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12.1 INTRODUCTION

This chapter provides an assessment on waste for the project and identifies and assesses the potential impacts resulting from waste generation throughout the mine's lifecycle of the project including the construction, operation and decommissioning phases. The chapter describes the approach to be taken by Waratah to waste generation, minimisation and management and mitigation measures with the aim of protecting environmental values from the impacts of the waste streams associated with the operation of the mine.

The assessment encompasses all developmental phases of the mine site that have the potential to generate waste streams into the surrounding environment. Management and mitigation measures are proposed to minimise the associated impacts. This has been achieved through reviewing Commonwealth, State and Regional Legislative Frameworks and Policies that is applicable with the project.

12.2 LEGISLATIVE FRAMEWORK

12.2.1 LEGAL DEFINITION OF WASTE

The legal framework governing waste and its management in Queensland are the:

- EP Act 1994;
- *Environment Protection Regulation 2008* (EPR);
- Environment Protection (Waste Management) Regulation 2000 (EPR (Waste)); and
- Environment Protection (Waste Management) Policy 2000 (EPP (Waste)).

Section 13 of the EP Act defines *"waste"* as:

> *1) Waste includes anything, other than a resource approved under subsection (4), that is:*
>
> *a) left over, or an unwanted by-product, from an industrial, commercial, domestic or other activity; or*
>
> *b) Surplus to the industrial, commercial, domestic or other activity generating the waste.*
>
> *Example of paragraph (a) — abandoned or discarded material from an activity is left over, or an unwanted by-product, from the activity.*
>
> *(2) Waste can be a gas, liquid, solid or energy, or a combination of any of them.*
>
> *(3) A thing can be waste whether or not it is of value.*

12.2.2 GENERAL AND REGULATED WASTE

General and regulated waste is defined in s 65 of the EPR as:

- general waste means waste other than regulated waste;
- regulated waste has the meaning given by the EPR as commercial and industrial waste listed in Schedule 7 (whether or not it has been treated or immobilised), and includes:
  - for an element, any chemical compound containing the element; and
  - anything that contains residues of the waste.

12.2.2.1 Draft Queensland's Waste Strategy 2010 - 2020

The Queensland Government is currently undertaking a substantial waste reform program which includes:

- new legislation (including a new Act);
- a new waste strategy; and
- an industry waste levy.

The reform intends to re-direct Queensland's approach to waste management to one that focuses on the principles of sustainability and a preferred approach of the waste management hierarchy, with particular emphasis on the waste avoidance and recovery. The renewed waste strategy will allow Queensland to meet it contemporary obligations under the *National Waste Policy* and the targets contained in *Q2: Tomorrow's Queensland*. The strategy will outline visions, goals, targets and actions for waste and resource management in Queensland over the next decade.

The reforms indicate that the current legislative framework lacks an ability to undertake or improve actions associated with waste avoidance, product stewardship and resource recovery. The preparation of a new Act and amendments to existing legislation should result in a strengthened framework that can deliver improved outcomes for waste and resource management in Queensland, and as an added benefit, will be consistent with framework used in other States.

The industry waste levy will only apply at the point of disposal and is likely to be charged per tonne of waste. The introduction of the waste levy has several purposes, with the primary function designed to provide a price signal to waste generators and encourage waste avoidance and resource recovery behaviour, and discourage disposal to landfill as the first option.

The waste strategy roll-out commenced in June 2010 and comprises the *Queensland's Waste Strategy 2010 -2020: Consultation Draft* which builds on feedback from a 2007 discussion paper. The key roll out milestones includes:

- waste strategy endorsement by September 2010;
- waste legislation approved by April 2011; and
- implementation of the waste levy by July 2011.

This legislation may be relevant to the project during construction.

12.3 PROJECT WASTE MANAGEMENT STRATEGY

The existing waste production and management within the project area is typical of that characterised by agricultural land use (predominantly beef cattle production). Given the scale of the project and the activities associated with the construction, operation and decommissioning phases, waste generation and types will be increased from that associated with the existing land use.

The waste management approach for the project includes a sustainable waste management strategy that is a practical and effective tool in achieving the desired outcomes for the project. The strategy will address matters within the planning and concept stages and will continue to operate through the construction, operation and decommissioning phases. The strategy allows for the incorporation of waste management into daily operations, and is adaptive to allow for further development of efficient practices throughout the lifecycle of the project. These principles provide early identification of anticipated waste streams and quantities, and the implementation of appropriate management and mitigation measures to reduce their potential impacts.

Segregation during generation, storage and transport will allow for maximum recovery of waste. This facilitates a higher level of on-site reuse and recycling, while reducing landfill disposal. All waste streams will be assessed for potential reuse prior to off-site disposal.

It is not anticipated that the project will generate significant waste streams that will have a market demand. However, potential waste that may provide revenue will be recovered (albeit negligible in comparison to the project costs). This includes, for example, scrap metal off cuts and any millable timber obtained during clearing and grubbing activities. Opportunities for recycling will occur through the generation of office paper, cardboard and printer cartridges, timber pallets and plastic and glass bottles.

Ultimately the waste management strategy will minimise the on and off-site pollution attributable to the Project's activities, and reduce adverse impacts to the environment.

An EMP will be developed and will interface with separate plans for each of the discrete project elements. The EMP, together with additional project management plans and procedures, will comprise documentation in a suitable framework to facilitate the successful implementation of the Environmental Management System (EMS) throughout the duration of the project, to satisfy the content requirement of s 203 of the EP Act (in preparing a EMP), and any conditions imposed by the Coordinator-General.

12.3.1 WASTE MANAGEMENT HIERARCHY

The waste management principles are based on the Waste Management Hierarchy presented in Part 3 of the EPP (Waste). The waste management hierarchy is a framework for prioritising waste management practices to achieve the best possible environmental outcome.

The hierarchy includes:

- avoid waste by optimising methods used within the construction, operation and decommissioning phases;
- reuse waste by identification of secondary sources that can utilise the waste;
- recycle waste by identification of facilities that can recycle the particular waste stream;
- energy recovery from waste; and
- disposal of waste at an appropriate facility.

12.3.2 CLEANER PRODUCTION

Cleaner production (cp) principles provide for the implementation of solutions that increase efficiency and performance while reducing impacts to the environment and supporting the goals of sustainable development.

Cleaner production and eco-efficiency are practical and effective ways for more efficient use of the materials and energy employed, while minimising the generation of wastes and emissions. The mine's waste management strategy aligns with cleaner production principles that ultimately aim to reduce the quantity of waste generated as a result of the project. By reducing resource consumption and waste production, cleaner production can ameliorate the negative environmental impact of the project while reducing the cost of production.

Implementing cleaner production requires an assessment (and subsequent re-assessment as the strategy is a living document) of inputs, production processes, and pollution / wastes from the production, consumption and disposal of products and services, and changes to these through good housekeeping practices, process changes, design changes or new technologies.

Generally cleaner production techniques can be implemented through:

- good housekeeping – changes in operational procedures and management allow for the elimination of waste and emission generation. Examples include spill prevention and improved instruction of workers and training;
- product modifications – for example changing the product characteristics, such as shape and material composition is a are CP process. The lifetime of the new product, is for example, extended, the product is easier to repair, and/or the manufacturing of the product is less polluting;
- input substitution – this refers to the use of less polluting raw and adjunct materials and the use of process auxiliaries (such as lubricants and coolants) with a longer service lifetime;
- technology modifications – this includes improving process automation, process optimisation, equipment redesign and process substitution; and
- closed loop recycling – recycling can occur through reclamation from a production process that would otherwise be disposed of as waste and using it as an input in the same production process. This could take place through reuse as raw material, recovery of materials or other application.

Aspects of the Project that may contribute to cleaner production outcomes include:

- assessing the project's footprint to minimise the extent of clearing and grubbing activities;
- selecting the best available and most practical coal extraction and processing technology to ensure the appropriate energy intensity and production efficiency;
- selecting durable plant and equipment throughout the project lifecycle to minimise the purchase of new plant and equipment;
- selecting the most appropriate processes during operation and maintenance, such as the reuse of runoff for dust suppression, and the recycling of sewage within the water treatment plant for reuse or irrigation;
- recycling of materials such as glass, paper, cardboard and timber; and
- recycling of process wastewater from reuse throughout the Project.

12.3.3 WASTE TRACKING

In Queensland, certain activities require the tracking of waste:

- where the waste being transported is general waste, the transporter is required to be approved by the local government under s 369 of the EP Act;
- where the waste is a regulated waste as defined in the EPR, the transporter must be licensed by the department as a regulated waste transporter; and
- if the waste is trackable waste as defined by s 17 of the EPR (Waste), all waste handlers must comply with the applicable waste tracking requirements.

Further, the treatment, storage and transport of regulated waste requires and Environmental Approval (EA) under the EP Act due to its classification as an Environmentally Relevant Activity (ERA). All applicable requirements and the persons responsible for each of the tasks are reflected in the project's Waste Management Plan (WMP).

12.3.4 WASTE MONITORING

In order to ensure that the mine's waste management strategy continues to be robustly implemented throughout the lifecycle of the Project, waste monitoring and auditing will be undertaken. The purpose of monitoring waste management activities and outcomes on-site include:

- obtaining baseline data so waste generation and subsequent potential impacts can be analysed;
- monitoring to ensure compliance with the regulatory and project framework which will facilitate in minimising the potential for harm to the environment; and
- collation of data to enable continuous improvement in carrying out the WMP.

12.3.5 WASTE REPORTING

The National Environment Protection Council (NEPC) endorsed the first NEPM in the form of the National Pollutant Inventory (NPI) to set out agreed national objectives for protecting / managing particular aspects of the environment. The NPI is an internet database designed to provide information on the types and quantities of certain substances emitted to the three components of the environment being air, land and water.

The implementation of the NPI is the responsibility of each participating jurisdiction. In Queensland, the NPI is implemented under the EP Act to ensure compliance. The purpose of the NPI aims to achieve desired outcomes:

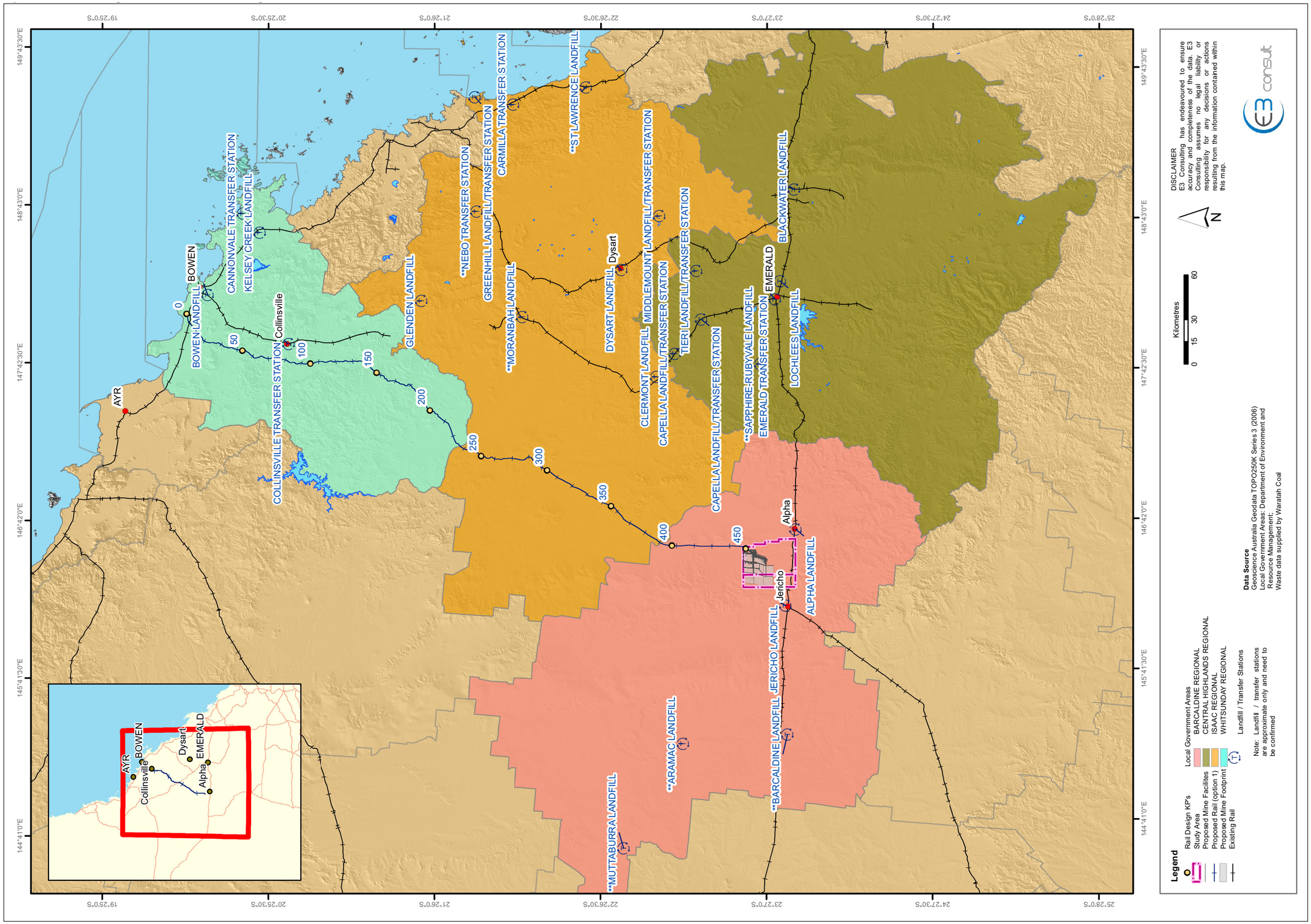
- maintain and improve air and water quality;
- minimise environmental impacts associated with hazardous waste; and
- improve the sustainable use of resources.

The NPI stipulates the requirements of reporting; specifically how a facility will trigger reporting obligations based on exceeding the threshold limits of the 93 substances included on the NPI database which have the potential to cause environmental harm. Based on the scale of the project, it is anticipated that its activities may exceed some of the threshold limits. In the event that limits might be exceeded, the Principal Contractor is required to estimate and report the project's emissions to the NPI annually and will need to refer to the Emission Technique Manual (ETM) for each of the activities associated with the project that will use any of the 93 specified substances. An outline of some of the key activities with the potential to generate emissions, and relevant to the Project are listed in Table 1.

Table 1. Summary of potential emission generating activities for the mine site

PROJECT ACTIVITY	KEY EMISSION GENERATING ACTIVITIES	EMISSION TYPE
Open Cut Coal Mining	Removal of vegetation and topsoil	Predominantly particulates and exhaust emissions (CO, NOx, SO_2, VOC) from mining equipment
	Drilling and blasting of overburden	
	Removing and placing overburden	
	Extracting, transporting and dumping of the coal	
	Crushing coal	
	Washing and workshop operations	
	Transporting and placing washing rejects	
Underground Coal Mining	Earthmoving associated with development of surface facilities	Predominantly particulates and exhaust emissions (CO, NOx, SO_2, VOC) from mining equipment
	Shaft access and ventilation	
	Extracting, transporting and dumping of the coal	
	Crushing coal	
	Washing and workshop operations	

Figure 1. Waste Management Infrastructure in Regional Council Areas



12.4 ASSESSMENT METHOD

Generated wastes were described by employing principles from the waste management hierarchy according to the development phases of the mine site. Likely impacts associated with the mine's activities and its identified waste were addressed and management options for these were then identified and discussed firstly upon avoidance and minimisation, and secondly reuse and recycle, and finally disposal.

12.4.1 ENVIRONMENTAL VALUES

Waste may be generated from numerous sources that have the potential to impact on the environment (e.g. land, water and ecological matters). In turn, environmental aspects may influence the impact of the waste itself due to the natural conditions and environmental setting. For example, where a portion of the site is located within close proximity to a river, in the event of a spill, there is the increased potential for transportation of the contaminant to other sensitive areas.

During the project construction, operation and decommissioning phases, waste will be managed such that the potential for adverse impacts to the health and well-being of local residents and project staff, and the environment, are avoided. Where this is not possible, mitigation measures will be employed to reduce the potential for adverse impacts arising.

12.4.2 WASTE INVENTORY, CHARACTERISATION AND MANAGEMENT

12.4.2.1 Existing Waste Management Infrastructure

The mine site is located within the BRC Local Government Area. BRC has existing waste management infrastructure and facilities, see Figure 1 for waste locations within the region.

12.4.3 WASTE MANAGEMENT FACILITIES BARCALDINE REGIONAL COUNCIL

12.4.3.1 Barcaldine Regional Council

Limited information is available from BRC concerning waste management and existing infrastructure. Based on information obtained from BRC (BRC, 2010), a total of five refuse disposal sites exist within the region (see Table 2).

All except The Barcaldine Landfill facilities accept general municipal waste of the Barcaldine Landfill. The Barcaldine Landfill is the largest waste management facility within the BRC and accepts regulated waste. Large commercial quantities of both municipal and regulated waste will require transportation to the Barcaldine landfill for disposal. The basic nature of the construction of all five sites generally limits waste acceptance criteria and accordingly, radioactive, medical and contaminated soil is not accepted. The Alpha landfill is the closest of the five facilities to the mine site.

There are currently no transfer stations within the region. Waste oil is accepted at the BRC Depot (located at Myall Street, Barcaldine).

12.4.4 OPPORTUNITIES TO RECYCLE

12.4.4.1 Bowen Resources Pty Ltd

Bowen Resources is a local recycling contractor located on the corner of the Bruce Highway and Collinsville Road, Bowen. They predominantly operate in the collection, segregation and recycling of scrap metals (including used batteries), cardboard, paper and plastics. Bowen Resources currently have an arrangement with AMCOR for recycling at the Ti-Tree facility in Brisbane (AMCOR Ltd, 2009).

Table 2. Barcaldine Regional Council waste management facilities

FACILITY	LOCATION
Alpha Landfill	Gordon Street, Alpha, 4724
Aramac Landfill	Muttaburra Road, Aramac, 4726
Barcaldine landfill	Landsborough Highway, Barcaldine, 4725
Jericho Landfill	Aramac Road, Jericho, 4728
Muttaburra Landfill	Muttaburra Road, Muttaburra, 4732

12.4.4.2 JJ Richards Pty Ltd

JJ Richards are a major waste management contractor currently servicing regional councils and industry including 26 coal mining operations throughout the Bowen Basin. To ensure efficient segregation of waste, JJ Richards provide general waste bins (coloured dark green) and recyclable waste bins (coloured lilac) in the form of 120 L wheelie bins and three m3 front lift industrial bins. Each bin is labelled with signage describing acceptable wastes. The 120 L general waste wheelie bins are fitted with black liners and the recyclable waste wheelie bins with clear liners to assist cleaning staff in determining appropriateness of contents (JJ Richards, 2010).

All industrial bins are constructed by J.J. Richards' in house Engineering Division and undergo stringent quality control and full certification with an approved engineering certificate.

Prior to collection, the J.J. Richards driver records the quantity of waste in each bin, inspects the contents for any regulated or non-compliant wastes and once emptied sprays the bin with an approved deodorizer. Any cross contamination of these waste types shall be documented and reported to project management.

A front lift truck is used to collect both general and recyclable wastes from the site. General and recyclable waste collections are conducted on separate runs.

Recyclable waste is transported to a J.J. Richards MRF for processing where it is separated by both automated and manual systems. The segregated material is either bailed or crushed and transported to various companies in Brisbane for reuse:

- glass is converted into new glass products;
- plastics are converted into wheelie bins, pipes, garden edging, polyester fibres and multi-layering on soft drink bottles;
- milk and fruit juice cartons are used to produce white office paper;
- paper and cardboard are used to produce paper and packaging products; and
- steel and aluminium cans are smeltered into steel and aluminium sheeting.

In addition to the general and recyclable bins, bulky cardboard can be segregated and stored in specially designed cages.

JJ Richards can also recycle waste batteries. Specially designed polyurethane boxes are used for the collection and transportation of the batteries. The boxes are clearly labelled for corrosive materials and include lids to prevent rainwater infiltration. The batteries are disposed at a scrap metal recycler providing a competitive market price.

12.4.4.3 Sims Metal Management Limited

Sims Metal is a global metal recycling company with sites located in Townsville, Mackay and Gladstone. Sims currently operates throughout Central Queensland with the capability to provide scrap metal bins and collection services at designated points along the project alignment. The preferred approach to scrap metal recycling on large scale projects involves point source storage and segregation (where possible) of the material into heavy gauge (>8 mm) and light gauge (<8 mm) portions. Segregation on site is considered to be more effective, yielding maximum economic returns rather than disposal to a nearby waste management facility.

12.4.4.4 Collection Logistics

Waste collection and transfer logistics are an integral component of an integrated waste management system. A key factor in collection logistics is reliable projection of key waste streams and volumes in order to establish potential waste management facilities that will accept this volume of waste over the life of the Project. A detailed assessment will be undertaken to establish:

- existing collection services within each project area;
- assess the effectiveness of existing collection services;
- identify collection system deficiencies in relation to project specific requirements; and
- identify efficient collection routes and schedules.

12.5 ON SITE LANDFILL

The potential requirement of an on-site landfill to be located at the mine has been identified due to the relatively remote location of the project and the potential for considerable waste volumes to be generated through the construction, operational and decommissioning phases of the project.

The following sections describe the estimated waste generation volumes and the minimum requirements to manage the expected waste streams in accordance with the *Environmental Protection (Waste Management)*

Policy 2000 and DERM Guidelines: Landfill Siting, Design, Operation and Rehabilitation, as a result of the Environmentally Relevant Activity (ERA) 60 – Waste Disposal (DERM, 2010).

The DERM Procedural Guide for Assessing Waste Disposal Facilities states the following:

> *"Waste disposal is an environmentally relevant activity (ERA) because it has the potential to cause environmental harm. A waste disposal facility is listed under item 75 of schedule 1 (ERA 75) with the following categories:*
>
> - *general waste;*
> - *regulated waste; or*
> - *general and clinical waste.*
>
> *These waste disposal facilities will require a development approval under the Integrated Planning Act 1997 (now Sustainable Planning Act 2009). Development approval conditions address key environmental issues associated with the activity".*

An on-site landfill facility would be classified as a general waste facility with all regulated and recyclable material transported to off-site facilities via licensed contractors. It is expected that the construction of the on-site waste facility would occur prior to the construction phase of the project to cater for waste generation during that phase.

12.5.1 PREDICTED WASTE STREAMS AND VOLUME

The construction and decommissioning phases are anticipated to create predominantly Construction and Demolition (C&D) / Commercial and Industrial (C&I) waste, and therefore an allowance of a nominal volume of 5,000 t during each of these phases has been made with respect to estimating the total project waste to landfill. Although the waste generated through this construction phase may be greater, an allowance has been made for the recovery of some waste streams. This value of 5,000 t has been used in projects of a similar size for the purposes of estimating waste generation rates (i.e. Hancock Prospecting's Alpha Coal Project).

The expected waste streams generated during the operational phase of the project are likely to comprise unrecoverable streams associated with both putrescible waste and to a lesser extent, C&I wastes. These unrecoverable streams will likely require on site disposal at an engineered landfill site. Putrescible waste will be generated through the day to day activities of the site including office facilities and kitchen waste and amenities. Commercial waste may require disposed to landfill and include packaging materials, conveyor components, and bricks, concrete, contaminated or soiled recyclable materials that may not be considered viable for recycling.

While the waste hierarchy will be adopted through all phases of the project, a realistic approach would indicate that the intended diversion rates of wastes to landfill for reuse or recycling may vary with a portion actually disposed to landfill.

Year Book Australia is the principal reference work produced by the Australian Bureau of Statistics (ABS). It provides a comprehensive and detailed statistical overview of various aspects of the economy and social conditions in Australia. The latest release (June 2010) includes a survey conducted in 2007/2008 to obtain a basis for waste generation rates per person. The survey reveals that during the 2006/2007 period, waste generation was estimated at 1,903 kg per person with a 47 % diversion rate. Therefore the waste per person disposed to landfill is estimated at 1,008 kg. As a conservative approach and making allowance for all waste generated at the project site including unrecoverable recyclable materials, a generation rate of 3,000 kg per person has been adopted. This rate also makes allowance for lower recycling rates anticipated throughout the project. This waste generation rate has been used to estimate the total volume of waste generation at the Mine during the operational phase.

The predicted volume of waste generation for the project is presented in **Table 3**.

12.5.2 MINIMUM REQUIREMENTS

The construction and operation of the on-site landfill disposal facility will require the following key points to be addressed:

- obtaining all necessary approvals and licensing;
- construction and operations of the on-site landfill facility in accordance with the DERM Guidelines;
- rehabilitation of the final landform; and
- monitoring and management of the site.

Table 3. Estimated waste generation rates

PROJECT PHASE	DURATION	NO. OF PERSONNEL	WASTE GENERATION PER PERSON PER ANNUM (KG)	WASTE GENERATION TOTAL TONNES PER ANNUM)	WASTE GENERATION FOR PHASE (M^3)
Construction	2 years	2000	3000 kg	5,000	14,000
Operation	30 years	1500		4,500	189,000
Decommissioning	2 years	Unknown – Nominated 1500 personnel		5,000	14,000
		Total - All Phases			217,000 m^3

Waste was assumed to be compacted to an average density of 1 - 1.4 t/m^3. This is the figure that the Victorian EPA (2002) requires landfill operators to use calculating their landfill levy returns.

The key landfill design features which will be incorporated into the design of the on-site landfill facility are consistent with the features outlined in the DERM (2010) Guidelines and are summarised in Table 4.

The DERM Operational Policy states that all new large facilities accepting putrescibles and or limited regulated waste must incorporate a landfill leachate and landfill gas management system which must meet certain performance requirements (listed under Landfill Liner in Table 4). The Policy does not imply that liner and gas collection systems are not required for smaller (less than 75,000 t/annum) facilities. Therefore for the purposes of outlining the potential design requirements of the on-site landfill facility, the requirements stipulated within the DERM operational policy have been included for consideration in Table 4.

Table 4. Landfill design requirements

ASPECT	COMPONENTS	OBJECTIVES	REQUIREMENTS	PROPOSED ASPECT
Landfill Siting	NA	To identify a site with best potential for landfilling with minimal impact to the surrounding community and environment.	Consideration should be given to the following hierarchy of aspects: • community needs and expectations; • landfill type and ancillary activities; • adjacent existing and future land uses; • groundwater resource system; • surface water system; • biodiversity; • external infrastructure; and • geological Setting.	Landfill currently proposed to be located east of the box cut features.
Landfill Liner	Sub Base	To provide a geotechnically stable platform for which the compacted landfill liner can be placed and to ensure the leachate drainage system effectively drains throughout the life of the landfill.	Where the sub-base is undisturbed material (rock or soil) at the base of a quarry, it is likely to be well consolidated. Where the sub base consists of imported material, it needs to be installed in a manner that is geotechnically sound. This is achieved by installation and compaction in thin layers. Sub base construction should be accompanied by Level 1 Geotechnical Testing.	Purpose excavated void with geotechnical assessment undertaken prior to liner installation.
	Compacted Clay Liner	To limit contaminant migration to groundwater and to control landfill gas migration. To protect the beneficial uses of all groundwater including that directly beneath the landfill.	The engineered earthen liner should be at least 0.6 m thickness, placed in at least two layers, achieving a maximum permeability of not greater than 1 x 10-9 m/s. Clay liner to be sloped into the leachate collection pipes that in turn slope to the leachate collection sump. These slopes should be greater than 3 % to the pipes and 1 % to the sump.	Ideally, a 1.0 m compacted clay liner will be installed (exceeding the minimum requirement of 0.6 m).
	Geomembrane	To limit contaminant migration, to reduce water ingress into the landfill and to control landfill gas migration.	A flexible membrane liner consisting of high density polyethylene (HDPE) of at least 1.5 mm thickness, installed above the engineered earthen liner and in direct and uniform contact with these layers.	Landfill to accept general waste only. Therefore geomembrane currently not proposed.

ASPECT	COMPONENTS	OBJECTIVES	REQUIREMENTS	PROPOSED ASPECT
Landfill Liner (Continued)	Leachate Collection System (leachate drainage layer, collection pipes, collection sump and leachate disposal pond)	To drain leachate such that the leachate head above the liner is minimised.	Drainage Layer to have minimum thickness of 0.3 m of coarse aggregate and hydraulic conductivity of 1 x 10-3 m/s. Drainage layer aggregate to have the following properties: • rounded and smooth surface; • D85≥40 mm; • D10≥10 mm; • uniformity coefficient <2; • fines content <1 %; • collection pipes with high resistance of chemical attack; and • leachate collection pipes should be spaced to minimise the head on the liner. The recommended maximum spacing is 25 m. Leachate pond must: • be lined as per landfill. • installed and maintained to prevent seepage of contaminants through bed or banks. • be installed and constructed to ensure stability. • maintain a freeboard of not less than 0.5 m at all times	Leachate collection system will be installed to capture leachate and minimise head on the liner. Leachate will be recycled through the waste profile to limit requirement for leachate storage and / or treatment.
	Landfill Gas System	To intercept any landfill gas which may escape laterally from the site	Location and spacing of landfill gas monitoring bores are site specific and generally governed by a landfill gas risk assessment.	Perimeter bores placed on boundary on completion of first cell.

ASPECT	COMPONENTS	OBJECTIVES	REQUIREMENTS	PROPOSED ASPECT
Groundwater Management System	Groundwater Relief Drains and Extraction Bores	Where the landfill is located below the water table, groundwater relief drains and extraction bore may be required to prevent impact to the beneficial uses of the groundwater.	While not outlined in the DERM Guidelines, groundwater relief systems typically include: • Generally installed in a grid pattern across the sub base; • Groundwater relief pipes installed within sub base by excavating trenches; • Trenches filled with aggregate which is free draining, free of organic or other deleterious material, fines content <1%; and • Groundwater collections sump required to collect groundwater.	Groundwater Relief Drains to be installed in the event of rising water table (although considered unlikely).
Daily Cover	NA	To minimise landfill odour, control litter, control disease vectors, ensure landfills trafficable and prevent spread of fires should they occur.	Typically, the daily cover requirements will depend on the volumes of waste received per day. Waste is typically covered at the end of each day. Where large volumes are received, covering of the waste may occur progressively throughout the day. The selected cover material should be placed to achieve the objectives listed, while maintaining a permeability (of both waste and cover) which allows leachate to pass through and prevents perched conditions.	Waste will be covered daily or as needed with material sourced on site.
Final Capping	NA	Prevent or minimise: • exposure of humans to waste fill; • infiltration into the landfill; • likelihood of erosion of capping or waste occurring; and • uncontrolled release of landfill gas.	Typically a 500 mm layer of low permeability compacted clay to achieve a hydraulic conductivity is considered sufficient to limit infiltration. Caps should not be steeper than 20 %.	Low permeability compacted clay liner.
Rehabilitation	NA	To further minimise the potential of any detrimental impacts from the landfill.	Best practice rehabilitation and after care should be considered early in the design and operation phase of the landfill. A conceptual rehabilitation plan should be developed to ensure the rehabilitation objectives are achieved.	Rehabilitation will be completed to establish a natural landform and vegetation cover.

ASPECT	COMPONENTS	OBJECTIVES	REQUIREMENTS	PROPOSED ASPECT
Environmental Monitoring System	May include groundwater, surface water, odour, dust, noise	To assess the baseline conditions prior to the operation of the landfill, as well as the ongoing conditions to determine the environmental performance of the site.	The environmental monitoring requirements are generally stipulated in conditions of the landfill license. Typically, monitoring at a minimum will require: • three groundwater monitoring points to determine quality and flow direction; • two surface water monitoring points: upstream and downstream of landfill; and • particulate monitoring during construction, and potentially during operation. Noise and Odour impacts will be considered with respect to the nearest sensitive receptors.	The environmental monitoring a minimum will include: • three groundwater monitoring points to determine quality and flow direction; • noise and particulate monitoring will be undertaken as part of the approval conditions for the Mine; and • surface water monitoring (upstream and downstream) of nearest tributary.

12.5.3 LANDFILL CONCEPT DESIGN

Should Waratah continue to proceed with an onsite landfill facility, detailed design would be required to be undertaken in light of the further detail including the confirmed available area for the facility and any constraints which would be required to be incorporated into the design such as maximum RLs to which the waste facility would be excavated, the depth of the water table and requirements of buffer distances from mine operations.

A concept landfill design has been prepared to demonstrate Waratah's understanding of the complexities and requirements of both the construction and operation of an on-site waste disposal facility.

Plan and elevation views have been prepared to demonstrate the various components of a landfill cell. These are presented in Figures 2 to Figure 6.

12.5.4 ALTERNATE OPTIONS

Due to the resource boom within Central Queensland but also more locally within the Galilee Basin, an alternate option to an onsite landfill may include a regional waste management strategy (RWMS) which would include a large scale waste disposal facility, capable of servicing multiple resource projects within the area. The number of concurrent EISs being prepared for projects proposed within the Galilee Basin and within close proximity to the mine, as well as the multiple exploration permits, which may eventuate into additional major project approvals, indicates that the consideration of regional waste management facility may be a viable option.

The RWMS and disposal facility would provide a practical and cost effective solution to the proponents of the respective major projects and the challenges associated with best practice waste management.

The strategy would likely be commissioned at a state and local government level, and would require a feasibility study for identification of options, comparative assessment of risks, implications and opportunities, as well as a triple bottom line analysis (environmental, social and financial).

The RWMS would result in a uniform approach to waste management across the region rather than ad hoc project based waste management methods, which may, inadvertently over time result in a waste management approach that is not in line with best practice.

The benefits of a RWMS and regional disposal facility may include:

- effective long term management of waste;
- more effective recovery and recycling;
- regional planning of waste service delivery and infrastructure to achieve continuity and efficiencies in economies of scale;
- reduce C&D / C&I waste to landfill;
- utilise funding opportunities at State levels;
- support the development of waste management policies, guidelines and procedures relevant for the Region;
- benchmarking of landfill performance (Best Practise); and
- regional focus on emerging waste streams (steel, concrete, batteries, waste oil).

12.6 MINE SITE WASTE GENERATION

Waste generation associated with the construction, operation and decommissioning of the mine are discussed in this chapter. Waste generation from other direct primary resources that will contribute to local climate and existing air quality will also be discussed. Detailed waste generation from emissions is discussed in the Air Quality and Greenhouse Gas Chapter 10 of the Volume.

12.6.1 CONSTRUCTION

During the construction of the mine, the major infrastructure components include:

- site preparation works including the establishment of overburden and topsoil stockpiles;
- CHPP including coal stockpile areas;
- railway turning loops and coal load out facility;
- water management structures including dams, levee banks and sediment traps;
- haulage and access roads; and
- ancillary infrastructure including mine office, communications, services, and associated amenities.

Figure 2. Compacted Clay Liner and Leachate System

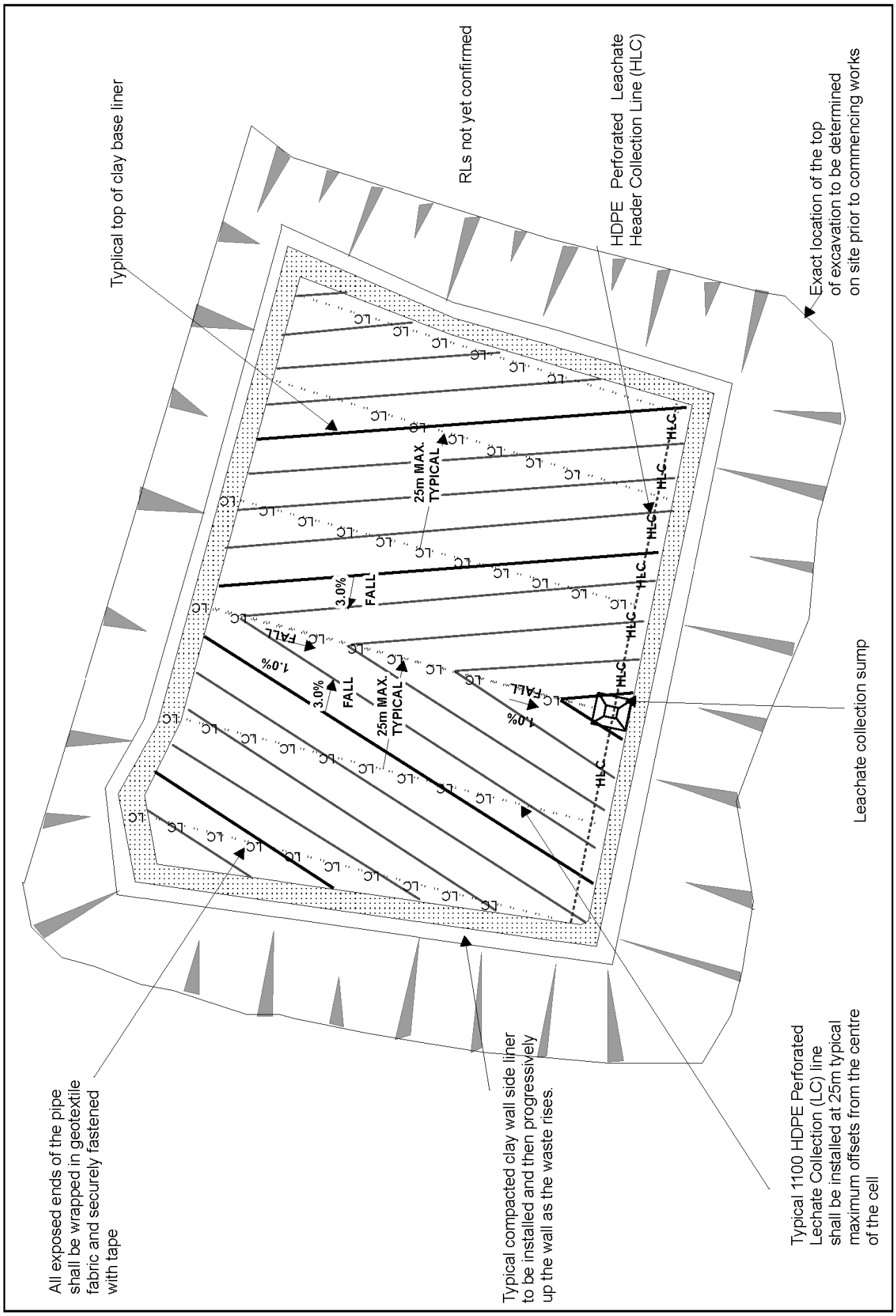


Figure 3. Groundwater Relief System

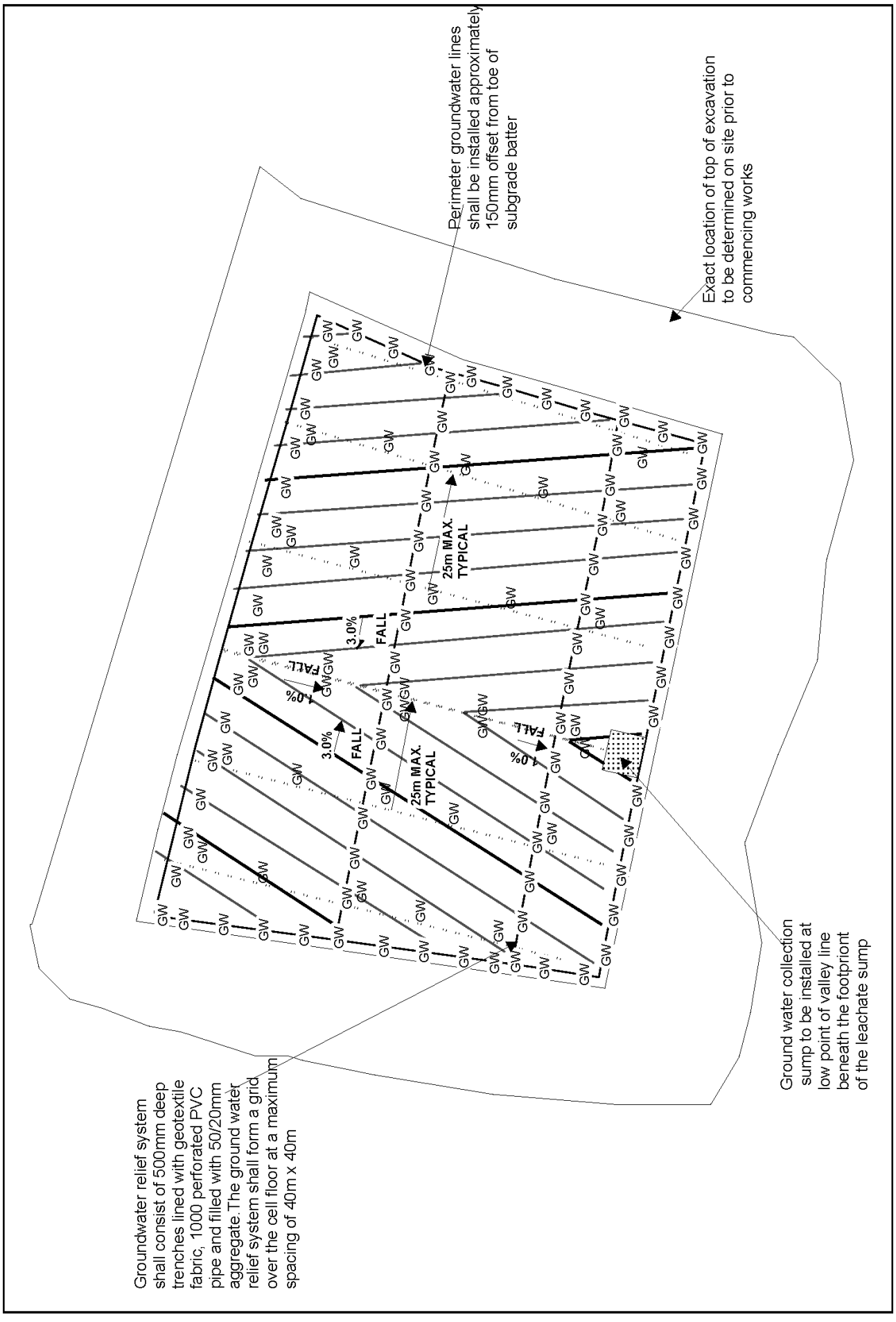


Figure 4. Concept Groundwater Extraction Sump

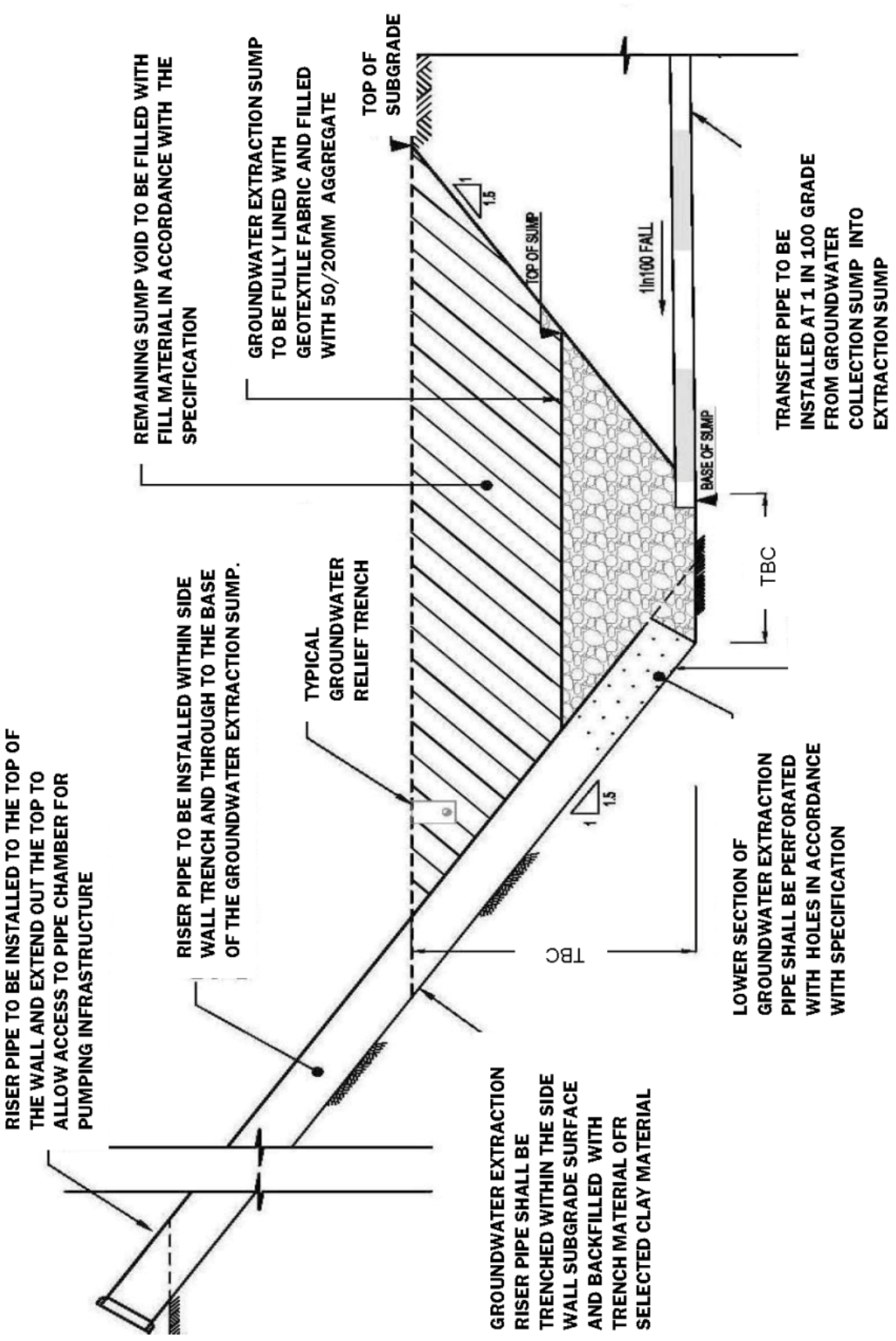


Figure 5. Concept Cell Base Liner and Leachate Collection Arrangement

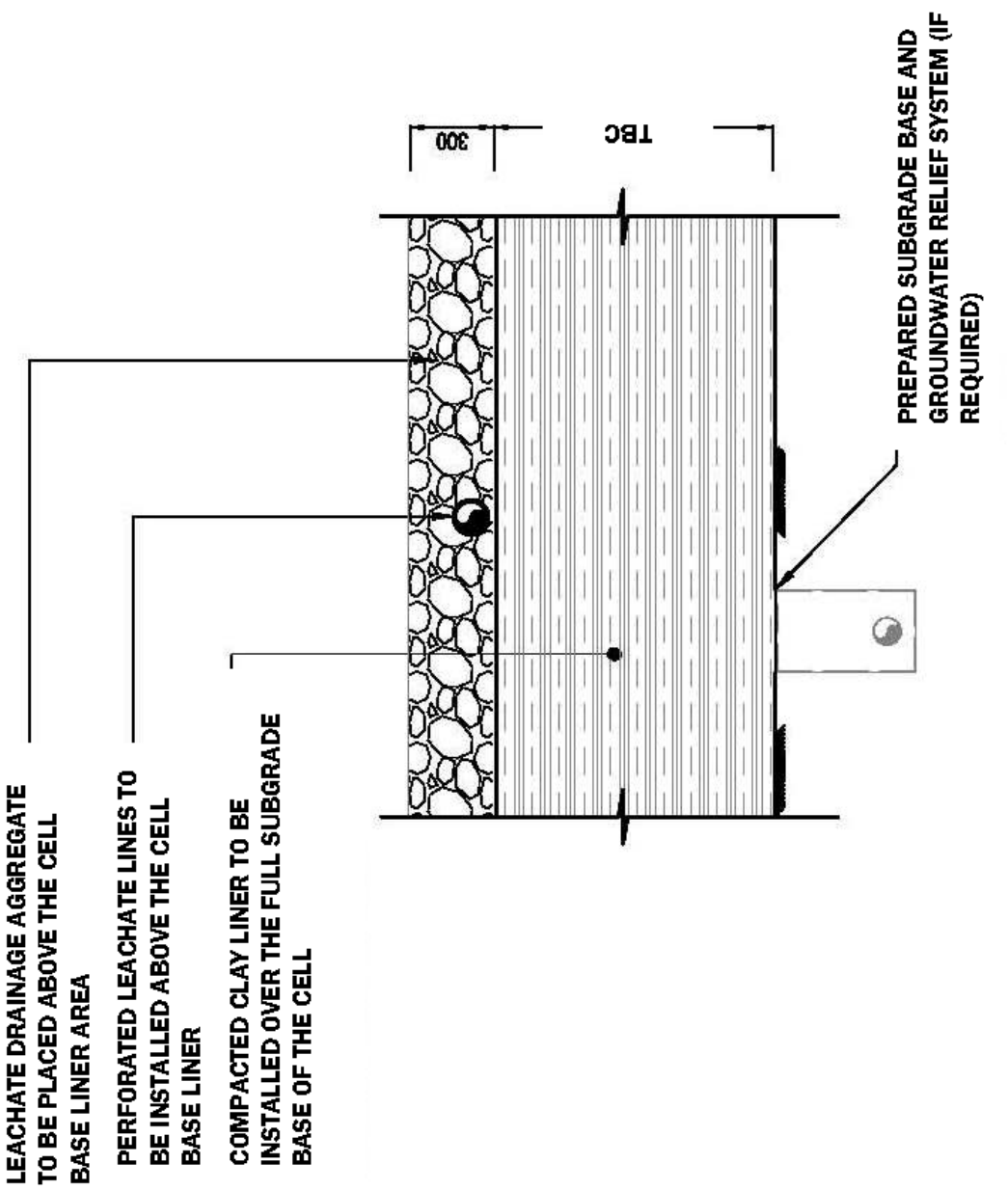
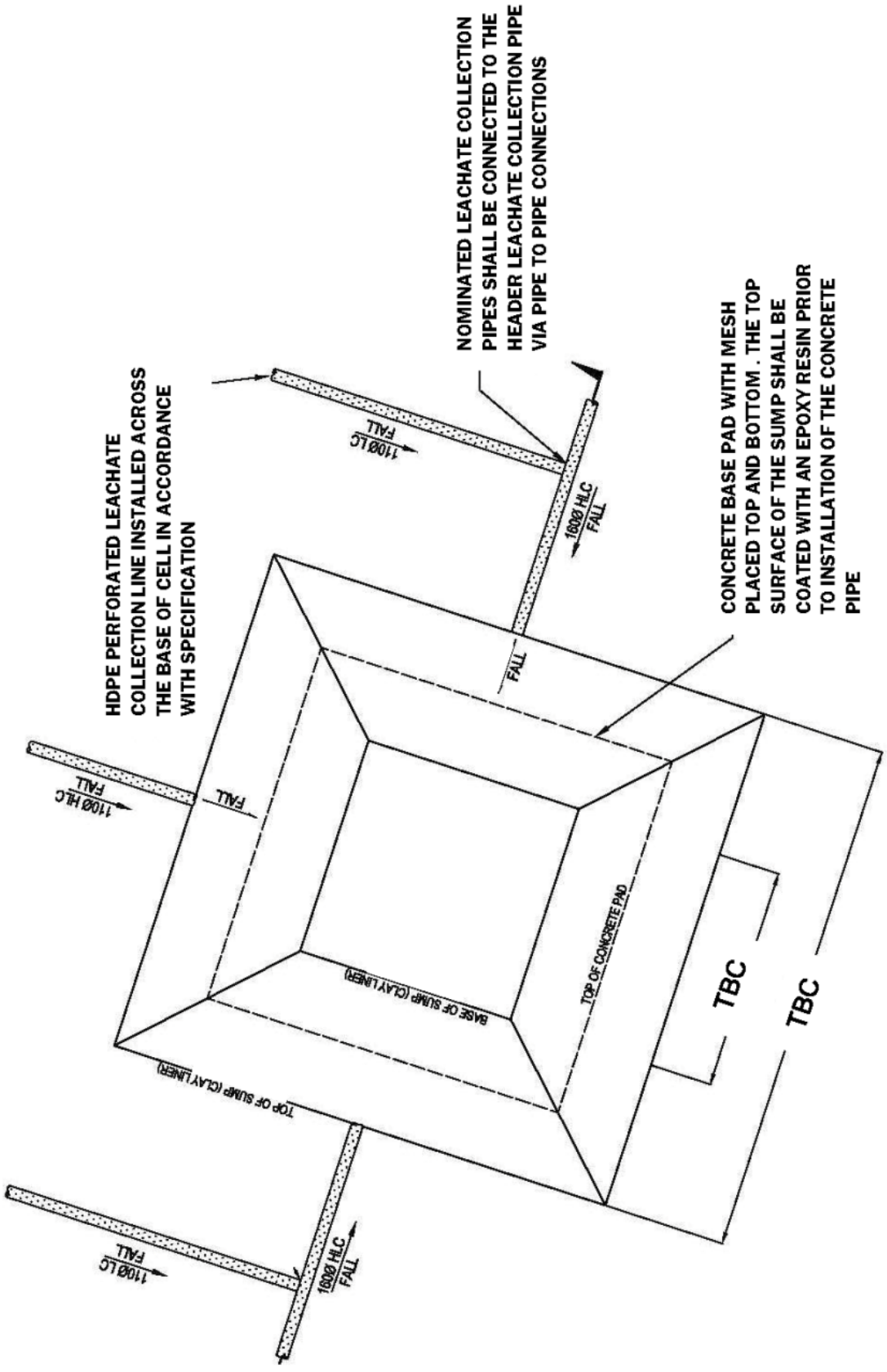


Figure 6. Concept Leachate Collection Sump Arrangement



Site Preparation Works: The excavation of the overburden will comprise topsoil, clay and a variety of rock material. Each will be stored in distinct stockpiles to ensure reuse of materials where practicable. The topsoil material (with appropriate sediment and erosion controls implemented) will be used in the progressive rehabilitation of the mine. Clay material extracted, and where deemed to be suitable by permeability testing, may be used to construct mine levee banks. Geotechnical investigations indicate that the majority of the rock material is non-acid forming (NAF) material. It is anticipated that there will be minimal waste generation during these works, as the NAF material can be used to construct mine structures including tailings storage facilities, mine levee walls and the Overburden Emplacement Facility (OEF).

CHPP: Waste generated during the construction of the CHPP will include general building waste such as surplus spoil from site when re-profiling the pad area, surplus concrete from footings, and steel off cuts from the sheet metal used in construction.

Railway Turning Loops and Coal Load out Facility: Waste generated during the construction of the railway turning loops will include materials described in the construction of the rail alignment including surplus spoil, ballast, concrete sleepers and steel off cuts from the track and fittings. Waste generation from the construction of the rail alignment is described in Volume 3, Chapter 12. The predominant waste streams generated from the construction of the coal load out facility will be general building waste including surplus spoil from preparation of the infrastructure pad area, non-ferrous and ferrous metals from construction of the conveyor frames and associated structures, surplus cement / concrete and to a lesser extent, packaging material. In order to minimise the extent of general building waste generated during the construction phase of the Project, where feasible and practicable, Waratah Coal will prefabricate materials off-site, with transportation and drop-off at designated points along the rail alignment. By procuring construction materials to the specifications and quantities necessary, general building waste from the Project will be considerably reduced.

Water Management Structures: It is expected that the majority of the excavated material from the water management structures will have the potential for reuse in construction of other project components such as haulage or access roads. It is anticipated that a separate area adjacent to the borrow pit will be designated for the storage of unsuitable material. The quantity of surplus material is not yet able to be determined.

Haulage and Access Roads: Waste streams are expected to consist predominantly of green waste from clearing, surplus spoil and fill material, and limited hydrocarbon / oils from plant equipment during grading and compaction works. The majority of the spoil material will be stockpiled for reuse during rehabilitation of the mine site, while surplus fill will be used in other areas of the project during construction including the pad area of the mine offices and amenities

Workers Village, Mine office and Associated Amenities: Waste streams anticipated to be generated during the construction of this mine infrastructure will predominantly occur during the early works phase where vegetation will be cleared, and the surface profile stripped in preparation of the sub grade / pad areas and installation of foundations and footings. General building waste including excess concrete, bricks, ferrous and nonferrous metal off cuts and surplus electrical cable associated with the establishment of services are also expected. Stormwater runoff will also be generated from the construction area. An appropriate Erosion and ESCP will be implemented to ensure that clean stormwater is diverted around the site boundary, and any sediment laden runoff is captured in catch drains. Stormwater and grey water / sewage will be generated during all phases of the project and are discussed separately in below. Waste packing material will also be generated for office furniture, equipment and supplies associated with the mine site offices and amenities.

12.6.1.1 Construction Emission Sources

Dust impacts during the initial construction phase of the coal mine, primarily from pre-stripping of tertiary materials and construction access portals to underground mines, are likely to exist. These impacts are expected to be of a transient nature. However, dust volumes are likely to be much less than those from the combined open cut and underground mining activities during normal operations. For these reasons, air quality impacts during construction of the coal mine have not been predicted through air dispersion modelling; rather, they will be managed through the mine's EMP. Primary activities which can result in emission sources and waste generation from the mine are discussed further in Volume 2, Chapter 1.

Dust agitation and generation may occur on unsealed roads especially with increase of speed from vehicles during the construction phase of the mine. To mitigate the potential issue of dust generation, a suppression and watering plan will be implemented. Spraying of water to unsealed roads, decreasing speed and keeping vehicles to well defined roads will be implemented though an EMP (refer to **Volume 1, Chapter 7**) to meet air quality objectives set in **Chapter 10** of this volume.

12.6.2 OPERATION

Waste generation during the operation of the mine site is likely to be associated from the following:

Tailings: It is estimated that approximately 16 Mt of waste material will be generated annually, with a ratio of 65 % coarse rejects and 35 % tailings. It is understood that the rejects and tailings storage area will increase during the life of the mine. The depth of the reject and tailings storage areas is not anticipated to exceed 7.5 metres above ground level. Based on a water balance report undertaken for the Project (AMEC, 2010), it is estimated that for an annual production of 40 Mtpa of washed coal, total rejects and tailings quantity are estimated to be 15,842,000 t. Two options are currently being considered for tailings management. The first, known as co-disposal, involves traditional disposal of the tailings into cells to be constructed within the open cut box cut spoil areas. The second option involves filter pressing tailings to remove the water, and trucking the waste to designated dump locations. The finding of preliminary water balance report indicates that there would be annual water saving of 3,000 ML where the latter option is selected.

Workers Village: A workers village will be constructed to cater for a maximum of 2,000 personnel. The workers village will include accommodation, kitchens, dining halls, wet messes, and recreational facilities. The predominant waste streams are likely to include black water, grey water, grease trap waste (from kitchen operations), recyclables and general domestic waste including food scraps. The black and grey water will be diverted to the mine site sewage treatment facilities (STF) with a capacity sufficient to cater for peak personnel volumes. A contractor will manage the STF and be responsible for the quality of the water post treatment so it can be used for irrigation / dust suppression purposes within the project.

Mine Office: Waste streams will comprise predominantly paper and cardboard recyclables. Printer toner cartridges will be segregated for collection and recycling. Some general domestic waste including food scraps will be disposed of consistent with the workers village.

Maintenance: Extensive plant and equipment will be used at the mine. This will result in frequent servicing requirements. Waste streams associated with such activities will include regulated waste (tyres and rubber off cuts) and hazardous material such as waste oil, lubricants, coolant and oily rags. Scrap metal may also be generated from broken machinery.

12.6.2.1 Operational Emission Sources

Potential emission during mining operations will primarily come from equipment using diesel, other sources are dust emissions and methane emitted from the project. Odour may rise from fuel burning of vehicles or equipment or explosive usage, but it is not expected to reach significant levels in the ambient air. **Chapter 10** proposes mitigation measures for controlling dust levels. These include, level two watering (greater than two litres / m^2 / hour) for haul roads, and reduction of wind erosion from the *'not-recently-disturbed'* exposed areas. Other dust control measures proposed for the mine include:

- the CHPP, as all activities are enclosed (including loading) and the CHPP uses a wet process;
- conveying, and conveyor transfer points (excluding loading/unloading), as all conveyors are fully enclosed;
- loading coal to trains, as train loading is fully enclosed; and
- tailings dams, as the tailings will be maintained as a wet paste.

The majority of emissions are associated with the waste (overburden soil and rocks) handling by the draglines, the transport of waste to the out-of-pit waste dumps, wheel-generated dust during hauling of coal and wind erosion of exposed areas.

12.6.3 DECOMMISSIONING

Prior to the decommissioning of the project, a mine closure and rehabilitation plan will be prepared. The plan will assess the volume and types of waste anticipated to be generated through this final phase of the project. The plan will be based on the best practice

principles at the time, and will be undertaken in line with the waste management hierarchy to identify the most appropriate measures to manage the remaining waste on the project site. Site infrastructure will be decommissioned and demolished in line with the intended post project land use.

12.6.4 SEWAGE AND STORMWATER

12.6.4.1 Sewage

Sewage will be generated throughout all phases of the project from construction to operations. Package STFs will provide efficient effluent management and effective wastewater treatment. STFs will be located at all workers' compounds to treat the generated sewage. The STFs provided will be sufficient to treat the waste to at least Class C recycled wastewater quality. This will allow disposal to land with minimal impact on the surrounding environment. Table 5 lists treatment levels required for disposal. The volume of sewage and grey water to be produced is an estimated 100 L per person per day.

A typical sewage treatment plant will include:

- a balance tank for flow equalisation;
- a primary tank for settlement, digestion storage of solid matter;
- an aeration compartment for biological degradation of organic matter;
- a clarifier for further removal of residual suspended solids; and
- a final effluent tank for disinfection and storage of treated water.

Absorption beds and / or irrigation fields will be used for treated wastewater disposal and will be located and designed to avoid:

- sensitive areas;
- soil erosion;
- surface ponding; and
- impact on the quality of groundwater.

Signage will be established around absorption beds and / or irrigation fields to restrict access. The treated sludge will be transported off-site by a regulated waste contractor to a regulated waste facility. The treatment facilities will be designed to include alternative storage and disposal options during times of system failure and in conditions preventing discharge to land such as rain events.

12.6.4.2 Stormwater

Stormwater is anticipated to be generated during all phases of the project. The management of stormwater will be considered as part of the design of the mine site, workers compounds and associated amenities. The construction of such infrastructure will result in impervious hard stand areas and increased generation of stormwater runoff and flow rates.

Stormwater is generally not considered a waste unless it becomes contaminated in a construction or process area. Stormwater generated at the mine has the potential to come into contact with contaminants such as hydrocarbons and suspended sediments. Suspended sediments are generally considered to be the most likely source of water quality pollutants from the construction sites.

Table 5. Sewage disposal parameter requirements for the mine

CLASS C WASTEWATER QUALITY CHARACTERISTICS	UNITS	LIMIT
Biological oxygen demand (BOD)	mg/L	20 (maximum)
pH	Scale	6.0 – 8.5
Electrical conductivity	µs/cm	<1,600
Total dissolved solids	mg/L	<1,000
Total suspended solids	mg/L	30 (maximum)
Escherichia coli (E. coli)	Colony forming units/100mL	<1,000 (maximum)
Total nitrogen	mg/L	35 (maximum)
Total phosphorous	mg/L	10 (maximum)
Dissolved oxygen	mg/L	2 (maximum)

The design and intent of the stormwater management system will be to avoid surface water ponding and flooding from overland flows as well as minimising the amount of sediment laden runoff leaving the site. Storm water capture will be included in the design where possible and stormwater discharge points will be designed to avoid impacting the natural flow system.

Each of the major facilities within the mine will be a self-contained entity including stormwater diversion drainage systems, runoff treatment to capture "oily water" using skid-mounted equipment, and first-flush sediment ponds used for other parts of these facilities. Where required, oily wastewater will be processed using a separator. The separated oil will be collected and transported to a licensed facility.

The EMP prepared for the Project will include an ESCP and site specific sub plans for each location. These plans will outline the minimum controls and management measures to be implemented to minimise the potential for impacts from erosion and sedimentation, and prevent non compliance and non conformance issues. Site specific ESCPs will be developed and implemented across the project. The ESCPs will identify the specific control measures to be implemented and will be developed in accordance with the *Soil and Erosion Sedimentation Control Guidelines for Queensland Construction Sites* (Institute of Engineers, 1996) and all relevant Legislation, Standards and / or Guidelines.

12.6.4.3 Decommissioning Emission Sources

Generated emissions from operational works will be mitigated to meet air quality objectives. Mitigation measures will include progressive rehabilitation of disturbed areas, watering of road and other areas to minimise dust generation. Technical information on decommission and rehabilitation phases post mine is available in Volume 2 Chapter 1, Chapter 7 and Chapter 10.

12.6.5 MINE SITE WASTE INVENTORY

A review of the activities expected throughout the construction, operation and decommissioning phases of the mine established that the majority of the waste streams are likely to occur throughout all phases. Table 6 provides the waste characteristics and potential disposal options for the waste streams associated with the mine.

Table 6. Mine - waste inventory, characterisation and management methods

PROJECT ACTIVITY	WASTE GENERATED	WASTE CHARACTERISATION	PHASE WASTE EXPECTED			TEMPORARY SITE STORAGE	FINAL DISPOSAL OPTION	MANAGEMENT METHODS
			CONSTRUCTION	OPERATION	DECOMMISSION			
General Earthworks								
Vegetation Clearing	Plant material	Biodegradable Solid	Yes	–	–	Stockpile	Reuse	Millable timber to be harvested for sale. Mulching of waste vegetation / timber by reuse on site during rehabilitation. Burning of green waste is strictly prohibited and is not an acceptable waste management option. Preferred re-use as a substitute energy source. Exposed areas following clearing will be minimised and erosion control measures implemented.
	Weeds	Biodegradable Solid – some seeds may regenerate.	Yes	–	–	Stockpile	Refer to EMP and WMP.	
	Mulch	Biodegradable Solid	Yes	–	Yes	Stockpile	Reuse	
	Timber	Solid Inert	Yes	–	–	Stockpile	Recycle	
Topsoil Placement/ Removal	Topsoil	Solid inert	Yes	–	Yes	Stockpile	Reuse	Topsoil to be stripped and stockpiled for subsequent rehabilitation works. Topsoil to be returned to areas from which it was stripped during rehabilitation works where practicable to maximise return of plant propagules and prevent sediment laden runoff.

PROJECT ACTIVITY	WASTE GENERATED	WASTE CHARACTERISATION	PHASE WASTE EXPECTED			TEMPORARY SITE STORAGE	FINAL DISPOSAL OPTION	MANAGEMENT METHODS
			CONSTRUCTION	OPERATION	DECOMMISSION			
Excavation of unsuitable in-situ material	Spoil	Solid inert*	Yes	–	Yes	Stockpile	Reuse	Excess spoil will be used where practicable in rehabilitation works or stored in temporary bunded stockpiles.
		Potential contamination	Yes	–	Yes	Separate Stockpile from non-contaminated material	Disposal with potential treatment and re-use.	Spoil identified as contaminated / regulated waste will be transported off site by licensed regulated waste transporter and disposed to a licensed waste receiver. Where there is a shortage of material, treatment options will be adopted where deemed appropriate for the Project.
Placement or Removal of sub-grade/fill	Excess Fill	Inert solid	Yes	–	Yes	Stockpile	Reuse	Excess fill will be used where possible in ancillary activities i.e. construction of haul and access roads. Residual fill will be stockpiled and used during rehabilitation works.
Concrete Batching								
Concrete Manufacture	Process Wastewater	Alkaline liquid	Yes	Yes	–	Sediment Pond	Treat and Reuse	Waste will be minimised by procuring only the amount required for the activity. Containment solid and liquid wastes (bowl washout water) will be disposed at the concrete batch plant. Collection of excess concrete for re-use as fill material.
	Surplus Cement	Solid Inert	Yes	Yes	–	Stockpile	Reuse	
	Surplus Concrete	Solid Inert	Yes	Yes	–	Stockpile	Reuse	

PROJECT ACTIVITY	WASTE GENERATED	WASTE CHARACTERISATION	PHASE WASTE EXPECTED			TEMPORARY SITE STORAGE	FINAL DISPOSAL OPTION	MANAGEMENT METHODS
			CONSTRUCTION	OPERATION	DECOMMISSION			
Coal Handling and Preparation Plant								
Run of Mine Coal Handling	Tailings / Rejects	Contaminated Material	–	Yes	–	Tailings / Waste Rock Storage Areas	Covered with benign rock material for permanent burial	Tailings/rejects will be placed in the OEF so that any PAF material is fully encapsulated. The PAF material should be located at a level that is below the Projected post-mining water table and covered with sufficient overburden. The tailings / rejects should be managed in accordance with the Reject Disposal Plan.
	Mine Water (from work area runoff or ground water seepage)	Contaminated Liquid	–	Yes	–	Sediment Pond	Reuse in CHPP Process	Runoff from work areas will be segregated from runoff from undisturbed areas and reused in the CHPP process, of for dust suppression purposes.
Coal Stockpiling	Fugitive Dust Particles	Potentially Hazardous Material	–	Yes	–	Not Applicable	Not Applicable	Implementation of dust control measures. Wet down of stockpiles. Stockpile area may include water cannons designed to wet down the surface of the stockpiles and form a crust that inhibits the erosion of dust. Mist curtains may also be used as a secondary suppression system. The mist curtain is designed to enhance deposition of dust by impaction of the dust particles.

PROJECT ACTIVITY	WASTE GENERATED	WASTE CHARACTERISATION	PHASE WASTE EXPECTED			TEMPORARY SITE STORAGE	FINAL DISPOSAL OPTION	MANAGEMENT METHODS
			CONSTRUCTION	OPERATION	DECOMMISSION			
Coal Stockpiling (continued)	Runoff	Hazardous Liquid	–	Yes	–	Sediment Pond	Reuse in CHPP Process	All runoff from coal stockpile areas will be segregated from clean stormwater runoff and re-used within the CHPP process where possible.
Coal Washing	Process Wastewater	Hazardous Liquid	–	Yes	–	Coal Washery Waste Disposal Area	Reuse in CHPP Process	Process water to be re-used in the CHPP process. Perimeter bunding to be maintained around coal washery waste disposal area. Coal washery waste not to be deposited in any other location.
General Track Works for Rail Loops								
Laying/Removal of cable	Surplus Cable	Solid inert (Non Ferrous Metal)	Yes	Yes	Yes	Scrap Metal Skip	Recycle	Minimisation of waste by procuring only necessary quantities. Segregation and collection on site with transportation off site by licensed waste contractor for recycling.
	Surplus Conduit	Solid Inert	Yes	Yes	Yes	Stockpile	Recycle	
Laying/Removal of ballast	Surplus Ballast	Solid inert	Yes	Yes	Yes	Stockpile	Reuse	Minimisation of waste by procuring only necessary quantities. During decommissioning, an assessment for market demand will be undertaken or recycle/disposal to nearby facility.
Laying/Removal of sleepers	Broken or surplus sleepers	Solid inert	Yes	Yes	Yes	Stockpile	Reuse/ Recycling Facility	Minimisation of waste by procuring only the amount necessary. Broken concrete sleepers during operational phase will be stockpiled until sufficient quantity to transport off site to licensed disposal facility.

PROJECT ACTIVITY	WASTE GENERATED	WASTE CHARACTERISATION	PHASE WASTE EXPECTED			TEMPORARY SITE STORAGE	FINAL DISPOSAL OPTION	MANAGEMENT METHODS
			CONSTRUCTION	OPERATION	DECOMMISSION			
Laying/Removal of track	Surplus steel	Solid inert (Ferrous Metal)	Yes	Yes	Yes	Scrap Metal Skip	Sale	Minimise waste by procuring only the amount necessary. Segregation via provision of scrap metal skips with transportation off-site by waste contractor.
	Surplus fittings	Solid inert (Ferrous Metal)	Yes	Yes	Yes	Scrap Metal Skip	Recycle	
Plant Maintenance								
Routine Maintenance (oil change. Water check etc)	Waste oil, lubricants, fuels.	Hazardous liquid	Yes	Yes	Yes	Designated storage in bunded tanks/ drums	Disposal	Waste oil should be stored in drums on site. The drums will be transported off site by waste contractor for offsite reuse, recycling or disposal. Other hazardous material will be collected and transported offsite by a licensed regulated waste transporter to a licensed regulated waste receiver.
	Used filters and oily rags.	Hazardous material	Yes	Yes	Yes	Designated Storage in receptacle.	Disposal	
High Level Plant Maintenance	Waste oil, fuel, lubricants, hydraulic fluid.	Hazardous liquid	Yes	Yes	Yes	Designated storage	Disposal	As per management methods described above.
	Broken Parts	Solid Inert (likely to be Ferrous Metal)	Yes	Yes	Yes	Scrap metal skip or general waste skip.	Recycle or dispose.	Assessment to be undertaken for potential market for recycling / resale. Segregation and collection on site. Transport off site by waste contractor for recycling.
	Tyres	Solid Inert (Limited Regulated Waste)	Yes	Yes	Yes	Stockpile	Recycle	Due to fire risk, tyres to be stockpiled away from flammable material. Transportation off site by licensed regulated waste transporter to a licensed regulated waste receiver.

PROJECT ACTIVITY	WASTE GENERATED	WASTE CHARACTERISATION	PHASE WASTE EXPECTED			TEMPORARY SITE STORAGE	FINAL DISPOSAL OPTION	MANAGEMENT METHODS
			CONSTRUCTION	OPERATION	DECOMMISSION			
High Level Plant Maintenance (continued)	Batteries	Hazardous material	Yes	Yes	Yes	Stockpile	Recycle	Stockpiled in a covered and bunded area. Transport off site by licensed regulated waste transporter to a licensed regulated waste receiver.
Wash down	Waste wash down water containing Sediment Detergent;	Contaminated Liquid	Yes	Yes	Yes	Sedimentation pond.	Treat for reuse, or disposal	Wash down to be conducted over hard stand and drainage to sump / sedimentation pond. Sedimentation pond to be cleaned regularly.
Receival of parts/ supplies	Packaging Material; Timber Pallets; Plastic/Paper/ Cardboard	Solid inert	Yes	Yes	Yes	Stockpile pallets. Paper, Plastic and Cardboard to be stored in recycling receptacle.	Recycle/ Reuse	Quantities of timber pallets may be reduced by procuring only the necessary quantities required. Pallets in good condition to be returned. Damaged pallets may be processed via wood chipper for use on vegetated / rehabilitation areas. Paper / plastic and cardboard to be segregated and transported off site by waste contractor.
Chemical and Fuel Storage	Empty Containers	Hazardous Liquid	Yes	Yes	Yes	Stockpile	Disposal	Stockpiled in a covered and bunded area. Transport off site by licensed regulated waste transporter to a licensed regulated waste receiver.
	Surplus Material	Hazardous Liquid	Yes	Yes	Yes	Liquid to be stored in designated drums in bunded area.	Recycle or disposal at appropriate facility by licensed transporter.	Refer to management methods described above.
	Spill Cleanup Material	Hazardous Material (solid)	Yes	Yes	Yes	Designated bins.	Disposal at appropriate facility by licensed transporter.	

PROJECT ACTIVITY	WASTE GENERATED	WASTE CHARACTERISATION	PHASE WASTE EXPECTED			TEMPORARY SITE STORAGE	FINAL DISPOSAL OPTION	MANAGEMENT METHODS
			CONSTRUCTION	OPERATION	DECOMMISSION			
Workers Village, Offices and Associated Facilities								
Dining Facilities	Grey water	Contaminated liquid	Yes	Yes	Yes	On Site Septic	Collection and disposal by contractor	Removal by licensed contractor to approved facility.
	General waste including putrescibles and organic.	Biodegradable	Yes	Yes	Yes	General Waste Skip or dedicated compost receptacle.	Dispose or Application of Compost.	General waste to be transported off site to nearby landfill. Food scraps to be used as compost / fertiliser for application on vegetated / rehabilitation areas.
	Packaging Material	Solid inert	Yes	Yes	Yes	Dedicated Recycle Bin	Recycle	Refer to management methods described above.
Printing	Waste paper	Solid inert	Yes	Yes	Yes	Dedicated Recycle Bin	Recycle	Printing management methods will be implemented including double side printing, recycling of printed paper for reuse where possible and avoid printing where it is not essential. Collection and segregation on site. Transportation off site by waste contractor for recycling.
	Printing Cartridges	Solid inert	Yes	Yes	Yes	Dedicated Recycle Bin	Recycle	
Ablutions	Sewage	Biodegradable Liquid Biological Hazard	Yes	Yes	Yes	On Site Septic	Collection and disposal by contractor	Removal by licensed contractor to approved facility.
	Grey water	Contaminated liquid	Yes	Yes	Yes	On Site Septic	Collection and disposal by contractor	Removal by licensed contractor to approved facility.

12.7 COMMITMENTS

Waratah commit to undertaking actions that will reduce potential impacts through a proactive rather than reactive approach to waste generation and minimisation. This will facilitate in reducing impacts to the surrounding environment.

12.7.1 ENVIRONMENTAL MANAGEMENT PLAN

The EMP will:

- describe the management and control of construction and operational activities to ensure that all parties involved are aware of their environmental obligations;
- ensure that all environmental aspects and impacts for each phase of the project are addressed; and
- ensure that the management and mitigation measures incorporated into the EMP reflect the Waste Management Strategy adopted for the project, and consider relevant sustainability principles where appropriate.

The EMP will include measures designed to comply with the relevant industry standards and will be designed in response to the predicted impacts with detailed design measures to address localised impacts where necessary. Mitigation measures may include change in work procedures and practices, physical interventions to separate or buffer specific areas from predicted impacts, physical relocation of affected parties for agreed periods of time.

The EMP will contain a program and procedure for ongoing monitoring for relevant aspects to identify the effectiveness of the control and mitigation measure. Monitoring may include a range of activities including such as scientifically conducted measurements of specified parameters, visual inspections, recording of events and communication. Specific air quality management arrangements are outlined within Chapter 10 of this EIS.

12.7.2 PREFABRICATION

Waratah will commit to, where practicable and possible, have materials prefabricated to reduce waste streams from the construction of the project.

12.7.3 SOCIAL RESPONSIBILITY

Waratah Coal will carry out waste management in a manner that will have the most benefit to the local community. This includes:

- throughout the life of the project Waratah will work with the regional councils and other relevant groups to determine existing capacities and accepted waste types of their landfills and where required assist with the planning of expansion and upgrade of landfills to ensure wastes generated from the project can be accommodated;
- when sourcing waste contractors preference will be given to local businesses employing sustainable waste management practices; and
- work with local businesses so that they can take advantage of opportunities for re-use and recycling.

12.8 CONCLUSIONS

The construction, operation and decommissioning of the project will increase the volume and diversity of the waste from the project area compared to the existing land use. While the waste produced during the construction works will be of short duration (in comparison to the operational phase of the project), waste will continue to be produced during the operation and maintenance phases of the mine site.

Despite an overall increase in waste compared to baseline conditions, the cumulative impacts of the waste are considered to be minor due to the implementation of best practice protocols and a responsible waste management approach, ensuring the potential for harm to the environment and human health is minimised, and where possible, avoided completely. This will ensure compliance with the Queensland regimes and guidelines.

12.9 COMMITMENTS

Waratah Coal will:

- develop and implement a detailed waste management guideline utilising the principles of the waste management hierarchy;
- work with local councils to determine the current landfill capacities and accepted waste types and will work with councils to assist with the planning of expansion and upgrade of landfills to ensure wastes generated from the mine can be accommodated if required;
- establish contracts with companies encouraging sustainable waste management practices;
- encourage the procurement of pre-fabricated materials where practicable;
- encourage local businesses to take advantage of opportunities for re-use and recycling, if available or initiate opportunities, if unavailable; and regularly review of the waste management plan including the marketability of wastes and the results of waste audits to improve waste management.