COWAL GOLD OPERATIONS

HAZARDOUS MATERIALS MANAGEMENT PLAN

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1 INTRODUCTION

The Cowal Gold Operations (CGO) is located approximately 38 kilometres (km) north-east of West Wyalong in New South Wales (NSW) (Figure 1). Evolution Mining (Cowal) Pty Limited (Evolution) is the owner and operator of the CGO. Development of the CGO occurs within Mining Lease (ML) 1535.

Development Consent (DA 14/98) for the CGO (including the Bland Creek Palaeochannel Borefield water supply pipeline) was granted by the NSW Minister for Urban Affairs and Planning under Part 4 of the NSW *Environmental Planning and Assessment Act, 1979* (EP&A Act) on 26 February 1999. Development Consent (DA 2011/64) for the operation of the Eastern Saline Borefield was granted by the Forbes Shire Council on 20 December 2010.

The NSW Minister for Planning's delegate granted approval to modify Development Consent (DA 14/98) for the *Cowal Gold Operations Processing Rate Modification* (herein referred to as the Processing Rate Modification) under Section 75W of the EP&A Act on 4 October 2018.

The Processing Rate Modification generally involves:

- an increase to the CGO's ore processing rate from 7.5 million tonnes per annum (Mtpa) to 9.8 Mtpa;
- construction of a secondary crusher to increase throughput rates of the CGO processing plant;
- an increase in annual cyanide consumption for the primary and oxide circuits in the processing plant by approximately 25 percent (%);
- modification/expansion of the existing tailings storage facilities to form the Integrated Waste Landform (IWL) to facilitate storage of tailings over the life of the mine, which also integrates with the existing Northern Waste Rock Emplacement;
- relocation of portions of the Up-catchment Diversion System (UCDS) and Internal Catchment Drainage System (ICDS) around the IWL, including relocation of contained water storage D10;
- duplication of the existing water supply pipeline across Lake Cowal; and
- a new mining lease tenement Mining Lease ML 1791 north-west of ML 1535 to accommodate infrastructure displaced by the IWL (e.g. soil stockpiles).

The general arrangement of the approved CGO is provided in Figure 2.

A further administrative modification to the Development Consent (DA 14/98) was made on 26 August 2019. A copy of the CGO's approved Development Consent (DA 14/98) (as modified on 26 August 2019) is available on Evolution's website (www.evolutionmining.com.au).

1.1 SCOPE AND OBJECTIVES

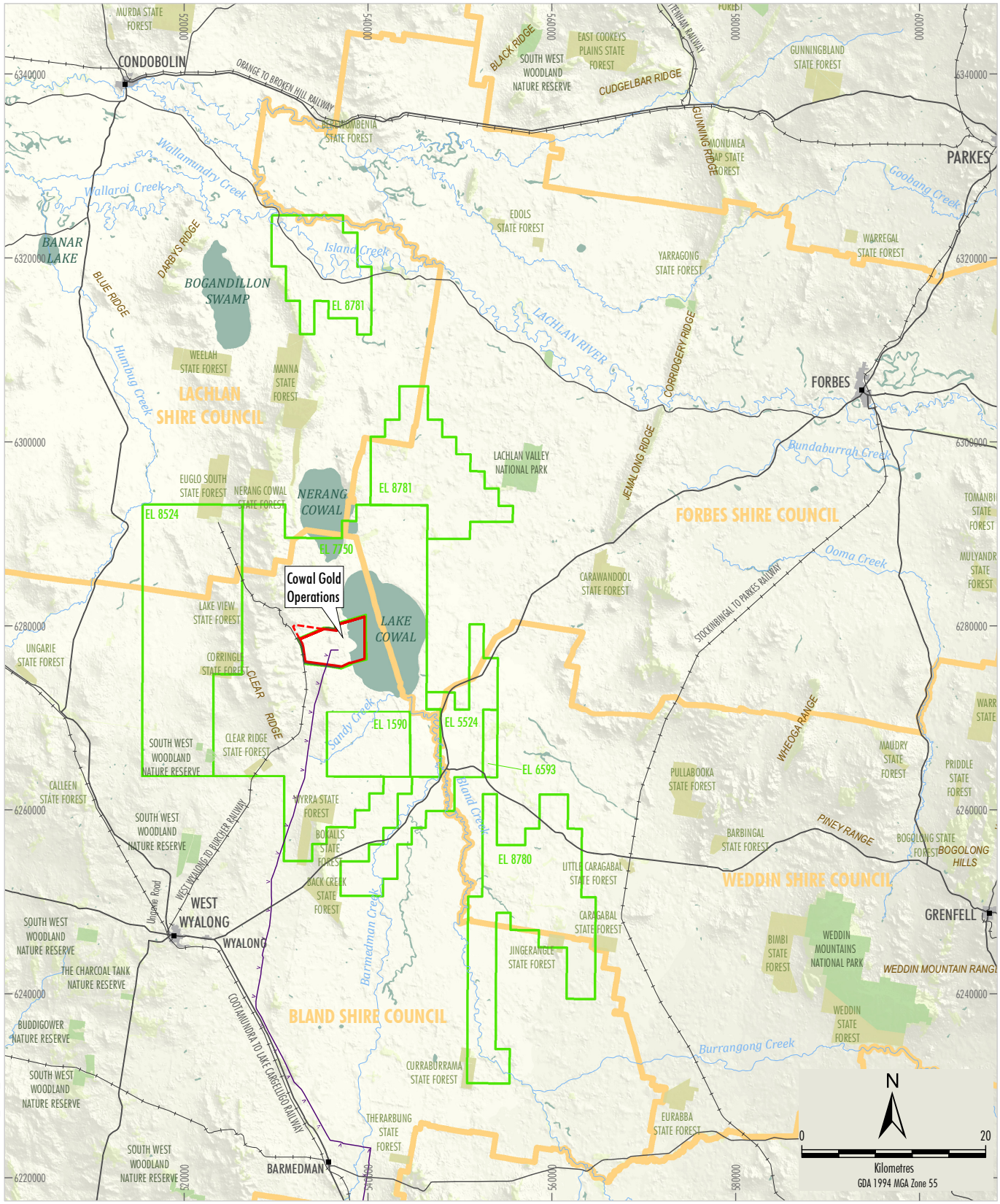
Scope

This Hazardous Materials Management Plan (HMMP) has been prepared in accordance with the requirements of Development Consent Condition 5.4(d).

The requirements of Development Consent Condition 5.4(d) and where they are addressed within this HMMP are outlined in Section 2.1.

In accordance with Development Consent Condition 5.4(d), once approved, this HMMP will supersede the pre-commissioning studies required by Development Consent Condition 5.4(b)(i and ii) (i.e. the

Transport of Hazardous Materials Study and the Emergency Response Plan), and the Hazardous Waste and Chemical Management Plan required by Development Consent Condition 5.7.



HAL-18-43 CGO MP2018_HMMP_201A

LEGEND

- Mining Lease Boundary (ML 1535)
- Mining Lease Boundary (ML 1791)
- Exploration Licence (EL) National Park & Nature Reserve State Forest
- Local Government Area Boundary Electricity
- Transmission Line Railway

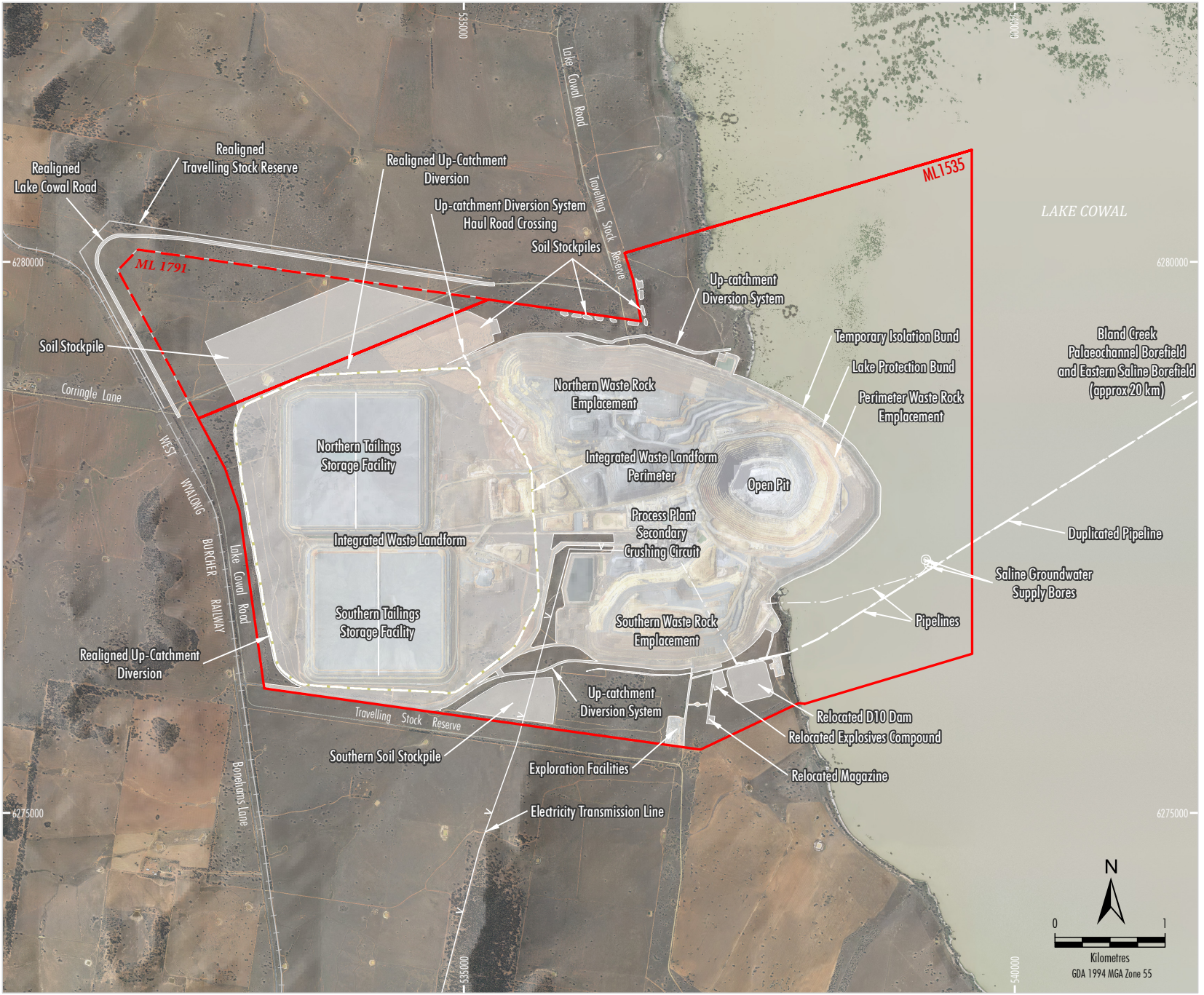
Source: © NSW Department of Finance, Services & Innovation (2017); Office of Environment & Heritage NSW (2017)

Evolution MINING Cowal

HAZARDOUS MATERIALS MANAGEMENT PLAN

CGO Locality

Figure 1



LEGEND

Mining Lease Boundary (ML 1535)

Mining Lease Boundary (ML 1791)

Approximate Extent of Approved Surface Development

Source: Evolution (2018); © NSW Department of Finance, Services & Innovation (2017)
Orthophoto: Evolution (Oct 2017)

Evolution MINING Cowal

HAZARDOUS MATERIALS MANAGEMENT PLAN

General Arrangement of Approved CGO

Figure 2

Objectives

The objectives of this HMMP are to fulfil the requirements of Development Consent Condition 5.4(d) (Section 2.1) by providing:

- a description of the CGO's cyanide management measures which are consistent with the *International Cyanide Management Code for the Manufacture, Transport and Use of Cyanide in the Production of Gold*;
- a description of the storage and handling procedures and management measures for sodium cyanide and other toxic chemicals which are in accordance with the requirements of AS/NZ 4452 – *The Storage and Handling of Toxic Substances*;
- a description of the relevant hazardous materials transportation measures for the local road network which are in accordance with the *Hazardous Industry Planning Advisory Paper No. 11 – Route Selection* guidelines (Department of Planning [DoP], 2011a) (the Route Selection Guidelines) and the *Australian Code for the Transport of Dangerous Goods by Road and Rail* (the ADG Code)*;* and
- details of the emergency procedures for the CGO which are consistent with the *Hazardous Industry Planning Advisory Paper No. 1 – Emergency Planning.*

1.2 REGULATORY CONSULTATION

As required by Development Consent Condition 5.4(d)(i), this HMMP will be prepared in consultation with the Department of Industry – Lands and Water (DPIE Water), Environmental Protection Authority (EPA), Roads and Maritime Services (RMS), the Department of Resources and Geoscience (DRG), Forbes Shire Council (FSC), Bland Shire Council (BSC) and Lachlan Shire Council (LSC).

1.3 STRUCTURE OF THIS HMMP

The remainder of this HMMP is structured as follows:

Section 2: Identifies the statutory requirements relevant to this HMMP including relevant Development Consent, Mining Lease and Environmental Protection Licence conditions, and legislation, standards, codes and guidelines applicable to this HMMP.

Section 3: Summarises the requirements of the International Cyanide Management Code and the CGO's compliance with the Code.

Section 4: Outlines the classification system for hazardous chemicals and dangerous goods.

Section 5: Describes the chemical management measures implemented at the CGO, including the CGO's Chemical Management Strategy.

Section 6: Describes how sodium cyanide and other chemicals are stored and handled at the CGO.

Section 7: Details how the transportation of hazardous materials on the local road network surrounding the CGO will be undertaken in accordance with the Route Selection Guidelines and the ADG Code.

Section 8: Outlines the safeguards and emergency procedures relevant to hazardous materials and chemicals which are implemented at the CGO.

Section 9: Details the notification and reporting requirements relevant to this HMMP.

Section 10: Outlines auditing and review requirements relevant to this HMMP.

Section 11: Lists the references cited in this HMMP.

2 STATUTORY REQUIREMENTS

Statutory requirements relevant to this HMMP include the requirements of CGO approval documents and relevant Australian Standards, codes and guidelines for the management of hazardous materials.

Accordingly, Section 2.1 outlines the Development Consent requirements for this HMMP. Sections 2.2 and 2.3 describe the conditions in the CGO's EPL 11912 and Authority for ML 1535 relevant to the management of hazardous materials. Section 2.4 provides a summary of the legislation relevant to this HMMP. Section 2.5 provides a summary of the Australian Standards, codes, and other guidelines relevant to this HMMP. Detail regarding the application of the legislation, Australian Standards, codes, and guidelines to this HMMP is provided in Appendix A.

2.1 DEVELOPMENT CONSENT CONDITIONS

This HMMP has been prepared in accordance with the requirements of Development Consent Condition 5.4(d). The requirements of Development Consent Condition 5.4(d) and where they are addressed in this HMMP are provided in Table 1.

Table 1
Development Consent Requirements for this HMMP

Development Consent Conditions	Section
The applicant must prepare and implement a Hazardous Materials Management Plan for the development to the satisfaction of the Planning Secretary. This plan must:	This HMMP
(i) *be prepared in consultation with Forbes, Bland and Lachlan councils, RMS, EPA, DPIE Water and DRG;*	Section 1.2
(ii) *be consistent with the International Cyanide Management Code for the Manufacture, Transport and Use of Cyanide in the Production of Gold; and*	Section 3
(iii) describe the measures that will be implemented to ensure: • sodium cyanide and other toxic chemicals are stored and handled on the site in accordance with *AS/NZ 4452 – The Storage and Handling of Toxic Substances*;	Sections 4, 5 and 6
• the transportation of hazardous materials to or from the site on the local road network shown in Appendix 7 is undertaken in accordance with the *Department's Hazardous Industry Planning Advisory Paper No. 11 – Route Selection* and the *Australian Code for the Transport of Dangerous Goods by Road and Rail – current version*; and	Section 7 and Appendix B
• detail the emergency procedures for the development consistent with the Department's *Hazardous Industry Planning Advisory Paper No1. – Emergency Planning*.	Section 8
Note: The approved Hazardous Materials Management Plan shall replace the pre-commissioning studies required by conditions 5.4(b)(i) and (ii) and the Hazardous Waste and Chemical Management Plan required by condition 5.7 of Schedule 2 of this consent.	Section 1.1

Further to Development Consent Condition 5.4(d) above, additional Development Consent conditions of relevance to this HMMP include:

- Development Consent Condition 5.3 which requires the preparation of a Cyanide Management Plan (CMP). The CMP is discussed in Section 6.1.
- Development Consent Condition 5.4 which requires preparation of a Fire Safety Study, Hazard and Operability Study, Final Hazard Analysis and the conduct of a Hazard Audit. This condition is discussed in Sections 5.1.3.4, 8 and 10.2.
- Development Consent Condition 9.2(a) which requires Independent Environmental Audits to be conducted. This condition is addressed in Section 10.3.
- Development Consent Condition 9.3 which outlines incident and non-compliance notification requirements. This condition is addressed in Sections 9.1 and 9.2.
- Development Consent Condition 9.1(b) which requires the preparation of an Annual Review. This condition is addressed in Section 9.4.

- Development Consent Condition 9.1(c) which outlines the review requirements for this HMMP. This condition is addressed in Section 10.6.

2.2 EPL 11912 CONDITIONS

The CGO's EPL 11912 also includes requirements relevant to materials, substance, waste and cyanide management and monitoring. Relevant EPL 11912 Conditions include:

- Operating Condition O1 which requires that the Licensed activities must be carried out in a competent manner. This includes:

  a) The processing, handling, movement and storage of materials and substances used to carry out the activity.

  This condition is addressed in Sections 4, 5 and 6.

- Operating Condition O5 which requires all above ground storage facilities containing flammable and combustible liquids must be bunded in accordance with Australian Standard AS 1940-2017. This condition is addressed in Sections 5 and 6.2.
- Reporting Condition R1 which requires the licensee to prepare an Annual Return which reports on compliance with the conditions of the EPL. This condition is addressed in Section 9.5.
- Reporting Condition R2 which requires the licensee to notify the EPA of incidents causing or threatening material harm to the environment. This condition is addressed in Section 9.1.

2.3 ML 1535 CONDITIONS OF AUTHORITY

The Conditions of Authority for ML 1535 includes a requirement relevant to the use of cyanide, *viz.*:

- Condition of Authority 28 requires the leaseholder not to use cyanide or any solution containing cyanide without the prior written approval of the former Minister for Mineral Resources and subject to any conditions stipulated by the Minister.

Written approval from the former Minister for Mineral Resources was obtained in correspondence dated 17 January 2006.

Condition of Authority 14 requires:

Prevention of Soil Erosion and Pollution

14. Operations must be carried out in a manner that does not cause or aggravate air pollution, water pollution (including sedimentation) or soil contamination or erosion, unless otherwise authorised by a relevant approval, and in accordance with an accepted Mining operation Plan. For the purpose of this condition, water shall be taken to be include any watercourse, waterbody or groundwaters. The lease holder must observe and perform any instruction given by the director general.

This Condition is addressed in Sections 6.2 and 8.1.

The *Cowal Gold Operations Mining Operations Plan (ML 1535) 1 January 2019 – 31 December 2019* relevant to the commencement of development of the approved Processing Rate Modification activities, was approved by the DRG Resources Regulator on 23 January 2019.

Condition of Authority 28 for ML 1535 includes environmental performance reporting requirements associated with an Annual Environmental Management Report (AEMR). The Annual Review (Section 9.4) will address the AEMR requirements of ML 1535 Condition of Authority 28.

Mining lease has been granted for the ML1791 and any hazardous materials management requirements of the new tenement authority will be incorporated into this HMMP, as required.

2.4 LEGISLATION

The following legislation may be of relevance to chemical and hazardous material management at the CGO:

- *Protection of the Environment Operations Act, 1997* (NSW) (PoEO Act);
- *Dangerous Goods (Road and Rail Transport) Act, 2008* (NSW);
- *Dangerous Goods (Road and Rail Transport) Regulation, 2014* (NSW) (DG Regulations);
- *Explosives Act, 2003* (NSW);
- *Explosives Regulation, 2013* (NSW);
- *Work Health and Safety (Mines and Petroleum Sites) Act, 2013* (NSW) (WHS [Mines and Petroleum Sites] Act);
- *Work Health and Safety (Mines and Petroleum Sites) Regulation, 2014* (NSW);
- *Work Health and Safety Act, 2011* (NSW) (WHS Act); and
- *Work Health and Safety Regulation, 2017* (NSW) (WHS Regulation).

Further detail regarding the application of the above legislation to this HMMP is provided in Appendix A.

2.5 STANDARDS, CODES AND GUIDELINES

The following sub-sections identify Australian Standards, Codes and guidelines which are of relevance to handling, storage and transportation of hazardous materials which may be applicable to the CGO.

Australian Standards

Where applicable, Evolution or its contractors will comply with the requirements of the following Australian Standards relevant to hazardous material and chemical management (including any subsequent revisions):

- *Australian Standard (AS) 1216-2006: Class labels for dangerous goods;*
- *AS 1319-1994 Safety Signs for the Occupational Environment;*
- *AS 1345-1995 Identification of the Contents of Pipes and Conduits and Ducts;*
- *AS 1894-1997 The Storage and Handling of Non-flammable Cryogenic and Refrigerated Liquids;*
- *AS 1940-2017 The Storage and Handling of Flammable and Combustible Liquids;*
- *AS 2030.1:2009 Gas cylinders – General requirements;*
- *AS 2187.1-1998 Explosives – Storage, Transport and Use – Storage;*
- *AS/New Zealand Standard (NZS) 2243.10:2004 Safety in Laboratories - Storage of Chemicals;*
- *AS 2809.1-2008 Road Tank Vehicles for Dangerous Goods - General Requirements for all Road Tank Vehicles;*

- *AS 2931-1999 Selection and Use of Emergency Procedure Guides for the Transport of Dangerous Goods;*
- *AS 3780-2008 The Storage and Handling of Corrosive Substances;*
- *AS 4326-2008 The Storage and Handling of Oxidizing Agents;*
- *AS 1596:2014 The Storage and Handling of LP Gas;*
- *AS/NZS 2906:2001 Fuel Containers – Portable – Plastic and Metal;*
- *AS/NZS 3833:2007 The Storage and Handling of Mixed Classes of Dangerous Goods in Packages and Intermediate Bulk Containers;* and
- *AS/NZS 4452:1997 The Storage and Handling of Toxic Substances.*

A summary description of the above Standards is provided in Appendix A.

Codes

The following Codes are relevant to dangerous goods management and cyanide management at the CGO, and have been considered in the preparation of this HMMP:

- *Australian Code for the Transport of Dangerous Goods by Road and Rail* (ADG Code) (National Transport Commission, 2018)*;* and
- *International Cyanide Management Code For the Manufacture, Transport, and Use of Cyanide In the Production of Gold.*

Under the DG Regulations, carriers of dangerous or hazardous loads are required to be appropriately licensed and to conduct all transport procedures in accordance with the provisions of the ADG Code. Documentation requirements, safety equipment and emergency responses and guidelines are also covered in detail in the ADG Code.

A summary of some of the key requirements of the ADG Code and DG Regulations relevant to the transportation of hazardous materials on the local road network (Section 7) are provided in Appendix B.

A description of the application of the *International Cyanide Management Code For the Manufacture, Transport, and Use of Cyanide In the Production of Gold* to the CGO provided in Section 3.

Relevant Guidelines

The following guidelines are of relevance to chemical and hazardous material management at the CGO, and have been considered in the preparation of this HMMP:

- *Leading Practice Sustainable Development Program for the Mining Industry - Hazardous Materials Management Handbook* (Commonwealth of Australia, 2016); and
- *Leading Practice Sustainable Development Program for the Mining Industry - Cyanide Management Handbook* (Commonwealth of Australia, 2008).

3 INTERNATIONAL CYANIDE MANAGEMENT CODE

The *International Cyanide Management Code For the Manufacture, Transport, and Use of Cyanide In the Production of Gold* (Cyanide Code) was developed by a multi-stakeholder steering committee under the guidance of the United Nations Environmental Program and the then- International Council on Metals and the Environment (International Cyanide Management Institute [ICMI], 2018).

The Cyanide Code is a voluntary industry program for gold and silver mining companies (ICMI, 2018). It focuses exclusively on the safe management of cyanide and cyanidation mill tailings and leach solutions (*ibid*). Companies that adopt the Cyanide Code must have their mining operations that use cyanide to recover gold and/or silver audited by an independent third party to determine the status of Cyanide Code implementation (*ibid*.). Those operations that meet the Cyanide Code requirements can be certified.

The ICMI was established for the purpose of administering the Cyanide Code.

On 17 April 2006, the CGO was the first non-operational gold mine using cyanide in the world to be certified by the ICMI to the Cyanide Code. Then on 2 August 2007, the CGO was then also the first operational gold mine using cyanide in the world to be pre-operationally and operationally certified to the Cyanide Code.

Annual audits of the CGO (including the CGO's cyanide management processes described in the CGO's Cyanide Management Plan) by the ICMI against the Cyanide Code have been undertaken since 2007. The CGO has been certified as fully compliant with the Cyanide Code since 2007 (i.e. CGO operations and cyanide management processes, including the CGO's Cyanide Management Plan [CMP]) are compliant with the Cyanide Code.

The cyanide storage, handling and management measures and procedures described in Section 6.1 of this HMMP are entirely consistent with the procedures and measures described in the CGO's CMP. Accordingly, it is considered that this HMMP is also consistent with the requirements of the Cyanide Code, as required by Development Consent Condition 5.4(d)(iii). Any future updates to cyanide management at the CGO described in the CMP, will also be incorporated into this HMMP, as required.

4 CLASSIFICATION OF HAZARDOUS CHEMICALS AND DANGEROUS GOODS

4.1 HAZARDOUS CHEMICALS

The *Leading Practice Sustainable Development Program for the Mining Industry Hazardous Materials Management Handbook* (Commonwealth of Australia, 2016) outlines that 'hazardous materials' is a term frequently used to cover one or more of:

- hazardous chemicals;
- hazardous substances;
- dangerous goods;
- hazardous or controlled waste materials; and
- radioactive materials.

The *Globally Harmonised System of Classification and Labelling of Chemicals* (GHS) was developed by the United Nations to create a single, global methodology for chemical classification and hazard communication using labelling and Safety Data Sheets (SDS) (Safe Work Australia, 2019). The GHS gives users practical, consistent and easy to understand information on chemical hazards and helps users take the appropriate preventive and protective measures for their health and safety (*ibid*.).

The GHS replaces the previous *Approved Criteria for Classifying Hazardous Substances* (National Occupational Health and Safety Commission, 2004).

The 'hazardous chemicals' terminology of the GHS, used by the WHS Regulations, replaces the 'hazardous substances' terminology used by the *Approved Criteria for Classifying Hazardous Substances*.

The NSW WHS Regulation define a hazardous chemical as:

> *a substance, mixture or article that satisfies the criteria for a hazard class in the GHS (including a classification referred to in Schedule 6), but does not include a substance, mixture or article that satisfies the criteria solely for one of the following hazard classes:*
>
> *(a) acute toxicity—oral—category 5,*
> *(b) acute toxicity—dermal—category 5,*
> *(c) acute toxicity—inhalation—category 5,*
> *(d) skin corrosion/irritation—category 3,*
> *(e) serious eye damage/eye irritation—category 2B,*
> *(f) aspiration hazard—category 2,*
> *(g) flammable gas—category 2,*
> *(h) acute hazard to the aquatic environment—category 1, 2 or 3,*
> *(i) chronic hazard to the aquatic environment—category 1, 2, 3 or 4,*
> *(j) hazardous to the ozone layer.*
>
> ***Note.***
>
> *The Schedule 6 tables replace some tables in the GHS.*

This definition and the classifications of chemicals under the GHS will be used to inform chemical management at the CGO (Section 5).

4.2 DANGEROUS GOODS

Dangerous goods are substances or articles that, because of their physical, chemical (physicochemical) or acute toxicity properties, present an immediate hazard to people, property or the environment (Commonwealth of Australia, 2016). The classification of dangerous goods in Australia is set in the ADG Code.

Chemicals/substances (including mixtures and solutions) and articles subject to the ADG Code are assigned to one of nine classes according to the hazard or the main hazard they present. The ADG Code classes and divisions are listed below.

Class & Division	Description	Example
Class 1	**Explosives**	Detonators, emulsion explosives, flares
Division 1.1	Substances and articles which have a mass explosion hazard	
Division 1.2	Substances and articles which have a projection hazard but not a mass explosion hazard	
Division 1.3	Substances and articles which have a fire hazard and either a minor blast hazard or a minor projection hazard or both, but not a mass explosion hazard	
Division 1.4	Substances and articles which present no significant hazard	
Division 1.5	Very insensitive substances which have a mass explosion hazard	
Division 1.6	Extremely insensitive substances which have a mass explosion hazard	
Class 2	**Gases**	
Division 2.1	Flammable gases	LPG, LNG, Acetylene, Oxygen, Methane
Division 2.2	Non-flammable, non-toxic gases	Nitrogen, Carbon dioxide, Compressed air
Division 2.2 subrisk 5.1	Oxidising gases	Oxygen
Division 2.3	Toxic gases – poisonous	Ammonia, Hydrogen cyanide, Sulphur dioxide
Class 3	**Flammable liquids**	Unleaded petrol, Kerosene, Aviation fuel
Class 4	**Flammable solids** substances liable to spontaneous combustion; substances which, on contact with water, emit flammable gases	
Division 4.1	Flammable solids, self re-active substances and solid desensitised explosives	Sulphur
Division 4.2	Substances liable to spontaneous combustion	Pyrite-bearing coal, Xanthates
Division 4.3	Water reactive substances	
Class 5	**Oxidising substances and organic peroxides**	
Division 5.1	Oxidizing substances	Caro's acid, Ammonium nitrate, Ammonium nitrate emulsion, suspension or gel
Division 5.2	Organic peroxides	Benzoyl peroxide
Class 6	**Toxic and infectious substances**	
Division 6.1	Toxic substances	Sodium cyanide
Division 6.2	Infectious substances	Clinical waste from medical centres
Class 7	**Radioactive material**	Uranium
Class 8	**Corrosive substances**	Nitric acid, Sulphuric acid, Hydrochloric acid
Class 9	**Miscellaneous dangerous goods**	Asbestos

Source: after ADG Code and Commonwealth of Australia (2016).

ADG Code provides procedures and protocols for the transport of non-Class 1 dangerous goods. Class 1 dangerous goods (explosives) are regulated by the *Australian Explosives Transport Code*.

Ammonium nitrate and unsensitised Ammonium nitrate emulsion are too insensitive to be classified as Class 1 explosives. While these precursor chemicals are not explosives, their main hazard is an explosion risk, albeit one that is much lower than that for Class 1 explosives.

5 CHEMICAL MANAGEMENT AT THE CGO

The management of chemicals and dangerous goods used at the CGO is conducted by the use of the Chemalert 3 chemical management system and other supporting software applications.

When new chemicals/consumables are brought to site for use at the CGO, the SDS information will be assessed to determine whether the chemical/consumable poses an environmental hazard in accordance with the Chemical Management Strategy (Section 5.1). The new chemical/consumable will be recorded in an Inventory Register within the Chemalert 3 system (Section 5.1.1). If the chemical/consumable is assessed as being either a hazardous chemical or dangerous good, the chemical/consumable will be added to a Hazardous Chemical and Dangerous Good Register (HCDGR) within the Chemalert 3 system (Section 5.1.2). Fuels and oils recorded in the Inventory Register will also be included in a Fuels and Oils Register (FOR) within the Chemalert 3 system (Section 5.1.3). New chemicals/consumables brought to site for use at the CGO will be managed in accordance with the relevant legislation, the relevant SDS and Australian Standards using the Chemalert 3 system.

Small quantities of biodegradable herbicides, pesticides and fertilisers will be used at the CGO for land management practices. Pesticide and herbicide storage, handling and use will be in compliance with the NSW *Pesticide Act, 1999* and the NSW WorkCover (2006) *Safe Use of Pesticides including Herbicides in Non-Agricultural Workplaces Code of Practice* and is described in detail in the CGO's Land Management Plan.

5.1 CHEMICAL MANAGEMENT STRATEGY

The Chemical Management Strategy described in this section and shown in Figure 3 is implemented at the CGO. A description of the primary components of the Chemical Management Strategy is provided in the following sub-sections.

5.1.1 Inventory Register

In accordance with best practice and the Chemical Management Strategy, all raw materials/consumables brought on-site for use at the CGO will be recorded in an Inventory Register which will be updated and available for inspection by the appropriate authorities. The CGO uses the Chemalert 3 system for the management of the Inventory Register. SDSs for all chemicals included in the Inventory Register will be available on the Chemalert 3 system.

5.1.2 Hazardous Chemicals and Dangerous Goods Register

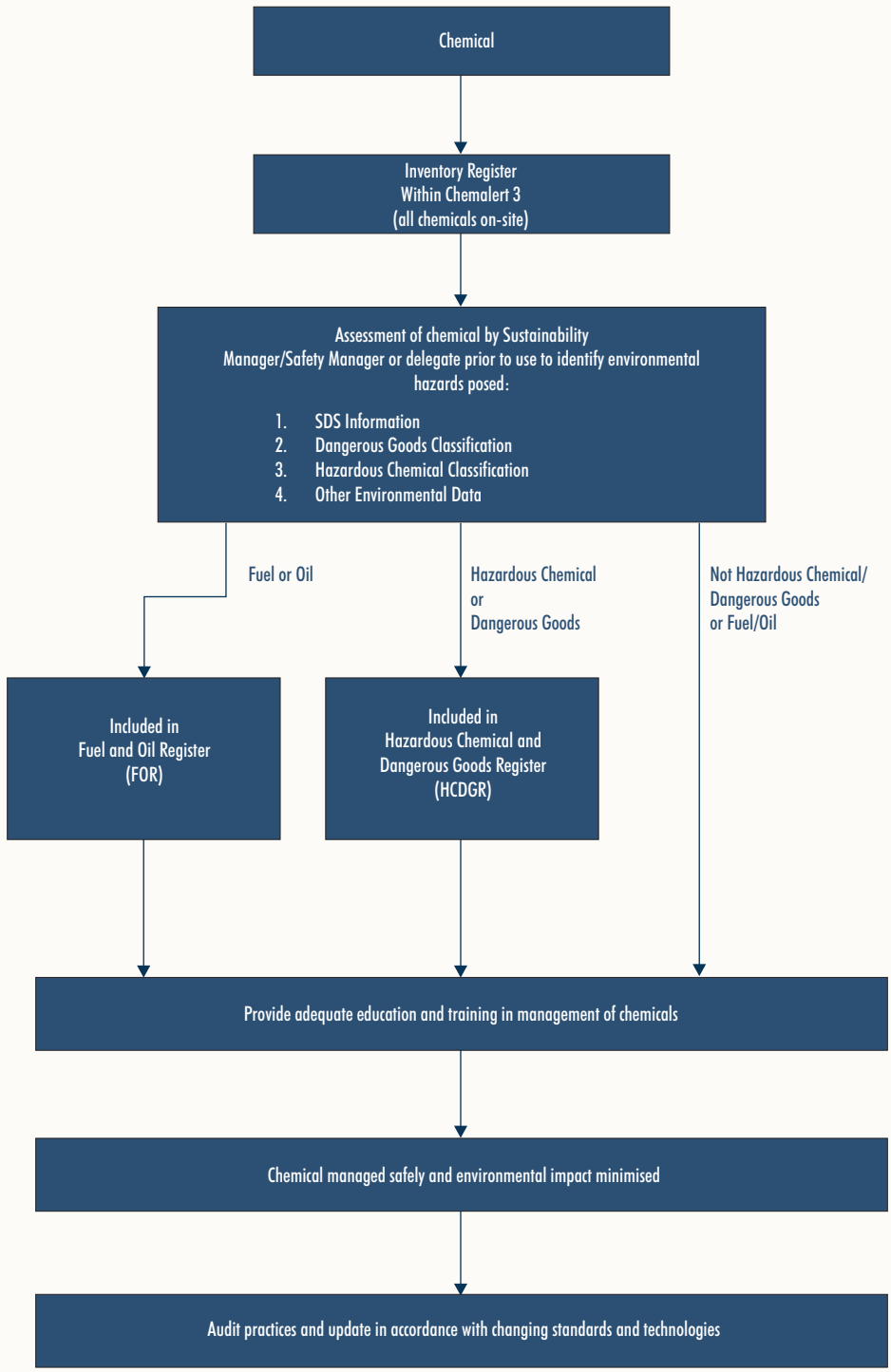
A HCDGR has been developed for the CGO. All hazardous chemicals and dangerous goods used, stored or produced on-site will be recorded in the HCDGR. The HCDGR will also include intermediate processing materials used in the process plant that may require management in the event of a plant failure or shutdown.

The CGO uses the Chemalert 3 system for the management of the HCDGR. The purpose of the HCDGR is to facilitate efficient audit functions as well as conform to requirements of the WHS Regulation (Section 2.4 and Appendix A) and leading practice environmental and hazardous material management guidelines.

In accordance with the WHS Regulation, the HCDGR and Chemalert 3 system will be maintained to include (where applicable) the following for each chemical and dangerous good:

(a) the SDS provided by the supplier of the chemical;

Chemical Management Strategy



HAL-18-43 CGO MP2018_HMMP_001A

Source: Leading Practice Sustainable Development Program for the Mining Industry - Hazardous Materials Management, 2016

(b) the common name or trade name of the chemical;

(c) the formal chemical names of the components of the chemical;

(d) copies of the risk assessments carried out for the chemical;

(e) toxicological information;

(f) safe handling information;

(g) information concerning the health effects;

(h) first aid treatment information; and

(i) a response plan, indicating an appropriate means for dealing with a dangerous incident such as spillage or poisoning in relation to the chemical.

The applicable Job Hazard Analysis for the use of chemicals and dangerous goods will also be stored in the Chemalert 3 system.

The Chemalert 3 system (and other chemical management applications used at the CGO) will also include:

- the United Nations Number, if applicable, to assist in information searches about the material;
- the dangerous goods class to indicate particular precautions needed, especially for mixed storages;
- applicable storage and process areas;
- typical quantities maintained on-site;
- details of the primary manufacturer and suppliers of relevant consumables;
- location plan of site identifying operational and storage areas for the material shown; and
- relevant handling, storage and disposal training requirements.

5.1.2.1 Maintenance of the Register

The Sustainability Manager (or delegate) will be responsible for regularly maintaining and updating the HCDGR and the Chemalert 3 system. In the event that a new chemical/consumable is relevant to the site, it will be listed on the Inventory Register in Chemalert 3, the Sustainability Manager (or delegates) will assess SDS information, hazardous chemical (Section 4.1) and dangerous goods classifications (Section 4.2) and other available environmental data to determine whether the material is hazardous or dangerous and whether special handling and storage requirements are needed. All chemicals and hydrocarbons are required to be registered in Chemalert 3 prior to use on site. The Chemalert 3 system will contain sufficient supporting information on the requirements for handling, storage location, quantities stored and spill response.

In addition, when a significant change to the supplier, consumption rate, storage facilities/location, relevant staff, or use of a relevant material occurs at site, the HCDGR will also be updated.

5.1.2.2 Medical/Environmental Safety Data

Suppliers and manufacturers of hazardous chemicals and dangerous goods are obliged to provide current SDS information with their product under the WHS Regulation.

Relevant and up-to-date SDSs for each chemical will be included in the HCDGR and the Chemalert 3 system in accordance with the WHS Regulation.

In addition to the above requirements for SDSs, each SDS included in the HCDGR and Chemalert 3 system will contain first aid treatment information.

Consistent with Part 3.1 of the WHS Regulation, Evolution will record an assessment of the risks to health created by work that involves possible exposure to hazardous substances. Evolution will use Planned General Inspections, Job Hazard Analysis, Standard Operating Procedures, Field Level Risk Assessment, Emergency Procedures and training sessions to manage and record risk management of hazardous substance exposure created by work with these substances.

5.1.2.3 Quantities and Storage Locations

The Chemalert 3 system (and other applications) will contain details of the quantity and storage location of hazardous chemicals used at the CGO. Information provided will include:

- chemical classification (i.e. hazardous/dangerous goods classification – Section 4);
- maximum quantity stored in operational areas;
- a storage location plan for site storage areas;
- storage conditions (e.g. open/vented enclosure); and
- emergency supplier's details are available in Chemalert 3 stock management programme.

5.1.2.4 Safety and Hazard Management Procedures

A number of safeguards will be implemented at the CGO to minimise the potential for incidents involving hazardous chemicals and dangerous goods (Section 8.1). The HCDGR via the Chemalert 3 system will contain safety and hazard management procedures to minimise the potential for incidents and reduce the severity of incidents should one occur (e.g. undertake liquid transfer operations within a bunded area).

5.1.2.5 Personnel Training Procedures

Evolution employees and contractors will receive relevant training in the use of chemicals in their routine tasks. Procedures will include but not limited to the following:

- appropriate use/handling of hazardous chemicals/consumables and wastes;
- SDS interpretation and use;
- Job Hazard Analysis interpretation and use;
- measures to prevent accidental release;
- use of Personal Protective Equipment (PPE);
- spill containment and incident reporting; and
- applicable clean-up techniques.

Training and inductions for employees with responsibility for particular operational areas and routine activities involving storage and handling hazardous chemicals, dangerous goods and hydrocarbons will be recorded in the CGO training database or similar training matrix. Administrative employees will initiate and maintain requests for chemical and hydrocarbon use in various operational areas via Chemalert 3.

5.1.2.6 Contingency, Clean-up and Disposal Procedures

The HCDGR via Chemalert 3 system will contain detailed contingency, clean-up and disposal procedures for each chemical recorded in the HCDGR. Safeguards and contingency measures implemented at the CGO are described in Section 8.1. General spill response and emergency response procedures are also described in Section 8.

General management and response procedures for hazardous chemicals and dangerous goods that will be implemented at the CGO include the following, consistent with the AS/NZS 3833:2007 *The Storage and Handling of Mixed Classes of Dangerous Goods in Packages and Intermediate Bulk Containers*:

- Every endeavour shall be made to prevent leaks and spills and to control them if they do occur. Clean-up action shall be initiated immediately. Leaked or spilled dangerous goods shall be kept and disposed of in accordance with AS/NZS 3833:2007 *The Storage and Handling of Mixed Classes of Dangerous Goods in Packages and Intermediate Bulk Containers*.
- In order to deal with leaks and spills, clean-up equipment, chemicals for neutralising or decontaminating spills and absorbent materials shall be maintained at every area at the CGO where dangerous goods are kept or handled. Where practicable, sufficient neutraliser will be kept available to treat the contents of the largest container stored.

A typical list of materials and equipment to deal with leaks and spills and requirements for storage of spilled dangerous goods and subsequent disposal is provided in AS/NZS 3833:2007 *The Storage and Handling of Mixed Classes of Dangerous Goods in Packages and Intermediate Bulk Containers*. The materials and equipment relevant to the hazardous chemicals and dangerous goods stored at the CGO will be incorporated in the HCDGR and Chemalert 3 system.

5.1.2.7 Auditing and Review Procedures – HCDGR & FOR

CGO internal audits and inspections will review on-site standard operating procedures for the following:

- maintenance of a risk-based audit schedule with defined responsibilities and frequency;
- timely implementation of audit findings; and
- review following audits to confirm successful implementation of audit recommendations.

These procedures will be implemented by the Sustainability Manager (or delegates) in accordance with general environmental auditing practices (e.g. AS/NZS ISO 19011:2014 *Guidelines for Auditing Management Systems*).

The Sustainability Manager (or delegates) will also complete an annual review of the HCDGR within the Chemalert 3 system. The annual review will involve:

- completeness check of hazardous chemicals and dangerous goods across the site to confirm inclusion on the relevant Register;
- confirmation that SDS information held in inventories and registers is current and available at points of storage and use;
- reconciliation of storage locations and storage quantities against the relevant Registers data; and

- assessment of site operations against SDS requirements for storage, handling and transfer operations.

5.1.3 Fuel and Oil Register

A Fuel and Oil Register (FOR) has been developed for the CGO and is a subset of the Chemalert 3 chemical management system. The type and volume of all fuels and oils used and stored on-site will be available in the FOR. The Sustainability Manager (or delegates) will assess SDS information and will be responsible for maintaining and updating the register. The purpose of the register is to facilitate audit functions and conform to best practice environmental management.

5.1.3.1 Maintenance of the Register

The Sustainability Manager (or delegate) will be responsible for regularly maintaining the Chemalert 3 system (and other applications) and updating the FOR. In the event that a new fuel or oil is brought to site, it will be recorded in the Inventory Register in Chemalert 3, the Sustainability Manager (or delegates) will assess SDS information and other available environmental data to determine whether special handling and storage requirements are needed for inclusion in the FOR. Where applicable, fuels and oils may also be included in the HCDGR.

5.1.3.2 Storage Methods and Facilities

The FOR subset of the Chemalert 3 system will describe the brands and volumes of fuel and oils used at the CGO. In addition, the register will also detail the location of storage facilities (main bulk stores and mobile or satellite storages) and methods of storage (vessel drum/tank construction) and compliance with relevant standards (AS 1940:2017 *The Storage and Handling of Flammable and Combustible Liquids*). Where applicable, the FOR will also contain maintenance measures for storage facilities including draining of bunded areas and regular maintenance of drains and piping.

5.1.3.3 Pumping, Piping, Transfer and Separation Procedures

The Chemalert 3 system and other applications will provide information and procedures for the pumping, piping, transfer and separation of fuel and oils. Procedures and protocols will also be provided for the draining of bunded areas and dealing with spills contained within the bunded area.

5.1.3.4 Fire Protection

Evolution's Maintenance and Emergency Response applications detail the fire protection measures and equipment for the fuel facilities and areas where hydrocarbons will be stored and used.

General provisional fire suppression systems are described in Section 8.1. Evolution has completed a Fire Safety Study for the CGO that complies with the requirements of Development Consent Condition 5.4(a)(i) and addresses the following recommendations of the *Preliminary Risk Assessment of Cowal Gold Project* (ANSTO Safety and Reliability, 1997) (PRA):

- storage of the hazardous consumable in such a manner as to minimise the possibility of fire; and
- provision of efficient fire alarm systems; and
- provision of efficient fire suppression systems.

Further detail regarding these systems is provided in Section 8.1.

5.1.3.5 Spill Containment and Clean-up Procedures

Procedures have been developed for spill containment and clean-up for both bulk and temporary fuel and oil storage locations. The procedures include, but are not limited to, the following:

- principal containment measures (permanent/temporary bunding);
- site drainage and measures for controlling runoff;
- spill trailer/kit location and use;
- incident reporting requirements; and
- procedures for the disposal/recycling of used clean-up materials.

General spill response procedures are discussed in Section 8.4.

5.1.3.6 Waste Oil Collection, Treatment and Disposal

The collection and disposal of waste oil will be managed using EPA licensed companies, vehicles and facilities for the following:

- identification of on-site waste oil storage locations;
- requirements for the storage of waste oil (quantities and labelling);
- contact details of the licensed waste contractor(s) (authorised to remove waste oil from the CGO);
- required documentation for disposal of waste oils;
- reporting requirements; and
- contact details for:
  - emergency services;
  - SDS stored in Chemalert 3; and
  - advice on the disposal of unknown hydrocarbons.

5.1.4 Personnel Training

In accordance with the Chemical Management Strategy (Section 5.1), all Evolution employees and contractors will be trained in the appropriate use of chemicals relevant to their tasks and duties. Training will include:

- hazardous chemical/dangerous good awareness;
- Job Hazard Analysis preparation and use;
- use of SDS information;
- measures to prevent accidental release;
- potential environmental impacts;
- use and maintenance of PPE;
- emergency spill response and containment; and
- clean-up techniques.

Education and training programmes will be used to instruct employees and contractors on the appropriate use of chemicals. The programmes will also be used to distribute information on the occupational health and safety implications and potential environmental impacts of these consumables.

The education and training programmes will include, but will not necessarily be limited to:

- induction of all company employees, contractors and first-time visitors;
- training in the Job Hazard Analysis for the use of each chemical for those personnel whose work involves its use;
- specific emergency response training to suit individual work requirements; and
- ongoing refresher training programmes for key employees and contractors to improve skills and competencies as necessary.

Training will also include reinforcement by refresher courses, short 'toolbox' discussions and/or routine discussion with supervisors. Records of all staff induction and environmental training will be kept to assist in the identification of personnel who require 'refresher' training.

Operators moving or using any reagents will be trained in the requirements of the material such as PPE, handling procedures and spill clean-up procedures in accordance with the relevant SDS and the information recorded for the material in the HCDGR/Chemalert 3 system.

5.1.5 Auditing of Chemical Management

The CGO will be subject to periodic audit and review (refer Section 10). During the audit and review process, CGO chemical management practices and procedures will be assessed against the Chemical Management Strategy and this HMMP. Audit results will be used to identify improvements that can be made to the site Chemical Management Strategy, procedures and this HMMP if appropriate.

CGO audits relevant to this HMMP are described in Section 10.

6 STORAGE AND HANDLING OF SODIUM CYANIDE AND OTHER CHEMICALS

6.1 SODIUM CYANIDE

Sodium cyanide is managed is accordance with the CGO's CMP.

SDSs for solid sodium cyanide, sodium cyanide solution and hydrogen cyanide gas are included in the Inventory Register within the Chemart 3 system. In accordance with the Chemical Management Strategy, chemicals such as cyanide, recorded on the Inventory Register that are designated as a hazardous chemical and/or dangerous good, are also included in the HCDGR (Section 5.1.2).

Sodium cyanide will be stored and handled in accordance with the requirements of the CMP, the Cyanide Code, the AS/NZS 4452:1997 *The Storage and Handling of Toxic Substances* and the relevant SDSs.

Section 5 of AS/NZS 4452:1997 *The Storage and Handling of Toxic Substances* sets out the requirements for storage and handling of toxic substances in bulk, including:

- design and construction requirements for containers;
- requirements for portable and fixed tanks;
- bunds and compounds;
- locations of bulk containers; and
- filling of bulk containers.

In addition, the standard provides requirements for operational and personnel safety, emergency management, fire protection and waste storage and disposal.

A summary of legislation of relevance to the handling and storage of cyanide is included in Appendix A. For example, the *Work Health and Safety (Mines and Petroleum) Act 2013* and the *Work Health and Safety (Mines and Petroleum) Regulation 2014* require occupiers to notify WorkCover of dangerous goods stored and handled. The requirements for notification of an incident is set out in Schedule 8 to the *Work Health and Safety (Mines and Petroleum) Regulation 2014*.

Storage areas, tanks, pipelines, pumps and valves will have high visibility labelling and will be inspected regularly for signs of leakage, presence of solution outside of the tanks in the bunded areas and integrity of the containment. Any aspects requiring maintenance or repair will be noted and records documenting the inspection and corrective measures will be kept.

Each delivery that arrives at the CGO will contain up to 40 tonnes of solid cyanide (in bulk solids isotainers). During cyanide transfer, a pump will circulate water from a mixing tank through the solids isotainer, thereby dissolving the solid cyanide in the isotainer. The solution will be recirculated through the isotainer and mixing tank, resulting in a progressive increase in the concentration of cyanide in the liquor until all the cyanide is dissolved. A pump will be used to remove the remaining solution from the bottom of the isotainer and transfer it to the mixing tank. This process is known as sparging. The liquor in the mixing tank will be transferred to the storage tank, from which it will be distributed to the leach tanks via the cyanide ringmain. Prior to departing the delivery bay, the driver will complete a cyanide driver checklist.

The drainage provision for the cyanide storage area will slope away from the tanks to a sump. A pump will be fitted at the sump and will transfer any rainfall, hose down or spilt liquid collected to the leach tanks, or alternatively back into the cyanide solution tanks.

In the event that spillage does occur within the bunded area, the affected area will be ameliorated in accordance with the CGO's internal Cyanide Emergency Procedure (Section 8.3). The CGO's internal Cyanide Emergency Procedure also outlines the response and management procedures for a cyanide related emergency or incident. These general response procedures for a spill/uncontrolled release of cyanide is described in Section 8.3.

6.2 OTHER CHEMICALS

Chemical Handling and Storage Overview

The majority of chemicals/consumables will be stored and handled within bunded storage areas located in the process plant area in accordance with the relevant Australian Standards (Section 2.5). A runoff collection drain (secondary collection) has been installed around the perimeter of the process plant and will drain to the process plant contained water storage (contained water storage D5A). An overview of this system is provided in Section 4.2.2 of the *Cowal Gold Project Environmental Impact* Statement (EIS) (North Limited, 1998) and is further detailed in the CGO's Water Management Plan (WMP).

Any other consumable storage areas (e.g. explosive storages) outside the process plant area (e.g. the relocated explosives compound) (Figure 2) will also be bunded and have secondary collection drains as required by relevant Australian Standards.

In accordance with Condition of Authority 14 for ML 1535, the handling, storage and use of consumables will be carried out in accordance with the requirements of the relevant SDSs and in a manner that does not cause or aggravate air pollution or water pollution (including sedimentation or soil contamination or erosion). Further, EPL 11912 Operating Condition O1 requires licensed activities to be carried out in a competent manner. This includes the processing, handling, movement and storage of materials and substances used to carry out the activity.

All storage facilities will be designed with the protection of the environment as well as health and safety in mind and, as much as possible, will incorporate engineering protection. Safety features that will be incorporated into the design of the reagent storage areas include (North Limited, 1998):

- installation of ventilation systems in areas where dispensing and mixing of chemicals occurs;
- installation of drain valves and pipework to facilitate the removal of rainwater from bunded areas;
- provision of portable pumps within the processing area for use in pumping any chemical spills within bunded areas back to the storage tanks or emergency holding tanks;
- provision of appropriate fire protection facilities compatible with the volatility and flammable properties of the stored reagents/chemicals; and
- provision of eyewash and emergency showers for process plant workers to be used for immediate wash down should an accident occur.

Liquids

Liquid processing consumables and other potentially hazardous consumables will be stored in either drums or tanks and will be located in bunded areas to contain any fires/spills. The design, construction and operation of storage areas for these liquid chemicals (particularly for flammable and combustible liquids), will be in compliance with AS 1940:2017 *The Storage and Handling of Flammable and Combustible Liquids*, and in accordance with EPL 11912 Operating Condition O3, which requires all above ground storage facilities containing flammable and combustible liquids to be bunded in accordance with the abovementioned Standard.

Corrosive liquids such as sulphuric acid will be stored in accordance with AS 3780:2008 *The Storage and Handling of Corrosive Substances*. Oxidising liquids such as hydrogen peroxide will be stored and handled in accordance with AS 4326:2008 *The Storage and Handling of Oxidizing Agents*.

Portable plastic and metal fuel containers used at the CGO (up to 25 L) will comply with the requirements of AS/NZS 2906:2001 *Fuel Containers – Portable – Plastics and Metal* which details the requirements for such storage vessels.

Solids

Solid chemicals/substances will be stored at the CGO in bunded bulk storage bins and/or weatherproof buildings (North Limited, 1998).

Regularly programmed inspections of storage area bunding and other spill control and collection systems will be undertaken in accordance with the CGO maintenance programme. Such inspections ensure the continued integrity of the bunding and containment and indicate when any corrective measures are needed (Environment Australia, 1997). Corrective measures may include replacement or repair of perished/damaged bund linings, removal of debris, weed control or management of contained and potentially contaminated water.

Mixed Dangerous Goods

Dangerous goods stored as mixed classes will be stored in accordance with AS/NZS 3833:2007 *The Storage and Handling of Mixed Classes of Dangerous Goods in Packages and Intermediate Bulk Containers*, and the requirements of WorkCover and the NSW Department of Industry where applicable. The Standard sets out the requirements and recommendations for the safe storage and handling of mixed classes of dangerous goods. Section 6 of the Standard sets out requirements for the separation of and segregation within stores containing more than one class of dangerous goods and the minimum separation distances of stores containing mixed classes of dangerous goods to protected places (i.e. a workshop, office store or building where people are employed) and other applicable requirements.

Laboratory chemicals will be stored and handled in accordance with AS/NZS 2243.10:2004 *Safety in Laboratories – Storage of Chemicals* where applicable.

Explosives, Ammonium Nitrate, Ammonium Nitrate Emulsion and Potassium Amyl Xanthate

Explosives and security sensitive dangerous substances are regulated by the *Explosives Act, 2003* and the *Explosives Regulation, 2013*. The regulatory framework requires stricter security for explosives and security sensitive dangerous substances. Under the *Explosives Regulation, 2013*:

- a licence to store will be required (Clause 27);
- a blasting explosives user's licence will be required (Clause 28);

- an unsupervised handling licence (now a 'security clearance') will be required for anyone assisting an explosives user (Schedule 3, Clause 4); and
- a licence to use security sensitive dangerous substances will also be required (Clause 31).

Each of the above licences have been obtained by the CGO.

The design and construction of the relocated explosive compound and magazine will comply with AS 2187.1:1998 *Explosives – Storage, Transport and Use – Storage* in accordance with Clause 84(2)(c) of the *Explosives Regulation, 2013,* consistent with the design of the existing facilities.

The relocated stores for explosives, ammonium nitrate and ammonium nitrate emulsion (or similar) will be located within ML 1535 immediately south of the southern waste rock emplacement (Figure 2).

Ammonium nitrate and ammonium nitrate emulsion will be transported to site in trucks. Once at site and when required, ammonium nitrate will be combined with diesel to produce ammonium nitrate fuel oil (AnFo) for use in blasting. The storage of ammonium nitrate and ammonium nitrate emulsion will be constructed and operated in accordance with AS 4326:2008 *The Storage and Handling of Oxidising Agents*. Storage facilities for AnFo consist of separate emulsion tanks and a steel portal frame shed constructed of iron cladding on a concrete slab base. Storage and handling of explosives at the CGO will be undertaken as per the requirements of AS 1940:2017 *The Storage and Handling of Flammable and Combustible Liquids*.

Storage of the high explosives (accessories and primers) and detonators will be in a purpose-built building with concrete brick cladding, concrete roof and timber floor in accordance with Section 2 of AS 2187.1:1998 *Explosives – Storage, Transport and Use – Storage*.
Storage of Potassium Amyl Xanthate (PAX) at the CGO will be limited to a maximum of 40,000 kg at the designated reagent storage area (although this is subject to change dependent on DG permit requirements/allowances which may be updated on occasion).

Gas Storage

LPG, liquid oxygen and compressed oxygen (O_2) will be stored separately near the process plant.

Where appropriate LPG facilities will be installed and operated in accordance with AS/NZS 1596:2014 *The Storage and Handling of LP Gas* which details the requirements for the location, design, construction, commissioning and operation of LPG storages.

Liquid oxygen will be stored in a facility installed and operated in accordance with AS 1894:1997 *The Storage and Handling of Non-Flammable Cryogenic and Refrigerated Liquids* which sets out the requirements for storage and handling of non-flammable liquids at or below -15^{o}C. The Standard includes information on storage vessels, operation and personal safety, emergency management and fire protection.

AS 2030.1:2009 *Gas Cylinders – General Requirements* also specifies requirements for the design, verification and manufacture of all gas cylinders for the storage and transport of compressed, dissolved and liquefied gases, of water capacity ranging from 0.1 kg to 3,000 kg.

Signage

All chemical storage areas will be provided with appropriate signage in accordance with AS 1319:1994 *Safety Signs for the Occupational Environment*. These signs will be displayed at each point of access in accordance with AS 1940:2017 *The Storage and Handling of Flammable and Combustible Liquids*. General signage requirements for restricted areas (where flammable and combustible liquids are stored and handled) will be installed as required by AS 1940:2017 *The Storage and Handling of Flammable and Combustible Liquids*.

Every installation in which dangerous goods are kept shall be placarded in accordance with the Safe Work Australia *Guidance Materials Placard and manifest requirements under the Work Health and Safety Regulations*.

Section 7 of AS 1345:1995 *Identification of the Contents of Pipes, Conduits and Ducts* provides guidance for the marking of piping by the use of colours, words and symbols and will be applied where applicable to liquid storage facilities.

Clean-Up Materials and Equipment

Suitable absorbent materials, spill clean-up materials and equipment will be maintained in chemical and waste storage, handling and use areas for containing, neutralising or decontaminating spills.

In accordance with AS/NZS 3833:2007 *The Storage and Handling of Mixed Classes of Dangerous Goods in Packages and Intermediate Bulk Containers* the CGO will maintain in chemical and waste storage, handling and use areas:

- adequate quantities of absorbent material (e.g. sand, fullers earth or suitable proprietary substances);
- chemical wheelie bin spill response kits for use on chemical spills;
- hydrocarbon wheelie bin spill response kits for use on fuel/oil spills;
- sodium carbonate for use on acidic spills;
- a sufficient number of resealable waste-recovery containers (e.g. drums made of materials compatible with the substances being kept and appropriately marked as being for emergency use only);
- portable pumps and decanting equipment; and
- shovels, bags, PPE.

This list will be augmented as appropriate according to the materials stored in the relevant area. Neutralising, compatible and incompatible materials are generally listed in the relevant material SDS.

Spill Response Procedures

Spill response procedures for on-site and offsite spills are described in Section 8.4.

Notification of Emergency Services and/or Regulatory Authorities

Procedures for Emergency Services notification and notification of regulatory authorities are described in the CGO's internal Emergency Response Plan and summarised in Section 8.2.

In accordance with the CGO's internal Emergency Response Plan, Emergency Services will be called to the CGO immediately once an emergency is declared as a Level A emergency. When the Emergency Services (e.g. Fire and Rescue NSW, Police, Ambulance, RFS or State Emergency Service) arrive on-site, the Emergency Controller will hand over responsibility for directing emergency operations to the Emergency Services. Accordingly, the external Emergency Services Controller will then become the overriding authority. When hand over is made, the CGO Emergency Controller will liaise closely with the external Emergency Services Controller, providing advice and directing company personnel as required. In the event of a Level A emergency, the attending Emergency Services will liaise with other organisations/authorities as appropriate (e.g. the District Emergency Management Co-ordinator [and Committee], Local Emergency Management Committee[s] and other Emergency Services).

If emergency response includes actions for nearby residential areas, the CGO Emergency Controller will liaise with the Police attending the emergency and provide information to allow the Police to decide upon the appropriate actions.

Incident notification and reporting requirements are described further in Section 9.1.

7 TRANSPORTATION OF HAZARDOUS MATERIALS ON LOCAL ROAD NETWORK

7.1 APPLICATION OF ROUTE SELECTION GUIDELINES

As described in Section 2.1, Development Consent Condition 5.4(d)(iii) requires Evolution to:

> *describe the measures that will be implemented to ensure:*
>
> - *the transportation of hazardous materials to or from the site on the local road network shown in Appendix 7 of the Development Consent is undertaken in accordance with the Department's Hazardous Industry Planning Advisory Paper No. 11 – Route Selection and the Australian Code for the Transport of Dangerous Goods by Road and Rail – Current Version;*

Accordingly, this section outlines the components of the DPIE's (2011a) *Hazardous Industry Planning Advisory Paper No. 11 – Route Selection* guidelines (herein referred to as the Route Selection Guidelines) which are relevant to this HMMP, given the scope of this HMMP is limited to the local road network surrounding the CGO (i.e. an evaluation of the entire transport route from the hazardous material supplier source to the CGO is not required). A description of the local road network is provided in Section 7.2.

Application of Relevant Components of Route Selection Guidelines

The purpose of the Route Selection Guidelines is to provide guidance on the identification and assessment of transport routes suitable for hazardous materials, based on an integrated approach that accounts for traffic, environmental and land use safety, economic and other operational factors (DoP, 2011a).

The Route Selection Guidelines describe a process for the identification and assessment of suitable routes for the transport of hazardous materials associated with a specific development. This process is shown on Figure 4 and generally includes:

- definition of the transport area;
- identification of hazardous material, source and destination;
- identification of preferred routes;
- ranking and selection of routes; and
- identification of risk management measures.

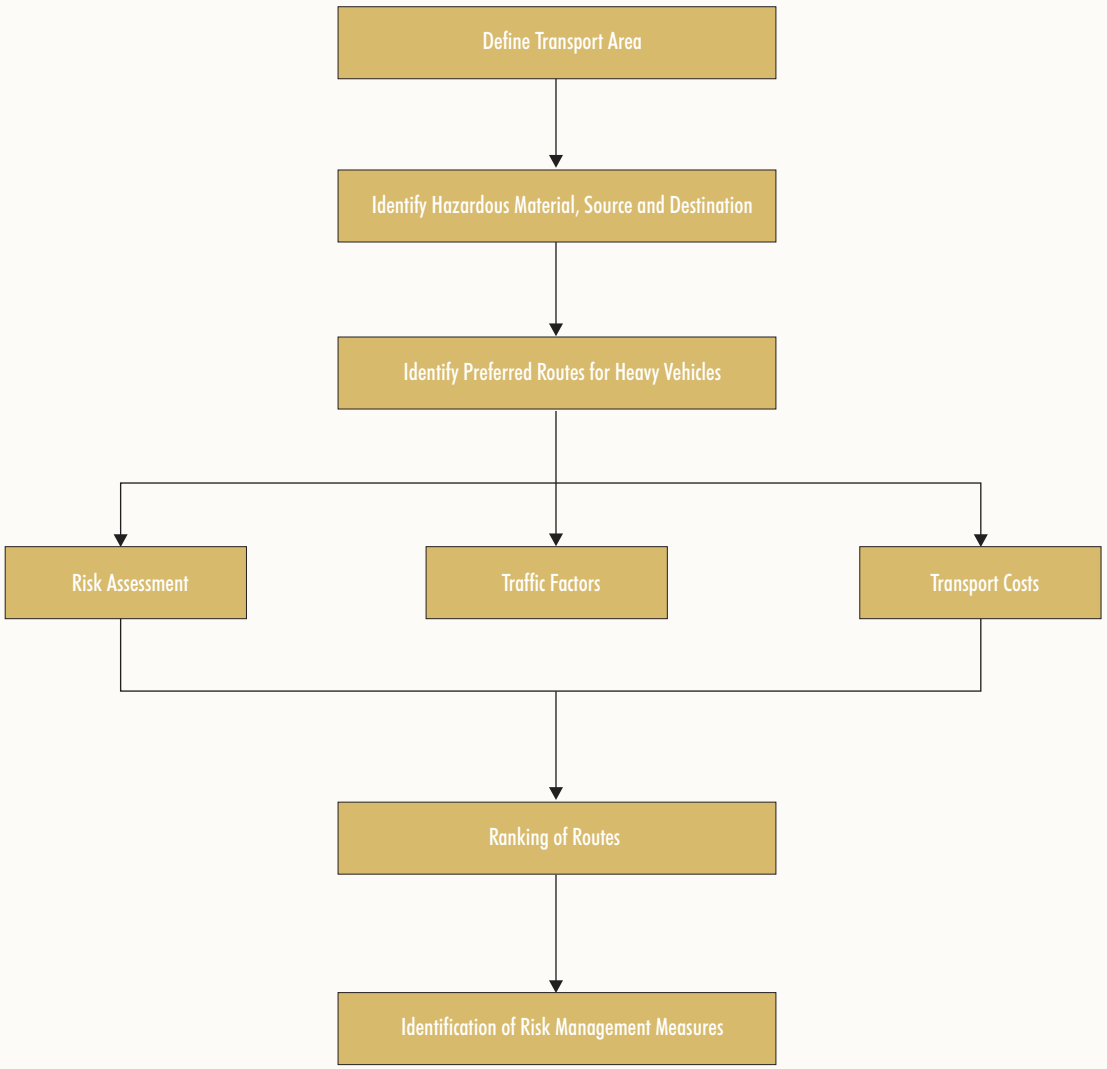
A summary description of the Route Evaluation Assessment Process components, and their relevance to the scope of this HMMP, is provided below.

1. Definition of the Transport Area

The Route Selection Guidelines defines this component as follows:

> *Definition of the transport area is carried out from a traffic perspective. It should include the area over which traffic to or from the development is likely to have a significant effect.*

The transport area is defined by Development Consent Condition 5.4(d)(iii) and is the local road network surrounding the CGO described in Section 7.2.



HAL-18-43 CGO MP2018_HMMP_001A

Source: Adopted from DoP, 2011a

Figure 4

2. Identification of Hazardous Material, Source and Destination

The Route Selection Guidelines defines this component as follows:

> *Identification of hazardous materials, source and destination is required to allows specific risk calculations to be carried out. Volume of traffic for the various types of hazardous materials is also required.*

Identification of Hazardous Materials

Prior to preparation of the CGO's Transport of Hazardous Materials Study (THMS), it was concluded and agreed with the then NSW Department of Planning (DoP) (as outlined in DoP correspondence dated 14 October 2005), that a route evaluation was desirable for eight hazardous materials that will be transported to the CGO. Accordingly, the eight hazardous materials subject to the THMS were: sodium cyanide, hydrochloric acid, sulphuric acid, caustic soda, hydrogen peroxide, LPG, ammonium nitrate and ammonium nitrate emulsion.

As described in the *Cowal Gold Operations Processing Rate Modification Environmental Assessment* (Evolution, 2018), no new reagents/process consumables will be used as part of the modified approved CGO. Therefore, these eight materials remain relevant to operations at the CGO and are addressed in this HMMP.

The classification of each of these materials under the ADG Code is provided in Table 2.

Table 2
Hazardous Materials Subject to this HMMP

Hazardous Material	Dangerous Goods Class[1]
Sodium Cyanide (NaCN)	Class 6 – Toxic substances *Class 6.1 – toxic substances - poisonous*
Hydrochloric Acid (HCl)	Class 8 – Corrosive substances
Sulphuric Acid (H_2SO_4)	Class 8 – Corrosive substances
Caustic Soda (NaOH)	Class 8 – Corrosive substances
Liquefied Petroleum Gas (LPG)	Class 2 – Gases *Class 2.1 – flammable gases*
Hydrogen Peroxide (H_2O_2)	Class 5 – Oxidizing substance; organic peroxides *Class 5.1 – oxidizing substances*
Ammonium Nitrate	Class 5 – Oxidizing substance; organic peroxides *Class 5.1 – oxidizing substances*
Ammonium Nitrate Emulsion	Class 5 – Oxidizing substance; organic peroxides *Class 5.1 – oxidizing substances*

1 Source: ADG Code Version 7.6.

Source and Destination

The sources for the above eight hazardous materials vary throughout Australia. Primarily the materials are sourced from supplier facilities in NSW (e.g. Botany Bay, Port Kembla), Queensland and Victoria. Material source locations can be subject to change outside of Evolution's or Evolution's contract supplier's control (e.g. port restrictions). Notwithstanding, as described in Sections 7.4 to 7.11, it is considered the risk to the local road network will not change as a result of a change to the source of the above eight hazardous materials.

The destination for each material is the CGO (i.e. none of the eight hazardous materials will be stored off-site). The chemical management and storage and handling procedures, described in Sections 5 and 6, are relevant to the above eight hazardous materials. The handling requirements for each material during transportation is regulated by the ADG Code and is responsible for the material supplier and transport provider. A summary of the key requirements of the ADG Code and DG Regulations for the transport of these hazardous materials is provided in Appendix B.

Volume of Traffic for the Hazardous Materials

The estimated increase of heavy vehicles on the local road network due to delivery of the relevant hazardous materials to the CGO is described in Sections 7.4 to 7.11.

3. Identification of Preferred Routes and Selection of Routes

The transport routes from the hazardous material sources to the CGO have been approved by the DPIE via the approval of the THMS and its associated Addenda. These transport routes have been communicated by Evolution to the relevant transport providers and these routes are set within the contracts between Evolution and the transport providers. Transport routes have been restricted to routes/roadways that are suitable to the type of heavy vehicle transporting the material (i.e. B-Double, single semi-trailers). Therefore, evaluation of all the potential transport routes from the hazardous material sources to the CGO is outside the scope of this HMMP.

As the scope of this HMMP is relevant to the local road network only (Section 7.2), the only transport routes relevant to the local road network surrounding the CGO for the transport of the hazardous materials to the CGO are (Figure 5):

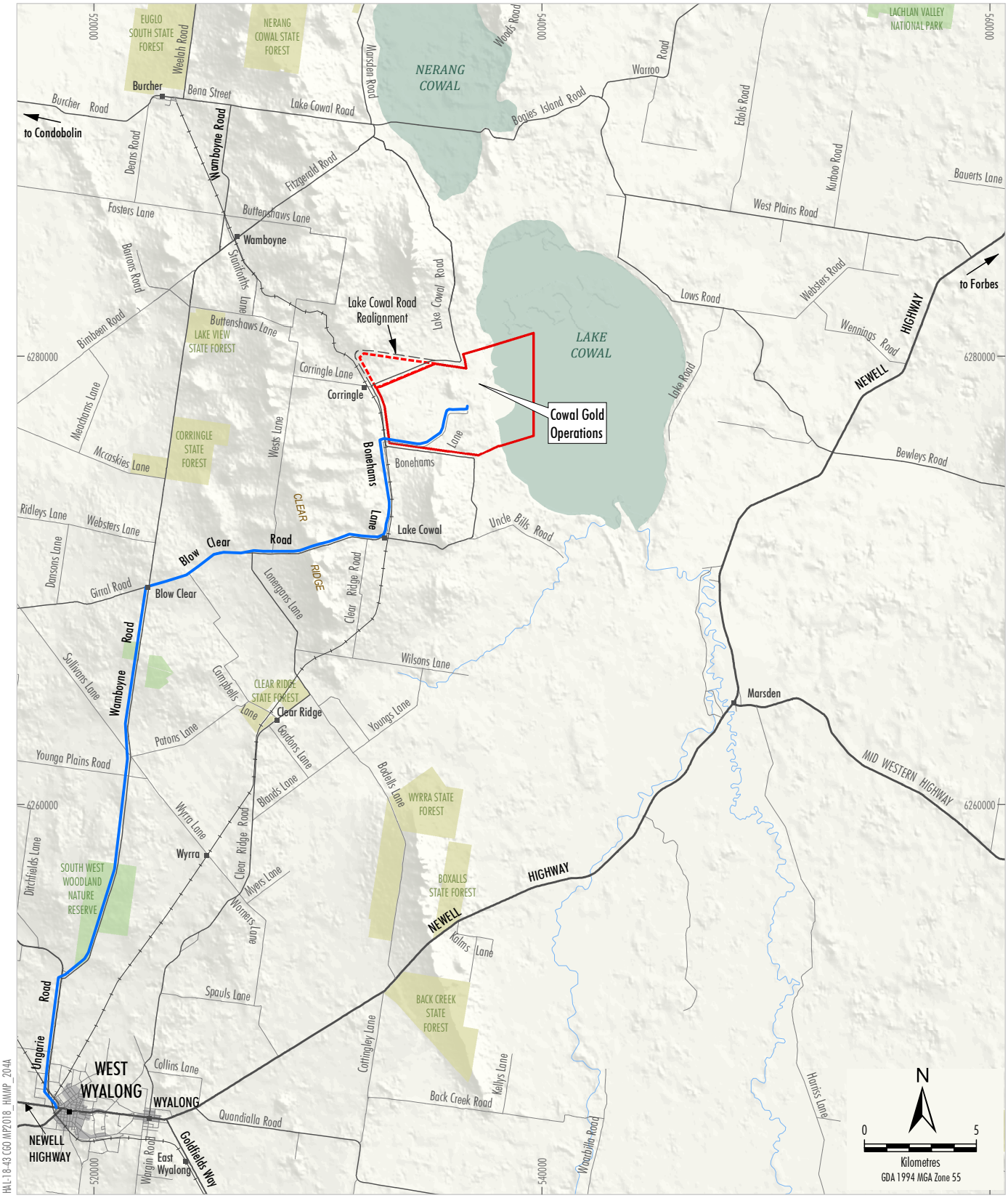
- the Newell Highway (from Forbes) into West Wyalong and then the approved Mine Access Route from West Wyalong to the CGO;
- the Newell Highway (from Narrandera/Mirrool) into West Wyalong and then the approved Mine Access Route from West Wyalong to the CGO;
- Goldfields Way (from Temora) into West Wyalong, and then the approved Mine Access Route from West Wyalong to the CGO; and
- Burley-Griffin Way (from Temora) to Mirrool, the Newell Highway (from Mirrool) to West Wyalong, and then the approved Mine Access Route from West Wyalong to the CGO.

A description of the local roads that comprise the approved Mine Access Route is provided in Section 7.2. No other local roads will be used for the heavy vehicle transport of hazardous materials to the CGO.

The four transport routes listed above are the only transport routes suitable for heavy vehicles and therefore are the only available routes for the transport of the hazardous materials to the CGO.

The Route Selection Guidelines recommends a risk assessment be undertaken for all preferred routes to determine which route presents the lowest possible risk to surrounding people property and the natural environment (DoP, 2011a).

Given it is not relevant to compare the risk levels between the above four transport routes, as these are the only transport routes available, risk assessments have been undertaken for each material in accordance with the DoP's (2011b) *Hazardous Industry Planning and Advisory Paper No. 6, Hazard Analysis* guidelines (HIPAP No. 6 Guidelines) methodology to assess the level of risk to the local road network routes associated with the transport of each hazardous material. These risk assessments for each material are presented in Sections 7.4 to 7.11.



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LEGEND

- Mining Lease Boundary (ML 1535)
- Mining Lease Boundary (ML 1791)
- National Park &
- Nature Reserve State Forest
- Railway
- Mine Access Route (West Wyalong)

Source: GTA Consultants (2018); Geoscience Australia (2006); NSW Department of Planning and Environment (2017); Office of Environment and Heritage NSW (2017)

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HAZARDOUS MATERIALS MANAGEMENT PLAN

Local Road Network

Figure 5

The assessments include a description of the potential consequences and an estimation of the likelihood of a potential hazardous event occurring (e.g. a heavy vehicle carrying the material of interest being involved in an accident resulting in a release of material).

4. Identification of Risk Management Measures

The identification of risk management measures is the final step in the route evaluation process (Figure 4). The Route Selection Guidelines state that the *identification of risk management measures should include opportunities for risk reduction where the evaluation shows undesirable levels of risk along the preferred routes, together with consideration of an appropriate safety management system* (DoP, 2011a).

The risk assessments for the relevant hazardous materials did not identify any undesirable levels of risk to the local road network associated with the transport of the hazardous materials (Sections 7.4 to 7.11). Therefore, no additional risk reduction measures are proposed beyond the risk management measures required to be implemented by the material supplier and transport provider and Evolution in accordance with the ADG Code and DG Regulations. A description of the risk management measures required to be implemented under the ADG Code and DG Regulations, is provided in Appendix B.

7.2 LOCAL ROAD NETWORK

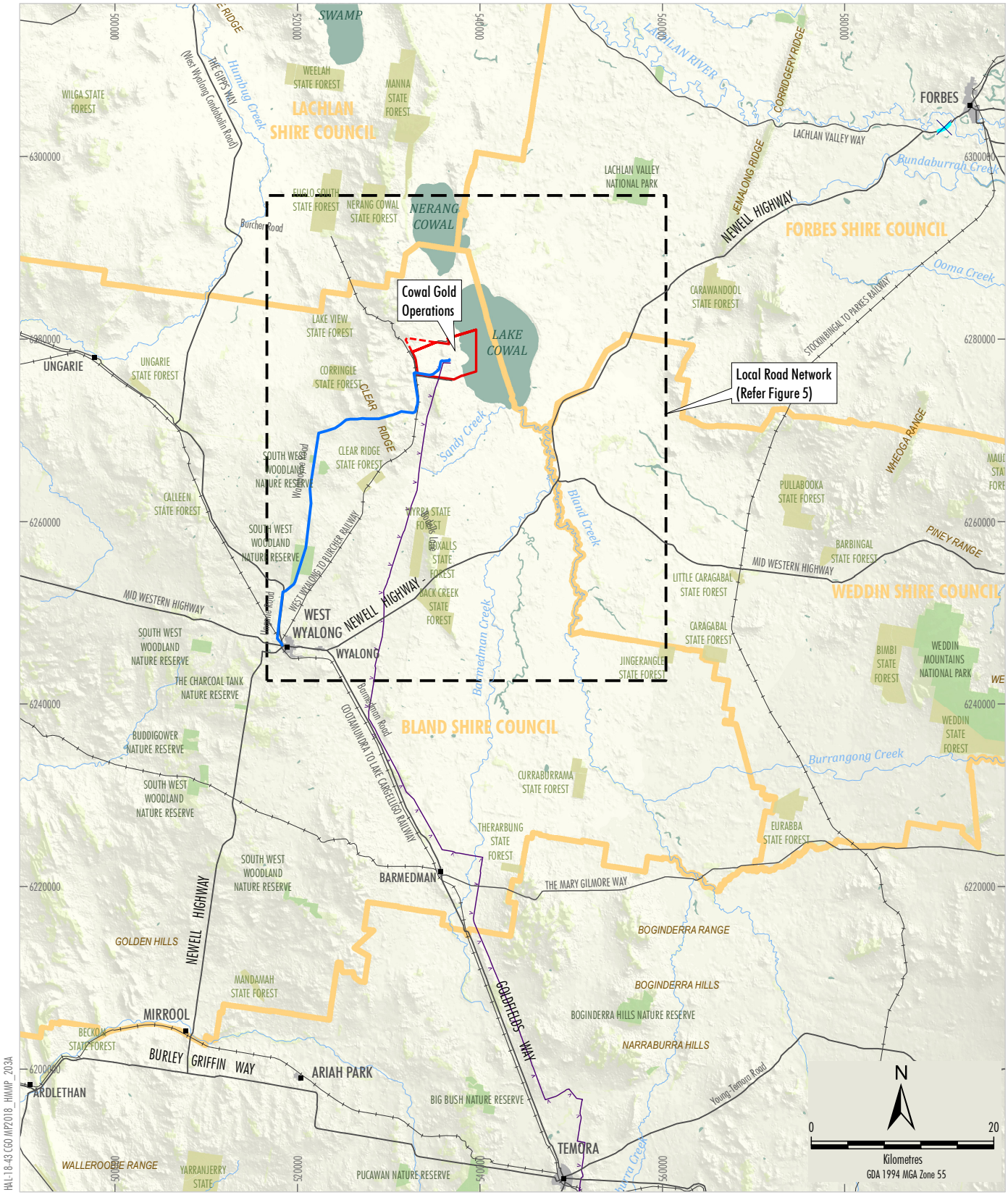
Development Consent Condition 5.4(d)(iii) defines the local road network as that shown in Appendix 7 of the Development Consent. Appendix 7 of the Development Consent presents all the approved access routes to the CGO for mine-related traffic (including light vehicle access routes for employees and/or contractors travelling to the CGO). However, heavy vehicles associated with the delivery of the relevant hazardous materials to and from the CGO, will only use the local road network transport routes described below.

As described in Section 7.1 above, the only transport routes relevant to the local road network for the delivery of the hazardous materials to the CGO are (Figure 5):

- the Newell Highway (from Forbes) into West Wyalong and then the approved Mine Access Route from West Wyalong to the CGO;
- the Newell Highway (from Narrandera/Mirrool) into West Wyalong and then the approved Mine Access Route from West Wyalong to the CGO;
- Goldfields Way (from Temora) into West Wyalong, and then the approved Mine Access Route from West Wyalong to the CGO; and
- Burley-Griffin Way (from Temora) to Mirrool, the Newell Highway (from Mirrool) to West Wyalong, and then the approved Mine Access Route from West Wyalong to the CGO.

The approved Mine Access Route from West Wyalong to the CGO comprises the following local roads (Figure 5): Ungarie Road, Wamboyne Road, Blow Clear Road and Bonehams Lane.

Only the segments of these local roads shown on Figure 5 are associated with the approved Mine Access Route. No other local roads will be used for the transportation of hazardous materials to and from the CGO. To provide a clear understanding of the roads to be used for the transport of the relevant hazardous materials to the CGO, and to provide context to the risk assessments in Sections 7.4 to 7.11, Figure 6 shows the regional road network, connecting to the CGO's local road network.



LEGEND

- Mining Lease Boundary (ML 1535)
- Mining Lease Boundary (ML 1791)
- National Park & Nature Reserve
- State Forest
- Local Government Area Boundary
- Electricity Transmission
- Line Railway
- Mine Access Route (West Wyalong)

Source: © NSW Department of Finance, Services & Innovation (2017); Office of Environment & Heritage NSW (2017)

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HAZARDOUS MATERIALS MANAGEMENT PLAN

Regional Road Network

Figure 6

7.3 RISK TO LOCAL ROAD NETWORK

7.3.1 Risk Assessment Methodology

The Route Selection Guidelines outline an intermediate risk assessment method that will be undertaken for each potential transport route found to be satisfactory on road and traffic grounds. If the intermediate method does not enable the analyst to identify a clear-cut low risk alternative and differences between potential routes are small then a detailed risk assessment may need to be carried out in accordance with HIPAP No. 6 Guidelines (DoP, 2011b).

A risk assessment has been undertaken by Pinnacle Risk Management Pty Ltd for each hazardous material using the methodology for hazard analysis provided in the HIPAP No. 6 Guidelines. The HIPAP No. 6 Guidelines methodology is as follows:

1 **Hazard identification:** the identification of all possible conditions that could lead to a hazardous incident is achieved by evaluating the hazards of the material of interest, the land use adjacent to each potential transport route, the type of transport vehicle to be used, the conditions of the material when being transported and the causes of potential incidents involving heavy vehicles.

2 **Consequence Analysis:** determined on either a qualitative or quantitative basis depending on the potential hazardous incident outcomes.

3 **Estimation of likelihood of a hazardous incident:** estimated using available historical traffic data or generic traffic data.

4 **Risk analysis.**

5 **Assessment of risk results.**

For the risk analysis component, the risk of an event occurring is determined using the risk matrix in Table 3 and the consequence ratings in Table 4 (Pinnacle Risk Management Pty Ltd, 2018).

Table 3
Risk Matrix

Likelihood						
Frequent >1/yr	II	II	I	I	I	I
Probable $>10^{-1}$ to 1/yr	III	II	II	I	I	I
Possible $>10^{-2}$ to 10^{-1}/yr	III	III	II	II	I	I
Unlikely $>10^{-4}$ to $>10^{-2}$/yr	III	III	III	III	II	I
Very Unlikely $>10^{-6}$ to 10^{-4}/yr	III	III	III	III	III	II
Extremely Unlikely $<=10^{-6}$/yr	III	III	III	III	III	III
Consequence	Minor	Significant	Severe	Serious	Extremely Serious	Catastrophic

Source: Pinnacle Risk Management Pty Ltd (2011; 2018)

Class I: Indicates a high level of risk which is intolerable and where risk reduction is required. This requires the reduction of frequency and/or consequence.

Class II: Indicates a moderate level of risk. Whilst the risk is not unacceptable, there should be practical measures taken to lower the risk if economically viable. For risks where further mitigation is not economically viable, judgement needs to be exercised as to whether the level of risk is acceptable or not. This area is the beginning of the ALARP region (i.e. as low as reasonably practicable).

Class III: indicates a low level of risk and is broadly considered to be acceptable. Further risk mitigation may not be required / appropriate. However, low and accepted risks should be monitored and routinely reviewed to ensure that they remain acceptable. Few risks remain static. This area includes ALARP as well as what are known as trivial or negligible risks.

Table 4
Consequence Ratings

	Minor	Significant	Severe	Serious	Extremely Serious	Catastrophic
Safety and Health	One minor injury, First Aid	Recordable or single Medical Treatment Injury	Multiple Medical Treatment Injuries or one Lost Time Injury	Permanent disability casualty or multiple Lost Time Injuries	Multiple permanent disabilities or one fatality	Multiple fatalities
Environment	Very minor pollution. No offsite escape of material (contained within the operational areas). Onsite nuisance value only	Minor local pollution. Nuisance offsite effect, typically of short duration, e.g. noise, odours, dust and/or visible plumes for less than one hour	Evident pollution, local concern. Minimal duration offsite effects (e.g. waterway slightly discoloured, turbid etc around the point of release with no or very few fish killed)	Significant local pollution. For example, waterways discoloured 10s of metres, fire or smoke affecting people near to the site	Major local pollution. Observable offsite effect (e.g. waterways discoloured 10s to 100s of metres for a few weeks with a significant number of aquatic life adversely affected)	Extremely severe pollution. Ecosystems at high risk of destruction. Only resolved via long term solutions (potentially taking years)
Public Relations	Minor issue, one complaint	Local issue, 10 complaints	Local media, 100 complaints	Regional or state media	Wide media national coverage	Headlines, corporate damage
Financial Impact	< $25,000	$25,000 to $100,000	> $100,000 to $1 million	> $1 million to $20 million	> $20 million to $100 million	> $100 million

Source: Pinnacle Risk Management Pty Ltd (2011; 2018)

The above risk matrix format and categories are based on Australian and British Standards for risk assessment including AS/NZS 4360: Risk Management; AS/NZS 3931: Risk Analysis of Technological Systems – Application Guide; Organisational Experiences in Implementing Risk Management Practices HB 250-2000 (Standards Australia, 2000) and Reducing Risks, Protecting People (Health and Safety Executive, 1999).

The methodology used for the matrix-based risk assessments in the sub-sections below closely follows the recommendations made in these references.

The following sub-sections present the risk assessments prepared by Pinnacle Risk Management Pty Ltd (2018; 2019) to assess the level of risk to the four local road network routes surrounding the CGO associated with the transport of each relevant hazardous material to the CGO.

7.4 SODIUM CYANIDE

1 Hazard Identification

Type of Hazardous Material

Sodium cyanide is classified under the ADG Code as Class 6.1 (toxic substance) and Packing Group I. It is a white solid with a bitter almond-like odour and will absorb moisture from the air.

Cyanide is toxic to humans and to animal species because it binds to key iron-containing enzymes required for cells to use oxygen. As a result, the tissues are unable to take up oxygen from the blood. The body then rapidly exhibits symptoms of oxygen starvation and suffocation, even if oxygen is available.

The Threshold Limit Value for sodium cyanide dust is 5 mg/m^3. Aqueous solutions are strongly alkaline and, in a fire, nitrogen oxides may be produced.

On contact with acid, acid fumes, water, combined carbon dioxide/water vapours or steam, sodium cyanide will produce hydrogen cyanide which is a highly toxic, flammable gas. Although hydrogen cyanide is not being transported to the CGO the hazardous nature of this material has been included below as it is a decomposition product from releases of sodium cyanide.

Hydrogen cyanide liquid is pale blue or colourless below 26°C and a colourless gas at higher temperatures. It is highly volatile. Hydrogen cyanide is highly soluble in water and exhibits a very low vapour pressure. Health effects and symptoms of hydrogen cyanide poisoning do not depend on the route of exposure (i.e. they are similar whether it is breathed in, ingested or absorbed through the skin). Exposure to high levels of hydrogen cyanide in the air for a short time harms the brain and heart and may cause coma and death. Exposure to lower levels of hydrogen cyanide for a long time may result in breathing difficulties, heart pains, vomiting, blood changes, headaches, and enlargement of the thyroid gland. Depending on the dose, the patient may make a full recovery with no residual disability. Near-lethal doses can cause irreversible effects. Skin contact with cyanide can produce irritation and sores (i.e. it can be corrosive). Hydrogen cyanide is not classifiable as a human carcinogen. Rapid damage to the central nervous system and to the heart results from breathing high levels of hydrogen cyanide over a short time. The response of humans to various concentrations of hydrogen cyanide in the air is as follows:

Hydrogen Cyanide Concentration (ppm)	Response to Humans
270	Immediately fatal
181	Fatal after 10 minutes
135	Fatal after 30 minutes
110 – 135	Fatal after 30 to 60 minutes
45 – 55	Tolerated for 30 to 60 minutes without immediate or subsequent effects
18 – 36	Slight symptoms after several hours

Adjacent Land Use

Sodium cyanide will typically be transported on the local road network using the Newell Highway travelling from Forbes to West Wyalong, and then the approved Mine Access Route (from West Wyalong) to the CGO.

Sensitive land uses include schools (pre-schools and primary and secondary schools), hospitals, aged care facilities, churches and items of heritage or cultural significance.

The area of the Newell Highway coming from Forbes to West Wyalong and the approved Mine Access Route predominantly pass through rural areas comprising of areas of open space.

Some sensitive land uses are located along the Newell Highway (Neeld Street) in Wyalong and West Wyalong, including the Wyalong Public School, Saint Mary's War Memorial School, and five churches. The West Wyalong Public School, West Wyalong High School, West Wyalong District Hospital and the Royal Freemason's Benevolent Institution West Wyalong Masonic Village Aged Care are located adjacent to or nearby Ungarie Road (i.e. the initial segment of the approved Mine Access Route).

Numerous heritage items are listed under the *Bland Local Environmental Plan 2011* (LEP) as located along the Newell Highway (Neeld Street) in Wyalong and West Wyalong, including the Tattersalls Hotel, Post Office Hotel, Globe Hotel and the "Wyalong House" residence.

Outside of Wyalong and West Wyalong sensitive land uses surrounding the local road network, such as those listed above, are relatively uncommon.

Other land uses include residential, commercial or industrial areas, which are largely concentrated in Wyalong and West Wyalong, and areas of open space.

Transport Vehicle and Conditions of Transport

Sodium cyanide will be transported to the CGO typically by B-Double with a maximum capacity of up to 40 tonnes per delivery or alternatively if required, by a single semi-trailer, with a maximum capacity of up to 22 tonnes per delivery. Sodium cyanide will be transported as a solid and contained within a bulk solids container (i.e. Isotainer). Regulation of temperature and pressure are not required during the transport of this solid material. The maximum frequency of deliveries via B-Doubles is 5 per week, while the maximum frequency of deliveries via single semi-trailers is 9 per week.

When the pH of sodium cyanide is lowered (e.g. by mixing with water or an acid), hydrogen cyanide is formed. Typically, at a pH of 8, 93% of sodium cyanide exists as hydrogen cyanide and at pH 7, 99% exists as hydrogen cyanide. Subsequently, solid sodium cyanide is mixed with approximately 0.2% to 0.3% solid caustic soda for transport. The addition of caustic soda assists in controlling pH so that the sodium cyanide does not readily decompose into hydrogen cyanide at high pH values (i.e. pH 10.5 or higher).

Causes of Hazardous Incidents

Initiating and contributory causes for incidents involving heavy vehicles has been detailed in *Guidelines for Chemical Transportation Risk Analysis* (Centre for Chemical Process Safety [CCPS], 1995). The identified causes, with additional causes included, are reproduced in Table 5.

Table 5
Heavy Vehicle Incidents – Initiating and Contributing Causes

Human Error	Equipment Failures	System or Procedural Failures	External Events
• driver impairment, e.g. alcohol or drugs • speeding • driver overtired • driver exceeding safe working hours • en-route inspection • contamination • overfilling • other vehicle's driver • taking tight turns/ramps too quickly (overturns) • unsecured loads	• rail road crossing guard failure • leaking valve • leaking fitting • brake failure • relief device failure • tyre failure • soft shoulder • overpressure • material defect • steering failure • high centre of gravity • corrosion • bad weld • excessive grade • poor intersection design • road chamber/width • suspension system • tyre fire caused by friction, brakes overheating or exploding tyres give sparks due to metal in the rubber) • fuel tank fire (diesel)	• driver incentives to work longer hours • driver training • carrier selection • container specification • route selection • emergency response training • speed enforcement • driver rest periods • maintenance • inspection • time of the day restrictions	• vandalism/sabotage • rain • fog/visibility • wind • flood/washout • fire at rest area/parking areas • earthquake • existing accident • animals on road

After: CCPS (1995).

2 Consequence Analysis

An accident involving a heavy vehicle transporting sodium cyanide resulting in a release of the material is the hazardous incident relevant to the transport of sodium cyanide. The following consequences of this hazardous incident are relevant:

- slow evolution of hydrogen cyanide gas from a quiescent solution, especially if ambient temperatures are below 26°C resulting in exposure for those at or near to an accident scene;
- inhalation of sodium cyanide dust resulting in exposure for those at or near to an accident scene; and
- contamination of waterways and resultant toxicity effects on organisms.

Sodium cyanide has low persistence in the environment and is not accumulated or stored in any mammals that have been studied.

A review of previous spills of sodium cyanide confirms the above consequences (Pinnacle Risk Management Pty Ltd, 2018).

3 Estimation of the Likelihood of a Hazardous Incident

Accident statistics for the Newell Highway have been obtained from the RMS for the area between Dubbo and West Wyalong and are summarised in Table 6. Although the entire transport route from Dubbo to the CGO is outside the CGO local road network (and is a greater extent than that required to be assessed), this extent provides a more conservative assessment of accident statistics. Accordingly, the accident statistics presented below are conservative as they are relevant to a greater area than the local road network surrounding the CGO (Figure 5). Available accident statistics for the approved Mine Access Route were also obtained from the RMS.

Table 6
Summary of Accident Statistics – Sodium Cyanide

Route (Figure 5)	Length (km)	No. of Heavy Vehicles (per day)[1]	% Increase of Heavy Vehicles due to Approved CGO[3]	Heavy Vehicle Accidents (per year)[4]	Annual Million km of Heavy Vehicle Travel	Heavy Vehicle Accidents/Annual Million km of Heavy Vehicle Travel
Dubbo – West Wyalong (Newell Highway)	257	746[2] – 1,102[2]	0.3 – 0.5%	11.6	69.99 – 103.41	0.11 – 0.17
Mine Access Route	41	217[2]	1.7%	1	3.24	0.31

1 Roads and Maritime Services Traffic Volume Viewer (retrieved 23 May 2018).

2 2018 values extrapolated from previous years assuming 1% annual growth rate.

3 Assumes 18 movements per week (includes movements to and from the CGO).

4 Roads and Maritime Services Crash Report Data (1 Jan 2012 to 21 Dec 2016).

Accident statistics for this segment of the Newell Highway (between Dubbo and West Wyalong) are considered to be within normal operating levels for the road type and use. The increase of heavy vehicles transporting sodium cyanide on the local road network due to the approved CGO will be very small (up to approximately 0.5%) and will be unlikely to affect traffic flows or accident statistics. The route on the Newell Highway between Dubbo and West Wyalong is therefore suitable for the transport of hazardous materials with respect to accident statistics.

Accident statistics for the approved Mine Access Route are considered to be within normal operating levels for the road types and use. Improved driving conditions have been achieved due to the upgrading of the Mine Access Route which included sealing of the road to the CGO. The increase of heavy vehicles transporting sodium cyanide on the Mine Access Route due to the approved CGO will be small (approximately 1.7%) and will be unlikely to affect traffic flows or accident statistics. The approved Mine Access Route is therefore suitable for the transport of hazardous materials with respect to accident statistics.

In the event of an accident involving a heavy vehicle, the carried goods may or may not be released. The probability of release is dependent on factors such as speed, shipping conditions (i.e. pressurised compared to non-pressurised), inadequate load securing, and strength and integrity of the container.

Various studies of release probabilities from heavy vehicles involved in an accident have been undertaken. The *Guidelines for Chemical Transportation Risk Analysis* (CCPS, 1995) indicates that the release probability for various road types is between 5 and 10% (i.e. approximately one heavy vehicle accident in every 10 to 20 will result in a release of a material) (Pinnacle Risk Management Pty Ltd, 2018).

An estimation of the likelihood of an accident involving a vehicle transporting sodium cyanide to the CGO resulting in a release of the material must take into account the following:

- the number of vehicles transporting sodium cyanide to the CGO relative to the total number of heavy vehicles already using the same transport route;
- the number of accidents that have involved heavy vehicles; and
- the probability of a release of the material (which is assumed to be 10% of all accidents involving heavy vehicles results in a release of material) (CCPS, 1995).

The likelihood of an accident (based on averaged accident data) involving a vehicle transporting sodium cyanide to the CGO resulting in a release of the material for the segment of the Newell Highway between Dubbo and West Wyalong is estimated to be $2x10^{-3}$/year (i.e. such an incident is estimated to occur on this route once every 500 years) (Pinnacle Risk Management Pty Ltd, 2019). This likelihood estimation is considered conservative given it is relevant to an area of greater extent than the local road network.

The likelihood of an accident (based on averaged accident data) involving a vehicle transporting sodium cyanide to the CGO resulting in a release of the material for approved Mine Access Route is estimated to be approximately $6x10^{-4}$/year (i.e. such an incident is estimated to occur once in every 1,700 years) (Pinnacle Risk Management Pty Ltd, 2019).

The risk of the event is determined using the risk matrix and the consequence ratings in Tables 3 and 4 in Section 7.3.1 (Pinnacle Risk Management Pty Ltd, 2018).

For releases of sodium cyanide from a road traffic accident, the consequence rating is determined to be “Serious” (Pinnacle Risk Management Pty Ltd, 2019). The volume is limited to the size of the tanker (i.e. up to 40 tonnes) and it is possible that only one of the two barrels is breached (Pinnacle Risk Management Pty Ltd, 2019).

Given a likelihood of $2x10^{-3}$/year for the segment of the Newell Highway between Dubbo and West Wyalong and $6x10^{-4}$/year for the approved Mine Access Route and consequence rating of “Serious”, the corresponding risk level is Class III (Pinnacle Risk Management Pty Ltd, 2019). These values indicate a low level of risk associated with the transport of sodium cyanide on the local road network (Pinnacle Risk Management Pty Ltd, 2018).

4 Risk Analysis and Assessment of Risk Results

Risk analysis took into account road and traffic factors, emergency response capability and operational factors for the segment of the Newell Highway between Dubbo and West Wyalong and the approved Mine Access Route. Table 7 provides a summary of all assessment factors utilised in the risk analysis.

Table 7
Summary of Risk Analysis Assessment Factors – Sodium Cyanide

Assessment Factor	Newell Highway between Dubbo and West Wyalong	Mine Access Route
Schools	#	2 (< 1km from route)
Number of School Students	#	595
Hospitals	#	1
Number of Hospital Beds	#	<50
Aged Care Facilities	#	1

Table 7 (Continued)
Summary of Risk Analysis Assessment Factors – Sodium Cyanide

Assessment Factor	Newell Highway between Dubbo and West Wyalong	Mine Access Route
Churches	#	0
Items of Heritage or Cultural Significance	#	0
Other Land use	Predominantly open space	Predominantly open space
Number of Park Reservations	5	1
Park Reservations – Approximate Total Road Frontage (km)	22.5	5.1
Waterways	13	22
Emergency Infrastructure	Adequate	Adequate
Length (km)	257	41
No. of Heavy Vehicles (per day)[1]	746[2] – 1,102[2]	217[2]
% Increase of Heavy Vehicles due to Approved CGO[3]	0.3 – 0.5%	1.7%
Heavy Vehicle Accidents (per year)[4]	11.6	1
Annual Million km of Heavy Vehicle Travel	69.99 – 103.41	3.24
Heavy Vehicle Accidents/Annual Million km of Heavy Vehicle Travel	0.11 – 0.17	0.31
Availability of Alternative Emergency Routes	Available	Available
Emergency Response Capability	Adequate	Adequate
Operational Factors	Cost effective	Cost effective

1 Roads and Maritime Services Traffic Volume Viewer (retrieved 23 May 2018).

2 2018 values extrapolated from previous years assuming 1% annual growth rate.

3 Assumes 18 truck movements per week (includes movements to and from the CGO).

4 Roads and Maritime Services Crash Report Data (1 Jan 2012 to 21 Dec 2016). Provided by Joshua Parkin on 24 May 2018.

Sensitive land uses along the route are relatively uncommon and do not preclude this route from a risk perspective.

Table 8 presents the results of the risk analysis for the segment of the Newell Highway between Dubbo and West Wyalong and the approved Mine Access Route, in which the consequences and likelihood of potential hazardous events were considered. This risk assessment approach effectively combines the estimated accident frequency with the potential for harm (i.e. risk), making it consistent with the principles and methodologies embodied within Australian Standard (AS) 4360 Risk Management and the HIPAP No. 6 Guidelines.

Table 8 presents the results of the risk analysis in terms of minimal, acceptable, significant and unacceptable risk. For the purposes of this risk assessment the following definitions apply:

- minimal risk: the transport of sodium cyanide along these routes is assessed as posing a minimal risk to the factor of interest;
- acceptable risk: the transport of sodium cyanide along these routes is assessed as posing an acceptable amount of risk to the factor of interest;
- significant risk: the transport of sodium cyanide along these routes is assessed as posing a significant increase of risk to the factor of interest; and
- unacceptable risk: the transport of sodium cyanide along these routes is assessed as posing an unacceptable level of risk to the factor of interest.

Note that the segment of the Newell Highway between Dubbo and West Wyalong and the approved Mine Access Route were not found to have any significant or unacceptable risk.

Table 8
Risk Analysis Findings – Sodium Cyanide

Assessment Factor	Minimal Risk		Acceptable Risk	
	Newell Highway between Dubbo and West Wyalong	Mine Access Route	Newell Highway between Dubbo and West Wyalong	Mine Access Route
Schools	✓	✓		
Hospitals	✓	✓		
Aged Care Facilities	✓	✓		
Churches	✓	✓		
Items of Heritage or Cultural Significance	✓	✓		
Other Land use	✓	✓		
Park Reservations			✓	✓
Waterways			✓	✓
Emergency Infrastructure	✓	✓		
Heavy Vehicle Accidents (per year)		✓	✓	
Heavy Vehicle Accidents/Annual Million km of Heavy Vehicle Travel	✓	✓		
Availability of Alternative Emergency Routes	✓	✓		
Emergency Response Capability	✓	✓		
Operational Factors	✓	✓		
Comparative Assessment of all Factors	✓	✓		

There are no defined absolute risk criteria for the transport of hazardous materials throughout NSW, therefore the assessment of risk results is a balanced judgement based on experience in accordance with HIPAP No.6 Guidelines.

Overall, the net increase in the number of heavy vehicles due to the transport of this material will be approximately 0.5% for the Newell Highway segment between Dubbo and West Wyalong and approximately 1.7% for the approved Mine Access Route (i.e. a minor impact on existing traffic volume). Therefore, there will be only a minor increase in transport risk when compared to existing risk levels.

From a risk perspective, the results detailed in Table 8 deem the transport route along the Newell Highway between Dubbo and West Wyalong and the approved Mine Access Route to pose a minimal to acceptable level of risk to surrounding people, property and the natural environment. These routes are therefore suitable for the transport of hazardous materials to the CGO.

5 Risk Management Measures

The identification of risk management measures is the final step in the route evaluation process (Figure 4). The Route Selection Guidelines state that the *identification of risk management measures should include opportunities for risk reduction where the evaluation shows undesirable levels of risk along the preferred routes, together with consideration of an appropriate safety management system* (DoP, 2011a).

The level of risk associated with the transport of sodium cyanide to the CGO has been minimised by the selection of a suitable transport route based on an assessment of road and traffic factors, emergency response capability, operational factors and risk. Further, no local roads other than those identified in Section 7.2 will be used for the transport of hazardous materials.

The assessment of the Newell Highway transport route (from Dubbo to West Wyalong) to the CGO and the approved Mine Access Route did not identify undesirable levels of risk for the transport of sodium cyanide. Therefore, no additional risk reduction measures are considered necessary beyond those required by the ADG Code and the DG Regulation.

The risk management measures under the ADG Code and DG Regulation that will be implemented by the material supplier and the transport provider for the transport of hazardous materials to the CGO are outlined in Appendix B. As required by the ADG Code, sodium cyanide will be mixed with caustic soda for transport to the CGO to minimise the potential for the formation of hydrogen cyanide in the event of a spill.

Compliance with the requirements of the ADG Code and DG Regulations will be a requirement of the contracts between Evolution and the material supplier and the transport provider.

7.5 HYDROCHLORIC ACID

1 Hazard Identification

Type of Hazardous Material

Hydrochloric acid is classified under the ADG Code as Class 8 (corrosive substance) and Packing Group II. It is a clear to slightly yellow fuming solution with a pungent odour.

Hydrochloric acid reacts violently with alkalis and sodium hypochlorite. It is highly corrosive to most metals with evolution of hydrogen gas (i.e. a highly flammable gas). If involved in a fire, toxic fumes can be evolved. Exposure to hydrochloric acid can lead to severe burns and irritation. Prolonged exposure can lead to dramatic effects. Hydrochloric acid is not classifiable as a human carcinogen.

Hydrogen chloride gas can be released to the atmosphere by evaporation from spills of concentrated hydrochloric acid. Hydrogen chloride gas is toxic and acts as a respiratory irritant.

Adjacent Land Use

Hydrochloric acid will typically be transported on the local road network using Goldfields Way from Temora through to Wyalong, then the Newel Highway (Neeld Street) from Wyalong to West Wyalong (Option 1: Temora - West Wyalong). Alternatively, hydrochloric acid may be transported on the local road network using Burley-Griffin Way from Temora through to Mirrool, then the Newell Highway from Mirrool to West Wyalong (Option 2: Temora - Mirrool - West Wyalong). Both routes will then use the approved Mine Access Route from West Wyalong to the CGO (Figure 5).

Sensitive land uses include schools (pre-schools and primary and secondary schools), hospitals, aged care facilities, churches and items of heritage or cultural significance.

Some sensitive land uses are located along the Newell Highway (Neeld Street) in Wyalong and West Wyalong, including the Wyalong Public School, Saint Mary's War Memorial School, and five churches. The West Wyalong Public School, West Wyalong High School, West Wyalong District Hospital and the Royal Freemason's Benevolent Institution West Wyalong Masonic Village Aged Care are located adjacent to or nearby Ungarie Road (i.e. the initial segment of the approved Mine Access Route).

Numerous heritage items are listed under the *Bland Local Environmental Plan 2011* (LEP) as located along the Newell Highway (Neeld Street) in Wyalong and West Wyalong, including the Tattersalls Hotel, Post Office Hotel, Globe Hotel and the "Wyalong House" residence.

Outside of Wyalong and West Wyalong sensitive land uses such as those listed above are relatively uncommon and both route options from Temora to West Wyalong and the approved Mine Access Route predominantly pass through rural areas comprising of areas of open space.

Subsequently, sensitive land uses along both routes options from Temora to West Wyalong do not provide a strong basis for comparison. Therefore, further detailed consideration of sensitive land uses was not undertaken for this route evaluation.

Adjacent land uses are also similar along both route options between Temora and West Wyalong and do not provide a strong basis for comparison. Therefore, further detailed consideration of other adjacent land uses was not undertaken for this route evaluation.

Other land uses may include residential, commercial or industrial areas, largely concentrated in Wyalong and West Wyalong, and areas of open space.

Transport Vehicle and Conditions of Transport

Hydrochloric acid will be transported to the CGO by single semi-trailer. It will be transported by bulk tanker as a liquid with a maximum capacity of up to 21,000 L per delivery. Regulation of temperature and pressure are not required during the transport of this material. The maximum frequency of deliveries is 2 per week.

Causes of Hazardous Incidents

Initiating and contributory causes for incidents involving heavy vehicles has been detailed in *Guidelines for Chemical Transportation Risk Analysis* (CCPS, 1995). The identified causes, with additional causes included, are reproduced in Table 5 in Section 7.4.

2 Consequence Analysis

An accident involving a heavy vehicle transporting hydrochloric acid resulting in a release of the material is the hazardous incident relevant to the transport of hydrochloric acid. The consequences of a release of hydrochloric acid from this hazardous incident are largely dependent on what is contacted by the corrosive liquid. The following consequences of this hazardous incident are relevant:

- direct exposure to acid liquid or mist for people or animals at or near to an accident scene;
- evolution of hydrogen chloride gas by evaporation from a spill resulting in exposure for people or animals at or near to an accident scene;
- contamination of waterways (from a large liquid release) causing acidification of the water resulting in fatality for fish and other aquatic life including aquatic plants;
- burning of vegetation upon contact with acid liquid or mist; and
- corrosion of metallic structures from acid mist.

Hydrochloric acid does not bio-accumulate.

3 Estimation of the Likelihood of a Hazardous Incident

Available accident statistics for both route options between Temora and West Wyalong and the approved Mine Access Route were obtained from the RMS and are summarised in Table 9. Although the entire transport route from Temora to the CGO is outside the CGO local road network (and is a greater extent than that required to be assessed), this extent provides a more conservative assessment of accident statistics. Accordingly, the accident statistics presented below are conservative as they are relevant to a greater area than the local road network surrounding the CGO (Figure 5).

Table 9
Summary of Accident Statistics – Hydrochloric Acid

Route (Figure 5)	Length (km)	No. of Heavy Vehicles (per day)[1]	% Increase of Heavy Vehicles due to Approved CGO[4]	Heavy Vehicle Accidents (per year)[5]	Annual Million km of Heavy Vehicle Travel	Heavy Vehicle Accidents/Annual Million km of Heavy Vehicle Travel
Option 1 Temora – West Wyalong (Goldfields Way)	77	159[2,3] – 903[2,3]	0.06% – 0.36%	3.25	4.47 – 25.37	0.13 – 0.73
Option 2 Temora – Mirrool – West Wyalong (Burley-Griffin Way)	97	170[2,3] – 505[3]	0.11% – 0.33%	2.25	6.02 – 17.87	0.13 – 0.37
Mine Access Route	41	217[3]	0.26%	1	3.24	0.31

1 Roads and Maritime Services Traffic Volume Viewer (retrieved 23 May 2018).
2 Assumes 10% of all vehicles are heavy vehicles.
3 2018 values extrapolated from previous years assuming 1% annual growth rate.
4 Assumes 4 truck movements per week (includes movements to and from the CGO).
5 Roads and Maritime Services Crash Report Data (1 Jan 2012 to 21 Dec 2016).

Accident statistics for both route options between Temora and West Wyalong are considered to be within normal operating levels for the road types and use. The increase of heavy vehicles transporting hydrochloric acid between Temora and West Wyalong on the local road network due to the approved CGO will be very small (up to approximately 0.36%) and will be unlikely to affect traffic flows or accident statistics. Both route options between Temora to West Wyalong are therefore suitable for the transport of hazardous materials with respect to accident statistics.

Accident statistics for the approved Mine Access Route are considered to be within normal operating levels for the road types and use. Improved driving conditions have been achieved due to the upgrading of the approved Mine Access Route. The increase of heavy vehicles transporting hydrochloric acid on the Mine Access Route due to the approved CGO will be small (approximately 0.26%) and will be unlikely to affect traffic flows or accident statistics. The approved Mine Access Route is therefore suitable for the transport of hazardous materials with respect to accident statistics.

In the event of an accident involving a heavy vehicle, the carried goods may or may not be released. The probability of release is dependent on factors such as speed, shipping conditions (i.e. pressurised compared to non-pressurised), inadequate load securing, and strength and integrity of the container.

Various studies of release probabilities from heavy vehicles involved in an accident have been undertaken. The *Guidelines for Chemical Transportation Risk Analysis* (CCPS, 1995) indicates that the release probability for various road types is between 5 and 10% (i.e. approximately one heavy vehicle accident in every 10 to 20 will result in a release of a material).

An estimation of the likelihood of an accident involving a vehicle transporting hydrochloric acid to the CGO resulting in a release of the material must take into account the following:

- the number of vehicles transporting hydrochloric acid to the CGO relative to the total number of heavy vehicles already using the same transport route;
- the number of accidents that have involved heavy vehicles; and
- the probability of a release of the material (which is assumed to be 10% of all accidents involving heavy vehicles results in a release of material) (CCPS, 1995).

The likelihood of an accident (based on averaged accident data) involving a vehicle transporting hydrochloric acid to the CGO resulting in a release of the material for both route options between Temora and West Wyalong is estimated to be approximately $1x10^{-4}$/year (i.e. such an incident is estimated to occur once in every 10,000 years) (Pinnacle Risk Management Pty Ltd, 2018).

The likelihood of an accident (based on averaged accident data) involving a vehicle transporting hydrochloric acid to the CGO resulting in a release of the material for the approved Mine Access Route is estimated to be approximately $1x10^{-4}$ /year. (i.e. an accident is estimated to occur once every 10,000 years) (Pinnacle Risk Management Pty Ltd, 2018).

The risk of the event is determined using the risk matrix and the consequence ratings in Tables 3 and 4 in Section 7.3.1 (Pinnacle Risk Management Pty Ltd, 2018).

For releases of hydrochloric acid from a road traffic accident, the consequence rating for both route options between Temora and West Wyalong and the approved Mine Access Route is determined to be “Serious” (Pinnacle Risk Management Pty Ltd, 2018). The volume is limited to the size of the tanker (i.e. 21,000 L) (Pinnacle Risk Management Pty Ltd, 2018).

Given a likelihood of $1x10^{-4}$/year for both route options between Temora and West Wyalong and $1x10^{4}$/year for the approved Mine Access Route and a consequence rating of “Serious”, the corresponding risk level is Class III (Pinnacle Risk Management Pty Ltd, 2018). These values indicate a low level of risk associated with the transport of hydrochloric acid on the local road network (Pinnacle Risk Management Pty Ltd, 2018).

4 Risk Analysis and Assessment of Risk Results

Risk analysis took into account road and traffic factors, emergency response capability and operational factors for both route options between Temora and West Wyalong and the approved Mine Access Route. Table 10 provides a summary of all assessment factors utilised in the risk analysis.

In accordance with the Route Selection Guidelines, Table 10 presents the results of the risk analysis on a comparative basis. In each case the consequences and likelihood of potential hazardous events were considered. This risk assessment approach effectively combines the estimated accident frequency with the potential for harm (i.e. risk), making it consistent with the principles and methodologies embodied within Australian Standard (AS) 4360 *Risk Management* and HIPAP No. 6.

Table 10
Summary of Risk Analysis Assessment Factors – Hydrochloric Acid

Assessment Factor	Option 1 Temora – West Wyalong (Goldfields Way)	Option 2 Temora – Mirrool – West Wyalong (Burley-Griffin Way)	Mine Access Route
Schools	#	#	2 (<1km from route)
Number of School Students	#	#	595
Hospitals	#	#	1
Number of Hospital Beds	#	#	<50
Aged Care Facilities	#	#	1
Churches	#	#	0
Items of Heritage or Cultural Significance	#	#	0
Other Landuse	#	#	Predominantly open space
Number of Park Reservations	1	1	1
Park Reservations – Approximate Total Road Frontage (m)	3,100	500	5.1
Waterways	20	42	22
Emergency Infrastructure	Adequate	Adequate	Adequate
Length (km)	77	97	41
No. of Heavy Vehicles (per day)[1]	159[2,3] – 903[2,3]	170[2,3] – 505[3]	217[3]
% Increase of Heavy Vehicles due to Approved CGO[4]	0.06% – 0.36%	0.11% – 0.33%	0.26%
Heavy Vehicle Accidents (per year)[5]	3.25	2.25	1
Annual Million km of Heavy Vehicle Travel	4.47 – 25.37	6.02 – 17.87	3.24
Heavy Vehicle Accidents/Annual Million km of Heavy Vehicle Travel	0.13 – 0.73	0.13 – 0.37	0.31
Availability of Alternative Emergency Routes	Available	Available	Available
Emergency Response Capability	Adequate	Adequate	Adequate
Operational Factors	More cost effective	Less cost effective	Cost Effective

1 Roads and Maritime Services Traffic Volume Viewer (retrieved 23 May 2018).
2 Assumes 10% of all vehicles are heavy vehicles.
3 2018 values extrapolated from previous years assuming 1% annual growth rate.
4 Assumes 4 truck movement per week (includes movements to and from the CGO).
5 Roads and Maritime Services Crash Report Data (1 Jan 2012 to 21 Dec 2016).
There is little difference in the type of land use along each potential route, therefore these factors were not used to compare Route Option 1 and Option 2.
RMS Roads and Maritime Services

Table 11 presents the results of the risk analysis in terms of minimal, acceptable, significant and unacceptable risk. For the purposes of this risk assessment the following definitions apply:

- minimal risk: the transport of hydrochloric acid along these routes is assessed as posing a minimal risk to the factor of interest;
- acceptable risk: the transport of hydrochloric acid along these routes is assessed as posing an acceptable amount of risk to the factor of interest;
- significant risk: the transport of hydrochloric acid along these routes is assessed as posing a significant increase of risk to the factor of interest; and
- unacceptable risk: the transport of hydrochloric acid along these routes is assessed as posing an unacceptable level of risk to the factor of interest.

Note that both routes between Temora and West Wyalong and the approved Mine Access Route were not identified to have any significant or unacceptable risks.

Table 11
Risk Analysis Findings – Hydrochloric Acid

Assessment Factor	Minimal Risk			Acceptable Risk		
	Option 1 Temora – West Wyalong (Goldfields Way)	Option 2 Temora – Mirrool – West Wyalong (Burley-Griffin Way)	Mine Access Route	Option 1 Temora – West Wyalong (Goldfields Way)	Option 2 Temora – Mirrool – West Wyalong (Burley-Griffin Way)	Mine Access Route
Schools	#	#	✓	#	#	
Hospitals	#	#	✓	#	#	
Aged Care Facilities	#	#	✓	#	#	
Churches	#	#	✓	#	#	
Items of Heritage or Cultural Significance	#	#	✓	#	#	
Other Land use	#	#	✓	#	#	
Park Reservations	✓				✓	✓
Waterways				✓	✓	✓
Emergency Infrastructure	✓	✓	✓			
Heavy Vehicle Accidents (per year)[1]	✓		✓		✓	
Heavy Vehicle Accidents/Annual Million km of Heavy Vehicle Travel	✓		✓		✓	
Availability of Alternative Emergency Routes	✓	✓	✓			
Emergency Response Capability	✓	✓	✓			
Operational Factors	✓	✓	✓			
Comparative Assessment of all Factors	✓		✓		✓	

[1] Roads and Maritime Services Traffic Volume Viewer (retrieved 23 May 2018).

There is little difference in the type of land use along each potential route, therefore these factors were not used to compare Route Option 1 and Option 2.

RTA Roads and Maritime Services

There are no defined absolute risk criteria for the transport of hazardous materials throughout NSW, therefore the assessment of risk results is a balanced judgement based on experience in accordance with HIPAP No. 6.

Overall, the net increase in the number of heavy vehicles due to the transport of this material will be up to approximately up to 0.36% for both route options between Temora and West Wyalong and up to approximately 0.26% for the approved Mine Access Route (i.e. a minor impact on existing traffic volumes).

Therefore, there will be only a minor increase in transport risk when compared to existing risk levels.

From a risk perspective, the results detailed in Tables 10 and 11 show little difference in the level of risk associated with either route option between Temora and West Wyalong. In addition, these results deem both potential route options to pose a minimal to acceptable level of risk to surrounding people, property and the natural environment.

Therefore, both route options between Temora and West Wyalong and the approved Mine Access Route are suitable for the transport of hazardous materials from a risk perspective. Subsequently, direct transport via Temora to West Wyalong on Goldfields Way (Option 1) has been determined the preferred route by the transport provider and therefore will be the typical route for transport of hydrochloric acid, although deliveries will still be accepted via route Option 2 if required.

5 Risk Management Measures

The identification of risk management measures is the final step in the route evaluation process. The Route Selection Guidelines state that the *identification of risk management measures should include opportunities for risk reduction where the evaluation shows undesirable levels of risk along the preferred routes, together with consideration of an appropriate safety management system* (DoP, 2011a).

The level of risk associated with the transport of hydrochloric acid to the CGO has been minimised by the selection of suitable transport routes based on an assessment of road and traffic factors, emergency response capability, operational factors and risk. Further, no local roads in addition to those identified in Section 7.2 will be used for the transport of hazardous materials.

The assessment of the segment of both routes between Temora and West Wyalong and the approved Mine Access Route did not identify undesirable levels of risk for the transport of hydrochloric acid. Therefore, no additional risk reduction measures are considered necessary beyond those required under the ADG Code, and the DG Regulations.

The risk management measures that will be implemented by the material supplier and the transport provider for the transport of hazardous materials to the CGO are outlined in Appendix B.

Compliance with the requirements of the ADG Code and DG Regulations will be a requirement of the contracts between Evolution and the material supplier and the transport provider.

7.6 SULPHURIC ACID

1 Hazard Identification

Sulphuric acid is classified under the ADG Code as Class 8 (corrosive substance) and Packing Group II. It is a colourless, oily, viscous liquid with a strong pungent odour. It is non-flammable but is highly corrosive, toxic and poisonous.

Sulphuric acid is a very powerful oxidiser that is incompatible with materials such as oxidising agents, organics, nitric acid, chlorates, carbides, metals (e.g. sodium, aluminium, potassium) and zinc oxide.

In the presence of water, sulphuric acid is highly corrosive to most metals. Flammable hydrogen gas may evolve upon contact with metals. Toxic sulphur oxides will evolve when the acid is heated to decomposition. When spilt, sulphuric acid is very slippery.

Although non-flammable, sulphuric acid may produce toxic gases when heated by fire (e.g. sulphuric acid mist and sulphur dioxide). If fumes are inhaled, severe irritation to the throat will occur. Over exposure may result in mucous membrane irritation, coughing, bronchitis, ulceration, bloody nose, lung tissue damage, chemical pneumonitis, pulmonary oedema and death. Contact with skin may result in rash, dermatitis, blistering, severe burns and discolouration. In splash accidents involving sulphuric acid, the heat liberated by dilution with water (i.e. from the body) can add thermal burn to the chemical injury caused by the acid itself.

Adjacent Land Use

Sulphuric acid will typically be transported on the local road network using Goldfields Way from Temora through to Wyalong, then the Newel Highway from Wyalong to West Wyalong (Option 1: Temora - West Wyalong). Alternatively, sulphuric acid may be transported on the local road network using Burley-Griffin Way from Temora through to Mirrool, then the Newell Highway from Mirrool to West Wyalong (Option 2: Temora - Mirrool - West Wyalong). Both routes will then use the approved Mine Access Route from West Wyalong to the CGO.

Sensitive land uses include schools (pre-schools and primary and secondary schools), hospitals, aged care facilities, churches and items of heritage or cultural significance.

Some sensitive land uses are located along the Newell Highway (Neeld Street) in Wyalong and West Wyalong, including the Wyalong Public School, Saint Mary's War Memorial School, and five churches. The West Wyalong Public School, West Wyalong High School, West Wyalong District Hospital and the Royal Freemason's Benevolent Institution West Wyalong Masonic Village Aged Care are located adjacent to or nearby Ungarie Road (i.e. the initial segment of the approved Mine Access Route).

Numerous heritage items are listed under the *Bland Local Environmental Plan 2011* (LEP) as located along the Newell Highway (Neeld Street) in Wyalong and West Wyalong, including the Tattersalls Hotel, Post Office Hotel, Globe Hotel and the "Wyalong House" residence.

Outside of Wyalong and West Wyalong sensitive land uses such as those listed above are relatively uncommon and both route options between Temora and West Wyalong predominantly pass through rural areas comprising of areas of open space.

Subsequently, sensitive land uses along both routes options between Temora and West Wyalong and do not provide a strong basis for comparison. Therefore, further detailed consideration of sensitive land uses was not undertaken for this route evaluation.

Adjacent land uses are also similar along both route options between Temora and West Wyalong and do not provide a strong basis for comparison. Therefore, further detailed consideration of other adjacent land uses was not undertaken for this route evaluation.

Other land uses may include residential, commercial or industrial areas, largely concentrated in Wyalong and West Wyalong, and areas of open space.

Transport Vehicle and Conditions of Transport

Sulphuric acid will be transported to the CGO by B-double road tankers with a maximum capacity of up to 40 tonnes per delivery. It will be transported as a liquid by a bulk tanker. Regulation of temperature and pressure are not required during the transport of this material. The maximum frequency of deliveries is 2 per day.

Causes of Hazardous Incidents

Initiating and contributory causes for incidents involving heavy vehicles has been detailed in *Guidelines for Chemical Transportation Risk Analysis* (CCPS, 1995). The identified causes, with additional causes included, are reproduced in Table 5.

2 Consequence Analysis

An accident involving a heavy vehicle transporting sulphuric acid resulting in a release of the material is the hazardous incident relevant to the transport of sulphuric acid. The following consequences of an accident involving a heavy vehicle transporting sulphuric acid resulting in a release of the material are relevant:

- direct exposure to acid liquid or mist for people or animals at or near to an accident scene;
- contamination of waterways (from a large liquid release) causing acidification of the water resulting in fatality for fish and other aquatic life including aquatic plants;
- burning of vegetation upon contact with acid liquid or mist; and
- corrosion of metallic structures from acid mist.

Sulphuric acid will remain indefinitely in waterways as a sulphate.

3 Estimation of the Likelihood of a Hazardous Incident

Available accident statistics for both route options between Temora and West Wyalong and the approved Mine Access Route were obtained from the RMS and are summarised in Table 12. Although the entire transport route from Temora to the CGO is outside the CGO local road network (and is a greater extent than that required to be assessed), this extent provides a more conservative assessment of accident statistics. Accordingly, the accident statistics presented below are conservative as they are relevant to a greater area than the local road network surrounding the CGO (Figure 5).

Table 12
Summary of Accident Statistics – Sulphuric Acid

Route (Figure 5)	Length (km)	No. of Heavy Vehicles (per day)[1]	% Increase of Heavy Vehicles due to Approved CGO[4]	Heavy Vehicle Accidents (per year)[5]	Annual Million km of Heavy Vehicle Travel	Heavy Vehicle Accidents/Annual Million km of Heavy Vehicle Travel
Option 1 Temora – West Wyalong (Goldfields Way)	77	159[2,3] – 903[2,3]	0.4% – 2.5%	3.25	4.47 – 25.37	0.13 – 0.73
Option 2 Temora – Mirrool – West Wyalong (Burley-Griffin Way)	97	170[2,3] – 505[3]	0.8% – 2.4%	2.25	6.02 – 17.87	0.13 – 0.37
Mine Access Route	41	217[3]	1.8%	1	3.24	0.31

1 Roads and Maritime Services Traffic Volume Viewer (retrieved 23 May 2018).
2 Assumes 10% of all vehicles are heavy vehicles.
3 2018 values extrapolated from previous years assuming 1% annual growth rate.
4 Assumes 28 truck movements per week (includes movements to and from the CGO).
5 Roads and Maritime Services Crash Report Data (1 Jan 2012 to 21 Dec 2016).

Accident statistics for both route options between Temora and West Wyalong are considered to be within normal operating levels for the road types and use. The increase of heavy vehicles transporting sulphuric acid between Temora and West Wyalong on the local road network due to the approved CGO will be very small (up to approximately 2.5%) and will be unlikely to affect traffic flows or accident statistics. Both route options are therefore suitable for the transport of hazardous materials with respect to accident statistics.

Accident statistics for the approved Mine Access Route are considered to be within normal operating levels for the road types and use. Improved driving conditions have been achieved due to the upgrading of the approved Mine Access Route. The increase of heavy vehicles transporting sulphuric acid on the Mine Access Route due to the approved CGO will be small (approximately 1.8%) and will be unlikely to affect traffic flows or accident statistics. The approved Mine Access Route is therefore suitable for the transport of hazardous materials with respect to accident statistics.

In the event of an accident involving a heavy vehicle, the carried goods may or may not be released. The probability of release is dependent on factors such as speed, shipping conditions (i.e. pressurised compared to non-pressurised), inadequate load securing, and strength and integrity of the container.

Various studies of release probabilities from heavy vehicles involved in an accident have been undertaken. The *Guidelines for Chemical Transportation Risk Analysis* (CCPS, 1995) indicates that the release probability for various road types is between 5 and 10% (i.e. approximately one heavy vehicle accident in every 10 to 20 will result in a release of the material).

An estimation of the likelihood of an accident involving a vehicle transporting sulphuric acid to the CGO resulting in a release of the material must take into account the following:

- the number of vehicles transporting sulphuric acid to the CGO relative to the total number of heavy vehicles already using the same transport route;
- the number of accidents that have involved heavy vehicles; and
- the probability of a release of the material (which is assumed to be 10% of all accidents involving heavy vehicles results in a release of material) (CCPS, 1995).

The likelihood of an accident (based on averaged accident data) involving a vehicle transporting sulphuric acid on the local road network to the CGO resulting in a release of the material for both route options between Temora and West Wyalong is estimated to be approximately $1x10^{-3}$ /year (i.e. such an incident is estimated to occur once every 900 years) (Pinnacle Risk Management Pty Ltd, 2018).

The likelihood of an accident (based on averaged accident data) involving a vehicle transporting sulphuric acid to the CGO resulting in a release of the material for the approved Mine Access Route is estimated to be approximately $9x10^{-4}$/year (i.e. such an accident is estimated to occur once every 1,000 years) (Pinnacle Risk Management Pty Ltd, 2018).

These values indicate a low level of risk associated with the transport of hazardous materials.

The risk of the event is determined using the risk matrix and the consequence ratings in Tables 3 and 4 in Section 7.3.1 (Pinnacle Risk Management Pty Ltd, 2018).

For releases of sulphuric acid from a road traffic accident, the consequence rating is determined to be “Serious” (Pinnacle Risk Management Pty Ltd, 2018). The volume is limited to the size of the tanker, i.e. 40 tonnes, and it is possible that only one of the two barrels is breached (Pinnacle Risk Management Pty Ltd, 2018).

Given a likelihood of $1x10^{-3}$ /year for both route options between Temora and West Wyalong and $9x10^{4}$ for the approved Mine Access Route and a consequence rating of "Serious", the corresponding risk level is Class III (Pinnacle Risk Management Pty Ltd, 2018). These values indicate a low level of risk associated with the transport of hazardous materials (Pinnacle Risk Management Pty Ltd, 2018).

4 Risk Analysis and Assessment of Risk Results

Risk analysis took into account road and traffic factors, emergency response capability and operational factors for the preferred and alternative access routes. Table 13 provides a summary of all assessment factors utilised in the risk analysis.

In accordance with the Route Selection Guidelines, Table 14 presents the results of the risk analysis on a comparative basis. In each case the consequences and likelihood of potential hazardous events were considered. This risk assessment approach effectively combines the estimated accident frequency with the potential for harm (i.e. risk), making it consistent with the principles and methodologies embodied within Australian Standard (AS) 4360 *Risk Management* and HIPAP No. 6.

Table 14 presents the results of the risk analysis in terms of minimal, acceptable, significant and unacceptable risk. For the purposes of this risk assessment the following definitions apply:

- minimal risk: the transport of sulphuric acid along these routes is assessed as posing a minimal risk to the factor of interest;
- acceptable risk: the transport of sulphuric acid along these routes is assessed as posing an acceptable amount of risk to the factor of interest;
- significant risk: the transport of sulphuric acid along these routes is assessed as posing a significant increase of risk to the factor of interest; and
- unacceptable risk: the transport of sulphuric acid along these routes is assessed as posing an unacceptable level of risk to the factor of interest.

Note that both routes between Temora and West Wyalong and the approved Mine Access Route were not identified to have any significant or unacceptable risks.

There are no defined absolute risk criteria for the transport of hazardous materials throughout NSW, therefore the assessment of risk results is a balanced judgement based on experience in accordance with HIPAP No. 6.

Overall, the net increase in the number of heavy vehicles due to the transport of this material will be up to approximately 1.8% for the Approved Mine Access Route and up to approximately 2.5% for either route option between Temora and West Wyalong (i.e. a minor impact on existing traffic volume). Therefore, there will be only a minor increase in transport risk when compared to existing risk levels.

From a risk perspective, the results detailed in Tables 13 and 14 show little difference in the level of risk associated with either route options between Temora and West Wyalong. In addition, these results deem both route options between Temora and West Wyalong and the approved Mine Access Road to pose a minimal to acceptable level of risk to surrounding people, property and the natural environment.

Table 13
Summary of Risk Analysis Assessment Factors – Sulphuric Acid

Assessment Factor	Option 1 Temora – West Wyalong (Goldfields Way)	Option 2 Temora – Mirrool – West Wyalong (Burley-Griffin Way)	Mine Access Route
Schools	#	#	2 (<1km from route)
Number of School Students	#	#	595
Hospitals	#	#	1
Number of Hospital Beds	#	#	<50
Aged Care Facilities	#	#	1
Churches	#	#	0
Items of Heritage or Cultural Significance	#	#	0
Other Land use	#	#	Predominantly open space
Number of Park Reservations	1	1	1
Park Reservations – Approximate Total Road Frontage (m)	3,100	500	5.1
Waterways	20	42	22
Emergency Infrastructure	Adequate	Adequate	Adequate
Length (km)	77	97	41
No. of Heavy Vehicles (per day)[1]	159[2,3] – 903[2,3]	170[2,3] – 505[3]	217[3]
% Increase of Heavy Vehicles due to Approved CGO[4]	0.4% – 2.5%	0.8% – 2.4%	1.8%
Heavy Vehicle Accidents (per year)[5]	3.25	2.25	1
Annual Million km of Heavy Vehicle Travel	4.47 – 25.37	6.02 – 17.87	3.24
Heavy Vehicle Accidents/Annual Million km of Heavy Vehicle Travel	0.13 – 0.73	0.13 – 0.37	0.31
Availability of Alternative Emergency Routes	Available	Available	Available
Emergency Response Capability	Adequate	Adequate	Adequate
Operational Factors	More cost effective	Less cost effective	Cost Effective

1 Roads and Maritime Services Traffic Volume Viewer (retrieved 23 May 2018).
2 Assumes 10% of all vehicles are heavy vehicles.
3 2018 values extrapolated from previous years assuming 1% annual growth rate.
4 Assumes 28 truck movement per week (includes movements to and from the CGO).
5 Roads and Maritime Services Crash Report Data (1 Jan 2012 to 21 Dec 2016).
There is little difference in the type of land use along each potential route, therefore these factors were not used to compare Route Option 1 and Option 2.
RMS Roads and Maritime Services.

Table 14
Risk Analysis Findings – Sulphuric Acid

Assessment Factor	Minimal Risk			Acceptable Risk		
	Option 1 Temora – West Wyalong (Goldfields Way)	Option 2 Temora – Mirrool – West Wyalong (Burley-Griffin Way)	Mine Access Route	Option 1 Temora – West Wyalong (Goldfields Way)	Option 2 Temora – Mirrool – West Wyalong (Burley-Griffin Way)	Mine Access Route
Schools	#	#	✓	#	#	
Hospitals	#	#	✓	#	#	
Aged Care Facilities	#	#	✓	#	#	
Churches	#	#	✓	#	#	
Items of Heritage or Cultural Significance	#	#	✓	#	#	
Other Land use	#	#	✓	#	#	
Park Reservations	✓				✓	✓
Waterways				✓	✓	✓
Emergency Infrastructure	✓	✓	✓			
Heavy Vehicle Accidents (per year)[1]	✓		✓		✓	
Heavy Vehicle Accidents/Annual Million km of Heavy Vehicle Travel	✓		✓		✓	
Availability of Alternative Emergency Routes	✓	✓	✓			
Emergency Response Capability	✓	✓	✓			
Operational Factors	✓	✓	✓			
Comparative Assessment of all Factors	✓		✓		✓	

[1] Roads and Maritime Services Traffic Volume Viewer (retrieved 23 May 2018).

There is little difference in the type of land use along each potential route, therefore these factors were not used to compare Route Option 1 and Option 2.

RMS Roads and Maritime Services

Both route options between Temora and West Wyalong and the approved Mine Access Route are therefore equally suitable for the transport of hazardous materials from risk perspective. Subsequently, direct transport via Temora to West Wyalong on Goldfields Way (Temora – West Wyalong) has been determined the preferred route by the transport provider and therefore will be the typical route for transport of sulphuric acid on the local road network, although deliveries will still be accepted via route Option 2 if required.

5 Risk Management Measures

The identification of risk management measures is the final step in the route evaluation process. The Route Selection Guidelines state that the *identification of risk management measures should include opportunities for risk reduction where the evaluation shows undesirable levels of risk along the preferred routes, together with consideration of an appropriate safety management system* (DoP, 2011a).

The level of risk associated with the transport of sulphuric acid to the CGO on the local road network has been minimised by the selection of suitable transport routes based on an assessment of road and traffic factors, emergency response capability, operational factors and risk. Further, no local roads in addition to those identified in Section 7.2 will be used for the transport of hazardous materials.

The assessment of both routes between Temora and West Wyalong and the approved Mine Access Route did not identify undesirable levels of risk for the transport of sulphuric acid. Therefore, no additional risk reduction measures are considered necessary beyond those required under the ADG Code and DG Regulations.

The risk management measures that will be implemented by the transport provider and the material supplier for the transport of hazardous materials to the CGO are outlined in Appendix B.

Compliance with the requirements of the ADG Code and DG Regulations will be a requirement of the contract between Evolution and the material supplier and the transport provider.

7.7 CAUSTIC SODA

1 Hazard Identification

Type of Hazardous Material

Caustic soda (i.e. sodium hydroxide) is classified under the ADG Code as Class 8 (corrosive substance) and Packing Group II. It is a colourless liquid and is highly alkaline. Caustic soda is corrosive to human tissue and can cause serious injury to skin and eyes. Inhalation of any mist containing caustic soda can result in respiratory irritation and lung conditions such as pulmonary oedema.

Caustic soda is corrosive to aluminium, zinc, lead, brass and tin. A product of its reaction with metals is hydrogen (a highly flammable gas). It reacts vigorously with acids and when mixed with ammonium salts, ammonia gas evolves. Caustic soda reacts exothermically with water and also attacks many glass and ceramic materials. When mixed with some organic matter carbon monoxide can evolve.

Depending on the production method, caustic soda may contain trace impurities such as mercury which can cause nervous system damage.

When spilt, caustic soda is very slippery. At low ambient temperatures, higher strength caustic soda can freeze.

Adjacent Land Use

Caustic soda will typically be transported on the local road network using Goldfields Way from Temora through to Wyalong, then the Newel Highway from Wyalong to West Wyalong (Option 1: Temora - West Wyalong). Alternatively, caustic soda may be transported on the local road network using Burley-Griffin Way from Temora through to Mirrool, then the Newell Highway from Mirrool to West Wyalong (Option 2: Temora - Mirrool - West Wyalong). Both routes will then use the approved Mine Access Route from West Wyalong to the CGO.

Sensitive land uses include schools (pre-schools and primary and secondary schools), hospitals, aged care facilities, churches and items of heritage or cultural significance.

Some sensitive land uses are located along the Newell Highway (Neeld Street) in Wyalong and West Wyalong, including the Wyalong Public School, Saint Mary's War Memorial School, and five churches. The West Wyalong Public School, West Wyalong High School, West Wyalong District Hospital and the Royal Freemason's Benevolent Institution West Wyalong Masonic Village Aged Care are located adjacent to or nearby Ungarie Road (i.e. the initial segment of the approved Mine Access Route). Numerous heritage items are listed under the *Bland Local Environmental Plan 2011* (LEP) as located along the Newell Highway in Wyalong and West Wyalong, including the Tattersalls Hotel, Post Office Hotel, Globe Hotel and the "Wyalong House" residence.

Outside of Wyalong and West Wyalong sensitive land uses such as those listed above are relatively uncommon and both route options from Temora and West Wyalong predominantly pass through rural areas comprising of areas of open space.

Subsequently, sensitive land uses along both routes options between Temora and West Wyalong and do not provide a strong basis for comparison. Therefore, further detailed consideration of sensitive land uses was not undertaken for this route evaluation.

Adjacent land uses are also similar along both route options between Temora and West Wyalong and do not provide a strong basis for comparison. Therefore, further detailed consideration of other adjacent land uses was not undertaken for this route evaluation.

Other land uses may include residential, commercial or industrial areas, largely concentrated in Wyalong and West Wyalong, and areas of open space.

Transport Vehicle and Conditions of Transport

Caustic soda will be transported to the CGO by single semi-trailer with a maximum capacity of up to 16,500 L per delivery. It will be transported by bulk tanker as a liquid. Regulation of temperature and pressure are not required during the transport of this material. The maximum frequency of deliveries is 3 per week.

Causes of Hazardous Incidents

Initiating and contributory causes for incidents involving heavy vehicles has been detailed in *Guidelines for Chemical Transportation Risk Analysis* (CCPS, 1995). The identified causes, with additional causes included, are reproduced in Table 5 (Section 7.4).

2 Consequence Analysis

An accident involving a heavy vehicle transporting caustic soda resulting in a release of the material is the hazardous incident relevant to the transport of caustic soda. The consequences of a release of caustic soda from this hazardous incident are largely dependent on what is contacted by the corrosive liquid. The following consequences of this hazardous incident are relevant:

- direct exposure to liquid or vapour caustic soda for those at or near to an accident scene;
- contamination of waterways (from a large liquid release) causing a higher water pH resulting in fatality for fish and other aquatic life including aquatic plants; and
- burning of vegetation upon contact.

Caustic soda does not bio-accumulate.

3 Estimation of the Likelihood of a Hazardous Incident

Available accident statistics for both route options between Temora and West Wyalong and the approved Mine Access Route were obtained from the RMS and are summarised in Table 15. Although the entire transport route from Temora to the CGO is outside the CGO local road network (and is a greater extent than that required to be assessed), this extent provides a more conservative assessment of accident statistics. Accordingly, the accident statistics presented below are conservative as they are relevant to a greater area than the local road network surrounding the CGO (Figure 5).

Table 15
Summary of Accident Statistics – Caustic Soda

Route (Figure 5)	Length (km)	No. of Heavy Vehicles (per day)[1]	% Increase of Heavy Vehicles due to Approved CGO[4]	Heavy Vehicle Accidents (per year)[5]	Annual Million km of Heavy Vehicle Travel	Heavy Vehicle Accidents/Annual Million km of Heavy Vehicle Travel
Option 1 Temora – West Wyalong (Goldfields Way)	77	159[2,3] – 903[2,3]	0.1% – 0.7%	3.25	4.47 – 25.37	0.13 – 0.73
Option 2 Temora – Mirrool – West Wyalong (Burley-Griffin Way)	97	170[2,3] – 505[3]	0.2% – 0.73%	2.25	6.02 – 17.87	0.13 – 0.37
Mine Access Route	41	217[3]	0.5%	1	3.24	0.31

1 Roads and Maritime Services Traffic Volume Viewer (retrieved 23 May 2018).
2 Assumes 10% of all vehicles are heavy vehicles.
3 2018 values extrapolated from previous years assuming 1% annual growth rate.
4 Assumes 6 truck movements per week (includes movements to and from the CGO).
5 Roads and Maritime Services Crash Report Data (1 Jan 2012 to 21 Dec 2016).

Accident statistics for both route options between Temora and West Wyalong are considered to be within normal operating levels for the road types and use. The increase of heavy vehicles transporting caustic soda between Temora and West Wyalong on the local road network due to the approved CGO will be very small (up to approximately 0.73%) and will be unlikely to affect traffic flows or accident statistics. Both route options between Temora and West Wyalong are therefore suitable for the transport of hazardous materials with respect to accident statistics.

Accident statistics for the approved Mine Access Route are considered to be within normal operating levels for the road types and use. Improved driving conditions have been achieved due to the upgrading of the approved Mine Access Route. The increase of heavy vehicles transporting caustic soda on the Mine Access Route due to the approved CGO will be small (approximately 0.5%) and will be unlikely to affect traffic flows or accident statistics. The approved Mine Access Route is therefore suitable for the transport of hazardous materials with respect to accident statistics.

In the event of an accident involving a heavy vehicle, the carried goods may or may not be released. The probability of release is dependent on factors such as speed, shipping conditions (i.e. pressurised compared to non-pressurised), inadequate load securing, and strength and integrity of the container.

Various studies of release probabilities from heavy vehicles involved in an accident have been undertaken. The *Guidelines for Chemical Transportation Risk Analysis* (CCPS, 1995) indicates that the release probability for various road types is between 5 and 10% (i.e. approximately one heavy vehicle accident in every 10 to 20 will result in a release of a material).

An estimation of the likelihood of an accident involving a vehicle transporting caustic soda to the CGO resulting in a release of the material must take into account the following:

- the number of vehicles transporting caustic soda to the CGO relative to the total number of heavy vehicles already using the same transport route;
- the number of accidents that have involved heavy vehicles; and
- the probability of a release of the material (which is assumed to be 10% of all accidents involving heavy vehicles results in a release of material) (CCPS, 1995).

The likelihood of an accident (based on averaged accident data) involving a vehicle transporting caustic soda to the CGO resulting in a release of the material for both route options between Temora and West Wyalong is estimated to be approximately $2x10^{-4}$/year (i.e. such an incident is estimated to occur once every 4,000 years) (Pinnacle Risk Management Pty Ltd, 2018).

The likelihood of an accident (based on averaged accident data) involving a vehicle transporting caustic soda to the CGO resulting in a release of the material for approved Mine Access Route is estimated to be approximately $2x10^{-3}$ /year (i.e. such an incident is estimated to occur once in every 5,000 years) (Pinnacle Risk Management Pty Ltd, 2018).

The risk of the event is determined using the risk matrix and the consequence ratings in Tables 3 and 4 in Section 7.3.1 (Pinnacle Risk Management Pty Ltd, 2018).

For releases of caustic soda from a road traffic accident, the consequence rating is determined to be "Serious" (Pinnacle Risk Management Pty Ltd, 2018). The volume is limited to the size of the single tank on the single semi-trailer, (i.e. 16,500 L), and it is possible that only one of the two barrels is breached (Pinnacle Risk Management Pty Ltd, 2018).

Given a likelihood of $2x10^{-4}$/year both route options between Temora and West Wyalong, and $2x10^{3}$/year for the approved Mine Access Route and consequence rating of "Serious", the corresponding risk level is Class III (Pinnacle Risk Management Pty Ltd, 2018). These values indicate a low level of risk associated with the transport of hazardous materials (Pinnacle Risk Management Pty Ltd, 2018).

4 Risk Analysis and Assessment of Risk Results

Risk analysis took into account the preliminary screening findings as well as road and traffic factors, emergency response capability and operational factors. Table 16 provides a summary of all assessment factors utilised in the risk analysis.

Table 16
Summary of Risk Analysis Assessment Factors – Caustic Soda

Assessment Factor	Option 1 Temora – West Wyalong (Goldfields Way)	Option 2 Temora – Mirrool – West Wyalong (Burley-Griffin Way)	Mine Access Route
Schools	#	#	2 (<1km from route)
Number of School Students	#	#	595
Hospitals	#	#	1
Number of Hospital Beds	#	#	<50
Aged Care Facilities	#	#	1
Churches	#	#	0

Table 16 (Continued)
Summary of Risk Analysis Assessment Factors – Caustic Soda

Assessment Factor	Option 1 Temora – West Wyalong (Goldfields Way)	Option 2 Temora – Mirrool – West Wyalong (Burley-Griffin Way)	Mine Access Route
Items of Heritage or Cultural Significance	#	#	0
Other Landuse	#	#	Predominantly open space
Number of Park Reservations	1	1	1
Park Reservations – Approximate Total Road Frontage (m)	3,100	500	5.1
Waterways	20	42	22
Emergency Infrastructure	Adequate	Adequate	Adequate
Length (km)	77	97	41
No. of Heavy Vehicles (per day)[1]	159[2,3] – 903[2,3]	170[2,3] – 505[3]	217[3]
% Increase of Heavy Vehicles due to Approved CGO[4]	0.1% – 0.7%	0.2% – 0.73%	0.5%
Heavy Vehicle Accidents (per year)[5]	3.25	2.25	1
Annual Million km of Heavy Vehicle Travel	4.47 – 25.37	6.02 – 17.87	3.24
Heavy Vehicle Accidents/Annual Million km of Heavy Vehicle Travel	0.13 – 0.73	0.13 – 0.37	0.31
Availability of Alternative Emergency Routes	Available	Available	Available
Emergency Response Capability	Adequate	Adequate	Adequate
Operational Factors	More cost effective	Less cost effective	Cost Effective

1 Roads and Maritime Services Traffic Volume Viewer (retrieved 23 May 2018).
2 Assumes 10% of all vehicles are heavy vehicles.
3 2018 values extrapolated from previous years assuming 1% annual growth rate.
4 Assumes 6 truck movement per week (includes movements to and from the CGO).
5 Roads and Maritime Services Crash Report Data (1 Jan 2012 to 21 Dec 2016).
There is little difference in the type of land use along each potential route, therefore these factors were not used to compare Route Option 1 and Option 2.
RMS Roads and Maritime Services

In accordance with the Route Selection Guidelines, Table 17 presents the results of the risk analysis on a comparative basis. In each case the consequences and likelihood of potential hazardous events were considered. This risk assessment approach effectively combines the estimated accident frequency with the potential for harm (i.e. risk), making it consistent with the principles and methodologies embodied within Australian Standard (AS) 4360 Risk Management and HIPAP No. 6.

Table 17 presents the results of the risk analysis in terms of minimal, acceptable, significant and unacceptable risk. For the purposes of this risk assessment the following definitions apply:

- minimal risk: the transport of caustic soda along these routes is assessed as posing a minimal risk to the factor of interest;
- acceptable risk: the transport of caustic soda along these routes is assessed as posing an acceptable amount of risk to the factor of interest;
- significant risk: the transport of caustic soda along these routes is assessed as posing a significant increase of risk to the factor of interest; and
- unacceptable risk: the transport of caustic soda along these routes is assessed as posing an unacceptable level of risk to the factor of interest.

Note that both routes between Temora and West Wyalong and the approved Mine Access Route were not identified to have any significant or unacceptable risks.

Table 17
Risk Analysis Findings – Caustic Soda

Assessment Factor	Minimal Risk			Acceptable Risk		
	Option 1 Temora – West Wyalong (Goldfields Way)	**Option 2** Temora – Mirrool – West Wyalong (Burley-Griffin Way)	**Mine Access Route**	**Option 1** Temora – West Wyalong (Goldfields Way)	**Option 2** Temora – Mirrool – West Wyalong (Burley-Griffin Way)	**Mine Access Route**
Schools	#	#	✓	#	#	
Hospitals	#	#	✓	#	#	
Aged Care Facilities	#	#	✓	#	#	
Churches	#	#	✓	#	#	
Items of Heritage or Cultural Significance	#	#	✓	#	#	
Other Land use	#	#	✓	#	#	
Park Reservations	✓				✓	✓
Waterways				✓	✓	✓
Emergency Infrastructure	✓	✓	✓			
Heavy Vehicle Accidents (per year)[1]	✓		✓		✓	
Heavy Vehicle Accidents/Annual Million km of Heavy Vehicle Travel	✓		✓		✓	
Availability of Alternative Emergency Routes	✓	✓	✓			
Emergency Response Capability	✓	✓	✓			
Operational Factors	✓	✓	✓			
Comparative Assessment of all Factors	✓		✓		✓	

[1] Roads and Maritime Services Traffic Volume Viewer (retrieved 23 May 2018).
[#] There is little difference in the type of land use along each potential route, therefore these factors were not used to compare Route Option 1 and Option 2.
RTA Roads and Maritime Services

There are no defined absolute risk criteria for the transport of hazardous materials throughout NSW, therefore the assessment of risk results is a balanced judgement based on experience in accordance with HIPAP No. 6.

Overall, the net increase in the number of heavy vehicles due to the transport of this material on the local road network will be up to approximately 0.7% for both route options between Temora and West Wyalong and up to approximately 0.5% for the approved Mine Access Route (i.e. a minor impact on existing traffic volume). Therefore, there will be only a minor increase in transport risk when compared to existing risk levels.

From a risk perspective, the results detailed in Tables 16 and 17 show little difference in the level of risk associated with both route options between Temora and West Wyalong. In addition, these results deem both route options between Temora and West Wyalong and the approved Mine Access Route to pose a minimal to acceptable level of risk to surrounding people, property and the natural environment.

Both route options between Temora and West Wyalong and the approved Mine Access Route are therefore equally suitable for the transport of hazardous materials from a risk perspective. Subsequently, direct transport from Temora to West Wyalong on Goldfields Way (Temora – West Wyalong) (and then the approved Mine Access Route) has been determined the preferred route by the transport provider and therefore will be the typical route for transport of caustic soda, although deliveries will still be accepted via route Option 2 is required.

5 Risk Management Measures

The identification of risk management measures is the final step in the route evaluation process. The Route Selection Guidelines state that the *identification of risk management measures should include opportunities for risk reduction where the evaluation shows undesirable levels of risk along the preferred routes, together with consideration of an appropriate safety management system* (DoP, 2011a).

The level of risk associated with the transport of caustic soda to the CGO on the local road network has been minimised by the selection of suitable transport routes based on an assessment of road and traffic factors, emergency response capability, operational factors and risk. Further, no local roads in addition to those identified in Section 7.2 will be used for the transport of hazardous materials.

The assessment of both routes between Temora and West Wyalong and the approved Mine Access Route did not identify undesirable levels of risk for the transport of caustic soda. Therefore, no additional risk reduction measures are considered necessary beyond those required under the ADG Code and DG Regulations.

The risk management measures required to be implemented by the material supplier and transport provider for the transport of hazardous materials to the CGO are outlined in Appendix B.

Compliance with the requirements of the ADG Code and DG Regulations will be a requirement of the material supply contract between Evolution and the material supplier and the transport provider.

7.8 LPG

1 Hazard Identification

Type of Hazardous Material

LPG is classified under the ADG Code as Class 2.1 (flammable gas). It is a colourless liquid composed predominantly of any of the following hydrocarbons or mixtures of any or all of them: propane; propylene; butane; and butylenes. These hydrocarbons are non-toxic below their lower flammability limit. Concentrations higher than the lower flammability limit can affect bodily functions, (e.g. ventricular fibrillation, central nervous system depression and narcosis). The hydrocarbons are not considered to represent a significant environmental threat. Their hazard potential derives solely from the fact that they are flammable materials.

When released from pressurised, ambient temperature storage to atmosphere, LPG will flash, generating large volumes of vapour and some liquid which will evaporate quickly. Vaporising liquids are rapidly cooled which may lead to cold burns if contact is made. The vapours are heavier than air and may accumulate in confined, unventilated places (and thereby create a confined explosion hazard).

LPG ignition can lead to jet fires, flash fires or vapour cloud explosions. A BLEVE (boiling liquid expanding vapour explosion) event can occur for a tank or vessel containing LPG when subjected to radiant heat from a nearby fire. Products of combustion include carbon monoxide and carbon dioxide.

Adjacent Land Use

LPG will typically be transported on the local road network using the Newell Highway from Narrandera through Mirrool to West Wyalong and then the approved Mine Access Route.

Sensitive land uses include some schools (pre-schools and primary and secondary schools), hospitals, aged care facilities, churches and items of heritage or cultural significance.

Some sensitive land uses are located adjacent to or nearby Ungarie Road (i.e. the initial segment of the approved Mine Access Route), including the West Wyalong Public School, West Wyalong High School, West Wyalong District Hospital and the Royal Freemason's Benevolent Institution West Wyalong Masonic Village Aged Care

Outside of West Wyalong, on the route from Mirrool, sensitive land uses such as those listed above are relatively uncommon.

Transport Vehicle and Conditions of Transport

LPG will be transported to the CGO by single semi-trailer with a maximum capacity of up to 20 tonnes per delivery. It will be transported as a liquid by bulk tanker. Regulation of temperature and pressure are not required during the transport of this material. The maximum frequency of deliveries is 2 per week.

Causes of Hazardous Incidents

Initiating and contributory causes for incidents involving heavy vehicles has been detailed in *Guidelines for Chemical Transportation Risk Analysis* (CCPS, 1995). The identified causes, with additional causes included, are reproduced in Table 5 (Section 7.4).

2 Consequence Analysis

An accident involving a heavy vehicle transporting LPG resulting in a release of the material is the hazardous incident relevant to the transport of LPG. The following consequences of this hazardous incident are relevant to LPG:

- prolonged fire as a result of an accident propagating to a BLEVE event causing catastrophic failure of the tanker vessel wall and ignition of the released material resulting in impact on people, property and the environment;
- immediate ignition of released material forming flash fire and/or jet fire resulting in impact on people, property and the environment; and
- delayed ignition of the released material causing vapour cloud explosion and flash fire resulting in impact on people, property and the environment.

3 Estimation of the Likelihood of a Hazardous Incident

Accident statistics available for the Newell Highway for the area between Narrandera and West Wyalong were obtained from the RMS and are summarised in Table 18. Although the entire transport route from Narrandera to the CGO is outside the CGO local road network (and is a greater extent than that required to be assessed), this extent provides a more conservative assessment of accident statistics. Accordingly, the accident statistics presented below are conservative as they are relevant to a greater area than the local road network surrounding the CGO (Figure 5). Available accident statistics for the approved Mine Access Route were also obtained from RMS.

Table 18
Summary of Accident Statistics - LPG

Route	Length (km)	No. of Heavy Vehicles (per day)	% Increase of Heavy Vehicles due to Approved CGO[5]	Heavy Vehicle Accidents (per year)	Annual Million km of Heavy Vehicle Travel	Heavy Vehicle Accidents/Annual Million km of Heavy Vehicle Travel
Narrandera – West Wyalong	134	500[2,4] – 695[2,4]	0.1-0.2	2.9[7]	24.46 – 34.0	0.09 – 0.12
Mine Access Route	41	217[1,3]	0.37	1[6]	3.24	0.31

1 Roads and Maritime Services Traffic Volume Viewer (retrieved 23 May 2018).
2 Roads and Maritime Services Traffic Volume Viewer (retrieved 30 January 2019).
3 2018 values extrapolated from previous years assuming 1% annual growth rate.
4 2018 values extrapolated from latest annual count assuming 1% annual growth rate.
5 Assumes 4 movements per week (includes movements to and from the CGO).
6 Roads and Maritime Services Crash Report Data (1 Jan 2012 to 21 Dec 2016).
7 Roads and Maritime Services Crash Report Data (1 July 2013 to 30 June 2018).

Accident statistics for the route between Narrandera and West Wyalong are considered to be within normal operating levels for the road type and use. The increase of heavy vehicles transporting LPG on the local road network due to the approved CGO will be very small (up to approximately 0.2%) and will be unlikely to affect traffic flows or accident statistics. The segment of the Newell Highway (from Narrandera) near West Wyalong is therefore suitable for the transport of hazardous materials with respect to accident statistics.

Accident statistics for the approved Mine Access Route are considered to be within normal operating levels for the road types and use. Improved driving conditions have been achieved due to the upgrading of the approved Mine Access Route. The increase of heavy vehicles transporting LPG on the Mine Access Route due to the approved CGO will be small (approximately 0.37%) and will be unlikely to affect traffic flows or accident statistics. The approved Mine Access Route is therefore suitable for the transport of hazardous materials with respect to accident statistics.

In the event of an accident involving a heavy vehicle, the carried goods may or may not be released. The probability of release is dependent on factors such as speed, shipping conditions (i.e. pressurised compared to non-pressurised), inadequate load securing, and strength and integrity of the container.

Various studies of release probabilities from heavy vehicles involved in an accident have been undertaken. The *Guidelines for Chemical Transportation Risk Analysis* (CCPS, 1995) indicates that the release probability for various road types is between 5 and 10% (i.e. approximately one heavy vehicle accident in every 10 to 20 will result in a release of the material).

An estimation of the likelihood of an accident involving a vehicle transporting LPG to the CGO resulting in a release of the material must take into account the following:

- the number of vehicles transporting LPG to the CGO relative to the total number of heavy vehicles already using the same transport route;
- the number of accidents that have involved heavy vehicles; and
- the probability of a release of the material (which is assumed to be 10% of all accidents involving heavy vehicles results in a release of material) (CCPS, 1995).

The likelihood of an accident involving a vehicle transporting LPG to the CGO resulting in a release of material for route between Narrandera and West Wyalong is estimated to be $1x10^{-4}$/year (i.e. such an accident is estimated to occur once every 10,000 years) (Pinnacle Risk Management Pty Ltd, 2019). This likelihood is considered conservative given it is relevant to a greater extent than the local road network surrounding the CGO.

The likelihood of an accident (based on recent accident data) involving a vehicle transporting LPG to the CGO resulting in a release of the material for the approved Mine Access Route is estimated to be $1x10^{-4}$/year (Pinnacle Risk Management Pty Ltd, 2019).

The risk of the event is determined using the risk matrix and consequence ratings in Tables 3 and 4 in Section 7.3.1 (Pinnacle Risk Management Pty Ltd, 2019). The volume is limited to the size of the tanker (i.e. 20 tonnes).

For releases of LPG from a road traffic accident, the consequence rating for the segment of the Newell Highway between Narrandera and West Wyalong and the approved Mine Access Route is determined to be ”Extremely Serious” (Pinnacle Risk Management Pty Ltd, 2019). This consequence is based on a worst-case fatality to the driver (Pinnacle Risk Management Pty Ltd, 2019). As not all accidents will result in ignition and a fatality, the likelihood will be lower than $1x10^{-4}$/year (Pinnacle Risk Management Pty Ltd, 2019). Taking into consideration a Conditional Modifier with a probability of 0.1 for ignition and fatality, the likelihood will be $1x10^{-5}$/year or lower (Pinnacle Risk Management Pty Ltd, 2019).

Given a likelihood of $1x10^{-5}$/year (or lower) for the segment of the Newell Highway between Narrandera and West Wyalong and also for the Mine Access Route and a consequence rating of “Extremely Serious”, the corresponding risk level is Class III (Pinnacle Risk Management Pty Ltd, 2019). These values indicate a low level of risk associated with the transport of hazardous materials (Pinnacle Risk Management Pty Ltd, 2019).

4 Risk Analysis and Assessment of Risk Results

The risk analysis took into account road and traffic factors, emergency response capability and operational factors. Table 19 provides a summary of all assessment factors utilised in the risk analysis.

In accordance with the Route Selection Guidelines, Table 20 presents the results of the risk analysis on a comparative basis. In each case the consequences and likelihood of potential hazardous events were considered. This risk assessment approach effectively combines the estimated accident frequency with the potential for harm (i.e. risk), making it consistent with the principles and methodologies embodied within Australian Standard AS 31000 Risk Management and HIPAP No. 6.

Table 20 presents the results of the risk analysis in terms of minimal, acceptable, significant and unacceptable risk. For the purposes of this risk assessment the following definitions apply:

- minimal risk: the transport of LPG along this route is assessed as posing a minimal risk to the factor of interest;
- acceptable risk: the transport of LPG along this route is assessed as posing an acceptable amount of risk to the factor of interest;
- significant risk: the transport of LPG along this route is assessed as posing a significant increase of risk to the factor of interest; and
- unacceptable risk: the transport of LPG along this route is assessed as posing an unacceptable level of risk to the factor of interest.

Note that the segment of the Newell Highway between Narrandera and West Wyalong and approved Mine Access Route were not identified to have any significant or unacceptable risks.

Table 19
Summary of Risk Analysis Assessment Factors - LPG

Assessment Factor	Narrandera to West Wyalong (Newell Highway)	Mine Access Route
Schools	#	2 (<1km from route)
Number of School Students	#	595
Hospitals	#	1
Number of Hospital Beds	#	<50
Aged Care Facilities	#	1
Churches	#	0
Items of Heritage or Cultural Significance	#	0
Other Landuse	#	Predominantly open space
Number of Park Reservations	0	1
Park Reservations – Approximate Total Road Frontage (m)	0	5.1
Waterways	5	22
Emergency Infrastructure	Adequate	Adequate
Length (km)	135	41
No. of Heavy Vehicles (per day)	500[2,3] – 695[2,4]	217[1,3]
% Increase of Heavy Vehicles due to Approved CGO[5]	0.1 - 0.2%	0.37
Heavy Vehicle Accidents (per year)	2.9[7]	1[6]
Annual Million km of Heavy Vehicle Travel	24.46 – 34.00	3.24
Heavy Vehicle Accidents/Annual Million km of Heavy Vehicle Travel	0.09 – 0.12	0.31
Availability of Alternative Emergency Routes	Available	Available
Emergency Response Capability	Adequate	Adequate
Operational Factors	Cost effective	Cost Effective

1 Roads and Maritime Services Traffic Volume Viewer (retrieved 23 May 2018).
2 Roads and Maritime Services Traffic Volume Viewer (retrieved 30 January 2019).
3 2018 values extrapolated from previous years assuming 1% annual growth rate.
4 2018 values extrapolated from latest annual count assuming 1% annual growth rate.
5 Assumes 4 movements per week (includes movements to and from the CGO).
6 Roads and Maritime Services Crash Report Data (1 Jan 2012 to 21 Dec 2016).
7 Roads and Maritime Services Crash Report Data (1 July 2013 to 30 June 2018).

Table 20
Risk Analysis Findings - LPG

Assessment Factor	Minimal Risk		Acceptable Risk	
	Narrandera – West Wyalong (Newell Highway)	Mine Access Route	Narrandera – West Wyalong (Newell Highway)	Mine Access Route
Schools	✓	✓		
Hospitals	✓	✓		
Aged Care Facilities	✓	✓		
Churches	✓	✓		
Items of Heritage or Cultural Significance	✓	✓		
Other Land use	✓	✓		
Park Reservations			✓	✓
Waterways			✓	✓
Emergency Infrastructure	✓	✓		

Table 20 (Continued)
Risk Analysis Findings - LPG

Assessment Factor	Minimal Risk		Acceptable Risk	
	Narrandera – West Wyalong (Newell Highway)	Mine Access Route	Narrandera – West Wyalong (Newell Highway)	Mine Access Route
Heavy Vehicle Accidents (per year)	✓	✓		
Heavy Vehicle Accidents/Annual Million km of Heavy Vehicle Travel	✓	✓		
Availability of Alternative Emergency Routes	✓	✓		
Emergency Response Capability	✓	✓		
Operational Factors	✓	✓		
Comparative Assessment of all Factors	✓	✓		

There are no defined absolute risk criteria for the transport of hazardous materials throughout NSW, therefore the assessment of risk results is a balanced judgement based on experience in accordance with HIPAP No.6.

Overall, the net increase in the number of heavy vehicles on the local road network due to the transport of LPG will be up to approximately 0.2% for the segment of the Newell Highway between Narrandera and West Wyalong and up to approximately 0.37% for the approved Mine Access Route (i.e. a minor impact on existing traffic volume). Therefore, there will be only a minor increase in transport risk when compared to existing risk levels.

From a risk perspective, the results detailed in Tables 19 and 20 deem the segment of the Newell Highway between Narrandera and West Wyalong and the approved Mine Access Route to pose a minimal level of risk to surrounding people, property and the natural environment. These routes are therefore suitable for the transport of hazardous materials to the CGO.

5 Risk Management Measures

The identification of risk management measures is the final step in the route evaluation process. The Route Selection Guidelines state that the *identification of risk management measures should include opportunities for risk reduction where the evaluation shows undesirable levels of risk along the preferred routes, together with consideration of an appropriate safety management system* (DoP, 2011a).

The level of risk associated with the transport of LPG to the CGO on the local road network has been minimised by the selection of suitable transport routes based on an assessment of road and traffic factors, emergency response capability, operational factors and risk. Further, no local roads in addition to those identified in Section 7.2 will be used for the transport of hazardous materials.

The assessment of the route between Narrandera and West Wyalong and the approved Mine Access Route did not identify undesirable levels of risk for the transport of LPG. Therefore, no additional risk reduction measures are considered necessary beyond those required under the ADG Code and DG Regulations.

The risk management measures that will be implemented by the material supplier and the transport provider and for the transport of hazardous materials to the CGO are outlined in Appendix B.

Compliance with the requirements of the ADG Code and DG Regulations will be a requirement of the contracts between Evolution and the material supplier and the transport provider.

7.9 HYDROGEN PEROXIDE

1 Hazard Identification

Type of Hazardous Material

Hydrogen peroxide is classified under the ADG Code as Class 5.1 (oxidising substance) with a Subsidiary Risk of Class 8 (corrosive substance) and Packing Group II. It is a clear, colourless liquid with a sharp odour and is a strong oxidising agent. In its pure form and at low pH, hydrogen peroxide is relatively stable.

Hydrogen peroxide can react strongly with organic materials, reducing agents, some acids and alkalis, metals and flammable and combustible materials (including paper, cloth, leather etc.). It is catalytically decomposed (into water and oxygen) by heavy metals and their salts, dust, oxidisable organic materials, enzymes and rust. Decomposition can also be initiated or accelerated by light, heat, high pH or various other impurities, and may be extremely violent. Decomposition due to contact with any organic materials may generate enough heat and oxygen to start a fire.

Hydrogen peroxide is not combustible but will strongly support the combustion of other materials. It is not toxic in itself, however can cause injury through its ability to form free, active oxygen. Irritation and burns to mucous membranes, skin, and eyes can occur. If people are exposed to hydrogen peroxide via ingestion, eye or skin contact or inhalation, relatively low toxic consequential impact is possible when compared to hydrochloric or sulphuric acids.

Hydrogen peroxide has no potential for bio-accumulation as it degrades rapidly in air and water. However, in sufficient quantities, it can be toxic to aquatic biota and plants.

Adjacent Land Use

Hydrogen peroxide will typically be transported on the local road network using Burley-Griffin Way from Temora to Mirrool, then the Newell Highway from Mirrool to West Wyalong (Option 1: Temora – Mirrool – West Wyalong). Alternatively, hydrogen peroxide may be transported on the local road network using the Newell Highway from Dubbo to West Wyalong (Option 2: Dubbo – West Wyalong). Both routes will then use the approved Mine Access Route from West Wyalong to the CGO.

Sensitive land uses include schools (pre-schools and primary and secondary schools), hospitals, aged care facilities, churches and items of heritage or cultural significance.

Some sensitive land uses are located along the Newell Highway (Neeld Street) in Wyalong and West Wyalong, including the Wyalong Public School, Saint Mary's War Memorial School, and five churches. The West Wyalong Public School, West Wyalong High School, West Wyalong District Hospital and the Royal Freemason's Benevolent Institution West Wyalong Masonic Village Aged Care are located adjacent to or nearby Ungarie Road (i.e. the initial segment of the approved Mine Access Route).

Numerous heritage items are listed under the *Bland Local Environmental Plan 2011* (LEP) as located along the Newell Highway (Neeld Street) in Wyalong and West Wyalong, including the Tattersalls Hotel, Post Office Hotel, Globe Hotel and the "Wyalong House" residence.

Outside of Wyalong and West Wyalong sensitive land uses such as those listed above are relatively uncommon and both route options from Temora to West Wyalong predominantly pass through rural areas comprising of areas of open space.

Other land uses may include residential, commercial or industrial areas, primarily located within Wyalong and West Wyalong, and areas of open space.

Transport Vehicle and Conditions of Transport

Typically, hydrogen peroxide will be transported to the CGO by single semi-trailer with a maximum capacity of up to 25.4 tonnes per delivery. It will be transported as a liquid and contained within a bulk tanker (i.e. Isotainer). Alternatively, hydrogen peroxide may be transported to the CGO by B-Double with a maximum capacity of up to 43.4 tonnes per delivery. It will be transported as a liquid and contained within a bulk tanker (i.e. Isotainer). Regulation of temperature and pressure are not required during the transport of this material. The maximum frequency of deliveries is 3 per week.

Causes of Hazardous Incidents

Initiating and contributory causes for incidents involving heavy vehicles has been detailed in *Guidelines for Chemical Transportation Risk Analysis* (CCPS, 1995). The identified causes, with additional causes included, are reproduced in Table 5 (Section 7.4).

2 Consequence Analysis

An accident involving a heavy vehicle transporting hydrogen peroxide resulting in a release of the material is the hazardous incident relevant to the transport of hydrogen peroxide. The consequences of a release of hydrogen peroxide from this hazardous incident are largely dependent on what is contacted by the liquid. The following consequences of this hazardous incident are relevant:

- direct exposure to liquid or vapour hydrogen peroxide for those at or near to an accident scene;
- contamination of waterways (from a large liquid release) causing a minor lowering of pH resulting in a moderate impact on fish and other aquatic life including aquatic plants; and
- burning of vegetation upon contact resulting in a possible fire.

Hydrogen peroxide does not bio-accumulate.

3 Estimation of the Likelihood of a Hazardous Incident

Available accident statistics for the routes between Temora and West Wyalong, and between Dubbo and West Wyalong and the approved Mine Access Route were obtained from the RMS and are summarised in Table 21. Although the entire transport route from Temora to the CGO is outside the CGO local road network (and is a greater extent than that required to be assessed), this extent provides a more conservative assessment of accident statistics. Accordingly, the accident statistics presented below are conservative as they are relevant to a greater area than the local road network surrounding the CGO (Figure 5).

Table 21
Summary of Accident Statistics – Hydrogen Peroxide

Route (Figure 5)	Length (km)	No. of Heavy Vehicles (per day)[1]	% Increase of Heavy Vehicles due to Approved CGO[4]	Heavy Vehicle Accidents (per year)[5]	Annual Million km of Heavy Vehicle Travel	Heavy Vehicle Accidents/Annual Million km of Heavy Vehicle Travel
Option 1 **Temora – Mirrool – West Wyalong (Burley-Griffin Way)**	97	170[2,3] – 505[2,3]	0.24 - 0.7	2.25	6.02 – 17.87	0.13 – 0.37
Option 2 **Dubbo to West Wyalong (Newell Highway)**	257	746[3] – 1,102[3]	0.11 - 0.16	11.6	69.99 – 103.37	0.11 – 0.17
Mine Access Route	41	217[3]	0.55	1	3.24	0.31

1 Roads and Maritime Services Traffic Volume Viewer (retrieved 23 May 2018)

2 Assumes 10% of all vehicles are heavy vehicles.

3 2018 values extrapolated from previous years assuming 1% annual growth rate.

4 Assumes 6 movements per week (includes movements to and from the CGO).

5 Roads and Maritime Services Crash Report Data (1 Jan 2012 to 21 Dec 2016).

Accident statistics for the route between Temora and West Wyalong are considered to be within normal operating levels for the road types and use. The increase of heavy vehicles transporting hydrogen peroxide on the local road network due to the approved CGO will very small (up to approximately 0.7%) and will be unlikely to affect traffic flows or accident statistics. The route between Temora and West Wyalong is therefore suitable for the transport of hazardous materials with respect to accident statistics.

Accident statistics for route between Dubbo and West Wyalong are considered to be within normal operating levels for the road type and use. The increase of heavy vehicles transporting hydrogen peroxide on the local road network due to the approved CGO will be very small (up to approximately 0.16%) and will be unlikely to affect traffic flows or accident statistics. The route between Dubbo and West Wyalong is therefore suitable for the transport of hazardous materials with respect to accident statistics.

Accident statistics for the approved Mine Access Route are considered to be within normal operating levels for the road types and use. Improved driving conditions have been achieved due to the upgrading of approved Mine Access Route. The increase of heavy vehicles transporting hydrogen peroxide on the Mine Access Route due to the approved CGO will be small (approximately 0.55%) and will be unlikely to affect traffic flows or accident statistics. The approved Mine Access Route is therefore suitable for the transport of hazardous materials with respect to accident statistics.

In the event of an accident involving a heavy vehicle, the carried goods may or may not be released. The probability of release is dependent on factors such as speed, shipping conditions (i.e. pressurised compared to non-pressurised), inadequate load securing, and strength and integrity of the container.

Various studies of release probabilities from heavy vehicles involved in an accident have been undertaken. The *Guidelines for Chemical Transportation Risk Analysis* (CCPS, 1995) indicates that the release probability for various road types is between 5 and 10% (i.e. approximately one heavy vehicle accident in every 10 to 20 will result in a release of a material).

An estimation of the likelihood of an accident involving a vehicle transporting hydrogen peroxide to the approved CGO resulting in a release of the material must take into account the following:

- the number of vehicles transporting hydrogen peroxide to the CGO relative to the total number of heavy vehicles already using the same transport route;

- the number of accidents that have involved heavy vehicles; and
- the probability of a release of the material (which is assumed to be 10% of all accidents involving heavy vehicles results in a release of material) (CCPS, 1995).

The likelihood of an accident (based on recent accident data) involving a vehicle transporting hydrogen peroxide to the CGO resulting in a release of the material for the route between Temora and West Wyalong is estimated to be $2.9x10^{-4}$/year (Pinnacle Risk Management Pty Ltd, 2019).

The likelihood of an accident (based on recent accident data) involving a vehicle transporting hydrogen peroxide to the CGO resulting in a release of the material for the route between Dubbo and West Wyalong is estimated to be $1x10^{-4}$/year (Pinnacle Risk Management Pty Ltd, 2019).

The likelihood of an accident (based on recent accident data) involving a vehicle transporting hydrogen peroxide to the CGO resulting in a release of the material for the approved Mine Access Route is estimated to be $2x10^{-4}$/year (Pinnacle Risk Management Pty Ltd, 2019).

The risk of the event is determined using the risk matrix and the consequence ratings in Tables 3 and 4 in Section 7.3.1 (Pinnacle Risk Management Pty Ltd, 2018).

For releases of hydrogen peroxide from a road traffic accident, the consequence rating is determined to be “Serious” (Pinnacle Risk Management Pty Ltd, 2019). The volume is limited to the size of the tanker (i.e. up to 25.4 tonnes, or 43.4 tonnes) and it is possible that only one of the two barrels is breached (Pinnacle Risk Management Pty Ltd, 2018).

Given a likelihood of $2.9x10^{-4}$/year for the route between Temora and West Wyalong, $1x10^{-4}$/year for the route between Dubbo and West Wyalong and $2x10^{-4}$/year for the approved Mine Access Route and a consequence rating of “Serious”, the corresponding risk level is Class III (Pinnacle Risk Management Pty Ltd, 2019).

These values indicate a low level of risk associated with the transport of hydrogen peroxide on the local road network (Pinnacle Risk Management Pty Ltd, 2018).

4 Risk Analysis and Assessment of Risk Results

The risk analysis took into account road and traffic factors, emergency response capability and operational factors. Table 22 provides a summary of all assessment factors utilised in the risk analysis.

Table 22
Summary of Risk Analysis Assessment Factors – Hydrogen Peroxide

Assessment Factor	Option 1 Temora – Mirrool – West Wyalong (Burley-Griffin Way)	Option 2 Dubbo – West Wyalong (Newell Highway)	Mine Access Route
Schools	#	#	#
Number of School Students	#	#	#
Hospitals	#	#	#
Number of Hospital Beds	#	#	#
Aged Care Facilities	#	#	#
Churches	#	#	#
Items of Heritage or Cultural Significance	#	#	#
Other Land use	#	Predominantly open space	Predominantly open space
Number of Park Reservations	1	5	1
Park Reservations – Approximate Total Road Frontage (m)	500	22.5	5,100
Waterways	42	13	22
Emergency Infrastructure	Adequate	Adequate	Adequate
Length (km)	97	257	41
No. of Heavy Vehicles (per day)[1]	170[2,3] – 505[3]	746[3] – 1,102[3]	217[3]
% Increase of Heavy Vehicles due to Approved CGO[4]	0.24 - 0.7	0.11 - 0.16	0.55
Heavy Vehicle Accidents (per year)[5]	2.25	11.6	1
Annual Million km of Heavy Vehicle Travel	6.02 – 17.87	69.99 – 103.37	3.24
Heavy Vehicle Accidents/Annual Million km of Heavy Vehicle Travel	0.13 – 0.37	0.11 – 0.17	0.31
Availability of Alternative Emergency Routes	Available	Available	Available
Emergency Response Capability	Adequate	Adequate	Adequate
Operational Factors	Less cost effective	Cost effective	Cost effective

1 Roads and Maritime Services Traffic Volume Viewer (retrieved 23 May 2018).
2 Assumes 10% of all vehicles are heavy vehicles.
3 2018 values extrapolated from previous years assuming 1% annual growth rate.
4 Assumes 6 truck movement per week (includes movements to and from the CGO).
5 Roads and Maritime Services Crash Report Data (1 Jan 2012 to 21 Dec 2016).
There is little difference in the type of land use along each potential route, therefore these factors were not used to compare Route Option 1 and Option 2.
RMS Roads and Maritime Services

In accordance with the Route Selection Guidelines, Table 23 presents the results of the risk analysis on a comparative basis. In each case the consequences and likelihood of potential hazardous events were considered. This risk assessment approach effectively combines the estimated accident frequency with the potential for harm (i.e. risk), making it consistent with the principles and methodologies embodied within Australian Standard AS 31000 Risk Management and HIPAP No. 6.

Table 23 presents the results of the risk analysis in terms of minimal, acceptable, significant and unacceptable risk. For the purposes of this risk assessment the following definitions apply:

- minimal risk: the transport of hydrogen peroxide is assessed as posing a minimal risk to the factor of interest;
- acceptable risk: the transport of hydrogen peroxide is assessed as posing an acceptable amount of risk to the factor of interest;
- significant risk: the transport of hydrogen peroxide is assessed as posing a significant increase of risk to the factor of interest; and

- unacceptable risk: the transport of hydrogen peroxide is assessed as posing an unacceptable level of risk to the factor of interest.

Note that the route between Temora and West Wyalong, the route between Dubbo and West Wyalong and the approved Mine Access Route were not identified to have any significant or unacceptable risks.

Table 23
Risk Analysis Findings- Hydrogen Peroxide

Assessment Factor	Minimal Risk			Acceptable Risk		
	Option 1 Temora – Mirrool – West Wyalong (Burley-Griffin Way)	**Option 2 Dubbo – West Wyalong (Newell Highway)**	**Mine Access Route**	**Option 1 Temora – Mirrool – West Wyalong (Burley-Griffin Way)**	**Option 2 Dubbo – West Wyalong (Newell Highway)**	**Mine Access Route**
Schools	#	#	✓	#	#	
Hospitals	#	#	✓	#	#	
Aged Care Facilities	#	#	✓	#	#	
Churches	#	#	✓	#	#	
Items of Heritage or Cultural Significance	#	#	✓	#	#	
Other Land use	#	#	✓	#	#	
Park Reservations				✓	✓	✓
Waterways				✓	✓	✓
Emergency Infrastructure	✓	✓	✓			
Heavy Vehicle Accidents (per year)[1]		✓	✓	✓		
Heavy Vehicle Accidents/Annual Million km of Heavy Vehicle Travel		✓	✓	✓		
Availability of Alternative Emergency Routes	✓	✓	✓			
Emergency Response Capability	✓	✓	✓			
Operational Factors	✓	✓	✓			
Comparative Assessment of all Factors		✓	✓	✓		

[1] Roads and Maritime Services Traffic Volume Viewer (retrieved 23 May 2018).

[#] There is little difference in the type of land use along each potential route, therefore these factors were not used to compare Route Option 1 and Option 2.

There are no defined absolute risk criteria for the transport of hazardous materials throughout NSW, therefore the assessment of risk results is a balanced judgement based on experience in accordance with HIPAP No.6.

Overall, the net increase in the number of heavy vehicles due to the transport of this material on the local road network will be approximately 0.7% for the route between Temora and West Wyalong, approximately 0.16% for the route between Dubbo and West Wyalong, and approximately 0.55% for the approved Mine Access Route (i.e. a minor impact on existing traffic volume). Therefore, there will be only a minor increase in transport risk when compared to existing risk levels.

From a risk perspective, the results detailed in Tables 22 and 23 deem the route between Temora and West Wyalong, the route between Dubbo and West Wyalong and the approved Mine Access Route to pose a minimal level of risk to surrounding people, property and the natural environment. These routes are therefore suitable for the transport of hazardous materials to the CGO.

Both route options from either between Dubbo and West Wyalong or between Temora and West Wyalong, via Burley-Griffin Way and the approved Mine Access Route are therefore equally suitable for the transport of hazardous materials from a risk perspective. Road transport between Temora and West Wyalong and then the approved Mine Access Route is the preferred route of the transport provider and therefore will be the typical route for the transport of hydrogen peroxide to the CGO, although deliveries via route Option 2 will still be accepted if required.

5 Risk Management Measures

The identification of risk management measures is the final step in the route evaluation process (Figure 4). The Route Selection Guidelines state that the *identification of risk management measures should include opportunities for risk reduction where the evaluation shows undesirable levels of risk along the preferred routes, together with consideration of an appropriate safety management system* (DoP, 2011a).

The level of risk associated with the transport of hydrogen peroxide on the local road network to the approved CGO has been minimised by the selection of suitable transport routes based on an assessment of road and traffic factors, emergency response capability, operational factors and risk. Further, no local roads in addition to those identified in Section 7.2 will be used to transport hazardous materials to the CGO.

This assessment of both transport routes between Dubbo and West Wyalong or between Temora and West Wyalong, and the approved Mine Access Route, did not identify undesirable levels of risk for the transport of hydrogen peroxide. Therefore, no additional risk reduction measures are considered necessary beyond those required by the ADG Code and DG Regulations.

The risk management measures that will be implemented by the material supplier and the transport provider for the transport of hazardous materials to the CGO are outlined in Appendix B.

Compliance with the requirements of the ADG Code and DG Regulations will be a requirement of the contracts between Evolution and the material supplier and the transport provider.

7.10 AMMONIUM NITRATE

1 Hazard Identification

Type of Hazardous Material

Ammonium nitrate is classified under the ADG Code as Class 5.1 (oxidising substance) and Packing Group III.

Ammonium nitrate is a stable compound and is generally difficult to explode. It may explode, however, when subjected to energy (heat and/or shock), especially when confined and/or in the presence of contaminants (e.g. chlorides, organics such as waxes and oils, urea, chromium, manganese, zinc, lead, copper, cobalt and nickel). In large quantities, localised areas of high temperature may be sufficiently confined by the total quantity to initiate an explosion. Sympathetic detonations (i.e. propagation from an initial small explosion to a secondary larger explosion) may occur.

Ammonium nitrate is not combustible but in contact with other combustible materials (e.g. wooden pallets) it increases the fire hazard. It can support and intensify a fire even in the absence of air. Fires involving ammonium nitrate can release toxic nitrogen oxides (yellow to brown fumes) and ammonia. A fire involving ammonium nitrate in a confined space could lead to an explosion. Closed containers can rupture violently when heated.

Adjacent Land Use

Ammonium Nitrate will typically be transported on the local road network using the Newell Highway, travelling from the direction of Forbes to West Wyalong, then the approved Mine Access Route (from West Wyalong) to the CGO.

Sensitive land uses along the route include schools (pre-schools and primary and secondary schools), hospitals, aged care facilities, churches and items of heritage or cultural significance.

Some sensitive land uses are located along the Newell Highway (Neeld Street) in Wyalong and West Wyalong, including the Wyalong Public School, Saint Mary's War Memorial school, and five churches. The West Wyalong Public School, West Wyalong High School, West Wyalong District Hospital and the Royal Freemason's Benevolent Institution West Wyalong Masonic Village Aged Care are located adjacent to or nearby Ungarie Road (i.e. the initial segment of the approved Mine Access Route).

Numerous heritage items are listed under the *Bland Local Environmental Plan 2011* (LEP) as located along the Newell Highway (Neeld Street) in Wyalong and West Wyalong, including the Tattersalls Hotel, Post office Hotel, Globe Hotel and the "Wyalong House" residence.

Outside of Wyalong and West Wyalong sensitive land uses such as those listed above are relatively uncommon.

Other land uses include residential, commercial or industrial areas, largely concentrated in Wyalong and West Wyalong, and areas of open space.

Transport Vehicle and Conditions of Transport

Ammonium nitrate will be transported to the CGO by B-Doubles with a maximum capacity of up to 42 tonnes per delivery. Ammonium nitrate will be transported as a solid (prilled) and contained within Bulk Tippers. Regulation of temperature and pressure are not required during the transport of this solid material. The maximum frequency of deliveries is 8 per month.

Causes of Hazardous Incidents

Initiating and contributory causes for incidents involving heavy vehicles has been detailed in *Guidelines for Chemical Transportation Risk Analysis* (CCPS, 1995). The identified causes, with additional causes included, are reproduced in Table 5 (Section 7.4).

2 Consequence Analysis

An accident involving a heavy vehicle transporting ammonium nitrate resulting in a release of the material or explosion is the hazardous incident relevant to the transport of ammonium nitrate. The following consequences of this hazardous incident are relevant:

- release of the material together with the combustion of other materials resulting in propagation of the fire by the ammonium nitrate and exposure to nitrogen oxides for those at or near to the accident scene;
- heating of the ammonium nitrate (whilst confined) resulting in an explosion and subsequent impact on people, property and the environment; and
- contamination of waterways causing an increase in the nitrogen content resulting in fatality for fish and other aquatic life including aquatic plants.

3 Estimation of the Likelihood of a Hazardous Incident

Accident statistics for the segment of the Newell Highway between Dubbo and West Wyalong were obtained from the RMS and are summarised in Table 24. Although the entire transport route from Dubbo to the CGO is outside the CGO local road network (and is a greater extent than that required to be assessed), this extent provides a more conservative assessment of accident statistics. Accordingly, the accident statistics presented below are conservative as they are relevant to a greater area than the local road network surrounding the CGO (Figure 5). Available accident statistics for the approved Mine Access Route were also obtained from the RMS.

Table 24
Summary of Accident Statistics – Ammonium Nitrate

Route (Figure 5)	Length (km)	No. of Heavy Vehicles (per day)[1]	% Increase of Heavy Vehicles due to Approved CGO[3]	Heavy Vehicle Accidents (per year)[4]	Annual Million km of Heavy Vehicle Travel	Heavy Vehicle Accidents/Annual Million km of Heavy Vehicle Travel
Dubbo – West Wyalong (Newell Highway)	257	746[2] – 1,102[2]	0.07% – 0.1%	11.6	69.99 – 103.41	0.11 – 0.17
Mine Access Route	41	217[2]	0.3%	1	3.24	0.31

1 Roads and Maritime Services Traffic Volume Viewer (retrieved 23 May 2018).

2 2018 values extrapolated from previous years assuming 1% annual growth rate.

3 Assumes 16 truck movements per month (includes movements to and from the CGO).

4 Roads and Maritime Services Crash Report Data (1 Jan 2012 to 21 Dec 2016).

Accident statistics for the segment of the Newell Highway between Dubbo and West Wyalong are considered to be within normal operating levels for the road type and use. The increase of heavy vehicles transporting ammonium nitrate on this segment of the Newell Highway due to the approved CGO will be very small (up to approximately 0.1%) and will be unlikely to affect traffic flows or accident statistics. The segment of the Newell Highway between Dubbo and West Wyalong is therefore suitable for the transport of hazardous materials with respect to accident statistics.

Accident statistics for the approved Mine Access Route are considered to be within normal operating levels for the road types and use. Improved driving conditions have been achieved due to the upgrading of the Mine Access Route which included sealing of the road to the CGO. The increase of heavy vehicles transporting ammonium nitrate on the Mine Access Route due to the approved CGO will be small (approximately 0.3%) and will be unlikely to affect traffic flows or accident statistics. The approved Mine Access Route is therefore suitable for the transport of hazardous materials with respect to accident statistics.

In the event of an accident involving a heavy vehicle, the carried goods may or may not be released. The probability of release is dependent on factors such as speed, shipping conditions (i.e. pressurised compared to non-pressurised), inadequate load securing, and strength and integrity of the container.

Various studies of release probabilities from heavy vehicles involved in an accident have been undertaken. The *Guidelines for Chemical Transportation Risk Analysis* (CCPS, 1995) indicates that the release probability for various road types is between 5 and 10% (i.e. approximately one heavy vehicle accident in every 10 to 20 will result in a release of the material).

An estimation of the likelihood of an accident involving a vehicle transporting ammonium nitrate to the CGO resulting in a release of the material must take into account the following:

- the number of vehicles transporting ammonium nitrate to the CGO relative to the total number of heavy vehicles already using the same transport route;
- the number of accidents that have involved heavy vehicles; and
- the probability of a release of the material (which is assumed to be 10% of all accidents involving heavy vehicles results in a release of material) (CCPS, 1995).

The likelihood of an accident (based on averaged accident data) involving a vehicle transporting ammonium nitrate to the CGO resulting in a release of the material for the route between Dubbo and West Wyalong is estimated to be approximately $3x10^{-4}$/year (i.e. such an accident is estimated to occur once every 2,900 years) (Pinnacle Risk Management Pty Ltd, 2018). This likelihood is considered conservative given it is relevant to an area of greater extent than the local road network surrounding the CGO.

The likelihood of an accident (based on averaged accident data) involving a vehicle transporting ammonium nitrate to the CGO resulting in a release of the material for the approved Mine Access Route is estimated to be approximately $1x10^{-4}$/year (i.e. such an accident is estimated to occur once every 8,200 years) (Pinnacle Risk Management Pty Ltd, 2018).

The risk of the event is determined using the risk matrix and the consequence ratings in Tables 3 and 4 in Section 7.3.1 (Pinnacle Risk Management Pty Ltd, 2018).

For releases of ammonium nitrate from a road traffic accident, the consequence rating is determined to be “Serious” (Pinnacle Risk Management Pty Ltd, 2018). The volume is limited to the size of the tanker (i.e. 42 tonnes) and it is possible that only one of the two barrels is breached (Pinnacle Risk Management Pty Ltd, 2018).

Given a likelihood of $3x10^{-4}$/year for the segment of the Newell Highway between Dubbo and West Wyalong and $1x10^{-4}$/year for the approved Mine Access Route and consequence ratings of “Serious”, the corresponding risk level is Class III (Pinnacle Risk Management Pty Ltd, 2018). These values indicate a low level of risk associated with the transport of hazardous materials (Pinnacle Risk Management Pty Ltd, 2018).

4 Risk Analysis and Assessment of Risk Results

Risk analysis took into account road and traffic factors, emergency response capability and operational factors for the segment of the Newell Highway between Dubbo and West Wyalong and the approved Mine Access Route. Table 25 provides a summary of all assessment factors utilised in the risk analysis.

Table 25
Summary of Risk Analysis Assessment Factors – Ammonium Nitrate

Assessment Factor	Dubbo - West Wyalong (Newell Highway)	Mine Access Route
Schools	#	2 (< 1km from route)
Number of School Students	#	595
Hospitals	#	1
Number of Hospital Beds	#	<50
Aged Care Facilities	#	1
Churches	#	0
Items of Heritage or Cultural Significance	#	0
Other Land use	Predominantly open space	Predominantly open space
Number of Park Reservations	5	1
Park Reservations – Approximate Total Road Frontage (km)	22.5	5.1
Waterways	13	22
Emergency Infrastructure	Adequate	Adequate
Length (km)	257	41
No. of Heavy Vehicles (per day)[1]	746[2] – 1,102[2]	217[2]
% Increase of Heavy Vehicles due to Approved CGO[3]	0.07 – 0.1%	0.3%
Heavy Vehicle Accidents (per year)[4]	11.6	1
Annual Million km of Heavy Vehicle Travel	69.99 – 103.41	3.24
Heavy Vehicle Accidents/Annual Million km of Heavy Vehicle Travel	0.11 – 0.17	0.31
Availability of Alternative Emergency Routes	Available	Available
Emergency Response Capability	Adequate	Adequate
Operational Factors	Cost effective	Cost effective

1 Roads and Maritime Services Traffic Volume Viewer (retrieved 23 May 2018).
2 2018 values extrapolated from previous years assuming 1% annual growth rate.
3 Assumes 16 truck movements per month (includes movements to and from the CGO).
4 Roads and Maritime Services Crash Report Data (1 Jan 2012 to 21 Dec 2016).

In accordance with the Route Selection Guidelines, Table 26 presents the results of the risk analysis, in which the consequences and likelihood of potential hazardous events were considered. This risk assessment approach effectively combines the estimated accident frequency with the potential for harm (i.e. risk), making it consistent with the principles and methodologies embodied within Australian Standard (AS) 4360 *Risk Management* and HIPAP No. 6.

Table 26 presents the results of the risk analysis in terms of minimal, acceptable, significant and unacceptable risk. For the purposes of this risk assessment the following definitions apply:

- *minimal risk*: the transport of ammonium nitrate along this route is assessed as posing a minimal risk to the factor of interest;
- *acceptable risk*: the transport of ammonium nitrate along this route is assessed as posing an acceptable amount of risk to the factor of interest;
- *significant risk*: the transport of ammonium nitrate along this route is assessed as posing a significant increase of risk to the factor of interest; and
- *unacceptable risk*: the transport of ammonium nitrate along this route is assessed as posing an unacceptable level of risk to the factor of interest.

Note that the segment of the Newell Highway between Dubbo and West Wyalong and the approved Mine Access Route were not identified to have any significant or unacceptable risks.

Table 26
Risk Analysis Findings – Ammonium Nitrate

Assessment Factor	Minimal Risk		Acceptable Risk	
	Dubbo – West Wyalong (Newell Highway)	Mine Access Route	Dubbo – West Wyalong (Newell Highway)	Mine Access Route
Schools	✓	✓		
Hospitals	✓	✓		
Aged Care Facilities	✓	✓		
Churches	✓	✓		
Items of Heritage or Cultural Significance	✓	✓		
Other Land use	✓	✓		
Park Reservations			✓	✓
Waterways			✓	✓
Emergency Infrastructure	✓	✓		
Heavy Vehicle Accidents (per year)	✓	✓		
Heavy Vehicle Accidents/Annual Million km of Heavy Vehicle Travel	✓	✓		
Availability of Alternative Emergency Routes	✓	✓		
Emergency Response Capability	✓	✓		
Operational Factors	✓	✓		
Comparative Assessment of all Factors	✓	✓		

There are no defined absolute risk criteria for the transport of hazardous materials throughout NSW, therefore the assessment of risk results is a balanced judgement based on experience in accordance with HIPAP No. 6.

Overall, the net increase in the number of heavy vehicles due to the transport of ammonium nitrate will be up to approximately 0.3% for the segment of the Newell Highway between Dubbo and West Wyalong and up to approximately 0.1% for the approved Mine Access Route (i.e. a minor impact on existing traffic volume). Therefore, there will be only a minor increase in transport risk when compared to existing risk levels.

From a risk perspective, the results detailed in Tables 25 and 26 deem the segment of the Newell Highway between Dubbo to West Wyalong to pose a minimal level of risk to surrounding people, property and the natural environment. These routes are therefore suitable for the transport of hazardous materials to the CGO.

5 Risk Management Measures

The identification of risk management measures is the final step in the route evaluation process. The Route Selection Guidelines state that the *identification of risk management measures should include opportunities for risk reduction where the evaluation shows undesirable levels of risk along the preferred routes, together with consideration of an appropriate safety management system* (DoP, 2011a).

The level of risk associated with the transport of ammonium nitrate to the CGO on the local road network has been minimised by the selection of suitable transport routes based on an assessment of road and traffic factors, emergency response capability, operational factors and risk. Further, no local roads other than those identified in Section 7.2 will be used for the transportation of hazardous materials to the CGO.

The assessment of the segment of the Newell Highway between Dubbo and West Wyalong and the approved Mine Access Route did not identify undesirable levels of risk for the transport of ammonium nitrate. Therefore, no additional risk reduction measures are considered necessary beyond those required under the ADG Code and the DG Regulations.

The risk management measures that will be implemented by the material supplier and the transport provider for the transport of hazardous materials to the CGO are outlined in Appendix B.

Compliance with the requirements of the ADG Code and DG Regulations will be a requirement of the contracts between Evolution and the material supplier and the transport provider.

7.11 AMMONIUM NITRATE EMULSION

1 Hazard Identification

Type of Hazardous Material

Ammonium nitrate emulsion is classified under the ADG Code as Class 5.1 (oxidising substance) and Packing Group II.

Ammonium nitrate emulsion is an ingredient for explosives and has a creamy consistency. It is stable for the purposes of general handling and transport but may explode, however, when subjected to energy (heat and/or shock), especially when confined and/or in the presence of contaminants (e.g. chlorides, organics such as tetranitromethane, strong acids, strong alkalis, hypochlorite, metal powders, nitrites, chlorates and permanganates). Sympathetic detonations (i.e. propagation from an initial small explosion to a secondary larger explosion) may occur. Heating can also result in decomposition of the material and a thickening of the emulsion over time. Decomposition products include nitrogen oxide, white ammonium nitrate fumes and water.

The material may be warm to hot (60 – 80^{o}C). Direct exposure can lead to burn injuries. Ammonium nitrate emulsion is not combustible but in contact with other combustible materials (e.g. wooden pallets) it increases the fire hazard. It can support and intensify a fire even in the absence of air. Fires involving ammonium nitrate emulsion can release toxic nitrogen oxides (yellow to brown fumes) and ammonia. A fire involving ammonium nitrate emulsion in a confined space could lead to an explosion. Closed containers can rupture violently when heated.

Adjacent Land Use

Ammonium nitrate emulsion will typically be transported on the local road network using the Newell Highway travelling from Forbes to West Wyalong (Forbes – West Wyalong), then the approved Mine Access Route (from West Wyalong) to the CGO.

Sensitive land uses include schools (pre-schools and primary and secondary schools), hospitals, aged care facilities, churches and items of heritage or cultural significance.

Some sensitive land uses are located along the Newell Highway (Neeld Street) in Wyalong and West Wyalong, including the Wyalong Public School, Saint Mary's War Memorial school, and five churches. The West Wyalong Public School, West Wyalong High School, West Wyalong District Hospital and the Royal Freemason's Benevolent Institution West Wyalong Masonic Village Aged Care are located adjacent to or nearby Unagrie Road (i.e. the initial segment of the approved Mine Access Route).

Numerous heritage items are listed under the *Bland Local Environmental Plan 2011* (LEP) as located along the Newell Highway (Neeld Street) in Wyalong and West Wyalong, including the Tattersalls Hotel, Post office Hotel, Globe Hotel and the "Wyalong House" residence.

Outside of Wyalong and West Wyalong sensitive land uses such as those listed above are relatively uncommon.

Other land uses include residential, commercial or industrial areas, largely concentrated in Wyalong and West Wyalong, and areas of open space.

Transport Vehicle and Conditions of Transport

Ammonium nitrate emulsion will be transported to the CGO by B-Doubles with a maximum capacity of up to 42 tonnes per delivery. Ammonium nitrate emulsion will be transported as a solid (suspension) and contained within Bulk Tippers. Regulation of temperature and pressure are not required during the transport of this solid material. The maximum frequency of deliveries is 12 per month.

Causes of Hazardous Incidents

Initiating and contributory causes for incidents involving heavy vehicles has been detailed in *Guidelines for Chemical Transportation Risk Analysis* (CCPS, 1995). The identified causes, with additional causes included, are reproduced in Table 5 (Section 7.4).

2 Consequence Analysis

An accident involving a heavy vehicle transporting ammonium nitrate emulsion resulting in a release of the material or explosion is the hazardous incident relevant to the transport of ammonium nitrate emulsion. The following consequences of this hazardous incident are relevant:

- release of the material together with the combustion of other materials resulting in propagation of the fire by the ammonium nitrate in the emulsion and exposure to nitrogen oxides for those at or near to the accident scene;
- heating of the ammonium nitrate emulsion (whilst confined) resulting in an explosion and subsequent impact on people, property and the environment;
- burn injuries to those at or near to the accident scene who come into contact with released warm to hot (60 – 80^{o}C) material; and
- contamination of waterways causing in an increase in the nitrogen content and pollution from the hydrocarbons present resulting in fatality for fish and other aquatic life including aquatic plants.

3 Estimation of the Likelihood of a Hazardous Incident

Available accident statistics for the segment of the Newell Highway between Dubbo and West Wyalong were obtained from the RMS and are summarised in Table 27. Although the entire transport route from Dubbo to the CGO is outside the CGO local road network (and is a greater extent than that required to be assessed), this extent provides a more conservative assessment of accident statistics. Accordingly, the accident statistics presented below are conservative as they are relevant to a greater area than the local road network surrounding the CGO (Figure 5). Available accident statistics for the approved Mine Access Route were also obtained from the RMS.

Table 27
Summary of Accident Statistics – Ammonium Nitrate Emulsion

Route (Figure 5)	Length (km)	No. of Heavy Vehicles (per day)[1]	% Increase of Heavy Vehicles due to Approved CGO[3]	Heavy Vehicle Accidents (per year)[4]	Annual Million km of Heavy Vehicle Travel	Heavy Vehicle Accidents/Annual Million km of Heavy Vehicle Travel
Dubbo – West Wyalong (Newell Highway)	257	746[2] – 1,102[2]	0.1% – 0.16%	11.6	69.99 – 103.41	0.11 – 0.17
Mine Access Route	41	217[2]	0.5%	1	3.24	0.31

[1] Roads and Maritime Services Traffic Volume Viewer (retrieved 23 May 2018).
[2] 2018 values extrapolated from previous years assuming 1% annual growth rate.
[3] Assumes 24 truck movements per month (includes movements to and from the CGO).
[4] Roads and Maritime Services Crash Report Data (1 Jan 2012 to 21 Dec 2016).

Accident statistics for the segment of the Newell Highway between Dubbo and West Wyalong are considered to be within normal operating levels for the road type and use. The increase of heavy vehicles transporting ammonium nitrate emulsion on the local road network due to the approved CGO will be very small (up to approximately 0.16%) and will be unlikely to affect traffic flows or accident statistics. The segment of the Newell Highway between Dubbo and West Wyalong is therefore suitable for the transport of hazardous materials with respect to accident statistics.

Accident statistics for the approved Mine Access Route are considered to be within normal operating levels for the road types and use. Improved driving conditions have been achieved due to the upgrading of the Mine Access Route which included sealing of the road to the approved CGO. The increase of heavy vehicles transporting ammonium nitrate emulsion on the Mine Access Route due to the approved CGO will be small (approximately 0.5%) and will be unlikely to affect traffic flows or accident statistics. The approved Mine Access Route is therefore suitable for the transport of hazardous materials with respect to accident statistics.

In the event of an accident involving a heavy vehicle, the carried goods may or may not be released. The probability of release is dependent on factors such as speed, shipping conditions (i.e. pressurised compared to non-pressurised), inadequate load securing, and strength and integrity of the container.

Various studies of release probabilities from heavy vehicles involved in an accident have been undertaken. The *Guidelines for Chemical Transportation Risk Analysis* (CCPS, 1995) indicates that the release probability for various road types is between 5 and 10% (i.e. approximately one heavy vehicle accident in every 10 to 20 will result in a release of the material).

An estimation of the likelihood of an accident involving a vehicle transporting ammonium nitrate emulsion to the CGO resulting in a release of the material must take into account the following:

- the number of vehicles transporting ammonium nitrate emulsion to the CGO relative to the total number of heavy vehicles already using the same transport route;
- the number of accidents that have involved heavy vehicles; and
- the probability of a release of the material (which is assumed to be 10% of all accidents involving heavy vehicles results in a release of material) (CCPS, 1995).

The likelihood of an accident (based on averaged accident data) involving a vehicle transporting ammonium nitrate emulsion to the CGO resulting in a release of the material for the segment of the Newell Highway between Dubbo and West Wyalong is estimated to be $5x10^{-4}$/year (i.e. such an accident is estimated to occur once every 1,900 years) (Pinnacle Risk Management Pty Ltd, 2018). This likelihood of an accident is considered conservative given it is relevant to an area of greater extent than the local road network surrounding the CGO.

The likelihood of an accident (based on averaged accident data) involving a vehicle transporting ammonium nitrate emulsion to the CGO resulting in a release of the material for the approved Mine Access Route is estimated to be $1x10^{-4}$ /year (i.e. such an accident is estimated to occur once every 5,500 years) (Pinnacle Risk Management Pty Ltd, 2018).

The risk of the event is determined using the risk matrix and the consequence ratings in Tables 3 and 4 in Section 7.3.1 (Pinnacle Risk Management Pty Ltd, 2018).

For releases of ammonium nitrate emulsion from a road traffic accident, the consequence rating is determined to be “Serious” (Pinnacle Risk Management Pty Ltd, 2018). The volume is limited to the size of the tanker (i.e. 42 tonnes) and it is possible that only one of the two barrels is breached (Pinnacle Risk Management Pty Ltd, 2018).

Given a likelihood of $5x10^{-4}$/year for the segment of the Newell Highway between Dubbo and West Wyalong and $1x10^{-4}$/year for the approved Mine Access Route and a consequence rating of “Serious”, the corresponding risk level is Class III (Pinnacle Risk Management Pty Ltd, 2018). These values indicate a low level of risk associated with the transport of hazardous materials (Pinnacle Risk Management Pty Ltd, 2018).

4 Risk Analysis and Assessment of Risk Results

Risk analysis took into account road and traffic factors, emergency response capability and operational factors for the route between Dubbo and West Wyalong and the approved Mine Access Route. Table 28 provides a summary of all assessment factors utilised in the risk analysis.

Table 28
Summary of Risk Analysis Assessment Factors – Ammonium Nitrate Emulsion

Assessment Factor	Dubbo – West Wyalong (Newell Highway)	Mine Access Route
Schools	#	2 (<1km from route)
Number of School Students	#	595
Hospitals	#	1
Number of Hospital Beds	#	<50
Aged Care Facilities	#	1
Churches	#	0
Items of Heritage or Cultural Significance	#	0
Other Landuse	Predominantly open space	Predominantly open space
Number of Park Reservations	5	1
Park Reservations – Approximate Total Road Frontage (m)	22,500	5.1
Waterways	13	22
Emergency Infrastructure	Adequate	Adequate
Length (km)	257	41
No. of Heavy Vehicles (per day)[1]	746[2] – 1,102[2]	217[2]
% Increase of Heavy Vehicles due to Approved CGO[3]	0.16%	0.5%
Heavy Vehicle Accidents (per year)[4]	11.6	1
Annual Million km of Heavy Vehicle Travel	69.99 – 103.41	3.24
Heavy Vehicle Accidents/Annual Million km of Heavy Vehicle Travel	0.11 – 0.17	0.31
Availability of Alternative Emergency Routes	Available	Available
Emergency Response Capability	Adequate	Adequate
Operational Factors	Cost effective	Cost effective

1 Roads and Maritime Services Traffic Volume Viewer (retrieved 23 May 2018).

2 2018 values extrapolated from previous years assuming 1% annual growth rate.

3 Assumes 24 truck movements per month (includes movements to and from the CGO).

4 Roads and Maritime Services Crash Report Data (1 Jan 2012 to 21 Dec 2016).

Sensitive land uses are relatively uncommon and do not preclude this route from the route evaluation.

RMS Roads and Maritime Services.

In accordance with the Route Selection Guidelines, Table 29 presents the results of the risk analysis in which the consequences and likelihood of potential hazardous events were considered. This risk assessment approach effectively combines the estimated accident frequency with the potential for harm (i.e. risk), making it consistent with the principles and methodologies embodied within Australian Standard (AS) 4360 *Risk Management* and HIPAP No. 6.

Table 29 presents the results of the risk analysis in terms of minimal, acceptable, significant and unacceptable risk. For the purposes of this risk assessment the following definitions apply:

- *minimal risk*: the transport of ammonium nitrate emulsion along this route is assessed as posing a minimal risk to the factor of interest;
- *acceptable risk*: the transport of ammonium nitrate emulsion along this route is assessed as posing an acceptable amount of risk to the factor of interest;
- *significant risk*: the transport of ammonium nitrate emulsion along this route is assessed as posing a significant increase of risk to the factor of interest; and

- *unacceptable risk*: the transport of ammonium nitrate emulsion along this route is assessed as posing an unacceptable level of risk to the factor of interest.

Note that the segment of the Newell Highway between Dubbo and West Wyalong and the approved Mine Access Route were not identified to have any significant or unacceptable risks.

Table 29
Risk Analysis Findings – Ammonium Nitrate Emulsion

Assessment Factor	Minimal Risk		Acceptable Risk	
	Dubbo – West Wyalong (Newell Highway)	Mine Access Route	Dubbo – West Wyalong (Newell Highway)	Mine Access Route
Schools	✓	✓		
Hospitals	✓	✓		
Aged Care Facilities	✓	✓		
Churches	✓	✓		
Items of Heritage or Cultural Significance	✓	✓		
Other Land use	✓	✓		
Park Reservations			✓	✓
Waterways			✓	✓
Emergency Infrastructure	✓	✓		
Heavy Vehicle Accidents (per year)[1]	✓	✓		
Heavy Vehicle Accidents/Annual Million km of Heavy Vehicle Travel	✓	✓		
Availability of Alternative Emergency Routes	✓	✓		
Emergency Response Capability	✓	✓		
Operational Factors	✓	✓		
Comparative Assessment of all Factors	✓	✓		

[1] Roads and Maritime Services Traffic Volume Viewer (retrieved 23 May 2018).

There are no defined absolute risk criteria for the transport of hazardous materials throughout NSW, therefore the assessment of risk results is a balanced judgement based on experience in accordance with HIPAP No. 6.

Overall, the net increase in the number of heavy vehicles due to the transport of ammonium nitrate emulsion will be up to approximately 0.16% for the segment of the Newell Highway between Dubbo and West Wyalong and up to approximately 0.5% for the approved Mine Access Route (i.e. a minor impact on existing traffic volume).

Therefore, there will be only a minor increase in transport risk when compared to existing risk levels.

From a risk perspective, the results detailed in Tables 28 and 29 deem the segment of the Newell Highway between Dubbo and West Wyalong and the approved Mine Access Route to pose a minimal level of risk to surrounding people, property and the natural environment. These routes are therefore suitable for the transport of hazardous materials to the CGO.

5 Risk Management Measures

The identification of risk management measures is the final step in the route evaluation process. The Route Selection Guidelines state that the *identification of risk management measures should include opportunities for risk reduction where the evaluation shows undesirable levels of risk along the preferred routes, together with consideration of an appropriate safety management system* (DoP, 2011a).

The level of risk associated with the transport of ammonium nitrate emulsion to the CGO on the local road network has been minimised by the selection of suitable transport routes based on an assessment road and traffic factors, emergency response capability, operational factors and risk. Further no local roads other than those identified in Section 7.2 will be used for transport of hazardous materials to the CGO.

The assessment of the segment of the Newell Highway between Dubbo and West Wyalong and the approved Mine Access Route did not identify undesirable levels of risk for the transport of ammonium nitrate emulsion. Therefore, no additional risk reduction measures are considered necessary beyond those required by through the ADG Code and the DG Regulations.

The risk management measures that will be implemented by the material supplier and the transport provider for the transport of hazardous materials to the CGO are outlined in Appendix B.

Compliance with the requirements of the ADG Code and DG Regulations will be a requirement of the contracts between Evolution and the material supplier and the transport provider.

8 SAFEGUARDS AND EMERGENCY PROCEDURES

There are a number of safeguards and emergency procedures that are and will continue to be implemented at the CGO. Evolution has completed a number of hazard and safety studies in accordance with Development Consent Condition 5.4(a) which included a *Hazard and Operability* (*HAZOP) Study* (Pinnacle Risk Management Pty Ltd, 2004a; 2005a), *Fire Safety Study* (Pinnacle Risk Management Pty Ltd, 2005b) and Final Hazard Analysis (Pinnacle Risk Management Pty Ltd, 2004b). Prior to these studies, the PRA (ANSTO Safety and Reliability, 1997) included a number of recommendations which resulted in the establishment of numerous safeguards and emergency procedures now implemented at the CGO.

In accordance with Development Consent Condition 5.4(b)(iii) emergency procedures at the CGO have been developed in accordance with the Department's *Hazardous Industry Planning Advisory Paper No. 1 – Emergency Planning*.

The following sub-sections provide an overview of the safeguards and emergency procedures implemented at the CGO.

8.1 SAFEGUARDS

Bunding/Runoff Containment

The Internal Catchment Drainage System (ICDS) will collect potentially contaminated surface water generated on-site. There will be no disposal of water from the ICDS to Lake Cowal under any circumstances, in accordance with Development Consent Condition 4.3 and ML 1535 Condition of Authority 14.

Any areas which are located outside of the ICDS/UCDS catchment area will be appropriately bunded or contained as to prevent any spillage, runoff etc from reporting to the surrounding environment. Within the ICDS, the process plant area is also bunded and graded such that runoff and any accidental spills of processing water, oils, fuels or reagents will report to a process plant runoff storage (North Limited, 1998). Further descriptions of the individual components of the ICDS are provided in the WMP.

Fire Suppression

Evolution has completed a Fire Safety Study for the CGO that complies with the requirements of Development Consent Condition 5.4(a)(i) and addresses the following recommendations of the PRA:

- storage of the hazardous consumable in such a manner as to minimise the possibility of fire;
- provision of efficient fire alarm systems; and
- provision of efficient fire suppression systems.

Table 30 provides a summary of the fire suppression systems implemented at the CGO.

Table 30
Fire Suppression Systems Summary

General Area	Specific Component	Fire Suppression Systems Summary
Site Fire Water Storage and Distribution	*Fresh/Fire Water Storage Pond*	• A dedicated firewater pond is provided which maintains a minimum of 1,020 cubic metres (m^3) or 3 hours of fire flow at the design flow rate.
	Fresh Water Distribution	• The fresh water distribution system is independent of the firewater distribution system. That is, water in the firewater distribution system will not be used for any purpose other than fire suppression. • The fresh water will be distributed to the process plant and mining facilities from a pumping station located at the firewater pond. The distribution piping will be buried with a minimum cover of 1.0 metre (m). • Pipe material will be High Density Polyethylene (HDPE).
	Fire Water	• There will be one electric motor driven and one diesel engine driven fire pump. The electric motor driven jockey pump will maintain the system pressure under normal conditions. When the system pressure drops one electric motor driven fire pump will automatically start to maintain pressure and deliver the design fire water flow. If the fire water system pressure continues to drop or there is a loss of electricity to the electric pump, the diesel engine driven fire pump will start. Both pumps are rated to deliver 360 cubic metres per hour (m^3/h) at 870 kPa. • Fire hydrants will be installed in the yard area to provide outside protection for the buildings. The hydrants will be spaced such that the maximum spacing will be 60 m and a 6 m length of hose can protect all points of the buildings. Each hydrant will be equipped with two 65 millimetre (mm) outlets. • Pipe material will be HDPE.
Building Fire Protection Design Requirements	*General*	• The fire protection systems described are based on the understanding that the process building structures are non-combustible, and minimal combustible furniture and equipment will be used. • Twenty-four hour watch will be maintained at a pre-determined location such as the Mill Control Room or Security Guardhouse. All automatic fire protection systems will have their own audible alarms at each building or location with visual alarms at the 24 hour watch location.
	Piping and Ducting	• An approved firestop material will be installed in all locations where cable tray and ductwork passes through fire rated walls and floors.
	Fire Protection Systems	• Automatic sprinkler protection will be provided at the mine and plant workshops, crushers and mill lubrication oil reservoirs and at the elution heater oil reservoir. • Where practical, whether the area is sprinklered or not, full coverage of all areas with fire hose cabinets will be provided as a minimum, supplemented with portable hand held fire extinguishers. Fire hose cabinets will be located so that all interior areas of the buildings are within reach of a fire hose stream. All buildings will be designed in accordance with Building Code of Australia fire prevention requirements. • In areas open to the atmosphere with partial walls, where the site fire hydrant stations can provide full hose coverage to all areas, no standpipe or sprinklers will be provided. • All sprinkler and fire hose stand pipe systems will be monitored via pressure switches and flow switches and integrated with the main fire alarm system.

Table 30 (Continued)
Fire Suppression Systems Summary

General Area	Specific Component	Fire Suppression Systems Summary
Building Fire Protection Design Requirements (Cont.)	*Fire Protection Systems (Cont.)*	• The sprinkler systems (zones), fire hose stations, manual pull stations and fire detection devices will alarm at a central fire control panel located in the Process Plant's Control Room. • Portable hand held fire extinguishers will be provided throughout all areas and at all exits or as required based on the operations in each area. The final location, capacity, type and number of units will be established with the CGO's Insurance Underwriters and the client's representative.
	Electrowinning and Gold Room	• Hand held clean gas and/or ABC fire extinguishers will be provided. Elution oil heater is located external to the building but will have wet sprinkler protection.
	Electrical Rooms	• Ionization type smoke detectors will be provided, supplemented with hand held fire extinguishers.
	Control Rooms	• Provided with fire protection in accordance with Building Code of Australia.
	Laboratory, Offices and Dry Area	• Fire hose coverage will be provided to all areas by external site fire hydrants supplemented by hand held clean gas and/or ABC fire extinguishers. Ionization type smoke detectors will be provided. Internal fire protection provided in accordance with Building Code of Australia.
	Conveyors	• The primary fire protection coverage for all non-critical path above ground conveyors will be from the site hydrant hose stations. • Sprinkler coverage will be provided for all below grade conveyors or conveyors stockpile feed conveyor and grinding plant feed conveyor designed in accordance with Factory Mutual Loss Prevention Data Sheet 7-11 for conveyors and include the following. • Sprinkler heads will be provided along all sections of underground conveyors and at head, tail and drive pulley areas. • If a fire is detected on a conveyor belt system, the belt will be interlocked with the drive motor and de-energised. If the belt motion is stopped an alarm will be activated. Any activation of the sprinkler system will also cause an alarm to sound. • The fire protection systems will be hydraulically designed for operation of the most remote ten sprinklers, with a minimum residual pressure of 70 kPa at the most remote sprinkler head.
	Reagent Mixing and Storage Area	• Fire protection will be provided by fire hydrant system, supplemented by hand held ABC fire extinguishers.
	Crushing/Grinding	• Fire hose cabinet coverage will be provided, supplemented by hand held portable ABC fire extinguishers.
	Lube Units	• Spot sprinkler coverage will be provided at each Lube Unit over 390 L capacity.
	Truckshops	• Fire hose cabinet coverage will be provided, supplemented by hand held portable ABC fire extinguishers. • Wet sprinkler system will be provided over lube areas which are internal to the building and the repair bays.

Fire Sprinkler Densities

Fire sprinkler densities and temperature ratings of sprinkler heads are provided in Table 31.

Table 31
Sprinkler Densities and Temperature Ratings of Heads

General Area Covered	Density (mm/min/m^2)/over m^2	Sprinkler Heads Set for Temperature (°C)
Electrowinning and Gold Room (Elution Oil Heater Only)	5/144	79
Conveyors	along length of conveyor only if main piping runs along the length of the conveyor	74
Lube Units	spot coverage 10/260	93

Source: Aker Kvaerner Australia, pers. comm., October 2005.

Bushfire Management

In accordance with Development Consent Condition 3.6(a) and Section 6.4.4 of the EIS (North Limited, 1998), the on-site fire fighting equipment maintained by Evolution meets the requirements of NSW Rural Fire Service (RFS) and Emergency Services, including:

- the stationing of a well maintained "emergency fire fighting unit"; and
- hydrants, fire hoses and/or washdown hoses in the CGO area which could be used for fire fighting. The details of the locations and specification of this equipment have been reviewed/ finalised as a component of the Fire Safety Study for the CGO in accordance with Development Consent Condition 5.4(a)(i).

8.2 EMERGENCY PROCEDURES

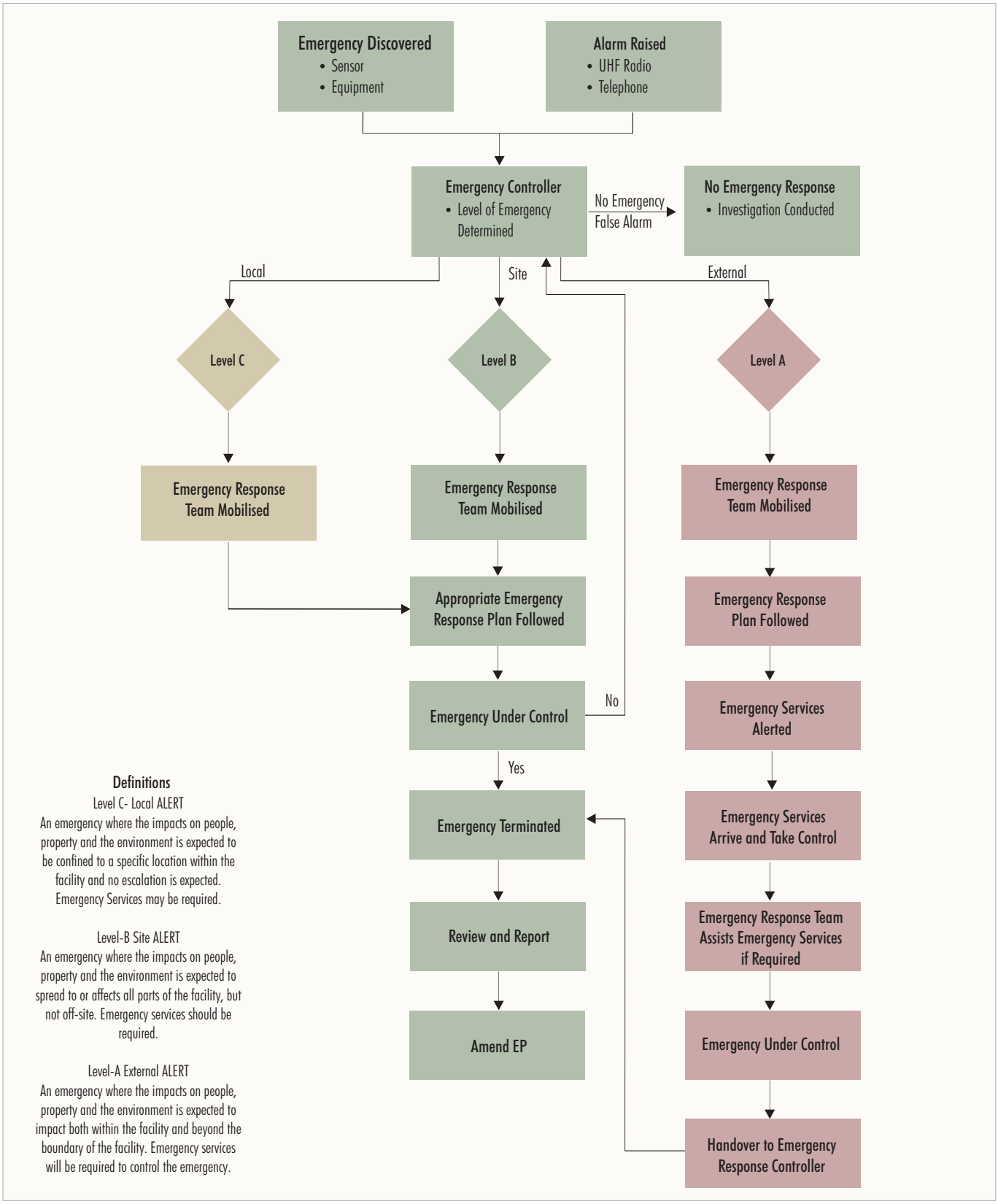
Safety Management System

A Safety Management System has been prepared for the CGO in accordance with Development Consent Condition 5.4(b)(iii). The Safety Management System specifies all safety related procedures, responsibilities and policies, along with details of mechanisms for ensuring adherence to procedures.

Emergency Procedures

In accordance with Development Consent Condition 5.4 (d) (iii), the emergency procedures relevant to the CGO have been developed in accordance with the *Department's Hazardous Industry Planning Advisory Paper (HIPAP) No. 1 – Emergency Planning* (HIPAP 1).

Emergency procedures have been established for the CGO for key potential and credible threats which could result in an emergency situation. The emergency procedures outline staff responsibilities and the process which the CGO will implement to reduce impacts to people, property or the environment. The Emergency Procedures form part of the CGO's internal Emergency Response Plan (ERP). The CGO's internal ERP includes the Emergency Response Flowchart provided in Figure 7 which outlines the key steps for how CGO personnel must respond to the various emergency or incident levels.



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Emergencies or incidents will be classified into one of three levels depending on the severity of the emergency or the potential of the incident to become more serious:

Level A - External Alert

An emergency where the impacts on people, property and the environment are expected to impact both within the facility and beyond the boundary of the facility. Emergency services will be required to control the emergency.

Level B - Site Alert

An emergency where the impacts on people, property and the environment is expected to spread to or affects all parts of the facility, but not off-site. Emergency services will be required.

Level C - Local Alert

An emergency where the impacts on people, property and the environment are expected to be confined to a specific location within the facility and no escalation is expected. Emergency services may be required.

Should an incident be determined a Level A – External Alert, the relevant Emergency Services will be contacted.

Any emergency situations or incidents which do or could potentially cause harm to people, property or the environment will be managed by the Emergency Response Coordinator through the CGO's Emergency Response Team. The CGO's Emergency Controller is the Emergency Response and Security Supervisor. A number of positions at the CGO are trained in role of the Emergency Controller, should the primary Emergency Controller not be available for the emergency situation the most senior staff who is adequately trained will assume the role.

The purpose of the Emergency Controller is to:

- Prioritise and then coordinate the following activities:
  - Damage Control.
  - Search and Rescue.
  - First Aid.
  - Communications – both internal and external.
  - Evacuation.
  - Traffic Control.
- Delegate the above activities to the Emergency Response Team.

The purpose of the CGOs Emergency Response Team is to:

- obtain all the facts about the incident/situation;
- to develop actions to address the immediate needs of the Emergency Controller;
- to provide high level direction to manage any emergency situation;
- to coordinate and implement the requirements of this ERP;
- to minimise losses associated with any emergency situation; and
- protect the interests of CGO and all other stakeholders associated with the mine.

The CGO Emergency Response Team is also responsible for anticipating all potential threats during an emergency situation, developing and implementing preventative strategies and planning to minimise their impact if they do occur.

The following subsections outline the emergency response procedures relevant to hazardous materials that will be implemented at the CGO, as part of the ERP, as a result of an emergency situation being declared. These emergency procedures are consistent with the CGO's internal Emergency Response Plan.

8.3 CYANIDE RELEASE

Immediate Action (All staff)

If there is an uncontrolled release / spill of cyanide:

- Activate the alarm.
- Notify the Emergency Phone 6975 4727 / Radio Channel 6
- Follow directions from the Emergency Controller / Emergency Response Team.

Emergency Controller

- Confirm 000 has been notified, if required.
- Notify the Emergency Response Team Coordinator, if you haven't done so already.
- Alert other members of the Emergency Response Team.
- Arrange for wardens to escort emergency vehicles on site if necessary.
- Coordinate an evacuation of the affected area if necessary.
- Initiate a controlled evacuation, if required.
- Keep the Emergency Response Team Coordinator informed of the situation.
- Act as the CGO liaison with emergency services, if they are on site.

Enact the CGO's internal Cyanide Emergency Plan.

8.4 ON-SITE AND OFF-SITE SPILLS

Spills have been identified as a key potential and credible threat at the CGO. As such, the following sub-sections summarise site specific spill response and preparedness procedures that have been developed for the CGO. These procedures will be regularly updated to reflect changes that occur on-site and apply to spills of chemicals/consumables and of wastes.

The following subsections describe management of off-site and on-site spills.

Off-Site Spills

In the event of a dangerous goods spill, the driver, prime contractor or rail operator and consignor are required to respond to the emergency and liaise with organisations/emergency services in accordance with the ADG Code and DG Regulations. Clean up procedures will be under the control of the attending emergency services (e.g. Fire and Rescue NSW or NSW Police). A description of the general requirements of the ADG Code and DG Regulations with regard to emergency information, safety equipment, procedures during transport and emergencies is provided in Appendix B.

On-Site Spills

Table 32 summarises staff responsibilities with regard to on-site spill response:

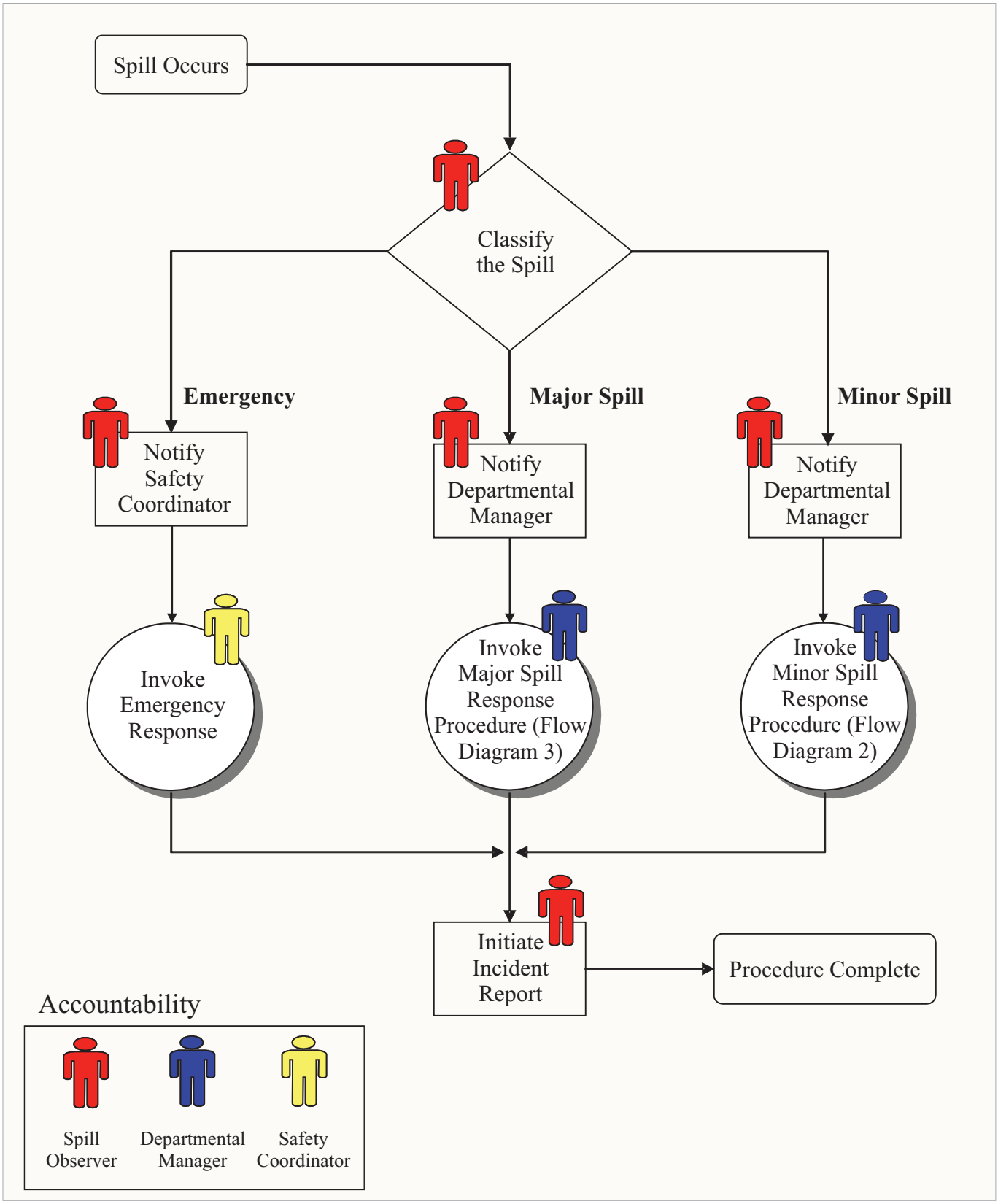
Table 32
Staff Spill Responsibilities

Staff Member	Responsibility
General Manager	• Ensuring that spill response plans and procedures are in place.
Departmental Managers	• Implementing the spill response procedure within their department and with contractors under their control; • Arranging for equipment to be available and maintained to control, contain and clean-up minor and major spills; • Organising employee training in minor and major spill response; • Organising availability of SDSs for every product stored and/or handled by their employees; and • Replenishing spill response trailers/kits immediately following a spill clean-up.
Sustainability Manager	• Organising minor and major spill response training; • Reporting major and emergency spills to the regulatory authorities; • Reporting major and emergency spills to Evolution corporate Environmental staff; and • Advising on clean-up methods, waste disposal and site rehabilitation. • Updating the Emergency Response Plan and maintaining the preparedness of the Emergency Response Team.
Stores Supervisor	• Maintaining stocks of hydrocarbon and chemical absorbent materials sufficient to restock at least one spill response trailer/kit.
Spill Observer	• Taking action to control and contain the spill if safe to do so; and • Notifying the responsible department that a spill has occurred.
Emergency Response Team (members of Evolution and contractor's management staff)	• Assess the situation; • Identify stakeholders potentially affected; • Develop an emergency response action plan; • Identify priority actions in the emergency action plan; • Implement action in the emergency action plan; • Monitor the effectiveness of the actions implemented; and • Develop a recovery plan to resume operations as soon as possible.

8.4.1 Spill Response Procedures

Spill Notification

Internal spill notification procedures are illustrated on Flow Diagram 1. The requirement for notification of Departmental Managers, Sustainability Manager or delegates will be determined by the spill classification.



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Source: Evolution - Spill Response & Preparedness

The EPA will be notified of any spills that have the potential to cause material harm to the environment as described in Section 147 of the PoEO Act, and in accordance with requirements of EPL 11912 Reporting Condition R2.

Spill Classification

Classifying the severity of a spill is dependent on three variables:

Volume	the amount spilled.
Substance	the product spilled.
Location	where spilled (the physical environment).

The site classification for minor, major and emergency spills is provided in Table 33.

Table 33
Spill Classification Criteria

Substance	Environmental Incident		
	Minor	**Major**	**Emergency**
Hydrocarbon Spill	Any spill that cannot impact on the lake, the borefield or a watercourse.	Any spill that has the potential to impact on the lake, the borefield or a watercourse where the volume spilled is less than 205 L.	Any spill that has the potential to impact on the lake, the borefield or a watercourse where the volume spilled is greater than 205 L.
Chemical Spill	Any substance that cannot impact on the lake, the borefield or a watercourse and can be contained and cleaned up with resources readily available at the spill site.	Any substance that has the potential to impact on the lake, the borefield or a watercourse but can be contained at the location of the spill and cleaned up with resources readily available on-site.	Any substance that has the potential to impact on the lake, the borefield or a watercourse that cannot be contained at the location of the spill or requires a specialist response to effect a clean-up.
ACTION:	Invoke Minor Spill Response Procedure (Flow Diagram 2)	Invoke Major Spill Response Procedure (Flow Diagram 3)	Invoke CGO's internal Emergency Response Plan.

Source: Evolution - Spill Response and Preparedness.

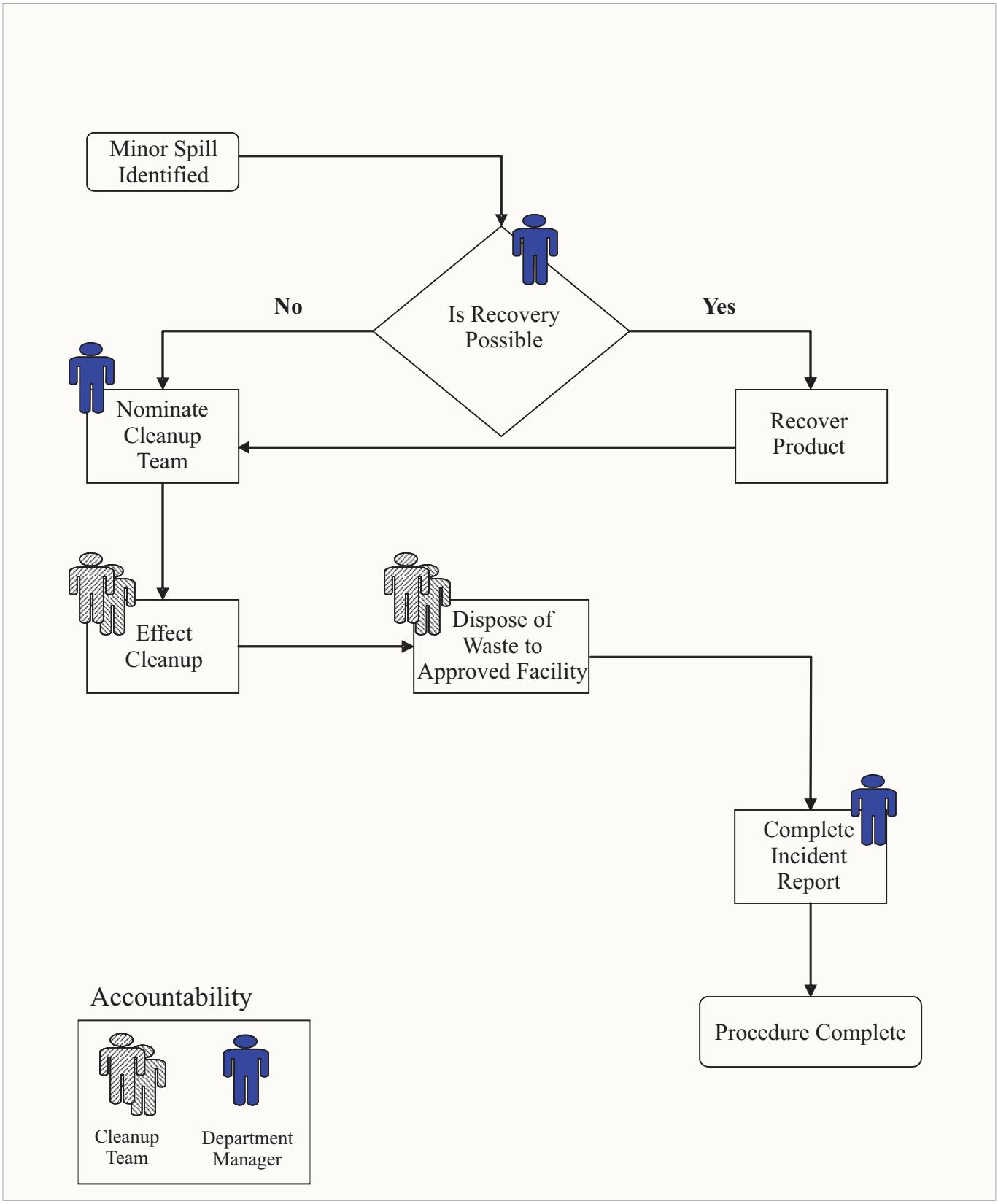
Spill Response Procedures

Health and Safety Considerations

It is fundamental to any response procedure that the first person/s on the scene evaluate the safety of the site and determine how and when to proceed. The health and safety of the response team must remain the prime focus throughout the incident above that of any victim, item of equipment, or the environment. Suitable PPE must be worn in accordance with relevant SDSs and the HCDGR if applicable. General staff training and Emergency Response Team training will include these requirements.

Spill Categories

In accordance with Table 33, spills are classified as minor, major or emergency. Spill response procedures for minor and major spills are illustrated on Flow Diagrams 2 and 3. Emergency spills will be subject to the same general response procedures as for a minor or major spill, however, the spill response will be managed from the Emergency Response Centre by the Emergency Response Team to provide managerial level (including Evolution and Contractor management staff) control and management of the spill response.



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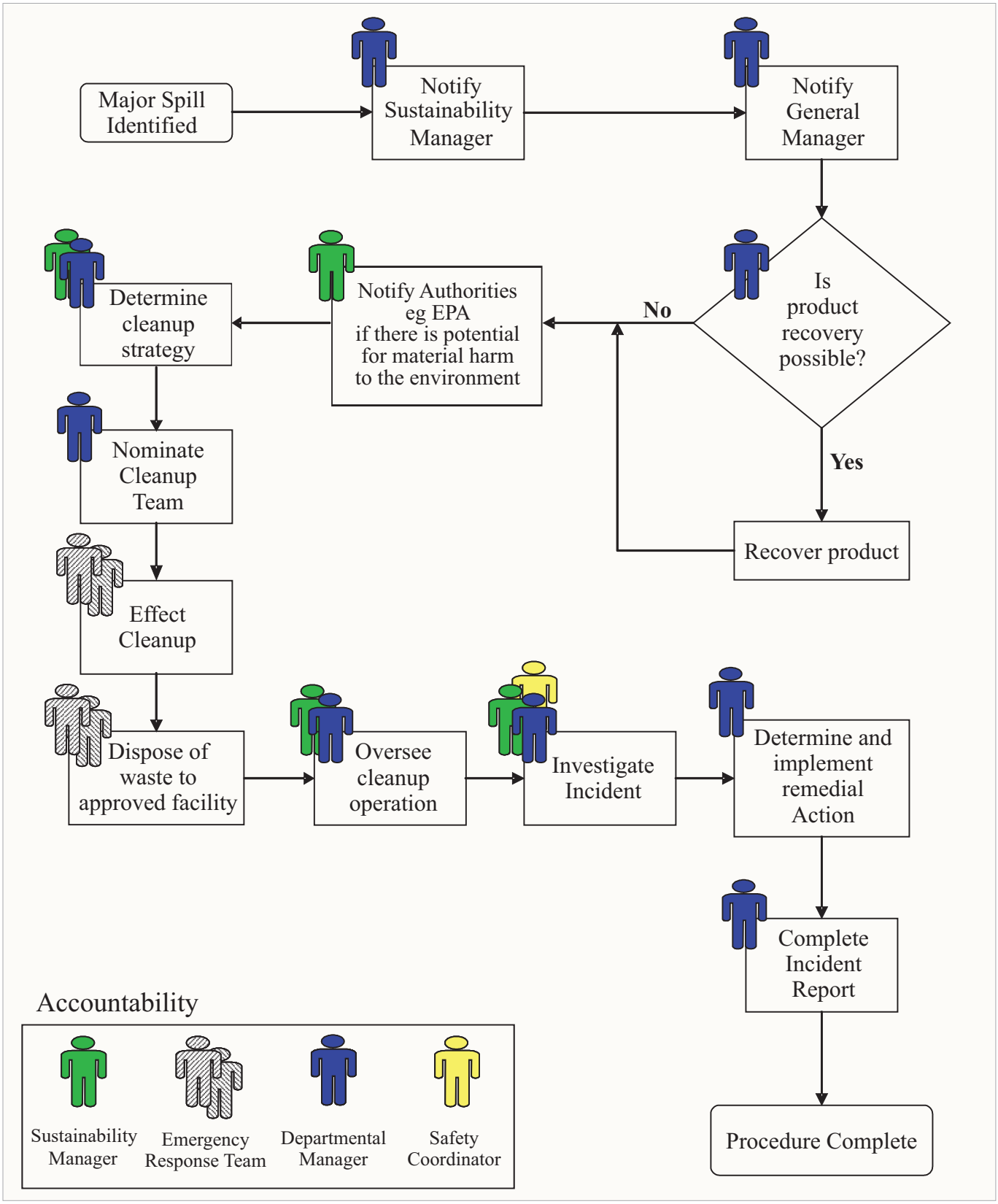
Source: Evolution - Spill Response & Preparedness



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Source: Evolution - Spill Response & Preparedness

Control, Contain and Clean-up

The methods available to contain a spill depend largely on the location of the spill, the equipment and material immediately at hand. Specific control, containment and clean-up procedures relevant to materials listed in the HCDGR and FOR will be provided in these registers. The importance of containment cannot be over emphasised. The effort will be put into ensuring that the spilled product is trapped and prevented from causing further contamination.

The "3C" approach is applicable to all categories of spill:

- **CONTROL the flow**

  In the case of ruptured pipes and lines, upstream valves will be closed. Where bulk tanks have been damaged all feeds into the tank will be stopped. Split or weeping drums will be rolled or turned so that openings are above the level of the liquid inside.

- **CONTAIN the material**

  Material can be contained by constructing barriers of earth, timber, pipe, etc. Hydrocarbon spills on water can be contained by installing a floating boom.

- **CLEAN UP the site**

  The deployment of equipment to recover product, remove the contaminated soil and rehabilitate the site will be the prime focus. The severity and location of a spill will determine the equipment needed to clean up the spill. Types of equipment include recovery pumps, trucks, front-end loaders, bobcats and graders. Spill control trailers/kits contain a variety of absorbent booms, pads and granules, as well as basic PPE, brooms and shovels.

  Clean-up of any spills that involve contamination of a natural watercourse or aquifer will be conducted in accordance with the requirements of the EPA and NSW Department of Primary Industries – Water. The affected site will be bunded, with potentially contaminated waters reporting to the ICDS, to minimise the possibility of this ever occurring.

Spill response guidance (including generic PPE requirements and clean-up details) is available in the Chemalert 3 management system, based on the manufacturer's SDSs.

8.5 EQUIPMENT FIRE

Response:

- Raise the alarm.
- Arrange for safe removal of employees, contractors and the public from any dangerous situation.
- Secure the area and do not allow any disturbance to the area.
- Ensure all hazards identified and managed / isolated prior to entry.
- Transformer or Substation fire requires approval and confirmation that plant and equipment is de-energized from site electrician prior to response / entry. Isolations will be required, which may include de-activating the emergency generator. Required contacts may include The Electrical Engineer to de-energize and isolate 132KV overhead supply to Evolution Mining CGO Site.
- Note – any incidence of electrocution, or suspected electrocution, requires immediate notification of the ERO. Please refer to the site First Aid Procedure.

- Many vessels and equipment contain oil, including the transformer and the electrical capacitors. Use fire water and foam to combat class B fires (liquids incl. oil). Immediate consideration to cooling or protecting from radiant heat is required to avoid an explosion (including BLEVE). See Section 8.6 below.
- A tyre fire has the capacity to explode as gasses heat up and expand. General procedure is a 300 metre (m) standoff and a 24-hour stand down. If a task requires advancing into the 300 m perimeter (e.g. extrication of personnel) – this will only be approved after a risk assessment recognising the hazards has been conducted, and with the Emergency Controller and Area Manager's approval.
- Allow only designated personnel into the area.
- Ensure that water or water-based suppression is not applied to Class E (electrical) fires until de-energized.
- Mobilise emergency response personnel to protect any endangered equipment by using the site's fire protection resources.
- If required call external emergency services organisations and escort to the area.

8.6 EXPLOSION

Response:

- Raise the alarm.
- Arrange for safe removal of employees, contractors and/or the public from any dangerous situation.
- Secure the area and do not allow any disturbance to the area.
- Ensure all hazards identified and managed / isolated prior to entry.
- Transformer or Substation incident requires approval and confirmation that plant and equipment is de-energized from site electrician prior to response / entry. Isolations will be required, which may include de-activating the emergency generator. Required contacts may include Electrical Engineer to de-energize and isolate 132 KV overhead supply to Evolution Mining CGO Site.
- Allow only designated personnel into the area.
- Ensure that water or water-based suppression is not applied to Class E (electrical) fires until de-energized.
- If the fire is a jet fire, isolate the source if possible. **Do not extinguish the flame as a vapour cloud could form which could subsequently explode.**
  - If the jet fire cannot be extinguished via isolation of the fuel source, apply fire water to any equipment and/or structures that are subject to excessive levels of radiant heat and could propagate the emergency if they fail. Perform this task until the emergency services arrive or the fuel source is depleted.
- Use fire water with foam for Class B fires and cool heat affected equipment and/or structures as required.

- If there is a fire impinging on the LPG bullet, there is a risk of a BLEVE event occurring. If safe to do so, apply fire water to the LPG bullet for cooling and extinguish the fire if possible. If there is a risk of a BLEVE event, all personnel will be evacuated to a safe distance as the effects of a BLEVE event (i.e. fireball and missiles) can travel hundreds of meters.
- Where buildings containing drums are on fire, there is a risk of exploding drums (some drums have been known to travel up to 300 m from fires). All personnel will be evacuated to a safe distance in such an event. Fire fighting is to be assessed based on the risk to the responders who are required to apply fire water.
- If required call external emergency services organisations and escort to the area.

8.7 GAS LEAK – FLAMMABLE (INCLUDING NATURAL GAS)

Response:

- Raise the alarm.
- Arrange for safe removal of employees, contractors and/or the public from any dangerous situation.
- Secure the area and do not allow any disturbance to the area.
- Allow only designated personnel into the area.
- Mobilize Emergency Response Team personnel to protect any endangered equipment by using the CGO's fire protection resources.
- If required call external emergency services organisations and escort to the area.
- Remove any possible ignition source if gas hasn't ignited.

8.8 GAS LEAK – TOXIC

Response:

- Raise the alarm.
- Ensure appropriate PPE – Refer to HAZCHEM code and / or Manufacturer's SDS.
- Arrange for safe removal of employees, contractors and/or the public from any dangerous situation.
- Secure the area and do not allow any disturbance to the area.
- Allow only designated personnel into the area.
- Mobilise Emergency Response Team personnel to protect any endangered equipment by using the CGO's fire protection resources.
- If required call external emergency services organisations and escort to the area.

8.9 MEDICAL EMERGENCY

Immediate Action

If any person is made aware of a medical emergency they will –

- Notify the emergency Phone 6975 4600 / UHF Radio Channel 5.

Emergency Controller

- Notify the Executive Leadership Response Team Leader.
- Arrange for wardens to escort emergency vehicles on site if necessary.
- Keep the Emergency Response Team Coordinator informed of the situation.
- Act as the CGO liaison with emergency services, if they are on-site.

Staff Medical Emergency

- If a staff member has to leave site for further medical attention, the Emergency Response Team Coordinator must be notified prior to them leaving site.

8.10 OTHER EMERGENCIES

Vehicle Accidents

Emergency Controller

- Notify the emergency Phone 6975 4600 / UHF Radio Channel 5.
- Arrange for Wardens to escort emergency vehicles on site if necessary.
- Secure the scene.
- Obtain details of those involved if possible.
- Ensuring First Aid is given to those injured.
- Initiate a controlled evacuation, if required.
- Conducting a search of the area, if safe to do so.
- In consultation with the IMT ERT Coordinator ensure all relevant authorities are notified.
- Keep the IMT ERT Coordinator informed of the situation.
- Act the CGO liaison with emergency services, if they are on site.

All Staff

- Notify the emergency Phone 6975 4600 / UHF Radio Channel 5.
- Notify your Supervisor / Manager.
- Render assistance if safe to do so.

Bomb Threat

If you are not directly involved –

- Leave the area if it is safe to do so, then raise the alarm e.g. Phone 6975 4600 / UHF Radio Channel 5.

Emergency Controller

- Support emergency services with the response.
- Act as the CGO liaison with emergency services.
- Coordinate an evacuation of the area if you deem it necessary.
- Notify the ERT Coordinator, if you haven't done so already.
- Keep the ERT Coordinator informed of the situation.
- Ask all witnesses to remain until the Police have taken statements, and explain to the witnesses that their view of what happened, however fleeting, could provide vital information when placed together with other evidence.
- Exclude all members of the media from the site if possible and if not keep them as far away from the area as possible.

If you are the person receiving the threat

- Keep calm. If possible attract the attention of a fellow worker.
- Keep the caller on the line as long as possible to gather information.
- Obtain as much detail as possible about the type of bomb or substance and its location.
- Listen carefully for any background noises, speech mannerisms, accents or other details that might give a clue to the age, sex, identity and location of the caller.
- DO NOT discuss the call with other occupants.
- Complete the attached Bomb Threat Checklist.

9 NOTIFICATION AND REPORTING

9.1 INCIDENT NOTIFICATION AND REPORTING

An incident is defined in the CGO Development Consent as:

> *A set of circumstances that causes or threatens to cause material harm to the environment, and/or breaches or exceeds the limits or performance measures/criteria in this Consent.*

In accordance with Development Consent Condition 9.3(a) Evolution will notify the DPIE in writing to compliance@planning.nsw.gov.au, and any other relevant agencies immediately after becoming aware of any incident related to the CGO. Evolution will provide the DPIE and any other relevant agencies with a detailed report on the incident, and any further reports that may be requested.

In addition, in accordance with EPL 11912 Condition R2, Evolution will notify the EPA (and all other relevant authorities) of incidents causing or threatening material harm to the environment immediately after the person becomes aware of the incident. Evolution will provide written details of the notification to the EPA within seven days of the date on which the incident occurred. Evolution will maintain a record of/and report on any cyanide-related incidents.

9.2 NON-COMPLIANCE NOTIFICATION AND REPORTING

A non-compliance is defined within the Development Consent as:

> *An occurrence, set of circumstances, or development which is a breach of the development Consent but is not an incident.*

In accordance with Development Consent Condition 9.3(b), Evolution will notify the DPIE in writing to compliance@planning.nsw.gov.au within seven working days after becoming aware of any non-compliance with the Development Consent Conditions. Evolution will provide in writing to the DPIE a detailed report of the non-compliance which identifies, the development application number for the CGO, the Development Consent Condition of which the CGO is non-compliant, the way in which the CGO does not comply and the reason for the non-compliance. The CGO will also provide details around any actions which have been or will be taken to address the non-compliance.

9.3 CN_{WAD} REPORTING

In accordance with Development Consent Condition 5.3(d)(i), any CN_{WAD} measurements of the aqueous component of the tailings slurry stream at the process plant verified by the off-site laboratory in West Wyalong as exceeding 20 mg/L CN_{WAD} will be assessed daily (to ensure that CN_{WAD} levels do not exceed 20 mg/L [90 percentile over six months]) and reported in the Annual Review, unless otherwise agreed by the Secretary of the DPIE.

As required by Development Consent Condition 5.3(b)(i), in the event CN_{WAD} levels are verified by the off-site laboratory in West Wyalong as exceeding 30 mg/L in the aqueous component of the tailings slurry stream at the process plant at any time, discharge to the tailings storages/IWL shall cease until CN_{WAD} levels can be reduced to below the levels stated in Development Consent Condition 5.3(a), and the exceedance will be reported to the EPA within 24 hours.

In accordance with Development Consent Condition 5.3(d) a summary of the cyanide monitoring results will be provided on Evolution's website on a regular basis, or as directed by the Secretary of the DPIE.

9.4 ANNUAL REVIEW

In accordance with Condition 9.1(b) of the Development Consent, Evolution will prepare an Annual Review to report on the environmental performance of the CGO by the end of July each year, or other timing as may be agreed by the Secretary of the DPIE. The Annual Review will be made publicly available on Evolution's website (www.evolutionmining.com.au) in accordance with Development Consent Condition 9.4(a)(vii). The Annual Review will also address the Annual Environmental Management Report requirements of ML 1535 Condition of Authority 26.

The Annual Review will report on cyanide management and use and the cyanide monitoring programme. Cyanide monitoring results collected in accordance with Development Consent Condition 5.3(d)(i) will be reported in the Annual Review.

9.5 ANNUAL RETURN

In accordance with Condition R1 of the EPL 11912, Evolution will prepare an Annual Return for submission to the EPA, which reports on compliance with the conditions of the EPL. The Annual Return will report on compliance with the cyanide management and monitoring requirements of the EPL (Section 2.2).

In addition, in accordance with Section 66(6) of the PoEO Act and written requirements of the EPA, monitoring data collected as a result of an EPL condition will be made publically available on Evolution's website (www.evolutionmining.com.au).

10 AUDITING AND REVIEW

10.1 FACILITATION OF AUDIT FUNCTIONS

As described in Section 6.4.1 of the EIS (North Limited, 1998) one of the purposes of the HCDGR and FOR is to facilitate efficient audit functions.

AS/NZS ISO 19011:2003 *Guidelines for Quality and/or Environmental Management Systems Auditing* provides guidelines for environmental auditing and general principles, including the requirement for suitable audit criteria. Audit criteria include (AS/NZS ISO 19011:2003 *Guidelines for Quality and/or Environmental Management Systems Auditing*):

> *applicable policies, procedures, standards, laws and regulations, management system requirements, contractual requirements or industry/business sector codes of conduct.*

This HMMP and associated Chemical Management Strategy and registers will facilitate efficient audit functions by providing audit criteria as described in Table 34.

Table 34
Facilitation of Efficient Audit Functions

Component	Facilitation of Efficient Audit Functions
Inventory Register	• Chemalert 3 is the central and complete list of all consumables/chemicals on-site that can be included in the audit protocol as an area to be examined for completeness (inclusion of all relevant materials). • Provides the starting point for examination of consumables/chemicals in the HCDGR and FOR.
Chemical Management Strategy	• A criteria against which site chemical management activities can be assessed for compliance with the strategy.
HCDGR and FOR	• Chemalert 3 contains all hazardous chemicals, dangerous goods and fuel and/or oils approved for use on-site (including applicable wastes) that can be included in the audit protocol as an area to be examined for completeness (inclusion of all relevant materials). • Provides a description of the requirements for management of each hazardous chemcial and dangerous good that can be audited for: – completeness (including manufacturers SDSs); and – compliance of site activities to the management requirements for each hazardous chemical and dangerous good in the HCDGR and FOR.

10.2 HAZARD AUDIT

In accordance with Development Consent Condition 5.4(c), a comprehensive hazard audit of the CGO was conducted (by a duly qualified independent person or team approved by the then Department of Planning [DoP]) 12 months after the commencement of operations and an audit report submitted to the then Director-General for Planning.

As required by Development Consent Condition 5.4(c) Evolution will continue to conduct hazard audits every three years, or as determined by the Secretary, and a report of each hazard audit will be submitted to the Secretary within a month of the audit. Hazard audits will be carried out in accordance with the DPIE's *Hazardous Industry Planning Advisory Paper No. 5*, *Hazard Audit Guidelines*.

10.3 INDEPENDENT ENVIRONMENTAL AUDIT

An Independent Environmental Audit will be conducted in accordance with Development Consent Condition 9.2(a) and may include cyanide-related issues. The condition is reproduced below:

> ***9.2 Independent Auditing and Review***
>
> *(i) Independent Environmental Audit*
>
> *(ii) By the end of July 2016, and every 3 years thereafter, unless the Secretary directs otherwise, the Applicant shall commission and pay the full cost of an Independent Environmental Audit of the development. This audit must:*
> - *Be conducted by a suitably qualified, experienced and independent team of experts whose appointment has been endorsed by the Secretary;*
> - *Include consultation with relevant regulatory agencies, BSC and CEMCC;*
> - *Assess the environmental performance of the development and assess whether it is complying with the requirements in this consent and any other relevant approvals (such as environment protection licences and/or mining lease (including any assessment, plan or program required under this consent);*
> - *Review the adequacy of any approved strategy, plan or program required under this consent or the abovementioned approvals; and*
> - *Recommend measures or actions to improve the environmental performance of the development, and/or strategy, plan or program required under this consent.*
>
> *Note: This audit team must be led by a suitably qualified auditor, and include ecology and rehabilitation experts, and any other fields specified by the Secretary.*
>
> *(iii) Within 3 months of commissioning this audit, or as otherwise agreed by the Secretary, the Applicant shall submit a copy of the audit report to the Secretary, together with its response to any recommendations contained in the audit report, and a timetable for the implementation of these recommendations as required. The applicant must implement these recommendations, to the satisfaction of the Secretary.*

This process provides a mechanism by which the CGO environment management and monitoring procedures can be assessed against relevant Development Consent, mining lease and licence conditions, legislation and Australian Standards.

10.4 CYANIDE MANAGEMENT CODE AUDIT

A requirement of the Cyanide Management Code certification process includes annual audits by the ICMI against the requirements of the Cyanide Management Code.

The CGO will continue to be subject to annual audits against the Cyanide Management Code requirements while it is a signatory to the Code.

10.5 REVIEW OF THIS HMMP

In accordance with Condition 9.1(c) of the Development Consent, this HMMP will be reviewed within three months of:

- the submission of an Annual Review under Condition 9.1(b);
- the submission of an incident report under Condition 9.3(a);
- the submission of an audit under Condition 9.2(a);

- the submission of an Annual State of the Environment Report under Condition 9.2(b);
- the approval of any modification to the conditions of the Development Consent; or
- any direction of the Secretary under Condition 1.1(c).

Where this review leads to revisions of the HMMP, then within four weeks of the review, the revised HMMP will be submitted for the approval of the Secretary of the DPIE (unless otherwise agreed with the Secretary). The revision status of this HMMP is indicated after the title page of this HMMP.

This HMMP will be made publicly available on Evolution's website (www.evolutionmining.com.au) in accordance with Condition 9.4(a)(iii) of the Development Consent. A hard copy of the HMMP will also be kept at the CGO.

11 REFERENCES

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APPENDIX A

SUMMARY OF LEGISLATION, AUSTRALIAN STANDARDS AND OTHER GUIDELINES RELEVANT TO THIS HMMP

LEGISLATION

***Explosives Act, 2003* (NSW)**

Explosives and security sensitive dangerous substances are regulated by the *Explosives Act, 2003* and the *Explosives Regulation, 2013*. The new regulatory framework requires stricter security for explosives and concentrated ammonium nitrate.

The *Explosives Act, 2003* regulates the handling and conveyance of explosives and explosive precursors. Under this Act:

- a licence may be required to handle explosives and explosive precursors;
- a person conveying an explosive must at all times take all precautions that are necessary to prevent access to the explosive by persons not lawfully entitled to have access to the explosive; and
- a person must not negligently handle any explosives in such a manner to endanger life, cause injury to any person or damage property.

***Explosives Regulation, 2013* (NSW)**

The *Explosives Regulation, 2013* is made under the *Explosives Act, 2003* and deals with the following:

(a) matters relating to Security Clearances required to handle explosives and explosive precursors (Part 2);

(b) matters relating to licences under the *Explosives Act, 2003* including the types of licences, requirements for obtaining licences, certain prescribed licence conditions and certain exemptions from the requirement to have a licence (Part 3);

(c) a register of authorised and prohibited explosives (Part 4);

(d) specific security and safety measures relating to the handling of explosives (Part 5);

(e) specific enforcement of powers of inspectors and police officers (Part 6); and

(f) matters of a savings, transitional or administrative nature (Parts 1 and 7).

***Protection of the Environment Operations Act, 1997* (NSW) (PoEO Act)**

The PoEO Act creates a number of offences relevant to the management of hazardous waste and chemicals, including:

- the wilful or negligent disposal of waste in a manner that harms or is likely to harm the environment;
- the wilful or negligent causing of a substance to leak, spill or otherwise escape in a manner that harms or is likely to harm the environment;
- the unlawful transporting of waste;
- the offence of polluting waters; and
- the new offence of land pollution.

***Dangerous Goods (Road and Rail Transport) Act, 2008* (NSW)**

The purpose of *Dangerous Goods (Road and Rail Transport) Act, 2008* is to regulate the transport of dangerous goods by road and rail in order to promote public safety and protect property and the environment.

This Act is largely a uniform adoption of the now repealed Commonwealth *Road Transport Reform (Dangerous Goods) Act, 1995*. It regulates the transport of dangerous goods (other than explosives) by road and rail in NSW. It enables the making of regulations in relation to all aspects of the transportation of dangerous goods, including importing, loading, consigning, marking and placarding of goods and driving of vehicles. It creates a number of offences, including the offence of failing to ensure, as far as practicable, that dangerous goods are transported in a safe manner.

***Dangerous Goods (Road and Rail Transport) Regulation, 2014* (NSW) (DG Regulations)**

The DG Regulations replaces the *Dangerous Goods (Road and Rail Transport) Regulation, 2009,* subject to minor modifications.

***Work Health and Safety (Mines and Petroleum Sites) Act, 2013 (NSW)* (WHS [Mines and Petroleum Sites] Act)**

The WHS (Mines and Petroleum Sites) Act and *Work Health and Safety (Mines and Petroleum Sites) Regulation, 2014* (WHS [Mines and Petroleum Sites] Regulation) replaces the *Mine Health and Safety Act, 2004* and *Mine Health and Safety Regulation, 2007*, which were repealed on 31 January 2015.

The objects of the WHS (Mines and Petroleum Sites) Act include (but are not limited to):

(a) to assist in securing the objects of the Work Health and Safety Act 2011 at mines and petroleum sites, including the object of securing and promoting the health and safety of persons at work at mines, petroleum sites or related places,

(b) to protect workers at mines and petroleum sites and other persons against harm to their health and safety through the elimination or minimisation of risks arising from work or from specific types of substances or plant,

(c) to ensure that effective provisions for emergencies are developed and maintained at mines and petroleum sites,

(d) to establish a scheme for ensuring that persons exercising certain functions at mines and petroleum sites are competent to do so,

(e) to establish the Mine Safety Advisory Council,

(f) to provide for worker safety and health representatives in coal mines,

(g) to facilitate interstate regulatory co-operation,

(h) to establish Boards of Inquiry,

(i) to provide for enforcement powers that are in addition to those in the Work Health and Safety Act 2011

Work Health and Safety (Mines and Petroleum Sites) Regulation, 2014 (NSW)

The Work Health and Safety (WHS [Mines and Petroleum Sites]) Regulation places a duty on mine operators to ensure risk assessments and risk controls are followed and documented for hazards common in mining workplaces. The WHS (Mines and Petroleum Sites) Regulation also sets out certain requirements regarding notification and reporting of incidents at workplaces.

***Work Health and Safety Act, 2011 (NSW)* (WHS Act)**

The Work Health and Safety (WHS) Act imposes strict duties on various categories of persons to ensure the health, safety and welfare at work of all employees and others. The categories of persons subject to the operation of the Act include employers, controllers of work premises and employees.

Duties of Employers

An employer must ensure the health, safety and welfare at work of all the employees of the employer.

That duty extends (without limitation) to the following:

- ensuring that any premises controlled by the employer where the employees work (and the means of access to or exit from the premises) are safe and without risks to health;
- ensuring that any plant or substance provided for use by the employees at work is safe and without risks to health when properly used;
- ensuring that systems of work and the working environment of the employees are safe and without risks to health;
- providing such information, instruction, training and supervision as may be necessary to ensure the employees' health and safety at work; and
- providing adequate facilities for the welfare of the employees at work.

An employer must ensure that people (other than the employees of the employer) are not exposed to risks to their health or safety arising from the conduct of the employer's undertaking while they are at the employer's place of work.

Duties of Controllers of Work Premises

Controllers of work premises, plant or substances must ensure that the premises, plant or substances under their control are safe and without risks to health.

Duties of Employees

An employee must, while at work, take reasonable care for the health and safety of people who are at the employee's place of work and who may be affected by the employee's acts or omissions at work.

An employee must, while at work, co-operate with his or her employer or other person so far as is necessary to enable compliance with any requirement under the WHS Act or the WHS Regulation that is imposed in the interests of health, safety and welfare on the employer or any other person.

***Model Work Health and Safety Regulations 2016* (National Model Regulations)**

The National Model Regulations apply to all workplaces in which hazardous substances are used or produced, and to all persons with potential exposure to hazardous substances in those workplaces. The two principal components of the regulations are:

- information provisions - which address the delivery of specific information, for example, labels and Safety Data Sheets (SDSs), that the supplier of a workplace hazardous substance has to provide through the employer to employees. These provisions ensure that employee representatives, relevant public authorities and emergency services are also provided with access to relevant information; and

- assessment and control provisions - which require employers to identify hazardous substances in the workplace, make an assessment of those hazards, which arise out of the work activity and then take appropriate control action.

The National Model Regulations require employers to obtain SDSs for all substances from suppliers and ensure these are readily accessible to employees. Employers must also ensure all substances are labelled properly and must keep and maintain a register for all hazardous substances used or produced in the workplace. The register must contain a list of all hazardous substances used or produced at the workplace and the SDSs for all hazardous substances for which SDSs are required by the National Model Regulations. The National Model Regulations also require employers to provide induction and on-going training to all employees with the potential for exposure to hazardous substances in the workplace. It also provides for health surveillance, record keeping and employees duties to comply with the model regulations.

AUSTRALIAN STANDARDS

Australian Standard (AS) 1216-2006: Class labels for dangerous goods

This Standard sets out details of the design and selection of labels appropriate to the classes, categories and subsidiary risks of dangerous goods designated in the ADG Code.

AS 1319-1994 Safety Signs for the Occupational Environment

Any warnings, conditions of entry, emergency directions or other information intended for persons entering a restricted area shall be displayed on signs and notices at each point of access. Signs shall be constructed in accordance with AS 1319:1994 *Safety Signs for the Occupational Environment*.

AS 1345-1995 Identification of the Contents of Pipes and Conduits and Ducts

AS 1345:1995 *Identification of the Contents of Pipes and Conduits and Ducts* specifies means of identifying the contents of pipes, conduits, ducts and sheathing used to contain fluids, or for the distribution of electrical or communications services, by the use of colour, words and symbols. It is not intended to apply to buried or normally inaccessible services.

AS 1894-1997 The Storage and Handling of Non-flammable Cryogenic and Refrigerated Liquids

This standard sets out the requirements for the storage and handling of non-flammable liquids at or below -15 degrees Celsius (°C), of Class 2.2 (non-flammable, non-toxic gases), in quantities of at least 50 litres (L) water capacity and 50 kilopascals (kPa) (gauge) working pressure, up to and including 200,000 L water capacity. The standard applies to the storage of non-flammable cryogenic and refrigerated liquids in pressure vessels that conform to AS 1210 (Hardbound) Pressure Vessels. The standard applies in locations that are generally industrial or commercial in nature.

AS 1940-2017 The Storage and Handling of Flammable and Combustible Liquids

Relevant storage areas will be constructed and operated in compliance with the requirements of AS 1940:2017 *The Storage and Handling of Flammable and Combustible Liquids*, where applicable. The standard deals specifically with Class 3 flammable and combustible liquids, however it can be applied to other classes of dangerous goods (i.e. Class 8 corrosive substances).

AS 2030.1-2009 Gas cylinders - General requirements

All gas cylinders between a capacity of 0.1 kilograms (kg) and 3,000 kg used at the CGO site will be subject to AS 2030.1:2009 *Gas Cylinders - General Requirements.*

AS 2187.1-1998 Explosives – Storage, Transport and Use – Storage

The storage of explosives shall be conducted in accordance with the requirements of AS 2187.1:1998 *Explosives – Storage, Transport and Use – Storage*. The standard deals with the location, design, construction and maintenance of explosives magazines.

AS/New Zealand Standard (NZS) 2243.10:2004 Safety in Laboratories - Storage of Chemicals

The requirements for the safe keeping of chemicals in packages in laboratories are described in AS/NZS 2243.10:2004 *Safety in Laboratories - Storage of Chemicals*. The standard includes storage of chemicals and opening of packages in a laboratory. This Standard applies to all chemical substances including hazardous substances; non-hazardous substances, such as common salt, sugar and soda ash; dangerous goods as defined in the ADG Code, except for dangerous goods of Class 1; (Explosives), Class 6.2 (Infectious substances) or Class 7 (Radioactive substances); and combustible liquids.

AS 2809.1-2008 Road Tank Vehicles for Dangerous Goods - General Requirements for all Road Tank Vehicles

Any vehicles at the CGO site designed and manufactured specifically as dangerous goods tankers (and any conventional vehicles that are provided with transportable dangerous goods tanks) are subject to AS 2809.1:2008 *Road Tank Vehicles for Dangerous Goods - General Requirements for all Road Tank Vehicles*.

AS 2931-1999 Selection and Use of Emergency Procedure Guides for the Transport of Dangerous Goods

AS 2931:1999 *Selection and Use of Emergency Procedure Guides for the Transport of Dangerous Goods* provides guidance on the selection of the AS 1678 emergency procedure guides (EPGs) and group text emergency procedure guides required when transporting dangerous goods and information on completing and using an EPG.

AS 3780-2008 The Storage and Handling of Corrosive Substances

AS 3780:2008 *Storage and Handling of Corrosive Substances* sets out requirements and recommendations for the safe storage and handling of corrosive substances (substances that meet the Class 8 classification criteria of the ADG Code). The standard also applies to other dangerous goods that are assigned a Class 8 subsidiary risk by the ADG Code.

AS 4326-2008 The Storage and Handling of Oxidizing Agents

The storage and handling of oxidizing agents such as ammonium nitrate is addressed by AS 4326:2008 *The Storage and Handling of Oxidizing Agents*. The standard sets out requirements and precautions for storage, handling, safety and emergency procedures for oxidizing agents that may be applicable to the CGO.

AS/NZS 1596:2014 The Storage and Handling of LP Gas

This standard specifies the requirements for the location, design, construction, commissioning and operation of installations for the storage and handling of Liquefied Petroleum Gas (LPG) including the management of emergencies.

AS/NZS 2906:2001 Fuel Containers – Portable – Plastic and Metal

All portable, petroleum-product fuel containers made of metal or plastic, of nominal capacity up to and including 25 L, intended to be refilled, and of the following types: (a) Containers for the storage and transport of fuel; (b) Fuel tanks for boats on the CGO site will be subject to AS/NZS 2906:2001 *Fuel Containers - Portable-Plastic and Metal.* Containers covered by this standard are suitable for use with leaded, unleaded and super grades of petrol, two-stroke engine fuel, and kerosene and distillate and may therefore be used at the CGO.

AS/NZS 3833:2007 The Storage and Handling of Mixed Classes of Dangerous Goods in Packages and Intermediate Bulk Containers

Any storage of mixed classes of hydrocarbons and chemicals shall be stored in accordance with the requirements of AS/NZS 3833:2007 *The Storage and Handling of Mixed Classes of Dangerous Goods in Packages and Intermediate Bulk Containers*, where applicable.

AS/NZS 4452:1997 The Storage and Handling of Toxic Substances

AS/NZS 4452:1997 *The Storage and Handling of Toxic Substances* sets out requirements and recommendations for the safe storage and handling of toxic substances that are classified as Class 6.1 in the ADG Code and also applies to other dangerous goods that are assigned a Class 6.1 subsidiary risk by the ADG Code, except where they are of Class 2, or where more stringent requirements apply under another relevant Standard or applicable regulation.

OTHER RELEVANT GUIDELINES

Leading Practice Sustainable Development Program for the Mining Industry - Hazardous Materials Management (Commonwealth Government, 2016)

Produced by the then Commonwealth Department of Resources, Energy and Tourism as a part of the Leading Practice Sustainable Development Program for the Mining Industry series, this handbook provides guidance on the leading practice for Hazardous Materials Management in the mining industry. The handbook provides guiding principles and leading practices in the handling and storage of hazardous materials through the mine life cycle.

Leading Practice Sustainable Development Program for the Mining Industry – Cyanide Management Handbook (Commonwealth of Australia, 2008)

Produced by the Australia Government this booklet outlines principles and procedures of cyanide management so that it is used effectively, safely, economically and with no adverse effects on the environment. The aim of best practice cyanide management is "*to ensure that the risk of adverse health and environmental impacts is negligible and maintained at levels acceptable to the community and, therefore, to regulators*".

APPENDIX B
MANAGEMENT MEASURES FOR THE TRANSPORTATION OF HAZARDOUS MATERIALS TO THE CGO

Transport Risk Management Measures

The CGO's PRA provided that CGO environmental risk is dominated by road transport accidents leading to a spillage of the material (ANSTO, 1997). The transport risks dominate as a result of the long distances covered in delivering material to site. The risk of an accident has been determined to be low, the scenario contributing 80% to the total estimated risk is that of a truck transporting a hazardous material being involved in an accident that results in a spillage of material (ANSTO, 1997).

Although the material suppliers and transport providers of the hazardous materials are responsible for the load until the delivery has occurred (ANSTO, 1997), the Development Consent recognises that the risks associated with off-site transport of CGO chemical supplies (e.g. sodium cyanide) can be reduced through risk management measures. The following subsections provide an outline of the risk management measures that will be implemented by Evolution and the various material suppliers and transport providers.

Supply Contracts

In drawing up contracts with material suppliers and transport providers, Evolution will include clauses that require the material supplier or transport provider to comply with the relevant legislation and the ADG Code, and the CGO's safety and/or supplier/contractor emergency response plans. These may vary according to the supplier type, for example:

A contract with a transport provider will include clauses such as:

- The supplier will comply with all legislative requirements and industry guidelines for safe operation of its vehicles.
- The supplier will only engage in the performance of this agreement, personnel who are skilled and experienced in their trades and professions.

A contract with a supplier of fuels and associated services will include clauses such as:

- The supplier shall be responsible for the safety of its personnel on site.
- The supplier shall provide and shall ensure that it's personnel engaged in the supply of fuels and associated services, observe at all times a safe system of work which complies with relevant Acts, Regulations and adopts known and accepted safe working practices.
- The supplier shall provide Evolution with a copy of its safety plan and emergency response procedures for the supply of fuels and associated services. The supplier shall comply with these procedures and plans at all times when supplying to Evolution.

A contract with a supplier of dangerous goods/hazardous materials will include clauses such as:

- The supplier will comply with all statutory Acts and Regulations and Codes governing the transportation and handling of the relevant dangerous good/hazardous material and with industry best practice.
- The supplier will employ drivers certified for transport of dangerous goods/hazardous materials to ensure the material is delivered safely and efficiently to the site.
- The supplier will only engage in the performance of this agreement, personnel who are skilled and experienced in their trades and professions.
- Where the supply of dangerous goods/hazardous materials requires the supplier to enter the site, the supplier and its personnel must comply with the site rules and the CGO's internal Emergency Response Plan.

- The supplier will provide its personnel with a full range of safety equipment as required under relevant Regulations and Codes. All personnel are required to wear the appropriate safety protection.
- The supplier will conduct a safety review of the CGO's dangerous good/hazardous material storage area each year and advise Evolution of the findings of the review.
- Upon request by Evolution, the supplier shall provide safety training relevant to the dangerous good/hazardous material to the Evolution's site personnel.
- The supplier shall provide SDS information to site as required.
- The supplier shall provide Evolution with a copy of its emergency response procedures for the supply of the dangerous good/hazardous material. The supplier shall comply with these procedures at all times when transporting the dangerous good/hazardous material to the CGO.

A description of the general requirements of the ADG Code with regard to emergency information, safety equipment, procedures during transport and emergencies is provided below. These procedures will be required to be applied by contract suppliers during the transport of dangerous goods/hazardous materials in accordance with their ADG Code (and supply contract) requirements. A description of the ADG Code dangerous goods classifications is provided in Section 4.2.

Emergency Information

Emergency Information requirements are set out in Part 11 Division 2 of the DG Regulations. The consignor, prime contractor, rail operator, road vehicle driver and train driver each have duties in respect of emergency information. For example:

Consignor's duty

A person must not consign a placard load for transport in or on a vehicle if the person knows, or reasonably ought to know, that the required emergency information for the dangerous goods in the load is not on the vehicle.

Prime contractor's duties

A prime contractor must not use a road vehicle to transport a placard load if:

(a) the road vehicle is not equipped with an emergency information holder that complies with Chapter 11.2 of the ADG Code, or

(b) the required emergency information for the dangerous goods in the load is not in the holder.

Rail operator's duties

(1) A rail operator must not transport a placard load in a cargo transport unit on a train if the required emergency information for the dangerous goods in the load is not in the train driver's cab.

(2) Subclause (1) does not apply when a train transporting a placard load is involved in shunting operations and the required emergency information for the dangerous goods in the load is readily available elsewhere in the immediate vicinity of those operations.

Driver's duties

(1) A person must not drive a road vehicle transporting a placard load if:

(a) the road vehicle is not equipped with an emergency information holder that complies with Chapter 11.2 of the ADG Code, and

(b) the required emergency information for the dangerous goods in the load provided by the consignor of the goods, or by the prime contractor for the transport of the goods, is not in the holder.

(2) The driver of a road vehicle transporting a placard load must ensure that the road vehicle's emergency information holder contains only:

(a) the required emergency information for the dangerous goods in the load; and

(b) the transport documentation for the goods.

(3) The driver of a road vehicle transporting a placard load must produce the required emergency information for the dangerous goods in the load for inspection by an authorised officer, or an officer of an emergency service, if the officer asks the driver to produce the information for inspection.

Train driver's duties

(1) A person must not drive a train that is transporting a placard load if the required emergency information for the dangerous goods in the load is not in the train driver's cab.

(2) A train driver transporting a placard load must produce the required emergency information for the dangerous goods in the load for inspection by an authorised officer or an officer of an emergency service, if the officer asks the driver to produce the information for inspection.

(3) Subclauses (1) and (2) do not apply if the train driver transporting dangerous goods is in a depot or yard, or is engaged in shunting operations, and the required emergency information for the goods is readily available elsewhere in the immediate vicinity of the depot, yard or those operations.

Emergency Information is defined as emergency information complying with Chapter 11.2 of the ADG Code or emergency information that is approved by a Competent Authority.

Chapter 11.2 (Division 11.2.1) of the ADG Code states that *emergency information*, in relation to dangerous goods transported on a vehicle, means:

(a) the Dangerous Goods – Initial Emergency Response Guide; or

(b) an emergency procedure guide for the dangerous goods transported on the vehicle and the emergency procedure guide in relation to vehicle fire; or

(c) for use on trains transporting dangerous goods, the rail operator's Dangerous Goods Emergency Instructions for train crews which provides contact numbers for dangerous goods emergencies; or

(d) a relevant international or foreign standard, legible and in English, that is equivalent to the information provided by Standards Australia publication HB76. Any use of an international or foreign standard must be approved by the Competent Authority.

Dangerous Goods – Initial Emergency Response Guide

The *HB 76:2010 Dangerous Goods – Initial Emergency Response Guide* produced by Standards Australia provides emergency response information for dealing with accidents, spills, leaks or fires involving dangerous goods, as well as information on hazards, protective clothing and emergency procedures.

Emergency Procedure Guides

In accordance with the ADG Code, an Emergency Procedure Guide (EPG), in relation to particular dangerous goods, is a guide outlining procedures to be taken in the event of an emergency involving the goods which is either:

- in the form, or substantially in the form, of an EPG for the goods published by Standards Australia; or
- in a form approved by a Competent Authority in relation to goods of that kind.

In accordance with the ADG Code, an EPG, in relation to vehicle fire, is a guide outlining procedures to be taken in the event of a fire on a road vehicle which is either:

- in the form, or substantially in the form, of the EPG for vehicle fire published by Standards Australia; or
- in a form approved by a Competent Authority.

EPGs for the transport of dangerous goods are produced by Standards Australia. The following EPGs are of relevance to the materials transported to the CGO:

- HB 76:2010 – *Dangerous Goods – Initial Emergency Response Guide*;
- AS 1678.0.0.001:2004 – Emergency Procedure Guide – Transport - Vehicle Fire;
- AS 1678.3A1:2004 – *Emergency Procedure Guide – Transport - Group Text EPGs for Class 3 Substances - Flammable Liquids;*
- AS 1678.4A1:2004 – *Emergency Procedure Guide – Transport - Group Text EPGs for Class 4.1 Substances - Flammable Solids; Substances Liable to Spontaneous Combustion; and Substances that in Contact with Water Emit Flammable Gases;*
- AS 1678.8A1:2004 – *Emergency Procedure Guide – Transport - Group Text EPGs for Class 8 Substances – Corrosive Substances;*
- AS 1678.2.1.001:2003 – *Emergency Procedure Guide – Transport - Liquefied Petroleum Gas;*
- AS 1678.2.2.000:2003 – *Emergency Procedure Guide – Transport - Oxygen, Refrigerated Liquid;*
- AS 1678.5.1.002:1998 – *Emergency Procedure Guide – Transport - Ammonium Nitrate;*
- AS 1678.5.1.005:2003 – *Emergency Procedure Guide – Transport - Hydrogen Peroxide, Aqueous Solution;*
- AS 1678.6.0.002:1998 – *Emergency Procedure Guide – Transport - Sodium Cyanide, Potassium Cyanide;*
- AS 1678.8.0.001:2003 – *Emergency Procedure Guide – Transport - Hydrochloric Acid; and*
- AS 1678.3.1.001:2003 – *Emergency Procedure Guide – Transport - Petrol (as cargo).*

Safety Equipment

Safety equipment requirements are specified in Chapter 12 of the ADG Code including requirements for personal protective and safety equipment and fire extinguishers. Table B-1 sets out guidance as to the minimum requirements for personal protective and safety equipment on road vehicles transporting a placard load in accordance with Section 12.1.3.2 of the ADG Code (provided below):

> ***12.1.3.2*** *A road vehicle transporting a placard load of dangerous goods must carry the personal protective equipment and safety equipment specified in Table 12.2 for all the dangerous goods in the load, based on their primary hazards and any subsidiary risks, subject to any conditions incorporated in the table and its explanatory notes.*

This chapter of the ADG Code also includes requirements for road vehicles transporting a placard load of dangerous goods to be equipped with a fire extinguisher or fire extinguishers. Requirements are provided in Table B-2. A road vehicle transporting a placard load of dangerous goods must also be equipped with respiratory protection equipment in accordance with Section 12.1.3.5 of the ADG Code.

Table B-1
Minimum Personal Protective Equipment and Safety Equipment on Road Vehicles Transporting a Placard Load

Dangerous goods class or subsidiary risk	Respiratory protection equipment for escape purposes	Gas tight goggles or full face shield as appropriate	Eye-wash kit [d]	Chemically resistant gloves or gauntlets	Thermally insulated gloves or gauntlets	Chemically resistant suit or coveralls	Chemically resistant boots	Any electric torch	Electric torch complying with AS/NZS 60079.11 or other recognised Code
2.1 [a]	No	Yes [c]	No	No	Yes	No	No	No	Yes
2.2	No	Yes [c]	No	No	Yes	No	No	Yes	No
2.3	b	Yes	Yes	No	Yes	No	No	Yes	No
3	No	No	Yes	Yes	No	No	No	No	Yes
4	No	No	Yes	Yes	No	No	No	No	Yes
5.1 (solids)	No	No	Yes	Yes	No	No	No	Yes	No
5.1 (liquids)	No	Yes	Yes	Yes	No	Yes	Yes	Yes	No
5.2	No	Yes	Yes	Yes	No	Yes	Yes	No	Yes
6.1	Yes [b]	Yes	Yes	Yes	No	Yes	Yes	Yes	No
6.2	No	No	No	Yes	No	No	No	Yes	No
8	Yes [b]	Yes	Yes	Yes	No	Yes	Yes	Yes	No
9	No	No	Yes	Yes	No [e]	No	No	Yes	No

Source: ADG Code Table 12.2

[a] A vehicle transporting unodourised LPG must additionally be equipped with a gas detector suitable for detection of LPG, in accordance with AS 1596.

[b] The minimum requirement is air supplied short term breathing apparatus suitable for escape purposes, except when, even in an emergency, the dangerous goods will not give rise to harmful vapours, gases or dust. Note that where a driver attends to the loading or transfer of goods, Self-Contained Breathing Apparatus with a duration of greater than 15 minutes may be required by other (e.g. health and safety) legislation.

[c] Yes, if the goods are in receptacles with a capacity of > 500 L or are cryogenic liquids.

No, otherwise “Gas tight goggles” means face hugging goggles with increased facial seal.

[d] Where an eyewash kit is required, it must be of at least 250 millilitres capacity, filled and ready for use.

[e] Yes, if the goods are elevated temperature substances or dry ice.

No, otherwise.

Note 1*: Where an item of Personal Protective or Safety Equipment is required based on the primary hazard or subsidiary risk of any item of dangerous goods in the load, that item must be carried, except that where thermally insulated gloves or gauntlets are required and carried, any requirement for chemically resistant gloves or gauntlets may be ignored.*

Note 2*: Under other legislation, it may be necessary to carry additional Personal Protective Equipment where it is specified for the purpose on the Safety Data Sheet.*

Table B-2
Fire Extinguishers Required on Road Vehicles Transporting a Placard Load

Dangerous Goods Being Transported	Minimum Extinguisher Number, Rating and Type
All packaged types of dangerous goods	1 x 30B dry powder stored in cabin, or at the front of any trailer transporting a placard load
Non-flammable dangerous goods	In the load area, either: (a) 1 x 60B dry powder type; or (b) 2 x 30B dry powder type; Plus: 1 x 10B dry powder in the cabin.
Flammable dangerous goods (Division 2.1, Class 3 or 4, or having a subsidiary hazard of 2.1, 3 or 4)	In the load area, either: (a) 2 x 60B dry powder type; or (b) 1 x 80B dry powder type and 1 x 20B foam type; Plus: 1 x 10B dry powder type in the cabin.

Source: ADG Code Table 12.1
Note: In cases of combination vehicles. These directions apply to every separate trailer transporting the placard load.

Procedures During Transport

Chapter 13 of the ADG Code includes procedures to be followed in the event of a breakdown, general precautions during transport and route selection. If a road vehicle transporting a placard load of dangerous goods breaks down the following procedures must be implemented:

13.1.2 BREAKDOWNS

13.1.2.1 General Measures

If a road vehicle transporting a placard load of dangerous goods is disabled on a road or street, or has stopped and constitutes a traffic hazard, other road users must be alerted by:

(a) if:

(i) the battery has not been disconnected to prevent danger and there are flashing hazard lights on the vehicle – turning the lights on and leaving them on while the vehicle is stopped; or

(ii) the battery has not been disconnected to prevent danger and there are no flashing hazard lights on the vehicle – turning the parking lights on and leaving them on while the vehicle is stopped; and

(b) placing a portable warning device in a manner required by 13.1.2.2:

General precautions during transport outlined in the ADG Code include parking requirements and unloading the vehicle. The ADG Code specifies the requirements for unloading dangerous goods from a vehicle as follows:

13.1.3.3 Unloading the vehicle

Other than for transfer to another vehicle or to another mode of transport, dangerous goods should not be unloaded from a road vehicle unless:

(a) the consignee, or a person acting on the consignee's behalf, is present and receives the goods; or

(b) if the driver, prime contractor or consignor has agreed with the consignee for the goods to be unloaded into a secure place – the goods are unloaded into that place.

Transport routes will be pre-planned and pose minimal risk of personal injury or harm to the environment or property during the journey. In addition:

13.1.4.3 Routes should wherever practicable avoid heavily populated or environmentally sensitive areas, congested crossings, tunnels, narrow streets, alleys, or sites where there may be, a concentration of people.

Emergencies

Part 14 of the DG Regulations set out the duties of a road vehicle driver, train driver, a rail operator, a prime contractor and consignor in respect of a road and rail vehicles transporting dangerous goods in an emergency, as follows:

General responsibilities of the driver of a road vehicle in an emergency

Clause 147 of the DG Regulations sets out the duties of a driver in the event that a road vehicle is involved in a dangerous situation.

…

(2) The driver of the road vehicle must:

(a) notify the prime contractor, the Competent Authority, and the police or fire service, of the incident as soon as practicable, and

(b) provide any reasonable assistance required by an authorised officer or an officer of an emergency service to deal with the situation.

General responsibilities of the driver of a train and rail operator in an emergency

Clause 148 of the DG Regulations sets out duties for drivers and rail operators in the event that a train transporting dangerous goods is involved in a dangerous situation.

…

(2) The driver of the train must:

(a) notify the rail operator and rail infrastructure manager of the incident as soon as practicable, and

(b) provide any reasonable assistance required by an authorised officer, or an officer of an emergency service, to deal with the situation.

(3) On being notified by the train driver of the incident, the rail operator and the rail infrastructure manager must:

(a) notify the police or fire service of the incident as soon as practicable, and

(b) provide any reasonable assistance required by an authorised officer or an officer of an emergency service to deal with the situation.

General responsibilities on the Consignor

Clause 153 of the DG Regulations sets out the consignor's duties in the event that a vehicle transporting a placard load of dangerous goods by road is involved in an incident resulting in a dangerous situation:

…

(2) As soon as practicable after being asked by an authorised officer or an officer of an emergency service, the consignor of the goods must:

(a) give the officer the information that the officer requires about:

(i) the properties of the dangerous goods being transported, and

(ii) safe methods of handling the goods, and

(iii) safe methods of containing and controlling the goods in a dangerous situation, and

(b) provide the equipment and other resources necessary:

(i) to control the dangerous situation, and

(ii) to contain, control, recover and dispose of dangerous goods that have leaked, spilled or accidentally escaped.

(3) If the prime contractor and the consignor, or the rail operator and the consignor, of the dangerous goods are asked to give the same information or provide the same resources for the incident, it is sufficient if the consignor, as the case may be, the prime contractor or the rail operator gives the information or provides the resources.

General responsibilities on the Prime Contractor and Rail Operator

Clause 150 of the DG Regulations requires prime contractors and rail operators to inform the Competent Authority in the event that a vehicle transporting dangerous goods is involved in an incident resulting in a dangerous situation:

…

(2) As soon as practicable after becoming aware of the incident, the prime contractor or the rail operator responsible for the transport of the goods must provide the Competent Authority with the following details about the incident:

(a) where the incident occurred,

(b) the time and date of the incident,

(c) the nature of the incident,

(d) the dangerous goods being transported when the incident occurred,

(e) any other details that the Competent Authority may require.

(3) Not later than 21 days after the day when the incident occurs, the prime contractor or rail operator must give to the Competent Authority a written report about the incident stating the following:

(a) where the incident occurred,

(b) the time and date of the incident,

(c) the nature of the incident,

(d) what the driver believes to be the likely cause of the incident,

(e) what the prime contractor or rail operator believes to be the likely cause of the incident,

(f) the dangerous goods being transported when the incident occurred,

(g) the measures taken to control any leak, spill or accidental escape of dangerous goods, and any fire or explosion, arising out of the incident,

(h) the measures taken after the incident in relation to the dangerous goods involved in the incident.

Clause 154 of the DG Regulation requires prime contractors and rail operators to provide information and resources in the event that a vehicle transporting a placard load is involved in an incident resulting in a dangerous situation:

…

(2) As soon as practicable after being asked by an authorised officer or an officer of an emergency service, the prime contractor or the rail operator must:

(a) give to the officer the information that the officer requires about the vehicle's construction, properties and equipment; and

(b) provide the equipment and other resources necessary:

(i) to control the dangerous situation, and

(ii) to recover a vehicle involved in the situation or its equipment.

(3) If the prime contractor and the consignor, or the rail operator and the consignor, of the dangerous goods are asked to give the same information or provide the same resources for the incident, it is sufficient if the consignor gives the information or provides the resources.

Other Examples of Risk Management Measures required under the ADG Code and DG Regulations

Other examples of requirements set out in the ADG Code and DG Regulations required to be implemented by the material supplier or transport provider for the transportation of dangerous goods/hazardous materials include:

- dangerous goods must not be transported in a bulk container if the container is: constructed of material which is incompatible with the goods; or leaking, defective or damaged so that it is not safe to transport the goods (ADG Code Clause 4.4.2.4);
- a bulk container which is transported on a vehicle must be restrained on the vehicle for road transport, in accordance with the Load Restraint Guide and for rail transport, as required under the relevant legislation or agreements concerning Rail Safety (ADG Code Chapter 8.2);
- a bulk container, other than multi-compartment tank, that contains dangerous goods in bulk must be placarded with Emergency Information Panels in accordance with ADG Code Chapter 5.3.1.3;
- a road vehicle transporting a placard load dangerous goods in accordance with Table 5.3 of must be placarded in accordance with ADG Code Chapter 5.3;
- a vehicle used to transport dangerous goods: must be suitable for transporting the goods; and must be free of any defect that is likely to create a risk in transporting the goods (ADG Code Clause 4.4.1);
- dangerous goods must not be transported on the same vehicle with incompatible goods unless the dangerous goods and the incompatible goods: are segregated in accordance with the ADG Code; or are otherwise allowed under the ADG Code to be transported together, in accordance with ADG Code Chapter 9.1.1;
- an emergency information holder must be securely placed on a road vehicle in accordance with ADG Code Clause 11.2.2;
- requirements for safety equipment including personal protective equipment which a driver of a road vehicle transporting a placard load of dangerous goods will be provided; and the safety equipment with which a road vehicle used in the transport of a placard load of dangerous goods will be equipped (ADG Code Clause 12.1.1);
- a road vehicle transporting a placard load of dangerous goods must be equipped with a fire extinguisher or fire extinguishers in accordance with ADG Code Table 12.1 (Table B-2 of this Appendix B to the HMMP);
- Drivers transporting dangerous goods by road in bulk are required to be appropriately licensed to drive the vehicle under Part 18 of the DG Regulations.
- Vehicles transporting dangerous goods by road in bulk are required to be licensed to transport the goods under Part 18 of the DG Regulations.
- Those undertaking any task involved in the transport of dangerous goods by road (e.g. driving a vehicle transporting dangerous goods; loading dangerous goods into or onto a vehicle, or into a container to be put in or on a vehicle; unloading dangerous goods) are required to be appropriately instructed and trained under Part 1 Division 3 of the DG Regulations.

- The prime contractor and driver of a vehicle transporting dangerous goods by road that is involved in an incident resulting in a dangerous situation are required to tell the Competent Authority about the incident and give the Competent Authority a written report about the incident in accordance with Part 14 of the DG Regulations.
- Vehicles transporting hazardous materials to the approved CGO are required to carry appropriate communication devices (such as a radio or telephone).