Provision of Professional Services
Western Tasmania Industry Infrastructure Study

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SKM

Western Tasmania Industry Infrastructure Study

FINAL REPORT

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Executive Summary

Sinclair Knight Merz (SKM) was engaged to undertake the western Tasmanian Industry Infrastructure Study for the Department of Infrastructure, Energy and Resources (DIER). The overall objective of the study was to develop a list of recommended infrastructure projects for western Tasmania, to encourage and support economic development in the region. The western Tasmania region is an important part of the state's economy, with mining, tourism, forestry and aquaculture significant economic and employment generating activities. The project focused on infrastructure for transport, energy, telecommunications and water, with a 20 year horizon.

A major part of the study included discussions with infrastructure users in the area, as well as organisations providing and managing infrastructure in and servicing the region.

The project had three sections:

1) An audit of existing infrastructure – drawing upon information from providers and managers
2) A review of industry operations, development plans, which also sought information on infrastructure limitations and shortcomings
3) Development of a prioritised list of recommended infrastructure projects, including assessment of agreed projects using the P50 / P90 cost estimation process.

Research indicated that mining is the major industry user of infrastructure, and has the most projects under development. Firms currently operating in the region include Bass Metals, Bluestone Mines Tasmania, Copper Mines of Tasmania, Grange Resources, Intec, Minerals and Metals Group, Tasmania Mines, Tasmanian Advanced Minerals and Unity Mining. The industry is growing with expansions to a number of existing mines, possible recommissioning of operations in care and maintenance as well as a number of potential new ventures including Bright Phase Resources, Forward Mining, Frontier Resources, Macquarie Harbour Mining, Shree Minerals, Stellar Resources, Stonehenge and McDermott Mines, Tasmania Magnesite, TNT and Venture Minerals.

Aquaculture is a rapidly expanding industry on the West Coast. Huon, Tassal and Petuna have established aquaculture operations based from Strahan, and the three have formed the Macquarie Harbour Aquaculture Group. There is a significant proposed expansion of the industry involving expanding the marine harbour leases to almost double the existing size.

The West Coast is one of Tasmania's most popular tourist regions. The main attraction is the natural wilderness, with mining heritage providing a secondary attraction. Tourism is largely seasonal and tourist numbers vary substantially from year to year.

The forestry industry has been substantial in the region with both Gunns and Forestry Tasmania owning significant plantations. The industry is currently declining with the future uncertain. The future transport of forest products from the region will remain uncertain until a decision is reached regarding the Gunns' Bell Bay pulpmill.

Transport infrastructure was clearly identified as the main priority for industry on the West Coast. Roads on the West Coast traverse difficult mountainous terrain and are characterised by narrow widths and constrained alignments. The elevated roads are vulnerable to ice and snow during the winter months. Traffic volumes are relatively low across all roads, with a substantial proportion of freight vehicles. Freight volumes are predicted to increase, particularly due to expansions in the mining and aquaculture industries.

The Ridgley Highway, Murchison Highway, Zeehan Highway, Anthony Main Road, Lyell Highway and Henty Main Road form the major transport corridor linking industry on the West Coast to Burnie Port. Roads such as Waratah Road play an important feeder role to this main corridor.

Maintaining and extending High Productivity Vehicle routes and ensuring roads can support future growth is important for industry on the West Coast. While the main corridor between the West Coast and Burnie Port is HPV gazetted, it does not fully meet Tasmanian HPV guidelines due to some sections having insufficient width, tight curvature and limited overtaking opportunities.

Rail transport has limited competitiveness on the West Coast and is currently only utilised by the mining industry, transporting product from Melba Flats and Rosebery to Burnie Port. The overall infrastructure condition is fair to poor, reflecting lengthy periods of underinvestment. The Melba Line has tight curves and steep ruling gradients, reflecting the challenging terrain. The current locomotive fleet and much of the wagon fleet is either at, or very close to, a life expired condition. TasRail has recently committed to purchasing 17 new locomotives for delivery from mid 2013 to replace the existing fleet.

Start-up mining operations can have short operational life expectations due to lack of certainty of deposit potential and what further exploration may find. The dispersed locations and shorter operational lives means it is not feasible to provide a direct rail connection to many deposits. Double handling costs create challenges for rail to compete with road transport.

High energy costs are a challenge for industry in the region. Aurora is the sole distributer of low voltage electricity to most users, with some high voltage users being supplied direct from Transend Network's transmission system. There is no gas reticulation provided outside Hobart, Launceston and some North West coastal towns. As such, there is a lack of competition in the energy market. Reliability of electricity is a challenge for the study corridor, with transmission lines vulnerable to storm damage.

Given the remoteness of the region, telecommunications are particularly important. Mobile phone coverage is patchy throughout the region which is a safety concern, particularly for road travel. Very limited coverage by most carriers outside main towns is an issue for tourism. Unreliability of fixed phone lines is a major concern for industry in some areas.

Water infrastructure was not raised as a concern for industry in the region with water supply plentiful in most areas.

While the capacity analysis of ports was outside the scope of this study, inadequate port and shipping facilities were identified as a major challenge for export of product from the region. Burnie Port has limited storage space and its proximity to Burnie CBD means expansion of the site is difficult. It is also limited by the size of ship able to utilise the port. Port Latta is a deep water port and can cater for larger ship sizes. The port, however, is weather constrained which would become an increasing impediment with increasing port utilisation.

Other challenges for the region include a lack of "social infrastructure" making it difficult to attract and retain workers and their families to the region. Uncertainty around the environmental protection status of the region also creates challenges for industry.

A number of infrastructure development projects were identified which address the major challenges faced in the study corridor. Potential projects were assessed based on cost, time frame and relative benefit. Relative benefit was assessed by considering the number and scope of beneficiaries from the project, both currently and in the future. This included an assessment of the number of jobs these projects would create, as well as wider benefits to the local community. The likelihood of ventures proceeding was considered as well as other possible avenues for funding of the projects.

Based on this assessment, five projects were chosen for a more detailed cost estimate using the P50/P90 methodology. Transport infrastructure, particularly roads, was clearly identified as the main priority throughout the consultation process which is reflected in the chosen projects. One rail project was included, to improve the condition and increase the capacity and efficiency of the Melba Line. No telecommunication or energy projects were chosen for further assessment. While these areas provide challenges for industry, they do not impact on the competitiveness of industry to the same extent as transport infrastructure. Aurora and Transend have their own infrastructure upgrades planned for the region. Analysis of port and shipping facilities is outside the scope of this study and therefore projects in this area have not been considered. TasPorts is currently undertaking their own study addressing port storage capacity and waterside connection issues.

The Murchison Highway forms a major section of the transport corridor between the West Coast and Burnie, connecting isolated regions of the State to the port and transit centres. A detailed assessment of the upgrade requirements on the Murchison Highway between Cradle Mountain

Development Road and Melba Flats was undertaken as part of a separate study by SKM in early 2011. This project will deliver the 2010 Tasmanian Government $21 million election commitment to upgrade West Coast roads. This funding commitment was not sufficient to cover all the works recommended as part of the project, and the remaining projects are still considered a high priority for the region. In addition to the five projects identified in this report, a P50/P90 has also been undertaken for the remaining sections of the Murchison Highway upgrades not covered by the present Tasmanian Government funding commitment.

The following table shows the assessment of those projects agreed for further assessment using the P50 / P90 approach, following discussion and review with DIER and the project steering committee. The colour coding used is:

- Orange – undertake P50 / P90
- Yellow – borderline, do not undertake P50 / P90
- White – do not undertake P50 / P90
- Green – undertake P50 / P90 on sections not covered by funding under previous Murchison Highway project.

The assessment categories and definitions used in the project assessment table are as follows:

Key			
Time Frame		**Cost**	
Short (S)	1 – 2 yrs	Low (L)	$5 m
Short – medium (SM)	3 – 5 yrs	Medium (M)	$5-10 m
Medium (M)	5 – 10 yrs	Substantial (S)	$10-50m
Long term (L)	10 + yrs	High (H)	>$50 m
Relative Benefit			
Major	Substantial benefits to numerous companies, enabling increases in production and employment exceeding 50 people directly, and or to regions or whole communities of at least 1,500 people.		
Medium	Benefits to one or more companies employing at least 200 people enabling increases in production and employment, and or to communities of at least 1,500 people		
Localised	Benefits to one or more companies employing less than 200 people directly, or to a single region or settlement with a total population less than 1,500 people		

Project	Beneficiaries		Time Frame	Cost	Relative Benefit	Recommendation and rationale
	Current	Future				
Road projects						
Corinna Rd and Western Explorer Rd: Seal and widen 21 km Corinna Road Savage River to Corinna and 75 km Western Explorer Rd Corinna to east of Couta Rocks	TAM, tourism	Shree Minerals, Grange Resources, tourism	SM	S-H	Medium	Do not undertake P50 / P90 Challenge is long length, very substantial likely cost and several beneficiary projects not yet at go ahead. Tasmanian Advanced Minerals - Additional 40 staff at Wynyard and up to an additional 5 personnel at Corinna mine site. - 10-20 years with exploration continuing. - 2 loads per day for 3 trucks (38t load). Shree Minerals - Exploration only. Mining licence process by early 2012. - Hematite 4-500,000 tpa; Magnetite 1,000,000 tpa; Grange Resources - Use of slurry pipeline by other mining companies. Tourism - Improved tourist routes to the west coast/Tarkine area. Tourists with hired vehicles will be able to use route (currently restricted by insurance conditions on unsealed road).
Cradle Mountain Development Rd: Widen and realign curves 47 km Cradle Mountain Development Rd, Moina to Murchison Hwy	Bass Metals, tourism	Frontier Resources, TNT	SM	S	Major	Borderline for P50 / P90 Substantial current and future mining beneficiaries; major tourism route; substantial general linking route. Future beneficiaries not yet at go ahead. Bass Metals - Currently 150 staff on site. Potential to increase to over 220 people. - Life of current ore body 3-4 years. Ten year plan for the site. - Potential significant gold/silver project in the future. Potential to extract lead and zinc from the tailings. Potential to mine remnants from Hellyer. - 390,000 tonne ore per year, processed on site. - $50 to $180 M to build a new processing plant for Gold/Silver. Frontier Resources - Stormont – 5km west of Cradle Mountain Link Road, 2 year life span. Minerals close to the surface and high grade. High probability of proceeding. TNT (Mine Makers) - Ore deposit ~ 50 million tonne. Shipping would be ~ 1 million t/a.

Project	Beneficiaries		Time Frame	Cost	Relative Benefit	Recommendation and rationale
	Current	Future				
						- Moina mine life between 10-20 years. Tourism - Major tourist route, providing access to Cradle Mountain
Macquarie Heads Rd: Seal 5 km Macquarie Heads Road, Strahan to aquaculture hub	MHAG, local population, tourism	MHAG expansions	S	L	Localised	Borderline for P50 / P90 Substantial benefit for aquaculture industry Recommend for West Coast Council / Proponent funding Offer assistance to Council for Roads to Recovery or similar project application
Murchison Hwy, Melba Flats to Zeehan Hwy: Upgrade 21 km Murchison Highway to meet HPV standards	CMT, Intec, West Coast residents, tourism,	Stellar Resources, TNT	S	M	Medium	Undertake P50 / P90 Substantial number of major project beneficiaries, plus broader improvements for west coast residents and tourism. CMT - Produce 110,000t tonne/yr of concentrate (from 2.5-2.6 million t/yr of ore). - Employ approx 100 people as well as 100-150 contractors. At least 400-450 people are directly dependent on the operation. - Potential to increase output from 2.5- 3 million t/yr (110-140 kt/yr concentrate). - Mine life is 12-15 yrs. Intec - Extraction of zinc in Zeehan. - 1000 t/week to continue for ~ 18 months. Stellar Resources - Tin mining development near Zeehan. - Expected production in late 2014, with export of 10 – 15,000 tpa. - Life is expected to be 7 – 10 years, but subject to further prospecting and assessment. Tourism/residents - Safety improvements for drive in/drive out staff and residents. TNT – refer to projects above
Murchison Hwy, Melba Flats to Rosebery: Upgrade sections not covered by previous funding commitment.	Intec, Bluestone, West Coast residents, tourism,	Stellar Resources, TNT				Undertake P50 / P90 Intec- refer to Projects above Bluestone- - Renison Mine- 13,200 tpa tin concentrate and 6,000 tpa copper concentrate, 4 year mine life - Currently 250-300 employed - Planned rentails project- 14,000 tpa, 9 year life. Likely to proceed however timing uncertain.

Project	Beneficiaries		Time Frame	Cost	Relative Benefit	Recommendation and rationale
	Current	Future				
						- Additional 140 staff will be required Stellar Resources- refer to Projects above TNT- refer to Projects above Tourism/residents - Safety improvements for drive in/drive out staff and residents.
Murchison Hwy, Rosebery to Anthony Main Rd: Upgrade sections not covered by previous funding commitment.	Intec, Bluestone, West Coast residents, tourism,	Stellar Resources, TNT				Undertake P50 / P90 Intec- refer to Projects above Bluestone- refer to Projects above Stellar Resources- refer to Projects above TNT- refer to Projects above Tourism/residents - Safety improvements for drive in/drive out staff and residents.
Murchison Hwy, Anthony Main Rd Cradle Mountain Development Rd: Upgrade sections not covered by previous funding commitment.	Intec, Bluestone, forestry, West Coast residents, tourism,	Stellar Resources, TNT, Venture Minerals				Undertake P50 / P90 Intec- refer to Projects above Bluestone- Refer to Projects above Stellar Resources- refer to Projects above TNT- refer to Projects above Tourism/residents - Safety improvements for drive in/drive out staff and residents.
Pieman Rd: Upgrade 35 km Pieman Road Mt Lindsay to Murchison Hwy to meet HPV standards		Venture Minerals	SM	M	Medium	Undertake P50 / P90 Highly prospective mineral deposit at Mt Lindsay, with tin, tungsten, magnetite and copper. Venture Minerals - Presently believe life 8 years based on exploration to date but could be 20 – 40 years. - Second biggest undeveloped tin deposit in the world. - Construction estimated at $162 m. - Potential for tin, tungsten and copper concentrate ready to export by end 2013. Around 10,000 tpa - Around 200,000 tpa magnetite from 2013. - 1,000,000 magnetite DSO for 2 years, from 2013.

Project	Beneficiaries		Time Frame	Cost	Relative Benefit	Recommendation and rationale
	Current	Future				
						- Likely 400 – 500 jobs during construction and 130 – 140 permanent. - Tullah as accommodation base.
Waratah Rd Widen, realign curves, seal shoulders, 44 km Waratah Road Murchison Hwy to Savage River	TAM, Grange Resources, tourism	Venture Minerals, Bright Phase	SM	S	Major	Borderline for P50 / P90 On hold until future tasks are certain Tasmanian Advanced Minerals – refer to Projects above Grange Resources - Savage River iron ore mine, concentrator, iron ore slurry pipeline to Port Latta. - Produces around 2.25 mtpa iron ore. - 450- bed camp with own catering, about 85% full. Employs 600. - Mine life to 2027. - 3 signed MOUs for others to supply ores or use Grange equipment. Venture Minerals - refer to Projects above Bright Phase - Former tin mine, copper and tin tailings and also more resources underground. - Work next ten years on tailings. - One 20t truck every two days - Two 20t trucks/day after 3-4 years. - First 4 years employ 30-40 people and up to 200 people after 4 years of the operation. - Mine life is around 15-20 years, however at the upper level could be 30-40 years.
Zeehan Highway, Anthony Main Rd to Murchison Highway: Upgrade 18km to meet HPV requirements	CMT, forestry, tourism, local population		SM	M	Medium	Undertake P50/P90 CMT- refer to Projects above Forestry - Route used to bypass Mt Black which is not HPV gazetted. Tourism/residents - Major gateway for tourists into the west coast. - Safety improvements for drive in/drive out staff and residents.
Zeehan Highway, Murchison Highway to Zeehan: Upgrade 4.5km to meet HPV	Intec, forestry, tourism, local population	Stellar Resources, TNT	SM	M	Medium	Undertake P50/P90 Intec- refer to Projects above Stellar Resources- refer to Projects above TNT- refer to Projects above

Project	Beneficiaries		Time Frame	Cost	Relative Benefit	Recommendation and rationale
	Current	Future				
requirements						Forestry - Route used to bypass Mt Black which is not HPV gazetted. Tourism/residents - Major gateway for tourists into the west coast.
Rail projects						
Rail loading facility Hampshire		Forward Mining Other mining ventures	S	L-M	Medium	Do not undertake P50 / P90 assessment. Suggest private sector to fund if business case supports investment.
Melba Line – reduce landslip potential, welded track and address specific axle limit constraints	MMG, CMT	Bluestone, Forward Mining, TNT	S	L-M	Medium	Undertake P50/P90 MMG - Zinc – 150,000 t/a; Lead – 40,000 t/a; Copper – 8,000 t/a. - Mine life currently 15 years and longer with other prospective resources. - Potential to be 1.5 times the output within ten years. - Rail – unreliable due to derailments, landslips and blockages. Rail loading terminal within MMG site. CMT - Refer to projects above. - Transport product by road to Melba Flats and then by rail to Burnie Port. Bluestone - Rail passes through the site but currently not used. - Mine life 4 years with proven reserves, 15 years with known resources. - Rentails project to reprocess tailings could produce 9 year life in itself. Will require 21,000 tpa coal which could be transported by rail. - Currently 250 – 300 people employed. Additional 140 expected to be required for rentails project. TNT (Mine Makers) - Refer to projects above. - Potential to transport product to the Hellyer rail spur.

Project	Beneficiaries		Time Frame	Cost	Relative Benefit	Recommendation and rationale
	Current	Future				
Other infrastructure projects						
Sewage and water connection Strahan to aquaculture hub	Petuna	Huon, Tassal	S	L	Localised	Do not undertake P50 / P90 Proponents / West Coast Council / Water authority - Proposal to expand the marine harbour leases to almost double the existing size. - New centralised facility for 3 aquaculture companies. - Would require water and sewage connection across harbour or landside. - The three operations in Strahan employ a total of around 70 staff. Expected to almost double from 70 to 130 in the region.
Centralised mineral processing site	Would require market demand study		M-L	M	Potentially major	Do not undertake P50 / P90 assessment. Very difficult to scope until market demand study completed – more a task for private proponents. Government support could be considered in response to specific proponent request.

A P50/P90 cost estimation, using Evans and Peck methodology, has been conducted for each of the identified priority projects. The P50 represents the project cost with sufficient risk provisions to provide a 50% level of confidence in the outcome and the P90 represents the project cost with sufficient risk provisions to provide a 90% level of confidence in the outcome. The cost estimate has considered both inherent and contingent risks. Inherent risk relates to those items specifically identified within the various components of the Base Estimate and which will definitely contribute to project cost but where there remains uncertainty as to the accuracy or reliability of the amount in the Base Estimate. Contingent risk relates to the risk attached to unmeasured items, i.e. those items not listed in the Base Estimate because they are unknown or loosely identified and they may not occur and thus may or may not contribute to project cost.

The results for each of the projects are summarised in the table below.

Section	Project Description	Base Estimate (2011/12 rates)	
		$ P50	$ P90
Murchison Highway, Zeehan Highway to Rosebery	Upgrade 23 km to meet Tasmanian HPV standards	$26M	$31
Murchison Highway, Rosebery to Anthony Main Road (Mt Black)	Covered by previous finding commitment- pavement stabilisation, curve realignment and installation of pullover bays at specific locations	$5.5M	$6.5M
Murchison Highway, Anthony Main Road to Cradle Mountain Development Road	Upgrade sections not covered by previous funding commitment to meet HPV standards	$15M	$17M
Pieman Road	Upgrade 35 km between Venture Minerals' site at Mt Lindsay and the Murchison Highway, to meet Tasmanian HPV standards	$62M	$72M
Zeehan Highway, Anthony Main Road to Murchison Highway	Upgrade 18km to meet Tasmanian HPV standards	$27M	$30M
Zeehan Highway, Murchison Highway to Zeehan	Upgrade 4.5km to meet Tasmanian HPV standards	$6.5M	$7.5M
Melba Rail Line	Upgrade to increase axle load limits, reliability and efficiency	$118M	$132M

1. Introduction and background

1.1. Strategic background

SKM was engaged by the Department of Infrastructure Energy and Resources (DIER) to undertake a major study assessing infrastructure requirements in western Tasmania to identify priorities for developments that will encourage and support economic development in the region. The aim was to provide both the Tasmanian and Commonwealth Governments with a priority list of recommended infrastructure projects for the region over the next 20 years.

The western Tasmania region is an important part of the state's economy, with mining, tourism and aquaculture significant economic and employment generating activities. The mining industry is a key economic driver, not only for the West Coast, but for the State as a whole. In 2009-10 the Tasmanian mining sector exported $467.7 million overseas and $652.1 million interstate, contributing $458 million or 2.1% of Gross State Product. The combined mining and mineral processing sectors represent almost 50% of the State's export earnings and provides employment for 3410 people. Mining is therefore a crucial industry for Tasmania and plays an important role in the social fabric and history of the west coast region (Tasmanian Government media release, 24/08/2011).

Current and planned aquaculture activities in Macquarie Harbour are integral to growth of the aquaculture sector at a regional and state level. Tourism is a major economic sector, focused on heritage and wilderness landscapes, with key attractions including the Gordon River, West Coast Wilderness Railway and a number of heritage towns.

This study focused on activities in the region and the infrastructure corridor that connects industries to their supply sources and markets. These include Burnie, and the main import/export ports at Burnie and Port Latta. The study also includes specific utilities and other significant infrastructure needs outside the corridor, which support activities in the region, and relevant private infrastructure such as the Savage River to Port Latta slurry pipeline.

The study area is shown in Figure 1. It should be noted that the boundary is considered indicative.

The study specifically concentrated on:

- Transport infrastructure (roads, railways, port facilities)
- Energy (electricity and gas infrastructure, and facilities for liquid fuel availability)
- Telecommunications (broadband, mobile and fixed line telephony)
- Water for industrial and general requirements.

1.2. Policy and planning framework

The study was required to recognise and link to relevant strategic policies and plans, including those of government and infrastructure providers. Some of the key frameworks are outlined below.

The Tasmanian government recently released an economic development plan for Tasmania (Tasmanian Government, 2011). In relation to infrastructure, the plan builds on and compliments the Tasmanian Infrastructure Strategy, released in 2010. The Plan outlines the Government's economic development priorities over the next ten years. These priorities are organised around four goals:

- Support and grow business in Tasmania
- Maximise Tasmania's potential in key sectors
- Improve the social and environmental sustainability of the economy
- Support and grow communities within regions.

Regional economic development plans will translate the directions within the EDP, at the regional level, providing specific direction for each of Tasmania's three regions. The first iteration of the regional plans is due in June 2012.

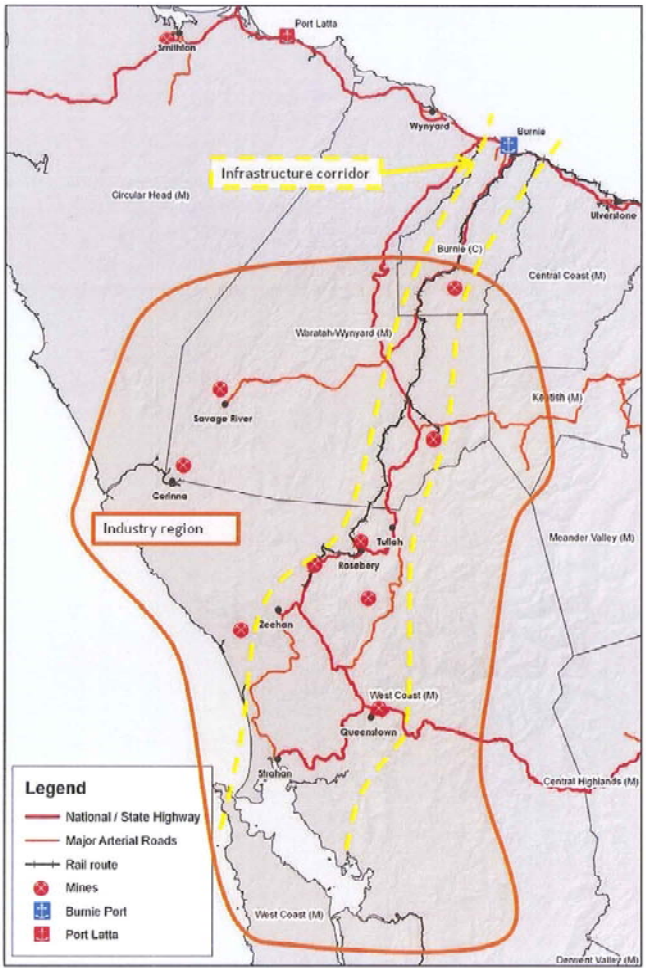
The Tasmanian Infrastructure Strategy coordinates effort across the major infrastructure sectors of transport, water, energy and digital. It guides future infrastructure priorities and decision-making for the planning, provision and use of infrastructure in Tasmania. Relevant priorities and directions include: ensuring Tasmania has adequate international and national gateways and connections; development and implementation of a Freight Strategy to guide Tasmania's freight system; and the delivery of key infrastructure projects across sectors.

The Tasmanian Government, Cradle Coast Authority, and member councils have developed a regional land use strategy to guide future planning within the north-west region. New planning schemes, which give effect to this strategy, are currently being prepared.

The Tasmanian Government is currently developing a Tasmanian Transport Policy and Tasmanian Freight Strategy. These will complement existing frameworks, including the Tasmanian State Road Hierarchy 2008 and Cradle Coast Integrated Transport Plan 2006.

The policies, plans and strategies developed by infrastructure providers and planners were critical to this Study. Of particular relevance were TasRail's 10 Year Plan and TasPorts' Strategic Plan and 10 Year Infrastructure Plan.

- **Figure 1 Study Area**



Source: DIER (2011b)

1.3. This report

This report consists of three main sections:

Section 1 summarises the current infrastructure and transport network within the region. It concentrates on roads, rail, ports, energy and telecommunications infrastructure plus any other relevant infrastructure including items located on private land. This report consists of:

- A desktop review of relevant reports and studies into infrastructure in the region post 2006 and earlier if relevant
- Identification of key infrastructure
- Report on organisations responsible for infrastructure provision, operation and maintenance

- Provision of GIS mapping to show infrastructure asset location
- Analysis of current infrastructure usage and capacity
- High level condition reporting.

Section 2 details the current and future industry structure and operations within the study area, providing specific focus on the relationship between industry structure and infrastructure provision. Special attention is paid to infrastructure related constraints faced by industry in undertaking their operations and identifies how targeted infrastructure investment may assist business competitiveness and economic development. Future proposed development projects are also included in this analysis. This section includes:

- Analysis of future proposed development projects
- A consideration of current and future needs of industry
- A summary of discussions with industries operating in the area, outlining current and planned future operations, infrastructure requirements and existing deficiencies
- A summary of discussions with industry associations and economic development organisations which identifies and better understands new entrants and their potential needs.

Section 3 provides analysis and a summary of needs and priorities and details recommended infrastructure projects for the study time horizon of 20 years.

1.4. Approach adopted

The approach for this study included the following:

- Discussions with relevant local, state and federal government departments and agencies
- Discussions and data provision from infrastructure owners and managers, including current arrangements, committed plans and future development possibilities
- Discussions with a wide range of industry representatives operating within the study region, including mining, agriculture, aquaculture, tourism and others, focussing on current perceived shortcomings, expansion and development plans, and developments which would enhance and support business competitiveness and viability
- Assessment of the existing situation, plans, demands from end users and opportunities to improve business support and viability
- Development of the regional infrastructure plan to address the needs of industry into the future.

Appendix A contains a listing of the organisations with which discussions were held, and the discussion checklist used is in Appendix B.

2. Report 1: Infrastructure audit report

2.1. Introduction

This section includes a detailed report into the current infrastructure within and servicing the region. It concentrates on roads, rail, ports, energy, telecommunication infrastructure plus any other relevant infrastructure including relevant privately owned assets.

The development of the Infrastructure Audit Report has required extensive consultation with relevant infrastructure providers which has provided a definitive view 'from the coalface' concerning the current issues and challenges facing infrastructure networks in Western Tasmania.

2.2. Road Infrastructure

2.2.1. Roads Policy and Planning Context

The roads on the West Coast are category 3-5 roads (regional access roads, feeder roads, other roads) with the exception of the Ridgley Highway which is a category 2 road (regional freight route). Category 1 and 2 roads are the highest priority from a state-wide perspective while category 3-5 roads are important from a regional perspective. Figure 2 illustrates the state's road hierarchy as well as current AADTs on the roads.

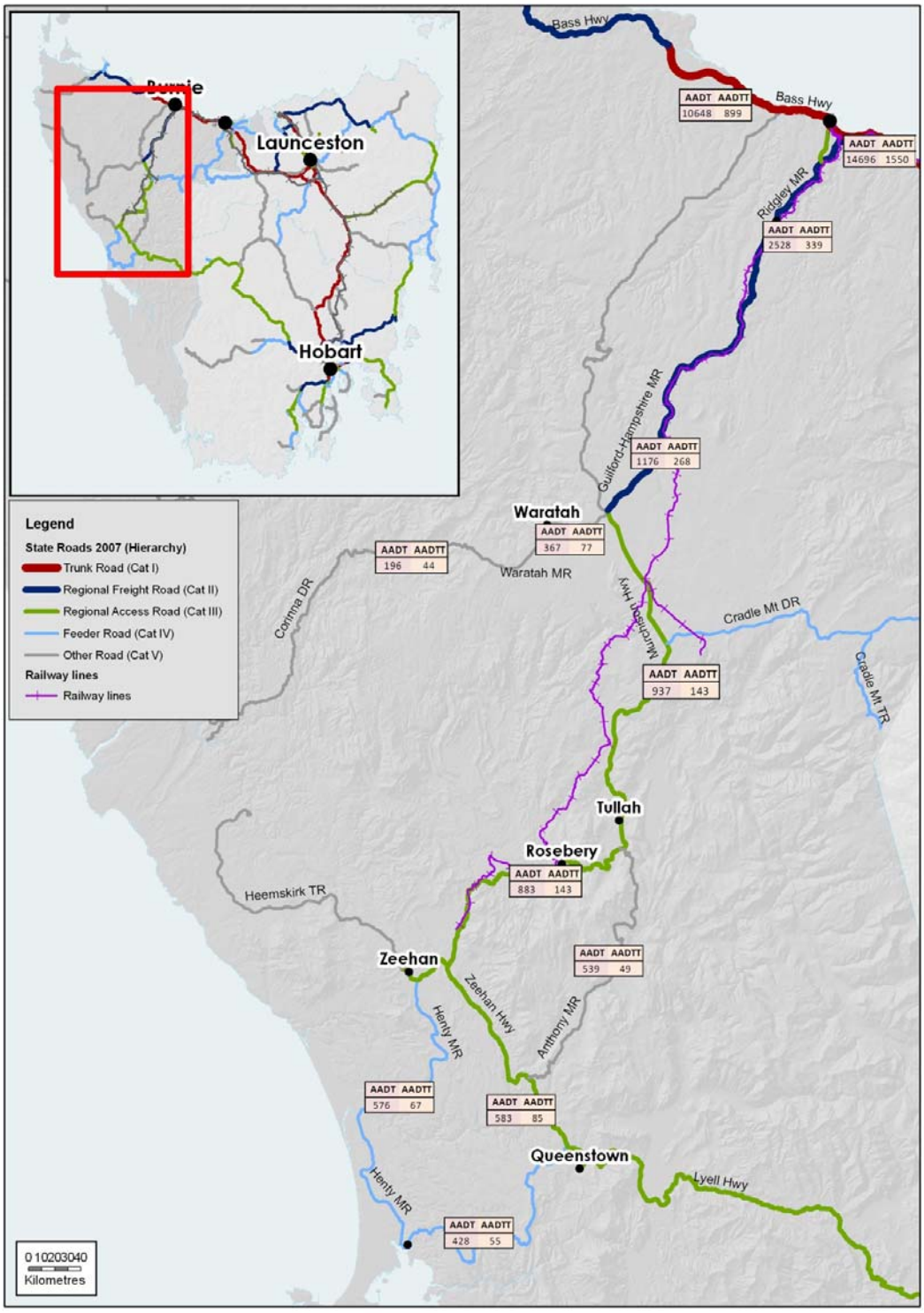
Roads on the West Coast traverse difficult mountainous terrain and are characterised by narrow widths and constrained alignments. Most of the roads are sealed with two lanes. Elevated roads are vulnerable to ice and snow during winter months. Traffic volumes are relatively low across all roads, with a substantial proportion of freight vehicles. Forestry volumes are likely to stabilise and remain substantial in the medium to long term and there is significant growth in the mining and aquaculture industries. The mining industry is unpredictable but high in value. A number of roads also carry substantial tourist traffic which is largely seasonal.

Start-up mining operations can have short operational life expectations due to lack of certainty of deposit potential and what further exploration may find. The dispersed locations and shorter operational lives means it is not feasible to provide a direct rail connection to many deposits and consequently providing an adequate road network is vital to operations on the West Coast.

The Ridgley Highway, Murchison Highway, Zeehan Highway, Anthony Main Road, Lyell Highway and Henty Main Road form the major transport corridor linking industry on the West Coast to Burnie Port. Roads such as Waratah Road play an important feeder role to this main corridor.

The major public roads in the area are shown in Figure 3. The sections following contain discussion on the roads making up the major corridor as well as the important feeder roads. Key characteristics of each road are summarised in the Table 1 following these sections.

Figure 2 State Road Hierarchy and Current AADT



Legend

- National State Hwy
- Major Arterial Roads
- Public Access, Feeder & Arterial Roads

N

1:1,250,000

0 12.5 25 50

Kilometers

August, 2011

PROJECTION - MGA Zone 55
DATUM - GDA94

Tasmania
Explore the possibilities

Data provided by:
Department of Infrastructure, Energy and Resources

FIGURE 3
MAJOR ROAD NETWORK STUDY AREA

West Coast Infrastructure Development Study

SKM

2.2.2. Major Road Corridor

2.2.2.1. Anthony Main Road (DIER)

Anthony Main Road is a major freight route linking the southern areas of the West Coast to the northern, as the shorter Murchison Highway route through Mt Black is a difficult route through steep terrain and cannot be used by over-dimensioned vehicles. The route is a sealed single carriageway with lane widths of 2.8 to 3.0 m and sealed / gravel shoulders of 0.3-0.8 m. Delineation is provided by road markings, guideposts and standard yellow on black warning signs conforming to AS 1743. W-beam safety railing is located at several locations along the route at varying clearances from the through lanes.

The road traverses typical West Coast terrain with steep grades and some tight curvature. The gradients (approx 10%) at each end of the road are sufficient to affect travel speeds for heavy vehicles and there are no overtaking opportunities along the route. The road is sometimes impassable due to snow events during winter. The road has lower traffic volumes than the Murchison Highway.

The route is HPV gazetted, although it does not meet Tasmanian guidelines.

2.2.2.2. Henty Main Road (DIER)

Henty Main Road links Strahan to Zeehan. The route is a single carriageway with a seal width of 7.5 m to 8.0 m, 3.2 m lanes and 0.6 m to 1.0 m seal/gravel shoulders. Delineation is provided by road markings, guideposts and standard warning signs.

The road follows the coastal plain and is relatively flat with gentle curvature, through plantation pines and undeveloped country. Generally the road is of a higher standard than other West Coast roads with better horizontal and vertical alignments. A long grade occurs around midway which affects northbound travel speeds for laden heavy vehicles. There are some straight sections that allow overtaking.

The route is HPV gazetted and meets the Tasmanian guidelines.

2.2.2.3. Lyell Highway (DIER)

Bronte Park to Queenstown

This section of the Lyell Highway is used for access to the West Coast from the south. The route is a sealed, single carriageway. The road is used by the aquaculture industry to transport smolt to Strahan. The road is used by a small number of people who commute to the West Coast from the south. It is also used by tourists and is part of the West Coast Wilderness Way. The road can be impassable during snow events. It has many sections with steep grades and tight corners which affect travel speeds.

It is not an HPV gazetted route.

Queenstown to Zeehan Highway

This section of the Lyell Highway is used for the transport of concentrates from Copper Mines of Tasmania to Melba Flats rail siding. The route is a sealed single carriageway with lane widths of 3.0-3.7 m. Shoulder widths also vary but a 0.5-0.7m gravel shoulder is provided throughout. Delineation is provided by road markings, guideposts and standard warning signs.

This section of the Highway has poor horizontal alignment with severe curvature throughout. The road has some widening provided throughout the curves. Both the curvature and the grades affect travel speeds. Lane widths vary due to the curvature and the location of the centre markings, which change to allow the more affected lane additional width. Travel speeds are low.

The route is HPV gazetted however volumes are low. The route does not meet Tasmanian guidelines.

Zeehan Highway to Strahan

This sealed single carriageway was built to avoid the need for bridges and is consequently very windy, with limited sight distances. The road is used by the aquaculture industry for the transport of smolt to Strahan. It caters for a significant number of tourists and is part of the West Coast Wilderness Way. A number of tourist buses also use the route. The road can be affected by ice and snow.

The road is not an HPV gazetted route.

2.2.2.4. Massy-Greene Drive (DIER)

Massy-Greene Drive is the truck route into Burnie. This route was specifically constructed to remove heavy vehicles from Mount Street, diverting this traffic to the Bass Highway. This road has a typical lane width of 3.5-3.7 m and shoulders of 0.3-0.6 m. The HPV gazetted route has been assessed as part of the Ridgley Highway and is marginally below Tasmanian guidelines.

2.2.2.5. Murchison Highway (DIER)

DIER has $21 million in funding to spend on the Murchison Highway between Rosebery and Cradle Mountain Development Road with the objective of improving road safety, travel efficiency, geometric consistency and overtaking opportunities. The funding is not sufficient to cover all desirable works and upgrades from the initial funding are likely to be progressed from north to south. Planning and detailed concept design is currently underway.

Zeehan Highway to Melba Flats

The route is a sealed, single carriageway with lane widths from 2.8 m to 3.1 m and shoulders from 0.0 m to 0.5 m. Shoulders are sealed / gravel. Delineation is provided by road markings, guideposts and standard warning signs. This section traverses undeveloped country through flat terrain and

gentle curvature. The route is used to transport product from Queenstown to the Melba Flats rail siding.

This route is HPV gazetted, however it does not meet Tasmanian guidelines.

Melba Flats to Rosebery

This route is used to transport product from Renison Mine to Burnie. The route is not HPV gazetted and is yet to be assessed against Tasmanian guidelines.

Rosebery to Anthony Main Road (Mt Black)

The road between Rosebery and Anthony Main Road is highly constrained and not suitable for high productivity vehicles. The route is a sealed, single carriageway. The road is narrow, with constrained alignments, no edge line and unsealed shoulders. There are a number of localised pavement failures, particularly on the outside edge around curves. The existing barriers at these locations are ineffective. There are no formal overtaking opportunities on the route but a number of short, narrow, gravel pullover bays. The route is vulnerable to icy road conditions.

The road is used for transport of product from Renison and for inputs to Renison and MMG mines. The road is not HPV gazetted and is highly unlikely to be upgraded to this standard.

Anthony Main Road to Cradle Mountain Development Road

This route is a sealed single carriageway with consistent lane widths of 2.8 m with shoulders varying from 0.3 m to 0.7 m. Delineation is provided by road markings, guideposts and standard signs. A number of sections have no edge line and unsealed shoulders.

This section traverses difficult terrain with some steep grades and difficult horizontal curvature. There are very few overtaking opportunities, with one slow vehicle turnout for northbound traffic and a few straight sections. The pavement condition is variable. A number of sections have high accident histories including near Bulgabac River Bridge and Farm Creek Bridge.

This section of the Highway passes through the town of Tullah. There are narrow widths and tight curves through Tullah.

The road is HPV gazetted but does not meet Tasmanian guidelines. There is no alternate route to this section of the Highway.

Cradle Mountain Development Road to Ridgley Highway

This section of the Murchison Highway has recently been upgraded with lane widths of 3.0m and sealed shoulders of 0.5 m. W-beam safety railing is located within 0.5 m of the edge line, adjacent to the edge of the sealed shoulders.

The road is HPV gazetted. It was assessed as part of the route north of Anthony Main Road and does not meet Tasmanian guidelines.

Ridgley Highway to Somerset

This section of the Murchison Highway is a difficult route particularly through the Hellyer Gorge area with steep grades and tight curves. This is not the preferred heavy vehicle route to Burnie, with the Ridgley Highway favoured instead. The road is used mostly by tourists and those requiring access to locations along the route.

The route is not HPV gazetted.

2.2.2.6. Ridgley Highway (DIER)

The Ridgley Highway connects the Murchison Highway and Waratah Main Road to Burnie. The road was built to remove heavy vehicles from the northern section of the Murchison Highway. The route caters for a substantial mining and forestry task.

The route is a sealed single carriageway with lane widths averaging 3.0-3.1 m with variable shoulder/verge widths of 0.1-1.0 m, both gravel and sealed. Delineation is provided by road markings, guideposts and standard warning signs. W-beam safety railing is provided at several locations along the route at varying clearances from the through lanes. Long barrier sections are within 0.5 m of edge lines.

The road traverses forest plantation and rural land, passing through the towns of Ridgley, Highclere and Hampshire. The majority of the road is relatively flat, although several inclines exist which affect the travel speed of laden heavy vehicles. Curve widening has been provided and appears adequate. There are few overtaking opportunities with no additional facilities provided. The road is a school bus route servicing a school in Ridgley.

The condition of the Ridgley Highway is good. The road could potentially cater for significant mining tonnages in the future with expansions to existing mines and new ventures all using the Ridgley Highway to access Burnie Port. Increased heavy vehicle volumes could create amenity and safety issues in the town of Ridgley. The EPA currently has a night time curfew on truck operations through Ridgley.

The route has an increasingly diverse mix of vehicles with more people using the corridor for commuting. HPVs made up 60% of heavy vehicles due to high forestry freight task (DIER, 2009) before the current downturn in forestry activity and closure of Gunns' Hampshire mill. The route is marginally below Tasmanian guidelines.

2.2.2.7. Zeehan Highway (DIER)

Lyell Highway to Murchison Highway

This section of the Zeehan Highway is part of the route used to transport concentrates from Queenstown to the Melba Flats rail siding. The route is a sealed single carriageway with lane widths between 2.8 m and 3.6 m. Shoulder surfacing is variable with measured widths from 0.3 to 0.7m. Delineation is provided by road markings, guideposts and standard warning signs. W-beam

safety rails have been placed along much of the road edge, and are down to only 200 mm from the travel lanes in some places.

The section between the Lyell Highway and Anthony Main Road has variable pavement condition. The section between Anthony Main Road and the Murchison Highway has no edge line and unsealed shoulders.

This route is HPV gazetted, however it does not meet Tasmanian guidelines.

Murchison Highway to Henty Main Road

This section is a sealed single carriageway with consistent lane widths of 2.8 m and 0.3 m gravel shoulders. Delineation is provided by road markings, guideposts and standard warning signs. The section traverses undeveloped country until entry to Zeehan and is short and flat with some moderate horizontal curves.

This route is HPV gazetted, however it does not meet Tasmanian guidelines.

2.2.3. Feeder Roads (to study infrastructure corridor)

2.2.3.1. Bass Highway (DIER)

Devonport to Burnie

The Bass Highway east of Burnie is a very high standard section of National Highway. The Highway has received significant investment over the past 10 years and is now dual lane from Devonport to Burnie. The route is HPV gazetted and meets Tasmanian guidelines.

Burnie to Port Latta

The Bass Highway between Burnie and Port Latta is a sealed single carriageway with lane widths of 3.0 to 3.3 m and shoulders varying from 0.1 m to 1.0 m+, both gravel and seal. This variation is partly due to a series of sectional upgrades along the route. Delineation is provided by road markings, guide posts, and standard warning signs.

This section of the Highway traverses agricultural land, with bypasses of all towns along the route. The road has varying horizontal and vertical alignments with travel speeds affected by vertical changes. There are some overtaking opportunities with additional lanes provided at variable intervals and occasional flat, straight sections of road. Curve widening is apparent and appears adequate.

The section of the Bass Highway between Sisters Creek and Rocky Cape has recently received a $30 million upgrade. There are, however, deficiencies on remaining sections of the Highway, particularly Wynyard to Sisters Creek and west of Rocky Cape. These include a number of direct access points, local road junctions and narrow pavement widths which create safety issues, especially with increasing heavy vehicle volumes.

The section of the Highway between Burnie and Wynyard is at a low level of service, particularly through Burnie. Capacity is expected to be reached by 2023 (DIER, 2009).

The road caters for a mix of traffic including commuters, freight, school buses, tourists and local traffic. The highway is part of the Great Nature Trail touring route and increasing interaction between tourist and heavy vehicles on constrained sections of the highway is a concern. The road provides a key link to Burnie Airport.

The route is HPV gazetted and is marginally below Tasmanian Guidelines.

2.2.3.2. Corinna Road (DIER)

Corinna Road, between Savage River and Corinna is a partly unsealed, single lane road carrying low traffic volumes. The road is used for the transport of sand from the mine at Corinna as well as by tourists to access the Tarkine region. Care is needed when vehicles travelling in opposite directions need to pass. The road is in poor condition and is not HPV gazetted.

Corinna Road

2.2.3.3. Cradle Mountain Development Road (DIER)

The Cradle Mountain Development Road provides access to forest and mineral reserves east of the Murchison Highway. The route is a sealed two lane single carriageway with lane widths averaging 3.1 m and shoulder widths of 0.2-0.6 m, both sealed and gravel. Delineation is provided by road markings, guideposts and standard warning signs.

The road traverses difficult topography through plantation forest and undeveloped land (including national park). Several inclines affect the travel speed of laden heavy vehicles and there are few overtaking opportunities. The curve widening provided appears adequate.

The road is a tourist route providing direct access between Cradle Mountain and the West Coast. Traffic volumes are low; however the traffic mix includes a significant percentage of non-local drivers.

The route is HPV gazetted and meets the Tasmanian guidelines.

2.2.3.4. Granville Harbour Road (West Coast Council)

This road is an unsealed, single carriageway. This road is used to provide access to mining at Granville Harbour. The road has been upgraded by the council and is in good condition. The road carries very low traffic volumes. It is not an HPV gazetted route.

2.2.3.5. Heemskirk Road (DIER)

This route is a sealed, single carriageway. The road traverses typical West Coast terrain and has a number of tight curves. The road is used to transport minerals from Granville Harbour. The road carries low traffic volumes and is not HPV gazetted.

2.2.3.6. Oonah Road (Waratah Wynyard Council)

This road links the Murchison Highway to the Ridgley Highway. The route commences as a gravel rural road (from the Murchison Highway) through plantation timber. Guide posts are intermittent. A single lane concrete bridge occurs at 600 m from the Murchison Highway. There is a 1km incline commencing immediately east of this bridge. The width at 2.0 km from the Murchison Highway is 6.0 m with no useable verges. At 6.0 km the road narrows to 4.5 m with 0.5 m verges. The road is sealed from 8.2 km with a sealed width of 6.1 m and 0.5 m gravel verges. The route currently has low traffic volumes.

The route is HPV gazetted and is marginally below the Tasmanian guidelines.

2.2.3.7. Pieman Road (Hydro Tasmania)

The Pieman Road provides a link to Reece Dam and is owned by Hydro Tasmania. The road is mainly used by light vehicles including a small number of Hydro vehicles, the general public and tourists. Hydro trucks use the road once or twice a year if work to the transformers is required. The road is also used by Forestry Tasmania who is charged a toll. There are three bridges on the route (all three capacity 44 t GVM) which are adequate for current needs.

2.2.3.8. Trial Harbour Road (West Coast Council)

This road provides access to Avebury Mine (currently under care and maintenance). The road from Zeehan to the Avebury mine is bitumen sealed by MMG. Thereafter it is a well graded unsealed road to Trial Harbour and Corinna. MMG personnel suggest the bitumen section is likely to deteriorate fairly rapidly if subjected to heavy haulage traffic for any length of time. The road has a centre line, standard warning signs and guideposts. A 10% grade exists over the initial 6 km from the Heemskirk Road junction. The road has a warning for 8km of winding road, with some comfort speeds advised. W-beam safety barriers have been installed over significant lengths but not to the standard to protect heavy vehicles. Lane widths at 700 m from the junction are 3.0 m with 0.8 m gravel verges. At 7.85 km there is a short one-lane concrete bridge. At 8.0 km (past Avebury Mine) the road narrows and reverts to gravel, with a width of 4.0 m and no useable verges. There are no access roads west of the 8 km point. The road has very low traffic volumes.

The road is HPV gazetted as far as Avebury Mine and is marginally below the Tasmanian guidelines.

2.2.3.9. Waratah Road (DIER)

Waratah Road is a single carriageway, sealed route providing access to Savage River. There are sections of the road with constrained alignments, inadequate pavement width, no edge lines and unsealed shoulders. The pavement condition is variable. The road is used to transport mining product from Corinna to Wynyard. The road is also a key entry point to the Tarkine for tourists. There is a bridge on the route between Waratah and Savage River with a load limit of 35 t.

The road is in poor condition and is not HPV gazetted.

Table 1 Key characteristics – major roads in study area

See Kev at bottom of table for definitions and abbreviations

Name	From	To	Length (km)	Format	HPV Route	HPV comp	Road Cat	AADT	% HV	Major users	Commodities	kT/yr[1]	Seasonal	Weather exposed
B28 Anthony Main Rd	Zeehan Highway	Murchison Hwy (Tullah)	38.5	Sealed, single carriageway	Y	N	5	359	14	Gunns, FT	Logs	120[2]	N	Y
A1 Bass Highway	Devonport	Burnie	43	Sealed, dual carriageway	Y	C	1	15,247	11	Gunns, FT, Simplot	Logs, groceries	1600[2]	N	N
	Burnie	Wynyard	18	Sealed, single carriageway	Y	C	1	12,600	8	TAM, National Foods	Silica, vegetables, dairy products	1450	N	N
	Wynyard	Port Latta	39	Sealed, single carriageway	Y	M	2	3,570	14	TAM, National Foods	Silica, Vegetables, dairy products	1650	N	N
C247 Corinna Rd	Savage River	Corinna	21	Gravel, single lane	N	TBA	5	52	37	TAM	Silica	40	N	N
C132 Cradle Mountain Development Road (Belvoir Rd)	Murchison Highway	Cradle Mountain Road	26.1	Sealed, single carriageway	Y	C	4	396	10	Bass Metals, Tourism	Lead, zinc, copper	30	Y	Y
Granville Harbour Road	Heemskirk Road	Granville Harbour	7	Unsealed, single carriageway	N	TBA	5	No data available		Stonehenge and McDermott	Tin	0.2	N	N
C249 Heemskirk Road	Zeehan	Granville Harbour Road	25	Sealed, single carriageway	N	TBA	5	No data available		Stonehenge and McDermott	Tin	0.8	N	N
B27 Henty Main Road	Zeehan	Strahan	43.5	Sealed, single carriageway	Y	C	4	576	7	Gunns ,FT, MHAG	Logs, fish feed, fish	120[2]	Y	Y
B24 Lyell Highway	Strahan	Zeehan Highway	36	Sealed, single carriageway	N	TBA	4	428	5	MHAG	smolt	40	Y	Y

[1] Source: DIER, 2009 Tasmanian Freight Survey

[2] Forest products tonnages are currently lower due to industry downturn

Name	From	To	Length (km)	Format	HPV Route	HPV comp	Road Cat	AADT	% HV	Major users	Commodities	kT/yr[1]	Seasonal	Weather exposed
	Zeehan Highway	Queenstown	3		Y	N	4	1,145	13	MHAG, CMT	smolt, copper	210	Y	Y
A10 Lyell Highway	Queenstown	Bronte Park	111		N	TBA	3	384	11	MHAG	smolt	40	Y	Y
A10 Murchison Highway	Zeehan Hwy	Melba Flats	4.5	Sealed, single carriageway	Y	N	3	901	TBC	CMT, MHAG, Intec	Copper, fish, fish feed, zinc	200	Y	Y
	Melba Flats	Rosebery	18.5		N	TBA	3	701	17	Bluestone, MHAG, Intec	Tin, copper, zinc fish, fish feed	230	Y	Y
	Rosebery	Anthony MR	10		N	TBA	3	1,676	10	Bluestone, MHAG, Intec	Tin, copper, fish, fish feed, zinc	400	Y	Y
	Anthony MR	Cradle Mtn DR	28		Y	N	3	958	15	Bluestone, Gunns, FT, MHAG, Intec	Tin, copper, zinc, logs, fish, fish feed	520[2]	Y	Y
	Cradle Mtn DR	Ridgley Hwy	16.5		Y	N	3	950	17	Bluestone, Bass Metals, Gunns, FT, MHAG	Tin, copper, lead, zinc, logs, fish, fish feed	500[2]	N	Y
	Ridgley Hwy	Bass Hwy (Somerset)	63		N	TBA	5	1,400	6	-	-	70	Y	Y
Oonah Rd	Murchison Hwy	Ridgley Hwy	24	Gravel/sealed single carriageway	Y	M	5	No data available		-	-	30	N	N
C152 Pieman Rd	Reece Dam	Tullah	25	Sealed, single carriageway	N	TBA	5	No data available		FT	Logs	20[2]	Y	Y
B18 Ridgley Highway	Murchison Hwy (Guildford)	Hampshire	27	Sealed, single carriageway	Y	M	2	1,322	28	TAM, Bluestone, Bass Metals,	Silica, copper, tin, zinc, lead, logs, fish	620[2]	N	N

Name	From	To	Length (km)	Format	HPV Route	HPV comp	Road Cat	AADT	% HV	Major users	Commodities	kT/yr[1]	Seasonal	Weather exposed
	Hampshire	Burnie	23	Sealed, single carriageway	Y	M	2	2,432	20	Gunns, FT, MHAG, Intec	Logs, silica, magnetite, scheelite, tin, copper, zinc, lead, fish	2000[2]	N	N
C248 Trial Harbour Road	Heemskirk Road (Zeehan)	Avebury Mine	8	Sealed, single carriageway	Y	M	5	No data available		MMG	Nickel (not currently)	0	N	N
B23 Waratah Rd	Murchison Hwy	Waratah	7	Sealed, single carriageway	N	TBA	5	367	21	TAM	Silica	340	N	N
	Waratah	Savage River	37		N	TBA	5	196	22	TAM	Silica	100		
A10 Zeehan Highway	Lyell Hwy (Queenstown)	Anthony Main Rd	10	Sealed, single carriageway	Y	N	3	583	15	CMT	Copper	170	N	Y
	Anthony Main Rd	Murchison Hwy (Zeehan)	18		Y	N	3	382	20	CMT, Gunns, FT	Copper, logs	200		
	Murchison Hwy	Zeehan	4.5		Y	N	3	846	14	MHAG, Gunns, FT, Intec	fish, fish feed, logs, zinc	160		

Source: SKM, drawing from DIER

KEY	
AADT	Annual Average Daily Traffic
CMT	Copper Mines of Tasmania
FT	Forestry Tasmania
HPV	High Productivity Vehicle
MHAG	Macquarie Harbour Aquaculture Group
MMG	Minerals and Metals Group
TAM	Tasmanian Advanced Minerals
HPV Compliance	
C	Compliant
M	Marginal
N	Non-compliant
TBA	To be assessed
Road Category	
1	Trunk Roads
2	Regional Freight Routes
3	Regional Access Roads
4	Feeder Roads
5	Other Roads

2.2.4. High Productivity Vehicle Routes

Maintaining and extending High Productivity Vehicle (HPV) routes and ensuring roads can support future growth is important for industry on the West Coast. HPVs are vehicle combinations, such as B-Doubles, which exceed standard mass and dimension limits and operate on a restricted route network or under permit condition. HPVs were introduced into Tasmania in 1993 to improve productivity in the transport sector.

The majority of the Tasmanian heavy vehicle fleet is made up of vehicles that are a maximum 19 m long and 42.5 t Gross Vehicle Mass (GVM). These vehicles are classified as General Access (GA) vehicles. A 21 m, seven axle, B-Double with 50 t GVM has also been permitted as a GA vehicle in Tasmania. Initial HPVs in Tasmania were 23 m long and had a maximum 52 t GVM. Vehicles sizes have increased to maximums of 26 m and 67 t GVM.

HPVs deliver significant gains in productivity due to increased carrying capacity. They can also deliver significant maintenance and safety improvements as fewer trips are required to move the same freight load.

The majority of Tasmania's road network is available for use by GA vehicles. Some roads have been gazetted for use by longer / heavier vehicles:

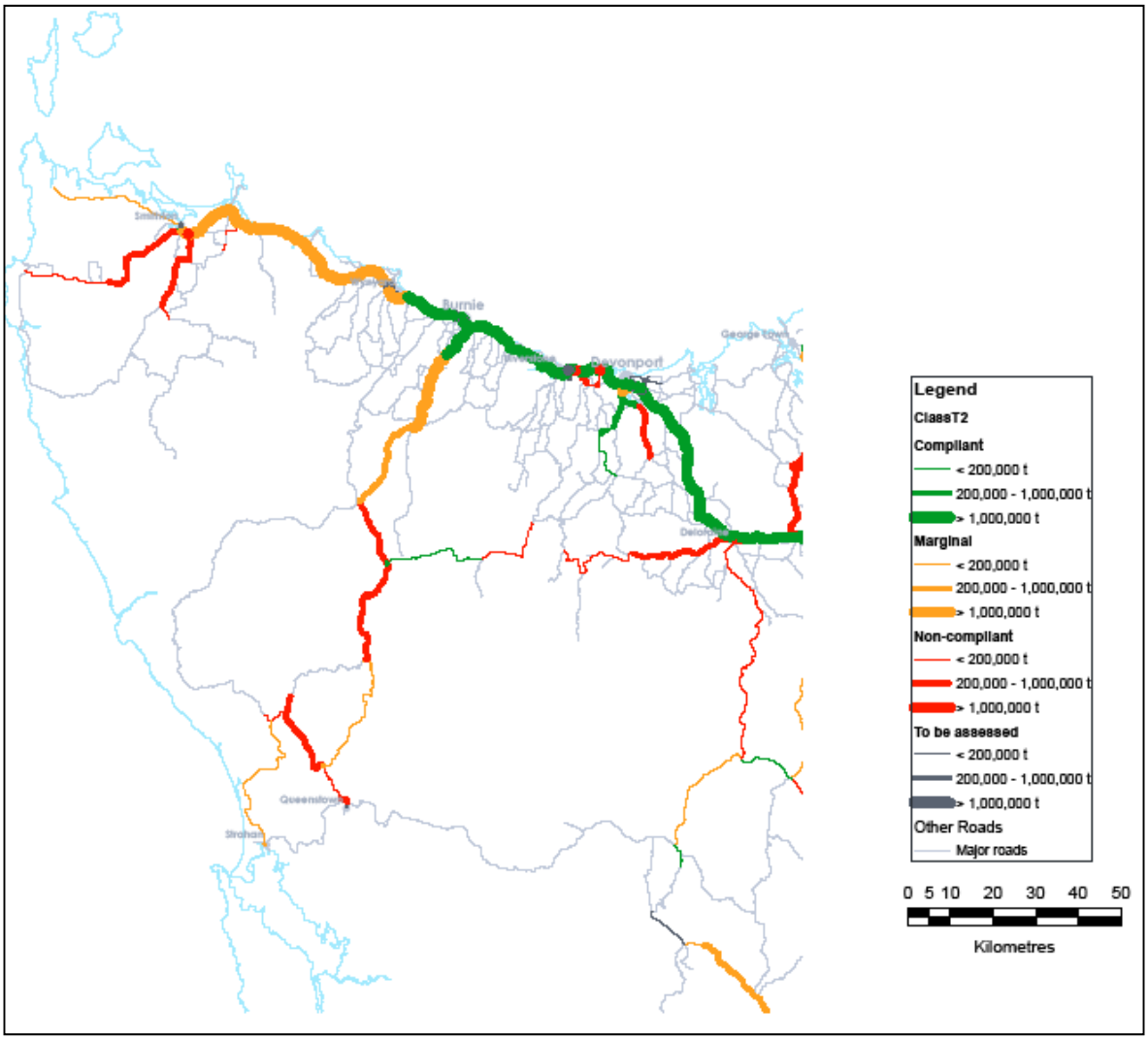
- HPV routes that allow 26 m vehicles to operate with GVMs of 62 t
- Higher Mass Limits (HML) routes that allow an additional 5 t loading to compliant vehicles.

Due to the differences in Tasmanian topography compared to mainland states, specific Tasmanian criteria for HPV routes have been developed. In a recent assessment of the current Gazetted HPV Route Network, routes were classified as either:

- Compliant – meet the Tasmanian guidelines
- Marginal – marginally below the Tasmanian guidelines
- Non-compliant – do not meet the Tasmanian guidelines.

Figure 4 shows Tasmania's HPV gazetted network on the West Coast and the assessed compliance status.

Figure 4 HPV Routes and Compliance Status



Source: DIER, Received 2011

2.2.5. Road Conditions

The mountainous terrain, remoteness and dispersed location of mining sites on the West Coast create difficulties in the movement of mining product. Many roads are narrow with highly constrained alignments and inadequate superelevation. For example, the Murchison Highway over Mt Black is a highly constrained route, which cannot be used by HPVs. HPVs that travel from the Strahan and Zeehan area to Tullah travel via Anthony Main Road, adding 21 km to the trip.

Reducing speed limits from 100 km/h to 90 km/h is being considered for a number of roads in the region, including in the context of gazetting HPV access on roads that are marginally below the required standards. The corridor north of Cradle Mountain Development Road is likely to stay 100km/h, while south it is likely to be reduced to 90 km/h.

2.2.6. Bridges

Bridge strengthening will become an issue as the number of HPVs increase. Some bridges are currently overstressed or too narrow. The bridges were built to older design standards (1930s-1960s) and lower design loads. A number of bridges in the region have load limits, restricting the type of vehicles that can be used.

2.2.7. Safety

2.2.7.1. Overtaking Opportunities

There is one slow vehicle turnout on the Murchison Highway north of Tullah. Due to the nature of the terrain there are few overtaking opportunities on straight sections of road. One overtaking facility on the highway is not adequate and the turnout itself is considered too short. Travel times on the corridor can be highly variable as it is common to travel behind slower vehicles (trucks, campervans and slower tourist vehicles) for extended periods. The lack of overtaking opportunities means trucks are not able to travel at full speed on straight sections as other vehicles are trying to overtake. The lack of overtaking opportunities is a safety concern as frustrated drivers take greater risks.

2.2.7.2. Weather Constraints

The West Coast roads traverse mountainous terrain and are subject to ice and snow. Temporary road closures can occur during the winter months due to snow falls causing production losses for industry. Ice on the roads is a major safety concern.

2.2.7.3. Mix of Vehicle Types

A safety concerns on the road network arises due to the mix of vehicle types. In addition to being used by heavy vehicles, the roads provide a commuting function for staff travelling from the North West Coast as well as within the region itself. The West Coast is one of Tasmania's most popular tourist destinations and caters for increasing numbers of caravan and campervans as well as tourists

in rental vehicles. The sharing of the road between heavy vehicle and tourists is particularly concerning as tourists are mostly unfamiliar with local road conditions. Car clubs visit the West Coast for group events. The road corridor to Burnie is also important for local communities in the area. The road is used by the ambulance service and is the lifeline into the West Coast for all who live there.

Operating shifts for industry on the West Coast are generally 5 days on / 5 days off or similar. As a result of the working roster, and the lack of 'social infrastructure' in the region, many workers drive in / drive out, mostly from the North West Coast. Consequently the roads cater for a large amount of commuter traffic. Fatigue due to travelling and working long hours is a significant safety concern.

Tourist traffic in the region is largely seasonal with peaks in the summer months. There is a touring route through the region, the West Coast Wilderness Way, which traverses Cradle Mountain, Tullah, Rosebery, Zeehan, Queenstown and Derwent Bridge. The Tarkine Road is an important tourist road. This road is unsealed and many hire car drivers are hesitant to use the road due to insurance conditions.

In November 2011 the Queenstown Police Division responded to 10 vehicles crashes, including a fatal collision on Henty Road. A number of collisions resulted from drivers failing to take corners, although they were reportedly well marked and had advisory speed signs. One crash involved a car crossing to the other side of the road while negotiating a bend and colliding with a fully laden B-Double. (Tasmania Police Media Release, 28 November 2011)

2.2.7.4. Signage

A common issue raised was the need for improved signage in the region. Current signage is inconsistent with warnings at some tight corners but not at others. More signs with times rather than just distances would be useful, particularly for tourists who are unfamiliar with the sinuous nature of the roads. Signs with distances to fuel locations would also be beneficial. The "end speed zone" signs are not well understood, particularly by tourists who are not familiar with the signage. The default speed limit of 100 km/h could be assumed however confusion may arise as a result of other trials throughout the State and the 110km/h speed limit on the Midland Highway.

"End Speed Zone" Sign, near Queenstown

2.2.8. Road Volumes

Traffic volumes across the West Coast road network are generally low (refer to Figure 2). The highest volumes are along the Murchison Highway, the main link to Burnie from the western

Tasmania region, and the Ridgley Highway, a designated freight route. The Murchison Highway south of Cradle Mountain Development Road carries around 1000 vpd; the Ridgley Highway carries around 1000 vpd south of Hampshire (2007), and around 2500 vpd north of Hampshire (2005).

Volumes within the West Coast region are significantly lower. The Zeehan and Lyell Highways, Anthony and Henty Roads connect the major population centres of Strahan, Zeehan, Queenstown and Rosebery, and key mining operations, however AADT remains low at around 400 to 600 vpd.

Reflecting the nature of industry on the West Coast, the proportion of heavy vehicles carried on individual roads is between 10-25% of total AADT.

Current freight volumes, reported in the 2009 Tasmania Freight Survey are shown in Table 2. Volumes are highest on the Ridgley Highway (predominantly forestry) and the Murchison Highway (predominantly mining).

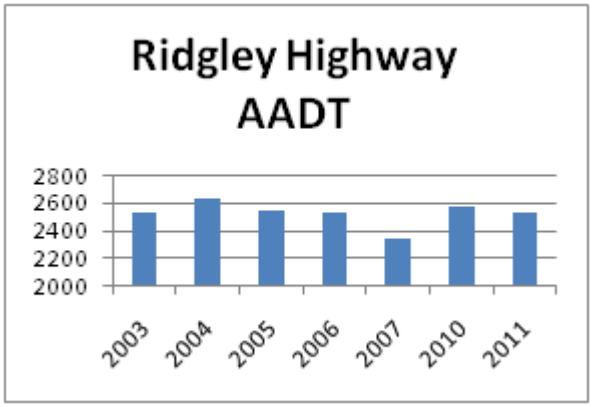
Table 2 Current Freight Volumes

Road	Point	Mtpa
Ridgley Highway	North of Ridgley	2.47
	Sth of Hampshire	0.68
Murchison Highway	Sth of Cradle Mountain Dev. Road	0.75
	Rosebery to Tullah	0.39
Anthony Road		0.29
Zeehan Highway	Sth of Anthony Road	0.47
Henty Highway		0.14
Lyell Highway	Zeehan-Strahan	0.04
Waratah Road		0.32
Rail		
Melba Line		0.30

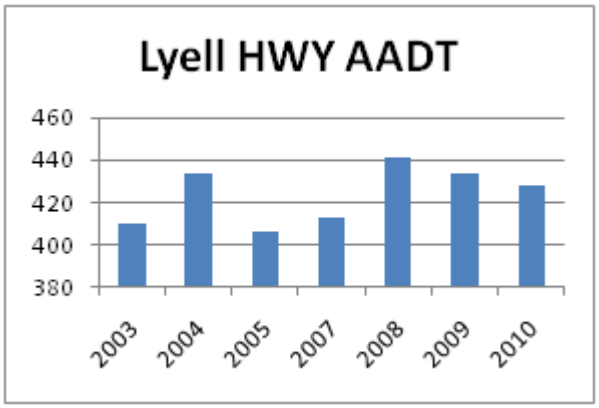
Source: DIER, Tasmanian Freight Survey 2009

Low base traffic volumes, the cyclical nature of mining and to a lesser extent, forestry; and the seasonal nature of tourism, makes the forecasting of AADT on West Coast roads difficult. The variability of traffic volumes is illustrated in historic AADT on the Lyell and Ridgeley Highways as shown in Figure 5 and Figure 6.

- **Figure 5 Ridgley Highway Historic AADT**



- **Figure 6 Lyell Highway Historic AADT**



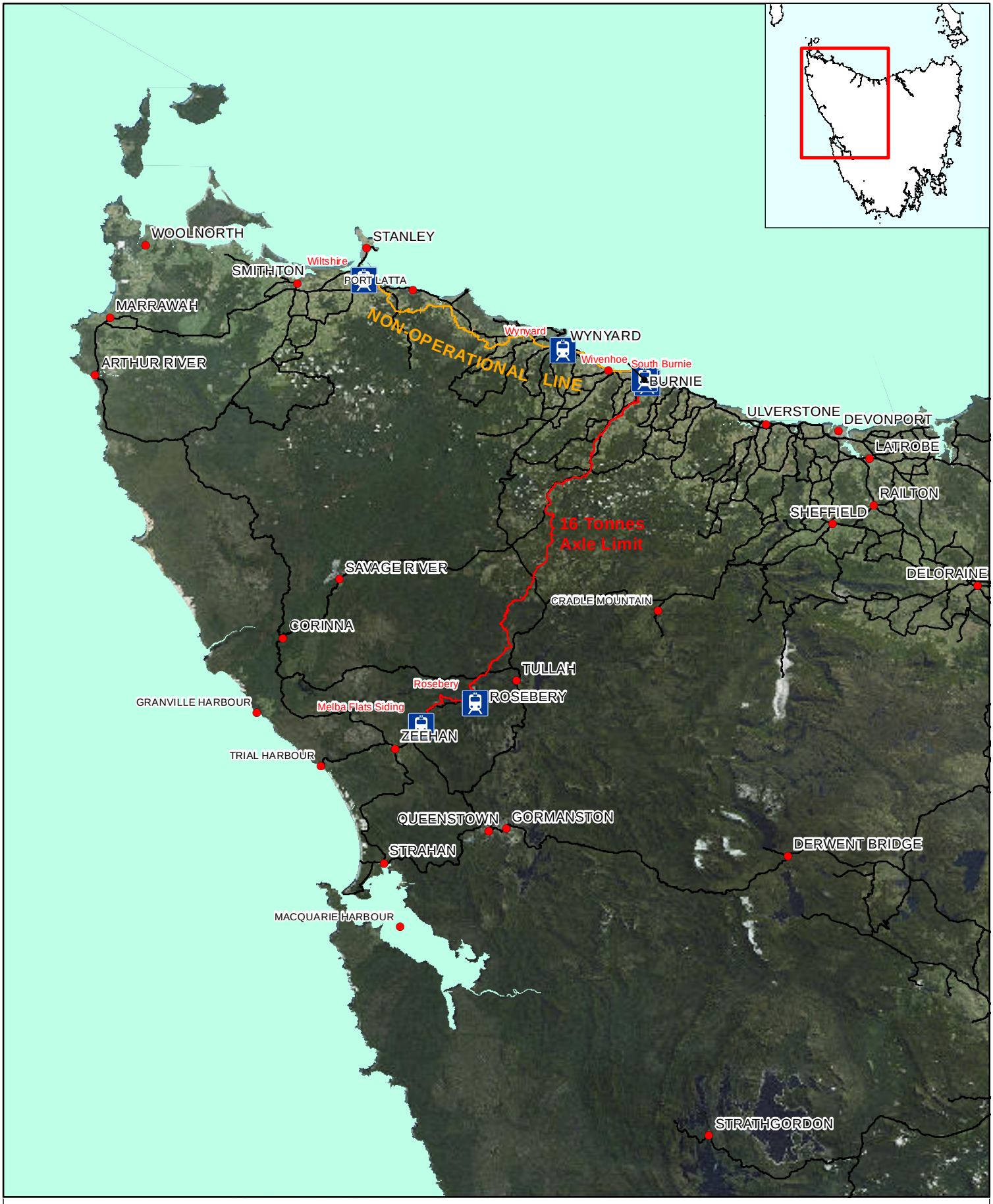
The recent closure of the Hampshire mill and general downturn in the forest industry has seen forestry freight volumes decline along Ridgley Highway, although there are significant timber reserves located directly to the south and west which are likely to be harvested over the long term.

Several new mining projects are expected to move from exploration to planning and development, which would lead to some growth in mining-related traffic volumes. Overall, the most significant increase in volumes would be on the Ridgley Highway, particularly if a number of high volume mining projects commence operation. The expected life of existing and new mining projects varies from several years to decades, making forecasting and infrastructure planning difficult.

2.3. Rail Network

Tasmania's rail network was mostly constructed in the late 1880s as a narrow gauge (1067 mm, 3'6") bidirectional single track network with passing loops. It has tight curves and steep ruling gradients, reflecting the challenging terrain. The rail network is shown in Figure 7.

The network is government owned and managed by TasRail Pty Ltd, a government owned company established under the Rail Company Act 2009 on 1 December 2009. This brought together the ownership and operational responsibility for Tasmania's rail business, including rollingstock, above rail assets, track and infrastructure.



Legend

- Railway Stations
- Melba
- Wiltshire - Non-Operational
- SW_TAS_Ocean_GDA94MGA55

N

1:1,250,000

0 12.5 25 50

Kilometers

August, 2011

PROJECTION - MGA Zone 55
DATUM - GDA94

Data provided by:
TasRail

FIGURE 7
TASMANIAN RAIL NETWORK

West Coast Infrastructure Development Study

The main characteristics of the rail lines in and servicing the study are summarised in Table 3.

Table 3 Key Characteristics of the West Coast Rail Lines.

Line	Origin	Destination	Status	Length	Loading sites	Major Users	Commodities	Tonnes per annum
Melba	Melba Flats	Burnie Port	Operational	130km	Melba Flats, Rosebery	CMT, MMG	Copper, zinc, lead concentrate	320,000
Hellyer Spur	Hellyer Mine	Melba line at Moorey Junction	Closed	11 km	Hellyer	-	-	-
Wiltshire	Wiltshire	Burnie Port	Care and Maintenance	80km	Wiltshire	-	-	-
Zeehan	Zeehan	Melba Flats	Land reserved and used as rail trail	~ 10 km	-	-	-	-

Source: SKM, drawing on TasRail information

Most of the track in use today follows the original alignment. The overall infrastructure condition is fair to poor, reflecting lengthy periods of underinvestment. There are permanent speed restrictions across the network relating to infrastructure standards and challenging terrain, plus temporary restrictions in various places to ensure safe operations, which relate to infrastructure condition and the operating environment. There are limits on train lengths from passing loop and terminal siding lengths, tight curves, and rollingstock limitations. These combine to restrict the efficiency and the market competitiveness of rail transport in Tasmania.

The sections below discuss those parts of the network in and servicing the study area.

2.3.1. Melba Line

The Melba Line connects western Tasmania to Burnie, and carries minerals from Melba Flats and Rosebery to the port. It is a single bidirectional track stretching 130 km from Melba Flats and 109 km from Rosebery. There are typically seven to eight return trains per week. The standard configuration is 18 ore wagons pulled by three locos.

The Melba Line is built through challenging terrain with mostly 100 m radius curves, and has ruling grades of 1 in 40 for northbound (loaded) operations and 1 in 38 for southbound (empty). There are tight clearances in gorges (<300 mm) and particularly tight clearances in the tunnel near Melba Flats which limit rollingstock dimensions and options. The track is constructed from 40’ lengths of jointed track with staggered joints on steel sleepers. Many of the steel sleepers are

corroded due to age and damp, highly mineralised ground conditions. The line has a 16 t axle load limit (64 t per bogie wagon). There are passing loops at former log loading sites, but none are currently in service, limiting capacity to a single train moving on the line at any time. Typical line speeds are 30 – 45 km/h.

The region is subject to flooding, falling trees and landslips. Clearing of trees contributes to the risk of landslips. Much of the track is at altitude and subject to ice and snow, as are road alternatives. Due to the terrain and resulting bridges, cuttings, tunnels and viaducts, much of the track can only be accessed by hi-rail vehicle. Currently the track is inspected every four days.

The Melba Line has lower operational standards than the rest of the Tasmanian network, reflecting challenging terrain and its origins as a separate private mineral railway. The existing arrangements are generally considered fit for purpose and meet current demand. The rest of the Tasmanian rail network has 18 t axle limits and operational speeds are up to 50 km/h, although most of the track is rated at 70 km/h. Reasonable tonnage growth would make an 18 t limit feasible, and would assist in achieving a common locomotive type across the network. Substantial tonnage growth would be required to justify the investment that would be required to substantially increase axle limits, which appears unlikely from the region.

TasRail has recently undertaken substantial maintenance work on the Melba Line, concentrating on track, sleeper and ballast works in higher derailment risk locations and sections with tight curves. Further work is planned over the next year. This is expected to further lower incident rate, which has improved considerably since the change in management.

The Melba Line is serviced by three trains, each 3 x DQ Class EMD locomotives pulling 18 wagons. The wagons carry 45-50 t each and are quite full at current axle limits. Services to Melba Flats leave an empty set of rail wagons for loading by contractors, who index wagons into the loading position and load with a front end loader. The locos bring an empty rake to Melba Flats and return with the full wagons. At Rosebery the locomotives pull empty wagons through the loader and return with the same wagons full. Loading the 18 wagons takes around two hours.

The Melba Line passes through the Renison mine, although the mine is not currently using rail transport. There is a potential for input coal for a future project at Renison to be moved by rail. The line runs in close proximity to the currently closed Hampshire woodchip mill. If that site was reopened for wood chipping or other operations, there is potential to run a spur line or conveyor to the site and use rail transport. There are a number of new mining prospects in the region which could use rail transport.

The Melba Line has been used to transport logs from Melba Flats in the past, but road has replaced rail as it avoids double handling.

TasRail's upgrade priorities for the Melba line include:

- Replacing existing steel and timber sleepers with concrete.
  - This also applies to much of the rail network.
  - The Melba line is regarded as second priority for funding after the main line between Brighton and Burnie. Available funds for Melba line would be devoted to tight radius curves initially.
- Measures to reduce landslip potential in vulnerable areas.
- Achieving higher axle load limits through bridge works and other point limits.
- Welded track to replace jointed track. This would reduce maintenance costs substantially for both track and rollingstock and make increases in rollingstock axle limits easier to achieve.
- Increasing clearances in the Melba Line tunnel:
  - Lowering of the tunnel floor has been considered.
  - This is particularly relevant to the current new locomotive acquisition program, where the tunnel limits loco dimensions below those for the rest of the network. A different specification of loco for the Melba line could otherwise be required.
- Transport of inputs to mine operations such as cement and fuel.

2.3.2. Hellyer Spur

An 11 km spur line runs from Hellyer mine to the eastern boundary of the Melba line at Moorey Junction. The line was closed when the mine was exhausted. A recent high level assessment of reopening the line for transport of reprocessed tailings suggested the formation was probably satisfactory for reuse but that the sleepers and track would probably require replacement. This would require more detailed assessment before a decision could be made about the investment required.

2.3.3. Wiltshire Line

The Wiltshire Line is outside the scope of this study, but is included here for completeness.

The Wiltshire Line (actually the section of the Western Line west of Burnie) connects Burnie to Wiltshire, near Port Latta. It was used to transport logs to Wiltshire prior to its closure in 2003, and is now under care and maintenance. The main opportunities for the Wiltshire Line include:

- Ore and minerals to Port Latta, requiring an extension of approximately 5 km
- Bentonite, currently trucked from Burnie to Port Latta as a process ingredient. Grange Resources has indicated a preference to use rail if available and cost comparable with road
- Logs to Burnie and then Bell Bay for Gunns proposed pulp mill

- Extension to Smithton (15 km) for process industry and forestry opportunities

TasRail estimated costs to reopen the existing track at $70-80 million in 2006, excluding any extensions.

2.3.4. Melba Flats to Zeehan

The former rail lines from Melba to Zeehan are currently available to the public as rail trails for walking, horse riding and mountain bike routes. There were two parallel lines, the continuation of the Emu Bay Railway Company line now operating as the Melba line, and a 2' 0" gauge North East Dundas Tramway which ran to Williamsford. The land corridors have been preserved in public ownership for potential future transport of minerals.

2.3.5. Above rail infrastructure

Above rail infrastructure is outside the scope of the study, but the information below was collected during the study and was considered worth including.

TasRail's current loco fleet and much of the wagon fleet, is either at, or very close to, a life expired condition. In the short term, enhanced levels of maintenance are being applied to improve reliability and availability.

The locomotives are over 30 years old on average and most are of obsolete and unsupported design. There are three separate classes, increasing maintenance and spare parts costs. Age and condition leads to increases in track wear and derailments as well as reduced availability through breakdowns. The lack of inter-operability between the locomotive types adds to inefficiency and capacity challenges.

TasRail's capital investment plan (TasRail 2010) includes:

- Purchase of 85 new container (intermodal) wagons
- Upgrade a further 90 container wagons
- Replacement of ballast wagons to replace the life expired fleet
- Replacement of the existing cement wagons
- Upgrade of the dry bulk (mineral ore) wagons used to transport ore and coal.

TasRail has recently spent $4.7 million replacing and upgrading 32 infrastructure work vehicles, including 17 hi-rail equipped vehicles.

On December 13 2011 TasRail signed a $60 million contract with Downer Rail and Progress Rail for the partnership to supply 17 diesel locomotives from mid-2013. CEO Damien White said

having a ‘contemporary and standardised’ fleet would ‘substantially improve the safety, reliability, efficiency and capacity of rail freight services’, and ‘enable us to provide a level of service equal to a modern-day standard which in turn will help to meet long-term demand and increase our contestable market share’. (Rail Gazette International, 2011)

TasRail expects to call tenders in early 2012 for the supply of a new wagon fleet, and has applied for an additional $240 million from Infrastructure Australia for further works. (Rail Gazette International, 2011)

Detailed analysis of above rail infrastructure is outside the scope of this project.

2.3.6. Shiploading facility

TasRail owns and operates a bulk mineral storage and shiploading facility at Burnie Port. This provides undercover storage and ship loading of mineral concentrates delivered by both road and rail. The shiploader typically operates at 1,200 tph although its theoretical capacity is 1,500 tph. The facility handles up to 500,000 tonnes of mineral concentrates per annum. At high tide it can be difficult to get the shiploader boom over the ship’s rail. The mineral holding area is currently at 80% capacity and is likely to be the first bottleneck if volumes increase. There is potential to move the shiploader from number 5 berth to number 6 berth to access deeper water for larger ships, which would provide more space for additional undercover mineral storage.

2.3.7. West Coast Wilderness Railway

The West Coast Wilderness Railway, running between Queenstown and Strahan, is one of Tasmania’s most popular tourist attractions. The 35 km track has been restored and is now carries passengers in heritage carriages hauled by steam and vintage diesel locomotives. The railway was originally constructed in 1896 to transport products from the copper mines at Queenstown to Macquarie Harbour at Strahan. Forty two bridges were built over the length of the railway, the majority timber trestle. The 3’ 6” gauge railway is constructed though treacherous terrain with grades of up to 1:16. The railway has a unique Abt rack and pinion system to cope with the steep grades. The line was closed in 1963 due to deterioration of the bridges and improved road access to the area.

The railway was restored and opened to passengers in 2002. Federal Group leases the railway from the Government and is responsible for maintaining the track and locomotives. The track sleepers are continually being replaced through a track maintenance programme which also addresses bridge condition. Due to the high maintenance costs the railway fails to cover costs. The railway, however, attracts a significant number of visitors to the region and is important for the tourism industry. Storm damage resulted in closure of 1,200 m of the track between March and July 2011.

The railway was able to be run from Strahan with the Queenstown section closed. The closure reportedly had a significant impact on the tourism industry in Queenstown.

2.3.8. Key policy and planning issues – rail

The Tasmanian government's policy position on rail is summarised in DIER's March 2011 *Tasmanian Rail Network – Objectives and Priorities for Action 2010-2011 to 2013-2014.* The overall thrust is:

- Achieving a viable rail network for the long term
- Having a greater proportion of Tasmania's growing freight task transported by rail
- Achieving a cost effective and efficient transport system.

The objectives and priorities recognise the interaction between freight transport users, rail service operators, rail infrastructure providers and government in achieving these aims.

It also confirms a position of competitive neutrality between government owned rail transport services and private sector road competitors, and within government for investment in rail and road assets. It states a clear policy position that rail services will be undertaken on a commercial basis.

Current investments in rail track have funding support from the Federal Government's Nation Building Program 2008-09 to 2013-14 totalling $205.3 m, and from the Tasmanian Government's 2010 budget, with $130 m for rollingstock and $70.8 for maintenance and administration, both over four years.

This investment funding need arose from an extended period of uncertainty and underinvestment, summarised briefly below.

The present regime commenced on 1 December 2009, when TasRail was established under the Rail Company Act 2009 as a state owned company. This combined the operational responsibility for Tasmania's rail business, including ownership of rollingstock, above rail assets, track and infrastructure into a single entity. The above rail assets (rollingstock, workshops, depots etc) and Melba line were purchased from Pacific National, a division of Asciano Ltd. Responsibility for track and associated infrastructure were also transferred to TasRail, after a period from 2007 in which the state government had assumed responsibility for the track and infrastructure when Pacific National, its owner and leaseholder, declined to honour its obligations.

The situation arose from the privatisation of the Federal Government controlled Tasmanian section of Australian National in 1997. This sale, of rollingstock and fixed assets included a 50 year lease on the land on which assets were situated, was to Australian Transport Network, a joint venture (JV) between NZ based Tranzrail and US Wisconsin Central. ATN was subsequently sold to

Pacific National in 2004, Australia's largest private freight rail operator. This occurred when Toll Holdings purchased Tranzrail, and Canadian National acquired Wisconsin Central, and both divested their Tasmanian assets. By September 2005 Pacific National threatened to withdraw all Tasmanian rail services unless a subsidy was paid, leading to a $120 m federal rescue package. A further $78 m was granted for maintenance of Tasmanian rail assets in 2007 from AusLink, following an agreement returning track responsibility to the state, plus a $4 m annual maintenance grant from the Tasmanian government.

This indicates the borderline financial viability of Tasmanian rail operations, which the federal and state governments have supported over many years, based on the reduction of freight trucks on the roads, resultant road damage, claimed environmental benefits and general public support for rail.

2.4. Ports

The Tasmanian Ports Corporation (TasPorts) manages the four major ports in Tasmania – Burnie, which is in the defined study transport corridor, Devonport Port, Bell Bay near the mouth of the Tamar River in the north and Hobart (Figure 8). TasPorts also manages a number of smaller ports including Strahan, Stanley and Smithton. Port Latta, located approximately 60 km west of Burnie is owned by Grange Resources.

While this study reviews the function of these ports in terms of land side connection, the scope excluded capacity analysis or waterside assessment as these areas are currently being addressed by TasPorts, Grange Resources and others. Although Burnie is the only major port within the defined study scope, research undertaken confirmed the importance of Port Latta for mineral exports. These two ports will be discussed in further detail in the following sections.

TasPorts strategies (e.g. TasPorts, 2011) for the northern ports are to encourage and continue current specialisation at each port, to increase economies of scale and reduce duplication. Burnie port exports a range of products including minerals, containers, woodchips, and wood logs, as well as being the receiving port for cruise ships to the north of the state. Port Latta is a major export base for Tasmanian iron ore pellets and is located between Wynyard and Stanley on the North West Coast. Devonport is the Tasmanian base for TT Line ferries, SeaRoad's container and Roll on-Roll off (RoRo) operations and cement.

TasPorts faces challenges maintaining four major ports. Speaking at the Tasmanian Transport Forum in December 2011, Tasmanian Freight and Logistics Council (TFLC) chief executive Rob McGuire suggested TasPorts needed to focus on a primary port in Tasmania. McGuire said 'we simply cannot afford to keep servicing and maintaining ports at Burnie, Devonport and Bell Bay and we should forget about Hobart now as a major port.' (Lloyd's List Australia, 2011)

Strahan is a minor port within the study area. The open ocean entrance to Macquarie Harbour, descriptively named Hell's Gates, has been a major challenge to shipping since the discovery of this harbour in the 1800s. It has been the site of many shipwrecks over the years, including some since the construction of the two lighthouses and two substantial rock walls which now stand at the entrance. The rock walls proved successful in maintaining a consistent channel location and draught of around 7 metres without dredging, although this has reduced in recent years to around 5.5 m with reductions in water outflows from damming rivers flowing into Macquarie Harbour.

Hell's Gates, Macquarie Harbour

This draught is well below the 12 - 14 m required for current day dry bulk ships, and underlines the likely ongoing reliance of west coast mining exports on ports at Burnie and Port Latta.

Legend

Managed By

- TasPorts
- Grange Resources
- Railway

N

1:2,200,000

0 12.5 25 50 75

Kilometers

August, 2011

PROJECTION - MGA Zone 55
DATUM - GDA94

TasPorts

Data provided by:
TasPorts

FIGURE 8
LOCATION OF PORTS WITHIN TASMANIA

West Coast Infrastructure Development Study

SKM

2.4.1. Burnie Port

Burnie port was first established in the 1960s and services the west coast mining, forestry and freight sectors. It is connected to the major highways of the North West and West Coast, i.e. Bass Highway, Murchison and Ridgley Highways. Road access into the port via the Bass Highway and the Port Road is adequate, although there is limited access via the Port Road underpass for over-height vehicles (DIER, 2009). Road access into the port from the West Coast via the Ridgley Highway is good and purpose built for transportation in and out of the West Coast. Transport via the Murchison Highway presents some issues as trucks are required to travel through two small towns, Somerset and Cooee creating potential conflict issues with other vehicles particularly during peak traffic periods. The TasPorts road into Burnie Port (within the port boundary) presents some issues with the queuing of trucks between the two intersections with the Bass Highway. TasPorts is currently investigating traffic flow improvements in this area.

Most of the minerals exported through Burnie Port from the West Coast are transported by rail. The Melba rail line provides an important link transporting minerals from Melba Flats and Rosebery to Burnie. Some containers are also transported to and from the port by rail, mostly to and from the south, but most containers are moved to and from the port by road.

The port has a RoRo operation for containers, two shiploaders for bulk minerals and woodchip, and an intermodal rail terminal providing rail access to the port. Currently Burnie Port utilises around 20-25% of its storage area for minerals and concentrates, with concentrates requiring under cover storage areas. Concentrated mineral and woodchip storage areas are linked to conveyor systems where product is loaded onto ships at approximately 1,200 t/hour for mineral ore and 1,000 t/hour for woodchips.

Both mineral ore and forest products storage and handling facilities are at or near capacity, and substantial capacity increases are likely to require major reassessment of the overall port layout. If companies are required to use off-site storage for containers or bulka bags this will make them less efficient due to increased handling and transport costs.

The port can accommodate Handymax sized ships up to 55-60,000 t, generally satisfactory for concentrates and medium sized container and RoRo vessels, but inadequate for ores traded in larger parcel sizes such as iron ore. Handling larger panamax and capsize vessels would require increased

draught, which would be expensive to achieve due to basalt substrate requiring blasting, and the need for greater weather protection, from a protective breakwater. Ship size limitations are not currently a major constraint for Burnie, but demand from anticipated increases in mining exports appear likely to exceed readily achievable capacity. Potential expansions may be limited by land constraints and the proximity of the Burnie CBD.

Burnie Port handles over 4.5 million tonnes per annum of both containers and bulk commodities of which 1.6-2.5 million tonnes (woodchips and minerals) is exported from Burnie Port (DIER, 2009). A reduction in woodchip export is anticipated as a result of the decline in Gunns milling and processing operations throughout Tasmania, including closure of the mill at Hampshire. Export of commodities is via a number of berths and storage areas and is summarised in Table 4, including existing limitations.

Table 4 Burnie Port Berth Operations, Including Storage

Berth/Storage	Commodity	Limitations
Berth 4	▪ Toll Berth with roll on-roll off ▪ Expansion and increased capacity required	▪ Shunting in front of beach area on foreshore area. ▪ Recreational conflicts ▪ Train length
Berth 5	▪ Petroleum and mineral berth	▪ Lacks efficient connection back to rail intermodal system
Berth 6	▪ Roll on –Roll off for cruise ships, imports, exports and general use area	▪ Ship size and draught
Berth 7	▪ Woodchip and forestry exports, up to 70,000 tonne on each of 3 stockpiles ▪ Multi-purpose and general use area	▪ Often vacant for general usage ▪ Woodchip trade currently in decline
Mineral concentrates	▪ 7 bins in a covered shed ▪ Require additional storage areas for concentrates (a further 4-6 sheds)	▪ Linkages to the spine of the conveyor system ▪ Amount of land that can be reclaimed for additional storage areas
Cold storage	▪ No longer operational ▪ Could be used for concentrate storage	▪ Floor re-strengthening required to accommodate concentrate storage ▪ Old facility

2.4.2. Port Latta

Port Latta is a deepwater port and the key site for the export of iron ore pellets interstate and to China. Approximately 2.5 million tonnes of iron ore pellets are exported from Port Latta each year. There are road constraints connecting surrounding areas to Port Latta. The highway is two way and the road into Port Latta is in poor condition. The transport of magnetite iron ore to Port Latta is via a slurry pipeline from Savage River. The pipeline is not suitable for the transport of all

minerals, and has limitations for other products within the West Coast region. The port is designed for the export of minerals and therefore there is a lack of significant loading opportunities at the wharf. Port Latta can accommodate larger vessels but is constrained to panamax size vessels and prevailing weather conditions. The port is closed an average of 10 days per month due to weather conditions. As shipping frequency is currently low, approximately every 10 days, this is not a major constraint. The Port is generally only closed for single days at a time and queuing of ships is rare. If shipping volumes were to increase, however, weather could become a significant constraint.

Port Latta is also restricted in terms of available land directly adjacent to the Port for future development or expansion of the existing port facilities. There is, however, an industrial park of around 2,000 Ha behind Port Latta which is connected to an electricity substation and gas line. Connection to the port would require a 2 km conveyor under The Bass Highway. This would be suitable for most concentrates and bulk minerals.

2.5. Electricity

Tasmania's electricity market is serviced by three state owned business enterprises:

- Hydro Tasmania, which generates electricity
- Transend Networks, which manages high voltage transmission
- Aurora Energy, which provides low voltage distribution to most end users.

Tasmania is the leader of renewable energy generation in Australia. Most of Tasmania's electricity is generated from renewable hydro electricity schemes owned and managed by Hydro Tasmania. Hydro Tasmania also has wind generation capacity.

The focus of this report is on the infrastructure that provides electricity to mining, aquaculture, agricultural and other users, and thus concentrates on the infrastructure and services provided by Transend and Aurora.

Transend owns and operates the high voltage electricity transmission system in Tasmania, linking power stations to substations around the state. The Transend transmission system is connected to the national electricity grid via Basslink, an undersea power cable linking Tasmania with the Australian mainland. Basslink allows the State to import electricity when low water storage levels limit the generation of hydro-electricity. Power can also be sold to mainland states when peak

demand can be met from generation capacity in Tasmania. Transend supplies a small number of larger electricity users directly at higher voltages.

Aurora Energy provides low voltage distribution of electricity to most end users. It also provides wholesale telecommunications services using optical fibre networks. Aurora Energy and Transend Networks work cooperatively to provide electricity services to end users throughout Tasmania.

All Tasmanian electricity companies are subject to regulation and management under Australian Energy Regulator (AER) and the Australian Energy Management Organisation (AEMO).

2.5.1. Transend Networks

Transend was formed from the disaggregation of Tasmania's electricity industry in 1998. It manages a predominantly 220 kV and 110 kV transmission network linking power stations, connection points to distribution terminal stations and the interstate interconnector (Bass Link) at various voltages. A small number of major customers receive high voltage electricity directly from Transend.

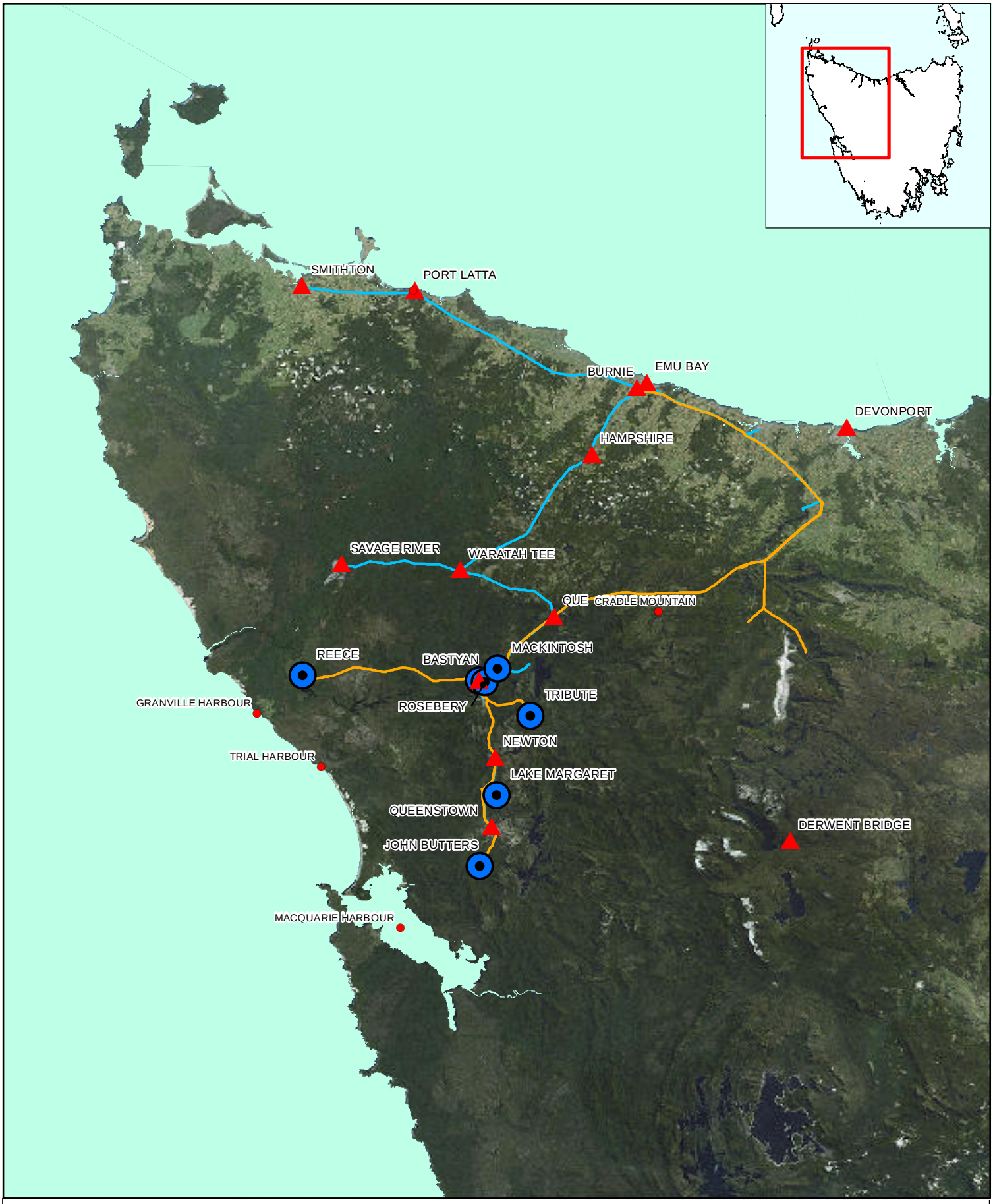
Transend owns all high voltage transmission assets on the west coast, with the exception of a transformer at Zeehan owned by Aurora (Figure 9). Transend and Aurora work closely on electricity supply and reliability issues throughout the region. The security of supply is determined by the number of circuits and transformers and the reliability of the electricity connection depends mostly on the distance from the substation and conditions through which the transmission and distribution lines pass.

Electricity assets are high capital cost items with a very long life - towers 100 years + and conductors typically lasting about 60 years. Network planning is important to ensure upgrade projects are justified and provide an adequate return on investment.

Load growth and demand on the West Coast is considered harder to predict than elsewhere in Tasmania as larger one off projects comprise much more of the load. Load growth projections have been historically low on the West Coast. Traditionally it has been more difficult to justify new capital projects that would improve reliability on the West Coast as overall demand is low compared with other regions of the state.

At present there is limited spare capacity to meet new demand on the West Coast within the existing network, estimated at around an additional 5-10 MW load. New loads over 20 MW would require system augmentation.

It is difficult to justify increasing system capacity when load growth has been slow and locations of new demand are uncertain. New major developments that increase energy demand are required to make capital contribution or completely fund the connection infrastructure.



Legend

- Sub Station
- Power Station
- 110kV Transmission Line
- 220kV Transmission Line

N

1:1,250,000

0 12.5 25 50

Kilometers

August, 2011

PROJECTION - MGA Zone 55
DATUM - GDA94

TRANSEND

Data provided by:
Transend

FIGURE 9
TRANSEND NETWORKS

West Coast Infrastructure Development Study

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The current major issues identified by Transend in the West Coast region include the following:

- Wind farm developments in the North West of Zeehan are likely to require transmission upgrades to connect to the network.
- Possible second interconnector to Victoria, with several connection locations and route options to consider.
- Replacement of old major assets.
- Replacement of conductor to increase capacity and remove corroded conductor.
- West Coast security of supply generally – currently there is only one, double circuit Farrell to Sheffield 220 kV line that links the area to the rest of the system.
- Security of supply to Roseberry and Queenstown – there is currently a single line to each township.
- Fragile 110 kV line to Savage River.
- 44 kV distribution in the Rosebery Queenstown area – and conversion to 66 kV for larger users.
- Single 22 kV distribution line to Strahan (managed by Aurora) – which is vulnerable to storm and falling tree damage.

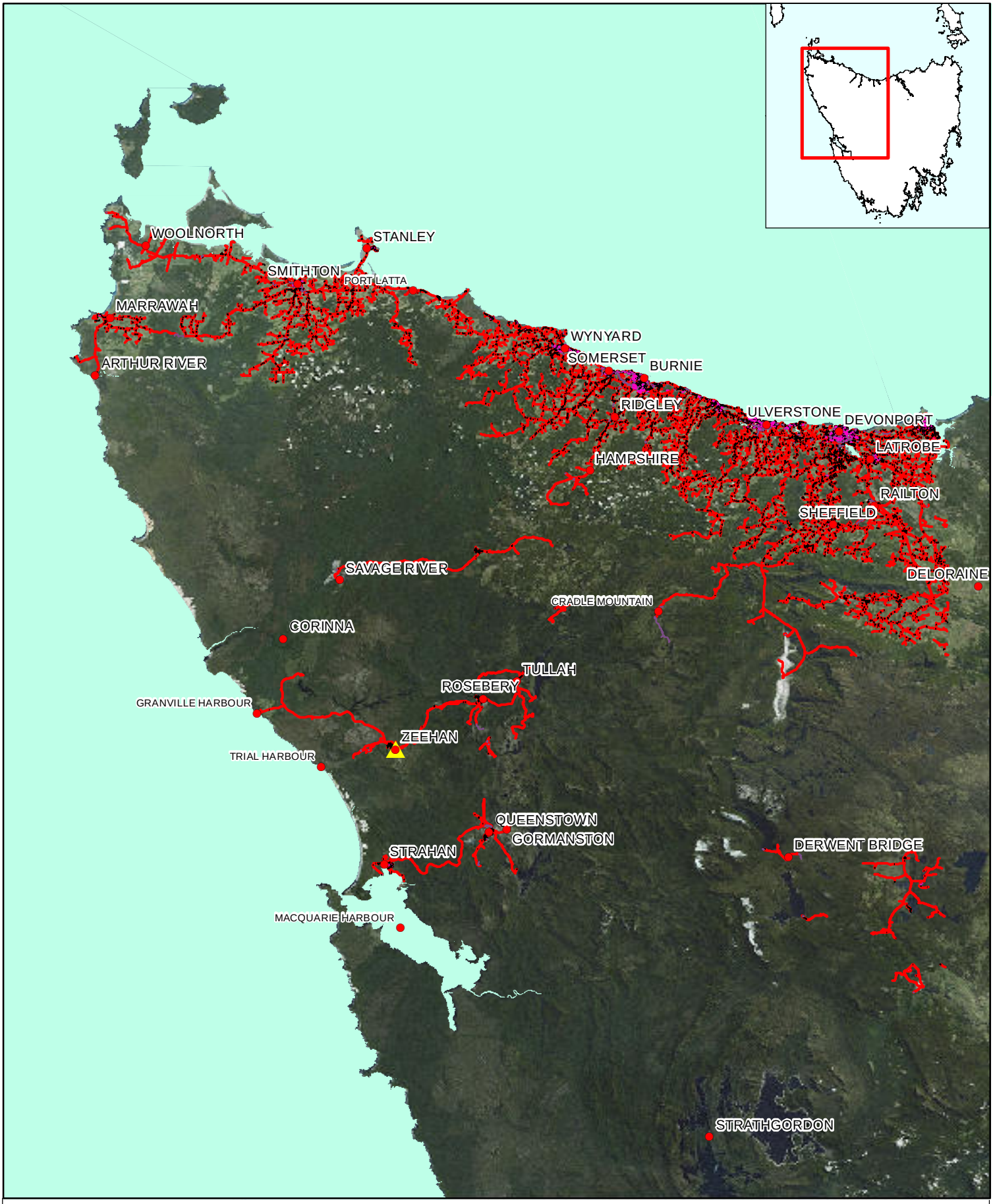
In Transend's Annual Planning Review (2011), priority projects for the region have been identified and include the following:

- Constraints on the security and capacity of transmission lines that supply the Rosebery Substation.
- Augmentation of the Rosebery Substation to enable the Farrell–Rosebery and the Farrell–Rosebery–Queenstown 110 kV transmission lines to be operated in parallel, providing firm supply to Rosebery Substation and meeting the performance criteria.
- Transend is working closely with Aurora and major customers to develop a long-term solution to the 44 kV supply from Rosebery Substation, with the transition to a sub-transmission voltage of 66 kV as one potential option.

Poor reliability has not been a trigger for transmission network development, but security of supply has been one of the main drivers for Transend.

2.5.2. Aurora Energy

Aurora Energy is Tasmania's main electricity distributor and a retailer of gas and electricity to consumers and businesses. Aurora's electricity supply is predominantly residential and commercial (Figure 10).



Legend

- Sub Station
- 11kV; 12.7kV; 22kV; 44kV OH Cable
- 240V; 415V OH Cable
- 11kV; 22kV UG Cable
- LV UG Cable

N

1:1,250,000

0 12.5 25 50

Kilometers

August, 2011

PROJECTION - MGA Zone 55
DATUM - GDA94

Data provided by:
Aurora Energy

FIGURE 10
AURORA NETWORKS

West Coast Infrastructure Development Study

Aurora has a customer connection policy that requires major users (such as mining or industrial users) to pay connection fees if they require new lines or connections. Mines in particular have large capacity requirements and those users with loads greater than 1 MW are also responsible for paying some of the headwork costs, such as additional transformers or switching equipment that may be required.

Aurora owns and manages the power supply line to Strahan. It also owns one substation at Zeehan, which was originally for the Avebury mine, which contributed to the cost of the substation.

The current major issues identified by Aurora Energy in the West Coast region include the following:

- Aurora manages and maintains the single 30 km line into the township of Strahan which carries a 4 MVA load. This line is vulnerable to storm and tree damage and reliability levels in Strahan are below average. Strahan is now classified as an urban area and therefore the required level of reliability for this area has increased. There are few solutions to increase the reliability for Strahan other than an additional line from Zeehan. However this would be a very high cost option without any known new major demands in the area.
- Emu Bay substation services the Burnie CBD at 11 kV. Burnie substation services the remaining areas at 22 kV. The load on the transformers at Burnie is currently reaching its limit (an issue for Transend) and studies are currently being undertaken for future supply options for Burnie.
- Wynyard currently has reliability issues and an option for this township is a new substation which would be subject to normal Development Application (DA) processes. Timeframe for a new substation for this region would be at least 4-5 yrs and would only proceed if Burnie capacity issue remains.
- Most of Aurora's reliability issues are in the North West due to the long distances of the 22kV lines. The number of faults is directly related to the number of kilometres a line extends. The current average for faults is approximately 8-10 faults every 100 km per annum.

Aurora is moving towards smart networks which allow switching between networks to minimise issues associated with reliability and peak energy use times.

There are no infrastructure development plans for the next five years on the West Coast.

2.5.3. Wind Energy

There are no existing wind power developments on the West Coast of Tasmania that are connected or require connection to the transmission line network. There are wind power developments on the

North West Coast, including Woolnorth and Studland Bay, and other potential developments are under assessment, including Marrawah, Robins Island and Granville Harbour.

There are no planned wind power projects for the study region that have been identified.

A number of mining operations on the West Coast have considered wind turbines and private gas turbine generation as an alternative to supply from Transend or Aurora.

2.6. Gas

Tas Gas Networks is the key reticulated gas supplier in Tasmania and supplies natural gas to over 10,000 domestic, commercial and industrial customers along the pipeline route and in the metropolitan areas of larger cities and towns. Aurora Energy and Tas Gas Retail are the major retailers of natural gas in Tasmania. TruEnergy also holds a retail license to sell natural gas in the State.

In the North West, gas pipelines are located in Burnie, Devonport and Wynyard. Both Burnie and Wynyard are located within the study infrastructure corridor. A gas pipeline also extends to Port Latta, servicing industrial areas and could be extended as far as Smithton should a viable project warrant gas supply in the future. An extension of the pipeline to the West Coast would only be considered if a major industrial client and significant project was proposed (e.g. gas fired power station) to warrant the investment.

There is currently a LNG plant located in Westbury where gas is delivered by road tanker to customers in the region. This is a more likely scenario for the West Coast than reticulated gas due to challenges of distance and terrain.

It would be possible to extend the existing Port Latta pipeline up to 10-15 km for substantial gas using projects depending on the level of investment required. Extensions beyond this distance are unlikely to be economically viable elsewhere on the West Coast (TasGas Pers.Comm. 24/8/2011).

TasGas has no immediate plans for any future projects on the West Coast (TasGas Pers.Comm. 24/8/2011).

2.7. Telecommunications

Tasmania has three mobile phone networks. Telstra, Optus and Vodafone have GSM (Global System for Mobile Communication) phone networks in Tasmania. Telstra's GSM network has the broadest coverage, but all three cover the main population centres and some highways, and are equipped with the General Packet Radio Services (GPRS) overlay which provides higher-speed data services (DIER, Iris Website, 2010).

GSM is the current and most widely used standard for mobile phones today while 3G is the next generation mobile technology that has begun to replace GSM. 3G is still in its infancy and only has a very small area covered when compared to GSM. GSM technology has been the most prominent mobile phone technology in the world. Although there are other technologies that are competing with GSM, it remains dominant. GSM offered new communication approaches to mobile phones such as text messaging and low speed internet access.

3G is new technology that was introduced as a replacement to the older GSM technology. It offers substantial improvements over its predecessor with increased mobile internet speeds for 3G networks. These faster speeds have allowed new features that were unavailable for GSM such as video calling. It is only a matter of time until 3G technologies fully supersede the GSM network, not through competition, but a natural transition from an older technology to a new.

Optus, Vodafone and Telstra also provide 3G technology which includes support for voice calls, pictures, television, video calls and wireless broadband. Telstra's Next G network currently covers 99% of the Australian population. Most population centres in Tasmania are covered fully and other areas in Tasmania are also covered with the use of an external antenna (DIER, Iris Website, 2010).

The extensive consultation process conducted as part of this study with a range of stakeholders, (including government agencies, infrastructure service providers, and mining and tourism sectors) indicated that there is a real need for improvement in telecommunication systems on the West Coast. Telecommunications is very important to the region given its remote location and there is a general consensus that the current services are inadequate. This is particularly problematic for tourists visiting this region of the state as they are often unaware that their current service provider has little or no coverage on the West Coast.

There are limited 3G services and coverage is poor in a number of areas which raises safety concerns, particularly for road travel. With an increasing demand from emerging phone technology (e.g. iPhones) this is becoming an issue for many West Coast residents and there is a requirement for upgrading the existing services. Mobile satellite phone lines are also poor and unsatisfactory. There are no digital services in the West Coast region which has adverse social implications.

The mining sector is impacted on by the lack of reliability and frequency of outages. Under these circumstances mining activity is often halted due to operational safety concerns. The use of Voice Over Internet Protocol (VOIP) and servers on site by the larger mining companies addresses potential communication issues.

Improvement in SKADA systems and telemetry systems is desirable with access to the National Broadband Network (NBN) or optic fibre preferable should it be introduced to the west coast townships.

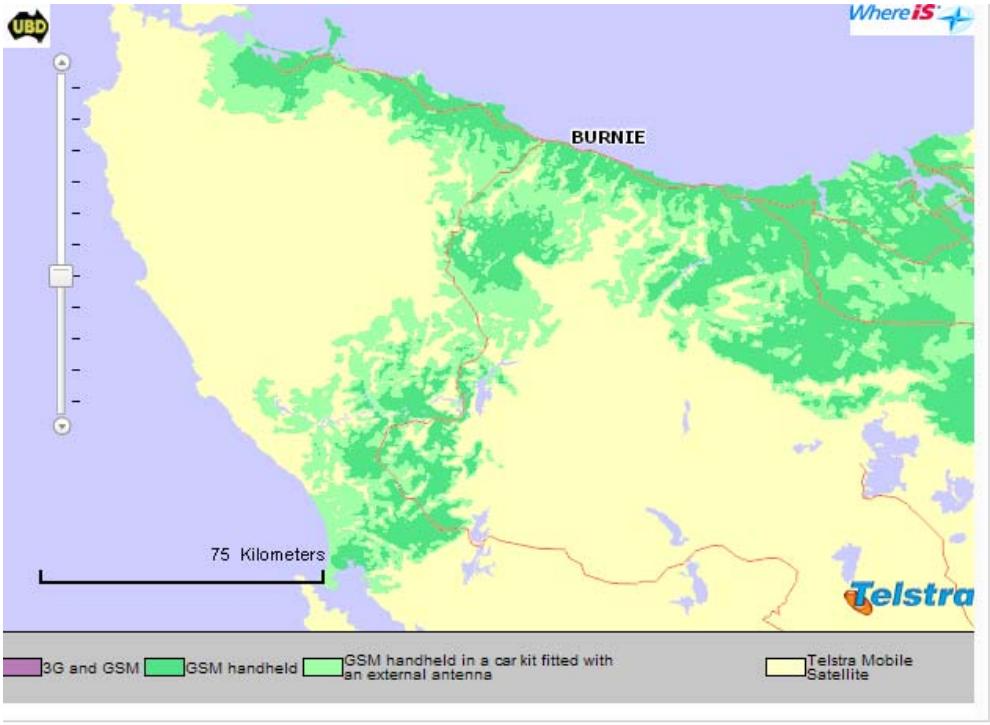
2.7.1. Telstra

Telstra was unwilling to provide any information relating to network coverage or planned future coverage for commercial-in-confidence and other considerations. We were referred to website coverage maps, shown in Figure 11 and Figure 12.

Telstra commented:

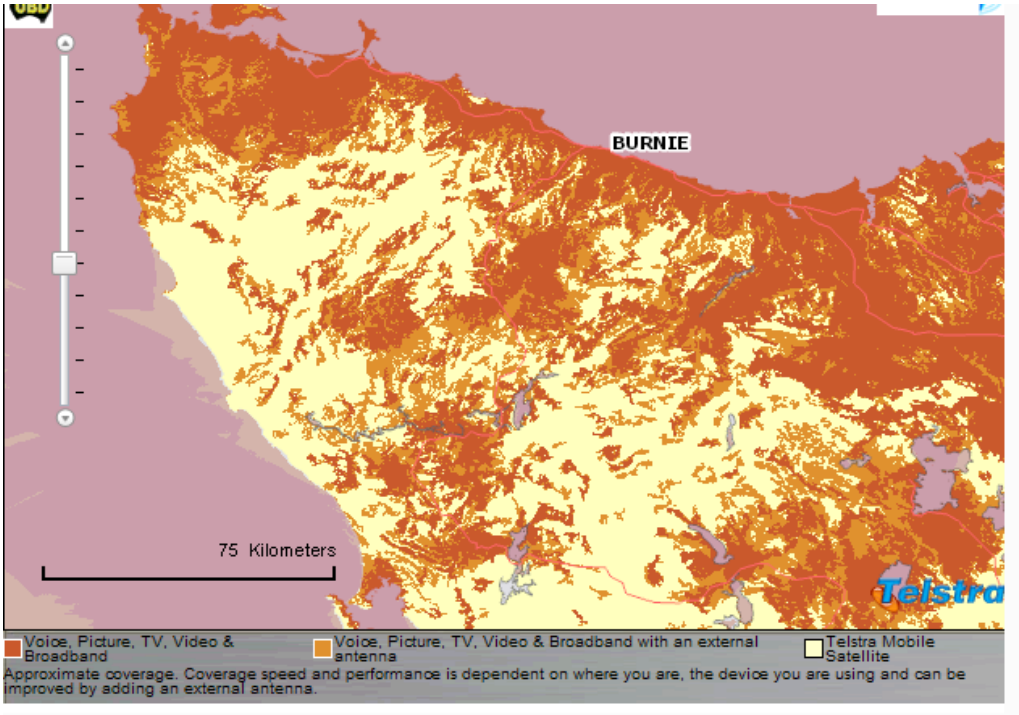
> "Our coverage is continually being added to and the current process ensures that updates are fed into the system monthly. Any data released could quickly become dated. In short Telstra does not want to lose control over its data and the way it presented to customers.
>
> "Telstra would not want its GIS data fed into any composite mapping with other carrier networks. In the study area, this composite would amount to Telstra's coverage and could be misinterpreted to suggest that other carriers had similar coverage to Telstra's.
>
> "While Telstra is not willing to share specific plans for network development, in the study area there is currently sufficient spare capacity to meet projected customer needs and plans exist that will enable additional capacity to be provided as required."

- **Figure 11 Telstra 3G and GSM Coverage**



Source: (www.telstra.com.au/mobile/networks/coverage/). Downloaded 2 September 2011

- **Figure 12 Telstra Next G Coverage**



Source: (www.telstra.com.au/mobile/networks/coverage/). Downloaded 2 September 2011

Telstra provides ADSL2+ broadband coverage in the following towns in the broader study area:

Burnie	Queenstown	Ridgley
Rosebery	Somerset	Strahan
Tullah	Wynyard	Zeehan

In addition Telstra provides broadband services using other technologies to larger corporate customers throughout the North West and west coast.

Telstra's transmission network infrastructure uses optical fibre throughout the North West and a combination of high capacity digital microwave (using licensed spectrum) and optical fibre to serve the west coast.

2.7.2. Optus

The Optus Open Network today offers 3G dual band, 3G single band and 2G services (Optus, 2011). The ability to access 3G and 2G services and the location where these services are available within the Optus Open Network is largely dependent on the capability of the telecommunication device being used. Where infrastructure exists, Optus is looking at strengthening services within the North West and West Coast region.

Optus' current coverage is illustrated in Figure 13 and Figure 14. Current and planned infrastructure is outlined in Table 5.

- **Figure 13 Optus 3G Dual Band Coverage – Current and Planned**

Source: Optus, Date downloaded (9 September 2011) (http://www.optus.com.au/aboutoptus/About+Optus/Network+Coverage/Optus+Network+Coverage+Maps/Tas)

Figure 14 Optus 3G Single Band

Source: Optus, Date downloaded (9 September 2011) (http://www.optus.com.au/aboutoptus/About+Optus/Network+Coverage/Optus+Network+Coverage+Maps/Tas)

■ **Table 5 Optus Mobile Network Infrastructure – Current and Planned**

Site	Tower Type	Optus owned?	Live?	Tech Type
Queenstown	Monopole - Concrete	Yes	Live	3G
Zeehan	Monopole - Concrete	Yes	Planned	3G
Strahan	TBA	Likely	Planned	3G
Rosebery TAS	Lattice Tower	Yes	Planned	3G
Tullah	Lattice Tower	Yes	Live	3G
Cradle Mountain	Co_Location	No	Planned	3G
Waratah Tas	Lattice Tower	Yes	Live	3G
Companion Hill	Co_Location	No	Planned	3G
Ulverstone	Co_Location	No	Planned	3G
Penguin	Co_Location	No	Live	3G
Burnie	Co_Location	No	Live	3G
Burnie Central	TBA	Likely	Planned	3G
Somerset	TBA	Likely	Planned	3G
Wynyard	Co_Location	No	Live	3G
Montumana	Co_Location	No	Live	3G
Edgcumbe Beach	TBA	Likely	Planned	3G
Forest Tas	Lattice Tower	Yes	Live	3G
Irishtown	Lattice Tower	Yes	Live	3G
Stanley	Monopole - Concrete	Yes	Live	3G
Smithton	Lattice Tower	Yes	Live	3G
Montagu	Lattice Tower	Yes	Live	3G

Source: Optus (John Lawrence, 2011)

2.7.3. Vodafone

Vodafone was awarded the third Australian mobile telecommunications carrier licence in December 1992. It provides 3G coverage to 94 per cent of Australians, providing access to 3G services, such as internet and email on mobile phones, or laptop via Vodafone Mobile Broadband (Vodafone Australia, 2011).

Within the study area Vodafone allows for good network coverage for the city of Burnie and is planning an upgrade to the existing frequency in June 2012 to allow for greater compatibility with new generation phones and enable faster connections.

No coverage or networks exist for the west coast towns of Queenstown, Zeehan, Rosebery, Tullah or Strahan, nor are there plans for future projects in these areas.

2.7.4. National Broadband Network (NBN)

The NBN is a new, wholesale-only, open access high-speed broadband network that will deliver high-speed broadband to all Australians (Department of Broadband, Communications and the Digital Economy - DBCDE). The high speed fibre network is capable of providing speeds of up to 1 gigabyte/second (National Broadband Network Information Campaign, 2011).

The first NBN services have been delivered in three Tasmanian Stage 1 communities (Scottsdale, Smithton and Midway Point). Stage 2 communities of Sorell, Deloraine, George Town, St Helens, Triabunna, Kingston Beach and South Hobart are scheduled to commence in 2011, with services expected to commence from March 2012. Under Stage 3, another 90 000 premises will be connected in Hobart, Launceston, Devonport and Burnie-Somerset (National Broadband Network Information Campaign, 2011).

The indicative list of towns within the study area that will receive some optic fibre coverage includes Rosebery, Tullah, Queenstown, Wynyard and Zeehan. The list is based on initial detailed modelling work done by NBN Co which may be subject to change following more detailed planning and design work (National Broadband Network Information Campaign, 2011).

2.7.5. Transend Networks

Transend Networks Pty Ltd also supplies telecommunications services within the study area.

Transend's telecommunications infrastructure is utilised for purposes relating to the transmission and supply of electricity within Tasmania. Transend provides limited additional services consistent with its licensing exemption under the telecommunications regulatory regime.

Transend's telecommunications assets are primarily optical fibre infrastructure in the form of Optical Ground Wire (OPGW), where the ground wire run along the top of the transmission line includes a number of fibre pairs, and so follows the electricity transmission line routes within the study area. Current optical fibre infrastructure within the study area extends from Burnie via Port Latta and Smithton and from Sheffield through to Tullah. Further optical fibre projects, currently scheduled for completion in 2012, will provide infrastructure from Queenstown through to Burnie (and hence on to Launceston and Hobart).

In addition Transend also owns and operates an extensive state-wide microwave radio bearer network, one component of which extends from Burnie through to Mt Read and from there services a number of west coast locations.

2.7.6. Other telecommunications service providers

There are additional telecommunications service providers in Tasmania. A summary of areas serviced and specialisation is provided in Table 6.

Table 6 Additional Telecommunications Service Providers

Company	Service Provided	Target locations	West Coast
Tasmanet	Tasmania's largest privately owned data communications infrastructure networks. Provides options for connectivity and networking that provide, cost-effective data communications across multiple locations and hundreds of users, including hard-to-reach areas. Targets private sector business users and does not offer services to domestic customers.	Tasmania	✓
BBW Telecom	Licensed carrier and mobile phone application service provider dedicated to providing corporate clients with next generation telecommunications solutions. BBW Telecom is now recognised as one of Tasmania's fastest growing technology companies.	Tasmania	✓
TasTel Community Telco	Services the Tasmanian market only, providing voice services (landline and mobile) and Internet services for residential and business customers.	Australia wide and Tasmania	✓
Tas Communications	Provides internet service to the major population centres on the North West Coast. Currently no service provided to the West Coast region.	Tasmania	×

2.7.6.1. Tasmanet

Tasmanet is 100% Tasmanian owned and provides customers with business solutions and options for connectivity and networking across multiple locations and regional areas. Tasmanet is an ISP specialising in business solutions for companies with multiple remotely located offices in Tasmania. It operates mostly on its own infrastructure including towers but will fit equipment to towers belonging to others (e.g. Telstra, Optus) if feasible, and purchases capacity from others where suitable for location and business needs. Services are generally run on GSM, not 3G due to greater reliability and fewer drop outs.

The main market for Tasmanet is providing network services, particularly connecting multiple offices for industry and providing internet access is a secondary service. Tasmanet is focused on regional areas, and service the CBD only when regional customers have offices in the city. The focus is on industry and they do not plan to provide services to residents however may provide a secondary function for residents if an industry requirement is evident.

Two main industries on the West Coast have requirements for data communication services provided by Tasmanet and include the aquaculture and mining sectors. Tasmanet has also received requests from other business sectors on the West Coast regarding high speed data access in this region. It is expected that Tasmanet can largely utilise existing towers, with one additional tower required to service Strahan. In regions without this existing infrastructure e.g. Arthur River, capital expenditure would be much higher.

Telstra and Hydro have towers in the region which Tasmanet may potentially use. Crown Castle also has 15 towers across Tasmania as a business investment (user pay system). Existing towers

becoming full is an issue on the West Coast. New towers on the West Coast will be required in the future and Tasmanet indicate a preference for a number of small towers over a few large towers.

Tasmanet also has applications for in truck systems, including timesheets, billing, routing and scheduling. Tasmanet systems can provide GPS reference points (calibrating GPS location references more accurately) and Continuously Operating Reference Points, (CORS).

2.7.6.2. BBW Telecom

BBW Telecom was founded to provide broadband communication solutions for the Thrifty Car Rental franchise which had broadband connection needs around Tasmania that could not be satisfied by any existing telecommunication provider. BBW soon expanded to provide services to other local and interstate companies (Broadband Wireless Pty Ltd, 2011).

BBW Telecom is now recognised as one of Tasmania's fastest growing technology companies and is a leader in providing flexible communication solutions including data communication services, fixed or wireless. BBW can operate on its own infrastructure if the demand is there or can utilise existing towers.

BBW is an authorised Networking Tasmania II (NTII) provider for the supply of connection and Internet-only services. NT II is an outsourced, integrated, data communications network for the Tasmanian Government. NT II provides a range of proactively managed end-to-end wide area network services, including managed network services, connection services, Internet gateway and filtering services and Government directory services (Broadband Wireless Pty Ltd, 2011).

BBW does not currently provide telecommunications service to the west coast of Tasmania, however is capable of providing this service if required.

2.7.6.3. Community Telco (TasTel)

Tastel Community Telco is a Tasmanian owned telecommunications provider and communications consultancy (TasTel Community Telco 2011) which utilises existing infrastructure to provide telecommunication services across Tasmania.

Tastel currently provides services to a number of residential and small businesses on the West Coast of Tasmania and has the capability of expanding services when demand arises.

Tastel is affiliated with Community Telco Australia (CTA), a Bendigo headquartered group aimed at supporting regional communities through local, community-owned telecommunications companies (Tastel Community Telco 2011). Telco affiliates provide high speed, highly reliable premium internet connections, with a network covering all states and territories in Australia.

2.7.6.4. Tas Communications

Tas Communications are owned by Burnie City Council and provide telecommunications services in the Burnie area. The services Tas Communications provide include (Tas Communications 2011):

- Fibre internet which is a new fibre optic based last mile infrastructure. It replaces reliance on older copper wiring technologies and provides a high-speed flexible alternative.
- Wireless broadband
- Safe and secure offsite backup service
- High speed wireless Point to Point connections between multiple business sites.
- VoIP

Tas Communications currently do not provide any services on West Coast. Discussions have been held in the past with Grange Resources at Savage River, however Grange used Telstra instead.

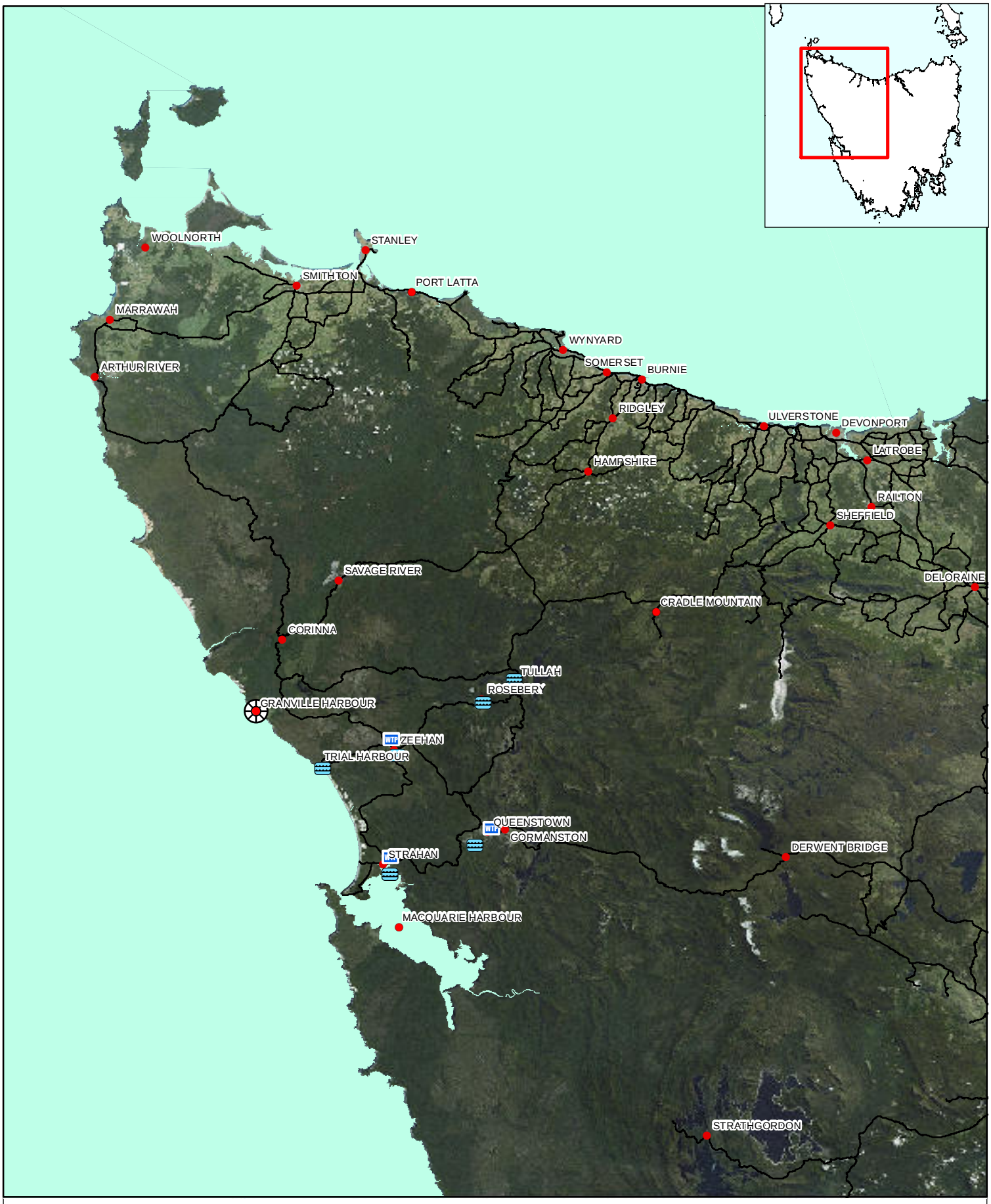
2.8. Water infrastructure

2.8.1. Water Supply and Water Treatment

The regional water corporation responsible for water supply and wastewater treatment within the study area is Cradle Mountain Water (CMW). The corporation services customers in the North West Region of Tasmania, encompassing the area of its nine owner Councils – Burnie, Central Coast, Circular Head, Devonport, Kentish, King Island, Latrobe, Waratah/Wynyard and West Coast Council. CMW provides water and wastewater services to approximately 110,000 people in an area of 22,500 square kilometres. The corporation is responsible for the operation of 14 water treatment plants and 29 wastewater treatment plants (Figure 15). The corporation is also responsible for 1100km of water pipelines, 990km of sewer mains and delivers a water supply of approximately 20,000ML per annum (Cradle Mountain Water, 2009).

For the purposes of this report, water supply pipelines for water processing are relevant, however CMW does not currently service major industry on the West Coast for process water. Wastewater treatment plants are relevant in this study where an industry requires the treatment of trade waste, and the quality of drinking water supply is important for the residents of the West Coast. CMW treats largely domestic waste and some trade waste but is limited to smaller local commercial operations. These are managed through a trade waste agreement system.

CMW does not envisage future requirements for additional water infrastructure within the region, however is committed to the communities of the region and has an obligation to construct additional services or upgrade services as needs arise. CMW's response to this need is reactive only and is ultimately driven by demand. For new major developments that occur, the costs of any upgrades or additions required to existing treatment plants will be transferred to the developer via developer charges.



Legend

Water Treatment

Water Treatment Plant

Waste Water Treatment

Lagoon

Treatment Plant

N

1:1,250,000

0 12.5 25 50

Kilometers

August, 2011

PROJECTION - MGA Zone 55
DATUM - GDA94

Data provided by:
Cradle Mountain Water

FIGURE 15
LOCATION OF EXISTING WATER INFRASTRUCTURE

West Coast Infrastructure Development Study

When constructing new water treatment plants (WTPs) or waste water treatment plants (WWTPs), all plants are designed to be as modular as possible so that plants can be added onto or upgraded as demand requires. Plants in Rosebery, Zeehan and Strahan have been designed as modular systems as to accommodate future growth and changes in demand in these regions. The current status of WTPs and WWTPs is outlined in Table 7.

Table 7 Current Status of WTPs and WWTPs in the Region

WWTP/WTP Location	Current Status (2011) and planned works
Waratah	■ Upgrading to membrane treatment this year. ■ Services township only. ■ Very little trade waste requirements in Waratah.
Savage River	■ Water treatment/supply managed by the mine itself. ■ No assets in Corinna area.
Granville Harbour and Trial Harbour	■ All residents on tank water. ■ Level 1 waste water treatment, managed by CMW and regulated by Council.
Zeehan	■ Level 2 WWTP and WTP. ■ Minor process improvements at WTP in progress. Plant upgrade and automation planned for 2015/16. ■ Investigation for new WWTP has commenced, with construction planned for 2020/21.
Rosebery	■ Currently drinking water source is chlorinated and sand filtered. ■ Investigation commenced on new WTP. Primary filtration system currently under construction. WTP planned for completion in 2015/16. ■ CMW do not provide bulk water services to any major industry. ■ Planning for a new WWTP in Rosebery is in progress and planned for completion in 2015/16.
Tullah	■ Currently level 2 WWTP in the form of a lagoon based system. ■ Minor process upgrades are in progress. ■ Planning underway for new WWTP subject to outcomes of environmental studies currently in progress. If required, construction is planned for 2015/16. ■ Minor process improvements at WTP in progress. New WTP construction planned for 2017/18.
Queenstown	■ Recently commissioned new drinking water plant in year 10/11. ■ New WWTP planned for construction in 2019/20.
Strahan	■ WWTP (Level 2) is relatively new and currently performing well. Process upgrade planned for 2015/16. ■ Drinking water plant about 8 years old. Process upgrades planned for 2015/16. ■ May need to work on rising main in the future on pipes and pumps to the plant, otherwise satisfactory.

2.9. Other infrastructure

2.9.1. Savage River Slurry Pipeline

Grange Resources operates the Savage River magnetite iron ore mine, concentrator, iron ore slurry pipeline to Port Latta, Port Latta pelletising plant, ship loader and port. Savage River is 110 km by road from Port Latta, and is currently producing around 2.25 mtpa iron ore. This is mined in an open cut pit, conveyed 1.3 km to mill, crushed, ground and turned into slurry for pumping to Port Latta in an 85 km long, 230 mm diameter pipeline (slurry pipeline). This runs to Port Latta through a 40 m wide easement, with the land held under a mining lease (Figure 16).

At Port Latta the slurry is dewatered and turned into 9 – 16 mm diameter pellets in a gas fired pelletising plant, conveyed 1.3 km to a pellet stockpile, then reclaimed and loaded via 2 x 2,000 – 2,500 tph shiploaders into 40,000 – 47,000 t Handymax shipments for BlueScope Steel and 70,000 – 80,000 t Panamax shipments for Chinese customers. This results in a ship load departing each 10 days on average, with around 36 shipments each year.

Table 8 Slurry Pipeline Capacity

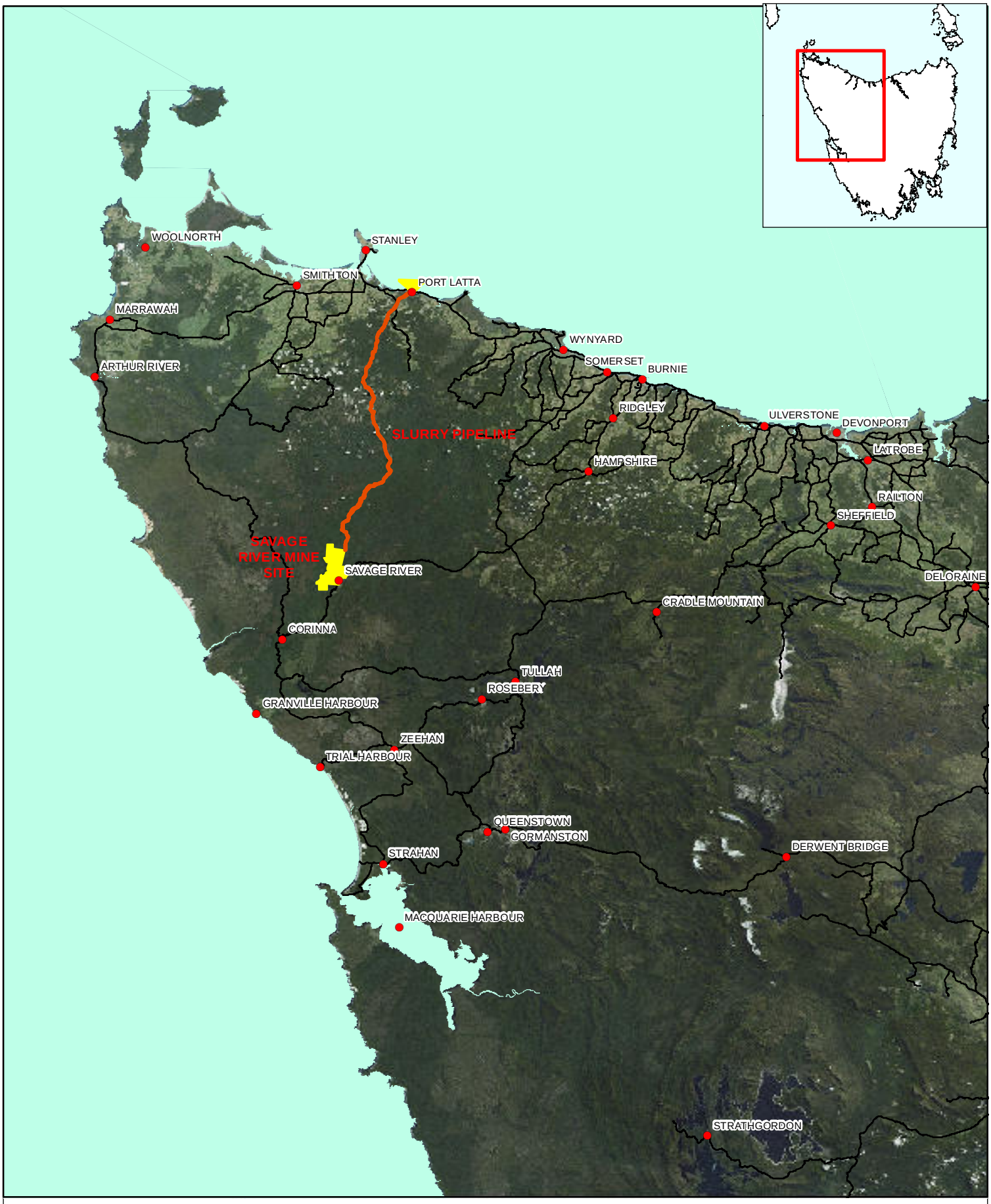
Owner	Origin	Destination	Length (km)	Diameter (mm)	Easement (m)	Commodities	Mt / year
Grange Resources	Savage River	Port Latta	85	230	40	Magnetite ore	2.25

Source: Grange Resources

The pipeline has been operating 43 years and is expected to meet the life of mine to 2027. A duplicate pipeline is under consideration. Grange has 3 signed MOUs for others to supply ore or use Grange equipment which could see pipeline volumes increase significantly.

2.9.2. Social infrastructure

Social infrastructure issues were raised by almost all stakeholders in the region. While outside the scope of this project they have been documented in Appendix C for completeness.



Legend

- Slurry Pipeline
- Savage River Leases

N

1:1,250,000

0 12.5 25 50

Kilometers

August, 2011

PROJECTION - MGA Zone 55
DATUM - GDA94

GRANGE RESOURCES

Data provided by:
Grange Resources

FIGURE 16
SAVAGE RIVER SLURRY PIPELINE

West Coast Infrastructure Development Study

SINCLAIR KNIGHT MERZ SKM

3. Report 2: Current and future industry structure and operations

3.1. Introduction

This section details the current and likely future industry structure and operations within the study area, providing specific focus on the relationship between industry structure and infrastructure provision. Special attention is paid to infrastructure related constraints faced by industry in undertaking current and planned operations and identifies how targeted infrastructure investment may assist in economic development. Future proposed development projects are also included within this analysis.

3.2. Approach

This section was informed and developed by an extensive program of industry consultation, undertaken predominantly in the region. Appendix A contains a listing of the organisations involved in this program, and Appendix B contains the discussion schedule summarising the issues covered in the discussions.

3.3. Regional context overview

The West Coast is home to most of the state's active mining operations, and also has substantial forestry, aquaculture, tourism and other industries. The mining industry is rapidly expanding with a number of new prospects as well as expansions to existing operations. The forestry industry in the region has been substantial but is currently declining with the future uncertain. The aquaculture industry at Macquarie Harbour is performing strongly with plans for a significant expansion in the near future. The region is an important tourism destination for the state. Tourism is largely seasonal and visitor numbers vary substantially year to year.

The region is characterised by difficult terrain and is somewhat isolated from the major centres. Facilities and services such as medical centres, secondary education, housing, public transport, digital television, supermarkets and child care are less developed or available than in major centres, resulting in a heavy dependence on the major centres in North West region.

The mining industry generally operates on a 12 hour shift pattern with 4 or 5 days on / off. This working roster as well as the lack of facilities in the region has lead to a trend towards drive in / drive out workers. A substantial number of workers live in the North West region with some living locally in the West Coast region. Workers who do not live permanently in the region tend to spend little time in the region when they are not working and therefore contribute little back to the region economically.

3.4. Mining, exploration and minerals processing

3.4.1. Background

Tasmania is one of the most highly mineralised regions in the world and Western Tasmania is home to most of the state's active mining operations. Minerals extracted on the West Coast include copper, gold, lead, magnetite, silver, tin, zinc and silica. In 2009-2010 the Tasmanian mining sector exported $467.7 million overseas and $652.1 million interstate, almost 50% of the State's export earnings. The mining sector contributed $458 million or 2.1% of Gross State Product. The sector employs an estimated 3,410 people, 1.5% of Tasmanian employment. (Tasmanian Government media release, 24/08/2011).

A survey of Tasmanian mining companies commissioned by the Tasmanian Minerals Council identified that in 2009-2010 the sector spent $323 million on goods and services in Tasmania, dealt with 347 individual Tasmanian suppliers and businesses and spent $63.7 in capital expenditure. A 12% increase in the exploration expenditure on mining leases from the previous year was also identified. (Department of Economic Development, Tourism and Arts, 2011)

3.4.2. Mines and mineral processing

Firms currently operating in the region include Bass Metals, Bluestone Mines Tasmania, Copper Mines of Tasmania, Grange Resources, Intec, Minerals and Metals Group, Tasmania Mines, Tasmanian Advanced Minerals and Unity Mining. The industry is growing with expansions to a number of existing mines, possible recommissioning of operations in care and maintenance as well as a number of potential new ventures including Bright Phase Resources, Corona and Jaguar Joint Venture, Forward Mining, Frontier Resources, Macquarie Harbour Mining, Shree Minerals, Stellar Resources, Stonehenge and McDermott Mines, Tasmania Magnesite, TNT and Venture Minerals.

Table 9 lists identified potential prospects in the region, as well as proposed expansions to existing operations, with current operational volumes shown for comparison. The colours indicate existing operation (green), extension from an existing operation (yellow), or a new venture (grey).

Existing operations and potential new ventures are described in more detail in the sections which follow.

Table 9 Mining and Mineral Operations and Identified Prospects

Proponent	Mineral (s)	Origin	Interim dest'n	Mode	Dest'n	Mode	Volume (t / annum)	Format	Est start date	Life of Operation	Issues/Comments
Bass Metals (current)	Lead concentrate, zinc concentrate, copper concentrate	Hellyer Mine	-	-	Burnie Port	Road	71,500	Bulk on truck	Existing operation	3-4 yrs	
Bass Metals	Dore (gold silver alloy)	Hellyer Mine	-	-	Burnie Port	Road	Small	Ingots	Not before 2014	Unknown	
Bluestone Mines (current)	Tin concentrate, Copper concentrate	Renison	-	-	Burnie Port	Road	19,200	tin- 2t steel skips on truck, copper- bulka bags on truck	Existing operation	4 yrs	
Bluestone Mines	Tin concentrate, copper concentrate	Renison	-	-	Burnie Port	Road	14,000	tin- 2t steel skips on truck, copper- bulka bags on truck	2016	9 yrs	Rentails processing project Appears likely to proceed but timing uncertain
Bluestone Mines - Mt Bischoff	Tin	Waratah	-	-	-	-	-	-	-	-	Currently on care & maintenance, no plans at present to reopen due to poor ground conditions and low ore grades
Bright Phase Resources	Tin concentrate	Luina	-	-	Burnie Port	Road	3,500	Bulk on truck	2013	10 yrs	Reprocessed tailings project Appears likely to proceed Volumes may increase with potential for future underground mining

Proponent	Mineral (s)	Origin	Interim dest'n	Mode	Dest'n	Mode	Volume (t / annum)	Format	Est start date	Life of Operation	Issues/Comments
Copper Mines of Tasmania (current)	Copper concentrate	Queenstown	Melba Flats	Road	Burnie Port	Rail	110,000	Bulk on truck/rail	Existing operation	12-15 yrs	By products of gold and silver also produced
Copper Mines of Tasmania	Copper concentrate	Queenstown	Melba Flats	Road	Burnie Port	Rail	30,000	Bulk on truck/rail	Unknown		Proposed expansion under current lease
Corona and Jaguar JV	Copper	Queenstown	Melba Flats	Road	Burnie Port	Rail	Unknown	Bulk on truck/rail	2017+ (SKM estimate)	Unknown	Based on positive drilling results only
Forward Mining Company	Magnetite concentrate	Hampshire area	Hamp-shire (new rail siding)	Road	Burnie Port	Rail	Unknown	Bulk on truck/rail	Unknown	Unknown	
Frontier Resources	Gold	Stormont	-	-	Renison or Hellyer	Road	Unknown	Bulk on truck	Unknown	Unknown	
Grange Resources (current)	Iron ore	Savage River	-	-	Port Latta	Slurry pipeline	2,250,000	Slurry	Existing operation	15 yrs	Sold as pellets from pelletising plant Port Latta
Intec (current)	Crushed zinc slag for reprocessing	Zeehan	-	-	Burnie Port	Road	50,000	Bulk on truck	Existing operation	18 months	
Macquarie Harbour Mining	Silica / silicon	Cape Sorrell	-	-	Smelter site – not finalised	Road / road-rail	Unknown	Bulk	Unknown	Substantial	

Proponent	Mineral (s)	Origin	Interim dest'n	Mode	Dest'n	Mode	Volume (t / annum)	Format	Est start date	Life of Operation	Issues/Comments
MMG (current)	Lead concentrate, zinc concentrate, copper concentrate Silver, gold ingots	Rosebery	-	-	Burnie Port	Rail	200,000	Bulk on rail	Existing operation	15 yrs +	Output could increase to 300,000 t within 10 yrs. Silver, gold small quantities
MMG - Avebury Mine	Nickel	Trial Harbour Rd									Currently in care & maintenance. Formal expression of interest process underway for sale of, or participation in Avebury. Probability of recommissioning seem good
Shree Minerals	Hematite DSO ore	Nelson Bay	-	-	Port Latta	Road	350,000	Bulk on truck	2012	2 yrs	Appears likely to proceed
Shree Minerals	Magnetite Concentrate	Nelson Bay	-	-	Port Latta	Road	150,000	Bulk on truck	2014	15-20 yrs	Alternate option is to transport unprocessed ore to Savage River and use slurry pipeline to Port Latta. MOU has been signed with Grange. Appears likely to proceed.
Stellar Resources	Tin concentrate	Zeehan	-	-	Burnie Port	Road	15,000	2t steel skips on truck	2014	7-10 yrs	Appears likely to proceed
Stone-henge and McDermott Mines	Tin concentrate	Granville Harbour	-	-	Burnie Port	Road	350	Containers on truck	2013	10-20 yrs	Very small 2 person operation. Some doubt expressed about expansion.

Proponent	Mineral (s)	Origin	Interim dest'n	Mode	Dest'n	Mode	Volume (t / annum)	Format	Est start date	Life of Operation	Issues/Comments
Tasmania Magnesite	Magnesite ore (processed magnesia)	Arthur River	Hamp-shire or Meunna (process ing)	Road	Burnie Port	Road	300,000 (100,000 processed)	Container-ised or bulka bags on truck	2013	25 yrs	Location of processing facility still to be finalised. Council roads to both potential locations would require upgrading. Appears likely to proceed.
Tasmania Mines (current)	Magnetite concentrate	Hampshire	-	-	Burnie Port	Road	150,000	Bulk on truck	Existing operation	>20 yrs	The mine also produces scheerlite, a tungsten mineral in 50 kg bags on specialised pallets in containers.
Tasmania Mines	Magnetite concentrate	Hampshire	-	-	Burnie Port	Road	50,000	Bulk on truck	2012	>20 yrs	Total production for site could increase to up to 300,000 tpa.
Tasmanian Advanced Minerals (current)	Silica	Corinna, Hawkes Creek, Blackwater	Wyn-yard	Road	Burnie Port	Road	36,000 (processed)	Containers on truck	Existing operation	15-20 yrs	
TNT Mines	Fluorspar, magnetite	Moina	Hellyer rail spur option	Road	Burnie Port	Rail or road	1,000,000	Bulk on rail or truck	2015	Up to 20 yrs	Road via Cradle Mtn Development Rd likely an issue with tourist traffic. Metallurgical issue also.
TNT Mines	Tin, plus some silver and silver/lead	Zeehan	-	-	Other mine or Burnie Port	Road	100,000-200,000 tpa	Bulk on truck	2014	A few years only	Reprocessed old workings, no new footprint. Short term proposition.

Proponent	Mineral (s)	Origin	Interim dest'n	Mode	Dest'n	Mode	Volume (t / annum)	Format	Est start date	Life of Operation	Issues/Comments
Unity Mining (current)	Gold (dore)	Henty Mine	Launceston	Road	Perth	Air	2	Ingots	Existing operation	4 yrs	New leases acquired and are expected to increase mine life.
Venture Minerals	Magnetite DSO	Mt Lindsay (Pieman Road)	-	-	Burnie Port	Road	1,000,000	Bulk on truck	2012	2 yrs	Transport method/destination not confirmed. Alternate options are truck to Port Latta or the Savage River slurry pipeline. Appears likely to proceed
Venture Minerals	Tin concentrate, tungsten concentrate, copper concentrate	Mt Lindsay (Pieman Road)	-	-	Burnie Port	Road	10,000	Containers on truck	2013	8 yrs	Appears likely to proceed
Venture Minerals	Magnetite concentrate	Mt Lindsay (Pieman Road)	Savage River	Road	Port Latta	Slurry pipeline	200,000	Bulk on truck / slurry	2013		MOU signed with Grange Resources to process at Savage River and use slurry pipeline to Port Latta. Alternative option is road or rail to Burnie Port. Appears likely to proceed

3.4.2.1. Bass Metals

Bass Metals operates Hellyer Mine approx 80 km south of Burnie. Operations were restarted in 2007 following discovery of additional reserves. The operation processes 390,000 t ore pa producing 22,000 tpa lead concentrate, 46,000 tpa zinc concentrate and 3,500 tpa copper concentrate. There are currently 150 staff members on site. The life of the current ore body is 3-4 years, but other reserves are expected to deliver a site life of at least 10 years.

Transport infrastructure:

- Concentrate transported to Burnie Port in 38 t trucks, typically with 6-12 truck movements per day. The route is via Mine Access Road, Cradle Mountain Development Road and then Murchison and Ridgley Highways. These arrangements are currently satisfactory.
- Burnie Port arrangements are currently satisfactory.
- An 11 km rail line ran from Hellyer mine to the Melba line at Moorey Junction, but was closed when the original mine was exhausted in 2000. Rail line reopening costs estimated at several million dollars would be at Bass Metals' expense and is not considered viable.

Other infrastructure:

- **Electricity** is sourced from the 220 kV line which passes over the site, and there is also a 110 kV line to the west. Power reliability has been generally good.
- There is no reticulated **gas**, but no requirement.
- **Telecommunications**: There are no issues with landline telephony. There is no mobile phone coverage at the mine site. Satellite phones are used for emergencies. Broadband on site is tolerable.
- There are no issues with process **water,** which is sourced from the Southwell River.

Planned developments:

- A significant gold/silver project is undergoing a feasibility assessment, with the study completion in 12 months and a further 12 – 18 months before operations would commence. Capex would be in the range of $50-$180 m to build a new processing plant depending on the approach used.
- These developments could lead to an additional 70 direct employees on site.

3.4.2.2. Bluestone Mines Tasmania

Bluestone Mines Tasmania Joint Venture is a 50% Yunnan Tin and 50% Metals X owned operation, established in 2010. Production is around 13,000 tpa tin concentrate and 3,000 tpa of copper concentrate. The mine currently employs 300-350 people. The mine life is 4 years with proven reserves with a further 11 years of resource.

Transport infrastructure:

- Tin concentrate is transported by road in 2 t steel skips to Burnie Port and containerised for export. Copper concentrate is currently stored on site in bulka bags awaiting market.
- Product is transported via Mt Black, in 45 t GVM semi trailers. Truck payload is 24-26 t.
- Total truck movements are around 2,800 per year- 11 per day (8 input, 3 output), 5 days per week. There is substantial back loading of inward and outward movements.
- Rail passes through the site but is currently not used.

Other infrastructure:

- **Electricity:** The mine uses 10-12 MW from a 44 kV Aurora line. Reliability has increased recently. Capacity would need to be doubled to cater for planned developments.
- There is no reticulated **gas**, but no requirement.
- **Telecommunications:** Bluestone is a big user of VOIP. Broadband speed on site is ok. Mobile coverage is patchy but there are Satellite phones for emergency back-up.
- There are no issues with process water.

Planned developments:

- There is a planned rentails project which will reprocess tailings to produce tin and copper concentrates, a total of approximately 14,000 tpa. The project will see exports double. The project is considered a high chance of proceeding, however the timing is uncertain. A full feasibility study has been completed..
- It is estimated an additional 50 staff will be employed.
- Bluestone also owns the Mt Bischoff Mine at Waratah which is under care and maintenance. Whilst there is still some potential for underground mining at the site Bluestone does not envisage reopening it at present due to low ore grades. As a result of the care and maintenance program there is 1 full time staff member who lives locally and is visited by support staff from Renison on a regular basis. The site receives 1 delivery truck daily, 5 days per week, as well as 1 full diesel fuel load (42 t HC tanker) delivery approximately every 5 months.

3.4.2.3. Bright Phase Resources

Bright Phase Resources has a proposed mine on the footprint of the former Cleveland Tin Mine in Luina. The product will be tin concentrate (30-50% tin) recovered from tailings (0.3-0.7 % tin). Bright Phase Resources intends to submit a Notice of Intent (NOI) to the Government early in 2012. The tailings reprocessing project is expected to take 10 years.

There is potential to commence an underground mining project after 3-4 years of operation. Based on current resource information the life of underground mining would be 15-20 years but at the upper level it could be 30-40 years. This project would require a separate approval process if it is determined to be viable.

Employment would be 30-40 in the initial stage and should underground mining commence a significantly higher workforce may be required.

Transport infrastructure:

- Traffic movements in the initial phase would be one 20 t truck every two days taking concentrate to Burnie Port.
- If underground mining was to commence, movements would increase to up to two 20 t trucks per day.
- Waratah Road runs adjacent to and immediately north of the proposed project and will be important for personnel access, construction, suppliers and product transport.
- There is one access road leading into the property from Waratah Road. All onsite roads and tracks are managed by Forestry Tasmania.

Other infrastructure:

- **Electricity** would be sourced from an existing line running through the tenement.
- **Telecommunications:** There is mobile coverage on site from Telstra.
- **Water** will be required from the Whyte River for mining and mineral processing. Some water will be recycled but water requirements are currently unknown.

3.4.2.4. Copper Mines of Tasmania

Copper Mines of Tasmania (CMT) operates the copper mine at Queenstown which has been a continuous operation since CMT took over ownership in 1999. CMT produces 110,000 tpa of concentrate from 2.5-2.6 mtpa of ore. By-products of gold and silver are also produced. CMT currently employs 100 staff directly as well as 100-150 contractors. The outlook for the mine is 12-15 years.

Transport infrastructure:

- Concentrate is transported by road in B-Doubles with 40 t loads to Melba Flats and then by rail to Burnie Port.

- B-Double configuration is 32 m long, 2.43 m wide, 68 t GVM and tare 27.3 (pictured).
- The operating shift is 6am to 6pm with trucks making 5-6 return trips per day.
- CMT has a separate storage area at Burnie Port with 25,000 t capacity which is generally adequate for purpose. Source: CMT

Other infrastructure:

- The reliability of **electricity** is acceptable. Security is an issue with only one incoming line. A long term outage would be a problem. CMT has no backup generators and requires pumping of a significant amount of water for production.
- **Telecommunications:** Mobile reception in the area is patchy. A significant concern is the unreliability of fixed line phones. The emergency response system does not work if there is a problem with the fixed line phones. Broadband in the area is good.

Planned developments:

- CMT is looking at expanding, all within the current mining lease. There are 10 million tonnes of defined resource and more is expected to be discovered.
- There is potential to increase output to 3 mtpa (140,000 tpa concentrate).

3.4.2.5. Corona Minerals and Jaguar Joint Venture

The Mt Jukes Project is a joint venture between Corona Minerals and Jaguar. The project is located within the Mt Read Volcanics (MRV), just south of Queenstown. The MRV hosts several high value deposits including Mt Lyell, Renison Bell and Rosebery. The project is exploration only at present with promising results from initial testing:

- First hole at Mt Jukes JV returns 122 m at 0.4% Cu from 66 m
- 4 km of strike of similar magnetic targets yet to be tested
- Two further holes completed - Assays awaiting (4-Traders, 20 January 2012)

Copper and gold are the main minerals of interest, although significant scope for zinc, lead and silver mineralisation exists throughout the tenement. SKM estimates substantial physical ore movement from the prospect is likely to be in the 5 – 15 years time scale, and that the most likely outcome would be export of concentrate through Burnie port, with transport by road or rail.

3.4.2.6. Grange Resources

Grange Resources operates the Savage River magnetite ore mine, concentrator, iron ore slurry pipeline, Port Latta pelletising plant, ship loader and port (Port Latta). The mine currently produces around 2.25 mtpa of iron ore. Grange's direct employment is currently 445 at Savage River (mostly in mining), 125 at Port Latta and 30 at the head office in Burnie. The life of the mine is expected to be 15 years.

Transport infrastructure:

- Ore is conveyed 1.3 km to the mill and turned into a slurry for pumping to Port Latta through the pipeline. At Port Latta slurry is dewatered and turned into 9-16mm diameter pellets in the gas fired pelletising plant and conveyed 1.3 km to the pellet stockpile. The pellets are then loaded via 2 x 2,000-2,500 tph shiploaders.
- The maximum capacity of the pipeline is approximately 3.1 mtpa. The pipeline is expected to last the life of the mine to 2027.
- A duplicate pipeline is under consideration. Road and rail are also potential alternatives if the pipeline reaches capacity.
- There is a bridge load limit of 35 t on the road to Savage River. This limits vehicle types to smaller semi trailers rather than the preferred truck and dog.
- Inputs for the Port Latta processing facility are trucked from Burnie. Grange reported that the Bass Highway intersection connection into Port Latta is not ideal and have indicated a preference to use rail if the Wiltshire Line was operational.

Other infrastructure:

- **Electricity** supply is adequate at Savage River with improvements in reliability due to the Woolnorth wind farm and increases in substation capacity.
- **Gas** is vital to operations at Port Latta but is not required at Savage River.
- Most process **water** for Port Latta comes from dewatering slurry. The potential industrial estate would likely face water constraints and there is the potential to pump water from Arthur River.

Planned developments:

- Grange has 3 signed MOUs for others to supply ore or use Grange equipment. A trial is underway to test processing potential and output quality. Savage River could receive virtually any magnetite ore for processing.
- There are opportunities to receive and load direct ship iron ore and other minerals including limestone through the existing shiploaders. There is adequate stockpile storage space, shiploader and berth capacity. Berth utilisation is currently 30-40 % at Port Latta.
- There is an industrial park of around 2,000 Ha behind Port Latta, connected to electricity and gas. Connection to the port would require a 2 km conveyor under the Bass Highway. This would be suitable for most concentrates and bulk minerals. Grange would consider a new pellet plant at the industrial estate subject to a business case.

3.4.2.7. Intec

Intec has a simple operation at Zeehan with zinc extracted from an existing slag heap. Transported volumes are approximately 1000 t/week. Operations are expected to continue for approximately 18 months although this will be largely dependent on the economic climate.

Transport infrastructure:

- Zinc is trucked to Burnie Port by truck and dog with 30 t capacity. The route is via the Murchison Highway over Mount Black.
- The current infrastructure at Burnie Port is adequate for needs, however some elements such as the conveyor systems need work.
- Intec tried to arrange rail transport but were unsuccessful. TasRail no longer service Zeehan and reported that they do not have trains or wagons to accommodate the different material. It is not cost effective for TasRail to service small mines which may be subject to closure.

Other infrastructure:

- **Electricity** infrastructure is adequate.
- **Telecommunications** are currently adequate for the small operation. Broadband is ok, with the only requirement to contact the head offices in Tasmania and Sydney.
- **Water** supply is not an issue.

3.4.2.8. Minerals and Metals Group (MMG)

MMG conducts mining and milling operations at Rosebery Mine which has been operational since 1936. The mine produces zinc concentrate (150,000 tpa), lead concentrate (40,000 tpa), copper concentrate (8,000 tpa) and a small amount of gold and silver (bars). Mined ore is approximately 750,000 tpa. Mill capacity is 850,000 tpa, meaning there is opportunity for expansion. MMG has 500 staff, approximately 40% of which are contractors. The current life of the mine is 15 years but is expected to be longer with other prospective resources.

Transport infrastructure:

- Product is transported 115 km to Burnie Port by rail. The Melba Line runs through the mine site.

Other infrastructure:

- **Electricity** is currently supplied at 44 kV from the Rosebery substation. There are plans to upgrade this substation to 66 kV meaning new transformers would be required.
- If **gas** was available in the future it would be a viable energy option. If a gold plant was operational in the future then gas would be required for heating.
- **Telecommunications:** Access to optic fibre is desirable. Telstra is the main supplier and lacks competition.
- Mine operations have to be closed down in **electricity** or **telecommunication** outages for safety reasons.
- Process **water** is not an issue for MMG.

Planned developments:

- The ore body is the 7th largest in the world and output has the potential to be 1.5 times current volumes within 10 years.
- MMG is currently evaluating 15 sites for future use. Deposits approximately 30 km to the north and 12 km to the south could be transported by large rigid trucks to the mill.

- MMG owns Avebury, a nickel mine near Zeehan which is currently under care and maintenance. Avebury was first commissioned in June 2008 but operations were suspended in December 2008 due to a major fall in the price of nickel. A formal expression of interest process is underway for sale of, or participation in Avebury.
- Access to Avebury Mine is provided by Trial Harbour Road. MMG has sealed the section of this road to Avebury Mine. MMG personnel suggest the bitumen section is likely to deteriorate fairly rapidly if subjected to heavy haulage traffic for any length of time.

3.4.2.9. Shree Minerals

Shree Minerals has a resource south of Arthur River, 4 km east of Couta Rocks (60-70 km south of Smithton). Shree is currently undertaking environmental and mining license processes, which are expected to be finalised by mid 2012. In the first 1-2 years 400,000 tpa of hematite (DSO) would be produced. Production is expected to start 6-7 months after the mine operation commences (late 2012). After the first couple of years of hematite phase, a magnetite operation would commence, producing 150,000 tpa of concentrate from 400,000 tpa of ore. The project is expected to employ up to 125 full time employees.

Transport infrastructure:

- Hematite as raw product would be trucked to Port Latta or Burnie Port. The product would require crushing and screening only. The route would be via Wuthering Heights Road, Rebecca Link Road, Blackwater Road, Sumac Road, Roger River Road, Trowutta Road, Grooms Cross Road, Irishtown Road and the Bass Highway. Local access to the resource site is via the end of a forestry spur road and then a newly upgraded local access road. This would require approximately 41 truck movements per day with up to 42 t per truck.
- There are two options for the second phase of operations. The first option would be to process on site and transport to Port Latta or Burnie Port using the same route as for the first stage of operations. The construction of the processing plant and infrastructure will cost approximately $15 M and $5 M respectively. This would require approximately 17 truck loads per day.
- The second option is to do only preliminary processing on site (crushing and dry magnetic separation) for final processing offsite. For offsite processing the ore will need to be transported to Savage River Mine for processing at the concentrator plant and then transported to a pellet plant at Port Latta via the slurry pipeline. The Western Explorer Road would require upgrading for this option to be viable.
- Due to load restricts on the Kanunnah Bridge, B-Doubles would not be used to transport product. A truck and quad dog trailer combination is expected to be used.

Other infrastructure:

- **Telecommunications:** Mobile coverage in the region is faint and unreliable.

- The processing plant will have a maximum annual **water** requirement of 1.8 Mm^3, comprising approximately 1.7 Mm^3 of recycled water and 0.1 Mm^3 of make-up water.
- Power will be supplied by diesel powered generators. It is estimated that the total energy demand for the site, excluding mine dewatering pumps, will be approximately 2 MW. Mine dewatering pumps will be trailer mounted mobile units powered by diesel engines.

3.4.2.10. Stellar Resources

Stellar Resources is pursuing a tin mining development near Zeehan. The project is anticipated to commence production in late 2014, with export of 10,000 – 15,000 tpa of tin concentrate (~ 50% Sn) through Burnie Port. Product would be processed at the Renison tin concentrator, 18 km from the site. The mine is based on a previously unexploited ore body. The employment on site is anticipated to be 100-150 (mostly contractors). The life of the mine is expected to be 7 – 10 years, but is subject to further prospecting and assessment.

Transport infrastructure:

- Transport is expected to be by road in 2 t steel skips, transferred to bulka bags and loaded into containers at Burnie Port.
- It is anticipated that non bulk inputs can be delivered on the return journey of these semitrailers. Bulk input requirements are uncertain, but are likely to be acid, lime, cement, concrete and other binders.
- The existing sealed roads are anticipated to be adequate for needs.

Other infrastructure:

- **Electricity** is expected to be supplied from the existing Aurora line servicing the nearby Avebury operation (currently in care and maintenance).
- **Gas** is not anticipated to be required.
- **Telecommunications:** Mobile coverage in the region is ok but is only provided by Telstra. Broadband is currently not available on site but will be required.
- Process **water** is expected to be available from mine dewatering and nearby surface water.

3.4.2.11. Stonehenge and McDermott Mines

Stonehenge and McDermott Mines (SAMM) operates a small, isolated tin mine just out of Granville Harbour. Operations are at an early stage and expansions are dependent on the market value and the Australian dollar. The operations are an open cut mine with material stockpiled to take to the mill on site. The operation is a family business but may employ up to four staff in the future. The expected life of the mine is 10-20 years.

Transport infrastructure:

- Concentrate is trucked out 5 t at a time in small trucks (~2 trucks) to Burnie Port. Only one load has been exported to date. The route is via Rosebery, Mount Black and the Ridgley Highway.
- The mine uses Granville Harbour Road which has been upgraded by the council and is in good condition. SAMM upgraded the access road to the mine from Granville Harbour Road. The operation uses small trucks only which do not cause much damage to the roads.
- There are no issues with the port.

Other infrastructure:

- The reliability of **electricity** on site is ok, with only occasional outages due to storms. The mill runs only on electricity and there are no viable alternatives.
- **Telecommunications:** There is no mobile coverage on site, with occasional Telstra service from the top of a hill. There is currently no landline although it would be necessary if mining operations increase as planned. Lack of communications is an issue when ordering in supplies and equipment. There is no broadband on site.
- **Water** is an issue for the site when rainfall is low. Water is required for the mill operation and a small dam is usually relied upon. Currently it is so dry that the mill cannot be operated. There are plans to increase the capacity of the dam. Piping water may also be considered in the future.

Planned developments:

- SAMM is looking at expanding within the next 12-24 months. Small truck movements would increase to fortnightly (~2-3 trucks).

3.4.2.12. Tasmania Magnesite

Tasmania Magnesite is a wholly owned subsidiary of Beacon Hill Resources. The company has a mining lease on the southern side of Arthur River and is currently working through the national and state approval processes. The lease area is expected to produce 300,000 t of magnetite (raw product). It is planned to have the first stage processing plant nearby with the location dependent on transport options. Potential sites include the old Gunns site at Hampshire, Meunna and north of Arthur River close to the mine site. After processing production would be 100,000 tpa of magnesia. The minimum mine life is expected to be 25 years.

Transport infrastructure:

- Tasmania Magnesite is currently undertaking a pre-feasibility study on preferable transport routes. The options are:
  - **Hampshire processing site:** Shared Forestry/Council road through to Yolla (15 km from proposed site, would require upgrading), Murchison Highway, Oonah Road to Hampshire, Ridgley Highway to Burnie Port
  - **Meunna processing site:** Council road to Meunna (would require upgrading), Myalla Road, Bass Highway to Burnie or Port Latta

- **Process on site:** Forestry/Council road to Yolla, Murchison Highway to Burnie Port
- **Transport raw product:** Council road to Meunna, Myalla Road, Bass Highway to Burnie or Port Latta

- Processed product would be transported containerised or in bulka bags. It is estimated that fuel costs would be approximately $5 million greater per year to transport to Hampshire than Meunna.
- Storage capacity at Burnie Port is an issue. There is currently not sufficient infrastructure (available space and machinery) to store the bulk product. Off-site storage of containers or bulka bags would be inefficient, increasing handling and transport costs. The Port is also limited to ship sizes of about 50,000 t. If Port Latta was used the product would need to be stored under cover and sealed to prevent contamination from the pelletising plant. Shipping would likely be an issue as volumes would not be sufficient to attract a ship into Port Latta. The wharf at Port Latta would also need upgrading, including a discrete and covered conveyor for magnesia.
- The slurry pipeline is an alternate transport option, linking in at approximately the 10 km linkage. Grange Resource's consideration of a second pipeline is being factored into the feasibility study.
- Rail is not considered a viable option, even if the Wiltshire Line was reopened.

Other infrastructure

- The first stage processing plant would need both **electricity** and **gas**. Discussions are to be held with Aurora regarding the extension of 3 phase power to the mine site and calcining plant. Reliability of the supply is important. A gas pipeline would need to be extended to Meunna (12 km), the site (15 km) or Hampshire (8 km) should one of these locations be selected for the first stage processing plant.
- **Telecommunications:** There is no mobile phone coverage on the mine lease and satellite phones must be used.
- **Water** supply is not an issue. Only a small amount of water is required for processing and groundwater can be used.

3.4.2.13. Tasmania Mines

Tasmania Mines owns Kara Mine south of Hampshire. Production is around 150,000 tpa magnetite concentrate from around 450,000-500,000 tpa ore. The mine also produces scheelite, a tungsten mineral sold in 50 kg bags on specialised pallets in containers. The mine is predicted to have a long life.

Transport infrastructure:

- Product is transported by road to Burnie Port in 33 t truck and dog. Three trucks make 5-6 return trips per day.

- Tasmania Mines has 35,000 t of concentrate storage at Burnie Point. Insufficient storage area is a challenge at Burnie Port. Burnie is limited to 50,000 t loads, which results in greater shipping costs as sea freight is cheaper for larger parcels. Port Latta caters for larger ships and Tasmania Mines sometimes sells concentrate to Grange Resources.
- Tasmania Mines maintains an unsealed forestry road for access to the site. Forestry Tasmania has offered to maintain the road but would charge a toll per tonne and maintaining the road is considered cheaper. The road is also used by tourists visiting St Valentine's Peak. There is a restricted vehicle weight on the bridge on this road. This means 33 t capacity trucks must be used rather 40 t capacity trucks, resulting in more trucks on the road.

Other infrastructure:

- **Electricity** reliability is now pretty good, with improvements over the last 5 years. The mine is connected to an 11 kV supply by 7 km of private line. Diesel is currently used for scheerlite production. **Gas** would be a potential option for this operation if it was available.
- **Telecommunications** are adequate, however some interference occurs most likely due to internal causes.
- The operations use a lot of **water** which is sourced from Old Park Creek and recycled from the tailings dam. Water could be an issue if there was another dry summer and production increased.

Planned developments:

- Expansions are currently underway which will increase productions to 200,000 tpa in 2012. The expansions will require two new mills. One smaller existing mill will be retired.
- Tasmania Mines also has a deposit at Kara North with 60-100 mt. Tasmania Mines is aiming to move 1.3 mt of overburden and then process through the expanded Kara facility. This will require a new tailings dam which is planned to be constructed early in 2012. This would result in production from this site of up to 300,000 tpa.

3.4.2.14. Tasmanian Advanced Minerals

Tasmanian Advanced Minerals (TAM) has mined high quality silica from a mine at Corinna since 1987. The opening of new Blackwater (opened in 2008) and Hawkes Creek (opened in 2011) mines near Kununnah has reduced output from Corinna to around 10% of the feedstock to the Wynyard processing plant. The Wynyard factory was built in 2007 and commenced production in 2008. Currently Blackwater provides most of the input and will do so in the future, however the portion from Hawkes Creek will increase as the Corinna resources start to deplete. TAM employs 39 staff in total. At each mine there are a total of 4-5 workers per shift. The life of the existing reserves is 15-20 years with exploration continuing.

Transport infrastructure:

- Product is transported using 38 t capacity truck and quad dog. Operations are up to 2 loads per day for 3 trucks from Corinna and up to 3 loads per day for 3 trucks at each of Blackwater and Hawkes Creek.
- The product is loaded into containers with 20 t per 20' container. Production is 150 containers per month, trucked from Wynyard to Burnie Port.
- The road journeys to the Wynyard factory are:
  - Corinna: Corinna Road, Waratah Road, Ridgley Highway, Bass Highway
  - Blackwater: Sumac Road, Roger River Road, Trowutta Road, Grooms Cross Road, Irishtown Road, Bass Highway
  - Hawkes Creek: 22 km from mine to sumac road and then same route as Blackwater
- 22km of the road to the Hawkes Creek site is a forestry road. Forestry Tasmania sought to impose a toll of $2.72 per tonne for the use that road a few weeks before mining commenced, an increase of almost 700% on a toll agreed 7 months earlier. That toll is currently the subject of a legal dispute brought TAM against Forestry Tasmania.
- The withdrawal of AAA from Burnie has added several hundred dollars per container to shipping costs. TAM reported they could double volumes if Bass Straight shipping was more competitive or there was a direct international service.

Other infrastructure:

- **Electricity** is very unreliable. TAM is supplied by an 11 kV Aurora line at Wynyard. It is typical in poor weather to have days with up to 6 outages. Most outages are only short, but because the production process has sequenced shutdown steps outages of even several seconds can require up to an hour to bring back to normal production. Long outages are very disruptive.
- The **gas** supply at the Wynyard is very reliable.
- **Telecommunications:** Broadband at Wynyard is fine. Mobile coverage at the mines is very limited and mobile satellite phones are also unsatisfactory. There is a fixed line satellite phone at Corinna which is reliable.

3.4.2.15. TNT

TNT Mines has a potentially large project at Moina, recognised as the largest fluorspar deposit in Australia. Moina has a 1970s resource estimate of 26.5Mt containing 18% fluorspar, 20% magnetite, 0.1% tungsten and 0.1% tin with minor bismuth, molybdenum and gold. Further drilling could see the resource increase to 40Mt. At an annual rate of production of 800,000t, the life of mine is potentially 30 to 50 years.

Transport infrastructure

- At a mining rate of 800,000 tonnes per annum, up to 300,000 tonnes or product would need to be transported to Burnie Port per annum.

- Product could be transported to Burnie Port via the Cradle Mountain Development Road. This would have challenges due to the number of tourists on this road. Upgrading forestry roads, including construction of short linking sections, may be an alternative.
- A slurry pipeline would be an option for the magnetite; however it may be difficult to get approvals for a pipeline in the current day.
- An alternative option would be to transport to the Hellyer rail spur, although this would create a double handling issue.
- Storage at Burnie Port would be an issue.

Other infrastructure

- **Electricity:** Transmission lines run close to the site.
- **Telecommunications:** Mobile coverage at Moina is patchy.

Planned Developments

- TNT Mines also has tenements at Zeehan and Waratah. Waratah is primarily exploration. The Zeehan project involves redevelopment of a partly mined, the Oonah Mine. At present indications, the Zeehan site is not a long term proposition and would produce no more that 1mt, although exploration drilling may increase the size. Ideally, another mine's infrastructure would be used for processing or the product would be sold to another mine. The site is well serviced by existing infrastructure.

3.4.2.16. Unity Mining

Unity Mining operates the Henty gold mine approximately 30 km north of Queenstown. Production is currently around 40,000-50,000 oz pa, from around 270,000-300,000 tpa of ore. The product is dore- a gold silver alloy typically 55-70% gold which is sold to the Perth mint. Unity currently employs 150 permanent staff, with 190 typically on site. The life of the mine is currently estimated at 4 years, however new leases are expected to result in further life extensions.

Transport infrastructure:

- Product is transported out by a security firm. Daily deliveries are made of supplies and consumables, using heavy rigid trucks.
- There is approximately 4 km of council owned gravel road access to the site. Unity spends $80,000-100,000 pa to maintain the road.

Other infrastructure:

- Reliability of **electricity** on site is generally pretty good with the occasional outage mostly due to lightning strikes. The current capacity is adequate.
- Small quantities of **LP gas** are used for the gold furnace in the gold room.
- Unity has an onsite 150,000 L **diesel** tank and 3,000 L mobile tanker for refuelling machinery in work areas.

- **Telecommunications** are adequate for needs. There would be no business benefit in having broadband available.
- **Water** is sourced from mine dewatering with the surplus discharged into Henty River or a Hydro canal once it has been treated to suitable environmental standards.

3.4.2.17. Venture Minerals

Venture Minerals has a highly prospective mineral deposit at Mt Lindsay with tin, tungsten, magnetite and copper. The site is approximately 35 km along Pieman Road, west of the Murchison Highway. The construction cost is estimated at $162 m. The initial production is planned to be from two recently discovered hematite direct shipping ore ("DSO") deposits located at Livingstone near Stanley River, around 3 km west from Mt Lindsay and at Riley Creek which is about 12kms to the southeast. This would occur over 4 years beginning in early 2013. In the second phase Venture aims to have tin, tungsten and copper concentrate ready to export in early 2014. Volumes are expected to be 10,000 tpa. As part of this phase 220,000 tpa of magnetite concentrate would also be produced. There are likely to be 500-1,000 jobs during construction and about200 permanent jobs once operations commence. Based on exploration to date the life of the mine is expected to be 10 years plus 4 years of DSO production, however it could be 20-40 years.

Transport infrastructure:

- The Melba Line runs approximately 23 km east of the mine site, and from this point it is 100 km by rail to Burnie Port.
- Viable transport options are critical to achieving project feasibility. There are a number of issues with transport and destination options for the initial hematite DSO:
  - The maximum ship size at Burnie (45,000 t) is too small. Stockpile capacity at Burnie is limited to 40,000-60,000 t. Rail to Burnie is currently not price competitive. Transporting by road in 40 t B-Doubles is possible but is likely to cause social and maintenance issues.
  - Ship sizes are bigger at Port Latta, however transport options to Port Latta are limited. A short mine life is unlikely to justify the costs of reopening the Wiltshire Line. A significant increase in trucks on the road between Burnie and Port Latta is likely to cause concern.
- Tin, tungsten and copper concentrate would be trucked in containers to Burnie Port.
- There are two options for the destination and the route for the magnetite concentrate. One option is to use the Savage River concentrator and slurry pipeline, however, the road to Savage River is poor. The second option is to use the road to the Port Latta pellet plant .

Other infrastructure

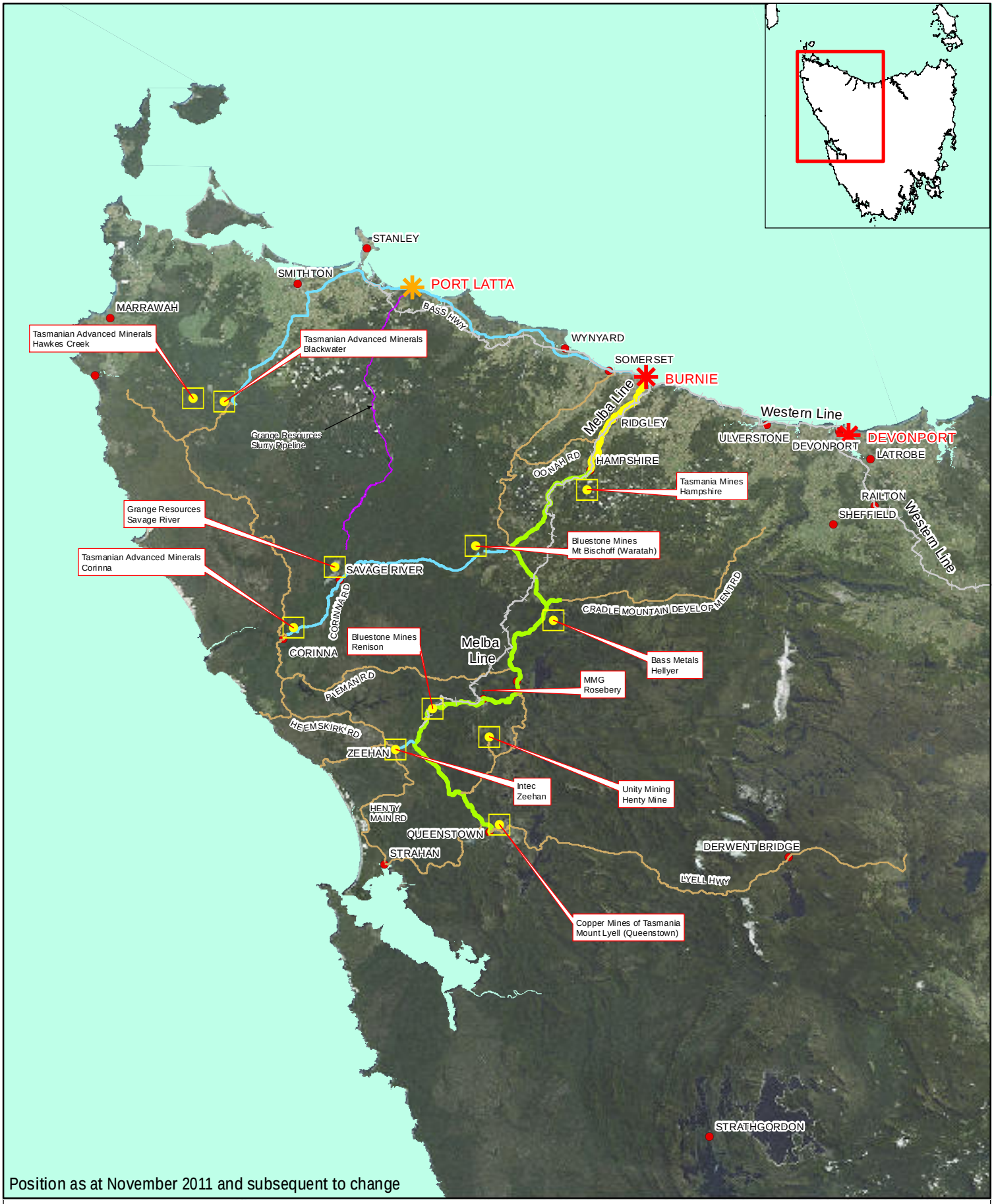
- **Electricity:** A 220 kV line crosses the mine site. Aurora would supply 3,300 V for major equipment use via a transformer connected to a substation built on site by Transend.
- **Gas** is not required.
- **Telecommunications:** Mobile reception is not great but this is not a major concern. Broadband will be required once operations are underway.
- The concentration process requires a lot of **water** but it is expected that mine dewatering will provide most, if not all required water. There is plenty of water available from nearby creeks and rivers.

3.4.3. Future mineral processing options

Many Tasmanian mineral deposits are initially assessed as being relatively small and localised, resulting in mine lives of only a few years. One option which could be considered is the establishment of centralised, regional mineral processing centres, able to receive and concentrate a range of mineral ores using a variety of processes and treating regimes. Possible locations suggested include Hampshire and MMG at Rosebery. Both of these have good rail access, and such a facility could be the trigger to justify substantial rail upgrades enabling more cost competitive transport to Burnie Port. Hampshire is likely to have spare capacity in electricity and water, including capacity previously used by the Gunns woodchip processing facility. A slurry pipeline between Hampshire and Burnie Port is unlikely to be feasible due to insufficient volumes (minimum 2 mtpa generally required) and problems managing changeover interfaces between batches of different products.

3.4.4. Mining tonnages

The locations of current mining operations are shown in Figure 17, along with current mining tonnages. Figure 18 indicates expected future (2016-2020) mining operations and volumes.



Legend

- Current Mining Operations
- Port Locations Managed By
  - TasPorts
  - Grange Resources
- Slurry Pipeline
- Rail Line
- Current Mining Haulage
  - 0 tpa
  - 1- 50,000 tpa
  - 50,001 - 250,000 tpa
  - 250,001 - 500,000 tpa
  - 500,001 - 1,000,000
  - > 1,000,000 tpa

N

1:1,250,000

0 12.5 25 50

Kilometers

December, 2011

PROJECTION - MGA Zone 55
DATUM - GDA94

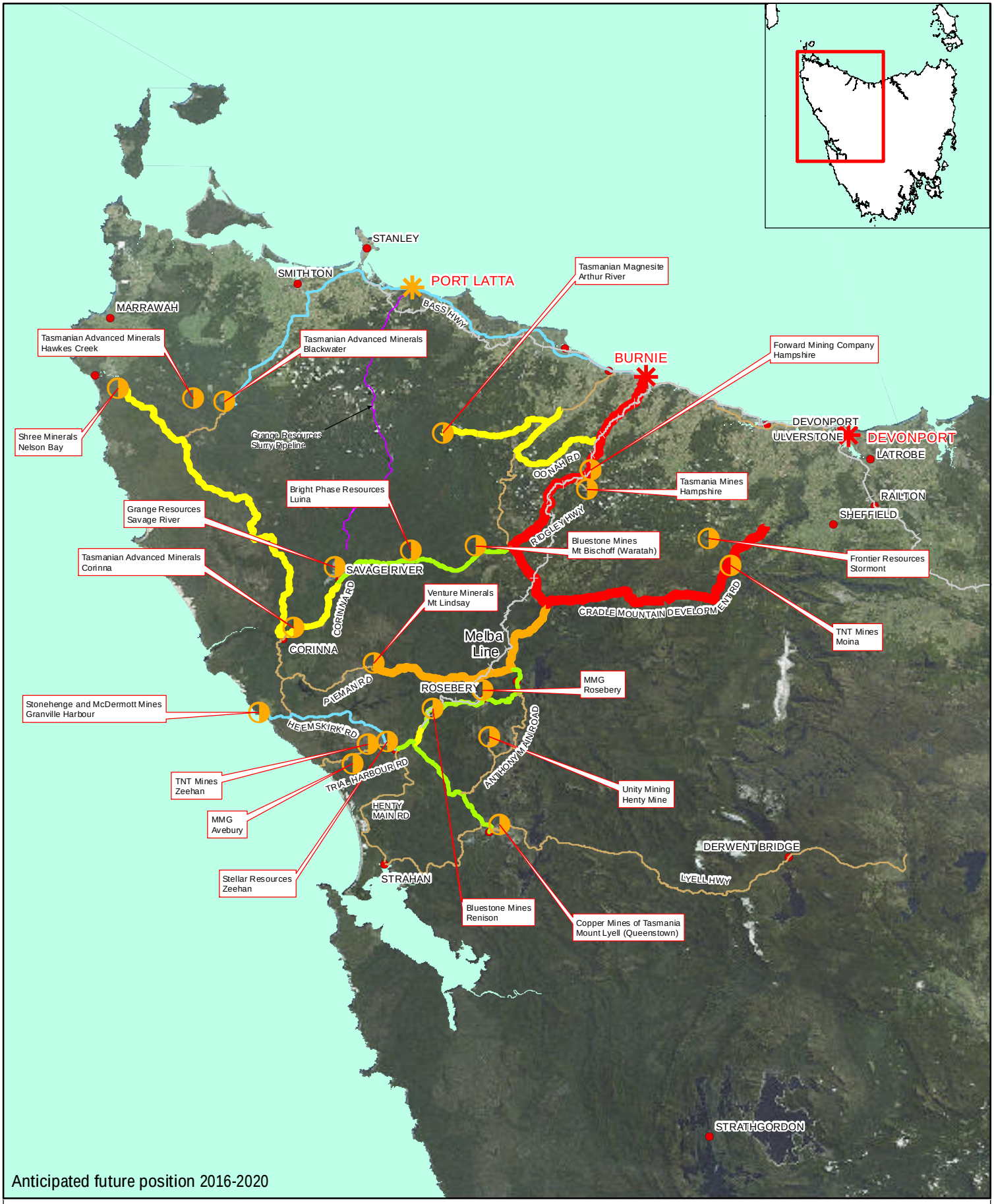
Tasmania
Explore the possibilities

Data provided by:
Department of Infrastructure, Energy and Resources

FIGURE 17
CURRENT MINING OPERATIONS

West Coast Infrastructure Development Study

SKM



Legend

Anticipated Future Mining Operations

Port Locations

Managed By

TasPorts

Grange Resources

Slurry Pipeline

Rail Line

Future Mining Haulage

0 tpa

1 - 50,000 tpa

50,001 - 250,000 tpa

250,001 - 500,000 tpa

500,001 - 1,000,000 tpa

> 1,000,000 tpa

N

1:1,250,000

0 12.5 25 50

Kilometers

December, 2011

PROJECTION - MGA Zone 55
DATUM - GDA94

Tasmania
Explore the possibilities

Data provided by:
Department of Infrastructure, Energy and Resources

FIGURE 18
FUTURE MINING OPERATIONS

West Coast Infrastructure Development Study

SKM

3.4.5. Mineral Resource Potential

Mineral Resources Tasmania has produced a Weighted Mineral Resource Potential Map, which is considered the best overall indication of mineral potential, based on the potential for the commodity with the highest potential within each region. This value is multiplied by the weighting given by an expert panel based on the relative importance of that commodity. The Weighted Mineral Resource Potential Map is shown in Figure 19, clearly indicating the high potential for mineral resources in the West Coast region.

3.4.6. Potential Gas Users

A number of companies on the West Coast identified that gas would be considered should gas supply be extended to the West Coast. Generally companies stated that the use of gas would depend on an economic assessment. One potential future venture, Tasmania Magnesite, will require gas to be extended to their processing facility. There are two potential options for the location of this site. The locations of potential gas uses are shown in Figure 20. There is also a potentially major new gas user developing a dairy processing plant at Smithton, although this is outside the study area.

Map 3.1

TASMANIA

Regional Forest Agreement

Weighted Composite Mineral Resource Potential

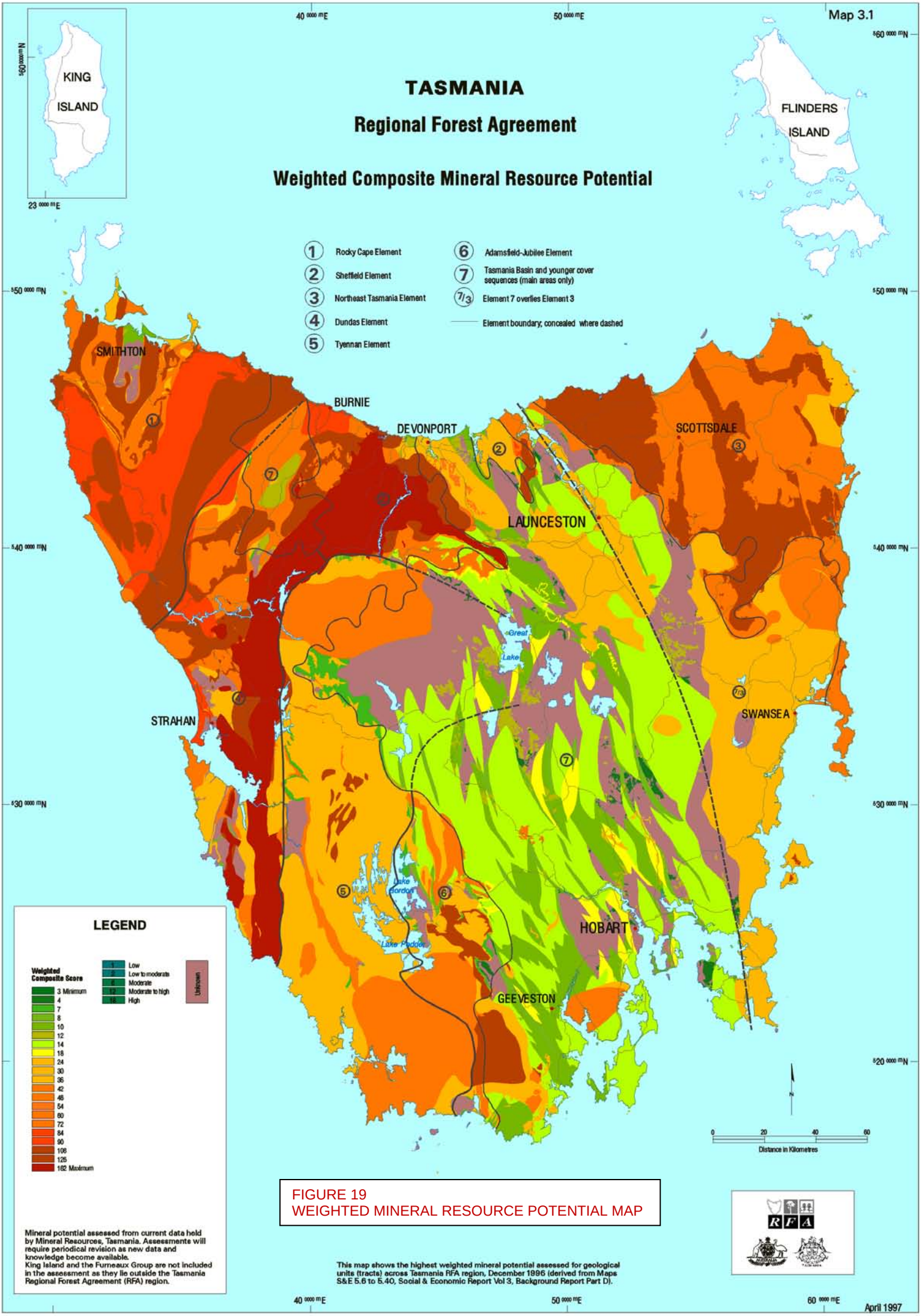
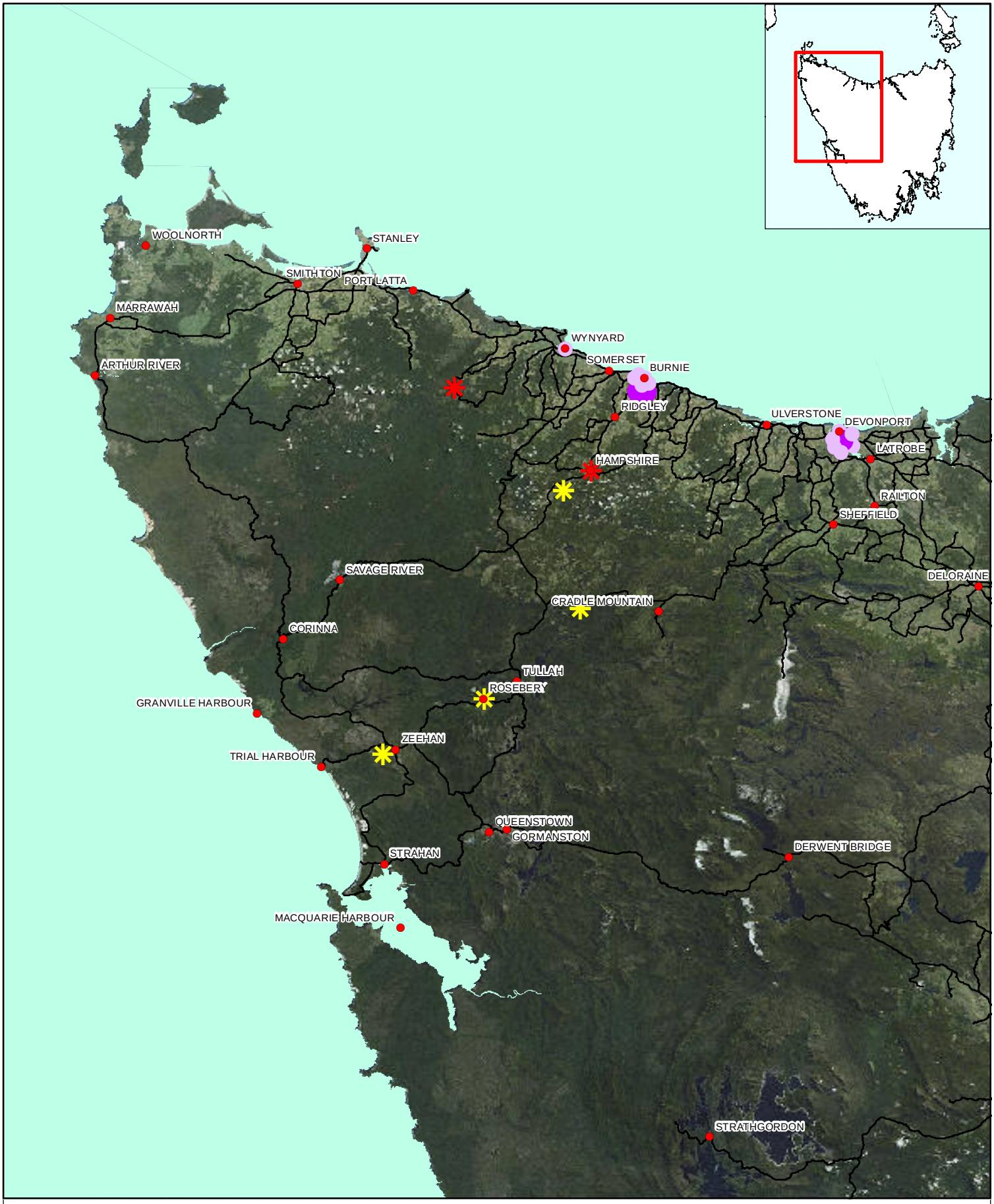


FIGURE 19
WEIGHTED MINERAL RESOURCE POTENTIAL MAP



Legend

Location of Potential Gas Users

- Required
- Potential Option

Gas Coverage Locations

- Full Coverage
- Partial Coverage

N

1:1,250,000

0 12.5 25 50

Kilometers

August, 2011

PROJECTION - MGA Zone 55
DATUM - GDA94

Data provided by:
TasGas

FIGURE 20
LOCATION OF POTENTIAL GAS USERS

West Coast Infrastructure Development Study

3.6. Forest Products

Forestry industries have been an important economic sector in Tasmania virtually since white settlers began using forest products for numerous purposes, including construction, shipping needs, as an energy source and for firewood from the early 1800s.

The government business enterprise Forestry Tasmania manages forestry operations on State forest, with most of the available timber harvested under contract by private sector contractors and either processed in a large number of saw mills, veneer mills and chip mills or sold as logs to local or overseas markets.

There has been a substantial reduction of forest industry processing facilities over the past decades, through amalgamations and closures, with Gunns Limited emerging as the dominant player. Gunns has substantial areas of private native forest, hardwood and softwood plantations, as well as a number of processing sites receiving wood from public and private lands. Norske Skog's Boyer mill produces nearly 300,000 tpa newsprint, magazine and similar papers per annum entirely from plantation softwood and recycled materials. Paperlinx's high quality writing and copying paper making operations at Wesley Vale and Burnie closed in 2010.

Since 2010 Gunns Ltd has embarked on a significant change in business strategy by closing most of its native forest based processing mills while proceeding with plans to develop its proposed Bell Bay Pulp Mill based on its plantation resources. This has created a period of substantial uncertainty and downturn for the whole industry, with reduced demand for timber and reduced activity levels across the industry, reflecting a global reduction in demand for paper and related forest products. Potential for expansion in the dairy industry could lead to plantation forests being returned to grazing pasture after harvest in some areas, but this more likely in the north and north west, outside the study area.

There is growing interest in the potential to process Tasmanian hardwood into new engineered wood products to take advantage of its inherent strength, and to take advantage of the increasing recognition of wood as a renewable, low carbon building product. Ta Ann

Tasmania has established two rotary veneer mills to produce veneer sheets from regrowth eucalypt for export to Asia for manufacture into flooring products. There is growing interest in China in the use of Tasmanian eucalypt for the manufacture of laminated veneer lumber (LVL) for construction, furniture and decorative products.

Small but valuable markets continue for Tasmanian specialty species such as myrtle, blackwood celery top pine and Huon pine. These species are predominately found in Western Tasmania and processed at mills on the West and North West Coast.

3.6.1. Tasmanian Forests Intergovernmental Agreement

In August 2011 the Prime Minister and the Tasmanian Premier signed the Tasmanian Forests Intergovernmental Agreement. The agreement placed 430,000 hectares of native forest into informal reserve, subject to verification, which the governments will protect under a Conservation Agreement. The Agreement is focused on public native forests and does not impose any obligations on private landholders.

The reserve areas, illustrated in Figure 21, include the Tarkine in Western Tasmania. These forests will not be accessed for harvest while verification takes place.

As part of the agreement, a total of $276 million will be provided in the following areas:

- $85 million to support contractors and their families affected by the downturn in the industry, and in particular Gunns Limited's decision to exit native forest harvesting
- $43 million to facilitate protection of new areas of high conservation value forests
- $120 million over 15 years, including an initial payment of $20 million to identify and fund appropriate regional development projects
- $7 million per annum ongoing to manage new reserves

The Australian Government will provide $45 million in assistance for voluntary exits from public native forest operations for haulage, harvest and/or silvicultural contractors. (Australian Government media release, 7 August 2011)

The Governments have appointed a verification group, lead by Professor Jonathan West, to assess and verify sustainable timber supply requirements, available public native forest and plantation volumes, and areas and boundaries of reserves from within the areas of high conservation value public native forest. The group will provide advice to the Tasmanian and Federal Governments by the end of 2011.

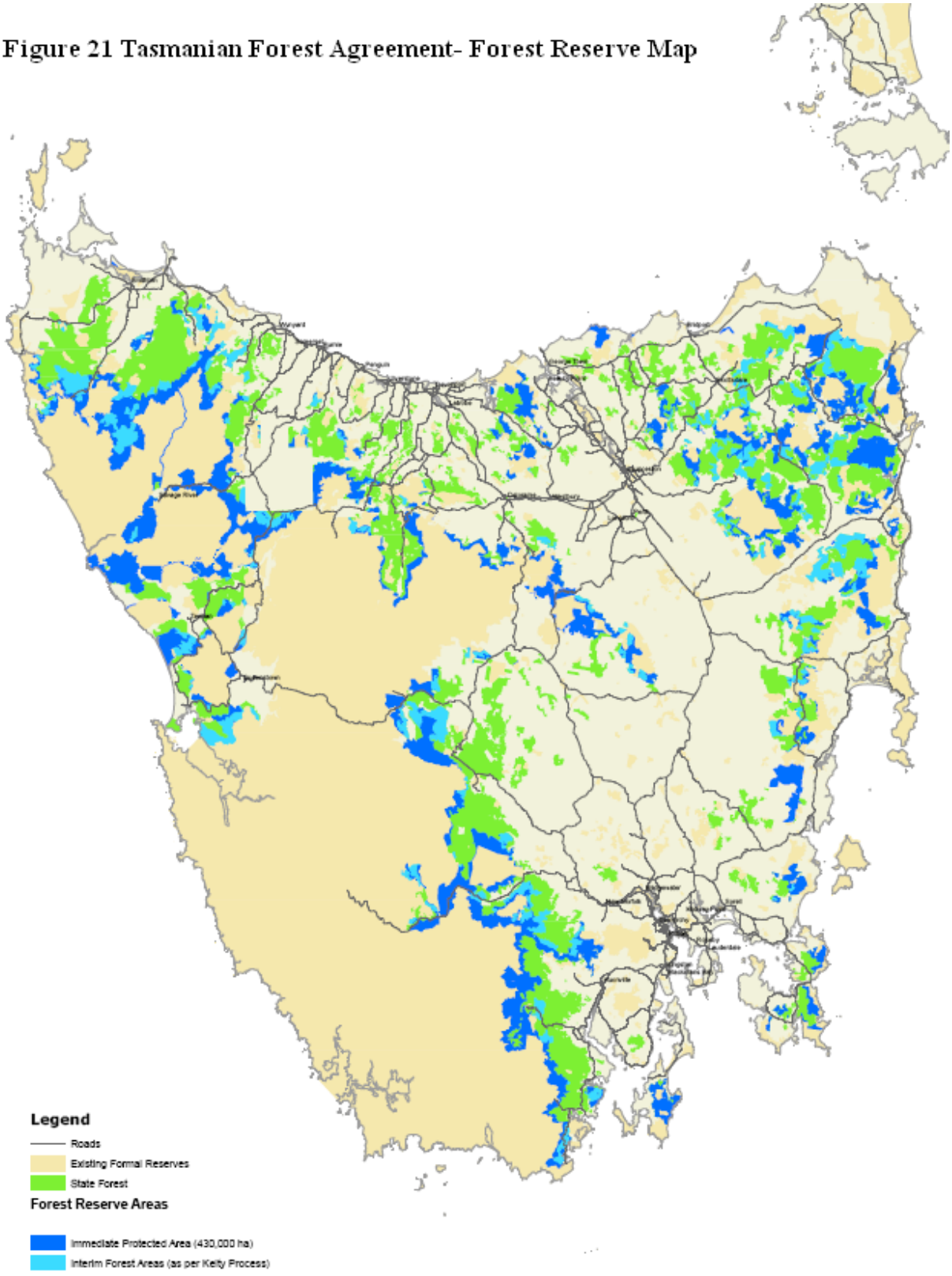
Once this process is complete the State will develop legislation to formalise reserves and guarantee annual sustainable timber supply of at least 155,000 cubic metres of high quality sawlog per year, 256,000 cubic metres of peeler logs per year and verified specialty timber requirements. Existing contracts for native wood supply will be honoured.

As part of the Agreement two independent forestry schedulers have also been appointed to determine:

- What harvesting work is currently occurring in coupes within the environment non government organisation nominated 430,000 hectare areas;
- The contractual wood supply that this harvesting is intended to meet; and
- Whether there are practical alternative coupes outside the 430,000 ha are for meeting these contractual requirements.

This work is nearing completion and will enable the finalisation of a Conservation Agreement over the interim reserve area. (Australian Government, November 2011)

Figure 21 Tasmanian Forest Agreement- Forest Reserve Map



3.6.2. Forestry Tasmania

Forestry Tasmania manages forestry operations from around 1.5 million hectares of State forest, with management undertaken in four districts. The Murchison district of 0.5 million hectares covers the public land in the study area such as Strahan, as well as Circular Head, Forth and King Island. The Murchison District has 25,000 hectares of plantation forests and 150,000 hectares of native forest coupes, with remaining areas unsuitable for harvesting.

Operations and Transport Infrastructure

Annual hardwood production from State forest in the Murchison District is typically around 400,000 t, including 250 – 300,000 t pulpwood, 70,000 t domestic peeler (to Smithton) and 30 – 40,000 t saw logs. All pulpwood is currently transported to Bell Bay after the closure of Gunns' woodchip mill at Hampshire. Travel distances to Bell Bay are much greater making transport significantly more expensive. There is a chance that some pulpwood whole logs will be exported from Burnie, however this is not occurring at the moment.

Over the last few years Forestry Tasmania has harvested around 50,000 t of softwood sawlogs per year from Strahan, which was transported to Gunns Scottsdale mill prior to its closure in 2011. This was transported via Anthony Main Road as the Murchison Highway over Mount Black is unsuitable for large heavy vehicles. Forestry Tasmania is exploring other processing options for the Strahan wood supply, with Bell Bay the most likely option. It is predicted there is approximately 4-5 years left of harvesting at 40,000 t/year.

Some pulpwood is also harvested from Strahan and sent to Norske Skog at Boyer. This wood is transported north and then down the Midlands Highway.

Forestry Tasmania has 30,000 t of eucalypt plantation wood that will be ready for harvest in Zeehan by the year 2020. An additional 18,000 t pine plantation in Zeehan and 100,000 t pine plantation in Strahan which will be ready to harvest by 2030, is likely to be scheduled over a few years with annual volumes 20,000-40,000 tpa depending on demand and market conditions.

Forestry Tasmania also harvests other forest products from the area. Special species for sawlogs and craftwood go to mills at Strahan, Smithton and Somerset.

The general condition of the roads is an issue for Forestry Tasmania, particularly the Murchison Highway south of Cradle Mountain Development Road.

Storage at Burnie Port is an issue, with about 5,000 t log stockpile capacity at the port and 10,000 t nearby in Burnie. This is less than larger shipments, which can be up to 30,000 t. At times it is necessary to conduct dual port loading with part of the ship loaded at Bell Bay and the remainder at Burnie Port. Forestry Tasmania does not have access to woodchip loading facilities at Burnie Port.

Forestry Tasmania's future operations will be impacted by the Tasmanian Forests Intergovernmental Agreement. Forestry Tasmania has analysed the implications of the Agreement on its contractual requirements, including whether it is possible to re-schedule harvesting operations from within the 430,000 hectares identified for reservation.

Forestry Tasmania has formally advised the Australian and Tasmanian governments that it will be unable to meet its contractual requirements from forest areas outside the nominated 430,000 hectares. Independent experts appointed under the Agreement will review these findings and attempt to reschedule harvesting activities. This could increase the scale of harvesting activities outside the areas nominated in the Intergovernmental Agreement, depending on the outcome of the verification process and market demand.

Figure 21 illustrates the affected reserve areas.

Other Infrastructure

- Forestry Tasmania does not process wood and therefore **energy and water** are not issues.
- **Telecommunications:** Mobile coverage ok, but patchy in places on the Murchison Highway.

3.6.3. Gunns Limited

Gunns Limited is Australia's largest integrated hardwood and softwood forest products company, originally established in 1875.

Gunns Ltd has extensive hardwood and plantation resources on freehold private land within the study area, mostly in the region between Burnie and Waratah. These plantations are mostly managed for pulpwood production.

Gunns' proposed Bell Bay Pulp Mill project has received all necessary approvals and is awaiting financial closure. Future transportation implications will remain uncertain until a final decision on this development is reached.

If the Bell Bay Pulp Mill proceeds, it is expected to require approximately four and a half million tonnes of input wood each year, predominantly to be sourced from Tasmania. In the long term all wood is likely to be sourced from Tasmanian plantations.

Gunns stated primary infrastructure interests were in road infrastructure. In particular the potential to use larger vehicles to reduce the number of trucks required for any given task, and eliminating truck routes through residential areas, where feasible.

If the mill does not proceed, the Gunns plantation resource will continue to be harvested and shipped as woodchips to interstate or overseas pulpmills.

Operations and Transport Infrastructure

With Bell Bay Pulp Mill:

- Wood from Gunns' plantations would be used for the Bell Bay mill and the woodchip mill in Hampshire would remain closed.
- There would be 120-130 truck movements per day on the Ridgley Highway for wood from plantations in the Surrey Hills area.

Current Business (Continued Export Sales):

- It appears that there are two main scenarios if the current export woodchip business continues or needs to re-expand:
- Most (or some) of the mills closed or sold by Gunns could reopen, resulting in re-establishment of similar operational patterns that applied before Gunns' restructuring to concentrate on the pulp mill:
    - The majority of logs in the region were transported to the Hampshire mill which produced 1 million tonnes of woodchips a year, equating to around 30,000 truck movements per year. Woodchips were transported to Burnie Port.
    - The Massy Greene woodchip mill at Burnie now owned by Pentarch Forest Products Pty Ltd, processed lower volumes, predominantly from along the North West Coastal strip.
    - 15-20% of wood product was taken to Boyer as it was unsuitable for Gunns needs at Hampshire or other sites. It is financially better for trucks to travel the route to Burnie, Launceston and south to Boyer using trucks with higher mass limits rather than using smaller trucks that can travel on non- HPV roads such as the Lyell Highway.
- Resulting patterns would be influenced by which facilities are reopened and what volumes they process.
- The second possible outcome is that current operational patterns with the substantial industry downturn remain. Under this scenario, markets for processing timber do not re-establish, harvesting rates remain low and timber transport demands on forestry and main roads result in lower pressure for road upgrades.

Other Infrastructure

- **Electricity** is adequate for Gunns' current needs.
- No **telecommunications** issues were raised.

3.6.4. Timberlands Pacific Pty Ltd

Timberlands Pacific Pty Ltd, based in Launceston, is a sister company to the New Zealand owned forestry management company Timberlands Limited. Timberlands Pacific Pty Ltd manages 45,000 hectares of softwood plantations in Northern Tasmania. This estate provides around 600,000 tonnes of wood products annually with Tasmanian customers processing the majority of this resource. Timberlands Pacific Pty Limited employs 13 staff based in Tasmania.

Operations and Transport Infrastructure

- Timberlands customers include:
  - Gunns saw mill, Bell Bay (340,000 tpa)
  - Norske Skog (160,000 tpa)
  - Branxholm saw mill
  - Mole Creek
  - Koppers, Longford
  - Small amounts exported through Burnie and Bell Bay ports
- Where permitted B-Doubles are used to transport logs, elsewhere general access vehicles are used.
- A major constraint is where different road segments have different owners, who have differing usage limits, such as HPV restrictions.
- Timberlands has no major issues with ports because very little product is exported. Port costs, however, are double that of New Zealand.
- Timberlands is currently speaking with TasRail about the potential for rail transport. Rail has not been used because it was considered unreliable. Rail transport would be considered if it was cost-effective and reliable.

3.7. Aquaculture Industry

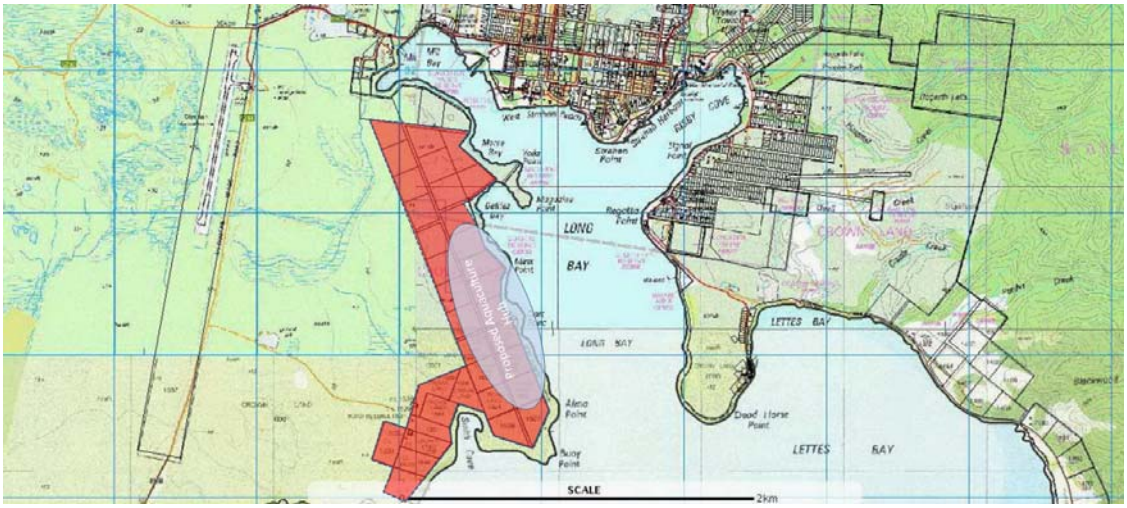
3.7.1. Current operations and proposed expansion

Huon, Tassal and Petuna have established aquaculture operations based from Strahan, and the three have formed the Macquarie Harbour Aquaculture Group (MHAG). There is a significant proposed expansion of the aquaculture industry at Macquarie

Harbour, involving expanding the marine harbour leases to almost double the existing size. This would be significant for both the West Coast region and the Tasmanian aquaculture industry. An environmental assessment of the development is currently being completed.

Huon and Tassal currently operate from adjacent sites in Strahan. If the expansion proceeds, pressure to move these operations is likely, enabling other developments on the prime town sites. A new aquaculture hub is proposed across the bay from the town centre (shaded blue below) on Crown Land (shaded red) to allow for consolidation of activities relating to the salmon farming industry. Huon and Tassal would require a Crown Lease and would need to submit a development application. Petuna is currently based on this site and also plans to expand. Tassal's site is cramped for current operations. The Huon site is adequate, but Huon has stated willingness to relocate if the expansion goes ahead.

- **Figure 22 Proposed Site for New Aquaculture Hub**



Source: Huon Aquaculture

The inputs to the fish farms include:

- Fish feed: Almost daily, constant year round. Transported by a semi-trailer in one tonne bags.
- Smolt (small fish): 5 trucks per day but not at all times of the year. Transported by semi-trailer in tanks (pictured).

The output from the fish farms is harvested fish, transported by semi-trailers in tanks. Fish is harvested between late February and May to correspond with a decrease in fish being harvested in the south.

Previously separate trucks were used for inputs and outputs, but a new semitrailer design has been developed which brings feed in and takes the harvested fish out. The tanks lift up to allow the feed to be stored underneath. This saves a significant amount in transport costs and has resulted in 250 less truck movements for Tassal during the 6 month season.

The harvest occurs in the evening and all truck movements for feed and harvested fish occur at night. Consequently there is minimal conflict on the road between aquaculture trucks and other vehicles. Harvested fish is transported north to Devonport (Petuna and Tassal) and Parramatta Creek (Huon) via Henty Road and the Murchison/Ridgley Highway. Each truck carries 18 t of harvested fish. Smolt comes from hatcheries in the south and north east. Feed comes from Cambridge in the south as well as from Burnie Port.

Transport in the aquaculture industry is time constrained as the products are perishable. Transport operators have reported that fish is the most difficult product to transport. Occasionally smolt has not been able to be delivered to Strahan due to ice and snow. Harvested fish needs to get to the Spirit of Tasmania by the cut off time. Time constraints limit the opportunities for rail in the aquaculture industry. The transport of fish feed could potentially be via rail, but given the efficiency gains provided by the new trucks, rail is unlikely to be feasible. As truck movements are largely at night, variable travel times on the Murchison Highway are generally not an issue.

Macquarie Harbour is not very deep, limiting the type of vessel that can be used by the industry. Huon uses flat bottom landing barges requiring only 2 m of draft. Tassal uses vessels requiring 5 m of draft.

The three operations in Strahan employ a total of approximately 70 staff. In total Huon and Tassal employ 400 and 700 staff respectively. Staffing in Strahan is expected to almost double to 130 between the three operations if the expansion goes ahead.

Current traffic movements for Huon, Tassal and Petuna are approximately 88 vehicles per day, including all staff, feed, harvest, smolt deliveries and miscellaneous visits to and from the site. Harvested tonnages are approximately 11,000 tpa. Estimated traffic movements for Petuna, Tassal and Huon if all located within the proposed Aquaculture Hub are likely to increase commensurate with tonnages of fish farmed and could reach (on average) around 208 vehicles a day by 2017. This corresponds to around 30,000 tpa of harvested fish. Operations are expected to remain at a constant level from this period onwards.

Table 10 summarises the current operations and predicted expansion.

- **Table 10 Aquaculture Industry Operations and Proposed Expansion**

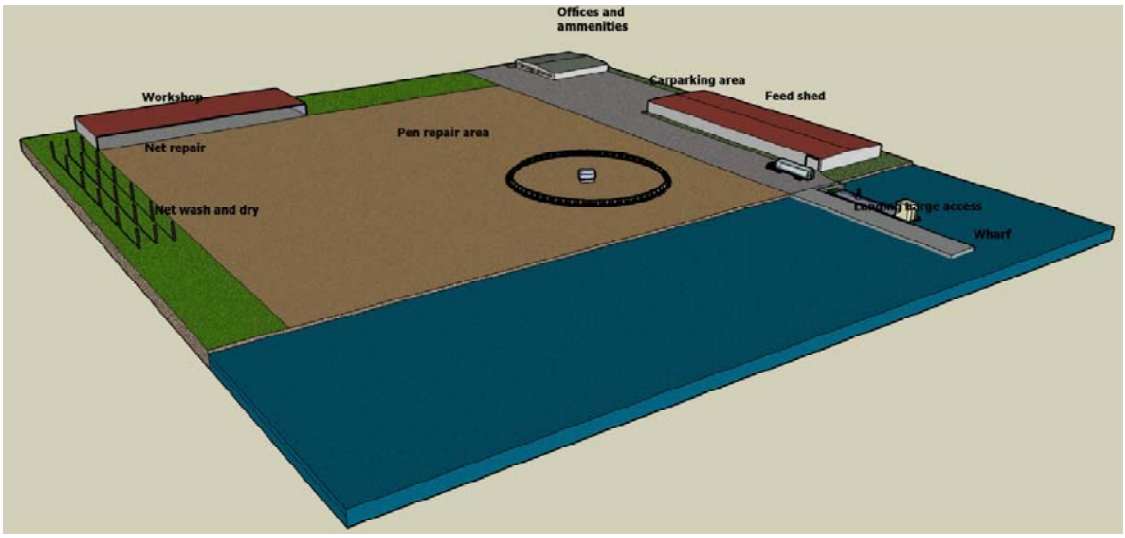
Proponent	Product	Origin	Destination	Mode	Tonnes/ Annum	Format	Year	Issues/Comments
Macquarie Harbour Aquaculture Group Current	Harvested Fish	Strahan (existing sites)	Devonport/Parramatter Creek	Road	11,000	Tanks on truck	Existing	
	Fish Feed	Burnie and Hobart	Strahan (existing sites)	Road	18,000	Bulk on truck	Existing	
	Smolt	South and North East	Strahan (existing sites)	Road	7,000	Tanks on semitrailer	Existing	
Macquarie Harbour Aquaculture Group Expansion	Fish	Strahan (new aquaculture hub)	Devonport/Parramatta Creek	Road	30,000	Tanks on truck	2017	Operations are predicted to increase yearly until a constant production is reached in 2017.
	Fish Feed	Burnie and Hobart	Strahan (new aquaculture hub)	Road	45,000	Bulk on truck	2017	
	Smolt	South and North East	Strahan (new aquaculture hub)	Road	18,000	Tanks on semitrailer	2017	

3.7.2. Infrastructure requirements for new aquaculture hub

Figure 23 shows a potential new site layout for Huon if the expansion goes ahead. Huon currently leases land on the Lyell Highway, outside of the centre of town, used as a net handling and storage area. This requires additional transport as the nets are transported to and from the site. If Huon was to move consolidation of the net handling and storage facility on the one new site would be required.

Tassal would require a similar layout to that pictured below for Huon. Petuna is also likely to expand their current site. In particular they require a larger area for pens. One larger facility to service all three operations has been considered in the past but has been deemed unlikely to work.

- **Figure 23 Possible Layout for New Huon Site**



Source: Huon Aquaculture

Major infrastructure requirements for the proposed aquaculture hub include connections to water and sewage. Petuna operates on the site already and only has tank water. Water would most likely be connected across the harbour. The alternate route around the harbour on land would be significantly longer. At the moment blood water from harvested fish is temporarily stored on the Huon site to allow graduated release to the Strahan Waste Water Treatment Plant (WWTP). The Strahan WWTP does not have any disinfection. The capacity of the WWTP is not an issue with maximum thought to be 4 x the population in summer. Tassal's blood water travels to Devonport with harvested fish, while harvest boat wash goes to Cradle Mountain Water, is not treated and is discharged at depth. In the future some disinfection/treatment should occur.

Telecommunications are important for the aquaculture industry. There is a need to communicate from the base in Strahan to both the farm and the base in Hobart. Orders are taken up until 1 pm

and harvest occurs that evening. The businesses will try to accommodate late orders for larger customers, requiring communication with the farm once harvesting has begun. Huon has reported that there is generally no mobile reception on the boat out to the farm but there is usually reception once at the farm.

The road to the proposed new site is mainly an unsealed road. There is a section of private road owned by Petuna. If Huon and Tassal move, they would need to share the road. The industry would want the council to take over ownership of the road. The road would require upgrading to cope with the expected number of trucks. Huon does not have the money to upgrade the road and are not in the position that they would need to move.

Huon would like to have liquid oxygen at the Strahan site (it is currently used at other sites). Oxygen is pumped into the water in times when oxygen levels are too low. Liquid oxygen would be brought in by truck every now and then.

Currently the bowser in Strahan is used for fuel. If the expansion goes ahead it is likely that fuel would be required on the new site.

Figure 24 illustrates the location of the aquaculture industry in Macquarie Harbour and route used to Devonport for processing.

3.7.3. Rock Lobster Trial

As part of a commercial trial to help boost the value of the State's fishery, 100,000 rock lobsters will be relocated from waters off Tasmania's South-West to the West Coast. This has the potential to significantly improve the productivity and value of the fishery by moving lobsters from deep waters where growth rates are slow to more productive in shore waters along the West Coast. The boost to fish stocks is expected to be equivalent to cutting the commercial stocks by 10 per cent. The commercial pilot will run for two years to determine whether the project is cost effective. (ABC News Release, 12/12/11)

3.8. Agriculture

Figure 25 shows that there is little agricultural activity within the study area. Agricultural products including milk, dairy products and vegetables are transported on the Bass Highway from the North West to Burnie and Devonport ports, but do not affect the study area or corridor. Advice from various agricultural industries and agencies was that agriculture is unlikely to become significant in the study area due to terrain, weather and soil conditions. Agriculture was not investigated further as part of this study.

Legend

Marine Leases

Aquaculture Routes

Huon

Petuna, Tassal, Huon

N

1:1,250,000

0 12.5 25 50

Kilometers

August, 2011

PROJECTION - MGA Zone 55
DATUM - GDA94

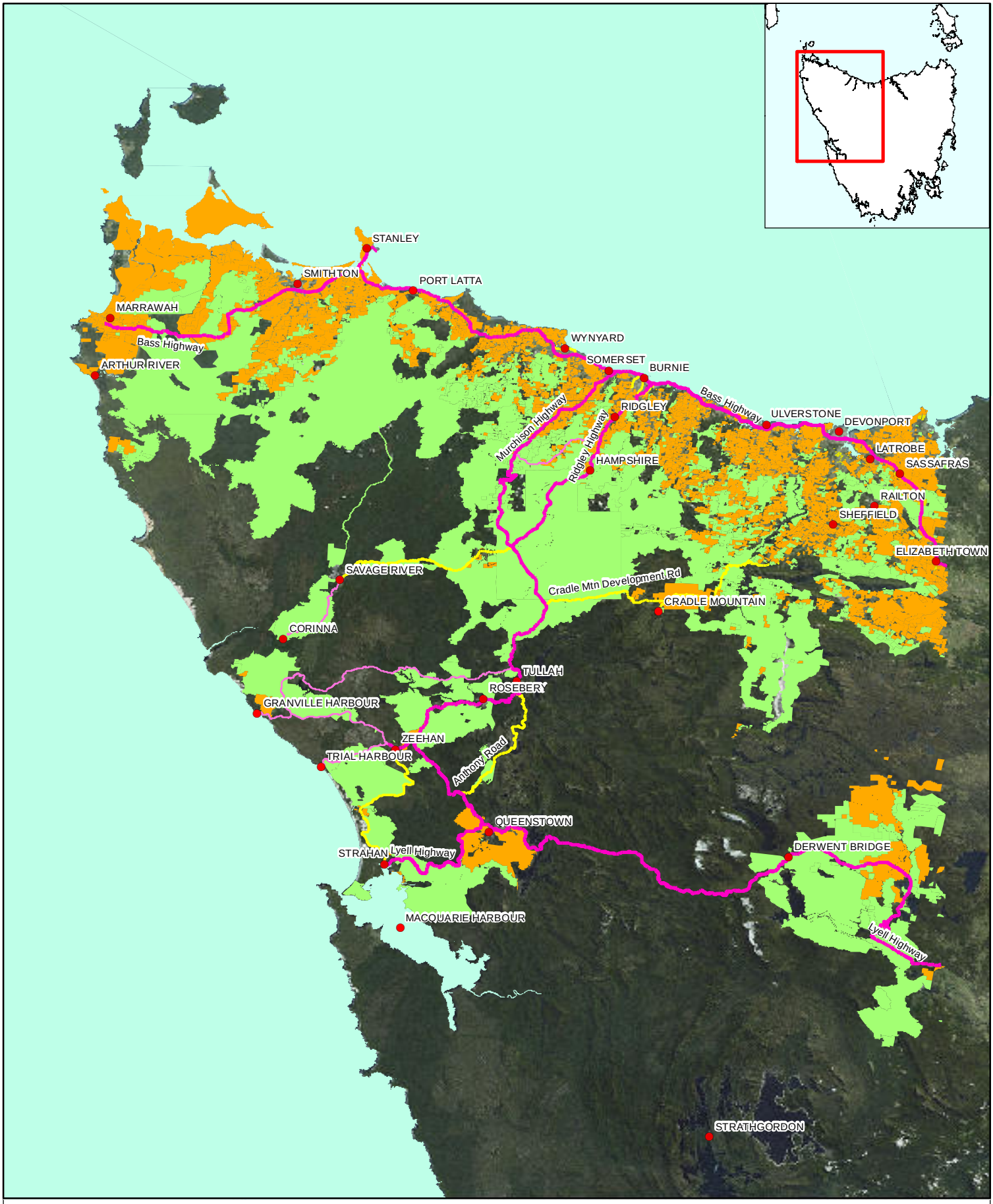
Tasmania
Explore the possibilities

Data provided by:
Department of Infrastructure, Energy and Resources

FIGURE 24
AQUACULTURE INDUSTRY

West Coast Infrastructure Development Study

SKM



Legend

- Forestry
- Farming
- Horticulture
- National State Highway
- Major Arterial Roads
- Public Access, Feeder & Arterial Roads

N

1:1,250,000

0 12.5 25 50

Kilometers

August, 2011

PROJECTION - MGA Zone 55
DATUM - GDA94

Tasmania
Explore the possibilities

Data provided by:
Department of Infrastructure, Energy and Resources

FIGURE 25
AGRICULTURE ACTIVITY

West Coast Infrastructure Development Study

SKM

3.9. Tourism

3.9.1. Current Operations

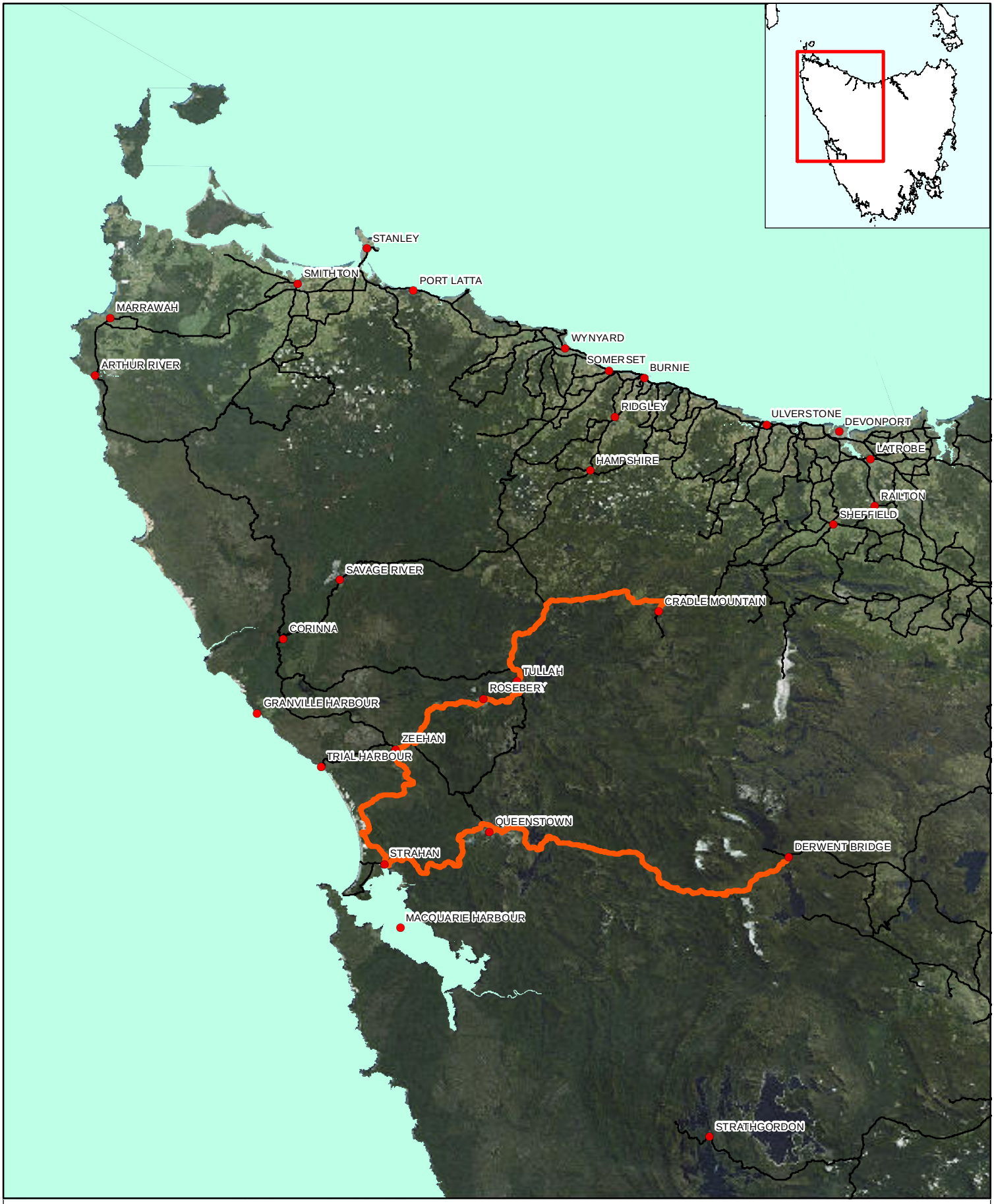
The West Coast is one of Tasmania's most popular tourist regions. The main attraction of the area is the natural wilderness, particularly between Cradle Mountain, the Tarkine and the Gordon River. Mining heritage provides a secondary attraction, in particular the West Coast Heritage Museum at Zeehan. Sarah Island in Macquarie Harbour, Tasmania's first penal station, is a popular tourist attraction. There is a touring route through the region, The West Coast Wilderness Way, which traverses Cradle Mountain, Rosebery, Strahan, Queenstown and Derwent Bridge as illustrated in Figure 26. Tourism Tasmania (2011) reports 190,200 visitors to the 'Western Wilderness' region for the year ending June 2011. This was down 7% from the previous year. The market is seen as fickle, with visitor numbers varying significantly from year to year.

The tourism industry on the West Coast is largely seasonal, with the peak period between Boxing Day and Easter. Federal Group in Strahan reported an increase in occupancy from 50-60% overall to 100% in peak periods. A major challenge for the industry is reducing this seasonality. There is currently a push towards adventure activities such as mountain biking, rafting and day walking. Another challenge for the industry is increasing the average duration of visits. Federal Group reported an average stay of 1-2 nights.

The Sarah Island Story

Around 15% of visitors to Tasmania were international visitors in 2010-2011 (Tourism Tasmania, 2011). The high value of the Australian dollar is a challenge for the tourism industry, making overseas travel cheaper for Australians but Australia more expensive for overseas visitors.

Tourism Tasmania estimates that 85-90% of visitors self drive in rental vehicles, private cars or campervans. There are some chartered coach tours to Queenstown, AAT Kings the leading operator. These have declined substantially over the last 25 years when they were a major source of visitors. There are now approximately 25 coach visits (1,000 people) per annum. There are a few scheduled bus services to the region which are mainly used by back packers and bush walkers.



Legend

West Coast Wilderness Way

Main Highway

N

1:1,250,000

0 12.5 25 50

Kilometers

August, 2011

PROJECTION - MGA Zone 55
DATUM - GDA94

Tasmania
Explore the possibilities

Data provided by:
Department of Infrastructure, Energy and Resources

FIGURE 26
TOURING ROUTE - THE WEST COAST WILDERNESS WAY

West Coast Infrastructure Development Study

SKM

3.9.2. Infrastructure Issues

Tourism operators raised the condition of the roads as their main concern. Tourism operators have indicated a need to increase road widths, improve the camber of the road and provide more overtaking opportunities. Campervan and caravan numbers are increasing, and interaction between heavy vehicles and tourists who are generally unfamiliar with the road conditions is a safety concern. Weather exposure is an issue with tourists sometimes missing flights or bookings due to road closures.

Queenstown – Strahan road

The Western Explorer Road through the Tarkine is an important tourist road, stretching from Corinna in the south to Heemskirk Road in the north. The road is rough and unsealed and some hire car drivers are reluctant to use it due to insurance conditions.

Tourism operators also raised concerns about signage for tourists on the West Coast. Current signage is inconsistent with warnings at some tight corners but not at others. More signs with typical travel times rather than just distances would be useful for tourists who are unfamiliar with the sinuous nature of the roads. Tourists tend to under estimate travel times which can lead to attempting to include too much in available time, and driving too quickly for the conditions, particularly if trying to meet connections or bookings. Signs with distances to fuel locations would also be beneficial. The “end speed zone” signs are not well understood as tourists are generally unfamiliar with this signage and often are uncertain what the general background speed limit is in any given location.

Strahan is the centre of West Coast tourism operations. There are plans to open up the waterfront for greater visitor use. Reliability of electricity is one of the highest infrastructure priorities for tourism operators in Strahan. The town is serviced by a single line from Queenstown. This line is vulnerable to storm and tree damage and reliability levels are below average. In an outage hotels are not able to check in guests and operations completely stop. Water infrastructure is also

important for the tourism industry in Strahan. While reliability of water has generally been good, when there is an issue it causes significant problems, including guest hygiene etc. The Queenstown airstrip caters only for charter flights and limited facilities and weather vulnerability limits opportunities. Better air facilities could open new tourism markets.

Telecommunications are an issue throughout the West Coast region. Telstra is the main provider of mobile coverage, with Optus coverage beginning to increase. No other mobile phone providers service the West Coast region. This is an issue for tourism, as interstate and international visitors are generally unaware that they may have little or no coverage in the region. Tourism operators rely on telecommunications for bookings, as well as connection with other offices. Federal Group in Strahan reported approximately 20 % of bookings are made online with the number increasing.

The West Coast Wilderness Railway, running between Queenstown and Strahan, is one of Tasmania's most popular tourist attractions. The 35 km track was restored in 2000 – 2003 and now carries passengers in heritage carriages hauled by steam and vintage diesel locomotives. The track, however, is in poor condition with substandard sleepers and bridges requiring work. Due to the high maintenance costs the railway fails to cover costs. The railway, however, attracts a significant number of visitors to the region and is important for the tourism industry. Storm damage resulted in closure of 1,200 m of the track between March and July 2011. The railway was able to be run from Strahan with the Queenstown section closed. The closure reportedly had a significant impact on the tourism industry in Queenstown.

3.10. Other industries

3.10.1. Bee Keeping

There are approximately 120 sites in the Murchison district (between Arthur River and Macquarie Harbour, west of the Highway) licensed to bee keepers for leatherwood honey. The larger players have 20 or so sites each. Approximately 10,000 bee hives are moved to the West Coast for the leatherwood production from December to March. Forestry roads are used to access the sites. The uncertain future of forestry is a concern for the industry with access becoming an issue if the roads are not maintained.

The hives are brought in on various size trucks from small beekeepers with utilities to the larger bee keepers with rigid tray trucks. The hives remain in the one spot for the period they are on the West Coast. Assuming an average 20 hives / vehicle this is approximately 1,000 movements per annum on forestry roads. Approximately 2,000 vehicles per annum are also estimated on local access roads in agricultural areas for pollination work.

4. Infrastructure deficiencies and potential upgrade projects

Identified infrastructure deficiencies and potential projects to address shortcomings are summarised in the tables which follow, together with the likely beneficiaries and assessment of the likely time frame, cost and relative benefit levels. These assessments have used the following categories:

Key			
Time Frame		**Cost**	
Short (S)	1 – 2 yrs	Low	<$5 m
Short – medium (SM)	3 – 5 yrs	Medium	$5-10 m
Medium (M)	5 – 10 yrs	Substantial	$10-50m
Long term (L)	10 + yrs	High	>$50 m
Relative Benefit			
Major	Substantial benefits to numerous companies, enabling increases in production and employment exceeding 50 people directly, and or to regions or whole communities of at least 1,500 people.		
Medium	Benefits to one or more companies employing at least 200 people enabling increases in production and employment, and or to communities of at least 1,500 people		
Localised	Benefits to one or more companies employing less than 200 people directly, or to a single region or settlement with a total population less than 1,500 people		

4.1. Road

Table 11 Road Opportunities

Road	From	To	Length (km)	Issue / Opportunity	Solution	Beneficiaries		Time Frame	Cost	Relative Benefit
						Current	Future			
Anthony Main Road	Zeehan Highway	Murchison Highway	38.5	HPV gazetted but does not meet requirements.	Upgrade to meet HPV guidelines	Forestry, Unity		S	M	Localised
Bass Highway	Port Latta Intersection		-	No acceleration/deceleration lanes.	Provide acceleration/deceleration lanes	Grange Resources	Shree Minerals	S	L	Localised
Corinna Road	Savage River	Corinna	21	Unsealed, single lane (Linked to Western Explorer Road)	Seal, widen	TAM, tourism	Shree Minerals, Grange Resources	SM	M	Localised
Cradle Mountain Development Road	Moina	Murchison Highway	47	Narrow, constrained alignments, combination of heavy vehicles and tourist traffic	Widening, curve realignment	Bass Metals, tourism	Frontier Resources, TNT	SM	S	Medium
Kara Road	Kara Road Bridge		-	Restricts vehicle sizes to 33t. Potential to increase to 40t trucks and reduce the number of trucks on road.	Upgrade bridge to take increased load	Tasmania Mines, residents, other road users	Tasmania Mines expansion	SM	M	Localised
Lyell Highway	Queenstown	Zeehan Highway	3	HPV gazetted but does not meet requirements	Upgrade to meet HPV guidelines	CMT, tourism		S	L	Localised
Lyell Highway	Zeehan Highway	Strahan	36	Safety concerns- tight curvature, limited sight distances	Curve realignments, improve sight distance	Tourism, MHAG, local population		SM	S	Localised
Macquarie Heads Road	Strahan	Aquaculture Hub	5	Unsealed road	Seal road for aquaculture trucks and reduce dust	MHAG, local population, tourism	MHAG expansions	S	L	Localised
Murchison Highway	Zeehan Highway	Melba Flats	4.6	HPV gazetted but does not meet requirements	Upgrade to meet HPV guidelines	CMT, Intec, tourism	Stellar Resources,	S	L	Medium

Road	From	To	Length (km)	Issue / Opportunity	Solution	Beneficiaries		Time Frame	Cost	Relative Benefit
						Current	Future			
							TNT			
Murchison Highway	Melba Flats	Rosebery	15	Narrow, no overtaking opportunities	Widening, localised safety improvements, improved overtaking opportunities and localised pavement repairs	Bluestone, Intec, MHAG, tourism, local population	Stellar Resources, TNT	Refer to Murchison Highway Project		
Murchison Highway	Rosebery	Anthony Main Road	10	No overtaking opportunities, pavement failure.	Install overtaking opportunities, stabilisation of key pavement subsidence areas	Bluestone, Intec, MHAG, tourism, local population	Stellar Resources, TNT	Refer to Murchison Highway Project		
Murchison Highway	Anthony Main Road	Cradle Mountain Development Road	28	HPV gazetted but does not meet requirements, no overtaking opportunities	Widening and targeted pavement strengthening, localised safety improvements at high crash sites and installation of climbing lanes	Intec, Bluestone MHAG, forestry, tourism, local population	Stellar Resources, TNT, Venture Minerals	Refer to Murchison Highway Project		
Oonah Road	Murchison Highway	Ridgley Highway	24	HPV gazetted, does not meet guidelines.	Upgrade to meet HPV guidelines	Forestry	Tasmania Magnesite	SM	M	Localised
Pieman Road	Mount Lindsay	Murchison Highway	35	Not HPV gazetted	Upgrade to meet HPV guidelines		Venture Minerals	SM	M	Medium
Pieman Road	Murchison Highway Intersection		-	Situated on crest, poor sight distance	Crest adjustment, acceleration/deceleration lanes,	Commuters, other HVs	Venture Minerals	Refer to Murchison Highway Project		
Ridgley Highway	Ridgley township		-	Safety and amenity issues in town of	Bypass township	Residents, other HVs,		M	S	Localised

Road	From	To	Length (km)	Issue / Opportunity	Solution	Beneficiaries		Time Frame	Cost	Relative Benefit
						Current	Future			
				Ridgley- currently curfew exists		commuters				
Trial Harbour Road	Heemskirk Road	Avebury Mine	8	Insufficient strength to cater for heavy vehicles	Upgrade pavement		MMG/future Avebury owners	S	M	Localised
Waratah Road	Murchison Highway	Savage River	44	Narrow, constrained alignments, unsealed shoulders.	Widen, realign curves, seal shoulders	TAM, Grange Resources, tourism	Venture Minerals, Bright Phase	SM	S	Major
Western Explorer Road	East of Couta Rocks	Corinna	75	Unsealed, poor condition (Linked to Corinna Road)	Upgrade to cater for heavy vehicles	Tourism	Shree Minerals, Grange Resources	SM	H	Localised
Zeehan Highway	Lyell Highway	Anthony Main Road	10	HPV gazetted but does not meet requirements	Upgrade to meet HPV guidelines	CMT, tourism, commuters, local population		SM	M	Medium
Zeehan Highway	Anthony Main Road	Murchison Highway	18	HPV gazetted but does not meet requirements	Upgrade to meet HPV guidelines	CMT, forestry, tourism, local population		SM	M	Medium
Zeehan Highway	Murchison Highway	Henty Main Road	4.5	HPV gazetted but does not meet requirements	Upgrade to meet HPV guidelines	Intec, forestry, tourism, local population	Stellar Resources, TNT	SM	M	Medium

4.2. Rail

- **Table 12 Rail Opportunities**

Line	From	To	Length (km)	Issue / Opportunity	Beneficiaries		Time Frame	Cost	Relative Benefit
					Current	Future			
Wiltshire Line	Burnie	Wiltshire	80	Under care and maintenance, upgrade for recommissioning	Grange Resources, Forestry		M	H	Uncertain
	Wiltshire	Port Latta	5	Extension to Port Latta	Grange Resources	Iron ore projects	M	S-H	Uncertain
	Wiltshire	Smithton	15	Extension to Smithton	Forestry		M-L	S	Uncertain
Hellyer Spur Line	Hellyer	Moorey Junction (Melba Line)	11	Under care and maintenance; replacement of sleepers and track for recommissioning	Bass Metals	TNT	M	S	Uncertain
Melba Line	Hampshire		-	New loading facility		Forward Mining Other mining ventures	S	L-M	Medium
	Hampshire	Burnie	33	Upgrade rail track to increase efficiency	MMG, CMT	MHM	S-M	M-S	Localised
	Melba Flats	Zeehan	10	Extend track to Zeehan		Intec, MHM	S-M	M-S	Localised
	Zeehan	Strahan	55 appro	Rebuild line within existing reservation		MHM	M-L	H	Localised

Line	From	To	Length (km)	Issue / Opportunity	Beneficiaries		Time Frame	Cost	Relative Benefit
					Current	Future			
			x						
	Melba Flats	Burnie	130	Replace existing steel and timber sleepers with concrete	MMG, CMT	Bluestone, Forward Mining, TNT	S	M	Medium
	Melba Flats	Burnie	-	Reduce landslip potential in vulnerable areas	MMG, CMT	Bluestone, Forward Mining, TNT	S	L-M	Medium
	Melba Flats	Burnie	130	Welded track to replace jointed track	MMG, CMT	Bluestone, Forward Mining, TNT	S-M	M	Medium
	Melba Flats	Burnie	-	Achieving higher axle load limits through bridge works and other point limits.	MMG, CMT	Bluestone, Forward Mining, TNT	S-M	M-S	Medium
	Melba tunnel *		-	Increase clearances in Melba tunnel	CMT	Forward Mining, TNT	M	M-S	Localised

*It is understood that the locos TasRail has contracted to purchase will fit through the existing Melba tunnel clearances, and so issues of accommodating inadequate clearances will no longer be an issue once the new locos replace existing ones on this line.

4.3. Other Infrastructure

- **Table 13 Other infrastructure opportunities**

Infrastructure	From	To	Length (km)	Issue / Opportunity	Beneficiaries		Time Frame	Cost ($)	Relative Benefit
					Current	Future			
Sewage connection	Strahan WWTP	Macquarie Harbour Aquaculture hub	2 approx	Sewage connection required across Macquarie Harbour to new aquaculture hub	Petuna	Huon, Tassal	S	L	Localised
Water connection	Strahan	Macquarie Harbour Aquaculture hub	2 approx	Water connection required across Macquarie Harbour to new aquaculture hub	Petuna	Huon, Tassal	S	L	Localised
Electricity line	Zeehan	Strahan	48 approx	Electricity unreliable in Strahan- only one line from Queenstown. Provide secondary line from Zeehan.	Tourism, local population, MHAG	MHM	M	S	Localised
New substation	Wynyard		-	Reliability issues at Wynyard, provide new substation	TAM, local population		M	S	Localised
Second slurry pipeline	Savage River	Port Latta	85	Potential for Grange to process ore from other companies. Likely to be mostly or entirely privately funded.	Grange Resources	Venture Minerals, Shree Minerals, Tasmania Magnesite	M	S-H	Major
Centralised mineral processing site	Hampshire or Rosebery		-	Smaller mineral deposits which cannot justify good standard transport connections	Would require market demand study		M-L	M	Potentially major

5. Infrastructure management challenges

The aim of this study is to identify projects that will encourage economic development in Western Tasmania. The primary economic driver on the West Coast is the mining industry, with the region being one of the most highly mineralised areas in the world. Aquaculture, forestry and tourism are also substantial industries in the region. The West Coast of Tasmania is one of the most rugged regions in the State, with challenging terrain and mountainous topography that brings with it a range of infrastructure challenges. The challenges within the study corridor are summarised below.

Increased freight volumes and dispersed task

The West Coast road network is characterised by relatively low traffic volumes, with a substantial proportion of freight vehicles on most roads. Freight volumes are forecast to increase, but from a low base. The freight volumes associated with a number of proposed mining developments will be significant, and will require careful planning and management.

The majority of freight on the West Coast is generated by the mining industry, and is spread across at least ten major locations. The region also has a number of current and potential smaller mining operations with shorter lives. These characteristics make the long-term planning and management of transport infrastructure challenging, for both road and rail. For example, the dispersed locations of mine sites and shorter operational lives mean it is not feasible to provide a direct rail connection or high quality roads to many deposits, limiting vehicle size and requiring product to first be trucked to a rail loading facility for rail transport.

The Ridgley Highway, Murchison Highway, Zeehan Highway, Anthony Main Road, Lyell Highway and Henty Main Road form the major transport corridor linking industry on the West Coast to Burnie Port. Roads such as Waratah Road play an important feeder role to this main corridor.

Difficult topography, ageing infrastructure and high maintenance costs

Roads on the West Coast are characterised by narrow widths, tight curvature and limited sight distances. Weather conditions are often difficult, and include ice and snow during winter. While the general forecast increase in freight volumes is relatively low (excluding the task associated with a number of proposed major developments), maintaining an efficient and safe network for all road users is essential. The major road corridor between the West Coast and Burnie is HPV gazetted, but does not fully meet Tasmanian HPV guidelines due to some sections having insufficient width, tight curvature and limited overtaking opportunities.

The remoteness and dispersed location of mining operations on the West Coast results in “last kilometre” issues with access to mine sites. Some mines report paying substantial costs to maintain council or forestry owned roads and in other cases are charged significant tolls to use roads. Rail

users are also generally required to contribute to rail line extension costs and this is generally not economical in comparison to road transport. However, the cost of maintaining a reasonably extensive transport network is high for all infrastructure providers. Where some 'cost-recovery' already occurs, presumably this is economical for industry.

Road infrastructure was identified as the main priority for all industries through the stakeholder consultation process. Any improvements to transport efficiency provide opportunities for Tasmanian companies to become more competitive interstate and on a global scale.

Rail transport has limited competitiveness on the West Coast. The overall infrastructure condition is fair to poor, reflecting lengthy periods of underinvestment. The Melba Line has tight curves and steep ruling gradients, reflecting the challenging terrain. The current locomotive fleet and much of the wagon fleet, is either at, or very close to, a life expired condition. Acquisition of a new locomotive fleet is currently being progressed, and some new rollingstock maintenance equipment is also on capital budgets. The Melba Line has an axle limit of 16 t, and infrastructure upgrades would be required before the load limit could be increased substantially. There are permanent speed restrictions due to infrastructure condition and challenging terrain, as well as limits on train lengths from terminal siding lengths, tight curves and rolling stock limitations.

Road traffic issues

West Coast roads need to cater for a mix of freight, commuter and tourism traffic. There is a trend toward larger, higher productivity vehicles within the freight sector, although the majority of vehicles on the West Coast are general access. Most tourists self drive in rental vehicles and campervans as well as own vehicles. Road access to and within the West Coast is critical, with no other regular transport modes providing access to the region. A trend toward drive in drive out mining operations also generates increased volumes of commuter traffic, particularly to and from the North West of the State, with much travel occurring at night.

Managing the interaction between local traffic, heavy vehicles and tourist traffic is challenging, particularly given large parts of the road network have narrow widths, tight curves, limited sight distances and limited overtaking opportunities. Visitors generally have limited local road knowledge and many travel more slowly than freight vehicles.

Poor telecommunications

Given the remoteness of the region, telecommunications are particularly important. Mobile phone coverage is patchy throughout the region which is a safety concern, particularly for road travel. Poor mobile coverage is particularly problematic for tourists visiting the area as they are often unaware that service providers other than Telstra have little or no coverage on the West Coast.

Unreliability of fixed phone lines is a major concern for industry in some areas. Telecommunications are important for emergency response systems and companies are forced to

suspend operations for safety reasons when telecommunications are down. Many sites use satellite phones, with reports on reliability varying depending on location.

Energy costs and reliability

High energy costs are a challenge for industry in the region. Aurora is the sole distributer of electricity to most users, with some high voltage users being supplied direct from Transend Network's transmission system. There is no gas reticulation provided outside Hobart, Launceston and some North West Coastal towns. As such, there is a lack of competition in the energy market. Aurora has a company customer connection policy that requires major users to pay connection fees if they require new lines or connections. This applies to many of the mining ventures on the West Coast due to their remote location. Mines in particular have large power requirements and those users with loads greater than 1MW are also responsible for paying some of the headwork costs.

Reliability of electricity is a challenge for the study corridor, with transmission lines vulnerable to storm damage. Strahan in particular has reliability issues, supplied by a single line from Queenstown. This has potential impacts on the tourism industry where businesses rely on internet bookings, activity bookings for customers and providing adequate customer service.

Other challenges

Port and shipping constraints

While the capacity analysis of ports was outside the scope of this study, inadequate port and shipping facilities were identified as a major challenge for export of product from the region. Burnie Port has little additional storage space and its proximity to Burnie CBD means expansion of the site is difficult. Rearrangement of facilities on the current site is required to provide a more efficient use of space. Inadequate storage space has resulted in Forestry Tasmania using dual port loading to achieve shipload targets. Burnie Port's draught limits ship sizes to around 60,000 t. This is a constraint for companies exporting large volumes of mineral ore, such as the proposed Venture Minerals project. Limited ship sizes increase shipping costs with costs dependent on parcel size.

Port Latta is a deep water port and can cater for ships up to 80,000 t. The Port is weather constrained and is closed an average of 10 days per month, but this is not currently a major concern as port utilisation is fairly low. If shipping volumes were to increase, weather could become a significant constraint.

Lack of container shipping competition, exacerbated by the recent withdrawal of AAA, is a challenge for containerised exports from Tasmania. Industry reported the withdrawal of AAA's direct international services from Burnie Port has added several hundred dollars per container to shipping costs, through the requirement for transhipping in Melbourne. This increases the challenge to remain competitive on a global market.

Lack of 'social infrastructure'

A major challenge for economic development in the region is the lack of or inadequate 'social infrastructure'. This includes secondary education, medical facilities, public transport, supermarkets, child care, housing, tradespeople, airports, sporting facilities and job opportunities. As a result it is difficult to attract workers to the region, particularly in skilled roles. There is a strong trend towards drive in / drive out employees on 5 days on / 5 days off 12 hour shift type working rosters. Employees who drive in / drive out tend to work long hours while they are in the region and leave on completion of their shift, contributing little to the region's lifestyle and liveability.

Environmental constraints

Uncertainty surrounding environmental protection in the West Coast region is a challenge for growth in the mining sector. The West Coast is home to the Tarkine wilderness area which is roughly bounded by the coast to the west, the Arthur River to the north, the Pieman River to the south and the Murchison Highway to the east. The Tarkine contains the largest temperate rainforest in Australia and may include the greatest concentration of Aboriginal sites in the country

A recommendation by the Australian Heritage Council to make the Tarkine rainforest a protected area has not been supported by the State Government, which is concerned about the potential long term impacts on the mining sector. If the area was declared protected, many future prospects are likely to face significant challenges and lengthy time delays gaining environmental approvals. The uncertainty surrounding the area's protection status and the actual boundary of the Tarkine may discourage companies exploring the area.

The viability of current and future industries in the region can be affected by these challenges. A key challenge for infrastructure providers is determining when to proceed with infrastructure upgrades. A new venture may require infrastructure upgrades to improve the viability of the project, while infrastructure providers will only want to upgrade infrastructure once it is certain the beneficiaries are viable projects that will proceed.

In section 4 of this study, projects were identified which address the major challenges faced by the corridor. This process has drawn upon information from the first report summarising the current infrastructure condition and Report 2 summarising current and future industry operations. This enabled gaps in infrastructure to meet the current and future needs of industry to be identified. Potential projects have been assessed based on cost, time frame and relative benefit. Relative benefit was assessed by considering the number and scope of beneficiaries from the project, both current and in the future. This included an assessment of the number of jobs these projects would create, as well as wider benefits to the local community. The likelihood of ventures proceeding was considered as well as other possible avenues for funding of the projects.

Based on this assessment, five projects were chosen for a more detailed cost estimate (P50/P90 analysis) with the results included in Report 3. Transport infrastructure, particularly roads, was clearly identified as the main priority throughout the consultation process which is reflected in the chosen projects. One rail project was included, to improve the condition and increase the capacity and efficiency of the Melba Line. Extensions to the rail system were not included as these would have high costs and only benefit specific ventures, some with relatively short operational lives or which are not certain to proceed.

No telecommunication or energy projects were chosen for further assessment. While these areas provide challenges for industry, they do not impact on the competitiveness of industry to the same extent as transport infrastructure. Aurora and Transend have their own infrastructure upgrades planned for the region. Priorities include upgrades to the Rosebery substation and improving capacity in the Burnie CBD. Optus is looking at strengthening services within the North West and West Coast region. Analysis of port and shipping facilities is outside the scope of this study and therefore projects in this area have not been considered. TasPorts is currently undertaking their own study addressing storage capacity and waterside connection issues.

The Murchison Highway forms a major section of the transport corridor between the West Coast and Burnie, connecting isolated regions of the State to the port and transit centres. A detailed assessment of the upgrade requirements on the Murchison Highway between Cradle Mountain Development Road and Melba Flats was undertaken as part of a separate study by SKM in early 2011. This project will deliver the 2010 Tasmanian Government $21 million election commitment to upgrade West Coast roads. This funding commitment was not sufficient to cover all the works recommended as part of the project and the remaining projects are still considered a high priority for the region. In addition to the 5 projects identified in this report, a P50/P90 has also been undertaken for the remaining sections of the Murchison Highway not covered by Tasmanian Government funding commitment.

Carbon Pricing

The Australian Government is introducing a price on carbon which will start from 1 July 2012. At this stage it is unknown if, how and to what extent this may impact on the infrastructure needs for industry in western Tasmania. As it is expected to increase the price of fuel, it could have less impact on more fuel efficient operations, such as rail over road transport.

6. Report 3 – Recommended Projects

6.1. Context and approach

This section contains the recommended regional infrastructure projects. Priorities have been objectively assessed as far as possible, considering cost and relative benefits provided to both the region and Tasmania as a whole. This includes an objective cost analysis of potential infrastructure projects in the region using the P50 / P90 assessment method. The assessment of identified projects to address identified agreed infrastructure shortcomings used the following approach:

- Review of all suggested projects to identify those with broad and substantial potential benefits, including high level assessment of the likely cost and timeframe for completion (undertaken in section 4 above)
- Review of the projects to identify those proposed for more detailed P50 / P90 cost assessment
- Undertaking P50 / P90 cost assessment
- Compilation of the recommended infrastructure project list from the study.

6.2. Project assessment and short-listing

Table 14 shows the assessment of those projects agreed for further assessment using the P50 / P90 approach, following discussion and review with DIER and the project steering committee. The assessment categories and definitions used in the project assessment table below were:

Key			
Time Frame		**Cost**	
Short (S)	1 – 2 yrs	Low (L)	$5 m
Short – medium (SM)	3 – 5 yrs	Medium (M)	$5-10 m
Medium (M)	5 – 10 yrs	Substantial (S)	$10-50m
Long term (L)	10 + yrs	High (H)	>$50 m
Relative Benefit			
Major	Substantial benefits to numerous companies, enabling increases in production and employment exceeding 50 people directly, and or to regions or whole communities of at least 1,500 people.		
Medium	Benefits to one or more companies employing at least 200 people enabling increases in production and employment, and or to communities of at least 1,500 people		
Localised	Benefits to one or more companies employing less than 200 people directly, or to a single region or settlement with a total population less than 1,500 people		
Orange – undertake P50 / P90		Yellow – borderline, do not undertake P50 / P90	
White- do not undertake P50 / P90		Green- undertake P50 / P90 on sections not covered by funding under previous Murchison Highway project	

Table 14 Project recommendations for P50/P90 evaluation

Project	Beneficiaries		Time Frame	Cost	Relative Benefit	Recommendation and rationale
	Current	Future				
Road projects						
Corinna Rd and Western Explorer Rd: Seal and widen 21 km Corinna Road Savage River to Corinna and 75 km Western Explorer Rd Corinna to east of Couta Rocks	TAM, tourism	Shree Minerals, Grange Resources, tourism	SM	S-H	Medium	Do not undertake P50 / P90 Challenge is long length, very substantial cost and several beneficiary projects not yet at go ahead. Tasmanian Advanced Minerals - Additional 40 staff at Wynyard and up to an additional 5 personnel at Corinna mine site. - 10-20 years with exploration continuing. - 2 loads per day for 3 trucks (38t load). Shree Minerals - Exploration only. Mining licence process by early 2012. - Hematite 4-500,000 tpa; Magnetite 1,000,000 tpa; Grange Resources - Use of slurry pipeline by other mining companies. Tourism - Improved tourist routes to the west coast/Tarkine area. Tourists with hired vehicles will be able to use route (currently restricted by insurance conditions on unsealed road).
Cradle Mountain Development Rd: Widen and realign curves 47 km Cradle Mountain Development Rd, Moina to Murchison Hwy	Bass Metals, tourism	Frontier Resources, TNT	SM	S	Major	Borderline for P50 / P90 Substantial current and future mining beneficiaries; major tourism route; substantial general linking route. Future beneficiaries not yet at go ahead. Bass Metals - Currently 150 staff on site. Potential to increase to over 220 people. - Life of current ore body 3-4 years. Ten year plan for the site. - Potential significant gold/silver project in the future. Potential to extract lead and zinc from the tailings. Potential to mine remnants from Hellyer. - 390,000 tonne ore per year, processed on site. - $50 to $180 M to build a new processing plant for Gold/Silver. Frontier Resources - Stormont – 5km west of Cradle Mountain Link Road, 2 year life span. Minerals close to the surface and high grade. High probability of proceeding.

Project	Beneficiaries		Time Frame	Cost	Relative Benefit	Recommendation and rationale
	Current	Future				
						TNT (Mine Makers) - Ore deposit ~ 50 million tonne. Shipping would be ~ 1 million t/a. - Moina mine life between 10-20 years. Tourism - Major tourist route, providing access to Cradle Mountain
Macquarie Heads Rd: Seal 5 km Macquarie Heads Road, Strahan to aquaculture hub	MHAG, local population, tourism	MHAG expansions	S	L	Localised	Borderline for P50 / P90 Substantial benefit for aquaculture industry Recommend for West Coast Council / Proponent funding Offer assistance to Council for Roads to Recovery or similar project application
Murchison Hwy, Melba Flats to Zeehan Hwy: Upgrade 4 km Murchison Highway to meet HPV standards	CMT, Intec, West Coast residents, tourism,	Stellar Resources, TNT	S	L	Medium	Undertake P50 / P90 Substantial number of major project beneficiaries, broader improvements for residents and tourism. CMT - Produce 110,000 tonne/yr of concentrate (from 2.5-2.6 million t/yr of ore). - Employ approx 100 people as well as 100-150 contractors. At least 400-450 people are directly dependent on the operation. - Potential to increase output from 2.5- 3 million t/yr (110-140 kt/yr concentrate). - Mine life is 12-15 yrs. Intec - Extraction of zinc in Zeehan. - 1000 t/week to continue for ~ 18 months. Stellar Resources - Tin mining development near Zeehan. - Expected production in late 2014, with export of 10 – 15,000 tpa. - Life is expected to be 7 – 10 years, but subject to further prospecting and assessment. Tourism/residents - Safety improvements for drive in/drive out staff and residents. TNT – refer to projects above
Murchison Hwy, Melba Flats to Rosebery: Upgrade sections not	Intec, Bluestone, West Coast	Stellar Resources, TNT				Undertake P50 / P90 Intec- refer to Projects above Bluestone-

Project	Beneficiaries		Time Frame	Cost	Relative Benefit	Recommendation and rationale
	Current	Future				
covered by previous funding commitment.	residents, tourism,					- Renison Mine- 13,200 tpa tin concentrate and 6,000 tpa copper concentrate, 4 year mine life - Currently 250-300 employed - Planned rentails project- 14,000 tpa, 9 year life. Likely to proceed however timing uncertain. - Additional 140 staff will be required Stellar Resources- refer to Projects above TNT- refer to Projects above Tourism/residents - Safety improvements for drive in/drive out staff and residents.
Murchison Hwy, Rosebery to Anthony Main Rd: Upgrade sections not covered by previous funding commitment.	Intec, Bluestone, West Coast residents, tourism,	Stellar Resources, TNT				Undertake P50 / P90 Intec- refer to Projects above Bluestone- refer to Projects above Stellar Resources- refer to Projects above TNT- refer to Projects above Tourism/residents - Safety improvements for drive in/drive out staff and residents.
Murchison Hwy, Anthony Main Rd Cradle Mountain Development Rd: Upgrade sections not covered by previous funding commitment.	Intec, Bluestone, forestry, West Coast residents, tourism,	Stellar Resources, TNT, Venture Minerals				Undertake P50 / P90 Intec- refer to Projects above Bluestone- Refer to Projects above Stellar Resources- refer to Projects above TNT- refer to Projects above Tourism/residents - Safety improvements for drive in/drive out staff and residents.
Pieman Rd: Upgrade 35 km Pieman Road Mt Lindsay to Murchison Hwy to meet HPV standards		Venture Minerals	SM	M	Medium	Undertake P50 / P90 Highly prospective mineral deposit at Mt Lindsay, with tin, tungsten, magnetite and copper. Venture Minerals - Presently believe life 8 years based on exploration to date but could be 20 – 40 years. - Second biggest undeveloped tin deposit in the world. - Construction estimated at $162 m.

Project	Beneficiaries		Time Frame	Cost	Relative Benefit	Recommendation and rationale
	Current	Future				
						- Potential for tin, tungsten and copper concentrate ready to export by end 2013. Around 10,000 tpa - Around 200,000 tpa magnetite from 2013. - 1,000,000 magnetite DSO for 2 years, from 2013. - Likely 400 – 500 jobs during construction and 130 – 140 permanent. - Tullah as accommodation base.
Waratah Rd Widen, realign curves, seal shoulders, 44 km Waratah Road Murchison Hwy to Savage River	TAM, Grange Resources, tourism	Venture Minerals, Bright Phase	SM	S	Major	Borderline for P50 / P90 On hold until future tasks are certain Tasmanian Advanced Minerals – refer to Projects above Grange Resources - Savage River iron ore mine, concentrator, iron ore slurry pipeline to Port Latta. - Produces around 2.25 mtpa iron ore. - 450- bed camp with own catering, about 85% full. Employs 600. - Mine life to 2027. - 3 signed MOUs for others to supply ores or use Grange equipment. Venture Minerals - refer to Projects above Bright Phase - Former tin mine, copper and tin tailings and also more resources underground. - Work next ten years on tailings. - One 20t truck every two days - Two 20t trucks/day after 3-4 years. - First 4 years employ 30-40 people and up to 200 people after 4 years of the operation. - Mine life is around 15-20 years, however at the upper level could be 30-40 years.
Zeehan Highway, Anthony Main Rd to Murchison Highway: Upgrade 18km to meet HPV requirements	CMT, forestry, tourism, local population		SM	M	Medium	Undertake P50/P90 CMT- refer to Projects above Forestry - Route used to bypass Mt Black which is not HPV gazetted. Tourism/residents - Major gateway for tourists into the west coast. - Safety improvements for drive in/drive out staff and residents.

Project	Beneficiaries		Time Frame	Cost	Relative Benefit	Recommendation and rationale
	Current	Future				
Zeehan Highway, Murchison Highway to Zeehan: Upgrade 4.5km to meet HPV requirements	Intec, forestry, tourism, local population	Stellar Resources, TNT	SM	M	Medium	Undertake P50/P90 Intec- refer to Projects above Stellar Resources- refer to Projects above TNT- refer to Projects above Forestry - Route used to bypass Mt Black which is not HPV gazetted. Tourism/residents - Major gateway for tourists into the west coast.
Rail projects						
Rail loading facility Hampshire		Forward Mining Other mines	S	L-M	Medium	Do not undertake P50 / P90 assessment. Suggest private sector to fund if business case supports investment.
Melba Line – reduce landslip potential, welded track and address specific axle limit constraints	MMG, CMT	Bluestone, Forward Mining, TNT	M	H	Major	Undertake P50/P90 MMG - Zinc – 150,000 t/a; Lead – 40,000 t/a; Copper – 8,000 t/a. - Mine life currently 15 years and longer with other prospective resources. - Potential to be 1.5 times the output within ten years. - Rail – unreliable due to derailments, landslips and blockages. Rail loading terminal within MMG site. CMT - Refer to projects above. - Transport product by road to Melba Flats and then by rail to Burnie Port. Bluestone - Rail passes through the site but currently not used. - Mine life 4 years with proven reserves, 15 years with known resources. - Rentails project to reprocess tailings could produce 9 year life in itself. Will require 21,000 tpa coal which could be transported by rail. - Currently 250 – 300 people employed. Additional 140 expected to be required for rentails

Project	Beneficiaries		Time Frame	Cost	Relative Benefit	Recommendation and rationale
	Current	Future				
						project. TNT (Mine Makers) - Refer to projects above. - Potential to transport product to the Hellyer rail spur.
Other infrastructure projects						
Sewage and water connection Strahan to aquaculture hub	Petuna	Huon, Tassal	S	L	Localised	Do not undertake P50 / P90 Proponents / West Coast Council / Water authority - Proposal to expand the marine harbour leases to almost double the existing size. - New centralised facility for 3 aquaculture companies. - Would require water and sewage connection across harbour or landside. - The three operations in Strahan employ a total of around 70 staff. Expected to almost double from 70 to 130 in the region.
Centralised mineral processing site	Would require market demand study		M-L	M	Potentially major	Do not undertake P50 / P90 assessment. Very difficult to scope until market demand study completed – more a task for private proponents. Government support could be considered in response to specific proponent request.

6.3. P50 / P90 evaluation of proposals

Evans and Peck Best Practice for Cost Estimation for Publicly Funded Road and Rail Projects (commonly known as the P50-P90) was applied for each of the identified priority projects. The cost estimates include the following key components:

- A **Base Estimate** comprising the sum of Construction Costs and Client's Costs
- A **Contingency** allowance that is applied to the Base Estimate to reflect the required level of confidence with the estimate

The quantum of the contingency allowance included depends upon how much risk is 'insured for' in the estimate. The contingency allowance is expressed as a "P" or probability value, with P50 and P90 values typically used.

- P50 represents the project cost with sufficient risk provisions to provide a 50% level of confidence in the outcome, i.e. that there is a 50% likelihood that the project cost will not be exceeded.
- P90 represents the project cost with sufficient risk provisions to provide a 90% level of confidence in the outcome, i.e. that there is a 90% likelihood that the project cost will not be exceeded.

Risk components are generally categorised as 'inherent' and 'contingent' risks.

- Inherent risk relates to those items specifically identified within the various components of the Base Estimate and which will definitely contribute to project cost but where there remains uncertainty as to the accuracy or reliability of the amount in the Base Estimate. Risk can be applied to both the quantity and the rate used.
- Contingent risk relates to the risk attached to unmeasured items, i.e. those items not listed in the Base Estimate because they are unknown or loosely identified and they may not occur and thus may or may not contribute to project cost.

(Evans and Peck, 2011)

Outturn costs have not been included in reporting the P50/P90 analysis. Deriving outturn costs requires the following components:

- Annual **Cash Flow** estimates for each year of the project, derived from the Base Estimate plus Contingency based on the project timeframe
- **Escalation** that is applied to the Cash Flow and which takes account of increased costs for the period from the base date of the estimate to the completion of construction.

Because the projects are currently unfunded and have not been prioritised at a State level completion dates can not yet be estimated with any accuracy. This necessitates using the Base Estimate only at this stage.

6.3.1. Road Projects

6.3.1.1. HPV Requirements

Each identified road project involves upgrading to meet HPV standards. Standard Tasmanian requirements for pavement width, desirable distances between overtaking opportunities are shown in Table 15 and Table 16.

The AADTs on the identified roads are generally in the range of 500-2000. The requirements therefore include a 3m lane width and 1m shoulder width. The desirable maximum distance between overtaking opportunities is 30km.

- **Table 15 Tasmanian HPV Straight Road Width Requirements**

AADT	Road Surface	Trafficable Width	Lane Width	Shoulder Width	Comments
Industry only	Unsealed	5.5m	N/A	0.6m	60km/h feeder, very low traffic flows (60km/h refers only to ambient speed as likely these roads will fit into general rural speed limit, i.e. 100km/h
<2000	Unsealed	6.7m	N/A	1.0m	Mixed traffic, lower speeds.
150-2000	Sealed	N/A	3.0m	1.0m	Most roads assessed have these traffic levels
2000-6000	Sealed	N/A	3.0m	1.2m	
>6000	Sealed	N/A	3.25	1.2	

- **Table 16 Desirable distance between overtaking opportunities**

AADT	Average distance (km)	Maximum distance (km)
<100	N/A	N/A
100-500	30	50
500-1,000	15	30
1,000-2,000	8	10
>2,000	5	10

6.3.1.2. Scope of Works and Rates

Standard Scope of Works and unit costs used are shown in Table 17.

Table 17 Scope Categories and Rates

Name	Description	$ Total
a: Basic Widening	No crown adjustment and widening to both sides. Pavement overlay with 200mm base course, widening to 8m + 0.5 m of unsealed shoulders on each side. V Drains and removal of existing "french drains". 2 culverts per km.	519,138
b: Widen and strengthen pavement	As per basic widening, but with pavement strengthening included to the existing pavement.	632,888
c: Widening with sight benching	Crown adjustment (if there is one) and widening to one side including some sight benching. Pavement overlay with 200mm base course, widening to 8m + 0.5 m of unsealed shoulders on each side. V Drain on one side and removal of existing "french drains", assumed 2 culverts per km. Barriers required to ~20%	721,089
d: Widening with sight benching plus pavement strengthening	As per widening with sight benching but with pavement strengthening included to the existing pavement.	880,019
e: HC alignment	Realignment of the pavement to a greater horizontal radius. Due to the nature of the terrain, the requirement for horizontal realignment is mainly due to the ridge or valley of a hill getting in the way. Thus extensive earthworks are often required to accommodate the new alignment and associated sight benching. Barriers required for 50% of these sections, V drain on inside of curve and three culverts required per km.	1,398,763
f: VC alignment	Earthworks to fill in a "dip" or to excavate the crest off a hill. Due to the terrain, this work can involve substantial formation earthworks. Crests prioritised over dips and therefore only 10% of sections requiring barriers and 2 culverts required per km.	1,569,658
g: HC & VC alignment	Major formation earth works for revised horizontal and vertical alignment of pavement. Drainage V drains and 3 culverts per km. 30% requiring barrier on one side	1,772,738
h: Climbing lane suitable terrain	Additional lane, widening existing pavement. Terrain suitable for additional lane, cut to fill not excessive. 3 culverts / km, V drains. No barriers	1,273,983
i: Climbing Lane undulating terrain (includes acceleration lane at intersection)	Lane widening and introduction of additional lane. Terrain requiring considerable cut to fill. 3 culverts per km and V drains. 20% of section requiring barriers	1,582,748
j: Intersection	Intersections requiring better definition, turn out lanes and accelerations lanes. No ITS, barriers included	870,810
k: Bridge transition	Barriers required at bridge transitions	680,907
l: Basic widening to 7.0m wide pavement	Basic widening from 7.0m to 8.0m wide	359,266
m: Strengthen and seal shoulder	Increase the width of shoulder by 750mm, and 0.5m unsealed shoulder	274,295
n: Sight benching only	Carry out clearing and grubbing and excavation on inside of curve to provide enhanced sight distance	110,549
o: Seal shoulder and sight bench	Increase the width of shoulder by 750mm, and 0.5m unsealed shoulder, and carry out sight benching	411,339

Broad categories were developed to define the scope of works required for the road projects. For each project, the road corridor was broken down into sections with each allocated a category for the required works in that section. Per km rates were applied to each category.

In the absence of relevant historical per km rates, actual costs were worked up from first principals. The categories used and the final rates applied for each category are shown in Table 17.

6.3.1.3. Contingent Risks

Contingent risk relates to the risk attached to unmeasured items, i.e. those items not listed in the Base Estimate because they are unknown or loosely identified and they may not occur and thus may or may not contribute to project cost (Evans and Peck, 2011). The contingent risks associated with the road upgrades are:

- Unforeseen geotechnical issues
- Project held up in approval for political reasons
- Construction activities interrupted by mining activities
- Unavailability of road construction materials
- Unforeseen requirements for diversion roads
- Unforeseen geotechnical stabilisation requirements (inc. Drainage)
- Adverse weather
- Unforeseen foundations issues with bridges
- Skilled labourer issues
- Access to site and accommodation issues
- Project scoping issues and litigation
- Project timeline exceeded
- Material quality issues
- Unforeseen bridge (superstructure) strengthening requirements
- Unforeseen flora and fauna issues
- Unforeseen heritage issues
- Complications with land acquisition
- Unforeseen underground service locations
- Market pressures due to other projects.

6.3.1.4. Murchison Hwy, Zeehan Hwy to Rosebery – upgrade to HPV standards

Project definition

This section combines upgrades to the Murchison Highway between the Zeehan Highway and Melba Flats and between Melba Flats and Rosebery. These upgrades are expected to occur concurrently and consequently have been combined in one cost estimate. The project will see 23 km of the Murchison Highway upgraded to meet Tasmania HPV standards.

The scope of works between Rosebery and Melba Flats was determined as part of the Murchison Highway Project in 2011. The scope of works required for this section is included in Appendix D.

The existing road condition and required upgrades for the section between Melba Flats and the Zeehan Highway are detailed in Table 18. Widening and strengthening is required along the length of the road section.

- **Table 18 Murchison Highway, Zeehan Highway to Melba Flats, Existing Condition and Required Upgrades**

Length (m)	Comments	Existing Road Width (m)	Gradients	Type of upgrade	$ Cost/ km	$ Total
4590	Pavement showing signs of wear with grooves and worn surface in high traffic areas. 4 areas with pavement repairs 2 to 4 metres in length. 4 short sections with rock walls on one side of the road on corners. Relatively flat with gentle horizontal curves. The sight distance could be improved on a few corners. Small bridge over Leslie Creek at the start of section. White lines on edge for 95% of length. 3-5 telegraphy poles will need to be relocated.	6.0-7.0	Average Slope 3%. Max Slope 13%	b: Widen and strengthen pavement	632,888	2,904,956

P50 / P90 cost estimation

Details of the P50/P90 cost estimation for the Murchison Highway, between the Zeehan Highway and Rosebery, are shown in Table 19. The base estimates (plus contingency) are:

- P50: $26,694,010
- P90: $30,687,120

Table 19 Murchison Highway, Zeehan Highway to Rosebery, P50/P90 Cost Estimates

Description	Base Estimate				
	Unit	Billed Qty	$ Net Rate	$ Net amount	
Concept Development					
Project initiation, strategic initiation	item	1	15,000	15,000	
Engineering Survey	item	1	380,000	380,000	
Project Identification Services (desk top studies)	item	1	120,000	120,000	
Concept Design	item	1	130,000	130,000	
Project Scoping Services including PPR	item	1	80,000	80,000	
Subtotal Concept Development				725,000	
Detail Design and Documentation					
Site investigations including geotechnical, Flora and Fauna, and Heritage	item	1	240,000	240,000	
Detail Design and Design report	item	1	550,000	550,000	
DIER Project Management Time billing	item	1	60,000	60,000	
Subtotal Detail Design and Documentation				850,000	
Contract Administration					
Contract Administration cost per year	years	2.0	525,000	1,050,000	
DIER Project Management Time billing	years	2.0	120,000	240,000	
Insurances	%	17,218,840	0	63,417	
Professional Services (Legal)	item	1.0	25,000	25,000	
Subtotal Contract Administration				1,378,417	
Total Owners Costs				2,953,417	
Construction					
b: Widen and strengthen pavement	/km	18.8	632,888	11,904,623	
f: VC alignment	/km	0.3	1,569,658	486,594	
d: Widening with sight benching plus pavement strengthening	/km	2.6	880,019	2,296,851	
e: HC alignment	/km	0.4	1,398,763	573,493	
g: HC & VC alignment	/km	0.5	1,772,738	957,279	
Service relocations	Item	1	1,000,000	1,000,000	
Total Construction Costs (TCC)				17,218,840	
Base Estimate (Owners Cost + Construction Cost)				20,172,257	
				P50	P90
Inherent risk allowance				1,247,256	3,501,324
Contingent risk allowance				5,274,497	7,013,539
Base Estimate + Contingency (Inherent + Contingent)				26,694,010	30,687,120

6.3.1.5. Murchison Hwy, Rosebery to Anthony Main Rd (Mt Black)

Project definition

Upgrades to the Murchison Highway over Mt Black were assessed as part of the Murchison Highway Project in 2011. The required upgrades included pavement stabilisation, curve realignment and installation of a number of pullover bays. Due to the challenging nature of the terrain, this section will not be upgraded to meet HPV standards. The required scope of works for this section is included in Appendix D.

P50 / P90 cost estimation

The results of the P50/P90 cost estimate are detailed in Table 20. The base estimates (plus contingency) are:

- P50: $5,515,656
- P90: $6,323,311

This project is currently in design phase and will be constructed within the next couple of years.

Table 20 Murchison Highway, Rosebery to Anthony Main Road, P50/P90 Cost Estimates

Description	Base Estimate				
	Unit	Billed Qty	$ Net Rate	$ Net amount	
Project Scoping and Development (Incl. Detailed design)					
Consultant project scoping phase activities (engineering survey, concept design and site investigations)	item	1.00	120,000	120,000	
Consultant project development phase activities (detailed design, Tender documentation)	item	1.00	130,000	130,000	
DIER Project Management Scoping to Development	item	1.00	75,000	75,000	
Subtotal Detail Design and Documentation				325,000	
Contract Administration					
DIER Project Management Delivery Phase cost per annum	years	0.50	150,000	75,000	
Contract Admin costs per annum	years	0.50	1,137,600	568,800	
Insurances	%	3.61E+06	0	14,079	
Professional Services (Legal)	item	1.00	5,000	5,000	
Subtotal Contract Administration				662,879	
Total Owners Costs				987,879	
Construction					
A: Pavement stabilisation	/km	0.33	475,150	156,799	
B: Pavement stabilisation and drainage assessment	/km	0.19	511,150	97,119	
C: Horizontal curve realignment	/km	1.21	1,843,820	2,231,022	
D: Southbound pullover bay	/km	0.38	768,671	292,095	
E: Northbound pullover bay	/km	-	768,671	0	
F: Southbound climbing lane	/km	0.23	1,483,748	341,262	
G: Northbound climbing lane	/km	0.32	1,310,748	419,439	
H: Northbound pullover bay with lengthening and widening	/km	0.09	803,278	72,295	
Total Construction Costs (TCC)				3,610,031	
Base Estimate (Owners Cost + Construction Cost)				4,597,910	
				P50	P90
Contingency - Inherent and Contingent risk				917,746	1,725,401
Base Estimate + Contingency (Inherent + Contingent)				5,515,656	6,323,311

6.3.1.6. Murchison Hwy, Anthony Main Road to Cradle Mountain Development Road – upgrade remaining sections to HPV standards

Project definition

This section of road was assessed as part of the Murchison Highway Project in 2011. This project covers the remaining upgrades which were not covered under the initial funding. The scope of works includes widening and pavement strengthening as well as sight benching and curve realignment at specific locations. The required scope of works for this section is included in Appendix D.

P50 / P90 cost estimation

Details of the P50/P90 cost estimation are shown in Table 21. The base estimates (plus contingency) are:

- P50: $14,754,415
- P90: $16,628,723

Table 21 Murchison Highway, Anthony Main Road to Cradle Mountain Development Road, P50/P90 Cost Estimates

Description	Base Estimate				
	Unit	Billed Qty	$ Net Rate	$ Net amount	
Concept Development					
Project initiation, strategic initiation	item	1	5,000	5,000	
Engineering Survey	item	1	150,000	150,000	
Project Identification Services (desk top studies)	item	1	60,000	60,000	
Concept Design	item	1	60,000	60,000	
Project Scoping Services including PPR	item	1	80,000	80,000	
Subtotal Concept Development				355,000	
Detail Design and Documentation					
Site investigations including geotechnical, Flora and Fauna, and Heritage	item	1	150,000	150,000	
Detail Design and Design report	item	1	350,000	350,000	
DIER Project Management Time billing	item	1	60,000	60,000	
Subtotal Detail Design and Documentation				560,000	
Contract Administration					
Contract Administration cost per year	years	1.8	250,000	450,000	
DIER Project Management Time billing	years	1.5	60,000	90,000	
Insurances	%	10,290,811	0.37%	37,901	
Professional Services (Legal)	item	1.0	25,000	25,000	
Subtotal Contract Administration				602,901	
Total Owners Costs				1,517,901	
Construction					
b: Widen and strengthen pavement	/km	8.7	632,888	5,487,139	
c: Widening with sight benching	/km	4.3	721,089	3,079,052	
e: HC alignment	/km	-	1,398,763	-	
f: VC alignment	/km	0.2	1,569,658	235,449	
l: basic widening to 7.0m wide sections of pavement	/km	3.3	359,266	1,189,171	
Service relocations	Item	1	300,000	300,000	
				-	
Total Construction Costs (TCC)				10,290,811	
Base Estimate (Owners Cost + Construction Cost)				11,808,712	
				P50	P90
Inherent risk allowance				709,605	1,918,419
Contingent risk allowance				2,236,098	2,901,592
Base Estimate + Contingency (Inherent + Contingent)				14,754,415	16,628,723

6.3.2. Pieman Rd – upgrade to HPV standards

Project definition

This project involves upgrading 35 km of the Pieman Road, between Venture Minerals' site at Mt Lindsay and the Murchison Highway, to meet Tasmanian HPV standards. This road is expected to carry a significant HPV task with the development of the Venture Minerals' project.

Table 22 details the existing condition of the road and the required upgrades. The table begins at the Murchison Highway and ends at Mt Lindsay. Widening is required along the extent of the road, with some curve realignment, sight benching and pavement strengthening also required.

P50 / P90 cost estimation

Details of the P50 / P90 cost estimation are shown in Table 23. The base estimates (plus contingency) are:

- P50: $ 62,425,131
- P90: $ 72,159,765

Table 22 Pieman Road Existing Condition and Required Upgrades

Length (m)	Comments	Existing Road Width (m)	Gradients	Type of upgrade	$Cost/ km	$ Total
1390	Section begins at the Murchison Highway. Pavement generally in good condition. Limited corners. Mainly grass or no shoulder. Some gravel shoulders. Mostly good site distances.	5.2-5.8	Average Slope 2.8%. Max Slope 5.6%	b: Widen and strengthen pavement	632,888	879,714
2120	Pavement generally in good condition. Limited corners. Mainly grass and gravel shoulders. Mostly good site distances. 2 x 100 metre sections with barriers. One section of 100 metres with telegraph poles within 1-1.5 metres of existing pavement.	5.2-5.6	Average Slope 5.5%. Max Slope 15%	b: Widen and strengthen pavement	632,888	1,341,723
4940	Cracked edges of pavements and some repairs for 20% of length (approx. 1000 m). Sections with no line markings. Many steep corners with poor site distance. A few corners marked 25km/h. Mainly corners and cuttings with rock walls within 1.0- 2.5 metres of the existing pavement. This rock material is likely to be hard based on the geology. 9 sections of barriers totalling 2450 metres. Areas with large drop-offs. One landslip evident based on Feb 2008 photos and one section with 100 metres of concrete retaining wall where a previous landslip occurred. Steep gradients. One T44 bridge with poor approaches on a corner and drop-off one side before the bridge.	5.2-5.8	Average Slope 8.4% Max Slope Approximately 20-25%	e: HC alignment	1,398,763	6,909,890
765	Road narrows in this section. Pavement is in relatively poor condition with a number of repairs. One 45 km/h corner.	5.0-5.4	Average slope 9% Max Slope Approx. 20-25%	c: Widening with sight benching	721,089	551,633
2800	A few pavement repairs. Only one steep corner (45km/h). Mostly straight.	5.2-5.6	Average slope 4% Max Slope Approx. 15%	b: Widen and strengthen pavement	632,888	1,772,086
8900	A few pavement repairs and small sections with edge cracking. 4 steep corners (25-45 km/h) with relatively poor sight distances. Approximately 1000 metres of barriers in total for 5 sections. One section near the bridge is both sides of the road. Very few areas of rock. T44 Bridge with concrete surface that appears to be in good condition.	5.2-5.6	Average Slope 4.4% Max Slope Approx. 17%	e: HC alignment	1,398,763	12,448,992

Length (m)	Comments	Existing Road Width (m)	Gradients	Type of upgrade	$Cost/ km	$ Total
1970	Two small areas with existing pavement repairs. Mostly straight.	5.2-5.8	Average slope 3.7% Max Slope Approx. 11%	d: Widening with sight benching plus pavement strengthening	880,019	1,733,638
10100	Mainly areas with minor pavement flaws. Some cracked edges and a few areas with pavement repairs. Many steep corners 35-45 km/h with poor sight distances. 19 sections of barrier with two of them both sides of the road for a total of 2040 metres of barrier. In a number of locations rock cuttings with step rock walls near the edge of the road exist on one side with drop offs on the other side (within 1 -2.5 metres of the existing pavement). Large T44 Bridge over the Wilson River with concrete surface that appears to be in good condition. Two sections are very steep.	5.2-5.8	Average Slope 6.4 % Max Slope Approx. 20%	g: HC & VC alignment	1,772,738	17,904,656
2100	Mainly straight section with limited sharp corners. Rock cuttings with 1-2 metres of the road in 4 places. In general good site distances. One T44 Bridge with reasonable approaches. Occasional pavement repair	5.2-5.8		d: Widening with sight benching plus pavement strengthening	880,019	1,848,041

Table 23 Pieman Road P50/P90 Cost Estimates

Description	Base Estimate				
	Unit	Billed Qty	$ Net Rate	$ Net amount	
Concept Development					
Project initiation, strategic initiation	item	1	15,000	15,000	
Engineering Survey	item	1	400,000	400,000	
Project Identification Services (desk top studies)	item	1	120,000	120,000	
Concept Design	item	1	150,000	150,000	
Project Scoping Services including PPR	item	1	80,000	80,000	
Subtotal Concept Development				765,000	
Detail Design and Documentation					
Site investigations including geotechnical, Flora and Fauna, and Heritage	item	1	260,000	260,000	
Detail Design and Design report	item	1	600,000	600,000	
DIER Project Management Time billing	item	1	60,000	60,000	
Subtotal Detail Design and Documentation				920,000	
Contract Administration					
Contract Administration cost per year	years	2.5	525,000	1,312,500	
DIER Project Management Time billing	years	2.5	150,000	375,000	
Insurances	%	46,090,374	0.37%	169,751	
Professional Services (Legal)	item	1.0	25,000	25,000	
Subtotal Contract Administration				1,882,251	
Total Owners Costs				3,567,251	
Construction					
b: Widen and strengthen pavement	/km	6	632,888	3,993,523	
c: Widening with sight benching	/km	1	721,089	551,633	
d: Widening with sight benching plus pavement strengthening	/km	4	880,019	3,581,679	
e: HC alignment	/km	14	1,398,763	19,358,883	
g: HC & VC alignment	/km	10	1,772,738	17,904,656	
Service relocations	Item	2	350,000	700,000	
Total Construction Costs (TCC)				46,090,374	
Base Estimate (Owners Cost + Construction Cost)				49,657,625	
				P50	P90
Inherent risk allowance				3,976,677	10,812,908
Contingent risk allowance				8,790,829	11,689,231
Base Estimate + Contingency (Inherent + Contingent)				62,425,131	72,159,765

6.3.2.1. Zeehan Highway, Anthony Main Road to Murchison Highway

Project definition

This project involves upgrading 18 km of the Zeehan Highway, between Anthony Main Road and the Murchison Highway, to meet Tasmanian HPV standards. The road is part of the route used by HPVs to transfer product from Queenstown to Melba Flats.

The existing road condition and required upgrades are detailed in Table 24. The table begins at the Anthony Main Road and ends at the Murchison Highway. Widening is required along the extent of the road, with some curve realignment and sight benching also required.

P50 / P90 cost estimates

Details of the P50/ P90 cost estimation are shown in Table 25. The base estimates (plus contingency) are:

- P50: $ 26,735,989
- P90: $ 29,985,393

Table 24 Zeehan Highway, Anthony Main Road to Murchison Highway, Existing Condition and Required Upgrades

Length	Comments	Existing Road Width (m)	Gradients	Type of upgrade	$Cost/ km	Total
2560	Section begins at Anthony Main Road. Pavement in relatively poor condition with many repairs, worn sections and broken edges. 5 severe horizontal curves from 45 to 65 km/h. 200 metres of barriers in three sections. Shoulders 0.5 to 1 metre wide unsealed. Rock walls within 1.5 metres of existing pavement on two corners. One area with drop-off past barrier. Poor sight distances on corners and frequently changing grades. No edge lines.	6.0-7.0	Average Slope 8%. Max Slope Approx. 15%	g: HC & VC alignment	1,772,738	4,538,2010
1000	Pavement in relatively good condition. 2 severe horizontal curves (65 and 45 km/h) with rock within 1.5 metres from existing pavement on both. Rock walls on one side for 100 metres of section. Shoulders gravel and normally 0.5 to 0.75 metres wide. Large Bridge at start of section in relatively good condition. Poor site distances on corners. No edge lines.	5.8-6.0	Average Slope 5%. Max Slope approx. 13%	c: Widening with sight benching	721,089	721,089
1530	Pavement in relatively good condition with a few minor repairs and some broken edges. Long straight section with no curves. Shoulder 0.5 to 1.0 metres. One crest with poor site distances. No edge lines.	5.8-6.0	Average Slope 3%. Max Slope approx. 10%	a: Basic Widening	519,138	794,281
3680	Pavement in good condition. 5 severe horizontal curves, 55 to 65 km/h with relatively poor site distances. Short sections with rock walls within 1.5 metres of existing pavement. Very small bridge over Ewart Creek with 3 metre lanes and 0.5 metre shoulders in good condition. Frequently changing grades. No edge lines.	5.8-6.0	Average Slope 4%. Max Slope Approx. 12%	e: HC alignment	1,398,763	5,147,449
6560	75% of section has pavement edge repairs. Only one severe horizontal curve, 55 km/h. Short sections where rock walls are within 1.5 metre of the existing pavement on one side only (in 4 sections mostly on corners). Pavement narrower for most of this section. 3 small bridges. No edge lines.	5.6-5.8	Average Slope 4%. Max Slope Approx. 15%	d: Widening with sight benching plus pavement strengthening	880,019	5,772,928
2800	Pavement in good condition except for 6 small repairs (approx. 1-6 metres in length). No severe horizontal curves, all curves with relatively good sight distances. One small bridge near Murchison Hwy intersection. No edge lines.	5.8-6.0	Average Slope 2.4%. Max Slope 11%	b: Widen and strengthen pavement	632,888	1,772,086

Table 25 Zeehan Highway, Anthony Main Road to Murchison Highway, P50/P90 Cost Estimates

Description	Base Estimate				
	Unit	Billed Qty	Net Rate	Net amount	
Concept Development					
Project initiation, strategic initiation	item	1	15,000	15,000	
Engineering Survey	item	1	300,000	300,000	
Project Identification Services (desk top studies)	item	1	120,000	120,000	
Concept Design	item	1	100,000	100,000	
Project Scoping Services including PPR	item	1	80,000	80,000	
Subtotal Concept Development				615,000	
Detail Design and Documentation					
Site investigations including geotechnical, Flora and Fauna, and Heritage	item	1	200,000	200,000	
Detail Design and Design report	item	1	500,000	500,000	
DIER Project Management Time billing	item	1	60,000	60,000	
Subtotal Detail Design and Documentation				760,000	
Contract Administration					
Contract Administration cost per year	years	2.0	525,000	1,050,000	
DIER Project Management Time billing	years	2.0	100,000	200,000	
Insurances	%	20,223,717	0	74,484	
Professional Services (Legal)	item	1.0	25,000	25,000	
Subtotal Contract Administration				1,349,484	
Total Owners Costs				2,724,484	
Construction					
a: Basic Widening	/km	1.5	519,138	794,281	
b: Widen and strengthen pavement	/km	2.8	632,888	1,772,086	
d: Widening with sight benching plus pavement strengthening	/km	6.6	880,019	5,772,928	
e: HC alignment	/km	4.7	1,398,763	6,546,212	
g: HC & VC alignment	/km	2.6	1,772,738	4,538,210	
Service relocations	Item	2	400,000	800,000	
Total Construction Costs (TCC)				20,223,717	
Base Estimate (Owners Cost + Construction Cost)				22,948,201	
				P50	P90
Inherent risk allowance				857,512	3,140,782
Contingent risk allowance				2,930,276	3,896,410
Base Estimate + Contingency (Inherent + Contingent)				26,735,989	29,985,393

6.3.2.2. Zeehan Highway, Murchison Highway to Zeehan

Project definition

This project involves upgrading 4.5 km of the Zeehan Highway, between the Murchison Highway and Zeehan, to meet Tasmanian HPV standards.

The existing road condition and required upgrades are detailed in Table 26. The table begins at the Murchison Highway and ends at Zeehan. Widening is required along the extent of the road, with some sight benching and pavement strengthening also required.

P50 / P90 assessment reports

Details of the P50 and P90 cost estimation are shown in Table 27. The base estimates (plus contingency) are:

- P50: $6,571,189
- P90: $7,581,948

Table 26 Zeehan Highway, Murchison Highway to Zeehan, Existing Condition and Required Upgrades

Length	Comments	Existing Road Width (m)	Gradients	Type of upgrade	$ Cost/ km	$ Total
1110	Pavement show wear in a few sections and a number of areas have edge repairs. 2 horizontal curves that are 65 km/h. Small Bridge over Leslie Creek. Shoulders quite narrow in a few sections (less than 0.5 metres). Rock wall on one of 65 km/h corners within 1 metre of existing pavement.	5.6-5.8	Average Slope 2.9%. Max Slope 11%	a: Basic Widening	519,138	576,243
3540	Pavement edge repairs for 80% of the section, some quite extensive. Relative flat with few horizontal curves.	5.6-5.8	Average Slope 1.1%. Max Slope 8%	d: Widening with sight benching plus pavement strengthening	880,019	3,115,269

Table 27 Zeehan Highway, Murchison Highway to Zeehan, P50/P90 Cost Estimates

Description	Base Estimate				
	Unit	Billed Qty	$ Net Rate	$ Net amount	
Concept Development					
Project initiation, strategic initiation	item	1	5,000	5,000	
Engineering Survey	item	1	150,000	150,000	
Project Identification Services (desk top studies)	item	1	60,000	60,000	
Concept Design	item	1	60,000	60,000	
Project Scoping Services including PPR	item	1	80,000	80,000	
Subtotal Concept Development				355,000	
Detail Design and Documentation					
Site investigations including geotechnical, Flora and Fauna, and Heritage	item	1	150,000	150,000	
Detail Design and Design report	item	1	350,000	3500,00	
DIER Project Management Time billing	item	1	60,000	60,000	
Subtotal Detail Design and Documentation				560,000	
Contract Administration					
Contract Administration cost per year	years	1.8	250,000	450,000	
DIER Project Management Time billing	years	1.5	60,000	90,000	
Insurances	%	3,517,245	0	12,954	
Professional Services (Legal)	item	1.0	25000	25,000	
Subtotal Contract Administration				577,954	
Total Owners Costs				1,492,954	
Construction					
b: Widen and strengthen pavement	/km	3.5	632,888	2,240,424	
c: Widening with sight benching	/km	-	721,089	0	
d: Widening with sight benching plus pavement strengthening	/km	1.1	880,019	976,822	
e: HC alignment	/km	-	1,398,763	0	
g: HC & VC alignment	/km	-	1,772,738	0	
Service relocations	Item	1	300,000	300,000	
				0	
Total Construction Costs (TCC)				3517245	
Base Estimate (Owners Cost + Construction Cost)				5010199	
				P50	P90
Inherent risk allowance				305,158	901,858
Contingent risk allowance				1,255,833	1,669,890
Base Estimate + Contingency (Inherent + Contingent)				6,571,189	7,581,948

6.3.3. Melba Rail Line – Upgrade to increase axle limit, reliability and efficiency

Project definition

There are many levels and standards of upgrades which could be undertaken to increase the axle load limit, reliability and operational efficiency of the Melba rail line. Greater increases in performance will come with substantially (even exponentially) increasing cost. The critical issues in defining an upgrade project that will bring the best benefit : cost ratio outcome include:

- Demand for rail freight movements at current and achievable freight rate pricing points
- Existing major infrastructure items that impose specific limits that would be extremely expensive to increase or remove (e.g. major bridges)
- Operational performance issues that impose step changes in efficiency levels (e.g. reducing transit time to enable an additional return trip per day).

The project defined and assessed below has been structured to achieve the following:

- Axle load limit of 21 t. The issue of potential axle load limit increases, and costs to achieve them are complicated and can be difficult to resolve definitively without specific structural investigations, which were beyond the scope and available timeline of this project. Obviously there is a trade off in terms of greater rail system capacity achieved, but with increasing associated costs. It was concluded in discussions with TasRail engineering staff that increases from the current 16 t limit on Melba line beyond 20 or 21 t were increasingly likely to lead to a need to replace major bridges with very substantial costs. 21 t was selected as the target limit as it was felt to provide a worthwhile capacity increase (31.25%) without major risk of breaching limits which would require major expenditure on bridge replacement.
- Loading profile clearances consistent with the rest of the TasRail network
- Round trip times Burnie – Melba Flats or Rosebery – Burnie less than 10 hours, permitting two return trips per trainset per day
- Trains of 460 m (25 x 15 m wagons + 3 x 20 m locos).

P50 / P90 cost estimation

The rates applied to each component of the works are shown in Table 28.

- **Table 28 Melba Line Upgrades Rates**

Description	Unit	$ Rate	Notes
Concept Development			
Project initiation, strategic initiation	item	15,000	High level cost estimates, objectives and outcomes
Engineering Survey	item	500,000	Engineering survey of the line including bridge survey
Project Identification Services (desk top studies)	item	120,000	Detailed scoping statement following objectives and project outcomes

Description	Unit	$ Rate	Notes
Concept Design	item	120,000	High level concept design
Project Scoping Services including PPR	item	120,000	Federal govt. / State govt. submissions for funding based on high level project scope
Detail Design and Documentation			
Site investigations including geotechnical, Flora and Fauna, and Heritage	item	180,000	Investigations and reports
Detail design, including bridge design, geotechnical solutions, formation and rail design	item	450,000	Preliminary designs, followed by detailed designs of the track, including bridges
TasRail Project Management Scoping to Development	item	120,000	Project sponsor costs associated with project pre-planning
Contract Administration			
Contract Administration cost per year	item	525,000	Superintendent, supers representative, QA, safety and environmental services
TasRail Project Management Delivery Phase costs per year	item	180,000	Administration of contract administration
Insurances	%	0.3683%	% of TCC
Professional Services (Legal)	item	25,000	Contract drafting, procurement contracts
Construction			
Track works, formation acceptable	/km	176,000	Removal of ballast, cleaning, replacement including topping up as required, reshaping, re-compacting and placement of geofabric, clear and upgrade drainage on formation as required. Production rate = 1 manhour per sleeper, crew average 1km per fortnight. 6-8 hours productivity per day. Typical crew consists of 15 men, 2 high rail excavators, 2 high rail trucks and one track jack and tamping machine
Track works, formation acceptable - difficult access and terrain	/km	250,000	Removal of ballast, cleaning, replacement including topping up as required, reshaping, re-compacting and placement of geofabric, clear and upgrade drainage on formation as required. Difficult terrain restricting access, and therefore production rates.
Track works, formation strengthening - difficult access and terrain	/km	350,000	Removal of ballast, cleaning, replacement including topping up as required, removal unsuitable material, fill with suitable material, reshaping, re-compacting and placement of geofabric, clear and upgrade drainage on formation as required. Production rates equate to 1km per month.
Track formation stabilisation - unsuitable material and difficult terrain	/km	1,000,000	Removal of ballast, cleaning, replacement including topping up as required, removal unsuitable material, fill with suitable material, geotechnical stabilisation, reshaping, re-compacting and placement of geofabric, clear and upgrade drainage as required.
Track realignment, underpinning, difficult terrain, temporary works	/km	5,000,000	There is a location where wagons have derailed and are unrecoverable. Realign road into side of cutting, or underpin on outside of curve. $1m rate as estimated by R. Walpole of TasRail
Provision of new ballast	/m3	25	New ballast $20 per m3 purchase, $5 per m3 delivery
Concrete re-sleepering, procurement and delivery track side	/km	250,000	Concrete sleepers @ $105 each, 1460 sleepers / km (683mm between sleeper centres).
Supply 47 kg rail and tracklok type clips	/km	295,000	Second hand rail available at 1/3 of new price. 47 kg rail. Weld 66% on installation, and weld remainder 2-3 years later.
Weld remaining 33% of rail 2-3 years after installation	/km	25,000	This covers welding only. Survey prior to welding required to identify scope - 100% welding may not be required offsetting the cost of the survey.
Re-transoming bridges	/km	1,000,000	Timber transom replacement on bridges requiring deck

Description	Unit	$ Rate	Notes
			strengthening
Major bridge strengthening works	No.	50,000	Bridges requiring foundation and support strengthening.
Landslip stabilisation	/km	34,000	Landslip stabilisation costed as major earthworks - cut to fill @ $19 / m3
Devegetation clearing	item	45,000	Devegetation of areas prone to cause problems on line - consultancy study
Allowances for temporary track and facilities to minimise track closure for revenue services	year	65,000	Separate allowances for specific work sites / tasks

The contingent risks associated with the works are listed in Table 29. The major risks identified for this project include:

- Unforeseen geotechnical issues
- Alternative concrete sleeper supplier required
- Alternative rail supplier required
- New grade separated crossings required

Table 29 Melba Line Upgrades Contingent Risks

Description	Likelihood of occurring				Consequence of occurring			Allowance	
	Min	ML	Max	Mean	$ Min Value	$ ML Value	$ Max Value	$ Cost if occurs	$ Mean output
Unforseen geotechnical issues	0%	75%	90%	65%	250,000	3,000,000	12,000,000	4,041,667	2,627,083
Train schedules interrupt construction activities	0%	80%	95%	69%	25,000	120,000	900,000	234,167	161,965
Delay in supply of rail	0%	75%	90%	65%	5,000	15,000	250,000	52,500	34,125
Alternative rail supplier required	0%	40%	60%	37%	50,000	6,000,000	12,000,000	6,008,333	2,203,056
Alternative concrete sleeper supplier required	0%	40%	60%	37%	3,000,000	5,000,000	12,000,000	5,833,333	2,138,889
Hi rail availability issues	0%	60%	75%	53%	200,000	250,000	750,000	325,000	170,625
Adverse weather	0%	50%	75%	46%	10,000	250,000	750,000	293,333	134,444
Unforseen foundations issues with bridges	0%	20%	30%	18%	10,000	600,000	4,000,000	1,068,333	195,861
Skilled labourer issues	0%	20%	30%	18%	50,000	250,000	6,000,000	1,175,000	215,417
Access to site and accommodation issues	0%	30%	60%	30%	1,500,000	2,000,000	4,000,000	2,250,000	675,000
Project scoping issues and litigation	0%	15%	35%	16%	40,000	250,000	3,500,000	756,667	119,806
Project timeline exceeded	0%	20%	30%	18%	600,000	750,000	3,500,000	1,183,333	216,944
Material quality issues	0%	10%	20%	10%	12,000	600,000	1,200,000	602,000	60,200
Unforseen bridge strengthening requirements	0%	10%	20%	10%	5,000	400,000	4,000,000	934,167	93,417
Unforseen bridge transom replacement	0%	10%	20%	10%	500,000	750,000	2,000,000	916,667	91,667
Tippler upgrade required	0%	25%	50%	25%	200,000	600,000	4,000,000	1,100,000	275,000
New grade separation required	0%	25%	50%	25%	3,000,000	5,000,000	8,000,000	5,166,667	1,291,667
Loss of revenue due to construction activities	0%	40%	80%	40%	400,000	960,000	2,400,000	1,106,667	442,667
Additional Level crossings required	0%	50%	70%	45%	500,000	1,000,000	2,000,000	1,083,333	487,500
								P50	11,430,053.05
								P90	14,297,254.67

Details of the P50/P90 cost estimation are shown in Table 30. The base estimates (plus contingency) are:

- P50: $118,421,795
- P90: $132,432,988

Table 30 Melba Line P50/P90 Cost Estimates

Description	Base Estimate			
	Unit	Billed Qty	$ Net Rate	$ Net amount
Concept Development				
Project initiation, strategic initiation	item	1	15,000	15,000
Engineering Survey	item	1	500,000	500,000
Project Identification Services (desk top studies)	item	1	120,000	120,000
Concept Design	item	1	120,000	120,000
Project Scoping Services including PPR	item	1	120,000	120,000
Subtotal Concept Development				875,000
Detail Design and Documentation				
Site investigations including geotechnical, Flora and Fauna, and Heritage	item	1	180,000	180,000
Detail design, including bridge design, geotechnical solutions, formation and rail design	item	1	450,000	450,000
TasRail Project Management Scoping to Development	item	1	120,000	120,000
Subtotal Detail Design and Documentation				750,000
Contract Administration				
Contract Administration cost per year	years	4.0	525,000	2,100,000
TasRail Project Management Delivery Phase costs per year	years	4.0	180,000	720,000
Insurances	%	92,156,000	0.37%	339,411
Professional Services (Legal)	item	1.0	25,000	25,000
Subtotal Contract Administration				3,184,411
Total Owners Costs				4,809,411
Construction				
Track works, formation acceptable	/km	64	176,000	11,264,000
Track works, formation acceptable - difficult access and terrain	/km	14	250,000	3,500,000
Track works, formation strengthening - difficult access and terrain	/km	50	350,000	17,500,000
Track formation stabilisation - unsuitable	/km			

Description	Base Estimate				
	Unit	Billed Qty	$ Net Rate	$ Net amount	
material and difficult terrain		2	1,000,000	2,000,000	
Track realignment, underpinning, difficult terrain, temporary works	/km	0.35	5,000,000	1,750,000	
Provision of new ballast	/m3	30,000	25	750,000	
Concrete re-sleepering, procurement and delivery track side	/km	126	250,000	31,500,000	
Supply 47 kg rail and tracklok type clips	/km	75	295,000	22,125,000	
Weld remaining 33% of rail 2-3 years after installation	/km	45.00	25,000	1,125,000	
Landslip stabilisation	/km	8	34,000	272,000	
Devegetation clearing	item	1	45,000	45,000	
Allowances for temporary track and facilities to minimise track closure for revenue services	year	5	65,000	325,000	
Total Construction Costs (TCC)				92,156,000	
Base Estimate (Owners Cost + Construction Cost)				96,965,411	
				P50	P90
Inherent risk allowance				10,026,332	21,170,322
Contingent risk allowance				11,430,053	14,297,255
Base Estimate + Contingency (Inherent + Contingent)				118,421,795	132,432,988

6.4. Summary – infrastructure development priorities

The Western Tasmania Industry Infrastructure Study has identified a number of priority projects which address the major challenges faced by the study corridor. Projects were prioritised based on cost, time frame and relative benefit. Relative benefit was assessed by considering the number and scope of beneficiaries from the project, both current and in the future. This included an assessment of the number of jobs these projects would create, as well as wider benefits to the local community. The likelihood of ventures proceeding was considered as well as other possible avenues for funding of the projects.

Transport infrastructure was identified as the main priority for all industries through the stakeholder consultation process, and this has been reflected in the identified projects. Any improvements to transport efficiency provide opportunities for Tasmanian companies to become more competitive interstate and on a global scale.

A P50 / P90 cost estimation, using Evans and Peck methodology, has been conducted for each of the identified priority projects. The P50 represents the project cost with sufficient risk provisions to provide a 50% level of confidence in the outcome and the P90 represents the project cost with sufficient risk provisions to provide a 90% level of confidence in the outcome. The cost estimate has considered both inherent and contingent risks. Inherent risk relates to those items specifically identified within the various components of the Base Estimate and which will definitely contribute to project cost but where there remains uncertainty as to the accuracy or reliability of the amount in the Base Estimate. Contingent risk relates to the risk attached to unmeasured items, i.e. those items not listed in the Base Estimate because they are unknown or loosely identified and they may not occur and thus may or may not contribute to project cost.

The results for each of the projects are summarised in Table 31.

- **Table 31 Summary of P50/P90 Cost Estimates**

Section	Project Description	Base Estimate (2011/12 rates)	
		$ P50	$ P90
Murchison Highway, Zeehan Highway to Rosebery	Upgrade 23 km to meet Tasmanian HPV standards	$26M	$31
Murchison Highway, Rosebery to Anthony Main Road (Mt Black)	Covered by previous finding commitment-pavement stabilisation, curve realignment and installation of pullover bays at specific locations	$5.5M	$6.5M
Murchison Highway, Anthony Main Road to Cradle Mountain Development Road	Upgrade sections not covered by previous funding commitment to meet HPV standards	$15M	$17M
Pieman Road	Upgrade 35 km between Venture Minerals' site at Mt Lindsay and the Murchison Highway, to meet Tasmanian HPV standards	$62M	$72M
Zeehan Highway, Anthony Main Road to Murchison Highway	Upgrade 18km to meet Tasmanian HPV standards	$27M	$30M
Zeehan Highway, Murchison Highway to Zeehan	Upgrade 4.5km to meet Tasmanian HPV standards	$6.5M	$7.5M
Melba Rail Line	Upgrade to increase axle load limits, reliability and efficiency	$118M	$132M

Appendix A Stakeholders Consulted

1) Aurora
2) Bass Metals
3) Bluestone Mines
4) Bright Phase Resources
5) Burnie City Council
6) Copper Mines Tasmania
7) Cradle Coast Authority
8) Cradle Mountain Water
9) De Bruyn Transport
10) Department of Economic Development, Tourism and the Arts
11) Department of Primary Industries, Parks, Water and Environment
12) DIER- Energy- Energy Supply and Security
13) DIER- Roads and Traffic
14) Federal Group
15) Forestry Tasmania
16) Forward Mining
17) Frontier Resources
18) Grange Resources
19) Gunns Limited
20) Huon Aquaculture
21) Hydro Tasmania
22) Intec
23) Macquarie Harbour Mining
24) Mineral Resources Tasmania- Geoff Green
25) Mineral Resources Tasmania- Kim Creak
26) Minerals and Metals Group
27) Optus
28) Regional Development Australia- North West Coast Tasmania
29) Regional Development Australia- Tasmania
30) Shree Minerals

31) Stellar Resources
32) Stonehenge and McDermott Mines
33) TasGas
34) Tasmanet
35) Tasmania Magnesite
36) Tasmania Mines
37) Tasmanian Advanced Minerals
38) Tasmanian Farmers and Graziers Association
39) Tasmanian Infrastructure Advisory Council
40) Tasmanian Minerals Council
41) TasPorts
42) TasRail
43) Telstra
44) Timberlands
45) TNT (Mine Makers)
46) Tourism Tasmania
47) Transend
48) Transend- Telecommunications
49) Unity Mining
50) UTAS- Janelle Allison
51) UTAS- Laurie Bonne
52) Venture Minerals
53) Vodafone
54) Waratah/Wynyard Council
55) West Coast Council / West Coast Mayor
56) West Coast Tourist Information Centre
57) Zeehan Railway Museum

Appendix B Discussion Schedule

This checklist should be used as a guide to ensure that all issues are covered, and not as a rigid questionnaire. Discussions should be undertaken as a natural flowing conversation as far as possible. The order in which issues are covered is not important, but the introduction should come first, and a check through just before the end will ensure that no major issues are overlooked.

1. Introduction:

Study purpose and objectives – better understand needs, requirements, of mining and other industry in Western Tasmania for transport and related infrastructure over next 20 years to aid economic development and industry expansion and employment growth.

Infrastructure within scope:

- Transport infrastructure – roads, railways, ports, infrastructure connections to Burnie Port and Port Latta (facilities within these ports excluded, as the subject of other studies)
- Telecommunications infrastructure, including broadband
- Energy supply and availability for users – electricity, gas
- Other infrastructure as identified during the study.

Client (DIER)

Brief intro to consultant and background (minimum as required to provide credibility only)

2. Interviewee background:

Interviewee role, length of time in that role, previous roles with present company, other previous roles of relevance etc

3. Company operations:

3.1 Mining, agriculture, and other industry

Current operations overview (sites, origins, destinations, volumes / tonnages, use of road, rail and other transport modes

Major suppliers and inwards goods flows

Major outwards goods flows

Customer types (importers, exporters, manufacturers, assemblers, retail supplier, wholesalers)

3.2 Infrastructure providers

Infrastructure and assets in the area

Unmet demand

Spare capacity

Upgrade and augmentation plans

Problems, issues and opportunities

3.3 Transport companies

Resources and scale of operations – vehicles, people

Operational bases and routes

Major customers and operations in the area

Problems, issues and opportunities

4. Changes and developments expected, anticipated or possible

Growth, decline, new products / markets and services, competitors, other service suppliers or service offerings, routes, origins, destinations

Changes in tonnages, processing on site, ore / concentrate / refined metal or other products

General changes in the region – growth, decline, initiatives etc

5. Satisfaction with current infrastructure, facilities and arrangements

Try to get understanding of how good or bad things are

What changes are sought, over what time period?

Quantify the benefit - $, time, employment, profitability, number of vehicles, any quantification is better than none

6. Are you currently considering any major changes in operations, locations, products or services bought or sold?

Changes under consideration? – location, type, rationale?

7. Desire for change:

What would you like to see change?

8. Other issues as arising or desired to discuss

9. If there was one thing you could change about infrastructure arrangements that supplies and services your operations, what would it be?

10. Study next steps – notes for review, potential for further discussion

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Appendix C Social Infrastructure Issues

A number of other infrastructure issues were raised that were outside the defined scope of the project. Most of these could broadly be described as concerning 'social infrastructure' compared with the 'hard' infrastructure focus of transport, energy, communications and water. However, as these issues appeared relevant to the overall project goals of increasing and supporting economic development and employment in Western Tasmania, the approach has been taken to document them here. It is hoped that this may provide a useful base for subsequent investigation and action. They are listed in the generally expressed priority order.

Secondary education

The issue of the lack of any secondary education for students in Years 11 and 12 anywhere on the West Coast, and below average educational standards for Years 7 – 10 was raised by nearly all businesses operating in the area which employed, or preferred to employ, people based in the region. It was commonly stated that retaining good teachers beyond one or two years was rare, and that student behaviour and discipline standards were poor. This could be related to the lack of expulsion as a disciplinary option, as there was nowhere else a student could attend school. There is neither technical nor TAFE sector educational options. Several mining companies' Human Resources officers spoken with stated that they dissuaded potential employees with upper primary or secondary school aged children from relocating their families to the region for this reason. This is despite the fact that some roles are hard to fill, and maintenance of the population base of the region is beneficial for staff retention and general quality of life.

Medical facilities and services

Declining medical service availability and standards was also mentioned by nearly all the companies spoken with. Lack of doctors and lack of consistency in people filling these roles were the most common complaints, often expressed along the lines "It's rare to see the same doctor twice." The procedures and services undertaken in local medical centres and hospitals were reported as reducing, with anything with any degree of challenge requiring a patient trip to Burnie, Latrobe or other larger centres. There are no children's medical centres, and children requiring treatment beyond the resources of a general practitioner have to be transferred, generally to Burnie.

Public Transport

The issue of lack of public transport was raised a number of times, primarily as causing difficulties for people without access to cars for any reason. This particularly included people who may have lost their driver licence and those younger than 17, who do not have family, colleague or friends who can assist. Difficulties for younger apprentices were specifically raised. It was pointed out that most public transport is focussed on assisting school children to get to and from school, and these services are generally not available to people other than students. There are some bus

services which enable people to go to larger centres such as Burnie and Hobart on certain days, but are slower than private car travel times.

Supermarkets and basic supplies

The only local supermarket options were independent IGA type stores which compared poorly with Coles and Woolworths in terms of range, pricing and quality of fresh produce. The lack of butchers, limited pharmacy range, higher fuel price (around $0.10 / litre) and lack of specialty retailing makes regular trips to larger centres for shopping normal practice.

Child care

Lack or inadequate quality of pre-school child care services and facilities was raised as an issue by some companies.

Housing

It was stated that there is presently a glut of vacant housing in the region, but that most was of a very low quality standard and not appealing to families. The comment was also made that the high vacancy rate could change rapidly when a number of projects nearing commencement kick off.

Tradespeople

It was stated that it was difficult to get competent tradespeople for smaller domestic repair tasks. Some mines preferred to employ such people on staff due to lack of satisfactory options in the trades marketplace.

Airports

The lack of air facilities and services in western Tasmania was raised, particularly the lack of scheduled services and susceptibility of Queenstown airport to bad weather. There have been reductions in the scheduled services to Burnie and Wynyard, making early arrivals and late departures impossible.

Lack of critical mass and commitment to the regional community

This broad issue was reflected in a number of specific points made, such as lack of opportunities for sporting activities and clubs and very limited opportunities for employment for mining personnel partners and family members. The impact of 12 hour even time rosters with four or five days on then off were frequently raised, which make drive in drive out personnel arrangements viable. This latter point tends to reduce population numbers in the region, but also means that such mining employees are either working 12 hours per day or are not in the region. Neither makes contributing to the general social fabric of the area easy.

Appendix D Project Identification, Murchison Highway Project

This appendix contains a summary of the project elements identified by SKM in the 2011 Murchison highway upgrade project.

Scope of Works Rosebery to Melba Flats

Link	Start Ch	Finish Ch	Length (m)	Comments	Existing Road Width (m)	Type of upgrade	$ Cost/ km	$ Total
12	11.64	11.56	80	Stitt River Bridge-Bridge transition. Township of Rosebery- Speed limit 60km/h.	5.8-6.0	b: Widen and strengthen pavement	632,888	50,631
12	11.56	11.42	140	Basic widening on both sides.	5.8-6.0	b: Widen and strengthen pavement	632,888	88,604
12	11.42	11.28	140	Poor sight distance due to crest and tight horizontal curve. Horizontal and vertical curve adjustment required. Embankment excavation required on inside of curve. Existing pullover area on eastern side.	5.8-6.0	g: HC & VC alignment	1,772,738	248,183
12	11.28	11.18	100	Basic widening on both sides.	5.8-6.0	b: Widen and strengthen pavement	632,888	63,289
12	11.18	11.08	100	Embankment excavation required on inside or curve (western side) to improve sight distance.	5.8-6.0	d: Widening with sight benching plus pavement strengthening	880,019	88,002
12	11.08	10.98	100	Basic widening on both sides. Speed limit 80km/h.	5.8-6.0	b: Widen and strengthen pavement	632,888	63,289
12	10.98	10.89	90	Sight benching required on inside or curve (eastern side).	5.8-6.0	d: Widening with sight benching plus pavement strengthening	880,019	79,202
12	10.89	10.83	60	Sight benching required on inside or curve (western side).	5.8-6.0	b: Widen and strengthen pavement	632,888	37,973
12	10.83	10.72	110	Embankment excavation on inside or curve (eastern side) to improve sight distance.	5.8-6.0	d: Widening with sight benching plus pavement strengthening	880,019	96,802
12	10.72	10.64	80	Widening on eastern side. Clearing and grubbing on inside or curve (western side) to improve sight distance. Truck drivers suggest tight corner with poor road condition- truck wheels nearly in gravel.	5.8-6.0	d: Widening with sight benching plus pavement strengthening	880,019	70,402
12	10.64	10.53	110	Widening biased to eastern side due to slope on western side.	5.8-6.0	b: Widen and strengthen pavement	632,888	69,618
12	10.53	10.39	140	Embankment excavation on inside or curve (eastern side) to improve sight distance.	5.8-6.0	d: Widening with sight benching plus pavement strengthening	880,019	123,203
12	10.39	10.32	70	Widening on eastern side.	5.8-6.0	b: Widen and strengthen pavement	632,888	44,302
12	10.32	10.23	90	Embankment excavation on inside or curve (eastern side) to improve sight distance.	5.8-6.0	b: Widen and strengthen pavement	632,,888	56,960
12	10.23	10.19	40	Williamsford Road intersection.	5.8-6.0	b: Widen and strengthen pavement	632,888	25,316
12	10.19	10.08	110	Embankment excavation on inside or curve (eastern side) to improve sight	5.8-6.0	b: Widen and strengthen pavement	632,888	69,618

Link	Start Ch	Finish Ch	Length (m)	Comments	Existing Road Width (m)	Type of upgrade	$ Cost/ km	$ Total
				distance.				
12	10.08	9.98	100	Widening on both sides. Clearing and grubbing on inside of curve to improve sight distance.	5.8-6.0	b: Widen and strengthen pavement	632,888	63,289
12	9.98	9.87	110	Basic widening on both sides.	5.8-6.0	b: Widen and strengthen pavement	632,888	69,618
12	9.87	9.77	100	Widening on both sides. Slight crest.	5.8-6.0	b: Widen and strengthen pavement	632,888	63,289
12	9.77	9.6	170	Widening on both sides. Clearing and grubbing on inside of curve to improve sight distance.	5.8-6.0	b: Widen and strengthen pavement	632,888	107,591
12	9.6	9.2	400	End 80km/h speed limit. Basic widening on both sides.	5.8-6.0	b: Widen and strengthen pavement	632,888	253,155
12	9.2	9.09	110	Sight benching on inside or curve (eastern side).	5.8-6.0	b: Widen and strengthen pavement	632,888	69,618
12	9.09	8.98	110	Basic widening. Slight crest.	5.8-6.0	b: Widen and strengthen pavement	632,888	69,618
12	8.98	8.85	130	Widening on eastern side due to railway line on western side.	5.8-6.0	b: Widen and strengthen pavement	632,888	82,275
12	8.85	8.69	160	Sight benching on inside or curve (eastern side). Significant excavation required.	5.8-6.0	d: Widening with sight benching plus pavement strengthening	880,019	140,803
12	8.69	8	690	Widening biased to eastern side due to railway on western side.	5.8-6.0	b: Widen and strengthen pavement	632,888	436,693
12	8	7.77	230	Sight benching on inside of curve (eastern side). Existing informal pullover area on northbound side.	5.8-6.0	b: Widen and strengthen pavement	632,888	145,564
12	7.77	7.68	90	Widening on eastern side. Remove trees on western side to improve sight distance.	5.8-6.0	b: Widen and strengthen pavement	632,888	56,960
12	7.68	7.59	90	Sight benching on inside or curve. Widening biased to eastern side.	5.8-6.0	b: Widen and strengthen pavement	632,888	56,960
12	7.59	7.18	410	Widening biased to eastern side due to railway on western side.	5.8-6.0	b: Widen and strengthen pavement	632,888	259,484
12	7.18	7.02	160	Poor sight distance due to crest. Vertical curve alignment required.	5.8-6.0	f: VC alignment	1,569,658	251,145
12	7.02	6.94	80	Widening biased to eastern side.	5.8-6.0	b: Widen and strengthen pavement	632,888	50,631
12	6.94	6.8	140	Widening biased to eastern side. Clearing and grubbing required on western side to improve sight distance.	5.8-6.0	b: Widen and strengthen pavement	632,888	88,604
12	6.8	6.65	150	Basic widening on both sides.	5.8-6.0	b: Widen and strengthen pavement	632,888	94,933
12	6.65	6.45	200	Widening/sight benching on eastern side.	5.8-6.0	b: Widen and strengthen pavement	632,888	126,578
12	6.45	6.3	150	Widening on eastern side. Clearing and grubbing on inside or curve (eastern side) to improve sight distance.	5.8-6.0	b: Widen and strengthen pavement	632,888	94,933
12	6.3	6.16	140	Basic widening on both sides. Slight crest.	5.8-6.0	b: Widen and strengthen pavement	632,888	88,604
12	6.16	6.05	110	Basic widening on both sides.	5.8-6.0	b: Widen and strengthen pavement	632,888	69,618
12	6.05	5.99	60	Widening on both sides. Clearing and grubbing on inside of curve to improve sight distance.	5.8-6.0	b: Widen and strengthen pavement	632,888	37,973
12	5.99	5.67	320	Basic widening on both sides.	5.8-6.0	b: Widen and strengthen pavement	632,888	202,524

Link	Start Ch	Finish Ch	Length (m)	Comments	Existing Road Width (m)	Type of upgrade	$ Cost/ km	$ Total
12	5.67	5.6	70	Clearing and grubbing on inside of curve to improve sight distance.	5.8-6.0	b: Widen and strengthen pavement	632,888	44,302
12	5.6	5.41	190	Embankment excavation required on inside or curve (eastern side).	5.8-6.0	d: Widening with sight benching plus pavement strengthening	880,019	167,204
12	5.41	5.27	140	Embankment excavation on inside or curve (western side).	5.8-6.0	b: Widen and strengthen pavement	632,888	88,604
12	5.27	5.17	100	Clearing and grubbing on inside of curve to improve sight distance.	5.8-6.0	b: Widen and strengthen pavement	632,888	63,289
12	5.17	5.1	70	Basic widening on both sides.	5.8-6.0	b: Widen and strengthen pavement	632,888	44,302
12	5.1	4.99	110	Clearing and grubbing on inside of curve to improve sight distance.	5.8-6.0	b: Widen and strengthen pavement	632,888	69,618
12	4.99	4.78	210	Basic widening on both sides. Culvert at 4.94.	5.8-6.0	b: Widen and strengthen pavement	632,888	132,906
12	4.78	4.58	200	Widening biased to eastern side. Slight crest.	5.8-6.0	b: Widen and strengthen pavement	632,888	126,578
12	4.58	4.34	240	Basic widening on both sides.	5.8-6.0	b: Widen and strengthen pavement	632,888	151,893
12	4.34	4.15	190	Poor sight distance due to crest. Vertical curve alignment required.	5.8-6.0	b: Widen and strengthen pavement	632,888	120,249
12	4.15	3.96	190	Basic widening on both sides. Slight crest.	5.8-6.0	b: Widen and strengthen pavement	632,888	120,249
12	3.96	3.54	420	Potential northbound overtaking lane- suggested as a good location by truck drivers. Consideration of access required.	5.8-6.0	b: Widen and strengthen pavement	632,888	265,813
12	3.54	3.34	200	Poor sight distance due to crest and tight horizontal curve. Horizontal and vertical curve adjustment required. Embankment excavation required on inside of curve.	5.8-6.0	g: HC & VC alignment	1,772,738	354,548
12	3.34	3.25	90	Widening biased to eastern side. Embankment excavation required.	5.8-6.0	b: Widen and strengthen pavement	632,888	56,960
12	3.25	3.16	90	Clearing and grubbing on inside of curve (western side) to improve sight distance.	5.8-6.0	b: Widen and strengthen pavement	632,888	56,960
12	3.16	2.96	200	Tight horizontal radii identified by truck drivers. Horizontal curve realignment required.	5.8-6.0	e: HC alignment	1,398,763	279,753
12	2.96	2.75	210	Horizontal curve realignment required. Embankment excavation on inside of curve (western side) to improve sight distance.	5.8-6.0	e: HC alignment	1,398,763	293,740
12	2.75	2.65	100	Basic widening on both sides.	5.8-6.0	b: Widen and strengthen pavement	632,888	63,289
12	2.65	2.53	120	Embankment excavation on eastern side to allow widening and improve sight distance.	5.8-6.0	d: Widening with sight benching plus pavement strengthening	880,019	105,602
12	2.53	2.46	70	Basic widening on both sides.	5.8-6.0	b: Widen and strengthen pavement	632,888	44,302
12	2.46	2.29	170	Embankment excavation on inside or curve (western side) to allow widening and improve sight distance.	5.8-6.0	b: Widen and strengthen pavement	632,888	107,591
12	2.29	2.15	140	Embankment excavation on inside or curve (eastern side) to allow widening and improve sight distance.	5.8-6.0	d: Widening with sight benching plus pavement strengthening	880,019	123,203
12	2.15	2.08	70	Widening biased to eastern side. Clearing and grubbing required on	5.8-6.0	b: Widen and strengthen pavement	632,888	44,302

Link	Start Ch	Finish Ch	Length (m)	Comments	Existing Road Width (m)	Type of upgrade	$ Cost/ km	$ Total
				western side to improve sight distance.				
12	2.08	1.92	160	Widening on eastern side. Significant excavation required.	5.8-6.0	d: Widening with sight benching plus pavement strengthening	880,019	140,803
12	1.92	1.8	120	Bridge transition- Ring River Bridge.	5.8-6.0	b: Widen and strengthen pavement	632,888	75,947
12	1.8	1.67	130	Basic widening on both sides.	5.8-6.0	b: Widen and strengthen pavement	632,888	82,275
12	1.67	1.56	110	Embankment excavation required on inside or curve (western side).	5.8-6.0	b: Widen and strengthen pavement	632,888	69,618
12	1.56	1.4	160	Basic widening on both sides.	5.8-6.0	b: Widen and strengthen pavement	632,888	101,262
12	1.4	1.24	160	Sight benching on inside of curve (western side).	5.8-6.0	d: Widening with sight benching plus pavement strengthening	880,019	140,803
12	1.24	1.05	190	Embankment excavation on inside of curve (eastern side).	5.8-6.0	b: Widen and strengthen pavement	632,888	120,249
12	1.05	1	50	Widening on both sides.	5.8-6.0	b: Widen and strengthen pavement	632,888	31,644
12	1	0.96	40	Widening limited by Mine Road Bridge overhead.	5.8-6.0	b: Widen and strengthen pavement	632,888	25,316
12	0.96	0.8	160	Widening on eastern side. Embankment excavation required.	5.8-6.0	d: Widening with sight benching plus pavement strengthening	880,019	140,803
12	0.8	0.5	300	Widening on eastern side. Potential southbound overtaking lane. Approximately 200m of existing pullover areas.	5.8-6.0	b: Widen and strengthen pavement	632,888	189,866
12	0.5	0.4	100	Intersection- Renison Bell Mine. Provide acceleration lane for exiting trucks (northbound) and right turn lane for entering trucks.	5.8-6.0	b: Widen and strengthen pavement	632,888	63,289
12	0.4	0.26	140	Widening biased to eastern side. Embankment excavation required.	5.8-6.0	d: Widening with sight benching plus pavement strengthening	880,019	123,203
12	0.26	0.14	120	Widening biased to eastern side. Embankment excavation required.	5.8-6.0	b: Widen and strengthen pavement	632,888	75,947
12	0.14	0	140	Widening on both sides. Sight benching on inside or curve. Existing pullover area on western side.	5.8-6.0	d: Widening with sight benching plus pavement strengthening	880,019	123,203
5	11.01	10.89	120	Basic widening on both sides.	5.8-6.0	b: Widen and strengthen pavement	632,888	75,947
5	10.89	10.79	100	Widening limited due to deep gully. Railway line on western side.	5.8-6.0	b: Widen and strengthen pavement	632,888	63,289
5	10.79	10.66	130	Embankment excavation on eastern side. Existing pullover area on western side.	5.8-6.0	b: Widen and strengthen pavement	632,888	82,275
5	10.66	10.56	100	Basic widening on both sides.	5.8-6.0	b: Widen and strengthen pavement	632,888	63,289
5	10.56	10.36	200	Widening with sight benching on inside or curve (western side).	5.8-6.0	d: Widening with sight benching plus pavement strengthening	880,019	176,004
5	10.36	10.23	130	Basic widening on both sides.	5.8-6.0	b: Widen and strengthen pavement	632,888	82,275

Link	Start Ch	Finish Ch	Length (m)	Comments	Existing Road Width (m)	Type of upgrade	$ Cost/ km	$ Total
5	10.23	10.04	190	Widening on both sides. Sight benching on inside of curve.	5.8-6.0	b: Widen and strengthen pavement	632,888	120,249
5	10.04	9.44	600	Basic widening on both sides.	5.8-6.0	b: Widen and strengthen pavement	632,888	379,733
5	9.44	9.2	240	Embankment excavation required on inside of curve. Pullover area on western side.	5.8-6.0	d: Widening with sight benching plus pavement strengthening	880,019	211,205
5	9.2	9.1	100	Bridge transition- Argent Creek Bridge	5.8-6.0	b: Widen and strengthen pavement	632,888	63,289
5	9.1	8.89	210	Widening on western side. Existing pullover area.	5.8-6.0	b: Widen and strengthen pavement	632,888	132,906
5	8.89	8.77	120	Rail underpass at 8.84.	5.8-6.0	b: Widen and strengthen pavement	632,888	75,947
5	8.77	8.5	270	Widening biased to the eastern side due to high embankment on western side.	5.8-6.0	b: Widen and strengthen pavement	632,888	170,880
5	8.5	8.4	100	Widening on both sides. Sight benching on inside of curve (western side).	5.8-6.0	b: Widen and strengthen pavement	632,888	63,289
5	8.4	8.2	200	Poor sight distance due to crest and bend. Horizontal and vertical curve realignment required.	5.8-6.0	g: HC & VC alignment	1772738	354,548
5	8.2	7.83	370	Basic widening on both sides.	5.8-6.0	b: Widen and strengthen pavement	632,888	234,169
5	7.83	7.69	140	Sight benching on inside of curve (western side).	5.8-6.0	d: Widening with sight benching plus pavement strengthening	880,019	123,203
5	7.69	7.46	230	Widening biased to eastern side due to high embankment on western side. Existing pullover areas on eastern side.	5.8-6.0	b: Widen and strengthen pavement	632,888	145,564
5	7.46	7.28	180	Embankment excavation required on inside of curve (western side) to improve sight distance.	5.8-6.0	b: Widen and strengthen pavement	632,888	113,920
5	7.28	7.18	100	Basic widening.	5.8-6.0	b: Widen and strengthen pavement	632,888	63,289
5	7.18	7.04	140	Widening on both sides. Embankment excavation required on western side to improve sight distance. Existing pullover area on eastern side.	5.8-6.0	d: Widening with sight benching plus pavement strengthening	880,019	123,203
5	7.04	6.63	410	Basic widening on both sides.	5.8-6.0	b: Widen and strengthen pavement	632,888	259,484
	6.63	6.57	60	Widening on both sides. Existing pullover bay on northbound side.	5.8-6.0	b: Widen and strengthen pavement	632,888	37,973
5	6.57	6.44	130	Clearing and grubbing on inside of curve (western side) to improve sight distance.	5.6-6.0	b: Widen and strengthen pavement	632,888	82,275
5	6.44	6.18	260	Embankment excavation on inside or curve (eastern side) to improve sight distance. Seal northbound pullover area- potential slow vehicle turnout.	5.6-6.0	b: Widen and strengthen pavement	632,888	164,551
5	6.18	5.86	320	Widening on both sides. Clearing and grubbing required around curves to improve sight distance.	5.6-6.0	b: Widen and strengthen pavement	632,888	202,524
5	5.86	5.77	90	Embankment excavation on inside of curve to improve sight distance.	5.6-6.0	b: Widen and strengthen pavement	632,888	56,960
5	5.77	5.48	290	Widening biased to western side due to embankment on eastern side.	5.6-6.0	b: Widen and strengthen pavement	632,888	183,538

Link	Start Ch	Finish Ch	Length (m)	Comments	Existing Road Width (m)	Type of upgrade	$ Cost/ km	$ Total
5	5.48	5.19	290	Basic widening on both sides.	5.6-6.0	b: Widen and strengthen pavement	632,888	183,538
5	5.19	5.04	150	Crest adjustment required to improve sight distance.	5.6-6.0	f: VC alignment	1,569,658	235,449
5	5.04	4.56	480	Intersection upgrade to Melba Flats Sidings	5.6-6.0	b: Widen and strengthen pavement	632,888	303,786

Scope of Works Murchison Highway, Rosebery to Anthony Main Road (Mt Black)

Link	Start Ch	Finish Ch	Length	Scope of work Category	Description of Works
20	8.63	8.55	80	D: Southbound pullover bay	Formalisation of existing gravel pull over bay. Includes line marking
20	8.52	8.34	180	C: Horizontal curve realignment	Pavement failure on embankment fill. Slope of terrain too high to sustain pavement loading, cut needs to be extended into the hill
20	8.08	8.07	10	B: Pavement stabilisation and drainage assessment	Reinstatement and strengthening of pavement required, drainage assessment and modifications required to offer longevity to the repairs
20	7.76	7.74	20	B: Pavement stabilisation and drainage assessment	Reinstatement and strengthening of pavement required, drainage assessment and modifications required to offer longevity to the repairs
20	7.6	7.53	70	D: Southbound pullover bay	Formalisation of existing gravel pull over bay. Includes line marking
20	7.52	7.5	20	B: Pavement stabilisation and drainage assessment	Reinstatement and strengthening of pavement required, drainage assessment and modifications required to offer longevity to the repairs
20	7.45	7.25	200	C: Horizontal curve realignment	Pavement failure on embankment fill. Slope of terrain too high to sustain pavement loading, cut needs to be extended into the hill
20	7.1	7.05	50	D: Southbound pullover bay	Formalisation of existing gravel pull over bay. Includes line marking
20	7.05	6.81	240	C: Horizontal curve realignment	Pavement failure on embankment fill. Slope of terrain too high to sustain pavement loading, cut needs to be extended into the hill
20	5.65	5.42	230	F: Southbound climbing lane	An additional lane southbound near crest of hill. Excavation to take place on southern batter and filled at gully near crest
20	5.42	5.1	320	G: Northbound climbing lane	Creation of additional lane near the crest for northbound vehicles. Excavation to take place on southern batter and filled at gully near crest to join southbound climbing lane
20	4.48	4.45	30	A: Pavement stabilisation	Box out to solid foundation and key in additional fill, possibly with the use of gabians. Deep lift asphalt required for wearing surface.
20	4.27	4.22	50	D: Southbound pullover bay	Formalisation of existing gravel pull over bay. Includes line marking
20	3.88	3.82	60	A: Pavement stabilisation	Box out to solid foundation and key in additional fill, possibly with the use of gabians. Deep lift asphalt required for wearing surface.
20	3.79	3.72	70	A: Pavement stabilisation	Box out to solid foundation and key in additional fill, possibly with the use of gabians. Deep lift asphalt required for wearing surface.

Link	Start Ch	Finish Ch	Length	Scope of work Category	Description of Works
20	3.69	3.66	30	A: Pavement stabilisation	Box out to solid foundation and key in additional fill, possibly with the use of gabians. Deep lift asphalt required for wearing surface.
20	3.62	3.61	10	A: Pavement stabilisation	Box out to solid foundation and key in additional fill, possibly with the use of gabians. Deep lift asphalt required for wearing surface.
20	3.59	3.58	10	A: Pavement stabilisation	Box out to solid foundation and key in additional fill, possibly with the use of gabians. Deep lift asphalt required for wearing surface.
20	3.5	3.06	440	C: Horizontal curve realignment	Pavement failure on embankment fill. Slope of terrain too high to sustain pavement loading, cut needs to be extended into the hill
20	3.01	2.95	60	B: Pavement stabilisation and drainage assessment	Reinstatement and strengthening of pavement required, drainage assessment and modifications required to offer longevity to the repairs
20	2.86	2.81	50	B: Pavement stabilisation and drainage assessment	Reinstatement and strengthening of pavement required, drainage assessment and modifications required to offer longevity to the repairs
20	2.7	2.65	50	D: Southbound pullover bay	Formalisation of existing gravel pull over bay. Includes line marking
20	2.64	2.61	30	B: Pavement stabilisation and drainage assessment	Reinstatement and strengthening of pavement required, drainage assessment and modifications required to offer longevity to the repairs
20	2.56	2.41	150	C: Horizontal curve realignment	Pavement failure on embankment fill. Slope of terrain too high to sustain pavement loading, cut needs to be extended into the hill
20	2.41	2.33	80	D: Southbound pullover bay	Formalisation of existing gravel pull over bay. Includes line marking
20	2.17	2.14	30	A: Pavement stabilisation	Box out to solid foundation and key in additional fill, possibly with the use of gabians. Deep lift asphalt required for wearing surface.
20	2.08	2.04	40	A: Pavement stabilisation	Box out to solid foundation and key in additional fill, possibly with the use of gabians. Deep lift asphalt required for wearing surface.
20	1.94	1.85	90	H: Northbound pullover bay with lengthening and widening	Formalisation of existing gravel pull over bay with minor excavations and pavement construction to make the length of the bay useful. Includes line marking.
20	1.93	1.89	40	A: Pavement stabilisation	Box out to solid foundation and key in additional fill, possibly with the use of gabians. Deep lift asphalt required for wearing surface.
20	1.77	1.76	10	A: Pavement stabilisation	Box out to solid foundation and key in additional fill, possibly with the use of gabians. Deep lift asphalt required for wearing surface.

Scope of Works, Anthony Main Road to Cradle Mountain Development Road

Link	Start Ch	Finish Ch	Length (m)	Scope of work Category	Project Scope of work
39	4.5	4.45	50	I: basic widening to 7.0m wide sections of pavement	Widen existing road to 8m (from 7m)
39	4.45	4.35	100	I: basic widening to 7.0m wide sections of pavement	Widen existing road to 8m (from 7m)
39	4.35	3.9	450	I: basic widening to 7.0m wide sections of pavement	Widen existing road to 8m (from 7m)

Link	Start Ch	Finish Ch	Length (m)	Scope of work Category	Project Scope of work
39	3.9	3.55	350	l: basic widening to 7.0m wide sections of pavement	Widen existing road to 8m (from 7m), consider clearing and grubbing on inside of curve to increase sight distance through corner
39	3.33	3.2	130	l: basic widening to 7.0m wide sections of pavement	Widen existing road to 8m (from 7m)
39	2.37	2.1	270	l: basic widening to 7.0m wide sections of pavement	Widen existing road to 8m (from 7m)
39	2.1	1.85	250	l: basic widening to 7.0m wide sections of pavement	Widen existing road to 8m (from 7m)
39	1.85	1.63	220	l: basic widening to 7.0m wide sections of pavement	Widen existing road to 8m (from 7m), consider clearing and grubbing on inside of curve to increase sight distance through corner
39	0.57	0.4	170	l: basic widening to 7.0m wide sections of pavement	Basic widening on both sides. Embankment excavation required on western side. Slight crest.
39	0.2	0.05	150	l: basic widening to 7.0m wide sections of pavement	Widen existing road to 8m (from 7m)
39	0.05	0.02	30	b: Widen and strengthen pavement	Animal Creek Bridge.
31	11.04	11.01	30	b: Widen and strengthen pavement	Animal Creek Bridge.
31	11.01	10.85	160	l: basic widening to 7.0m wide sections of pavement	Basic widening on both sides. Embankment raised from plains potential for unsuitable material.
31	10.85	10.51	340	l: basic widening to 7.0m wide sections of pavement	Widening on both sides. Remove embankment on inside of curve to improve sight distance. Slight crest. Existing superelevation is good.
31	10.05	9.95	100	b: Widen and strengthen pavement	Basic widening on both sides.
31	9.95	9.75	200	b: Widen and strengthen pavement	Widening on both sides.
31	9.75	9.6	150	b: Widen and strengthen pavement	Basic widening on both sides.
31	9.6	9.4	200	b: Widen and strengthen pavement	Basic widening on both sides.
31	9.4	9.3	100	b: Widen and strengthen pavement	Basic widening on both sides. Culvert at 9.38.
31	9.3	9.15	150	b: Widen and strengthen pavement	Basic widening on both sides.
31	9.15	8.95	200	b: Widen and strengthen pavement	Basic widening on both sides.
31	8.95	8.81	140	b: Widen and strengthen pavement	Basic widening on both sides.
31	8.81	8.79	20	b: Widen and strengthen	Road (to boco siding).

Link	Start Ch	Finish Ch	Length (m)	Scope of work Category	Project Scope of work
				pavement	
31	8.79	8.4	390	b: Widen and strengthen pavement	Basic widening on both sides.
31	8.4	8.15	250	b: Widen and strengthen pavement	Basic widening on both sides.
31	8.15	8.1	50	b: Widen and strengthen pavement	Basic widening on both sides.
31	8.1	7.85	250	b: Widen and strengthen pavement	Embankment excavation on both sides to allow widening.
31	7.85	7.75	100	b: Widen and strengthen pavement	Basic widening on both sides.
31	7.75	7.27	480	b: Widen and strengthen pavement	Basic widening on both sides.
31	6.82	6	820	b: Widen and strengthen pavement	Veg clearing on inside of curve to improve sight distance.
31	6	5.5	500	c: Widening with sight benching	Remove embankment on inside of curve to improve sight distance. Widening on both sides. Barrier required on northbound side.
31	5.5	5.45	50	b: Widen and strengthen pavement	
31	5.25	5.1	150	b: Widen and strengthen pavement	Widen on inside of curve with embankment fill. Remove trees on inside of curve to increase sight distance.
31	5.1	5.05	50	b: Widen and strengthen pavement	Basic widening on both sides.
31	5.05	4.8	250	c: Widening with sight benching	Remove embankment on western side to allow widening and improve sight distance. Provide barrier on southbound side.
31	4.8	4.49	310	b: Widen and strengthen pavement	Widening on both sides. Embankment excavation required on western side. Provide barrier on southbound side.
31	4.49	4.35	140	c: Widening with sight benching	Embankment excavation on both sides to allow widening. Benching will be required to facilitate widening and better sight distance
31	4.35	4.25	100	b: Widen and strengthen pavement	Tramway Creek, bridge transition.
31	4.25	4.05	200	c: Widening with sight benching	Significant excavations required. Existing barriers through the region to be reinstated. Embankment excavation on western side to allow widening, pavement strengthening to allow for revised super elevation.
31	4.05	3.9	150	f: VC alignment	Crest hindering sight distance. Significant excavations required. Embankment excavation on eastern side (rock) to allow widening.

Link	Start Ch	Finish Ch	Length (m)	Scope of work Category	Project Scope of work
31	3.9	3.8	100	b: Widen and strengthen pavement	Embankment excavation on both sides to allow widening.
31	3.7	3.65	50	b: Widen and strengthen pavement	Farm Creek Bridge.
31	3.65	3.61	40	b: Widen and strengthen pavement	Widening biased to eastern side. Barrier on northbound side.
31	3.61	3.49	120	c: Widening with sight benching	Revised superelevation required due to high frequency of collisions. Remove embankment on inside curve to allow widening and improve sight distance. Widening to take place on inside of curve to increase radius.
31	3.49	3.45	40	b: Widen and strengthen pavement	Basic widening on both sides to marry into new superelevation at corners at each end
31	3.3	2.96	340	b: Widen and strengthen pavement	Embankment excavation on both sides to allow widening.
31	2.96	2.86	100	c: Widening with sight benching	Embankment excavation on inside of curve to allow widening and improve sight distance.
31	2.86	2.74	120	b: Widen and strengthen pavement	Basic widening on both sides.
31	2.74	2.64	100	c: Widening with sight benching	Remove embankment on inside of curve to allow widening and improve sight distance.
31	2.11	1.24	870	c: Widening with sight benching	Widening where possible with existing pavement areas, sight benching on the corners and providing additional pavement on the areas where the current width is insufficient
31	1.24	0.93	310	c: Widening with sight benching	Embankment excavation on both sides to allow widening and improve northbound sight distance.
31	0.93	0.49	440	c: Widening with sight benching	Additional earthworks required to provide sight benching and a small amount of additional pavement
31	0.49	0.15	340	c: Widening with sight benching	Widening achieved through sealing of the existing shoulders, some strengthening and shaping may be required
31	0.15	0.05	100	b: Widen and strengthen pavement	Bridge transition- Mackintosh Bridge.
26	4.79	4.61	180	b: Widen and strengthen pavement	Widening achieved through sealing of the existing shoulders, some strengthening and shaping may be required

Link	Start Ch	Finish Ch	Length (m)	Scope of work Category	Project Scope of work
26	4.61	4.05	560	c: Widening with sight benching	Additional earthworks over crest and on corners to shape the drainage channels and provide additional area for the new shoulders
26	4.05	3.7	350	b: Widen and strengthen pavement	Widening achieved through sealing of the existing shoulders, some strengthening and shaping may be required
26	3.03	0.43	2600	b: Widen and strengthen pavement	Box out and strengthen shoulder to provide a 7m wide seal (750mm each side) with 0.5m wide gravel shoulder. Intersections to be left as is, speed restrictions to be left as is.
26	0.43	0.37	60	l: basic widening to 7.0m wide sections of pavement	Widen existing road to 8m (from 7m)
26	0.37	0.27	100	c: Widening with sight benching	No treatment proposed acceptable as Class D2
26	0.27	0.14	130	l: basic widening to 7.0m wide sections of pavement	Widen existing road to 8m (from 7m)
26	0.14	0.09	50	b: Widen and strengthen pavement	Bridge transition- Murchison Bridge.
20	11.5	11.45	50	b: Widen and strengthen pavement	Bridge transition- Murchison Bridge.
20	11.45	11.31	140	l: basic widening to 7.0m wide sections of pavement	Widen existing road to 8m (from 7m)
20	11.31	11.23	80	c: Widening with sight benching	Embankment excavation on inside of curve to allow widening and improve sight distance.
20	11.23	10.97	260	l: basic widening to 7.0m wide sections of pavement	Widen existing road to 8m (from 7m)
20	10.97	10.81	160	c: Widening with sight benching	Sight benching either side of culvert. Widening not practical at barrier locations, leave barriers as is.
20	10.81	10.73	80	l: basic widening to 7.0m wide sections of pavement	Widen existing road to 8m (from 7m)
20	10.73	10.5	230	b: Widen and strengthen pavement	Basic widening on both sides.
20	10.5	10.4	100	b: Widen and strengthen pavement	Improve Anthony Main Road intersection.

Abbreviations and Definitions

The following abbreviations have been used in this report:

AADT	Annual Average Daily Traffic
CMT	Copper Mines of Tasmania
CMW	Cradle Mountain Water
DIER	Department of Infrastructure, Energy and Resources
DSO	Direct Shipping Ore
EPA	Environmental Protection Authority
FT	Forestry Tasmania
GA	General Access
GSM	Global System for Mobile Communication
GVM	Gross Vehicle Mass
HML	Higher Mass Limit
HPV	High Productivity Vehicle
HV	Heavy Vehicle
JV	Joint Venture
MHAG	Macquarie Harbour Aquaculture Group
MHM	Macquarie Harbour Mining
MMG	Minerals and Metals Group
MOU	Memorandum of Understanding
RDA	Regional Development Australia
TAM	Tasmanian Advanced Minerals
TPA	Tonnes per Annum
SAMM	Stonehenge and McDermott Mines
SKM	Sinclair Knight Merz
VOIP	Voice over Internet Protocol
VPD	Vehicles per Day
WTP	Water Treatment Plant
WWTP	Waste Water Treatment Plant

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