ACIL ALLEN CONSULTING

REPORT TO
DEPARTMENT OF STATE GROWTH

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BURNIE TO HOBART FREIGHT CORRIDOR STRATEGY

FREIGHT DEMAND ANALYSIS AND FUTURE PRODUCTIVITY IMPROVEMENTS

Public report

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Note: Commercial-in-confidence information, including information relating to company volumes, market share and operations, has been removed from this report.

1 INTRODUCTION

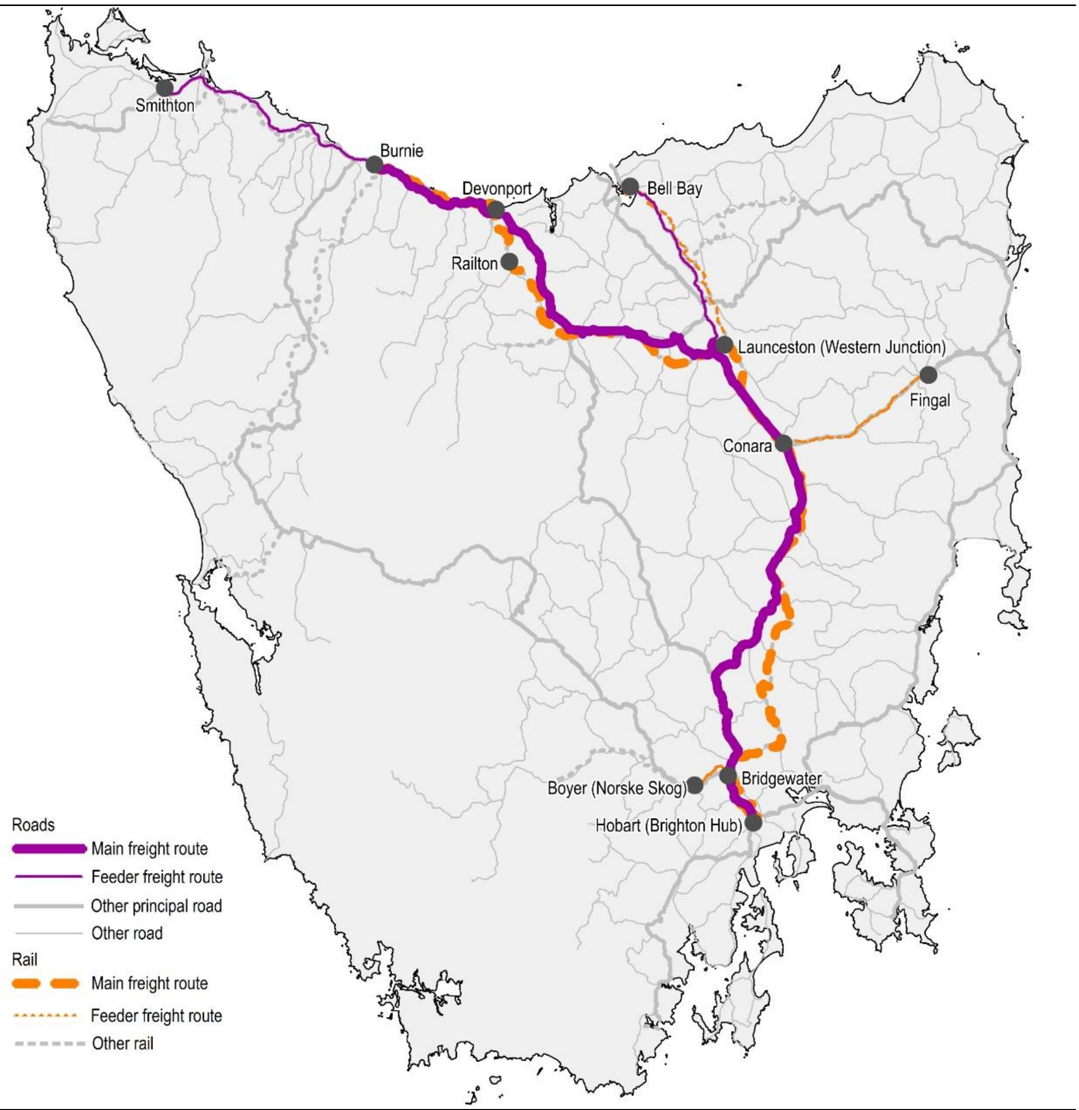
The Tasmanian Department of State Growth (the Department) has appointed ACIL Allen Consulting (ACIL Allen) to conduct an analysis of freight demand and future productivity improvements along the Burnie to Hobart corridor (the Corridor).

The Corridor's efficiency is vital to many of Tasmania's key export industries as well as to consumers throughout the State. At some point along the supply chain, almost the entire import and export task is handled at one of the State's four publicly owned ports: Burnie, Devonport, Bell Bay and Hobart. While container trade is concentrated at the Ports of Burnie and Devonport, bulk goods are handled at all four ports. In total, bulk freight accounts for about two thirds of Tasmania's freight task and containers for the remaining third.

The Corridor, which is illustrated in Figure 1.1, consists of the following networks:

- **Main freight routes**
  - Road
    - Bass Highway, Burnie Port to Launceston
    - Midland Highway, Launceston to Granton
    - Illawarra Main Road
    - Brooker Highway, Domain Overpass to Granton
  - Rail
    - Burnie Port to Western Junction
    - Western Junction to Brighton Hub, including Railton to Devonport Port
- **Feeder freight routes**
  - Road
    - Bass Highway, west of Burnie
    - East Tamar Highway, Bell Bay to Launceston
  - Rail
    - Derwent Valley Line (Boyer to Brighton Hub)
    - Fingal line (Fingal to Conara)
    - Bell Bay line (George Town railyard to Western Junction)

FIGURE 1.1 BURNIE TO HOBART FREIGHT CORRIDOR



This project consists of two linked components:

1. **Task 1** – Analysis of freight demand, freight demand forecasting and contestability analysis
2. **Task 2** – Evaluation of and advice on the infrastructure responses required to meet future freight demand

ACIL Allen collaborated with WSP Parsons Brinckerhoff (PB) in the delivery of this project. ACIL Allen is the lead contractor and is responsible for delivering all reports, while PB provided the specialised engineering and planning advice that underpins Task 2.

The next chapter of this report presents the key findings of the two tasks. The full reports from the first two tasks are included in this report as Appendices A and B.

2 KEY FINDINGS FROM PREVIOUS TASKS

The Corridor connects the major ports in Tasmania, and at some point along the supply chain, almost the entire import and export task is handled at one of the State's four publicly owned ports: Burnie, Devonport, Bell Bay and Hobart. Consequently the freight transported along the Corridor is diverse. The Tasmanian Freight Survey (the Survey) distinguishes between the following ten commodity groups:

- Agriculture & agricultural products
- Construction inputs
- Consumer goods
- Forestry
- Manufacturing
- Mining ores
- Wood products
- Cement
- Empty containers
- Basic metal products.

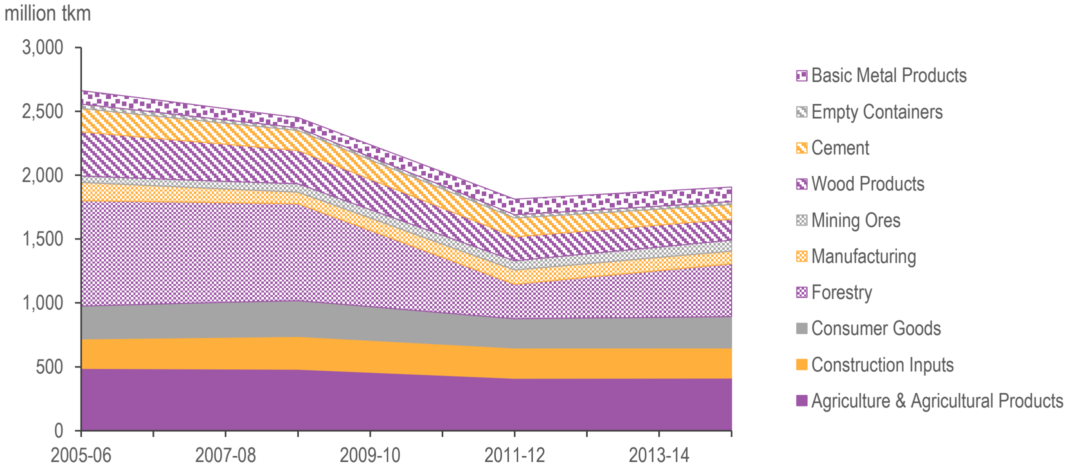
Figure 2.1 presents freight volumes recorded by the Survey for the ten commodity groups between 2005-06 and 2014-15. In this context, freight is measured in tonnes kilometres (tkm).

The figure shows that the total Tasmanian freight task decreased from 2.7 billion tkm in 2005-06 to 1.9 billion tkm 2014-15. The key driver of this trend was wood-related industries, with the freight task of forestry and wood products halving from 824 to 413 million tkm and from 346 to 166 million tkm respectively.

The dominant mode for conveying export products to the ports and for distributing imports to their final destinations is road transport. The Tasmanian road network is generally in very good condition, with limited congestion or travel time reliability issues. Rail freight is predominantly used for regular bulk transports originating from resource or wood product operations. In recent times, significant investment has been made in the rail network to improve safety and reliability.

The key freight-generating commodities in Tasmania include cement, hardwood logs, woodchips and zinc. The markets for most of these key freight-generating commodities are highly concentrated, and dominated by a small number of companies.

FIGURE 2.1 FREIGHT BY COMMODITY GROUP

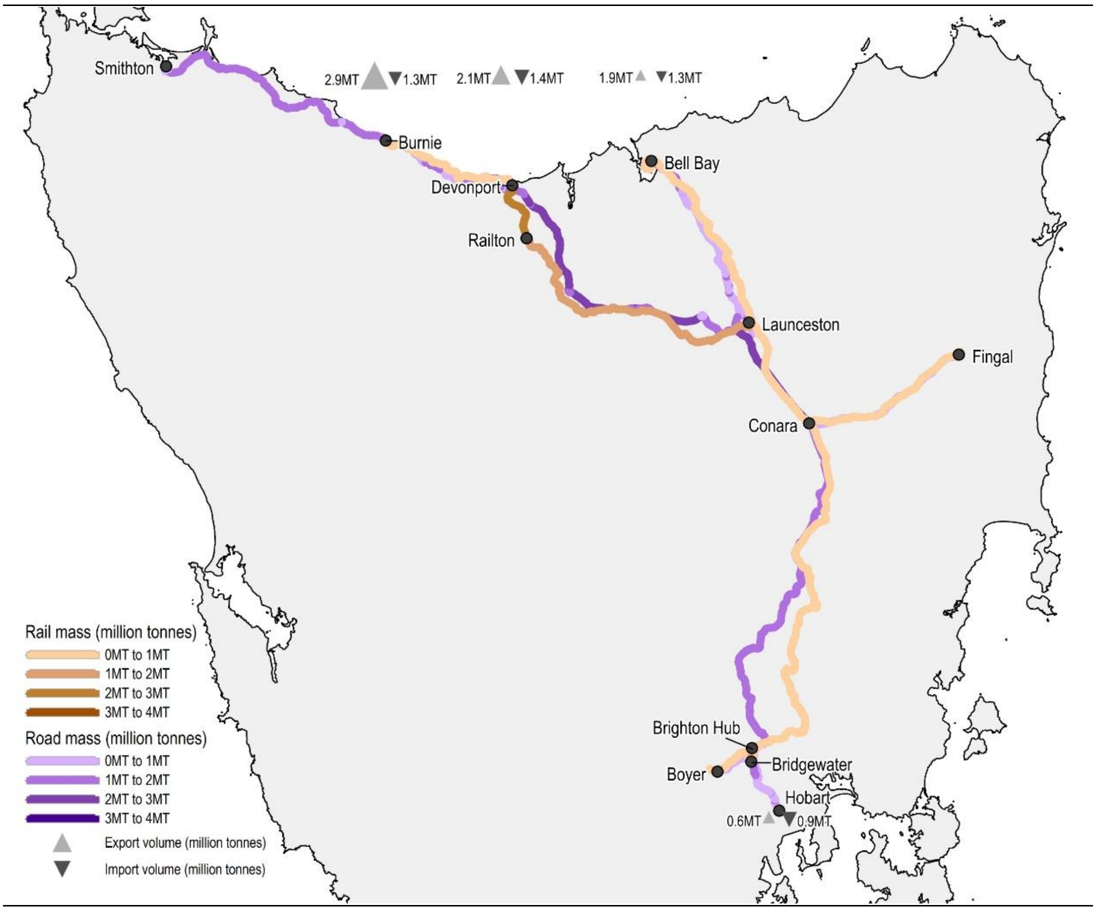


Note: Data displayed for non-survey years is extrapolated

SOURCE: ACIL ALLEN ANALYSIS OF TASMANIAN FREIGHT SURVEY

The Corridor can be broken down into a number of key segments based on the type of commodities carried and geographical locations. The key network segments can carry either road or rail freight, or a combination of both. Given the composition and location of Tasmanian industries, each of the segments tend to be dominated by a small number of key commodities. Figure 2.2 illustrates the segments and their tonnage carried.

FIGURE 2.2 FREIGHT BY MODE AND NETWORK SEGMENT



SOURCE: ACIL ALLEN ANALYSIS OF TASMANIAN FREIGHT SURVEY

2.1 Freight demand forecasts (Task 1)

ACIL Allen researched recent trends in the Tasmanian economy in order to forecast freight demand. This research was supplemented by information gathered during stakeholder consultation. Three economic growth scenarios (low, medium and high) were developed in order to produce three freight demand scenarios. ACIL Allen developed these scenarios in collaboration with the Department. They are designed to cover the range between plausible best and worst case economic conditions.

Growth rate projections were derived in two groups according to the degree of market concentration:

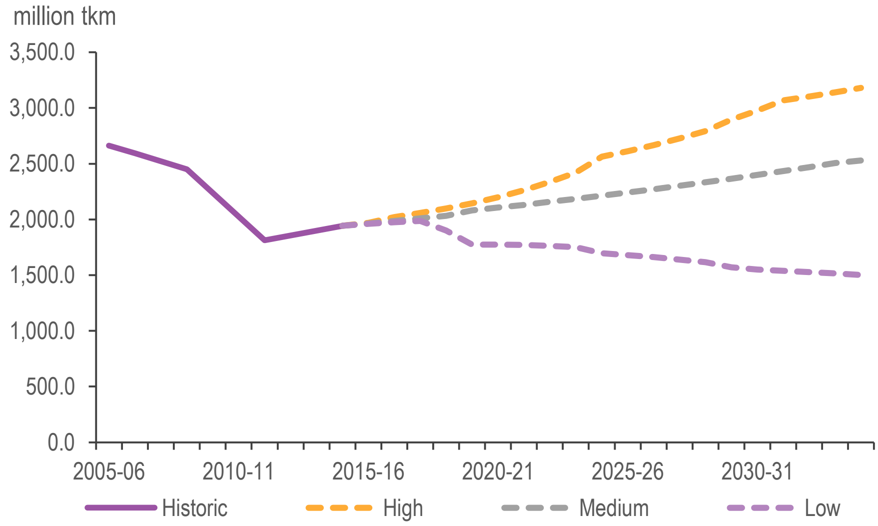
— For fragmented freight markets where there are many companies involved in the production of a certain commodity group, a group-specific growth rate and a company-specific performance indicator were derived. The group growth rates were estimated using (econometric) time series analyses.

— For concentrated freight markets where production of a certain commodity is dominated by a small number of companies, growth rates were derived based on an assessment of the relevant companies' production history. This information was typically sourced from annual and other company reports.

2.1.1 Overall demand

Figure 2.3 presents the three growth scenarios. Under the medium growth scenario, road and rail volumes along the corridor are projected to increase by 36 per cent and 10 per cent on average by 2034-35 respectively.

FIGURE 2.3 FREIGHT DEMAND FORECAST BY SCENARIO



SOURCE: ACIL ALLEN ANALYSIS OF TASMANIAN FREIGHT SURVEY

The chart shows that under the medium growth scenario, freight demand is forecast to grow from just under two billion tkm currently to about 2.5 billion tkm in 2034-35. The fastest growth is expected to take place in the agriculture and construction inputs commodity groups. Consumer goods are forecast to grow more moderately, while the freight demand for the rest of the commodity groups (including empty containers) is forecast to be mostly stable throughout the forecast period. Under the high growth scenario, freight demand is expected to grow to over three billion tkm over the same period. By contrast, the low scenario forecasts a moderate decrease in freight demand to just over 1.5 billion tkm by 2034-35.

2.1.2 Demand by network segment

Figure 2.4 presents the freight volume by network segment under the medium growth scenario. Road freight demand is forecast to experience the fastest growth of the network. This is particularly the case between Smithton and Burnie, on the Brooker Highway and over the Bridgewater Bridge, which are anticipated to grow by more than 40%.

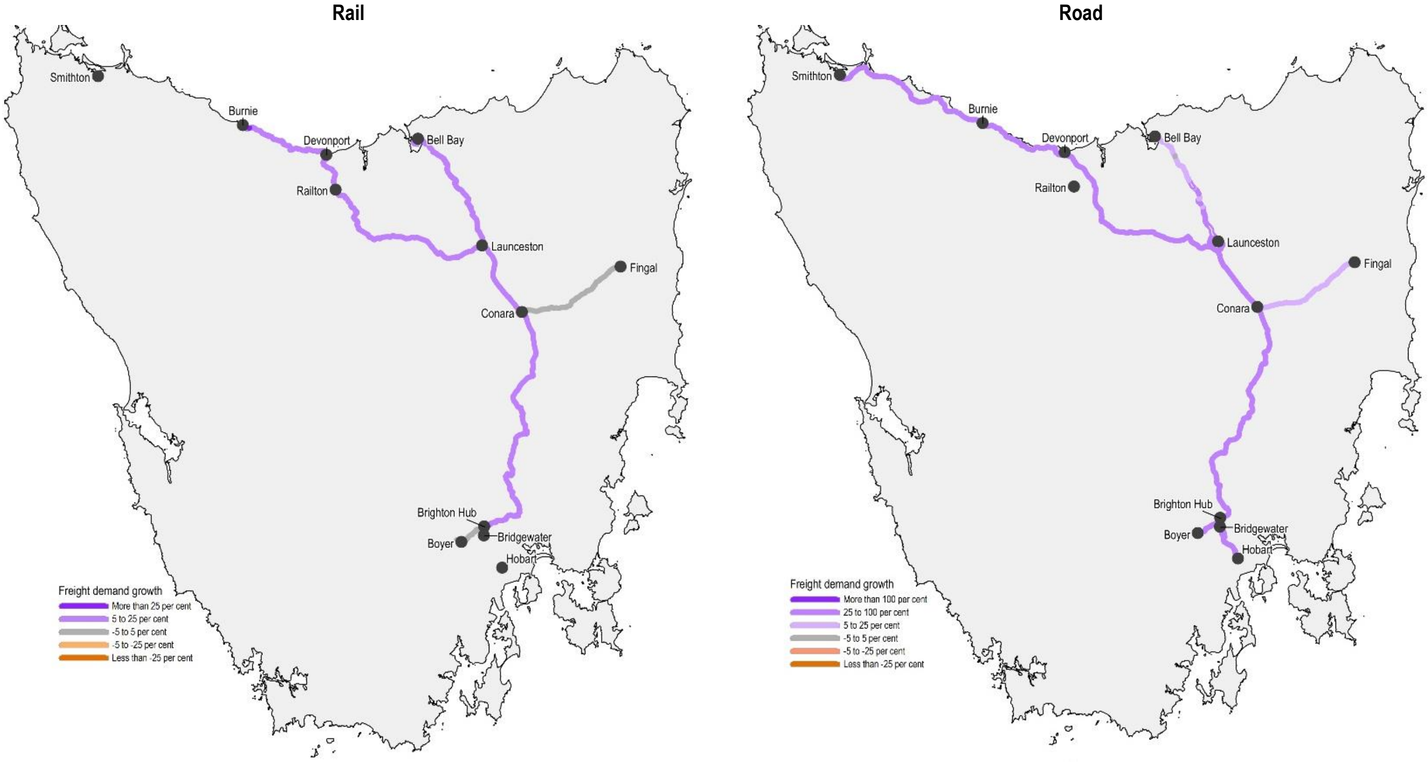
Tonnages of over 3 million tonnes are forecast between Burnie and Launceston, and over the Bridgewater Bridge. Growth along these segments is driven by freight demand from a combination of industries such as consumer goods, agriculture and construction inputs.

Road freight demand on remaining feeder routes, between Launceston and Bell Bay, Conara to Fingal and Brighton to Boyer, is forecast to grow moderately.

Under the medium growth scenario, volumes on all rail segments between Burnie and Hobart increase, with the largest increases between Burnie and Devonport and Launceston to Railton. All segments between Burnie and Conara are forecast to carry over 1 million tonnes. Rail freight demand between Launceston and Bell Bay, between Conara and Fingal, as well as between Brighton and Boyer, is forecast to remain stable.

While projected freight growth rates differ between scenarios, the most affected road and rail segments discussed above are similar for all three scenarios.

FIGURE 2.4 MEDIUM SCENARIO: FREIGHT VOLUME BY MODE AND NETWORK SEGMENTS



SOURCE: ACIL ALLEN ANALYSIS OF TASMANIAN FREIGHT SURVEY

2.1.3 Demand in tonnages

Under the medium growth scenario:

- road volumes along the corridor and key feeder routes increase by 36 per cent on average by 2034-35;
- rail volumes along the corridor and key feeder routes increase by 10 per cent on average by 2034-35;
- tonnages of over 3 million tonnes are forecast between Burnie and Launceston, and over the Bridgewater Bridge – all other road segments on the main Burnie to Hobart Corridor are forecast to carry freight volumes of over 2 million tonnes;
- all rail segments between Burnie and Conara are forecast to carry over 1 million tonnes
- Railton to Devonport is forecast to remain as the section with the highest rail tonnage.

2.2 Modal contestability (Task 1)

The choice of freight transport mode can be characterised as a price-service trade-off. Some companies tend to be organised for just-in-time efficiency or for quick customer service, and consequently require integrated logistics management and high levels of reliability from their freight service provider. They are typically willing to pay a premium for this level of service. Other companies might have a stronger focus on transport costs and can accept slower transit times and some lessening of reliability.

ACIL Allen analysed the transport mode market dynamics by simulating the market participants' reactions to changes in three key parameters – price, transit time and services level – for both rail and road. The effect of a parameter was analysed by using a model to estimate freight demand for a range of values for that parameter and keeping all other parameters unchanged.

2.2.1 Key determinants of mode choice

The demand elasticities used in the mode share analysis identified the following (high level) market characteristics.

— Rail users tend to be particularly price sensitive. Road transport demand is also price sensitive, but to a lesser degree.
— Agricultural products transported on road tend to be time sensitive; however all other commodity groups react only moderately to changes in transit time.
— Reliability of rail services is particularly important for mining related bulk products, cement, and manufactured products.
— Service levels are of only limited importance in road transport.
— The low cross price elasticities indicate that effect of price changes of the substitute mode is marginal.

2.2.2 Simulation results

The simulations show that:

— rail price reductions (increases) of more than 15 per cent have the potential to significantly increase (reduce) rail demand
— a rail price reduction of 40 per cent or more could grow rail demand by almost one billion tkm
— changes in rail service levels of up 10 ten per cent in either direction are unlikely to affect rail demand; the model predicts that even a reduction of rail service level by up to 40 per cent would only result in a slight demand reduction
— rail service level increases of around 40 per cent could more than double rail demand.

The road demand analyses demonstrate that only changes in road transport prices are likely to have a significant impact on mode choice. The simulations show that:

— road price increases (reductions) of more than 20 per cent have the potential to significantly increase (reduce) rail demand
— a 20 per cent price reduction in road transport prices (for example, triggered by a step change in heavy vehicle productivity) could result in a shift of all current rail users to road
— conversely, road price increases of around 20 per cent could lead to exponential growth in rail demand.

2.2.3 Scenario analysis

ACIL Allen applied the modal contestability framework to a range of scenarios that were developed in collaboration with the Department. The mode choice scenarios are designed to (a) to test the sensitivity of road and rail to price, transit time and service levels; and (b) to address network and customer-based scenarios. The key results from two of the scenarios are summarised below:

— **All freight currently transported on rail switches to road**
The analysis indicates that if all current Tasmanian rail users switched to road, road freight along the Corridor would increase by approximately 25 per cent.

— **Existing major rail users switch to road**
The analysis indicates that a switch by existing major rail users would have an impact across all segments of the Burnie to Hobart corridor. The largest impact in terms of percentage change is between Brighton and Boyer (25 per cent), along Illawarra Main Road (20 per cent), and between Railton and Devonport (25 per cent).

2.3 Capacity assessment (Task 2)

The road network carries four times the amount of the freight task on the Burnie to Hobart corridor compared with rail, and based on the forecasts prepared by ACIL Allen, this proportion is expected to increase into the future. Nevertheless, freight traffic represents a very small proportion of total vehicle trips in the corridor and investment in projects to alleviate congestion or enhance road safety is generally driven by passenger vehicle activity, not freight vehicles.

The Corridor's road network is generally considered to be efficient, with few capacity constraints. There is little or no congestion on the network, except on some of the urban portions of the corridor during peak commuter periods. This facilitates the provision of reliable and efficient freight services, with the network providing excellent access to ports and major freight precincts for trucks.

The road network has adequate capacity to accommodate the existing freight task, as well as the capability to easily accommodate the highest forecasts of the future freight task, without the need to invest in capacity related upgrades.

However, investment in upgrading bridge structures, and widening of pavements, will be required in order to accommodate higher productivity freight vehicles over some portions of the network. The road freight industry's pursuit of increased efficiency over time will continue to place pressure on network design standards, and to a lesser degree maintenance costs, as a result of demands for the operation of heavier and longer vehicles.

The rail network has also been assessed as having sufficient capacity to accommodate the highest predicted future freight forecast task. Investment in rail needs to be largely focused on improving the reliability and safety of the network in the short term, and reducing track maintenance costs to a level that will be supportable from operating revenues as early as possible. TasRail has indicated that a further once-off capital injection of $120M would be sufficient to reach this position. This investment should be focused on the primary customer expectation of rail becoming more reliable rather than pursuing transit time reductions.

The total maintenance cost for the State Road network is $63M per annum, giving an annual average road maintenance cost of $16,700 per kilometre, compared with a future average annual rail maintenance cost of $21,370 per kilometre, suggesting that the cost of maintaining the road network has a lower unit cost than rail, especially in the context that road carries a greater proportion of the freight task.

Road maintenance costs are also relatively insensitive to changes in freight volumes, and there is no requirement for capital expenditure in order to sustain current maintenance budgets. However, this does not adequately represent the total costs and benefits of the rail network and cannot be used as the basis of a decision on the future allocation of funds. A full economic assessment is necessary to understand the true value of each of the transport modes and the contribution they make to the Tasmanian economy.

Government should therefore consider an integrated strategy for the management of the corridor and the prioritisation of investment. The development of a 10-year asset and maintenance renewal plan for both road and rail would allow the prioritisation of capital allocation between modes and thereby optimise investment returns from the corridor. This process would need to be supported by the development of robust business cases to support funding application with both road and rail applications being prepared in the same format to allow an easier comparison to be made around good investment choices.

The financial performance of the TasRail business is highly dependent on the revenue from a small number of freight customers. Major business decisions by any one of those customers have the potential to impact rail freight volumes along the corridor. In the case of Boyer and Fingal, loss of the only traffic carried on those corridors could trigger the closure of those branch lines. Therefore investment in those lines needs to be considered in the context of the business risk. Any significant reduction in mainline volumes will challenge the viability of rail as a whole, due to a reduced revenue base to cover the cost of maintaining the mainline.

A funding dilemma arises because the branch lines are of a lower standard than the main lines and require a disproportionate amount of ongoing maintenance and capital investment to support the volume of operations. Unless funding is allocated to these lines, which have lower traffic volumes and tonne kilometres, then a substantial portion of the TasRail revenue would be foregone. The role and viability of these branch lines therefore require careful analysis.

An assessment of the impact on the road network from transferring all or part of the rail task to road has identified:

— There would be no immediate need to upgrade the main Burnie to Hobart road corridor. Upgrades including a new South Perth link between the Midland Highway and Illawarra Main Road, upgrades to the Brooker Highway in Hobart and a new Bridgewater Bridge, will deliver improved freight outcomes.

— The transfer of the Fingal to Railton coal traffic to road would trigger the need to consider bringing forward bridge strengthening road widening projects on Esk Main Road. There is an identified package of works for this road, based largely on incremental safety improvements, which will also deliver freight benefits. It is also important to note that coal has already been roaded over this corridor for the Boyer Mill and that the road has carried a significant forestry task, so the main change would be an increase in truck volumes. Significant upgrade of Railton Road may also be required.

— The transfer of Boyer rail freight to road would trigger the need to consider bridge strengthening and road widening projects on Boyer Road. However, there is an alternative route available via Lyell Highway, although it has a longer route distance and requires trucks to cross the existing Bridgewater Bridge, which makes this option unattractive.

— Bell Bay rail freight traffic volumes are quite low and the parallel East Tamar Highway could generally accommodate these volumes. Although additional truck volumes would represent a very small percentage of total volumes through Launceston, community perception may see this as undesirable within the town centre.

— The transfer of rail freight from Railton would introduce significant volumes onto the Railton to Devonport corridor. The transfer of tonnage to road would result in substantial volumes of new traffic movement and would require a major upgrade of road infrastructure and potentially some bridge upgrades.

The funding priority for freight movements will be to gain advantage from productivity improvements. While works are currently in hand to enable widespread B-double truck operation, the pursuit of continued improvements in the freight industry will generate ongoing pressure for greater truck efficiency.

New road freight productivity projects will require further capital investment in the network, but at the same time challenge the contestability of rail freight. Investments in the road network may thus cause a reduction in the financial performance of rail. This should be considered as part of the business case development for road projects.

Finally, the impact of new (disruptive) technologies needs to be considered. The development of autonomous vehicles and the platooning of trucks are likely to change the infrastructure requirements for the Burnie to Hobart corridor.

A

TASK 1 REPORT: FREIGHT DEMAND

ACIL ALLEN CONSULTING

CONFIDENTIAL REPORT TO
DEPARTMENT OF STATE GROWTH
SEPTEMBER 2016

BURNIE TO HOBART FREIGHT CORRIDOR STRATEGY

FREIGHT DEMAND ANALYSIS
TASK 1 REPORT

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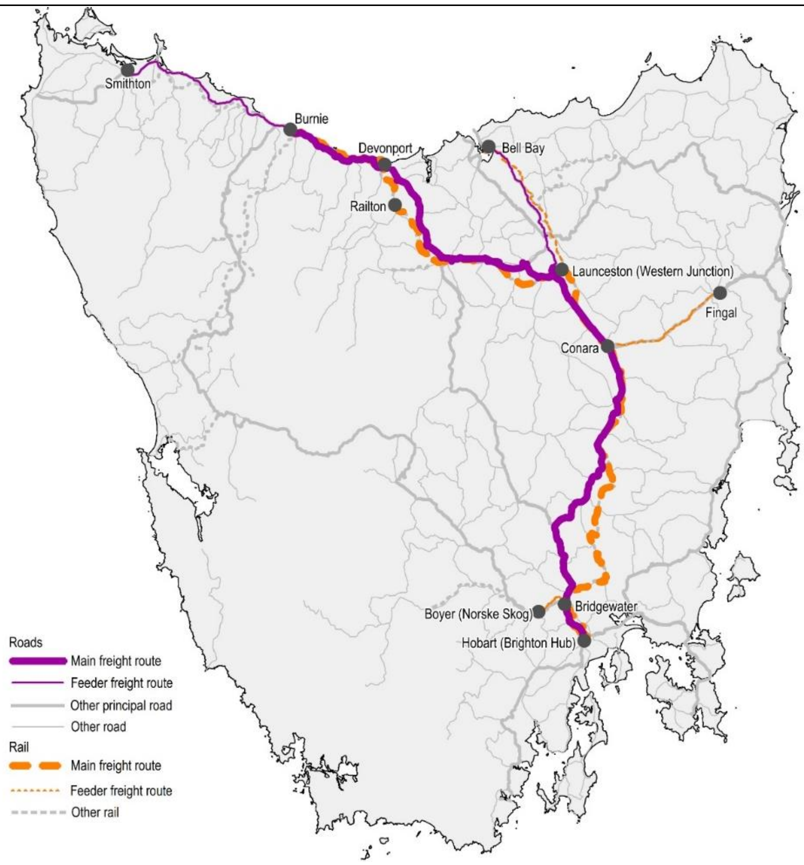
Note: Commercial-in-confidence information, including information relating to company volumes, market share and operations, has been removed from this report.

EXECUTIVE SUMMARY AND KEY RESULTS

The Department of State Growth (the Department) has appointed ACIL Allen Consulting (ACIL Allen) to conduct an analysis of freight demand and future productivity improvements along the Burnie to Hobart corridor (the Corridor). The Corridor is shown on the map in Figure ES 1.

FIGURE ES 1 BURNIE TO HOBART FREIGHT CORRIDOR



The Corridor connects the major ports in Tasmania, making its efficiency vital to many of the state's key export industries as well as to consumers throughout the state. At some point along the supply chain, almost the entire import and export task is handled at one of the State's four publicly owned ports: Burnie, Devonport, Bell Bay and Hobart. While container trade is concentrated at the Ports of

Burnie and Devonport, bulk goods are handled at all four ports. In total, bulk freight accounts for about two-thirds of Tasmania's freight task and containers for the remaining third.

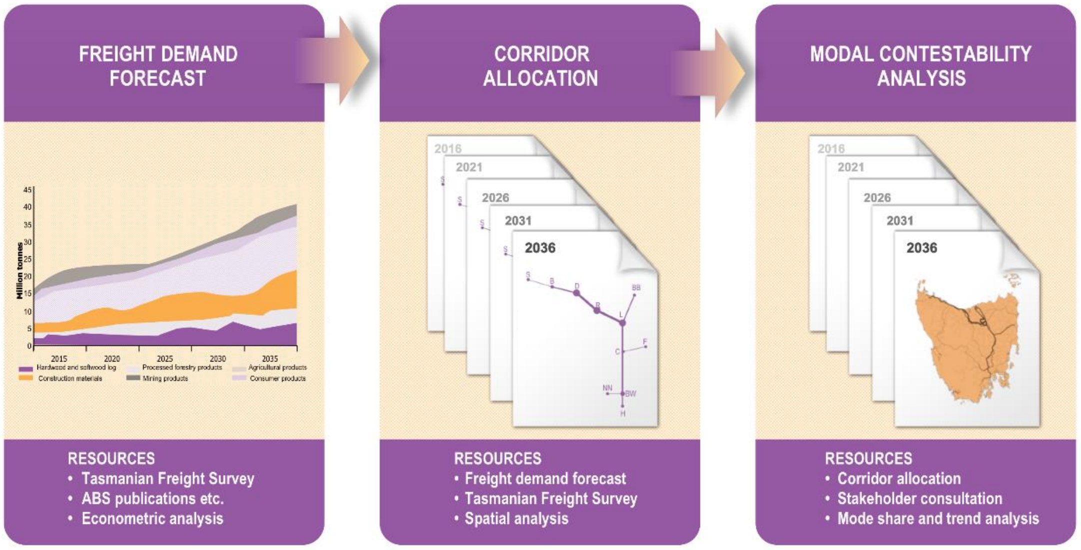
This is the first of two task reports. It analyses past freight demand, generates forecasts and conducts a mode contestability analysis. ACIL Allen will provide the key findings to WSP Parsons Brinckerhoff (PB), who will use them to develop infrastructure responses to meet the forecast demand.

For this study, the Department provided ACIL Allen with data from the Tasmanian Freight Survey (the Survey) covering four periods: 2005-06, 2008-09, 2011-12 and 2014-15. The Survey data forms the foundation of this study.

Approach

ACIL Allen's approach is broken into three steps. The first step projects the total freight task by commodity class based on (external) economic projections. The results are allocated to corridors and modes within the corridors in the second step. In the final step, the freight task is allocated down to specific networks. Figure ES 2 illustrates this methodology.

FIGURE ES 2 FREIGHT DEMAND ANALYSIS



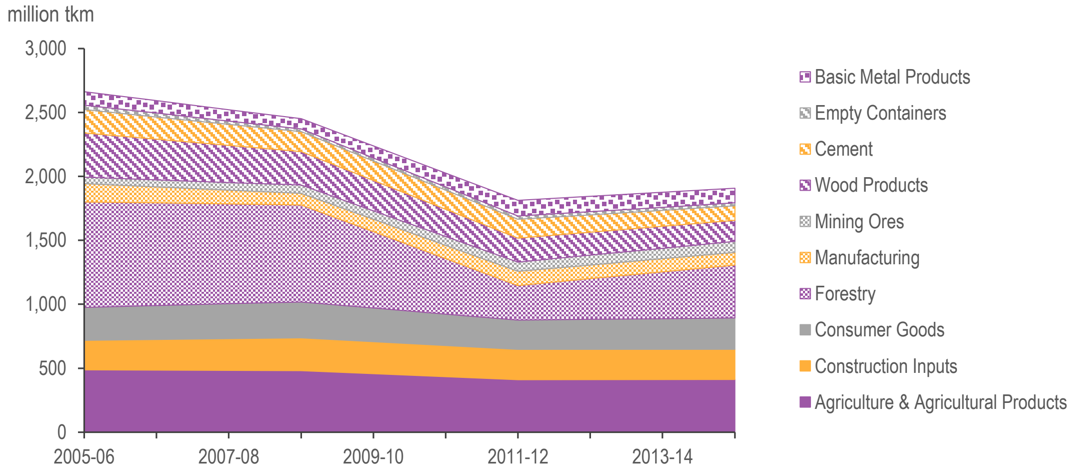
Historical freight demand

The Corridor connects the major ports and at some point along the supply chain, almost the entire import and export task is handled at one of the State's four publicly owned ports: Burnie, Devonport, Bell Bay and Hobart. Consequently the freight transported along the Corridor is diverse. The Survey distinguishes between the following ten commodity groups:

- Agriculture & agricultural products
- Construction inputs
- Consumer goods
- Forestry
- Manufacturing
- Mining ores
- Wood products
- Cement
- Empty containers
- Basic metal products.

Figure ES 3 presents freight volumes recorded by the Survey for the ten commodity groups between 2005-06 and 2014-15. In this context, freight is measured in tonnes kilometres (tkm) in order to adjust potential double counting issues (discussed in section 2.1 in the body of the report). Tonnage data can be found on the map presented in Figure ES 4.

FIGURE ES 3 FREIGHT BY COMMODITY GROUP



Note: Data displayed for non-survey years is extrapolated

SOURCE: ACIL ALLEN ANALYSIS OF TASMANIAN FREIGHT SURVEY

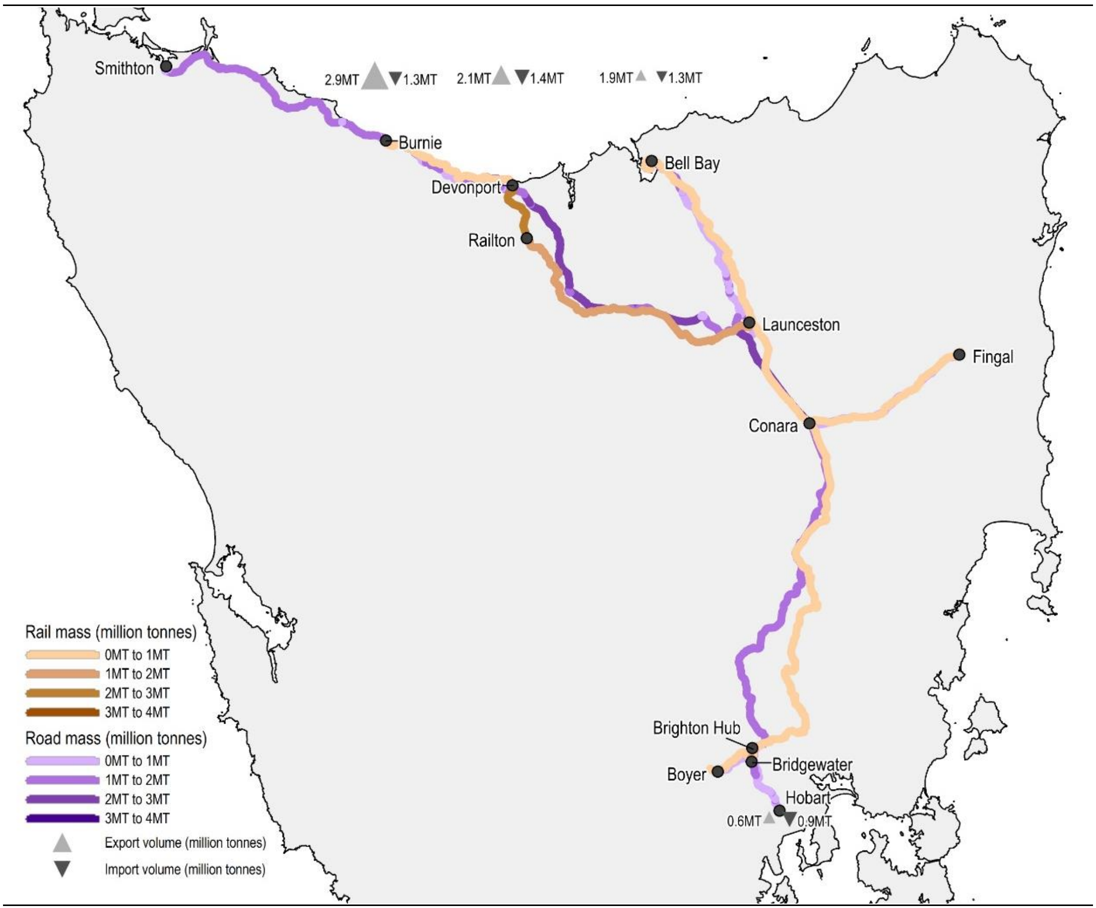
The figure shows that the total Tasmanian freight task decreased from 2.7 billion tkm in 2005-06 to 1.9 billion tkm 2014-15. The key driver of this trend was wood-related industries with the freight task of forestry and wood products halving from 824 to 413 million tkm and from 346 to 166 million tkm respectively.

The dominant mode for conveying export products to the ports and for distributing imports to their final destinations is road transport. The Tasmanian road network is generally in very good condition, with limited congestion or travel time reliability issues. Rail freight is predominantly used for regular bulk transports originating from resource or wood product operations. In recent times, significant investment has been made in the rail network to improve safety and reliability.

The key freight-generating commodities in Tasmania include cement, hardwood logs, woodchips and zinc. The markets for most of these key freight-generating commodities are highly concentrated and dominated by a few companies.

The Corridor can be broken down into a number of key segments based on the type of commodities carried and geographical locations. The key network segments can carry either road or rail freight, or a combination of both. Given the composition and location of Tasmanian industries, each of the segments tend to be dominated by a small number of key commodities. Figure ES 4 illustrates the segments and their tonnage carried.

FIGURE ES 4 FREIGHT BY MODE AND NETWORK SEGMENT



SOURCE: ACIL ALLEN ANALYSIS OF TASMANIAN FREIGHT SURVEY

Freight demand forecasts

ACIL Allen researched recent trends in the Tasmanian economy in order to forecast freight demand. This research was supplemented by information gathered during stakeholder consultation. Three economic growth scenarios (low, medium and high) were developed in order to produce three freight demand scenarios. ACIL Allen developed these scenarios in collaboration with the Department. They are designed to cover the range between plausible best and worst case economic conditions.

Growth rate projections were derived in two groups according to the degree of market concentration:

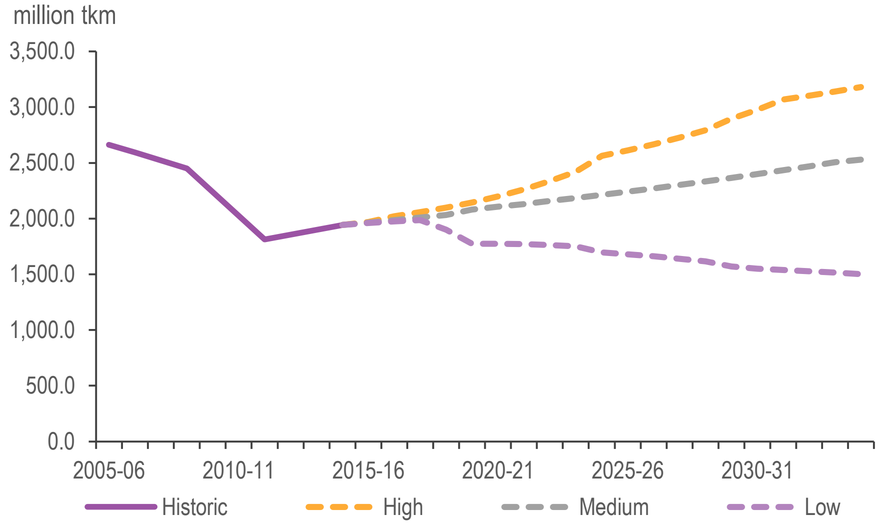
— For fragmented freight markets where there are many companies involved in the production of a certain commodity group, a group-specific growth rate and a company-specific performance indicator were derived. The group growth rates were estimated using (econometric) time series analyses; they can be found in the Appendices at the back of this report for each commodity group.

— For concentrated freight markets where production of a certain commodity is dominated by a small number of companies, growth rates were derived based on an assessment of the relevant companies' production history. This information was typically sourced from annual and other company reports.

Overall demand

Figure ES 5 presents the three growth scenarios. Under the medium growth scenario, road and rail volumes along the corridor are projected to increase by 36 per cent and 10 per cent on average by 2034-35 respectively.

FIGURE ES 5 FREIGHT DEMAND FORECAST BY SCENARIO



SOURCE: ACIL ALLEN ANALYSIS OF TASMANIAN FREIGHT SURVEY

The chart shows that under the medium growth scenario, freight demand is forecast to grow from currently just under two billion tkm to about 2.5 billion tkm in 2034-35. The fastest growth expected to take place in the agriculture, consumer goods and construction inputs commodity groups. Freight demand for the rest of the commodity groups (including empty containers) is forecast to be mostly stable throughout the forecast period. Under the high growth scenario, freight demand is expected to grow to over three billion tkm over the same period. By contrast, the low scenario forecasts a moderate decrease in freight demand to just over 1.5 billion tkm by 2034-35.

Demand by network segment

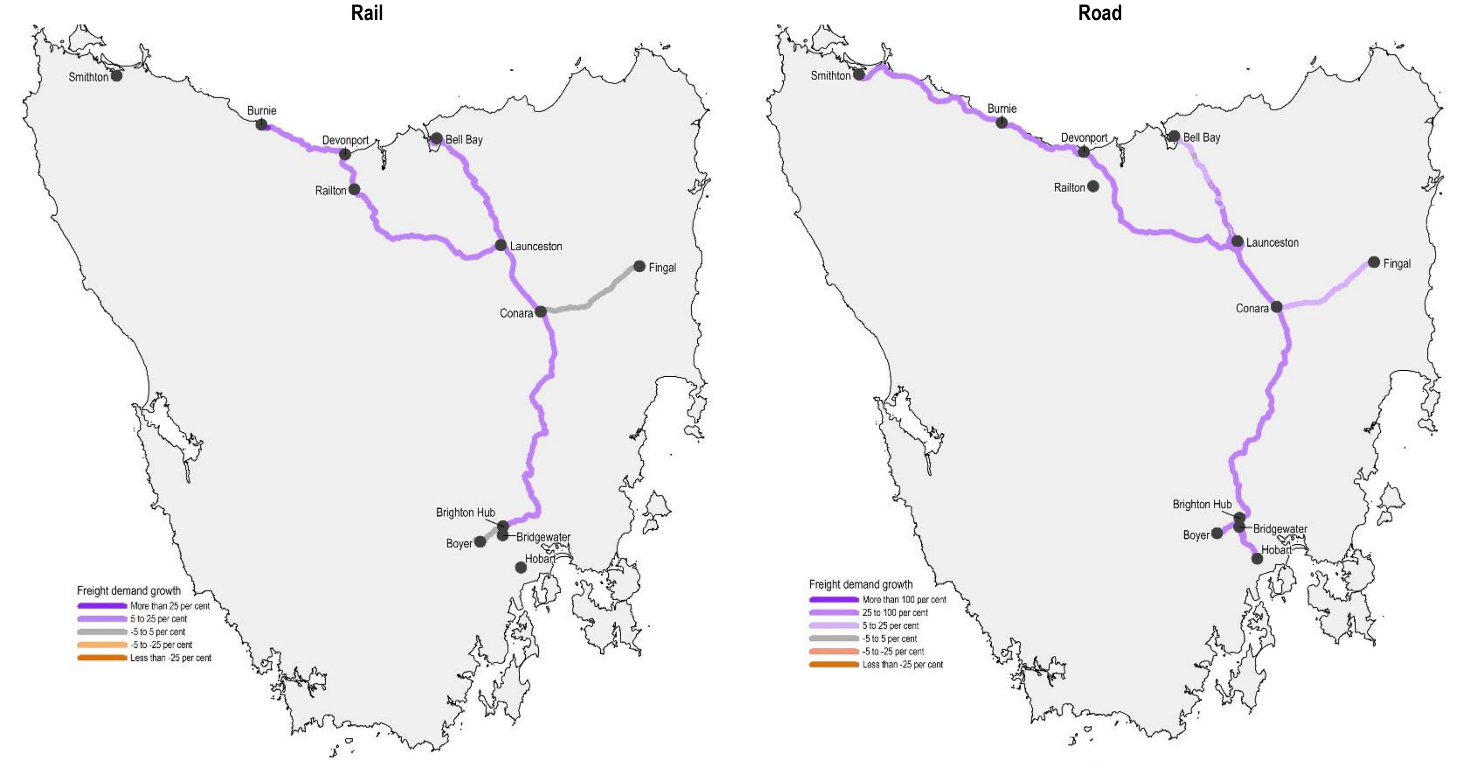
Figure ES 6 presents the freight volume by network segment under the medium growth scenario. Road freight demand is forecast to experience the fastest growth of the network. This is particularly the case between Smithton and Burnie, on the Brooker Highway and over the Bridgewater Bridge, which are anticipated to grow by more than 40%.

Tonnages of over 3 million tonnes are forecast between Burnie and Launceston, and over the Bridgewater Bridge. Growth along these segments is driven by freight demand from a combination of industries such as consumer goods, agriculture and construction inputs.

Road freight demand on remaining feeder routes, between Launceston and Bell Bay, Conara to Fingal and Brighton to Boyer, is forecast to grow moderately.

Under the medium growth scenario, volumes on all rail segments between Burnie and Hobart increase, with the largest increases between Burnie and Devonport and Launceston to Railton. All segments between Burnie and Conara are forecast to carry over 1 million tonnes. Rail freight demand between Launceston and Bell Bay, Conara to Fingal and Brighton to Boyer, is forecast to remain stable.

FIGURE ES 6 MEDIUM SCENARIO: FREIGHT VOLUME BY MODE AND NETWORK SEGMENTS



SOURCE: ACIL ALLEN ANALYSIS OF TASMANIAN FREIGHT SURVEY

While projected freight growth rates differ between scenarios, the most affected road and rail segments discussed above are similar for all three scenarios.

Demand in tonnages

Under the medium growth scenario:

— road volumes along the corridor and key feeder routes increase by 36 per cent on average by 2034-35;

— rail volumes along the corridor and key feeder routes increase by 10 per cent on average by 2034-35;

— tonnages of over 3 million tonnes are forecast between Burnie and Launceston, and over the Bridgewater Bridge - all are other road segments on the main Burnie to Hobart Corridor are forecast to carry freight volumes of over 2 million tonnes;

— all rail segments between Burnie and Conara are forecast to carry over 1 million tonnes; and,

— Railton to Devonport is forecast to remain the highest rail tonnage section.

Modal contestability

The choice of freight transport mode can be characterised as a price-service trade-off. Some companies tend to be organised for just-in-time efficiency or for quick customer service, and consequently require integrated logistics management and high levels of reliability from their freight service provider. They are typically willing to pay a premium for this level of service. Other companies might have a stronger focus on transport costs and can accept slower transit times and some lessening of reliability.

ACIL Allen analysed the transport mode market dynamics by simulating the market participants' reactions to changes in three key parameters (price, transit time and services level) for both rail and road. The effect of a parameter was analysed by using a model to estimate freight demand for a range of values for that parameter and keeping all other parameters unchanged.

Key determinants of mode choice

The demand elasticities used in the mode share analysis identified the following (high level) market characteristics.

- Rail users tend to be particularly price sensitive. Road transport demand is also price sensitive, but to a lesser degree.
- Agricultural products transported on road tend to be time sensitive; however all other commodity groups react only moderately to changes in transit time.
- Reliability of rail services is particularly important for mining related bulk products, cement, and manufactured products.
- Service levels are of only limited importance in road transport.
- The low cross price elasticities indicate that effect of price changes of the substitute mode is marginal.

Simulation results

The simulations show that:

- rail price reductions (increases) of more than 15 per cent have the potential to significantly increase (reduce) rail demand;
- a rail price reduction of 40 per cent or more could grow rail demand by almost one billion tkm;
- changes in rail service level of up 10 ten per cent in either direction are unlikely to affect rail demand. The model predicts that even a reduction of rail service level by up to 40 per cent would only result in a slight demand reduction; and,
- rail service level increases of around 40 per cent could more than double rail demand.

The road demand analyses demonstrate that only changes in road transport prices are likely to have a significant impact on mode choice. The simulations show that:

- road price increases (reductions) of more than 20 per cent have the potential to significantly increase (reduce) rail demand;
- a 20 per cent price reduction in road transport prices (for example, triggered by a step change in heavy vehicle productivity) could result in a shift of all current rail users to road; and,
- conversely, road price increases of around 20 per cent could lead to exponential growth in rail demand.

Scenario analysis

ACIL Allen applied the modal contestability framework to a range of scenarios that were developed in collaboration with the Department. The mode choice scenarios are designed to (a) to test the sensitivity of road and rail to price, transit time and service levels; and (b) to address network and customer-based scenarios. The key results from two of the scenarios are summarised below:

- **All freight currently transported on rail switch to road**
  The analysis indicates that if all current Tasmanian rail users switched to road, road freight along the Corridor would increase by approximately 25 per cent.
- **Existing major rail users switch to road**
  The analysis indicates that a switch by existing major rail users would have an impact across all segments of the Burnie to Hobart corridor. The largest impact in terms of percentage change is between Brighton and Boyer (25 per cent), along Illawarra Main Road (20 per cent), and between Railton and Devonport (25 per cent).

1 INTRODUCTION

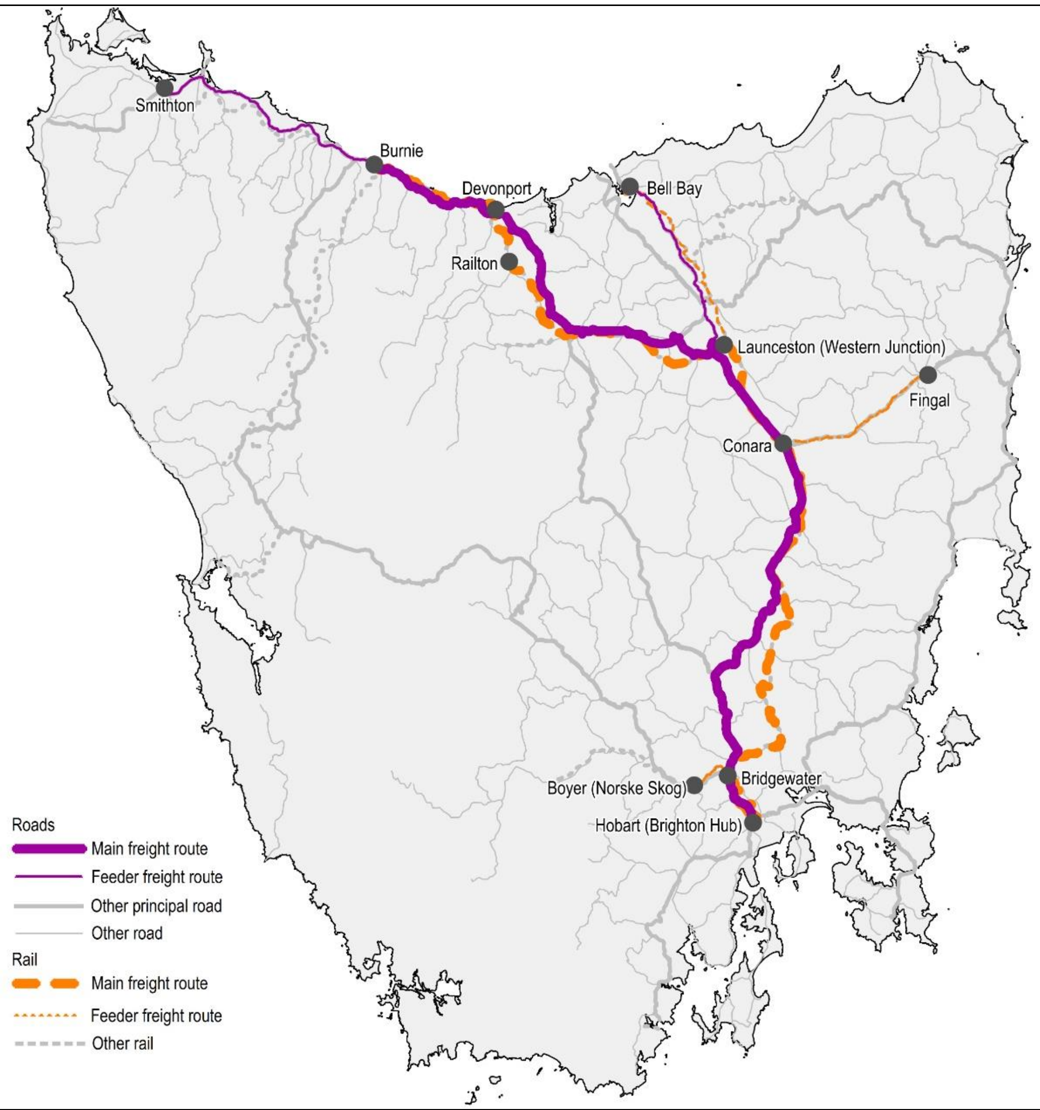
The Department of State Growth (the Department) has appointed ACIL Allen Consulting (ACIL Allen) to conduct an analysis of freight demand and future productivity improvements along the Burnie to Hobart corridor (the Corridor).

The Corridor connects the major ports making its efficiency vital to many of Tasmania's key export industries as well as to consumers throughout the State. At some point along the supply chain, almost the entire import and export task is handled at one of the State's four publicly owned ports: Burnie, Devonport, Bell Bay and Hobart. While container trade is concentrated at the Ports of Burnie and Devonport, bulk goods are handled at all ports. In total, bulk freight accounts for about two thirds of Tasmania's freight task and containers for the remaining third.

The Corridor comprises the following networks that are also displayed in a geographic context on the map in Figure 1.1:

- **Main freight routes**
  - Road
    - Bass Highway, Burnie Port to Launceston
    - Midland Highway, Launceston to Granton
    - Illawarra Main Road
    - Brooker Highway, Domain Overpass to Granton
  - Rail
    - Burnie Port to Western Junction
    - Western Junction to Brighton Hub, including Railton to Devonport Port
    -
- **Feeder freight routes**
  - Road
    - Bass Highway, west of Burnie
    - East Tamar Highway, Bell Bay to Launceston
  - Rail
    - Derwent Valley Line (Boyer to Brighton Hub)
    - Fingal line (Fingal to Conara)
    - Bell Bay line (George Town railyard to Western Junction)

FIGURE 1.1 BURNIE TO HOBART FREIGHT CORRIDOR



This consultancy project consists of three linked components:

1. Analysis of freight demand: Freight demand forecasting and contestability analysis
2. Evaluation of and advice on the infrastructure responses required to meet future freight demand
3. General advice on opportunities to improve freight productivity across the Burnie to Hobart Freight Corridor, including key freight feeder routes.

ACIL Allen is collaborating with WSP Parsons Brinckerhoff (PB) in the delivery of this project. ACIL Allen is the lead contractor and responsible for delivering all reports while PB is providing specialised engineering and planning advice that will underpin Task 2.

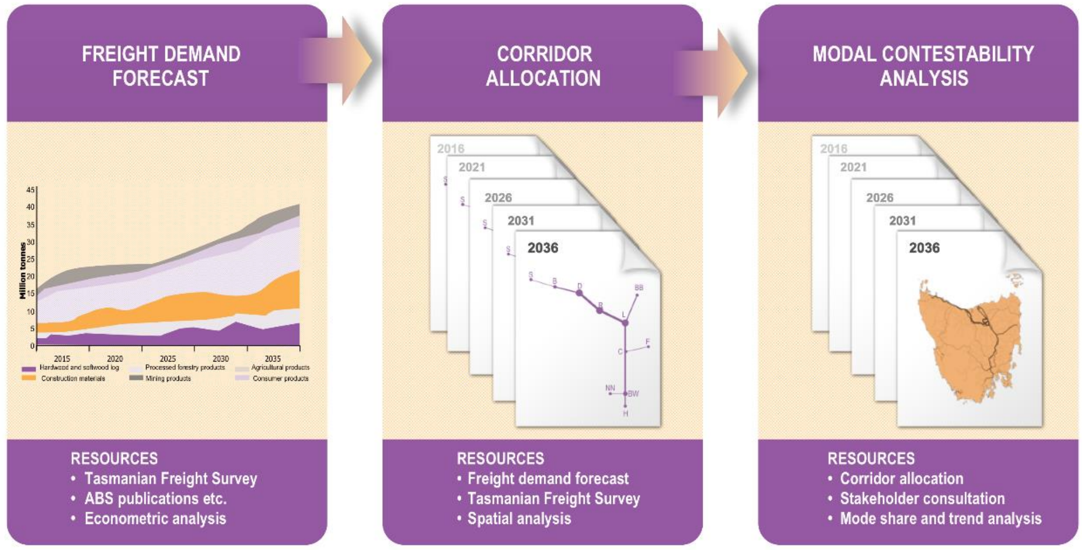
This report presents the analysis and results of Task 1.

1.1 Methodology

The Department has provided ACIL Allen with four iterations of data from the Tasmanian Freight Survey (the Survey). These datasets cover the years 2005-06, 2008-09, 2011-12 and 2014-15. The contained data are the foundation of this study.

The analytical approach deployed in this report can be broken down into three steps. The first step projects the total freight task by commodity class based on (external) economic projections. The results are allocated to corridors and modes within the corridors in the second step. In the final step, the freight task is allocated down to specific networks to identify potential infrastructure constraints. Figure 1.2 illustrates this methodology.

FIGURE 1.2 FREIGHT DEMAND ANALYSIS



1.2 Key definitions and acronyms

This report uses a number of specific terms and acronyms. They are summarised in the Table 1.1 below.

TABLE 1.1 TERMS AND ACRONYMS

Term	Definition
BITRE	Bureau of Infrastructure, Transport and Regional Economics
Commodity	Product based freight descriptor. There are 68 commodities.
Commodity group	Industry based commodity aggregate. There are 10 commodity groups.
Destination company	Freight receiving company recorded in the Survey. If the destination company is a port, the associated goods are exported.
Freight demand	Freight demand refers to the 'realised demand', not 'potential demand'. This means the freight demand is based on the observed historical freight volume, excluding the unmet freight demand that cannot be observed using available data.
km	Kilometres
km/h	Kilometres per hour
Origin company	Freight generating company recorded in the Survey. If the origin company is a port, the associated goods are imported.
Survey freight task	One observation in the freight survey raw data that is unique through its combination of origin company, destination company, commodity, mode choice and freight mass.
The Corridor	Burnie to Hobart freight corridor and feeder routes as defined in Figure 1.1
The Department	Department of State Growth
The Survey	Tasmanian Freight Survey
tkm	Tonne kilometres

1.3 Structure of this report

This report is split into two parts. The main body presents the analytical approach to each of the three steps presented in Figure 1.2 in detail and then forecasts at the (aggregate) commodity group level. The Appendix contains detailed discussions of the composition of each commodity group, the key freight generating companies and how the (group specific) growth scenarios were derived.

ACIL Allen adopted this approach because of the richness of the data contained in the Tasmanian Freight Survey. The Survey data allowed ACIL Allen to conduct research at a very granular level and consequently produce forecasts at a freight task level. While the resulting forecasts can be interpreted at an aggregate level with only a small loss of information, understanding their derivation requires descriptions at a commodity group or even commodity specific level. ACIL Allen expects that most readers of this report will not require information at this level of detail.

The main body of the report is structured as follows:

— **Chapter 2** provides context for the forecasts by presenting the recent history of freight demand in Tasmania, introducing the key players and discussing the limitations of the Survey

— **Chapter 3** presents forecast freight volumes (approach and results)

— **Chapter 4** analyses modal contestability along the corridor and presents forecasts

— The **Appendices** characterise each commodity group in detail and contain findings from the interviews with the relevant stakeholders that were conducted by ACIL Allen in June and July 2016.

2 FREIGHT DEMAND

The Corridor connects the major ports and at some point along the supply chain, almost the entire import and export task is handled at one of the State's four publicly owned ports: Burnie, Devonport, Bell Bay and Hobart. Consequently the freight transported along the Corridor is very diverse.

This chapter provides context by presenting the recent history of freight demand in Tasmania. Using four iterations of the Survey that cover the financial years 2005-06, 2008-09, 2011-12 and 2014-15, it analyses the freight volumes by commodity group, discusses recent trends in mode choice and introduces the key players. It commences by discussing the limitations of the Survey and introducing the key supplementary data sources used for the preparation of this report.

2.1 Limitations of the Survey

The Department of State Growth has conducted the freight survey every three years for the last 15 years. Data consistency between Surveys has been achieved since the 2005-06 iteration.

Data is collected by Department interviewers contacting freight generating companies to request information including the volume, origin and destination of inputs and outputs, where their freight moves to, and what type of vehicles are used. The result of is a dataset with between 5,000 and 6,000 observations, where each observation describes unique combinations of origin company, destination company, commodity, mode choice and freight mass. This report refers to these unique combinations as freight tasks.

While the Survey contains a wealth of data, it is important to note its limitations, including:

- A significant amount of data was "rolled-over" for the 2014-15 freight survey. Specifically, between 10 and 20 per cent of the tonnage was not changed between the 2011-12 and 2014-15 survey years (entirely "rolled-over") and a significant amount of spatial data also has not been updated between these years.
- The survey records a company's freight task for one financial year every three years. This has the following implications:
  - The survey does not capture seasonal fluctuations.
  - As a result of the three year gap between observations, the validity of Survey data based time series analysis is limited.
- The survey records every handling event and therefore can lead to some double-counting issues in the tonnage recorded.

ACIL Allen addressed these issues by developing a forecast methodology that is robust to inconsistent recording across Surveys and by supplementing the Survey data with two key data sources:

— ACIL Allen used tonne kilometres instead of tonnes for our analysis to avoid the double-counting issue.
— Seasonality was assessed using container freight data provided to ACIL Allen by the Port of Melbourne. Section 2.5 presents this analysis in detail.
— Industry growth rates used in the forecasts were derived from a range of sources and using different methodologies. For example, in cases where a limited number of freight generators was observed in the Survey, their likely reaction to future market conditions was anticipated by assessing the producer's market position and production capacity. For commodity groups in which freight generation is fragmented, growth rates were derived from relevant proxy time series such as price adjusted industry value add using (econometric) time series analysis techniques. Only the level of market concentration was estimated using Survey data.

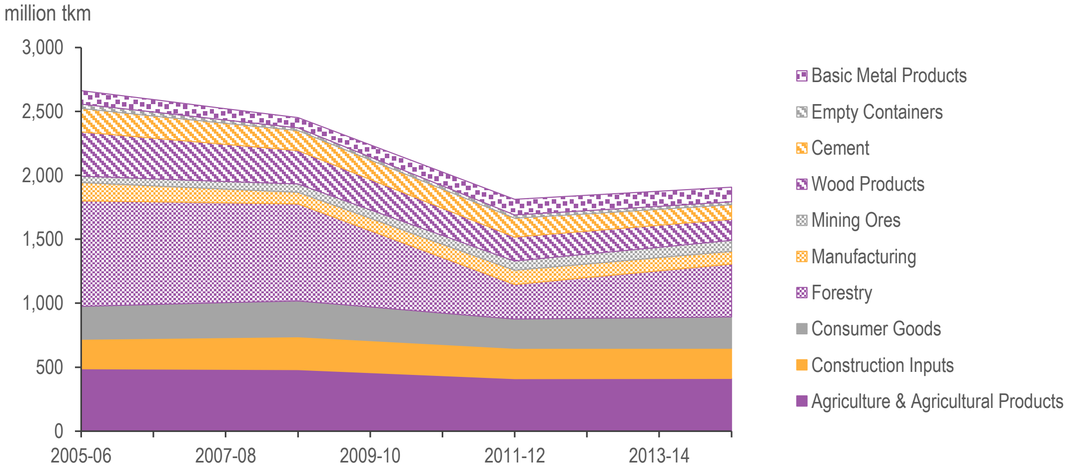
2.2 Freight by commodity group

This section presents summary statistics based on the four iterations of the Survey covering the financial years 2005-06, 2008-09, 2011-12 and 2014-15. The Survey distinguishes between the following ten commodity groups:

— Agriculture & Agricultural Products
— Construction inputs
— Consumer goods
— Forestry
— Manufacturing
— Mining ores
— Wood products
— Cement
— Empty containers
— Basic metal products

Figure 2.1 presents freight volumes recorded by the Survey by commodity groups. In this context, freight is measured in tkm in order to adjust for the double counting issues discussed in section 2.1. Tonnage data can be found in section 2.4.

FIGURE 2.1 FREIGHT BY COMMODITY GROUP



Note: Data displayed for non-survey years is extrapolated

SOURCE: ACIL ALLEN ANALYSIS OF TASMANIAN FREIGHT SURVEY

The figure shows that the total Tasmanian freight task decreased from 2.7 billion tkm in 2005-06 to 1.9 billion tkm 2014-15. The key driver of this trend was wood related industries with the freight task of forestry and wood products halving over this time period, from 824 to 413 million tkm and from 346 to 166 million tkm, respectively. This decrease reflects

— A recent period of significant change in the forest industry, including the decline of a dominant processor. However, new market entrants have seen the volume of some forest products increase, and approach previous production levels in some regions.
— The low value nature of forestry generally restricts freight movements to within a 75 to 100km radius of harvesting. Largely for this reason, forest products historically moved intra-regionally to one of three regional chip mills in the north-west (Hampshire), north (Longreach) and south (Triabunna).

Generally, it is not expected that there will be a return to the high volumes of forestry and wood product freight moving along the Corridor, experienced during previous peaks in the mid- to late 2000s.

Other significant decreases could be observed in manufacturing and cement related freight as well as in empty container. ACIL Allen understands that the latter is likely to be a result of changes in the Survey's data collection methodology.

2.3 Mode shares

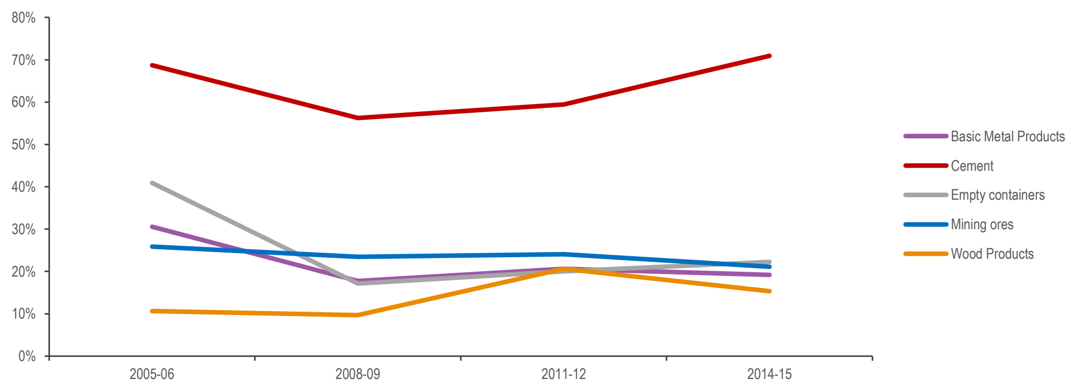
The dominant mode of conveying export products to the ports and of distributing imports to their final destinations is road transport. The Tasmanian Road network is generally in a very good condition, with limited congestion or travel time reliability issues.

Rail freight is pre-dominantly used for regular bulk transports originating from resource or wood product operations. Significant recent investment has been made in the rail network to improve safety and reliability.

Stakeholder consultation conducted by ACIL Allen found that TasRail's legacy customers still dominate demand for rail transport.

Figure 2.2 presents the rail share by commodity group over time. For brevity and better graphic illustration, only commodity groups with an average rail share of ten per cent are presented here.

FIGURE 2.2 RAIL SHARE BY COMMODITY GROUP

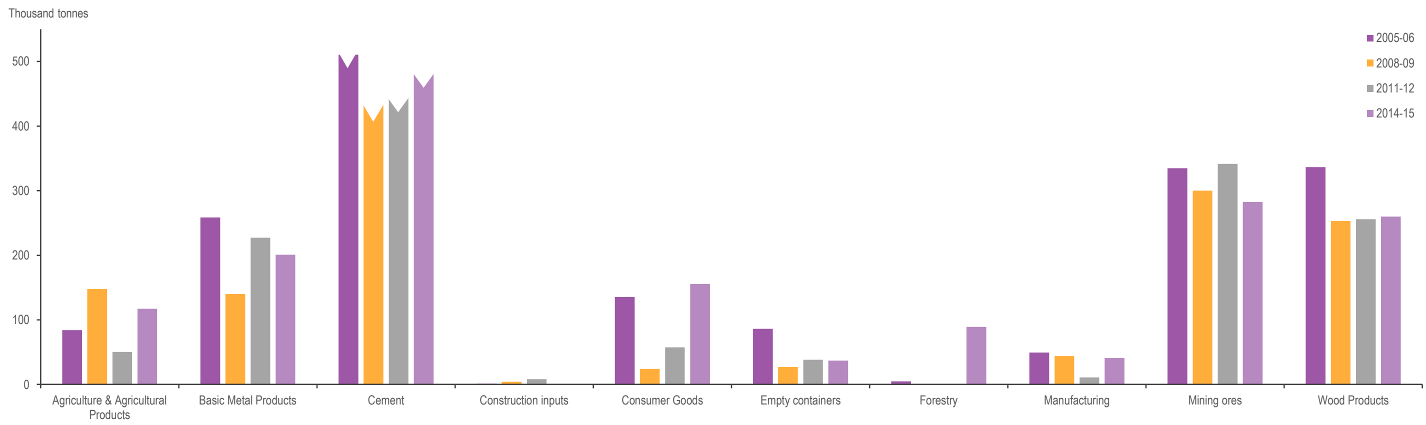


SOURCE: ACIL ALLEN ANALYSIS OF TASMANIAN FREIGHT SURVEY

It is most notable that cement has a high rail share of approximately 70 per cent compared to the rest of the commodity groups that have a rail share of between 10 to 30 per cent. Additionally, the rail share of empty containers has dropped from 40 per cent in 2005-06 to 20 per cent in 2014-15. Analysing the trend for rail share is difficult at this stage due to the short data series; but most commodity groups appear to have stable rail share given the data available at this point.

The volume of rail freight was also calculated as a product of rail share and total freight volume. The rail freight volume at commodity group level is presented in Figure 2.3.

FIGURE 2.3 RAIL VOLUME BY COMMODITY GROUP



SOURCE: ACIL ALLEN ANALYSIS OF TASMANIAN FREIGHT SURVEY

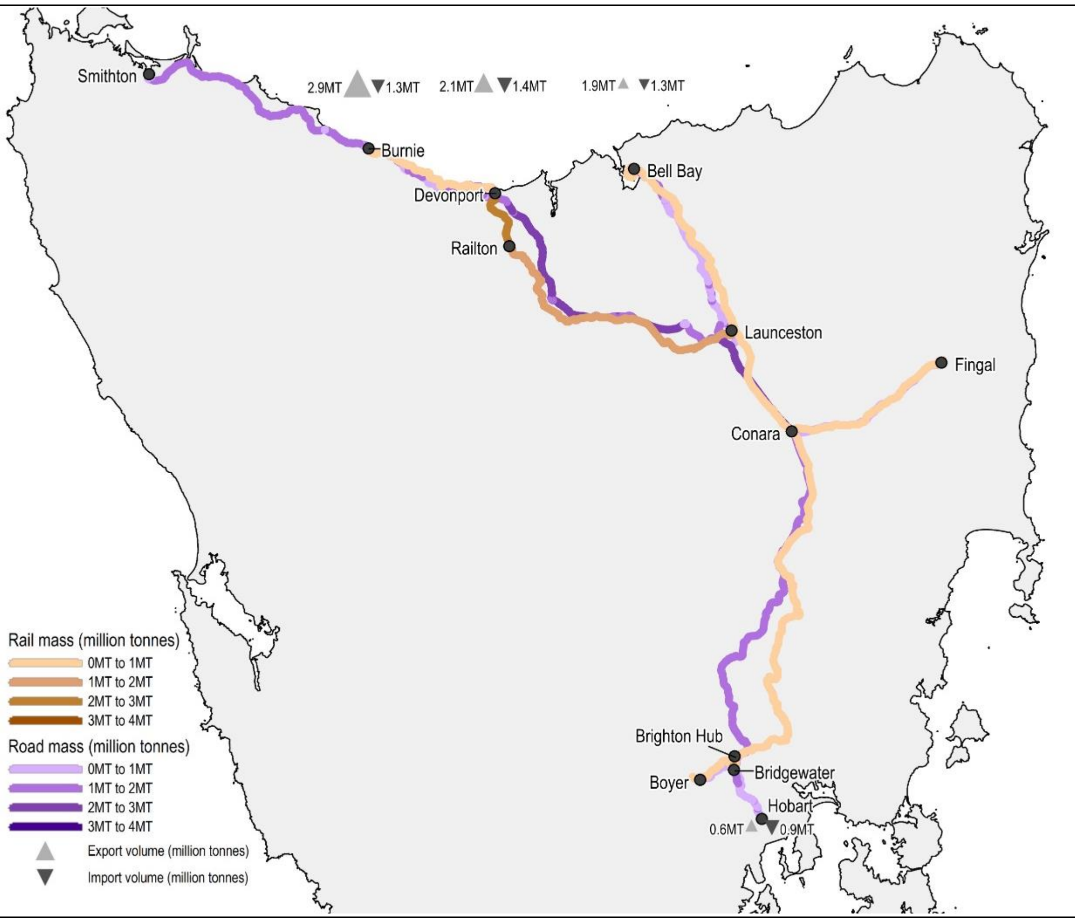
The figure shows rail freight volumes for all commodity groups. The commodity groups with a higher rail freight share tend to have larger freight volumes. Cement, mining ores and wood products are the main rail users.

Within the commodity groups that use rail as part of their supply chain, there are products that strongly rely on rail as their means of transport. However, due to their comparatively small volume, the rail share and volume of these commodities tend to appear low at the aggregate commodity group level. These products include: pulp (100 per cent on rail), cement (89 per cent on rail), paper and newsprint (76 per cent on rail), zinc (40 per cent on rail), and other metallic ores (27 per cent on rail).

2.4 Burnie to Hobart Freight Corridor

The Corridor can be broken down into a number of key segments based on the type of commodities carried and geographical locations. The key network segments can carry either road or rail freight, or the combination of both. Given the composition and location of Tasmanian industries, each of the segments tend to be dominated by a small number of key commodities. Figure 2.4 illustrates the segments and their tonnage carried.

FIGURE 2.4 FREIGHT BY MODE AND NETWORK SEGMENT



SOURCE: ACIL ALLEN ANALYSIS OF TASMANIAN FREIGHT SURVEY

This study breaks down the Burnie to Hobart freight corridor into the following key network segments:

— **Smithton <> Burnie**
The Smithton to Burnie segment of the Burnie to Hobart corridor is located in the north-west, which is a key agricultural region. This road only segment carries a relatively large freight volume of almost two million tonnes per year. Dairy, fruit and vegetables account for a large share of the freight transported. Major processors dominate this part of the Corridor.

— **Burnie <> Devonport**
The Burnie to Devonport segment of the corridor is located in north-western Tasmania. This segment transports both rail and road freight. The road freight on this segment is dominated by agricultural goods, such as vegetables and dairy. These goods are transported from the farm gate to the processing facilities. Road freight volumes are 2.3 million tonnes, compared to 0.85 million tonnes of rail freight per year. Goods transported on rail include containerised consumer goods, and empty containers to Hobart.

— **Devonport <> Launceston (Western Junction)**
The Devonport to Launceston segment of the corridor is located in northern Tasmania. This segment includes a portion of the Bass Highway and the high tonnage cement task, carried on rail. Over 2 million tonnes is moved on the road and rail networks, respectively. Cement is mainly generated by Cement Australia who transport their product from the Railton processing facility to the Port of Devonport for export.

Launceston has a number of packaging material companies, warehouses and distribution centres, which provide input materials and supply chain services to individual companies. The relatively large freight volume transported on this segment covers a wide range of commodities such as containerised consumer goods, local newspapers, packaging materials and empty containers.

— **Illawarra Main Road**

Illawarra Main Road connects the Bass and Midland Highways, and is an important link for freight travelling between the north-west and southern regions. The segment supports a varied freight task.

— **Launceston (Western Junction) <> Bell Bay**

Bell Bay is an important industrial precinct in Tasmania and has a high concentration of facilities for mineral processing and forestry. It also has warehouses, distribution centres and a major bulk port. The Launceston to Bell Bay segment carries a relatively small freight volume, with a combined tonnage across road and rail of just over 1.8 million tonnes. The freight transported includes containers, aluminium and limestone, and logs.

— **Conara <> Fingal**

The Conara to Fingal segment transports a relatively small amount of freight of around 600,000 per annum. This is dominated by coal, which is transported to Railton and Boyer by rail. Forestry is a key task on the road network.

— **Brighton <> Boyer**

The Brighton to Boyer segment primarily supports Norske Skog's processing facility. Commodities delivered to Boyer include input materials such as coal, kraft pulp and softwood logs from Fingal and Burnie.

— **Launceston <> Hobart**

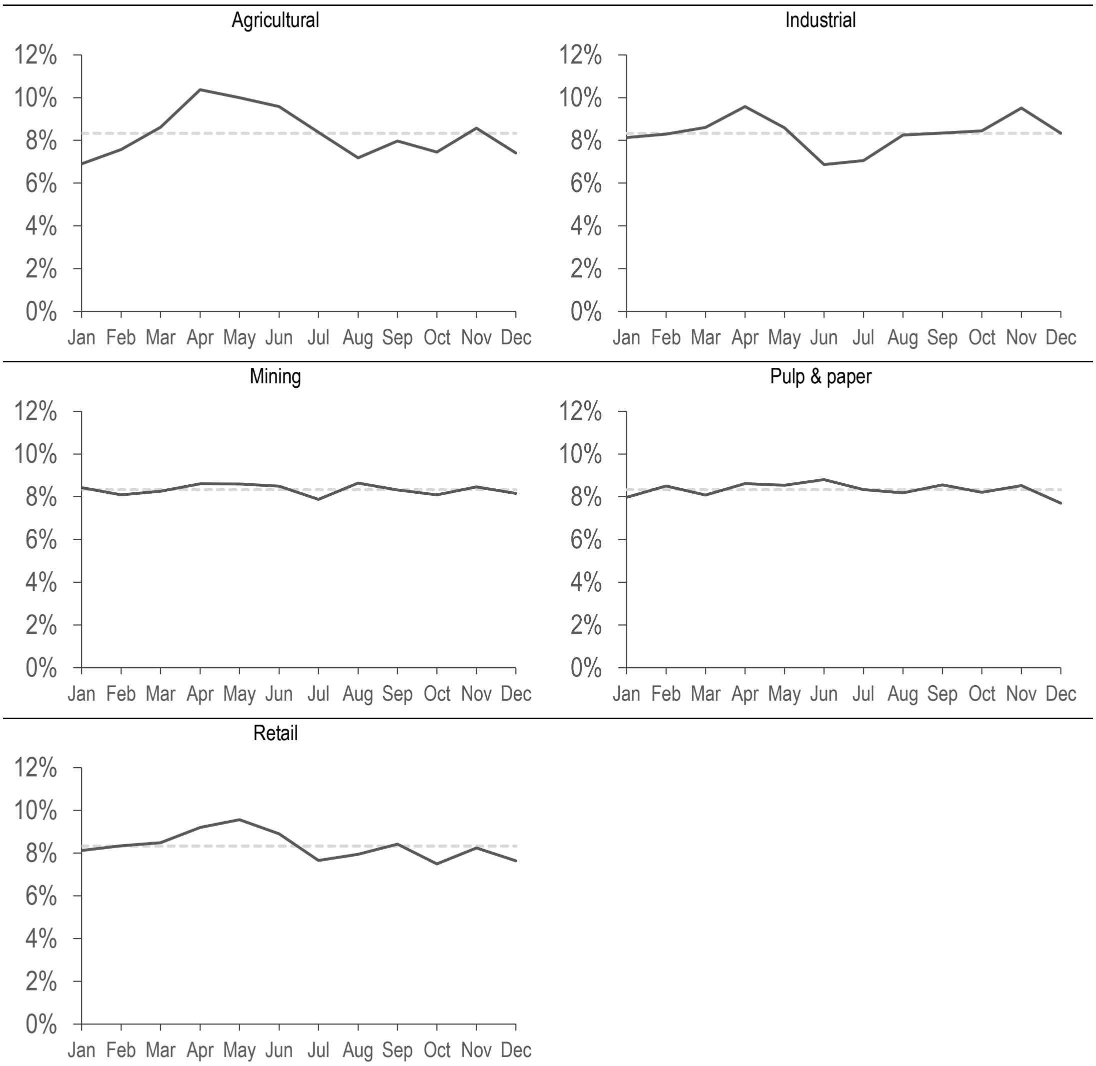
The road component of this section provides access to the Brighton Hub, the Bridgewater Bridge and the Brooker Highway into Hobart. The rail component of this section connects at Conara and terminates at the Brighton Hub, where a proportion of the task continues to Boyer. An average of around 2 million tonnes is carried across individual road segments within this corridor, and one million tonnes on rail (with a smaller proportion continuing to Boyer). Key commodities transported on this segment include zinc, logs and containerised consumer goods. The Launceston to Hobart segment has a high consumer goods tonnage.

2.5 Seasonality

Seasonal peaks, which cannot be identified in annual aggregates, can put significant strain on infrastructure assets and services. In Tasmania, peak capacity issues can be an issue during Tasmania's key summer export season.

In order to develop an understanding of any seasonal patterns affecting Tasmanian freight demand, ACIL Allen has analysed container trade data provided by the Port of Melbourne. This data records all exports from Tasmania and imports to Tasmania from the Port Melbourne by detailed commodity on a monthly basis over ten years. While this data represents only a subset of the freight flows along the Corridor, ACIL Allen considers it a representative proxy for relative changes. Figure 2.5 presents the results.

FIGURE 2.5 SEASONALITY OF CONTAINERISED EXPORTS TO PORT OF MELBOURNE



Note: The above analysis is based on the Port of Melbourne's commodity categories which only partly align with the Department's commodity groups. As ACIL Allen considers this the most comprehensive relevant dataset available, the closest related category was used when necessary. Which Port of Melbourne commodity category was assigned to which commodity group is presented in the commodity group characterisations in the Appendices.

SOURCE: ACIL ALLEN ANALYSIS OF PORT OF MELBOURNE DATA

The figure compares the average monthly contribution to the annual total (dark grey lines) to a line representing 8.33 per cent which illustrates equal monthly contributions (dotted light grey lines). The more the dark line differs from the light grey one, the more pronounced are the seasonal pattern.

The figure consequently shows strong seasonality for agriculture and industrial product exports, almost no seasonality for mining and pulp and paper exports and weak seasonality for retail and other exports. The patterns were derived using a statistical decomposition algorithm whose output can be found in in the detailed commodity group characterisations in the Appendices.

3 FREIGHT DEMAND FORECASTS

ACIL Allen researched recent trends in the Tasmanian economy in order to forecast freight demand. This research was supplemented by information gathered during the stakeholder consultations. Three economic growth scenarios (low, medium and high) were developed in order to produce three freight demand scenarios. ACIL Allen developed these scenarios in close collaboration with the Department. They are designed such that they cover the range between plausible best and worst case economic conditions.

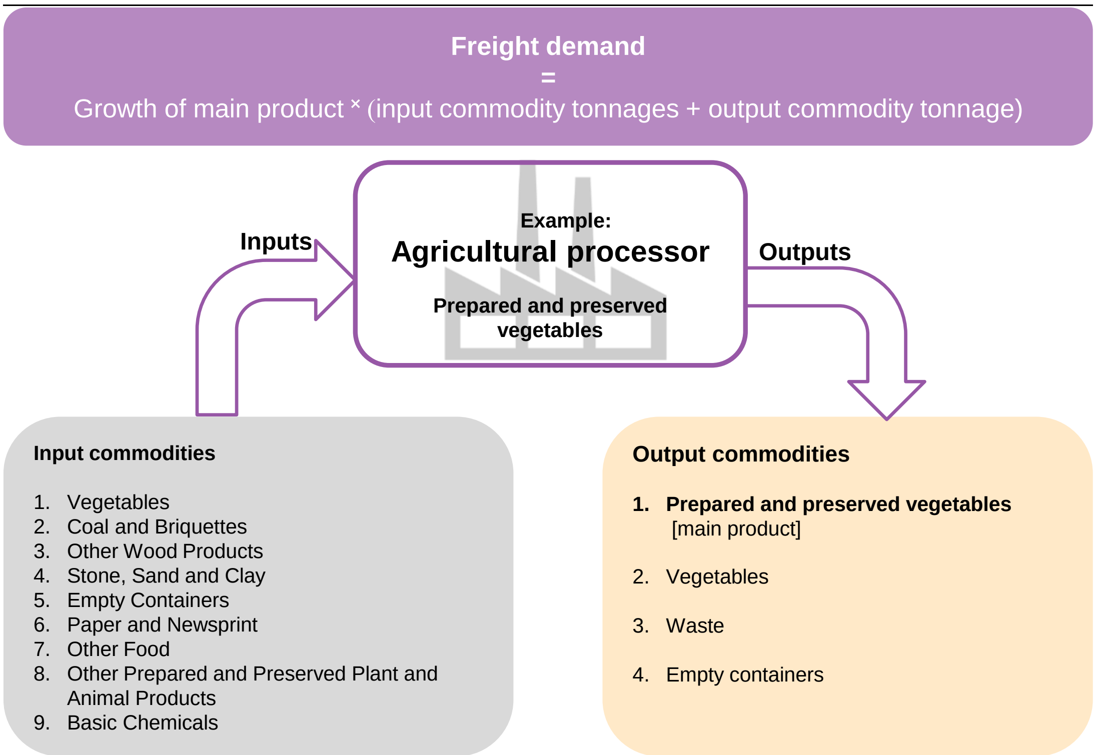
This chapter presents the details of the forecasting approach and the assumptions and results of the three scenarios. The growth rates presented in this chapter are derived in the Appendices.

3.1 Forecasting approach

The deployed approach derives forecasts by applying a growth rate to each freight task. Given the available data, ACIL Allen considers this the most accurate approach as it ensures that growth of a certain commodity takes place in the location(s) it actually occurs and is consequently allocated to the appropriate segments of the Corridor. For example, growth in vegetable production is most likely to occur in the north-west of the island and is consequently most likely to be transported along the Smithton to Burnie and Burnie to Devonport segments (compare section 2.4). As growth rates are applied to the existing producers, this will be the case.

Specific growth rates were allocated to the associated freight tasks using a supply chain based approach. Using this approach, freight volumes for both purchased inputs and final outputs grow in line with the main product the associated company produces. For this study, a company's main product is defined as the output product with the highest value (or volume if the value is not available) recorded in the Survey. This concept is illustrated in the example below of an agricultural processor supply chain (Figure 3.1).

FIGURE 3.1 SUPPLY CHAIN BASED FORECAST



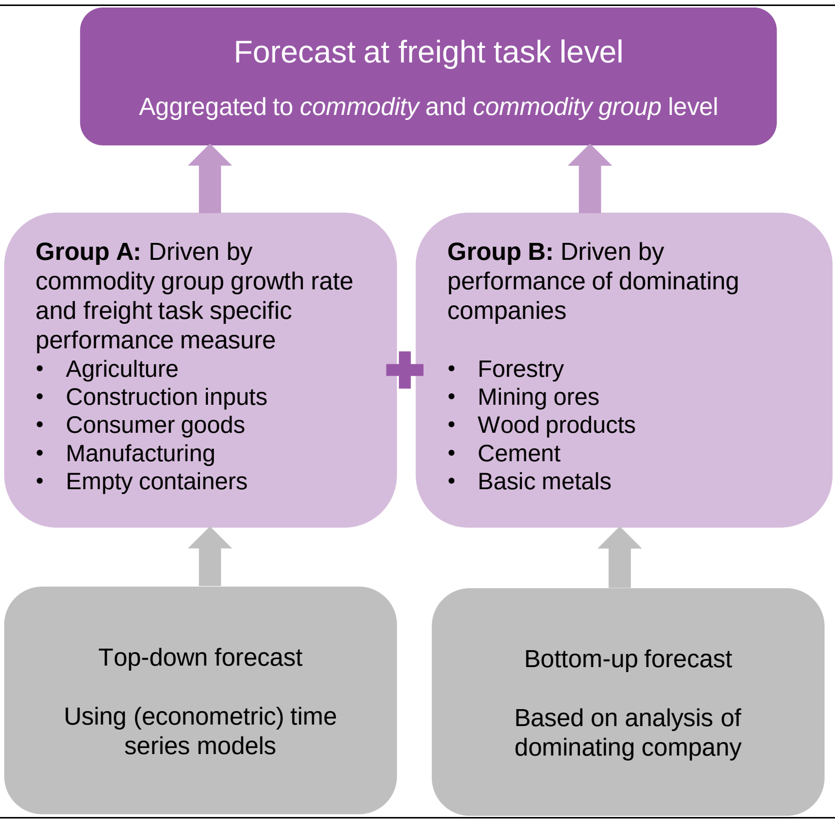
SOURCE: ACIL ALLEN AND TASMANIAN FREIGHT SURVEY

Figure 3.1 illustrates the concept of the supply chain-based forecast by using the supply chain of an agricultural processor as an example. The processor produces prepared and preserved vegetables. For this purpose, the company acquires input commodities such as fresh vegetables, energy and packaging (see the grey box in the bottom left corner of the figure). The production process converts these inputs into prepared and preserved vegetables, fresh vegetables, waste and empty containers (as shown in the orange box). The model assumes that the input requirements and the secondary outputs grow proportional to the main product, that is the processor requires the same volumes of fresh vegetables, energy, packaging to produce one tonne of prepared and preserved vegetables, and also that each tonne generates the same amount of waste and secondary products.

Growth rate projections were derived in two groups. For fragmented freight markets where there are many companies involved in the production of a certain commodity group, a group-specific growth rate and a company specific performance indicator were derived. The group growth rates were estimated using (econometric) time series analyses which can be found in the relevant commodity group Appendices. The company specific performance indicators were derived by comparing company- and commodity-wide growth recorded in the freight survey. If a company's growth is aligned with the average growth (within one standard deviation of the average), the company was assigned a performance indicator of one. If this was not the case, the performance indicator reflects the company's relative deviation from the relevant commodity group's growth and the direction of the deviation.

For concentrated freight markets where production of a certain commodity is dominated by a small number of companies, growth rates were derived based on an assessment of the relevant companies' production history. This information was typically sourced from annual and other company reports. Figure 3.2 illustrates the forecasting approach.

FIGURE 3.2 FORECASTING APPROACH



The remainder of this chapter presents the three freight demand forecast scenarios. Each scenario section presents the assumptions underpinning it, discusses the resulting freight demand by commodity group and describes how the changes in demand are distributed along the network.

3.2 Medium growth scenario

As discussed in section 3.1 above, the forecasts were generated using two approaches: Freight demand forecasts for fragmented markets were derived by applying commodity group growth rate (top-down approach) and concentrated markets using company specific growth assumptions (bottom-up approach). The growth rates for the top-down approach are presented in Table 3.1 and those for the bottom-up approach in Table 3.2. The Appendices contain detailed discussions on how they were derived.

TABLE 3.1 MEDIUM SCENARIO: TOP-DOWN GROWTH RATES

Commodity group	Base growth rate	Annual change
Agriculture & Agricultural Products	2.4%	0.0%
Construction Inputs	3.7%	0.0%
Consumer Goods	2.6%	0.0%
Empty Containers	0.1%	0.0%
Manufacturing	-1.0%	0.0%

Note: See Appendices for details

SOURCE: ACIL ALLEN ANALYSIS OF TASMANIAN FREIGHT SURVEY

The one-off company-level growth rates and the associated year in which occur were based on the information collected through the consultation with the stakeholders, such as the company's own growth expectations.

TABLE 3.2 MEDIUM SCENARIO: BOTTOM-UP GROWTH RATES

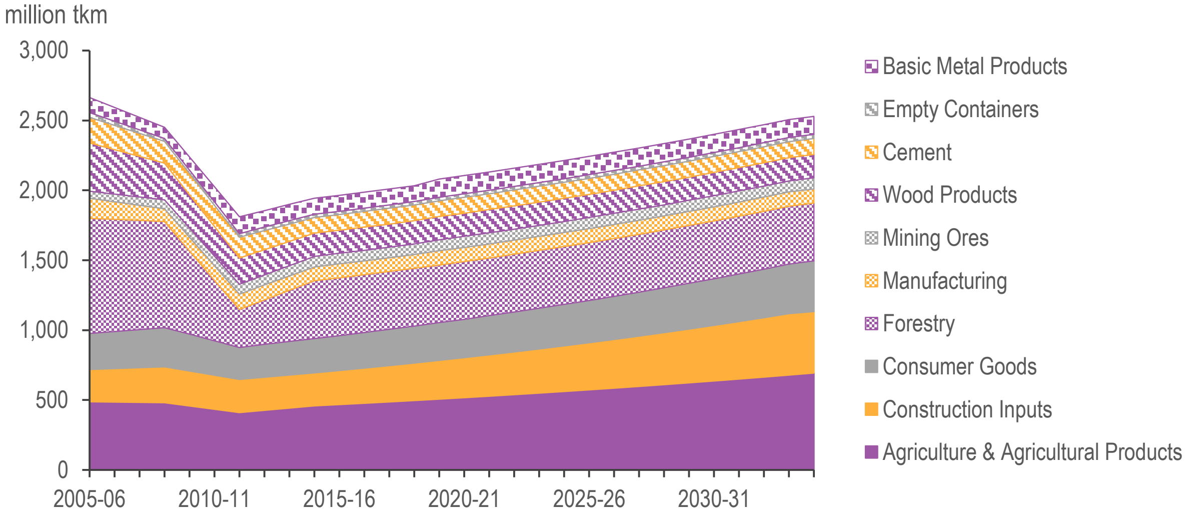
Company	Appendix reference	One-off growth	Year of growth
Company A	E - Forestry	0%	NA
Company B	E - Forestry	0%	NA
Company C	E - Forestry	0%	NA
Company D	E - Forestry	0%	NA
Company E	F - Mining ores	0%	NA
Company F	F - Mining ores	0%	NA
Company G	H - Basic metal products	20%	2020-21
Company H	H - Basic metal products	0%	NA
Company I	H - Basic metal products	0%	NA
Company J	I - Processed forestry products (wood products)	0%	NA
Company K	I - Processed forestry products (wood products)	0%	NA
Company L	I - Processed forestry products (wood products)	0%	NA
Company M	J - Cement	0%	NA
Company N	J - Cement	0%	NA

Note: See Appendices for details

SOURCE: ACIL ALLEN ANALYSIS OF TASMANIAN FREIGHT SURVEY

The forecast for the medium scenario is presented in Figure 3.3.

FIGURE 3.3 MEDIUM SCENARIO: FORECAST BY COMMODITY GROUP



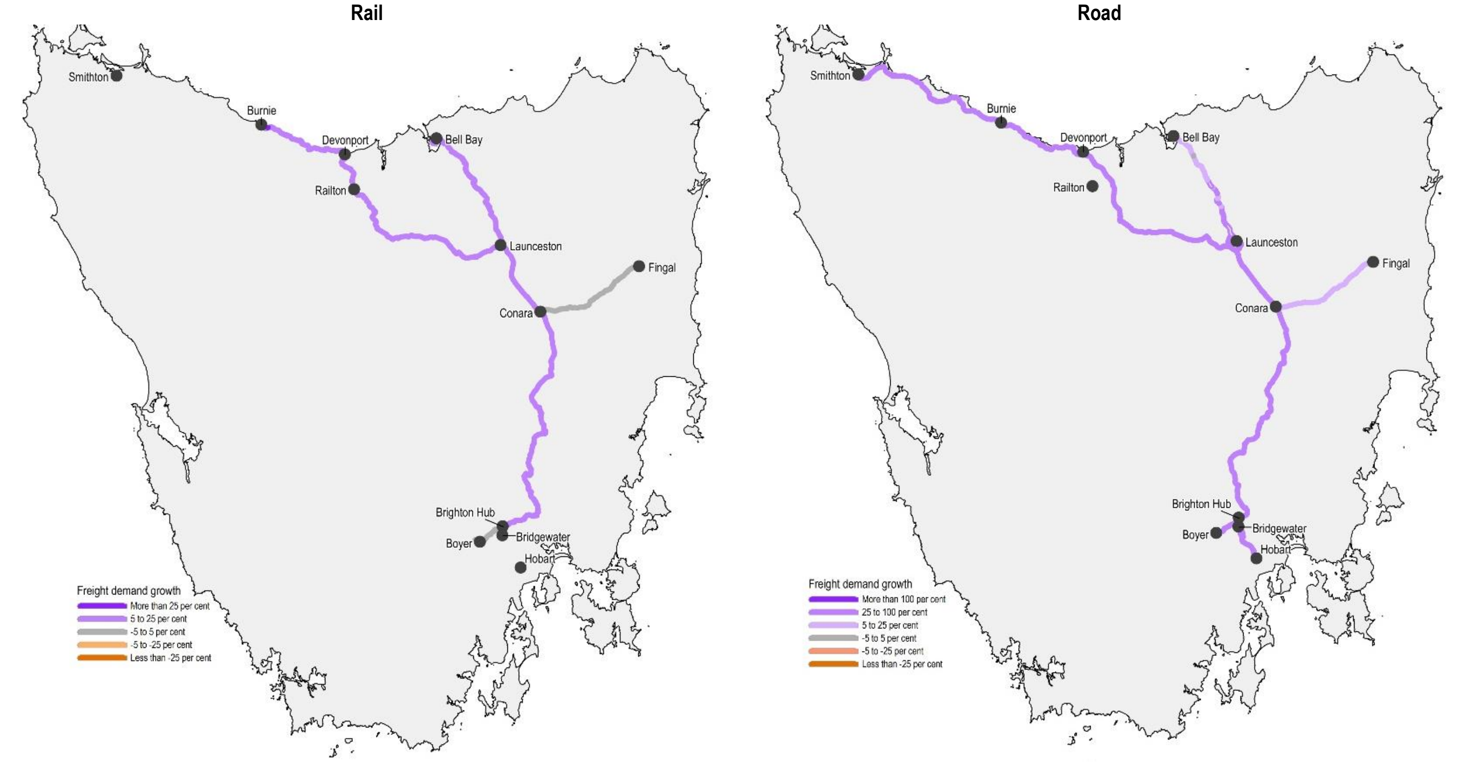
SOURCE: ACIL ALLEN ANALYSIS OF TASMANIAN FREIGHT SURVEY

The fastest growth is seen in the agriculture and construction inputs commodity groups. Consumer goods and empty containers are forecast to grow only moderately, while the freight demand for the rest of the commodity groups is forecast to be stable throughout the forecast period.

The freight shares by commodity group are expected to stay relatively unchanged over the forecast period.

Figure 3.4 shows how the changes in freight demand are distributed along the key freight network.

FIGURE 3.4 MEDIUM SCENARIO: FREIGHT VOLUME BY MODE AND NETWORK SEGMENTS



Note: Forecast tonnages for the key segments were estimated by the Department by allocating ACIL Allen's forecasts to representative elements of its GIS dataset of the Tasmanian road and rail network
SOURCE: ACIL ALLEN ANALYSIS OF TASMANIAN FREIGHT SURVEY

Road freight demand is forecast to experience the fastest growth on the network - particularly between Smithton and Burnie, on the Brooker Highway and over the Bridgewater Bridge, all at over 40%. Tonnages of over 3 million tonnes are forecast between Burnie and Launceston, and over the Bridgewater Bridge. Growth along these segments is driven by freight demand from a combination of industries such as consumer goods, agriculture and construction inputs. Road freight demand on remaining key freight routes, between Launceston and Bell Bay, Conara to Fingal and Brighton to Boyer, is forecast to grow moderately.

Table 3.3 presents the road freight volumes forecast for the medium scenario by network segment.

TABLE 3.3 MEDIUM SCENARIO: ROAD FREIGHT VOLUME BY NETWORK SEGMENTS

Segment	Mass 2014-15	Mass 2034-35	Growth
	million tonnes	million tonnes	percentage
Smithton<>Burnie	1.55	2.14	39%
Smithton<>Burnie (before Burnie)	1.99	2.81	41%
Burnie<>Devonport	2.32	3.17	36%
Devonport<>Launceston	2.98	4.07	37%
Devonport<>Railton	0.28	0.35	24%
Illawarra Main Road	1.63	2.25	38%
Launceston<>Bell Bay (south of Batman Bridge)	0.99	1.17	18%
Launceston<>Bell Bay (north of Batman Bridge)	1.75	2.06	18%

Segment	Mass 2014-15	Mass 2034-35	Growth
Launceston<>Conara	2.20	2.97	35%
Conara<>Fingal	0.43	0.52	20%
Conara<>Brighton Hub	1.82	2.44	34%
Conara<>Brighton Hub (Conara)	1.92	2.59	35%
Brighton<>Boyer	0.55	0.59	8%
Bridgewater Bridge	2.14	3.03	41%
Brooker Highway (south of Bridgewater Bridge)	2.00	2.91	46%
Brooker Highway (north of Bowen Bridge)	1.85	2.70	46%

Note: Forecast tonnages for the key segments were estimated by the Department by allocating ACIL Allen's forecasts to representative elements of its GIS dataset of the Tasmanian road and rail network

SOURCE: DEPARTMENT OF STATE GROWTH

Under the medium growth scenario, volumes on all rail segments between Burnie and Hobart increase, with the largest increases between Burnie and Devonport and Launceston to Railton. All segments between Burnie and Conara are forecast to carry over 1 million tonnes. Rail freight demand between Launceston and Bell Bay, Conara to Fingal and Brighton to Boyer, is forecast to remain stable.

Table 3.4 presents the rail freight volumes forecast for the medium scenario by network segment.

TABLE 3.4 MEDIUM SCENARIO: RAIL FREIGHT VOLUME BY NETWORK SEGMENTS

Segment	Mass 2014-15	Mass 2034-35	Growth
	million tonnes	million tonnes	percentage
Burnie<>Devonport	0.85	1.00	18%
Devonport<>Railton	2.15	2.30	7%
Launceston<>Railton	1.01	1.16	15%
Launceston<>Bell Bay	0.09	0.09	0%
Launceston<>Conara	0.97	1.08	12%
Conara<>Fingal	0.16	0.16	0%
Conara<>Brighton Hub	0.81	0.92	14%
Brighton<>Boyer	0.36	0.36	0%

Note: Forecast tonnages for the key segments were estimated by the Department by allocating ACIL Allen's forecasts to representative elements of its GIS dataset of the Tasmanian road and rail network

SOURCE: DEPARTMENT OF STATE GROWTH

3.3 High growth scenario

The high growth scenario provides the forecast for a situation where the freight demand grows faster than the (expected) medium scenario but still within a statistically plausible range. This range was determined by utilising the deviation from the base growth rate estimated by the time series analysis (see Appendices). The high scenario describes the upper bound of this range. It can be interpreted as ideal conditions occurring every year for the next 20 years triggering an acceleration in production growth and consequently in freight demand.

As for the medium growth scenario, the forecasts were generated using two approaches: top-down and bottom-up. The growth rates for the top-down approach are presented in Figure 3.3 and those for the bottom-up approach in Figure 3.4. The Appendices contain detailed discussions on how they were derived.

The annual change shown in the third column of the table distinguishes the high growth scenario from the medium and low growth scenarios. The base growth rate is the same across all scenarios. The annual change is the deviation of the high scenario growth rate from the medium scenario growth rate in forecasting year one (2015-16), and it grows by the same percentage each year from 2015-16 until 2034-35. For example, construction inputs grow by 3.7 per cent in the first year, 4.7 per cent in the second year, 5.7 per cent in the third year and so on. As this example shows, the difference between the three scenarios widens each year in the forecast period.

TABLE 3.5 HIGH SCENARIO: TOP-DOWN GROWTH RATES

Commodity group	Base growth rate	Annual change
Agriculture & Agricultural Products	2.4%	0.4%
Construction Inputs	3.7%	1.0%
Consumer Goods	2.6%	0.2%
Empty Containers	0.1%	0.0%
Manufacturing	-1.0%	0.4%

Note: See Appendices for details

SOURCE: ACIL ALLEN ANALYSIS OF TASMANIAN FREIGHT SURVEY

The one-off company-level growth rates and the associated year in which they occur were based on the information collected through the consultation with the stakeholders, such as the company's own growth expectations.

TABLE 3.6 HIGH SCENARIO: BOTTOM-UP GROWTH RATES

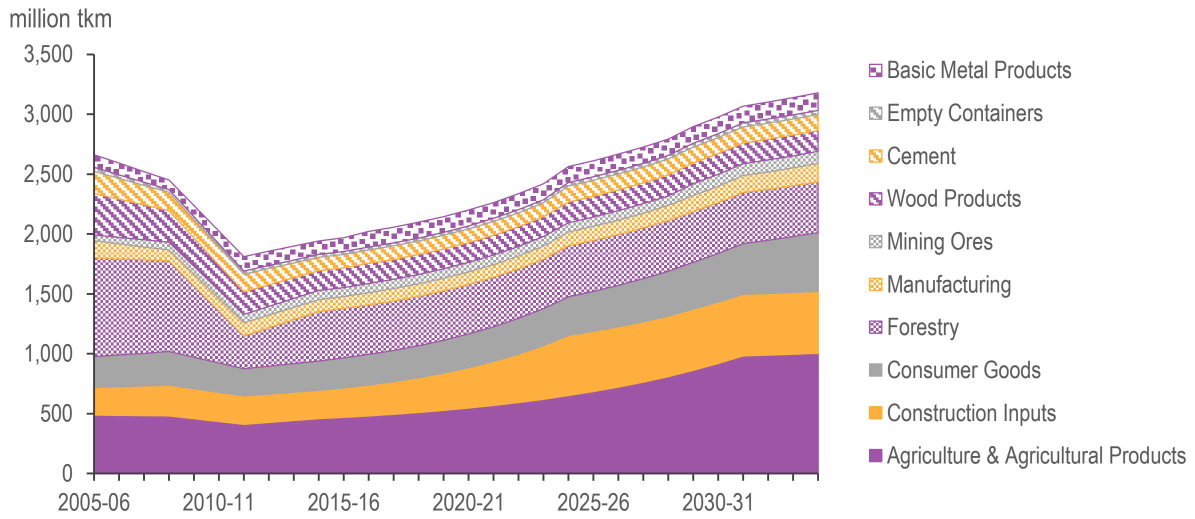
Company	Appendix reference	One-off growth	Year of growth
Company A	E - Forestry	0%	NA
Company B	E - Forestry	0%	NA
Company C	E - Forestry	0%	NA
Company D	E - Forestry	0%	NA
Company E	F - Mining ores	50%	2020-21
Company F	F - Mining ores	25%	2020-21
Company G	H - Basic metal products	20%	2016-17
Company H	H - Basic metal products	0%	NA
Company I	H - Basic metal products	0%	NA
Company J	I - Processed forestry products (wood products)	20%	2024-25
Company K	I - Processed forestry products (wood products)	0%	NA
Company L	I - Processed forestry products (wood products)	0%	NA
Company M	J - Cement	20%	2024-25
Company N	J - Cement	0%	NA

Note: See Appendices for details

SOURCE: ACIL ALLEN ANALYSIS OF TASMANIAN FREIGHT SURVEY

The forecast by commodity group for the high growth scenario is presented in Figure 3.5.

FIGURE 3.5 HIGH SCENARIO: FORECAST BY COMMODITY GROUP

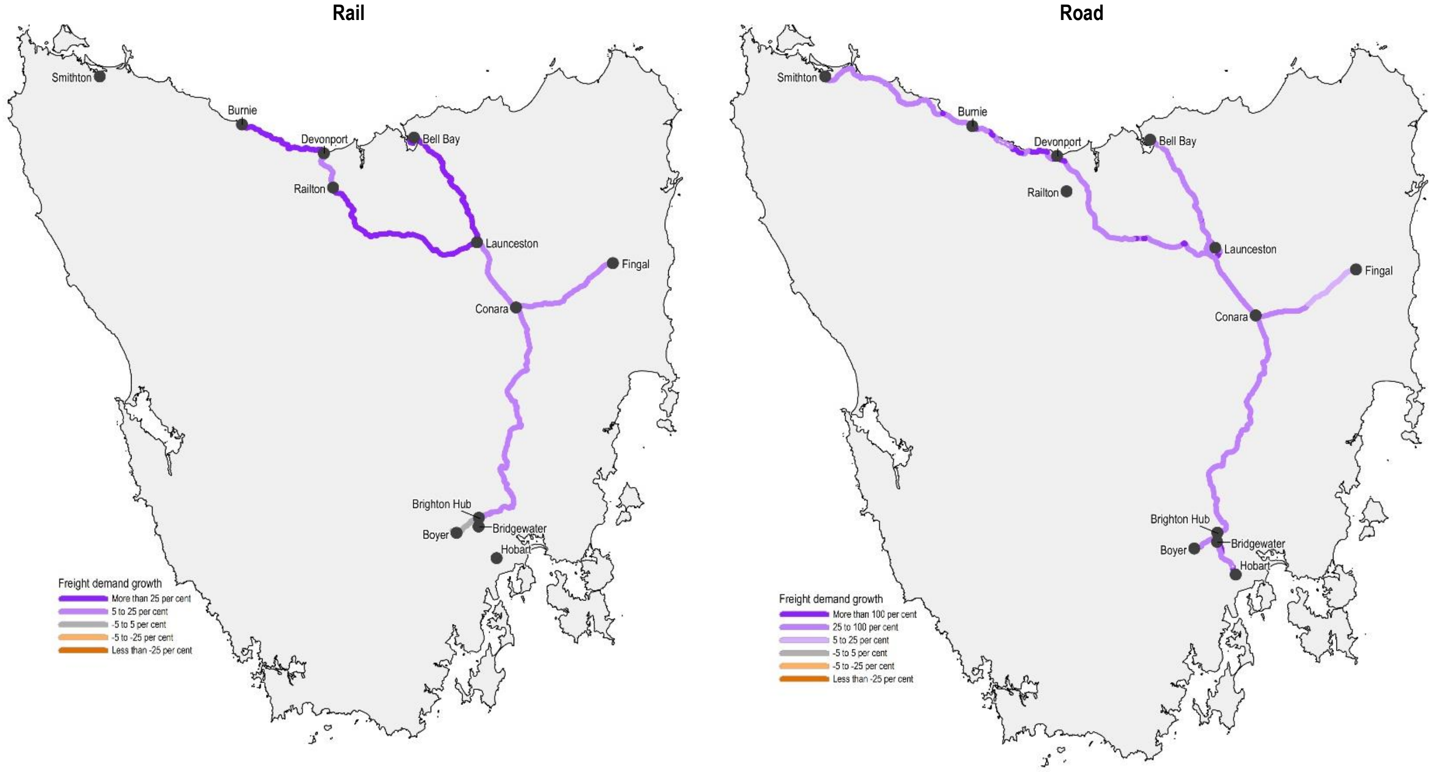


SOURCE: ACIL ALLEN ANALYSIS OF TASMANIAN FREIGHT SURVEY

As for the medium scenario, the fastest growth is seen in the agriculture, consumer goods and construction inputs commodity groups. Freight demand for the rest of the commodity groups is forecast to be stable throughout the forecast period, except for some of the one-off growth in the bottom-up forecast commodity groups. The high scenario does not predict major changes in the commodity groups' freight shares.

Figure 3.6 shows how the changes in freight demand for the high growth scenario are distributed along the key freight network.

FIGURE 3.6 HIGH SCENARIO: FREIGHT VOLUME BY MODE AND NETWORK SEGMENTS



SOURCE: ACIL ALLEN ANALYSIS OF TASMANIAN FREIGHT SURVEY

The road freight demand is forecast to experience strong growth of over 70 per cent along key segments of the corridor, with steadier growth on key feeder routes, such as between Conara and Fingal, Launceston to Bell Bay and Brighton to Boyer. The growth along these segments is driven by the freight demand by a combination of industries such as consumer goods, agriculture and manufacturing.

Table 3.7 presents the road freight volumes forecast be the high scenario by network segment.

TABLE 3.7 HIGH SCENARIO: ROAD FREIGHT VOLUME BY NETWORK SEGMENTS

Segment	Mass 2014-15	Mass 2034-35	Growth
	million tonnes	million tonnes	percentage
Smithton<>Burnie	1.55	2.80	81%
Smithton<>Burnie (before Burnie)	1.99	3.70	86%
Burnie<>Devonport	2.32	4.51	94%
Devonport<>Launceston	2.98	5.53	86%
Devonport<>Railton	0.28	0.42	51%
Illawarra Main Road	1.63	3.02	85%
Launceston<>Bell Bay (south of Batman Bridge)	0.99	1.34	35%
Launceston<>Bell Bay (north of Batman Bridge)	1.75	2.55	46%
Launceston<>Conara	2.20	3.88	76%
Conara<>Fingal	0.43	0.57	32%
Conara<>Brighton Hub	1.82	3.17	74%
Conara<>Brighton Hub (Conara)	1.92	3.36	75%
Brighton<>Boyer	0.55	0.60	10%
Bridgewater Bridge	2.14	3.82	78%
Brooker Highway (south of Bridgewater Bridge)	2.00	3.73	87%
Brooker Highway (north of Bowen Bridge)	1.85	3.45	87%

Note: Forecast tonnages for the key segments were estimated by the Department by allocating ACIL Allen's forecasts to representative elements of its GIS dataset of the Tasmanian road and rail network

SOURCE: DEPARTMENT OF STATE GROWTH

Under the high growth scenario, rail freight demand is forecast to experience the fastest growth along the Burnie to Brighton via Launceston, with a growth rate of more than 20 per cent. The rest of the segments are forecast to grow moderately or remain steady.

Table 3.8 presents the rail freight volumes forecast for the high scenario by network segment.

TABLE 3.8 HIGH SCENARIO: RAIL FREIGHT VOLUME BY NETWORK SEGMENTS

Segment	Mass 2014-15	Mass 2034-35	Growth
	million tonnes	million tonnes	percentage
Burnie<>Devonport	0.85	1.10	30%
Devonport<>Railton	2.15	2.66	24%
Launceston<>Railton	1.01	1.29	28%
Launceston<>Bell Bay	0.09	0.09	0%
Launceston<>Conara	0.97	1.17	21%
Conara<>Fingal	0.16	0.19	20%
Conara<>Brighton Hub	0.81	0.98	21%

Segment	Mass 2014-15	Mass 2034-35	Growth
Brighton<>Boyer	0.36	0.36	0%

Note: Forecast tonnages for the key segments were estimated by the Department by allocating ACIL Allen's forecasts to representative elements of its GIS dataset of the Tasmanian road and rail network

SOURCE: DEPARTMENT OF STATE GROWTH

3.4 Low growth scenario

The low growth scenario provides the forecast for a situation where the freight demand grows slower than the (expected) medium scenario but still within a statistically plausible range. This range was determined utilising the deviation from the base growth rate estimated by the time series analysis (see the Appendices). The low scenario describes the lower bound of this range. It can be interpreted as problematic conditions occurring every year for the next 20 years, triggering a decline in production growth and consequently in freight demand.

As in the medium and high growth scenarios, the forecasts were generated using two approaches: top-down and bottom-up. The growth rates for the top-down approach are presented in Table 3.9 and those for the bottom-up approach in Table 3.10. The Appendices contain detailed discussions on how they were derived.

The annual change shown in the third column of the table distinguishes the low growth scenario from the medium and high growth scenarios. The base growth rate is the same across all scenarios. The annual change is the deviation of the high scenario growth rate from the medium scenario growth rate in forecasting year one (2015-16), and it grows by the same percentage point each year from 2015-16 until 2034-35. For example, construction inputs is forecast to grow by 3.7 per cent in the first year, 2.7 per cent in the second year, 1.7 per cent in the third year and so on. As this example shows, the difference between the three scenarios widens each year in the forecast period.

TABLE 3.9 LOW SCENARIO: TOP-DOWN GROWTH RATES

Commodity group	Base growth rate	Annual change
Agriculture & Agricultural Products	2.4%	-0.4%
Construction Inputs	3.7%	-1.0%
Consumer Goods	2.6%	-0.2%
Empty Containers	0.1%	-0.0%
Manufacturing	-1.0%	-0.4%

Note: See Appendices for details

SOURCE: ACIL ALLEN ANALYSIS OF TASMANIAN FREIGHT SURVEY

The 'annual change' distinguishes the low growth scenario from the medium and high growth scenarios. The base growth rate is the same across all scenarios. The 'annual change' was used to calculate the deviation of the low scenario from the medium scenario. The method in calculating the low growth scenario deviation interval is the same as that discussed in the high growth scenario section above, and is described in detail in section 3.1.

TABLE 3.10 LOW SCENARIO: BOTTOM-UP GROWTH RATES

Company	Appendix reference	One-off growth	Year of growth
Company A	E - Forestry	-50%	2020-21
Company B	E - Forestry	-50%	2024-25
Company C	E - Forestry	-50%	2030-31
Company D	E - Forestry	0%	NA
Company E	F - Mining ores	0%	NA

Company	Appendix reference	One-off growth	Year of growth
Company F	F - Mining ores	0%	NA
Company G	H - Basic metal products	0%	NA
Company H	H - Basic metal products	0%	NA
Company I	H - Basic metal products	0%	NA
Company J	I - Processed forestry products (wood products)	-20%	2024-25
Company K	I - Processed forestry products (wood products)	0%	NA
Company L	I - Processed forestry products (wood products)	-50%	2018-19
Company M	J - Cement	-20%	2024-25
Company N	J - Cement	0%	NA

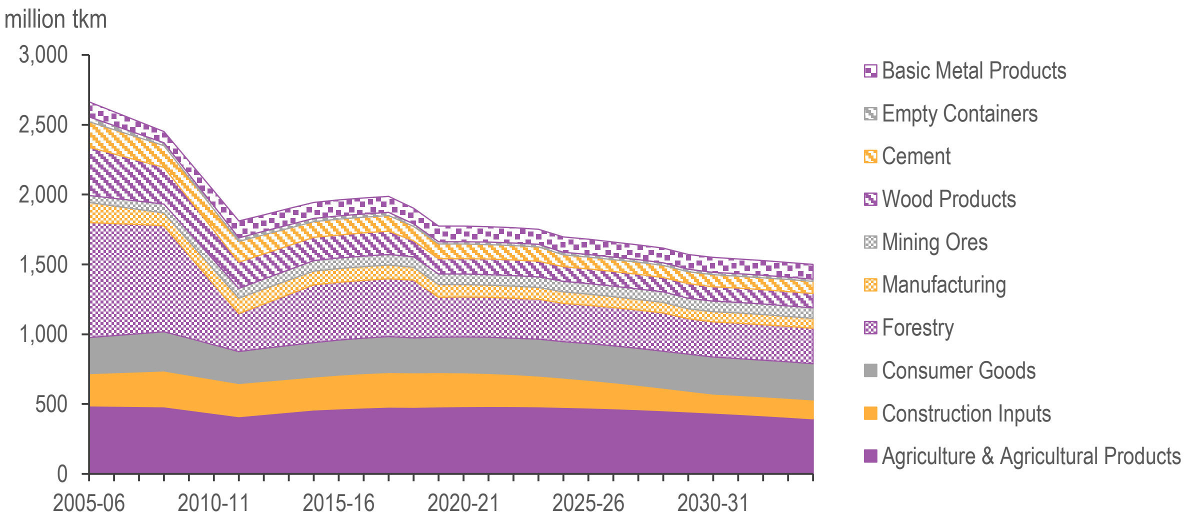
Note: See Appendices for details

SOURCE: ACIL ALLEN ANALYSIS OF TASMANIAN FREIGHT SURVEY

The one-off company level growth rates and the associated year in which occur were based on the information collected through the consultation with the stakeholders, such as the company's own growth expectations.

The forecast for the low growth scenario is presented in Figure 3.7.

FIGURE 3.7 LOW SCENARIO: FORECAST BY COMMODITY GROUP

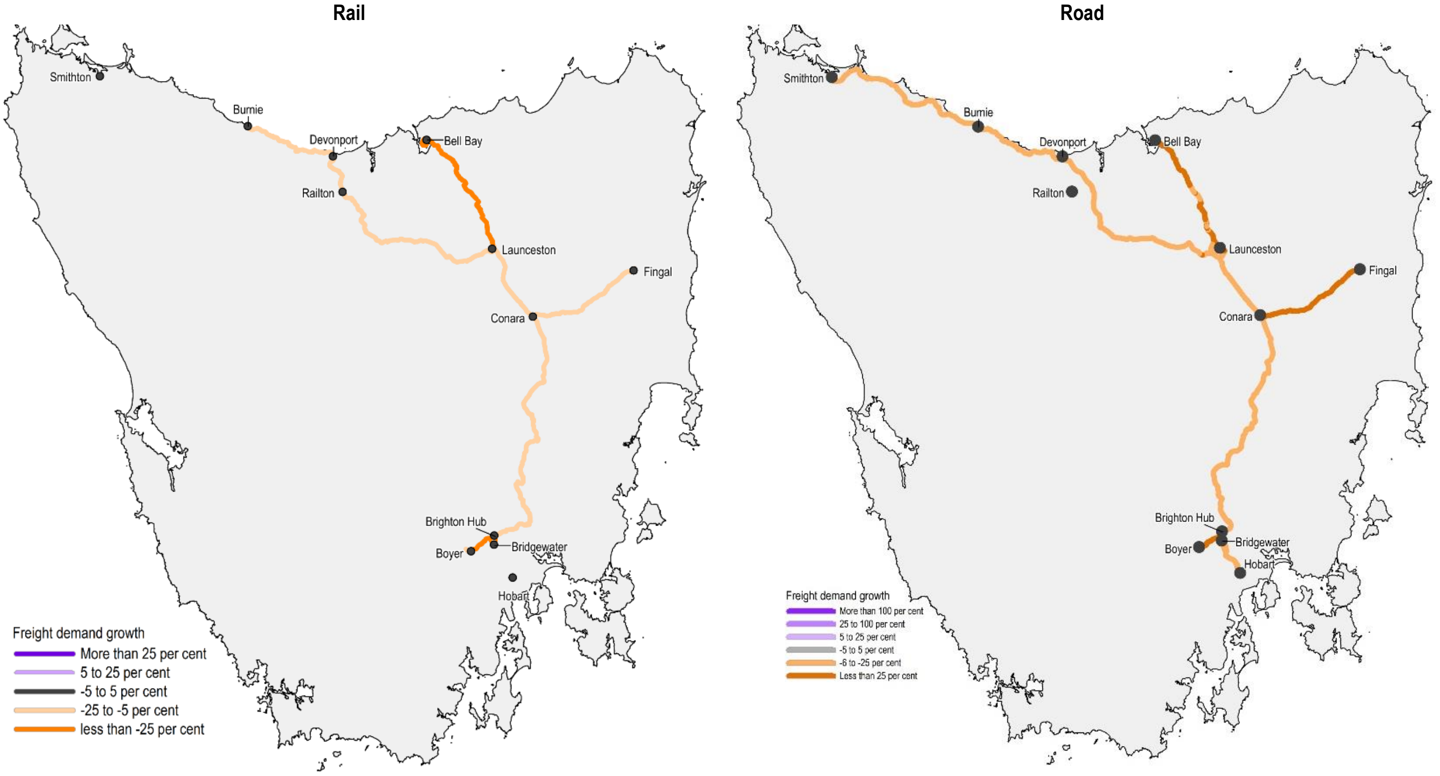


SOURCE: ACIL ALLEN ANALYSIS OF TASMANIAN FREIGHT SURVEY

Under the low growth scenario, construction inputs experience the most noticeable decline in freight demand, followed by manufacturing and agriculture. The rest of the commodity groups are forecast to be relatively stable, except for the one-off growth rate drop in the bottom-up forecast commodity groups.

Figure 3.8 shows how the changes in freight demand for the low growth scenario are distributed along the key freight network.

FIGURE 3.8 LOW SCENARIO: FREIGHT VOLUME BY MODE AND NETWORK SEGMENTS



SOURCE: ACIL ALLEN ANALYSIS OF TASMANIAN FREIGHT SURVEY

Road freight demand for all road segments is forecast to decline. A decrease of 30% or more is forecast on the feeder routes between Launceston and Bell Bay, Conara to Fingal and Brighton to Boyer. The majority of segments between Smithton and Bridgewater Bridge will see volume decreases of around 20%.

Table 3.11 presents the road freight volumes forecast be the low scenario by network segment.

TABLE 3.11 LOW SCENARIO: ROAD FREIGHT VOLUME BY NETWORK SEGMENTS

Segment	Mass 2014-15	Mass 2034-35	Growth
	million tonnes	million tonnes	percentage
Smithton<>Burnie	1.55	1.19	-23%
Smithton<>Burnie (before Burnie)	1.99	1.53	-23%
Burnie<>Devonport	2.32	1.86	-20%
Devonport<>Launceston	2.98	2.48	-17%
Devonport<>Railton	0.28	0.21	-23%
Illawarra Main Road	1.63	1.36	-16%
Launceston<>Bell Bay (south of Batman Bridge)	0.99	0.69	-30%
Launceston<>Bell Bay (north of Batman Bridge)	1.75	1.29	-26%
Launceston<>Conara	2.20	1.75	-21%
Conara<>Fingal	0.43	0.27	-38%
Conara<>Brighton Hub	1.82	1.45	-20%
Conara<>Brighton Hub (Conara)	1.92	1.53	-20%
Brighton<>Boyer	0.55	0.34	-38%

Segment	Mass 2014-15	Mass 2034-35	Growth
Bridgewater Bridge	2.14	1.74	-19%
Brooker Highway (south of Bridgewater Bridge)	2.00	1.70	-15%
Brooker Highway (north of Bowen Bridge)	1.85	1.56	-15%

Note: Forecast tonnages for the key segments were estimated by the Department by allocating ACIL Allen's forecasts to representative elements of its GIS dataset of the Tasmanian road and rail network

SOURCE: DEPARTMENT OF STATE GROWTH

Under the low growth scenario, rail freight demand along all network segments is forecast to decrease. This is primarily driven by a decrease in forecast demand by key rail users.

Table 3.12 presents the rail freight volumes forecast for the low scenario by network segment.

TABLE 3.12 LOW SCENARIO: RAIL FREIGHT VOLUME BY NETWORK SEGMENTS

Segment	Mass 2014-15	Mass 2034-35	Growth
	million tonnes	million tonnes	percentage
Burnie<>Devonport	0.85	0.68	-20%
Devonport<>Railton	2.15	1.72	-20%
Launceston<>Railton	1.01	0.80	-20%
Launceston<>Bell Bay	0.09	0.04	-50%
Launceston<>Conara	0.97	0.74	-23%
Conara<>Fingal	0.16	0.13	-20%
Conara<>Brighton Hub	0.81	0.61	-24%
Brighton<>Boyer	0.36	0.18	-50%

Note: Forecast tonnages for the key segments were estimated by the Department by allocating ACIL Allen's forecasts to representative elements of its GIS dataset of the Tasmanian road and rail network

SOURCE: DEPARTMENT OF STATE GROWTH

4 MODAL CONTESTABILITY

The choice of mode can typically be characterised as a price-service trade-off. Some companies tend to be organised for just-in-time efficiency or for quick customer service and consequently require excellent integrated logistics management and high levels of reliability from their freight service provider. They are typically willing to pay a premium for this level of service. Other companies might have a stronger focus on transport costs and can accept slower transit times and some lessening of reliability.

4.1 Overview

As discussed in section 2.3, the dominant mode of conveying export products to the ports and distributing imports to their final destinations is road transport. Rail freight is predominantly used for regular bulk transports and TasRail's legacy customers still dominate demand for rail transport. TasRail has identified intermodal freight as its key growth sector (TasRail, 2016).

In a recent published report, BITRE analysed the "circumstances that can make short-haul[1] urban and regional rail port shuttles viable […]" (Why short haul intermodal rail services succeed, 2016). The report points out that while bulk rail freight haulage is usually undertaken door-to-door, intermodal (non-bulk) haulage typically involves using a second mode to convey the goods from the origin to the railhead, from the railhead to the destination or both. In this context, BITRE assesses the economics of competing modes based on three notional cost types:

— **Terminal costs** vary across modes in reflection of the additional effort involved in using rail relative to road. While containers sent by road are shifted without intermediate tasks from door-to-door, containers sent by rail tend to incur the additional container tasks of unloading, stacking and reloading.

— **Drayage costs** refer to the road element of a rail journey between the railhead and origin and/or destination. This rail specific cost component tends to be associated with higher marginal (per kilometre) costs than the equivalent single mode road linehaul.

— **Linehaul costs** are much lower for rail than they are for road. This is a result of the significant scale effects (more containers per driver, higher payload, better fuel efficiency etc.) associated with rail transport.

How the interaction between these three cost components affects modal competitiveness can be illustrated by way of example: Assume containers are to be sent from a port to an inland destination and the shipper can choose between a door-to-door road based option and a mixed mode option where containers are sent to a hinterland terminal by rail and then transferred to road. Such a setting is not dissimilar to the import of containerised consumer goods to Tasmania which are shipped to the

[1] The report defines short-haul as distances of under 1,500km making all rail transport in Tasmania short-haul.

Port of Burnie from where they can either be directly trucked to a final destination in Hobart or use TasRail to the Brighton Hub where they are transferred to a truck for final delivery.

As discussed above, road haulage is assumed to be associated with lower terminal costs but higher marginal (per kilometre) costs than rail. These two features are illustrated in Figure 4.1 by road haulage's (dark grey line) low intercept with the vertical axis and steep slope compared to rail haulage (orange lines). Rail haulage incurs additional handling costs at the hinterland terminal (step change in the orange lines) and the road stage that follows is associated with higher marginal costs than the road only haulage (steeper slope after the step change).

In the example illustrated in Figure 4.1, rail haulage is cheaper (i.e. contestable) to the point at which the orange intersects with the dark grey line (highlighted as M1). The distance between the hinterland terminal and M1 consequently constitutes the radius around said terminal for which rail is the more economic transport mode. Beyond this point, door-to-door road transport is the more economic transport option.

From this high level perspective, it appears that the operating costs saving and efficiency improving measures discussed in TasRail's corporate plan (TasRail, 2016), are aimed at reducing cumulative transport cost for the shipper. This could for example be achieved by decreasing the (marginal) linehaul costs. The dotted orange line in Figure 4.1 illustrates the impact of such a cost reduction, shifting the intersection of the dark grey and dotted orange line to the right (highlighted as M2). The reduction of linehaul costs effectively increases the radius around the hinterland terminal in which rail is more cost efficient than road haulage.

FIGURE 4.1 ROAD AND INTERMODAL SHIPPER – PORT HAULAGE COSTS

SOURCE: ACIL ALLEN ILLUSTRATION BASED ON BITRE ANALYSIS

This example highlights the impact that the distance between the port and shipper and the distance between the railhead (hinterland terminal) has on the contestability of rail. These two factors are specific for each shipper and therefore need to be taken into consideration when assessing the contestability for a certain rail task. As an alternative to separately estimating these two transport costs for 5,825 freight tasks recorded in the Survey, ACIL Allen has retrieved demand elasticities for price, service quality and transit time for road and rail from the BITRE elasticities database in order to determine the competitiveness of the two modes. The details are presented below.

4.2 Modal contestability analysis framework

As discussed above, ACIL Allen has adopted an approach that uses demand elasticities to individually determine the competitiveness of road and rail for each freight task recorded in the Survey. Elasticities measure the degree to which market participants are willing to change their behaviour as a result of changes in costs of products. They can therefore be used to assess the (likely) reactions of the freight generators to changes in transport costs.

Specifically, the modal contestability model developed for this report applies the following elasticities:

— own price measuring the impact a price change has on demand for the associated mode (e.g. the effect an increase the price of rail transport has on demand for rail)
— service level measuring the impact a change in service level has on demand for the associated mode (e.g. the effect a deterioration of the road surface has on demand for road transport)
— transit time measuring the impact a change in transit times has on demand for the associated mode (e.g. the effect an increase in speed between Brighton Hub and Launceston has on demand for rail)
— cross price measuring the impact a price change has on demand for the substitute of the associated mode (e.g. the effect an increase the price of rail transport has on demand for road).

ACIL Allen considers the Elasticities Database published by BITRE (Bureau of Infrastructure Transport & Economics, 2016) to be the most authoritative and comprehensive source. The Database is a collection of elasticities estimated by authoritative sources around the world. Table 4.1 presents the elasticities that were selected from this database for the contestability analysis. They were selected based on the following criteria:

Single published source
For example, some sources only have freight price related elasticities but no information on transit time and service level. ACIL Allen aimed to use elasticities of the different types estimated by the same source and therefore estimated using the same set of data using a consistent methodology. This consistency will make the analysis across mode and influence factors more comparable. Therefore, the most comprehensive database was chosen that comprises all the elasticities required for this analysis.

Comparable location
The Database contains estimates for a wide range of countries. Elasticities were selected from a country as similar to Tasmania as possible, especially to its traffic and economic system. Therefore, focus was given to publications from the United States, United Kingdom and other European nations.

Timeliness of data
ACIL Allen attempted to use recent elasticities that meet the above criteria. If this was not possible, priority was given to the previous two criteria.

Compliance of estimates
The selected elasticities were compared with those published by other relevant sources in order to ensure that they lay within a consensus range

TABLE 4.1 ELASTICITIES BY COMMODITY GROUP

Commodity group	Own price		Transit time		Service level		Cross price	
	Rail	Truck	Rail	Truck	Rail	Truck	Rail	Truck
Agriculture Products	-2.58	-1.00	-2.33	-0.60	0.73	0.33	0.02	0.00
Basic Metal Products	-2.54	-1.08	-0.07	-0.10	2.11	0.33	0.05	0.01
Cement	-1.68	-1.03	-0.07	-0.10	1.52	0.33	0.03	0.02
Construction Inputs	-1.68	-1.03	-0.07	-0.10	1.52	0.33	0.03	0.02
Consumer Goods	-2.42	-1.07	-0.07	0.23	0.96	0.33	0.04	0.02
Empty Containers	-2.33	-1.17	-0.07	-0.10	1.38	0.33	0.05	0.04
Forestry	-1.97	-1.55	-0.07	-0.10	0.64	0.33	0.05	0.13
Manufacturing	-2.41	-1.22	-0.07	-0.04	1.64	0.33	0.06	0.05
Mining Ores	-2.54	-1.08	-0.07	-0.10	2.11	0.33	0.05	0.01

Commodity group	Own price		Transit time		Service level		Cross price	
Wood Products	-1.97	-1.55	-0.07	-0.15	0.64	0.33	0.05	0.13

SOURCE: BITRE ELASTICITIES DATABASE

The table demonstrates that rail users tend to be particularly price sensitive. Depending on the industry the own price elasticity for rail is between -1.66 and -2.58 which means that the percentage change in demand exceeds the percentage change in price by a factor of up to -2.58, that is a 10 per cent price increase reduces demand by 25.8 per cent. Road transport demand also tends to be price sensitive, but to a lesser degree.

While Agriculture products tend to be time sensitive (rail elasticity of -2.33 and road elasticity of -0.6), all other commodity groups tend to only react moderately to changes in transit time. Reliability of the rail service tends to be particularly important for mining related bulk products, cement, and manufactured products which all show a service level elasticity of more than 1.5. The service level for road transport tends to be of only limited importance. The low cross price elasticities indicate that effect of price changes of the substitute mode is marginal.

Mode share forecasts are derived by applying the selected elasticity estimates to the 2014-15 Survey freight tasks using a modelling framework that follows these steps:

1. **Identify the base mode**
   The base mode is defined as that recorded in the 2014-15 Survey by the "Uses Rail" variable which indicates if rail is used **anywhere** along the way. The share of the journey that actually takes place on rail is used as a weighting for the elasticities. This approach ensures that the distance to and from the railhead is taken into consideration.
2. **Apply one of the scenarios described in the next section**
   For this purpose the scenarios are translated into relative (percentage) changes in the six cost components (price rail and road, service level rail and road, transit time rail and road) for which elasticities were included in the model.
3. **Calculate the cost component specific willingness to change**
   The cost component specific willingness to change is calculated by applying the relevant elasticity to the associated change defined in the scenario and multiplying the result with the freight task's mass. It is expressed as relative to the total mass. For example, for a freight task of 100 tonnes transported on rail with a rail price elasticity of two, a five per cent price increase would result in a willingness to change of 0.1 ((5 per cent * 2 *100 tonnes) / 100 tonnes).
4. **Calculate the total willingness to change**
   The total willingness to change is calculated as the sum of the cost component specific willingness to pay relevant for the freight task. For example, for road it is calculated as the sum of those for road price, road service level, road transit time and cross price with rail. Note that the total willingness to change can in extreme cases be larger than one. Potential changes in transit time triggered by switching to the alternative mode were also taken into account.
5. **Assess if the total willingness exceeds a predefined critical level**
   The critical total willingness to change in the model is 30 per cent. The details for determining this critical willingness to change are documented in Appendix K.
6. **Assign mode**
   If the total willingness to change exceeds the critical level, the entire freight task changes mode.

Mathematically the model is described by the following equations

$$\omega_i = \sum_{CC=1}^{4} s_i * \delta^{CC} * \varepsilon_i^{CC} * m_i$$

$$\Delta_i = \begin{cases} -1 \; if \; \omega_i < -\omega^{crit} \\ 0 \; if \; \omega^{crit} \leq \omega_i \geq -\omega^{crit} \\ 1 \; if \; \omega_i > \omega^{crit} \end{cases} \qquad (1)$$

with

i	~ freight task
ω_i	~ freight task specific total willingness to change
ω^{crit}	~ critical willingness to change
s_i	~ freight task specific share of the journey taking place on rail (1 if the base mode is road)
δ^{CC}	~ cost component specific change defined in the scenario
ε_i^{CC}	~ freight task and cost component specific demand elasticity
m_i	~ freight task specific mass
Δ_i	~ mode switch indicator

The equation shows the mode switch indicator can take three values:

— a value of one means that the associated freight task switches from its base to the analysed mode

— a value of minus one means that the associated freight task switches from the analysed mode to the alternative mode

— a value of zero indicates no change.

Table 4.2 below presents an example that illustrates how a 20 per cent decrease in the rail price can lead to a predicted mode change.

TABLE 4.2 MODE CHOICE MODEL EXAMPLE

	Example A	Example B	Example C
Mass (tonnes)	1,000	80,000	10,000
Base mode	**Road**	**Rail**	**Road**
Rail price change	-20%	-20%	-20%
Rail share of journey	50%	100%	80%
Price elasticity	-2.58	-1.68	-2.42
Service level elasticity	0.73	1.52	0.96
Transit time elasticity	-2.33	-0.07	-0.07
Cross price elasticity with road	0.02	0.03	0.04
Total willingness to change	**0.26**	**0.34**	**0.39**
Critical willingness to change	0.3	0.3	0.3
Δ	0	0	1
New mode	**Road**	**Rail**	**Rail**

EXAMPLE

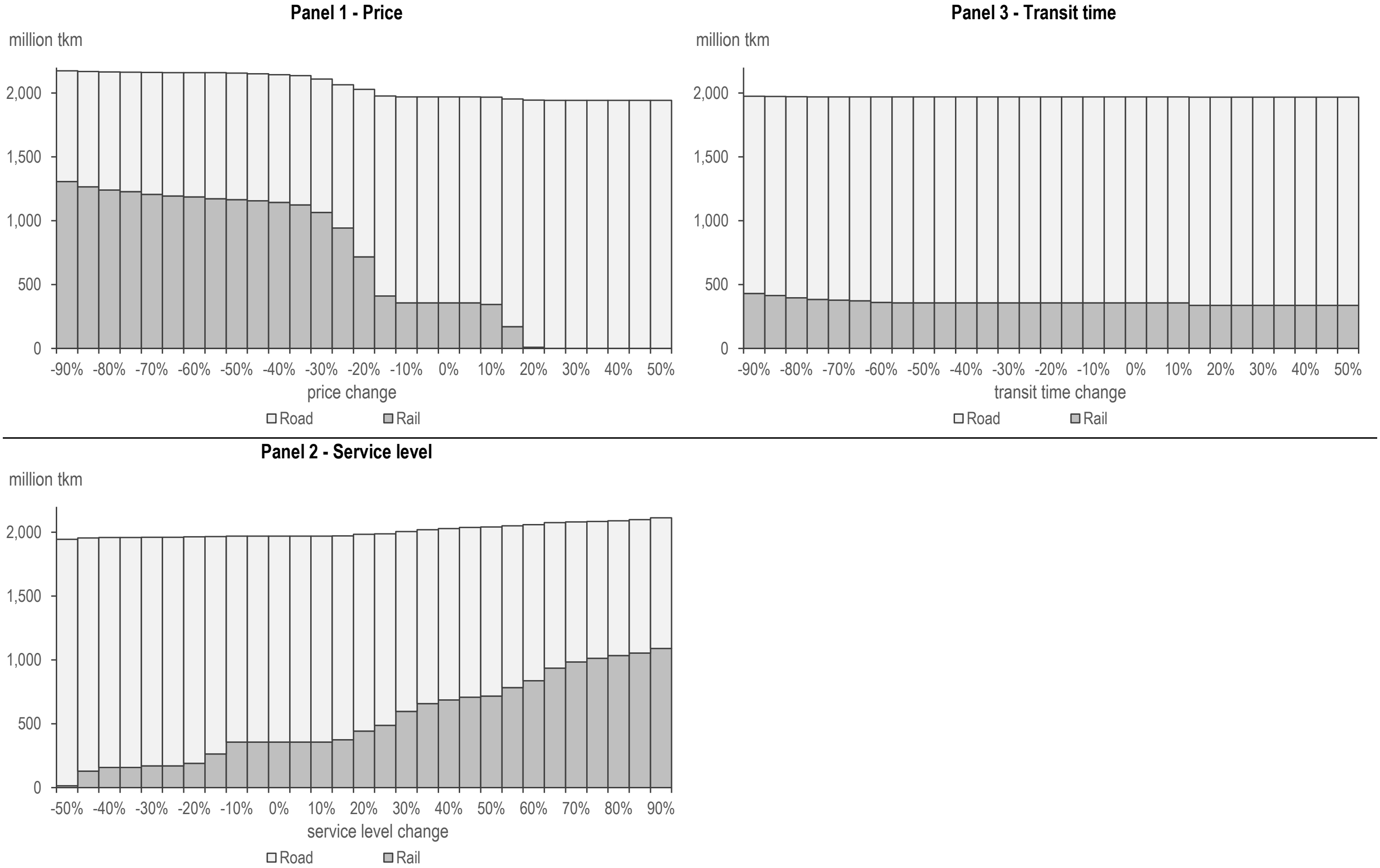
In the following sections, this analysis framework will be applied to a range of scenarios that ACIL Allen developed in collaboration with the Department. The scenarios are designed to (a) to test the sensitivity of road and rail to price, transit time and service levels; and (b) to address network and customer-based scenarios. For example, what would be the impact on road freight volumes if part or all of the current rail task switched modes, or what would be the impact of a major new freight task on the rail network?

4.3 Market dynamics

Market dynamics were analysed by simulating the market participants' reactions to changes in the three key parameters (price, transit time and services level) for both rail and road. The effect of a parameter was analysed by using the model to estimate freight demand for a range of values and keeping all other parameters unchanged.

Figure 4.4 presents the simulation results for changes in rail price, service level and transit time. Each panel shows the demand for road and rail (in million tkm) predicted by the model for a range of relative improvements in one parameter. The figure demonstrates that while rail demand is comparatively sensitive to rail prices and service levels, it does not react much to changes in rail transit time.

FIGURE 4.2 MODE SHARE SIMULATION FOR CHANGES IN RAIL PARAMETERS



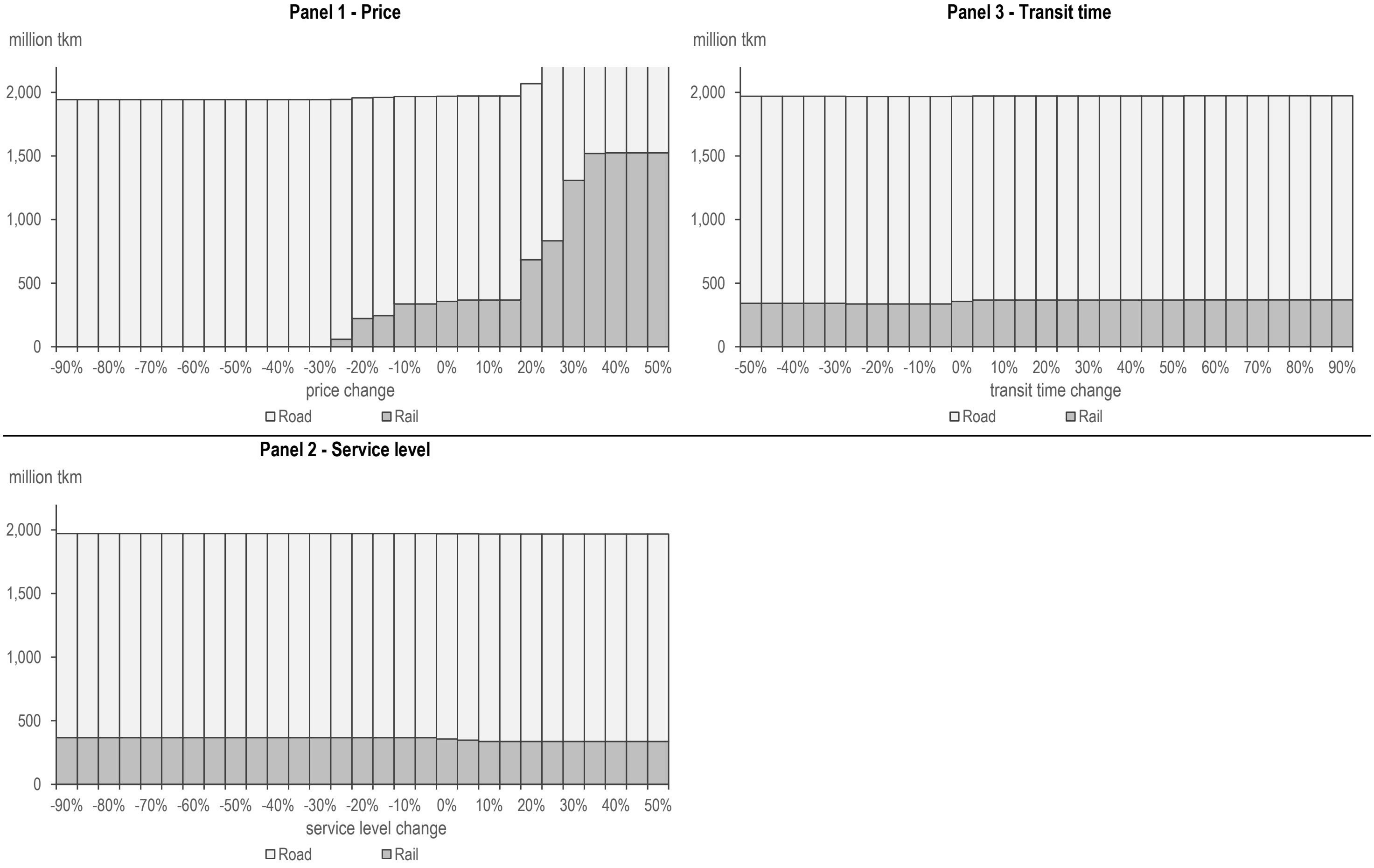
Note: For the simulation average rail speed was assumed to be 40 km/h and average road speed 70 km/h.
SOURCE: ACIL ALLEN SIMULATION

Rail price increases (reductions) of more than 15 per cent have the potential to significantly increase (reduce) rail demand. A rail price reduction of 40 per cent or more could grow rail demand by almost one billion tkm.

Changes in rail service level of up to 10 per cent in either direction are unlikely to affect rail demand. The model predicts that even a reduction of rail service level by up to 40 per cent would only result in a slight demand reduction. Increases of around 40 per cent could more than double rail demand.

Figure 4.3 presents the simulation results for changes in road price, service level and transit time. Each panel shows the rail demand (in million tkm) predicted by the model for a range of relative improvements in one parameter. The figure demonstrates that only changes in road transport prices are likely to have significant impact on rail demand.

FIGURE 4.3 MODE SHARE SIMULATION FOR CHANGES IN ROAD PARAMETERS



Note:. For the simulation average rail speed was assumed to be 40 km/h and average road speed 70 km/h.
SOURCE: ACIL ALLEN SIMULATION

Road price increases (reductions) of more than 20 per cent have the potential to significantly reduce (increase) rail demand. The model predicts that a 20 per cent price reduction in road transport prices (for example, triggered by a step change in heavy vehicle productivity) could result in a shift of all current rail users to road. Road price increases of above 20 per cent, on the other hand, could lead to exponential growth in rail demand.

In this context, it is important to note, that an increase in rail demand does not translate into an equal reduction in road demand because freight still has to be brought to the railhead. Since the model does not take the cost associated with this leg into consideration, it is likely to overestimate the impact of road price increases of 30 per cent or higher shown in Panel 1.

4.4 Mode choice scenarios

This section assesses the change in rail freight demand along key segments of the Corridor if three of the largest rail users switched to road. Specifically, the following scenarios were assessed:

— User A (southern Tasmania) switches to road
— User B (southern Tasmania) switches to road
— User C (north-west Tasmania) switches to road
— All three users switch to road.

In addition, two other scenarios were also assessed:

— All current rail users switch to road
— Additional/new forestry task on rail

Under each assessment, freight demand forecasts were undertaken for the medium, high and low growth scenarios.

In all graphs below, the purple bars in Panels 1 to 3 indicate the mode shift impact on rail freight demand. Since it is calculated before any growth rates are applied, the mode switch impact is the same across all growth scenarios (the same applies to Panel 4). The orange bars represent the impact of the growth scenarios in terms of rail usage by remaining users. For example if User A switched to road, demand along the Hobart to Burnie segment drops by their tonnage. However, the scenario may forecast a tonnage increase for other users, for example, consumer goods. The net change is the growth induced change less the mode share induced change. The grey bars in Panel 4 represent the percentage increase in road freight demand resulting from the mode shift.

User A (large-scale producer in southern Tasmania) switches to road

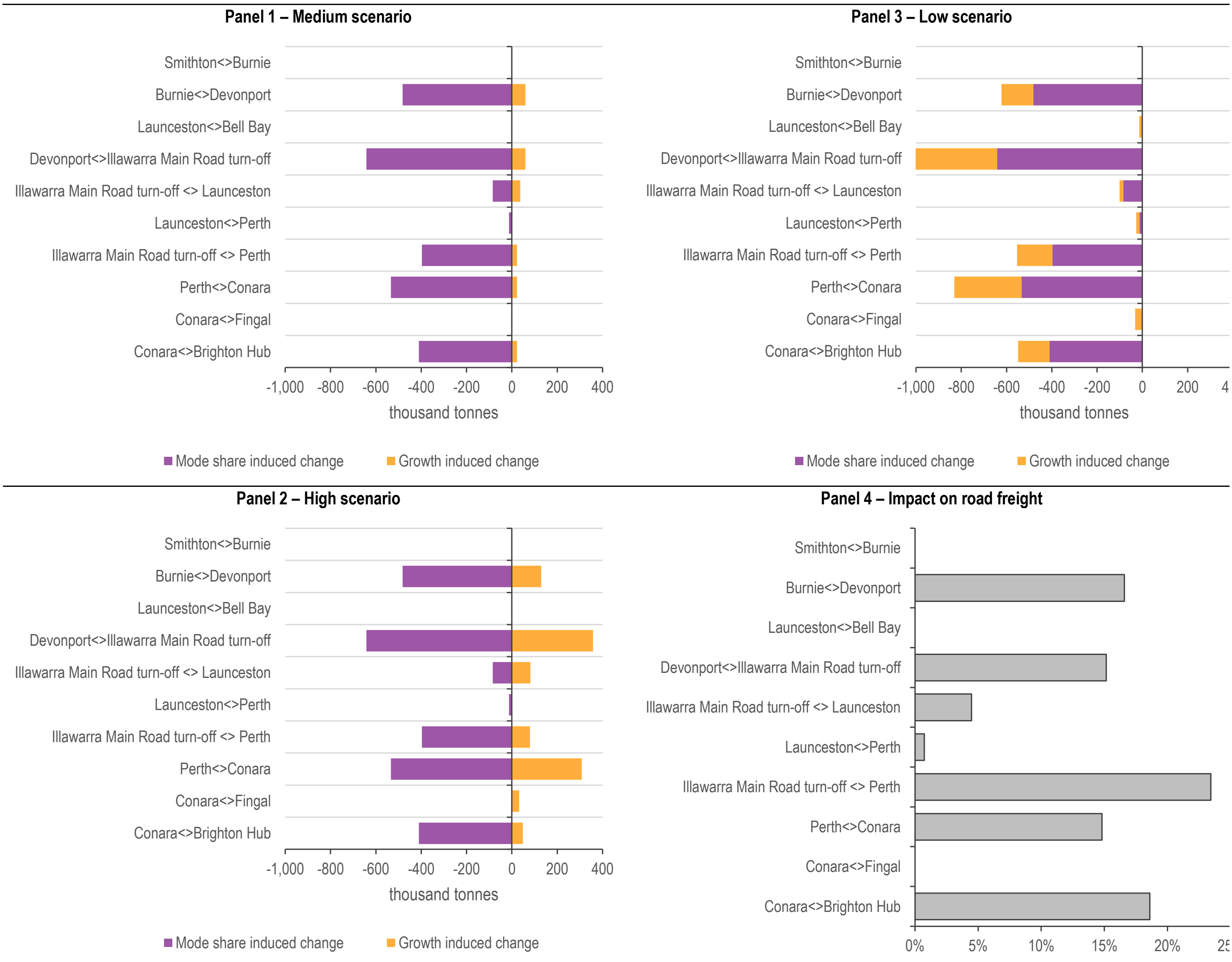
Figure 4.4 presents the mode shift assessment for a large producer in southern Tasmania under a medium, high and low growth scenario.

Panel 1 of Figure 4.4 above shows that under the medium growth scenario, switching from rail to road by this user affects the Burnie to Brighton hub segments (via Illawarra Main Road) of the network the most.

The growth scenarios also have a larger impact along the Burnie to Brighton Hub part of the network, because this section of the network has greater availability of rail freight infrastructure. The rail freight is forecast to decline under the low growth scenario (Panel 3) because the key rail users' freight demand is forecast to decrease under this scenario.

Panel 4 shows that the largest relative increase in road usage would occur along Illawarra Main Road segment. This is the combined effect from the relatively large freight task shifted from rail as well as the lower road usage base along the segment. On the other segments along the Devonport to Brighton Hub route, the switch would add between 15 and 20 per cent to the current road freight demand.

FIGURE 4.4 MODE SHIFT ASSESSMENT – USER A (LARGE SCALE PRODUCER IN SOUTHERN TASMANIA)



SOURCE: ACIL ALLEN ANALYSIS OF TASMANIAN FREIGHT SURVEY

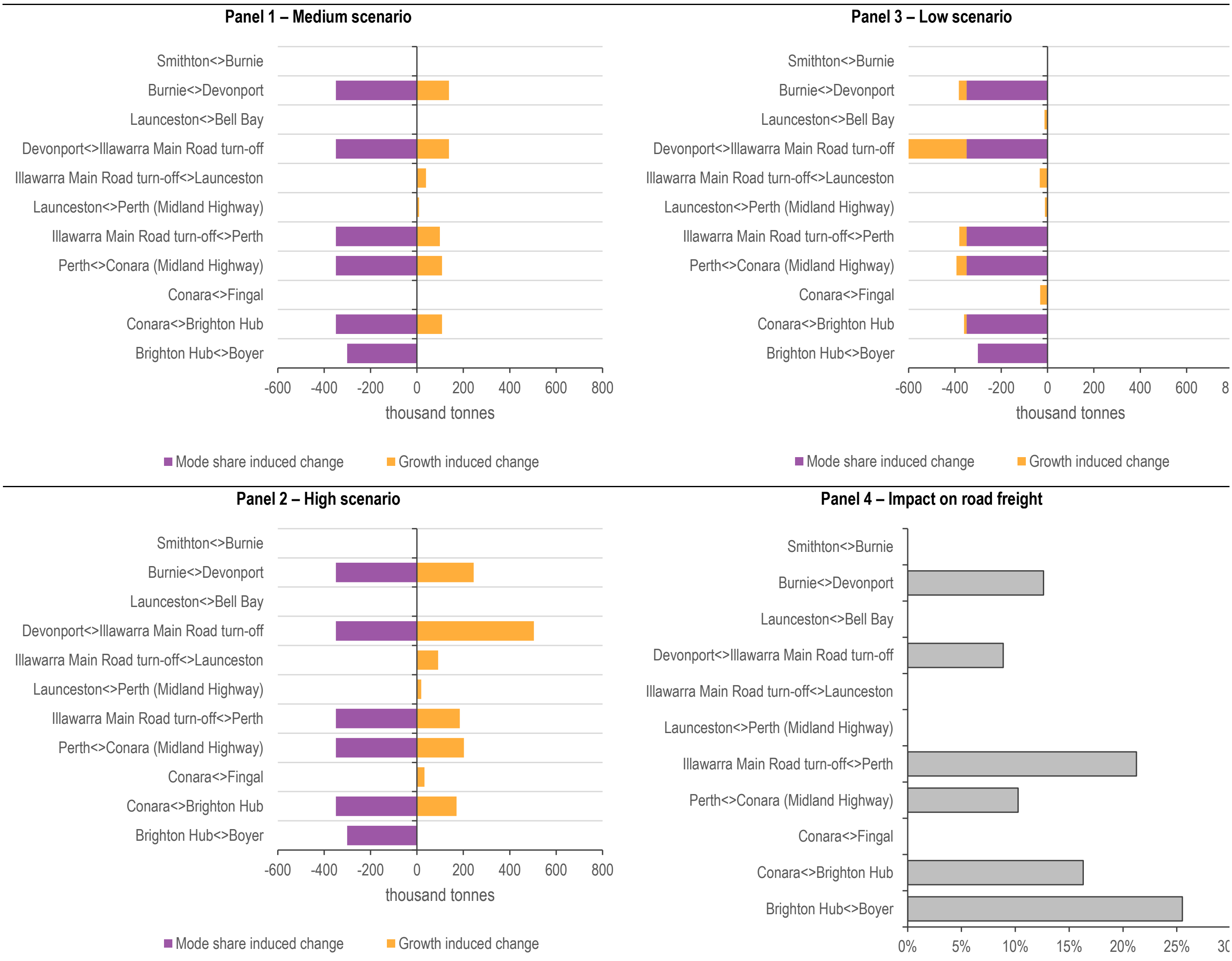
User B (large-scale producer in southern Tasmania) switches to road

Figure 4.5 presents the mode shift assessment for a second large-scale producer in southern Tasmania under a medium, high and low growth scenario.

Panel 1 of Figure 4.5 shows that under the medium growth scenario, switching from rail to road by User B affects the Burnie to Brighton hub segments (via Illawarra Main Road) of the network the most. The growth scenarios also have a larger impact along the Burnie to Brighton Hub part of the network, because this section of the network has greater availability of rail freight infrastructure. The rail freight is forecast to decline under the low growth scenario (Panel 3) because the key rail users' freight demand is forecast to decrease under this scenario.

Panel 4 shows that the largest relative increase in road usage would occur between the Brighton Hub and Boyer. This is the combined effect from the relatively large freight task shifted from rail as well as the lower road usage base along the segment. On the other segments along the Burnie to Brighton Hub route, the switch would add between 10 and 20 per cent to the current road freight demand.

FIGURE 4.5 MODE SHIFT ASSESSMENT – USER B (LARGE SCALE PRODUCER IN SOUTHERN TASMANIA)



SOURCE: ACIL ALLEN CONSULTING ANALYSIS OF THE TASMANIAN FREIGHT SURVEY

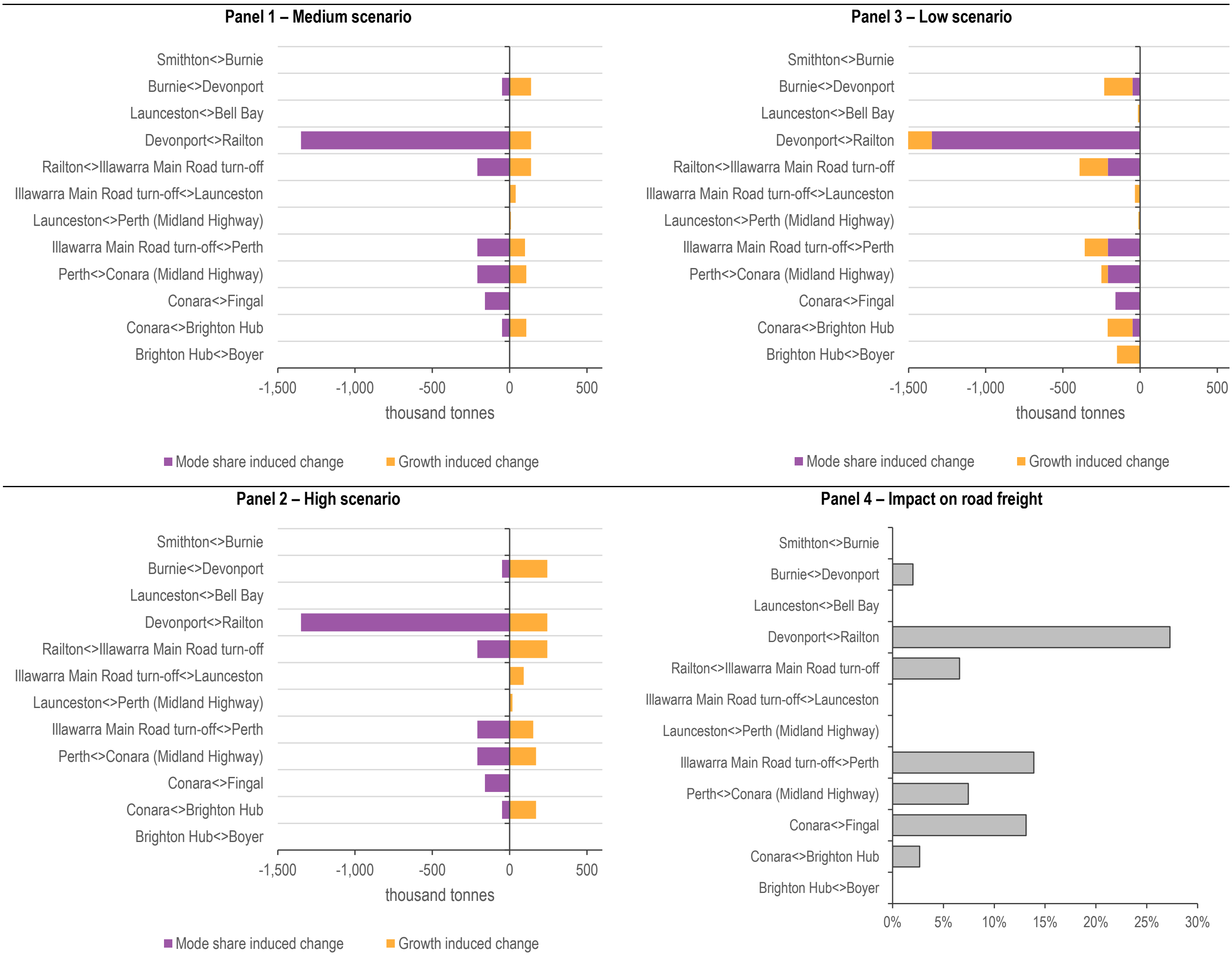
User C (large-scale producer in north-west Tasmania) switches to road

Figure 4.6 presents the mode shift assessment for a large producer in north-west Tasmania under a medium, high and low growth scenario.

Panel 1 of Figure 4.6 shows that under the medium growth scenario, switching from rail to road by User C affects the Devonport to Railton segment of the network the most. As the freight demand associated with this task is not forecast to substantially change under each of the scenarios, the impact of the switch does not change.

Panel 4 shows the largest percentage increase in road usage also occurs along Devonport to Railton segment of the network. This is the combined effect from the relatively large freight task shifted from rail as well as the lower road usage base along the segment. On the other segments along the Devonport to Brighton Hub route, the switch would add between 10 and 15 per cent to the current road freight demand.

FIGURE 4.6 MODE SHIFT ASSESSMENT – USER C (LARGE SCALE PRODUCER IN NORTH WEST TASMANIA)



SOURCE: ACIL ALLEN CONSULTING ANALYSIS OF THE TASMANIAN FREIGHT SURVEY

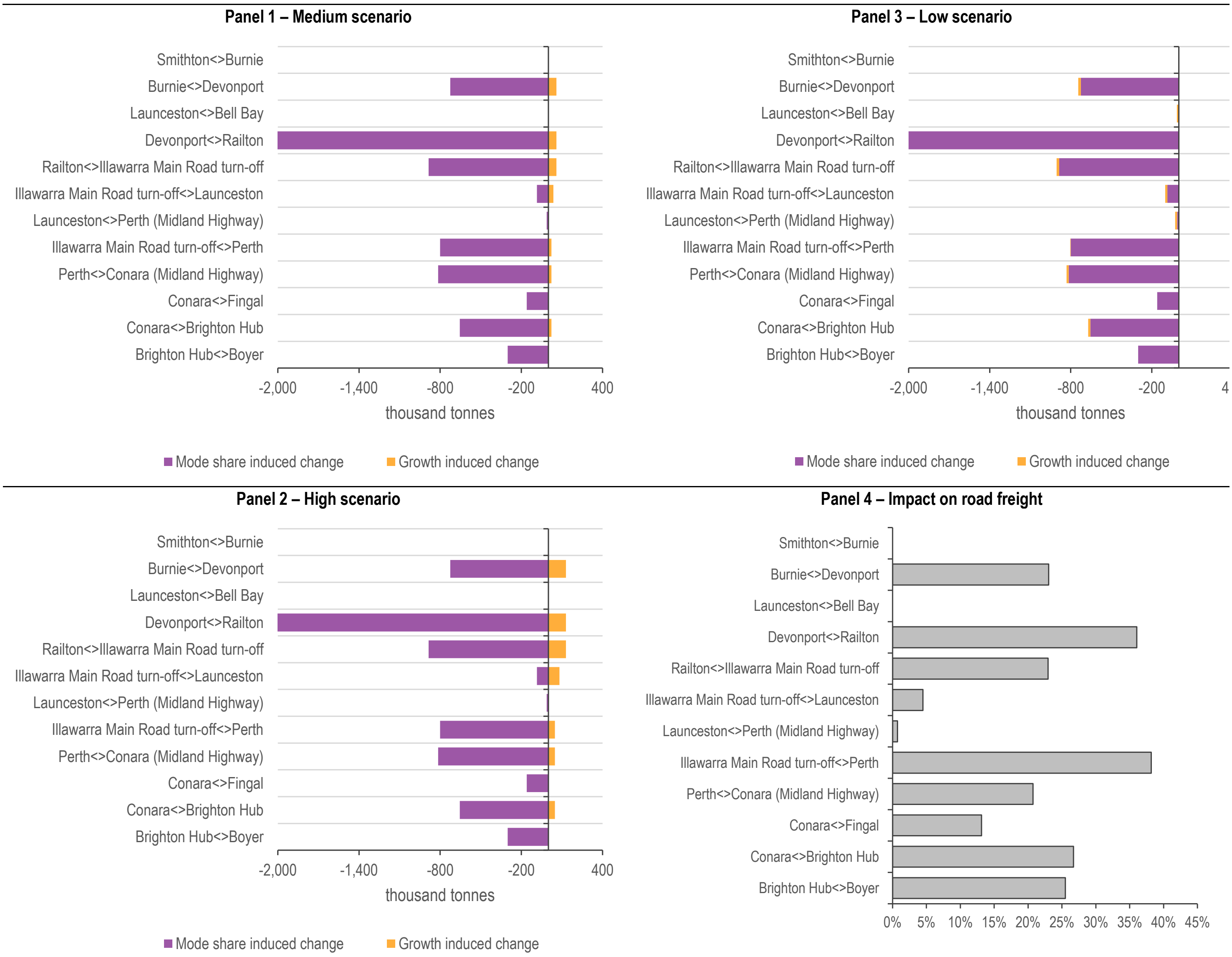
All three largest rail users switch to road

Figure 4.7 presents the mode shift assessment for all three largest rail users under the medium, high and low growth scenarios.

Panel 1 of Figure 4.7 shows that under the medium growth scenario, switching from rail to road by the three largest rail users affects the entire corridor from Burnie to Brighton (via Illawarra Main Road) segments of the network the most. These segments have the highest use by each of the three users. The impact from the growth scenarios is much smaller compared to the mode switching assessment for individual rail users above because the three largest users switch to road.

Panel 4 shows the largest percentage increase in road usage occurs along the Devonport to Railton and Illawarra Main Road segments which results from the lower road usage base along the segment.

FIGURE 4.7 MODE SHIFT ASSESSMENT – ALL THREE LARGEST RAIL USERS



SOURCE: ACIL ALLEN CONSULTING ANALYSIS OF THE TASMANIAN FREIGHT SURVEY

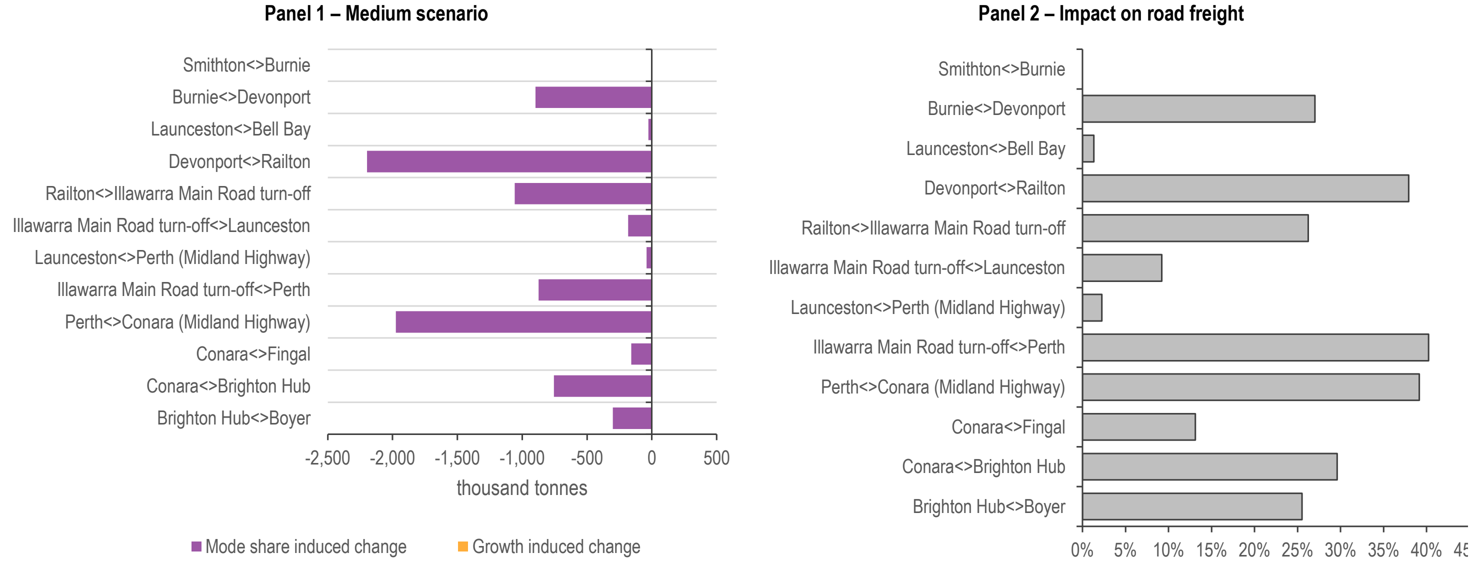
All current Tasmanian rail users switch to road

Figure 4.8 presents the assessment for the scenario where all current Tasmanian rail users switch to road. As there is no growth induced change in this scenario, the figure only presents the results of the medium scenario.

Panel 1 of Figure 4.8 shows that switching from rail to road by all current Tasmanian rail users would result in an increase in road freight by 25 per cent along all Burnie to Brighton segments of the network. This is primarily driven by the mode switch impact from the largest rail users.

Panel 4 shows that with more than 30 per cent the largest percentage increase in road usage occurs along the segments between Burnie and Perth (via Illawarra Main Road). On the other segments along the Perth to Brighton Hub route, the switch would add between 20 and 25 per cent to the current road freight demand.

FIGURE 4.8 MODE SHIFT ASSESSMENT – ALL RAIL USERS IN TASMANIA



SOURCE: ACIL ALLEN CONSULTING ANALYSIS OF THE TASMANIAN FREIGHT SURVEY

Additional/new forestry task on rail

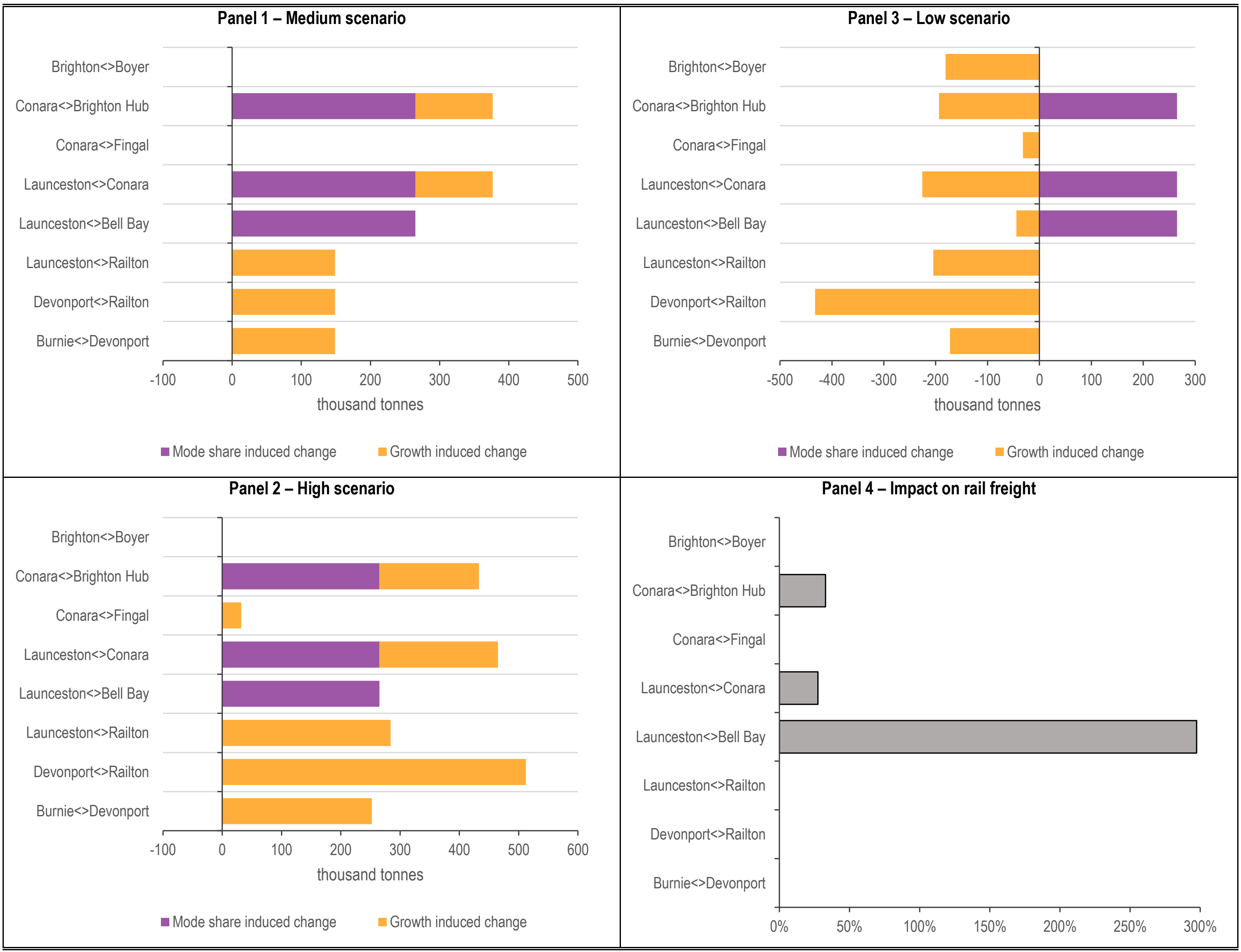
Currently, the north-bound residue task is shared between road and rail, and, under certain circumstances, the task could be expected to grow over the coming years. Figure 4.9 demonstrates the impact of an additional, hypothetical forestry task being carried on rail under the three projected growth scenarios.

The impact of the scenario is modelled by considering the mode share induced change (direct response of the additional task) and the growth induced change (determined through growth projections) under low, medium and high scenarios. The impact on rail freight as a direct result of the mode share induced change is also shown for the scenario.

The mode share induced change is modelled to occur after 5 years for the scenario, where it is then assumed to remain steady. The growth induced change is represented as the projected growth at the end of the 20 year projection period.

Figure 4.9 shows that with the additional task, the mode share induced change exclusively affects the rail network between the Brighton Hub and Bell Bay. On this part of the network, the proportional rail freight volumes between Launceston and Bell Bay are affected the most under the scenario, as this section carries the lowest overall task, however all three sections carry the additional task. Panel 1 of Figure 4.9 shows that under the medium growth scenario, freight volumes along the highly populated section between the Brighton Hub and Launceston are projected to grow by around 30 per cent, directly as a result of the additional forestry task.

FIGURE 4.9 MODE SHIFT ASSESSMENT – ADDITIONAL/NEW FORESTRY TASK ON RAIL



SOURCE ACIL ALLEN CONSULTING ANALYSIS OF THE TASMANIAN FREIGHT SURVEY:

4.5 Comparison with other forecasts

In *TasRail - Delivering value for Tasmania* (Pitt & Sherry, 2015), total freight demand of 2,059 million tkm is forecast for 2018-19, of which 552 million tkm is expected to be transported on rail. This forecast freight demand aligns with the medium growth scenario presented in section 3.2 which predicts total freight demand of 2,067 million tkm for 2018-19. However, without any changes in the improvement parameters (price, transit time and service level), the predicted demand for rail is only 387 million tkm.

Table 4.3 below presents one possible combination of improvement parameter values[2] that could support the demand forecast included in the above report.

[2] ACIL Allen selected this particular combination of values because a) with no value exceeding 15 per cent, they are considered to be within a reasonable range and b) the resulting rail demand forecast very closely aligns with that in *TasRail - Delivering value for Tasmania*.

TABLE 4.3 COMBINATION OF RAIL IMPROVEMENT PARAMETERS

Rail service indicator	Change in service
Rail price	-12 per cent
Rail transit time	-15 per cent
Rail service level	+10 per cent

SOURCE: ACIL ALLEN SIMULATION

Table 4.4 presents the effect these improvements are predicted to have on freight demand.

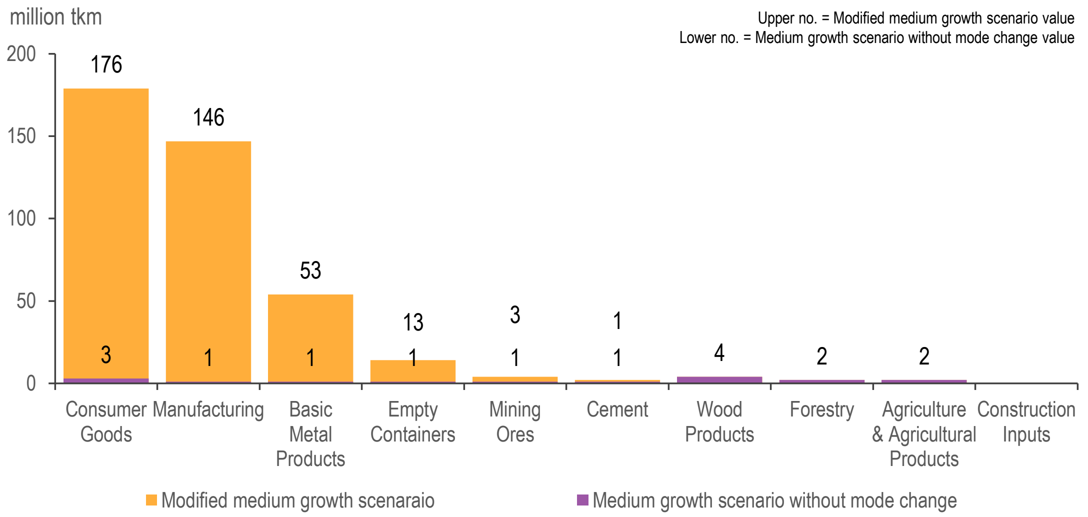
TABLE 4.4 EFFECT OF RAIL IMPROVEMENT PARAMETERS ON 2018-19 FREIGHT DEMAND

Scenarios	Change in tkm	Rail market share
Medium growth scenario without mode change	393	20%
Modified medium growth scenario	570	29%
Difference	177	9%

SOURCE: ACIL ALLEN SIMULATION

Figure 4.10 presents the freight demand and the number of freight tasks that are predicted to switch to rail by commodity group. It demonstrates that the most likely growth markets for TasRail are consumer goods, manufacturing and basic metal products. The other commodity groups are likely to be either too time-sensitive (for example, agriculture) or are expected to experience only very limited growth (for example, forestry or cement).

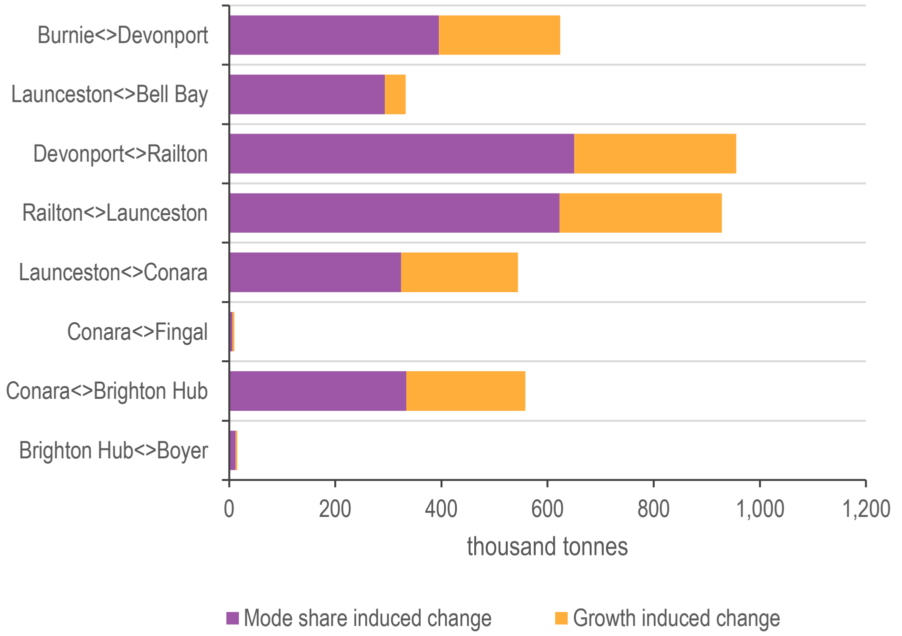
FIGURE 4.10 EFFECT OF RAIL IMPROVEMENT PARAMETERS ON FREIGHT DEMAND, NUMBER AND COMMODITY OF FREIGHT TASKS USING RAIL, 2018-19



SOURCE: ACIL ALLEN SIMULATION

All three key growth commodity groups tend to travel most of the length of the Corridor, that is either from Burnie to the Brighton Hub or at least form Devonport to the Brighton Hub. Consequently, with the parameter improvements significantly increased rail freight demand can be observed along all main routes of the Corridor (compare Figure 4.11). The largest growth is to be expected on the Devonport to Railton and Railton to Launceston segments.

FIGURE 4.11 EFFECT OF RAIL IMPROVEMENT PARAMETERS ON FREIGHT DEMAND BY CORRIDOR SEGMENT, 2018-19



SOURCE: ACIL ALLEN SIMULATION

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APPENDICES

1. Agriculture A–2
2. Construction inputs B–1
3. Consumer goods C–1
4. Manufacturing D–1
5. Forestry E–1
6. Mining ores F–1
7. Empty containers G–1
8. Basic metal products H–1
9. Wood products I–1
10. Cement J–1
11. Critical willingness to change K–1

Note: Commercial-in-confidence information, including information relating to company volumes, market share and operations, has been removed from all Appendices.

A

AGRICULTURE

The agriculture and agricultural products commodity group includes the following commodities:

- Animal Feed
- Beer, Ale and Stout
- Cereals
- Chocolates and Confectionery
- Dairy Products
- Fertilisers and Pesticides
- Fish, Live, Fresh or Chilled
- Fruit and Nuts
- Live Animals
- Meat and Meat Products
- Natural Water
- Other Animal Products
- Other Minerals
- Other Plant Products
- Other Prepared and Preserved Plant and Animal Products
- Prepared and Preserved Fish
- Prepared and Preserved Vegetables
- Raw Milk
- Vegetables
- Wool
- Prepared and Preserved Fruit and Nuts

The key commodity are:

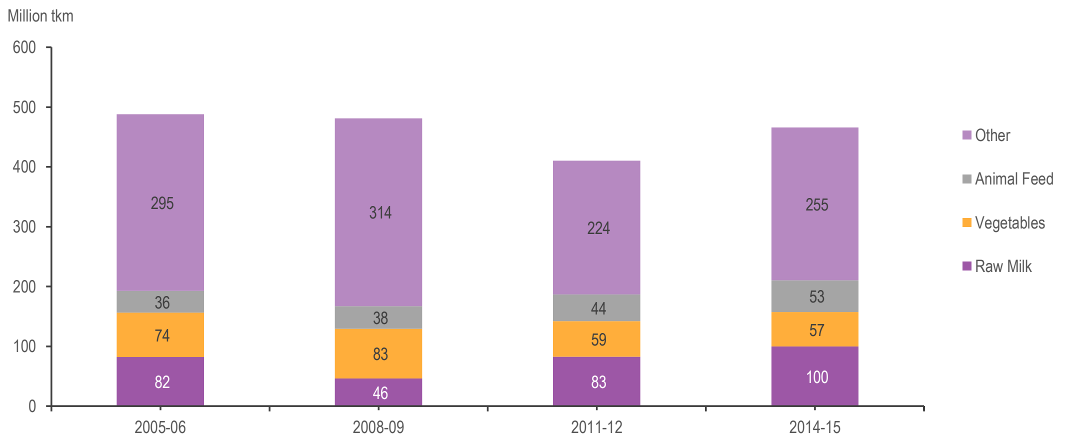
- Raw Milk
- Fertilisers and Pesticides
- Vegetables

The following sections discuss key characteristics of the freight demand generated by agriculture and present summaries of interviews conducted with key producers.

A.1 Freight by commodity - agriculture

The top three key commodities in the agriculture product commodity group in 2014-15 were raw milk, vegetables and animal feed. The freight demand in tkm for these three key commodities accounted for nearly 50 per cent of the freight share in 2014-15. Freight demand for the key commodities is illustrated in Figure A.1.

FIGURE A.1 AGRICULTURAL FREIGHT VOLUME OVER TIME FOR THE KEY COMMODITIES



Note: The key commodities refer to the commodities with a freight share of ten per cent and above in 2014-15.

SOURCE: ACIL ALLEN CONSULTING ANALYSIS OF TASMANIAN FREIGHT SURVEY

The Figure above shows that the total freight demand in tkm has remained relatively stable between 2005-06 and 2014-15. The shares of raw milk and animal feed have increased slightly over the period whereas the share of vegetables has marginally decreased.

A.2 Key companies – agriculture

Table A.1 shows the number of companies under each commodity for the agriculture products commodity group. The table demonstrates that this commodity group is a fragmented market comprising a large number of commodities and companies.

As discussed in Section 3.1, fragmented commodity groups are forecast using a top-down approach which uses one growth rate for the entire commodity group. The underlying analysis is discussed in the following section.

TABLE A.1 COMMODITIES AND COMPANIES - AGRICULTURE (2014-15)

Commodity	Number of companies
Beer, Ale and Stout	3
Cereals	2
Dairy Products	9
Fertilisers and Pesticides	5
Fish, Live, Fresh or Chilled	17
Fruit and Nuts	10
Live Animals	10
Meat and Meat Products	9
Other Animal Products	2
Other Minerals	7

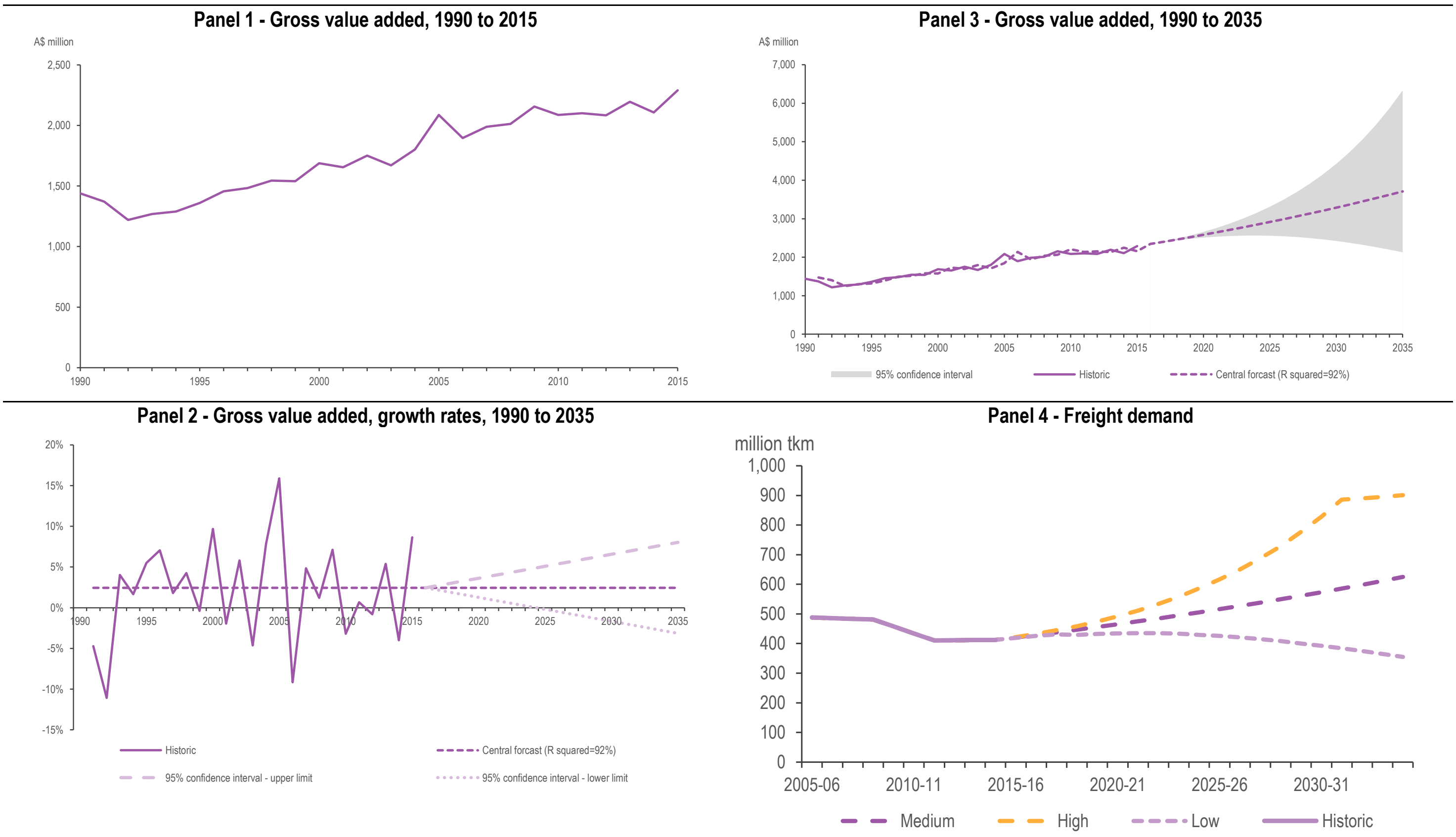
Commodity	Number of companies
Other Plant Products	11
Prepared and Preserved Fish	1
Prepared and Preserved Vegetables	2
Raw Milk	5
Vegetables	14
Wool	1
Total	**108**

SOURCE: ACIL ALLEN ANALYSIS OF TASMANIAN FREIGHT SURVEY 2014-15

A.3 Growth - agriculture

As discussed above, since the agricultural freight market is fragmented, ACIL Allen considers estimating an industry growth rate an appropriate approach. As discussed in section 3.1 a proxy series from ABS catalogue 5220 was used to estimate the growth rates. For the agriculture commodity group the proxy series is Agriculture, forestry and fishing; Industry gross value added: Chain volume measures (Australian Bureau of Statistics, 2016). Figure A. presents key outputs of this analysis.

FIGURE A.2 AGRICULTURE GROWTH ANALYSIS



SOURCE: ABS CAT. 5220

Panel 1 of Figure A.2 shows the gross value added for the agriculture industry between 1990 and 2015 as reported in ABS catalogue 5220. It shows that the gross value added has followed a stable upward trend with short term fluctuations in some years.

Panel 2 presents the actual (1990–2015) and forecast (2015-2035) annual growth rate of agricultural value added. Over this period, the actual annual growth rate fluctuated within a range of -10 to

+10 per cent. ACIL Allen conducted econometric time series analysis to forecast the growth rate. The model estimates annual growth of 2.4 per cent with a standard error of 0.2 per cent. In this context the R squared[3] of 0.92 indicates a very good fit. Table A.2 provides the key parameters generated by the econometric model used for forecasting.

TABLE A.2 KEY PARAMETERS FROM ECONOMETRIC MODELLING

Industry	Growth rate	Standard error	R squared
Agriculture	2.4 per cent	0.2 per cent	0.92

SOURCE: ACIL ALLEN ANALYSIS OF TASMANIAN FREIGHT SURVEY

The model forms the basis of the growth scenarios which are derived as deviations from the forecast (medium scenario) growth rate. The high and low scenario simulate the agricultural growth under optimistic and pessimistic economic conditions respectively. They are calculated by applying the growth rate estimate's standard error to the medium scenario.

Panel 3 applies the forecast growth rate to the agriculture gross value added. This provides forecast growth from just under $2 billion to approximately $3.7 billion in 2035 following a stable growth path. The confidence interval is relatively wide resulting in value added growing to over $6 billion in the high scenario and to just over $2 billion in the low scenario.

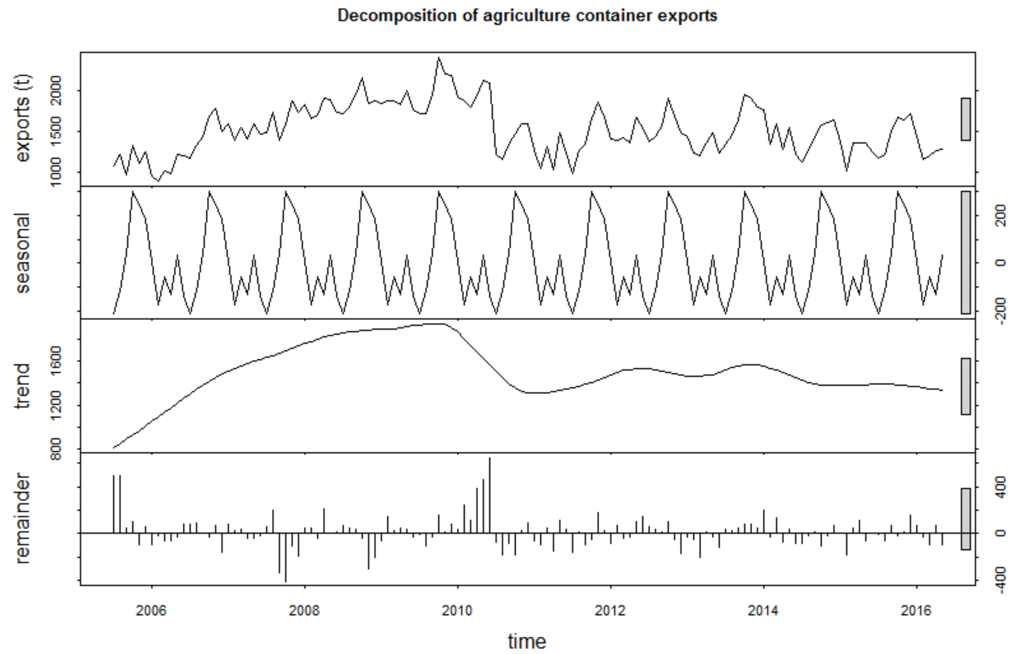
Panel 4 illustrates the freight demand forecast in tkm. The historical data from the Survey shows that freight demand for the agriculture and agricultural products commodity group has decreased slightly in the past decade. The medium scenario forecast follows a steady upward trend from 421 million tkm in 2015-16 to 625 million tkm in 2034-35. The scenario analysis forecast a high scenario of 901 million tkm and a low scenario of 355 million tkm by 2034-35.

A.4 Seasonality - agriculture

Figure A.3 shows a decomposition of the agricultural container export series (expressed in tonnes) generated by seasonal decomposition of time series by Loess (Cleveland, McRae, & Terpenning, 1990). The figure shows that there is a re-occurring seasonal pattern, a relatively stable trend and a random component whose influence has decreased since mid-2010.

[3] R squared is an indicator of the quality of fit of an econometric model. An R squared of one indicates a perfect model that is capable of performing forecast at 100 per cent accuracy level.

FIGURE A.3 AGRICULTURE CONTAINER EXPORTS DECOMPOSITION



SOURCE: ACIL ALLEN ANALYSIS OF PORT OF MELBOURNE DATA

B

CONSTRUCTION INPUTS

The construction inputs commodity group includes the following commodities:

— Bitumen and Asphaltic Mixtures
— Bricks, Roofing Tiles and Concrete Products
— Premixed Concrete
— Stone, Sand and Clay

The following sections discuss key characteristics of the freight demand generated by construction inputs. No interviews were conducted for this commodity group.

B.1 Freight by commodity – construction inputs

The only commodity that has a freight demand share above ten per cent in the construction inputs product commodity group in 2014-15 was stone, sand and clay with a freight demand share of 84 per cent. Its freight demand is illustrated in Figure B.1.

FIGURE B.1 CONSTRUCTION INPUTS FREIGHT VOLUME OVER TIME FOR THE KEY COMMODITIES

Note: The key commodities refer to the commodities with a freight share of ten per cent and above in 2014-15.

SOURCE: ACIL ALLEN ANALYSIS OF TASMANIAN FREIGHT SURVEY

The Figure above shows that both the freight demand associated with the construction inputs commodity group and stone, sand and clay in tkm has remained relatively stable between 2005-06 and 2014-15.

B.2 Key companies– construction inputs

Table B.1 shows the construction inputs commodity group is a fragmented market comprising a large number of companies. The forecast was thus performed at commodity group level rather than individual company level following the rationale discussed in the agriculture commodity group section above.

TABLE B.1 COMMODITIES AND COMPANIES – CONSTRUCTION INPUTS (2014-15)

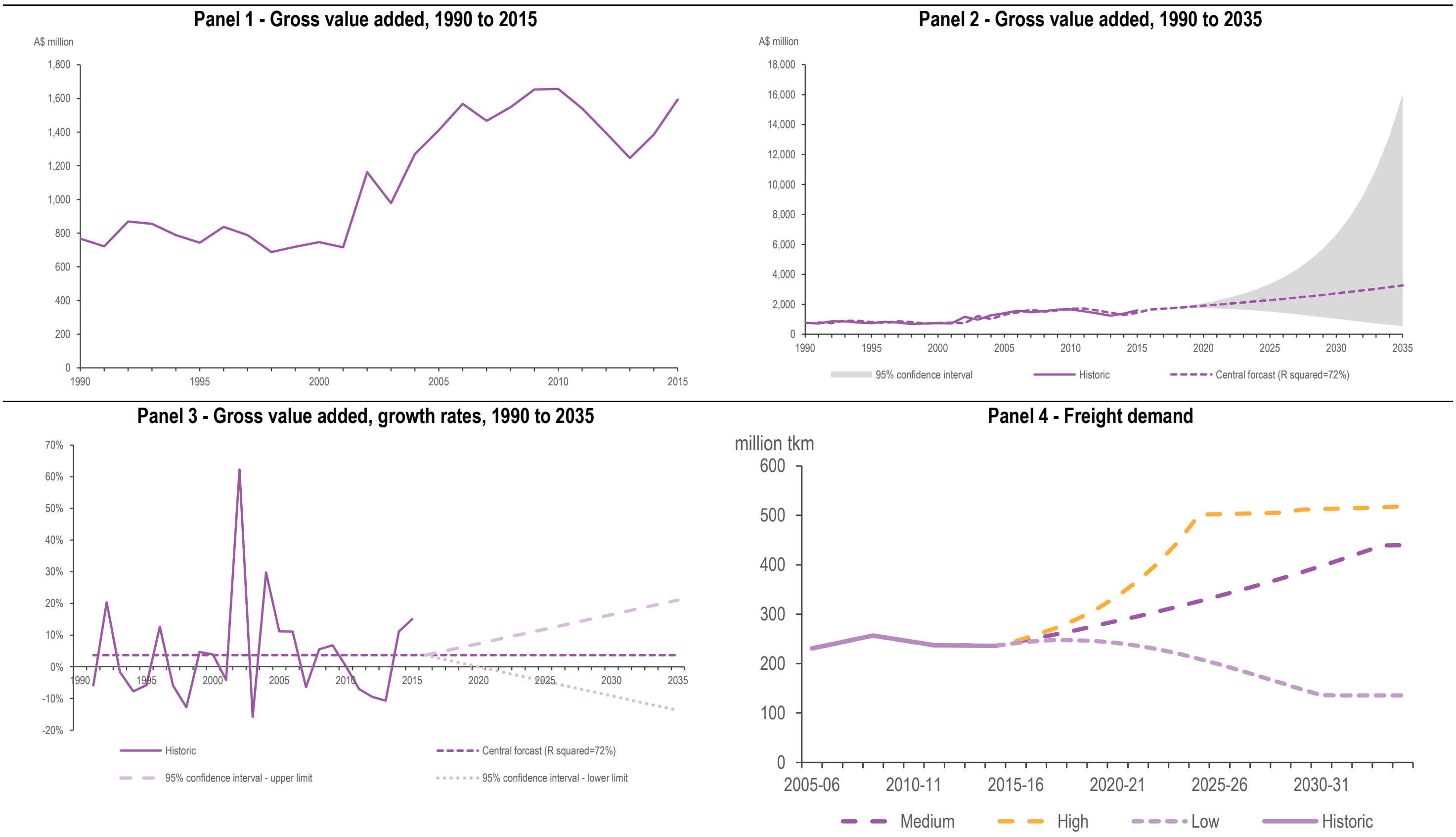
Commodity	Number of companies
Bitumen and Asphaltic Mixtures	3
Bricks, Roofing Tiles and Concrete Products	9
Premixed Concrete	4
Stone, Sand and Clay	56
Grand Total	**72**

SOURCE: ACIL ALLEN ANALYSIS OF TASMANIAN FREIGHT SURVEY 2014-15

B.3 Growth– construction inputs

As discussed above, since the construction inputs freight market is fragmented, ACIL Allen has applied an industry growth rate. As discussed in section 3.1, a proxy series from ABS catalogue 5220 was used to estimate the growth rates. For the construction inputs commodity group the proxy series is Construction; Industry gross value added: Chain volume measures (Australian Bureau of Statistics, 2016).

FIGURE B.2 CONSTRUCTION INPUTS GROWTH ANALYSIS



SOURCE: ABS CAT. 5220

Panel 1 of Figure B.2 shows the gross value added for the construction industry between 1990 and 2015 as reported in ABS catalogue 5220. It shows that the gross value added had a stable trend between 1990 and 2000 followed by a steep increase until 2010. The series then decreased between 2010 and 2013 before it picked up again.

Panel 2 presents the actual (1990–2015) and forecast (2015-2035) annual growth rate of construction value added. Over this period, the actual annual growth rate fluctuated within a range of -20 to +60 per cent (Panel 3). ACIL Allen conducted econometric time series analysis to forecast the growth rate. The model estimates annual growth of 3.7 per cent with a standard error of 0.5 per cent. In this context the R squared[4] of 0.72 indicates a good fit. Table B.2 provides the key parameters generated by the econometric model used for forecasting.

TABLE B.2 KEY PARAMETERS FROM ECONOMETRIC MODELLING – CONSTRUCTION

Industry	Growth rate	Standard error	R squared
Construction	3.7 per cent	0.5 per cent	0.72 per cent

SOURCE: ACIL ALLEN ANALYSIS OF TASMANIAN FREIGHT SURVEY

The model forms the basis of the growth scenarios which are derived as deviations from the forecast (medium scenario) growth rate. The high and low scenario simulate the construction inputs growth under optimistic and pessimistic economic conditions respectively. They are calculated by applying the growth rate estimate's standard error to the medium scenario.

Panel 3 (Figure B.2) applies the forecast growth rate to the construction gross value added. This provides forecast growth from just under $2 billion to approximately $3.3 billion in 2035 following a stable growth path. The confidence interval is very wide resulting in value added growing to over $16 billion in the high scenario and declining to $0.5 billion in the low scenario.

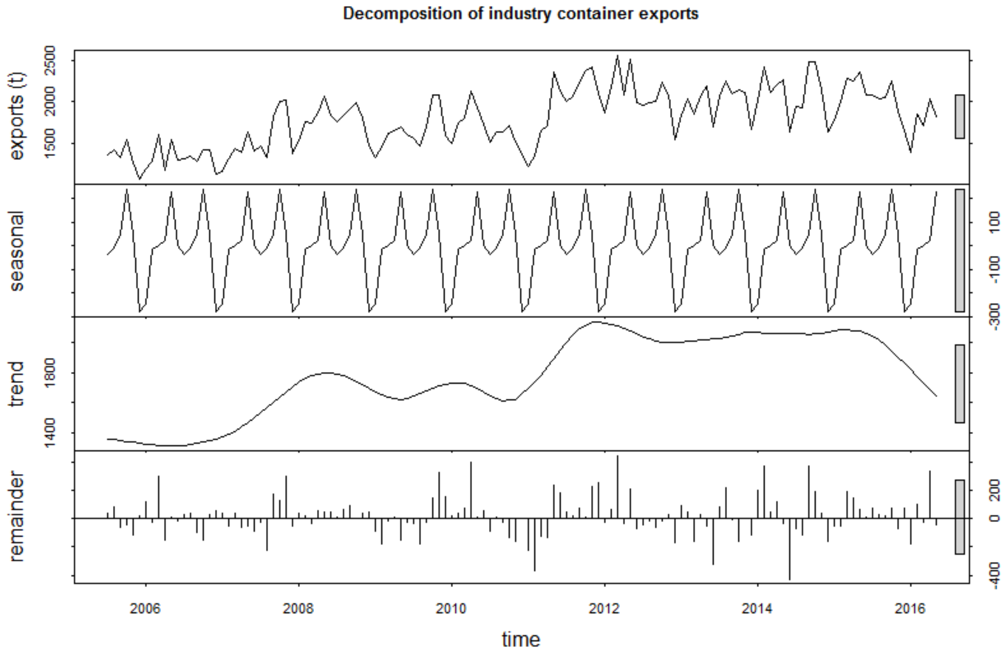
Panel 4 illustrates the freight demand forecast in tkm. The historical data from the Survey shows that freight demand for the construction inputs commodity group has been mostly stable in the past decade. The medium scenario forecast follows an upward trend from 244 million tkm in 2015-16 to 440 million tkm in 2034-35. The scenario analysis forecast a high scenario of 518 million tkm and a low scenario of million 135 tkm by 2034-35.

B.4 Seasonality – construction inputs

Figure B.3 shows a decomposition of the industrial products container export series (used as a proxy for construction inputs and expressed in tonnes) generated by seasonal decomposition of time series by Loess (Cleveland, McRae, & Terpenning, 1990). The figure shows that there is a strong re-occurring seasonal pattern, a plateauing upward trend and a relatively regular random component.

[4] R squared is an indicator of the quality of fit of an econometric model. An R squared of one indicates a perfect model that is capable of performing forecast at 100 per cent accuracy level.

FIGURE B.3 INDUSTRIAL PRODUCTS CONTAINER EXPORTS DECOMPOSITION



SOURCE: ACIL ALLEN ANALYSIS OF PORT OF MELBOURNE DATA

C CONSUMER GOODS

The consumer goods commodity group includes the following commodities:

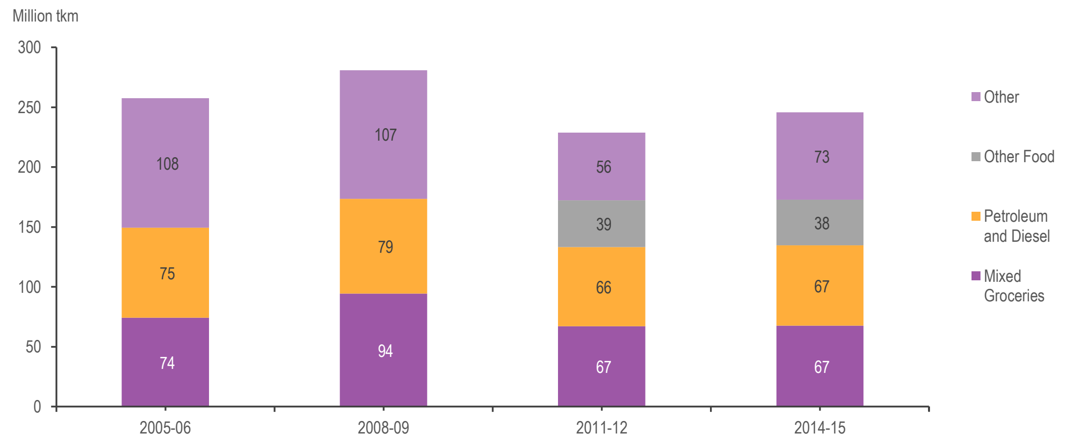
- Grain Mill Products
- Mixed Consumer Goods
- Mixed Groceries
- Motor Vehicles and Parts
- Other Alcoholic Beverages and mixed alcoholic consignments
- Other Food
- Petroleum and Diesel
- Petroleum Gasses
- Clothing, Footwear and Leather
- Other Food
- Textiles
- Yarn and Thread and textiles

The following sections discuss key characteristics of the freight demand generated by consumer goods and present summaries of interviews conducted with key freight generators.

C.1 Freight by commodity – consumer goods

The top three key commodities in the consumer goods commodity group in 2014-15 are mixed groceries, petroleum and diesel and other food. The freight demand in tkm for these three key commodities accounted for 71 per cent of the freight share in 2014-15. Freight demand for the key commodities is illustrated in Figure C.1.

FIGURE C.1 CONSUMER GOODS FREIGHT VOLUME OVER TIME FOR THE KEY COMMODITIES



Note: The key commodities refer to the commodities with a freight share of ten per cent and above in 2014-15.

SOURCE: ACIL ALLEN ANALYSIS OF TASMANIAN FREIGHT SURVEY

The Figure above shows that the total freight demand in tkm has fluctuated slightly between 2005-06 and 2014-15. The commodity other food only appeared in 2011-12 and 2014-15. Freight demand for remaining commodities has decreased over this period.

C.2 Key companies – consumer goods

Table C.1 shows the consumer goods commodity group is made up of large number of companies and is a fragmented market. As discussed in Section 3.1, fragmented commodity groups are forecast using a top-down approach which uses one growth rate for the entire commodity group. The underlying analysis is discussed in the following section.

TABLE C.1 COMMODITIES AND COMPANIES – CONSUMER GOODS (2014-15)

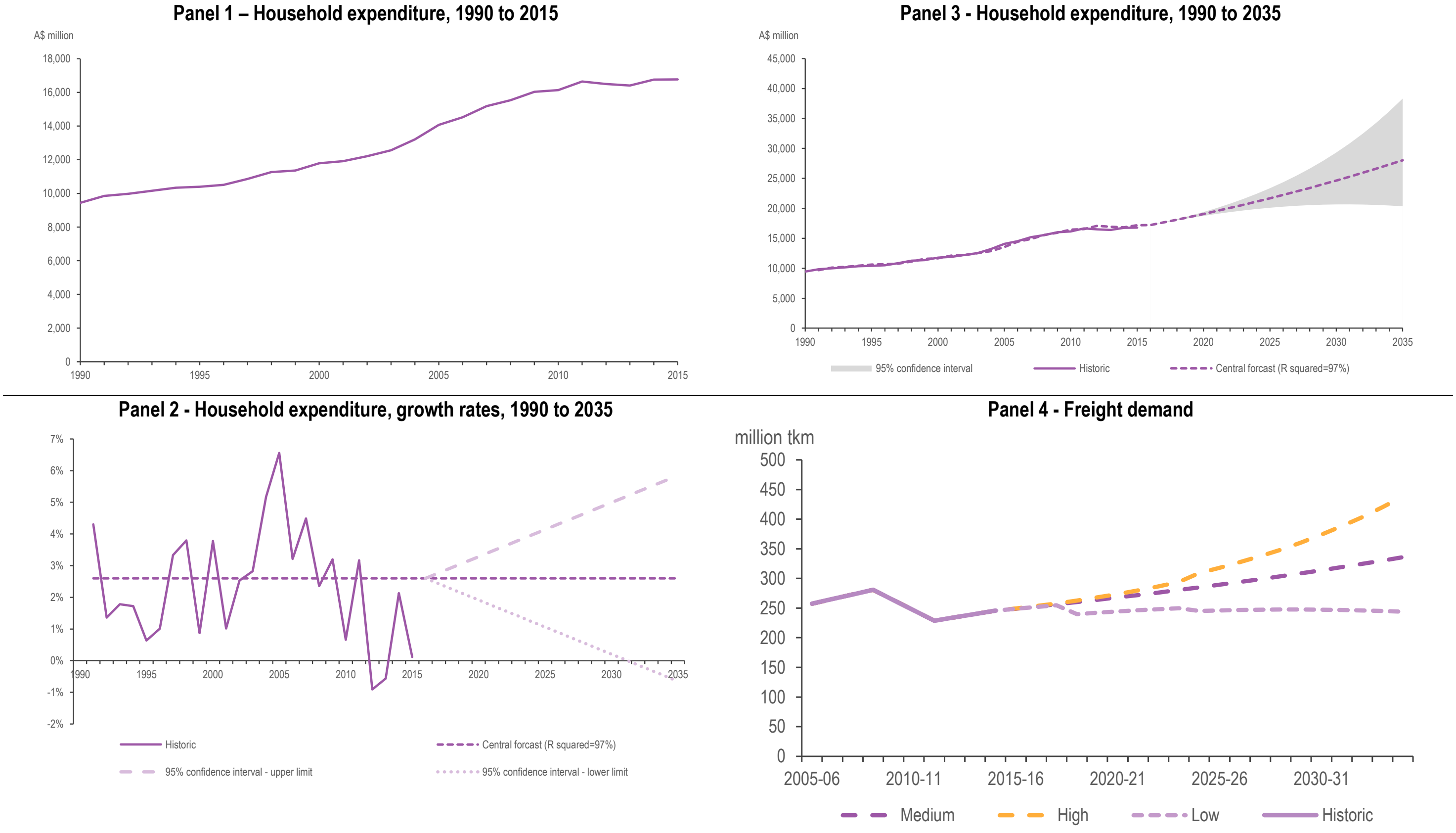
Commodity	Number of companies
Grain Mill Products	1
Mixed Consumer Goods	11
Mixed Groceries	9
Motor Vehicles and Parts	2
Other Alcoholic Beverages and mixed alcoholic consignments	3
Other Food	39
Petroleum and Diesel	12
Petroleum Gasses	3
Total	**80**

SOURCE: ACIL ALLEN ANALYSIS OF TASMANIAN FREIGHT SURVEY 2014-15

C.3 Growth – consumer goods

The consumer goods freight market is fragmented, and ACIL Allen has applied an industry growth rate. As discussed in section 3.1, a proxy series from ABS catalogue 6530.0 was used to estimate the growth rates. For the consumer goods commodity group the proxy series is Household Expenditure Survey, Australia: TAS Data Table (Australian Bureau of Statistics, 2016). Figure B.2 presents the key outputs of this analysis.

FIGURE C.2 CONSUMER GOODS GROWTH ANALYSIS



SOURCE: ABS CAT. 5220

Panel 1 of Figure C.2 shows the Tasmanian household expenditure between 1990 and 2015 as reported in ABS catalogue 6530.0. It shows that the series has followed a stable upward trend until it stabilised in 2010.

Panel 2 presents the actual (1990–2015) and forecast (2015-2035) annual growth rate of household expenditure. Over this period, the actual annual growth rate fluctuated within a range of -0.5 to +6.5 per cent. ACIL Allen conducted econometric time series analysis to forecast the growth rate. The model estimates annual growth of 2.6 per cent with a standard error of 0.1 per cent. In this context the R squared[5] of 0.97 indicates a very good fit. Table C.2 provides the key parameters generated by the econometric model used for forecasting.

TABLE C.2 KEY PARAMETERS FROM ECONOMETRIC MODELLING – CONSUMER GOODS

Industry	Growth rate	Standard error	R squared
Consumer goods	2.6 per cent	0.1 per cent	0.97

SOURCE: ACIL ALLEN ANALYSIS OF TASMANIAN FREIGHT SURVEY

The model forms the basis of the growth scenarios which are derived as deviations from the forecast (medium scenario) growth rate. The high and low scenario simulate the household consumption growth under optimistic and pessimistic economic conditions respectively. They are calculated by applying the growth rate estimate's standard error to the medium scenario.

Panel 3 applies the forecast growth rate to the construction gross value added. This provides forecast growth from $17.2 billion to approximately $28 billion in 2035 following a stable growth path. The

[5] R squared is an indicator of the quality of fit of an econometric model. An R squared of one indicates a perfect model that is capable of performing forecast at 100 per cent accuracy level.

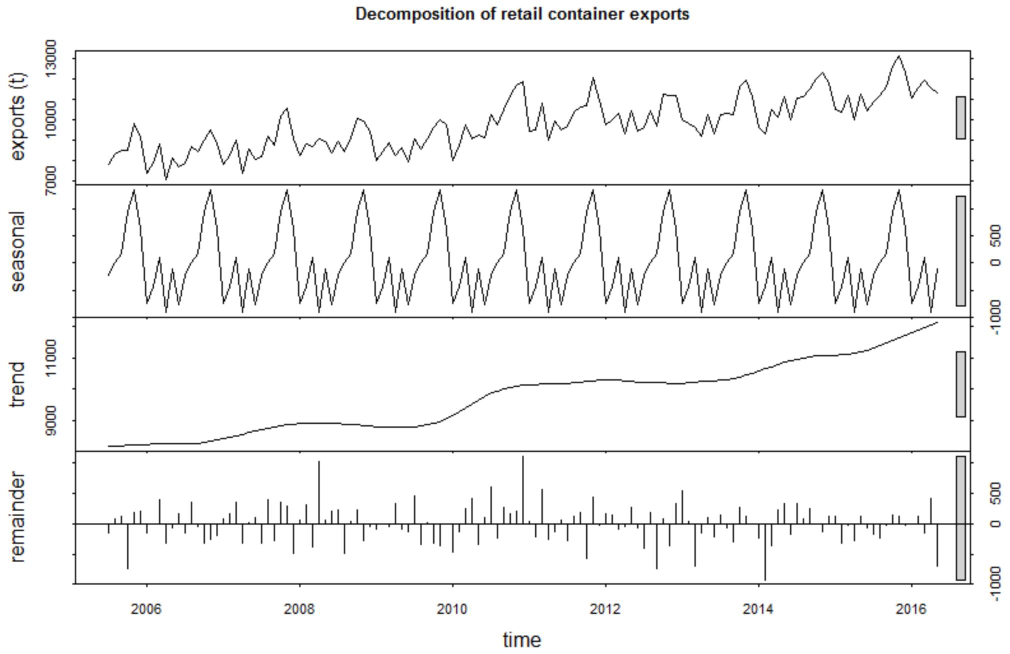
confidence interval shows value added growing to $38.3 billion in the high scenario and to $20.3 billion in the low scenario.

Panel 4 illustrates the freight demand forecast in tkm. The historical data from the Survey shows that freight demand for the consumer goods commodity group has been fluctuating within a relatively narrow range in the past decade. The medium scenario forecast follows a slight upward trend from 249 million tkm in 2015-16 to 336 million tkm in 2034-35. The scenario analysis forecast a high scenario of 439 million tkm and a low scenario of million 244 tkm by 2034-35.

C.4 Seasonality – consumer goods

Figure C.3 shows a decomposition of the industrial products container export series (used as a proxy for construction inputs and expressed in tonnes) generated by seasonal decomposition of time series by Loess (Cleveland, McRae, & Terpenning, 1990). The figure shows that there is a modest re-occurring seasonal pattern, a strong upward trend and a relatively regular random component.

FIGURE C.3 RETAIL PRODUCTS CONTAINER EXPORTS DECOMPOSITION



SOURCE: ACIL ALLEN ANALYSIS OF PORT OF MELBOURNE DATA

D MANUFACTURING

The manufacturing commodity group includes the following commodities:

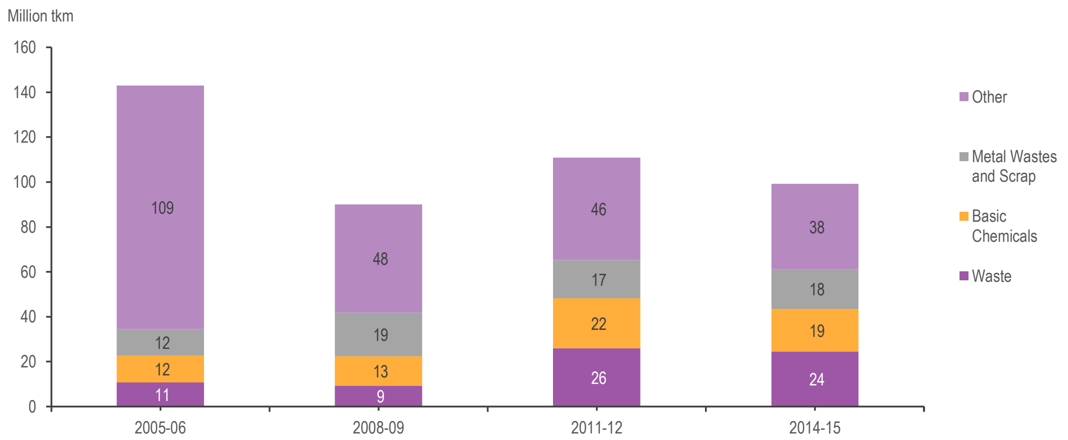
— Basic Chemicals
— Fabricated Metal Products
— Furniture and Pre-fabricated Buildings
— Metal Wastes and Scrap
— Mixed or Unknown Commodities
— Other Articles and Commodities
— Other Chemicals, Rubber and Plastics Products and Explosives
— Other Machinery and Parts
— Other Non-metallic Mineral Products
— Other Petroleum and Coal Products
— Pharmaceutical Products and Essential Oils
— Waste
— Ships and Boats
— Water Transport Services

The following sections discuss key characteristics of the freight demand generated by manufacturing. No interviews were conducted for this commodity group.

D.1 Freight by commodity – manufacturing

The top three key commodities in the manufacturing commodity group in 2014-15 are waste, basic chemicals and metal wastes and scraps. The freight demand in tkm for these three key commodities accounted for nearly 62 per cent of the freight share in 2014-15. Freight demand for the key commodities is illustrated in Figure D.1.

FIGURE D.1 MANUFACTURING FREIGHT VOLUME OVER TIME FOR THE KEY COMMODITIES



Note: The key commodities refer to the commodities with a freight share of ten per cent and above in 2014-15.

SOURCE: ACIL ALLEN ANALYSIS OF TASMANIAN FREIGHT SURVEY

The Figure above shows that the total freight demand in tkm has fluctuated between 2005-06 and 2014-15. The freight demand for the three key commodities have increased over the period whereas it has decreased for other commodities.

D.2 Key companies – manufacturing

Table D.1 shows the number of companies under each commodity for the manufacturing commodity group. The table demonstrate that this commodity group is a fragmented market made up of large number of commodities and companies.

As discussed in Section 3.1, fragmented commodity groups are forecast using a top-down approach which uses one growth rate for the entire commodity group. The underlying analysis is discussed in the following section.

TABLE D.1 COMMODITIES AND COMPANIES – MANUFACTURING (2014-15)

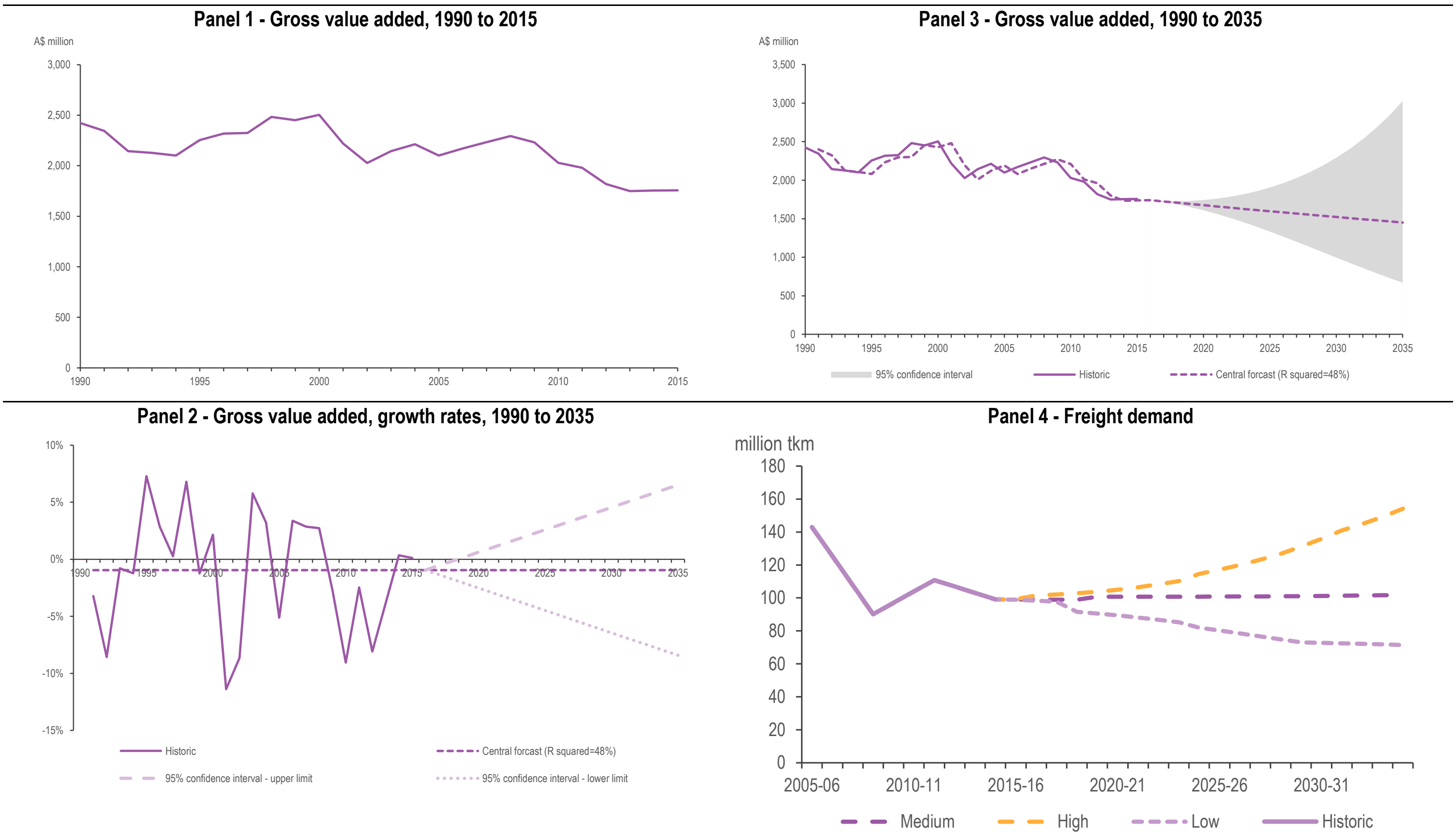
Commodity	Number of companies
Basic Chemicals	42
Fabricated Metal Products	5
Furniture and Pre-fabricated Buildings	1
Metal Wastes and Scrap	21
Mixed or Unknown Commodities	11
Other Articles and Commodities	4
Other Chemicals, Rubber and Plastics Products and Explosives	4
Other Machinery and Parts	15
Other Non-metallic Mineral Products	4
Other Petroleum and Coal Products	1
Waste	16
Total	**124**

SOURCE: ACIL ALLEN ANALYSIS OF TASMANIAN FREIGHT SURVEY 2014-15

D.3 Growth – manufacturing

Since the manufacturing freight market is fragmented, ACIL Allen has applied an industry growth rate. As discussed in section 3.1, a proxy series from ABS catalogue 5220 was used to estimate the growth rates. For the Manufacturing commodity group the proxy series is Manufacturing; Industry gross value added: Chain volume measures (Australian Bureau of Statistics, 2016). Figure D.2 presents key outputs of this analysis.

FIGURE D.2 MANUFACTURING GROWTH ANALYSIS



SOURCE: ABS CAT. 5220

Panel 1 of Figure D.2 shows the gross value added for the manufacturing industry between 1990 and 2015 as reported in ABS catalogue 5220. It shows that the gross value added has followed a slight downward trend over the period with short term fluctuations in some years.

Panel 2 presents the actual (1990–2015) and forecast (2015-2035) annual growth rate of manufacturing value added. Over this period, the actual annual growth rate fluctuated within a range of -10 to +8 per cent. ACIL Allen conducted econometric time series analysis to forecast the growth rate. The model estimates annual growth of -1.0 per cent with a standard error of 0.2 per cent. In this context the R squared[6] of 0.48 indicates the model is acceptable. **Error! Reference source not ound.** provides the key parameters generated by the econometric model used for forecasting.

TABLE D.2 KEY PARAMETERS FROM ECONOMETRIC MODELLING – MANUFACTURING

Industry	Growth rate	Standard error	R squared
Manufacturing	-1.0 per cent	0.2 per cent	0.48

SOURCE: ACIL ALLEN ANALYSIS OF TASMANIAN FREIGHT SURVEY

[6] R squared is an indicator of the quality of fit of an econometric model. An R squared of one indicates a perfect model that is capable of performing forecast at 100 per cent accuracy level.

The model forms the basis of the growth scenarios which are derived as deviations from the forecast (medium scenario) growth rate. The high and low scenario simulate the manufacturing growth under optimistic and pessimistic economic conditions respectively. They are calculated by applying the growth rate estimate's standard error to the medium scenario.

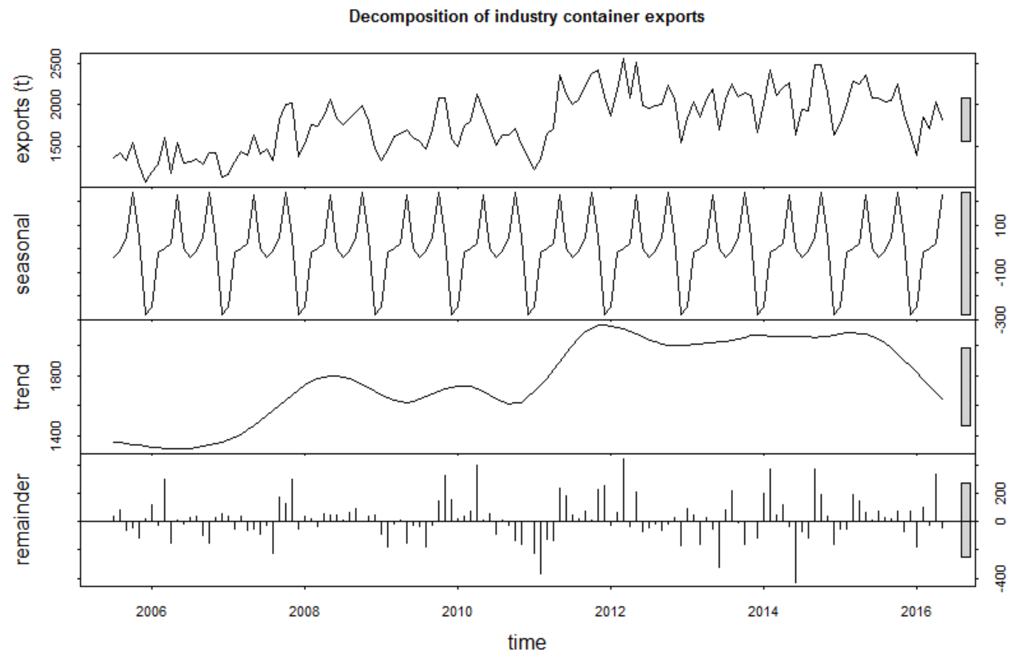
Panel 3 applies the forecast growth rate to the construction gross value added. This provides forecast growth from $1.7 billion to approximately $1.5 billion in 2035 following a stable growth path. The confidence interval is relatively wide, resulting in value added growing to $3 billion in the high scenario and declining to $0.7 billion in the low scenario.

Panel 4 illustrates the freight demand forecast in tkm. The historical data from the Survey shows that freight demand for the manufacturing commodity group has decreased over the past decade. The medium scenario forecast follows a stable trend from 99 million tkm in 2015-16 to 102 million tkm in 2034-35. The scenario analysis forecast a high scenario of 154 million tkm and a low scenario of 71 million tkm by 2034-35.

D.4 Seasonality – manufacturing

Figure D.3 shows a decomposition of the industrial products container export series (used as a proxy for construction inputs and expressed in tonnes) generated by seasonal decomposition of time series by Loess (Cleveland, McRae, & Terpenning, 1990). The figure shows that there is a strong re-occurring seasonal pattern, a plateauing upward trend and a relatively regular random component.

FIGURE D.3 INDUSTRIAL PRODUCTS CONTAINER EXPORTS DECOMPOSITION



SOURCE: ACIL ALLEN ANALYSIS OF PORT OF MELBOURNE DATA

E FORESTRY

The forestry commodity group include the following commodities:

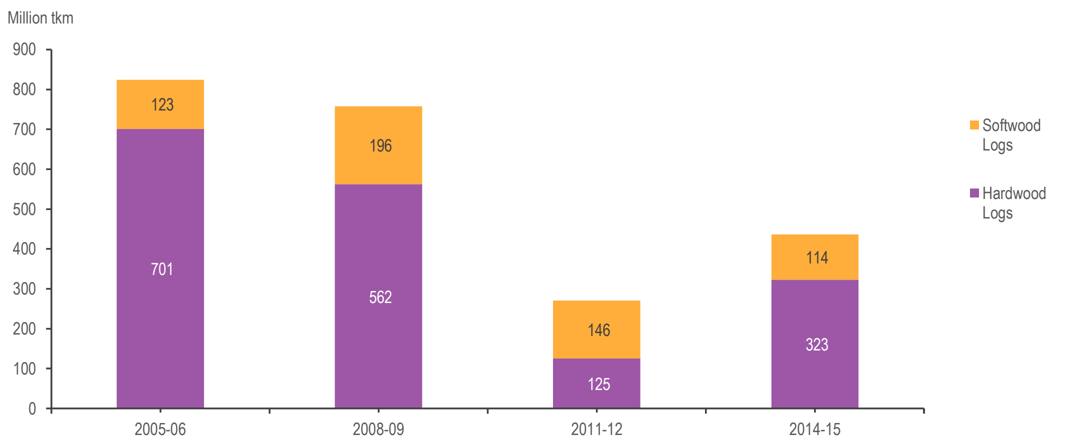
— Hardwood Logs
— Softwood Logs

The following sections discuss key characteristics of the freight demand generated by forestry. No interviews were conducted for this commodity group.

E.1 Freight by commodity – forestry

The key commodities in the forestry commodity group in 2014-15 are soft and hard logs. The freight demand in tkm for the key commodities accounted for 100 per cent of the freight share in 2014-15. Freight demand for the key commodities is illustrated in Figure E.1.

FIGURE E.1 CONSTRUCTION INPUTS FREIGHT VOLUME OVER TIME FOR THE KEY COMMODITIES



Note: The key commodities refer to the commodities with a freight share of ten per cent and above in 2014-15.
SOURCE: ACIL ALLEN ANALYSIS OF TASMANIAN FREIGHT SURVEY

The chart above shows that freight demand associated with both soft and hard wood logs has decreased substantially.

F

MINING ORES

The mining ores commodity group include the following commodities:

— Other Metallic Ores
— Iron Ores and Concentrates

The following sections discuss key characteristics of the freight demand generated by mining ores. No interviews were conducted for this commodity group.

F.1 Freight by commodity – mining ores

The key commodities in the mining ores commodity group in 2014-15 are other metallic ores and iron ores and concentrates. The freight demand in tkm for the key commodities accounted for 100 per cent of the freight share in 2014-15. Freight demand for the key commodities is illustrated in Figure F.1.

FIGURE F.1 MINING ORES FREIGHT VOLUME OVER TIME FOR THE KEY COMMODITIES

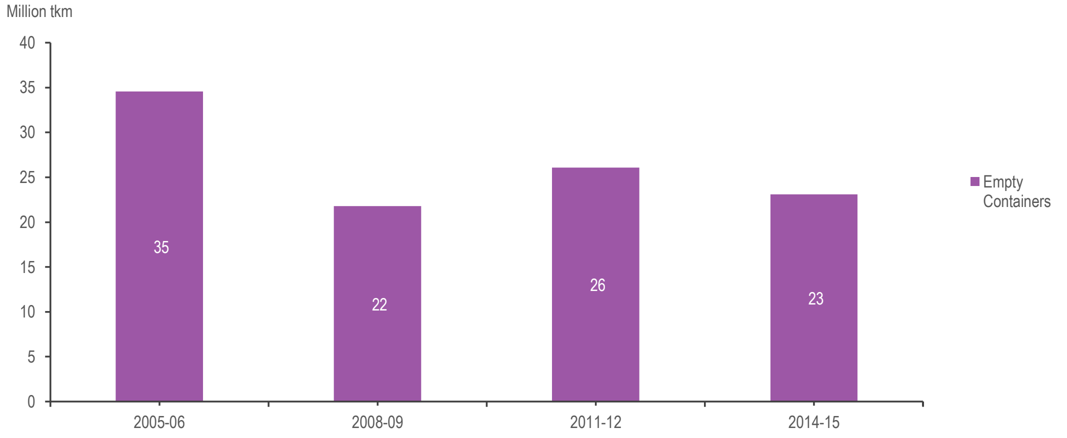
Note: The key commodities refer to the commodities with a freight share of ten per cent and above in 2014-15.
SOURCE: ACIL ALLEN ANALYSIS OF TASMANIAN FREIGHT SURVEY

The Figure above shows that the freight demand for the mining ores commodity group has increased over the period mainly due to growth in iron ores and concentrates.

G EMPTY CONTAINERS

The freight demand for empty containers is illustrated in Figure G.1.

FIGURE G.1 EMPTY CONTAINERS FREIGHT VOLUME OVER TIME



SOURCE: ACIL ALLEN ANALYSIS OF TASMANIAN FREIGHT SURVEY

Since empty containers are always an input or secondary output of a supply chain, a growth rate was not estimated.

H BASIC METAL PRODUCTS

The basic metal products commodity group includes the following commodities:

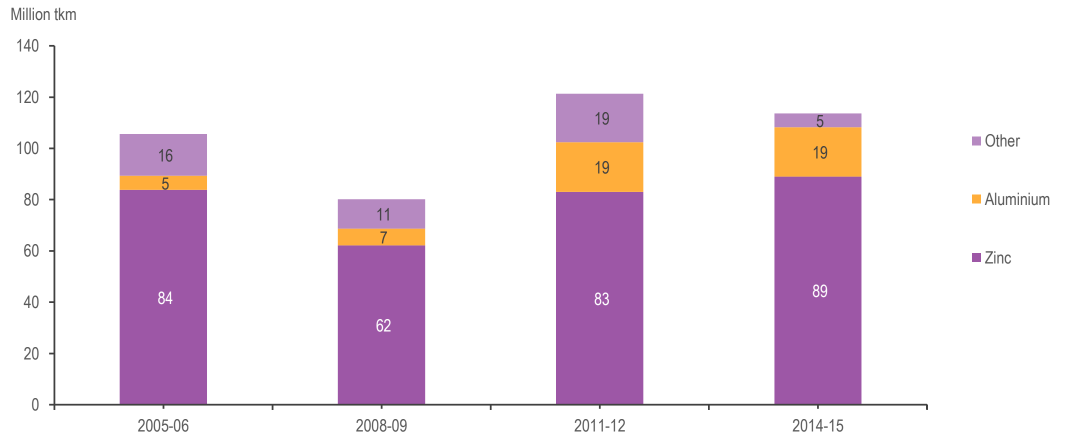
— Zinc
— Basic Iron and Steel
— Aluminium

The following sections discuss key characteristics of the freight demand generated by basic metal products and present summaries of interviews conducted with key producers.

H.1 Freight by commodity– basic metal products

The key commodities in the basic metal products commodity group in 2014-15 are zinc and aluminium. The freight demand in tkm for the key commodities accounted for 95 per cent of the freight share in 2014-15. Freight demand for the key commodities is illustrated in Figure H.1.

FIGURE H.1 BASIC METAL PRODUCTS FREIGHT VOLUME OVER TIME FOR THE KEY COMMODITIES



Note: The key commodities refer to the commodities with a freight share of ten per cent and above in 2014-15.

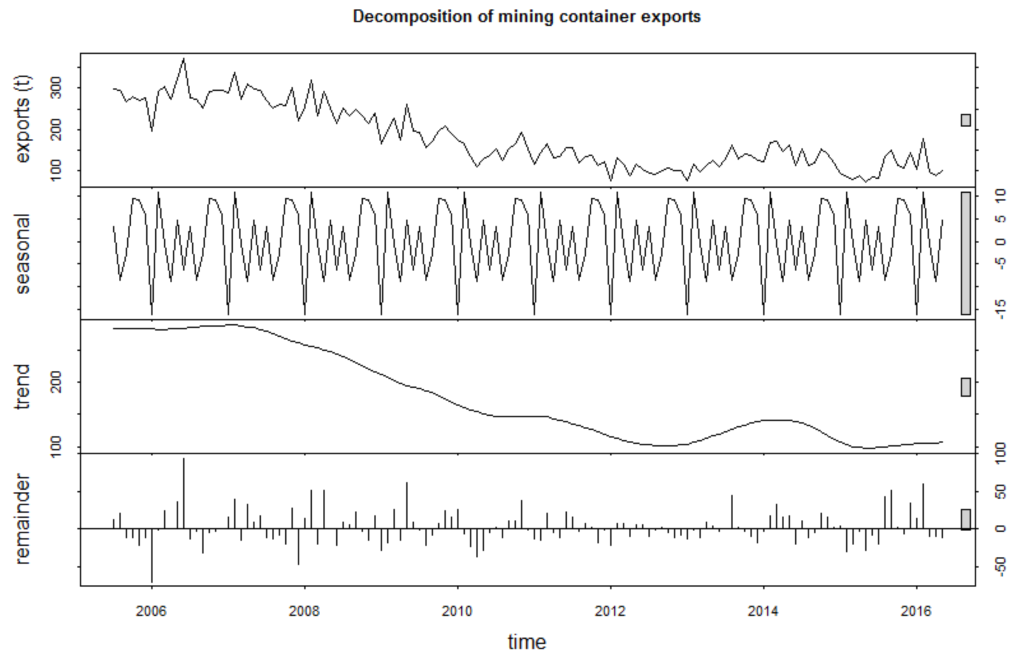
SOURCE: ACIL ALLEN ANALYSIS OF TASMANIAN FREIGHT SURVEY

The Figure above shows that the trend for the commodity group has fluctuated over the study period with an overall increasing trend. This increase is mainly because of an increase in zinc and aluminium freight demand.

H.2 Seasonality – basic metal products

Figure H.2 shows a decomposition of the mining container export series (as a proxy and expressed in tonnes) generated by seasonal decomposition of time series by Loess (Cleveland, McRae, & Terpenning, 1990). The figure shows that there is a very weak re-occurring seasonal pattern, a decreasing trend and a relatively stable random component.

FIGURE H.2 MINING CONTAINER EXPORTS DECOMPOSITION



SOURCE: ACIL ALLEN ANALYSIS OF PORT OF MELBOURNE DATA

PROCESSED FORESTRY PRODUCTS (WOOD PRODUCTS)

I

The wood products commodity group includes the following commodities:

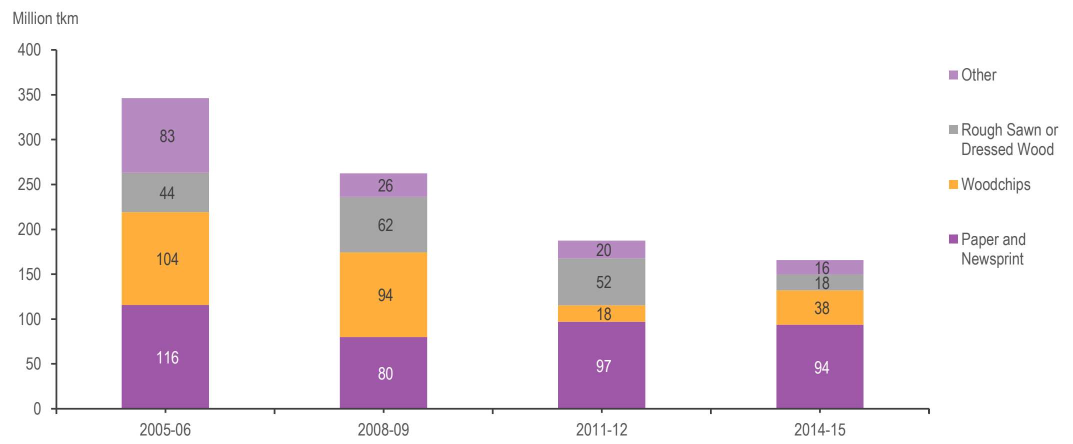
— Woodchips
— Paper and Newsprint
— Rough sawn or dressed wood
— Boards, panels and veneer sheets
— Pulp
— Other wood products

The following sections discuss key characteristics of the freight demand generated by wood products and present summaries of interviews conducted with key producers.

I.1 Freight by commodity – wood products

The key commodities in the wood products commodity group are woodchips, paper and newsprint and rough sawn or dressed wood. The freight demand for these key commodities accounted for 89 per cent of the freight share in 2014-15. Freight demand for the key commodities is illustrated in Figure I.1.

FIGURE I.1 WOOD PRODUCTS FREIGHT VOLUME OVER TIME FOR THE KEY COMMODITIES



Note: The key commodities refer to the commodities with a freight share of ten per cent and above in 2014-15.

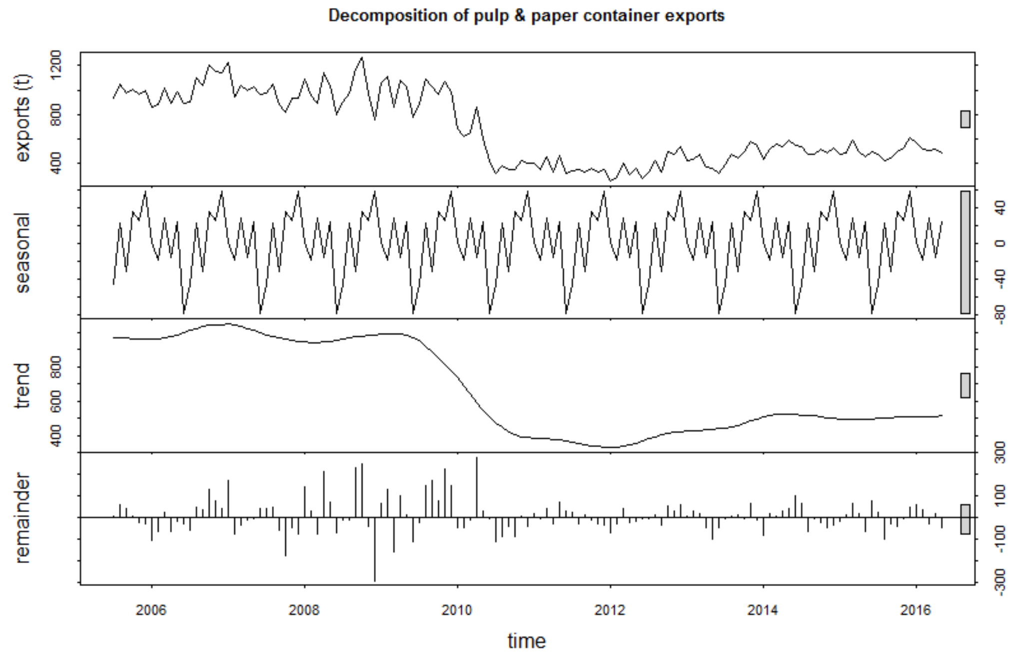
SOURCE: ACIL ALLEN ANALYSIS OF TASMANIAN FREIGHT SURVEY

The Figure above shows that wood product freight demand has decreased. This is mainly a result of a decrease in woodchips and rough sawn or dressed wood production.

I.2 Seasonality – wood products

Figure I.2 shows a decomposition of the pulp and paper container export series (as a proxy and expressed in tonnes) generated by seasonal decomposition of time series by Loess (Cleveland, McRae, & Terpenning, 1990). The figure shows that there is a very weak re-occurring seasonal pattern, a decreasing trend and a random component whose influence has decreased since early-2010.

FIGURE I.2 PULP AND PAPER CONTAINER EXPORTS DECOMPOSITION



SOURCE: ACIL ALLEN ANALYSIS OF PORT OF MELBOURNE DATA

J CEMENT

The cement products commodity group includes the following commodities:

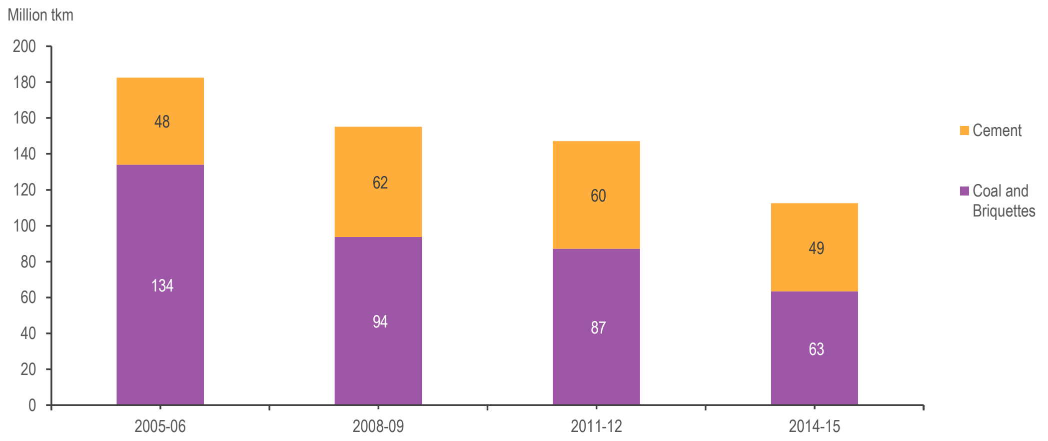
- Cement
- Coal and Briquettes

The following sections discuss key characteristics of the freight demand generated by cement and present summaries of interviews conducted with key producers.

J.1 Freight by commodity – cement

The key commodities in the cement commodity group contain cement and coal briquettes. The freight demand for these key commodities accounted for 100 per cent of the freight share in 2014-15. The share of the key commodities have remained relatively stable over time. Freight demand for the key commodities are illustrated in Figure J.1.

FIGURE J.1 CEMENT FREIGHT VOLUME OVER TIME FOR THE KEY COMMODITIES



Note: The key commodities refer to the commodities with a freight share of ten per cent and above in 2014-15.

SOURCE: ACIL ALLEN ANALYSIS OF TASMANIAN FREIGHT SURVEY

The Figure above shows that this commodity group has been decreasing over the period with both cement and coal and briquettes contributing to this decrease.

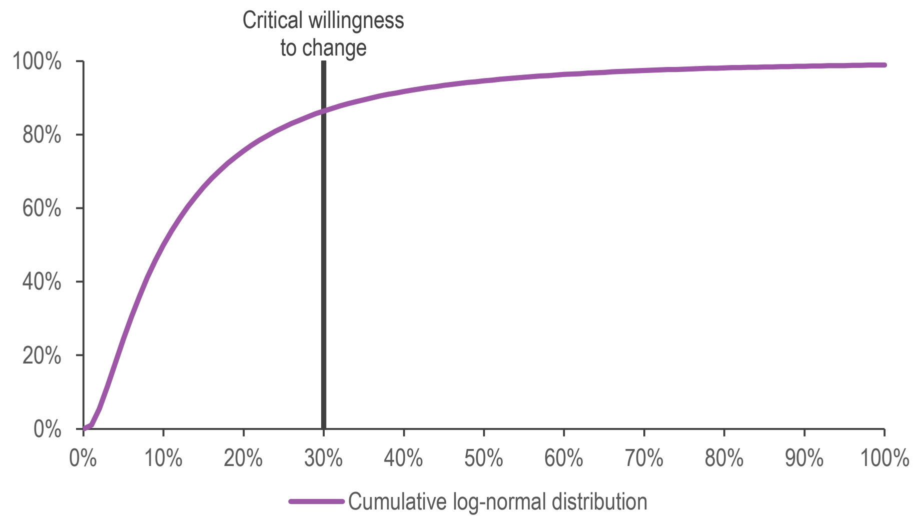
K CRITICAL WILLINGNESS TO CHANGE

ACIL Allen used a statistical approach to determine the critical willingness to change. Transport mode choice is typically modelled using a logit model that is the standard approach for simulating binary choices. A logit model assumes a functional form that follows a logistic distribution under which the probability of choice change diminishes after a particular critical value of its driver. For example, the probability of switching from road to rail diminishes after the price has increased by a certain amount.

Figure K.1 illustrates a standard (mean of 0 and standard deviation of 1) logistic distribution. The purple line represents the cumulative probability of change in choice (y axis) in response to the change in its driver (x axis). For example, an increase in the driver from 10 to 20 per cent leads to a cumulative choice change probability of 25 per cent whereas the increase from 30 to 40 per cent in the driver results in only 0.05 per cent increase in the cumulative change in choice. The impact of the driver on the choice probability is indicated by the slope of the purple line. After 30 per cent the probability of choice change diminishes in response to the driver.

Based on these findings, ACIL Allen has selected 30 per cent as the critical willingness to change threshold for this study.

FIGURE K.1 ILLUSTRATION OF CRITICAL WILLINGNESS TO CHANGE



SOURCE: ACIL ALLEN ANALYSIS

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B

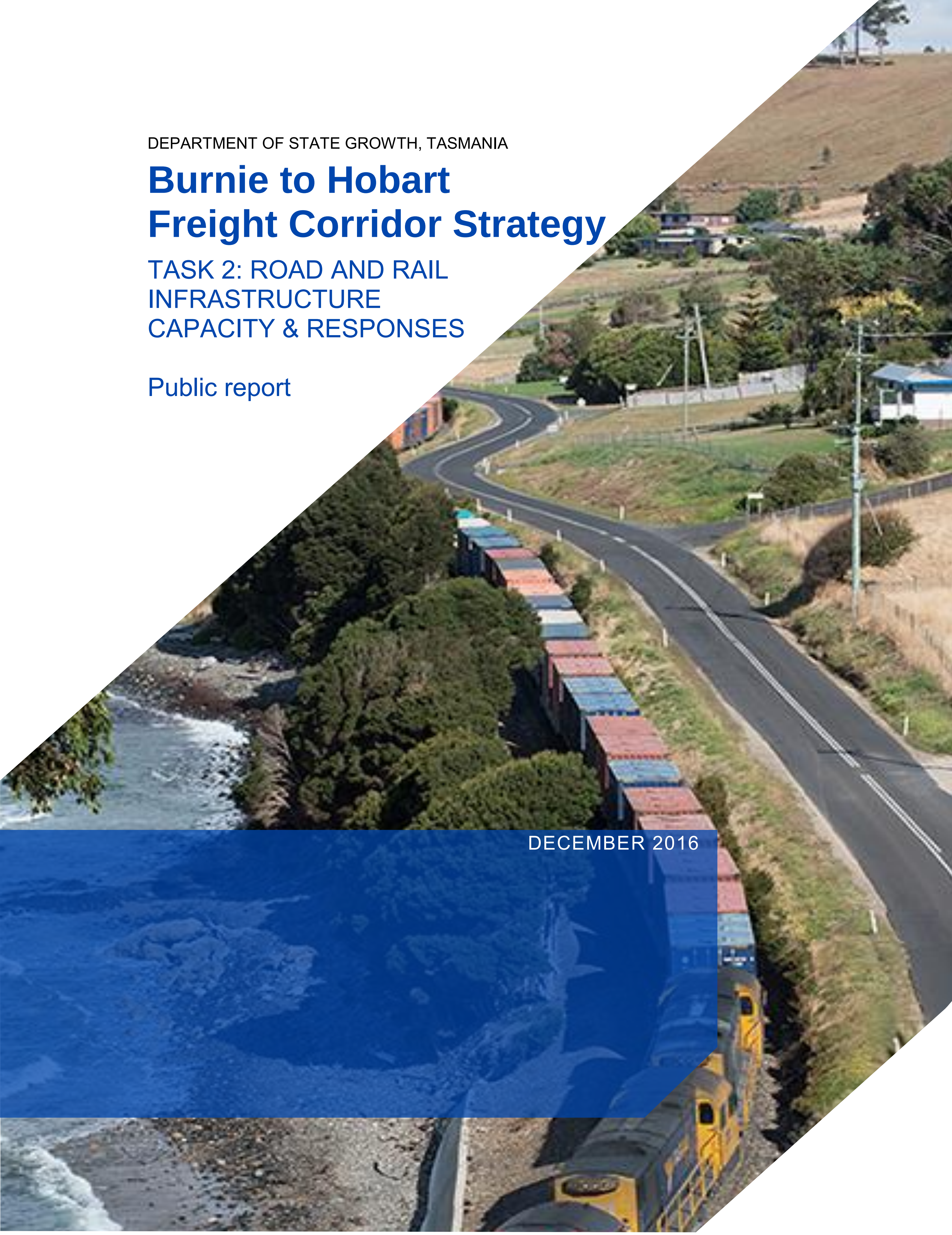
TASK 2 REPORT: CAPACITY AND RESPONSES

DEPARTMENT OF STATE GROWTH, TASMANIA

Burnie to Hobart Freight Corridor Strategy

TASK 2: ROAD AND RAIL INFRASTRUCTURE CAPACITY & RESPONSES

Public report



DECEMBER 2016

WSP | PARSONS BRINCKERHOFF

Burnie to Hobart Freight Corridor Strategy

TASK 2: ROAD AND RAIL INFRASTRUCTURE CAPACITY & RESPONSES

Department of State Growth, Tasmania

REV	DATE	DETAILS
0	Initial Draft	For ACIL Allen review and comment
1	Draft	For State Growth comment
2	Revised Draft	Restructure in response to State Growth request
3	Revised Draft	Take in feedback and revise tonnage inputs
4	Final	Take in updates

AUTHOR, REVIEWER AND APPROVER DETAILS

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Filename: Burnie-Hobart Infrastructure Responses Rev4b

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Appendix A Characteristics of the rail network
Appendix B Characteristics of the road network

Note: Commercial-in-confidence information, including information relating to company volumes, market share and operations, has been removed from this report.

EXECUTIVE SUMMARY

This report examines the capability of the Burnie to Hobart road and rail corridors to accommodate future forecast traffic volumes.

The road network carries four times the amount of the freight task on the Burnie to Hobart corridor compared to rail, and based on the forecasts prepared by ACIL Allen, this proportion is expected to increase into the future. Nevertheless, freight traffic represents a very small proportion of total vehicle trips in the corridor and upgrade investment based on safety and congestion projects is generally driven by passenger vehicle activity, not freight vehicles.

The road network is generally considered to be efficient, with few capacity constraints. There is little or no congestion on the network, except on some of the urban portions of the corridor during peak commuter periods. This facilitates the provision of reliable and efficient freight services, with the network providing excellent access to ports and major freight precincts for trucks.

The road network has adequate capacity to accommodate the existing freight task, as well as the capability to easily accommodate the highest forecast future freight task, without the need to invest in capacity related upgrades. Investment in upgrading bridge structures, and widening of pavements, will be required in order to accommodate higher productivity freight vehicles over some portions of the network. The road freight industry's pursuit of increased efficiency over time will continue to place pressure on network design standards, and to a lesser degree maintenance costs, as a result of demands for the operation of heavier and longer vehicles.

The rail network has also been assessed as having sufficient capacity to accommodate the highest predicted future freight forecast task. Investment in rail needs to be largely focused on improving the reliability and safety of the network in the short term, and reducing track maintenance costs to a level that will be supportable from operating revenues as early as possible. TasRail has indicated that a further once off capital injection of $120M would be sufficient to reach this position. This investment should be focused on the primary customer expectation of rail becoming more reliable rather than pursuing transit time reductions.

The total maintenance cost for the State Road network is $63M per annum, giving an annual average road maintenance cost of $16,700 per kilometre compared to a future average annual rail maintenance cost of $21,370 per kilometre, suggesting that the cost of maintaining the road network has a lower unit cost than rail, especially in the context that road carries a greater proportion of the freight task. Road maintenance costs are also relatively inelastic to changes in freight volumes and there is no requirement for capital expenditure in order to sustain current maintenance budgets. However this does not adequately represent the total costs and benefits of the rail network and cannot be used as the basis of a decision on the future allocation of funds. A full economic assessment is required in order to understand the true value of each of the transport modes and the contribution they make to the Tasmanian economy.

The financial performance of the TasRail business is highly dependent on the revenue from a small number of freight customers. Major business decisions by any one of those customers have the potential to impact rail freight volumes along the corridor. In the case of Boyer and Fingal, loss of the only traffics carried on those corridors could trigger the closure of those branch lines. Therefore investment in those lines needs to be considered in the context of the business risk. Any significant reduction in mainline volumes will challenge the viability of rail as a whole due to a reduced revenue to cover the cost of maintaining the mainline.

An assessment of the impact on the road network from transferring all or part of the rail task to road has identified:

- There would be no immediate need to upgrade the main Burnie to Hobart road corridor. Upgrades including a new South Perth link between the Midland Highway and Illawarra Main Road, upgrades to the Brooker Highway in Hobart and a new Bridgewater Bridge, will deliver improved freight outcomes.

- The transfer of the Fingal to Railton coal traffic to road would trigger the need to consider bringing forward bridge strengthening road widening projects on Esk Main Road. There is an identified package of works for this road, based largely on incremental safety improvements, which will also deliver freight benefits. It is also important to note that coal has already been roaded over this corridor for the Boyer Mill and that the road has carried a significant forestry task, so the main change would be an increase in truck volumes. Significant upgrade of Railton Road may also be required.
- The transfer of Boyer paper traffic to road would trigger the need to consider bridge strengthening and road widening projects on Boyer Road. However, there is an alternative route available via Lyell Highway, albeit that it has a longer route distance and requires trucks to cross the existing Bridgewater Bridge which makes this option unattractive.
- Bell Bay rail freight traffic volumes are quite low and the parallel East Tamar Highway could generally accommodate these volumes. Although additional truck volumes would represent a very small percentage of total volumes through Launceston, community perception may see this as undesirable within the town centre.
- The transfer of cement traffic from Railton would introduce significant volumes onto the Railton to Devonport corridor. The transfer of tonnage to road would result in substantial volumes of new traffic movement and would require a major upgrade of road infrastructure and potentially some bridge upgrades.

1 INTRODUCTION

1.1 Scope of this report

ACIL Allen has been engaged by the Department of State Growth to undertake freight demand and contestability analysis, and to assess infrastructure and future productivity opportunities, on the Burnie to Hobart Freight Corridor. The study is an input to a broader Burnie to Hobart Freight Corridor Strategy. WSP | Parsons Brinckerhoff has been subcontracted by ACIL Allen to undertake a corridor capacity assessment to determine the ability of existing road and rail infrastructure to accommodate the forecast demand.

This report considers:

1. How future freight demand may impact the design and performance of the corridor and its ability to sustain an efficient logistics outcome for Tasmania.
2. Infrastructure responses required to support the future freight task for road and rail.
3. The road capacity implications of any transfer of freight from road to rail.

1.2 Context

The Burnie to Hobart corridor is Tasmania's most significant freight corridor which connects major ports, processing centres, industrial land uses, and population centres. The corridor contains both road and rail infrastructure with the two modes competing to move the freight task. Both are part of the Australian Government National Network. Rail does not provide passenger transport options therefore all movements of people are confined to the road network.

The road corridor is managed by the Department of State Growth and extends from Burnie Port to Hobart, including the Bass Highway, Midland Highway, Illawarra Main Road, and Brooker Highway. The feeder road network includes the East Tamar Highway to Bell Bay, Fingal Road between Conara and Fingal, Boyer Road, and the Bass Highway west of Burnie.

The rail network is managed and operated by TasRail and consists of the main line from Burnie Port to Brighton Transport Hub, and feeder branch lines to Bell Bay, Fingal and Boyer.

This means that Tasmania is supporting parallel road and rail networks which require Australian and Tasmanian Government funding support for capital works and maintenance.

Infrastructure Australia (IA) has previously sought clarification of the Tasmanian Government's objectives for its parallel road and rail networks, particularly between Burnie and Hobart, and has noted the need to develop a strategy along this corridor that *'considers the roles of rail and road in respect of freight using an integrated approach to identify the best solutions'*.

1.3 Freight scenarios considered

The assessment of infrastructure requirements responds to a series of future freight demand scenarios developed for the corridor by ACIL Allen. There are three primary future scenarios:

- Low
- Medium
- High

Details of the forecast freight volumes under each of these scenarios is presented in Table 1.1.

Table 1.1 Forecast road task (million tonnes)

	EXISTING (2014-15)	FUTURE FORECAST (2034-35)		
		Low	Medium	High
Smithton<>Burnie	1.55	1.19	2.14	2.80
Smithton<>Burnie (before Burnie)	1.99	1.53	2.81	3.70
Burnie<>Devonport	2.32	1.86	3.17	4.51
Devonport<>Launceston	2.98	2.48	4.07	5.53
Devonport<>Railton	0.28	0.21	0.35	0.42
Illawarra Main Road	1.63	1.36	2.25	3.02
Launceston<>Bell Bay (south of Batman Bridge)	0.99	0.69	1.17	1.34
Launceston<>Bell Bay (north of Batman Bridge)	1.75	1.29	2.06	2.55
Launceston<>Conara	2.20	1.75	2.97	3.88
Conara<>Fingal	0.43	0.27	0.52	0.57
Conara<>Brighton Hub (Conara)	1.92	1.53	2.59	3.36
Conara<>Brighton Hub	1.82	1.45	2.44	3.17
Brighton<>Boyer	0.55	0.34	0.59	0.60
Bridgewater Bridge	2.14	1.74	3.03	3.82
Brooker Highway (South of Bridgewater Bridge)	2.00	1.70	2.91	3.73
Brooker Highway (North of Bowen Bridge)	1.85	1.56	2.70	3.45

Source: ACIL Allen

Table 1.2 Forecast rail task (million tonnes)

	EXISTING (2014-15)	FUTURE FORECAST (2034-35)		
		Low	Medium	High
Burnie<>Devonport	0.85	0.68	1.00	1.10
Devonport<>Railton	2.15	1.72	2.30	2.66
Railton<>Launceston	1.01	0.80	1.16	1.29
Launceston<>Bell Bay	0.09	0.04	0.09	0.09
Launceston<>Conara	0.97	0.74	1.08	1.17
Conara<>Fingal	0.16	0.13	0.16	0.19
Conara<>Brighton Hub	0.81	0.61	0.92	0.98
Brighton<>Boyer	0.36	0.18	0.36	0.36

Source: ACIL Allen

This report examines the demand that these freight tasks are expected to place on the road and rail infrastructure within the corridor and considers the potential impacts related to capacity and future investment requirements for each mode. It also considers the future roles of road and rail to identify how changes in these roles may affect the future operation and planning of the integrated freight corridor.

1.4 Tasmanian Integrated Freight Strategy

The Tasmanian Integrated Freight Strategy provides an excellent reference point for identifying the potential role of the Burnie to Hobart freight corridor. The Strategy sets the vision for a freight network that:

- Provides services that are commercially sustainable, and which deliver competitive and sustainable prices to users over the long-term.
- Reflects the current and future needs of customers, and the broader community.
- Maximises supply chain efficiency and quality, with a continued focus on productivity improvement.
- Supports safe, reliable and secure freight service provision.
- Ensures freight service provision operates within an efficient and certain regulatory environment.

The Strategy notes that Government has prioritised the development of a Burnie to Hobart freight corridor strategy to guide future planning and investment by:

- Identifying a single, integrated package of investment priorities for road and rail based on freight demand, corridor and system outcomes.
- Prioritising major freight-related investment in support of general freight growth.
- Confirming required road and rail infrastructure standards and service levels.
- Planning for an appropriate level of service, including in support of major step changes in heavy vehicle productivity.
- Focusing rail investment to support a safe, reliable and sustainable rail network.
- Considering broader and alternative mechanisms to support freight users to meet their supply chain needs.

The report sets a series of desired outcomes and priorities for the corridor as set out in Table 1.3.

Table 1.3 Burnie-Hobart corridor investment and operational priorities

Freight category	Outcomes	Investment principles
Premier freight corridor Burnie to Hobart freight corridor	Priority for investment to support general freight growth and major step changes in vehicle productivity. Highest standard road freight productivity and efficiency, including: • high level of service in terms of vehicle operating costs • pre-approved higher productivity vehicle routes, supporting more productive freight movements • pre-approved access for specified oversize/over-mass vehicles. Alternative options to meet freight needs examined, across modes. Improved safety and reliability on the rail network.	Road Priority network for investment. Projects that address major freight infrastructure deficiencies. Infrastructure standards that cater for major step changes in heavy vehicle productivity. Upgrades to provide as of right access for specified classes of higher productivity vehicles; retain access controls for others. Delivery of capital works programmes that incorporate design standards for higher productivity and oversize/ overmass vehicles. Rail Target remaining safety and reliability deficiencies. Consolidate investment around current funding. Demand-driven investment, directly assessed against road capacity.

Source: Tasmanian Integrated Freight Strategy

2 RAIL NETWORK

2.1 Ownership of the rail network

TasRail is the current operator of the Tasmanian railway network and it is wholly owned by the Tasmanian Government.

Ownership of the railway has changed hands many times as documented below:

- 1890 to 1978 – Tasmanian Government Railways, a state government owned and operated department.
- 1978 to 1997 – AN TasRail, a subsidiary of the Federal Government's Australian National.
- 1997 to 2004 – TasRail was owned by Australian Transport Network, a partnership of New Zealand-based Tranz Rail and United States railroad Wisconsin Central.
- 2004 to 2009 – TasRail was acquired by Pacific National, a partnership between Patrick Corporation and Toll Holdings.
- 2007 – ownership of the below rail infrastructure acquired by state government.
- 2009 – ownership of the above rail business was acquired by state government to create a vertically integrated railway network on government hands.

This diverse ownership over an extended time period has meant that priorities for the financial performance of the network have not been consistent. The net result has been a reluctance to invest in the business and a consequential decline in the quality of the assets. At the time that the Tasmanian Government assumed control of the entity in 2009 there was an urgent need to invest in new rollingstock and to upgrade the track to avoid derailments and restore service reliability for customers.

TasRail only operates freight services, passenger trains having ceased in July 1978 with the change of ownership.

2.2 Government objectives for TasRail

The Tasmanian Government set the objectives for rail in the report *“Tasmanian Rail Network: Objectives and Priorities for Action 2010-11 to 2013-14”*, as:

- The safe operation and use of the rail network, including interaction with the broader community.
- A greater proportion of Tasmania’s growing freight task is transported by rail.
- A viable rail network for the long term.
- A cost effective and efficient transport system.

TasRail's Corporate Plan[1] includes the following Mission Statements:

- Our customers will consider us a strategic partner in their supply chains.
- TasRail will provide safe, reliable, efficient and competitively priced services to all major freight ports delivering full State connectivity between major industrial areas and international markets.
- TasRail will become the Freight Transport supplier of choice for Intermodal and Bulk Freight transport markets in Tasmania.
- Our people will be proud to contribute to excellence in customer service.

2.3 Rail network description

Appendix A contains a brief description of the characteristics of the rail network.

2.4 TasRail's core business

The TasRail business services two main categories of customers in the Burnie to Hobart corridor:

- Containers – these move in each direction between the Brighton Transport Hub in the south and the ports of Bell Bay, Devonport, and Burnie in the north of the state:
  - The major freight forwarder is Toll which is co-located at the Brighton Transport Hub.
  - Paper products are carried in containers between the Norske Skog mill at Boyer and the Port of Burnie.
  - General freight to/from Launceston.
- Bulk commodities:
  - Coal from the Fingal mine to Railton as an input to cement manufacture, and from Fingal to Norske Skog at Boyer
  - Cement from Railton to Devonport for Cement Australia.
  - Logs from Brighton Transport Hub to Bell Bay.

Further details of the nature of these commodities, volumes and forecast future demand can be found in the ACIL Allen report.

TasRail has a small number of large customers that make up the majority of its tonnage demand, and hence its revenue. The reliance on a few large producers presents an ongoing financial risk for TasRail, noting that these customers and industries represent a significant section of Tasmania's key economic activity.

2.5 Freight train operations

An examination of TasRail's 2016 train program has identified that TasRail operates the following services:

- 2 trains per day in each direction between Brighton/Boyer to Burnie (containers & logs).
- 1 train per day in each direction between Brighton/Boyer to Bell Bay (containers & logs).
- 1 train per day (4 days per week) in each direction between Fingal and Railton (coal).
- 6 trains per day in each direction between Railton and Devonport (cement) as required.
- 1 train per day between Burnie to Rosebery (noting that this route is not within the Burnie to Hobart corridor)

[1] TasRail Corporate Plan, 2016/17 – 2019/20

Overlaying these train movements to a schematic map of the rail network helps to identify the level of activity over each segment of the corridor as shown in Figure 2.1.

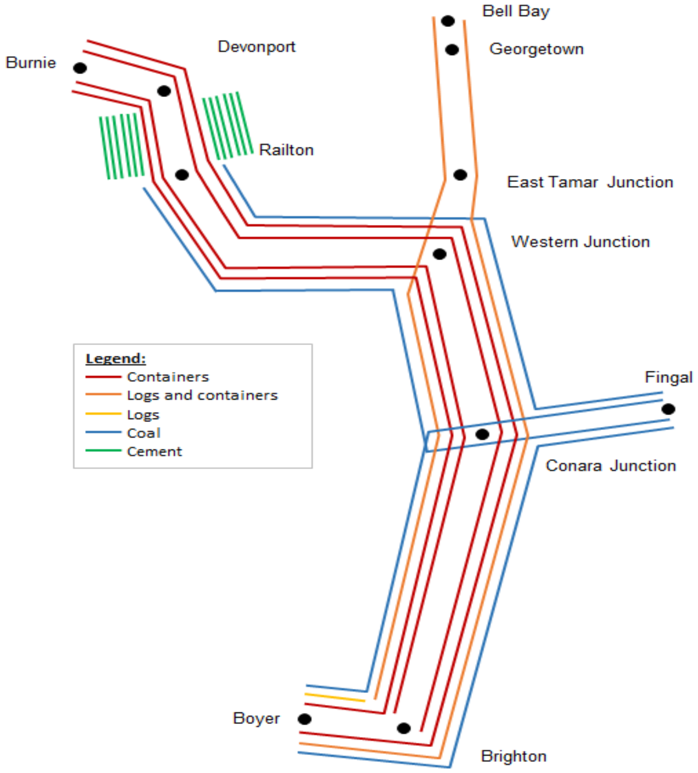

Figure 2.1 Schematic representation of the current train operations plan

The key link in the network is the Brighton to Burnie line, connecting Hobart to the northern port of Burnie. There are branch lines that join the north-south line from Fingal (located in the east of Conara Junction) which carries coal products onto the corridor, Boyer (located in the Derwent Valley) servicing the Norske Skog paper mill, and the Bell Bay and Launceston lines (located north of Western Junction) used for timber and containers. The Melba Line connects mines on the West Coast to Burnie Port but this is not included in the scope of this study and therefore is not shown on the schematic.

2.5.1 Past capital investment in the network

When the Tasmanian Government assumed responsibility for operation of the rail network it faced a significant maintenance and renewal backlog. It was understood that there would be a need to undertake a major upgrade of track and structures in order to move the railway towards a more sustainable financial outlook. A priority work program was developed by TasRail which focussed on the reduction of derailment risks, removing condition related speed restrictions, and addressing life expired assets including rail, sleepers and bridges. There was also an urgent need to renew locomotive and wagon fleets and upgrade operations systems, such as train control and communications, to access efficiency gains and improve service delivery.

In 2008-9 the Australian Government committed $205.3 million for the state's rail system under the National Building Economic Stimulus (NB) program as follows:

- $78 million under the Rail Rescue Package, and
- $127.3 million in 2007 through election commitments to the Tasmanian Rail Network:
  - Rail capacity improvements at Rhyndaston $24 million.
  - Upgrade of the Burnie to Western Junction line $28.9 million.
  - Upgrade for the Hobart to Western Junction line $20.3 million.
  - Main north-south line rail capacity improvements $31.6 million:
  - Upgrade of the Fingal line $5.7 million.
  - Upgrade of the Boyer line $1.1 million.
  - Upgrade of the Melba Flats to Burnie Line $15.7 million.

In August 2012, the Tasmanian Government submitted a multi-modal transport funding package to the Australian Government and Infrastructure Australia, as part of the Nation Building 2 program. TasRail provided a comprehensive submission as part of this package, based on a five-year program of $240 million. An additional $85 million was identified as part of the full program required to lift safety and productivity across the rail network. This was to be sought upon completion of the five year $240 million program.

The program focused on concrete re-sleepering (including formation rehabilitation), together with rail and bridge replacements -

- Relaying approximately 290 track kilometres of life expired rail track.
- Selective insertion of steel sleepers (primarily on the Fingal, Bell Bay, Derwent Valley and Melba lines).
- Completing 73 per cent of the concrete re-sleepering program between Burnie Port and the Brighton Transport Hub.
- Upgrade works on the Melba Line

The focus was to bring the network to a condition to substantially reduce the risk of derailment, improve network reliability, and to reduce ongoing recurrent maintenance costs.

The $240 million program was reflected in the 2014 Commonwealth budget under the newly-named Infrastructure Investment Program (IIP). However, during the 2015 State and Commonwealth budget processes, only $119.6 million of the full $240 million was made available over the first five year period of the IIP. The reduced funding led to TasRail discontinuing the initial concrete sleeper-based program, to focus on an incremental and traditional steel sleeper and rail replacement program of works.

Under the Infrastructure Improvement Program (IIP), the Tasmanian and Australian Governments co-contributed a first tranche of funding totalling $119.6 million over four years to 30 June 2019 for the Tasmanian Freight Rail Revitalisation program that provides for significant rail network renewals such as.

- Western Line – Continue the resleeper and rerail works packages.
- Southern Line – Continue the resleeper and rerail works packages.
- Bell Bay Line – Install 2 new culverts.
- Sleeper, trackwork, drainage and formation package completion on the Western, Southern, Bell Bay, Fingal, Derwent Valley Lines.
- Structures (bridges and culverts) package completion on the Western, Southern, Bell Bay, Fingal, and Derwent Valley Lines.
- Melba Line –Rail replacement and re-welding joint works package

Both the Tasmanian and the Australian Governments have provided an in-principle commitment to the second tranche of IIP funding of $120M for the Tasmanian Freight Rail Revitalisation program beyond 2019 but this funding is not as yet forthcoming.

TasRail considers that the second tranche of funding under the program is necessary for the ongoing development and renewal of core infrastructure and consequently, the achievement of a sustainable maintenance regime. The outstanding works are focussed on improving safety and network reliability in order to provide an acceptable level of customer service. These works would include completion of:

- Resleepering and rerailling.
- Control of coastal erosion.
- Renewal of bridge transitions.
- Level crossing upgrades.

In addition to the capital commitments to TasRail, the Tasmanian Government also provides an annual Below Rail Infrastructure Contribution (BRIC) to help ensure that the track assets are maintained to an appropriate standard and to avoid the problems of the past where the infrastructure deteriorated to the point that it was no longer able to support safe or reliable freight operations.

The rate of derailments has reduced by 90 percent since TasRail was established in 2009 as shown in Figure 2.1. Upgraded infrastructure has made a significant contribution to this outcome, together with an improved internal engineering capability and condition monitoring regime. TasRail's condition monitoring regime will take another significant step forward with the deployment of a real-time track geometry recording device in the first half of 2017. Currently, TasRail undertakes track geometry measurements every three months. The new equipment will effectively support daily measurements over much of the network.

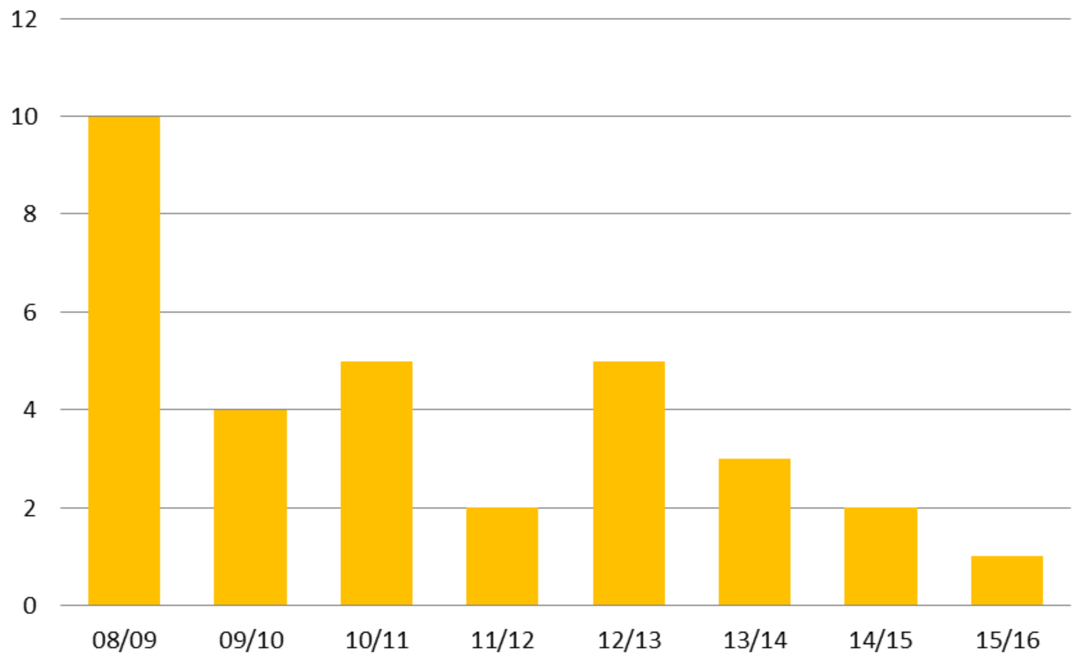

Figure 2.2 Mainline derailments from FY2009 onwards

2.6 Ongoing funding requirements

The challenge presented by the deteriorated condition of the rail network infrastructure at the time the railway was acquired by the Tasmanian Government, and more generally the unique operational challenges of the network (short haul distances, tight curves, steep gradients), means that there will need to be an going requirement for significant financial support for the railway operation.

Tasmania's below rail infrastructure is expected to be funded by surpluses from above rail operations, plus an annual grant from the Tasmanian Government. Payments directed to TasRail since its inception, and forecast funding requirements until 2018-19 are provided in Table 2.1.

Table 2.1 Capital allocations made to TasRail

Source	Purpose	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	SUB TOTAL	2016/17	2017/18	2018/19	SUB TOTAL	TOTAL
		$ million	$ million	$ million	$ million	$ million	$ million	$ million	million	$ million	$ million	$ million	$ million	**$ million**
TAS Govt	Start-up funding	47.49							47.49					47.49
	BRIC		14.59	18.78	16.3	16.57	16.83	11.99	95.06	11.97	8.1	8.1	28.17	123.23
	Capital	4.72	19.01	33.49	20	*27.3	20	20	*144.52					144.52
	IIP/NPA							29.9	29.9	29.9			29.9	59.8
														375.04
AUST Govt	Nation Building	^88.89	19.05	21.26	37.41	34.01	4.68		^205.3					205.3
	Bell Bay					0.6	4.6		5.2					5.2
	TasRailer Project						0.5	0.5	1					1
	IIP/NPA							16.5	16.5	15	14.3	14	43.3	59.8
														271.3
	TOTAL	141.1	52.65	73.53	73.71	78.48	46.61	78.89	**544.97**	56.87	22.4	22.1	**101.37**	**646.34**

LEGEND:

Green	*Funding has been received or is secured*
Orange	*Funding was announced in the 2014/15 Tasmanian State Budget and the 2014/15 Australian Federal Budget and has been included in the respective Forward Estimates*
^	*Includes funds received and retained by DIER for expenditure prior to the establishment of TasRail on 1/12/09*
*	***Includes a $3.69 million co-contribution funding for the Bell Bay Terminal Project and the Burnie Port Optimisation Project and $3.61 million for upgrade of the Melba Line***

Source: TasRail – Submission to Legislative Council – Inquiry into the financial sustainability of TasRail, July 2015

TasRail has proactively sought opportunities to carry new products (eg logs), to integrate with road to provide a whole of supply chain response, and to integrate across products and modes at the Brighton Transport Hub in order to boost volumes and revenues. TasRail has an expectation that its above rail operations division (Freight Operations) is expected to generate a positive result for Earnings Before Interest, Tax, Depreciation & Amortisation (EBITDA) for the 2015-16 financial year[2].

The access fees paid by the Freight Operations Division and the BRIC provided by the State Government do offset the annual cost of maintenance. The continued provision of capital to fund the inherited backlog of defects will improve the overall condition of the network and have an offsetting impact on the value of the BRIC in future years, which from 2017-18 will be set at $8.1M p.a., a reduction from $18.78M in 2011-12.

It is proposed that after completion of Tranche 2 of the IIP the investment will deliver an overall improvement in the standard of the network to the point where it can be considered as having a sound foundation upon which a contemporary asset maintenance and renewals program can be applied. The condition of the

2 Submission to the Legislative Council Sessional Committee Government Administration A "Inquiry into the Financial Sustainability of TasRail" July 2015

network will be able to be supported by a modest annual renewals program designed to progressively replace the remaining old assets over time. The key issues is that efficient, planned maintenance activities become the norm, and reactive maintenance requirements are the exception.

In FY2017-18, the Below Rail Infrastructure Contribution (BRIC) from the Tasmanian Government is forecast to reduce by 33% from $11.9m to $8.1m. In order to respond to this, TasRail will need to continue to focus on improved efficiency from both its above and below rail divisions, whilst also seeking additional revenue.

TasRail's position is that it believes that the reduction in BRIC was intended to be conditional on receiving capital funding for the period FY2015-16 to FY2019-20 of $240 million, when in fact only half of that amount has so far been provided.

TasRail has identified[3] the potential impact on its maintenance costs likely to be driven by capital investment levels as shown in Figure 2.3.

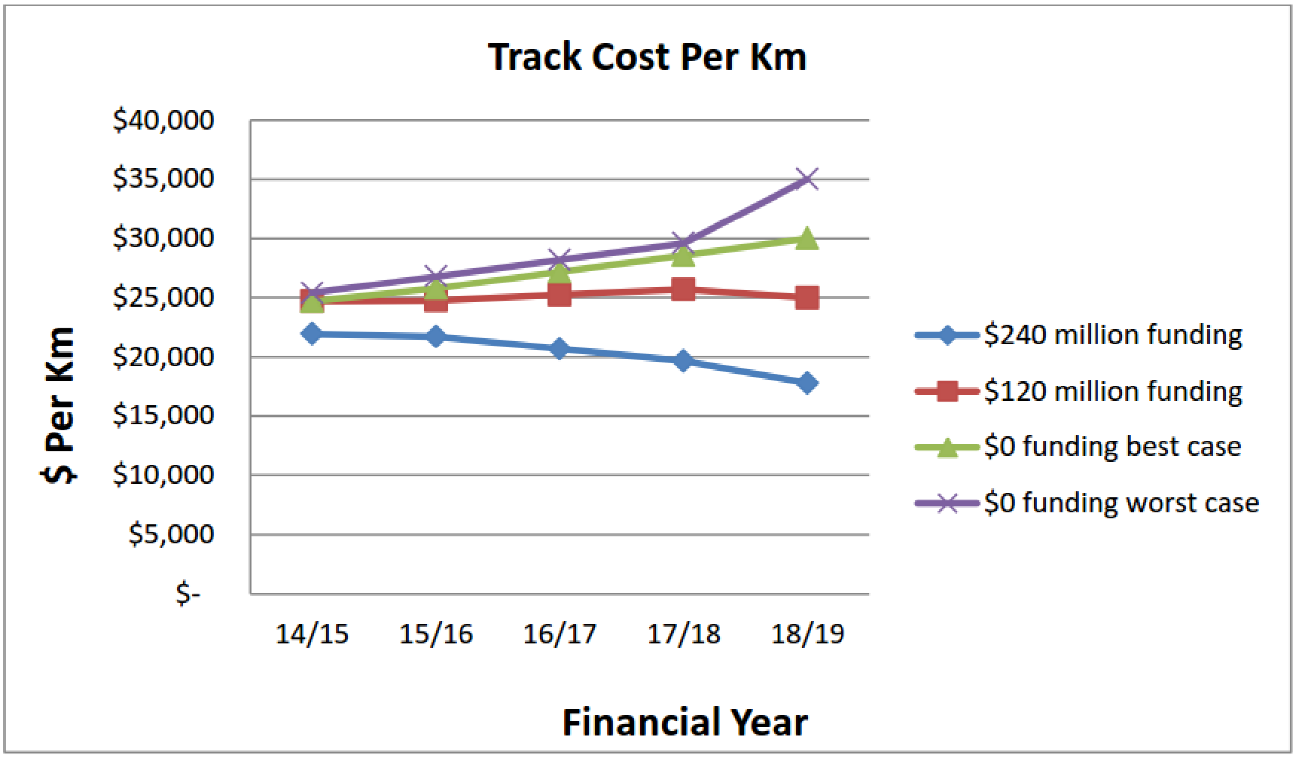

Figure 2.3 Forecast track maintenance costs under different investment scenarios (2014/5 dollars)

The observation from this graph is that the current $120M program is expected to have little effect on maintenance costs, which is the reason for TasRail insisting that the second tranche of funding should follow. However, the relationship between maintenance cost reduction and long term profitability (or financial sustainability for the railway) is not clearly articulated given that there are many other cost and revenue items that will drive the profitability agenda. Figure 2.3 also does not attempt to illustrate the respective risk associated with each of the funding scenarios. Increased recurrent maintenance will not obviate the increased risk associated with failing to address historic maintenance and renewal requirements.

[3] Infrastructure Investment Programme, Tasmanian Freight Rail Revitalisation Project Proposal Report (Delivery Phase) – On Network Lines

Note that recent advice from TasRail amends this graph, indicating that existing maintenance costs of $23,895 per kilometre per annum are expected to be reduced to $21,370 per kilometre per annum upon completion of works associate with the second tranche of IIP funding.

TasRail's preferred infrastructure strategy is to replace non-standard and life expired assets, such that sustainable levels of maintenance and renewals can be implemented. This aligns with a 'fit for purpose' approach, which is defined as a network that -

- is safe (i.e. no derailments)
- facilitates service reliability (i.e. on-time running)
- satisfies customer requirements regarding transit times (but no faster)
- facilitates efficient asset utilisation (i.e. rolling stock turnaround)

Based on Tasmania’s freight task, transit time requirements are not necessarily the primary issue for customer attraction and retention, therefore programs that increase train speed and/or reduce transit time would not be candidates for future funding applications. However, transit time improvements will have a positive effect on asset utilisation/productivity which will help to drive commercial viability and cost competitiveness.

As demand for TasRail’s capacity matures, the company expects to better understand its anticipated long term freight volumes, enabling it to hone its business model to maximise productivity and cost efficiency.

2.7 Future capacity of the network to meet forecast demand

Table 2.2 documents the forecast tonnages to be carried by rail under defined low, medium and high growth scenarios. The following sections consider the relationship between freight volumes and the capacity of the network to carry those volumes in order to assess any need for further capital investment to support the task.

Table 2.2 ACIL Allen forecasts of rail freight volumes (million tonnes)

	BASE	LOW SCENARIO		MEDIUM SCENARIO		HIGH SCENARIO	
LINE SECTION	*Mass 2014-15*	Mass 2034-35	Growth	Mass 2034-35	Growth	Mass 2034-35	Growth
Burnie<>Devonport	***0.85***	0.68	***-20%***	1.00	***18%***	1.10	***30%***
Devonport<>Railton	***2.15***	1.72	***-20%***	2.30	***7%***	2.66	***24%***
Railton<>Launceston	***1.01***	0.80	***-20%***	1.16	***15%***	1.29	***28%***
Launceston<>Bell Bay	***0.09***	0.04	***-50%***	0.09	***0%***	0.09	***0%***
Launceston<>Conara	***0.97***	0.74	***-23%***	1.08	***12%***	1.17	***21%***
Conara<>Fingal	***0.16***	0.13	***-20%***	0.16	***0%***	0.19	***20%***
Conara<>Brighton Hub	***0.81***	0.61	***-24%***	0.92	***14%***	0.98	***21%***
Brighton<>Boyer	***0.36***	0.18	***-50%***	0.36	***0%***	0.36	***0%***
Total			**-23%**		**10%**		**23%**

2.7.1 Low scenario

Under the low forecast scenario there is a general reduction in freight volumes, which means that the existing network capacity will be more than adequate to handle the future task and no intervention would be required.

2.7.2 Medium scenario

The forecasts for the medium scenario can be divided into three key outcomes:

- *Burnie to Hobart* – Forecast growth of around 15% is predicted for train movements in this corridor. This equates to the need for one additional trains service in each direction each day.
- *Launceston to Bell Bay* – No increase in freight volume is predicted. Note the forecast analysis does not consider container traffic as a result of the George Town Freight Terminal being completed. This task commenced after the freight survey period (2014-15 financial year), which forms the basis of the forecast period.
- *Boyer and Fingal branch lines* – Zero change is predicted to demand on these lines therefore no intervention would be required.

The operation of one or two trains on the network is unlikely to require the provision of additional infrastructure, particularly if TasRail has some flexibility around the scheduled time for the service. On the other hand, if the traffic is an extension of existing loadings and the train needs to depart the origin or arrive at the destination at a similar time as the existing train services then the capacity of the single track could become an issue. However, the new advanced network train control system has provided functionality for trains in the same direction to follow closely behind each other (whereas previously they needed to follow one crossing loop behind). This means that trains can be 'flighted[4]' through the corridor significantly increasing the capacity of the network. Where two trains flighted in one direction must cross an opposing train that train can be held in the crossing loop until both trains have passed. The only real constraint is imposed when two flighted trains approach from each direction, but this is not expected to be the case.

TasRail has indicated during consultation meetings that it plans to resource the wagons and locomotives required to carry additional container business by optimising asset utilisation through achieving faster turnarounds, thus releasing rollingstock for the additional task.

It is considered that there is no need to enhance the capacity of the rail track network to accommodate the medium forecast scenario.

2.7.3 High scenario

The forecasts for the high scenario deliver a mixed outcome across the network requiring a more diversified assessment of capacity constraints:

- *Burnie to Hobart* – Forecast growth of around 30% is predicted for train movements in this corridor. This equates to the need for one additional train service in each direction each day.
- *Launceston to Bell Bay* – No increase in freight volume is predicted. Note the forecast analysis does not consider container traffic as a result of the George Town Freight Terminal being completed. This task commenced after the freight survey period (2014-15 financial year), which forms the basis of the forecast period.
- *Boyer branch line* – Zero change is predicted to demand on this line therefore no intervention would be required.

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[4] Flighted refers to two or more trains following each other at an interval closer that the distance between available crossing loops

- *Fingal branch line* – A 20% change is predicted to demand. The coal train currently operates with 17 wagons and two locomotives between Fingal and Railton. The size of the train will be constrained by siding size which limits it to 18 wagons, and the matched to motive power haulage capacity. It is expected that the additional tonnage will not trigger the need for an additional train service on the Fingal line. There is the opportunity to stage loading in the sidings at Conara to assist with forming efficient train sizes for the mainline.

As previously demonstrated in Figure 2.1, the most congested part of the Burnie to Hobart rail corridor is the section of single track between Railton and Devonport where there are currently 16 trains per day working over this section. The high forecast has identified the need for four additional trains (2 in each direction). Given a sectional running time of 30 minutes, then under the high scenario the main line would be occupied for at least 10 hours per day, which is well within the capability of the advanced network train control system to manage. The real issue is the timing of the train movements and how the longer haul services could be interfaced with the regular cement train operations.

Figure 2.4 below examines the spare capacity available of this track to demonstrate that there is sufficient capacity, provided that trains are scheduled appropriately. Multiple pathways are available throughout the day to insert an additional train pathway in a similar manner to the way in which the existing container trains operate through the section.

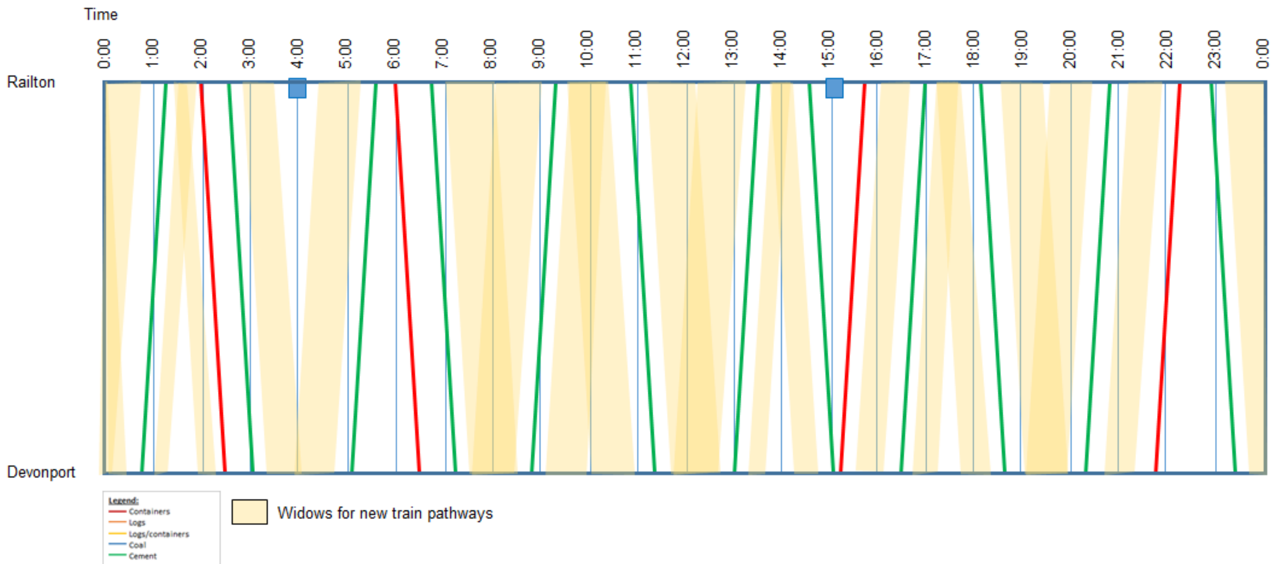

Figure 2.4 Assessment of train congestion between Railton and Devonport

2.8 Conclusions

There is no identified requirement to invest in additional corridor infrastructure capacity in order to accommodate the future forecast rail task, even for the high forecast scenario.

TasRail has indicated that it requires one additional capital input of $120M, and ongoing BRIC payments of $8.1M p.a. in order to be sustainable, believing that it will be able to operate independent from the need for further capital inputs from Government. The exceptions to this are likely to be where additional rollingstock is required to meet future demands, or major infrastructure renewal & replacement requirements arise. TasRail has indicated that any additional rollingstock will be self-funding.

TasRail has indicated that it will be able to handle growth in its container business by achieving productivity improvements related to improved wagon and locomotive utilisation.

The financial outcome is reliant on TasRail being able to retain its existing customer base and constrain its track maintenance budget to $21,370 per km, and that there are no special expense items related to occurrences such as derailments, accidents or failures that are not covered by insurance. In this context, TasRail's significant reductions in derailments and expected further improvements under its new track geometry measuring regime, are noted.

Direction provided through recent TasRail corporate plans has been that surplus above rail funds will be directed to supplement recurrent funding. As a result, no retained earnings are available to provide for long-term above rail asset replacement.

In addition to the financial performance, it will be important to clearly articulate and agree the economic benefit that the rail network provides to the wider economy. The above assessment considers only those issues related to the cost of providing capacity on the network. It does not consider the broader viability of the rail network.

2.9 Key observations

- TasRail’s revenue performance is reliant on a small number of large clients, the loss of any one of which will have a significant impact on its financial viability due to a need to continue to support maintenance of the mainline asset with less use.
- A large portion of TasRail’s freight task starts or ends on a branchline. The selective or complete closure of branchlines will reduce the volume task carried on the mainline making the business less viable.
- There is little clarity around the requirement for Government funding in future years. TasRail's existing submission for major infrastructure funding was developed in 2012. It is reasonable that this submission is now reviewed, given time elapsed, change to project scope from the original submission, and in the context of an updated freight demand profile.
- There appears to have been a change in expectation as to the level of reduction in track maintenance cost resulting from receiving the $120M second tranche funding. Figure 2.3 indicates that these costs could be reduced to as little as $15,500 per kilometre per annum, however more recent advice from TasRail indicates that the target number is now $21,370 per kilometre per annum. If this is the case, then the justification for the $120M additional funding should be revisited to determine if government will still receive an acceptable return on that investment
- TasRail funding requests should be considered on the basis of detailed, current business cases, and as part of a broader freight planning and investment package. Infrastructure Tasmania is key in coordinating and assessing broader investment and in standardising business case assumptions (e.g. common freight demand profiles, safety and environmental BCR values).
- A single point of focus within Government could be beneficial to improved understanding of the ongoing requirements and viability of the rail network in a consistent manner over time.
- TasRail could be asked to prepare a 10 year asset maintenance and renewal plan in order to generate a financial plan that clearly articulates capital and recurrent funding requirements to allow government to decide its preparedness to commit to a stream of future funding, and allow it to monitor performance over time.
- Branchlines are a critical part of the TasRail network because they feed tonnage onto the mainline. Without the tonnage generated by the Boyer, Fingal and Bell Bay branchlines there would be insufficient tonnage, and hence revenue, to support the continued operation of the main lines. This creates a funding dilemma because the branchlines are of a lower standard than the main lines and require a disproportionate amount of ongoing maintenance and capital investment to support the volume of operations. Unless funding is allocated to these lines, which have lower traffic volumes and tonne kilometres, then a substantial portion of the TasRail revenue would be foregone. The role and viability of these branchlines requires careful analysis.

3 ROAD NETWORK

3.1 Objectives for the road freight network

The key objectives for the design and maintenance of the road network[5] for freight operations are considered to be to provide a network that is:

- As safe as reasonably possible.
- Supportive of economic growth through responsible investment, in particular by:
  - Providing a well-defined freight vehicle access networks and policies that are responsive to the needs of industry.
  - Maintaining high levels of travel time reliability and ride quality on the major portions of the freight network.
  - Pursuing innovative opportunities to increase freight transport productivity while providing for any associated increase in infrastructure costs.

3.2 Road network description

Appendix B provides an overview of the configuration of the road network as an aid to identifying the latent capacity that may remain within each of the road sections.

It is important to note that, unlike rail, the road network is designed for both freight and passenger use, with passenger vehicle movements being the dominant use over most of the network.

The network also performs a number of different functions ranging from freeway style operations, to lower order access to property. In the freight context, the main corridor provides the line haul capability and the feeder road network provides access to the major producers and industries as part of a last mile logistics network. Therefore in order to take advantage of efficiency issues such as high productivity vehicles, it is important that the network can accommodate these vehicles from end to end of their journey.

3.3 Infrastructure condition

State Growth released a 'State of the Roads Report' in 2014 which provided a summary of the condition of the state road network at a point in time. The following summary of that report was included in the 'State Roads Audit' undertaken by Infrastructure Australia:

- Road Pavement and Seals:
  - New road pavements typically have a design life of 20 years. Good regular maintenance practices can result in economic life extending to around 40 years from highly used roads and 60 years for less used roads.
  - The overall average of seals is generally 15 years. In 2013 the average seal age was 10 years with 21 per cent being greater than 20 years.
  - Since 2009 the average seal age has been decreasing due to implementation of a program to increase skid resistance.
  - In 2013 average pavement age was 38 years, increasing in average age of three years.

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5 State Roads Infrastructure Service Policy as adapted by WSP|PB to reflect a freight perspective

- Bridges:
  - Bridges built since the 1970s are anticipated to have an economic life of 100 years.
  - Steel and concrete bridges built prior to the 1970s have been found to have an average life of around 70 years.
  - Bridges built over salt water tend to have shorter lives.
  - In recent times the number of bridges over 70 years of age has increased by about 10%.
  - Over the next 10 years about 150 additional bridges will become 70 years of age or older meaning they have exceeded their average expected bridge economic life.
  - 22 bridges have been replaced in the past decade. The majority of bridges older than 70 years are on Category 3-5 roads.
  - Six bridges in Category 1 are 70 years and older.

The Burnie to Hobart corridor is designed to main road standards and has sufficient capacity to efficiently meet the existing freight task on most sections. Level of service issues exist on the Bass Highway between Burnie and Devonport and Elizabeth Town to Launceston; on the Bridgewater Bridge and the Brooker Highway. .

Bridge strength and road width are the most common factors that limit heavy vehicle access to the State Road Network (limiting heavy vehicle weight and length respectively). Road width on the main corridor is not perceived to be an issue, and for most of the feeder roads width is also not considered to be a problem, however, the addition of sealed shoulders could improve safety and maintenance in some cases.

Ageing bridge infrastructure poses the greatest risk to current freight access and levels of service as older bridges were not designed to withstand the stresses caused by modern heavy vehicles. These structures are strengthened initially and ultimately replaced to increase their level of functionality making them wider and safer for all motorists, and ultimately allowing heavier or more productive vehicles on the State Road network.

Heavy freight vehicles have the potential to cause rutting of the sealed surface of the road which affects safety (through steering effects and water pooling) and causes maintenance challenges. Rutting is caused by compression of the road structure by the dynamic pressure from the wheels of heavy vehicles and results in two lineal grooves in the traffic lanes. Figure 3.1 shows the latest audit of rutting condition across the State Roads network indicating that much of the corridor is experiencing medium levels of rutting which will require future remediation funding.

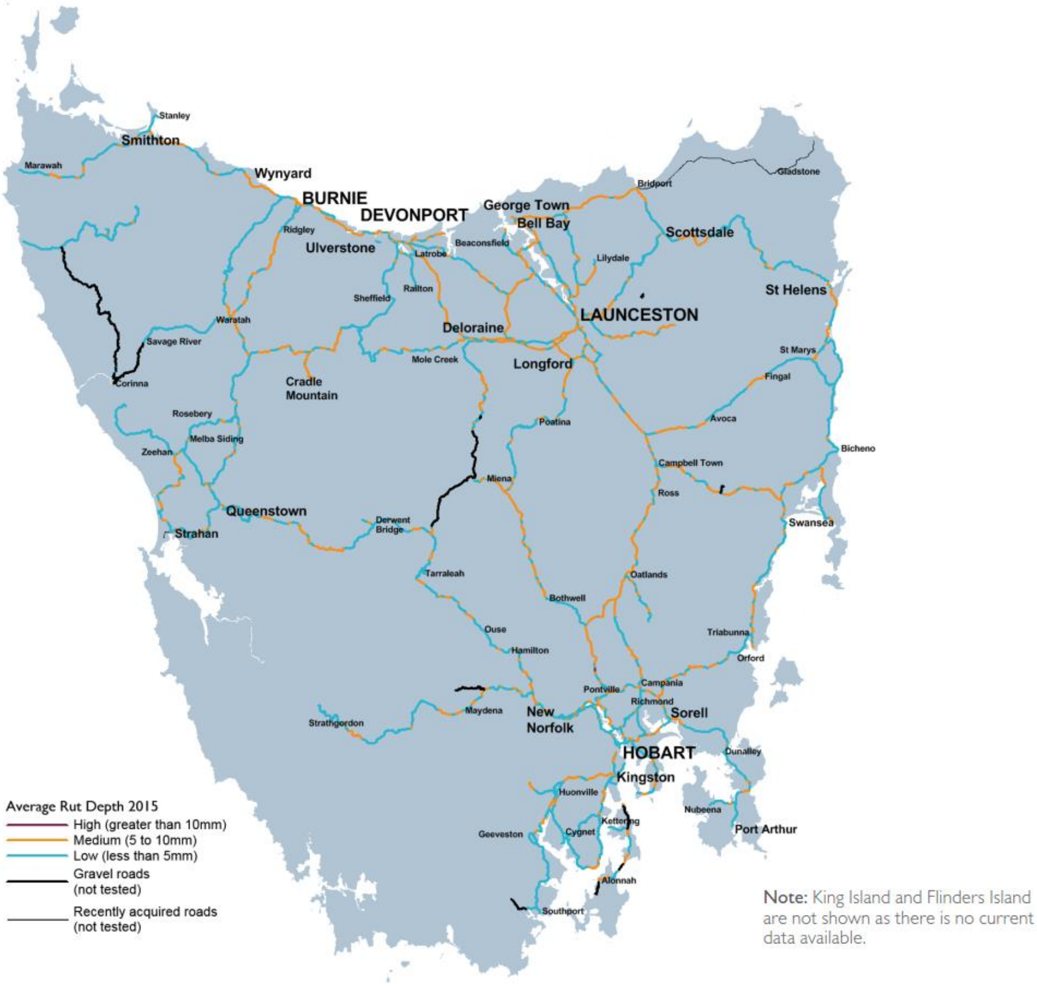


Figure 3.1 Extent of rutting across the road network

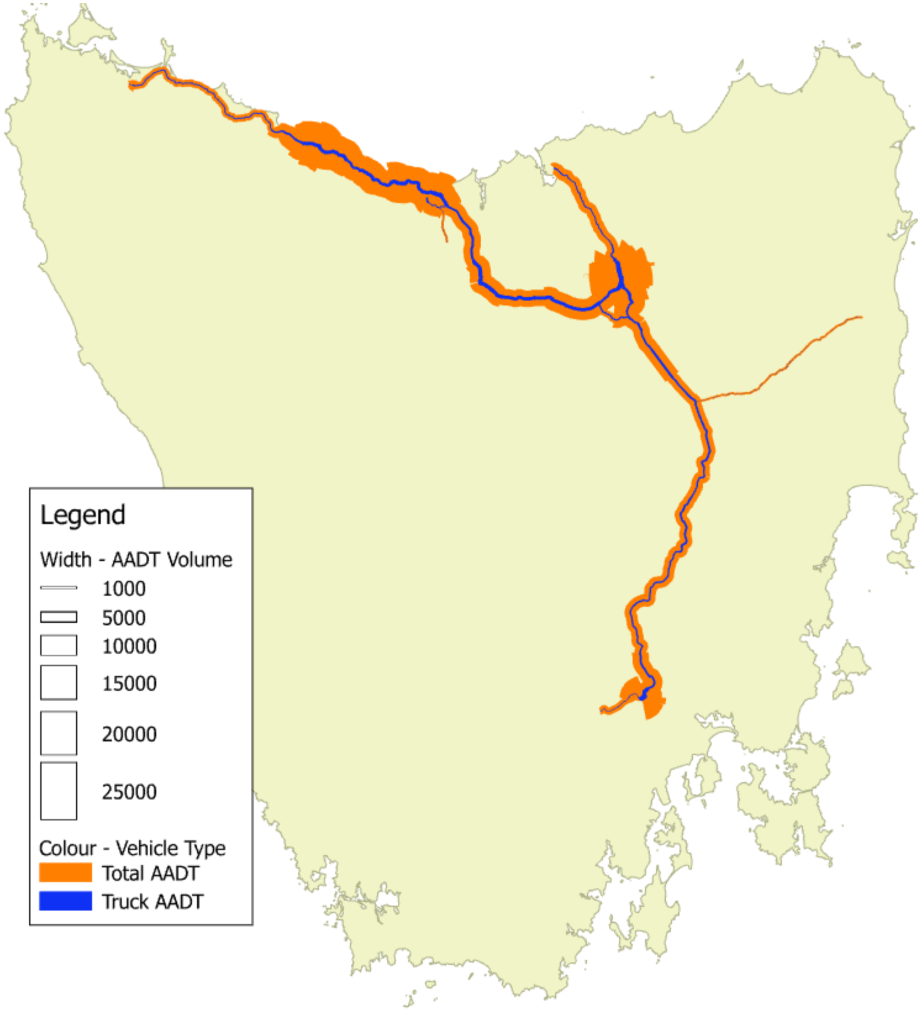
Road pavement width is generally suitable throughout the main corridor, however on some of the feeder roads the preference would be to establish sealed shoulders to reduce maintenance costs and improve safety for long vehicles which are more susceptible to trailer sway, causing edge damage.

3.4 Operations

Table 3.1 provides a listing of Average Annual Daily Traffic (AADT) volumes by road section in the corridor and compares heavy vehicle volumes to total traffic counts. Vehicles are defined as heavy vehicles when the wheel base has a length greater than 3.2m between the axles or has more than two axles. Cars towing trailers are excluded.

Table 3.1 AADT by road section showing the magnitude and proportion of heavy vehicle traffic

ROAD SECTION	TOTAL	TRUCKS	% OF TRUCKS
Smithton<>Burnie	4000	500	13%
Smithton<>Burnie (before Burnie)	8000	900	11%
Burnie<>Devonport	14000	1550	11%
Devonport<>Elizabeth Town (turnoff)	7200	1150	16%
Devonport<>Railton	1900	150	8%
Railton<>Elizabeth Town	n/a	n/a	n/a
Elizabeth Town<>Illawarra Main Road (turnoff)	9700	1500	15%
Illawarra Main Road (to Perth)	3100	500	16%
Launceston<>Bell Bay (south of Batman Bridge)	4500	600	13%
Illawarra Main Road turn-off <> Launceston*	13600	1450	11%
Launceston<>Perth*	11300	900	8%
Perth<>Conara	6400	1000	16%
Conara<>Fingal	1200	150	13%
Conara<>Brighton Hub (Brighton Hub)	4300	800	19%
Brighton<>Boyer	3100	280	9%
Bridgewater Bridge	18400	1650	9%
Brooker Highway (South of Bridgewater Bridge)	27300	2100	8%
Brooker Highway (North of Bowen Bridge)	38300	2800	7%



The accompanying diagram demonstrates that on much of the network trucks represent a very small proportion of total traffic. The key observations are:

- The Burnie-Devonport to Hobart freight corridor carries the highest freight volumes, reflecting its linkages to major ports, population centres and industrial and processing areas in Burnie, Devonport, Launceston and Hobart.
- The Burnie to Devonport section of the Bass Highway carries high levels of general traffic but truck volumes are only marginally higher than the road section to the east of Devonport.
- The Bass Highway west of Burnie feeds the greatest volumes of freight into the corridor.
- The Fingal to Conara and Boyer to Brighton roads feeding into the main corridor carry very low levels of freight activity.

It is important to note that these numbers are averages. Peak periods align with the start end and of business hours, and the middle of the day for shipping cut off deadlines. Also, seasonal fluctuations correspond to primary production peaks and periods of high shipping demand. Bass Strait shipping services experience two seasonal peaks -

  - Outbound freight peaks between February and May, reflecting the movement of large volumes of agricultural products.
  - Inbound freight peaks in October driven by an influx of retail goods for Christmas, and in March to May, related to an inflow of empty containers for agricultural export.

The National Network from Hobart to Burnie, including Illawarra Main Road, the Bass Highway and the East Tamar Highway, are part of the:

- 26m B-double network (ie B-double vehicles up to 26m total length can operate.
- Truck and Dog network.
- High Mass Limit (HML) and Increased Mass Limit (IML) networks.
- Quad axle combination network.
- Performance Based Standards (PBS) 2A network.

This means that, for example:

- The combination of 26m and HML allows for 9 axle B-doubles to operate at up to 68 tonnes. These are the typical combination used to transport goods on this network because they can carry three 20ft containers.
- The combination of truck and dog with IML allows a 3 or 4 axle truck with 4 axle dog trailer to operate at 57 or 62 tonnes respectively.
- PBS truck and dog trailer combinations operating as PBS 2A combinations as follows:
  - 3 axle truck and 5 axle trailers (length <23m), able to operate at a gross mass of 63t.
  - 4 axle truck and 5 axle trailer (length 21–25mwith extendable drawbar), able to operate at a gross mass of 67.5t.
- PBS A-double combinations at 26m length which will be initially permitted to operate over this full network at 68.5t. This mass is below the potential HML axle loading due to some deficiencies with a small number of bridges on the highway. Following further analysis and some bridge strengthening works it is possible for these combinations to operate at up to 74.5t with a single steer axle or 79t with a twin steer configuration.

- Tri-Quad Axle B-doubles and quad-quad axle B-doubles are currently able to apply for access over the full corridor with the latter allowed to 77.5t between Launceston and Bell Bay and 72.5t for the rest of the corridor.

3.5 Capital investment in infrastructure

Capital expenditure on the road network has historically focussed on improving the safety and capacity of infrastructure with projects such as road widening, intersection upgrades, road duplication and hazard removal. These projects are justified on the basis of, and largely undertaken for the benefit of, wider road users, the vast majority of which are private passenger vehicles. Freight is not a significant factor in the majority of these projects, however there are some projects that are undertaken to assist freight productivity. These generally fall into the following categories:

- *Access* – improving roads that link the main road network to demand nodes such as factories, ports and rail freight terminals.
- *Productivity* – allowing heavier or longer trucks to be operated on the network. These project are generally focussed on pavement upgrades and bridge strengthening.
- *Safety* – it is difficult to separate issues related to freight vehicle safety for those that benefit the wider road users. Such projects generally relate to enhancing vehicle control and rest areas for drivers.

It is not affordable to provide the same level of heavy vehicle access across all state roads and therefore investment to sustain or improve road freight efficiency must be based on strategic merit assessment and prioritisation to areas of greatest benefit.

The most important investments that support the introduction of further productivity gains for heavy freight vehicles are:

- Bridge strength, which affects vehicle weight, addressed by bridge strengthening or replacement as required. This includes replacement of the Bridgewater Bridge.
- Road width, which limits vehicle length.

The Department of State Growth plans to address these issues by ensuring current levels of heavy vehicle access are maintained on the state's Category 1 and Category 2 strategic freight network.

The investment plan includes planned outcomes that support:

- Opportunity for improved freight efficiency between Brighton, Bell Bay and Burnie by 2025 by testing and strengthening bridges on the Category 1 network where required.
- Further freight efficiency improvements through programmed upgrades of the Midlands and Bass Highways to enable safe access by more efficient freight vehicles by 2035.
- Strengthening of bridges outside the strategic freight network to maintain current heavy vehicle access levels of service where possible, irrespective of asset ownership.
- A road width and shoulder widening program by 2025 that will improve the safety of key rural roads.

3.6 Future road funding requirements

3.6.1 Capital

The Government has outlined a program of capital investment as part of the Midland Highway 10-Year Action Plan. The Plan represents a joint, $500 million commitment by the Australian and Tasmanian governments to improve safety along the Highway. These upgrades will also deliver freight benefits, including improved junctions, extended sealed shoulders and additional overtaking lanes. Key projects include:

- Southern Perth link road: New link to remove heavy vehicles travelling between the south of the state and Burnie Port, from travelling through central Perth.
- Perth to Breadalbane: New dual carriageway section between Perth and Breadalbane.
- Esk Main Road Junction: Installation of a north bound acceleration lane for heavy vehicles turning north from Esk Main Road.
- Upgrade of key sections along the length of the Highway from north of Brighton to Perth.

The Government has also prioritised replacement of the Bridgewater Bridge as a key Corridor project over the short-term. The Bridge represents the single most significant capital investment project along the Corridor, and will deliver a new dual carriageway bridge on Hobart's key northern approaches. The State Government is in the final stages of geotechnical work prior to a detailed design being finalised, with the final business case expected to be submitted to Infrastructure Australia by the end of the first quarter of calendar 2017. Pending successful assessment by IA and funding from the Australian Government, it is hoped construction will commence in the 2018-19 financial year.

As previously identified, bridges are a critical factor in supporting the operation of freight vehicles and enabling further productivity gains related to vehicle mass. A primary objective of the Government's bridge investment program (refer to Table 3.2) is to ensure that current levels of heavy vehicle access are maintained on the state’s Category 1 and Category 2 roads.

Table 3.2 Bridge upgrades to support freight operations including proposed expenditure up until 2018/19

ROAD	NATURE OF WORKS	PROJECT COST ($’000)	TOTAL BY ROAD ($’000)
Bass Highway			**7,250**
	Stoney Rise Main Road Underpass B5607 strengthening	250	
	Tarleton Street Underpass B5238 strengthening	450	
	Emu River Bridge B5672 strengthening	250	
	Lovett Street underpass B5631 strengthening	1,250	
	Don River Bridge B5099 strengthening	300	
	Leven River Bridge B5484 strengthening	250	
	Liffey River Bridge B5770 strengthening	1,250	
	Pateena Road Interchange Underpass B389 strengthening	1,000	
	Devonport Rail Underpass B561 strengthening	550	
	Penguin I/C Off Ramp Underpass B5892 strengthening	550	
	Appledore Street Underpass B5307 strengthening	550	
	Chasm Creek Bridge B245 strengthening	150	
	Mole Creek Interchange B5692 strengthening	50	
	Bracknell Main Road Underpass B5822 strengthening	50	

ROAD	NATURE OF WORKS	PROJECT COST ($'000)	TOTAL BY ROAD ($'000)
	Whitemore Road Underpass B5823 strengthening	50	
	Bishopsbourne Road Underpass B5824 strengthening	50	
	Oakleigh Rail Underpass B5540 strengthening	50	
	Rail Underpass B5589 strengthening	50	
	Port Access Road Underpass B5874 strengthening	50	
	Jones Street Underpass B5704 strengthening	50	
	Devonport Rail Underpass B5445 strengthening	50	
Midland Highway			**1,500**
	Kings Meadows Connector Underpass B5794 strengthening	50	
	Jordan River Bridge B5665 strengthening	50	
	Mt Pleasant Interchange B5685 strengthening	50	
	Blackman River Bridge South B5358 strengthening	800	
	Blackman River Flood Opening B5359 strengthening	550	
Brooker Highway			**150**
	Berriedale Road Underpass B5573 strengthening	50	
	Berriedale Rail Underpass B5542 strengthening	50	
	Euston Street Underpass B5561 strengthening	50	
CORRIDOR TOTAL			**$8,900M**

3.6.2 Maintenance

The Department of State Growth advises that road maintenance costs have a fixed and a variable component. Of the $63M annual budget only $10M is considered to be responsive to vehicle activity because it is allocated for the maintenance of bridges and pavement.

Given that the State Road network is 3,774 km in length, this implies that the variable cost is $2,650 per kilometre p.a. of which freight traffic will be responsible for a portion of the total depending on the mix of vehicles types using the roads.

The fully allocated average cost of road maintenance over the State Road network works out to be $16,690 per kilometre.

3.7 Future capacity of the network to meet forecast demand

Table 3.3 examines the importance of truck movements to the total task performed by the road network, identifying that trucks represent a small proportion of total road users.

The prediction of road capacity is a difficult task which can be affected by differing factors over the length of the road corridor such as the number of lanes, lane width, the number and design of intersections, terrain, elements next to the road, presence of parking, speed limits, types of vehicles etc. Capacity is often expressed in terms of 'level of service' which is a qualitative measure for ranking operating conditions, based on factors such as speed, travel time, delay, density, freedom to manoeuvre, interruptions, comfort and convenience.

Given the complexity of these issues, the determination of road capacity is often undertaken using computer modelling, however this approach does not fit within the brief for this study and therefore a more subjective assessment has been applied. In the absence of available AADT forecasts for 2034-35 it has been necessary to consider the importance of truck traffic relative to the capacity of road design.

Much of the Burnie to Hobart corridor consists of two-lane two-way roads (refer to Section B.2), with exceptions being upgraded sections of the highway and locations in and around built up areas. As such, the two-lane two way sections control the capacity of most of the corridor.

The AustRoads Guide to Traffic Management Part 3: Traffic Studies and Analysis has been consulted to help to identify if the forecast truck numbers are likely to trigger the need for network capacity upgrades. It concludes that the capacity of a two-lane highway is:

- 1700 pc/h for each direction of travel.
- For extended lengths of two-lane highway, the capacity will not exceed 3200 pc/h for both directions of travel combined.

For a multi-lane highway with a speed limit of 100km/h the document suggests a flow rate of between 700 and 2,200 vehicles per hour depending on the level of service. At lower speed limits such as in a 70km/h zone the capacity will drop to between 490 to 1,900 vehicles per hour.

For the purposes of this report a capacity of 1,500 vehicles per hour has been adopted for the majority of the corridor. This suggests that a corridor could theoretically carry 36,000 vehicles over a 24 hour period. The problem with using this number to assess its capability to carry trucks is that it assumes that movements are distributed evenly over the day. In practice, truck volumes are focussed more towards daylight hours and particularly around the start and end times of business and the shipping cut off times at the ports. Therefore a 10 hour window has been adopted to represent the most likely time during the day that trucks will be occupying space on the road network. On this basis, the one way AADT capacity in which trucks must be accommodate would be 15,000.

Despite this approach to assessing volumes containing a number of simplifications, the outcome shown in the right hand column of Table 3.3 indicates that even under the highest freight forecast scenario, future truck volumes are expected to occupy a very small proportion of road capacity. The locations where volumes are highest is in the urban areas of Hobart.

Table 3.3 Forecast change in truck volumes, two way by road section

ROAD SECTION	EXISTING TRUCK VOLUMES	TRUCKS AS % OF TOTAL AADT	LOW SCENARIO TRUCK VOLUMES	MEDIUM SCENARIO TRUCK VOLUMES	HIGH SCENARIO TRUCK VOLUMES
Smithton<>Burnie	500	13%	383	693	904
Smithton<>Burnie (before Burnie)	900	11%	690	1271	1671
Burnie<>Devonport	1550	11%	1242	2115	3011
Devonport<>Elizabeth Town (turnoff)	1150	16%	956	1572	2137
Devonport<>Railton	150	8%	115	186	227
Railton<>Elizabeth Town	150	n/a	150	150	150
Elizabeth Town<>Illawarra Main Road (turnoff)	1500	15%	1247	2051	2787
Illawarra Main Road (to Perth)	500	16%	418	690	926
Launceston<>Bell Bay (south of Batman Bridge)	600	13%	417	711	810
Illawarra Main Road turn-off <> Launceston*	1450	11%	1152	1957	2556
Launceston<>Perth*	900	8%	665	1060	1315
Perth<>Conara	1000	16%	794	1349	1763
Conara<>Fingal	150	13%	93	180	198
Conara<>Brighton Hub (Brighton Hub)	800	19%	637	1072	1392
Brighton<>Boyer	280	9%	173	301	308
Bridgewater Bridge	1650	9%	1342	2334	2943
Brooker Highway (South of Bridgewater Bridge)	2100	8%	1786	3064	3924
Brooker Highway (North of Bowen Bridge)	2800	7%	2369	4097	5222

Another way of analysing this is to consider the impact on the level of service (LOS), or the degree of congestion of the road network caused by the additional trucks. This can be done by considering a nominal peak hour and comparing it against a predicted 2034-35 level of service without the additional rail generated trucks, and with them. In order to take this approach, a number of assumptions have needed to be made, due to an absence of traffic data, which are listed below

- A peak hour which has 10% of the daily demand (in the absence of any local detail).
- Levels of service as per Austroads AGTM vol 3 pages 38-39 (noting that these are for passenger cars and not vehicles).
- Range of passenger car unit factors (conversion of truck to passenger car equivalents) which differ depending on terrain (1.7 for flat and 2.5 for rolling hills).
- Assumed background growth rate of 1.3% per annum (based on info in State Roads audit).

Table 3.4 shows the outcome of these calculations and the resultant level of service expected to be observed in 2034-35. It is observed that there is expected to be significant levels of congestion around the major towns, as well as on the Bass Highway.

Table 3.4 Predicted level of service by road section in 2034-35

	2034-35 TOTAL PEAK HOUR PCU	PERDICTED PEAK HOUR LOS
Smithton<>Burnie	607	B
Smithton<>Burnie (before Burnie)	1203	D
Burnie<>Devonport	2124	E
Devonport<>Elizabeth Town (turnoff)	1147	C
Devonport<>Railton	283	A
Railton<>Elizabeth Town#	628	B
Elizabeth Town<>Illawarra Main Road (turnoff)	1758	D
Illawarra Main Road (to Perth)	494	B
Launceston<>Bell Bay (south of Batman Bridge)	708	B
Illawarra Main Road turn-off <> Launceston	2008	E
Launceston<>Perth	1570	D
Perth<>Conara	999	C
Conara<>Fingal	294	A
Conara<>Brighton Hub (Brighton Hub)	801	C
Brighton<>Boyer	442	A
Bridgewater Bridge	2669	E
Brooker Highway (South of Bridgewater Bridge)	3930	F
Brooker Highway (North of Bowen Bridge)	5484	F

Level of service A	A condition of free-flow in which individual drivers are virtually unaffected by the presence of others in the traffic stream. Freedom to select desired speeds and to manoeuvre within the traffic stream is extremely high, and the general level of comfort and convenience provided is excellent.
Level of service B	In the zone of stable flow where drivers still have reasonable freedom to select their desired speed and to manoeuvre within the traffic stream. The general level of comfort and convenience is a little less than with level of service A.
Level of service C	Also in the zone of stable flow, but most drivers are restricted to some extent in their freedom to select their desired speed and to manoeuvre within the traffic stream. The general level of comfort and convenience declines noticeably at this level.
Level of service D	Close to the limit of stable flow and approaching unstable flow. All drivers are severely restricted in their freedom to select their desired speed and to manoeuvre within the traffic stream. The general level of comfort and convenience is poor, and small increases in traffic flow will generally cause operational problems.
Level of service E	Traffic volumes are at or close to capacity, and there is virtually no freedom to select desired speeds or to manoeuvre within the traffic stream. Flow is unstable and minor disturbances within the traffic stream will cause breakdown.
Level of service F	In the zone of forced flow, where the amount of traffic approaching the point under consideration exceeds that which can pass it. Flow breakdown occurs, and queuing and delays result.

3.8 Conclusions

Road network design and capacity upgrades will continue to be driven by the need to provide safe and efficient movements for private motor vehicles. Freight vehicles do not contribute sufficient volume to the corridor to cause congestion issues, but will benefit from safety and capacity upgrades generally.

The challenge for the freight network is the continued upgrade of bridge capacity and road width to enable further productivity improvement outcomes for the road freight industry. Investigation of the next standard to apply beyond B-double vehicles needs to be carefully investigated to ensure expenditure is focussed efficiently into the right infrastructure. For example, will industry be better with B-triple trucks which can carry lighter cubic loads, or would an A-double combination capable of carrying heavier loads be more important. The allocation of funding for the associated upgrades will need to be subject to a business case assessment.

3.9 Key observations

→ The road network is maintained to a standard that supports the operation of freight vehicles, with works proposed to enable the use of high productivity vehicles for all major freight routes.

→ The majority of network upgrade projects are promoted on the basis of passenger vehicle use of the network and the need for safety or capacity (congestion) improvements. Maintaining and improving access and efficiency for freight vehicles on the urban road network is important to the broader freight system.

→ The funding priority for freight movements will be to gain advantage from productivity improvements. Works are currently in hand to enable wide-spread B-double operation. However, the pursuit of continued improvements in the freight industry will generate ongoing pressure for greater truck efficiency.

→ New road freight productivity projects will require further capital investment in the network, but at the same time challenge the contestability of rail freight. Therefore investments in the road network may cause a reduction in the financial performance of rail. This should be considered as part of the business case development for road projects.

→ The impact of new (disruptive) technologies needs to be considered. The development of autonomous vehicles and the platooning of trucks are likely to change the infrastructure requirements for the corridor.

4 INTEGRATED CORRIDOR RESPONSES

4.1 Supporting modal roles within the corridor

Road vehicles are the dominant means of moving freight on the Burnie to Hobart corridor. As such, there would be a prima facie case to allocate a higher level of funding towards the upgrade and maintenance of the road infrastructure compared to rail. However, the solution is not as straight forward as this because this simplistic assessment does not recognise the relative efficiency of moving the freight by the different modes. Rail has an advantage in that the freight is consolidated into larger units (ie trains) and therefore can take advantage of the economies of scale to generate lower operating costs per tonne. On the other hand, rail has to maintain its right of way (ie track and corridor), and the cost of doing so is more expensive per kilometre than for road.

A further consideration is the wider economic benefits derived by each mode. TasRail makes the case that the use of rail provides improved environmental, social and safety outcomes for the community and therefore generates a better economic outcome than road freight.

In order to aid the development of a position on future investment allocation it would be necessary to undertake an economic assessment of the full corridor upgrade options, something which is beyond the scope of this study.

One thing which is clear however, is that the ability to move freight is critical to the economic future of Tasmania and therefore any investment in improving corridor efficiency has a high probability of providing a beneficial return.

Analysis in this report has identified that both road and rail have sufficient capacity within the existing infrastructure to accommodate the forecast freight task for the foreseeable future, given the predicted mode shares identified by ACIL Allen. The reasons for this are:

- Freight is a small contributor to overall traffic volumes and road corridor use – passenger vehicle usage generally drives investment decisions.
- The rail network infrastructure is capable of accommodating additional train services. TasRail has indicated that it would not likely pursue longer trains to address capacity growth, which would give rise to the need to extend crossing loops, yards and terminals.

Future efficiency improvements in the corridor are likely to come from the better utilisation of existing infrastructure. Examples of how this might unfold are:

- In the case of road, the need to accommodate enhanced safety drives the majority of investment, with capacity improvements on selected sections of the network also being important. These capital upgrades are expected to be undertaken irrespective of the level of freight activity on the corridor. Freight efficiency is likely to come from the use of higher productivity freight vehicles. Existing network standards support PBS Level 2A vehicles (Brighton to Burnie), while future upgrades are targeted at supporting PBS 3A vehicles.
- In the case of rail, the key to strong financial outcomes is the generation of a high level of utilisation of the fixed assets (ie the track and corridor) as well as improving rollingstock and manpower utilisation. This could be achieved in number of ways such as:
  - Increasing freight volumes – this relates to the contestability of freight and the scope for rail to win freight away from road, most likely through the use of competitive pricing but also through the offer of an integrated logistics solution.
  - More efficient terminals – this has been a strong focus for past capital expenditure programs with upgrades undertaken at Brighton, Burnie and Bell Bay.

- Increased capacity of vehicles – this would be expensive to achieve because there is a need to upgrade rail and/or sleepers across the full length of the corridor to accommodate heavier axle loads.
- Faster journey times – speed is constrained by the radius of curves, gradients, and the design of the track structure. These are also expensive items to resolve but selective improvements in locations of greatest impact could be an option. However, the freight industry has indicated that service reliability is more important and therefore it is expected that investments of this nature would be difficult to justify.

4.2 Decisions on funding priority and allocations

Given the parallel road and rail infrastructure in the corridor, investment decisions for the corridor need to consider how investment in road and rail can support and maximise freight outcomes. Decisions across modes must be coordinated.

The question is whether the current funding regime across both modes can be supported into the future or whether there is a more efficient funding model. In order to answer this question it would be necessary to develop an economic model for the corridor. It is not appropriate to form a decision based purely on capital investment requirements and/or maintenance costs. However, from a financial perspective, particularly the issue of cash flow, Government may not have the capacity to fund these costs out of recurrent budgets.

Earlier, in Section 3.6.2, it was identified that the total maintenance cost for the State Road network was $63M, giving an annual average road maintenance cost of $16,700 per kilometre compared to the current average annual rail maintenance cost of $23,895 per kilometre, suggesting that the cost of maintaining the road network has a lower unit cost than rail, especially in context that road carries a greater proportion of the freight task. Road maintenance costs are also relatively inelastic to changes in freight volumes and there is no requirement for capital expenditure in order to sustain the current maintenance budgets.

It has also been established that rail requires a further capital investment, including the IIP second tranche of $120M, and a further $85M identified by Tasrail, in order to reach a stabilised annual track maintenance expenditure level of $21,370 per kilometre, without any ongoing capital requirements beyond this being necessary to sustain rail services in meeting its market requirements.

Any proposed capital expenditure directed towards the road network for freight activity would be directed towards enabling greater use of high productivity vehicles is discretionary and would ultimately create the potential for road freight to become more competitive relative to rail. This expenditure needs to be assessed in a detailed business case that also considers the financial impact on rail from reduced tonnages and hence loss of revenue required to support below rail maintenance costs.

In order to test the capability of the road network to handle changes in the road freight task, the following section examines the implication of a full, or a partial, transfer of rail freight to road.

4.3 Corridor implications from rail freight transfer to road

Given the significant government investment in the rail network in the past and the potential for future financial risk exposure, it is appropriate to evaluate the broader competitive and system outcomes associated with this investment to inform the role rail can play in Tasmania's freight system. The focus is on the impact on the operation of the Burnie to Hobart corridor road network should all or part of the current rail task be transferred to road.

The future role of rail needs to be clearly articulated and expectations related to future government funding agreed.

The triggers for a transfer of rail traffic to road could come from one of the following sources:

- Loss of commercial competitive advantage. This could be caused by a number of factors related to the behaviour of road competitors. It could come from improved road vehicle efficiency (such higher productive vehicles), road operational changes (such as triangulation of operations to reduce empty running), poor customer relationship management etc.
- Loss of commercial viability where rail cannot make a profit from the traffic as a result of operating costs, or the need for significant capital investment in the track and/or rollingstock.
- Loss or closure of a major client. TasRail's viability is exposed to a small number of major freight generators.
- Major incident whereby there is significant infrastructure damage, the repair of which cannot be supported in light of the revenue opportunity presented from resuming operations. Most likely associated with a branchline.

4.3.1 Converting the rail task into truck numbers

The starting point for the analysis is to convert the rail task into an equivalent number of trucks. This has been done by using information supplied by TasRail related to the train operations plan. It should be noted that the operations plan for containers represents the planned capacity of train services and does not necessarily reflect actual loading on any particular day. Whilst actual volume of freight on any day is more likely to be less than train capacity, the road network will need to be able to accommodate all the freight may have to be moved on a peak day, so the results will not be representative of a typical day.

Table 4.1 Conversion of current rail container volumes to truck numbers

TEU PER ANNUM	TEU PER WEEK	FROM	TO	NUMBER OF SERVICES PER WEEK	CONTAINERS PER DAY	AVERAGE CONTAINERS PER ROAD TRUCK	ROAD TRUCKS
18000	360	Boyer	Burnie	6	60	2	30#
18000	360	Burnie	Boyer	6	60	2	30
15600	312	Brighton	Burnie	6	52	2	26
15600	312	Burnie	Brighton	6	52	2	26
5000	100	Brighton	Devonport	5	20	2	10
5000	100	Devonport	Brighton	5	20	2	10
800	16	Brighton	Bell Bay	3	5	2	3
800	16	Bell Bay	Brighton	3	5	2	3
1000	20	Brighton	East Tamar	5	4	2	2
3500	70	East Tamar	Brighton	5	14	2	7
1500	30	East Tamar	Bell Bay	3	10	2	5
3000	60	East Tamar	Burnie	5	12	2	6
7000	140	Burnie	East Tamar	5	28	2	14
3000	60	Bell Bay	Burnie	4	15	2	8
3000	60	Burnie	Bell Bay	4	15	2	8
5000	100	Bell Bay	Brighton/Boyer	5	20	2	10
5000	100	Brighton	Bell Bay	5	20	2	10

#This number could be higher due to the weight of the containers requiring one container per truck

Table 4.2 Conversion of current rail bulk volumes to truck numbers

COAL FROM FINGAL TO RAILTON - 32 Trucks per day

CEMENT FROM RAILTON TO DEVONPORT - 137 Trucks per day

Using this information, and applying it to the specific road sections that the freight would traverse between the trip origin and destination provides the following table.

Table 4.3 Allocation of rail freight trucks to road sections

ROAD SECTION	CONTAINER TRUCKS		COAL TRUCKS		CEMENT TRUCKS		2014-15 TOTAL	
	Each way truck trips per day	Two way truck trips per day	Each way truck trips per day	Two way truck trips per day	Each way truck trips per day	Two way truck trips per day	***Each way truck trips per day***	***Two way truck trips per day***
Boyer to Brighton	30	60					**30**	**60**
Brighton to Conara	81	161					**81**	**161**
Conara to Fingal			32	65			**32**	**65**
Conara to Perth	81	161	32	65			**113**	**226**
Illawarra Road	66	132	32	65			**98**	**197**
Illawarra Junction to Elizabeth Town	80	159	32	65			**112**	**224**
Elizabeth Town to Railton			32	65			**32**	**65**
Railton to Devonport					137	275	**137**	**275**
Elizabeth Town to Devonport	80	159					**80**	**159**
Devonport to Burnie	44	87					**44**	**87**
Perth to Launceston	15	29					**15**	**29**
Launceston to Bell Bay	15	29					**15**	**29**
Launceston to Illawarra Rd	14	27					**14**	**27**

4.3.2 Impacts on road network capacity

Using the same methodology as applied to generate Table 3.4, but adding the additional truck volumes generated in Table 4.3 as a result of the transfer of freight from rail to road, the change in volumes and level of service is provided in Table 4.4.

The Bass Highway, between Devonport and Illawarra Main Road, is identified as the only portion of the corridor that is impacted through a reduction in the LOS. The consequence of this is that any proposed expenditure to upgrade the capacity of this road may need to be brought forward, but this is not necessarily as a precursor to the transfer of freight in the short term.

Table 4.4 Predicted level of service by road section in 2034-35 with rail freight transferred to road

	2034-35 TOTAL PEAK HOUR PCU	PEAK HOUR LOS WITH RAIL	PEAK HOUR LOS WITHOUT RAIL
Smithton<>Burnie	676	B	B
Smithton<>Burnie (before Burnie)	1334	D	D
Burnie<>Devonport	2391	E	E
Devonport<>Elizabeth Town (turnoff)	1349	C	D
Devonport<>Railton	371	A	A
Railton<>Elizabeth Town#	639	B	B
Elizabeth Town<>Illawarra Main Road (turnoff)	2152	D	E
Illawarra Main Road (to Perth)	609	B	B
Launceston<>Bell Bay (south of Batman Bridge)	767	B	B
Illawarra Main Road turn-off <> Launceston	2201	E	E
Launceston<>Perth	1647	D	D
Perth<>Conara	1175	C	C
Conara<>Fingal	394	A	A
Conara<>Brighton Hub (Brighton Hub)	998	C	C
Brighton<>Boyer	468	A	A
Bridgewater Bridge	2889	E	E
Brooker Highway (South of Bridgewater Bridge)	4240	F	F
Brooker Highway (North of Bowen Bridge)	5896	F	F

4.3.3 Potential impacts on road infrastructure design standards

In order to determine if the design standard of any sections of road network would need to be upgraded, each has been examined independently.

Brighton to Burnie

Generally this corridor is of a suitable design to accommodate the additional truck traffic that might be generated even if all the rail tonnage is converted to road, with the potential exception of Illawarra Main Road.

Illawarra Main Road is the key connection between the Bass and Midland Highways, providing a shorter, more attractive route for freight moving between Burnie and Hobart.

The existing road is a single carriageway, 16km in length. It has been identified as being deficient in terms of current and future vehicle productivity needs along the length of the corridor, but particularly at the southern end where it passes through the centre of Perth.

The South Perth link road is an identified project under the Midland Highway 10-Year Action Plan. The project will provide a new link to remove heavy vehicles travelling between the south of the state and Burnie port, from travelling through Perth.

Boyer to Brighton

The transfer of paper products to road will result in 60 additional truck movements per day. Boyer Road is not currently of a suitable standard to handle this task. Upgrade of the 13.5 km of road to accept the anticipated traffic is expected to cost $14M and involve making the corridor suitable for PBS2A design vehicles by:

- Providing 8.0 metres seal width (lanes 3.0m, shoulders 1.0m).
- Pavement strengthening as required.
- Minor alignment improvements and accommodation works.
- Removal of clearance issues (rail overpass – clearance at 4.4m, and overhead water main – clearance at 4.4m) are not considered as part of the upgrade cost.

The alternative would be for trucks to operate to the west of Boyer via New Norfolk and the Lyell Highway, a route which is already PBS2A 'approved'. However this route is 22.5km longer, passes through the town of New Norfolk, and requires use of the existing Bridgewater Bridge which has known constraints.

Given that Norske Skog is the beneficiary of any upgrades, there are risks associated with making any major investment. Consideration should be given to Norske Skog contributing to the cost of any upgrades.

Fingal to Conara Junction

The sole access route for the coal mine is via Esk Main Road. Until recently, coal was transported on road and rail but the task has now switched to rail. As part of a broader, long-term planning and investment package for this road, the Department of State Growth has earmarked $13 million for shoulder widening and for stability works at St Mary's Pass over the next three years, largely completing shoulder widening along the full length of Esk Main Road. In the longer term, and with any potential closure of the rail line, further funding would be sought for road widening expected to cost $15 million. Furthermore, there are a number of bridges that require strengthening at an estimated cost of $10 million bring the total investment required for Esk Main Road to $25M.

Table 4.5 identifies the bridges that would require further investigation and likely strengthening in order to allow more productive vehicles (including quad axle groups at 27t) to access Esk Main Road:

Table 4.5 HPV bridge upgrade requirements

BRIDGE NAME	ESTIMATED STRENGTHENING COST ($'000)
Blanchards Creek Bridge	175
Esk Main Road Rail Underpass	350
Tullochgorum Creek Bridge	650
Esk Main Road Culvert	175
Rostrevor Rivulet Culvert	175

Bell Bay to Western Junction

This road is already suitable for heavy vehicles and no further expenditure is expected should rail operations cease. However, there is a long running issue associated with the movement of heavy vehicles through the centre of Launceston.

Railton to Devonport

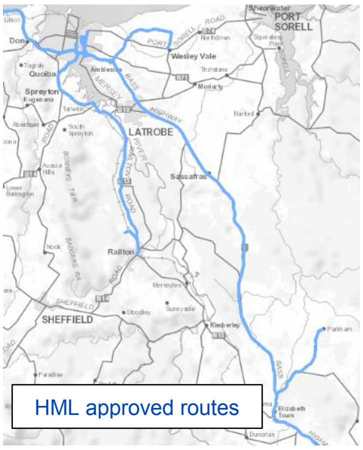
The primary freight on this link is cement. Currently nearly all cement is carried by rail, therefore a transfer of this traffic to road would trigger a major upgrade of Railton Road and Mersey Main Road which would involve:

- Upgrade to 8.0 metres seal width (lanes 3.0m, shoulders 1.0m).
- Shoulder widening and pavement strengthening required.
- Minor alignment improvements and accommodation works.

The cost of upgrading 19km of road is expected to be $19M.

The road movement will represent a significant change to the use and functionality of the roads and their connections to the port in Devonport. It is possible that this could trigger a degree of community concern.

Elizabeth Town to Railton



The primary freight on this link is coal. Currently nearly all coal is carried by rail, therefore a transfer of this traffic to road would trigger a major upgrade of Railton Road because this is not HML standard – HML vehicles must detour through Devonport. The upgrade would involve the following works and approval for HML operation:

- Upgrade to 8.0 metres seal width (lanes 3.0m, shoulders 1.0m).
- Shoulder widening and pavement strengthening required.
- Minor alignment improvements and accommodation works.

The cost of upgrading 22km of road is expected to be $22M.

The road movement will represent a significant change to the use and functionality of the road. It is possible that this could trigger a degree of community concern.

4.3.4 Impact on road maintenance costs

The increased volume of road trucks operating over the Burnie to Hobart corridor as a result of transferring rail traffic onto road will result in an increase in road maintenance costs. Table 4.6 provides a method of calculating the potential increase in maintenance costs, which equates to approximately $0.75M p.a. The methodology for estimating the cost change has involved:

- Using a ratio of network kilometres, allocate the estimated State Roads total network variable maintenance cost to road sections. Applying a factor of 4 to recognise that the Burnie to Hobart corridor carries greater AADT than other parts of the network.
- Identifying the additional trucks by road section assuming the high freight forecast scenario.
- Applying the change in truck numbers as a percentage to the calculated current variable maintenance costs and factor the value by 3 to recognise the additional road wear caused by each heavy vehicle

Table 4.6 Calculation of additional road maintenance costs from transfer of rail volumes (High Scenario)

ROAD SECTION	LENGTH (KM)	% OF STATE ROAD NETWORK	SHARE OF VARRIABLE MAINTENANCE	BASE AADT	INCREASE IN BASE AADT DUE TO RAIL TRANSFER	% INCREASE IN TOTAL AADT	FACTORED INCREASE IN VARIABLE MAINTENANCE COSTS
Smithton<>Burnie	55	1.5%	$584,000	4000	0	0.0%	$0
Smithton<>Burnie (before Burnie)	15	0.4%	$160,000	8000	0	0.0%	$0
Burnie<>Devonport	26	0.7%	$276,000	14000	141	1.0%	$9,000
Devonport<>Elizabeth Town (turnoff)	40	1.1%	$424,000	7200	246	3.4%	$45,000
Devonport<>Railton	24	0.6%	$256,000	1900	275	14.4%	$111,000
Railton<>Elizabeth Town	22	0.6%	$232,000	2000	88	4.4%	$30,000
Elizabeth Town<>Illawarra Main Road (turnoff)	44	1.2%	$468,000	9700	383	4.0%	$54,000
Illawarra Main Road (to Perth)	16	0.4%	$168,000	3100	341	11.0%	$54,000
Launceston<>Bell Bay (south of Batman Bridge)	31	0.8%	$328,000	4500	41	0.9%	$9,000
Launceston<>Bell Bay (north of Batman Bridge)	14	0.4%	$148,000	4200	0	0.0%	$0
Illawarra Main Road turn-off <> Launceston	20	0.5%	$212,000	13600	42	0.3%	$3,000
Launceston<>Perth	17	0.5%	$180,000	11300	44	0.4%	$3,000
Perth<>Conara	39	1.0%	$412,000	6400	372	5.8%	$72,000
Conara<>Fingal	52	1.4%	$552,000	1200	106	8.8%	$147,000
Conara<>Brighton Hub	122	3.2%	$1,292,000	4300	250	5.8%	$225,000
Brighton<>Boyer	19	0.5%	$200,000	3100	86	2.8%	$18,000
Burnie to Hobart Corridor Total	***557***		***$5,904,000***				***$780,000***

Assumptions: *Total road distance in State Roads Network = 3,774*
State Roads Network variable maintenance cost = $10M
Factorisation for higher maintenance on main roads = 4
Factorisation for additional damage by trucks = 3

4.4 Conclusions

Currently, the Tasmanian Government is funding the upgrade and maintenance of two parallel freight routes between Burnie and Hobart. Although road and rail partly perform differing tasks, with rail carrying a greater proportion of bulk freight, the modes are generally competing for business in the same market based on service and price.

It is appropriate therefore that government considers an integrated strategy for the management of the corridor and the prioritisation of investment. The development of a 10 year asset and maintenance renewal plan for both road and rail would allow the prioritisation of capital allocation between modes and thereby optimise investment returns from the corridor. This process would need to be supported by the development of robust business cases to support funding application with both road and rail applications being prepared in the same format to allow an easier comparisons to be made around good investment choices.

This report does not have sufficient scope to determine the most appropriate course of action. In Section 3.6.2, it was identified that the total maintenance cost for the State Road Network was $63M. Adding the $0.78M maintenance cost increase predicted to result from the transfer of all rail freight to road, this gives an annual average road maintenance cost of $16,900 per kilometre p.a. compared to $16,700 per kilometre p.a. calculated for the existing network, an increase of $200 per km pa. This can be compared to the average annual rail maintenance cost of $21,370 per kilometre (assumes the allocation of a further $120M of capital investment), suggesting that the cost of maintaining the road network has a lower unit cost than rail, even after all rail freight has been transferred to road. However this does not adequately represent the total costs and benefits of the rail network and cannot be used as the basis of a decision on the future allocation of funds. A full economic assessment is required in order to understand the true value of each of the transport modes and the contribution they make the Tasmanian economy.

Appendix A

CHARACTERISTICS OF THE RAIL NETWORK

The Burnie to Hobart mainline corridor extends from Burnie Port in the north-west to Brighton Transport Hub (Hobart) in the south. There are also operational branch lines connecting to the mainline for the following locations:

- Port of Bell Bay and Launceston connecting at Western Junction.
- Fingal connecting at Conara.
- Boyer connecting at Brighton Junction.
- Melba at Burnie, however this line is not included in the scope of this study).

The mainline generally runs through undulating country however a significant range of hills between Brighton and Ross, including a 1200m long tunnel near Rhyndaston and a series of sharp curves, sets the ruling grade load for locomotives on the network.

TasRail is the train operator and it is wholly owned by the Government of Tasmania. It has operated the rail network in Tasmania since September 2009 when the government bought back the railway from private interests. TasRail manages above-rail (rollingstock) and below-rail (track and associated infrastructure) assets as a vertically integrated rail operator.

The network is based on narrow gauge track standard of 3ft 6in (1,067 mm) and has axle load limitations of 18t over most of the network.

Rail Line	Location	Total length (km)
Bell Bay	East Tamar Junction to Bell Bay Port	57
Derwent Valley	Bridgewater to Boyer	71
Fingal	Fingal to Conara	55
South	Brighton Hub to Western Junction	199
Western	Inveresk to Burnie Port via Western Junction	259
Melba	Melba Flats to Burnie	130
	Total	**632km**

Figure 4.1 Overview of the TasRail network (note: Melba Line is not within the scope of this study)

Key general freight handling terminals are located at Brighton, Railton, Devonport and Burnie on the main corridor, and at Boyer, Fingal, and Bell Bay/Georgetown on the branch lines. In addition, Launceston and Conara have the capacity to handle freight as required.

All corridors on the network are of a single track configuration, which means that trains in opposite directions can only pass each other at designated crossing loops where a section of double track is provided for that purpose. The frequency and location of these crossing loops controls the design of train timetables and limits the capacity of the network to accommodate trains. Figure 4.2 shows the location and length of available crossing facilities on the mainlines.

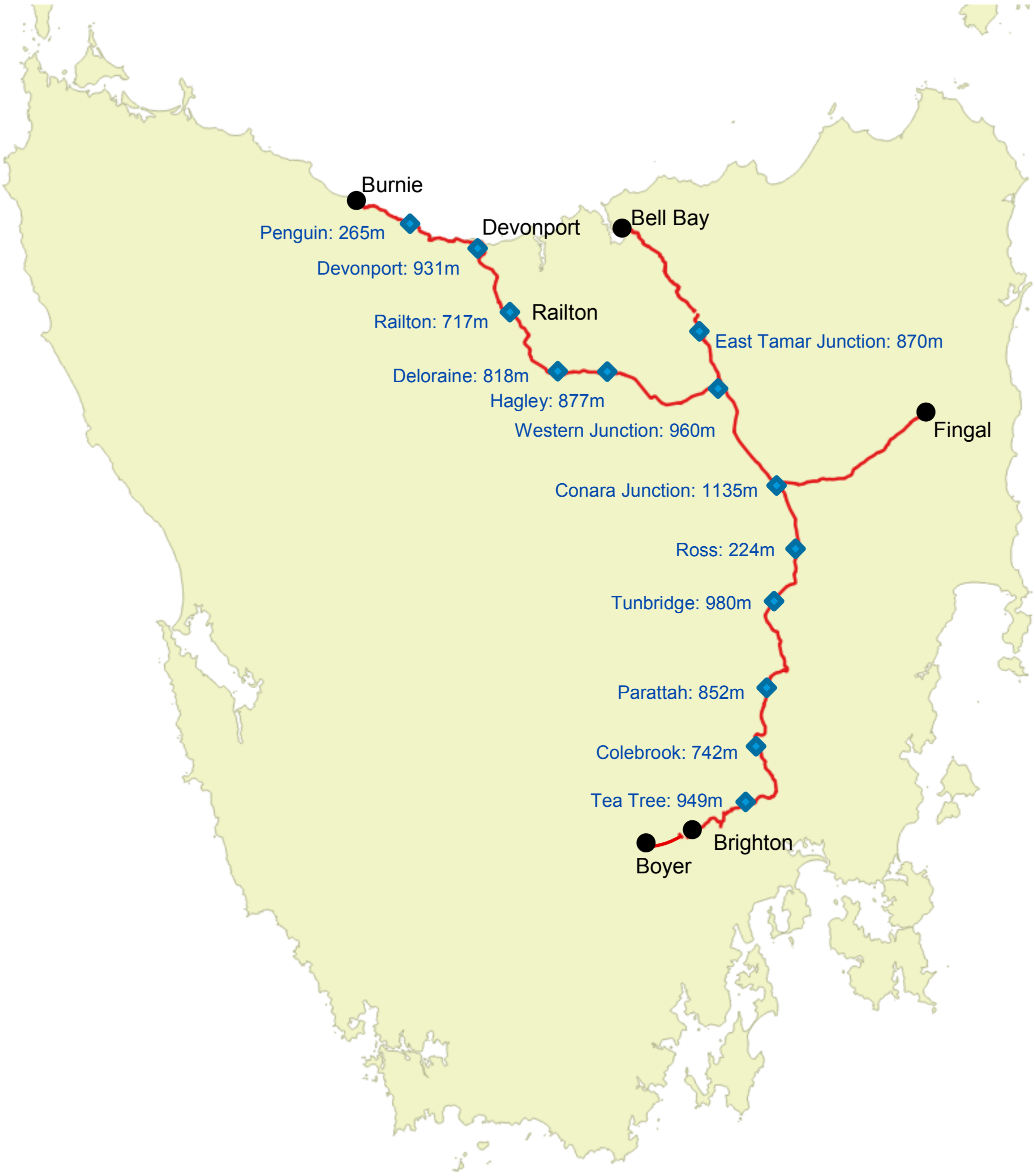


Figure 4.2 Location of crossing loops

Appendix B

CHARACTERISTICS OF THE ROAD NETWORK

B.1 ROAD CATEGORIES

Department of State Growth has adopted a five-tier road hierarchy to assist plan and manage its network. These standards are applied to the network to reflect the use, operating speed and surrounding environment.

The hierarchy identifies five categories of roads:

- ***Category 1 Roads***: The primary freight and passenger roads connecting Tasmania.
- ***Category 2 Roads***: Tasmania's major regional roads for carrying heavy freight.
- ***Category 3 Roads***: The main access roads to Tasmania's regions, carrying less heavy freight traffic than regional freight roads.
- ***Category 4 Roads***: Allowing safe travel between towns, major tourist destinations and industrial areas.
- ***Category 5 Roads***: The remainder of the state roads.

Table B.1 shows how the standards are applied across the main road network. The Burnie to Hobart corridor is assigned a Category 1 rating, including Illawarra Road,

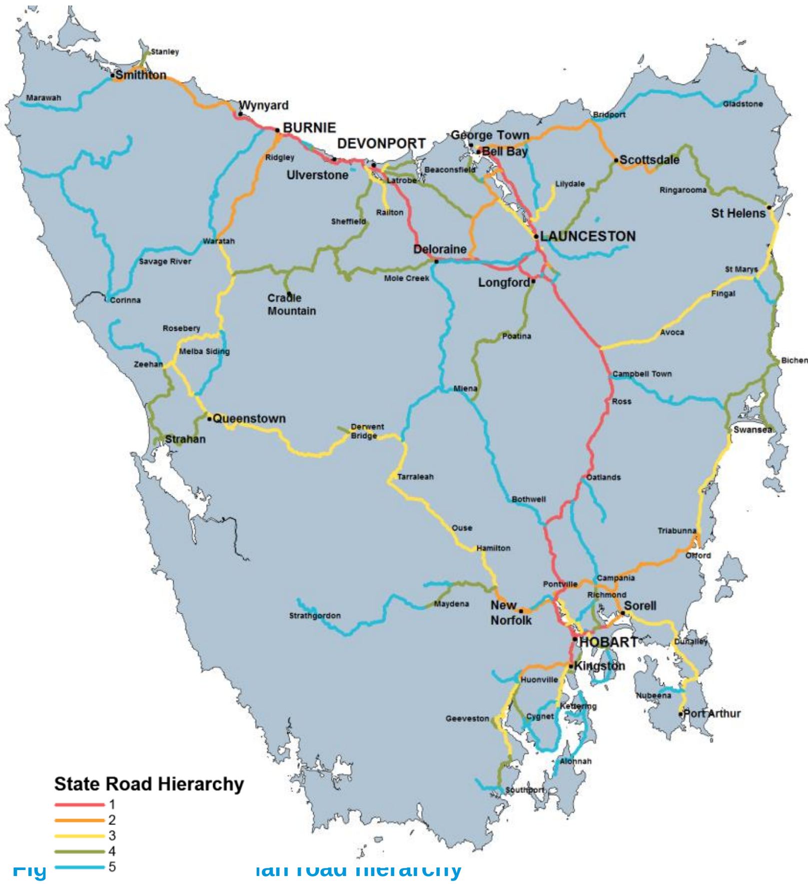
The standards applying to Category 1 Roads are as follows:

- 3.5m lanes
- 2m sealed shoulders
- central 2.1m median with flexible safety barrier
- regular overtaking lanes
- dual carriageway where volumes above 15000 per day

Some of the feeder roads are of a lesser standard. Roads north and south of Railton and between Fingal and Conara are of note in this regard. The very low rating of Boyer Road can be avoided by utilising the Lyell Highway, albeit that trucks from the paper mill would need to back track via Rocks Road to access this route.

Table B.1 Burnie to Hobart corridor road hierarchy classifications

STUDY ROAD SECTION	STATE ROADS NETWORK SECTION	CATEGORY
Smithton<>Burnie	Smithton<>Wynyard	2
Smithton<>Burnie (before Burnie)	Wynyard<>Burnie	1
Burnie<>Devonport	Burnie<>Devonport	1
Devonport<>Elizabeth Town (turnoff)	Devonport<>Elizabeth Town	1
Devonport<>Railton	Devonport<>Railton	3
Railton<>Elizabeth Town	Railton<>Elizabeth Town	n/a
Elizabeth Town<>Illawarra Main Road (turnoff)	Elizabeth Town<>Illawarra Main Road	1
Illawarra Main Road (to Perth)	Illawarra Main Road	1
Launceston<>Bell Bay (south of Batman Bridge)	Launceston<>Bell Bay	1
Illawarra Main Road turn-off <> Launceston	Illawarra Main Road <> Launceston	1
Launceston<>Perth	Launceston<>Perth	1
Perth<>Conara	Perth<>Conara	1
Conara<>Fingal	Conara<>Fingal	3
Conara<>Brighton Hub (Brighton Hub)	Conara<>Brighton	1
Brighton<>Boyer	Brighton<>Boyer (via Boyer Road)	5
Bridgewater Bridge	Bridgewater Bridge	1
Brooker Highway (South of Bridgewater Bridge)	Brooker Highway (Bridgewater Bridge<>Goodwood)	1
Brooker Highway (North of Bowen Bridge)	Brooker Highway (Bridgewater Bridge<>Goodwood)	1

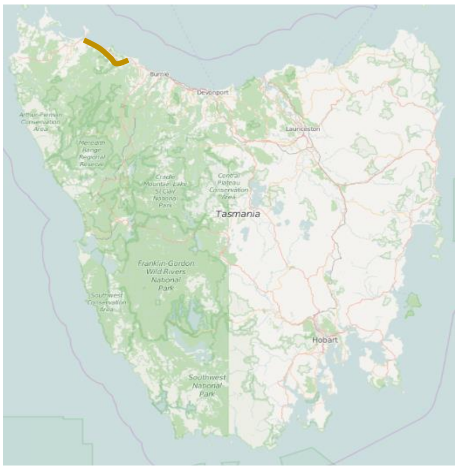


Source: Roads for Our Future: State Roads

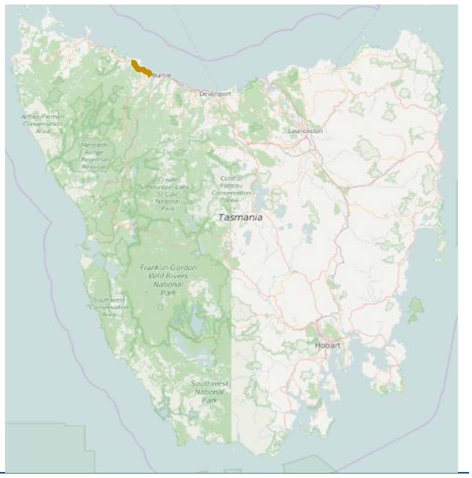
B.2 ROUTE DESCRIPTION

The following tables provide an overview of the existing road network

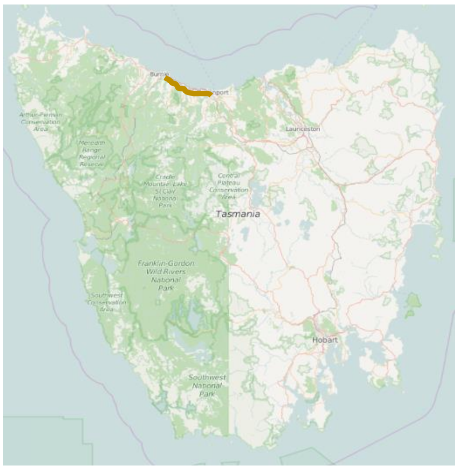
Section	Smithton<>Burnie (western section)
Road Names	Bass Highway
Section Length	55-km
Ownership	State Growth
Road Classification	Category 2
Maximum Permitted Truck	HML
Number of Lanes	2
Typical Lane Widths	2.9m – 3.1m
Sealed Shoulders	Yes



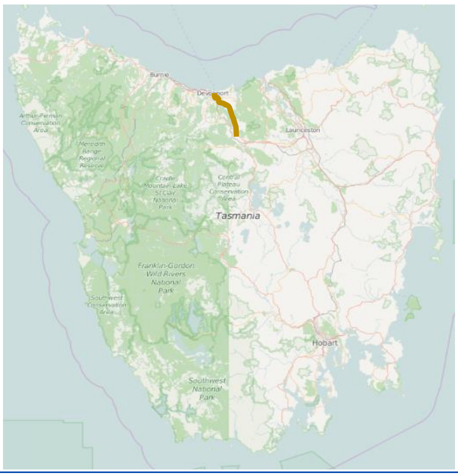
Section	Smithton<>Burnie (eastern section)
Road Names	Bass Highway
Section Length	15-km
Ownership	State Growth
Road Classification	Category 1
Maximum Permitted Truck	HML
Number of Lanes	2
Typical Lane Widths	3.3m
Sealed Shoulders	Yes



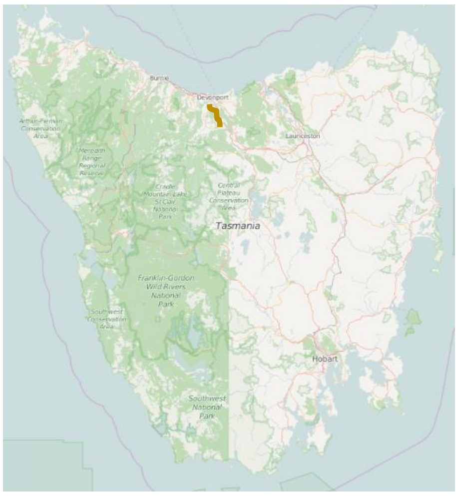
Section	Burnie<>Devonport
Road Names	Bass Highway
Section Length	26-km
Ownership	State Growth
Road Classification	Category 1
Maximum Permitted Truck	HML
Number of Lanes	2 / 4
Typical Lane Widths	3.3m
Sealed Shoulders	Yes



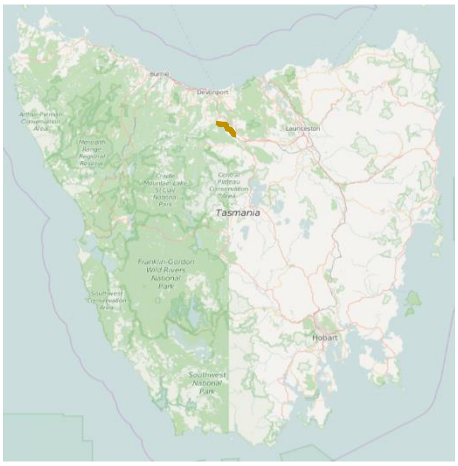
Section	Devonport<>Elizabeth Town
Road Names	Bass Highway
Section Length	40-km
Ownership	State Growth
Road Classification	Category 1
Maximum Permitted Truck	HML
Number of Lanes	2 / 4
Typical Lane Widths	3.3m
Sealed Shoulders	Yes



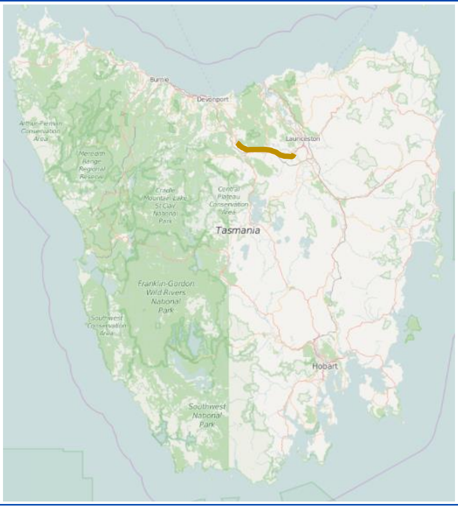
Section	Devonport to Railton
Road Names	Mersey Main Road/ Railton Road/ Latrobe Road
Section Length	24-km
Ownership	State Growth/ Latrobe Council
Road Classification	Category 3
Maximum Permitted Truck	HML
Number of Lanes	2
Typical Lane Widths	3.0m
Sealed Shoulders	Yes



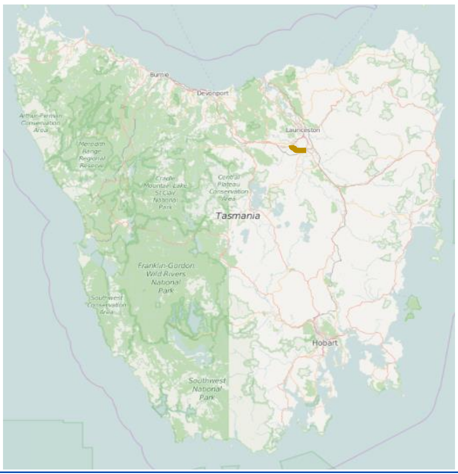
Section	Railton<>Elizabeth Town
Road Names	Railton Road/ Bass Highway
Section Length	21.7-km
Ownership	State Growth
Road Classification	Category 4/ Category 1
Maximum Permitted Truck	Not HML
Number of Lanes	2 / 4
Typical Lane Widths	3.0m – 3.3m
Sealed Shoulders	Yes



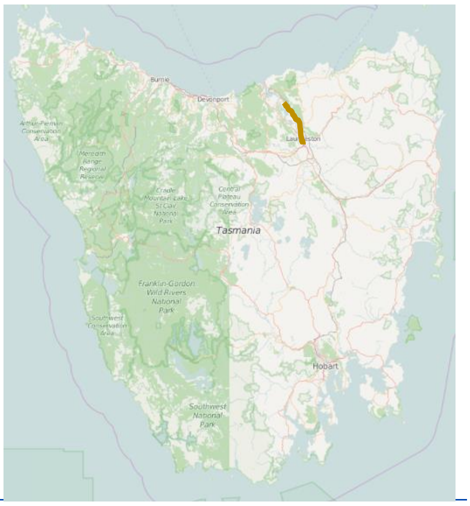
Section	Elizabeth Town<>Illawarra Road (Carrick)
Road Names	Bass Highway
Section Length	43.6-km
Ownership	State Growth
Road Classification	Category 1
Maximum Permitted Truck	HML
Number of Lanes	2 / 4
Typical Lane Widths	3.3m
Sealed Shoulders	Yes



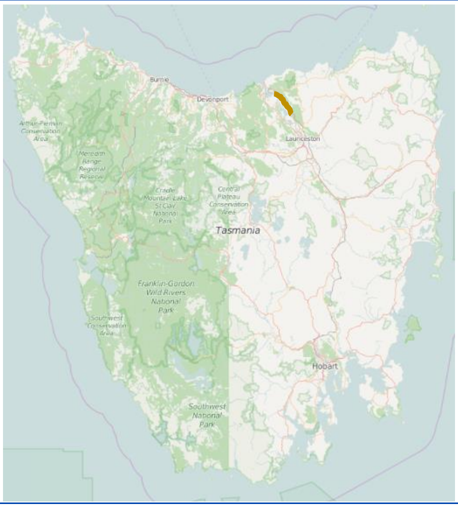
Section	Illawarra Road (Carrick<>Perth)
Road Names	Illawarra Road
Section Length	16.0-km
Ownership	State Growth
Road Classification	Category 1
Maximum Permitted Truck	HML
Number of Lanes	2
Typical Lane Widths	3.2m
Sealed Shoulders	No



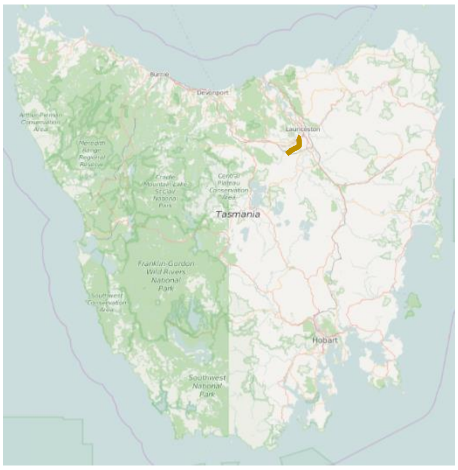
Section	Launceston<>Bell Bay (south of Batman Bridge)
Road Names	East Tamar Highway
Section Length	31-km
Ownership	State Growth
Road Classification	Category 1
Maximum Permitted Truck	HML
Number of Lanes	2 / 3
Typical Lane Widths	3.3m
Sealed Shoulders	Yes



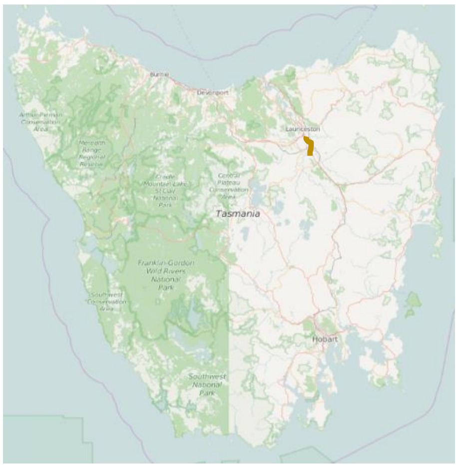
Section	Launceston<>Bell Bay (north of Batman Bridge)
Road Names	East Tamar Highway
Section Length	14.0-km
Ownership	State Growth
Road Classification	Category 1
Maximum Permitted Truck	HML
Number of Lanes	2
Typical Lane Widths	3.3m
Sealed Shoulders	Yes



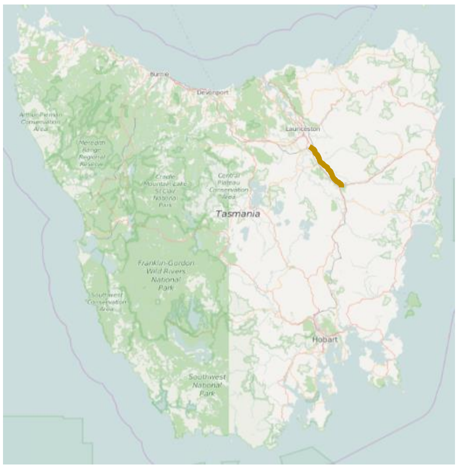
Section	Illawarra Road (Carrick)<>Launceston
Road Names	Bass Highway / Midland Highway
Section Length	20-km
Ownership	State Growth
Road Classification	Category 1
Maximum Permitted Truck	HML
Number of Lanes	2 / 4
Typical Lane Widths	3.3m
Sealed Shoulders	Yes



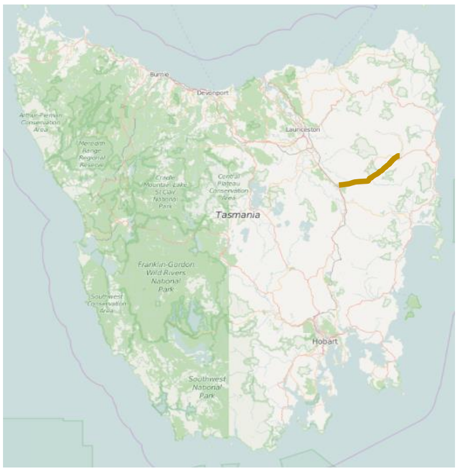
Section	Launceston<>Perth
Road Names	Midland Highway
Section Length	17.0-km
Ownership	State Growth
Road Classification	Category 1
Maximum Permitted Truck	HML
Number of Lanes	4 / 2
Typical Lane Widths	3.3m
Sealed Shoulders	Yes



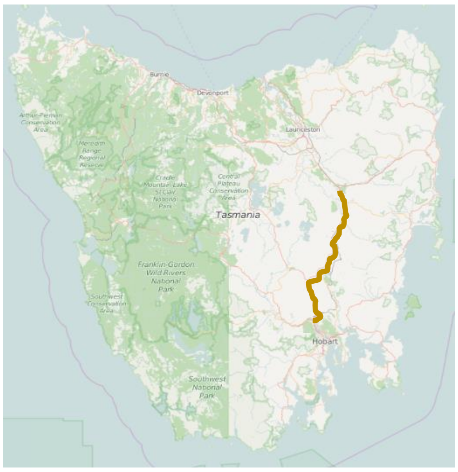
Section	Perth<>Conara
Road Names	Midland Highway
Section Length	39-km
Ownership	State Growth
Road Classification	Category 1
Maximum Permitted Truck	HML
Number of Lanes	2 / 4
Typical Lane Widths	3.3m
Sealed Shoulders	Yes



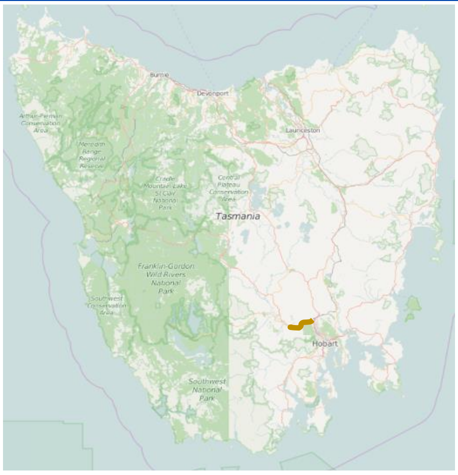
Section	Conara<>Fingal
Road Names	Esk Main Road
Section Length	52-km
Ownership	State Growth
Road Classification	Category 3
Maximum Permitted Truck	HML
Number of Lanes	4 / 2
Typical Lane Widths	3.0m
Sealed Shoulders	Yes



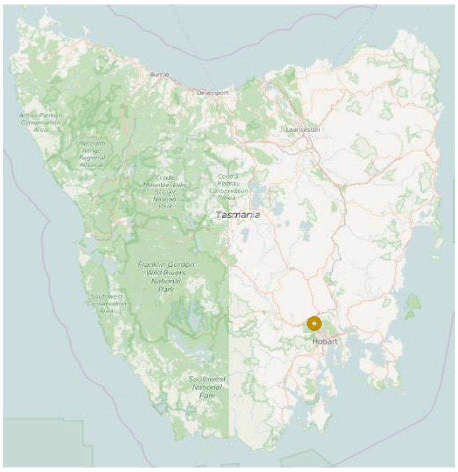
Section	Conara<>Brighton Hub
Road Names	Midland Highway
Section Length	122-km
Ownership	State Growth
Road Classification	Category 1
Maximum Permitted Truck	HML
Number of Lanes	2 / 4
Typical Lane Widths	3.3m
Sealed Shoulders	Yes



Section	Brighton<>Boyer
Road Names	Boyer Road
Section Length	18.7-km
Ownership	State Growth
Road Classification	Category 3
Maximum Permitted Truck	HML
Number of Lanes	2
Typical Lane Widths	3.0m
Sealed Shoulders	Yes



Section	Bridgewater Bridge
Road Names	Midland Highway
Section Length	1-km
Ownership	State Growth
Road Classification	Category 1
Maximum Permitted Truck	HML
Number of Lanes	2
Typical Lane Widths	3.0m
Sealed Shoulders	Yes



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