ARUP

Cleanaway Operations Pty Ltd

Bromelton Energy and Resource Centre

Waste Feedstock Report

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Acknowledgement of Country

Arup acknowledges the Traditional Owners across all lands, waters and skies our firm may reach; we acknowledge their wisdom, resilience, and rich cultural heritage. We pay our respects to the Elders, past and present, and to all Aboriginal and Torres Strait Islander peoples.

‘Continuing to Shift to shape an even better world’ original artwork by Tarni O’Shea of Gilimbaa and updated by David Williams of Gilimbaa.

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Abbreviations and glossary

Abbreviations	Definition
^{O}C	degrees Celsius
APCr	Air Pollutant Control residues
ar	as received
BERC	Bromelton Energy and Resource Centre (the Project)
BREF	Best Available Techniques Reference Document
BREF-WI	Best Available Techniques Reference Document for Waste Incineration
C&D	Construction and Demolition
C&I	Commercial and Industrial
CMS	Control and Monitoring System
CRS	Container Refund Scheme
CV	Calorific Value
db	dry basis
EfW	Energy from Waste
EPS	Expanded Polystyrene
FOGO	Food Organics and Garden Organics
GO	Garden Organics
HDPE	High Density Polyethylene
IBA	Incinerator Bottom Ash
IBAA	Incinerator Bottom Ash Aggregate
IED	Industrial Emissions Directive
kg	kilogram
LGA	Local Government Area
LHV	Lower Heating Value
MJ	megajoules
MSW	Municipal Solid Waste
MWh	Megawatt hour
PET	Polyethylene Terephthalate
PFAS	Per- and poly-Fluoroalkyl substances
QA/QC	Quality Assurance / Quality Control
SDA	State Development Area
TEEP	Technically, environmentally, and economically practicable
tpa	tonnes per annum

Executive Summary

Cleanaway Operations Pty Ltd (Cleanaway) is an Australian waste management, recycling, and industrial services company. Cleanaway is developing an energy from waste (EfW) facility in Queensland known as the Bromelton Energy and Resource Centre (BERC / the Project). The Project will be located within the Special Industry Precinct of the Bromelton State Development Area (SDA), west of Beaudesert.

This report defines the waste feedstock to be utilised for energy recovery at the BERC and addresses the requirements of outcomes 1, 4 and 5 of the Queensland Energy from Waste Policy (Queensland EfW Policy). The BERC protects the waste hierarchy by accepting only residual waste as feedstock and can adapt to residual waste changes over the project's lifetime.

The BERC's feedstock will primarily consist of residual Municipal Solid Waste (MSW), and residual Commercial and Industrial (C&I) wastes, that meet the definition of residual waste in the Queensland EfW Policy (waste that is not technically, environmentally, and economically practical (TEEP) to reuse or recycle) and are therefore suitable for processing in a thermal energy recovery facility. Feedstock modelling, undertaken by Arcadis, has demonstrated that there is sufficient feedstock available to support the operation of the BERC, even with expected changes in recycling behaviour and collection practices.

Cleanaway has developed an excellent understanding of the feedstock through a waste sampling, characterisation and testing regime (undertaken by HRL Technology Group) to quantify the composition of existing residual waste streams and determine physical, chemical and combustion properties, which has informed the facility design. The BERC will be capable of handling variation in the feedstock, both in the short-term (day to day, due to variability in deliveries) and over time (due to changes in source separation and recycling practices, as well as renegotiation of supply contracts and waste arisings) through a range of measures, such as adjusting the waste feed rate to the boiler or adjusting the amount of reagents used in the flue gas treatment system. Such adjustments will occur automatically and in real time under the supervision of the facility's Control and Monitoring System (CMS).

The BERC will implement a Waste Acceptance Protocol, which will define acceptable and unacceptable waste for the facility, as well as to provide information about waste supply, on-site procedures, contingency measures and operational practices to suppliers and operators. The Waste Acceptance Protocol is provided in Appendix A.

This report concludes that the BERC has been developed in alignment with the Queensland EfW policy outcomes as outlined below:

- **Policy outcome 1:** The proposal supports circular economy principles by demonstrating that energy recovery does not undermine reuse, recycling, or appropriate waste disposal practices.
- **Policy outcome 4:** The facility is designed to process only residual waste, demonstrating that materials suitable for recycling or reuse are not diverted to energy recovery.
- **Policy outcome 5:** The BERC incorporates flexibility to adapt to changes in the composition of residual waste over time, supporting long-term sustainability and responsiveness to evolving waste management practices and policy reforms.

1. Introduction

1.1 Purpose of this Assessment

The purpose of this report is to clearly define the waste feedstock to be utilised for energy recovery at the Bromelton Energy and Resource Centre (BERC). It provides assurance that the BERC will comply with policy requirements and uphold the principles of the waste hierarchy, by only accepting residual.

This report includes:

- A summary of the waste feedstock strategy proposed for the BERC
- A summary of the feedstock modelling undertaken for the BERC
- A summary of compliance of the feedstock with the Queensland Energy from Waste (EfW) Policy (2021) and EfW Guideline (2021)
- A description of expected feedstock composition
- An overview of the sampling and testing regimes to be undertaken at the BERC during facility operation.

This report addresses the requirements of the Queensland EfW Policy (outcomes 1, 4 and 5). Further discussion of the BERC's compliance with the Queensland EfW Policy is contained in the Energy from Waste Policy Report.

Supplementary to this report is a Waste Acceptance Protocol (refer Appendix A), prepared by Ramboll. The BERC will implement the Protocol and associated operating procedures, to be developed during detailed design, to control waste feedstock acceptance through a range of measures including pre-qualification of suppliers, contractual arrangements and on-site Quality Assurance/Quality Control (QA/QC) procedures. These procedures are designed to ensure that waste feedstock composition remains within the parameters which can be safely and reliably processed by the facility.

The purpose of the Waste Acceptance Protocol is to:

- Define acceptable and unacceptable waste feedstock streams for processing at the BERC
- Set out the scheduling and procedures for the delivery and inspection of the waste feedstock at the BERC
- Assist the operator to determine whether waste delivered to the BERC is acceptable waste
- Identify contingency processes for handling unacceptable waste and handling waste deliveries during a full plant outage.

The Waste Acceptance Protocol has been prepared to act as a standalone document and is provided in Appendix A of this report.

1.2 Project Description

1.2.1 Project Overview

Cleanaway Operations Pty Ltd (Cleanaway) is developing an Energy from Waste (EfW) facility in Queensland known as the Bromelton Energy and Resource Centre (BERC / the Project). The Project will be located within the Special Industry Precinct of the Bromelton State Development Area (SDA), west of Beaudesert within the Scenic Rim Regional Council local government area.

The Project has been designed to thermally treat approximately 760,000 tonnes per annum (tpa) of waste feedstock, consisting of residual Municipal Solid Waste (MSW) and residual Commercial and Industrial (C&I) waste. Residual waste is waste that is not technically, environmentally, and economically practical (TEEP) to reuse or recycle, which would otherwise be sent to landfill for disposal. The facility's actual annual throughput will vary depending on the calorific value of the feedstock and plant availability. To

account for variability in feedstock energy content, the facility will be designed for a maximum processing capacity of up to 10% above the nominal figure (836,000 tpa). The EfW process is summarised in Figure 1.

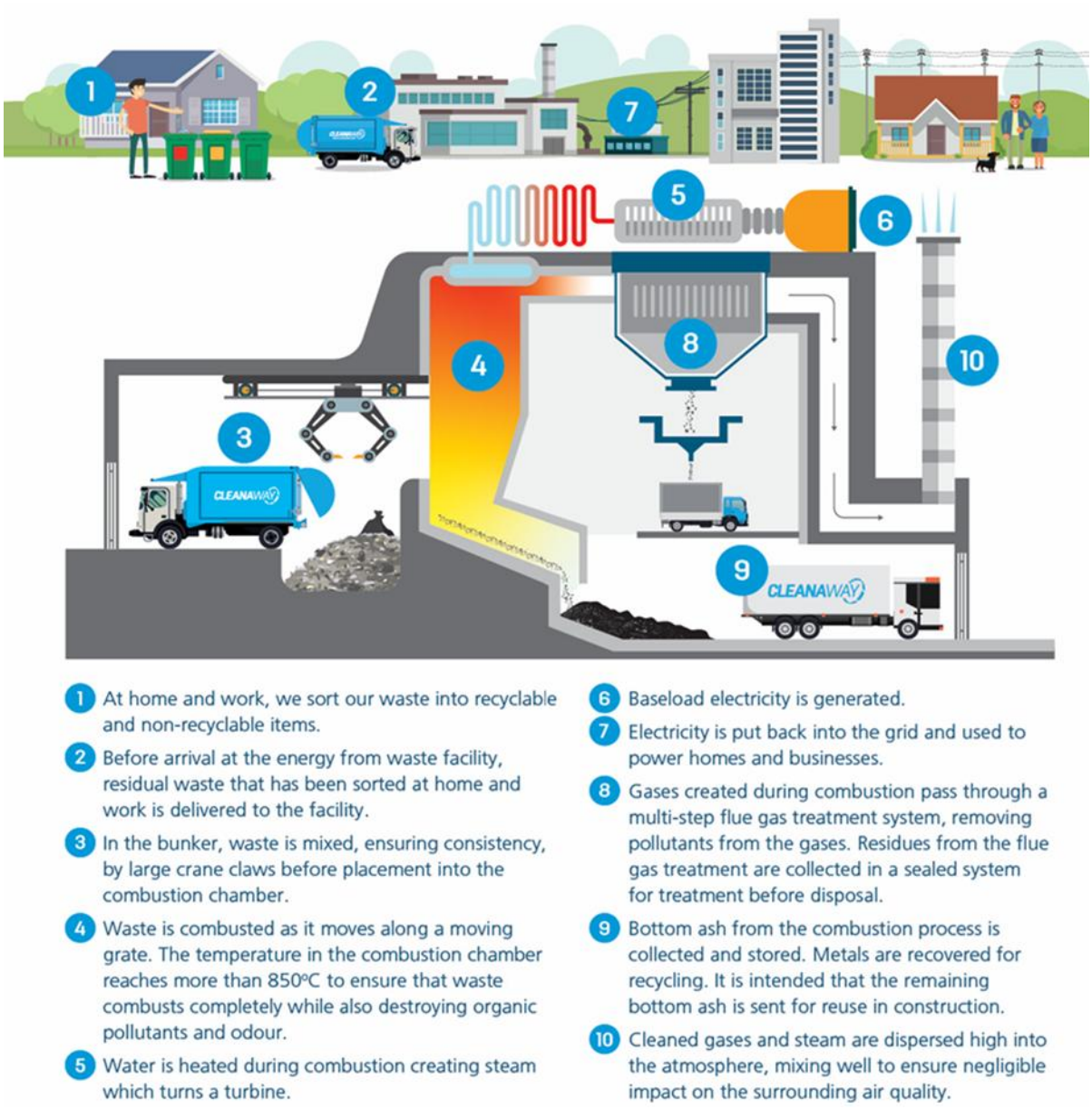

Figure 1: Energy from Waste Process

1.2.2 Proponent

Cleanaway, an Australian owned company, has operated for more than 50 years, supporting industry, government, communities and households across Australia. Its mission is to make a sustainable future possible, achieved through action across all levels of the waste hierarchy. Waste generation is minimised through extensive education programs, with Cleanaway's 50 education officers reaching over 120 businesses, 30 councils, and almost 33,000 school participants in the last financial year.

Cleanaway invests heavily in recycling, operating several Material Recovery Facilities nationwide and has partnered with Pact Group, Asahi Beverages and Coca-Cola to deliver two large-scale PET (polyethylene terephthalate) recycling facilities and a HDPE (high density polyethylene) recycling facility with Pact Group. In addition, in collaboration with Viva Energy, Cleanaway is developing a soft plastics recycling plant. EfW is recognised by Cleanaway as an important part of the future waste management framework, enabling recovery of energy and other resources from residual waste that cannot otherwise be recycled.

1.2.3 Policy Alignment

The BERC aligns with the Queensland EfW Policy and the Queensland EfW Guideline (2021) by diverting residual waste from landfill and delivering economic and social benefits through employment and local business opportunities in South East Queensland.

In accordance with Policy outcome 7 of the Queensland EfW Policy, the BERC will be designed to meet the best practice emission standards and requirements of the European Industrial Emissions Directive (IED) (2010) and the associated Best Available Techniques Reference (BREF) Document for Waste Incineration (2019), which sets the European Union environmental standards for waste incineration.

The Project also supports the Queensland Waste Strategy contributing to its 2050 targets to reduce household waste by 25%, recycle 75% of all waste, and divert 90% from landfill. In doing so, the BERC will play a key role in advancing Queensland's transition to a circular economy and reducing long-term reliance on landfill.

1.2.4 Key Components

The key components of the Project are summarised in Table 1.

Table 1: Key Project Components

Project Component	Detail
Address	Lot 1 Beaudesert Boonah Road, Bromelton, Queensland, 4285 (Lot 1 on RP45234). Refer Figure 2.
Site Area	63 hectares
Summary of proposed works	The Project includes the construction of a main EfW facility for waste processing, incinerator bottom ash (IBA) maturation and processing facility and an air pollution control residue (APCr) facility. It also includes all onsite infrastructure needed for the EfW facility, such as site utilities, internal roads, weighbridges, parking and hardstand areas, stormwater infrastructure, fencing and landscaping. The Project will include a visitor centre to help educate and inform the community on circular economy principles, the waste hierarchy, including waste avoidance, recycling, resource recovery, the benefits of landfill diversion and the EfW process. The intent behind this education is to drive a shift in community awareness and attitudes toward waste management and resource recovery.
Technology Used	The proposed technology is moving grate combustion technology. This has been used globally for over 100 years and is common in many of the 500 similar operational examples across Europe.
Facility Outputs	Approximately 73.2 MW (577,600 MWh/year, corrected for ambient temperature) exported to the grid as baseload electricity. Potential to supply energy in the form of heat and/or process steam to local industrial users. Residual materials include IBA and APCr. • It is intended that the IBA will be mechanically processed on site to create incinerator bottom ash aggregate (IBAA). During this process, both ferrous and non-ferrous metals are recovered for recycling and sale. It is intended that the remaining material is repurposed for use as an aggregate in construction. • The Project includes a facility to stabilise APCr before removal and disposal at a licensed landfill.
Key infrastructure	EfW facility including administration and visitor's centre IBA maturation and processing facility (2 x pads and 2 x sheds) APCr facility (1 x pad, 1 x shed) Transformer yard and switchyard De-coupling area for trucks Weighbridges

Project Component	Detail
	Internal road network and carparking 2 x combined storm water treatment and detention basin 1 x lined retention basin Access from Beaudesert Boonah Road via a signalised intersection with Recycling Street
Hours of Operation	24 hours per day, seven days per week (365 days per year)
Operational Staff	Approximately 60 staff

Figure 2: Site Location

2. Proposed feedstock

The BERC will receive and process residual waste that meets the definition of residual waste in the Queensland EfW Policy. This approach upholds the principles of the waste hierarchy, encourages maximising resource recovery and enables the BERC to demonstrate compliance with the Queensland EfW Policy.

2.1 Waste Acceptance Protocol

The BERC has adopted a Waste Acceptance Protocol (Appendix A) that defines Acceptable Waste for the facility and aims to avoid the processing of unacceptable waste streams through a hierarchy of controls, from waste supply contracts to inspection and removal of unacceptable wastes. All waste deliveries will come from suppliers approved by the BERC who will have to pre-qualify before feedstock will be accepted from them. Pre-qualification will involve confirmation with the supplier that the waste to be supplied meets the criteria of Acceptable Waste. Homogeneous loads of unacceptable waste will be excluded through waste acceptance criteria within the pre-qualification process and contractual agreements with waste suppliers.

It is acknowledged that small quantities of individually 'unacceptable wastes' (such as batteries) will unavoidably be received as part of residual MSW and residual commercial waste. The process equipment is designed to handle these items in the quantities typically found in residual mixed waste streams without compromising the safety of the process or staff and without creating a risk to sensitive receptors.

Most of the waste to be processed will be residual MSW and residual C&I waste, with smaller fractions of other wastes identified in the Waste Acceptance Protocol. No on-site pre-sorting or pre-treatment is required for any intended waste feedstock streams (as they will already meet the acceptability requirements of the BERC). A shredder is provided in the design for resizing bulky items of acceptable feedstock.

2.2 Feedstock approach

The waste feedstock to be processed at the facility is:

- Residual MSW (the residual stream from source-separated kerbside collection systems), as defined in the Waste Acceptance Protocol and the EfW Guideline (2021)
- Residual C&I waste, as defined in the Waste Acceptance Protocol and the EfW Guideline (2021)
- Any other residual waste streams defined as 'Acceptable Waste' in the Waste Acceptance Protocol.

Waste feedstock availability and likely changes over time due to policy, demographic and economic factors have been modelled by Arcadis and presented in a confidential Waste Flow Analysis for South East Queensland (SEQ) report for the BERC[1]. The modelling indicates that there will be a surplus of eligible residual waste available for processing by the BERC.

Based on this modelling, the BERC has planned for a feedstock which reflects the greater uptake of source separation over time in MSW, particularly for garden organics (GO). Source separation is the most desirable outcome as it secures high quality material streams for recycling and reduces the quantity of mixed residual waste requiring disposal or recovery. Once valuable materials have been extracted for recycling as part of this source separation process, the remaining residual mixed waste material is appropriate for the recovery of energy and other resources.

The design capacity of the facility is 760,000 tpa of residual waste feedstock at a reference average annual calorific value (CV) of 10.6 MJ/kg (LHV) and assuming an annual boiler availability of 8,000 hours. The facility's actual annual throughput will vary depending on the CV of the feedstock and plant availability. To

[1] The Waste Flow Analysis for SEQ report is not appended as it contains commercial-in-confidence information. However, non-confidential information and findings are included in this report where relevant.

account for variability in feedstock energy content and/or boiler availability, the facility will be designed for a maximum processing capacity of up to 10% above the nominal figure (836,000 tpa).

The BERC is designed to accept between 0-100% throughput of MSW and 0-100% throughput of C&I waste at any time to achieve 100% thermal capacity requirements. The relative proportions of MSW and C&I waste will differ over long- and short-term timescales; however, because the material components of MSW and C&I waste streams are broadly similar (and therefore their physical and chemical composition is similar) there are no significant changes required to the operation of the facility.

The design capacity at a CV of 10.6MJ/kg (LHV) has been determined based on feedstock mix for the BERC which is expected to include:

- A higher proportion of residual MSW waste. Initial estimates indicate ~70% of the feedstock to be residual MSW waste.
- ~30% of waste feedstock is expected to be sourced from residual C&I sources.

The Waste Flow Analysis for SEQ report estimates that, in 2031, the BERC's feedstock requirements of 760,000 tpa represents approximately 53% of the residual MSW and residual C&I waste expected to be generated within the target catchment (defined as Local Government Areas (LGAs) with a geographic centroid within a 90 minute one-way trip to/from the BERC via road).

At the current stage of project development, waste supply contracts for residual MSW have not yet been confirmed. Councils are being engaged by Cleanaway to help inform the development of these supply contracts. These agreements will be negotiated once development consent is secured, however are typically longer-term contracts and therefore residual MSW from local councils may not be available for the BERC to access immediately. Over the long term, the waste supply will adapt to expected changes in source separation and recycling practices, as well as renegotiation of contracts and changes in waste arisings (depending on the supply contract model). The BERC is designed to safely and efficiently accommodate this feedstock variability over time.

The Waste Flow Analysis for SEQ report estimates that, in 2041, the BERC's feedstock requirements of 760,000 tpa will represent approximately 46% of the MSW and C&I residual waste expected to be generated within the target catchment. Waste generation is forecast to continue increasing over time, with the BERC's feedstock requirements representing less of the target catchment's total waste generation by 2041.

2.3 Feedstock modelling

Cleanaway have undertaken a year-by-year analysis of waste forecast for the region and predicted feedstock which accounts for changes over time due to policy and behaviour change, and sensitivity analysis to determine impacts to feedstock of policy success. The feedstock modelling undertaken for the BERC (Waste Flow Analysis for SEQ report) considered a variety of key drivers of change over time, including population growth, GO uptake by councils, source separation performance and changing waste generation rates per capita. No transition to food organics and garden organics (FOGO) services were applied in the modelling undertaken due to a lack of appetite in Queensland and no further council commitments in South East Queensland[2]. A summary of the modelling inputs is shown in Table 2.

Table 2: Feedstock modelling parameters

Driver of change	Base Case	Modelled scenarios and sensitivities
Population	Normal projected population growth	High and low scenarios (Note: Approximately 5% uncertainty in population growth associated with impact of covid-19 pandemic)

[2] The Queensland Organics Strategy and Action Plan 2022-2032 (2022, DES) includes non-mandatory targets to halve the amount of food waste generated by 2030, recycle at least 70% of organics and divert at least 80% of organics from landfill. At the time of writing, the Waste Flow Analysis for SEQ acknowledged no councils have made commitments to implement food organics collections and therefore was not modelled within the feedstock parameters for MSW diversion.

Driver of change	Base Case	Modelled scenarios and sensitivities
Changes in waste generation rate per capita per annum (MSW) until 2030	-0.39%	-0.50% -0.27%
Changes in waste generation rate per capita per annum (C&I) until 2030	-0.43%	-1.67% +0.80%
Improvement in recycling practices per annum (MSW & C&I) until 2030	0.5%	1.5% 0%
MSW diversion (GO uptake) from 2030 onwards	15.7%	High and low scenarios based on capture efficiency rates. 99% and 90% respective capture efficiency rates.
C&I diversion (GO / Food Organics uptake) from 2030 onwards	10%	0% 15%

Table 3 provides a summary of the forecast feedstock available to the BERC, from the target catchment identified. The results demonstrate that there is significantly more waste available in the target catchment area than the design capacity of the BERC. These modelling results indicate that the target catchment will generate enough residual waste to support BERC (and other EfW facilities which may be under development), whilst supporting continued source separation, recycling and landfill diversion. In this context, the BERC has significant flexibility to secure waste from both MSW and C&I sources to achieve optimum commercial and energy recovery outcomes.

Table 3: Base case waste feedstock forecasting (excerpt from modelling)

	2026	2031	2036	2041	2051
C&I Residual (target catchment) (tpa)	688,198	656,808	704,147	751,358	848,250
MSW Residual (target catchment) (tpa)	719,630	765,040	819,834	874,166	985,230
Total target feedstock (target catchment) (tpa)	1,407,828	1,421,848	1,523,981	1,625,524	1,833,480
BERC - Feedstock requirements (tpa)	760,000	760,000	760,000	760,000	760,000

3. Feedstock compliance with the Queensland EfW Policy

Policy outcome 4 of the EfW Policy Queensland states that only residual wastes is used for the proposed feedstock of an EfW facility. This section details how the BERC feedstock complies with the residual waste requirements through provision of primary and secondary controls for waste acceptance.

Feedstock modelling indicates that there is sufficient feedstock available to meet the BERC's requirements, maintain competition in the waste market and support improvements in waste management and resource recovery processes and infrastructure in the future.

The BERC will accept waste from multiple generators, including both MSW and C&I waste collections as summarised in Table 4. The precise sources of waste cannot be confirmed until contracts are in place. However, the Project's approach to seeking and negotiating feedstock contracts will be guided by the feedstock modelling and Waste Acceptance Protocol.

To be eligible as a feedstock for thermal EfW processes under the Queensland EfW policy, all waste feedstock must be residual (that is, not technically, environmentally, or economically practicable (TEEP) to reuse or recycle). This excludes waste streams such as uncontaminated comingled recyclables from yellow lid bins, or source-separated green waste. Table 4 describes how the waste streams which may be accepted at the BERC are compliant with the EfW policy.

Table 4: Waste source and eligibility of proposed feedstocks under the Queensland EfW Policy

Waste feedstock stream	Source	Eligibility
Residual MSW From kerbside residual waste bin (red bin) or residual kerbside hard waste after resource recovery	Local councils	**Residual waste (not Technically Practicable to reuse or recycle)** Feedstock contracts will ensure that only the residual stream (i.e. red-bin waste) is collected from councils that have a multi-bin kerbside collection system in place. The Queensland EfW Guideline defines this waste stream as not technically practicable to reuse or recycle.
Residual C&I waste	Various transfer stations or direct supply from approved businesses	**Residual waste (not Technically Practicable to reuse or recycle)** Feedstock contracts will ensure that the waste has undergone source-separation processes. It is noted that these processes (and the ability to achieve higher order resource recovery outcomes) may change over time as waste composition changes and technologies develop. When key influencing factors are introduced, such as new regulation, policy or recycling schemes, waste supply agreements will be reassessed (under Change in Law provisions) to confirm the feedstock retains its status as residual waste. Whilst this waste stream is not specifically defined as 'residual' in the Queensland EfW Policy or Guideline, it is noted that "MSW, C&I or C&D [Construction & Demolition] waste that has not been source separated" is given as an example of non-residual waste.
Other acceptable waste feedstock streams Residual MSW or C&I wastes from sources other than the above (refer to the Waste Acceptance Protocol for details)	Various	**Residual waste (not Technically Practicable to reuse or recycle)** Refer to Waste Acceptance Protocol for details. These waste streams include wastes such as Material Recovery Facility residuals, or source-separated waste streams which are too contaminated to be recycled. They are therefore by definition not Technically Practicable to recycle, however will still be subject to waste supply contract requirements i.e. to ensure that the waste is Acceptable Waste in accordance with the BERC Waste Acceptance Protocol. Note that these streams will likely form a small fraction of the overall waste processed at the BERC and as such are not a focus of the feedstock modelling.
		Residual waste (not Environmentally or Economically Practicable to reuse or recycle) Refer to Waste Acceptance Protocol for details.

Waste feedstock stream	Source	Eligibility
		Note that this is not a target feedstock stream for the BERC, however may be considered acceptable feedstock if in line with the 'considerations for waste supply agreements' listed in the Waste Acceptance Protocol.

4. Supporting higher-order resource management

Policy outcome 1 of the EfW Policy Queensland states that energy from waste proposals do not undermine reuse and recycling and the circular economy principles, and disposal does not undermine appropriate energy recovery. This section demonstrates Cleanaway's alignment to the Queensland waste and resource management hierarchy.

Cleanaway will encourage high-quality resource recovery (in line with the waste hierarchy) through various methods and expects the prevalence of source separation for recycling, particularly GO collection services for households, to increase over time. Cleanaway operate a range of other facilities which process and recycle various waste streams in line with the waste hierarchy and have adopted their own waste hierarchy as shown in Figure 3.

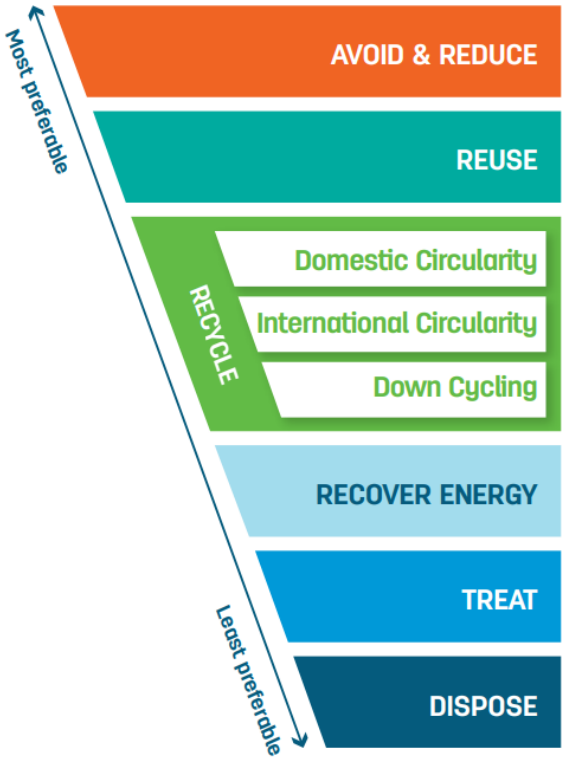

Figure 3: Cleanaway's Waste Hierarchy

Cleanaway also supports higher-order waste management through methods such as:

- Offering competitive commercial rates for collection of separate recycling streams
- Education resources to support correct separation and disposal practices, including continuation of existing programs, provision of resource recovery officers, the Greenius online learning platform and the development of a visitor centre at the BERC
- Investment in dedicated collection vehicles for source-separated collections, such as specialist vehicles for organics, and infrastructure for high-quality recycling of source separated materials such as FOGO and items collected through the container refund scheme (CRS) 'Containers for Change'
- Continual review and optimisation of collection processes.

5. Waste composition

Residual waste is heterogeneous, and composition varies between sources, loads and seasonally. This typical variation is accommodated within the energy recovery process.

As part of the development of the BERC, Cleanaway conducted seasonal residual MSW and residual C&I waste audits to build an understanding of the expected feedstock composition. This sampling has been undertaken by HRL Technology Group (HRL) and included physical composition audits, laboratory testing and analysis to determine chemical composition of the waste.

5.1 Physical composition

Table 5 summarises the physical composition results for both residual MSW and residual C&I waste averaged over two seasonal waste audits (residual MSW from Nudgee Transfer Station and Willawong Resource Recovery Centre, and residual C&I from the Willawong Bowhill Road Site) undertaken for Cleanaway by waste audit and analysis specialist HRL. A “shoulder” season waste audit was undertaken in May 2023, while a “dry” season waste audit was undertaken in September 2023. Natural variability in this feedstock (due to factors such as seasonality, consumer behaviour, changes in legislation and changes in commercial and municipal waste suppliers) is expected over the course of a year and across the design life of the facility. Such variability is expected to remain well within the operational capability of the proposed technology.

The sampling procedure took large amounts of the waste and mixed them to yield a sample representative of the feedstock that would be found in the BERC bunker (i.e. mixtures from multiple deliveries and on multiple days).

Table 5: Residual waste composition audit data (% by weight) averaged over two audits (May/June and September 2023, HRL)

Waste Category	MSW average composition %	C&I average composition %
Paper and Cardboard	17.6	28.4
Nappies	5.3	1.6
Wood	2.7	15.6
Plastics & Expanded Polystyrene (EPS)	6.8	7.4
Soft plastics (film)	7.2	10.6
Ferrous metals	1.7	1.9
Non-ferrous metals	0.9	0.5
Food organics	26.2	27.7
Garden organics	12.0	0.1
Other putrescible	1.4	0.0
Textiles	7.2	3.4
Electronic equipment, household chemicals & pharmaceuticals	4.8	0.7
Glass	3.0	1.7
Other – potentially combustible	0.4	0.2
Other - inert	2.7	0.1
Total	**100**	**100**

The Project has assessed various sensitivity cases to understand the impacts of future changes to source separation and recycling practices on the expected composition of waste to be combusted. Key assumptions include increased diversion of FOGO via new council collection services and increased diversion of plastics through the CRS, banning single use items and developing soft plastic recycling programs (state-wide initiatives). More moderate improvements are assumed for the diversion of residual paper, cardboard and textiles.

Long-term composition values contain greater uncertainty. This uncertainty stems from changes in consumer behaviour and policy changes related to issues such as packaging, single use plastics and waste classification as well as the level of engagement and participation by households and business, which will influence residual waste composition. However, the level of variability indicated in both the short and long term is within the tolerance of the BERC technical design, as discussed in Section 6.1.

Table 6 displays the short term and long term forecast feedstock composition, taking into account the sensitivity cases as provided in the Process Description Brief prepared by Ramboll (2025).

Table 6: Forecast BERC short-term and long-term waste feedstock compositions, with hypothetical increased recycling

Waste Category	Forecast feedstock composition: 70% MSW, 30% C&I (2025) %	Forecast feedstock composition: 70% MSW, 30% C&I (2050) %
Paper and Cardboard	22.7	29.1
Nappies	4.8	6.9
Wood	7.1	9.0
Plastics & EPS	7.2	5.3
Soft Plastics (film)	8.7	7.3
Ferrous metals	2.0	2.7
Non-ferrous metals	0.9	1.3
Food organics	23.2	15.9
Garden organics	6.3	0.3
Other putrescible	1.1	1.7
Textiles	6.6	7.2
Electronics, household chemicals & pharmaceuticals	4.1	6.0
Glass	2.9	3.5
Other – potentially combustible	0.4	0.5
Other – inert	2.2	3.2
Total	**100**	**100**

5.2 Chemical composition & combustion characteristics

As part of the waste audits, Cleanaway engaged HRL to undertake laboratory analysis of the MSW and C&I waste samples to determine chemical composition (constituent elements) and combustion characteristics.

Table 7, Table 8 and Table 9 present the results of the additional investigations undertaken by HRL.

Table 7: HRL audit results - chemical composition and combustion characteristics

Parameter		MSW – Combined Average	C&I – Combined Average
Test	Unit		
Ash Yield at 550° C	% (db)	23.0	11.8

Parameter		MSW – Combined Average	C&I – Combined Average
Moisture Content	% (ar)	38.5	31.8
Carbon	% (db)	43.8	51.0
Hydrogen	% (db)	5.8	7.2
Nitrogen	% (db)	1.1	1.0
Sulphur	% (db)	0.12	0.09
Chlorine	% (db)	0.64	0.56
Calorific Value Gross Dry	MJ/kg (db)	19.8	21.2
Calorific Value Gross Wet	MJ/kg (ar)	12.2	15.7
Calorific Value Net Wet *(Note 1)*	MJ/kg (ar) (LHV)	10.6	14.0
Volatile Matter	% (db)	68.9	78.6
Fixed Carbon	% (db)	8.2	9.7
Note 1: This value is the calorific value that represents the LHV referred to throughout the rest of the BERC documentation.			

Table 8: HRL audit results - major elemental analysis

Major elements, as element in sample	MSW – Combined Average % (db)		C&I – Combined Average % (db)	
	May/June 2023	September 2023	May/June 2023	September 2023
Silicon	0.77	0.47	0.39	0.32
Aluminium	0.22	0.27	0.25	0.13
Iron	0.11	0.08	0.06	0.04
Titanium	0.19	0.15	0.07	0.11
Potassium	0.30	0.20	0.25	0.14
Magnesium	0.13	0.16	0.13	0.08
Sodium	0.45	0.33	0.43	0.11
Calcium	2.0	1.57	1.4	1.35
Phosphorus	0.22	0.07	0.11	0.07

Table 9: HRL audit results - trace elemental analysis

Trace elements, as element in sample	MSW – Combined Average mg/kg (db)		C&I – Combined Average mg/kg (db)	
	May/June 2023	September 2023	May/June 2023	September 2023
Arsenic	7	2	5	<1
Barium	84	94	37	85
Beryllium	<1	<1	<1	<1
Cadmium	<1	1	4	<1
Cobalt	7	2	4	<1
Chromium	26	19	10	11
Copper	36	20	36	36
Mercury	<0.05	<0.05	<0.05	<1
Manganese	46	21	22	21
Molybdenum	1	2	<1	2
Nickel	26	3	11	3
Lead	15	36	4	3
Antimony	11	13	20	6
Selenium	<1	<1	<1	1
Tin	2	3	3	1
Thallium	1	<1	<1	5
Vanadium	1	1	1	<1
Zinc	119	100	107	349

These results show that the design CV of 10.6 MJ/kg (LHV) for the BERC is supported by analytical combustion characteristics obtained from the waste audits in combination with Ramboll's assessment of how the CV of the waste may change over time.

5.2.1 Per- and poly-Fluoroalkyl substances (PFAS)

It is possible that low levels of PFAS may be present in residual MSW and C&I waste due to their widespread use in products used in the general community and around homes.

There is no requirement for analysis of these chemicals in emissions from similar plants in Europe due to the difficulty in undertaking such analysis and the low levels expected to be present. As a result, there is no data available from the reference facilities.

The BERC's thermal treatment and flue gas treatment technologies have the ability to manage the presence of these materials in the feedstock, via a combination of destruction, through high temperature combustion, and capture via lime injection, powdered activated carbon injection and the bag house filter system.

The risk of PFAS being present in the waste feedstock has been assessed as part of the Human Health Risk Assessment for the BERC. The assessment determined that the "*contribution made by PFAS in these risk calculations was extremely low so risks due to the presence of the expected very low to negligible levels of these chemicals within residual waste to be combusted at this facility are expected to be negligible.*".

5.3 Excluding inappropriate waste

The BERC has developed and will implement a Waste Acceptance Protocol to control waste feedstock acceptance through pre-qualification of suppliers, contractual arrangements and onsite QA/QC procedures, to ensure that the waste feedstock composition remains within the parameters which can be safely and reliably managed by the thermal and flue gas treatment processes.

Inappropriate waste will be excluded from processing via several layers of control, including the Waste Acceptance Protocol and operational controls, including:

- Pre-qualification procedures for waste suppliers
- Periodic sampling and testing
- Onsite QA/QC procedures (such as waste delivery vehicle recognition and recording of each waste delivery and each rejected waste delivery, randomised inspection, radiation detection and inspection of waste in the bunker prior to processing).

These measures are defined in more detail within sections 5.3.1, 5.3.2 and the Waste Acceptance Protocol (refer Appendix A).

The nature of residual MSW and C&I waste is that it is heterogenous in composition and is reliant on human behaviour for its composition. Every effort will be made and supported by the project to control the quality of incoming waste streams, including supporting education and awareness of the community and alternative depots/drop-off points for recyclable and household 'hazardous' chemicals and materials such as paint and E-waste. However, not all contamination can practicably be removed from a heterogenous waste stream. For example, it is possible that a consignment of residual MSW could contain one or more small batteries that have been placed in a household residual waste bin.

The facility will be designed and operated to international best practice standards, to be able to safely accommodate and manage underlying minor levels of contamination in the waste feedstock. The flue gas cleaning equipment will be appropriately designed so that emissions from the waste combustion process, including potential contaminants, are kept below the limits set out in the Air Quality Assessment. EfW facilities globally, including the BERC and the BERC's reference facilities, are designed in line with best practice (defined in the BREF-WI) to deal with contamination within a waste stream (refer to the Technical Process Description for further details).

5.3.1 Sampling and testing

During facility operations, sampling and testing of the waste feedstock material will be carried out on a periodic basis. There is no specific guidance provided in Australia for waste sampling for EfW purposes. However, the BERC proposes that (unless otherwise required by the regulator) the sampling frequency will be six monthly as currently required by the Clean Energy Regulator for estimating the portion of electricity generation eligible for creating Large-scale Generation Certificates under the Renewable Energy (Electricity) Act 2000. (Waste feedstock sampling will be in line with regulatory or best practice guidelines, taken from actual deliveries and/or taken from the waste bunker, which will allow seasonal variation to be accounted for. A detailed sampling procedure will be prepared as part of the operational plan for the facility and will include:

- Composition (constituents of the waste)
- Chemical analysis to determine lower heating value, moisture content, sulphur content, chlorine content and ash yield.

Sampling will be carried out by a skilled operative within the waste inspection bay adjacent to the bunker. During sampling periods, samples will be made up from material taken from multiple vehicles, combined and mixed, or directly from the waste bunker, to present a sample which is representative of the material which is combusted. A portion of this will then be sent to a laboratory for analytical testing of chemical composition and combustion characteristics. The advantage of composite sampling is to reduce the margin of error introduced by the inherent variability in the waste stream (for example, some samples of C&I may be higher in timber than others). Composite sampling also better reflects the operation of the facility, in that the amount of waste combusted at any one time vastly exceeds the sample size. By taking multiple samples and mixing (as is undertaken within the waste bunker prior to incineration), the waste sample is more representative of the instantaneous mixture of waste combusted.

5.3.2 Random inspection

If a vehicle is selected for random inspection, it will be directed to the inspection bay after passing over the weighbridge. If it is found during the random inspection process that waste supplied includes unacceptable waste, a correction plan will be put in place with waste suppliers (plan to be determined on a case-by-case basis dependent upon the specific issue). In addition, the random inspection frequency of the offending suppliers' loads will be increased providing a proactive approach to using inspections to effectively mitigate contamination risks. Random inspection is detailed further in the Waste Acceptance Protocol (Appendix A).

5.3.3 Additional information on controls for hazardous waste

The BERC is not designed or permitted to accept hazardous waste and contractual arrangements with waste suppliers explicitly prohibit the delivery of any material classified as hazardous under applicable legislation. The Waste Acceptance Protocol establishes a comprehensive contractual framework to ensure that only Acceptable Waste is received and processed at the BERC. Further details on how the controls in the Waste Acceptance Protocol will be implemented in practice are provided below.

Pre-acceptance and contractual controls

All waste suppliers (e.g. municipal councils, institutions and businesses) are subject to pre-qualification and must enter into Waste Supply Agreements that:

- Require demonstration that the waste stream is residual and not technically, environmentally or economically practicable to reuse or recycle (TEEP test), consistent with regulatory requirements;
- Require documented verification of waste classification and composition; and
- Mandate periodic independent audits e.g. at the suppliers' site or at the transfer station, random inspection of waste loads (as described below under 'Inspection and verification procedures') and quality assurance/quality control (QA/QC) verification of the waste stream.

These agreements explicitly prohibit the supply of Unacceptable Waste, including hazardous waste, and include enforcement provisions such as audits and compliance reviews. In addition, Waste Supply Agreements typically include terms under which responsibility for the collection, recovery, and appropriate disposal of Unacceptable Waste remains with the waste supplier, who bears all associated costs.

Site entry controls and initial screening

Upon arrival, all Authorised Delivery Vehicles are:

- Identified and weighed at the weighbridge; and
- Subject to radiation detection monitoring, with any load exceeding threshold levels diverted to a dedicated quarantine and pre-inspection area for assessment and potential rejection.

Vehicles may then be directed either to a tipping bay or to a designated inspection or quarantine area depending on risk factors and inspection requirements. There is a designated quarantine and pre inspection bay in the north-west portion of the decoupling area.

Inspection and verification procedures

The Waste Acceptance Protocol includes multiple inspection layers to identify Unacceptable Waste:

- Periodic random pre-inspection: Visual checks of selected loads prior to tipping;
- Waste inspection area: Where feasible, loads can be tipped onto the floor in a designated waste inspection area of the waste reception hall for detailed inspection where required;
- Post-tipping inspection: Waste will also be visually inspected within the bunker by crane operators and via a closed circuit TV (CCTV) monitoring system.

If Unacceptable Waste is identified at any stage, the load or relevant fraction is segregated and rejected.

Rejection, quarantine and removal

While inspections are undertaken, the delivery vehicle will be required to remain on site under controlled conditions. If hazardous waste or non-conforming material is identified, the load will either be rejected in its entirety or the hazardous fraction will be isolated and removed from the load, with the remainder (if uncontaminated) deposited into the waste bunker at the discretion of the operations staff. Rejected loads will be taken off-site by, and at the expense of the waste supplier for lawful disposal at an appropriately licensed facility. Thus providing a contractual incentive not to bring Unacceptable Waste to the BERC.

This process ensures that hazardous waste is not accepted into the facility and provides a clear enforcement mechanism to maintain feedstock compliance. In addition, the rejection process supports continuous improvement by ensuring that suppliers are informed of non-conformances, enabling corrective actions and reinforcing compliance expectations across the waste supply chain.

Waste bunker monitoring and secondary control

All waste within the bunker is subject to continuous visual inspection and monitoring using crane operators and CCTV. Upon detection, supplier/delivery details can be logged, and the grab crane can be used to remove the material from the bunker to a skip in the backloading bay for inspection and if necessary, removal from site for alternative resource recovery, resizing via the onsite bulky waste shredder or landfill disposal, if the material is found to be unacceptable waste.

Operators are trained to identify and remove any suspect or non-conforming material, including oversized materials and hazardous or potentially hazardous waste that may be visually identified within the bunker. Where such material is detected, it will be promptly isolated and removed from the active waste pile. Depending on the nature and accessibility of the material, it may be transferred either to a designated quarantine area within the bunker system or removed directly to a secure skip located in the backloading bay within the tipping hall. This ensures that waste is always managed and handled within the enclosed waste reception hall, and is only removed from site in fully enclosed or covered vehicles, for the purposes of preventing environmental impacts and maintaining amenity (odour control).

All identified hazardous or non-conforming waste, typically a very small fraction of total waste deliveries, will be stored in a controlled manner pending arrangement for lawful off-site transport and disposal at an appropriately licensed facility.

These controls operate in conjunction with contractual enforcement mechanisms, supplier auditing and facility operating procedures to ensure that hazardous waste is effectively excluded from the process stream. Any supplier found to be in breach of waste acceptance requirements is subject to contractual penalties and potential termination of supply arrangements.

The provision of education and educational resources regarding acceptable and unacceptable waste will also be an important aspect of the on-going community and stakeholder engagement activities being undertaken by the BERC. Project stakeholders also include individual waste suppliers such as businesses and institutions. This may include bringing waste suppliers to site to educate them on why certain waste types cannot be accepted, how unacceptable wastes can impact Facility availability (which potentially impacts them), as well as consumables and residues etc., which will ultimately also impact the gate fees paid by waste suppliers.

Accordingly, the combination of contractual controls, pre-acceptance screening, inbound inspection, continuous visual monitoring within the bunker and quarantine procedures together help to ensure that hazardous waste is identified and removed prior to processing, and that compliant residual waste is combusted at the facility.

6. Adapting to change

Policy outcome 5 of the EfW Policy Queensland requires EfW facilities to adapt to changes in residual waste over time. This section explains how feedstock variability has been accounted for through the design of the BERC including any long-term changes to the CV over time with as a result of waste reforms and policy drivers.

6.1 Feedstock variability

The technical design of the BERC facility allows for continuous operation (at 100% thermal input) on waste with a CV in the range 8.8-14.6 MJ/kg (LHV) and down to an CV of 7.4 MJ/kg (LHV) at a reduced thermal input. Similarly, the facility will be designed to process waste with a broad range of ash content, moisture content, and other key physical and chemical properties (such as sulphur and chlorine content).

During operation, the automated combustion control system adjusts the feed rate to each boiler to maintain an optimum boiler energy load to meet a steam flow setpoint, for efficient energy recovery and electricity generation. As the CV increases, the waste throughput decreases, and vice-versa. In this way, the facility can reliably provide electricity from a range of different feedstocks. The EfW facility will mix waste thoroughly in the waste bunker to homogenise the material and prevent rapid spikes in contaminant levels or changes in CV associated with individual waste deliveries.

The design CV (10.6 MJ/kg) for the BERC has been determined from experience, supported by analytical combustion characteristics obtained from samples collected during the waste audits in combination with Ramboll's assessment of how the CV of the waste may change over time as a result of expected improvements in recycling and waste diversion. The design CV was also benchmarked against international EfW facility data[3] from facilities processing similar types of mixed waste streams. It is noted that CV will change over time due to waste reform including the introduction of FOGO collection services and associated FOGO processing infrastructure, and other policy drivers such as bans on the use of single use plastics or the development of soft plastics recycling pathways.

If waste with a very low CV is received and is unable to be mixed sufficiently in the bunker to raise the overall waste feedstock CV, auxiliary diesel fuel burners are provided within the boiler design, which are activated by the combustion control system such that the flue gas temperature is always above 850°C for at least 2 seconds, after the last injection of combustion air. These auxiliary burners also enable the facility to continue running safely and efficiently during short excursions beyond the lower limits of the capacity diagram and also facilitate start-up (warm-up) and the safe shutdown of the boiler. If waste with a very high CV is received and is unable to be suitably mixed, the feed rate will be reduced accordingly.

In addition, over the operational life of the BERC, it is likely that both technical advancement and policy changes will result in changes to the residual waste stream. This will cause long-term changes to the waste mix received, however the BERC has been designed to be adaptable to these changes. Changes to waste composition primarily influence the overall energy content of the waste entering the facility, but will also influence the levels of sulphur, chlorine and other elements, which need to be managed by the Air Pollution Control systems.

The facility has been designed with a capacity diagram that can accept a variety of waste types over a range of CVs. Refer to Figure 4 for the capacity diagram, which illustrates the normal operating envelope for each moving grate combustion system. Since the actual CV of the waste is continuously varying, a thermal overload region is typically provided by the moving grate technology provider, to accommodate temporary operation above the 100% thermal input line (i.e. LP2, LP1 and LP5 on the capacity diagram). Temporary operation in the thermal overload region between 100% thermal input and 110% thermal input (i.e. the region bounded by LP2, LP3, LP4 and LP5 in the capacity diagram) is typically limited to ~2 hours and

[3] Ramboll has access to confidential annual average LHV data from a range of UK and European EfW facilities, as well as waste component LHV, moisture and ash content data obtained via extensive experience in the development of EfW facilities globally.

operational setpoints within the thermal overload region are typically not recommended by technology providers.

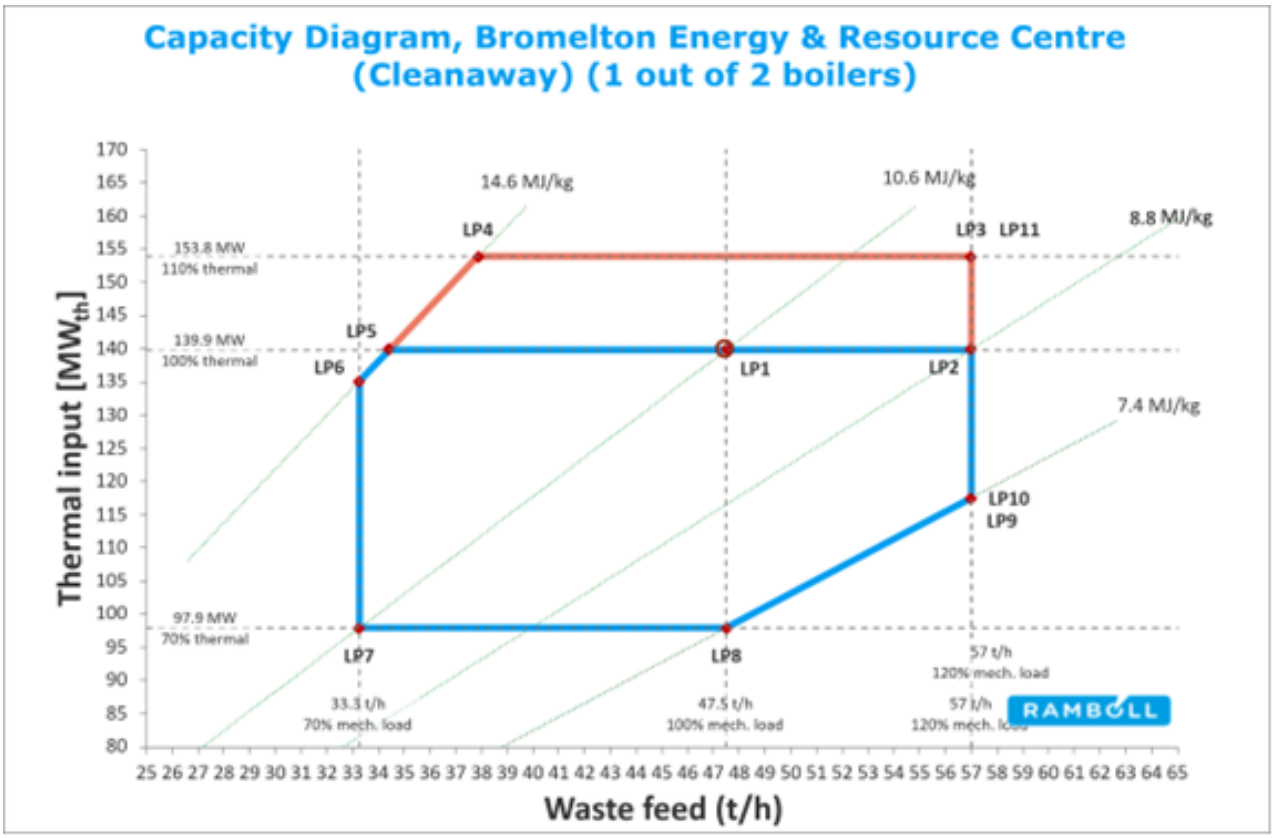

Figure 4: The BERC capacity diagram

The capacity diagram illustrates that the facility can safely handle variations in feedstock CV by managing the waste feed rate. This ongoing management and feedstock variation may impact aspects of facility performance such as:

- Renewable energy generation (due to variation in the fraction of biogenic material in feedstock)
- Gross energy generation and tonnage of waste processed (due to feedstock limitations and/or LHV variation)
- Amount and composition of solid residues (IBA and APCr) produced
- Stack emission rates, to a limited extent, due to:
  - tight controls and limits on pollutant emission concentrations
  - a strong correlation between flue gas volumetric flow rate (at reference conditions of 0ºC, 101.325 kPa, dry and 11% Oxygen) and thermal input, such that flue gas volumetric flow rate is essentially constant for a given thermal input irrespective of the waste feed rate
- Potentially, auxiliary fuel usage, though given the relatively high waste CV expected, auxiliary fuel usage is more likely to be a function of operational availability than feedstock variability.

The flue gas treatment system will be designed to handle variability in the feedstock chemical composition. Emissions impacts are further discussed in the Air Quality Assessment.

The ability of modern EfW facilities to accommodate variability in feedstock LHV and chemical composition is also illustrated in the reference facility performance data, as these facilities also manage variance in their feedstock (refer Technical Process Description for data).

6.2 Changes in waste arising over the long-term

Cleanaway recognise that the definition of residual waste (and therefore acceptable feedstock for the BERC) is fluid and over time technologies may develop which enable better recycling outcomes for some materials. When key influencing factors are introduced, such as new regulation, policy or recycling schemes, waste supply agreements will be reassessed, either at renewal or under Change in Law provisions, to confirm the feedstock retains its status as residual waste.

The Waste Flow Analysis for SEQ report investigated the policy context within Queensland and Australia along with forecasted high resource recovery scenarios and identified sufficient waste sources and feedstock volumes with 1.4-1.9 million tonnes of feedstock forecast within the target catchment to be suitable for EfW from 2026 to 2056. There is therefore significant feedstock available to manage the transition to/from preferable feedstocks over time as policies may change.

7. Conclusion

The BERC's feedstock will consist of residual MSW, and residual C&I wastes, that meet the definition of residual waste in the Queensland EfW Policy and are therefore suitable for processing in a thermal energy recovery facility. Feedstock modelling, undertaken by Arcadis, has demonstrated that there is sufficient feedstock available to support the operation of the BERC.

Implementation of a Waste Acceptance Protocol will define the acceptable and unacceptable waste feedstocks for the facility, as well as provide information about waste supply, on-site waste delivery and handling procedures, contingency measures and operational practices to suppliers and operators.

This report concludes that the BERC has been developed in alignment with the Queensland EfW policy outcomes as outlined below:

- **Policy outcome 1:** The proposal supports circular economy principles by demonstrating that energy recovery does not undermine reuse, recycling, or appropriate waste disposal practices.
- **Policy outcome 4:** The facility is designed to process only residual waste, demonstrating that materials suitable for recycling or reuse are not diverted to energy recovery.
- **Policy outcome 5:** The BERC incorporates flexibility to adapt to changes in the composition of residual waste over time, supporting long-term sustainability and responsiveness to evolving waste management practices and policy reforms.

Appendix A

Waste Acceptance Protocol

Bromelton Energy and Resource Centre Draft Waste Acceptance Protocol

Purpose

This Waste Acceptance Protocol sets out the process for the delivery of Waste by a Waste Supplier or by or on behalf of Cleanaway to the Facility and details the on-site QA/QC procedures to determine whether Waste delivered to the Facility is Acceptable Waste.

The Facility will only process waste which is 'Acceptable Waste' as defined by this Protocol.

The Queensland Energy from Waste Policy (2021) (EfW Policy) **Outcome 4: Only residual waste is used for energy recovery**, states that "Residual waste is waste that is not technically, environmentally, and economically practical (TEEP) to reuse or recycle. Residual waste may include, for example:

- residues from a waste recycling or remanufacturing process, for which no further recycling process is available
- waste that is too degraded or contaminated to be recycled."

The Queensland Energy from Waste Guideline (2021) (EfW Guideline) provides further details regarding the determination of whether waste is or is not residual waste: "Residual waste is waste that is not technically, environmentally, or economically practicable (TEEP) to reuse or recycle. Making this determination is a stepped process as outlined in Figure 2 [see Figure 1]. Applicants should first assess the technical practicability of reusing or recycling their proposed feedstock. If this is shown to be impractical, then the feedstock would qualify as residual waste under the Policy and no further analysis is recommended."

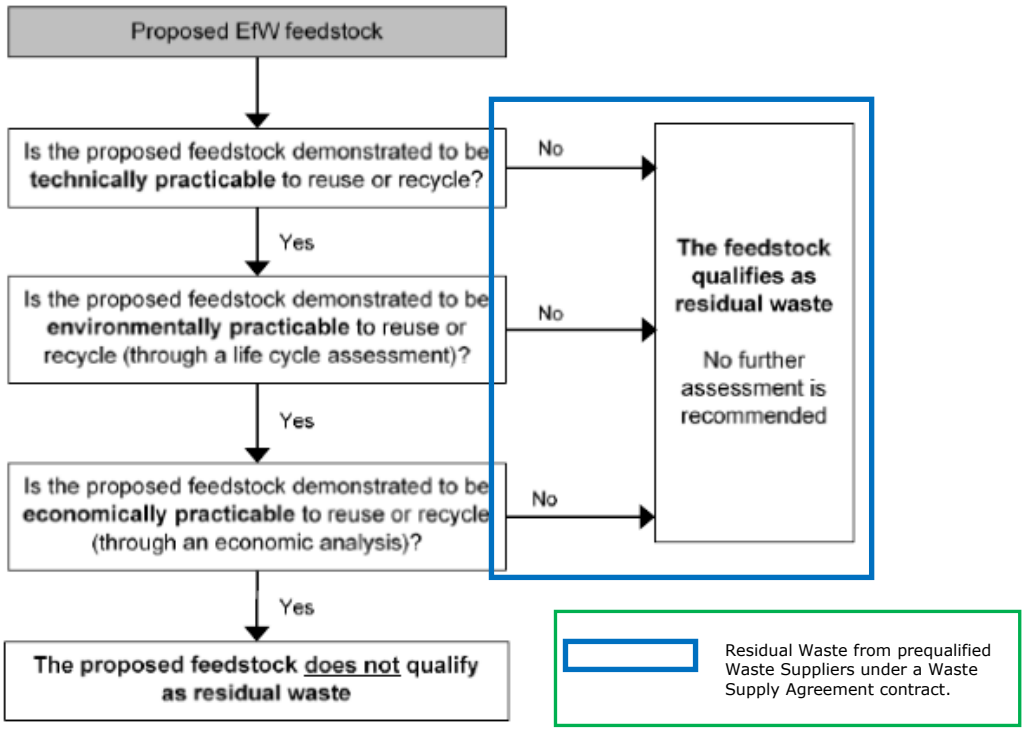

Figure 2: Recommended process to determine whether a proposed feedstock is residual waste

Figure 1 Process to determine whether a proposed feedstock is residual waste (Figure 2, EfW Guideline (2021).

The EfW Guideline (2021) further defines Technically Practicable as follows:

"If waste is 'not technically practicable' to reuse or recycle, it means there is no capacity or capability to legally reuse or recycle the waste. For example, this may be because:

- the infrastructure, technology or process to reuse or recycle the waste has not yet been developed or proven anywhere in the world. In this regard, proponents should be aware that new technologies are becoming available to recycle previously problematic wastes. It is important that proposed EfW facilities are able to adapt to feedstock changes resulting from the evolution and development of recycling technologies
- the feedstock has unusual or unavoidable characteristics that make reuse/recycling impracticable (e.g. waste is too degraded or contaminated and would otherwise be disposed of in landfill)
- recycling is restricted or prohibited by law (e.g. biosecurity waste, clinical and related waste)
- all reasonable efforts have been taken to divert the reusable/recyclable components from the waste. This diversion could be achieved, for example:
    - through source separation of recyclable materials and/or food and garden organics (e.g. by sourcing residual MSW waste from councils with well-developed and high-performing kerbside recycling schemes)
    - by pre-processing the waste stream through a material recovery facility to remove recyclable materials."

This Waste Acceptance Protocol includes practical measures that Cleanaway will take to ensure the feedstock is not Technically, Environmentally, or Economically Practicable to reuse or recycle. These measures include pre-qualification of suppliers through contractual Waste Supply Agreements (also see **Considerations for Waste Supply Agreements**) and onsite **Waste Acceptance Procedures**.

Considerations for Waste Supply Agreements

Waste Supply Agreements shall incorporate the following considerations:

1. The Technically Practicable test is the first consideration of any Waste Supply Agreement with a Waste Supplier. Where applicable, this will include written confirmation that the Waste Supplier's premises and/or Waste Supplier's customers have and will continue to maintain a waste management system that facilitates source separation of recyclable and non-recyclable waste. If the Waste Supplier is a municipal council, that the council has a well-developed and high-performing kerbside recycling scheme.
2. If waste is Technically Practicable to reuse or recycle, the Waste Supplier must provide Cleanaway with written evidence that it is either not Environmentally Practicable or Economically Practicable to reuse or recycle the waste. The EfW Guideline (2021) provides guidance on the types of evidence needed to support decision making in relation to these tests. As such, demonstrating that waste is not technically, environmentally, or economically practicable to reuse or recycle shall be a prerequisite of any Waste Supply Agreement between Cleanaway and a Waste Supplier seeking to access the energy and resource recovery services provided by the Facility.
3. Waste Supply Agreements will include a requirement for [the Waste Supplier or Cleanaway] to arrange an independent audit of the waste stream to confirm the waste type(s) and confirm that the waste is Acceptable Waste for delivery to the BERC.
4. Waste Supply Agreements shall also include provisions for periodic waste audits and where applicable, confirmation of currency of the Waste Supplier's accredited Quality Assurance and Quality Control (QA/QC) systems, and random periodic audits of the Waste Supplier QA/QC systems relating to waste management, source separation of waste and, where applicable, processes, procedures and criteria to be used to verify the level of contamination which may cause source separated waste stream to become Residual Waste.
5. Waste Supply Agreements shall include a periodic review clause and a requirement to review the WSA if there are changes to this Waste Acceptance Protocol, or a change in law.

Definitions

Acceptable Waste means:

(a) **Residual MSW**, being:

i. source separated general waste collected by or on behalf of Cleanaway or a Waste Supplier through a regular waste collection service from households using council supplied bins;

ii. source separated waste from a bulk verge kerbside collection by or on behalf of Cleanaway or a Waste Supplier ;

iii. Residual public drop-off waste, delivered directly to a transfer station or resource recovery centre;

iv. Waste materials having been separately collected for recycling, that is subsequently unsuitable for recycling or recovery, other than energy recovery, including:

(a) Contaminated GO Waste;

(b) Contaminated FOGO Waste;

v. waste collected by or on behalf of Cleanaway or a Waste Supplier from public litter bins, public places or from events; or

(b) **Residual C&I Waste**, being:

i. source separated C&I Waste;

ii. Contaminated FO Waste

iii. MRF residuals which would otherwise be destined for landfill disposal;

iv. FOGO processing facility residuals which would otherwise by destined for landfill disposal;

v. Other combustible alternative waste treatment facility residuals which would otherwise be destined for landfill disposal;

(c) **Residual C&D Waste**, being construction and demolition (C&D) waste that only contains waste material that is not Unacceptable Waste, is pre-sorted combustible construction and demolition waste resulting from residential and commercial construction and demolition activities; and

(d) any other Waste that Cleanaway notifies any Waste Supplier can be considered Acceptable Waste for the purposes of this Waste Acceptance Protocol,

which in each case classifies as Residual Waste and must not contain Unacceptable Waste in quantities greater than might otherwise be found in typical Residual MSW, Residual C&I Waste or Residual C&D Waste, as determined by a physical audit of the waste[1], to be undertaken periodically by a waste audit specialist or a reputable third party acting on behalf of Cleanaway, a Waste Supplier or a Waste Supplier's customer; and

Authorised Delivery Vehicle means a Delivery Vehicle whose owner or operator has been notified by Cleanaway as being authorised to deliver Waste to the Facility that has its vehicle registration details and tare weight recorded on Cleanaway's BERC site data management system.

C&I Waste means solid waste generated from institutions, businesses, industries and waste arising from commercial, industrial or trade activities of from laboratories, including any waste prescribed to be a commercial waste by the government, which has been collected or received by or on behalf of Cleanaway or a Waste Supplier, or mixed waste received at a drop off facility operated by or on behalf of a Waste Supplier.

Contaminated GO Waste means Source Separated GO Waste which has a level of other materials that makes it unsuitable for recycling, as determined by the Waste Supplier in accordance with their QA/QC systems and procedures.

[1] In accordance with a waste audit protocol (to be developed in due course).

Contaminated FOGO Waste means Source Separated FOGO Waste which has a level of other materials that makes it unsuitable for recycling, as determined by the Waste Supplier in accordance with their QA/QC systems and procedures.

Contaminated FO Waste means Source Separated FO Waste which has a level of other materials that makes it unsuitable for recycling, as determined by the Waste Supplier in accordance with their QA/QC systems and procedures, and classifies as Residual Waste under the EfW Policy (2021).

Economically Practicable is a test defined in the EfW Guideline (2021).

Environmentally Practicable is a test defined in the EfW Guideline (2021).

Facility means the Bromelton Energy and Resource Centre (BERC).

MRF means a materials recovery facility which mechanically separates commingled dry recyclables into different material streams.

MSW means general waste collected by or on behalf of Cleanaway or a Waste Supplier through a regular waste collection service from households using council supplied bins.

Regulated Waste is waste as defined in section 42 of the Regulations.

Regulations means the *Environmental Protection Regulations 2019* (Qld), [as amended from time to time].

Residual Waste is waste that is not Technically, Environmentally or Economically Practicable to reuse or recycle.

Source Separated FOGO Waste means source separated food organic and garden organic waste that is collected or received by or on behalf of Cleanaway or a Waste Supplier.

Source Separated GO Waste means source separated garden waste that is collected or received by or on behalf of Cleanaway or a Waste Supplier.

Source Separated FO Waste means source separated organic waste that is collected or received by or on behalf of Cleanaway or a Waste Supplier.

Technically Practicable is a test defined in the EfW Guideline (2021), as detailed in the Purpose of this Waste Acceptance Protocol and is the first test to be used to confirm if a waste is Residual Waste. If waste is not Technically Practicable to reuse or recycle, it is classified as Residual Waste. This may be because all reasonable efforts have been taken to divert the reusable/recyclable components from the waste. This diversion could be achieved, for example:

(a) through source separation of recyclable materials and/or food and garden organics (e.g. by sourcing residual MSW waste from councils with well-developed and high-performing kerbside recycling schemes)

(b) by pre-processing the waste stream off-site to remove recyclable or compostable materials.

Unacceptable Waste means:

(a) Wastes not permitted by the Environmental Authority for the Facility, or under legislation to be processed at the Facility;

(b) Waste that is not classified as Residual Waste, which includes MSW and C&I Waste that has not been source separated;

(c) loads of the following wastes:

(i) Source Separated FOGO Waste that is not Contaminated FOGO Waste;

(ii) Source Separated FO Waste that is not Contaminated FO Waste;

(iii) Source Separated GO Waste that is not Contaminated GO Waste;

(iv) Source separated recyclables other than MRF residuals;

(v) Construction and demolition waste which has not been source separated and/or processed for materials recovery, to remove the bulk of the inert materials;

(vi) Asphalt;

(vii) Category 1 and Category 2 regulated wastes listed in Schedule 9 Part 1 of the Regulations including but not limited to:

- Tyres and other mono-stream loads, whether combustible or inert, unless specifically listed as Acceptable Waste;
- Asbestos [Environment Protection Regulations 2019 Schedule 11 waste code N220];
- Clinical and related wastes, pharmaceuticals, drugs and medicines waste, and waste from the manufacture or preparation of pharmaceutical products, unless a specific approval or exemption applies [Environment Protection Regulations 2019 Schedule 11 waste code R100*, R120*, R140][2];
- Car batteries;
- Animal effluent and residues, including abattoir effluent and poultry and fish processing wastes [Environment Protection Regulations 2019 Schedule 11 waste code K100];
- Sewage sludge and residues, including nightsoil and septic tank sludge [Environment Protection Regulations 2019 Schedule 11 waste code K130]

(viii) Waste that is not Regulated Waste and is listed in Schedule 9 Part 3 Division 1 of the Regulations including:

- Electronic equipment and white goods, including pre- and post-recycled e-waste (meaning electronic waste which has been pre-processed to recover recyclable material);
- Concentrations of disposable batteries typically used in small electronic devices or handheld devices;
- Wood treated with arsenic and chromium; other than sawdust or shavings

(ix) Source separated metals and glass;

(x) Inert, non-combustible materials (such as ash, sand, salt, bricks, concrete, soil including contaminated soil, glass, gypsum/plasterboard, metals etc.);

(xi) Combustible powders;

(xii) Drummed waste;

(xiii) Liquid waste in quantities greater than 50 litres in one container;

(xiv) Shredder flock;

(xv) Mining processing waste (such as slurries, tailings or fill from mining or extractive industries);

(xvi) Pressure vessels;

(xvii) Waste materials containing high concentrations of sulphur, chlorine, or other potential polluting substances;

(xviii) Tree stumps and logs unsuitable for shredding;

(xix) Individual loads containing more than 30% woody biomass[3].

(d) radioactive wastes - a load must not have a radiation level above a suitable threshold (to be determined and agreed during commissioning) above the background radiation levels as detected at the Facility*;*

(e) other Regulated Wastes as per Schedule 9 Part 1 of the Regulations which include, for

[2] Environment Protection Regulations 2019 Schedule 11 explanatory note 2: If a substance falls under more than 1 item in this list, and the code for one of the items is marked with an asterisk, the code for the substance is the code marked with an asterisk.

[3] due to different combustion characteristics of woody fuels - typically high moisture content, and high degree of volatiles, requiring lower primary (grate) combustion air and higher secondary air. Subject to the above criteria, some fractions of treated wood are acceptable, for example only surface treated waste wood. However, wood treated with Chromium and Arsenic is unacceptable.

example:

(i) special events for bulk collection of residue chemicals,

(ii) explosives, fireworks, and munitions,

(iii) highly corrosive or toxic materials in bulk form,

(iv) flammable liquids and solvents in bulk form,

(v) pathogens,

(vi) biologically or bacteriologically contaminated waste and body parts, but does not include household hazardous waste that is normally mixed within the weekly waste collection service from households

(vii) chemical waste arising from a research and development or teaching activity, including new or unidentified material and material whose effects on human health or the environment are not known [Environment Protection Regulations 2019 Schedule 11 waste code T100];

(f) Any individual item over 100 kg;

(g) Bales of household waste stored for longer than 6 months.

(h) Waste exceeding the following dimensions[4]:

(i) to avoid blockage issues (i.e. blocking of the feed hopper): 1000 x 500 x 150 (mm) or 500 x 500 x 500 (mm); and

(ii) to avoid burnout issues: Maximum dimension on the shortest side of 40 (mm); and

(iii) Waste exceeding the maximum size of approximately 3000 x 2000 mm (subject to basic design of shredder receiving hopper) which is the maximum size of Waste suitable for shredding.

(i) Waste with the following characteristics[5]:

(i) Large pieces of solid paper, wood, plastics, or other combustibles;

(ii) The waste must not contain metal plates, bars, pipes, etc. greater than 100 x 800 x 800 mm; and

(j) any other waste that Cleanaway determines is Unacceptable Waste for the purposes of this Waste Acceptance Protocol.

Waste means all waste delivered by or on behalf of Cleanaway or any Waste Supplier to the Facility, irrespective of whether the waste is Acceptable Waste or Unacceptable Waste.

Waste Inspection Area means an area in the tipping hall, where an Authorised Delivery Vehicle can be directed to tip its load onto the tipping hall floor to facilitate an inspection for Unacceptable Waste.

Waste Supplier means a supplier of Waste to the Facility pursuant to a Waste Supply Agreement.

Waste Supply Agreement means a waste supply contract between Cleanaway and the Waste Supplier.

[4] Note this is subject to use of an on-site shredder (and subject to design).

[5] Note this is subject to incineration use without an on-site shredder.

Waste Acceptance Procedure

Acceptance of Waste

The Facility will only process Waste delivered to the Facility that is Acceptable Waste.

Scheduling of Waste Deliveries
Waste deliveries will be scheduled in advance by the site operations team. Schedules for waste consignments to be delivered will be prepared on an annual, quarterly, monthly, weekly, and daily basis and agreed between Cleanaway and the Waste Supplier to make sure that there is sufficient storage capacity in the bunker to accommodate the nominated waste deliveries. This will avoid overfilling of the waste bunker. Deliveries will be scheduled to enable on site operational staff to monitor the delivery process.

Waste deliveries shall be undertaken by Authorised Delivery Vehicles, during normal operating hours for waste deliveries (unless otherwise approved by Cleanaway).

Process on Arrival
A high-level waste delivery and inspection process for the EfW facility, showing pathways for rejection of Unacceptable Waste, is illustrated in Figure 2. Figure 3 displays the areas in which these key activities occur.

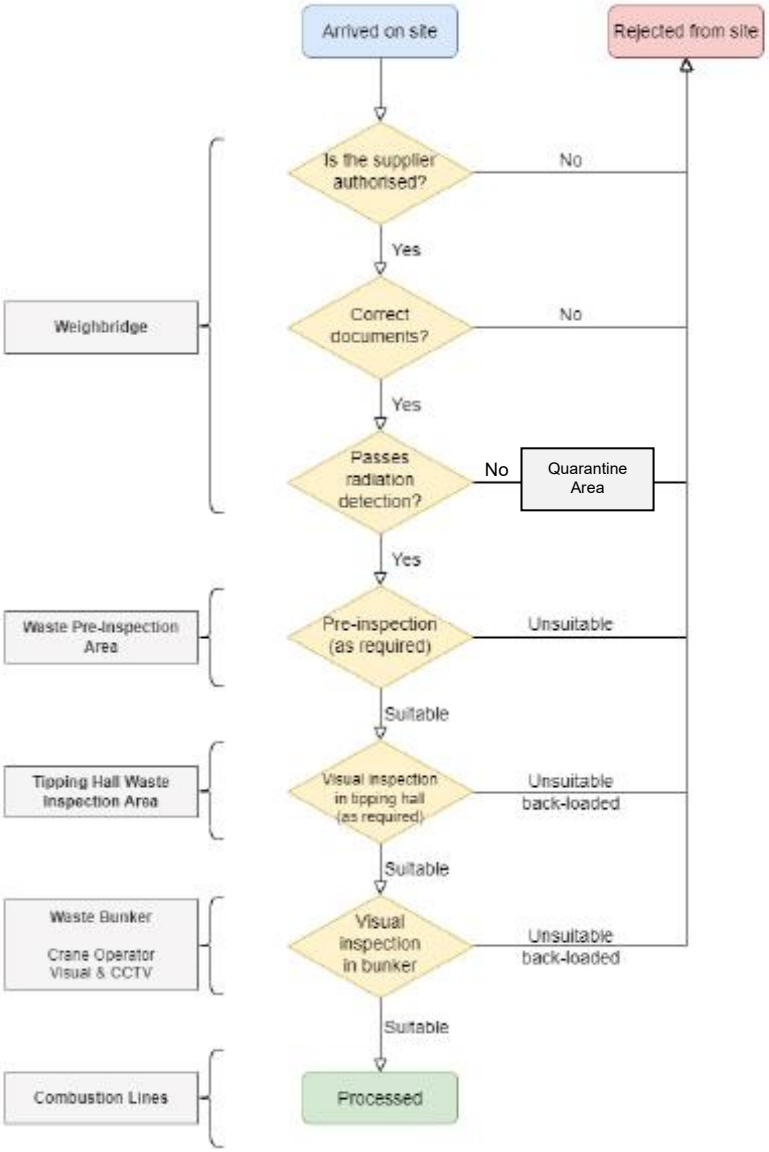

Figure 2 Overview of process on arrival for a waste delivery to the EfW facility.

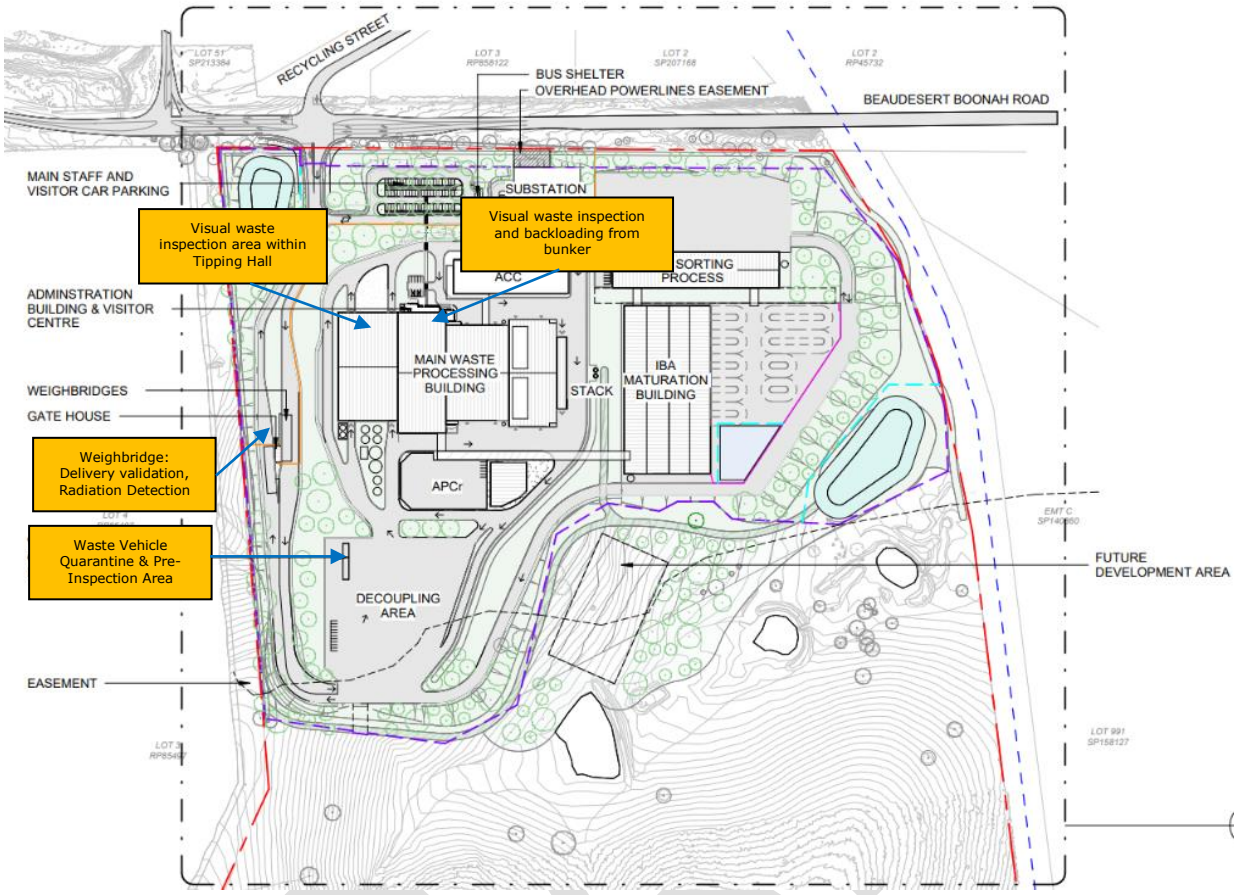

Figure 3 Site layout – feedstock QA/QC areas [Preliminary Subject to Detailed Design].

Site Entry:

As Authorised Delivery Vehicles arrive at the site they are identified (to confirm Waste Supplier details, waste type(s), vehicle type and other vehicle details, vehicle origin) and weighed on a weighbridge. Radiation detection will be housed adjacent to the weighbridge. Authorised Delivery Vehicles which are found to exceed the acceptable radiation level will be directed to the designated "Waste Vehicle Quarantine & Pre-Inspection Area" for further assessment as to whether the load should be rejected or accepted. The gross weight of the Authorised Delivery Vehicles at the entry weighbridge shall be recorded for comparison against the gross weight of the Authorised Delivery Vehicles at the exit weighbridge, to determine the weight of waste delivered.

Authorised Delivery Vehicles can either be directed to a designated tipping bay to unload the waste or to the "Waste Vehicle Quarantine & Pre-inspection area" or the "inspection area" in the tipping hall. Unless the waste delivery is rejected in accordance with Figure 2, once the Authorised Delivery Vehicles has tipped its load at the designated tipping bay or inspection area, the Authorised Delivery Vehicles is to exit the Facility via the exit weighbridge at the designated exit point.

Periodic Random pre-inspection of waste:
A "Waste Vehicle Quarantine & Pre-inspection area" within the truck decoupling area is an allocated area where waste vehicle loads and waste load and/or driver details can be visually inspected (if feasible to do so) and details verified. The Waste load shall not be tipped for inspection in this area.

Periodic Random waste inspection/rejection in tipping hall:
A "Waste Inspection area" in the tipping hall is an allocated area where a waste load can be dumped/tipped on the floor for periodic random visual inspection. Alternately, waste can be inspected after it is tipped into the waste bunker. The decision to inspect waste on the floor of the tipping hall or in the bunker will be made on a case-by-case basis subject to operational and safety considerations (for example, odorous or large loads may be more suitable for inspection in the bunker). After inspection and if the waste is Acceptable Waste, the pile is to be pushed into the bunker via a front loader.

If Unacceptable Waste is discovered (e.g. large amounts of electronics or inert materials) the rejected waste, or portion of the waste, will be loaded back into trucks/open containers via a front-loader or other mobile equipment. If necessary, rejected waste may need collection via separate vehicles.

Inspection of Semi and Twin Trailer Trucks :
Waste delivered by semi-trailer or twin trailer trucks will be off-loaded directly into the bunker and visually inspected by the crane operator and monitored by a closed-circuit television (CCTV) system.

Waste Bunker Monitoring and Back-loading of Waste from Waste Bunker:
Waste loads tipped into the bunker will be observed and monitored as part of normal facility operation. If the waste tipped into the waste bunker is observed to contain material that cannot be combusted, the waste crane or a smaller picking crane will be used to remove this waste from the bunker. Oversize combustible waste can be returned to the waste bunker via the shredder.

Back-loading of the rejected waste is undertaken through hatches at each end of the Waste Bunker via the grab crane, which can lower rejected waste into an accessible area, where it can be placed in a skip bin or removed via a front-loader or other mobile equipment to a storage container or vehicle for removal offsite and proper disposal or recovery if possible.

Note: Operational procedures are to be further developed during detailed design / operational readiness.

EfW Facility Bypass

If the capacity of the Waste Bunker is exceeded at any point in time or the Facility is unable to receive Acceptable Waste (e.g. due to a full plant outage), Cleanaway will temporarily divert Authorised Delivery Vehicles to an appropriately licenced facility (under pre-arranged contractual arrangements).

Review

This Waste Acceptance Protocol shall be subject to review including:

- In the event of a change in law
- At the expiration date of a major Waste Supply Agreement [to be defined by Cleanaway]
- In the event that a technological change such that specific waste streams become Technically, Environmentally or Economically Practicable to reuse or recycle.