

T4.01 | Interim Waste Management Plan





Interim Waste Management Plan

Kevin's Corner Project

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Prepared for
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Table of Contents

1 Introduction	1
1.1 Outline	1
1.2 Background	1
2 Assessment Approach	2
2.1 Overview	2
2.2 Assessment Approach	2
3 Existing Regional Waste and Recycling Infrastructure and Services	3
3.1 Overview	3
3.2 Landfills and Waste Transfer Stations	3
3.3 Sewage Treatment Works	5
3.4 Recycling Services	6
3.5 Regulated Waste Services	7
3.6 Collection Services	7
4 Interim Waste Management Plan	8
4.1 Overview	8
4.2 Assessment of Waste Management Options	8
4.3 Interim Waste Management Plan	8
4.3.1 On-site Infrastructure and Services	9
4.3.2 Preferred Waste Management Strategy	9
5 Limitations	13

Tables

Table 3-1	Summary of relevant permits for waste storage and disposal	4
Table 3-2	Summary of relevant permits for sewage treatment	6
Table 4-1	Summary of interim waste management plan	11

Figures

Figure 4-1	Preferred waste management hierarchy	8
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Appendices

Appendix A	Construction Waste Management Options
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Abbreviations

Abbreviation	Description
DEHP	Department of Environment and Heritage Protection, Queensland Government
EIS	Environmental Impact Statement
EP	Equivalent Persons
HGPL	Hancock Galilee Pty Ltd
IWMP	Interim Waste Management Plan
km	kilometre
L	Litres
Mtpa	Million tonnes per annum
SEIS	Supplementary Environmental Impact Statement
STP	Sewage Treatment Plant
t	tonnes
URS	URS Australia Pty Ltd

Introduction

1.1 Outline

Hancock Galilee Pty Ltd (HGPL) engaged URS Australia Pty Ltd (URS) to investigate management pathways for general and regulated waste streams generated during early works and construction of the Kevin's Corner Project (the Project) prior to the development of an on-site landfill.

This Interim Waste Management Plan (IWMP) was developed to further refine details of management strategies (such as service providers, transport arrangements, end destinations) for waste streams generated from construction of the Project given the availability and constraints of existing waste management infrastructure and services in the region.

The IWMP is intended to address the issues raised by project submitters regarding the availability of adequate waste services and infrastructure capacity in the region to accommodate the types and volumes of waste generated from the Project during the initial construction period.

1.2 Background

The Project aims to develop an integrated open-cut and underground long-wall coal mine with nominal production of up to 30 million tonnes per annum (Mtpa) of product coal over a 30 year period within the Galilee Basin, Queensland. The mining lease is located 65 kilometres (km) north of the town of Alpha, 110 km south-west of the town of Clermont and approximately 340 km south-west of Mackay in Central Queensland.

Project development is planned to commence in early 2014 with first production in early 2016, with construction to continue beyond the initial 24 month period for up to nine years. It is anticipated that the Project will employ up to 2,500 personnel during peak construction and a permanent workforce of approximately 1,500 personnel to operate the mine, with periodic additions up to 2,000 people.

The Kevin's Corner Environmental Impact Statement (EIS) (HGPL 2011) identifies and describes waste streams and management practices to be implemented to minimise the impacts of waste generation and disposal during the construction, operation and decommissioning phases of the Project (based on planning and design documentation available at the time of the assessment). Preliminary estimates of construction waste types and volumes are presented in Table 16-1 of the General Waste Section of the EIS (HGPL 2011).

The Project waste management strategy adopts the preferred waste management hierarchy set out in the *Environmental Protection (Waste Management) Regulation 2000* and aims to maximise waste segregation for beneficial reuse and recycling and minimise volumes of residual waste for disposal to landfill, as far as practical. Residual waste will be diverted to an on-site landfill once operational.

The EIS (HGPL 2011) estimated that, during the initial stages of the Project development, approximately 25,000 tonnes of waste will require disposal at regional landfills (such as Alpha or Emerald). Submitters raised concerns regarding the capacity and availability of sufficient infrastructure and services in the region to manage these wastes.

This IWMP responds to submitters' concerns by providing clarification on the interim waste management strategy for the Project in consultation with regional councils, waste service providers, contractors and other key stakeholders such as Queensland Department of Environment and Heritage Protection (DEHP).

Assessment Approach

2.1 Overview

The scope of works agreed with HGPL are summarised as follows and are addressed in this report.

- Consult with DEHP, regional councils and local waste service providers on waste and recycling infrastructure and services, relevant approval conditions and available capacity.
- Update waste streams and estimated volumes in Table 16-1 of the EIS (HGPL, 2011) based on new information that may be available.
- Identify management options for waste streams (such as service provider/s, transport arrangements, end destinations), including opportunities to integrate or enhance regional waste and recycling services.
- Develop interim waste management plan and make recommendation for preferred waste management of each waste stream.

This scope of work has been designed to develop a better understanding of the availability, condition and capacity of waste and recycling infrastructure and services in the region. These constraints can then be taken into account in planning an effective interim waste management plan for construction waste streams generated prior to development of the on-site landfill.

2.2 Assessment Approach

The waste impact assessment completed as part of the EIS process described likely sources, quantities and options for management of general waste generated during construction, operation and decommissioning phases of the Project, on the basis of planning and design documentation available at the time of the assessment.

The construction waste inventory for the initial construction period (estimated between 24 and 30 months) presented in Table 16-1 of the General Waste Section of the EIS (HGPL 2011) was adopted as the foundation for further assessment. This inventory was updated considering recent changes to the Project description or proposed in response to issues raised by submitters, as detailed in the SEIS (Volume 1). Wastes generated off-site in the region associated are not considered in this assessment.

In addition to URS expertise in the Project area and a thorough review of information available online, the following organisations were consulted to inform this assessment.

- Queensland DEHP;
- Barcardine Regional Council;
- Central Highlands Regional Council;
- JJ Richards and Sons Pty Ltd; and
- CQ Compost.

Consultation sought feedback on the waste and recycling infrastructure and services in the region, constraints (such as relevant conditions of approval and available capacity), and opportunities to enhance services (such as improve diversion from landfill).

Generally, communications with representatives of the above organisation were ad hoc, occurring as informal discussions; therefore the views presented do not necessarily represent the Company's policy or future direction. Detailed planning will be required and contractual arrangements agreed on a case by case basis to secure waste management outcomes for the Project.

Taking into account the preferred waste management hierarchy and the constraints on regional waste and recycling infrastructure and services, a range of management options were identified for each waste stream expected to be generated during construction. Subsequently, an interim waste management plan was developed for the Project.

Existing Regional Waste and Recycling Infrastructure and Services

3.1 Overview

In addition to general waste landfill proposed to be developed at the Project site (timing to be confirmed) and at the adjacent Alpha Coal Project (timing to be confirmed), a number of general, recyclable and regulated waste facilities and services were identified in the region. For the identified waste infrastructure and services, broad consideration was given to the design standard, operational control, reliability, practicality, environmental performance and record keeping as well as the ability to accommodate new waste streams and control potential environmental impacts in the future.

3.2 Landfills and Waste Transfer Stations

Generally, waste management assets in the region have been established by councils to service isolated rural communities. These waste disposal sites are generally not engineered facilities but unlined areas with limited, if any, leachate or landfill gas management systems. At landfills, the open tip face is accessible for disposal of general solid waste. Both landfill and transfer stations provide facilities (either designated stockpiles or bulk storage containers) for collection of recoverable and regulated waste streams for processing or disposal off-site. Often sites are unmanned; however, councils conduct regular inspection and maintenance activities to ensure the applicable rules and regulations for use of these facilities are complied with. These facilities may be closed during wet weather.

Barcaldine Regional Council currently operates three open tip faces, incorporating industrial dump sites. These locations and approximate distances from the Project site include Alpha (approximately 75 km), Jericho (approximately 100 km) and Barcaldine (approximately 200 km). These sites are uncontrolled (unmanned); however are regularly inspected. Sites are provided for collection of source separated green waste/timber, scrap metal, concrete/ bricks, paper and cardboard for reprocessing off-site. Facilities are not currently in place for accounting for waste tonnes and calculating fees, therefore gate fees do not apply.

Central Highlands Regional Council currently operates a number of landfills and waste transfer stations (WTS) in the region. The following locations accept commercial and industrial construction and demolition waste. The approximate distances from the Project site are provided next to each facility description.

- Sapphire Rubyvale (Gemfields) Landfill (approximately 200 km);
- Emerald WTS (approximately 220 km);
- Emerald Landfill (Lochlees) (approximately 250 km);
- Springsure landfill (approximately 280 km);
- Blackwater landfill (approximately 300 km);
- Rolleston landfill (approximately 360 km); and
- Tieri WTS and landfill (approximately 300 km).

At Central Highlands Regional Council facilities, refuse fees and State Government waste levies apply for waste for final disposal to landfill. However, facilities are provided to encourage source separation of clean green waste, timber, steel, batteries, engine oil, concrete/bricks and commingled recyclables for reprocessing.

A summary of permit details of the general waste disposal facilities in the region are provided in Table 3-1; however minor waste disposal facilities have not been listed for the purposes of this assessment.

3 Existing Regional Waste and Recycling Infrastructure and Services

Table 3-1 Summary of relevant permits for waste storage and disposal

Operator	Location	Environmentally relevant activity	Threshold
Central Highlands Regional Council	Gemfields, Rubyvale-Sapphire Road	ERA 60 Waste disposal	2(b) operating a facility for disposing of, in a year, more than 2,000 t to 5,000 t of only general waste and any combination of limited regulated waste that is no more than 10% of the total amount of waste received at the facility or – if the facility is in a scheduled area – no more than 5 t of untreated clinical waste
	Emerald, Glasson Street	ERA 56 Regulated waste storage	2 operating a facility for receiving and storing regulated waste other than tyres
	Emerald, Lochlees Road	ERA 56 Regulated waste storage	1 operating a facility for receiving and storing 5 t or more or 500 or more equivalent passenger units, of tyres or parts of tyres
	Emerald, Lochlees Road	ERA 60 Waste disposal	2(d) operating a facility for disposing of, in a year, more than 10,000 t to 20,000 t of only general waste or general waste and any of any combination of limited regulated waste that is no more than 10% of the total amount of waste received at the facility or – if the facility is in a scheduled area – no more than 5 t of untreated clinical waste
	Springsure, Tambo Road	ERA 60 Waste disposal	1(a) operating a facility for disposing of, in a year, less than 50,000 t of regulated waste or regulated waste and any, or any combination of general waste; limited regulated waste or if the facility is in a scheduled area – no more than 5 t of untreated clinical waste
			2(b) operating a facility for disposing of, in a year, more than 2,000 t to 5,000 t of only general waste and any combination of limited regulated waste that is no more than 10% of the total amount of waste received at the facility or – if the facility is in a scheduled area – no more than 5 t of untreated clinical waste
	Blackwater, Ardurad Road	ERA 60 Waste disposal	2(b) operating a facility for disposing of, in a year, more than 2,000 t to 5,000 t of only general waste and any combination of limited regulated waste that is no more than 10% of the total amount of waste received at the facility or – if the facility is in a scheduled area – no more than 5 t of untreated clinical waste
	Rolleston, western side of Rolleston	ERA 60 Waste disposal	1(a) operating a facility for disposing of, in a year, less than 50,000 t of regulated waste or regulated waste and any, or any combination of general waste; limited regulated waste or if the facility is in a scheduled area – no more than 5 t of untreated clinical waste
			2(b) operating a facility for disposing of, in a year, more than 2,000 t to 5,000 t of only general waste and any combination of limited regulated waste that is no more than 10% of the total amount of waste received at the facility or – if the facility is in a scheduled area – no more than 5 t of untreated clinical waste
Tieri, Crinum Road	ERA 60 Waste disposal	2(b) operating a facility for disposing of, in a year, more than 2,000 t to 5,000 t of only general waste and any combination of limited regulated waste that is no more than 10% of the total amount of waste received at the facility or – if the facility is in a scheduled area – no more than 5 t of untreated clinical waste	

3 Existing Regional Waste and Recycling Infrastructure and Services

Operator	Location	Environmentally relevant activity	Threshold
Barcaldine Regional Council	Jericho, Furbers Road	ERA 60 Waste disposal	2(b) operating a facility for disposing of, in a year, more than 2,000 t to 5,000 t of only general waste and any combination of limited regulated waste that is no more than 10% of the total amount of waste received at the facility or – if the facility is in a scheduled area – no more than 5 t of untreated clinical waste
	Jericho, Aramac Road		2(c) operating a facility for disposing of, in a year, more than 500 t to 10,000 t of waste of any, or any combination of regulated waste; general waste; limited regulated waste; if the facility is in a scheduled area – no more than 5 t of untreated clinical waste
	Barcaldine	ERA 60 Waste disposal	2(c) operating a facility for disposing of, in a year, more than 500 t to 10,000 t of waste of any, or any combination of regulated waste; general waste; limited regulated waste; if the facility is in a scheduled area – no more than 5 t of untreated clinical waste

There is limited landfill capacity (less than two years at current fill rates) remaining at primary waste disposal facilities in the region.

- Central Highlands Regional Council waste acceptance rates were reported to be just below the licensed acceptance rates and Council is currently considering alternative sites for development of a large regional waste disposal facility.
- Barcaldine Regional Council facilities are capable of taking only local residential waste. Barcaldine Regional Council is understood to be looking to other councils (such as Longreach, Blackwater, etc.) to establish a joint waste initiative to develop a regional facility to accommodate future waste disposal needs.

Councils are actively looking for cost effective solutions to maximise diversion from landfill and operational efficiencies to improve management of recoverable waste streams such as construction and demolition waste (large stockpiles on-site) and tyres (more than 220,000 stored on-site).

There may be opportunities to find operational efficiencies through collaboration with other mine site developments in the region.

3.3 Sewage Treatment Works

Larger sewage treatment works in the region are operated by Barcaldine Regional Council at Barcaldine and Central Highlands Regional Council at Emerald, Blackwater and Tieri. Small sewage treatment works (< 4000 EP) in the region were not considered to be sufficient capacity for the purposes of this assessment. A summary of permit details of the relevant sewage treatment facilities is provided in Table 3-2.

3 Existing Regional Waste and Recycling Infrastructure and Services

Table 3-2 Summary of relevant permits for sewage treatment

Operator	Location	Environmentally relevant activity	Threshold
Central Highlands Regional Council	Emerald, Park Avenue	ERA 63 Sewage treatment	2(e) operating sewage treatment works, other than no release works, with a total daily peak design capacity of more than 10,000 to 50,000 EP
	Blackwater, Cooroorah Road	ERA 63 Sewage treatment	2(d) operating sewage treatment works, other than no release works, with total daily peak design capacity of 4,000 to 10,000 EP
	Tieri, North Road	ERA 63 Sewage treatment	2(d) operating sewage treatment works, other than no release works, with total daily peak design capacity of 4,000 to 10,000 EP
Barcaldine Regional Council	Barcaldine, Bauhinia Street	ERA 63 Sewage treatment	2(d) operating sewage treatment works, other than no release works, with total daily peak design capacity of 4,000 to 10,000 EP

Representatives from Regional Councils reported that these sewage treatment facilities are basic services for the local community and currently operate at or close to maximum capacity, particularly during recent periods of elevated rainfall.

3.4 Recycling Services

The following regional recycling services were identified as part of this assessment.

- JJ Richards operate a Materials Recycling Facility (MRF) located at Clermont and Emerald. Currently, recyclable materials from mine sites in the area are taken to the MRF for initial processing, typically involving segregation, crushing and baling for transport to various companies in Queensland for recycling. JJ Richards are permitted to conduct
 - ERA 8(3)(a) Chemical storage – storing the following quantity of chemicals of class C1 and C2 combustible liquids under AS1940 or dangerous goods class 3 under subsection (1)(c)-(a) 10 m³ to 500 m³;
 - ERA 62 Waste transfer station; and
 - ERA 56(2) Regulated waste storage – receiving and storing regulated waste other than tyres.
 JJ Richards reported that there is currently capacity to expand the collection and recycling services
- JJ Richards also collect waste timber, grease trap, septic and sludge for composting.
- CQ Compost accept food waste, vegetation, non-treated timber, food waste, wash-down water, grease trap waste, septic and bio-solids (dewatered sewage sludge) for composting. CQ Compost is currently in the process of applying to update permit limits to process up to 50,000 t solids per annum and 100,000,000 L liquid per annum and accept drilling mud and coal dust.
- Emerald Green Waste Collection provides a service out of Emerald for the collection and re-use of primarily domestic green waste.
- SITA offer paper and cardboard collection and recycling services, subject to contract.
- Veolia and SIMS Recycling are also looking to establish competitive contract services for collection and recycling in the region.
- SIMS Recycling indicated that services could be arranged for collection and recycling of scrap metal for processing from yards at Mackay or Gladstone.

3 Existing Regional Waste and Recycling Infrastructure and Services

3.5 Regulated Waste Services

- North Queensland Resources Recovery (NQRR) facilities located in Mackay, Townsville and Cairns accept regulated waste materials for processing and disposal.
- Transpacific International offer regulated waste collection and processing services for regulated waste, either 1.5 m³ skip bins or bulk pump-out can be arranged. Options also offered for oily waste waters, sewage, etc. Assistance can also be arranged for tyre sorting and pre-processing.
- ChemClear can be contracted to collect bulk stores of regulated waste for processing and disposal.
- Drum musters are held periodically at Rolleston and Springsure landfills, contact 1300 242 686 for future schedule.

Given the significant transportation distance in the region, efficient and effective recycling and regulated waste services in the region rely on bulk service contracts; this may be achieved through bulk storage, pre-treatment (such as compaction or baling) or collaboration with other mines or councils.

It is recommended that HGPL confirm that the service provider is licensed to accept the waste types and volumes for collection, recycling, treatment and/or disposal prior to establishing service contracts.

3.6 Collection Services

Presently, Barcaldine Regional Council and Central Highlands Regional Council provide domestic waste and recycling collection services only.

JJ Richards is recognised as the primary commercial waste service provider in the region. It is understood that JJ Richards can provide waste and recycling collection services out of Emerald. As a large commercial company it is reported to be able to accommodate large commercial waste contracts and currently provides such services for a number of mines in the region. JJ Richards utilise a number of licensed landfill operations in the Bowen Basin and charge nominal rates for the disposal of general wastes and individual fees for contaminated and/or regulated wastes.

There are multiple trucking companies (such as Anwest, DA Busst and DP & S Smith) operating in the area that advertises the carting of waste; however, limited information is available regarding capacity and capability.

Given the significant transportation distance in the region, efficient and effective recycling and regulated waste services in the region rely on bulk service contracts; this may be achieved through bulk storage, pre-treatment (such as compaction or baling) or collaboration with other mines or councils.

It is recommended that HGPL confirm that each service provider is licensed to accept the specific waste types and volumes for collection, recycling, treatment and/or disposal prior to establishing service contracts.

Interim Waste Management Plan

4.1 Overview

This IWMP aims to manage construction waste generated during early works at the Kevin's Corner Project taking into account the available waste and recycling infrastructure and services in the region (discussed in Section 3) and the preferred waste management hierarchy (shown in Figure 4-1 **Error! Reference source not found.**).

Figure 4-1 Preferred waste management hierarchy



Based on available information, it is anticipated that early works will generate the following waste streams to be managed through this IWMP.

- Cleared vegetation (approximately 90% of total waste generated during early works);
- General waste, including putrescible waste (such as food waste) and non-putrescible waste (such as soft plastic packaging or contaminated materials);
- Reusable or recyclable materials (such as cardboard, wood pallets, scrap metal);
- Regulated wastes such as waste oil and oily wastes, sewage sludge, redundant chemicals, engine coolant, solvents, batteries and tyres; and
- Sewage effluent.

4.2 Assessment of Waste Management Options

For each waste stream expected to be generated during early works and construction, options for segregation, storage and reuse, transport, recycling and disposal have been identified. These options take into account the preferred waste management hierarchy (avoidance and reduction, reuse and recycling before treatment and final disposal) and practical availability of suitable infrastructure and services.

A comprehensive review of management options for each waste stream is presented in Appendix A. On this basis, the preferred waste management strategy was defined as described in Section 4.3.

4.3 Interim Waste Management Plan

As far as practical, waste streams will be source separated for reuse, recycling or reprocessing and diversion from landfill; however some minor quantities of residual waste will require landfill disposal.

4 Interim Waste Management Plan

Given the existing constraints on regional landfills and sewage treatment works, on-site facilities described in Section 4.3.1, including an engineered landfill, will be developed with priority to maximise on-site waste management opportunities during early works. However while these facilities are established, within the first 3-6 months of commencing early works, there may be a need to divert minor quantities to regional facilities.

Where on-site management is not feasible, suitable commercial contracts will be established with licensed operators for transport and processing of waste off-site. Operational efficiencies will be sought to overcome the regional constraints of transporting materials over large distances, through provision for bulk collection, storage and service contracts and collaboration with regional partners, such as councils or other mines.

4.3.1 On-site Infrastructure and Services

On-site waste and recycling infrastructure and services to be developed with priority, i.e. within 3-6 months of commencing early works, include:

- appropriate waste management area, providing for adequate bulk containment of source separated waste materials, including recyclable and regulated wastes;
- engineered landfill for disposal of residual general waste;
- shredder/grinder for chipping and mulching green waste and waste timber processing;
- package composting facility for processing green waste, waste timber, food waste and dewatered sewage sludge;
- crushing facility for recycling concrete and brick into road base material;
- compactor and baler for pre-treatment of cardboard to maximise transport efficiency; and
- package sewage treatment plant (STP) and sludge dewatering facility.

Appropriate environmental authorities and approvals (such as construction certificates) would be sought prior to development and operation of on-site facilities.

4.3.2 Preferred Waste Management Strategy

Green Waste

During early works, the large majority of waste (approximately 90%) is green waste generated from land clearing activities. Suitable vegetation will be reused to provide fauna habitat on-site, before green waste is shredded and chipped for reuse in rehabilitation, with the remainder stored for use in on-site composting operations. The on-site landfill will be licensed to accept surplus green waste, which may be generated later in the Project life. Accordingly, no green wastes are expected to be disposed off-site. The on-site landfill will be managed according to the site Landfill Design and Environmental Management Plan (SEIS, Volume 2, Appendix T4.06) and Proposed Environmental Authority Conditions (SEIS, Volume 2, Appendix T1, Environmental Management Plan).

The remaining wastes comprise general waste (putrescible, recyclable or residual) and regulated waste streams.

4 Interim Waste Management Plan

General Waste

Of the remaining waste stream, approximately 40% is putrescible waste (such as waste timber, food waste and sewage sludge) and will also feed into composting operations to produce a soil conditioner for reuse on-site.

It is the intent that both recyclable materials, which make up approximately 10% of the remaining waste stream, are diverted from landfill, with only the residual waste diverted to the on-site landfill once operational.

Recyclable materials (such as paper, cardboard, aluminium cans and plastic containers) are expected to be collected in a commingled system and diverted from the landfill. HGPL expects to generate the economies of scale to promote recycling in the area and divert these wastes from landfill.

Dedicated bulk recycling services can also be set up with approved operators for collection and recycling of scrap metals and cardboard.

Building Waste

Approximately 6% of the remaining waste consists of concrete and brick wastes generated from building activities. These wastes will be crushed on-site in the crushing facility and reused for road base material, or alternatively, used as clean fill on-site.

Regulated Waste

Regulated wastes generated on-site (such as tyres, waste oil, hydrocarbon-contaminated materials, solvents, sealers, resins, paints and grease trap waste) make up almost 40% of the remaining waste stream and can be collected for processing off-site. The majority of the regulated waste stream is waste oil or hydrocarbon contaminated materials that can be recycled by an approved waste oil recycler. Regulated wastes shall be managed (handled, transported, treated and disposed) by appropriately licensed waste service providers in accordance with regulatory requirements.

Sewage Sludge

Sewage will be managed on-site by a package sewage treatment plant. Recycled water will be treated to Class A+ standard. Treated water and organic sludge will be managed in accordance with Mine Water Management (SEIS, Volume 2, Appendix T4.12) and Sewage Treatment Management (SEIS, Volume 2, Appendix T4.10) Plans, and Proposed Environmental Authority Conditions (SEIS, Volume 2, Appendix T1, Environmental Management Plan).

Requirements for Off-site Waste Disposal

While the proposed on-site facilities are established, there may be an interim period of 3-6 months that necessitates off-site disposal solutions for up to 4,000 tonnes of food waste and dewatered sludge.

Potential options to be considered for interim management of food waste, subject to agreement, include:

- disposal to regional council landfill;
- processing of CQ Compost for in commercial composting operations; or
- disposal to other suitable facilities (e.g. Mackay or Rockhampton).

4 Interim Waste Management Plan

Potential options to be considered for interim management of dewatered sludge, subject to agreement, include:

- treatment at regional council' sewage treatment works;
- processing in CQ Compost commercial composting operations; or
- treatment at other suitable facilities (e.g. Mackay or Rockhampton).

Appropriate bulk waste containment will be prepared for collection and storage of wastes generated from the commencement of early works, prior to development of the on-site landfill. Planning and implementation of these waste management strategies will be subject to agreement of suitable contractual arrangements with relevant service providers.

A summary of the preferred management strategy for waste streams generated during the construction period is presented in Table 4-1.

Table 4-1 Summary of interim waste management plan

Waste	Estimated Quantity	Units	Proposed Management Strategy
Green waste	390,000	tonnes	Source segregate in designated storage area. Suitable material to be reused on-site to provide fauna habitat; or shredded for reuse in progressive rehabilitation on-site; or stockpile shredded material, and once package composting plant is established, use as feedstock to produce soil conditioner for reuse on-site.
Processed wood products	3,000	tonnes	Stockpiled in designated storage area for reuse on-site; or shred for reuse in progressive rehabilitation on-site; or stockpile shredded material, and once package composting plant is established, use as feedstock to produce soil conditioner for reuse on-site. Contaminated material stockpiled for disposal to on-site landfill once operational.
General waste	18,000	tonnes	Contain in covered bins for collection at least twice weekly. Prior to development of on-site composting and landfill facilities, off-site processing or disposal option to be set up for general waste. Once on-site facilities are established, provide for source separation of food waste and other non-recyclable general waste. Food wastes to be used as feedstock to produce soil conditioner for reuse on-site. Other general waste to be disposed to on-site landfill.
Sewage effluent	up to 750	kL/day	Treat on-site in package STP to Class A+ quality suitable for re-use on site.
Sewage sludge	up to 1.5	t/day	Dewater on-site in package STP. Prior to on-site facilities being operational, off-site processing or disposal option to be set up. Once package composting plant is established, use as feedstock to produce soil conditioner for reuse on-site.
Concrete and bricks	3,000	tonnes	Concrete and brick (uncontaminated) to be stockpiled in designated storage area for reuse as clean fill on-site or crushed for road base, once crushing facility set up. Contaminated material stockpiled for disposal to on-site landfill once operational.
Metals	900	tonnes	Source-separate and collect in bulk for removal by a licensed operator for recycling. Contaminated material stockpiled for disposal to on-site landfill once operational.
Cardboard and paper	2,500	tonnes	Source-separate, compact and bale clean cardboard for transport by licensed contractor for recycling. Paper to be collected as part of commingled recycling service, or alternative paper recycling set up. Contaminated material stockpiled for disposal to on-site landfill once operational.

4 Interim Waste Management Plan

Waste	Estimated Quantity	Units	Proposed Management Strategy
Glass	260	tonnes	If service contract for commingled recycling is not established, glass to be disposed to on-site landfill.
Plastic	800	tonnes	If service contract for commingled recycling is not established, plastic to be disposed to on-site landfill.
Electrical wastes	1,000	tonnes	Collect in appropriate bulk storage container for removal by licensed contractor for recycling and disposal, subject to suitable contract.
Printer cartridges	Minimal		Source segregate into appropriate container for bulk storage of used or empty laser and inkjet printer cartridges in administration areas for bulk transport to Planet Ark collection points in Barcaldine for recycling.
Oils	9,000	tonnes	Provide appropriate bunded containment with pneumatic pumps for bulk storage and collection by a licensed contractor for recycling, subject to suitable contract.
Grease trap waste	10	tonnes	Waste grease to be collected in a bunded storage container for removal and treatment by licensed contractor, subject to suitable contract.
Sealers, resins, solvents, paints	2	tonnes	Collect containers in designated bunded storage area for bulk transport by licensed contractor to North Queensland Resource Recovery or other licensed facility for reprocessing and disposal, subject to suitable contract.
Other regulated wastes	9,000	tonnes	Collect in designated bunded storage area for bulk collection and treatment by licensed contractor at North Queensland Resource Recovery or other licensed facility, subject to suitable contract.
Drums	20	tonnes	Empty drums to be stored in a covered, secure bunded area for collection by licensed contractor for recycling, subject to suitable contract.
Batteries	60	tonnes	Provide bunded and covered containment for source-separated storage for bulk collection and treatment by licensed contractor at North Queensland Resource Recovery or other licensed facility, subject to suitable contract.
Tyres	1,500	tonnes	Storage and disposal of tyres on-site in accordance with operational policy for storage and disposal of scrap tyres at mine sites, with the exception of storage up to four tyres high or 3 m whichever is greater.
Explosives	0	tonnes	Explosive materials to be stored for collection and disposal by Orica Mining Services in line with AS2187.2-2006 - Explosives Storage, Transport and Use, Part 2, Use of Explosives. Waste explosive materials may be detonated/ burnt by emergency response officers. Subject to suitable contract, steel casing may be collected for recycling.
Asbestos	0	tonnes	Asbestos to be collected in secure storage container for removal by specialist contractor and disposal off-site.

Limitations

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It is prepared in accordance with the scope of work and for the purpose outlined in the contract dated 27 March 2012.

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Any estimates of potential costs which have been provided are presented as estimates only as at the date of the Report. Any cost estimates that have been provided may therefore vary from actual costs at the time of expenditure.

Appendix A Construction Waste Management Options

Appendix A - Construction Waste Management Options

Table Appendix A-1 Review of construction waste management options by waste stream

Waste	Source	Estimated Quantity	Units	Options			
				Segregation, reuse	Transport	Recycling	Disposal
Green waste	Vegetation clearing during construction of mine and associated industrial facilities and amenities.	390,000	tonnes	Suitable material may be used on-site to provide fauna habitat. Remaining material may be stockpiled for processing (chip and mulch) for reuse during erosion and sediment control, progressive rehabilitation and revegetation.	It is not expected that green waste will need to be transported off-site. However, if required, Emerald Green Waste Collection provides a service out of Emerald for the collection and re-use of green waste. There may also be opportunities to backfill heavy vehicles making deliveries for Project start-up.	Shredder and package composting facility to be established on-site for processing green waste for reuse as soil conditioner. Alternatively, CQ Compost or Emerald Green Waste Collection provides a service for recycling of green waste. Green waste is accepted at landfills operated by Central Highlands Regional Councils and Barcaldine Shire Council where it is shredded and distributed for reuse.	Burning of green wastes may only occur as a last resort, subject to obtaining necessary permits and approvals.
Concrete and bricks	Waste from new construction activities (e.g. ROM, OLC external MIAs and rail sleepers), airstrip, access and circulating roadways and car parking areas.	3,000	tonnes	Concrete and brick (uncontaminated) can be stockpiled in designated storage areas for reuse, either as clean fill or crushed for road base. Contaminated material can be stockpiled in appropriate containment area for disposal to landfill.	It is not expected that green waste will need to be transported off-site. However, if required, JJ Richards can provide a service out of Emerald. There are multiple trucking companies (Anwest, DA Busst, DP & S Smith) around the area that advertise the carting of waste.	Crushing facility to be established on-site for processing uncontaminated concrete and bricks for reuse in road base. Alternatively, JJ Richards provide commercial and industrial recycling of concrete and bricks, subject to suitable contract.	Contaminated concrete and brick can be disposed to on-site landfill once operational. Alternatively, contaminated concrete and bricks are accepted at landfills operated by Central Highlands Regional Council and Barcaldine Shire Council, subject to fees and levy; however limited capacity remaining. No privately operated landfills were identified within the region.
Processed wood products	Waste from new construction activities or temporary structures.	3,000	tonnes	Stockpiled in designated storage area for reuse on-site. Remaining material may be stockpiled for processing (chip and mulch) for reuse during erosion and sediment control, progressive rehabilitation and revegetation.	It is not expected that green waste will need to be transported off-site. However, if required, JJ Richards can provide a service out of Emerald. There are multiple trucking companies (Anwest, DA Busst, DP & S Smith) around the area that advertise the carting of waste.	Shredder and package composting facility to be established on-site for processing waste timber for reuse as soil conditioner. Alternatively, commercial services for the collection and re-use of waste timber exist in the area, subject to contract. Uncontaminated timber is accepted at landfills operated by Central Highlands Regional Councils and Barcaldine Shire Council for shredding (as needs basis).	Contaminated process wood waste can be disposed to on-site landfill once operational. Alternatively, contaminated wood products are accepted at landfills operated by Central Highlands Regional Council and Barcaldine Shire Council, subject to fees and levy; however limited capacity remaining. No privately operated landfills were identified within the region.
Waste electrical and electronic equipment (WEEE)	Waste from new construction activities or temporary structures.	1,000	tonnes	Collect in appropriate bulk containment (covered area) for removal by licensed contractor for reuse, reprocessing or final disposal.	Multiple waste service providers and trucking can provide licensed waste transport services.	Set up collection and recycling service with licensed recycling operator – e.g. SIMS offers reprocessing and recycling services subject to contract. No recycling facilities in close proximity.	It is not preferable to dispose of WEEE to landfill.
Sealers, resins, solvents and paints	Waste from new construction activities.	2	tonnes	Source separate regulated waste in appropriate bulk containment (covered, banded) for storage for removal by licensed contractor for reuse, reprocessing or final disposal off-site. Regulated wastes will be tracked via an approved waste tracking system.	Multiple waste service providers and trucking can provide licensed waste transport services.	Set up collection and recycling service with licensed recycling operator – e.g. North Queensland Resource Recovery accepts regulated waste for reprocessing and disposal. No recycling facilities in close proximity.	It is not preferable to dispose of regulated waste to landfill.

Appendix A - Construction Waste Management Options

Waste	Source	Estimated Quantity	Units	Options			
				Segregation, reuse	Transport	Recycling	Disposal
Metals	Waste from new construction activities or temporary structures.	900	tonnes	Metals to be source-separated and collected in bulk for removal by a licensed operator for recycling off-site. JJ Richards can provide bins for collection of metals for recycling on-site.	Multiple waste service providers and trucking can provide licensed waste transport services.	Set up collection and recycling service with licensed recycling operator – e.g. JJ Richards, SIMS or Veolia may offer recycling services subject to contract. Barcaldine and Central Highlands Regional Councils provide areas for storage of source separated scrap metal at their landfills for recycling off-site.	Contaminated metals can be disposed to on-site landfill once operational. Alternatively, commercial waste disposal to landfills operated by Central Highlands Regional Council and Barcaldine Shire Council, subject to fees and levy; however limited capacity remaining. No privately operated landfills were identified within the region.
Plastic	Waste from new construction activities or from offices, crib rooms or accommodation.	800	tonnes	Plastic containers to be collected as part of commingled recycling stream for collection and recycling off-site. Other soft plastics or contaminated material to be collected with general waste for disposal.	Multiple waste service providers and trucking can provide licensed waste transport services.	JJ Richards can provide commingled recycling collection services for standard 240 L wheelie bin or bulk storage for recycling at MRF at Clermont subject to contract.	Other soft plastics or contaminated material can be disposed to on-site landfill once operational. Alternatively, commercial waste disposal to landfills operated by Central Highlands Regional Council and Barcaldine Shire Council, subject to fees and levy; however limited capacity remaining. No privately operated landfills were identified within the region.
Paper and cardboard	Waste from new construction activities or from offices, crib rooms or accommodation.	2,500	tonnes	Segregate clean cardboard for collection and recycling off-site. Install compactor/baler to improve efficiency of transport and service contracts. Other paper and cardboard to be collected as part of commingled recycling stream for collection and recycling off-site. Contaminated material to be collected with general waste for disposal.	Multiple waste service providers and trucking can provide licensed waste transport services. Opportunities to backfill on heavy vehicles making deliveries of supplies for construction workforce accommodation.	JJ Richards and SITA can provide bins for paper and cardboard recycling subject to contract. JJ Richards can provide commingled recycling collection services for standard 240 L wheelie bin or bulk storage for recycling at MRF at Clermont subject to contract.	It is not preferable to dispose of paper and cardboard to landfill. Contaminated paper/card can be disposed to on-site landfill once operational. Alternatively, commercial waste disposal to landfills operated by Central Highlands Regional Council and Barcaldine Shire Council, subject to fees and levy; however limited capacity remaining. No privately operated landfills were identified within the region.
Glass	Waste from new construction activities or from offices, crib rooms or accommodation.	260	tonnes	Glass to be collected as part of commingled recycling stream for collection and recycling off-site. Non-recyclable glass to be collected with general waste for disposal.	Multiple waste service providers and trucking can provide licensed waste transport services.	JJ Richards can provide commingled recycling collection services for standard 240 L wheelie bin or bulk storage for recycling at MRF at Clermont subject to contract.	Non-recyclable glass can be disposed to on-site landfill once operational. Alternatively, commercial waste disposal to landfills operated by Central Highlands Regional Council and Barcaldine Shire Council, subject to fees and levy; however limited capacity remaining. No privately operated landfills were identified within the region.
General waste	Waste from offices, crib rooms or accommodation.	18,000	tonnes	General waste to be collected in covered containers for regular removal (at least twice per week). Source separation of food waste. Contaminated material to be collected with general waste for disposal.	JJ Richards can provide a service out of Emerald. There are multiple trucking companies (Anwest, DA Busst, DP & S Smith) around the area that advertise the carting of waste.	Shredder and package composting facility to be established on-site for processing food waste for reuse as soil conditioner. Alternatively, CQ Compost provides a service for composting food waste. No putrescible waste sorting was identified in the region.	Should it be required, general waste can be disposed to on-site landfill once operational. Alternatively, commercial waste disposal to landfills operated by Central Highlands Regional Council and Barcaldine Shire Council, subject to fees and levy; however limited capacity remaining. No privately operated landfills were identified within the region.

Appendix A - Construction Waste Management Options

Waste	Source	Estimated Quantity	Units	Options			
				Segregation, reuse	Transport	Recycling	Disposal
Batteries	Wet cell batteries from vehicles and dry cell batteries from phones, radios and other equipment.	60	tonnes	Source-separated and stored in appropriate bulk containment facilities for collection for off-site processing. Regulated wastes will be tracked via an approved waste tracking system.	JJ Richards can provide a service out of Emerald. There are multiple trucking companies (Anwest, DA Busst, DP & S Smith) around the area that advertise the carting of waste.	North Queensland Resource Recovery and SIMS accept batteries for reprocessing and disposal subject to suitable contract. It is noted that Barcaldine and Central Highlands Regional Councils provide areas for storage of source separated batteries at their landfills for recycling off-site.	Wet cell batteries cannot be disposed to landfill.
Printer cartridges	Administration buildings.	0	tonnes	Used or empty laser and inkjet printer cartridges to be source segregated and stored for bulk transport for off-site processing.	Multiple waste service providers and trucking can provide licensed waste transport services. Opportunities to backfill on vehicles making deliveries to site.	Planet Ark has pickup points in Barcaldine for the recycling of print cartridges.	It is not preferable to dispose of printer cartridges to landfill.
Oils	Routine servicing of plant, equipment and vehicles in workshop.	9,000	tonnes	Waste oil to be collected and stored in appropriate containment (bunded, covered) for transport by a licensed contractor for reuse, reprocessing, recycling or disposal off-site. Where possible, pneumatic pumps to be used to transfer waste oil from machinery to bunded storage. Regulated wastes will be tracked via an approved waste tracking system.	Multiple waste service providers and trucking can provide licensed waste transport services.	Commercial services such as SITA or North Queensland Resource Recovery will collect used oils that can be cleaned and reused, subject to suitable contract. It is noted that Barcaldine and Central Highlands Regional Councils provide areas for storage of source separated oils at their landfills for recycling off-site.	Waste oil cannot be disposed to landfill.
Grease trap waste	Accommodation village kitchen.	10	tonnes	Waste grease to be collected and stored in appropriate containment (bunded, covered) for transport by a licensed contractor for reuse, reprocessing, recycling or disposal off-site. Regulated wastes will be tracked via an approved waste tracking system.	Multiple waste service providers and trucking can provide licensed waste transport services.	Commercial services such as SITA or North Queensland Resource Recovery will collect used oils that can be cleaned and reused, subject to suitable contract. It is noted that Barcaldine and Central Highlands Regional Councils provide areas for storage of source separated oils at their landfills for recycling off-site.	It is not preferable to dispose of grease trap waste to landfill.
Other regulated waste (including hydrocarbon and hydrocarbon contamination)	Routine servicing of plant, equipment and vehicles in workshop. Demolition, maintenance or construction activities.	9,000	tonnes	Other regulated waste to be collected and stored in appropriate containment (bunded, covered) for transport by a licensed contractor for reuse, reprocessing, recycling or disposal off-site. Regulated wastes will be tracked via an approved waste tracking system.	Multiple waste service providers and trucking can provide licensed waste transport services.	Commercial services such as SITA or North Queensland Resource Recovery will collect used oils that can be cleaned and reused, subject to suitable contract. Chemclear may also accept waste for transport and disposal. It is noted that Barcaldine and Central Highlands Regional Councils provide areas for storage of source separated oils at their landfills for recycling off-site.	It is not preferable to dispose of regulated waste to landfill.
Drums	Small and bulk drums and other containers that typically contained oils and greases.	20	tonnes	Empty drums to be stored in a covered, secure bunded area for periodic collection by a licensed contractor for recycling.	Multiple waste service providers and trucking can provide licensed waste transport services.	JJ Richards and SITA provide services that will recycle used drums. Drum Muster is held at some regional landfills.	It is not preferable to dispose of empty drums to landfill.
Explosives (blasting residue from use of ANFO explosive, boosters and detonator)	Defective explosives or packaging.	0	tonnes	Explosive materials are to be treated in accordance with AS2187.2-2006 - Explosives Storage, Transport and Use, Part 2, Use of Explosives. Source separated, stored in secure covered area for collection by licensed contractor.	Orica Mining Services operate out of Emerald and would be capable of transport unexploded explosives.	Following detonation, stainless steel casings can be recycled, subject to contract with JJ Richards or SIMS.	Waste explosive materials may be detonated/ burnt by emergency response officers. Disposal to landfill is not suitable method of disposal.

Appendix A - Construction Waste Management Options

Waste	Source	Estimated Quantity	Units	Options			
				Segregation, reuse	Transport	Recycling	Disposal
Asbestos	Removal of asbestos-containing materials discovered during excavation.	TBD	tonnes	Source separated, stored in secure covered area for collection by specialist contractor.	Asbestos to be removed and disposed by specialist contractor.	N/A	Asbestos to be removed and disposed by specialist contractor. Central Highlands Regional Councils Landfill accepts asbestos and charges \$158.80 plus a management fee of \$119.10.
Tyres	Tyre failure and routine servicing of plant, equipment and vehicles in workshop.	1,500	tonnes	Waste tyres to be stored on-site in accordance with operational policy for storage and disposal of scrap tyres at mine sites, with the exception of storage up to four tyres high or 3 m whichever is greater.	Typically it is not practical to transport large amount of tyres over long distance; however multiple trucking companies can provide a service out of Emerald, if required.	No tyre recycling services were identified in the region and typically not practical to transport large amount of tyres over long distance. Procurement contract set up to consider option for tyre supplier to collect and reprocess scrap tyres.	Disposal of tyres on-site in accordance with operational policy for storage and disposal of scrap tyres at mine sites. It is not considered feasible to deliver waste tyres to regional landfills, as there is currently no processing arrangement set up.
Sewage effluent	Sewage effluent from offices, crib rooms, accommodation, kitchen and amenities.	up to 750	kL/day	Dedicated package STP (pump out system) to be installed during construction until pipeline connected to permanent WWTP on-site. The STP will be a packaged treatment plant with inlet works incorporating inlet screening, screenings compactor and 2 buffer tanks sized for 24hrs storage. The plant will incorporate a treated effluent storage dam with sufficient capacity for 10 days of wet weather storage (10ML). Effluent treated to Class A quality and reused on-site (an area to be maintained for irrigation purposes).	Should on-site treatment not be possible, local trucking companies can provide a collection service out of Emerald.	It is noted that CQ Compost utilise septic in composting operations.	Sewage treatment plants at Emerald or Alpha have limited spare capacity; however may be utilised during initial commissioning of on-site treatment facility or if on-site systems fail at any time.
Sewage sludge	WWTP	1.5	t/day	Dedicated package STP (pump out system) to be installed during construction until pipeline connected to permanent WWTP on-site. Sludge to be dewatered and stored in appropriate containment on-site.	Multiple waste service providers and trucking can provide licensed waste transport services.	Dewatered sludge to be used as feedstock in on-site package composting facility for manufacturing soil conditioner, which will be reused on-site. Alternatively, it is noted that CQ Compost utilise dewatered sludge in compost and soil manufacturing operations.	If sludge is not dewatered, it must be disposed to existing sewage treatment plant at Emerald or Alpha for treatment; however there is limited spare capacity available at these facilities. Should alternatives not be available at any time, sludge may be disposed to on-site landfill once operational.



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