



Appendix EE

| *Preliminary
hazard analysis*

REPORT

PRELIMINARY HAZARD ANALYSIS

WOODLAWN ADVANCED ENERGY RECOVERY CENTRE (ARC)

ENVIRONMENTAL IMPACT ASSESSMENT

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Title: Report Preliminary Hazard Analysis Woodlawn Advanced Energy Recovery Centre (ARC) Environmental Impact Assessment	QA verified: S. Chia
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ABBREVIATIONS

ACC	Air-Cooled turbine Condenser
ADGC	Australian Dangerous Goods Code
ARC	Advanced Energy Recovery Centre
APCr	Air Pollution Control residue
AS	Australian Standard
BCA	Building Code of Australia
C&I	Commercial and Industrial
DA	Development Application
DG	Dangerous Goods
EIS	Environmental Impact Statement
EP&A Act	Environmental Planning and Assessment Act 1979
EPL	Environment Protection Licence
ERF	Energy Recovery Facility
FSS	Fire Safety Study
GHS	Globally Harmonized System
HAZID	Hazard Identification
HAZOP	Hazards and Operability study
HIPAP	Hazardous Industry Planning Advisory Paper
IBA	Incinerator Bottom Ash
IMF	Intermodal Facility
LTP	Leachate Treatment Plant
MBT	Mechanical Biological Treatment
MSW	Municipal Solid Waste
PHA	Preliminary Hazard Analysis
RSW	Restricted Solid Waste
SDS	Safety Data Sheet
SEARs	Secretary's Environmental Assessment Requirements
SEPP	State Environmental Planning Policy
SNCR	Selective Non-Catalytic Reduction
SSD	State Significant Development

TERMINOLOGY

Term	Definition
Consequence	Outcome or impact of a hazardous incident, including the potential for escalation
Offsite	Areas beyond Veolia's Eco Precinct boundary
Onsite	Areas within Veolia's Eco Precinct boundary
Risk	The likelihood of a specified undesired event occurring within a specified period or in specified circumstances, It may be either a frequency (the number of specified events occurring in unit time) or a probability (the probability of a specified event following a prior event), depending on the circumstances.
The project	Woodlawn Advanced Energy Recovery Centre (ARC), an energy recovery facility (ERF). This refers to all of the elements that comprise the project for which approval is sought.

1. SUMMARY

1.1. Background

Veolia Environmental Services (Australia) Pty Ltd (Veolia) owns and operates the Woodlawn Eco Precinct (the Eco Precinct), located on Collector Road, approximately 6 kilometres (km) west of Tarago, approximately 50 km south of Goulburn and 70 km north of Canberra. The Eco Precinct is located in the Goulburn Mulwaree local government area (LGA). The Eco Precinct has provided sustainable and innovative waste management services since 2004.

The Eco Precinct comprises the following integrated waste management operations, energy recovery technologies and energy generation, and other sustainable land uses:

- Woodlawn Bioreactor (the Bioreactor) – a putrescible residual waste landfill in which leachate is recirculated to help bacteria break down the waste, enhancing the early generation of gas, enabling more efficient capture and extraction of landfill gas, including leachate and landfill gas management systems.
- Woodlawn BioEnergy Power Station – utilises landfill gas from the Bioreactor to generate electricity.
- Woodlawn Mechanical Biological Treatment (MBT) Facility – processes Municipal Solid Waste (MSW) to extract the organic content for use in tailings dam remediation.
- Agriculture – a working farm (sheep and cattle) that applies sustainable management practices.
- Aquaculture and horticulture – operation which uses captured waste heat from the BioEnergy Power Station for use in sustainable fish farming and hydroponic horticulture at the Eco Precinct.
- Renewable energy generation – the Woodlawn Wind Farm (operated by Iberdrola) which has an installed capacity of 48.3 MW, and a solar farm (operated by Veolia) with an installed capacity of 2.3 MW.

The Eco Precinct is served by the Crisps Creek Intermodal Facility (IMF) near the village of Tarago. Crisps Creek IMF is approximately 6 km to the east of the Eco Precinct (8.5 km by road). Eco Precinct operations are augmented by two waste transfer terminals located in Sydney: the Clyde Transfer Terminal, which commenced operation in 2004 with the Bioreactor and Crisps Creek IMF, and the Banksmeadow Transfer Terminal, which commenced operation in 2016.

Waste is transported from the Sydney waste transfer terminals in purpose-built shipping containers by rail via the Goulburn-Bombala Railway line to the Crisps Creek IMF. The Crisps Creek IMF has an approved throughput of 1.18 million tonnes per annum (tpa). On receipt at the Crisps Creek IMF, containers are loaded on to trucks for delivery to the

Eco Precinct. Waste from the regional area is also approved to be transported to the Eco Precinct by road, up to 130,000 tpa.

The Eco Precinct also includes two other primary operations, the Woodlawn Wind Farm and the Woodlawn Mine.

Veolia proposes to develop and operate the Woodlawn Advanced Energy Recovery Centre (ARC) (the project), an energy recovery facility (ERF), at the Eco Precinct. This involves the development of an additional waste management technology at the Eco Precinct, processing a portion of the residual waste feedstock received at the site, and generating electricity from the energy recovery process.

The project is a State Significant Development (SSD) which requires development consent under Part 4, Division 4.1 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act). A Development Application (DA) for SSD is required to be accompanied by an Environmental Impact Statement (EIS).

EMM Consulting Pty Ltd (EMM) engaged Sherpa Consulting to undertake the Preliminary Hazard Analysis (PHA) for input into the EIS.

1.2. Objectives

The objective of the hazard analysis is to:

- Conduct an assessment to determine whether the proposed project is 'potentially hazardous' within the guidelines of NSW State Environmental Planning Policy No.33 Hazardous and Offensive Development *Applying SEPP 33*, Ref [1], hence whether a PHA is required.
- Conduct a PHA in line with the *Hazardous Industry Planning and Advisory Paper No 6 – Hazard Analysis* (HIPAP 6), Ref [2], based on the SEPP 33 screening results as well as any incidents arising from project operation with potential offsite land use safety impact for inclusion in the EIS.

1.3. Results

1.3.1. SEPP 33 screening assessment

A summary of results of the SEPP 33 assessment is provided in Table 5.1. The screening assessment found that the quantity of Class 4.2 materials ('substances liable to spontaneous combustion') to be stored and handled was above the screening threshold nominated in the DPIE's *Applying SEPP 33* guidelines, Ref [1]. Screening thresholds for other types of Dangerous Goods (DG) were not exceeded.

Therefore, the development is classified as 'potentially hazardous' and a PHA is required.

Screening thresholds for DG transportation were not exceeded and a route evaluation study is not required.

In the absence of controls, the proposal has the potential to cause pollutants to be discharged to the surrounding environment. Therefore, it is considered 'potentially offensive industry' under SEPP 33 and will require an Environment Protection Licence (EPL). Environmental impacts are addressed in other parts of the EIS.

1.3.2. Preliminary Hazard Analysis

Hazard identification

For this PHA study, the hazards were identified by:

- Reviewing the proposed DG against *Applying SEPP 33* guidance,
- Undertaking a stakeholder workshop (August 2021) with Veolia (operations), Ricardo (technical advisors), EMM and third-party specialists, and
- Literature research of past incidents of facilities similar to the proposed development.

The focus of the workshop was to identify potentially hazardous scenarios associated with the proposed ARC operation and screen forward those incidents with potential offsite safety impact. Using the Veolia risk matrix, the qualitative risk ranking ranged from medium (tolerable risk) to low risk.

When accounting for the separation distance from the ARC to the nearest Eco Precinct boundary (approximately 2 km) and nearest residential receptor (approximately 4.2 km), the workshop team believed that there would be no offsite safety impacts and that the corresponding offsite risk would be low. As a conservative approach, to confirm the workshop findings, a set of scenarios were taken forward for consequence review as indicated in Table 6.2. These scenarios covered the tipping hall, flue gas treatment (where Class 4.2 material is utilised), steam turbine hall and utilities.

Consequence Review

During the conduct of this PHA, Ricardo had engaged RiskCon to attend the HAZID workshop and to conduct a fire safety assessment study, Ref [3]. This PHA has utilised the findings from this study to determine the potential for offsite safety impact. The PHA consequence review found:

- Incidents (fire and explosion) involving activated carbon (Class 4.2) screened forward from the SEPP 33 threshold analysis did not have offsite safety impacts in terms of fire and explosion to the site boundary or nearest residential area.
- Remaining incidents relating to the ARC operation including utilities (fires involving diesel storage and transformers) did not have offsite safety impact.

Risk Assessment

As a result of the consequence review and with reference to the Multi Level Risk Assessment Guideline, Ref [4], a qualitative risk analysis has been selected for this PHA. This approach is known as a Level 1 risk assessment.

No hazardous incidents have been identified for the proposed ARC with potentially significant offsite safety impacts on surrounding land uses. Therefore, the risk is consistent with the HIPAP 4 qualitative risk criteria as summarised in Table 1.1 and the likelihood of any offsite safety impacts on people or property is considered minimal.

Table 1.1: Comparison against HIPAP 4 qualitative risk criteria

Criteria	Comments	Complies?
<p>a) All 'avoidable' risks should be avoided. This necessitates the investigation of alternative locations and alternative technologies, wherever applicable, to ensure that risks are not introduced in an area where feasible alternatives are possible and justified.</p>	<p>No identified events involving Class 4.2 (Substances liable to spontaneous combustion) or other DG materials with significant acute safety or environment effects beyond the boundary.</p> <p>The proposed ARC technology is well understood with standard controls. The benefits of the ARC in terms of generating power from residual waste material is described in the EIS.</p> <p>Whilst fires have occurred in ERFs, typically in the waste fuel storage, consequences are typically localised.</p> <p>In terms of flue gas treatment, Veolia has chosen to use aqueous ammonia solution (Class 8) in lieu of anhydrous ammonia (Class 2.3) which is less hazardous and toxic in a loss of containment event. This decision is an effective 'substitution' option from a risk reduction hierarchy perspective.</p>	<p>Yes</p>
<p>b) The risk from a major hazard should be reduced wherever practicable, irrespective of the numerical value of the cumulative risk level from the whole installation. In all cases, if the consequences (effects) of an identified hazardous incident are significant to people and the environment, then all feasible measures (including alternative locations) should be adopted so that the likelihood of such an incident occurring is made very low. This necessitates the identification of all contributors to the resultant risk and the consequences of each potentially hazardous incident. The assessment process should address the adequacy and relevancy of safeguards (both technical and locational) as they relate to each risk contributor.</p>	<p>No identified events from the ARC with significant safety or environment effects reached the site boundary. Consequences were all found to be localised on site.</p> <p>The storage and use of all DGs would be compliant with relevant Australian Standards, Building Code of Australia with respect to separation distances and segregation.</p> <p>Safeguards will be provided as per Australian Standards. Veolia will also be undertaking a Hazard and Operability (HAZOP) study during detailed design to ensure adequate process safeguarding has been provided.</p>	<p>Yes</p>
<p>c) The consequences (effects) of the more likely hazardous events (i.e. those of high probability of occurrence) should, wherever possible, be contained within the boundaries of the installation.</p>	<p>No identified events with significant safety or environment effects reached the nearest site boundary.</p>	<p>Yes</p>

Criteria	Comments	Complies?
d) Where there is an existing high risk from a hazardous installation, additional hazardous developments should not be allowed if they add significantly to that existing risk.	The site does not have an existing hazardous facility. The proposed ARC will not overly increase the cumulative risk in the area as there are no identified events with offsite effects or escalation risk.	Yes

1.4. Conclusions and recommendations

Offsite effects due to fire or explosion involving DG Class 4.2 materials and hazardous scenarios associated with the ARC operations were considered unlikely. The consequence assessment confirmed that the impacts would be localised and contained on site. This was due to proposed design measures and that these areas are well separated from the site boundary. It is therefore unlikely that an accident event involving hazardous materials would have any effect that could extend offsite.

This PHA was classified as a Level 1 study with reference to the Multi Level Risk Assessment guideline, Ref [4]. Comparison of safety effects to surrounding land uses or environmental effects to surrounding ecosystems due to accident events indicated that all HIPAP 4 qualitative risk criteria are met by the proposed development, hence the offsite risk can be considered low.

The PHA recommends that to ensure the assumptions made in the hazard analysis remain valid:

- [PHA 1] That the final layout and design for the ARC meets the safety and separation distance requirements of AS 5026 *The storage and handling of Class 4 dangerous goods*, AS 1940 *The storage and handling of flammable and combustible liquids* and AS 3780 *The storage and handling of corrosive substances*.

In addition, the following recommendations are provided for Veolia to consider in the detailed design phase:

- [PHA 2] Confirm there is a sufficient number and redundancy of remote emergency isolation and shutdown stations in the boiler and flue gas treatment area.

2. INTRODUCTION

2.1. Background

Veolia Environmental Services (Australia) Pty Ltd (Veolia) owns and operates the Woodlawn Eco Precinct (the Eco Precinct), located on Collector Road, approximately 6 kilometres (km) west of Tarago. Veolia proposes to develop and operate the Woodlawn Advanced Energy Recovery Centre (ARC) (the project), an energy recovery facility (ERF), at the Eco Precinct.

The project is State Significant Development (SSD) which requires development consent under Part 4, Division 4.1 of the NSW Environmental Planning and Assessment Act 1979 (EP&A Act). A Development Application (DA) for SSD is required to be accompanied by an Environmental Impact Statement (EIS).

This PHA has been prepared by Sherpa Consulting Pty Ltd (Sherpa). Veolia has commissioned EMM Consulting Pty Ltd (EMM) to prepare the EIS for the project. EMM has retained Sherpa to undertake a PHA for the proposed facility operation for input to the 'Hazards and Risks' section of the EIS.

2.2. Study objectives

The overall study objective was to address the assessment requirement for the project under the 'Hazards and Risk' component of the Secretary's Environmental Assessment Requirements (SEARs), issued on 2 July 2021 as follows:

- Hazards and Risk – including a preliminary risk screening completed in accordance with *State Environmental Planning Policy No. 33 – Hazardous and Offensive Development and Applying SEPP 33 (DoP, 2011)*, with a clear indication of class, quantity and location of all dangerous goods and hazardous materials associated with the development. Should preliminary screening indicate that the project is “potentially hazardous” a Preliminary Hazard Analysis (PHA) must be prepared in accordance with *Hazardous Industry Planning Advisory Paper No. 6 – Guidelines for Hazard Analysis (DoP, 2011)* and *Multi-Level Risk Assessment (DoP, 2011)*.

The objective of this PHA was to identify the hazards and assess the risks associated with the project in the operational phase to determine risk acceptability from land use safety planning perspective. The focus of this PHA was upon events that could result in potential offsite impacts.

2.3. Scope

The scope of this PHA was upon the proposed materials (waste feedstock, in-situ additives including storage, processing and final product handling) and utilities (diesel storage and power transformers) involved in the ARC operation.

The ARC has five key unit operations:

1. Waste feedstock reception and storage
2. Combustion and boiler
3. Energy recovery steam turbine generator
4. Flue gas treatment
5. Residue handling and treatment.

2.4. Exclusions and limitations

The PHA study exclusions and limitations are summarised in Table 2.1.

Table 2.1: Exclusions and limitations

Item	Scope	Exclusions and limitations
1	Site layout and process conditions	At the time of this study, the site layout was still preliminary and subject to a future design review. The process was in the front end engineering design phase and Veolia provided the expected process conditions and an estimate of additives (e.g. hydrated lime, activated carbon and aqueous ammonia solution) to be stored and consumed in the process.
2	Potentially offensive aspects	This PHA focused upon the potentially hazardous nature of the ARC within the meaning of SEPP 33. The potentially offensive aspects of the facility have been addressed under the air quality and surface water studies as part of the EIS.
3	Routine solid, liquid and gaseous emissions	Assessment of routine solid, liquid and gaseous emissions from the site is beyond the scope of the PHA, which is intended to focus on the impact of abnormal operations due to equipment failure, with associated acute effects. Normal emissions impacts are assessed in the EIS.
4	Safety – long term health impacts	Any long-term health impacts arising from the ARC operation is beyond the scope of this PHA. This is addressed in the health risk assessment study as part of the EIS.
5	Bushfire assessment	Bushfire assessment is addressed by 3 rd party specialists. This PHA has referenced this study as an input to the overall hazard identification of the site.
6	Fire protection systems and fire safety study	Site fire protection and incident management considerations have been addressed by a 3 rd party fire study. This PHA has referenced this study as an input to the overall hazard identification of the site and consequence analysis.
7	Transport of hazardous materials	The transport of hazardous materials to/from site is outside the scope of this PHA. Transportation has been addressed as a specialist study within the EIS.

3. DESCRIPTION OF DEVELOPMENT

3.1. Location and surrounds

The project is located in the Woodlawn Eco Precinct on Collector Road, approximately 6 km west of the village of Tarago and 50 km south of Goulburn.

The Woodlawn Eco Precinct is situated in the headwaters of Lake George and Wollondilly River catchment via Allianoyonyiga Creek to the west, and the Mulwaree River catchment via Crisps Creek to the east. The Crisps Creek catchment is part of the WaterNSW regulatory area. Other prominent water features include Lake George approximately 7.5 km to the west and Lake Bathurst approximately 8 km to the north-east of the Woodlawn Eco Precinct.

The ARC development footprint is within areas formerly used for mining which are predominantly disturbed. The proposed encapsulation cell is within the footprint of an existing evaporation dam (known as ED1). The project location is shown in Figure 3.1.

3.1.1. Surrounding land uses

There are existing waste and resource recovery operations within the Woodlawn Eco-Precinct including the Woodlawn Bioreactor Landfill, Woodlawn Bioenergy Power Station, Woodlawn Mechanical Biological Treatment (MBT) facility and aquaculture and horticulture operations. The Eco Precinct also includes two other primary operations, the Woodlawn Wind Farm to the south of the proposed ARC and the Woodlawn Mine immediately to the east of the ARC. The Woodlawn Mine has project approval (PA07_0143) to extract 1.5M tonnes of copper, lead and zinc ore for up to 21 years from the existing tailings dams and underground workings. The Woodlawn Mine Project includes dewatering the underground mine workings into, and drawing processing water from, Veolia’s evaporation dams. Mining operations have been in care and maintenance since early 2020.

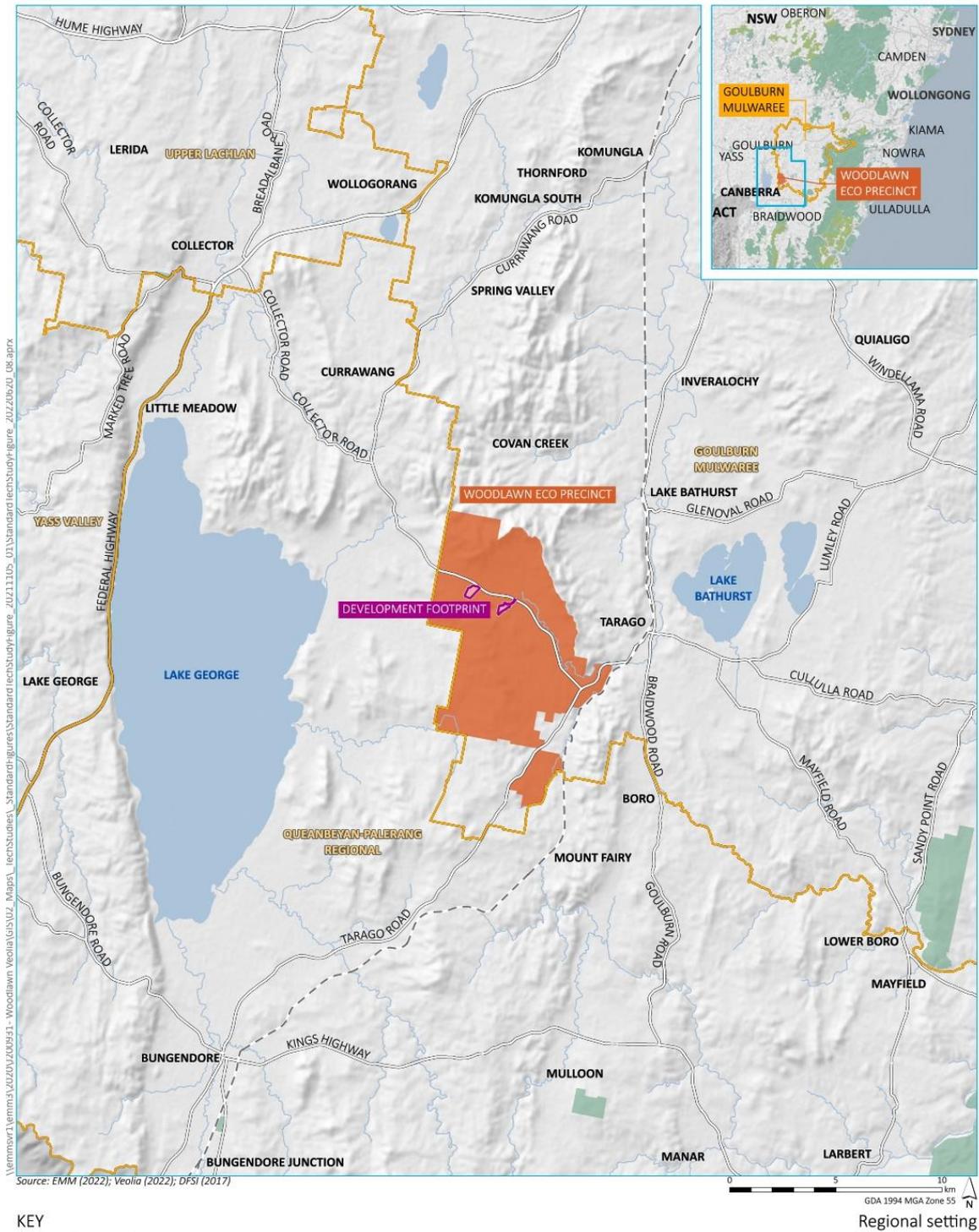
The neighbouring facilities are displayed in Figure 3.2.

From an offsite perspective, Table 3.1 summarises the nearest residential and industrial land uses to the proposed ARC.

Table 3.1: Industrial and residential land uses near the ARC

Land use	Location	Distance from ARC
Residential	North-east	4.2 km
	South-west	4.5 km
Crisps Creek Intermodal Facility	East	5.7 km
Woodlawn Mine	East	Adjacent <500 m

Figure 3.1: Project location

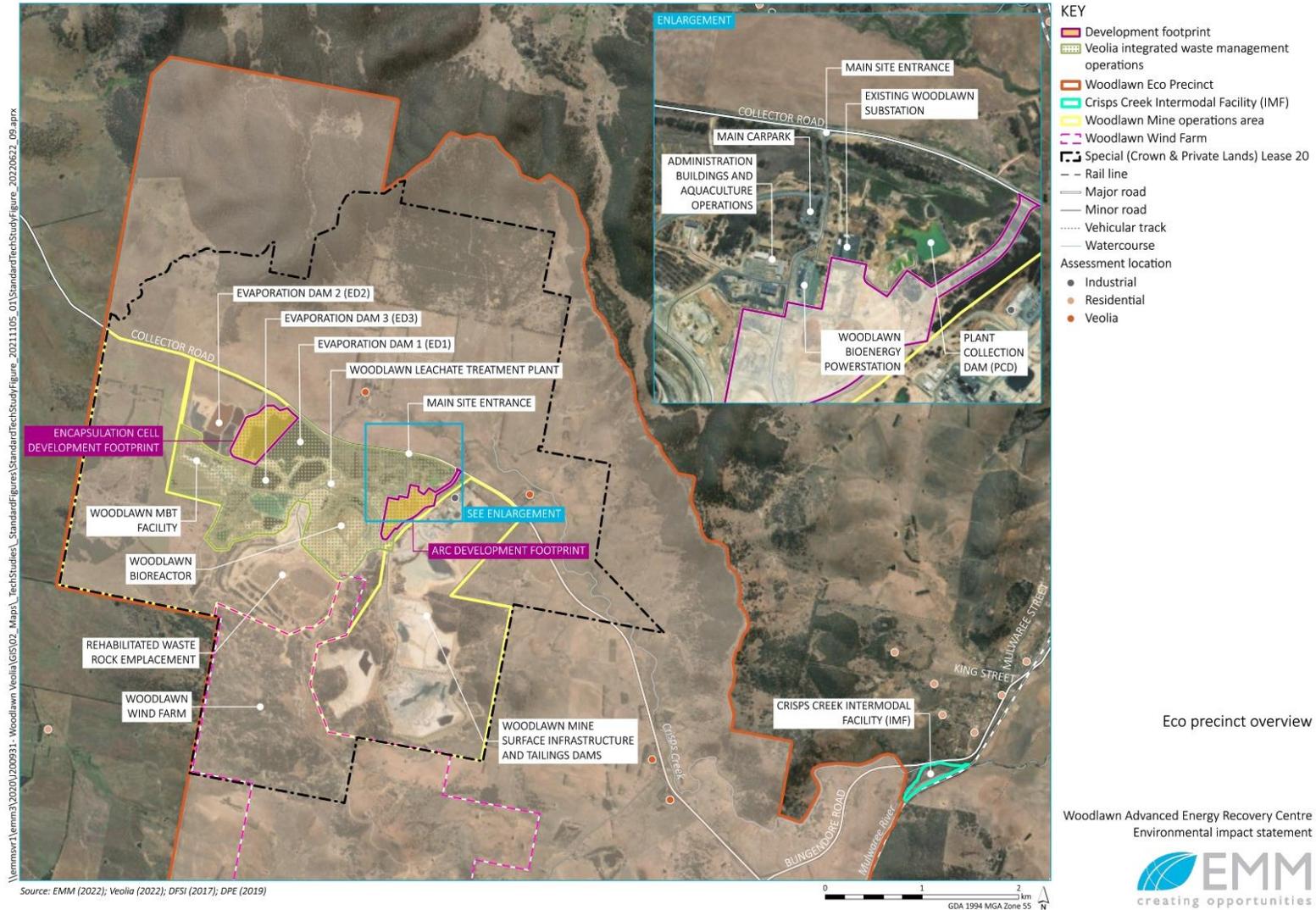


- KEY
- Development footprint
 - Woodlawn Eco Precinct
 - Rail line
 - Major road
 - Watercourse
 - Named waterbody
 - NPWS reserve
 - Local government area

Woodlawn Advanced Energy Recovery Centre
Environmental impact statement



Figure 3.2: Surrounding land use



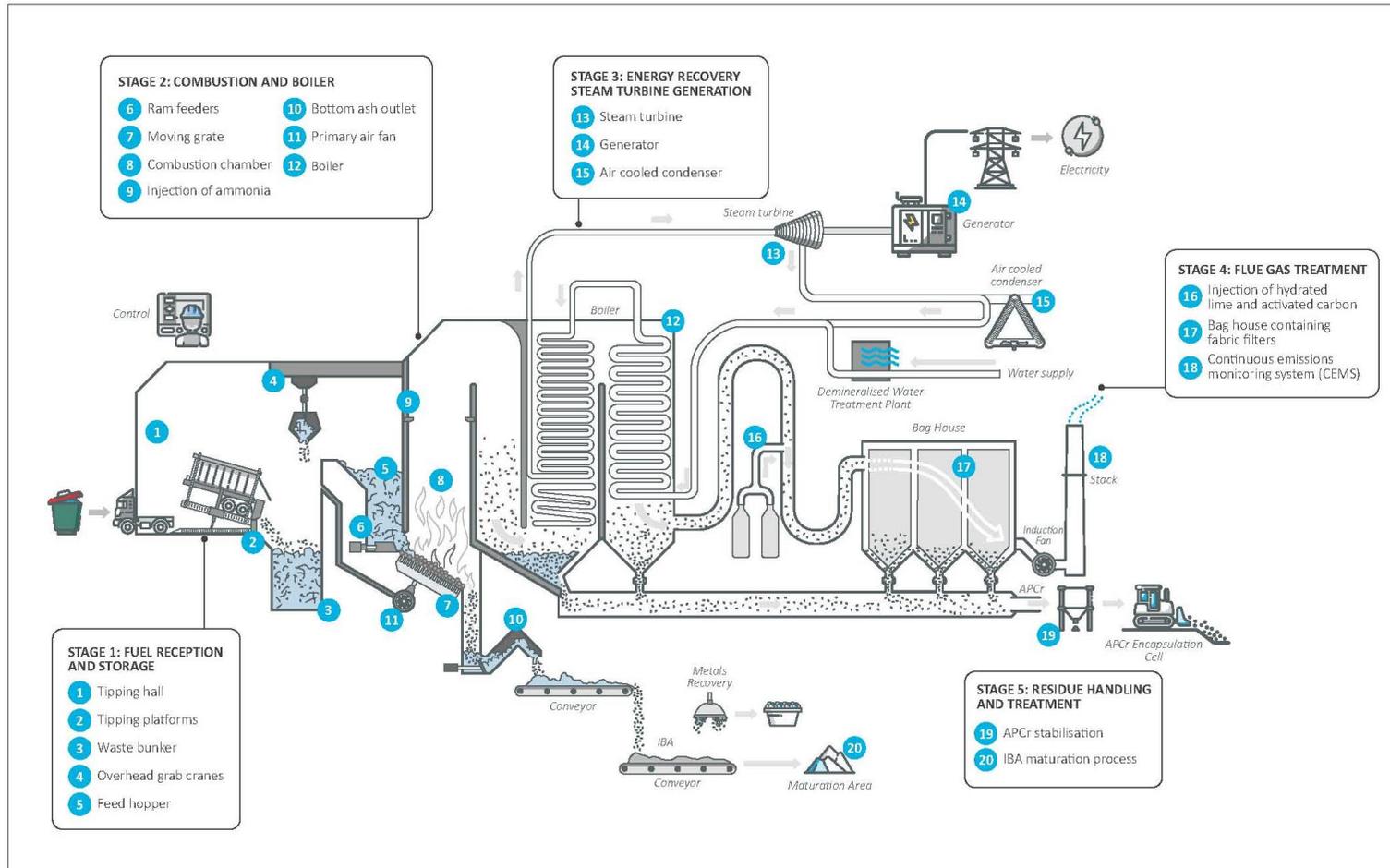
3.2. Process design

The project will process 380,000 tpa of residual MSW and residual C&I waste. The project thermally treats waste feedstock using a proven, reliable and robust moving grate technology in a combustion chamber to produce superheated steam used for energy generation, Ref [5]. This technology is the most commonly used ERF technology worldwide used in more than 1,200 facilities. Veolia operates more than 65 ERFs worldwide, the majority of which also use this technology.

The process schematic is shown in Figure 3.3. and can be divided into five key unit operations:

1. Waste feedstock reception and storage
2. Combustion and boiler
3. Energy recovery steam turbine generator
4. Flue gas treatment
5. Residue handling and treatment.

Figure 3.3: Schematic of the overall process



Schematic of the ARC process
Woodlawn Advanced Energy Recovery Centre
Environmental impact statement
Figure 4.6

3.2.1. Waste feedstock receiving and storage

Residual sorted MSW and C&I waste are transported in containers from the Crisps Creek Intermodal Facility to the ARC in Veolia trucks, weighed at incoming weighbridge. At the ARC, the trucks will reverse into entry points accessed by a fast-acting door to ensure that the tipping hall can be kept under negative pressure. The waste handling system will consist of dedicated tipping platforms on specific bays, discharging the residual waste into the waste bunker and two waste grapple cranes for waste mixing and feeding of the thermal treatment system.

3.2.2. Combustion and boiler

The thermal treatment system consists of an air-cooled grate, combined with a heat recovery boiler. The waste from the bunker is fed to the boiler via the feed hopper, ensuring continuous delivery of the waste onto the grate. Ram feeders push the waste from the hopper to the grate. The combustion chamber is designed for continuous waste combustion in the range between 60 and 107% of the thermal design load. The operation of the system is automated and under continuous process control with monitoring of temperature and oxygen levels. In this unit operation, the following chemical is used:

- **Ammonia water (aqueous solution)** – injected via nozzles in the upper part of the furnace where the temperature of the combustion gas is within the range of 900°C and 1,100°C. At these temperatures selective non-catalytic reduction reduces the NO_x emissions in the flue gas. The storage and handling of the ammonia water will be as per AS 3780 *The storage and handling of corrosive substances*.

The normal source of the primary air is the waste bunker. This allows for odour control in the tipping hall. Air is drawn from the bunker by the primary air fan. Then it is pre-heated by a steam preheater and directed under the grate.

Some volatile components of the waste are not directly combusted on the grate, but as they pass through the combustion chamber. The secondary air system delivers combustion air to burn out and mix the flue gases. The set-up is similar to the primary air (with fan and pre-heater).

In case the temperature in the secondary combustion chamber drops below the legal permit limit, diesel fired auxiliary burners automatically start operation. Veolia has indicated that such activation occurs very rarely. Predominantly the burners remain in a stand-by position and are cooled by cooling air fans. The auxiliary burners are, however, routinely used for start-up and shut down of the plant.

The combustion control system is fully automated. The operator only selects the desired steam output and all other parameters (waste feeding, grate speed, amount of combustion air etc.) are handled by the control system itself. This ensures that the plant operates continuously at optimal level regarding efficiency, environmental protection and life expectancy of the equipment.

Veolia has indicated that a full Hazard and Operability (HAZOP) study will be undertaken during detailed design. The HAZOP study will also be used to confirm the required process safety control trips.

3.2.3. Energy recovery steam turbine generator

Feed water is supplied to a steam-water circuit in the combustion chamber from the feed water tank by pumps in redundant configuration. The steam produced in the boilers is supplied to a steam turbine turbo set. The turbo set generates electrical energy for the needs of the complete ARC (parasitic load) as well as exports the excess electricity into the grid.

After the steam turbine the expanded steam is condensed in an air-cooled turbine condenser (ACC). The condensate is returned to the feed water tank.

3.2.4. Flue gas treatment

Gases are produced as a result of combusting the fuel in the furnace. These are referred to as flue gas. To ensure flue gas emissions at the stack are compliant to the environmental standards, they require treatment. The system consists of dedicated reaction ducting with additives injection, fabric filter for solid-gas separation and residue recirculation. To achieve the best adsorption performance with minimum additive consumption, solids from the fabric filter are recirculated into the reaction ducting. Chemicals injected into the flue gas to remove harmful pollutants are:

- **Hydrated lime** – injected to the reaction ducting downstream to particulate acid gases. This is then captured in the downstream bag filter.
- **Activated carbon** – injected to the reaction ducting downstream of the economiser to particulate dioxins, furans and heavy metals. These are then captured in the downstream bag filter. The safety and separation distance requirements will be as per AS 5026 *The storage and handling of Class 4 dangerous goods*.

The fine dust particulate, spent lime and activated carbon are removed from the flue gas using a bag filter. The material builds up on the surface of the bag filter increasing the removal efficiency and increasing the reaction time for acid gases and increasing adsorption time for heavy metals, dioxins and furans. These particulates are commonly known as Air Pollution Control residues (APCr).

3.2.5. Residue handling and treatment

Residue handling and treatment is described in detail in the EIS. The following handling treatment aspects of residual wastes were considered in the PHA:

- Incinerator bottom ash (IBA).
- APCr and fly ash (sometimes known as boiler ash) and filter bag residues – these are combined and referred to collectively herein as APCr.

Following combustion, approximately 15% to 20% of the original waste by weight remains as IBA. It is discharged through an ash quencher to reduce the temperature of the ash and transferred through a series of conveyors.

Two wet ash extractors remove IBA from the moving grate quench pit. The IBA flows over a grizzly screen to remove large items, before being discharged and collected on a conveyor from below the moving grate. Stockpiling bays and open topped bins will collect oversize material.

IBA is then transferred by conveyor to the IBA area for screening and maturation. IBA will leave the ash bunker at the ARC building via a conveyor system (normal operations). In the event of a conveyor breakdown, IBA will be transferred into open top bins for transport to the IBA area by truck.

The waste classification of the IBA based on the reference data is general solid waste (GSW) and as such is suitable for disposal to an appropriately licenced landfill without treatment. Processing (i.e. screening and maturation) of the IBA will occur to ensure consistency of the output material and to enhance the potential for beneficial re-use in the future. Screening and maturation are undertaken in the IBA area. Following maturation, the IBA will be ready for either disposal or beneficial re-use as detailed below:

- Disposal: During the initial operation phase of the ARC (nominally 6 months) and once laboratory analysis confirms that the material is suitable for characterisation as GSW, the IBA will be transported by trucks to the existing Bioreactor for disposal as required.
- Alternative cover: Following the initial operation phase and after the actual physical and chemical characteristics of the material can be established, Veolia intends to seek approval for the use of the IBA as alternative cover material at the Bioreactor landfill and or the APCr encapsulation cell. This will reduce the need for clean fill material to be imported to the Eco Precinct for this purpose, which currently occurs, and would have the benefit of replacing a number of heavy vehicle movements to the Eco Precinct on a daily basis associated with the import of clean fill.
- Beneficial re-use: The preferred management strategy for IBA is ultimately beneficial reuse as aggregate material for the construction industry. However, this industry is in its infancy in Australia and the economics of recycling are yet to mature. Options for beneficial re-use of the IBA would be revisited periodically (e.g. 3-year intervals), as the Australian EfW and associated resource recovery industries develop. Reuse of IBA will require stockpiling of this material at the IBA maturation area whilst conducting laboratory analysis to confirm characteristics until an eventual transport offsite for reuse by third parties.

The APCr will be collected from the boiler hall and from the filter bags. It will be pneumatically transferred to a collecting silo. The APCr is expected to be classified as a

hazardous waste, which requires treatment (stabilisation) to enable it to be disposed to a restricted waste landfill. This stabilisation process will occur within the ARC building. After stabilisation the APCr will be classified as Restricted Solid Waste (RSW) under the NSW EPA Waste Classification Guidelines. The preferred stabilisation process will use a solid binding agent (e.g. cement). The stabilised APCr will be transported (internally) from the ARC building by truck or tractor/bin via the internal road network and will be unloaded in the encapsulation cell.

3.3. Site layout

The preliminary site layout and overview of the ARC development footprint are shown in Figure 3.4 and Figure 3.5. The main processing areas are within enclosed buildings. The building closest to the road is the turbine hall located just over 500 m from the main entrance on Collector Road. The furthest end of the main processing area is the tipping hall located just over 650 m from the main entrance.

The main processing areas are highlighted in Figure 3.6 and consist of:

- Tipping hall
- Waste bunker
- Boiler hall
- Turbine hall
- Flue gas treatment
- IBA transfer point
- APCr stabilisation and storage.

Of relevance to the PHA, also located on site is:

- IBA area (receiving IBA from the IBA transfer conveyor)
- 2 adjacent diesel storage tanks
- Substation.

Figure 3.4: Site layout

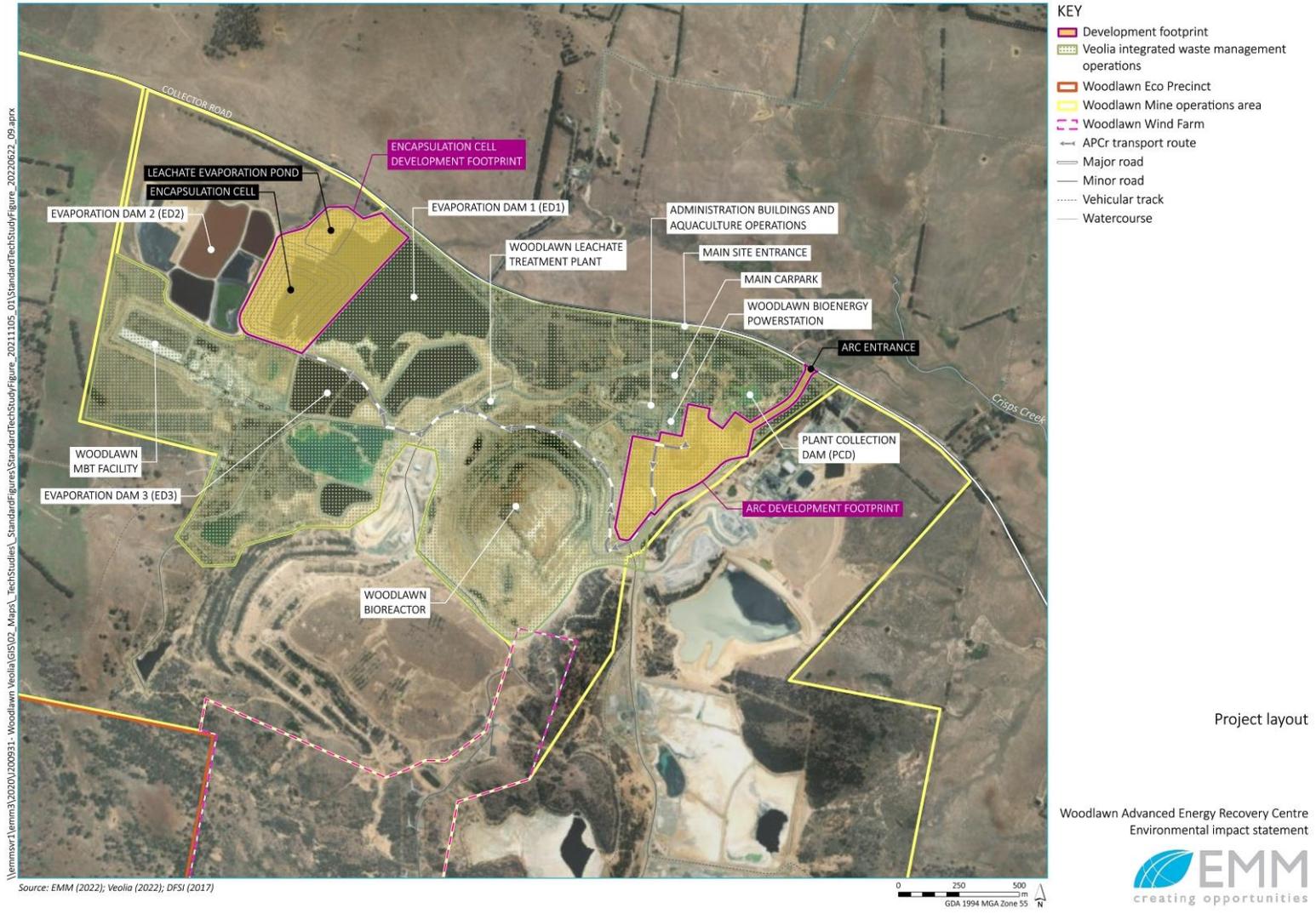


Figure 3.5: Overview of ARC development footprint



Source: EMM (2022); Veolia (2022); DFSI (2017)

0 100 200
m
GDA 1994 MGA Zone 55

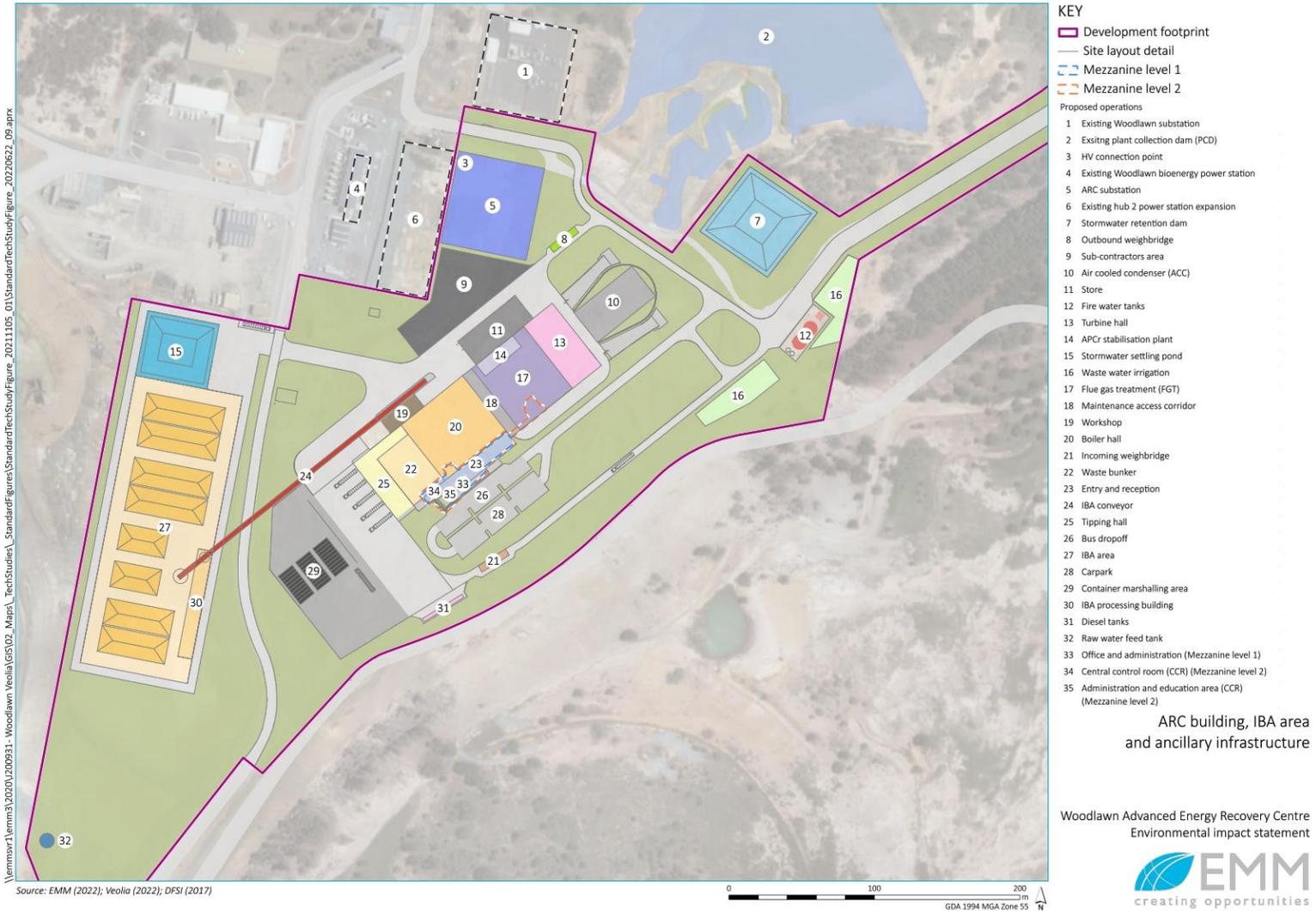
Overview of ARC development footprint

- KEY
- Development footprint
 - Site layout detail
 - Major road
 - ARC building
 - ARC substation
 - IBA area

Woodlawn Advanced Energy Recovery Centre
Environmental impact statement



Figure 3.6: Sections of the main building



3.4. Transportation

Residual waste is sorted at Veolia’s transfer terminals in Sydney and loaded into containers for transport by rail to Crisps Creek IMF before being transported to the ARC via truck (8.5 km by road).

Chemicals used in the flue gas treatment stage of the process will also be delivered via truck to be stored onsite in silos and dedicated storage areas

APCr will be stabilised onsite and transported from the ARC via truck to a proposed encapsulation cell within the Woodlawn Eco-Precinct.

The preferred management strategy for IBA is ultimately beneficial reuse as aggregate material for the construction industry. However, this industry is in its infancy in Australia and the economics of recycling are yet to mature. Options for beneficial re-use of the IBA would be revisited periodically (e.g. 3-year intervals), as the Australian EfW and associated resource recovery industries develop. Reuse of IBA will require stockpiling of this material at the IBA maturation area whilst conducting laboratory analysis to confirm characteristics until an eventual transport offsite for reuse by third parties. The EIS has included an assessment of traffic impacts associated with transport of matured IBA offsite in the future.

3.5. Fire protection systems

The proposed fire detection and protection systems to be installed onsite, Ref [3], are listed in Table 3.2.

Table 3.2: Fire detection and protection systems on site

Process area ¹	Proposed fire detection and protection systems
Tipping hall and Waste bunker	<u>Detection</u> <ul style="list-style-type: none"> • Infrared detection and alarm • Smoke alarm detection and activation of suppression system
	<u>Protection</u> <ul style="list-style-type: none"> • Remote operated fire water monitors • Sprinkler system • Hydrant system to provide full coverage of the waste bunker
Boiler hall	<u>Detection</u> <ul style="list-style-type: none"> • Manual fire detection and alarm
	<u>Protection</u> <ul style="list-style-type: none"> • Hydrant and monitor systems
Flue gas treatment	<u>Detection</u> <ul style="list-style-type: none"> • Smoke alarm detection and fire suppression system activation
	<u>Protection</u> <ul style="list-style-type: none"> • Sprinkler coverage of the bag house filters
Turbine hall	<u>Detection</u> <ul style="list-style-type: none"> • Smoke alarm detection and fire suppression system activation

Process area ¹	Proposed fire detection and protection systems
	<u>Protection</u> <ul style="list-style-type: none"> • Sprinkler system to protect the fluid lines, bearings (turbine and generator), and beneath the turbine • Hydrant system to provide full coverage to turbine and turbine hall • Concrete fire walls between turbine hall and the rest of the ARC. • Powder type fire extinguishers
Diesel storage tanks (located outside buildings)	<u>Detection</u> <ul style="list-style-type: none"> • Manual detection and alarm
	<u>Protection</u> <ul style="list-style-type: none"> • Hydrant system to provide full coverage to diesel tanks • Hose reel and foam making equipment for use when water supply is inadequate as per AS 1940 • Powder type extinguishers for each tank located within 15 m of tanks
Substation (transformer)	<u>Detection</u> <ul style="list-style-type: none"> • Manual detection
	<u>Protection</u> <ul style="list-style-type: none"> • Powder type fire extinguisher located within 10 m of the transformer and positioned outside the bund • Hydrant system to provide full coverage of transformer room
Reagent Building	<u>Protection</u> <ul style="list-style-type: none"> • Concrete fire wall
Note 1: IBA, APCr area identified as very low fire risk.	

3.6. Hours of operation

The ARC is proposed to operate 24/7. The site will only receive waste feedstock between 6 am – 10 pm from Monday to Saturday. The site will have operators 24 hours per day.

3.7. Hazardous chemicals

The project will require the use of hazardous chemicals, particularly in the flue gas treatment stage. The hazardous chemicals and their quantities to be stored onsite are listed in Table 3.3.

Table 3.3: Hazardous chemicals on site

Substance	DG Class	Packing Group	Location stored onsite	Quantity stored onsite
Activated Carbon	4.2	III	APCr and reagents building	24 t
Ammonia Solution (25 wt%)	8	III	APCr and reagents building	50 m ³
APCr	Not classified as a DG.		Flue gas treatment area	-(a)
Diesel	C1 combustible		2x above ground tanks (100 m ³ each), away from main building	170 t
Hydrated lime	Not classified as a DG.		APCr and reagents building	90 t
IBA	Not classified as a DG.		IBA maturation area	-(b)
(a) APCr is stabilised with a solid binding agent and transported to the proposed encapsulation cell.				
(b) IBA is transported on the IBA hall conveyor to an outdoor IBA maturation area structure.				

4. METHODOLOGY

This study was undertaken with reference to the following prescribed approaches given in guidelines:

- NSW Department of Planning *Applying SEPP 33*, Ref [1].
- NSW Department Planning and Infrastructure HIPAP No. 6, Ref [2].
- NSW Department Planning and Infrastructure *Multi Level Risk Assessment*, Ref [4].

4.1. SEPP 33 Preliminary Screening

The proposed storage and transportation movements involving hazardous and dangerous materials was compared against the SEPP 33 screening thresholds. The Applying SEPP 33 Guideline, Ref [1], is a consequence-based screening technique and done in the absence of controls.

'Applying SEPP 33 guideline' was used to establish whether the proposed AEC development is 'potentially hazardous' or 'potentially offensive', hence whether further analysis is required.

4.1.1. Potentially hazardous development

SEPP 33 defines a potentially hazardous industry as:

'Potentially hazardous industry' means a development for the purposes of an industry which, if the development were to operate without employing any measures (including, for example, isolation from existing or likely future development on other land) to reduce or minimise its impact in the locality or on the existing or likely future development on other land, would pose a significant risk in relation to the locality:

(a) to human health, life or property; or

(b) to the biophysical environment; and

includes a hazardous industry and a hazardous storage establishment.

In this report, for consistency with the Applying SEPP 33 guideline, materials to be stored and used at the ARC have been referred to by their Dangerous Goods (DG) classification, not their classification under the Globally Harmonized System (GHS), which is used in most recent ADGC Edition 7.6 (National Transport Commission, 2018), Ref [6].

The outcome of this screening is reported in Section 5, and it was determined that the proposed development could be 'potentially hazardous' and a PHA was required.

4.1.2. Potentially offensive development

SEPP 33 defines a potentially offensive industry as follows:

'Potentially offensive industry' means a development for the purposes of an industry which, if the development were to operate without employing any measures (including, for example, isolation from existing or likely future development on other land) to reduce or minimise its impact in the locality or on the existing or likely future development on other land, would emit a polluting discharge (including, for example, noise) in a manner which would have a significant adverse impact in the locality or on the existing or likely future development on other land, and includes an offensive industry and an offensive storage establishment.

In the absence of controls, the proposed ARC has the potential to cause pollutants to be discharged to the surrounding environment. Therefore, it is considered a 'potentially offensive industry' and will require an Environment Protection Licence (EPL).

Environmental impacts are addressed in other parts of the EIS.

4.2. Preliminary Hazard Analysis

A risk screening exercise was conducted in a workshop setting with Veolia (ARC operators) and Ricardo (technical advisors) as well as stakeholders involved in the EIS. This workshop considered other hazards that are not explicitly covered by a screening threshold under the Applying SEPP 33 guideline. For example, at the proposed ARC this could involve:

- Reactions with incompatible materials
- Combustible dusts
- Hazardous processing conditions (e.g. high temperatures).

The PHA was undertaken with reference to the Multi Level Risk Assessment guideline, Ref [4], and HIPAP No 6, Ref [2]. This PHA study followed the following steps:

- Identification of hazards resulting from the ARC operations and identification of incidents with potential for impact offsite (Section 6).
- Assessment of the consequences for those scenarios that were judged to have potential offsite impact (Section 7). As part of the EIS, a Fire Safety Study was undertaken by Riskcon, Ref [3]. As relevant, this study has referenced parts of that study consequence assessment to support the PHA.
- Risk Assessment (Section 8).

As a result of the consequence review, this PHA was classified as a Level 1 study with reference to the Multi Level Risk Assessment guideline, Ref [4].

5. SEPP 33 SCREENING ASSESSMENT

5.1. Dangerous goods

A summary of the expected types and quantities of materials to be stored or handled at the ARC, with the relevant SEPP 33 screening thresholds is presented in Table 5.1.

Table 5.1: SEPP 33 screening of onsite DGs

Substance	DG Class	Packing Group	Location stored onsite	Quantity stored onsite	SEPP 33 screening limit	Above or below limit
Activated Carbon	4.2	III	APCr and reagents building	24 t	1 t	Above
Ammonia Solution (25 wt%)	8	III	APCr and reagents building	34 t (50 m ³)	50 t	Below
APCr	Not classified as a DG.		Flue gas treatment area	-(a)	N/A	N/A
Diesel	C1 combustible		2x above ground tanks (100 m ³ each), away from main building	170 t	N/A	N/A
Hydrated lime	Not classified as a DG.		APCr and reagents building	90 t	N/A	N/A
IBA	Not classified as a DG.		IBA maturation area	-(b)	N/A	N/A

(a) APCr is stabilised with a solid binding agent and transported to the proposed encapsulation cell.
 (b) IBA is transported on the IBA hall conveyor to an outdoor IBA maturation area structure.

5.2. Hazardous Material Transport

A list of the expected types and quantities of hazardous materials transport movements to and from the facility with the relevant SEPP 33 transport screening thresholds is presented in Table 5.2.

The proposed development may be determined as 'potentially hazardous' if the number of generated traffic movements (for significant quantities of hazardous materials entering or leaving the site) is above the SEPP 33 transport screening thresholds, Ref [1]. If the proposed development is found to be potentially hazardous with respect to transportation, a route evaluation study would be required.

Table 5.2: SEPP 33 screening of transport deliveries of DGs

Substance	DG Class	Packing Group	Quantity per load (tonne)	Vehicle Movements (per year)	SEPP 33 minimum quantity per load (tonne) ^(a)	SEPP 33 vehicle movement screening limit (per year)	Above or below limit
Activated Carbon	4.2	III	10	12	5 ^(b)	100	Below
Ammonia Solution (25 wt%)	8	III	20	70	2 ^(c)	500	Below
APCr	Not classified as a DG		Stabilised before being transported to the proposed encapsulation cell within the Woodlawn Eco Precinct.				
Diesel	C1 combustible		N/A	N/A	N/A	N/A	N/A
Hydrated lime	Not classified as a DG		N/A	N/A	N/A	N/A	N/A
IBA	Not classified as a DG		N/A	N/A	N/A	N/A	N/A
<p>N/A – Not applicable as this substance is not a DG and does not need to be assessed further</p> <p>(a) If quantities are below this level, the potential risk is unlikely to be significant unless the number of traffic movements is high.</p> <p>(b) It was assumed that the activated carbon will be delivered in packages and thus this threshold was selected. If delivered in bulk the threshold drops to 2 t.</p> <p>(c) It was assumed that the ammonia solution will be delivered in bulk and thus this threshold was selected.</p>							

5.3. Conclusion

The screening assessment demonstrates that the:

- Quantity of activated carbon (Class 4.2) materials to be stored and handled on site is above the screening threshold nominated in SEPP 33. Therefore, the development is classified as 'potentially hazardous' in the context of SEPP 33 and a PHA is required.
- The stored quantities and transportation frequency of all other DGs are below the screening threshold hence as per the Applying SEPP 33 guideline and there is unlikely to be a significant offsite risk.
- However, for completeness of this study, the following material was carried forward with the activated carbon (Class 4.2) to the PHA:
 - Diesel is a combustible liquid that will be used for refuelling on site vehicles or for starting up generators. Ignition of this material requires a pre-existing fire and it has been carried over to the PHA to determine if there are offsite impacts.

6. HAZARD IDENTIFICATION

6.1. Overview

Hazard Identification (HAZID) is the process of establishing the scenarios that could result in an adverse impact, together with their causes, consequences and existing safeguards. For this PHA study, the hazards were identified by:

- Reviewing the proposed DG against Applying SEPP 33 guidance.
- Conducting a stakeholder workshop (August 2021) with key stakeholders from Veolia (operations), Ricardo (technical advisors), EMM and third-party specialists.
- Literature research of past incidents (if any) of facilities similar to the proposed development.

6.2. Properties of hazardous materials

As indicated in Section 5, the following hazardous materials (see APPENDIX B for Safety Data Sheets) are proposed for use.

6.2.1. Activated Carbon

Activated carbon has a DG class of 4.2 (III). It is stored and used onsite as a powder. Due to its high porosity and large surface area, it is used to remove harmful particulates in the flue gas treatment. Activated carbon's high surface area also poses fire and oxygen depletion hazards as it can adsorb oxygen onto its surface. The process of adsorbing substances to its surface is exothermic, heating the surface. When heated to 425°C in free flowing air it can spontaneously combust. As activated carbon is a powder and is combustible, it has the potential to cause a dust explosion under the right conditions. It will be stored in a single silo in the flue gas treatment area. The proposed quantity stored is above the SEPP 33 threshold and has been carried forward for consequence analysis.

6.2.2. Ammonia solution (25 wt%)

Ammonia solution at a 25 wt% concentration is corrosive and has a DG class of 8 (III). It is used as an additive in the combustion stage of the process to remove nitrous oxides (NO_x). Ammonia (anhydrous) is a toxic substance, however in a solution at this concentration the risk of high toxic exposure levels to personnel is greatly reduced. As a process safety initiative, Veolia and Ricardo elected to use this solution form as it is less hazardous. The ammonia solution is an irritant to personnel if direct contact occurs (i.e. skin, eyes). It will be stored in an atmospheric tank in the flue gas treatment area. The proposed storage quantity for this Class 8 material is below the SEPP 33 threshold.

6.2.3. Hydrated lime

Hydrated lime is added in the flue gas treatment stage to remove acid gases. It is not classified as a DG. It is only hazardous to personnel if direct contact occurs (i.e. skin, eyes). There will be 2 storage silos onsite which will transport hydrated lime pneumatically. A spillage of hydrated lime would be confined on site and this material was not considered further in the PHA study.

6.2.4. Diesel

Diesel is a C1 combustible fuel that is used during start up and shutdown of the furnace or when waste fuel cannot maintain temperature of the combustion chamber. It poses a fire risk to the site if an ignition source is found. Diesel is to be stored in 2 above ground storage tanks outside the main building. Although the proposed quantity stored is below the SEPP 33 threshold, this material has been carried forward for consequence analysis to confirm there are no offsite impacts.

6.2.5. Boiler ash

Boiler ash will be mixed with the APCr for further stabilisation. The particulates in boiler ash are generally quite small and consequently can be dispersed in air easily. As per the Ash Management study, Ref [7], the ash is not considered a dangerous good and does not pose an acute safety hazard. This was not considered further in the PHA study.

6.2.6. Incinerator Bottom Ash (IBA)

IBA is a by-product of the combustion stage composed and is not considered to be a DG material and only poses a risk to personnel onsite if they come into contact with hot IBA (i.e. has not been cooled enough in the cooling process). It will be transported via conveyor to the IBA area for processing and maturation. A spillage of IBA would be confined on site and this material was not considered further in the PHA study.

6.2.7. Air Pollution Control residue (APCr)

APCr is one of the residues of the flue gas treatment stage compiled of the adsorbed particulates. As a result it is a corrosive and hazardous material that has a high pH, heavy metal content and organic pollutant content. It absorbs moisture if exposed to air which can transform it into a sludge that is difficult to manage. Onsite it will be treated as a hazardous waste. It will be temporarily stored onsite in the flue gas treatment area for stabilisation with the intention of achieving the category of restricted waste before being transported to the proposed encapsulation cell. A spillage of APCr would be confined on site and this material was not considered further in the PHA study. The EIS addresses the health risk assessment of this material.

6.3. Operational hazards

A hazard identification workshop (August 2021) was undertaken with key personnel from Veolia (operations), Ricardo (technical advisors) and EIS project specialists. The focus of the workshop was to identify potentially hazardous scenarios associated with the

proposed ARC operation. The workshop minutes was developed as a word hazard identification (APPENDIX A) and summarises:

- Potential hazardous incident scenarios (by unit operations).
- Potential causes.
- Control measures and safeguards included in the design.
- Qualitative risk assessment.
- Consideration of potential for offsite safety consequences.

All scenarios involved the loss of containment of a potential hazard (Section 6.2) and the workshop team qualitatively assessed the safety risk (to personnel) using the Veolia risk matrix. With reference to Figure 3.3, the workshop found:

- 51 potential incidents were identified but not all had a safety impact. Qualitative risk ranking (Veolia matrix) ranged from medium (tolerable risk) to low risk.
- By nature of the waste composition, fires involving this combustible material could occur at the **tipping hall and bunker storage** areas. However, the fire would be localised to this area and fire water systems are provided. As indicated in Section 6.4, most fire incidents associated with ERFs occur in the storage area. However offsite impact from heat radiation was considered unlikely. Nevertheless, this incident was carried forward to the consequence assessment to confirm this.
- Incidents at the **boiler hall** could have a potential environmental impact. For example, loss of oxygen or incomplete combustion of the waste could lead to an air quality issue. Whilst not an acute safety impact issue, actions were identified by the workshop to be carried forward to the EIS air quality study.
- Loss of containment events involving various hazards at the **flue gas treatment** posed an onsite safety impact. For example, exposure to hydrated lime during manual handling or spillage could result in irritation to personnel but pose no offsite impact. Similarly, inadvertent exposure to aqueous ammonia solution would also result in irritation. Unlike anhydrous ammonia (Class 2.3), this diluted aqueous solution is not considered a major hazard (Class 8). Spillages at the storage area would be contained within bunds and the dosage rate into the flue gas treatment is low. The ammonia solution system will follow the requirements of AS 3780 *The storage and handling of corrosive substances*.
- Within the **flue gas treatment** area, the workshop team identified:
 - That a fire involving activated carbon at the storage area or potential dust explosion charging of the storage silo could occur. The activated carbon system will follow the safety and separation distance requirements of AS 5026 *The storage and handling of Class 4 dangerous goods*. The silo will be designed for overpressure protection and located away (920 metres) from the nearest site

boundary, the offsite impact potential would be low. Nevertheless, this incident was carried forward to the consequence assessment.

- That a fire would be unlikely at the baghouse (activated carbon feed hopper addition or filter bag fire) due to high secondary carbon in the ash or inadequate cleaning. This was based upon the ash management study, Ref [7], indicated that the activated carbon would be at a low concentration.
- At the **steam turbine hall**, identified incidents were found to result in onsite safety impact. From a fire viewpoint, turbine fires may result from ignition of lube oil causing asset damage. Whilst the potential for offsite impact was considered low, this incident was carried forward to the consequence assessment. Other safety hazards were related to occupational safety (e.g. noise, heat) aspects associated with rotating machinery and exposure to boiler feedwater chemicals (e.g. corrosion inhibitor). Loss of containment of these chemicals would not result in an offsite safety impact.
- Within the **APCr stabilisation and storage**, exposure to this solid material due to poor manual handling or spillage posed an onsite safety impact. Should this material become sufficiently wet, the APCr could become a sludge and pose an environmental hazard. However, this area will be fully enclosed, and any spillages will be contained and secured (using clean-up kits) to minimise escape. The potential for site runoff is unlikely and this aspect has been investigated in the EIS.
- At the **IBA area**, exposure to this solid ash material could pose a safety impact to personnel when emptying the combustion chamber as the ash may still be warm or result in dust irritation to eyes and lungs if inhaled. Veolia and Ricardo advised that this IBA does not pose a fire or explosion hazard. Design measures include collecting the ash in an enclosed area and wetting will minimise dust generation. Enclosed conveyors from the IBA transfer point to the IBA receiving area will also minimise dust generation. The EIS investigated this environmental aspect and the potential for offsite safety impact was considered minimal.
- As indicated in Section 5, hazards associated with **utilities** included:
 - loss of containment from the aboveground diesel storage. As indicated in Section 5, the potential for offsite impact was considered low. However, this incident was carried forward to the consequence assessment to verify this.
 - fire involving transformer oil. Although initially identified in the HAZID as potential incident, Veolia has now chosen a dry type of transformer. As such fire incidents were now not considered credible based upon this design type.
- Considered **external events** such as earthquake, flooding, airplane crash and bushfire affecting the ARC were identified as a low potential for offsite safety impact. Earthquake and flooding considerations have been included in the preliminary site layout, structural and foundation design by Ricardo. Airplane impact was considered

to be a low likelihood event as the site is not under major commercial flight path. From a bushfire perspective, burning embers could pose an ignition risk to storages of flammable or combustible materials, Ref [8]. At the ARC this potential is minimal as:

- There are no major storages of flammable liquids (Section 5).
- Diesel which is a combustible liquid is located well within the site. Fire protection will be provided in accordance with *AS 1940:2017 Storage and Handling of Flammable and Combustible Liquids* as recommended by the Fire Safety Study, Ref [3]. As noted in Section 5, fire impacts have been carried forward to determine if there is an offsite impact.
- Required setbacks as per the Bushfire Assessment study, Ref [8], between the bush and ARC will prevent flame contact and heat radiation impact to onsite facilities.
- The ARC will be provided with fire protection in accordance with the Building Code of Australia as recommended by the Fire Safety Study, Ref [3]. Veolia has advised that the facility is provided with safety systems to allow the operations team to shut down and secure the facility.

When accounting for the separation distance to the site boundary, the workshop team believed that there would be no offsite safety impacts and that the corresponding offsite risk would be low. To confirm the workshop findings, a set of scenarios were taken forward for consequence review as indicated in Table 6.2.

6.4. Review of significant incidents

A literature review of past incidents (1997 – 2021) occurring at ERFs was conducted to develop an understanding of potential scenarios that could occur. A summary of the incidents found are presented in Table 6.1.

Table 6.1: Summary of ERF incidents

Incident description	No. of incidents
Accidental release of steam injuring two workers during maintenance	1
Accidental release of hydrated lime	2
Fire in waste bunker/waste storage areas	28
Fire in the IBA	1
Incorrect waste sent to facility	1
Activated carbon incidents ¹	2
Note 1: There were no activated carbon incidents found for ERFs. As activated carbon is a DG of concern for this study, the incident search was expanded to cover all industries storing powdered activated carbon.	

The review found that:

- Fire in the waste fuel during storage is the most common type of incident. This incident was identified in the workshop. The workshop team determined that a fire incident would be localised and pose no offsite impact. The ARC is located approximately 2 km to the nearest Eco Precinct boundary and 4.2 km to the nearest residential. However, this incident was carried forward to confirm.
- There have been no reported instances of fires involving activated carbon in these facilities. Sherpa did identify two reported activated carbon storage fires in a production plant and a coal power plant. This hazard was taken forward for consequence analysis to determine if there was an offsite impact.
- There have been no reported instances of explosions in the flue gas treatment systems.

6.5. Summary of incidents carried forward for consequence assessment

Based upon the SEPP 33 review, HAZID workshop findings and incident review, the following incidents shown in Table 6.2 were carried forward for consequence assessment to investigate for offsite safety impacts.

Table 6.2: Potential ARC operational hazards

Process Unit (HAZID workshop ID, APPENDIX A)	Potential incident	Potential impacts
Tipping hall and storage (1-3)	Fire involving waste fuel	Heat radiation
Flue gas treatment (28)	Fire/explosion at the Activated Carbon storage	Heat radiation/overpressure
Steam turbine hall (43)	Fire involving lube oil at the turbine hall	Heat radiation
Utilities (48)	Fire at the diesel storage area	Heat radiation

7. CONSEQUENCE ANALYSIS

7.1. Overview

During the HAZID workshop, the study team believed that there would be no offsite safety impacts from identified incidents due to the separation distances from the ARC to the nearest Eco Precinct boundary (approximately 2 km) and to the nearest sensitive residential land use (approximately 4.2 km). To confirm the workshop findings that such incidents would be localised on site, a set of scenarios were taken forward for consequence review as indicated in Table 6.2.

During the conduct of this PHA, Ricardo had engaged Riskcon to attend the HAZID workshop and to conduct a Fire Safety Study, Ref [3], as part of the EIS. As appropriate this PHA has referenced findings from this study to determine the potential for offsite safety impact.

Table 7.1 and Table 7.2 summarise the exposure levels for injury and property damage of interest for this PHA from fires and explosions.

Table 7.1: Heat radiation exposure levels for injury and property damage

Heat radiation (kW/m ²)	Reference	Description
3	AS1940:2017 The storage of handling of flammable and combustible liquids, Ref [9]	Radiant heat flux allowing personnel with suitable clothing to operate firefighting equipment for 10 min operation.
4.7	HIPAP 4 (2011): Risk Criteria (Consequences for heat radiation), Ref [10]	Will cause pain in 15-20 seconds and injury after 30 seconds exposure (at least second degree burns will occur).
10	IP 19: Fire precautions at petroleum refineries and bulk storage installations, Ref [11]	Fire escalation to adjacent tank(s) if prolonged exposure and no protection.
12.6	HIPAP 4 (2011): Risk Criteria (Consequences for heat radiation), Ref [10]	High chance of injury and significant chance of fatality for extended exposure. Can cause thermal stress level high enough to cause structural failure.
23	HIPAP 4 (2011): Risk Criteria (Consequences for heat radiation), Ref [10]	Likely fatality for extended exposure and chance of fatality for instantaneous exposure. Unprotected steel will reach thermal stress temperatures which can cause failures.

Table 7.2: Overpressure levels for injury and property damage

Explosion Overpressure (kPa)	Reference	Description
3.5	HIPAP 4 (2011): Risk Criteria (Consequences for heat radiation), Ref [10]	No fatality and low chance of injury. 90% glass breakage.
7	HIPAP 4 (2011): Risk Criteria (Consequences for heat radiation), Ref [10]	10% of injury. No fatality. Damage to internal partitions and joinery but can be prepared.
21	HIPAP 4 (2011): Risk Criteria (Consequences for heat radiation), Ref [10]	20% chance of fatality to a person in a building. Reinforced structure distort and storage tanks fail.
35	HIPAP 4 (2011): Risk Criteria (Consequences for heat radiation), Ref [10]	50% chance of fatality for a person in a building and 15% chance of fatality for a person in the open. House uninhabitable.
70	HIPAP 4 (2011): Risk Criteria (Consequences for heat radiation), Ref [10]	100% chance of fatality for a person in a building or in the open. Complete demolition of houses.

7.2. Consequence Review

7.2.1. Tipping Hall and Bunker Storage

Fire involving residual waste fuel

The FSS, Ref [3], assessed this incident as a fully developed fire in the waste storage bunker. The PHA has summarised the findings as follows:

Hazard	Tipping Hall and Bunker (waste)			
	Level	Effect (HIPAP 4)	Effect Distance (rounded to nearest m, Ref [3])	Incident reaches nearest boundary?
Eco Precinct boundary (2 km)				Resident (4.2 km)
4.7 kW/m ²	Injury	6	Not reached	Not reached
12.6 kW/m ²	Fatality potential	2	Not reached	Not reached

It was concluded a fire at the waste storage area will not have an impact offsite.

7.2.2. Flue Gas Treatment

Activated Carbon Storage Fire and Explosion

The FSS, Ref [3], assessed this incident as the explosion initially occurring followed by a fire involving residue. The PHA has summarised the findings as follows:

Hazard	Activated Carbon Storage			
Level	Effect (HIPAP 4)	Effect Distance (rounded to nearest m, Ref [3])	Incident reaches nearest boundary?	
			Eco Precinct boundary (2 km)	Resident (4.2 km)
7 kPa	Injury	42	Not reached	Not reached
70 KPa	100% Fatality	10	Not reached	Not reached
4.7 kW/m ²	Injury	13	Not reached	Not reached
12.6 kW/m ²	Fatality potential	10	Not reached	Not reached

The following findings were made:

- Although not part of the PHA scope, from an onsite safety perspective, the estimated explosion overpressure level of 21 kPa (fatality potential) could impair the adjacent electrical workshop and possibly the switch room and boiler. The following recommendations are provided:
 - During detailed design, Veolia account for potential activated carbon fire and explosion incidents and damage impacts when finalising the site layout and location of the storage silo. However, the design has now provided fire rated concrete walls and explosion protection on the storage silo.
 - During detailed design, Veolia confirm that there is a sufficient number and redundancy of remote emergency isolation and shutdown stations in the boiler and flue gas treatment area.
- In conclusion, an incident involving the full inventory of activated carbon will not have offsite safety impacts.

7.3. Steam turbine hall

Fire (lube oil) at the turbines

The FSS, Ref [3], assessed this incident as ignition of turbine lube oil and subsequent fire. The PHA has summarised the findings as follows:

Hazard	Steam Turbine (lube oil)			
Level	Effect (HIPAP 4)	Effect Distance (rounded to nearest m, Ref [3])	Incident reaches nearest boundary?	
			Eco Precinct boundary (2 km)	Resident (4.2 km)
4.7 kW/m ²	Injury	Within hall	Not reached	Not reached
12.6 kW/m ²	Fatality potential	Within hall	Not reached	Not reached

It was concluded that a fire at the steam turbine hall will not have fire radiation impacts offsite.

7.4. Utilities

Fire at the diesel storage

The FSS, Ref [3], conservatively assessed this incident as a full bund fire. The PHA has summarised the findings as follows:

Hazard	Diesel			
Level	Effect (HIPAP 4)	Effect Distance (rounded to nearest m, Ref [3])	Incident reaches nearest boundary?	
			Eco Precinct boundary (2 km)	Resident (4.2 km)
4.7 kW/m ²	Injury	19	Not reached	Not reached
12.6 kW/m ²	Fatality potential	9	Not reached	Not reached

In conclusion, a full bund fire incident involving diesel will not have offsite safety impacts.

7.5. Conclusions of consequence assessment

The consequence review demonstrated that:

- Incidents (fire and explosion) involving activated carbon (Class 4.2) screened forward from the SEPP 33 threshold analysis did not have offsite safety impacts in terms of fire and explosion to the site boundary or nearest residential area.
- Remaining incidents relating to the ARC operation including utilities (diesel storage) did not have offsite safety impacts in terms of fire impacts.

No hazardous incidents have been identified for the proposed ARC potentially significant offsite safety impacts on surrounding land uses.

8. RISK ANALYSIS

8.1. Overview

The PHA has been developed in accordance with NSW DPIE guidelines HIPAP No 6, Ref [2], and as suggested in the DPIE Multi-Level Risk Assessment (Ref [3]) guideline, depending on the potential severity and complexity of the hazards, the consequence and risk analysis can be carried out either qualitatively or quantitatively, or using a combination of techniques.

As per the SEPP 33 screening, Class 4.2 are the only DGs at the ARC which exceed the threshold. All other DGs are stored and handled in small quantities and have large separation distances to the site boundary. Furthermore, the consequence modelling involving these DG materials or ARC operational related hazards have been shown to be localised at the Woodlawn Eco-Precinct. Identified incidents did not reach the nearest site boundary nor the nearest residential area.

With reference to the Multi Level Risk Assessment Guideline, Ref [4], a qualitative risk analysis has been selected for this PHA. This approach is known as a Level 1 risk assessment.

8.2. Risk criteria

Risk criteria for qualitative analysis are given in HIPAP 4, Ref [10], as follows:

- a. All 'avoidable' risks should be avoided. This necessitates the investigation of alternative locations and alternative technologies, wherever applicable, to ensure that risks are not introduced in an area where feasible alternatives are possible and justified.
- b. The risk from a major hazard should be reduced wherever practicable, irrespective of the numerical value of the cumulative risk level from the whole installation. In all cases, if the consequences (effects) of an identified hazardous incident are significant to people and the environment, then all feasible measures (including alternative locations) should be adopted so that the likelihood of such an incident occurring is made very low. This necessitates the identification of all contributors to the resultant risk and the consequences of each potentially hazardous incident. The assessment process should address the adequacy and relevancy of safeguards (both technical and locational) as they relate to each risk contributor.
- c. The consequences (effects) of the more likely hazardous events (i.e. those of high probability of occurrence) should, wherever possible, be contained within the boundaries of the installation.
- d. Where there is an existing high risk from a hazardous installation, additional hazardous developments should not be allowed if they add significantly to that existing risk.

8.3. Risk assessment – safety risk to offsite land uses

No hazardous incidents have been identified for the proposed ARC with potentially significant offsite safety impacts on surrounding land uses. Therefore, the risk is consistent with the HIPAP 4 qualitative risk criteria as summarised in Table 8.1 and the likelihood of any offsite safety impacts on people or property is considered minimal.

Table 8.1: Comparison against HIPAP 4 qualitative risk criteria

Criteria	Comments	Complies?
<p>a) All 'avoidable' risks should be avoided. This necessitates the investigation of alternative locations and alternative technologies, wherever applicable, to ensure that risks are not introduced in an area where feasible alternatives are possible and justified.</p>	<p>No identified events involving Class 4.2 (substances liable to spontaneous combustion) or other DG materials with significant acute safety or environment effects beyond the boundary.</p> <p>The proposed ARC technology is well understood with standard controls. The benefits of the ARC in terms of generating energy from residual waste material is described in the EIS.</p> <p>Whilst fires have occurred in ERFs, typically in the waste fuel storage, consequences are typically localised. In terms of flue gas treatment, Veolia has chosen to use aqueous ammonia solution (Class 8) in lieu of anhydrous ammonia (Class 2.3) which is less hazardous and toxic in a loss of containment event.</p>	<p>Yes</p>
<p>b) The risk from a major hazard should be reduced wherever practicable, irrespective of the numerical value of the cumulative risk level from the whole installation. In all cases, if the consequences (effects) of an identified hazardous incident are significant to people and the environment, then all feasible measures (including alternative locations) should be adopted so that the likelihood of such an incident occurring is made very low. This necessitates the identification of all contributors to the resultant risk and the consequences of each potentially hazardous incident. The assessment process should address the adequacy and relevancy of safeguards (both technical and locational) as they relate to each risk contributor.</p>	<p>No identified events from the ARC with significant safety or environment effects reached the site boundary. Consequence were all found to be localised on site.</p> <p>The storage and use of all DGs would be compliant with relevant Australian Standards, Building Code of Australia with respect to separation distances and segregation.</p> <p>Safeguards will be provided as per Australian Standards. Veolia will also be undertaking a Hazard and Operability (HAZOP) study during detailed design to ensure adequate process safeguarding has been provided.</p>	<p>Yes</p>

Criteria	Comments	Complies?
c) The consequences (effects) of the more likely hazardous events (i.e. those of high probability of occurrence) should, wherever possible, be contained within the boundaries of the installation.	No identified events with significant safety or environment effects reached the nearest site boundary.	Yes
d) Where there is an existing high risk from a hazardous installation, additional hazardous developments should not be allowed if they add significantly to that existing risk.	The site does not have an existing hazardous facility. The proposed ARC will not overly increase the cumulative risk in the area as there are no identified events with offsite effects or escalation risk.	Yes

8.4. Risk Assessment – Risk to the Biophysical Environment

The principal concern relating to environmental risk from accident events typically relates to effects on whole systems or populations. HIPAP 4 provides the following qualitative guidance for assessment of environmental risk due to accident events.

- Industrial developments should not be sited in proximity to sensitive natural environmental areas where the effects (consequences) of the more likely accidental emission may threaten the long-term viability of the ecosystem or any species within it.
- Industrial developments should not be sited in proximity to sensitive natural environmental areas where the likelihood (probability) of impacts that may threaten the long-term viability of the ecosystem or any species within it is not substantially lower than the background level of threat to the ecosystem.

The raw materials stored on site with the most serious potential environmental impact is the aqueous ammonia solution (Class 8). If released into waterways there would be an acute toxic impact on aquatic life. However, this material is readily biodegradable, i.e. does not accumulate in the environment. The likelihood of a spill impacting sensitive receptors offsite is considered very low as the storage will be bunded. As detailed in the EIS, there will be an on-site stormwater management system and spill control measures will be provided.

Process upsets involving the boiler system or flue gas treatment resulting in air impact has been investigated by air quality specialists in the EIS. This study has concluded that there are no impacts (in terms of odour impact) to nearest environmental sensitive receptors.

The waste product generated and stored on site with the most serious potential environmental impact is the APCr. This material if inadvertently wetted could form a sludge and if released to the waterways would impact the aquatic life. However, the

APCr is collected in an enclosed building and stabilised before transportation to a proposed encapsulation cell onsite for disposal.

No incidents were identified which could result in an offsite effect threatening the long-term viability of an ecosystem. Therefore, the environmental risk due to accident events is considered low.

8.5. Conclusions

Offsite effects due to fire or explosion involving Dangerous Goods Class 4.2 materials and hazardous scenarios associated with the ARC operations were considered unlikely. Consequence assessment confirmed that the acute safety impacts would be localised and contained on site. This was due to proposed design measures and that these areas are well separated from the site boundary. It is therefore very unlikely that an accident event involving hazardous materials would have any effect that could extend offsite.

This PHA was classified as a Level 1 study with reference to the Multi Level Risk Assessment guideline (Ref [4]). Comparison of safety effects to surrounding land uses or environmental effects to surrounding ecosystems due to accident events indicated that all HIPAP 4 qualitative risk criteria are met by the proposed development, hence the offsite risk can be considered low.

The PHA recommends that to ensure the assumptions made in the hazard analysis remain valid:

- [PHA 1] That the final layout and design for the ARC facilities meet the safety and separation distance requirements of AS 5026: The storage and handling of Class 4 dangerous goods, AS 1940: The storage and handling of flammable and combustible liquids and AS 3780: The storage and handling of corrosive substances.

In addition, the following recommendations are provided for Veolia to consider in the detailed design phase:

- [PHA 2] Confirm there is a sufficient number and redundancy of remote emergency isolation and shutdown stations in the boiler and flue gas treatment area.

APPENDIX A. HAZARD IDENTIFICATION

Project: Woodlawn Advanced Energy Recovery Centre (AERC)

Date: 11/08/2021

Venue: Microsoft Teams

Team:

Name	Company	Role	Day 1	Day 2
Alex Roskilly	Ricardo	Analyst Consultant	-	X
Andrew Race	Veolia	Technical Manager - Waste to Energy at Veolia	X	X
Christina Lumsden	Veolia	Project Manager	X	-
Christine Hodgkiss	Veolia	Program Delivery Director	-	-
David Snashall	EMM	Energy Market Leader	X	X
David Woolford	Ricardo	Associate Director	-	-
Declan Reilly	Ricardo	Project Engineer (Consultant)	-	X
Emma Holden	Ricardo	Analyst Consultant	-	X
John Battaglia	Veolia	Project Director	-	-
Kate Cox	EMM	Associate Environmental Scientist	-	-
Lucy Jimenez	RiskCon	Graduate Engineer	X	X
Makesh Kaliyaperumal	Ricardo	Principal Consultant	X	X
Michael White	Ricardo	Associate Director	X	X
Pablo Gonzalez	Veolia	Strategic Development Manager - Energy from Waste at Veolia	X	X
Rachel Dodd	EMM	Associate Environmental Scientist	-	-
Renton Parker	RiskCon	Director	X	X
Simone Ligori	Sherpa Consulting	Scribe	X	X
Stuart Chia	Sherpa Consulting	Facilitator	X	X
Tom Roche	Veolia	Deputy Project Manager	-	-
X - attended workshop				

RISK REGISTER

Project: Woodlawn Advanced Energy Recovery Centre (AERC)
 Last Risk Register Rev: A
 Rev Date: 11/08/2021
 13/08/2021

ID	Plant Area	Guide Word	Risk Event	Causes	Controls - (Prevention, Detection/Mitigation)	Consequence	Risk Category	Conseq Rating	Likelihood Rating	Risk Rank	Actions	By	Forward to consequence review to determine if there is offsite impact (Y/N)
1	[Tipping hall/Waste bunker] Fuel Reception and Storage	Fire / explosion (following release)	Incompatible material in waste stream	MSW-inadvertent flammable and/or toxic material in waste feed	- Waste acceptance protocols - Customers are councils so waste type and composition is well known - Loading operator inspects waste before fed into compactor - Thermal (IR) cameras look for hotspots in the waste stack and initiate fire water cannons if fire detected - Any smouldering waste is segregated in the bunker - Building sprinklers as per BCA requirements	Fire in the tipping hall. Potential injury (radiation, toxic fumes) to personnel.	Health and Safety	4	2	Medium	No additional actions identified.	-	Yes
2	[Tipping hall/Waste bunker] Fuel Reception and Storage	Fire / explosion (following release)	Incompatible material in waste stream	C&I-inadvertent flammable and/or toxic material in waste feed	- Waste acceptance protocol - Customers are clients with a good relationship with Veolia so waste type and composition is well known - Loading operator inspects waste before fed into compactor - Thermal (IR) cameras look for hotspots in the waste stack and initiate fire water cannons if fire detected - Any smouldering waste is segregated in the bunker - Building sprinklers as per BCA requirements	Fire in the tipping hall. Potential injury (radiation, toxic fumes) to personnel.	Health and Safety	4	2	Medium	No additional actions identified.	-	Yes
3	[Tipping hall/Waste bunker] Fuel Reception and Storage	Fire / explosion (following release)	Hot loads (in container) on trucks	MSW/C&I - inadvertent flammable and/or toxic material in waste feed	- Designated areas for waste tipping (hot load zone) at the transfer station - Front end loader operator visually checks the load during container loading at the transfer station - See controls for Item 1 and 2 above Note: this event is more likely to occur at the transfer station than at the Woodlawn site because of the controls.	Smouldering fire on truck. Fire in the tipping hall. Potential injury (radiation, toxic fumes) to personnel.	Health and Safety	4	1	Medium	No additional actions identified.	-	Yes
4	[Tipping hall/Waste bunker] Fuel Reception and Storage	Fire / explosion (following release)	Dry waste in bunker	Dry MSW/C&I and generation of dust during bunker charging	- By nature of the waste (municipal), it is not dusty and does not generate dust - Waste material is not shredded so minimal dust generation - Building ventilation system	Dust generation and explosion not considered credible.	Health and Safety	No issue	-	-	No additional actions identified.	-	No
5	[Tipping hall/Waste bunker] Fuel Reception and Storage	Harmful exposure (acute or chronic)	Strong odour generation or accumulation from MSW/C&I waste	Odour extraction system fails or undersized Hot summer day	- Ventilation fan alarm and redundancy provided - During shutdown, the waste inventory is kept low in the bins - Waste is diverted to the site landfill	Potential exposure causing irritation and injury to personnel	Health and Safety	1	2	Low	No additional actions identified.	-	No

RISK REGISTER

ID	Plant Area	Guide Word	Risk Event	Causes	Controls - (Prevention, Detection/Mitigation)	Consequence	Risk Category	Conseq Rating	Likelihood Rating	Risk Rank	Actions	By	Forward to consequence review to determine if there is offsite impact (Y/N)
6	[Tipping hall/Waste bunker] Fuel Reception and Storage	External Dependencies	Loss of control of waste trucks in the tipping hall	Waste truck driver error Poor markings, speeding, new driver, evening operations	- Trucks reverse into dedicated bays - Approved drivers (Veolia) as per competence requirements - Operator monitors and assist truck movement onto tipping platform - Site speed limit - Restricted vehicle movement (e.g. no public vehicles allowed)	Damage to tipping hall. Potential injury (impact) to personnel (e.g. impact by vehicle).	Health and Safety	3	2	Medium	No additional actions identified.	-	No
7	[Tipping hall/Waste bunker] Fuel Reception and Storage	Process deviations	Exposure to an oxygen depleted environment	Residual waste in bin and operator undertakes maintenance ("confined space entry")	- Veolia LSR (Life Saving Rules) - Site permit to work system - Personnel with confined space training - Emergency plan	Asphyxiation, fatality in worst case.	Health and Safety	5	1	Medium	No additional actions identified.	-	No
8	[Boiler hall] Combustion and Boiler	Process deviations	Grate blockage	Oversized MSW/C&I	- Control system detection and alarm (grate not moving) - Thermal cameras (will detect hot spots) and alarm - Operator 'moves' the grate to dislodge the waste - Control system operates auxiliary burners (to assist in the full combustion)	Smouldering waste in the combustion chamber and requirement to move when system is cooled. Safety issue only when operator attempts to dislodge stuck material (manual handling). Potential exposure.	Health and Safety	2	1	Low	No additional actions identified.	-	No
9	[Boiler hall] Combustion and Boiler	Fire / explosion (internal to process)	Backfire from furnace into chute	Oversized MSW/C&I	- Operator detects oversized waste and can use small grapple to remove blockages from feed chute - Water ring over the top of the chutes	Fire in the chute potentially damaging the plant. Potential injury (radiation) to personnel. Note: similar to fire in the bunker	Health and Safety	4	2	Medium	No additional actions identified.	-	No
10	[Boiler hall] Combustion and Boiler	Process deviations	Failure to quench hot bottom ash ("wet approach")	Loss of water supply to cooling system Blocked sprays	- Process monitoring (temperature, quenching loss of water) and alarms for operator response	Exposure to fumes/ smouldering fire. Potential injury to personnel.	Health and Safety	3	2	Medium	No additional actions identified.	-	No
11	[Boiler hall] Combustion and Boiler	Process deviations	Failure to cool hot bottom ash ("dry approach")	Loss of air supply Dampner closed	- Process monitoring (temperature, air flow) and alarms for operator response - Load reduction into furnace	Exposure to fumes/ smouldering fire. Potential injury to personnel.	Health and Safety	3	2	Medium	No additional actions identified.	-	No

RISK REGISTER

ID	Plant Area	Guide Word	Risk Event	Causes	Controls - (Prevention, Detection/Mitigation)	Consequence	Risk Category	Conseq Rating	Likelihood Rating	Risk Rank	Actions	By	Forward to consequence review to determine if there is offsite impact (Y/N)
12	[Boiler hall] Combustion and Boiler	Process deviations	Incomplete combustion of waste	Insufficient oxygen entering furnace due to air fan failure or high feed flow	- Process operational control (e.g. oxygen levels, feed to air ratio) to maintain optimum temperature of 850C	This is an operability, not safety issue. Flue gas composition could exceed emission limits. Potential non compliant environmental discharge.	Environmental			-	Confirm that the Air Quality Study has included process upsets (e.g. incomplete combustion of waste, loss of ID fans) that could result in exceedance of allowed flue gas composition.	EMM	No
13	[Boiler hall] Combustion and Boiler	Process deviations	Steam tube failure	Stress failure	- Process safeguarding (high pressure trip) - Site preventative maintenance inspections (PM plan) - Restricted area for personnel	Damage to boiler. Potential injury to personnel if exposed to superheated steam (and high pressure 40barg).	Health and Safety	5	1	Medium	No additional actions identified.	-	No
14	[Boiler hall] Combustion and Boiler	Process deviations	Excessive combustion chamber temperature	Excessive combustion air, incorrect ratio of fuel:air or high calorific waste Excess addition of waste	- Process operational control (e.g. oxygen addition) to maintain optimum temperature of 850C for the required time (2 seconds)	Operability issue, not safety. Damage to boiler (long term- reduce life of tubes and cause corrosive environment in tubes.	Operations			-	No additional actions identified.	-	No
15	[Boiler hall] Combustion and Boiler	Process deviations	Loss of balance draft in combustion chamber	Imbalance between ID fans circulating air into and out of the furnace	- Process operational control - Process safeguarding and automatic system shutdown (fail safe)	In the worst case, could result in furnace backfire (see item 9) but the likelihood is very low. Major operability issue and potential environmental non compliance for air quality.	Health and Safety	4	1	Medium	Confirm that the Air Quality Study has included process upsets (e.g. incomplete combustion of waste, loss of ID fans, loss of bag filter(s)) that could result in exceedance of allowed flue gas composition.	EMM	No
16	[Boiler hall] Combustion and Boiler	Process deviations	Incomplete combustion	No/low flow of waste into the furnace	- Combustion control will automatically initiate auxiliary oil firing to maintain furnace temperature - Automatic combustion control (e.g. air draft)	Loss of production and not considered a safety issue.	Health and Safety			-	No additional actions identified.	-	No
17	[Boiler hall] Combustion and Boiler	Fire / explosion (following release)	Hydrogen explosion in incinerator bottom ash (IBA)	Quench water reacting with aluminium (contaminated ash)	- Maximum 0.5% ferrous weight in waste material and the composition of aluminium is correspondingly low - the IBA temperature is less than the melting point of aluminium (<600 C) - not considered to be credible for this facility.	Not credible for this site.	Health and Safety	No issue		-	No additional actions identified.	-	No

RISK REGISTER

ID	Plant Area	Guide Word	Risk Event	Causes	Controls - (Prevention, Detection/Mitigation)	Consequence	Risk Category	Conseq Rating	Likelihood Rating	Risk Rank	Actions	By	Forward to consequence review to determine if there is offsite impact (Y/N)
18	Flue Gas Treatment	Process deviations	Loss of containment of aqueous ammonia solution (25% wt)	Overfill of ammonia solution storage tank	- Ammonia solution (Class 8) will be stored and handled as per AS 3780. - Filling procedures. - Approved contractor for delivery - spill cleanup kits - Bunding - HAZOP will be conducted for this system. - separation distances and safety requirements (eg safety shower) as per AS 3780	Potential injury to personnel.	Health and Safety	2	2	Medium	No additional actions identified.	-	No
19	Flue Gas Treatment	Process deviations	Loss of containment of aqueous ammonia solution (25% wt)	Leak from ammonia solution storage, pipe work, or pump(s)	- Safeguards as for Item 18 abov. - Preventative maintenance with scheduled equipment/ vessel inspections	Potential injury to personnel.	Health and Safety	2	2	Medium	No additional actions identified.	-	No
20	Flue Gas Treatment	Process deviations	Loss of containment of aqueous ammonia solution (25% wt)	Transfer/ injection hose(s) transferring ammonia mechanical failure (wear & tear etc..).	- Safeguards as for Item 18 abov. - Preventative maintenance with scheduled equipment/ vessel inspections	Potential injury to personnel.	Health and Safety	2	2	Medium	No additional actions identified.	-	No
21	Flue Gas Treatment	Exposure to personnel	High concentration of ammonia in flue gas	Overdosing of ammonia		Potential injury to personnel.	Health and Safety	2	2	Medium		-	No
22	Flue Gas Treatment	Fire / explosion (internal to process)	Hydrated lime involved in fire	External fire	- Hydrated lime is not a combustible or flammable material	Release of hydrated lime dust to environment. Potential exposure to personnel causing irritation to skin/eyes.	Health and Safety	3	2	Medium	No additional actions identified.	-	No
23	Flue Gas Treatment	Exposure to personnel	Hydrated lime spill	Overfill of silos	- Unloading procedures - PPE - Silo bins (two) sized for incoming loads - one active and the other standby - Unloading will occur in enclosed area	Release of hydrated lime dust to environment. Potential exposure to personnel causing irritation to skin/eyes.	Health and Safety	3	2	Medium	No additional actions identified.	-	No
24	Flue Gas Treatment	Exposure to personnel	Hydrated lime spill	Overpressure of silo (pneumatic transfer)	- Silos will have an overpressure protection system - Relief valve	Release of hydrated lime dust to environment. Potential exposure to personnel causing irritation to skin/eyes.	Health and Safety	3	2	Medium	No additional actions identified.	-	No
25	Flue Gas Treatment	Fire / explosion (internal to process)	Ignition of activated carbon in flue gas treatment system	Excessive flue gas temperature	- Operating conditions (activated carbon concentration injection is below the explosive limit) - Operating conditions (excess air in flue gas). - HAZOP will be done to fine tune the control and safeguarding system - separation distances and safety requirements as per AS 5026	Not considered to be a credible scenario. See incident for fire in filter bags				-	No additional actions identified.	-	No

RISK REGISTER

ID	Plant Area	Guide Word	Risk Event	Causes	Controls - (Prevention, Detection/Mitigation)	Consequence	Risk Category	Conseq Rating	Likelihood Rating	Risk Rank	Actions	By	Forward to consequence review to determine if there is offsite impact (Y/N)
26	Flue Gas Treatment	Exposure to personnel	Activated carbon spill	Bag damage during handling and/or storage	<ul style="list-style-type: none"> - Activated carbon is delivered in bulk bags. - Bags are inspected prior to storage. - Bags are lifted by dedicated equipment. - Loading is done one bag at a time. - PPE - safety requirements as per AS 5026 	Personnel injury from exposure to dust causing an abrasive irritation to eyes.	Health and Safety	2	1	Low	No additional actions identified.	-	No
27	Flue Gas Treatment	Exposure to personnel	Depleted oxygen in activated carbon storage area	<p>Activated carbon becomes wet (e.g. roof leak)</p> <p>Activated carbon (by nature) absorbs oxygen</p>	<ul style="list-style-type: none"> - Activated carbon stored in large enclosure with ventilation - Activated carbon area is restricted access - Personnel aware of activated carbon hazards (induction) - See action - safety requirements as per AS 5026 	<p>Asphyxiation, fatality in worst case.</p> <p>[Activated carbon absorbs oxygen]</p>	Health and Safety	5	1	Medium	Confirm that a fixed oxygen monitor (low oxygen alarm) will be located in the activated carbon storage area.	Veolia	No
28	Flue Gas Treatment	Fire / explosion (internal to process)	Activated carbon forming a combustible cloud in the silo	Filling operations with excessive dust generation.	<ul style="list-style-type: none"> - Activated carbon is delivered in bulk bags - Bags are lifted by dedicated equipment - Loading is done one bag at a time - Silo will have explosion overpressure protection - Hazardous area classification - Equipment is bonded - safety requirements as per AS 5026 	<p>Dust explosion within activated carbon silo. Potential injury/fatality (overpressure) to personnel.</p> <p><u>Post workshop:</u> Incident literature review found a fire involving Activated Carbon at a storage silo. Fire was reported to be localised. No injuries reported.</p>	Health and Safety	5	1	Medium	No additional actions identified.	-	Yes
29	Flue Gas Treatment	Process deviations	Filter cartridge bag failure	<p>Damaged during handling</p> <p>Excessive heat (see above)</p> <p>Overload of bags/wear and tear</p>	<ul style="list-style-type: none"> - Filter system is under negative pressure - Filter bag alarm failure - Filter capacity redundancy 	Dust breakthrough to stack discharge. Potential to exceed emissions limits. Environmental issue.	Environmental			-	No additional actions identified.	-	No
30	Flue Gas Treatment	Process deviations	Hopper or bag filter fire	<p>Secondary combustion (high secondary carbon in ash) and air ingress into hopper</p> <p>Non emptying/poor cleaning of ash from the silo</p>	<ul style="list-style-type: none"> - Cleaning cycle and procedures for regular cleaning of ash from silo - Level detection in hopper system - Process monitoring (in line temperature monitoring) and response - Personnel not generally present in area - Plant shutdown and allowed to cool before repairing 	<p>Potential to cause injury (radiation to site personnel). Loss of production and asset damage.</p> <p>[Note: filter bag dust is not considered to be an acute hazard].</p>	Health and Safety	4	1	Medium	No additional actions identified.	-	Yes

RISK REGISTER

ID	Plant Area	Guide Word	Risk Event	Causes	Controls - (Prevention, Detection/Mitigation)	Consequence	Risk Category	Conseq Rating	Likelihood Rating	Risk Rank	Actions	By	Forward to consequence review to determine if there is offsite impact (Y/N)
31	APCr Stabilisation and Store	Exposure to personnel	Loss of containment of Air Pollution Control Residue (APCr) prior to stabilisation	Overflow of silo	<ul style="list-style-type: none"> - There is redundancy by design (2 silos with active and standby) - Enclosed building - Preventative Maintenance of the APCr system - Level protection in silos - Personnel in full PPE 	Spillage to ground. Potential runoff to environment and breach of compliance. Potential for injury (corrosive) to personnel upon exposure. [Note: Waste is classified in this form as Hazardous (before stabilisation and Restricted (after stabilisation). This aspect is covered under the health risk assessment.]	Health and Safety	2	1	Low	No additional actions identified.	-	No
32	APCr Stabilisation and Store	Exposure to personnel	Loss of containment of APCr after stabilisation	Spill (human error) while loading transport truck to monocell	<ul style="list-style-type: none"> - APCr is stabilised onsite (and inert) - Building is enclosed - Waste clean-up procedures 	Spillage to ground. Minor injury potential to personnel upon exposure [Note: Material is now stabilised. No acute toxicity]	Health and Safety	1	1	Low	No additional actions identified.	-	No
33	APCr Stabilisation and Store	Exposure to personnel	Loss of containment of Air Pollution Control Residue (APCr)	Pipework blocked	<ul style="list-style-type: none"> - Sensors across pipework to detect high pressure - Level protection systems in silos - Enclosed building - Housekeeping/ maintenance - PPE - bunding 	Spillage to ground. Potential runoff to environment and breach of compliance. Potential for injury (corrosive) to personnel upon exposure.	Health and Safety	2	1	Low	No additional actions identified.	-	No
34	APCr Stabilisation and Store	Waste products and materials	Air Pollution Control Residue (APCr) exposed to water	Water ingress (roof leak) into conveyor from bottom of incinerator to stabilisation unit	<ul style="list-style-type: none"> - Conveyor is enclosed - APCr and fly ash building is restricted access - Building is enclosed - Waste clean-up procedures 	Spillage to ground. Potential for injury (corrosive) to personnel upon exposure.	Health and Safety	2	1	Low	No additional actions identified.	-	No
35	APCr Stabilisation and Store	Waste products and materials	Air Pollution Control Residue (APCr) blocked in silo - personnel required to remove blockage	APCr when wet forms a sludge to block the outlet of the silo (see item above for blocked pipe)	<ul style="list-style-type: none"> - Sensors across pipework to detect high pressure - Level protection systems in silos - Procedures for rodding blockages - Housekeeping/ maintenance - PPE 	Manual handling issues. Potential for injury (corrosive) to personnel upon exposure.	Health and Safety	3	1	Low	No additional actions identified.	-	No
36	IBA Hall	Exposure to personnel	Release of dust from incinerator bottom ash (wet system)	Transfer incident	<ul style="list-style-type: none"> - IBA is wet and generation of dust is very minimal - Total carbon content < 3-5% (inert) - Enclosed building - PPE 	Not considered a safety issue	Environmental			-	Confirm that the Air Quality Study has included process upsets (e.g. incomplete combustion of waste, loss of ID fans, loss of bag filter(s)) that could result in exceedance of allowed flue gas composition.	EMM	No

RISK REGISTER

ID	Plant Area	Guide Word	Risk Event	Causes	Controls - (Prevention, Detection/Mitigation)	Consequence	Risk Category	Conseq Rating	Likelihood Rating	Risk Rank	Actions	By	Forward to consequence review to determine if there is offsite impact (Y/N)
37	IBA Hall	Exposure to personnel	Release of dust from incinerator bottom ash IBA (dry system)	Transfer incident	- Enclosed building - Safety showers - PPE	Potential for injury (warm dust exposure).	Health and Safety	2	1	Low	No additional actions identified.	-	No
38	IBA Hall	Exposure to personnel	Spillage of ash on transport from energy recovery plant to ash repository (via conveyor) (wet)	Transfer incident (e.g. overloading of conveyor)	- IBA is wet and generation of dust is very minimal - Total carbon content < 3-5% (inert) - PPE	Not considered a safety issue	Environmental			-	No additional actions identified.	-	No
39	IBA Hall	Exposure to personnel	Spillage of ash on transport from energy recovery plant to ash repository (via conveyor) (dry)	Transfer incident (e.g. overloading of conveyor)	- Enclosed conveyor - PPE	Potential for minor injury (warm dust exposure).	Health and Safety	2	1	Low	No additional actions identified.	-	No
40	[Turbine hall] Energy Recovery Steam Turbine Generator	Process deviations	Failure of chemical dosing of boiler feedwater	Depleted chemicals (corrosion inhibitor) Dosing system equipment fails (corrosion inhibitor)	- PPE - Spill clean-up - Enclosed areas	Not a safety issue Operability issue	Health and Safety	No issue		-	No additional actions identified.	-	No
41	[Turbine hall] Energy Recovery Steam Turbine Generator	Process deviations	Spillage of chemical dosing of boiler feedwater	Equipment failure	- PPE - Spill clean-up - Enclosed areas - Spill clean-up	Loss of containment of chemicals - not a safety issue. Environmental issue only.	Environmental	1	2	Low	No additional actions identified.	-	No
42	[Turbine hall] Energy Recovery Steam Turbine Generator	Noise / Vibration	Excessive noise generation	Rotating equipment	- Turbines in enclosed building - Personnel PPE (Note: Covered under environmental noise impact)	OH&S issue (loss of hearing) and noise pollution.	Health and Safety	5	1	Medium	No additional actions identified.	-	No
43	[Turbine hall] Energy Recovery Steam Turbine Generator	Fire / explosion (internal to process)	Fire in the turbine area	Lube oil leak	- turbines are provided with safety protection (e.g. overspeed) - turbines and lubrication systems are regularly serviced by specialists - lube oil fire suppression system - fire sprinkler system to provide equipment cooling	Facility damage and potential for injury to personnel from heat radiation.	Health and Safety	4	2	Medium	No additional actions identified.	-	Yes
44	General overview	Natural Occurrence	Major flooding	1 in 100 year event	- Plant will be above worst case flooding design. - Plant safely shut down and isolated (Note: flooding assessment conducted)	Facility damage and potential for injury to personnel.	Health and Safety	3	2	Medium	Complete flooding assessment and confirm the ammonia storage (if used) will not be affected by flooding.	Ricardo	No
45	General overview	Natural Occurrence	Earthquake	Seismic event	- Woodlawn site is not in a high risk location (seismic) - Structure design (and loading) will be in accordance with Australian Standard - Safe plant shutdown (for high vibration)	Facility damage and potential for injury to personnel.	Health and Safety	3	1	Low	No additional actions identified.	-	No
46	General overview	External Dependencies	Air crash	Located near aerodrome	- Site is not on a flight path	Facility damage and potential for injury to personnel.	Health and Safety	5	1	Medium	No additional actions identified.	-	No
47	General overview	Natural Occurrence	High winds	Located in open space	- Buildings and structures will be designed for predicted wind loads	Facility damage and potential for injury to personnel.	Health and Safety	5	1	Medium	No additional actions identified.	-	No

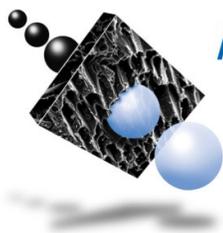
RISK REGISTER

ID	Plant Area	Guide Word	Risk Event	Causes	Controls - (Prevention, Detection/Mitigation)	Consequence	Risk Category	Conseq Rating	Likelihood Rating	Risk Rank	Actions	By	Forward to consequence review to determine if there is offsite impact (Y/N)
48	Diesel Storage	Fire / explosion (following release)	Fire in the diesel storage area	External fire	- Above ground storage and separation distance will be as per AS1940 - Fire protection will be as per AS1940	Escalation potential and damage to other facilities. Potential injury to personnel. (Note: Diesel is combustible and not flammable. Nearest offsite boundary is >700 metres away)	Health and Safety	5	1	Medium	As part of detailed design, locate the above ground storage diesel as per AS1940 requirements for separation distances to occupied buildings.	Ricardo	Yes
49	Diesel Storage	Sudden release of energy	Spillage of diesel	Filling of diesel storage tanks Site vehicle collision with storage tank Pump leak	- Above ground storage and separation distance will be as per AS1940 - Fire protection will be as per AS1940 - Storage tanks are banded as per AS1940 - Spill clean-up procedures - Diesel area will be protected with bollards - Site speed limit	Environmental impact. [Fire potential is low - covered in item 54]	Environmental			-	No additional actions identified.	-	No
50	Power Generation	Exposure to personnel	Exposure to high voltage (HV) switch gear	11kV generation	- HV gear is as per standard - Restricted area - Permit to work systems - Personnel HV trained	Electrocution. Fatality to personnel	Health and Safety	5	1	Medium	No additional actions identified.	-	No
51	Power Generation	Transformer fire	Leak of transformer oil	Mechanical wear and tear Lightning strike	- Transformer area is banded - Transformer located well away from facility and diesel storage, activated carbon	Fire if ignited. Potential for injury to personnel. [Note: Transformer is located at least 700 m away from nearest offsite boundary].	Health and Safety	4	2	Medium	No additional actions identified.	-	Yes

APPENDIX B. SAFETY DATA SHEETS

The safety data sheets (SDS) for the following substances are provided below:

- Activated Carbon
- Ammonia Solution (25 wt%)
- Diesel
- Hydrated lime.



**ACTIVATED CARBON
TECHNOLOGIES PTY LTD**

ABN 67 103 713 622

PO Box 1120, Research 3095, Victoria, AUSTRALIA

Phone: 03 9437 2600 Fax: 03 9437 2611

www.activatedcarbon.com.au

SAFETY DATA SHEET

1. IDENTIFICATION OF THE MATERIAL AND SUPPLIER

Product Name: Activated Carbon

Other Names: Activated charcoal
Char
Steam activated carbon

Manufacturer's Product Code:

Acticarb PC1000	Acticarb PS800	Acticarb PS1000
Acticarb PC1100	Acticarb PS1000F	Acticarb PS1300
Acticarb PS1300F	Acticarb PS800FT	

Use: Added to air streams and liquids to remove organic micropollutants

Company Name: Activated Carbon Technologies Pty Ltd
ABN: 67 103 713 622
Address: PO Box 1120
RESEARCH VIC 3095
Telephone: (03) 9437-2600
Emergency Telephone: (0418) 396 449 (Available 24 hourly)
Facsimile: (03) 9437-2611
e-mail: pcullum@activatedcarbon.com.au

2. HAZARDS IDENTIFICATION

Classified as non-hazardous in accordance with the NOHSC *Approved Criteria for Classifying Hazardous Substances* [NOHSC: 1008] and is not specified in the NOHSC *List of Designated Hazardous Substances* [NOHSC:10005].

3. COMPOSITION/INFORMATION ON INGREDIENTS

<u>Chemical Name</u>	<u>CAS Number</u>	<u>Proportion</u>
Activated carbon	7440-44-0	100%

4. FIRST AID MEASURES

Potential Health Effects

Medical conditions aggravated by exposure: None documented

Routes of exposure

Swallowed: No known deleterious effects however may cause irritation to the mouth and throat due to abrasive nature.

Eyes: Non corrosive however dust may have an abrasive effect causing moderate eye irritation.

Skin:	Non corrosive however may cause irritation due to abrasive nature.
Inhaled:	Repeated or prolonged inhalation of dust may cause moderate irritation to the respiratory system.
Chronic Effects:	Repeated or prolonged exposure may cause irritation to the respiratory system, skin and eyes.
<u>First Aid</u>	
Swallowed:	Rinse mouth with water. Do not induce vomiting since it is important that no amount of the material should enter the lungs (aspiration). Keep at rest and get prompt medical attention.
Eye:	Irrigate eyes with copious quantities of water for at least 15 minutes. Hold eyelids open. In all cases of eye contamination it is sensible to seek medical attention.
Skin:	Flush with large amounts of water. Use soap if available. Remove severely contaminated clothing (including shoes) and clean thoroughly before reusing. Seek medical advice if symptoms develop.
Inhaled:	In emergency situations, use proper respiratory protection to immediately remove the affected victim from exposure. Administer artificial respiration if breathing has stopped. Allow patient to assume most comfortable position, keep warm and at rest. Seek Medical Advice.
First Aid Facilities:	Eyewash station and normal wash room facilities.
Advice to Doctor:	Treat symptomatically.

5. FIRE FIGHTING MEASURES

Fire/Explosion Hazard

Flashpoint: Not applicable
Non-Flammable
Not Self Heating
Flammability Limits in Air: Not applicable

General Hazard:

Activated Carbon is difficult to ignite and tends to burn slowly (smolder) without producing smoke or flame. Toxic gases may form on combustion.

Extinguishing Media: Use foam, dry chemical, water fog or spray.

Special Exposure Hazards in Case of Fire: Avoid using water in a closed space.

Hazardous Combustion Products: May release CO and CO₂ in a fire.

Special Fire Fighting Procedures: Fire-Fighters to wear self contained breathing apparatus if inhalation risks exist.

6. ACCIDENTAL RELEASE MEASURES

Spills and Disposal

- Land spills:** Keep public away. Eliminate all sources of ignition. Prevent additional discharge of material if it is possible to do so without hazard. Prevent material from entering sewers or watercourse. Avoid generation of airborne dust. Scoop up solid for recovery or disposal. Those involved in the clean-up process need protection against skin and eye contact, and inhalation of dust.
- Water spills:** Prevent additional discharge of material if it is possible to do so without hazard. Try to contain any floating material and remove material by skimming or with suitable absorbent.
- Disposal:** Dispose of material in accordance with the Local, State and Federal Waste Management Authority.

7. HANDLING AND STORAGE

- Storage and Transport:** Store in a closed container in a clean, dry well-ventilated area away from strong oxidizing agents, sources of ignition, combustible materials and heat. Follow good handling and house keeping procedures; avoid spills, accumulation of dusts, and generation of airborne dusts.

8. EXPOSURE CONTROLS/ PERSONAL PROTECTION

- Exposure Standards:** No value assigned by the National Occupational Health and Safety Commission (Worksafe Australia). However, the Worksafe Australia exposure standard for nuisance dusts should be observed: 8 hour TWA : 10 mg/m³ air, inspirable dust.
- Engineering Controls:** In confined spaces, provide mechanical ventilation. Local exhaust ventilation is recommended where there is a need to remove dust from the workers breathing zone. Ventilation requirements will depend on the process and should be adequate to avoid exceeding the recommended exposure standard.
- Personal Protection:** The selection of personal protective equipment will vary depending upon site safety regulations and the actual conditions of use. Avoid prolonged or repeated contact with skin and eyes. Where skin and eye contact is unlikely, but may occur as a result of short and / or periodic exposure, wear long sleeves, chemical resistant gloves, safety glasses. If inhalation risks exist wear an approved dust mask meeting the requirements of AS1716 and AS1715. Wash thoroughly after handling. Workers should not enter confined spaces which contain activated carbon without self-contained breathing apparatus.
- Flammability:** Dusts may be ignited by heat, sparks or flames.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical Description/Properties

- Appearance:** Black powder. Odourless

Boiling Point:	4,000°C
Melting Point:	3,500°C
Vapour Pressure:	Not applicable
Apparent Density:	0.30 – 0.50 g/cc
Flashpoint:	Not applicable
Flammability Limits:	Not applicable
Solubility in Water:	Insoluble

Other Properties

Reactivity with air/water:	Material is normally stable in air and water.
Relative vapour density:	Not applicable
pH (of aqueous suspension):	8 to 11
Percent Volatiles:	Not applicable
Vapour Pressure:	Not applicable
Surface area:	> 700 m ² /g
Molecular weight:	12.01 g

10. STABILITY AND REACTIVITY

Reactivity

Stability:	Material is normally stable in air and water.
Polymerisation:	Not expected to occur.
Incompatibilities:	High temperatures, ignition sources and oxidising agents.
Hazardous decomposition:	CO and CO ₂ emanations.
Conditions to avoid:	Handle and open containers with care. Minimise generation of dust. Never enter a confined space containing activated carbon since it will absorb oxygen and asphyxiation may result.

11. TOXICOLOGICAL INFORMATION

Animal Toxicity:	No effects for chronic exposure are known. LD50 oral (rat) > 5 g/kg - Practically non-toxic.
Genotoxicity:	Activated carbon is not absorbed from gastrointestinal tract and is not expected to produce a problem during pregnancy.

Dust may irritate eyes and respiratory tract. Although dust accumulates in the lungs, prolonged exposure does not result in any significant effects on the respiratory system.

12. ECOLOGICAL INFORMATION

Ecotoxicity: No specific effects on the environment. Insoluble in aqueous environment, the product is separable by filtration or sedimentation. Not expected to be hazardous.

13. DISPOSAL CONSIDERATIONS

Disposal: Dispose of material in accordance with the Local, State and Federal Waste Management Authority.

14. TRANSPORT INFORMATION

NOT CLASSIFIED AS A DANGEROUS GOOD BY THE CRITERIA OF THE ADG CODE, IMDG OR IATA

	LAND TRANSPORT (ADG)	SEA TRANSPORT (IMDG / IMO)	AIR TRANSPORT (IATA / ICAO)
14.1 UN Number	None Allocated	None Allocated	None Allocated
14.2 Proper Shipping Name	None Allocated	None Allocated	None Allocated
14.3 Transport hazard class	None Allocated	None Allocated	None Allocated
14.4 Packing Group	None Allocated	None Allocated	None Allocated

Environmental hazards No information provided

Special precautions for user
Hazchem Code: No information provided

15. REGULATORY INFORMATION

Safety, health and environmental regulations/legislation specific for the substance or mixture

Poison schedule A poison schedule number has not been allocated to this product using the criteria in the Standard for the Uniform Scheduling of Medicines and Poisons (SUSMP).

Classifications Safework Australia criteria is based on the Globally Harmonised System (GHS) of Classification and Labelling of Chemicals.

The classifications and phrases listed below are based on the Approved Criteria for Classifying Hazardous Substances [NOHSC: 1008(2004)].

Hazard codes None allocated

Risk phrases None allocated

Safety phrases None allocated

Inventory listing(s) **AUSTRALIA: AICS (Australian Inventory of Chemical Substances)**
All components are listed on AICS, or are exempt.

16. OTHER INFORMATION

This Safety Data Sheet (SDS) has been supplied for the purpose of protecting the health and safety of industrial and commercial users who are deemed capable of understanding and acting on the information provided.

Please ensure this SDS is passed along to the appropriate person(s) in your company, who are capable of acting on the information.

Last Revision: 1 October 2018:

CONTACT POINT: Peter Cullum
Managing Director
Activated Carbon Technologies Pty Ltd
Telephone: (03) 9437-2600
Emergency Telephone: (0418) 396 449
Facsimile: (03) 9437-2611
e-mail: pcullum@activatedcarbon.com.au

End of SDS

1. IDENTIFICATION

Product Name	Aqueous ammonia (>10 - 35%)
Other Names	Ammonia aqua; Ammonia Aqueous, 23%; Ammonia Aqueous, 25%; Ammonia solution; Ammonia water; Ammonia, aqueous solution; Ammonium liquor
Uses	Cleaning/washing agents and additives; explosives; pH regulating agent; photochemical; flotation agent; laboratory chemical; manufacture of other chemicals.
Chemical Family	No Data Available
Chemical Formula	H5NO
Chemical Name	Ammonium, aqueous solution
Product Description	Strongly alkaline.

Contact Details of the Supplier of this Safety Data Sheet

Organisation	Location	Telephone
Redox Pty Ltd	2 Swettenham Road Minto NSW 2566 Australia	+61-2-97333000
Redox Pty Ltd	11 Mayo Road Wiri Auckland 2104 New Zealand	+64-9-2506222
Redox Inc.	3960 Paramount Boulevard Suite 107 Lakewood CA 90712 USA	+1-424-675-3200
Redox Chemicals Sdn Bhd	Level 2, No. 8, Jalan Sapir 33/7 Seksyen 33, Shah Alam Premier Industrial Park 40400 Shah Alam Sengalor, Malaysia	+60-3-5614-2111

Emergency Contact Details

For emergencies only; DO NOT contact these companies for general product advice.

Organisation	Location	Telephone
Poisons Information Centre	Westmead NSW	1800-251525 131126
Chemcall	Australia	1800-127406 +64-4-9179888
Chemcall	Malaysia	+64-4-9179888
Chemcall	New Zealand	0800-243622 +64-4-9179888
National Poisons Centre	New Zealand	0800-764766
CHEMTREC	USA & Canada	1-800-424-9300 CN723420 +1-703-527-3887

2. HAZARD IDENTIFICATION

Poisons Schedule (Aust) Schedule 6

Globally Harmonised System

Hazard Classification Hazardous according to the criteria of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS)

Hazard Categories Acute Toxicity (Oral) - Category 4
 Skin Corrosion/Irritation - Category 1C
 Specific Target Organ Toxicity (Single Exposure) - Category 3
 Acute Hazard To The Aquatic Environment - Category 1

Pictograms



Signal Word Danger

Hazard Statements

H302	Harmful if swallowed.
H314	Causes severe skin burns and eye damage.
H335	May cause respiratory irritation.
H400	Very toxic to aquatic life.
AUH071	Corrosive to the respiratory tract

Precautionary Statements

Prevention	P260	Do not breathe mist/vapour/spray.	
	P280	Wear protective gloves/protective clothing/eye protection/face protection.	
	P273	Avoid release to the environment.	
	P270	Do not eat, drink or smoke when using this product.	
	P271	Use only outdoors or in a well-ventilated area.	
	Response	P303 + P361 + P353	IF ON SKIN (or hair): Remove/take off immediately all contaminated clothing. Rinse skin with water/shower.
		P310	Immediately call a POISON CENTER or doctor/physician.
		P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
		P301 + P330 + P331	IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.
		P363	Wash contaminated clothing before reuse.
P391		Collect spillage.	
P304 + P340		IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.	
Storage	P403 + P233	Store in a well-ventilated place. Keep container tightly closed.	
	P405	Store locked up.	
Disposal	P501	Dispose of contents/container in accordance with local / regional / national / international regulations.	

National Transport Commission (Australia)

Australian Code for the Transport of Dangerous Goods by Road & Rail (ADG Code)

Dangerous Goods Classification Dangerous Goods according to the criteria of the Australian Code for the Transport of Dangerous Goods by Road & Rail (ADG Code)

Environmental Protection Authority (New Zealand)

Hazardous Substances and New Organisms Amendment Act 2015

HSNO Classifications

Health Hazards	6.1D	Substances that are acutely toxic - Harmful
	8.1A	Substances that are corrosive to metals
	8.2C	Substances that are corrosive to dermal tissue UN PGIII

	8.3A	Substances that are corrosive to ocular tissue
Environmental Hazards	9.1A	Substances that are very ecotoxic in the aquatic environment
	9.3C	Substances that are harmful to terrestrial vertebrates

3. COMPOSITION/INFORMATION ON INGREDIENTS

Ingredients

Chemical Entity	Formula	CAS Number	Proportion
Ammonia, aqueous solution	Unspecified	1336-21-6	>10 - <=35 %
Water	H2O	7732-18-5	Balance %

4. FIRST AID MEASURES

Description of necessary measures according to routes of exposure

Swallowed	IF SWALLOWED: Rinse mouth, then drink a glass of water. Do NOT induce vomiting. Immediately call a Poison Centre or doctor/physician for advice. Never give anything by mouth to an unconscious person.
Eye	IF IN EYES: Immediately flush eyes with running water for several minutes, holding eyelids open and occasionally lifting the upper and lower lids. Immediately call a Poison Centre or doctor/physician for advice. Remove contact lenses if present and easy to do. Continue rinsing for at least 15 minutes.
Skin	IF ON SKIN (or hair): Remove contaminated clothing and shoes immediately. Flush skin and hair with running water for at least 15 minutes. In case of gross contamination, drench contaminated clothing and skin with plenty of water before removing clothes. Immediately call a Poison Centre or doctor/physician for advice. For minor skin contact, avoid spreading material on unaffected skin. Wash contaminated clothing and shoes before reuse.
Inhaled	IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Immediately call a Poison Centre or doctor/physician for advice. Apply resuscitation if victim is not breathing - Do not use direct mouth-to-mouth method if victim ingested or inhaled the substance; use alternative respiratory method or proper respiratory device - Administer oxygen if breathing is difficult.
Advice to Doctor	Treat symptomatically. Keep victim calm and warm - Obtain immediate medical care. Following severe exposure, the patient should be kept under medical supervision for at least 48 hours due to the possibility of delayed pulmonary oedema. Ensure that attending medical personnel are aware of identity and nature of product(s) involved, and take precautions to protect themselves.
Medical Conditions Aggravated by Exposure	No information available.

5. FIRE FIGHTING MEASURES

General Measures	If safe to do so, move undamaged containers from fire area. Cool containers with water spray until well after fire is out. Avoid getting water inside containers.
Flammability Conditions	Non-combustible; Material itself does not burn.
Extinguishing Media	If material is involved in a fire, use dry chemical, Carbon dioxide (CO ₂), foam or water spray for extinction - Do not use water jets.
Fire and Explosion Hazard	Ammonia vapours may form explosive mixtures with air; may evolve flammable hydrogen gas. Containers may explode when heated.
Hazardous Products of Combustion	Fire or heat will produce irritating, toxic and/or corrosive gases, including ammonia, nitrogen oxides, hydrogen.
Special Fire Fighting Instructions	Contain runoff from fire control or dilution water - Runoff may be toxic and/or corrosive and may pollute waterways.
Personal Protective Equipment	Wear self-contained breathing apparatus (SCBA) and chemical splash suit. Fully-encapsulating, gas-tight suits should be worn for maximum protection. Structural firefighter's uniform is NOT effective for this material.
Flash Point	No Data Available
Lower Explosion Limit	16 %

Upper Explosion Limit	25 %
Auto Ignition Temperature	No Data Available
Hazchem Code	2R

6. ACCIDENTAL RELEASE MEASURES

General Response Procedure	Ensure adequate ventilation - Ventilate enclosed spaces before entering. ELIMINATE all ignition sources. Do not touch or walk through spilled material. Do not breathe vapours and prevent contact with eyes, skin and clothing.
Clean Up Procedures	Absorb with earth, sand or other non-combustible material and transfer to suitable, properly labelled containers for disposal (see SECTION 13).
Containment	Stop leak if safe to do so - Prevent entry into waterways, drains or confined areas. Cover with plastic sheet to prevent spreading. Use water spray to knock down vapours.
Decontamination	Carefully neutralise using dilute hydrochloric acid.
Environmental Precautionary Measures	Prevent entry into drains and waterways - If contamination of sewers or waterways has occurred, advise local emergency services.
Evacuation Criteria	Spill or leak area should be isolated immediately. Keep unauthorised personnel away. Keep upwind and to higher ground. Large spill: Immediately contact Police or Fire Brigade; Consider initial downwind evacuation of areas within at least 250 m.
Personal Precautionary Measures	Do not touch damaged containers or spilled material unless wearing appropriate protective clothing (see SECTION 8). Large spill: Wear SCBA and chemical splash suit. Fully-encapsulating, gas-tight suits should be worn for maximum protection.

7. HANDLING AND STORAGE

Handling	Safety showers and eyewash facilities should be provided within the immediate work area for emergency use. Ensure adequate ventilation. Handle in accordance with good industrial hygiene and safety practice. Do not breathe mist/vapours and prevent contact with eyes, skin and clothing. Do not ingest. Wear protective gloves/protective clothing/eye protection/face protection (see SECTION 8).
Storage	Store in a cool, dry and well-ventilated place, out of direct sunlight. Keep container tightly closed when not in use - Check regularly for leaks. Keep away from heat and sources of ignition - No smoking. Keep away from foodstuffs and incompatible materials (see SECTION 10). Store locked up.
Container	Keep in the original container.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

General	No specific exposure standards are available for this product. For Ammonia: - Safe Work Australia (SWA) Exposure Standard: TWA = 25 ppm (17 mg/m ³); STEL = 35 ppm (24 mg/m ³). - New Zealand Workplace Exposure Standard (WES): TWA = 25 ppm (17 mg/m ³); STEL = 35 ppm (24 mg/m ³).
Exposure Limits	No Data Available
Biological Limits	No information available.
Engineering Measures	A system of local and/or general exhaust is recommended to keep employee exposures as low as possible. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area.
Personal Protection Equipment	- Respiratory protection: In case of inadequate ventilation, wear respiratory protection. Recommended: Supplied-air respirator or self-contained breathing apparatus (refer to AS/NZS 1715 & 1716). - Eye/face protection: Wear appropriate personal protective clothing to prevent skin contact. Recommended: Chemical goggles, full face shield (Not required if wearing full-face, air-supplied mask). - Hand protection: Wear protective gloves. Recommended: Elbow-length, impervious gloves. - Skin/body protection: Wear appropriate eye protection to prevent eye contact. Recommended: Overalls, splash apron, rubber boots.
Special Hazards Precautions	No information available.

Work Hygienic Practices

Do not eat, drink or smoke when using this product. Always wash hands before smoking, eating, drinking or using the toilet. Remove contaminated clothing and shoes immediately. Wash contaminated clothing and other protective equipment before storage or re-use.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State	Liquid
Appearance	Clear liquid
Odour	Sharp, irritating
Colour	Colourless
pH	11.6 - 11.7 (1% aqueous solution)
Vapour Pressure	6.9 - 10.5 psi (@ 20 °C)
Relative Vapour Density	0.6 Air = 1
Boiling Point	18 - 37 °C
Melting Point	-72 °C
Freezing Point	No Data Available
Solubility	Miscible with water
Specific Gravity	0.88 - 0.92
Flash Point	No Data Available
Auto Ignition Temp	No Data Available
Evaporation Rate	No Data Available
Bulk Density	No Data Available
Corrosion Rate	No Data Available
Decomposition Temperature	No Data Available
Density	No Data Available
Specific Heat	No Data Available
Molecular Weight	35.05
Net Propellant Weight	No Data Available
Octanol Water Coefficient	No Data Available
Particle Size	No Data Available
Partition Coefficient	No Data Available
Saturated Vapour Concentration	No Data Available
Vapour Temperature	No Data Available
Viscosity	No Data Available
Volatile Percent	100 %
VOC Volume	No Data Available
Additional Characteristics	No information available.
Potential for Dust Explosion	Not applicable.
Fast or Intensely Burning Characteristics	No information available.
Flame Propagation or Burning Rate of Solid Materials	No information available.
Non-Flammables That Could Contribute Unusual Hazards to a Fire	The presence of oil or other combustible material will increase the fire hazard.
Properties That May Initiate or Contribute to Fire Intensity	Non-combustible; Material itself does not burn.
Reactions That Release Gases or Vapours	Fire or heat will produce irritating, toxic and/or corrosive gases, including ammonia, nitrogen oxides, hydrogen.
Release of Invisible Flammable Vapours and Gases	Ammonia vapours may form explosive mixtures with air; may evolve flammable hydrogen gas.

10. STABILITY AND REACTIVITY

General Information	Reacts violently with acids. Reacts exothermically with strong mineral acids. May form explosive compounds with mercury, halogens, and hypochlorites.
Chemical Stability	Flammable ammonia gas will be liberated at all temperatures, which may form explosive mixtures with air.
Conditions to Avoid	Keep away from heat and sources of ignition.
Materials to Avoid	Incompatible/reactive with acids, oxidising agents, metal halides, silver compounds, mercury, halogens and ethylene oxide; Corrosive to aluminum and zinc; Attacks copper, nickel, tin and brass.
Hazardous Decomposition Products	Fire or heat will produce irritating, toxic and/or corrosive gases, including ammonia, nitrogen oxides, hydrogen.
Hazardous Polymerisation	No information available.

11. TOXICOLOGICAL INFORMATION

General Information	<ul style="list-style-type: none"> - Acute toxicity: Harmful if swallowed. May be harmful if inhaled. Swallowing may cause nausea, vomiting, diarrhoea, abdominal pain and chemical burns to the mouth, throat and gastrointestinal tract. Inhalation of high concentrations may cause severe breathing difficulties, chest pain and lung damage, including pulmonary oedema and death. - Skin corrosion/irritation: Corrosive to skin; Causes severe skin burns. - Eye damage/irritation: Corrosive to eyes; Causes serious eye damage. - Respiratory/skin sensitisation: No information available. - Germ cell mutagenicity: Not considered to have significant genotoxic potential [NICNAS]. - Carcinogenicity: Considered to have a low potential to cause carcinogenic effects [NICNAS]. - Reproductive toxicity: Not expected to cause specific reproductive or developmental toxicity [NICNAS]. - STOT (single exposure): Inhalation of mists/vapours/aerosols causes respiratory irritation (nose, throat, mucous membranes); May be corrosive to the respiratory tract. - STOT (repeated exposure): Not expected to cause systemic effects following repeated exposure, although local effects in the gastrointestinal tract, eye and respiratory tract irritation, could occur [NICNAS]. Repeated or prolonged exposure may cause bronchitis. - Aspiration toxicity: No information available.
Acute	
Ingestion	<p>Acute toxicity (Oral):</p> <p>COMPONENT: Ammonium hydroxide (CAS No. 1336-21-6):</p> <ul style="list-style-type: none"> - LD50, Rats: 350 mg/kg bw. [NICNAS].
Carcinogen Category	None

12. ECOLOGICAL INFORMATION

Ecotoxicity	<p>Aquatic toxicity:</p> <ul style="list-style-type: none"> - LC50, Fish (Rainbow trout): 0.53 mg/L (96 h) [for Ammonia; Supplier's SDS]. - EC50, Crustacea (Daphnia magna): 0.66 mg/L (48 h) [Supplier's SDS].
Persistence/Degradability	The material is biodegradable.
Mobility	No information available.
Environmental Fate	Very toxic to aquatic life - Avoid release to the environment.
Bioaccumulation Potential	Does not bioaccumulate.
Environmental Impact	No Data Available

13. DISPOSAL CONSIDERATIONS

General Information	Dispose of contents/container in accordance with local/regional/national regulations.
Special Precautions for Land Fill	No information available.

14. TRANSPORT INFORMATION**Land Transport (Australia)**

ADG Code

Proper Shipping Name	AMMONIA SOLUTION, relative density between 0.880 and 0.957 at 15°C in water, with more than 10% but not more than 35% ammonia
Class	8 Corrosive Substances
Subsidiary Risk(s)	No Data Available
EPG	37 Toxic And/Or Corrosive Substances Non-Combustible
UN Number	2672
Hazchem	2R
Pack Group	III
Special Provision	No Data Available

Land Transport (Malaysia)

ADR Code

Proper Shipping Name	AMMONIA SOLUTION relative density between 0.880 and 0.957 at 15°C in water, with more than 10% but not more than 35% ammonia
Class	8 Corrosive Substances
Subsidiary Risk(s)	No Data Available
EPG	37 Toxic And/Or Corrosive Substances Non-Combustible
UN Number	2672
Hazchem	2R
Pack Group	III
Special Provision	No Data Available

Land Transport (New Zealand)

NZS5433

Proper Shipping Name	AMMONIA SOLUTION, relative density between 0.880 and 0.957 at 15°C in water, with more than 10% but not more than 35% ammonia
Class	8 Corrosive Substances
Subsidiary Risk(s)	No Data Available
EPG	37 Toxic And/Or Corrosive Substances Non-Combustible
UN Number	2672
Hazchem	2R
Pack Group	III
Special Provision	No Data Available

Land Transport (United States of America)

US DOT

Proper Shipping Name	AMMONIA SOLUTION relative density between 0.880 and 0.957 at 15°C in water, with more than 10% but not more than 35% ammonia
Class	8 Corrosive Substances
Subsidiary Risk(s)	No Data Available
ERG	154 Substances - Toxic and/or Corrosive (Non-Combustible)
UN Number	2672
Hazchem	2R

Pack Group III
Special Provision No Data Available

Sea Transport
 IMDG Code

Proper Shipping Name AMMONIA SOLUTION relative density between 0.880 and 0.957 at 15°C in water, with more than 10% but not more than 35% ammonia
Class 8 Corrosive Substances
Subsidiary Risk(s) No Data Available
UN Number 2672
Hazchem 2R
Pack Group III
Special Provision No Data Available
EMS F-A, S-B
Marine Pollutant Yes

Air Transport
 IATA DGR

Proper Shipping Name AMMONIA SOLUTION, relative density between 0.880 and 0.957 at 15 °C in water, with more than 10% but not more than 35% ammonia
Class 8 Corrosive Substances
Subsidiary Risk(s) No Data Available
UN Number 2672
Hazchem 2R
Pack Group III
Special Provision No Data Available

National Transport Commission (Australia)

Australian Code for the Transport of Dangerous Goods by Road & Rail (ADG Code)

Dangerous Goods Classification Dangerous Goods according to the criteria of the Australian Code for the Transport of Dangerous Goods by Road & Rail (ADG Code)

15. REGULATORY INFORMATION

General Information No Data Available
Poisons Schedule (Aust) Schedule 6

Environmental Protection Authority (New Zealand)

Hazardous Substances and New Organisms Amendment Act 2015

Approval Code HSR001526

National/Regional Inventories

Australia (AICS) Listed
Canada (DSL) Not Determined
Canada (NDSL) Not Determined

China (IECSC)	Not Determined
Europe (EINECS)	Not Determined
Europe (REACH)	Not Determined
Japan (ENCS/METI)	Not Determined
Korea (KECI)	Not Determined
Malaysia (EHS Register)	Not Determined
New Zealand (NZIoC)	Listed
Philippines (PICCS)	Not Determined
Switzerland (Giftliste 1)	Not Determined
Switzerland (Inventory of Notified Substances)	Not Determined
Taiwan (NCSR)	Not Determined
USA (TSCA)	Not Determined

16. OTHER INFORMATION

Related Product Codes AMAQUB1000, AMAQUB1200, AMAQUB1201, AMAQUB2500, AMAQUB2501, AMAQUB2600, AMAQUB5000, AMAQUB5001, AMAQUB6000, AMAQUB6500, AMAQUB7000, AMAQUB7001, AMAQUE0700, AMAQUE0701, AMAQUE0800, AMAQUE0900, AMAQUE1000, AMAQUE1001, AMAQUE1002, AMAQUE1003, AMAQUE1004, AMAQUE1005, AMAQUE1006, AMAQUE1007, AMAQUE1008, AMAQUE1009, AMAQUE1010, AMAQUE1011, AMAQUE1012, AMAQUE1015, AMAQUE1050, AMAQUE1050, AMAQUE1100, AMAQUE1115, AMAQUE1200, AMAQUE1300, AMAQUE1400, AMAQUE1500, AMAQUE1600, AMAQUE1800, AMAQUE1801, AMAQUE1802, AMAQUE1803, AMAQUE1804, AMAQUE1805, AMAQUE1806, AMAQUE1807, AMAQUE1808, AMAQUE1809, AMAQUE1810, AMAQUE1811, AMAQUE1812, AMAQUE1813, AMAQUE1814, AMAQUE1815, AMAQUE1816, AMAQUE1817, AMAQUE1818, AMAQUE1819, AMAQUE1820, AMAQUE1821, AMAQUE1822, AMAQUE1823, AMAQUE1824, AMAQUE1825, AMAQUE1826, AMAQUE1827, AMAQUE1828, AMAQUE1829, AMAQUE1830, AMAQUE1831, AMAQUE1832, AMAQUE1833, AMAQUE1834, AMAQUE1835, AMAQUE1836, AMAQUE1843, AMAQUE2000, AMAQUE2001, AMAQUE2500, AMAQUE3000, AMAQUE4000, AMAQUE4500, AMAQUE5000, AMAQUE5200, AMAQUE5500, AMAQUE5501, AMAQUE5521, AMAQUE5700, AMAQUE5800, AMAQUE5900, AMAQUE6000, AMAQUE6100, AMAQUE6200, AMAQUE6300, AMAQUE6301, AMAQUE6302, AMAQUE6303, AMAQUE6304, AMAQUE6305, AMAQUE6306, AMAQUE6307, AMAQUE6400, AMAQUE6500, AMAQUE6600, AMAQUE6700, AMAQUE6800, AMAQUE6900, AMAQUE7000, AMAQUE7200, AMAQUE7300, AMAQUE7800, AMAQUE7900, AMAQUE7901, AMAQUE8000, AMAQUE8200, AMAQUE8201, AMAQUE8202, AMAQUE8205, AMAQUE8300, AMAQUE8301, AMAQUE8400, AMAQUE8500, AMAQUE8800, AMAQUI1000, AMAQUI1001, AMAQUI1004, AMAQUI1006, AMAQUI4000, AMAQUI5000, AMAQUI5800, AMAQUI6000, AMAQUI6100, AMAQUI6400, AMAQUI7000, AMAQUI7001, AMAQUI7002, AMAQUI7070, AMAQUI7500, AMAQUI7501, AMAQUI8000

Revision 4

Revision Date 25 Jul 2019

Key/Legend

- < Less Than
- > Greater Than
- AICS** Australian Inventory of Chemical Substances
- atm** Atmosphere
- CAS** Chemical Abstracts Service (Registry Number)
- cm²** Square Centimetres
- CO₂** Carbon Dioxide
- COD** Chemical Oxygen Demand
- deg C (°C)** Degrees Celcius
- EPA (New Zealand)** Environmental Protection Authority of New Zealand
- deg F (°F)** Degrees Farenheit
- g** Grams
- g/cm³** Grams per Cubic Centimetre
- g/l** Grams per Litre
- HSNO** Hazardous Substance and New Organism
- IDLH** Immediately Dangerous to Life and Health

immiscible Liquids are insoluble in each other.

inHg Inch of Mercury

inH₂O Inch of Water

K Kelvin

kg Kilogram

kg/m³ Kilograms per Cubic Metre

lb Pound

LC50 LC stands for lethal concentration. LC50 is the concentration of a material in air which causes the death of 50% (one half) of a group of test animals. The material is inhaled over a set period of time, usually 1 or 4 hours.

LD50 LD stands for Lethal Dose. LD50 is the amount of a material, given all at once, which causes the death of 50% (one half) of a group of test animals.

ltr or **L** Litre

m³ Cubic Metre

mbar Millibar

mg Milligram

mg/24H Milligrams per 24 Hours

mg/kg Milligrams per Kilogram

mg/m³ Milligrams per Cubic Metre

Misc or **Miscible** Liquids form one homogeneous liquid phase regardless of the amount of either component present.

mm Millimetre

mmH₂O Millimetres of Water

mPa.s Millipascals per Second

N/A Not Applicable

NIOSH National Institute for Occupational Safety and Health

NOHSC National Occupational Health and Safety Commission

OECD Organisation for Economic Co-operation and Development

Oz Ounce

PEL Permissible Exposure Limit

Pa Pascal

ppb Parts per Billion

ppm Parts per Million

ppm/2h Parts per Million per 2 Hours

ppm/6h Parts per Million per 6 Hours

psi Pounds per Square Inch

R Rankine

RCP Reciprocal Calculation Procedure

STEL Short Term Exposure Limit

TLV Threshold Limit Value

tne Tonne

TWA Time Weighted Average

ug/24H Micrograms per 24 Hours

UN United Nations

wt Weight

SAFETY DATA SHEET

1. IDENTIFICATION OF THE MATERIAL AND SUPPLIER

1.1 Product identifier

Product name	HYDRATED LIME
Synonyms	ADELAIDE BRIGHTON HYDRATED LIME • BLUE CIRCLE GENERAL PURPOSE LIME • BLUE CIRCLE HYDRATED LIME • BLUE CIRCLE PLASTERLIME • CALCIUM HYDRATE • CALCIUM HYDROXIDE • GENERAL PURPOSE LIME • LIME HYDRATE • PLASTER LIME • PREMIUM LIME • SLAKED LIME

1.2 Uses and uses advised against

Uses	BINDING AGENT • FILLER • MINERAL PROCESSING • MORTAR • NEUTRALISING AGENT • PH CONTROL • REAGENT • SOIL STABILISATION • WATER TREATMENT
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1.3 Details of the supplier of the product

Supplier name	BORAL AUSTRALIA
Address	Level 18, 15 Blue Street, North Sydney, NSW, 2060, AUSTRALIA
Telephone	(02) 9220 6300
Website	http://www.boral.com.au

1.4 Emergency telephone numbers

Emergency	1800 555 477 (8am – 5pm WST)
Emergency (A/H)	13 11 26 (Poisons Information Centre)

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

CLASSIFIED AS HAZARDOUS ACCORDING TO SAFE WORK AUSTRALIA CRITERIA

Physical Hazards

Not classified as a Physical Hazard

Health Hazards

Skin Corrosion/Irritation: Category 2
 Serious Eye Damage / Eye Irritation: Category 1
 Specific Target Organ Toxicity (Single Exposure): Category 3 (Respiratory Irritation)
 Carcinogenicity: Category 1
 Specific Target Organ Toxicity (Repeated Exposure): Category 2

Environmental Hazards

Not classified as an Environmental Hazard

2.2 GHS Label elements

Signal word **DANGER**

Pictograms



Hazard statements

H315	Causes skin irritation.
H318	Causes serious eye damage.
H335	May cause respiratory irritation.
H350i	May cause cancer by inhalation.
H373	May cause damage to organs through prolonged or repeated exposure.

PRODUCT NAME HYDRATED LIME

Prevention statements

P201	Obtain special instructions before use.
P202	Do not handle until all safety precautions have been read and understood.
P260	Do not breathe dust/fume/gas/mist/vapours/spray.
P264	Wash thoroughly after handling.
P271	Use only outdoors or in a well-ventilated area.
P280	Wear protective gloves/protective clothing/eye protection/face protection.

Response statements

P302 + P352	IF ON SKIN: Wash with plenty of soap and water.
P304 + P340	IF INHALED: Remove to fresh air and keep at rest in a position comfortable for breathing.
P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P310	Immediately call a POISON CENTER or doctor/physician.
P321	Specific treatment is advised - see first aid instructions.
P362	Take off contaminated clothing and wash before re-use.

Storage statements

P403 + P233	Store in a well-ventilated place. Keep container tightly closed.
P405	Store locked up.

Disposal statements

P501	Dispose of contents/container in accordance with relevant regulations.
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2.3 Other hazards

No information provided.

3. COMPOSITION/ INFORMATION ON INGREDIENTS

3.1 Substances / Mixtures

Ingredient	CAS Number	EC Number	Content
CALCIUM HYDROXIDE	1305-62-0	215-137-3	>88%
QUARTZ (CRYSTALLINE SILICA)	14808-60-7	238-878-4	<3%
CALCIUM CARBONATE	471-34-1	207-439-9	<2%
ALUMINIUM OXIDE	1344-28-1	215-691-6	<1%
CALCIUM OXIDE	1305-78-8	215-138-9	<1%
MAGNESIUM HYDROXIDE	1309-42-8	215-170-3	<1%
IRON OXIDE (FE2O3)	1309-37-1	215-168-2	<0.5%
IMPURITIES	-	-	<1%
MAGNESIUM OXIDE	1309-48-4	215-171-9	<1%

4. FIRST AID MEASURES

4.1 Description of first aid measures

Eye	If in eyes, hold eyelids apart and flush continuously with running water. Continue flushing until advised to stop by a Poisons Information Centre, a doctor, or for at least 15 minutes. If available, immediately flush eyes with Diphoterine® solution. The use of Diphoterine® has been shown to significantly reduce the risk of permanent injury.
Inhalation	If inhaled, remove from contaminated area. Apply artificial respiration if not breathing.
Skin	If skin or hair contact occurs, remove contaminated clothing and flush skin and hair with running water. Continue flushing with water until advised to stop by a Poisons Information Centre or a doctor. If available, immediately flush skin and hair with Diphoterine® solution.
Ingestion	For advice, contact a Poisons Information Centre on 13 11 26 (Australia Wide) or a doctor (at once). If swallowed, do not induce vomiting.
First aid facilities	Eye wash facilities and safety shower should be available.

4.2 Most important symptoms and effects, both acute and delayed

Irritating to the eyes, skin and respiratory system, with possible burns.

4.3 Immediate medical attention and special treatment needed

Treat as for moderate to strong alkali and symptomatically.

5. FIRE FIGHTING MEASURES

5.1 Extinguishing media

Use an extinguishing agent suitable for the surrounding fire.

5.2 Special hazards arising from the substance or mixture

Non flammable. May evolve toxic gases if strongly heated.

5.3 Advice for firefighters

No fire or explosion hazard exists.

5.4 Hazchem code

None allocated.

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

Wear Personal Protective Equipment (PPE) as detailed in section 8 of the SDS. Clear area of all unprotected personnel. Contact emergency services where appropriate.

6.2 Environmental precautions

Prevent product from entering drains and waterways.

6.3 Methods of cleaning up

Contain spillage, then collect and place in suitable containers for reuse or disposal. Avoid generating dust.

6.4 Reference to other sections

See Sections 8 and 13 for exposure controls and disposal.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling

Before use carefully read the product label. Use of safe work practices are recommended to avoid eye or skin contact and inhalation. Observe good personal hygiene, including washing hands before eating. Prohibit eating, drinking and smoking in contaminated areas.

7.2 Conditions for safe storage, including any incompatibilities

Store in a cool, dry, well ventilated area, removed from incompatible substances and foodstuffs. Ensure packages are adequately labelled, protected from physical damage and sealed when not in use.

7.3 Specific end uses

No information provided.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

8.1 Control parameters

Exposure standards

Ingredient	Reference	TWA		STEL	
		ppm	mg/m ³	ppm	mg/m ³
Aluminium & compounds	SWA [Proposed]	--	1	--	--
Aluminium oxide (a)	SWA [AUS]	--	10	--	--
Calcium carbonate (Limestone, Marble, Whiting)	SWA [AUS]	--	10	--	--
Calcium hydroxide	SWA [AUS]	--	5	--	--
Calcium hydroxide	SWA [Proposed]	--	1	--	--
Calcium oxide	SWA [AUS]	--	2	--	--
Calcium oxide	SWA [Proposed]	--	1	--	--
Iron oxide fume (Fe ₂ O ₃) (as Fe)	SWA [AUS]	--	5	--	--
Magnesium oxide (fume)	SWA [AUS]	--	10	--	--
Quartz (respirable dust)	SWA [AUS]	--	0.1	--	--
Quartz (respirable dust)	SWA [Proposed]	--	0.05	--	--
Quartz (respirable dust)	WorkSafe VIC	--	0.05	--	--

Biological limits

No biological limit values have been entered for this product.

8.2 Exposure controls

Engineering controls Avoid inhalation. Use in well ventilated areas. Where an inhalation risk exists, mechanical extraction ventilation is recommended. Maintain dust levels below the recommended exposure standard.

PPE

- Eye / Face** Wear safety glasses or dust-proof goggles when handling material to avoid contact with eyes.
- Hands** Wear PVC or rubber gloves when handling material to prevent skin contact.
- Body** Wear long sleeved shirt and full-length trousers.
- Respiratory** Where an inhalation risk exists, wear a Class P1 (Particulate) respirator. At high dust levels, wear a Powered Air Purifying Respirator (PAPR) with Class P3 (Particulate) filter or a Class P3 (Particulate) respirator.



9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

Appearance	FINE WHITE POWDER
Odour	ODOURLESS
Flammability	NON FLAMMABLE
Flash point	NOT RELEVANT
Boiling point	580°C
Melting point	580°C
Evaporation rate	NOT AVAILABLE
pH	13
Vapour density	NOT AVAILABLE
Specific gravity	2.1 - 2.3
Solubility (water)	1.6 g/L
Vapour pressure	NOT AVAILABLE
Upper explosion limit	NOT RELEVANT
Lower explosion limit	NOT RELEVANT
Partition coefficient	NOT AVAILABLE
Autoignition temperature	NOT AVAILABLE
Decomposition temperature	580°C

PRODUCT NAME HYDRATED LIME

9.1 Information on basic physical and chemical properties

Viscosity	NOT AVAILABLE
Explosive properties	NOT AVAILABLE
Oxidising properties	NOT AVAILABLE
Odour threshold	NOT AVAILABLE

9.2 Other information

Density	450 - 500 kg/m ³ (Bulk)
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10. STABILITY AND REACTIVITY

10.1 Reactivity

Carefully review all information provided in sections 10.2 to 10.6.

10.2 Chemical stability

Stable under recommended conditions of storage.

10.3 Possibility of hazardous reactions

Polymerization will not occur.

10.4 Conditions to avoid

Avoid contact with incompatible substances.

10.5 Incompatible materials

Incompatible (violently) with acids (e.g. nitric acid), maleic anhydride, nitroethane, nitromethane, nitroparaffins, nitropropane and phosphorus. Calcium hydroxide, or hydrated lime, is already neutralised and is not expected to undergo oxidation.

10.6 Hazardous decomposition products

May evolve calcium oxides when heated to decomposition.

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity No known toxicity data is available for this product. Based on available data, the classification criteria are not met.

Information available for the ingredients:

Ingredient	Oral LD50	Dermal LD50	Inhalation LC50
CALCIUM HYDROXIDE	7300 mg/kg (mouse)	--	--
CALCIUM CARBONATE	> 2000 mg/kg (rat)	> 2000 mg/kg (rat)	> 3.0 mg/L
ALUMINIUM OXIDE	> 5000 mg/kg (rat)	--	--
MAGNESIUM HYDROXIDE	8500 mg/kg (rat, mouse)	--	--

Skin	Irritating to the skin. Contact may result in irritation, redness, pain, rash, dermatitis and possible skin burns.
Eye	Irritating to the eyes. Contact may result in irritation, lacrimation, pain, redness, corneal burns and possible permanent damage.
Sensitisation	Not classified as causing skin or respiratory sensitisation.
Mutagenicity	Insufficient data available to classify as a mutagen.
Carcinogenicity	Crystalline silica is classified as carcinogenic to humans (IARC Group 1). However, there is a body of evidence supporting the fact that increased cancer risk would be limited to people already suffering from silicosis.
Reproductive	Insufficient data available to classify as a reproductive toxin.
STOT - single exposure	Irritating to the respiratory system. Over exposure to dust may result in severe mucous membrane irritation of nose and throat, coughing and bronchitis.
STOT - repeated exposure	Repeated exposure to respirable silica may result in pulmonary fibrosis (silicosis). Silicosis is a fibronodular lung disease caused by deposition in the lungs of fine respirable particles of crystalline silica. Principal symptoms of silicosis are coughing and breathlessness.
Aspiration	This product does not present an aspiration hazard.

12. ECOLOGICAL INFORMATION

PRODUCT NAME HYDRATED LIME

12.1 Toxicity

The aquatic toxicity of calcium hydroxide is due to its alkalinity.

12.2 Persistence and degradability

Neutralised to calcium carbonate by absorption of atmospheric carbon dioxide and is not degraded by oxidation.

12.3 Bioaccumulative potential

Calcium hydroxide does not bioaccumulate in the environment.

12.4 Mobility in soil

Not available, but considered low.

12.5 Other adverse effects

No information provided.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Waste disposal Neutralise with dilute acid (e.g. 3 mol/L hydrochloric acid) or similar. For small amounts, absorb with sand or similar and dispose of to an approved landfill site. Contact the manufacturer/supplier for additional information (if required).

Legislation Dispose of in accordance with relevant local legislation.

14. TRANSPORT INFORMATION

NOT CLASSIFIED AS A DANGEROUS GOOD BY THE CRITERIA OF THE ADG CODE, IMDG OR IATA

	LAND TRANSPORT (ADG)	SEA TRANSPORT (IMDG / IMO)	AIR TRANSPORT (IATA / ICAO)
14.1 UN Number	None allocated.	None allocated.	None allocated.
14.2 Proper Shipping Name	None allocated.	None allocated.	None allocated.
14.3 Transport hazard class	None allocated.	None allocated.	None allocated.
14.4 Packing Group	None allocated.	None allocated.	None allocated.

14.5 Environmental hazards

No information provided.

14.6 Special precautions for user

Hazchem code None allocated.

15. REGULATORY INFORMATION

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

Poison schedule A poison schedule number has not been allocated to this product using the criteria in the Standard for the Uniform Scheduling of Medicines and Poisons (SUSMP).

Classifications Safework Australia criteria is based on the Globally Harmonised System (GHS) of Classification and Labelling of Chemicals.

Inventory listings **AUSTRALIA: AICS (Australian Inventory of Chemical Substances)**
All components are listed on AICS, or are exempt.

16. OTHER INFORMATION

Additional information

PERSONAL PROTECTIVE EQUIPMENT GUIDELINES:

The recommendation for protective equipment contained within this report is provided as a guide only. Factors such as form of product, method of application, working environment, quantity used, product concentration and the availability of engineering controls should be considered before final selection of personal protective equipment is made.

HEALTH EFFECTS FROM EXPOSURE:

It should be noted that the effects from exposure to this product will depend on several factors including: form of product; frequency and duration of use; quantity used; effectiveness of control measures; protective equipment used and method of application. Given that it is impractical to prepare a report which would encompass all possible scenarios, it is anticipated that users will assess the risks and apply control methods where appropriate.

Abbreviations

ACGIH	American Conference of Governmental Industrial Hygienists
CAS #	Chemical Abstract Service number - used to uniquely identify chemical compounds
CNS	Central Nervous System
EC No.	EC No - European Community Number
EMS	Emergency Schedules (Emergency Procedures for Ships Carrying Dangerous Goods)
GHS	Globally Harmonized System
GTEPG	Group Text Emergency Procedure Guide
IARC	International Agency for Research on Cancer
LC50	Lethal Concentration, 50% / Median Lethal Concentration
LD50	Lethal Dose, 50% / Median Lethal Dose
mg/m ³	Milligrams per Cubic Metre
OEL	Occupational Exposure Limit
pH	relates to hydrogen ion concentration using a scale of 0 (high acidic) to 14 (highly alkaline).
ppm	Parts Per Million
STEL	Short-Term Exposure Limit
STOT-RE	Specific target organ toxicity (repeated exposure)
STOT-SE	Specific target organ toxicity (single exposure)
SUSMP	Standard for the Uniform Scheduling of Medicines and Poisons
SWA	Safe Work Australia
TLV	Threshold Limit Value
TWA	Time Weighted Average

Report status

This document has been compiled by RMT on behalf of the manufacturer, importer or supplier of the product and serves as their Safety Data Sheet ('SDS').

It is based on information concerning the product which has been provided to RMT by the manufacturer, importer or supplier or obtained from third party sources and is believed to represent the current state of knowledge as to the appropriate safety and handling precautions for the product at the time of issue. Further clarification regarding any aspect of the product should be obtained directly from the manufacturer, importer or supplier.

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[End of SDS]

SAFETY DATA SHEET



Section 1. Identification

Product name Fuels, diesel
Other means of identification DMA LS, Marine Distillate Fuels, Ultra Low Sulfur No. 2 Diesel Fuel
SDS # SMF2115
Code SMF2115

Relevant identified uses of the substance or mixture and uses advised against

Product use Fuel for marine engines.

Supplier BP Products North America Inc.
150 West Warrenville Road
Naperville, Illinois 60563-8460
USA

EMERGENCY HEALTH INFORMATION: 1 (800) 447-8735
Outside the US: +1 703-527-3887 (CHEMTREC)

EMERGENCY SPILL INFORMATION: 1 (800) 424-9300 CHEMTREC (USA)

OTHER PRODUCT INFORMATION 1 (866) 4 BP - MSDS
(866-427-6737 Toll Free - North America)
email: bpcares@bp.com

Section 2. Hazards identification

OSHA/HCS status This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Classification of the substance or mixture FLAMMABLE LIQUIDS - Category 4
ACUTE TOXICITY (inhalation) - Category 4
SKIN IRRITATION - Category 2
CARCINOGENICITY - Category 2
SPECIFIC TARGET ORGAN TOXICITY (REPEATED EXPOSURE) - Category 2
ASPIRATION HAZARD - Category 1

GHS label elements

Hazard pictograms



Signal word

Danger

Hazard statements

Combustible liquid.
Harmful if inhaled.
Causes skin irritation.
Suspected of causing cancer.
May be fatal if swallowed and enters airways.
May cause damage to organs through prolonged or repeated exposure.

Precautionary statements

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Section 2. Hazards identification

Prevention	Obtain special instructions before use. Wear protective gloves and eye protection. Do not breathe vapor. Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. Use explosion-proof electrical/ventilating/lighting/material-handling equipment. Avoid release to the environment.
Response	IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician. Do NOT induce vomiting. IF ON SKIN: Wash with plenty of soap and water. Take off contaminated clothing and wash it before reuse.
Storage	Keep cool.
Disposal	Dispose of contents and container in accordance with all local, regional, national and international regulations.
Hazards not otherwise classified	This material may contain significant quantities of polycyclic aromatic hydrocarbons (PAHs), some of which have been shown by experimental studies to induce skin cancer. Note: High Pressure Applications Injections through the skin resulting from contact with the product at high pressure constitute a major medical emergency. See 'Notes to physician' under First-Aid Measures, Section 4 of this Safety Data Sheet.

Section 3. Composition/information on ingredients

May also contain small quantities of proprietary performance additives.

Substance/mixture Mixture

Ingredient name	CAS number	%
Fuels, diesel, No 2	68476-34-6	> 99
Contains: naphthalene	91-20-3	1 - 3

There are no ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

Occupational exposure limits, if available, are listed in Section 8.

Section 4. First aid measures

Description of necessary first aid measures

Eye contact	In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Eyelids should be held away from the eyeball to ensure thorough rinsing. Check for and remove any contact lenses. Get medical attention.
Skin contact	In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Clean shoes thoroughly before reuse. Get medical attention.
Inhalation	If inhaled, remove to fresh air. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. Get medical attention.
Ingestion	Do not induce vomiting. Never give anything by mouth to an unconscious person. If unconscious, place in recovery position and get medical attention immediately. Aspiration hazard if swallowed. Can enter lungs and cause damage. Get medical attention immediately.
Protection of first-aiders	No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.

Most important symptoms/effects, acute and delayed

See Section 11 for more detailed information on health effects and symptoms.

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Section 4. First aid measures

Indication of immediate medical attention and special treatment needed, if necessary

Notes to physician

Treatment should in general be symptomatic and directed to relieving any effects. Product can be aspirated on swallowing or following regurgitation of stomach contents, and can cause severe and potentially fatal chemical pneumonitis, which will require urgent treatment. Because of the risk of aspiration, induction of vomiting and gastric lavage should be avoided. Gastric lavage should be undertaken only after endotracheal intubation. Monitor for cardiac dysrhythmias.

Note: High Pressure Applications

Injections through the skin resulting from contact with the product at high pressure constitute a major medical emergency. Injuries may not appear serious at first but within a few hours tissue becomes swollen, discolored and extremely painful with extensive subcutaneous necrosis.

Surgical exploration should be undertaken without delay. Thorough and extensive debridement of the wound and underlying tissue is necessary to minimize tissue loss and prevent or limit permanent damage. Note that high pressure may force the product considerable distances along tissue planes.

Specific treatments

No specific treatment.

Section 5. Fire-fighting measures

Extinguishing media

Suitable extinguishing media

In case of fire, use foam, dry chemical or carbon dioxide extinguisher or spray.

Unsuitable extinguishing media

Do not use water jet.

Specific hazards arising from the chemical

Combustible liquid. Fire water contaminated with this material must be contained and prevented from being discharged to any waterway, sewer or drain. In a fire or if heated, a pressure increase will occur and the container may burst, with the risk of a subsequent explosion. Runoff to sewer may create fire or explosion hazard.

Hazardous combustion products

Combustion products may include the following:
carbon oxides (CO, CO₂) (carbon monoxide, carbon dioxide)
other hazardous substances.

Special protective actions for fire-fighters

Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool. This material is toxic to aquatic organisms. Fire water contaminated with this material must be contained and prevented from being discharged to any waterway, sewer or drain.

Special protective equipment for fire-fighters

Fire-fighters should wear positive pressure self-contained breathing apparatus (SCBA) and full turnout gear.

Section 6. Accidental release measures

Personal precautions, protective equipment and emergency procedures

For non-emergency personnel

Immediately contact emergency personnel. No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. No flares, smoking or flames in hazard area. Avoid breathing vapor or mist. Provide adequate ventilation. Put on appropriate personal protective equipment. Floors may be slippery; use care to avoid falling. Eliminate all ignition sources.

For emergency responders

Entry into a confined space or poorly ventilated area contaminated with vapor, mist or fume is extremely hazardous without the correct respiratory protective equipment and a safe system of work. Wear self-contained breathing apparatus. Wear a suitable chemical protective suit. Chemical resistant boots. See also the information in "For non-emergency personnel".

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Section 6. Accidental release measures

Environmental precautions Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air). Water polluting material. May be harmful to the environment if released in large quantities.

Methods and materials for containment and cleaning up

Small spill Eliminate all ignition sources. Stop leak if without risk. Move containers from spill area. Absorb with an inert material and place in an appropriate waste disposal container. Use spark-proof tools and explosion-proof equipment. Dispose of via a licensed waste disposal contractor. The method and equipment used must be in conformance with appropriate regulations and industry practice on explosive atmospheres.

Large spill Eliminate all ignition sources. Stop leak if without risk. Move containers from spill area. Approach release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Dike spill area and do not allow product to reach sewage system and surface or ground water. Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations. Use spark-proof tools and explosion-proof equipment. Contaminated absorbent material may pose the same hazard as the spilled product. The method and equipment used must be in conformance with appropriate regulations and industry practice on explosive atmospheres. Dispose of via a licensed waste disposal contractor.

Section 7. Handling and storage

Precautions for safe handling

Protective measures Put on appropriate personal protective equipment (see Section 8). Do not get in eyes or on skin or clothing. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Avoid contact of spilled material and runoff with soil and surface waterways. Empty containers retain product residue and can be hazardous. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. Do not reuse container. Store and use away from heat, sparks, open flame or any other ignition source. Use explosion-proof electrical (ventilating, lighting and material handling) equipment. Use only non-sparking tools. Do not breathe vapor or mist. Avoid exposure - obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Do not swallow. Aspiration hazard if swallowed. Can enter lungs and cause damage. Never siphon by mouth.

Advice on general occupational hygiene Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Wash thoroughly after handling. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.

Conditions for safe storage, including any incompatibilities

Store in accordance with local regulations. Store in a segregated and approved area. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10) and food and drink. Store locked up. Eliminate all ignition sources. Separate from oxidizing materials. Keep container tightly closed and sealed until ready for use. Store and use only in equipment/containers designed for use with this product. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination.

Light hydrocarbon vapors can build up in the headspace of tanks. These can cause flammability/explosion hazards even at temperatures below the normal flash point (note: flash point must not be regarded as a reliable indicator of the potential flammability of vapor in tank headspaces). Tank headspaces should always be regarded as potentially flammable and care should be taken to avoid static electrical discharge and all ignition sources during filling, ullaging and sampling from storage tanks. Do not enter storage tanks. If entry to vessels is necessary, follow permit to work procedures. Entry to any tanks or other confined space requires a full risk assessment and appropriate control measures to be put in place in conformance with appropriate regulations and industry practice on confined space entry. When the product is pumped (e.g. during filling, discharge or ullaging) and when sampling, there is a risk of static discharge. Ensure

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Section 7. Handling and storage

equipment used is properly earthed or bonded to the tank structure. Electrical equipment should not be used unless it is intrinsically safe (i.e. will not produce sparks). Explosive air/vapor mixtures may form at ambient temperature. If product comes into contact with hot surfaces, or leaks occur from pressurized fuel pipes, the vapor or mists generated will create a flammability or explosion hazard. Product contaminated rags, paper or material used to absorb spillages, represent a fire hazard, and should not be allowed to accumulate. Dispose of safely immediately after use.

Section 8. Exposure controls/personal protection

Control parameters

Occupational exposure limits

Ingredient name	Exposure limits
Fuels, diesel, No 2	ACGIH TLV (United States). Absorbed through skin. TWA: 100 mg/m ³ , (measured as total hydrocarbons) 8 hours. Issued/Revised: 1/2007 Form: Inhalable fraction and vapor
naphthalene	ACGIH TLV (United States). Absorbed through skin. TWA: 52 mg/m ³ 8 hours. Issued/Revised: 5/1996 TWA: 10 ppm 8 hours. Issued/Revised: 5/1996 OSHA PEL (United States). TWA: 50 mg/m ³ 8 hours. Issued/Revised: 6/1993 TWA: 10 ppm 8 hours. Issued/Revised: 6/1993

While specific OELs for certain components may be shown in this section, other components may be present in any mist, vapor or dust produced. Therefore, the specific OELs may not be applicable to the product as a whole and are provided for guidance only.

Appropriate engineering controls

All activities involving chemicals should be assessed for their risks to health, to ensure exposures are adequately controlled. Personal protective equipment should only be considered after other forms of control measures (e.g. engineering controls) have been suitably evaluated. Personal protective equipment should conform to appropriate standards, be suitable for use, be kept in good condition and properly maintained. Your supplier of personal protective equipment should be consulted for advice on selection and appropriate standards. For further information contact your national organisation for standards.

Provide exhaust ventilation or other engineering controls to keep the relevant airborne concentrations below their respective occupational exposure limits.

The final choice of protective equipment will depend upon a risk assessment. It is important to ensure that all items of personal protective equipment are compatible.

Environmental exposure controls

Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

Individual protection measures

Hygiene measures

Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Eye/face protection

Chemical splash goggles.

Skin protection

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Section 8. Exposure controls/personal protection

Hand protection

Wear chemical resistant gloves. Recommended: Nitrile gloves.

Do not re-use gloves. Protective gloves must give suitable protection against mechanical risks (i.e. abrasion, blade cut and puncture). Protective gloves will deteriorate over time due to physical and chemical damage. Inspect and replace gloves on a regular basis. The frequency of replacement will depend upon the circumstances of use.

Consult your supervisor or Standard Operating Procedure (S.O.P) for special handling instructions.

Body protection

Use of protective clothing is good industrial practice. Cotton or polyester/cotton overalls will only provide protection against light superficial contamination that will not soak through to the skin. Overalls should be laundered on a regular basis. When the risk of skin exposure is high (e.g. when cleaning up spillages or if there is a risk of splashing) then chemical resistant aprons and/or impervious chemical suits and boots will be required. Wear suitable protective clothing. Footwear highly resistant to chemicals. When there is a risk of ignition from static electricity, wear anti-static protective clothing. For greatest effectiveness against static electricity, overalls, boots and gloves should all be anti-static. When there is a risk of ignition wear inherently fire resistant protective clothes and gloves. Work clothing / overalls should be laundered on a regular basis. Laundering of contaminated work clothing should only be done by professional cleaners who have been told about the hazards of the contamination. Always keep contaminated work clothing away from uncontaminated work clothing and uncontaminated personal clothes. When the risk of skin exposure is high (from experience this could apply to the following tasks: cleaning work, maintenance and service, filling and transfer, taking samples and cleaning up spillages) then a chemical protective suit and boots will be required. Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Other skin protection

Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Respiratory protection

Use only with adequate ventilation. Do not breathe vapor or mist. If ventilation is inadequate, use a NIOSH certified respirator with an organic vapor cartridge and P95 particulate filter. If operating conditions cause high vapor concentrations or the TLV is exceeded, use supplied-air respirator.

CAUTION: The protection provided by air-purifying respirators is limited. Use a positive pressure air-supplied respirator if there is any potential for an uncontrolled release, if exposure levels are not known, or if concentrations exceed the protection limits of air-purifying respirator.

Use with adequate ventilation.

In case of insufficient ventilation, wear suitable respiratory equipment.

If there is a requirement for the use of a respiratory protective device, but the use of breathing apparatus (independent of ambient atmosphere) is not required, then a suitable filtering device must be worn.

The filter class must be suitable for the maximum contaminant concentration (gas/vapor/aerosol/particulates) that may arise when handling the product.

The correct choice of respiratory protection depends upon the chemicals being handled, the conditions of work and use, and the condition of the respiratory equipment. Safety procedures should be developed for each intended application. Respiratory protection equipment should therefore be chosen in consultation with the supplier/manufacturer and with a full assessment of the working conditions.

Section 9. Physical and chemical properties

Appearance

Physical state

Liquid.

Color

Yellow. [Light]

Odor

Kerosene

Odor threshold

Not available.

pH

Not available.

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Section 9. Physical and chemical properties

Melting point	Not available.
Boiling point	162.78°C (325°F)
Flash point	Closed cup: >60°C (>140°F)
Evaporation rate	Not available.
Flammability (solid, gas)	Not applicable. Based on - Physical state
Lower and upper explosive (flammable) limits	Lower: 0.7% Upper: 5%
Vapor pressure	<0.266 kPa (<2 mm Hg) at 20°C
Vapor density	Not available.
Density	860 kg/m ³ (0.86 g/cm ³)
Solubility	negligible <0.1%
Partition coefficient: n-octanol/water	Not available.
Auto-ignition temperature	257°C (494.6°F)
Decomposition temperature	Not available.
Viscosity	Dynamic: 0.003 Pa·s (3 cP) at 37.778°C Kinematic: 2 to 11 mm ² /s (2 to 11 cSt) at 40°C

Section 10. Stability and reactivity

Reactivity	No specific test data available for this product. Refer to Conditions to avoid and Incompatible materials for additional information.
Chemical stability	The product is stable.
Possibility of hazardous reactions	Under normal conditions of storage and use, hazardous reactions will not occur. Under normal conditions of storage and use, hazardous polymerization will not occur.
Conditions to avoid	Keep away from heat, sparks and flame. Avoid all possible sources of ignition (spark or flame).
Incompatible materials	Reactive or incompatible with the following materials: oxidizing materials, acids and alkalis. halogenated compounds.
Hazardous decomposition products	Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Section 11. Toxicological information

Information on toxicological effects

Acute toxicity

Product/ingredient name	Test	Species	Result	Exposure	Remarks
Fuels, diesel, No 2	LC50 Inhalation Dusts and mists	Rat	4.1 mg/l	4 hours	Based on Diesel fuel
	LD50 Dermal	Rabbit	>4300 mg/kg	-	Based on No. 2 Heating Oil.
	LD50 Dermal	Rabbit	>4300 mg/kg	-	Based on Diesel fuel
	LD50 Oral	Rat	17900 mg/kg	-	Based on No. 2 Heating Oil.
	LD50 Oral	Rat	7600 mg/kg	-	Based on Diesel

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Section 11. Toxicological information

fuel

Conclusion/Summary Not available.

Irritation/Corrosion

Product/ingredient name	Species	Result	Score	Exposure	Observation	Conc.	Remarks
Fuels, diesel, No 2	Rabbit	Skin - Irritation	-	-	-	-	Based on No. 2 Heating Oil.
	Rabbit	Skin - Irritation	-	-	-	-	Based on Diesel fuel
	Rabbit	Eyes - Non-irritating to the eyes.	-	-	-	-	Based on No. 2 Heating Oil.
	Rabbit	Eyes - Non-irritating to the eyes.	-	-	-	-	Based on Diesel fuel

Sensitizer

Product/ingredient name	Route of exposure	Species	Result	Remarks
Fuels, diesel, No 2	skin	Guinea pig	Not sensitizing	Based on No. 2 Heating Oil.
	skin	Guinea pig	Not sensitizing	Based on Diesel fuel

Mutagenicity

Product/ingredient name	Test	Experiment	Result	Remarks
Fuels, diesel, No 2	OECD 471	Experiment: In vitro Subject: Non-mammalian species	Positive	Based on Diesel fuel
	Equivalent to OECD 476	Experiment: In vitro Subject: Mammalian-Animal Cell: Germ	Negative	Based on Heating Oil.
	not guideline	Experiment: In vivo Subject: Unspecified Cell: Somatic	Negative	Based on Heating Oil.

Conclusion/Summary Not classified. Based on available data, the classification criteria are not met.

Carcinogenicity

Product/ingredient name	Species	Route	Exposure	Test	Result	Remarks
Fuels, diesel, No 2	Mouse	Dermal	Positive - Dermal - Unspecified	2 years	-	Based on Heating Oil.

Conclusion/Summary Suspected of causing cancer.

Classification

Product/ingredient name	OSHA	IARC	NTP
naphthalene	-	2B	Reasonably anticipated to be a human carcinogen.

IARC :
2B - Possible carcinogen to human.

NTP :
Possible - Reasonably anticipated to be human carcinogens.

Reproductive toxicity

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Section 11. Toxicological information

Product/ingredient name	Maternal toxicity	Fertility	Development toxin	Species	Result	Exposure
Fuels, diesel, No 2	-	-	Negative	Rat	Dermal	20 days
	-	-	Negative	Rat	Dermal	10 days
	-	-	Negative	Rat	Dermal	10 days

Conclusion/Summary
 Development: Not classified. Based on available data, the classification criteria are not met.
 Fertility: Not classified. Based on available data, the classification criteria are not met.
 Effects on or via lactation: Not classified. Based on available data, the classification criteria are not met.

Specific target organ toxicity (repeated exposure)

Name	Category	Route of exposure	Target organs
Fuels, diesel, No 2	Category 2	Not determined	Not determined

Aspiration hazard

Name	Result
Fuels, diesel, No 2	ASPIRATION HAZARD - Category 1

Information on the likely routes of exposure
 Routes of entry anticipated: Oral, Dermal, Inhalation.

Potential acute health effects

Eye contact
 No known significant effects or critical hazards.

Skin contact
 Causes skin irritation.

Inhalation
 Harmful if inhaled.

Ingestion
 Irritating to mouth, throat and stomach. Aspiration hazard if swallowed -- harmful or fatal if liquid is aspirated into lungs.

Symptoms related to the physical, chemical and toxicological characteristics

Eye contact
 Adverse symptoms may include the following:
 pain or irritation
 watering
 redness

Skin contact
 Adverse symptoms may include the following:
 irritation
 redness

Inhalation
 Adverse symptoms may include the following:
 nausea or vomiting
 headache
 drowsiness/fatigue
 dizziness/vertigo
 unconsciousness

Ingestion
 Adverse symptoms may include the following:
 nausea or vomiting

Delayed and immediate effects and also chronic effects from short and long term exposure

Short term exposure

Potential immediate effects
 Vapor, mists or fumes may contain polycyclic aromatic hydrocarbons some of which are known to produce skin cancer. May be harmful by inhalation if exposure to vapor, mists or fumes resulting from thermal decomposition products occurs. Vapor, mist or fume may irritate the nose, mouth and respiratory tract. Vapor, mist or fume may cause eye irritation. Exposure to vapor, mist or fume may cause stinging, redness and watering of the eyes.

Potential delayed effects
 As with all such products containing potentially harmful levels of PCAs, prolonged or repeated skin contact may eventually result in dermatitis or more serious irreversible skin disorders including cancer.

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Section 11. Toxicological information

Long term exposure

Potential immediate effects Not available.

Potential delayed effects Not available.

Potential chronic health effects

General May cause damage to organs through prolonged or repeated exposure. Vapor, mists or fumes may contain polycyclic aromatic hydrocarbons some of which are known to produce skin cancer.

Carcinogenicity Suspected of causing cancer. Risk of cancer depends on duration and level of exposure.

Mutagenicity No known significant effects or critical hazards.

Teratogenicity No known significant effects or critical hazards.

Developmental effects No known significant effects or critical hazards.

Fertility effects No known significant effects or critical hazards.

Numerical measures of toxicity

Acute toxicity estimates

Not available.

Other information

Aspiration of this product into the lungs can cause chemical pneumonia and can be fatal. Aspiration into the lungs can occur while vomiting after ingestion of this product. Do not siphon by mouth.

Additional information

Middle distillate: From skin-painting studies of petroleum distillates of similar composition and distillate range, it has been shown that these types of materials often possess weak carcinogenic activity in laboratory animals. In these tests, the material is painted on the shaved backs of mice twice a week for their lifetime. The material is not washed off between applications. Therefore, there may be a potential risk of skin cancer from prolonged or repeated skin contact with this product in the absence of good personal hygiene. This particular product has not been tested for carcinogenic activity, but we have chosen to be cautious in light of the findings with other distillate streams.

Occasional skin contact with this product is not expected to have serious effects, but good personal hygiene should be practiced and repeated skin contact avoided. This product can also be expected to produce skin irritation upon prolonged or repeated skin contact. Personal hygiene measures taken to prevent skin irritation are expected to be adequate to prevent risk of skin cancer.

Diesel exhaust particulates have been classified by the National Toxicological Program (NTP) to be a reasonably anticipated human carcinogen. Exposure should be minimized to reduce potential risk.

Naphthalene has been reported to cause developmental toxicity in mice after oral exposure to relatively high dose levels, but developmental toxicity was not observed in NTP (National Toxicology Program) sponsored studies in rats and rabbits. Ingestion or inhalation of naphthalene can result in hemolysis and other blood abnormalities, and individuals (and infants) deficient in glucose-6-phosphate dehydrogenase may be especially susceptible to these effects. Inhalation of naphthalene may cause headache and nausea. Airborne exposure can result in eye irritation. Naphthalene exposure has been associated with cataracts in animals and humans.

Section 12. Ecological information

Toxicity

<u>Product/ingredient name</u>	<u>Species</u>	<u>Test/Result</u>	<u>Exposure</u>	<u>Effects</u>	<u>Remarks</u>
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Fuels, diesel, No 2	Micro-organism	EL50 >1000 mg/l Nominal Fresh water	40 hours	growth inhibition	Based on Vacuum gas oil / Hydrocracked gas oil / Distillate Fuel
	Micro-organism	NOELR 3.217 mg/ l Nominal Fresh water	40 hours	growth inhibition	Based on Vacuum gas oil / Hydrocracked gas oil / Distillate Fuel
	Algae	Acute EL50 22 mg/l Nominal Fresh water	72 hours	(growth rate)	Based on Diesel fuel
	Daphnia	Acute EL50 210 mg/l Nominal Fresh water	48 hours	Mobility	Based on Diesel fuel
	Daphnia	Acute EL50 68 mg/l Nominal Fresh water	48 hours	Mobility	Based on Diesel fuel
	Algae	Acute ErL50 78 mg/l Nominal Fresh water	72 hours	(growth rate)	Based on Diesel fuel
	Fish	Acute LL50 65 mg/l Nominal Fresh water	96 hours	Mortality	Based on Diesel fuel
	Fish	Acute LL50 21 mg/l Nominal Fresh water	96 hours	Mortality	Based on Diesel fuel
	Algae	Acute NOELR 10 mg/l Nominal Fresh water	72 hours	(growth rate)	Based on Diesel fuel
	Algae	Acute NOELR 1 mg/l Nominal Fresh water	72 hours	(growth rate)	Based on Diesel fuel
	Daphnia	Acute NOELR 46 mg/l Nominal Fresh water	48 hours	Mobility	Based on Diesel fuel
	Fish	Chronic NOEL 0. 083 mg/l Nominal Fresh water	14 days	Mortality	Based on Vacuum gas oil / Hydrocracked gas oil / Distillate Fuel
	Daphnia	Chronic NOELR 0.2 mg/l Nominal Fresh water	21 days	Immobilization	Based on Vacuum gas oil / Hydrocracked gas oil / Distillate Fuel

Conclusion/Summary Not available.

Persistence and degradability

Not available.

Product/ingredient name	Test	Result	Remarks
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Section 12. Ecological information

Fuels, diesel, No 2	OECD 301 F	60 % - Readily - 28 days	Based on Diesel fuel
	OECD 301 F	57.5 % - Not readily - 28 days	Based on Diesel fuel
	Equivalent to EPA OTS 796.3100	35 % - Not readily - 28 days	Based on Gas Oils (petroleum), solvent refined

Conclusion/Summary Not available.

Bioaccumulative potential

This product is not expected to bioaccumulate through food chains in the environment.

Mobility in soil

Soil/water partition coefficient (K_{oc}) Not available.

Mobility Spillages may penetrate the soil causing ground water contamination. This material may accumulate in sediments.

Other adverse effects No known significant effects or critical hazards.

Other ecological information Spills may form a film on water surfaces causing physical damage to organisms. Oxygen transfer could also be impaired.

Section 13. Disposal considerations

Disposal methods The generation of waste should be avoided or minimized wherever possible. Significant quantities of waste product residues should not be disposed of via the foul sewer but processed in a suitable effluent treatment plant. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Care should be taken when handling emptied containers that have not been cleaned or rinsed out. Empty containers or liners may retain some product residues. Vapor from product residues may create a highly flammable or explosive atmosphere inside the container. Do not cut, weld or grind used containers unless they have been cleaned thoroughly internally. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

United States - RCRA Toxic hazardous waste "U" List

Ingredient	CAS #	Status	Reference number
Naphthalene	91-20-3	Listed	U165

Section 14. Transport information

	DOT Classification	TDG Classification	IMDG	IATA
UN number	NA 1993	UN 1202	UN1202	UN1202
UN proper shipping name	DIESEL FUEL	DIESEL FUEL	DIESEL FUEL MARINE POLLUTANT	DIESEL FUEL

Section 14. Transport information

Transport hazard class(es)	Combustible liquid.	3 	3  	3 
Packing group	III	III	III	III
Environmental hazards	No.	No.	Yes.	No.
Additional information	<p>Non-bulk packages (less than or equal to 119 gal) of combustible liquids are not regulated as hazardous materials in package sizes less than the product reportable quantity.</p> <p>Reportable quantity 3333.3 lbs / 1513.3 kg [464.86 gal / 1759.7 L] Package sizes shipped in quantities less than the product reportable quantity are not subject to the RQ (reportable quantity) transportation requirements.</p>	-	<p>The marine pollutant mark is not required when transported in sizes of ≤5 L or ≤5 kg.</p> <p>Emergency schedules (EmS) F-E, S-E</p>	The environmentally hazardous substance mark may appear if required by other transportation regulations.

Special precautions for user Not available.

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

Proper shipping name

MARPOL Annex 1 rules apply for bulk shipments by sea.
Category: gas oils, including ship's bunkers

Section 15. Regulatory information

U.S. Federal regulations

United States inventory (TSCA 8b) All components are listed or exempted.

[SARA 302/304](#)

[Composition/information on ingredients](#)

No products were found.

[SARA 311/312](#)

Classification Fire hazard
Immediate (acute) health hazard
Delayed (chronic) health hazard

[SARA 313](#)

	Product name	CAS number	Concentration
Form R - Reporting requirements	naphthalene	91-20-3	1 - 3
Supplier notification	naphthalene	91-20-3	1 - 3

SARA 313 notifications must not be detached from the SDS and any copying and redistribution of the SDS shall include copying and redistribution of the notice attached to copies of the SDS subsequently redistributed.

State regulations

Massachusetts

The following components are listed: NAPHTHALENE

New Jersey

The following components are listed: NAPHTHALENE; MOTH FLAKES

Pennsylvania

The following components are listed: NAPHTHALENE

California Prop. 65

WARNING: This product contains a chemical known to the State of California to cause cancer.
naphthalene; ethylbenzene; cumene

WARNING: This product contains a chemical known to the State of California to cause birth defects or other reproductive harm.
toluene

WARNING: This product contains a chemical known to the State of California to cause cancer and birth defects or other reproductive harm.
Benzene

Prop 65 chemicals will result under certain conditions from the use of this material. For example, burning fuels produces combustion products including diesel exhaust, a Prop 65 carcinogen, and carbon monoxide, a Prop 65 reproductive toxin.

Other regulations

Australia inventory (AICS)

At least one component is not listed.

Canada inventory

All components are listed or exempted.

China inventory (IECSC)

All components are listed or exempted.

Japan inventory (ENCS)

Not determined.

Korea inventory (KECI)

All components are listed or exempted.

Philippines inventory (PICCS)

At least one component is not listed.

REACH Status

For the REACH status of this product please consult your company contact, as identified in Section 1.

Product name Fuels, diesel

Product code SMF2115

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Section 16. Other information

Hazardous Material Information System (U.S.A.)

Health	*	2
Flammability		2
Physical hazards		0
Personal protection		X

Caution: HMIS® ratings are based on a 0-4 rating scale, with 0 representing minimal hazards or risks, and 4 representing significant hazards or risks. Although HMIS® ratings are not required on SDSs under 29 CFR 1910.1200, the preparer may choose to provide them. HMIS® ratings are to be used with a fully implemented HMIS® program. HMIS® is a registered mark of the National Paint & Coatings Association (NPCA). HMIS® materials may be purchased exclusively from J. J. Keller (800) 327-6868.

National Fire Protection Association (U.S.A.)



History

Date of issue/Date of revision 10/07/2014.

Date of previous issue 10/03/2014.

Key to abbreviations

ACGIH = American Conference of Industrial Hygienists
ATE = Acute Toxicity Estimate
BCF = Bioconcentration Factor
CAS Number = Chemical Abstracts Service Registry Number
GHS = Globally Harmonized System of Classification and Labelling of Chemicals
IATA = International Air Transport Association
IBC = Intermediate Bulk Container
IMDG = International Maritime Dangerous Goods
LogPow = logarithm of the octanol/water partition coefficient
MARPOL 73/78 = International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978. ("Marpol" = marine pollution)
OEL = Occupational Exposure Limit
SDS = Safety Data Sheet
STEL = Short term exposure limit
TWA = Time weighted average
UN = United Nations
UN Number = United Nations Number, a four digit number assigned by the United Nations Committee of Experts on the Transport of Dangerous Goods.

✔ Indicates information that has changed from previously issued version.

Notice to reader

All reasonably practicable steps have been taken to ensure this data sheet and the health, safety and environmental information contained in it is accurate as of the date specified below. No warranty or representation, express or implied is made as to the accuracy or completeness of the data and information in this data sheet.

The data and advice given apply when the product is sold for the stated application or applications. You should not use the product other than for the stated application or applications without seeking advice from BP Group.

It is the user's obligation to evaluate and use this product safely and to comply with all applicable laws and regulations. The BP Group shall not be responsible for any damage or injury resulting from use, other than the stated product use of the material, from any failure to adhere to recommendations, or from any hazards inherent in the nature of the material. Purchasers of the product for supply to a third party for use at work, have a duty to take all necessary steps to ensure that any person handling or using the product is provided with the information in this sheet. Employers have a duty to tell employees and others who may be affected of any hazards described in this sheet and of any precautions that should be taken. You can contact the BP Group to ensure that this document is the most current available. Alteration of this document is strictly prohibited.

Product name Fuels, diesel

Product code SMF2115

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APPENDIX C. REFERENCES

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- [3] Riskcon Engineering Pty Ltd, "RCE-21129 Woodlawn ARC FSS_Final_10Jun22_Rev(4)," 2022.
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