projected to cause issues for the construction or operation of the plant. It may, in fact, provide more comfortable working conditions for staff working in open air environments. Cooling towers are likely to operate more effectively in lower humidity, but may require an increase in water consumption. Boiler efficiency also slightly increases with lower humidity, resulting in increases in steam and electricity production.	See also response to risk 12

No	Climate variable	Project receptor	Potential risk	Proposed risk treatment
17	Solar radiation	Operation of the EfW facility	Potential for elements of the plant which are susceptible to degradation from solar radiation to have a shorter lifetime than anticipated (although projections are for an average 2% increase annually). This could cause increased maintenance and increased cost to the plant.	Whilst plant is designed for historical conditions, the magnitude of the projected change in solar radiation, along with the lifetime of the intended plant (25 years) are suggested to reduce the risk.
18	Solar radiation	Control of emissions to air, land and water	Solar radiation is linked to atmospheric stability which in turn affects the rate at which air pollutants disperse and resulting air quality impacts. Higher levels of solar radiation can lead to more unstable turbulent atmospheres, where in general, air pollution will disperse more rapidly resulting in lower air quality impacts with some exceptions. However, like windspeed, meteorological conditions including solar radiation resulting in maximum short-terms air quality impacts will be similar to now under a climate change scenario.	As for windspeed, the current air quality assessment includes assessment of expected EfW plant maximum air quality impacts under a wide range of meteorological conditions (including solar radiation), and it is expected that the same conditions that result in maximum impacts now will remain unchanged in the future, despite some changes in average solar radiation.
19	Soil moisture	On site waste reception and storage prior to combustion	Reduction in soil moisture content could have the potential to destabilise foundations for plant and equipment, as well as hard stand areas. This could result in increased costs for maintenance and repair as well as requiring plant shutdown during works.	Risk low – accept.
20	Soil moisture	Operation of the EfW facility	Reduction in soil moisture content could have the potential to destabilise foundations for plant and equipment, as well as hard stand areas. This could result in increased costs for maintenance and repair as well as requiring plant shutdown during works.	Risk low – accept.
21	Extreme rainfall and flooding	Incoming waste feedstock and outgoing waste residues logistics	Potential for road networks to be adversely impacted by flooding, resulting in inability of feedstock to be delivered to site. Where road networks are affected there is the potential for diversions. Flood mapping available from a Lara Online Flood Study (via the City of Greater Geelong's website) shows that the	Alternate road access to the site (e.g. via the east) could be considered to provide a backup if local flooding affects major access roads. Design heights for access roads (as well as the facility) can also consider local flooding.

No	Climate variable	Project receptor	Potential risk	Proposed risk treatment
			1% and 10% Annual Exceedance Probability (AEP) floods border and very slightly impinge upon the north west corner of the site and could potentially affect the road to the north. The risk with climate change is that these floods become more severe or more frequent, resulting in issues with fuel supply.	The tipping hall is designed to carry excess feedstock which will provide a buffer in case of delays in delivery (and provide feedstock for weekends when there will be a lower rate of delivery of waste).
22	Extreme rainfall and flooding	On site waste reception and storage prior to combustion	Potential for flooding of waste receival and storage areas.	Review design heights at detailed design to confirm that they sit with sufficient freeboard above the 1% and 10% AEP flood
23	Extreme rainfall and flooding	Operation of the EfW facility	Potential for flooding of EfW plant itself resulting in site shutdown and potential damage from flood waters. The risk is elevated by climate change which makes the frequency and intensity of the flooding more severe.	Site selection criteria including liability to flood, which is low for this site.
24	Extreme rainfall and flooding	Control of emissions to air, land and water	Excess water is discharged to the neutralisation pond on site. Larger floods than projected result in the pond becoming overwhelmed with flood waters leading to contamination of surrounding environment.	Review the location and flood immunity of the neutralisation pond at detailed design.
25	Extreme rainfall and flooding	Export of steam and electricity	Potential for electrical distribution infrastructure to be negatively affected by flooding (flooding of substations or landslip affecting distribution poles and wires).	Review the location and flood immunity of electrical infrastructure at detailed design.
26	Fire danger days	Incoming waste feedstock and outgoing waste residues logistics	Potential road closures could lead to waste feedstock not being able to be delivered to the site.	The tipping hall is designed to carry excess feedstock which will provide a buffer in case of delays in delivery (and provide feedstock for weekends when there will be a lower rate of delivery of waste).

No	Climate variable	Project receptor	Potential risk	Proposed risk treatment
28	Fire danger days	Operation of the EfW facility	There is a risk that smoke could enter the tipping hall and therefore the air intake for the EfW plant, but this is unlikely to cause an issue. More of an issue would be ability for staff to operate within such an environment if smoke was thick (and fire approaching).	Bushfire management measures are to be put in place at the site. The waste bunker has a system for controlling fires should sparks set waste feedstock alight.
29	Fire danger days	Export of steam and electricity	Threat to electrical distribution infrastructure.	Buffer zone on easements and clearance around substations.
30	Sea Level Rise (SLR)	Incoming waste feedstock and outgoing waste residues logistics	Potential for coastal councils affected by SLR to experience difficulties from SLR in accessing properties for waste collection, and therefore provide issues in supply waste feedstock. Risk is expected to be negligible.	Accept risk

16. Environmental management

16.1 Overview

This chapter summarises the framework for managing environmental risks associated with construction, commissioning and operation of the Project. It also includes PHI's approach to develop a commissioning plan (and/or approval under Section 30A) and an application for an EPA Licence, to facilitate commissioning and operations of the EfW plant.

The primary management framework for delivery of the Project would be an Operations Management System (OMS). Site or phase-specific management plans would also be developed to describe how significant impacts would be addressed during specific phases of Project development (i.e. construction, commissioning and operation), including development of a Construction Environmental Management Plan (CEMP) and Operations Environmental Management Plan (OEMP). These documents will be developed during the detailed design phase and are not a requirement of the Works Approval application. However, this chapter addresses the scope of these documents and the responsibilities for developing and updating them.

This chapter should be read in conjunction with Chapter 6, which identifies the significant environmental risks that need to be addressed in the various management plans.

16.2 Non-routine operations and emergency management

The OEMP will address the potential risks occurring during non-routine or emergency events. An unplanned or emergency shut down can occur as the result of power or equipment failure, loss of water or waste supply or fire. Unplanned shutdowns are extremely rare, however in the case that they do occur, the plant is designed with the management controls to minimise emissions during these emergency events. Controls include:

- Manual emergency stop pushbuttons
- Backup power via emergency diesel generator and uninterruptable power supply (UPS)
- Redundancy designed into the air pollution control systems such as spare capacity in baghouse
- Air control dampers that instantaneously shut down combustion

In the event of a total failure of the internal power system, the back-up power system comes on line and allows a controlled shutdown involving the following steps:

- Waste feed ceases
- The burners are shutdown
- The combustion air dampers close restricting air flow through the furnace to reduce gas volumes and emissions and the main induced draught fan is shut down
- The back-up system powers a fan that directs minor volumes of exhaust gases though the air pollution control system

In a controlled shut down such as that outlined above, emissions are not anticipated to deviate significantly from those under normal operations.

The CEMS incorporates a 'hot' spare CEMS which can be switched into service when the primary CEMS on a combustion line chimney is not operating for maintenance, calibration or instrument faults. If the main electrical supply fails, then the UPS maintains supply for the CEMS.

Further work will be undertaken during the detailed design phase of the Project, which will look to capitalise on the knowledge and expertise of the Engineer, Procure and Construct (EPC) contractor appointed to identify and minimise risks posed by non-routine operations or emergency events. Precise operating procedures for the various possible scenarios according to the likelihood of incidents in the plant will be created, taking into

account the safety of personnel, then as far as possible, the safety of the plant. In the light of operating experience, the Operator will review the operating procedures and update as necessary.

16.3 Environmental management systems

Prior to construction of the Project, PHI would develop an Environmental Management System (EMS) which would form part of an Operations Management System (OMS) covering Quality, Safety and Major Hazard Facilities regulations.

The PHI OMS would provide a structured framework for effective environmental, health and safety practices and performance across all of PHI's activities and operations. The OMS would be designed to ensure that a rigorous approach to implement, achieve, review and maintain priorities targeted at zero harm to the people, environment, property and to sustain the business in the future.

The following certifications would be sought:

- Quality System certification to AS/NZS ISO 9001:2016
- Safety System certification to AS/NZS 45001:2018
- Environmental Management System certification to AS/NZS ISO 14001:2016
- Major Hazard Facilities licence

The OMS would incorporate a range of site-specific environmental standards to manage environmental risks relevant to the Project. The overarching objective of these standards would be to:

- Incorporate environmental considerations into operations, project design and decision making as early as possible and then on an ongoing basis
- Achieve continuous improvement in PHI's environmental performance
- Ensure that contractors are undertaking work on PHI's behalf to the acceptable standard.

Site and activity specific risk assessments would also be undertaken to reflect site operations and additional risk controls will be outlined in the relevant management plans (refer below).

It should be noted that the OMS system would be a governing system that requires contractors to perform work in accordance to PHI's standards, which would be monitored and contractually linked. A pre-qualification process would ensure that only contractors that adhere to, or better the standards are selected by PHI to conduct work.

PHI and the selected EPC contractor would develop more vigorous and in-depth standards regarding design and construction management. It would outline the requirements for the design and construction of the facilities with the intent that facilities can be commissioned, started up and operated in compliance with applicable legislation and PHI's OMS.

16.4 Operational management

The OEMP would be developed to establish procedures to identify environmental risks, manage impacts in accordance with agreed standards, objectives or targets, and monitor overall environmental performance during operation of the EfW plant. Some of the key areas to be included in the OEMP are:

- Air emissions
- Odour emissions
- Noise emissions
- Traffic management
- EfW waste residues handling and management practices.

These and other environmental risks will be addressed during the detailed design phase of the Project, when an EPC contractor has been appointed. The OEMP will be finalised prior to the completion of construction and provided to the EPA for review if required.

16.5 Construction environmental management plan

A CEMP would be developed by the EPC contractor and approved by PHI prior to implementation. The CEMP would be used to manage environmental risks associated with constructing the EfW plant.

A number of potential environmental risks may be associated with construction activities including site preparation, earthworks, piling, drainage, stockpiling, landscaping, and waste transport, storage and disposal. Several issues or activities have been identified as Medium level risk during the construction phase and are recorded in the PHI Project Environment Risk Register.

The CEMP would address all environmental risks identified in the Project Environment Risk Register. . Particular emphasis would be placed on managing higher risk activities, usually through adoption of best practice construction methods that remove or reduce the degree of risk to an acceptable level, and implementation of more intensive monitoring programs. The CEMP will also address risks and controls associated with environmental incident and emergency conditions.

The CEMP will include a comprehensive list of risk management measures and responsibilities for implementation. These measures will be developed in accordance with all relevant EPA Guidelines, in particular:

- EPA Publication 480, "Best Practice Environmental Management – Environmental Guidelines for Major Construction Sites" (EPA, 1996)
- EPA Publication 275, "Construction Techniques for Sediment Pollution Control" (EPA, 1991)
- EPA Publication 1254, "Noise Control Guidelines" (EPA, 2008)

The CEMP would be developed by the selected EPC contractor with a proposed structure of the CEMP similar to details provided in Table 16.1. The construction contractor would be required to comply at a minimum with all PHI OMS requirements and all conditions of the Works Approval, including the structure outlined below. In addition, the CEMP would be finalised and reviewed by PHI prior to construction and provided to the EPA for review if required. It would be the EPC contractor's responsibility to ensure that appropriate mitigation measures are implemented and documented, and that the CEMP is adhered to.

Table 16.1: Proposed overview of CEMP

Element	Description
Background	An introduction to the CEMP and an overview of the key environmental issues requiring management
Legal and other requirements	The legislation, policies, standards and other requirements that apply to the key environmental issues
Values	The relevant environmental values requiring protection
Performance objectives	The performance objectives that the CEMP is seeking to achieve in protecting the relevant environmental values
Performance indicators / targets	Identification of the required level of performance to meet environmental objectives, legislative compliance or project-specific requirements
Roles and responsibilities	A detailed description of the roles and responsibilities for managing environmental impacts and implementing management measures
Management strategies	An overview of the management measures that will be used to meet the performance objectives i.e. risk mitigation methods, risk treatments. Separate

Element	Description
	plans or procedures may need to be developed to manage particular risks, such as traffic impacts.
Monitoring	Procedures to monitor, measure and record environmental performance
Reporting	Requirements to report to regulators, the community and/or other stakeholders on environmental performance
Background	An introduction to the CEMP and an overview of the key environmental issues requiring management

16.6 Commissioning management

A Commissioning Management Plan will be developed before the end of construction that specifically addresses risks that are unique to plant start-up and which do not continue through to operation. The commissioning period is likely to cover the first 1-3 months of operation of the plant as various components of the plant come online and the site becomes fully operational.

The Commissioning Management Plan will be developed in alignment with PHI's OMS which specifically addresses environmental risks associated with restarting plant and equipment following a period of significant maintenance or project work. This requires a systematic EHS inspection and review of management documentation prior to facility start-up and implementation of any actions or monitoring to ensure that the facility is ready to be placed into operation safely and without environmental harm.

The Commissioning Management Plan will be developed by the EPC contractor in consultation with PHI and will be provided to the EPA for review if required.

16.7 EPA Licence application

An EPA Licence is required for all scheduled premises, unless the premises are exempted in the *Environment Protection (Scheduled Premises) Regulations 2017*. An EPA Licence contains standard conditions that aim to control the operation of the premises so that there is no adverse effect on the environment, addressing such areas as waste acceptance and treatment, air and water discharges and noise and odour.

Subject to Works Approval, PHI will apply for an EPA Licence prior to commissioning of the plant.

16.8 Monitoring

Monitoring environmental performance of the project will be conducted through the online CEMS and regular sampling (water and waste) and details of compliance with the EPA Licence will be reported annually via the Annual Performance Statements (which are published on EPA's website).

17. References

AEA Technology (2003). *Environmental and health risks associated with the use of processed IBA in road construction*

Agency for Toxic Substances and Disease Registry (2018). *Minimal Risk Levels (MRLs) – For Professionals*. Website: https://www.atsdr.cdc.gov/mrls/index.html

ANZG (2018). *Water Quality Guidelines Toxicant Default Guideline Values.* Website: http://www.waterquality.gov.au/anz-guidelines/guideline-values/default/water-quality-toxicants/search

Astrup, T., and Christensen, T. H. (2003). *Slagge fra affaldsbehandling – Status og udviklingsmuligheder år 2003*. Miljø & Ressourcer DTU.

Astrup, T. (2008) *Management of APC residues from W-t-E Plants*. Department of Environmental Engineering Technical University of Denmark, International Solid Waste Association (ISWA)

Australian and New Zealand Environment and Conservation Council and Agriculture and Resource Management Council of Australia and New Zealand (2000). *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*.

Australian Bureau of Meteorology (2020). *Summary Statistics Avalon Airport*. Website: http://www.bom.gov.au/climate/averages/tables/cw_087113.shtml

Australian Bureau of Statistics (2016). *2016 Census Quickstats – Lara*. Website: https://quickstats.censusdata.abs.gov.au/census_services/getproduct/census/2016/quickstat/SSC21460

Australian Bureau of Statistics (2018a). *3218.0 – Regional Population Growth, Australia, 2017-18*. Website: https://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/3218.02017-18

Australian Bureau of Statistics (2018b). *3222.0 - Population Projections, Australia, 2017 (base) – 2066*.

Australian Bureau of Statistics (2020). *3218.0 - Regional Population Growth, Australia, 2018-19*.

Australian Government (2016). *National Environment Protection Measure for Ambient Air Quality*.

Bühler, J., Schlumberger, S. (2011). *Metal recovery from air pollution control residues – filter ash*.

California Office of Environmental Health Hazard Assessment (2019). *OEHHA Acute, 8-hour and Chronic Reference Exposure.*

City of Greater Geelong (2011) Lara Structure Plan, available at: https://geelongaustralia.com.au/common/Public/Documents/8cdd8529fea9cbe-Lara%20Structure%20Plan%20-%20Adopted%20April%202011.pdf

Commonwealth of Australia (2015) Carbon Credits (Carbon Farming Initiative—Alternative Waste Treatment) Methodology Determination 2015 Website: https://www.legislation.gov.au/Details/F2015L00060

Debney, T. (1998). *Archaeological survey of a proposed fertiliser plant, Lara*. Port Melbourne, Victoria: Biosis Research Pty Ltd.

Department of Business, Energy & Industrial Strategy (2019). Website: https://www.gov.uk/government/collections/government-conversion-factors-for-company-reporting

Department of the Environment and Energy (2019). *National Greenhouse Accounts Factors – August 2019*.

Department of Environment, Land, Water and Planning (2020). *Recycling Victoria – A new economy*.

Environment Protection Authority Victoria (1991). *Construction techniques for sediment pollution control*. EPA Publication 275.

Environment Protection Authority Victoria (1996). *Environmental guidelines for major construction sites*. EPA Publication 480.

Environment Protection Authority Victoria (1999a). *State Environment Protection Policy (Ambient Air Quality)*.

Environment Protection Authority Victoria (1999b). *State Environment Protection Policy (Air Quality Management)*.

Environment Protection Authority Victoria (2018). *State Environment Protection Policy (Waters)*.

Environment Protection Authority Victoria (2002). *Protocol for Environmental Management: Greenhouse gas emissions and energy efficiency in industry*. EPA Publication 824.

Environment Protection Authority Victoria (2008). *Noise Control Guidelines*. EPA Publication 1254.

Environment Protection Authority Victoria (2009). *Industrial Waste Resource Guidelines – Solid Industrial Waste Hazard Categorisation and Management*. EPA Publication IWRG 631.

Environment Protection Authority Victoria (2010). *Industrial Waste Resource Guidelines – Waste Categorisation.* EPA Publication IWRG 600.2.

Environment Protection Authority Victoria (2011). *Noise from Industry in Regional Victoria*. EPA Publication 1411.

Environment Protection Authority Victoria (2017a). *Works approval application guideline*. EPA Publication 1658.

Environment Protection Authority Victoria (2017b). *Demonstrating best practice guideline*. EPA Publication 1517.1.

Environment Protection Authority Victoria (2017c). *EPA's works approval assessment process*. EPA Publication 1657.

Environment Protection Authority Victoria (2017d). *Energy from waste guideline*. EPA 1559.1.

Environment Protection Authority Victoria (2018a). *Waste Management Policy (Combustible Recyclable and Waste Materials) 2018*

Environment Protection Authority Victoria (2019a). *Your Environment – Waste*. Website: https://ref.epa.vic.gov.au/your-environment/waste

Environment Protection Authority Victoria (2019b). *Assessing and controlling risk: A guide for business*. EPA Publication 1695.1.

enHealth (2012). *Environmental Health Risk Assessment: Guidelines for assessing human health risks from environmental hazards*.

enHealth (2017). *Health impact assessment guidelines*.

EnRiskS (2020). *Energy from Waste – Prospect Hill: Health Impact Assessment*.

European Commission (2006). *Reference Document on the Best Available Techniques for Waste Incineration*.

European Commission (2010). *Directive 2010/75/EU of the European Parliament and of the Council of 24 November 2010 on industrial emissions (integrated pollution prevention and control)*.

European Commission (2017). *Joint Research Centre – The European Commission's science and knowledge service – Annual Report 2017*.

European Commission (2019a). *Best Available Techniques (BAT) Reference Document for Waste Incineration*

European Commission (2019b). *Commission Implementing Decision (EU) 2019/2010 of 12 November 2019 establishing the best available techniques (BAT) conclusions, under Directive 2010/75/EU of the European Parliament and of the Council, for waste incineration*

Fruergaard, T. et al (2010), *Life-cycle assessment of selected management options for APC residues from waste incineration*. Science of the Total Environment 408 4672-4680.

Hansen Partnership and MacroPlan for the City of Greater Geelong and the Department of State and Regional Development (2001) Geelong Industrial Land Study.

ICE (2017) – Institute of Civil Engineers - Cory Riverside Energy: A Carbon Case. Accessed at https://www.ice.org.uk/ICEDevelopmentWebPortal/media/Documents/Disciplines%20and%20Resources/Case%20Studies/Cory-Riverside-Energy-A-Carbon-Case.pdf

Infrastructure Sustainability Council of Australia (2020). *ISv1.2 AU Materials Calculator and Guidelines*.

Intergovernmental Panel on Climate Change (2006). *Guidelines for National Greenhouse Gas Inventories*.

International Solid Waste Association (2003). *Management of Bottom Ash from WTE Facilities*.

International Solid Waste Association (2015). *Bottom Ash from WTE Facilties – Metal Recovery and Utilisation.*

Izquierdo et al. (2008), as referenced in Silva et al. *Environmental impacts of the use of bottom ashes from municipal solid waste incineration: A review, 2019*

Jacobs Group (Australia) Pty Ltd (2018). *Maryvale Energy from Waste Plant, Australian Paper Works Approval Application*.

Jones, D. (2013). *Australia: Getting Full Value: The Victorian Waste and Resource Recovery Policy.* Website: https://www.mondaq.com/australia/waste-management/267590/getting-full-value-the-victorian-waste-and-resource-recovery-policy

Metropolitan Waste and Resource Recovery Group (2018). *Advanced Waste and Resource Recovery Technologies: Metropolitan Regional Business Case and Procurement Strategy*.

Morf, L. S., Gloor, R., Haag, O., Haupt, M.,Skutan, S., Lorenzo, F. D., et al. (2013). *Precious metals and rare earth elements in municipal solid waste – Sources*. Waste Management 33, 634-644.

National Environment Protection Council (2016). *National Environment Protection (Ambient Air Quality) Measure*. Federal Register of Legislative Instruments F2016C00215.

National Health and Medical Research Council (2008). *Guidelines for Managing Risk in Recreational Water*

National Health and Medical Research Council (2011). *Australian Drinking Water Guidelines 2011*.

OCO Technology. *OCO Technology Website.* https://oco.co.uk/

Silva et al (2019) *Environmental impacts of the use of bottom ashes from municipal solid waste incineration: A review*. Conservation & Recycling, 140 (2019) 23-35.

Sustainability Victoria (2013). *Waste flows in the Victorian commercial and industrial sector.*

Sustainability Victoria, (2019). *Victorian Recycling Industry Annual Report 2017-18*.

Texas Commission on Environmental Quality (2014). *Development Support Document, Ammonia*.

Texas Commission on Environmental Quality (2015a). *Hydrogen Chloride, Development Support Document*.

Texas Commission on Environmental Quality (2015b). *Hydrogen Fluoride and Other Soluble Inorganic Fluorides*.

United States Environmental Protection Agency (2019). *User's Guide for the AMS/EPA Regulatory Model (AERMOD)*. Office of Air Quality Planning and Standards, Air Quality Assessment Division, Air Quality Modeling Group, Research Triangle Park, North Carolina, EPA-454/B-19-027, August, 2019.

Victorian Government (2020). *Four Bin Waste and Recycling System*. Website: https://www.vic.gov.au/four-bin-waste-and-recycling-system