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12.1 INTRODUCTION

This chapter identifies and assesses the potential impacts resulting from waste generation throughout the 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 associated impacts of the identified waste streams along the rail alignment.

This Chapter is based on current and future waste stream generation and management for the rail alignment. Rail waste (air emission) generation also discussed in the Air Quality and GHG chapter (see Volume 3, Chapter 10).

12.2 PROJECT WASTE MANAGEMENT STRATEGY

The existing waste production and management within the rail study area is characterised by agricultural land use (predominantly cattle production). Given the scale of the Project and the activities associated with the construction, operation and decommissioning phases, waste generation and diversity will increase compared to the existing land use. While it is anticipated that environmental harm may occur, this harm will only occur where the waste streams are not managed in an acceptable and responsible manner.

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 assist through the construction, operation and decommissioning phases. The strategy allows for the incorporation into daily operations of waste management and will develop 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.

When a waste stream is identified, the segregation during generation, storage and transport will allow for maximum recovery. This facilitates a higher level of on-site reuse and recycling, while reducing landfill disposal. All waste streams are assessed for potential reuse prior to off-site disposal.

It is not anticipated that the rail construction will generate significant waste streams that 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 on and off-site pollution attributable to the Project's activities, and subsequently prevent adverse impacts to the environment. An EMP will be developed that will interface with each separate environmental management sub plans for the rail element.

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.

12.2.1 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 secondary sources that can utilise the waste;
- recycle waste by identification facilities that can recycle the particular waste stream;
- energy recovery from waste; and
- disposal of waste at an appropriate facility.

12.2.2 CLEANER PRODUCTION

Cleaner production 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 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 – change the product characteristics, such as shape and material composition are cleaner production processes. 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 the 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 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.

12.2.3 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 *Environmental Protection Regulation (1998)* EPR, the transporter must be licensed by the DERM 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 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).

12.2.4 WASTE MONITORING

In order to ensure that the rail's waste management strategy continues to be robustly implemented throughout the lifecycle of the Project, waste monitoring and auditing will be undertaken. The EMP prepared for the respective phases of the rail will outline the frequency of each of the monitoring requirements. 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 Waste Strategy.

12.2.4.1 Waste Reporting

The National Environment Protection Council (NEPC) endorsed the first *National Environment Protection Measure* (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 rail Project

PROJECT ACTIVITY	KEY EMISSION GENERATING ACTIVITIES	EMISSION TYPE
Railway Operations	Operation of diesel locomotives	Combustion products (i.e. NOx, CO, SO2, TVOC, PM_{10}, $PM_{2.5}$)
	Abrasive blasting	Particulates and speciated particulates
	Surface coating and solvent usage	VOCs
	Maintenance operations	VOC, solvent and particulates
	Volatile material loading	Organic vapour

12.3 ASSESSMENT METHOD

Generated wastes were described by employing principles from the waste management hierarchy according to the development phases of the rail alignment. Table 1 was developed to further investigate the likely impacts associated with the rail's activities and its identified waste. Management options for these were then identified and discussed firstly upon avoidance and minimisation, and secondly reuse and recycle, and finally disposal.

12.3.1 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.

12.3.2 WASTE INVENTORY, CHARACTERISATION AND MANAGEMENT

12.3.2.1 Existing Waste Management Infrastructure

The rail alignment is located within three regional local government authorities and in proximity to one additional regional local government, these being:

- Barcaldine Regional Council (BRC);
- Central Highlands Regional Council (CHRC) (proximity to);
- Isaac Regional Council (IRC); and
- Whitsunday Regional Council (WRC).

12.3.3 WASTE MANAGEMENT FACILITIES REGIONAL COUNCILS

Barcaldine Regional Council

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

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

All five facilities accept general municipal waste only with the exception of the Barcaldine Landfill. This 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 closest, most appropriate landfill for disposal. It should be notes that an on-site landfill option is currently being considered for the project in the vicinity of the mine. 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 rail terminus located at 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); see Figure 1 for waste infrastructure.

Central Highlands Regional Council

Information pertaining to waste management within CHRC was obtained through correspondence with the CHRC waste management co-ordinator. There are several waste management facilities in operation within the CHRC (Table 3).

Table 3. Central Highlands Regional Council waste management facilities

FACILITY	LOCATION
Blackwater Landfill	Ardurad Road, Blackwater, 4717
Capella Landfill/ Transfer Station	Capella-Clermont Highway, 4723
Emerald Transfer Station	Glasson Street, Emerald, 4720
Lochlees Landfill	Lochlees Road, Emerald, 4720
Sapphire – Rubyvale Landfill	Sapphire – Rubyvale Road, Sapphire, 4702

The Lochlees Landfill is the main landfill facility within the CHRC. The landfill comprises a low permeability clay liner and can accept limited regulated waste. Contaminated soil may be accepted at the site subject to approval by DERM. The site's licence conditions permit the maximum disposal of 20,000 tonnes of general waste per annum. CHRC are currently undertaking planning works for the construction of the subsequent landfill cell which will have a capacity of 50,000 m^3 and are seeking to purchase adjoining land which would extend the life of the site.

The Blackwater landfill is the second largest facility and accepts general domestic and commercial waste and comprises stockpile areas for the green waste, concrete and demolition material, co-mingled recyclables, batteries and steel.

JJ Richards Pty Ltd (JJ Richards) is commissioned to empty all recycling skips. The material is transferred to the JJ Richards Material Recovery Facility (MRF) located in Clermont. Sims Metal Pty Ltd (Sims Metal) are contracted to purchase and remove stockpiles of scrap metal from the facilities, while a local contractor (Emerald Recycling Pty Ltd) manage aluminium cans and cardboard. AMCOR currently processes all kerbside recyclables, which will be redirected to the new MRF located in Rockhampton which is currently under construction and due for completion by September 2010.

Isaac Regional Council

Information pertaining to waste management within IRC was obtained through correspondence with the IRC waste management co-ordinator. There are several waste management facilities in operation within the IRC (Table 4).

Table 4. Isaac Regional Council waste management facilities

FACILITY	LOCATION
Moranbah Landfill	Goonyella Road, Moranbah, 4744
Clermont Landfill	Turruma Road, Clermont, 4721,
Glenden Landfill	Ewan Drive, Glenden, 4743
Dysart Landfill	Clermont Road, Dysart, 4745
St Lawrence Landfill	Evans Street, St Lawrence, 4707
Nebo Transfer Station	Peak Downs Highway, Nebo, 4742
Greenhill Landfill / Transfer Station	Pacific Avenue, Greenhill, 4707
Carmilla Transfer Station	Carmilla West Rd, Carmilla, 4739
Middlemount Landfill Transfer Station	Centenary Drive South, Middlemount, 4707

The nearest waste management facilities to the rail alignment include the Clermont, Moranbah and Glenden landfills. The Clermont and Moranbah landfills are approximately 100 km east of KP383 and KP272 respectively. The Glenden landfill is approximately 50 km east of KP176.

All landfills within the IRC accept domestic, general construction and demolition and green waste. Regulated waste including car batteries, tyres and mineral oil is stored at each of the sites, for collection and recycling where possible. Asbestos is land filled at the Dysart, Moranbah, Middlemount and Glenden facilities. Contaminated soil issues are not common within IRC. In the event that such an issue arises, IRC has been instructed to liaise with DERM prior to the acceptance of such material at any of the facilities.

Three main contractors are responsible for the collection of various wastes; these being Sims Metal, NQ Resource Recovery Pty Ltd (NQRR) and JJ Richards. JJ Richards is responsible for domestic and commercial waste collection disposed at Moranbah, Clermont, Dysart, Middlemount, Glenden and St Lawrence landfills. Cardboard and co-mingle recyclables are stored at the Moranbah facility prior to bulk haulage to AMCOR in Brisbane.

Whitsunday Regional Council

Information pertaining to waste management within WRC was obtained through correspondence with the WRC waste management co-ordinator. There are several waste management facilities are in operation within the WRC (Table 5)

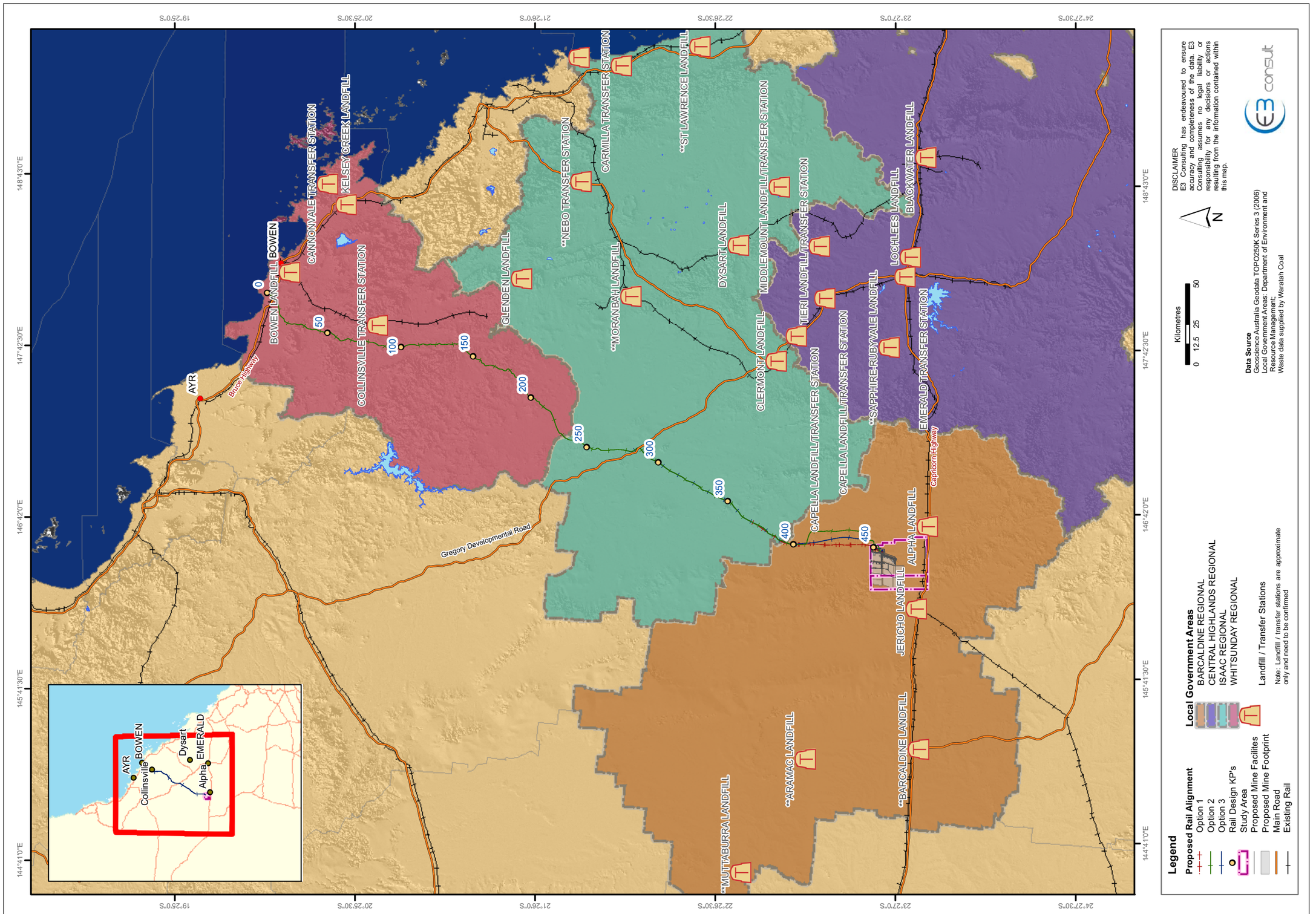
Table 5. Whitsunday Regional Council waste management facilities

FACILITY	LOCATION
Bowen Landfill	908 Collinsville Road, Bowen, QLD, 4804
Collinsvale Transfer Station	Scottville Road, Collinsville, QLD, 4805
Kelsey Creek Landfill	Kelsey Creek Road, Proserpine, QLD, 4008
Cannonvale Transfer Station	Carlo Drive, Cannonvale, QLD, 4802

The Bowen Landfill is located on Collinsville Road approximately 16 km southwest of Bowen and approximately 17 km southeast of the rail loop within the APSDA. The Kelsey Creek landfill is located approximately 85 km directly east of KP63 of the rail alignment.

The *Bowen Whitsunday Regional Waste Study* (Maunsell AECOM, 2005) indicates that the Bowen Landfill operates under License No NR0175 relating to ERA74 (e) - General Waste Disposal Facility, and ERA 76 - Regulated Waste Disposal. The report suggests that the current active cell at the landfill is unlined. Once full, three lined cells will be constructed with a combined lifespan of 15 years.

Figure 1. Waste Management Infrastructure in Regional Council Areas



Longer term, the site has the potential to be expanded to the south on WRC land.

The Kelsey Creek Landfill is located adjacent to Proserpine Kelsey Creek Road. The current active cell is lined and is estimated to have landfill airspace for six to seven years. Like the Bowen landfill, longer term options include expansion to the west, or alternatively, increasing the height of the cells will extend its lifespan to 15 years from present.

Contaminated soil is accepted at both the Bowen and Kelsey Creek Landfills providing that the material complies with site specific acceptance criteria for the unlined and lined cells. WRC accepts specific waste at each of the waste management facilities.

12.3.4 OPPORTUNITIES TO RECYCLE

12.3.4.1 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.

12.3.4.2 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 3 m^3 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.

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

Prior to collection, the JJ. 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.

12.3.4.3 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.

12.3.4.4 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.

12.4 RAIL ALIGNMENT WASTE GENERATION

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

The *Galilee Basin Railway Strategic Planning Study* (Waratah Coal, February 2009) identified the most feasible corridor between the mine and the coal terminal while satisfying a broad range of requirements. The preferred corridor comprises an estimated track alignment length of approximately 468 km. The following information and estimated waste generation calculations are based on the quantities likely for the preferred corridor.

12.4.1 CONSTRUCTION

During the construction of the rail alignment, the major infrastructure components will include:

site preparation works (including accommodation camps and laydown areas/depots);

construction of the rail alignment itself;

construction of the rail maintenance facility; and

construction of maintenance roads will be located within the railway easement along the length of the railway.

It is anticipated that the largest volume of waste will be associated with the construction of the railway track, rather than the ancillary activities associated with the construction or the long term operation of the rail alignment. Therefore it is estimated that the key points of waste generation during construction of the railway include the following.

General Alignment: Vegetation clearing and surplus earthwork/spoil material are likely to form the major portion of waste generated. The footprint clearing is approximately 8,940,000 m^2. The volume of expected vegetative waste has not been estimated as detailed vegetation assessments to determine vegetative cover are currently being undertaken. The preferred corridor traverses through diverse terrains ranging from relatively sparse rural land to the undulating slopes of the Leichardt and Clarke Ranges.

The railway alignment will be constructed at or near the natural surface where possible, and has been designed to minimise and balance the quantities of earthwork material. Waste will be minimised by reuse of material where possible throughout the rail alignment. Construction selected fill material for the rail embankments (approximately 5,830,000 m^3) will be sourced from material recovered from excavation of the railway cuttings (approximately 9,820,000 m^3).

Based on the preliminary assessment of the corridor alignment, excess earthwork material (referred to as dump material) will be approximately 4,100,000 m^3. Approximately half of this material comprises topsoil that will be stripped along the entire railway. This material will be stockpiled and spread on the outer edge of the railway and used for rehabilitation works.

The remainder of the dump material is comprised of both unusable cut beyond the layer of topsoil (such as cuttings through black soils), together with surplus usable cut (beyond the general fill requirements). It is expected that this material will be either stockpiled in spoil heaps along the railway, used to backfill borrow pits and quarries, or as a last resort, hauled to a suitable dump site (either a landfill or new dump pit by agreement with landowners or local council).

Ballast material (approximately 1,000,000 m^3 bulk cubic metres) will be sourced from existing and new quarry sites. Significant quantities of surplus ballast material are therefore not expected due to design specifications.

Remote and temporary camps: It is estimated that there will be up to four remote construction camps, located approximately 100 km apart. These will be temporary structures for construction teams working in remote areas along the extent of the rail alignment during track laying. The camps will generate putrescibles and sewage waste with putrescibles waste expected to form the major waste stream. A construction workforce of 900 people split over the three camps is considered necessary for the railway development. It is likely that mobile toilet and shower systems, and hence sewage and grey water will be managed via the use of a pump out system directed to a primary septic tank and collection well, prior to removal by the designated contractor. Sewage waste will then be treated via connection with municipal sewage waste infrastructure. Office waste including paper, toner and ink usage are expected to be minimal due to the primary operations orientated around general day to day living activities. It is understood that minor servicing will be undertaken and hazardous waste (waste oil, lubricants, hydraulic fluid, etc) will be generated. Spill kits will be located within the designated plant service area with the personnel trained in emergency response management to ensure a prompt response to such incidents.

Concrete Batch Plant: A concrete batch plant will be located near Collinsville and will service the rail corridor for the manufacture of rail sleepers, culverts and bridge structures. Waste generation is likely to include turbid and highly alkaline wastewater as well as dust emissions associated with the concrete batching plant. The plant will be designed such that clean stormwater will be diverted away from contaminated areas and directed to the stormwater discharge system. The wastewater collection system will be designed to collect process wastewater from:

- agitator washout;
- plant and yard wash down;
- concrete batching area;
- slump stand;
- contaminated stormwater; and
- any additional wastewater from the batching plant operation.

The process wastewater will be directed to a settling pond (or series of ponds) so the water can be reused in the concrete batching process to minimise the volume of wastewater to be discharged under a trade waste license. The dry sediment will be removed from the ponds and depending on the levels of contaminants, will either be land farmed and re-used throughout the Project where practicable, or disposed of at a licensed waste facility.

Mechanical Workshop: It is understood that all plant and equipment will be serviced off site for major servicing requirements. There will be capability onsite for minor servicing in the event of plant breakdown or tyre blowouts. The potential for the generation of small quantities of regulated waste including tyres, hydraulic fluids, coolants and oils is likely. The onsite vehicle maintenance contractors (following the Project waste management strategy and EMP) will be responsible for all waste generated. The vehicle maintenance contractor will be required to store any dangerous goods or hazardous substances in accordance with *Australian Standard 1940: Storage and Handling of Flammable and Combustible Liquids (AS1940)* with appropriate spill kits readily available and located near the designated storage area. All waste will be transported by a licensed contractor to an approved waste disposal facility.

Bridge, Culvert and Retaining Walls: Currently 12 bridges, 359 culverts totalling approximately 14 km in length and three retaining walls with a total face area of 892 m^2 are proposed for the preferred corridor. It is anticipated that the majority of waste generated will be construction material comprising predominantly excess concrete/cement and surplus steel and reinforcement off cuts. In order to minimise the extent of general building waste generated during the construction phase of the Project, where feasible and practicable, Waratah 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.

12.4.1.1 Construction Emission Sources

Air emissions during the construction phase of the rail easement will be primarily dust related. Emissions of combustion-related pollutants, such as nitrogen oxides and volatile organic compounds (VOCs) from diesel construction equipment and vehicles are expected to be minor. Dust emission sources include clearing of vegetation and topsoil, excavation works, blasting, transportation movements, and temporary activities associated with quarries along the proposed alignment. Measures to minimise dust emissions will

be implemented to mitigate off-site impacts. Primary activities which can result in emission sources and waste generation from the corridor are discussed further in Volume 3 Chapter 1, Chapter 10 and Chapter 8 of this EIS.

12.4.2 OPERATION

During the operation of the rail, the waste streams generated are anticipated to be significantly reduced in comparison to the construction phase of the Project. There will be a reduced workforce and demand for raw construction materials. Points of waste generation during the operation of the rail alignment are likely to be associated with:

Track maintenance: It is anticipated that waste generated during track maintenance will comprise predominantly vegetative waste associated with clearing of overgrown weeds and shrubs, concrete from broken sleepers, surplus ballast, and steel from damaged or broken track or fittings. It is anticipated that organic herbicides will be used along the extent of the rail alignment to manage weeds, and therefore some waste in the form of empty containers will be generated. All containers will be triple rinsed for recycling.

Operation of the maintenance facility for rail operations: This facility is expected to generate several waste streams due to its multiple purposes in servicing plant and equipment as well as providing facilities for track and signalling workers. The major portions of the waste are likely to comprise hazardous solids and liquids including waste oil, lubricants, coolant, oily rags and putrescibles waste including general domestic waste and sewage and grey water from ablutions. Hazardous substances will be stored within the facility, and in the event of spills, spill cleanup material will also be required to be managed.

Maintenance of Access Roads: During maintenance of access roads within the easement of the rail corridor, generated waste will predominantly consist of spoil and excess fill material from road surface re-profiling / regrading.

12.4.2.1 Operational Emission Sources

Potential emissions during rail operations (coal transportation) will primarily come from wind erosion from the surface of open coal wagons. This in part settles on rail easements. Where combustion related pollutants, such as nitrogen oxides and VOCs from diesel construction equipment and vehicles will minimally contribute as a primary emission source. 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.

Various management strategies have been proposed to mitigate potential impacts associated with the generation of dust. Chapter 10 of Volume 3 provides an outline of predicted air quality impacts and proposed mitigation measures.

12.4.3 DECOMMISSIONING

Given that the rail will be a significant piece of infrastructure that has the potential to benefit communities and a variety of private organisations, it is not expected that the rail would be decommissioned. This will particularly be the case if the rail becomes the only link to expand coal extraction operations within the Galilee Basin. Should the rail be decommissioned, it is expected that the rail embankment and bridge structure will remain in-situ. The track and concrete sleepers would be removed as would culverts and or other structures in flood prone areas.

12.4.4 SEWAGE AND STORMWATER

Sewage

Sewage will be generated throughout all phases of the Project from construction to operations. Package sewage treatment facilities (STF) 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 6 treatment levels required for disposal. The volume of sewage and grey water to be produced is an estimated 100L per person per day.

Table 6. Sewage disposal parameter requirements for the rail

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)

A typical sewerage 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.

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 rail alignment, 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 along the alignment has the potential to come into contact with contaminants such as hydrocarbons and loose sediments. Loose soil and sediments are generally considered to be the most likely source of water quality pollutants from the construction sites.

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 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.

12.4.5 RAIL WASTE INVENTORY

A review of the activities expected throughout the construction, operation and decommissioning phases of the rail alignment established that the majority of the waste streams are likely to occur throughout all phases. Table 7 presents the waste characteristics and potential disposal options for the waste streams associated with the rail alignment.

Table 7. Rail alignment – waste inventory, characterisation and management methods

PROJECT ACTIVITY	WASTE GENERATED	WASTE CHARACTER-ISATION	PHASE WASTE EXPECTED			TEMPORARY SITE STORAGE	FINAL DISPOSAL OPTION	MANAGEMENT METHODS
			CONSTRUCTION	OPERATION	DECOMMISS-IONING			
General Earthworks								
Vegetation Clearing	Plant matter	Biodegradable Solid	Yes	Yes	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. Exposed areas following clearing will be minimised and erosion control measures implemented. Preferred re-use as a substitute energy source.
	Weeds	Biodegradable Solid – some seeds may regenerate.	Yes	Yes	Yes	Stockpile	Refer to EMP and Weed Management Sub Plan.	
	Mulch	Biodegradable Solid	Yes	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.
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	Yes	Separate stock-pile 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, or where it is practical to remediate the area, in-situ treatment options will be adopted for the project.

PROJECT ACTIVITY	WASTE GENERATED	WASTE CHARACTER-ISATION	PHASE WASTE EXPECTED			TEMPORARY SITE STORAGE	FINAL DISPOSAL OPTION	MANAGEMENT METHODS
			CONSTRUCTION	OPERATION	DECOMMISS-IONING			
Placement or Removal of sub-grade/fill	Excess Fill	Inert solid	Yes	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	-	Sedimentation pond	Treat and reuse	Waste will be minimised by procuring only the amount required for the activity. Containment of 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	
Bridge, culvert and stock crossing								
Drainage and Structural Works	Spoil	Solid Inert/Potential Contamination	Yes	-	Yes	Stockpile	Disposal	As per previous management method outlined above.
	Concrete	Solid Inert	Yes	-	Yes	Stockpile	Reuse	Collection of excess concrete for re-use as fill material / erosion protection of for hard stand areas.
	Steel	Solid Inert (Ferrous Metal)	Yes	-	Yes	Scrap metal skip	Recycle	Minimise waste by procuring only the necessary quantities. Segregation via provision of scrap metal skips with transportation off-site by a licensed waste contractor.
General track works								
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	

PROJECT ACTIVITY	WASTE GENERATED	WASTE CHARACTER-ISATION	PHASE WASTE EXPECTED			TEMPORARY SITE STORAGE	FINAL DISPOSAL OPTION	MANAGEMENT METHODS
			CONSTRUCTION	OPERATION	DECOMMISS-IONING			
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 or will be broken down and used for erosion control works or as base for hard stand area.
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 operation								
Fuel Combustion	Water Vapour and Particulate Matter including CO_2 Emissions	Inert Gas	Yes	Yes	Yes	Not Applicable	Disperse to Atmosphere	Where practicable, low emission plant and equipment will be selected for use throughout the Project.
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 to be drained on site. The drums will be transported off site by waste contractor for offsite reuse, recycling or disposal. Oil and other hazardous material will be collected and transported offsite by a licensed regulated waste transporter to a licensed regulated waste receiver or recycler.
	Used filters and oily rags.	Hazardous material	Yes	Yes	Yes	Designated storage in receptacle.	Disposal	

PROJECT ACTIVITY	WASTE GENERATED	WASTE CHARACTER-ISATION	PHASE WASTE EXPECTED			TEMPORARY SITE STORAGE	FINAL DISPOSAL OPTION	MANAGEMENT METHODS
			CONSTRUCTION	OPERATION	DECOMMISS-IONING			
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 / Recondition 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 license regulated waste receiver.
	Batteries	Hazardous material	Yes	Yes	Yes	Stockpile	Recycle	Stockpile 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 and 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 sediment ponds. Sedimentation pond to be cleaned regularly.
Receival of parts/supplies	Packaging Material: Timber Pallets and Plastic/Paper/ Cardboard	Solid inert	Yes	Yes	Yes	Stockpile pal-lets. Paper, plastic cardboard to be stored in designated recycling re-ceptacle.	Recycle/ Reuse	Quantities of timber pallets may be reduced by procuring only the necessary quantities required. Pallets in good condition will 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.

PROJECT ACTIVITY	WASTE GENERATED	WASTE CHARACTER-ISATION	PHASE WASTE EXPECTED			TEMPORARY SITE STORAGE	FINAL DISPOSAL OPTION	MANAGEMENT METHODS
			CONSTRUCTION	OPERATION	DECOMMISS-IONING			
Chemical and Fuel Storage	Empty Containers	Hazardous Liquid	Yes	Yes	Yes	Stockpile	Disposal	Stockpile in a covered and bunded area. Transport off site by licensed regulated waste transporter to a licensed regulated waste receiver or supplier.
	Surplus Material	Hazardous Liquid	Yes	Yes	Yes	Liquid to be stored in des-ignated 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.	Selected staff to be trained in spill response and clean up procedures. Spill cleanup kits to be located at appropriate locations and easily accessible in the event of a spill event.
Staff accommodation and site offices – remote and temporary camps								
Dining Facilities	Grey water	Contaminated liquid	Yes	Yes	Yes	Sedimentation pond or on site septic	Reuse on site or disposal	Removal by licensed contractor to approved facility.
	General waste including putrescibles and organic.	Biodegradable	Yes	Yes	Yes	General waste skip or dedi-cated 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	

PROJECT ACTIVITY	WASTE GENERATED	WASTE CHARACTER-ISATION	PHASE WASTE EXPECTED			TEMPORARY SITE STORAGE	FINAL DISPOSAL OPTION	MANAGEMENT METHODS
			CONSTRUCTION	OPERATION	DECOMMISS-IONING			
Ablutions	Sewage	Biodegradable Liquid	Yes	Yes	Yes	On Site Septic	Collection and disposal by contractor	Removal by licensed contractor to approved facility.
		Biological Hazard						
	Grey water	Contaminated liquid	Yes	Yes	Yes	Sedimentation pond or septic.	Reuse on site or disposal.	Where disposal is the preferred option, removal to be undertaken by licensed contractor to approved facility.

12.5 CONCLUSIONS

The construction, operation and decommissioning of the Project will ultimately 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 rail alignment.

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.

12.6 COMMITMENTS

Waratah commit to:

- undertaking actions that will reduce potential impacts through a proactive rather than reactive approach to waste generation and minimisation;
- preparing a project specific WMP to be incorporated into the rail EMP. The EMP will be prepared in accordance with legislative requirements and any conditions imposed by the Coordinator-General;
- where practicable and possible, have materials prefabricated to reduce waste streams from the construction of the Project;
- carrying out waste management in a manner that will have the most benefit to the local community. This includes:
- throughout the life of the rail 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.