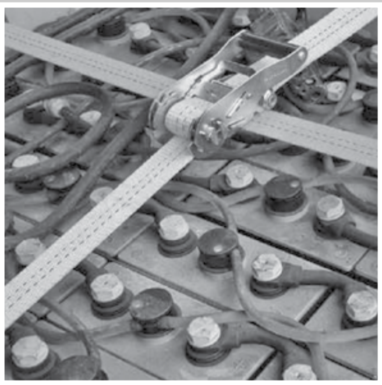
Route Evaluation Study

Appendix F



Appendix F — Route Evaluation Study

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KURRI KURRI BATTERY RECYCLING FACILITY

ROUTE EVALUATION STUDY

EMM CONSULTING PTY LTD

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Title: **Kurri Kurri Battery Recycling Facility** **Environmental Impact Statement** **Route evaluation study**	**QA verified:** H de Vries **Date: 27-Oct-2016**

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ABBREVIATIONS

ADG(C)	Australian Dangerous Goods (Code)
AS	Australian Standard
DA	Development Application
DG	Dangerous Good
DPE	Department Planning and Environment
EIS	Environmental Impact Statement
EP&A	Environmental Planning & Assessment
EPA	Environment Protection Authority
ERP	Emergency Response Plan
ha	hectare
HIPAP	Hazardous Industry Planning and Advisory Paper
km	kilometre
L	litre
LEP	Local Environmental Plan
LPG	Liquefied Petroleum Gas
m	metre
PG	Packing Group
PHA	Preliminary Hazard Analysis
PPE	Personal Protective Equipment
RMS	Roads and Maritime Services
SDS	(Material) Safety Data Sheet
SEPP	State Environmental Planning Policy
SSD	State Significant Development
TfNSW	Transport for New South Wales
tpa	tonnes per annum
ULAB	Used Lead-Acid Battery

1. SUMMARY

1.1. Background, purpose and scope

This route evaluation study has been prepared by Sherpa Consulting Pty Ltd (Sherpa) for Pymore Recyclers International Pty Ltd (Pymore) proposed Used Lead-Acid Battery (ULAB) recycling facility (the project) at 129 Mitchell Avenue, Kurri Kurri (the site).

The project is designed to recycle approximately 60,000 tonnes per annum (tpa) of ULABs. The project will have four main processes – crushing, screening and separation; desulphurisation; crystallisation; and lead extraction. The entire process converts a ULAB into materials which are recycled for use in new products. Lead and plastics recovered are used in the production of new batteries. Sodium sulphate crystals, a by-product of ULAB recycling, can be readily used in other industries.

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).

Based on the NSW Department of Planning and Environment (DPE) *Applying State Environmental Planning Policy (SEPP) 33* screening*,* Ref (1), the project was found to be 'potentially hazardous' with respect to transportation, hence a route evaluation study was required for inclusion in the EIS. This route evaluation study will be appended to the EIS for the project.

1.2. Major findings

There were a limited number of routes suitable for heavy vehicles between the Hunter Expressway and the site. Three routes from the Hunter Expressway to the site were assessed:

- Route 1: Hunter Expressway via Hart Road, Government Road and Mitchell Avenue to site.
- Route 2: Hunter Expressway via Main Road, Lang Street and Mitchell Avenue to site.
- Route 3: Hunter Expressway via John Renshaw Drive, Mulbring Street, Tarro Street, Victoria Street and Mitchell Avenue to site.

Due to the nature of materials being transported, the safety and environmental impacts of incidents (resulting in spills) are very low (i.e. low injury impact and low environmental impact).

It is concluded that the risk of transportation of materials to and from the proposed site will not result in a significant impact to sensitive land uses along the proposed routes as the consequences of spills is low and the expected frequency of spills is very low.

No transport incidents with the potential for serious impact such as major fires or explosions were identified and therefore risk transects were not generated for the transport routes to the site.

As the consequence and expected frequency of spill incidents is low, the risk of significant impact will also be low. Given that there is not a significant increase in risk to local traffic users and to sensitive land uses along the transport routes to the site, the proposed transport operations will meet the DPE criteria for acceptable risk.

The following conclusions were made:

- All three routes assessed were found to be suitable for transportation of the hazardous materials, assessed in this study, between the Hunter Expressway and the site.
- Out of the three routes assessed, Route 1 was preferred due to its:
    - lower impact on residential or sensitive land uses and associated populations
    - lower accident rates relative to the other two routes
    - removal of additional hazard posed by crossing at railway level crossing on alternate routes.
- Route 1 would be suitable for trucks travelling northbound to the site (the assumed common mode of travel from major population centres, i.e. Sydney and Newcastle) and southbound to the site.
- Trucks travelling southbound along the Hunter Expressway can use Route 1 by doing a U-turn at the intersection with Main Road, and then travelling north along Hunter Expressway back to the Hart Road exit.

2. INTRODUCTION

2.1. Background

This route evaluation study has been prepared by Sherpa Consulting Pty Ltd (Sherpa) for Pymore Recyclers International Pty Ltd's proposed Used Lead-Acid Battery (ULAB) recycling facility (the project) at 129 Mitchell Avenue, Kurri Kurri (the site).

The project would recycle approximately 60,000 tpa of ULABs. The project would have four main processes – crushing, screening and separation; desulphurisation; crystallisation; and lead extraction. The entire process converts a ULAB into materials which are recycled for use in new products. Lead and plastics recovered are used in the production of new batteries. Sodium sulphate crystals, a by-product of ULAB recycling, can be readily used in other industries.

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

Based on the screening process in the NSW DPE *Applying State Environmental Planning Policy (SEPP) 33,* Ref(1), the project was found to be 'potentially hazardous' with respect to transportation, hence a route evaluation study was required for inclusion in the EIS. This route evaluation study will be appended to the EIS for the project.

2.2. Objectives

The overall objectives of the route evaluation study were to identify whether there was a preferred transport route to and from the site, taking into account the following factors from NSW DPE Hazardous Industry Planning Advisory Paper (HIPAP) 11 *Route Selection (2011)* Ref (2):

- mandatory factors (i.e. statutory requirements)
- subjective factors (including sensitive populations, special land uses and emergency response capability)
- road and traffic factors including the identification of the most suitable routes.

2.3. Scope

The study covered the transportation of materials to and from the site.

The overall scope of the study was to undertake an assessment of the impact due to transport of hazardous material arising from the operations of the project. The study addressed transportation of the following materials:

- used batteries
- process chemicals

- furnace fluxes/reducing agents
- waste slag.

2.4. Exclusions and limitations

This study excluded the following:

- Quantification of transport risk. A comparative qualitative study only has been carried out based on the route selection factors identified in HIPAP 11.
- On site risks at the project (loading/unloading trucks) (i.e. gate to gate transport only is covered).
- Consultation with local emergency responders.
- Deliberate acts such as sabotage/terrorism.
- Fatalities and injuries to the truck drivers/ passengers in vehicles transporting materials to the site involved in accidents are outside the scope of the assessment which is concerned with risks to members of the public and to the environment.
- Hazards and risks associated with the storage and handling of hazardous materials at the site. This is carried out in a separate report, which is the Preliminary Hazard Analysis (PHA), Ref (3).

The limitations of this study are:

- It is assumed that the standard requirements for Australian Dangerous Goods Code transport requirements regarding placarding, driver training and securing load will be followed.
- The study assessed the routes from the Hunter Expressway to the site as these are the preferred routes. However a small number of vehicles may come from other locations such as Government Road south of Mitchell Avenue, and Northcote Street south of Mitchell Avenue as indicated in the traffic assessment Ref (4).
- The analysis was carried out and conclusions drawn based on the hazardous materials listed in APPENDIX A only.

3. SEPP 33 FINDINGS

To determine whether a proposed development is potentially hazardous for transportation and hence requires a route evaluation study, the risk screening process in the NSW DPE Applying SEPP 33 guideline Ref. (1) considers the type and quantity of hazardous materials to be transported to and from the site.

From the information in Table 3.2, the assessment in Table 3.1 was constructed. As the quantity of hazardous chemicals transported will exceed the SEPP 33 screening threshold, the project was classified as 'potentially hazardous' with respect to transportation.

Table 3.1: Site SEPP 33 screening

Class	Sub	PG[(a)]	Minimum quantity per load (in tonnes) Per load (bulk/ package)	Threshold (Bulk)	Threshold (Packages)	Potentially hazardous?	Vehicle Movements (Weekly – peak) Transport quantities	Threshold	Potentially hazardous?	Vehicle movements (Annual – cumulative) Transport quantities	Threshold	Potentially hazardous?
2.2	5.1	-	23	-	-	N/A [(b)]	0	-	N/A [(a)]	12	-	N/A [(a)]
5.1	8	II	24	2	5	Yes	0	>30	No	11	>500	No
8[(c)]	-	II	6	2	5	Yes	39	>30	Yes	2,000	>500	Yes

(a) PG means Packing Group.
(b) Non-flammable, non-toxic gases and are not considered to be potentially hazardous with respect to off-site risk.
(c) Predominantly sulphuric acid within the ULABs.

Table 3.2: Site hazardous chemical transportation

Dangerous goods classification	Class	Sub-class	Packing Group	UN	Proper Shipping Name	Description	Transport methods	Minimum quantity per load	Vehicle movements		Transport quantities (monthly)
									Weekly (peak)	Annual (cumula-tive)	
Non-flammable, non-toxic gases	2.2	5.1	-	1073	Oxygen, refrigerated liquid	Liquid oxygen	lorry (20,000 L capacity)	23	0	12	1
Oxidising substances	5.1	8	III	2984	Hydrogen peroxide, aqueous solutions	Hydrogen Peroxide	semi trailer (24 tonnes)	24	NA	11	1
Corrosive substances	8	-	II	1849	Sodium sulfide, hydrated	Sodium Sulphide (62%)	supplier ute/delivery van	NA	NA	1	NA
	8	-	-	2794	Batteries, wet, filled with acid, electric storage	ULAB	B doubles trailer (36 tonnes max) and semi trailers (24T)	7.2	39	2000	167

4. TRANSPORTATION DETAILS

4.1. Location and surrounds

The site is in the Cessnock local government area, approximately 40 km northwest of Newcastle Figure 4.1. The site will occupy part (approximately 3.4 ha) of the lot on which the Weston Aluminium Dross Recycling Plant (the aluminium plant) is located.

The site currently comprises undeveloped land used for the storage of unused industrial equipment for the aluminium plant. Some remnant native vegetation occurs in the southern portion of the site.

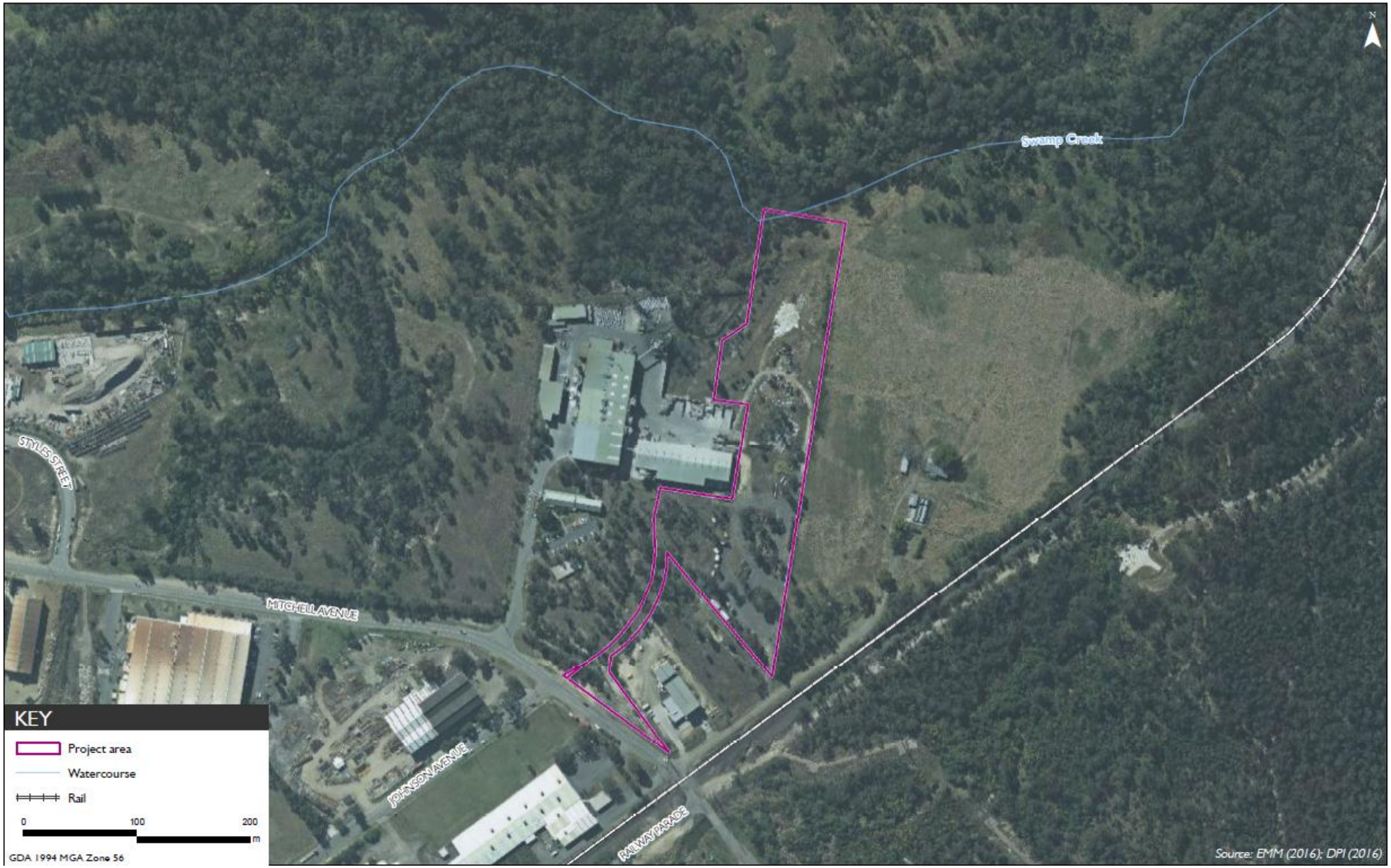
Surrounding land uses are primarily industrial as shown in Figure 4.2, including the aluminium plant, a waste-water treatment facility 750 m to the east, and the Hydro Aluminium Kurri Kurri Smelter 1,300 m to the north. The residential areas of Kurri Kurri and Weston are approximately 650 m to the south-east and 1,000 m to the west of the site, respectively. The Hunter Expressway is approximately 550 m to the north-east. Swamp Creek is approximately 70 m to the north.

The site is zoned IN3 Heavy Industrial under the Cessnock Local Environmental Plan (LEP) 2011.

A full description of the site and operations is given in the PHA report, Ref. (3). Information relevant to this route evaluation study is included here.

Figure 4.1: Site Location

Figure 4.2: Surrounding land use



4.2. Materials to be transported

4.2.1. Overview

The project is designed for a feed capacity of 60,000 tonnes of ULABs per year. The ULABs will be delivered to site in bulk by semi-trailers (with a capacity of 24 tonnes and B-doubles (with a capacity of 36 tonnes). Semi-trailers to B-Doubles will be in 50%-50% delivery ratio, hence an average loading capacity of 30 tonnes per truck. Approximately 2,000 truck-loads per year (Semi-Trailers and B-Doubles combined) would be delivered to the site.

Incoming ULABs, process chemicals, furnace fluxes/reducing agents and waste products will be transported to and from site by trucks. The source of materials delivered to site and the destination of materials transferred from the site is expected to be Sydney. .

The following materials will be transported to site:

- About 2,000 truck-loads (semi-trailers and b-doubles combined) of ULABs per year, assuming each truck contains an average of 30 tonnes.
- About 387 trucks of chemicals (including desulphurising agents) and 36 trucks of utility supplies per year, a typical truck would contain a minimum of 20-24 tonnes of material. Some products are used in low quantities and are delivered intermittently.

Materials produced by the recycling process will be transported from site as follows:

- About 750 trucks of recovered lead per year, each truck containing a minimum of 40 tonnes of lead bullion
- About 90 trucks of polypropylene per year, each truck containing a minimum of 40 tonnes of material
- About 465 trucks of sodium sulphate per year, each truck containing a minimum of 20 tonnes of material.

About 158 trucks of waste slag and 45 trucks of polyethylene waste per year, each truck containing a minimum of 20 tonnes of waste

A summary of the dangerous goods transported to and from the site is provided in Table 3.2.

4.3. Possible transportation routes

The supply of ULABs will be transported to the site from a variety of locations. Based on a review of the major truck routes provided by the Roads and Maritime Services

(RMS)[1], the three routes described in Table 4.1 and shown in Figure 4.3 from the Hunter expressway to the site are proposed for a route evaluation study.

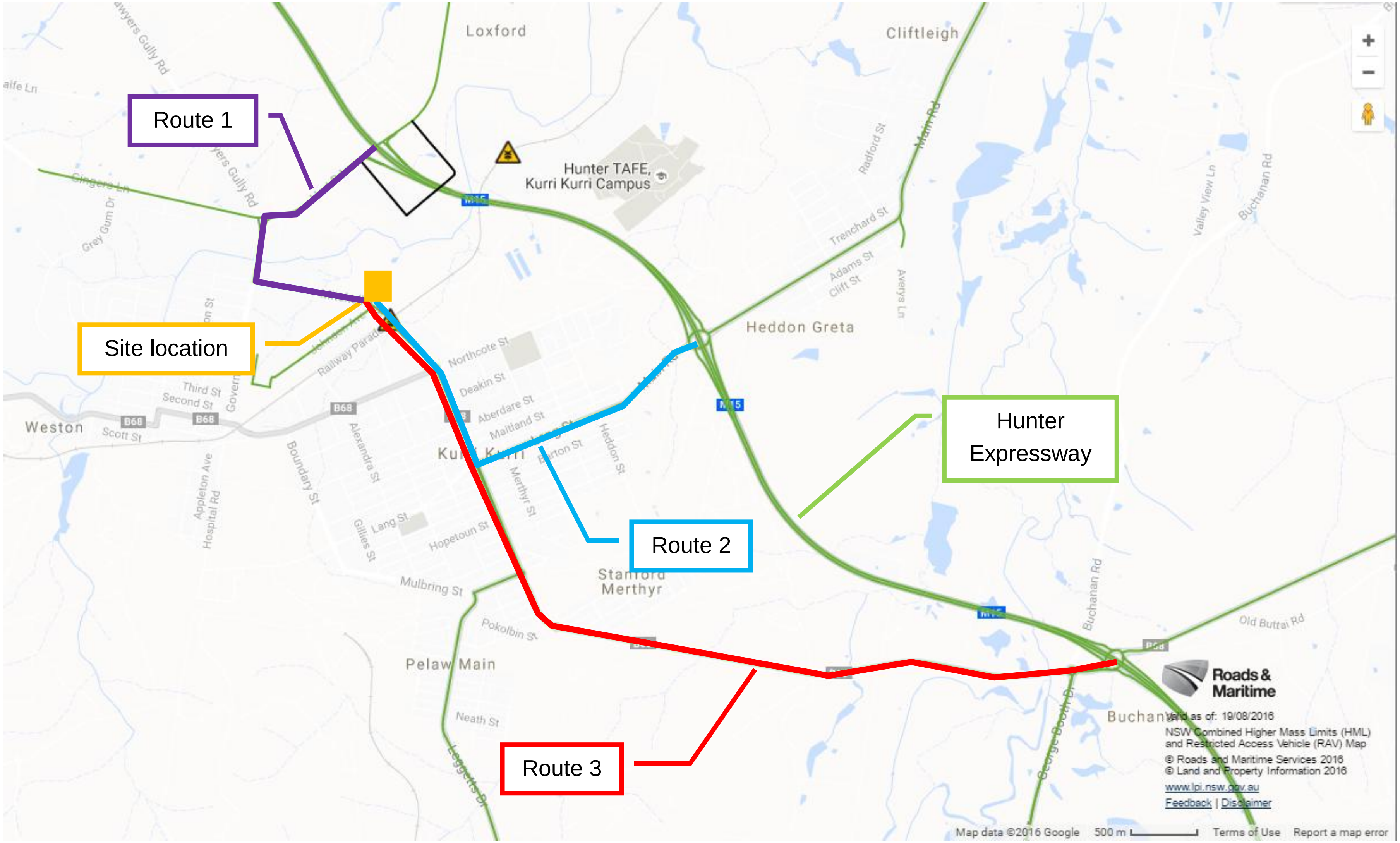
The three routes to/from the Hunter Expressway assessed in this study are preferred, however a small amount of vehicles may come from other locations such as Government Road south of Mitchell Avenue and Northcote Street south of Mitchell Avenue as indicated in the traffic assessment study, Ref (4).

Table 4.1: Route descriptions

Route	Directions
1	Hunter Expressway to Hart Road exit
	Hart Road to Government Road
	Government Road to Mitchell Avenue
	Mitchell Avenue to the site
2	Hunter Expressway to Main Road exit
	Main Road to Lang Street
	Lang Street to Mitchell Avenue
	Mitchell Avenue to the site
3	Hunter Expressway to John Renshaw Drive exit
	John Renshaw Drive to Mulbring Street
	Mulbring Street to Tarro Street
	Tarro Street to Victoria Street
	Victoria Street to Mitchell Avenue
	Mitchell Avenue to the site

[1]http://www.rms.nsw.gov.au/business-industry/heavy-vehicles/maps/restricted-access-vehicles-map/map/

Figure 4.3: Map of possible transportation routes



5. HAZARD IDENTIFICATION

5.1. Overview

Hazard identification involves a review of the nature of materials used and the type of operations undertaken to identify possible events which could lead to impact to members of the public or to the environment. The consequences of hazardous incidents should be considered when determining events with the potential for impact. When considering transport incidents, it is important to identify potentially sensitive locations (such as residences, rivers and creeks).

It is also important to identify the potential causes of incidents to ensure proposed safeguards are adequate to minimise the likelihood of incidents occurring and to identify additional safeguards which may be required to achieve an acceptable level of risk. Based on the materials listed in APPENDIX A, a hazard identification word table was prepared as shown in APPENDIX B. Further context was provided by the accident data sourced from RMS reproduced in APPENDIX C.

The following sections describe the results of the hazard identification.

5.2. Hazardous properties of material transport

The hazard identification matrix indicated that the main materials of concern for transport were:

- electrolyte
- slag
- process chemicals and furnace fluxes/reducing agents
- hydrogen peroxide.

Accidents involving transport of other substances, i.e. lead bullion, plastic, activated carbon, sodium sulphate, diesel fuel, oxygen and calcium hydroxide would not result in a significant safety or environmental hazard.

5.2.1. Electrolyte

Battery acid consists of dilute sulphuric acid (about 15-20%) and may result in skin irritation on contact and could potentially cause blindness if splashed in the eyes. Personnel should use personal protective equipment (PPE) when handling and recovering batteries or electrolyte.

5.2.2. Slag

Slag produced by Pymore will be classified as ‘hazardous waste’ as it contains 3-6% lead as per the NSW Environment Protection Authority (EPA) Waste Classification Guidelines Part 1: Classifying Waste, Ref (5).

5.2.3. Process chemicals and furnace fluxes/reducing agents

Process chemicals and furnace fluxes/reducing agents were found to pose a minor environmental impact being either non-classified or class 8 dangerous goods and so with similar properties to the electrolyte.

5.2.4. Hydrogen peroxide

Hydrogen peroxide is an oxidising agent and a corrosive substance. It is corrosive to skin and eyes and may cause severe skin irritation on contact, skin burns and permanent injury on contamination to eyes. Breathing in vapour hydrogen peroxide may cause respiratory irritation. Personnel should use PPE when handling hydrogen peroxide.

5.3. Hazardous incidents

The hazardous incidents resulting from materials transport to the site include:

- Dislodged loads leading to spill of electrolyte, slag or chemicals
- Traffic accidents leading to injury or fatality
- Windage loss, and dust generation during transport and offloading of slag

5.3.1. Dislodged loads and spills

Spills of material could occur as a result of a traffic accident or improper loading of the truck. Most traffic accidents would not be severe enough to cause a major loss of containment. Collisions with passenger vehicles are unlikely to result in a large spill. The types of accident which could result in a major spill include:

- jack-knifing
- overturns
- veering off the road
- striking large obstacles
- collisions with other heavy vehicles.

5.3.2. Windage loss during slag transport

The trucks carrying slag will be covered to prevent rain ingress and dust generation.

5.3.3. Dust generation during unloading

Unloading of slag at the end user site will generate dust when the contents are tipped. The unloading operation will need to minimise the impact of dust generation. Slag will be disposed at a licensed waste facility and dust management will be the responsibility of the users of the facility.

5.3.4. Fatalities and injuries from truck accidents

Truck accidents can result in fatalities or injuries to the truck driver and to members of the public (either in other vehicles or pedestrians). The likelihood of fatalities and serious injuries to the truck driver will be low because of the structural integrity of the vehicle and because of the low occurrence of serious accidents (overturns, jack-knifing, etc.). Collisions with light vehicles or striking pedestrians are more likely to result in fatalities or injuries to other parties. Best practice for transport contractor operations of potentially hazardous materials includes implementation of driver training program to ensure observance of speed limits and traffic indication and to use designated routes only.

5.4. Summary of incident scenarios modelled

A number of possible hazardous incidents have been identified. Some of the incidents have been assessed to be of very low likelihood or consequence based on the proposed safeguards.

The following hazardous incidents may be significant, and have been carried forward for further analysis:

- spills of electrolyte, slag and chemicals during transportation
- fatalities and injuries resulting from the increased truck movements to the site

5.5. Assessment of the impact of potential incidents

5.5.1. Slag spills

The amount of slag that could spill in the event of a truck accident depends on the maximum amount carried in a truckload. Most incidents will result in only small quantities of slag being spilt. The maximum quantity of slag that could be carried is about 30-35 tonnes.

The consequence of spills in towns may result in slag spilling into road drains resulting in environmental impact. Spills may also cause delays to local traffic but no serious consequences to people are expected. The effect of spills can be minimised by prompt recovery action.

5.5.2. Electrolyte spills

In the event of a truck accident, the consequences of electrolyte spill from dislodged batteries will be limited due to the following controls:

- The batteries are transported on pallets with holding ties and wrapped in plastic minimising the potential for dislodging individual batteries
- The structural integrity of the battery casing will minimise the potential for loss of containment of the electrolyte

- The electrolyte is dilute sulphuric acid which will limit the potential for serious acid burns and environmental impact
- Approximately half of the batteries sourced will not contain electrolyte

5.5.3. Chemical spills

The consequences of chemical spills will be limited because of the following controls:

- Integrity of packaging of packaged materials
- Structural integrity of truck for bulk materials
- The nature of chemicals transported means that they have limited impact area on loss of containment

5.6. Conclusions of impact assessment

Due to the nature of materials being transported, the safety and environmental consequences of incidents resulting in spills is very low.

The increased volume of truck traffic resulting from the transportation of materials to the site may result in an increase in the number of accidents leading to fatalities and injuries.

6. ROUTE SELECTION

6.1. Approach overview

As described in HIPAP 11, factors that influence routing decisions may be grouped into the following interrelated categories:

- Mandatory factors including statutory requirements, legal and physical constraints.
- Subjective factors that reflect community priorities and values which may not be easily quantified. Such factors include sensitive populations, special land uses and emergency response capability.
- Road and traffic factors including the identification of the most suitable routes.
- Environmental and land use risk factors including the identification of hazards and the quantification of risk. These are location dependent.
- Operational factors including economics and operator requirements.

The HIPAP 11 criteria were reviewed for the three possible routes identified in Section 4.3 as shown in Table 6.1.

6.2. Key findings

Based on the comparison of the possible routes to the HIPAP 11 criteria, Route 1 (via Hart Road, Government Road and Mitchell Avenue) was identified as the preferred due to:

- lower impact on residential or sensitive land uses and associated populations
- lower accident rates relative to the other two routes
- removal of additional hazard posed by crossing at railway level crossing on alternate routes.

Route 1 would be suitable for trucks travelling northbound to the site (the assumed common mode of travel from major population centres, i.e. Sydney and Newcastle) and southbound to the site.

Trucks travelling southbound along the Hunter Expressway can use Route 1 by doing a U-turn at the intersection with Main Road, and then travelling north along Hunter Expressway back to the Hart Road exit.

Table 6.1: Route selection (HIPAP 11)

Factors	Considerations	Comments on route	Recommendations
Mandatory	Physical considerations	The roads on the identified route are considered to be structurally adequate for the transport of Dangerous Goods (DGs). There are no physical factors (eg weight limitations on bridges or height restrictions on underpasses) that preclude the use of the identified route for transport of DGs.	-
	Legislation, codes and standards	Transport of DGs is regulated under the Australian Dangerous Goods Code (ADGC), Edition 7.4 managed by WorkCover NSW (Ref.(6)). The regulations require that: Routes should be pre-planned wherever possible. Routes should be selected to minimise the risk of personal injury, of harm to the environment or property during the journey. A road vehicle transporting dangerous goods should wherever practicable avoid heavily populated or environmentally sensitive areas, congested crossings, tunnels, narrow streets, alleys, or sites where there is, or may be, a concentration of people. A risk assessment in accordance with AS4360 (now superseded by AS31000) Risk Management to be prepared. (This is undertaken on a route specific basis by the transport company). Both drivers and vehicles are DGs licensed. Vehicles carrying DGs adhere to design standards (AS2809 series Road Tank Vehicles for Dangerous Goods).	-
Subjective	Sensitive land uses (schools, hospitals, childcare centres, retirement villages)	Total sensitive land uses (along Route 1): None Total sensitive land uses (along Route 2): Two Kurri Kurri Before & After School Care, Kurri Early Childhood Centre Inc. Total sensitive land uses (along Route 3): None	Very few sensitive land uses along each of the routes. Route 1 and 3 are preferred over Route 2.

Factors	Considerations	Comments on route	Recommendations
	Sensitive ecosystems and natural landscapes	Routes do not pass through national parks. Note: Materials are transported in small packages/quantities and so are not likely to spread to impact upon natural ecosystems.	-
	Emergency and evacuation planning and infrastructure	All routes are accessible by emergency response vehicles.	Ensure that consultation regarding emergency response in vicinity of sensitive locations occurs between operator, transporter and land user. Emergency response for both a vehicle accident, and also an unignited and ignited leak unrelated to vehicle accidents should be defined.
Road and traffic	Road structure	All roads are marked as suitable for B-doubles. No specific issues over road quality are anticipated. Route 1: Hart Rd, Government Rd and Mitchell Ave are two lanes wide. Route 2: Main Rd and Lang St are two lanes wide. Mitchell Ave is four lanes wide through the main urban area of Kurri Kurri. Route 3: John Renshaw Dr and Mulbring St are two lanes wide. Tarro St, Victoria St and Mitchell Ave are four lanes wide through the main urban area of Kurri Kurri.	-
	Volume & composition	Detailed traffic counts for all routes could not be provided. however the details of traffic volume surveys Ref. (4) show there is a low traffic volume along Mitchell Ave near the site. Traffic volumes along Government Rd north of Mitchell Ave (Route 1) are a similar size to those on Mitchell Ave east of Northcote St (Routes 2 and 3).	-
	Travel time	All Routes 1 and 2 have a five minute travel time, while Route 3 has a 10 minute travel time. No major impact on overall travel time.	-
	Level of service	Analysis of Route 1 has been completed using the SIDRA intersection traffic model which show that the levels of service are rated at least a B (good) during all times. This shows that there is a relatively low level of congestion along this route.	-
	Traffic signals	No specific issues anticipated based on routes identified.	-

Factors	Considerations	Comments on route	Recommendations
	Alternative routes	Routes 1, 2 and 3 are most appropriate routes for consideration as they are existing truck routes.	-
Environmental and land use risk	Adjacent land use	Route 1 has predominantly industrial adjacent land uses. Routes 2 and 3 pass through residential areas in Kurri Kurri.	-
	Population levels	Route 1 has smaller populations on industrial sites. Routes 2 and 3 pass through residential areas and the town centre of Kurri Kurri which has larger population levels.	-
	Sensitivity of ecosystems	No specific issues anticipated based on route.	-
	Accident and incident rates potential	Highest accidents are along Routes 2 and 3. Much lower accident rates along Route 1 according to Transport for New South Wales (TfNSW) statistics. Refer to APPENDIX C.	-
	Hazards	Railway level crossing located approximately 200 m east of the site on Routes 2 and 3. General traffic/vehicle accidents.	-
	Risk level	Route 1 has lower exposure factors based on populations than Routes 2 and 3, hence is judged to be the lower risk option.	-
	Drainage system	No specific issues anticipated based on route.	-
	Emergency access	All routes are accessible by emergency response resources. No difference between routes from an accessibility perspective.	Draft Emergency Response Plan (ERP) is to be prepared with input from selected transporter Issues to consider are: Detection of leaks Required response to ignited and unignited leaks Required evacuation distance Ensure that local, state and national transport authorities are consulted regarding the draft ERP.

Factors	Considerations	Comments on route	Recommendations
	Driver training	Same requirements as any ADGC transport driver licence requirements. (All drivers who carry Dangerous Goods are required to be licensed by state regulatory agencies In NSW the EPA is the responsible agency. To obtain a licence, drivers must complete an accredited training course, complete a medical and meet the driving history requirements).	-
	Vehicle safety design and maintenance	As per ADGC requirements	-
Operational	Distance	All routes are of similar distance.	-
	Travel time	All Routes 1 and 2 have a five minute travel time, while Route 3 has a 10 minute travel time.	-
	Operating costs	All routes are similar distance and travel time, so no great difference between operating costs.	-

7. CONCLUSIONS AND RECOMMENDATIONS

7.1. Major findings

A route evaluation study has been carried out for the transportation of hazardous materials to/from the Hunter Expressway and the site. A qualitative comparison of potential routes against HIPAP 11 route selection factors was prepared.

The following conclusions were drawn:

- All three routes assessed were found to be suitable for transportation of the hazardous materials, assessed in this study, between the Hunter Expressway and the site.
- Out of the three routes assessed, Route 1 was preferred due to its:
  - lower impact on residential or sensitive land uses and associated populations
  - lower accident rates relative to the other two routes
  - removal of additional hazard posed by crossing at railway level crossing on alternate routes.
- Route 1 would be suitable for trucks travelling northbound to the site (the assumed common mode of travel from major population centres, i.e. Sydney and Newcastle) and southbound to the site.
- Trucks travelling southbound along the Hunter Expressway can use Route 1 by doing a U-turn at the intersection with Main Road, and then travelling north along Hunter Expressway back to the Hart Road exit.

7.2. Other considerations

The following safety systems (maintained by the transport contractors) will be provided for the proposed transport operations, in compliance with the ADG Code and relevant Australian Standards:

- Induction training for drivers including training in emergency response, firefighting, first aid and handling procedures for materials
- Appropriate dangerous goods licences for transport of hazardous materials
- Mobile phones and/or radios for communication to emergency services and to the transport company base
- Fire extinguishers on trucks, where applicable
- Covering slag during transport
- An ERP provided to drivers including emergency service contact numbers, Safety Data Sheets, etc

- Regular maintenance and inspection of trucks for roadworthiness and containment integrity
- Contract requirements for loading and handling procedures
- DG driver licensing requirements.

APPENDIX A. TRANSPORTED SUBSTANCE LIST

The chemical information was obtained from Safety Data Sheets, however, in some cases, the information was obtained from the Australian Dangerous Goods Code or the Australian Hazardous Chemicals Information System. The SDS information is reproduced in the PHA, Ref (3).

Table A.1: Transport information

Classification	Class	Sub	PG	UN	Proper Shipping Name	Description	Transport methods	Minimum quantity per load (t) - bulk/packages	Vehicle movements Weekly (peak)	Vehicle movements Annual (cumulative)	Transport quantities (monthly)
Non-flammable, non-toxic gases	2.2	5.1	-	1073	Oxygen, refrigerated liquid	Liquid oxygen	lorry (20,000 L capacity)	23	0	12	1
Oxidising substances	5.1	8	III	2984	Hydrogen peroxide, aqueous solutions	Hydrogen Peroxide	semi trailer (24 Tons)	24	NA	11	1
Corrosive substances	8	-	II	1832	Sulphuric acid, spent	Electrolyte	NA	NA	NA	NA	NA
	8	-	II	1849	Sodium sulfide, hydrated	Sodium Sulphide (62%)	supplier ute/delivery van	NA	NA	1	NA
	8	-	-	2794	Batteries, wet, filled with acid, electric storage	ULAB	B doubles trailer (36 Tons max) and semi trailers (24T)	7.2	39	2000	167
Other materials	N/A	N/A	N/A	N/A	N/A	Activated carbon	25 kg bags	NA	1	10	1
	N/A	N/A	N/A	N/A	N/A	Lead bullion	semi container (20 tonnes max)	40	14	750	63
	N/A	N/A	N/A	N/A	N/A	Iron Sinter	semi trailer (24 tonnes)	24	1	30	3
	N/A	N/A	N/A	N/A	N/A	Sodium sulphate	lorry tanker (20 tonnes)	20	9	465	39
	N/A	N/A	N/A	N/A	N/A	Soda ash	bulk tanker (20 tonnes max)	20	7	405	30
	N/A	N/A	N/A	N/A	N/A	Anthracite coal	semi trailer (24 tonnes)	24	2	56	5
	N/A	N/A	N/A	N/A	N/A	Calcium Hydroxide	supplier UTE/delivery van	NA	NA	1	1
	N/A	N/A	N/A	N/A	N/A	Diesel Fuel	small lorry tank (2,000 L)	supplier dependent	1	12	1

Classification	Class	Sub	PG	UN	Proper Shipping Name	Description	Transport methods	Minimum quantity per load (t) - bulk/packages	Vehicle movements Weekly (peak)	Vehicle movements Annual (cumulative)	Transport quantities (monthly)
	N/A	N/A	N/A	N/A	N/A	Flocculant	supplier UTE/delivery van	NA	NA	1	NA
	NS	NS	NS	NS	NS	Polypropylene Plastics	B double container (40 tonnes max)	40	2	90	8
	N/A	N/A	N/A	N/A	N/A	Anti-foam	supplier UTE/delivery van	NA	NA	1	NA
	NS	NS	NS	NS	NS	Polyethylene separators	Dump Truck (20 tonnes)	20	1	45	4
	NS	NS	NS	NS	NS	Slag	Dump Truck (20 tonnes)	20	4	158	13

Table A.2: Material information sources

ID	Name	Information source	MSDS Name	Shipping Name	UN	DG	sub	PG	Comment
1	Activated Carbon	SDS	Activated Carbon	N/A	N/A	N/A	N/A	N/A	
2	Flocculant	SDS	Anionic Polymer	N/A	N/A	N/A	N/A	N/A	
3	Anthracite Coal	SDS	Anthracite Coal	N/A	N/A	N/A	N/A	N/A	
4	Anti-foam	SDS	Antifoam	N/A	N/A	N/A	N/A	N/A	
	Lead Carbonate	HCIS	N/A	N/A	N/A	N/A	N/A	N/A	HCIS states that this is GHS07/08. Acute toxicity category 4. Hence not Class 6.1
	Diesel Fuel	SDS	Diesel	N/A	N/A	N/A	N/A	N/A	Flashpoint in SDS states > 60C, hence it is not classified as a flammable liquid under ADG 7.4.
	Electrolyte	ADG 7.4	N/A	SULPHURIC ACID, SPENT	1832	8	-	II	
6	Polyethylene separators	SDS	Ground Plastics	N/A	N/A	N/A	N/A	N/A	
7	Calcium Hydroxide	SDS	Hydrated Lime	N/A	N/A	N/A	N/A	N/A	
8	Hydrogen Peroxide	SDS	Hydrogen Peroxide	Hydrogen peroxide, aqueous solutions	2984	5.1	8	III	
9	Iron Sinter	SDS	Iron Sinter	N/A	N/A	N/A	N/A	N/A	
10	Lead Bullion	SDS	Lead Bullion	N/A	N/A	N/A	N/A	N/A	
11	Liquid Oxygen	SDS	Liquid Oxygen	OXYGEN, REFRIGERATED LIQUID	1073	2.2	5.1	-	
12	Polypropylene Plastics	SDS	PP Chips	N/A	N/A	N/A	N/A	N/A	
13	Slag	SDS	Slag	N/A	N/A	N/A	N/A	N/A	
14	Soda Ash	SDS	Soda Ash	N/A	N/A	N/A	N/A	N/A	
15	Sodium Sulfate Anhydrous	SDS	Sodium Sulfate Anhydrous	N/A	N/A	N/A	N/A	N/A	
16	Sodium Sulphide (62%)	SDS	Sodium Sulfide	SODIUM SULFIDE, HYDRATED	1849	8	-	II	
	ULAB	ADG 7.4	ULAB	BATTERIES, WET, FILLED WITH ACID, electric storage	2794	8	-	-	
	SDS = Safety Data Sheet ADG 7.4 = Australian Dangerous Goods Code v7.4 (http://www.ntc.gov.au/Media/Reports/(7E6FD0E5-2D6A-4747-BE48-C0DDDF676A3A).pdf) HCIS = Hazardous Chemicals Information System (http://www.hcis.safeworkaustralia.gov.au/HazardousChemical/Details?chemicalID=827)								

APPENDIX B. HAZARD IDENTIFICATION MATRIX AND WORD DIAGRAM

Table B.1 shows the hazard identification table for the transportation of materials to and from the proposed development. The table identifies the following for each scenario:

- The hazardous event
- The consequence of the event
- The initiating causes of the event
- The safeguards proposed which will either reduce the likelihood of the event occurring or minimise the consequences of the event if it should occur.
- Any recommendations for additional safeguards or actions

Table B.1: Hazard identification for material transport

Incident Number	Hazardous Incident	Causes	Consequence	Safeguards	Actions
Battery Transportation					
1.	Dislodged Load	Traffic accident Pallets improperly loaded	Dropped batteries Spilt electrolyte Burns on contact with driver/public Environmental impact	Driver training schemes Speed Limits Vehicle inspection before dispatch Contract conditions for battery transport PPE for handling and spill recovery	-
Slag Transportation					
2.	Spill on road	Dislodged loads due to Traffic accident Lack of containment integrity Mechanical damage	Environmental effects of leachate and dust generation	Vehicles approved for use Regular truck maintenance and inspection Driver training schemes Fixed Routes Speed Limits Vehicle inspection before dispatch Mobile/Radio Communications	-
3.	Spills in towns	Traffic accident Lack of containment integrity Mechanical damage	Environmental effects Impact on local traffic Spill to stormwater drains	As per spills on road, plus: Speed limits in towns Restricted routes through towns	-
4.	Spills into watercourses, road drainage systems	Traffic accident Lack of containment integrity Mechanical damage	Environmental effects Leaching of slag into water	As per spills on road, plus: Cease transport in the event of torrential rain Speed limits on bridges over major watercourses Speed limits in towns	•-

Incident Number	Hazardous Incident	Causes	Consequence	Safeguards	Actions
5.	Water ingress during rain	Load poorly covered Tarpaulin damage	As per spills into watercourses, but smaller quantities expected	Inspection before dispatch Tarpaulins to cover load	-
6.	Windage loss during transport	Lack of containment integrity Mechanical damage	Dust escapes from truck	Inspection before dispatch Tarpaulins to cover load	-
7.	Dust Generation during dumping	Handling	Dust to atmosphere	Approved dumping procedure at end user site	Review need for wetting slag or provision of water spray system for unloading
Sodium Sulphate, process chemicals and furnace fluxes/reducing agents					
8.	Dislodged load	Traffic accident Mechanical damage	Spill of chemicals Environmental impact	Speed Limits Vehicle inspection before dispatch Package integrity Loading procedures Recovery Procedures	-
Liquefied Petroleum Gas					
9.	Dislodged load	Traffic accident Mechanical damage	Dislodgement of LPG cylinder Potential for fire/ explosion	Speed Limits Vehicle inspection before dispatch LPG cylinder integrity Compliance with ADG Code Compliance with AS 1596	-
Traffic Accidents					
10.	Driver fatality/injury	Traffic accident Veers off road Overturn High speed	Fatality/injury	Driver training Speed limit Restricted routes	-

Incident Number	Hazardous Incident	Causes	Consequence	Safeguards	Actions
11.	Fatality/injury to member of the public	Traffic accident Collision with other vehicle Truck strikes pedestrian High speed	Fatality/injury		-

APPENDIX C. ACCIDENTS ON THE SELECTED TRANSPORT ROUTES

Source: RMS - http://roadsafety.transport.nsw.gov.au/statistics/interactivecrashstats/lga_stats.html?tablga=4

APPENDIX D. REFERENCES

1. **NSW Department of Planning.** *Hazardous and Offensive Development Application Guideleines: Applying SEPP 33.* 2011. ISBN 978-1-74263-154-7.

2. —. *HIPAP 11 - Route Selection.* 2011. Electronic and Hard Copy are available.

3. **Sherpa Consulting Pty Ltd.** *Battery recycling facility - Preliminary Hazard Analysis.* 2016. 20194-RP-001.

4. **EMM Consulting.** *Traffic Assessment - Battery Recycling Facility, Mitchell Avenue, Kurri Kurri, Section 2.3 Traffic Volumes.* 2016. J15156RP1 Version 3.

5. **NSW Environment Protection Authority (EPA).** *Waste Classification Guidelines Part 1: Classifying Waste.* 2014. http://www.epa.nsw.gov.au/resources/wasteregulation/140796-classify-waste.pdf.

6. **National Transport Commission.** *Australian Code for the Transport of Dangerous Goods by Road and Rail 7th Edition.* June 2016. Volume 1 and 2. v7.4.