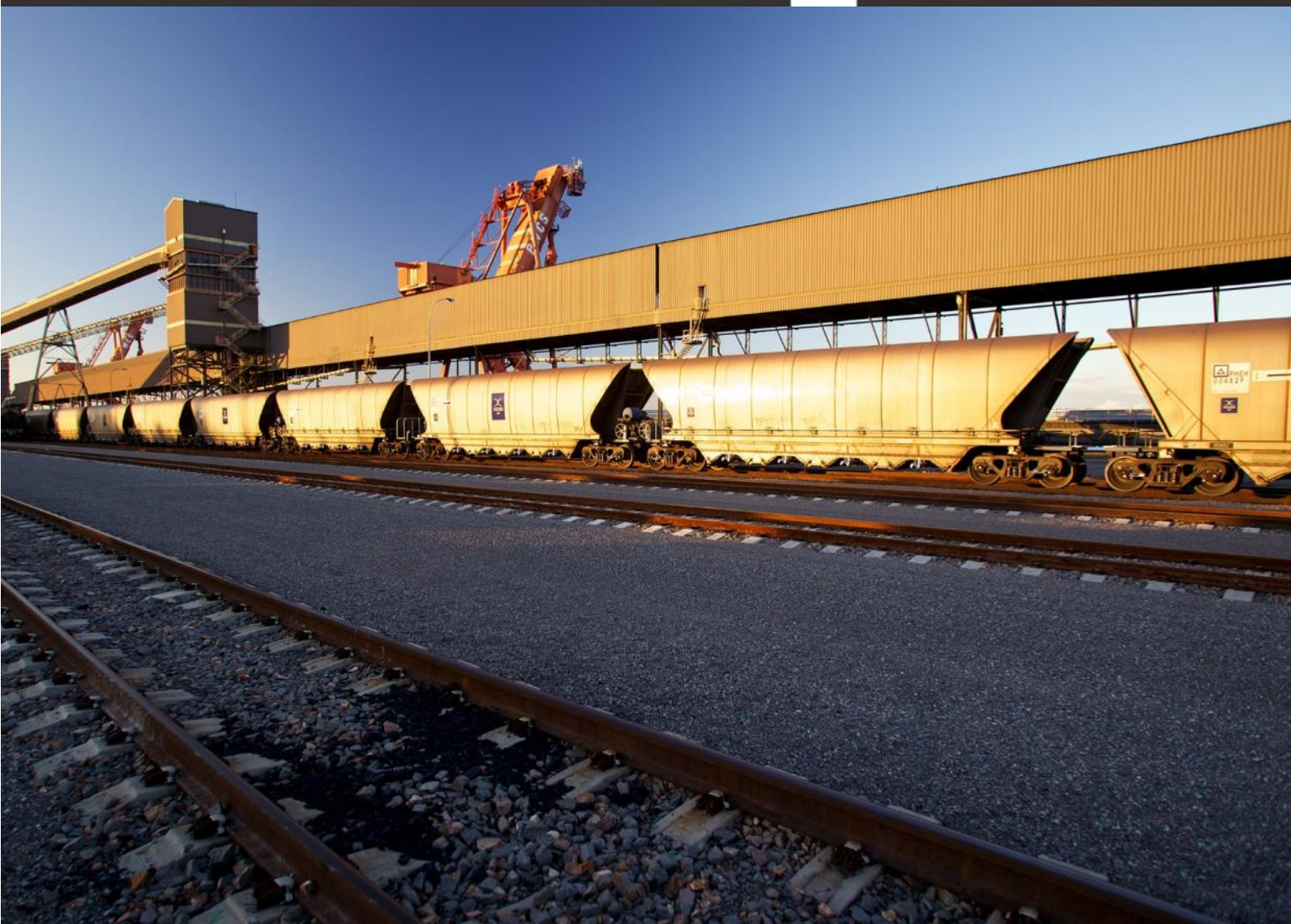
2024 HUNTER VALLEY CORRIDOR CAPACITY STRATEGY

CONSULTATION DRAFT

November 2024

ARTC



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NOVEMBER 2024

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INTRODUCTION

Key Points

- No projects are required for the Contracted volume scenario on all three zones.
- Projects are only required in Zone 3 under the Most Likely and Prospective volume scenarios.
- ATMS is no longer assumed in the Strategy.

Context

On 5 September 2004, the Australian Rail Track Corporation (ARTC) commenced a 60-year lease of the Interstate and Hunter Valley rail lines in New South Wales.

In early 2005, ARTC began to release an annual Hunter Valley Corridor Capacity Strategy (HVCCS), or the 'Strategy', setting out how ARTC planned to ensure that rail corridor capacity in the Hunter Valley would stay ahead of coal demand. This HVCCS is the fifteenth of these annual strategies.

The Hunter Valley rail network (figure 1-1) is an integral part of the world's largest coal export supply chain. It consists of a dedicated double track 'coal line' between Port Waratah and Maitland, a shared double track line (with some significant stretches of third track) from Maitland to Muswellbrook in the upper Hunter Valley, and a shared single track with passing loops from that point north towards Gunnedah and west towards Ulan.

Nearly all export coal shipped through Newcastle is transported by rail across this network for shipping from Carrington (Port Waratah), or one of the two terminals on Kooragang Island.

In common with the earlier strategies, this Strategy identifies the future constraints on the coal network's capacity, the options to resolve these constraints and a proposed course of action to achieve demand forecasts.

The fundamental approach of ARTC in developing this Strategy has been to provide sufficient capacity to meet contracted volumes based on the principles of the ARTC Hunter Valley Access Undertaking (HVAU). It also identifies those projects that would be required to accommodate volumes that have not yet been the subject of a contractual commitment, though these are hypothetical scenarios only and do not imply that such volumes will be contracted.

The underlying capacity of the system that has been built up over time has more than accommodated the contracted volumes across the network. However, changes to the configuration and performance of the train fleet that utilise the network, and operational and weather-related impacts on mining, train-running and track and related assets, have impacted the consumption of capacity across the network on a year-on-year basis and this continues to be reported in this edition of the strategy.

Customers have expressed interest in ARTC focusing on the increased efficiency and utilisation of the network rather than investment in additional capital infrastructure. Consistent with this, underlying network capacity increased from Q1 2022 with the adoption of the higher utilisation threshold of 73.5%, which deferred the need for some new capital works.

Like previous strategies, this strategy contemplates 'most likely' and 'prospective' scenarios in addition to the 'contracted' volume scenario. The most likely and prospective scenarios have been directly provided by producers and endorsed by the Rail Capacity Group (RCG).

The nominated most likely and prospective volumes inclusive of domestic demand peak at 194 and 206 million tonnes per annum (mtpa), respectively. The Most Likely volume is similar to the 2023 Strategy while the Prospective volumes are lower.

For administrative purposes under the HVAU, the network is categorised into three zones, Ports - Bengalla (zone 1), Bengalla - Ulan (zone 2) and Muswellbrook -

Narrabri (zone 3). This Strategy sometimes refers to these zones rather than section names, noting that for simplicity Muswellbrook - Bengalla is sometimes treated as being in zone 2 as it is located on the Ulan line.

It is important to note that the whole Hunter Valley coal supply chain is interlinked. The stockpiling and loading capability of the mines is interdependent to the trains required, while the train numbers are interdependent to the rail infrastructure and so on. The capacity and performance of the system is entirely interlinked and the capacity of the rail network needs to be considered in that context.

In determining capacity and its consumption ARTC makes certain assumptions which are generally covered in this Strategy. The data used to undertake this analyses is from 2023. The delivery of throughput to align to capacity can be impacted by a range of performance issues across the supply chain. While some of these performance issues are covered in this document, it is not the key purpose of the Strategy.

HVCCC Master Planning

Capacity analysis in this Strategy takes no account of the capabilities of loading and unloading interfaces, including the capabilities of private rail sidings and balloon loops. In other words, at the conclusion of each project the identified rail capacity will be available, but this does not necessarily mean the coal supply chain will be able to make use of this capacity at that stage. This broader coal supply chain capacity analysis is undertaken by the Hunter Valley Coal Chain Coordinator (HVCCC).

The HVCCC is responsible for the co-ordination of coal chain planning on both a day-to-day and long term basis. Its role includes continuously developing a Hunter Valley Master Plan that deals with the optimisation of capacity enhancements across all elements of the coal chain with a view to providing an integrated planning road map.

ARTC is strongly supportive of this master planning process. It sees this Strategy as both needing to provide the supporting rail infrastructure analysis for the master planning process, and to respond to the investment options identified in the Master Plan.

The HVCCC also makes an annual declaration of the system capacity of the Hunter Valley coal chain in the demand context of track contracted volumes. For 2024, the HVCCC has determined that track system capacity does not represent a constraint on system throughput. That is, HVCCC has forecast that track system capacity will not constrain currently contracted volumes.

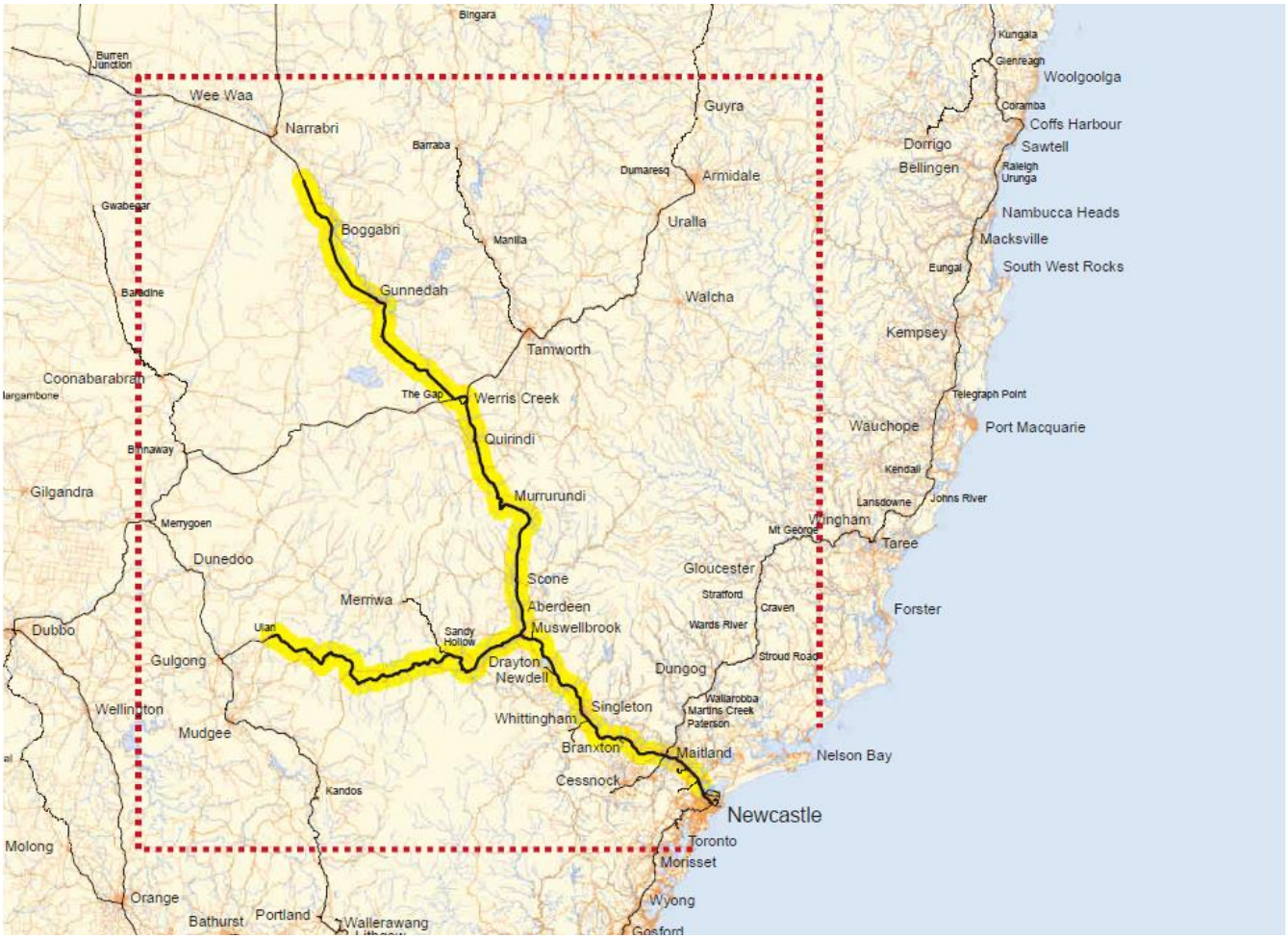

Figure 1-1 - The general location of the Hunter Valley network on the east coast of Australia.

Delivering capacity efficiently

ARTC's forward investment program has in recent years shifted to focus on technology, innovation and better utilisation of existing network infrastructure, with a view to increasing efficiency and lowering cost on a whole-of-coal-chain basis. Underpinning this approach is the introduction of the ARTC Network Control Optimisation (ANCO) project to optimise ARTC's network control in the Hunter Valley through enhanced dynamic capability to manage variation and streamline network wide train management.

ANCO was implemented between Hexham and Newcastle port in late 2020, marking the completion of ANCO implementation across the Hunter Valley network that commenced on the Gunnedah and Ulan lines in 2017.

Previous strategies had outlined the delivery of the Advanced Train Management System (ATMS). The rollout of ATMS across the ARTC Network, including the Hunter Valley, has been replaced with the pursuit of a nationally interoperable safeworking system that is based off European Train Control System (ETCS) technology. The timing of this new safeworking system is currently unknown.

Volume Forecasts

ARTC contracts on a rolling 10 year "evergreen" basis. Contracted export coal volumes are 183.5 mtpa in Q1 2024. These volumes gradually decline, falling to 116 mtpa in 2032, as some Access Holders choose not to roll over some volume.

Contracted volumes also include up to 8.8 mtpa of domestic coal. This volume is included in all modelling of capacity and utilisation. This volume declines to 5 mtpa from 2026.

The Strategies have always set out a 'prospective' volume scenario to provide an understanding of the consequences of a high-end volume outcome. The strategy since 2017 has included a 'most likely' scenario as a middle ground to help support more detailed capacity planning.

The most likely and prospective scenarios have been sourced from current and potential access holders on the basis that:

- Most likely volume is the volume pathway that access holders consider is their best assessment of future volume; and
- Prospective volume is that which access holders consider is their best assessment of maximum potential volume over and above existing contracts.

Under the provisions of the HVAU, it is a matter for the RCG to determine the prospective volumes that are to be used for the purposes of this Strategy. The RCG comprises representatives of the access holders, along with the HVCCC and rail operators. The three volume

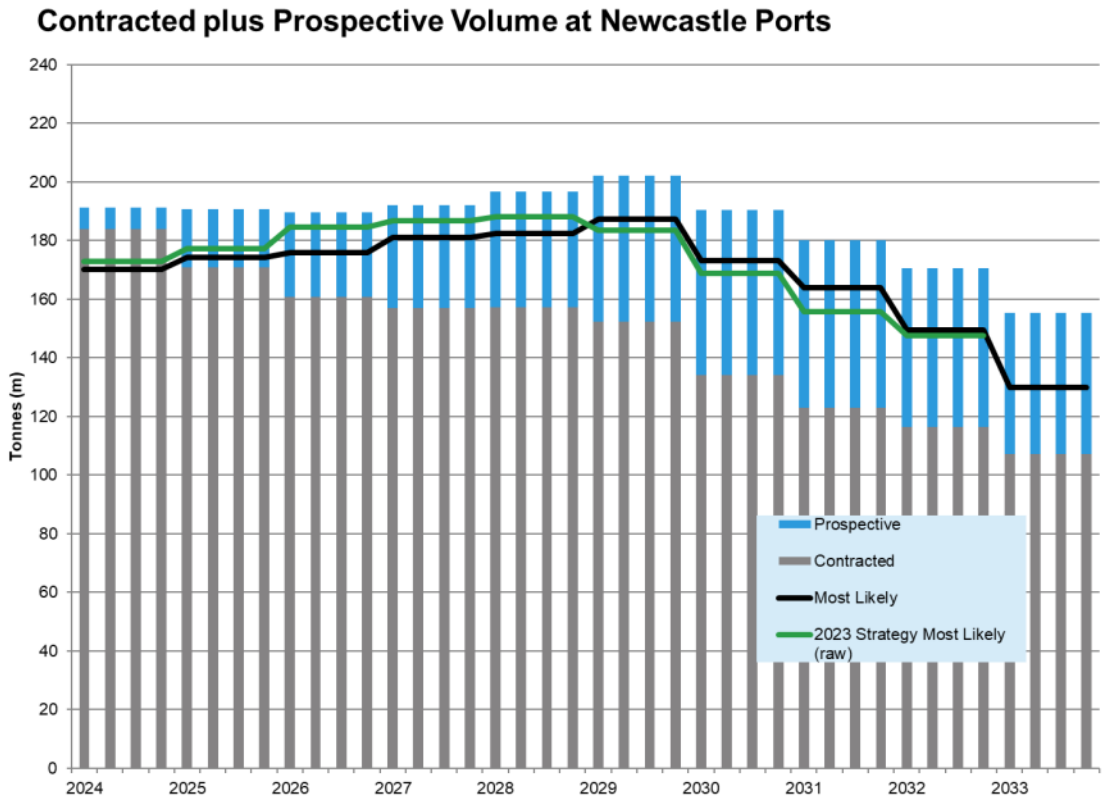

Figure 1-2 - Current Volume Forecasts vs. 2023 Strategy Volume Forecast, Newcastle Terminals (mtpa)

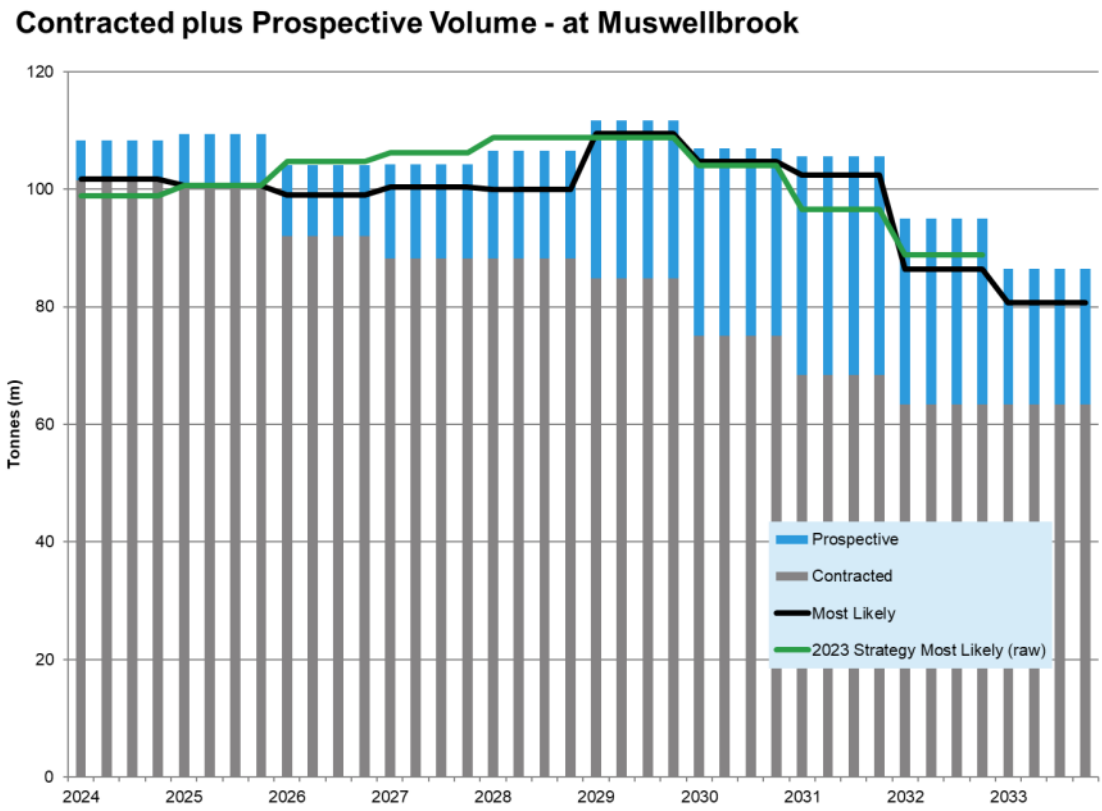

Figure 1-3 - Current Volume Forecasts vs. 2023 Strategy Volume Forecast, Muswellbrook (mtpa)

scenarios have been reviewed and supported by the RCG.

This Strategy continues to calculate capacity directly from the contracted number of paths.

Inclusion of a volume in the most likely or prospective scenario does not imply that ARTC believes that the volume will eventuate. Rather, it is used as a guide as to the nature of the potential projects required in that growth environment.

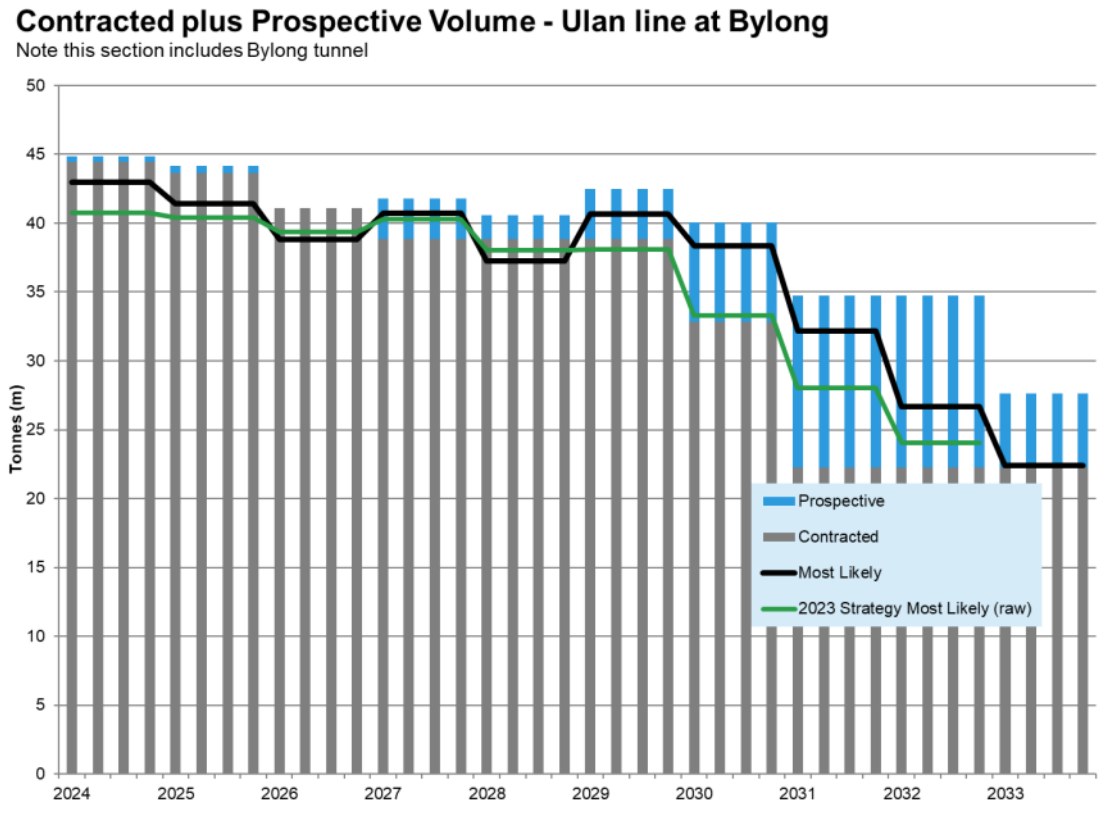

Figure 1-4 - Current Volume Forecasts vs. 2023 Strategy Volume Forecast, Bylong—Mangoola (mtpa)

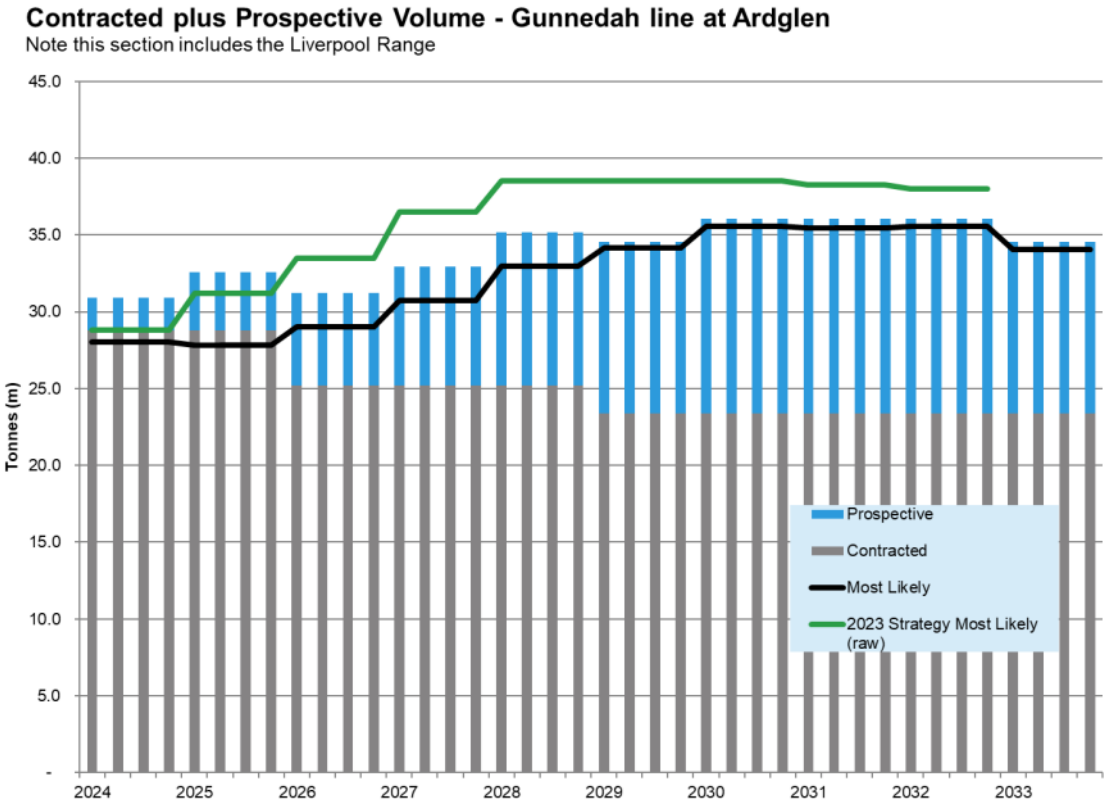

Figure 1-5 - Current Volume Forecast vs. 2023 Strategy Volume Forecast, Werris Creek—Muswellbrook (mtpa).

The most likely and prospective scenarios include some forecasts that sit below currently contracted volumes. This Strategy is based on these raw volumes rather than using the greater of contracted and producer nominated volumes.

The most likely scenario in this 2024 Strategy are similar to the 2023 Strategy for volumes from zones 1 and 2 but are lower in zone 3. The volumes under the prospective scenario are lower than the previous Strategy.

Figures 1-2 to 1-5 show the three volume scenarios. The most likely scenario is shown for both this Strategy (black line) and the 2023 Strategy (green line) to allow for a comparison.

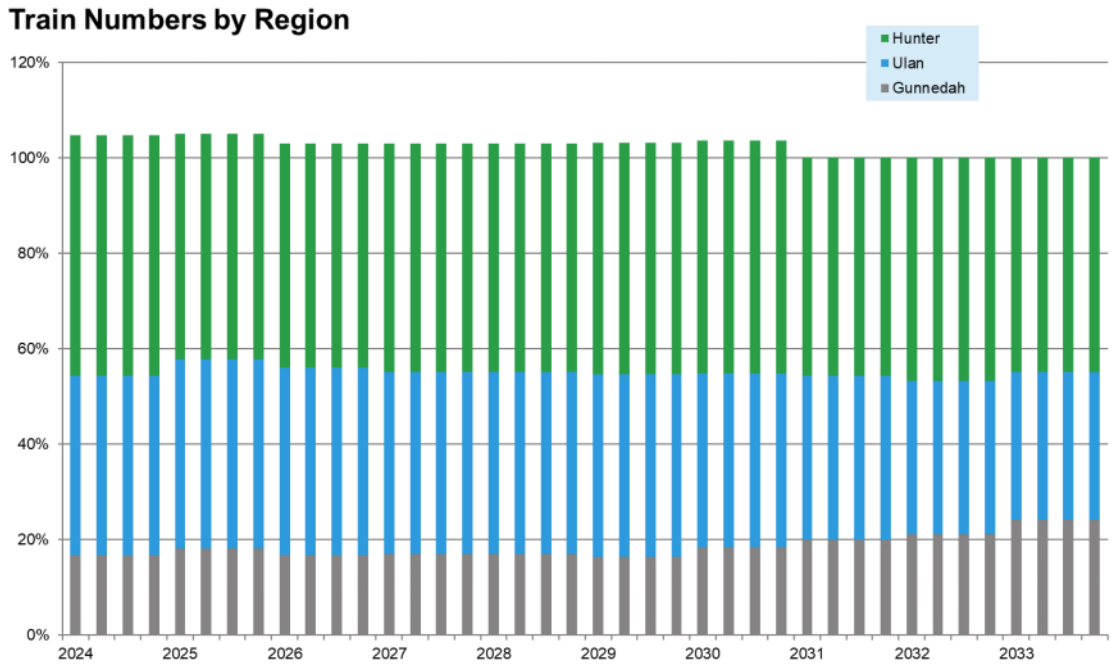

Figure 1-6 - Percentage of Trains by Sub-Network by Year, prospective scenario. Note that total train numbers are calculated as trains from each of the three zones as a proportion of all trains arriving at the port. The total number of trains exceeds 100% due to domestic coal.

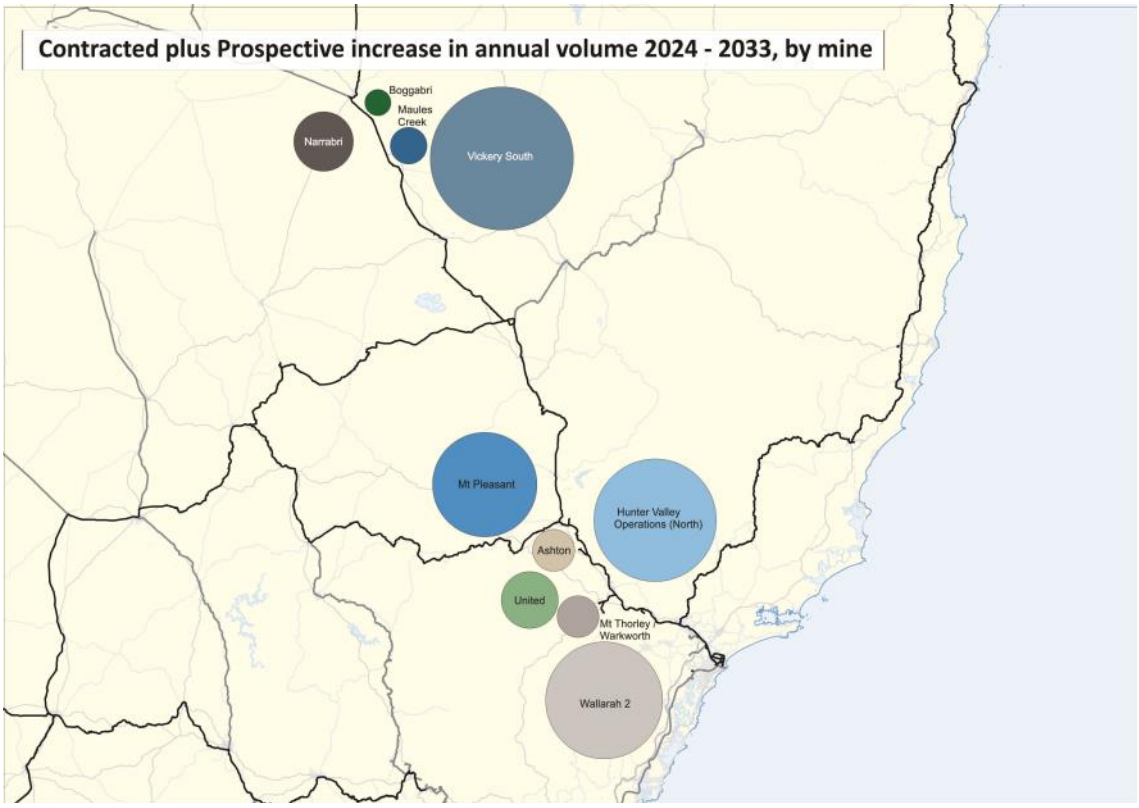

Figure 1-7 - Volume growth forecasts by mine, prospective scenario. Note that growth is represented by diameter.

Volume is shown at the Newcastle terminals, at Muswellbrook, at Bylong for the Bylong – Mangoola section (which is the majority of the Ulan line), and at Ardglen for the Werris Creek – Muswellbrook (which is representative of most of the Gunnedah basin line). Figure 1-6 shows the proportion of total trains by zone while figure 1-7 shows net growth under the prospective scenario geographically.

There is still a small but notable volume of traffic from the Western coal fields exported through Newcastle rather than the traditional Port Kembla export pathway and there is a small volume originating from mines near Lake Macquarie. This volume is generally using paths contracted from the coal fields south of Newcastle and on this basis has been implicitly recognised in the volume forecasts in this Strategy.

How this Strategy has been developed

The development of this Strategy retains the core and well documented methodology of recent editions of the Strategy. For further information, refer to this section of previous editions.

This Strategy factors in the agreed terms of the latest HVAU that commenced in Q1 2022 where at its core ARTC is increasing throughput opportunities by further leveraging the existing network infrastructure instead of delivering significant capital works. The utilisation capacity of the Gunnedah and Ulan lines has increased by 3.5% points to an agreed 73.5% for the term of the HVAU (until the end of 2026).

Adjustment factor	2023 Strategy	2024 Strategy
Live run losses (3-year avg)	Zone 1: 8.3% Zone 2: 8.7% Zone 3: 9.3%	Zone 1: 8.7% Zone 2: 9.0% Zone 3: 9.2%
Maintenance	All zones: 12.3%	All zones: 12.3%
TMTC	All zones: 10%	All zones: 10%
Adjustment Factor	**Zone 1: 74.8% Zone 2: 74.5% Zone 3: 74.1%**	**Zone 1: 74.5% Zone 2: 74.3% Zone 3: 74.1%**

Table 1-1 - Adjustment Factor (note that the final total is arrived at by multiplication of the percentage rates rather than addition). This 2024 Strategy only includes raw data from 2023.

This increase has been the most recent change in underlying capacity, which has continued to adequately accommodate the coal volumes that are contracted to be moved across the network. This Strategy continues to calculate the impact on the consumption of that capacity from changes in the performance of the train fleet that utilise the network and the impact of changes in live-run losses, which vary year-on-year.

This Strategy uses a three-year rolling average live run loss rate.

The live run losses are calculated as the difference between planned and actual tonnes divided by planned tonnes. This percentage is then converted into an escalation to reflect the required uplift in capacity. The adopted rates are shown in Table 1-1.

This methodology provides greater transparency and consistency, and allows for differential rates across the three zones, giving greater accuracy in the calculation of capacity on different sections of the network. This replaced the single adjustment factor across the network was that was used in pre-2021 editions.

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The maintenance loss rate has been left unchanged at 12.3%.

Consistent with the HVAU, a variability buffer has been formalised in the form of the Target Monthly Tolerance Cap (TMTC). A 10% TMTC has continued to be utilised for the 2024 Strategy.

The build-up of the Adjustment Factor for this Strategy, and comparison with the assumptions in the 2023 Strategy, is also shown in Table 1-1.

The loss rates improved across all zones in 2023, particularly in Zone 3, due to a drop in the number of incidents including weather-related events. However, the adjustment factors for each zone are largely similar to the 2023 Strategy because loss rates in the preceding years have been varied and the use of a 3-year rolling average smooths out fluctuations in the annual rates.

The Strategy continues to use actual train performance derived from the digital train radio system as the basis for calculating section run times.

Transaction times for zones 2 and 3 remain the same as in the 2023 Strategy.

The list of train consists used for the purposes of calculating train performance includes the following:

Ulan line:

- Pacific National—3 x 92/93/TT class (4400HP AC) locos with 96 wagons - 9,100 net tonnes, 1,541 metres nominal length.
- Pacific National—3 x 90 class (4000HP DC) locos with 92 wagons - 8,500 net tonnes, 1,529 metres.
- Aurizon—2 x 5000/5020 class (4400HP 30 TAL AC) locos with 88 wagons - 8,600 net tonnes, 1,492 metres.
- Aurizon—3 x 6000 class (4400HP AC) locos with 96 wagons—9,389 net tonnes, 1,543 metres
- One Rail—3 x GWA class (4400HP AC) locos with 96 wagons - 9,100 net tonnes, 1,541 metres.

Gunnedah line:

- Pacific National—3 x 92/93/TT class (4400HP AC) locos with 82 wagons - 7,954 net tonnes, 1,296 metres.
- Aurizon—3 x 6000 class (4400HP AC) locos with 82 wagons - 7,954 net tonnes, 1,296 metres.
- Aurizon—2 x 6000 class (4400HP AC) and 1 x 5000/5020 class (4250/4500HP AC) locos with 82 wagons - 7,954 net tonnes, 1,296 metres.
- Aurizon—2 x 5000/5020 class (4250/4500HP AC) locos with 82 wagons - 7,954 net tonnes, 1,296 metres.

The length of wagons can vary resulting in slight variations in train lengths across both lines.

The changes in the consumption of capacity as a result of the enhancements outlined in this section, including using an updated three-year rolling average of live run losses and updated train performance, are detailed in the relevant chapters. The impact of each change element has been quantified, which improves the transparency and traceability of changes to the methodology and allows for a comparison of performance in this Strategy with previous strategies.

Saleable & Surplus Capacity

At the time ARTC enters into contracts, capacity is based on a set of assumptions. Previous Strategies have noted that the need to constantly update the cancellation and maintenance loss rates to reflect current actual performance could have the unintended consequence that as these change over time it may infer that there is a shortage of capacity even though the capacity existed at the time contracts were entered into and the changes may be external to ARTC. This is compounded by the inevitability of changes to section run times as the train fleet evolves and operational changes are made. Also, the increase in the accuracy and granularity of train performance information made possible by the digital train radio system has led to the resetting of section run times and transaction times, which also feeds through to changes in capacity.

For the purposes of capacity planning, it is also important to understand likely throughput outcomes compared with the capacity projections at a point in time in the past. ARTC continues to monitor how actual performance compares to underlying assumptions. Where there is a sustainable change in performance, ARTC will consider whether a reset of assumptions is appropriate, noting that recognition of sustainable changes in performance assists to create appropriate incentives to maximise system performance.

Consistent with previous strategies, the saleable paths and saleable tonnage tables for the contracted, most likely and prospective scenarios remain in the Recommended Projects & Network Capacity chapter (Chapter 8).

Monthly Tolerance

The Target Monthly Tolerance Cap (TMTC) is designed to enable the contracted pathing to have a degree of flex to align with the supply and demand variations across the respective zone. This target can also be an input into decisions about enhancement investment and contracting of additional volume. The intention is that ARTC will ensure adequate capacity to allow a peaking in train path demand equal to the TMTC, relative to the average across the year. This Strategy, like most previous editions, applies a uniform 10% across all zones in the Hunter Valley, unchanged from the 2023 Strategy.

Transit Times

For any volume and network configuration scenario it is possible to predict a theoretical train transit time between two locations based on the actual train speed and transaction time information and a probability based approach to calculating theoretical loop dwell, escalated by an allowance for congestion delay based on percentage section utilisation.

This 2024 Strategy includes graphs of forecast transit times for each of the contracted, most likely and prospective scenarios calculated on this basis. These graphs first appeared in the 2019 Strategy and are included in the relevant Chapters and should allow the industry to develop a broad understanding of likely future cycle time outcomes.

It should be noted that adopting higher utilisation rates as with ANCO results in an increase in theoretical dwell and hence transit time as there are more trains for a given population of loops, thus increasing the probability of encountering an opposing movement without any offsetting reduction in the average length of dwell.

Where loops are used to enhance capacity, there is an increase in the probability of encountering an opposing train, but a reduction in the average dwell time at that location, since loops are on average closer together. Whether there is an increase or decrease in transit time in this case will depend on the specific circumstances and balance of these effects.

It should also be noted here that cycle time, including terminal and load point dwell, is a direct function of the number of trains required to move the available coal, divided by the number of train sets available. To the extent that there are surplus train sets in the system, velocity will necessarily slow down. This effect will in many cases be a more important consideration than crossing time on the rail network. However, it should be acknowledged that at times train cycle time performance may not be the ultimate objective.

Terminal Capacity

The Hunter Valley coal chain is built around the need to feed coal into the export terminals owned by Port Waratah Coal Services (PWCS) and Newcastle Coal Infrastructure Group (NCIG).

ARTC's understanding of terminal capacity is that nameplate capacity is currently 224 mtpa. There is no requirement for additional terminal capacity for ARTC contracted, most likely or prospective volumes.

The relationship between contracted, most likely and prospective volumes, and potential terminal capacity as assumed for this Strategy, is shown in Figure 1-8.

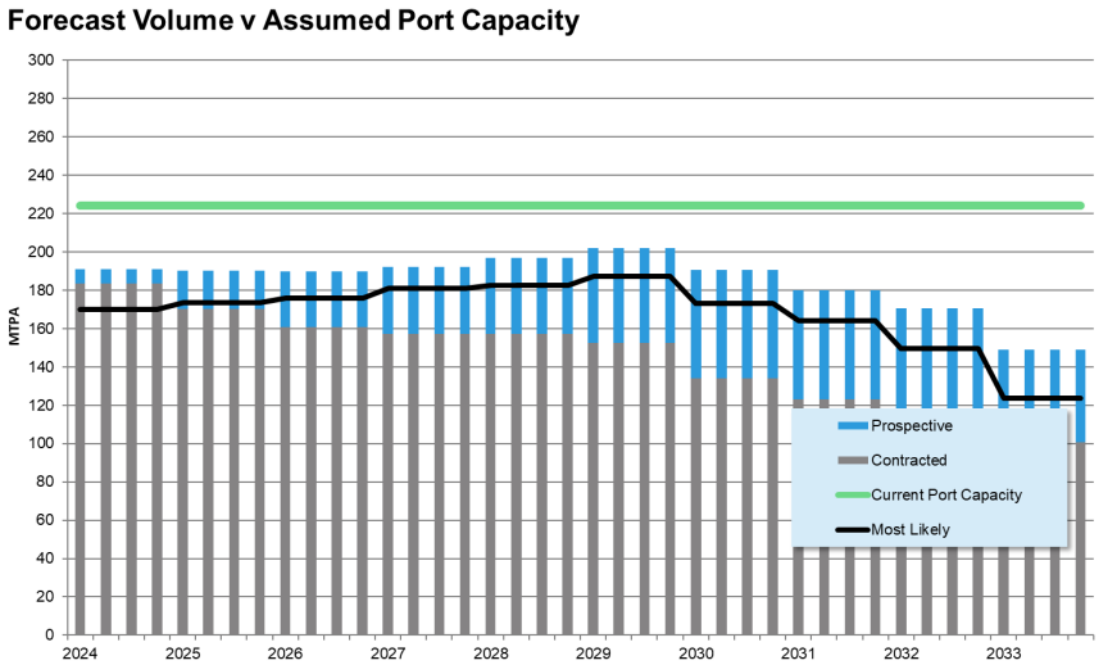

Figure 1-8 - Forecast volume at Newcastle Port compared to assumed port capacity (mtpa)

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OPERATIONS AND SYSTEM OPPORTUNITIES

Context

Operational and system opportunities have become increasingly important as the coal chain focusses on optimising efficiency and capacity within the constraints of the existing infrastructure. Increasing efficiency provides the platform for the Hunter Valley to maximise its competitive advantage within the global export coal market.

The coal export terminals, run by PWCS and NCIG, run to different operational modes. PWCS provides approximately 65% of export capacity with NCIG responsible for the remaining 35% of export capacity, operates largely on a push based system with a large percentage of its stockpiling capability allocated to dedicated storage for individual customers.

Coordinated coal chain planning and live-run disruption management is facilitated by the HVCCC. The daily coal schedule is constructed by the HVCCC to achieve coal deliveries in accordance with the Cargo Assembly Plan (CAP). Execution of the plan is optimised through real time decision making undertaken in accordance with principles and protocols agreed by the industry.

ARTC is actively engaged with the HVCCC, rail operators, coal terminals and other supply chain partners in working together to review planning and operational processes to reduce waste and to identify opportunities to improve operational performance.

Rail operations

At 2023 contracted volumes and train sizes, an average of around 64 loaded trains need to be operated each day of the year, or one train every 22 minutes. Capacity planning makes provision for this number of trains to peak at up to 87 per day, though in practice capacity exists for this to peak at even higher rates.

The coal chain is supported by a captive rail fleet operated by four above-rail operators: Pacific National (PN); Aurizon; East Coast Rail (a spun-off entity following the acquisition of One Rail Australia by Aurizon in late 2022) and, Southern Shorthaul Railroad (SSR).

While rail operations are dominated by coal arriving from the north, coal also arrives at the terminals from a number of smaller mines to the south of Newcastle and from mines in the Lithgow area. This traffic operates on the Sydney Trains network as far as Broadmeadow. There is also a volume of coal supplied to the Eraring and Vales Point power stations south of Newcastle. There are no identified capacity issues for this coal on the short section of the ARTC network which it traverses outside the port areas, and accordingly this Strategy does not discuss the network between the port terminals and Islington Junction (where the Hunter Valley adjoins the Sydney Trains network).

Although there are no identified capacity issues, the timetabling requirements of trains accessing the Sydney Trains network provides operational challenges that have the potential to impact on the Southern coal trains as they work in with the variability of the unloading events at the Newcastle coal terminals.

Train size

ARTC contracts on the basis of a contractual entitlement to paths known as Base Path Usage (BPU). Tranches of paths are associated with a nominated train configuration, giving an implied contractual volume.

Average train size as contracted with ARTC in 2023 was 8,485 tonnes, marginally higher than in 2022 but significantly higher than compared with under 7,500 tonnes a decade earlier.

Weighted average delivered coal volume per train has generally been rising from approximately 8,091 net tonnes in 2016 to 8,300 in 2023.

Figure 2-1 shows the historical growth in average train size and the current contracted train sizes at the Newcastle terminals for the period forecast in the Strategy. Loop length is the main limitation to train size with most operators already operating at or close to maximum length. The Strategy is based on the contracted train sizes and it should be noted that over time, as the proportion of volumes from Gunnedah Basin increases, the average train size in Zone 1 will decrease.

Train Length

Train length in the Hunter Valley and along the Ulan line is limited to 1,543 metres. This length recognises the constraints at the terminals, the Hexham Holding Roads, Ulan line loop lengths, balloon loop constraints, and standing distances between signals and level crossings.

The length limit in the Gunnedah basin is 1,329 metres, with trains from the Stratford mine along the North Coast line operating to a similar length. Trains to locations south of Newcastle operate with substantially shorter consists.

Operators continue to be interested in introducing longer trains into the system with a view to increasing operating efficiency and ARTC recognises increasing train length as a potentially effective mechanism to increase capacity when implemented in a systematic manner.

However, ARTC is cautious about permitting the introduction of trains on the network that are longer than the corridor maximum length without thorough assessment and change management being enacted which may include infrastructure and supporting systems alterations. A longer individual train would deliver an increase in volume per path, but without other supporting infrastructure investment, the de facto priority it gives these trains, the complexity that arises around fairness and competition, the constraints on where they can cross other trains longer than the corridor maximum, and the limitations they place on the system generally, means that they are likely to lead to a net reduction in system capacity. ARTC does not anticipate allowing increased train length on single track lines in the absence of appropriate enhancements.

Axle load

Most of the Hunter Valley coal network is capable of handling rollingstock with 30 tonne axle loadings (TAL) (i.e. 120 gross tonne wagons), but the North Coast line to Stratford and the lines south to Vales Point on the Central Coast are only rated for 25 tonne axle loads (100 gross tonne wagons).

This Strategy assumes no changes to axle loads over the timeframe of the Strategy.

Train speed

Trains made up of '120 tonne' (30 TAL) wagons are generally restricted to 60 km/h loaded and 100 km/h empty. Locomotives of up to 30 tonne axle load are permitted to run at 80 km/h.

However, engineering analysis has identified that due to formation issues it is not possible to give a blanket approval to operate higher axle load

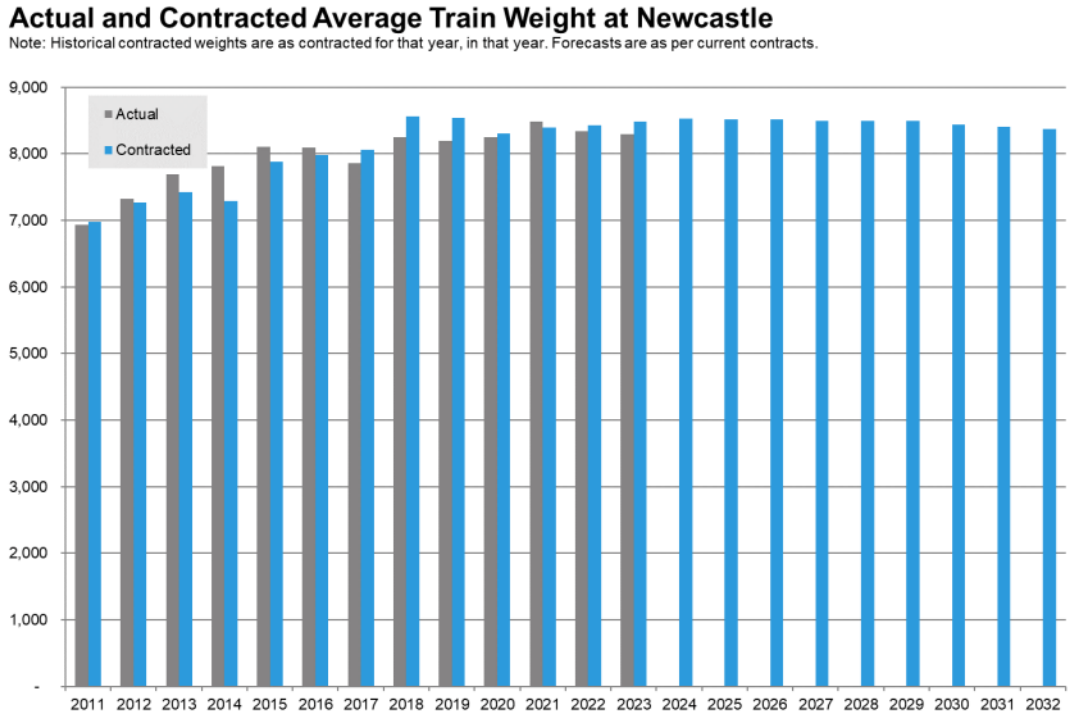

Figure 2-1 - Average Train Capacity under Contracted Volumes (tonnes)

locomotives, such as 30TAL locomotives, above 60 km/h to the Gunnedah basin. Accordingly, trains with locomotives weighing more than 134 tonnes are limited to 60 km/h north of Muswellbrook. This, however, has declined as an issue as heavier locomotives have not generally been operating on the Gunnedah line since mid 2019.

Trains have been operating at 100km/h empty running in the Down direction in the Gunnedah basin for the past several years providing opportunity to further improve cycle times.

Clearances

The Hunter Valley generally conforms to rollingstock outline plate B, which allows up to 3050mm width and 4030mm height, and 4220mm north of Werris Creek.

Operational Improvement Initiatives

Previous versions of the Strategy outlined a number of operational initiatives that aimed to improve the performance of the Hunter Valley Network aligned with capacity assumptions. Several of the initiatives have since been delivered while others are still being planned.

The initiatives delivered included:

- Continued to increase synergies between the track maintenance and network control functions with the outcome being increased effectiveness in maintenance activities combined with improved train flow on the network. The integration work over the past several years focused on the pre-day whole of network planning processes and coordination across multiple teams in live operations to coordinate safe and efficient track access while improving overall train flow on the day for our customers, particularly during moments of disruption management.

- Continued the effective integration of the coal / non-coal train programming and scheduling with increased non-coal demand. Weekly and daily processes were developed to manage the different supply chain characteristics of different commodities.

- ARTC created a new dedicated team focused on Live-Run management and communication with clear procedures, roles and accountabilities. Key outcomes have included: positive stakeholder feedback; a decrease in losses attributable to ARTC live run management practices; and an increase in on-time availability of possession windows for productive maintenance. This followed feedback sessions with stakeholders post the delivery of ANCO where ARTC was tasked with reviewing its roles and responsibilities within Live-Run to improve the consistency in comms.

Technological solutions

While there is much benefit in pursuing operational initiatives, the biggest opportunities to increase throughput in the absence of capacity-enhancing capital projects is in the day to day train control decision-making processes.

Historically, the biggest challenge for train control was to dynamically consider alternative scenarios and assess the potential flow-on impacts so as to deliver maximum performance for the supply chain as a whole. This arose from limited real-time, overall network visibility and a lack of tools to assist with short-term planning. To address this gap and deliver a step change in supply chain performance, ARTC has implemented ANCO across the Hunter Valley and is supporting the development of a Nationally Interoperable Safeworking System that will replace the Advanced Train Management System (ATMS) that has been discussed in previous strategies.

ANCO

The ANCO (ARTC Network Control Optimisation) project is ARTC's initiative that introduced new processes and technology to improve train control in the Hunter Valley. Horizon 1 has provided digital train planning in Network Control Centre North (NCCN) for train movements from Newcastle port to Narrabri Coal Junction and Ulan.

At the core of the ANCO system is 'Movement Planner', an off-the-shelf product by GE/Wabtec that enables digital train planning. This was implemented across all train control boards in the Hunter Valley between May 2019 and November 2020.

Digital train planning, coupled with near real-time data integration with supply chain partners, enables a rapid response to network variation, with train plans dynamically adjusted to minimise potential flow-on impacts and deliver maximum performance for the supply chain as a whole.

Dynamic pathing is of particular significance for the determination of track capacity. As discussed elsewhere in this Strategy, ARTC applies principles in determining capacity that make allowance for variations and unknowns. In particular, on single track it accommodates issues like uncertainty around actual train performance, temporary speed restrictions and manual decision making in the execution of crosses as well as the natural constraints on the efficiency with which train crosses can be timetabled. Dynamic pathing enables these factors to be considered and optimised dynamically, effectively eliminating the need for additional contingency in the train plan.

This manifests itself in an improvement in crossing decision making. The utilisation rate adopted in the 2020

Strategy was lifted from 65 per cent to 70 per cent in anticipation of ANCO implementation being completed by the end of that year.

The utilisation rate in this Strategy remains at 73.5% between 2022 and 2026, which was increased in the 2021 Strategy, as part of the agreed terms of the new HVAU that aim to deliver more capacity from the existing infrastructure. The utilisation rate has been assumed to revert back to 70% from 1 January 2027.

The New National Safeworking System

Previous strategies outlined a pathway to implementing ATMS across the ARTC Network including the Hunter Valley. ATMS is no longer being rolled out across the ARTC network and as a result, the investment pathways in previous editions of the strategy will no longer be included..

The delivery of infrastructure enhancements will be the main source of new capacity, where required.

There is a critical need to make Australia's railways more efficient and that includes reducing the number of train control systems on the national rail freight network from 11 to one. ARTC continues to work with commonwealth and state transport agencies and industry stakeholders to address the complex challenge of achieving interoperability across rail networks with a priority given to the east coast. ARTC will support the National Transport Commission (NTC) in its development of a strategic business case to set the policy direction for a signalling pathway for Australia and also support the Australian Government and the NTC to establish a technical leadership group to address In-Cab interoperability.

A timeframe for the implementation of the new system is yet to be determined. ARTC will support the National Transport Commission (NTC) in its development of a strategic business case to set the policy direction for a signalling pathway for Australia. ARTC will also support its shareholder and the NTC to establish a technical leadership group to address In-Cab interoperability.

Train Park-up

Train park-up has long been identified as a challenging issue that may have an investment requirement.

ARTC has worked with service providers in the industry to develop and implement processes for train park-up to avoid planning inefficient cycling of trains that are not required to meet demand. As per the assumptions listed above, cycle times improved by 8-10% for zones 2 and 3 during the first quarter of 2023 compared to the first quarter of 2022.

3

INCREASING CAPACITY BETWEEN NARRABRI AND MUSWELLBROOK

Context

The Gunnedah Basin line extends for 252 km, from the junction for the Narrabri mine to Muswellbrook in the Upper Hunter Valley. Figure 3-1 shows the crossing loop locations along the line.

This single-track line is highly complex. In addition to its coal traffic, it carries passenger trains (NSW Trains services to and from Scone and Moree / Armidale) and a proportionately high level of grain and export container train activity. This non-coal traffic is up to seven trains each way per day between Narrabri and Scone, and 10 trains each way per day south of Scone. Grain movements have been significant in recent years reflecting the favourable growing conditions in northern NSW.

Figure 3-1 - Muswellbrook to Narrabri Loops

There are currently four coal origins along the route, at Turrawan, Boggabri, Gunnedah and Werris Creek. The currently closed Dartbrook mine, just north of Muswellbrook, is working toward reopening. Only Aurizon and Pacific National operate coal trains from the mines along this line.

Vickery South, being developed by Whitehaven, is the only major new Gunnedah basin mine included in the most likely and prospective scenarios.

Construction commenced in June 2023 and the first coal was produced in the June quarter of 2024, with initial volumes (up to 1.3 million tonnes a year) to be hauled by road to the existing Gunnedah Coal Handling and Preparation Plant and railed to port from that location.

Subsequent volumes from Vickery South are assumed to load from a new balloon loop connecting at approximately 498.8 km, between Emerald Hill and Boggabri. Full-scale operations, which will require the new rail loop, are pending approval from Whitehaven later this year.

Liverpool Range

The Ardglen bank, crossing the Liverpool Range, is a particular impediment on this corridor. The severe grades on the short section between Chilcotts Creek and Murrurundi dictate limits for train operations on the whole Werris Creek to Newcastle route. The need to use 'banker' locomotives for loaded coal and grain trains on this section means it carries greater train volumes than the rest of the line.

Operational modelling assumes the following principles for the bank engines:

- There will be two sets of bank engines available at all times. Pacific National and Aurizon currently provide one set each.
- A train requiring banking will not have to wait for a bank engine.
- The attachment process will take 10 minutes to complete before the train will recommence its journey.
- Once the train has cleared Ardglen the bank engine will return to Chilcotts Creek in the shadow of a down train so as not to consume any additional network paths.
- Kankool loop will be used for the crossing of the returning bank engines if necessary to avoid delay to a train in the up direction.

ARTC works with rail operators to actively manage the banking process so as to optimise utilisation of the network and maximise productivity.

Train Performance

ARTC has been using actual rather than theoretical performance as a basis for capacity modelling between Muswellbrook and Narrabri since the 2016 Strategy and further refined the process by calculating and applying actual transactions times in 2017.

Aurizon and Pacific National operate the following train consists on the Gunnedah line:

- Pacific National—3 x 92/93/TT class (AC 4400HP) locos with 82 wagons - 7,954 net tonnes, 1,296 metres in length.
- Aurizon—3 x 6000 class (AC 4400HP) locos with 82 wagons - 7,954 net tonnes, 1,296 metres.
- Aurizon—2 x 6000 class (4400HP AC) and 1 x 5000/5020 class (4250/4500HP AC) locos with 82 wagons - 7,954 net tonnes, 1,296 metres.
- Aurizon—2 x 5000/5020 class (4250/4500HP AC) locos with 82 wagons - 7,954 net tonnes, 1,296 metres.

Since late 2019, empty coal trains have been permitted to operate at up to 100km/h on some sections. Aurizon progressively enabled this change by adopting consists that could travel at 100km/h in the down (empty) direction in late 2019, matching the Pacific National fleet that was already operating at this speed.

Transaction times used in this strategy remain unchanged from the 2023 Strategy. These are shown in Figure 3-2 (including adjustment for the effect of simultaneous arrivals).

Table 3-1 shows the incremental change in consumed capacity across seven key sections of the Gunnedah line from the changes mentioned in Chapter

Consumption of Sectional Capacity Q1 2026 (mtpa) - without projects

2024 Strategy	Gunnedah to Curlewis	Burilda to Werris Creek	Bells Gate to Braefield	Ardglen to Pages River	Pages River to Murulla	Murulla to Parkville	Parkville to Togar
Capacity as per 2023 Strategy (with 73.5% utilisation)	*31.29*	*37.28*	*40.48*	*44.89*	*43.19*	*35.56*	*36.68*
Capacity as per 2023 Strategy (w/o ATMS + w/o 73.5%)	29.15	34.85	37.90	42.10	40.48	33.22	34.16
Add 2023 contract paths	29.15	34.85	37.90	42.10	40.48	33.22	34.16
Live run losses (9.27% to 9.21%)	29.17	34.87	37.92	42.13	40.50	33.24	34.18
Maintenance (12.3% - Unchanged)	29.17	34.87	37.92	42.13	40.50	33.24	34.18
Add transaction times (Unchanged)	29.17	34.87	37.92	42.13	40.50	33.24	34.18
Add updated train performance	29.47	35.38	38.64	42.07	40.61	36.09	34.23
73.5% utilisation (Q1 2022 - Q4 2026)	31.63	37.84	41.26	44.86	43.33	38.58	36.76

Table 3-1 - Changes in consumption of capacity of key line sections of the Gunnedah line

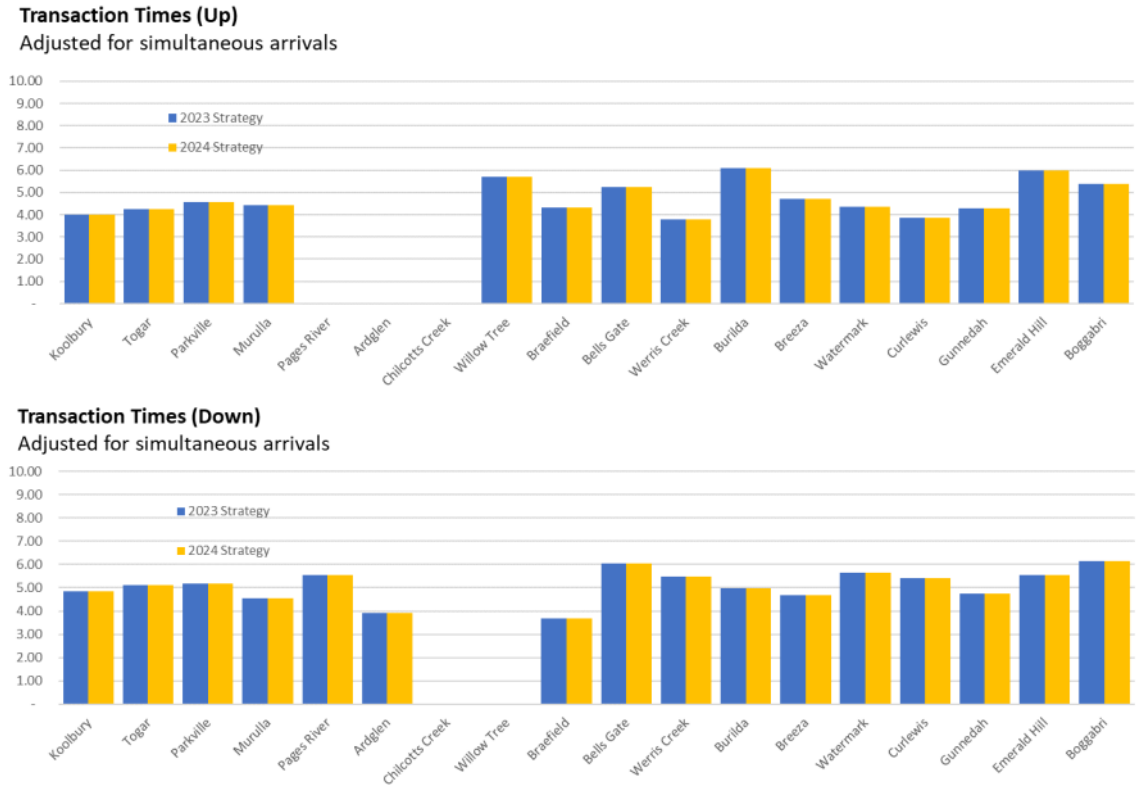

Figure 3-2 - Transaction times

1 and above. The changes are for Q1 2026, as per the 2022 Strategy, and assume no capacity enhancement projects are delivered so that the result reflects the raw change in capacity consumption.

Cancellations have a positive, but minor impact on consumed capacity across all sections.

With maintenance and transaction times unchanged, the application of the updated train performance trains results in slightly less capacity being consumed on the capacity-limiting Gunnedah to Curlewis section, and a significant reduction on Murrulla to Parkville.

Following the application of the 73.5% utilisation rate, the overall amount of consumed capacity across the line falls by between 0.15 million and 0.7 million tonnes more than the 2023 Strategy on all sections, except for Murrulla to Parkville with a significant reduction and Ardglen to Pages River where there is a minor increase in consumed capacity.

Performance Improvement Initiatives

ARTC identified a number of smaller scale initiatives aimed at incrementally increasing capacity between Narrabri and Muswellbrook at reduced cost compared to loop projects. Relevant initiatives identified as potentially viable options are as follows:

- Higher speeds for Up trains approaching grades at Werris Creek—Bells Gate, Bells Gate—Braefield and Pages River—Murulla:

Increasing the permitted speed of loaded coal trains to 80km/h on the approach to certain grades has been analysed on the basis that higher speeds would give trains additional momentum allowing them to ascend the grade faster, reducing section time. Loaded coal trains at 30 TAL are currently limited to 60km/h across the Hunter Valley Network except for the approaches to the Minimbah and Nundah banks, where 80 km/h is permitted to improve headways.

The 2020 Strategy included analysis that found allowing these trains to operate to 80km/h approaching selected grades would increase capacity in the order of 3.2 mtpa to 4.4 mtpa, depending on specific circumstances.

Despite the potential transit time reduction, producers are not currently supportive of this initiative in advance of a capacity trigger, noting the associated higher track maintenance costs and increased fuel consumption.

- Werris Creek configuration:

The current track configuration at Werris Creek results in trains passing through at low speeds, which affects capacity.

The 2020 Strategy identified several improvements to the track configuration to increase capacity, including increasing the permitted speed over turnout 105, immediately south of the station on the main line, from 25km/h to its capability of 35km/h. This was estimated to deliver a 0.7 to 1.6 mtpa increase in capacity on the

sections to Bells Gate and Burilda, respectively. Another initiative involved realigning tracks at Werris Creek station to reduce curvature and remove the little used 104 crossover in Werris Creek yard. This was estimated to increase capacity by between 3.9 and 4.6 mtpa on those sections. These works could delay the need for both the 414km and 407km loops.

However, the reduction in projected coal volumes compared with previous strategies and the increase in the utilisation rate to 73.5% has extended the timeframe for when the additional capacity from these works is required.

- Increased speed through Scone:

Trains are limited to 50km/h passing through Scone to manage noise. An increase in permitted speed to 70km/h would increase capacity by around 2.5 mtpa, but this would require additional noise attenuation to be provided for nearby affected properties. Investigations on whether this is feasible are ongoing.

- Intermediate signals:

An intermediate signal permits a single train to follow another train already in the section, but its benefit is a function of how frequently trains present as a following rather than opposing movement. It also assumes that the following train is less than the section length behind the train in front. The probability of this scenario was analysed in detail for the purposes of establishing the theoretical benefit of ATMS. The benefit is a function of section utilisation, the number of trains operating in a following pattern, and the extent to which there was a conscious decision to take advantage of the following capability. The benefit is equivalent to increasing the section utilisation threshold from 70% to 74%.

The most likely sections where intermediate signals would be deployed, if approved, are Gunnedah to Curlewis and Emerald Hill to Gunnedah.

This initiative would need to be weighed against others that would deliver increased capacity. This initiative will be redundant if and when there is a need to deliver South Gunnedah loop to meet demand.

- Increasing permitted speed of Down trains through Gunnedah to above 40km/h:

There is the potential to lift train speed in the Down direction through Gunnedah from the current limit of 40 km/h that was set to meet noise requirements. The Down limit was determined in advance of the yard reconfiguration project and was set with a view to optimising the scope of noise walls. The option remains to extend the noise walls. As a first step noise monitoring could be undertaken to confirm actual noise levels compared to the predictions, which will help inform a solution.

The 2020 Strategy discussed that lifting the speed limit to 60 km/h, and assuming that Down trains achieve an average of 54 km/h, would add 1.7 mtpa on this capacity limiting section. Lifting the speed to 70km/h would increase capacity by 2.6 mtpa, or a further 0.9mtpa. An engineering assessment indicated that 70km/h would be the maximum permissible speed for down trains through Gunnedah.

Further work is required before a decision is made on this initiative and would need to be assessed following the decision to increase utilisation to 73.5%, and be assessed against other initiatives including intermediate signalling, and delivery of South Gunnedah loop.

Train Lengths

ARTC has an approved train length of up to 1,329 metres in the Gunnedah basin. This represents a practical limit given current loop lengths and the need to allow a margin at the loop ends. There will be no further increase in train length in the absence of track configuration changes to facilitate it.

In 2015 ARTC undertook an analysis of the option of increasing train length to either 1420 m, or the zone 1 and 2 standard of 1543 m. The 1420 m option would require 10 loop extensions and the 1543 m option 15 extensions. The cost of extensions was estimated at an order of magnitude of $55 m and $90 m respectively.

While the longer trains increase volume per path, the expectation was that the longer trains would retain the same locomotive configurations. As a result, section run times would increase, which approximately offsets the extra capacity per train. Under the prospective scenario at the time, the 1543 m option was estimated to result in an NPV saving of around $5 m in the scope required to achieve the same tonnage throughput.

It was concluded that extending train lengths was not the most cost-effective solution for increasing capacity.

Loops & Double Tracking

Progressive lengthening of selected existing passing loops, and constructing additional passing loops, is the default option for accommodating volume growth beyond that provided by the proposed technology projects. The majority of loops are now 1,330m – 1,450m with only a small number of short loops remaining. Of these short loops, Gunnedah, Quipolly, Quirindi, Kankool and Scone have specific challenges that make extension difficult. Only two loops (Aberdeen and Murrurundi) remain for potential extension. The location of these, and other existing and potential loops, is shown in Figure 3-1.

Opportunities to insert additional mid-section loops are constrained due to the effects of grades and level crossings, while the increasingly short distances

between loops mean that additional mid-section loops are of declining benefit due to the transaction times at the loop.

Notwithstanding this, concept assessments previously undertaken on projects required to accommodate prospective volumes tended to conclude that a mid-section loop remains the preferred solution. In some cases these new loops will be quite close to existing loops. However, where it is practical to construct a mid-section loop the additional cost associated with building a passing lane does not justify the additional benefit. As a result, passing lanes have only been recommended where there are physical constraints to a mid-section loop.

Double-track sections remain as the preferred solution on the Liverpool Range as it is not practical to stop trains on either the up or down grade across the range. Bells Gate south extension is preferred to extending Quipolly loop due to the high cost of extending the loop given level crossing and environmental constraints, though this would be tested again before a final decision on a solution if and when required. The length of each of these double track sections is determined by physical constraints.

Investment Pathway

Table 3-2 shows the projects required to address the capacity constraint on each local section to meet demand, for the most likely and prospective scenarios . No loop projects are required or proposed for contracted volumes.

The timing of proposed projects is the later of when they are required, when they can be delivered and when they will deliver a capacity benefit given constraints elsewhere on the corridor.

Figure 3-3 shows the preferred investment pathway to meet the most likely volume forecast scenario, graphically. Figure 3-4 shows the investment pathway to meet the prospective volume forecast scenario.

Note that this graph shows volume at Muswellbrook plus surplus capacity on the most capacity limiting section of the corridor. Hence, capacity can increase independent of capacity enhancement projects if the volume increment is on the port side of the capacity limiting section.

Volume & Capacity

Demand and capacity by sector, based on the project timings recommended in this Chapter, and using the calculation methodology set out in Chapter 1, is shown in Figure 3-5. This chart shows both contracted and prospective volumes for the proposed infrastructure scope.

Forecast surplus capacity in both paths and tonnes under the most likely volume and infrastructure scenario is shown in Figure 3-6.

This is calculated as the surplus capacity on the most capacity constrained section, assuming a 10% TMTC, and is effectively the difference between the volume and capacity pathways shown in figures 3-3 and 3-4.

Transit Times

As discussed in Chapter 1, the capacity modelling tools were enhanced for the 2019 Strategy to include a transit time calculator. This uses actual train performance and transaction times, together with a probabilistic tool for calculating loop dwell frequency and duration, to forecast the likely average transit time.

This is shown in Figure 3-7 for the three volume / infrastructure scenarios. The predicted Muswellbrook - Narrabri mine transit time has been adopted as being illustrative of the likely performance for all load points. Overall transit time is forecast to remain relatively constant in the most likely and prospective scenarios because the forecast train numbers are expected to remain relatively high, requiring additional infrastructure, and increasing the probability of extended dwell.

Required by timing[1]	Most Likely with ANCO	Prospective with ANCO
South Gunnedah loop	Q1 2027	Q1 2027
414 km loop (Werris Creek North)	-	Q1 2030
Togar North Loop	-	Q1 2030

Table 3-2 - Project timings under various volume scenarios

Note 1 - Project timing is based on the later of when the project is required, when the project can be delivered and when it adds to capacity given other capacity bottlenecks.

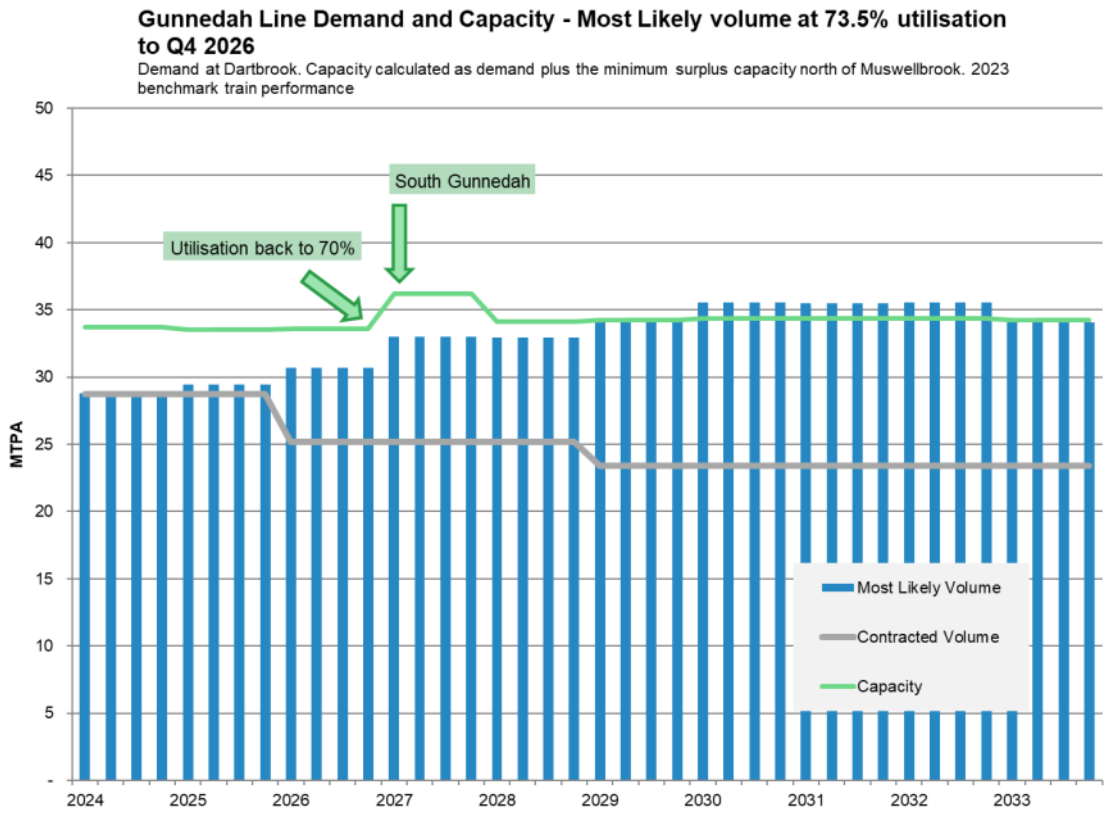

Figure 3-3 - Conceptual pathway for investment to meet the most likely volume scenario.

Note 1—No investment required for Contracted volumes.

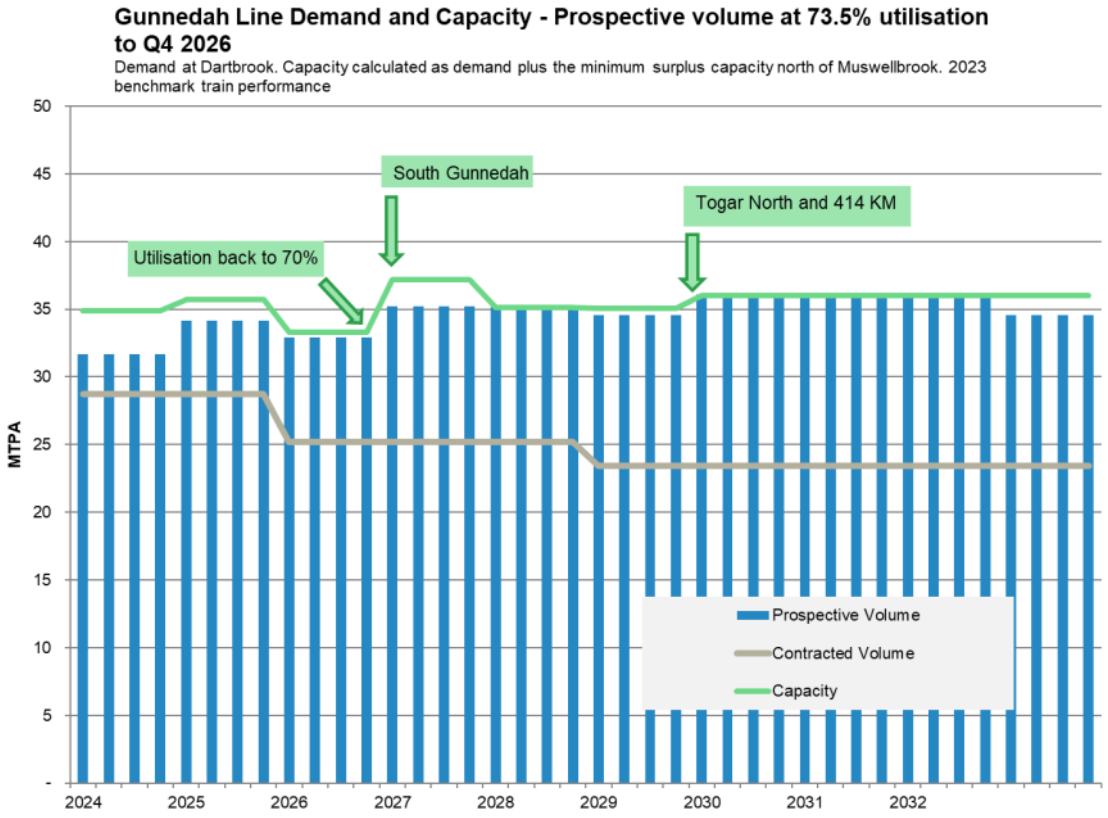

Figure 3-4 - Conceptual pathway for investment to meet the prospective volume scenario.

Note 1—Unlabelled changes in capacity reflect changes in volume on the port side of the capacity limiting section.

Note 2—No investment required for Contracted volumes.

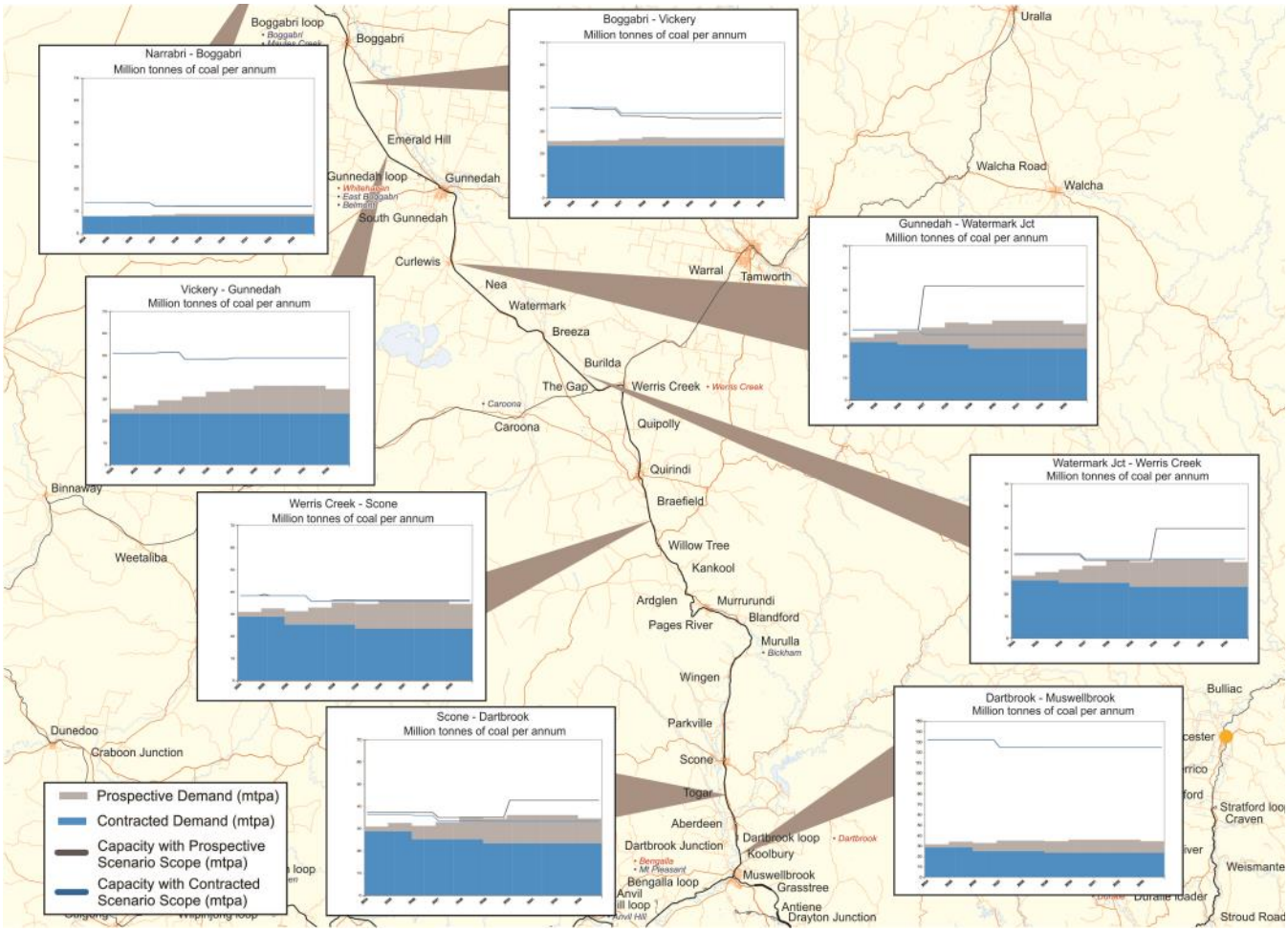

Figure 3-5- Volume and capacity on the Gunnedah basin line.

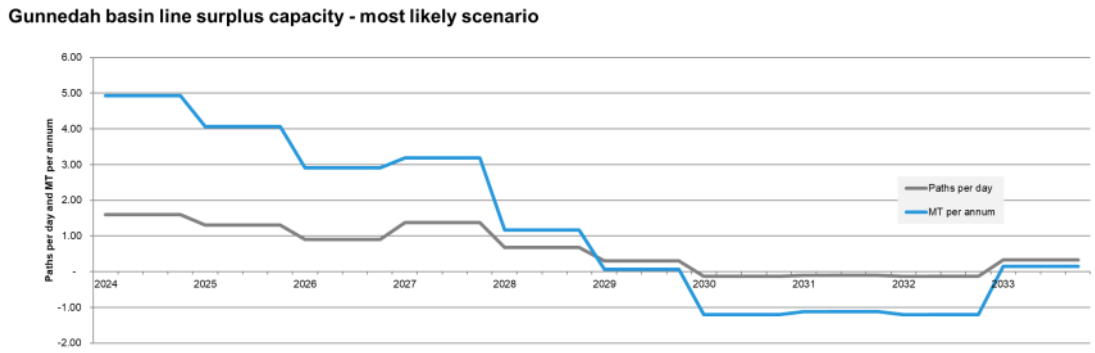

Figure 3-6 - Saleable surplus capacity in paths and tonnes for Zone 3 under the most likely volume and recommended projects.

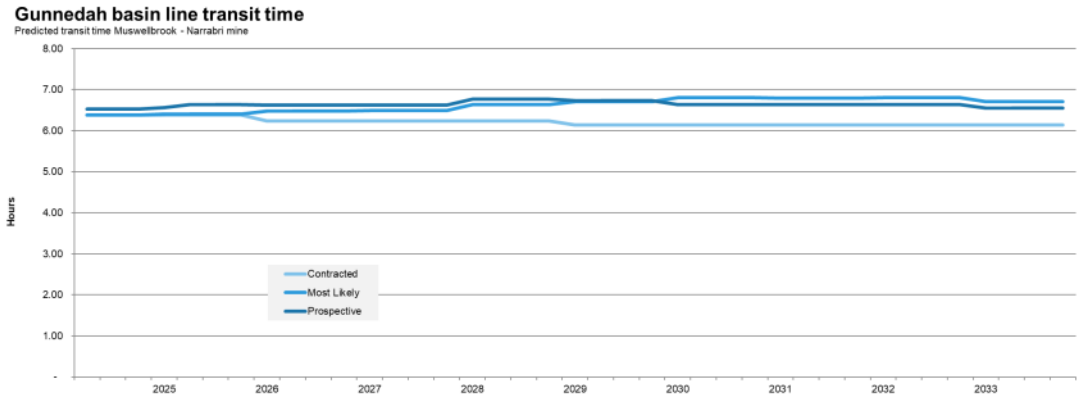

Figure 3-7 - Forecast transit time Muswellbrook - Narrabri mine under contracted, most likely and prospective volume scenarios and works as per Table 3-1.

4

INCREASING CAPACITY BETWEEN ULAN AND MUSWELLBROOK

Context

The Ulan line extends approximately 170 km, from Ulan, west of the dividing range, to Muswellbrook in the upper Hunter Valley. Figure 4-1 shows the line and loop locations along the line.

Although the line is used mainly by coal trains, it is also used by country ore and grain trains and occasionally by interstate freight trains that are bypassing Sydney during possessions. This analysis of the Ulan line assumes that there is no change to this current pattern of limited non-coal trains on this line.

The mines on this sector are clustered either at the start of the line near Muswellbrook (Bengalla, Mt Pleasant, Mangoola) or at the end of the line around Ulan (Ulan, Wilpinjong, Moolarben). This gives rise to a long section in the middle with stable demand.

Train Performance

As noted in Chapter 1, train performance has been updated to 2023 train performance, consistent with the methodology in the 2023 Strategy that continued to apply section times weighted by the expected proportions of each train type that was first used in the 2020 Strategy.

Five coal train consists are contracted for use on the Ulan line. The consists, as noted in Chapter 1, are:

- Pacific National—3 x 92/93/TT class (4400HP AC) locos with 96 wagons - 9,100 net tonnes, 1,541 metres nominal length.
- Pacific National—3 x 90 class (4000HP DC) locos with 92 wagons - 8,500 net tonnes, 1,529 metres.
- Aurizon—2 x 5000/5020 class (4400HP 30 TAL AC) locos with 88 wagons - 8,600 net tonnes, 1,514 metres.
- Aurizon—3 x 6000 class (4400HP AC) locos with 96 wagons—9,389 net tonnes, 1,541 metres
- One Rail—3 x XRN class (4400HP AC) locos with 96 wagons - 9,100 net tonnes, 1,541 metres.

Transaction times are unchanged from the 2023 Strategy. These are shown in Figure 4-2 and includes the simultaneous arrivals adjustment.

Table 4-1 shows the incremental change in consumed capacity on the two most capacity-limited sections on the Ulan line, Baerami to Kerrabee and Bylong to Murrumbo. The changes are for Q1 2026 and assume no capacity enhancement projects are delivered so that the result reflects the raw change.

The three-year rolling average live run loss rate specific to the Ulan line is 9.0%, higher than the 8.71% in the 2023 Strategy. Consumed capacity is slightly higher on both sections as a result of applying this higher rate.

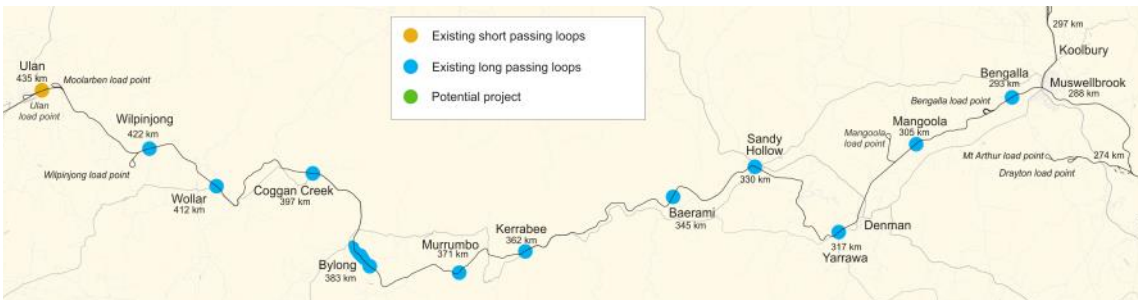

Figure 4-1 - Ulan Loops

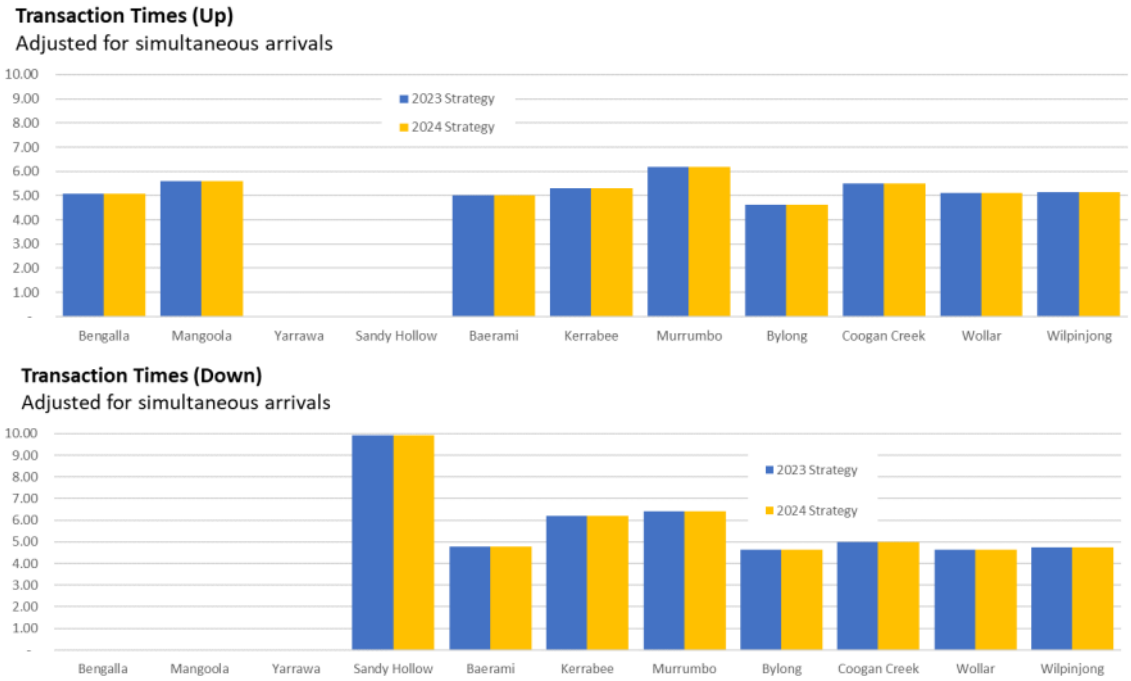

Figure 4-2 - Transaction times

Updated train performance increases consumed capacity on Baerami to Kerrabee but results in slightly less consumed capacity on Bylong to Murrumbo.

Following the application of the 73.5% utilisation rate, the consumption of capacity increases slightly on both sections compared with the 2023 Strategy.

Consumption of Sectional Capacity Q1 2026 (mtpa) - w/o projects		
2024 Strategy	Baerami to Kerrabee	Bylong to Murrumbo
Capacity as per 2023 Strategy (with 73.5% utilisation)	*47.54*	*51.35*
Capacity as per 2023 Strategy (w/o ATMS + w/o 73.5%)	45.17	48.79
Add 2023 contract paths	45.17	48.79
Live run losses (8.71% to 9.00%)	45.05	48.66
Maintenance (12.3% - Unchanged)	45.05	48.66
Add transaction times (Unchanged)	45.05	48.66
Add updated train performance	44.49	48.71
73.5% utilisation (Q1 2022 - Q4 2026)	46.83	51.25

Table 4-1 - Changes in the consumption of capacity of key line sections of the Ulan line.

Performance Improvement Initiatives

Given the Contracted, Most Likely and Prospective scenarios are projected to be accommodated without the need for further enhancement on the Ulan line, it is unlikely that ARTC will pursue further initiatives until required.

Train Length

Train length on the Ulan line is limited to 1,543 metres, which is the limit for the Hunter Valley as a whole. Operators have long shown interest in introducing longer trains on the Ulan line. The issue of longer trains is discussed in general in Section 2.

Past analysis by the HVCCC and ARTC found that any introduction of trains that were longer than the current length without complimentary investment would lead to a net reduction in capacity due to the inability of such trains to fit in some loops.

The 2020 Strategy discussed the analysis by ARTC that found the most cost effective way to introduce longer trains without negatively impacting on capacity involved delivering a series of infrastructure enhancements on the Ulan line and between Muswellbrook and the port, optimised for a 102 wagon train, or 1640 metres.

Previous editions of the Strategy provided discussion of analysis of the needs and costs of infrastructure and modifications to accommodate longer trains on the Ulan line. Please refer to these previous editions for further information.

Bylong Tunnel

Although the Ulan line was only built in 1982, it used works from the original uncompleted construction of the line that commenced in 1915. This included the Bylong tunnel, which was built to a relatively small outline that was consistent with the practices of the day, but which creates ventilation concerns in a modern environment.

Specifically, there are two potential issues: the work health and safety of drivers due to the gasses and particulates from diesel emissions, and; the effect on diesel engines from heat emissions.

Detailed discussion about these issues were discussed in detail in the 2021 Strategy and should be referred to for further information.

Investment Pathway

There are no projects required or proposed for any volume scenario beyond the technology initiatives.

As discussed earlier, ATMS is no longer assumed in the Strategy and hence a pathway incorporating it is no longer provided.

There are no projects required under either the Most Likely or Prospective volume scenarios. Figure 4-2 shows the location of existing loops while figures 4-3 and 4-4 also show no proposed projects under the investment pathways of both scenarios.

Note that these graphs show volume at Muswellbrook plus the surplus capacity on the most capacity limiting section of the corridor. Hence, capacity can change independent of capacity enhancement projects if the

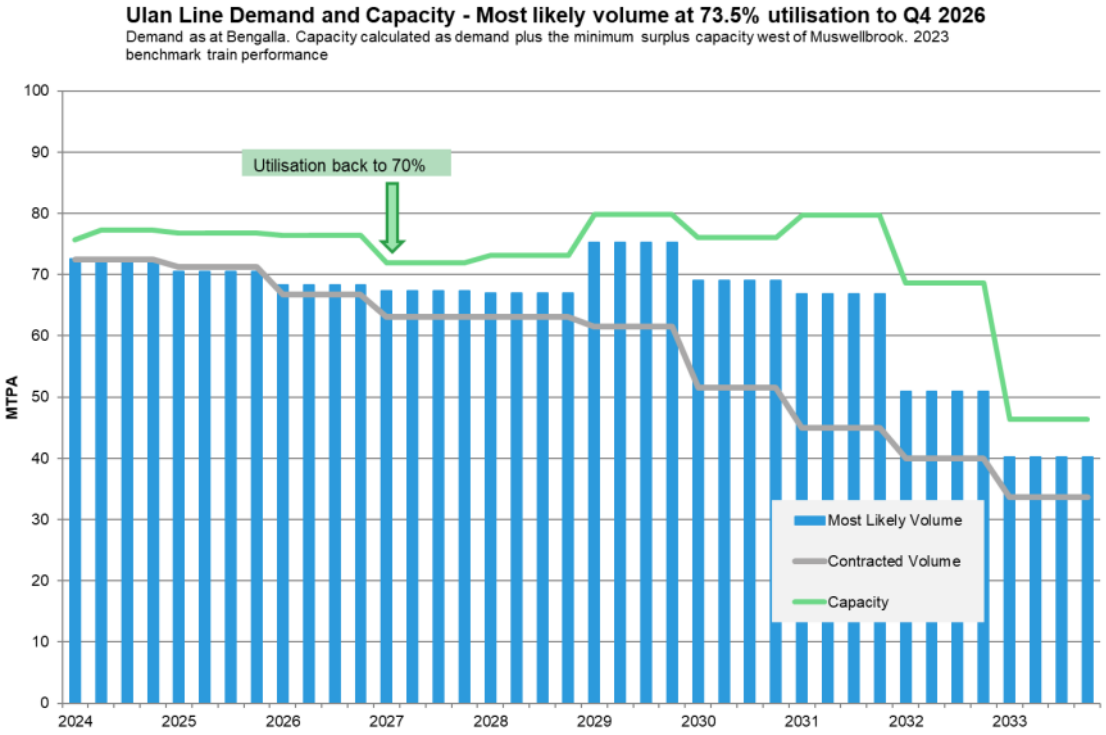

Figure 4-3 - Conceptual pathway for investment to meet Most Likely volume scenario.

Note 1—Unlabelled changes in capacity reflect changes in volume on the port side of the capacity limiting section.

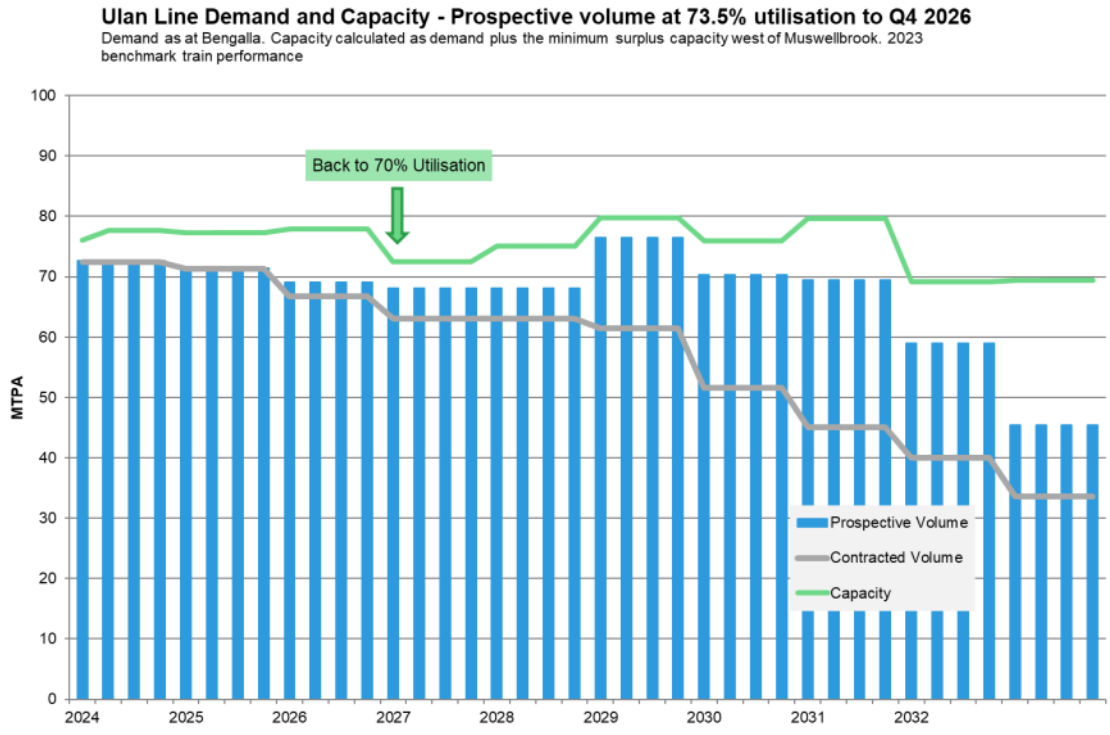

Figure 4-4 - Conceptual pathway for investment to meet the Prospective volume scenario.
Note 1—Unlabelled changes in capacity reflect changes in volume on the port side of the capacity limiting section.

volume increment is on the port side of the capacity limiting section.

Volume & Capacity

Demand and capacity by sector, based on the project timings recommended in this Chapter, and using the calculation methodology set out in Chapter 1, is shown in Figure 4-5. This chart shows both contracted and prospective volumes for the proposed infrastructure scope.

A chart showing forecast surplus capacity, in both paths and tonnes, under the most likely volume and infrastructure scenario is shown in Figure 4-6. The graphs are calculated as the surplus capacity on the most capacity constrained section, assuming a 10% TMTC and are equivalent to the difference between demand and capacity as shown in Figure 4-3.

Volumes are only expected to increase under the Prospective scenario, but only for several years. However this does not result in a shortfall in capacity. In the long run, there is no case for additional capacity.

Transit Times

As discussed in Chapter 1, the capacity modelling tools were enhanced for the 2019 Strategy to include a transit time calculator. This uses actual train performance and transaction times, together with a probabilistic tool for calculating loop dwell time, to forecast the likely average transit time.

This is shown in Figure 4-7 for the three volume / infrastructure scenarios. The predicted Muswellbrook - Ulan mine transit time has been adopted as being illustrative of the likely performance for all load points.

Transit time generally improves over time as demand declines.

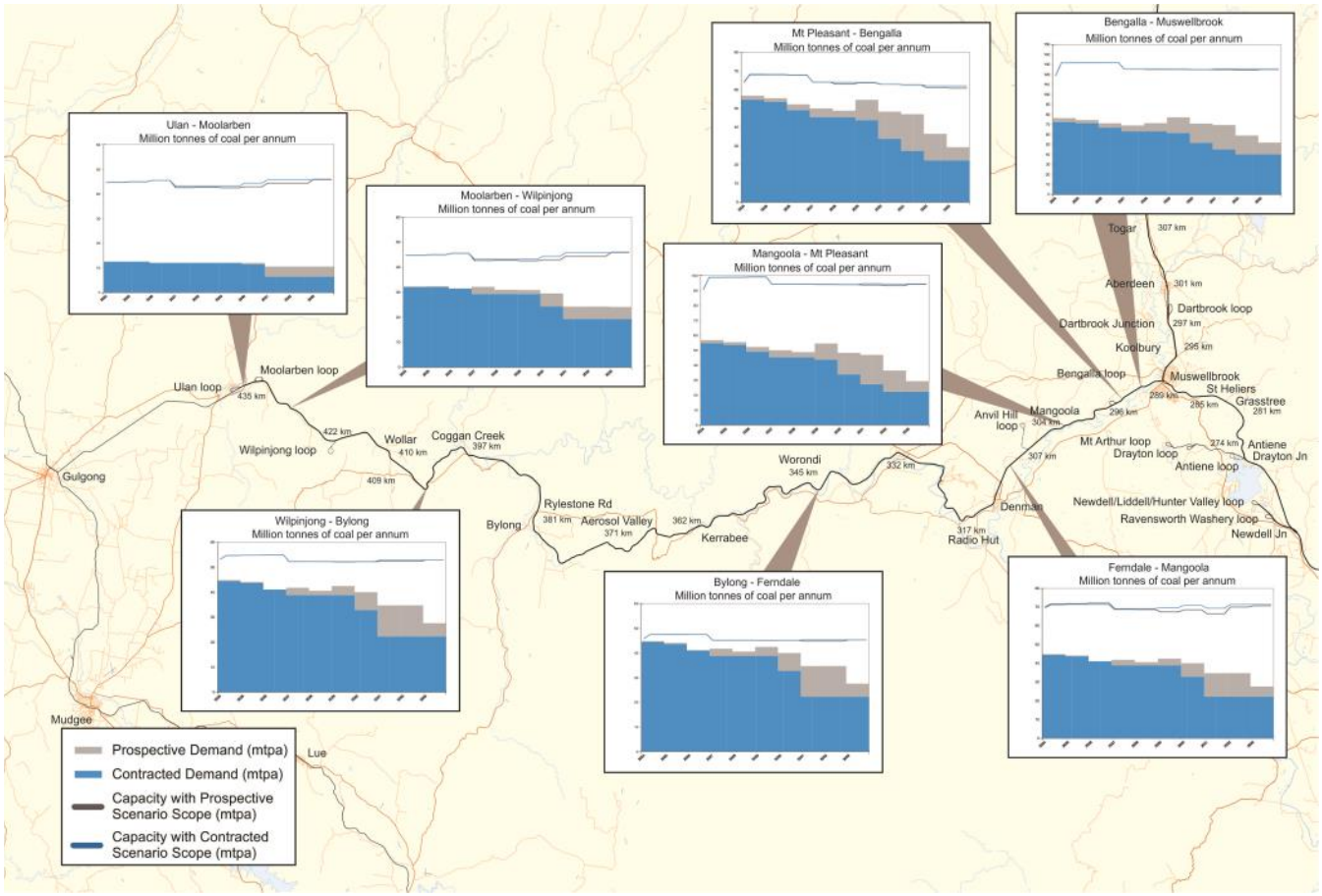

Figure 4-5 - Volume and capacity on the Ulan line

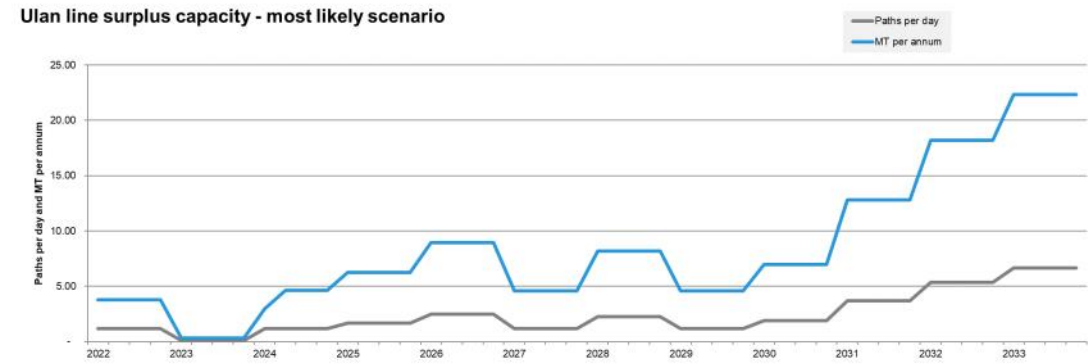

Figure 4-6- Saleable surplus capacity in paths and tonnes for Zone 2 under the most likely volume and recommended projects.

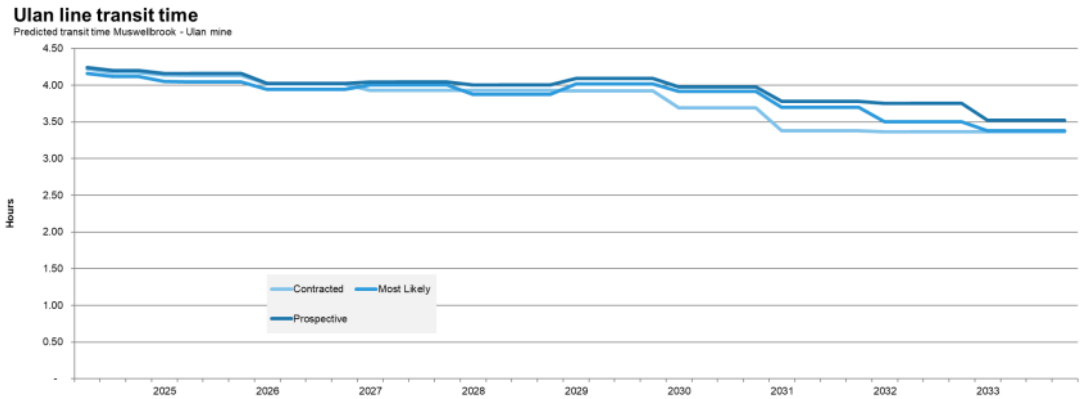

Figure 4-7 - Forecast transit time Muswellbrook - Ulan mine under contracted, most likely and prospective volume scenarios and works as per Table 4-1.

5

INCREASING CAPACITY BETWEEN MUSWELLBROOK AND THE TERMINALS

Context

The Muswellbrook—Terminals section is the core of the Hunter Valley network. A majority of the coal mines in the Hunter Valley connect to this part of the network, which includes a number of branches of varying length. All of the corridor is at least double track with significant sections of triple track and dedicated double track for coal from Maitland to Hexham.

Although this section has all of the non-coal freight and passenger trains from the Gunnedah and Ulan lines, plus two daily return Singleton passenger services and a daily return Muswellbrook passenger service, the volume of coal means that coal dominates operations across this corridor. The passenger services, which get priority and run down the coal services, create a disproportionate loss of capacity, particularly in the loaded direction. However, there is sufficient capacity on the corridor and flexibility created by the three track

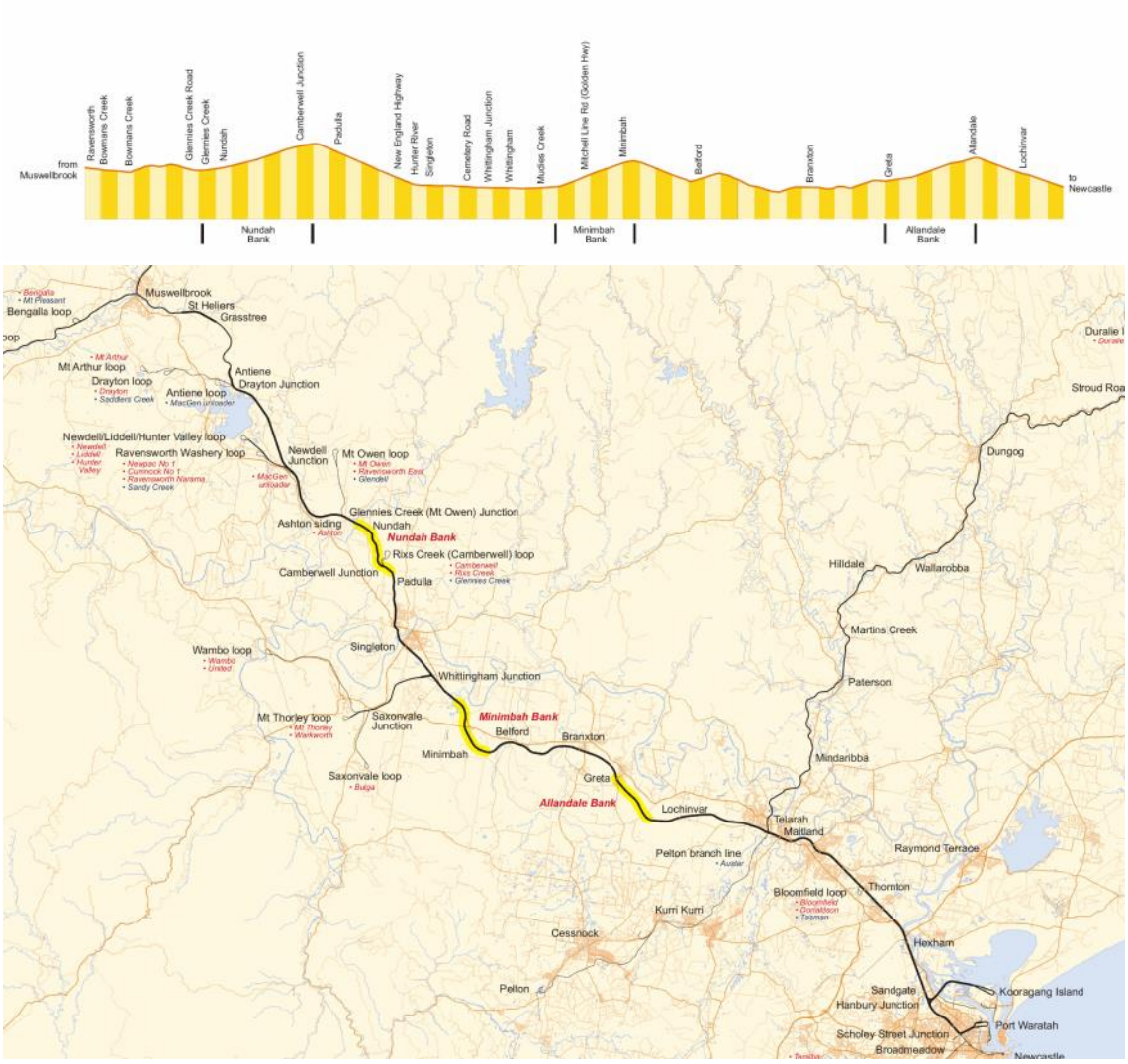

Figure 5-1 - The Nundah, Minimbah and Allandale Banks.

sections, that the shadow effect of the passenger services has a relatively limited effect.

The major issues affecting the line between Muswellbrook and the terminals are headways, junctions, the continuous flow of trains, efficient flows into the terminals, the timing of the release of loaded trains from load points on Zone 1, and the release of unloaded trains from the terminals and train service facilities.

Headways

Headways are fundamentally a function of signal spacing and design. Drivers should ideally only ever see a green signal on double track, so that they do not slow down in anticipation of potentially encountering a red signal. To achieve this outcome, a train needs to be at least 4 signals behind the train in front so that the signal a driver encounters, and the next one beyond, are both at green. Signal spacing also needs to take into account train speed and braking capability. Signals need to be spaced such that a train travelling at its maximum speed and with a given braking capability can stop in the distance between a yellow and a red signal. In some cases these constraints start to overlap, in which case it becomes necessary to go to a fifth signal, with a pulsating yellow indication.

There are three major banks (sections of steep grade) on the Muswellbrook - Maitland section that particularly affect the headways for trains; Nundah Bank, Minimbah Bank and Allandale Bank (Figure 5-1). The steep grades on these banks slow down trains to such an extent that it is not possible to obtain an adequate frequency of trains irrespective of how closely the signals are spaced. This then requires a third track to achieve the required capacity. A third track, or second Up track, exists on all three of the major banks.

There are no capacity constraints identified. Given the ample capacity on this section and that train performance for the Gunnedah and Ulan lines in this Strategy was an improvement on the performance used in the 2019 Strategy, there would be no adverse impact on this section and hence it was determined that there was no requirement to update train performance for Muswellbrook to the port for this Strategy.

It should also be noted that in a live operating environment, all trains will ideally operate at consistent speeds and achieve the section run time. To the extent that they do not it results in drivers encountering yellow signals, which causes them to slow, creating a cascading effect on following trains that will cause a loss of capacity.

Current contracted volumes do not trigger a requirement for any headway projects. When the new Nationally Interoperable Safeworking System based is implemented on this section, it will fundamentally alter the operating environment with trains able to operate at the minimum safe distance in all circumstances, which can be as low as four minutes. On Minimbah and Nundah banks though it will still be desirable to avoid two trains being on the bank on the same track, which means that on these sections the system would deliver a minimal reduction in headway compared to the current fixed signalling.

Implementation of this new system would negate the need for any signalling projects.

Junctions

There are numerous junctions on the Hunter Valley rail network where train conflicts at the at-grade interfaces impact on capacity (Figure 5-2).

Replacement of the low speed, high maintenance turnouts around Maitland was completed in early 2018. This upgrade was undertaken to reduce the future maintenance task and increase reliability and did not have any significant effect on train speeds through the junction.

Whittingham junction turnout speeds were upgraded to 70 km/h in conjunction with the 80 km/h approach to Minimbah bank project, and the junction has a three track configuration as a result of the Minimbah bank third track project. This allows loaded trains to exit the branch without needing to find a slot between loaded mainline trains. Accordingly this junction is highly efficient.

Camberwell Junction was upgraded to high speed turnouts in conjunction with the Nundah bank third track project, though the speed on the balloon loop limits the practical speed.

Mt Owen Junction has slow speed turnouts. However, the limited volume from Mt Owen means that its junction does not have a significant impact on capacity.

Ravensworth loop, which was previously integrated into the Newdell loop, was separated in 2013 and given a new junction with high-speed turnouts and a holding loop.

Newdell and Drayton Junctions have been upgraded with high-speed, low maintenance turnouts. While this was primarily maintenance driven, the speed upgrade means that these junctions are highly efficient. As discussed in Chapter 2, there is an emerging need for renewal of some of the signalling equipment at these junctions, but this is not driven by capacity.

Muswellbrook junction stands apart from the other junctions due to the need to sequence trains onto the

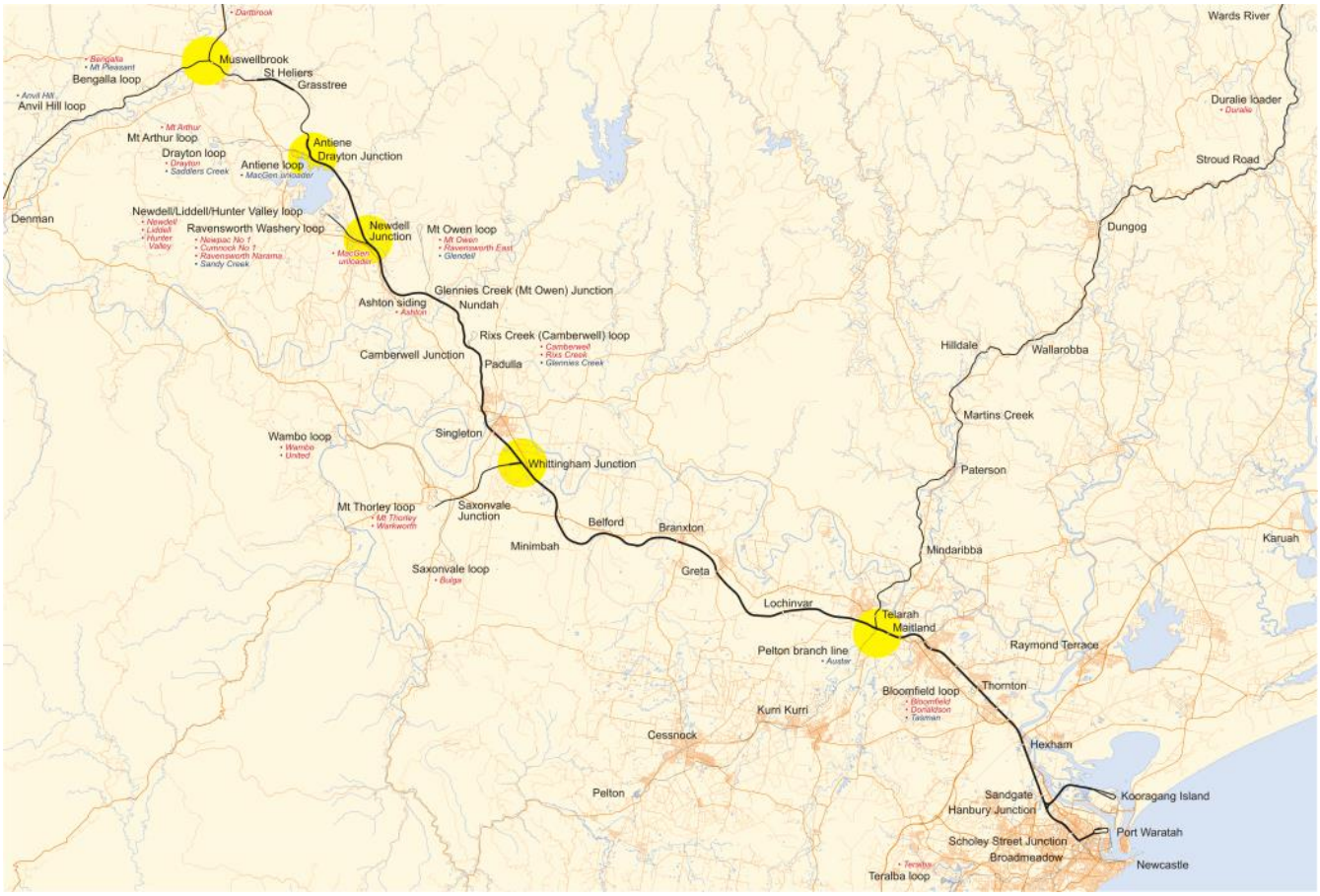

Figure 5-2 - Maitland, Whittingham, Newdell, Drayton and Muswellbrook Junctions

single track lines to Gunnedah and Ulan and the significant number of trains from both lines, which means a large number of conflicting movements at the at-grade junction.

While a level of congestion at Muswellbrook is present under contracted volumes, it is tolerable based on theoretical analysis assuming a level of intelligent design in the live run train plan and since the implementation of ANCO.

In previous editions of the Strategy, ARTC highlighted the potential need for additional capacity at Muswellbrook junction in the event that volumes would reach a threshold of 45 coal paths a day. This threshold is not achieved under the most likely and prospective volume scenarios.

The HVCCC confirmed in its 2021-2030 Master Plan Upside Scenario analysis that there was no need for a holding track at Muswellbrook in an environment of dynamic management of the network. This is consistent with their modelling completed in 2013. With ANCO Horizon 1 completed, there is now reasonable confidence that there will be no need for a holding track at this location with current volume forecasts and operational planning assumptions.

This junction will remain a focus for ARTC, both strategically and operationally, to ensure that traffic flows from the two single lines are integrated efficiently onto the double track spine south of Muswellbrook.

Whittingham branch

ARTC owns the short network of branches from Whittingham to Mt Thorley, Bulga and Wambo commonly known as the Whittingham branch.

This network was the subject of intensive analysis in 2014 in response to concerns that the branch network could contribute to upstream congestion. ARTC and HVCCC agreed at that time that the capacity of the branch network was in the order of 30 mtpa +/- 2 mtpa once signalling modifications proposed by ARTC, and subsequently implemented, were taken into account. Actual annual volume of around 29 mtpa was achieved prior to the signalling modifications, suggesting that the modelled capacity was conservative.

Track capacity on its own is an order of magnitude greater than this. Key issues in assessing the capacity were:

- Management of train flow, in particular terminal departure filtering and the feasible extent of staging at Whittingham Junction to access the single track sections, and
- Peaking, which historically has exceeded the 10% TMTC allowance.

The rollout of ANCO between Maitland and the port terminals in late 2020 further assists in improving train flow to help mitigate these issues.

Contracted, most likely and prospective volumes from Whittingham Junction are comfortably within the agreed capacity limits, with volumes peaking at 28.5 million tonnes in 2025.

Terminals

The Hunter Valley coal industry is serviced by three coal loader terminals, PWCS Carrington (CCT), PWCS Kooragang Island (KCT) and NCIG Kooragang Island (NCT). While the coal loaders are owned by Port Waratah Coal Services (PWCS) and the Newcastle Coal Infrastructure Group (NCIG), much of the track in and around the terminals is leased by ARTC and all train operations are controlled by ARTC.

The Carrington loader is the oldest of the facilities and is located in the highly developed Port Waratah precinct, with extensive rail facilities servicing a variety of activities. This includes steel products, containerised product for both third party logistics and mineral concentrate export in addition to bulk export grain for both GrainCorp and Newcastle Agri Terminal loader. There are also locomotive and wagon servicing and maintenance facilities.

The Carrington coal facilities include 3 arrival roads and 2 unloaders. While there are nominally 10 departure roads, these range in length from 414 metres to 863 metres, all of which are shorter than all coal trains, other than the short trains used by coal services from the south and western coalfields. Only two of the three arrival roads can accommodate 80 wagon and longer trains.

The Carrington facility has an environmental approval limit of 25 mtpa.

PWCS Kooragang Island is better configured for modern rail operations. It has 9 departure roads for its four dump stations and four fully signalled arrival roads.

Provisioning and inspection activity, which had historically contributed to congestion, has been moved out of the departure roads. Locomotives continue to shuttle between Kooragang and Port Waratah but this has a relatively minor impact on capacity.

PWCS nameplate capacity as a whole is 145 mtpa, while NCIG has nameplate capacity of 79 mtpa. NCIG has three arrival roads for its two dump stations.

All previously identified rail network investments to support current terminal capability have been completed. Any scope of work required for prospective volumes will be dependent on the details of any incremental enhancements to capacity at KCT or NCIG.

Volume & Capacity

Forecast surplus capacity, in both paths and tonnes, under the most likely volume and infrastructure scenario is shown in Figure 5-3. This is calculated as the surplus capacity on the most capacity constrained section, assuming a 10 per cent TMTC.

Volume and capacity by line sector using the calculation methodology set out in Chapter 1 is shown in figure 5-4. This chart shows both contracted and prospective volumes for the proposed infrastructure scope.

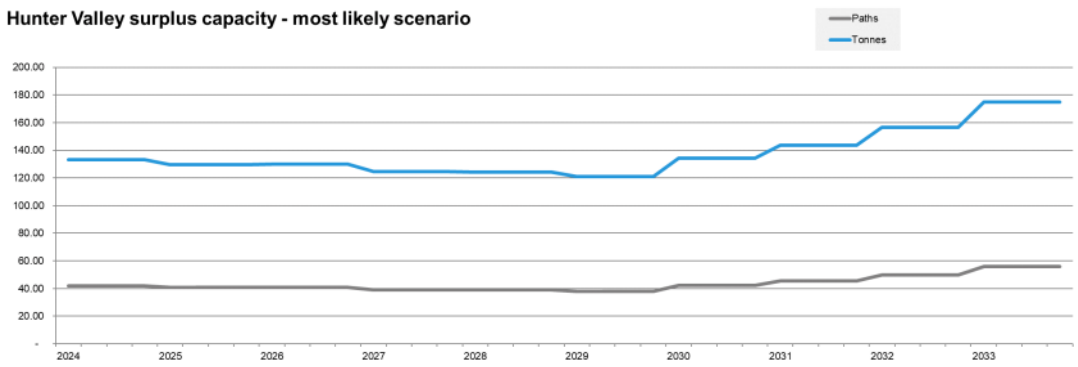

Figure 5-3 - Saleable surplus capacity for Zone 1 under the most likely volume and recommended projects scenario

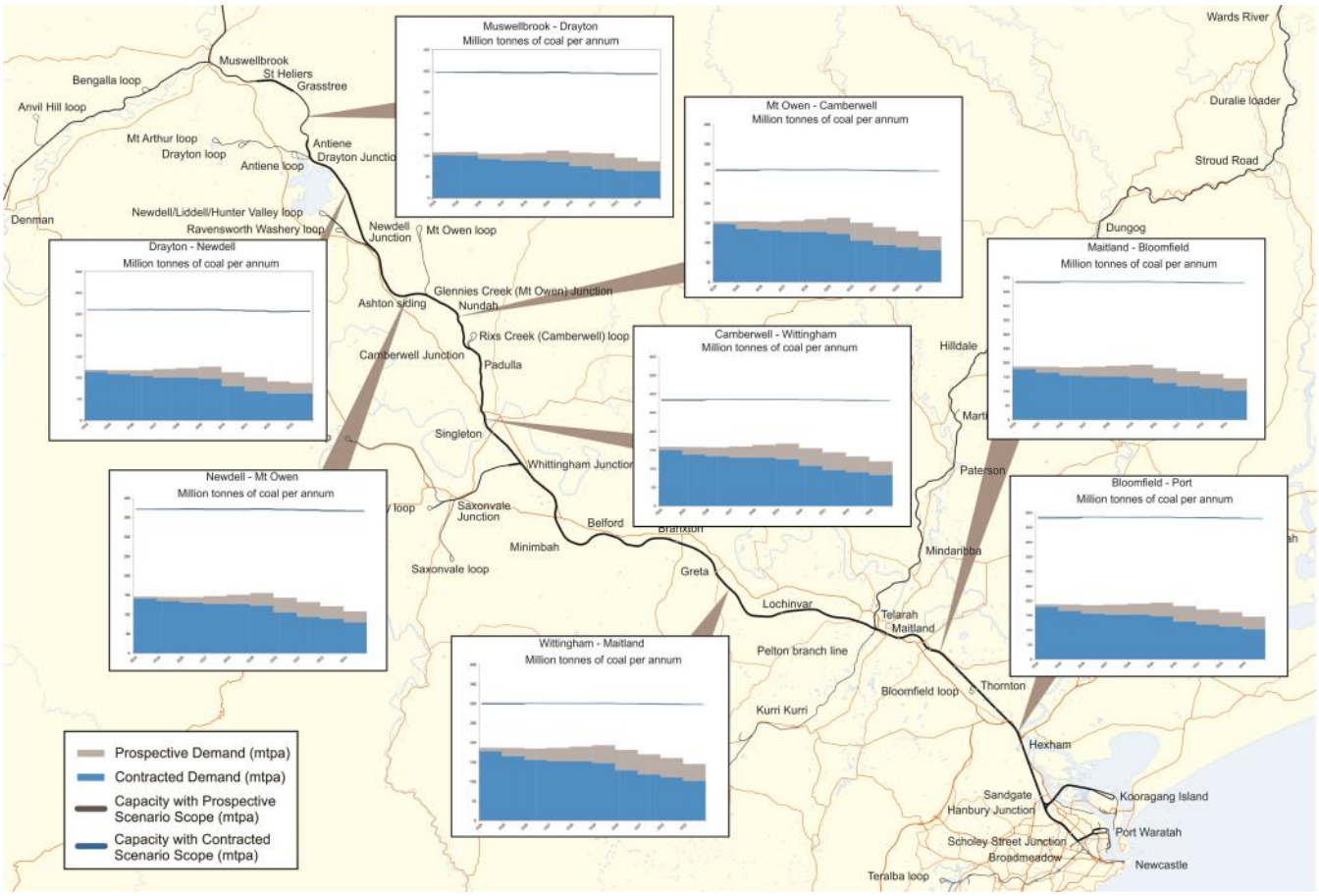

Figure 5-4 - Volume and capacity Muswellbrook—Newcastle

6

PROJECT INFORMATION

Context

This chapter aims to provide additional detail on the projects that are proposed to achieve the capacity outcomes. This chapter has been included in the strategies since 2019 following feedback from stakeholders.

The projects in this section are only those that are required under the Most Likely and Prospective scenarios.

South Gunnedah Loop

An options assessment was undertaken in 2011 with three options investigated around the existing level crossings between 465.885km and 470.520km in the section between Gunnedah and Curlewis. The option selected and approved by the relevant stakeholders including the RCG for progression to Phase 2 Feasibility consisted of a standalone loop between 467.066km and 468.615km.

The Phase 2 - Feasibility and subsequent Phase 3 – Project Assessments were completed during 2011 and 2012 with the investigation works including site surveys, identification of utilities, geotechnical investigations, hydraulic modelling of the local drainage, detailed designs, environmental approval and property negotiations.

During the project development the final loop configuration was confirmed as providing a simultaneous entry signalling system with the loop positioned between 466.730km and 468.593km (1.863km long).

The existing passively protected level crossing at 468.650km will be upgraded to active protection based on an assessment of the revised risk profile for this adjacent crossing.

As the Phase 3 scope was completed in 2012 a number of activities will need to be reviewed to ensure designs and assessments are appropriate and satisfy current standards and legislation prior to commencing construction. These activities include the following:

- Review and update track and civil designs

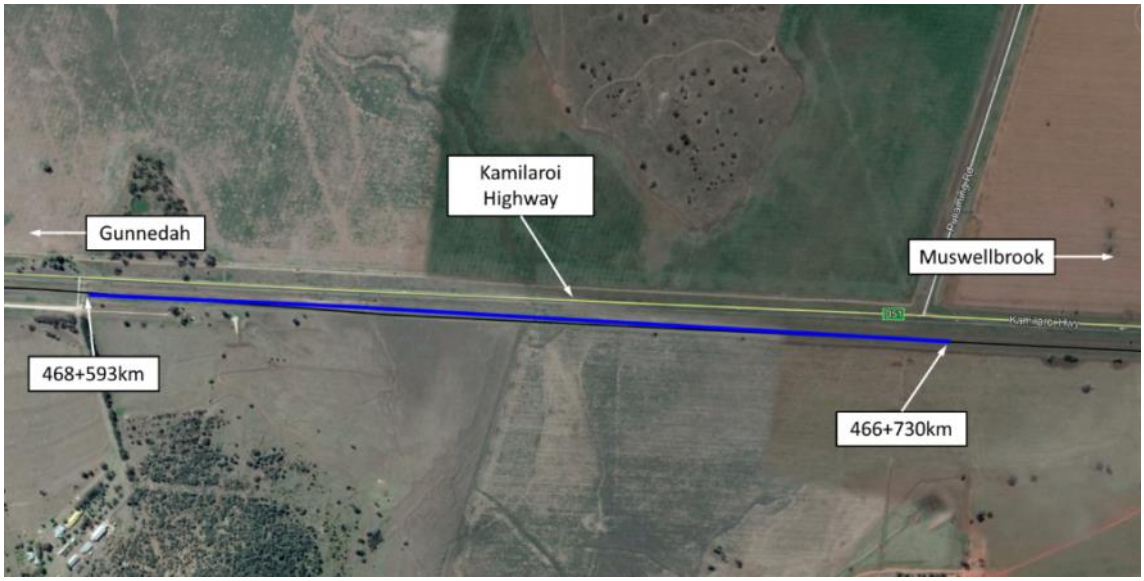

Figure 6-1 - Proposed South Gunnedah loop

Figure 6-2 - Proposed Togar North loop

- Review and update designs associated with Transport for NSW (TfNSW)
- Negotiate and execute a new major works licence with TfNSW
- Review and update signalling designs
- Prepare an updated project REF and have this updated document approved
- Negotiate and arrange execution of private property lease for construction compound.

Current status	Phase 1 completed March 2013
Time to complete	31 months
Cost estimate (unescalated)	$20 m
Cost estimate basis	As at end of Phase 1

Togar North Loop

Phase 1 of the proposed Togar North Loop was endorsed by the OSC on 10 December 2012. Seven options comprising both stand alone loops and loop extensions between Togar and Parkville were investigated during Phase 1 of the Togar North Loop project (311km Loop).

The Concept Assessment Report, endorsed by the RCG in January 2014, recommended a stand alone loop between Togar and Scone that is located as close to Scone as practical. The other considered options were discounted due to site constraints such as level crossings and the increased length of new track required for the alternate options. The stand alone loop at Togar North was determined to be the least cost option to achieve the capacity objective.

Phase 2 of the project was endorsed by the RCG in October 2014 proposing a standalone loop location on the Up side with modified simultaneous entry signalling between 310.345km and 311.957km (1.612km long). Phase 3 works on the project were placed on hold in early 2015.

The proposed loop can be constructed within the current rail corridor land (though leasing will be required for construction). The earthworks includes lime stabilisation to reduce the amount of material that needs to be removed from site while several culverts and minor underbridges require replacement and extensions during the loop construction.

Current status	Phase 1 completed January 2013
Time to complete	26 months
Cost estimate (unescalated)	$21 m
Cost estimate basis	As at end of Phase 1

Werris Creek North Loop

Phase 1 of the Werris Creek North Loop was endorsed by the OSC in February 2013 as part of a submission considering the three projects between Bells Gate and Burilda (Werris Creek Bypass, Werris Creek South & Werris Creek North). The detailed analysis of the options investigated are discussed in the Werris Creek Bypass, Bypass Extension South and Bypass Extension North Options Report (March 2013).

The Concept Assessment Report recommended a simultaneous entry crossing loop between 413.190km to 415.060km (1.870km long). Options to by-pass Werris Creek, extend the loops either side and build mid-section loops were considered to increase the capacity of the Bells Gate to Werris Creek to Burilda sections. The Werris Creek North Loop was one of the projects recommended to achieve the previously required capacity objective, along with the Werris Creek South Loop and the Burilda South Loop Extension.

The proposed Werris Creek North loop includes one culvert replacement, another culvert extension and a level crossing upgrade. The scope used as the basis for the delivery estimate included the assumption that approximately 25,000m3 of excess earthworks materials could be permanently stockpiled on site.

Current status	Phase 1 completed March 2013
Time to complete	31 months
Cost estimate (unescalated)	$27m
Cost estimate basis	As at end of Phase 1

Figure 6-3 - Proposed Werris Creek North loop

7

MAINTENANCE STRATEGY

Context

In this section ARTC aims to provide high level insight into the asset management objectives aimed at improving the customer value proposition of the existing asset along with a summary of the asset management framework and work programs. It reflects ARTC's major focus on the network service offering through long-term asset safety and reliability.

For the Hunter Valley Coal Network, ARTC produces an annual Maintenance Plan for consultation and annual Sustaining Capital Plan for customer endorsement. Further detail on maintenance and capital works planning and delivery is contained in these documents.

Asset Management Strategy and Objectives

At a high level, ARTC's overall asset management strategic objective is to provide safe and reliable rail infrastructure and capacity to deliver the train path required by its customers. To achieve this objective, ARTC's asset management program and plans balance the following inter-related elements:

Safety: to minimise rail infrastructure risk through compliance to ARTC's Safety Management System, including engineering standards and risk management framework.

Network Condition and Reliability: to maintain rail infrastructure condition and reliability in accordance with its Lease and Access Undertaking obligations in order to minimise disruptions including performance measures and Temporary Speed Restriction (TSR) and deliver the contracted rail infrastructure capacity.

Customer Outcomes: to manage network assets to meet current customer priorities, contracted requirements and forecasted future network demands. This includes working with the HVCCC and other stakeholders to align the capacity of the rail infrastructure, trains and ports with coal production demands through coordinated network closedowns for maintenance and sustaining capital projects.

These elements guide development and delivery of the rail infrastructure asset management plans.

- **Safety**: to minimise rail infrastructure risk through compliance to ARTC's Safety Management System, including engineering standards and risk management framework.
- **Network Condition and Reliability**: to maintain rail infrastructure condition and reliability in accordance with its Lease and Access Undertaking obligations in order to minimise disruptions including performance measures and Temporary Speed Restriction (TSR) and deliver the contracted rail infrastructure capacity.
- **Customer Outcomes**: to manage network assets to meet current customer priorities, contracted requirements and forecasted future network demands. This includes working with the HVCCC and other stakeholders to align the capacity of the rail infrastructure, trains and ports with coal production demands through coordinated network closedowns for maintenance and capital upgrades.

These elements guide development and delivery of the rail infrastructure asset management plans.

Asset Management Planning Process

ARTC has established processes to identify, plan, schedule, approve and execute required maintenance on its network infrastructure to deliver its safety and commercial objectives. Figure 7-1 outlines ARTC's overall asset management planning process.

The annual asset management program is divided into three main areas of expenditure; Routine Corrective and Reactive Maintenance (RCRM), Major Periodic Maintenance (MPM) and Sustaining Capital (CAP). The RCRM and MPM programs are an operating expense and considered to be Maintenance (or OPEX). The CAP program of works is subject to the RCG consultation and endorsement process under the HVAU. Table 7-1 provides a description of each work type.

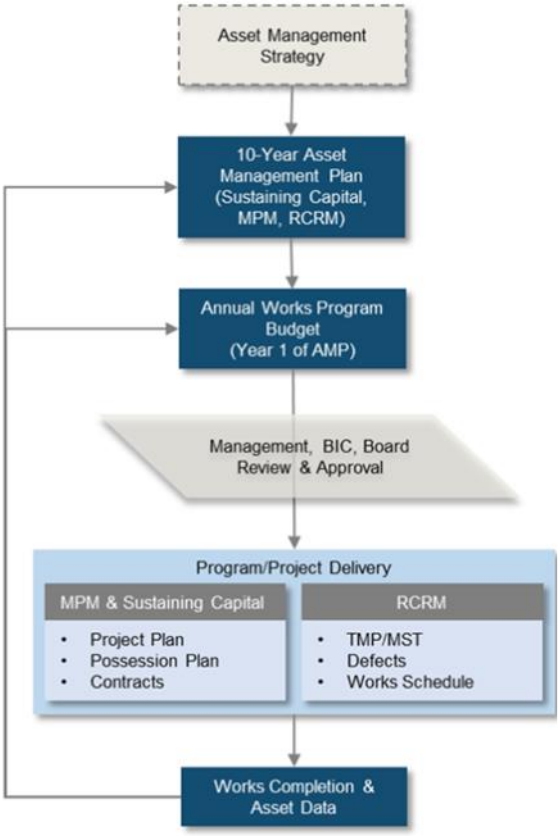

Figure 7-1 - ARTC Asset Management Planning Process

There is an inter-relationship between Sustaining Capital activities and maintenance expenditure and other operating costs. The maintenance plan is dependant up the delivery of the Sustaining Capital program.

Asset Management Decision Framework

The development of the Hunter Valley Asset Maintenance program involves a detailed process using a number of asset data inputs and analysis methods to arrive at a program of works that is considered to deliver ARTC's customer requirements in the most efficient manner. Figure 7-2 outlines the basis of the process.

ARTC is continuing to manage its assets based on a Risk and Condition approach and moving away from a Time and Tonnes approach where appropriate. ARTC is continuing to enhance the available condition related data sets through use of technology to provide objective reference points for condition related information.

ARTC's asset lifecycle decision making framework incorporates the Plan-Do-Check-Act (PDCA) cycle and considers:

ARTC's asset lifecycle decision making framework incorporates the Plan-Do-Check-Act (PDCA) cycle and considers:

- **Acquisition** – ensures evidence-based decision-making through business cases, feasibility and lifecycle considerations before acquisition, including consideration of spares.
- **Reliability and performance** – covers risk management, criticality and tactical decision-making for maintenance based on an assessment of available condition-based information.
- **Asset maintenance** – a 'Plan, Do, Check, Act' cycle to plan for, undertake, review and continually improve maintenance activities.
- **Asset assurance** – the processes to identify, analyse and develop actions for failures that may occur, and feed this back into the planning and reliability processes.

Asset Performance Monitoring

ARTC is committed to increasing the understanding of condition and risk to the network and enhancing ARTC's whole of life asset management systems.

In addition to asset inspection regimes, the following suite of monitoring tools are used as key inputs to the asset strategy, planning and maintenance processes.

Track Recording Vehicle (AK Car)

The AK car provides for both mandatory inspection and additional condition monitoring and runs approximately every four months. The vehicle provides track geometry measurements, rail profile

Maintenance Program	Description
RCRM	RCRM are scheduled activities used to inspect or service asset condition on a routine basis. RCRM extends to include reactive and corrective activities that are required as a result of inspections or defect identification.
MPM	MPM are cyclical or planned activities that maintain the operating performance and asset life of operational infrastructure. These activities aim to reduce the level of defects and corrective maintenance required.
Sustaining Capital	Generally characterised as an activity that will create or extend the useful life of the asset and/or provide additional functionality or increase the operating standard.

Table 7-1 - *RCRM, MPM and Sustaining Capital Descriptions*

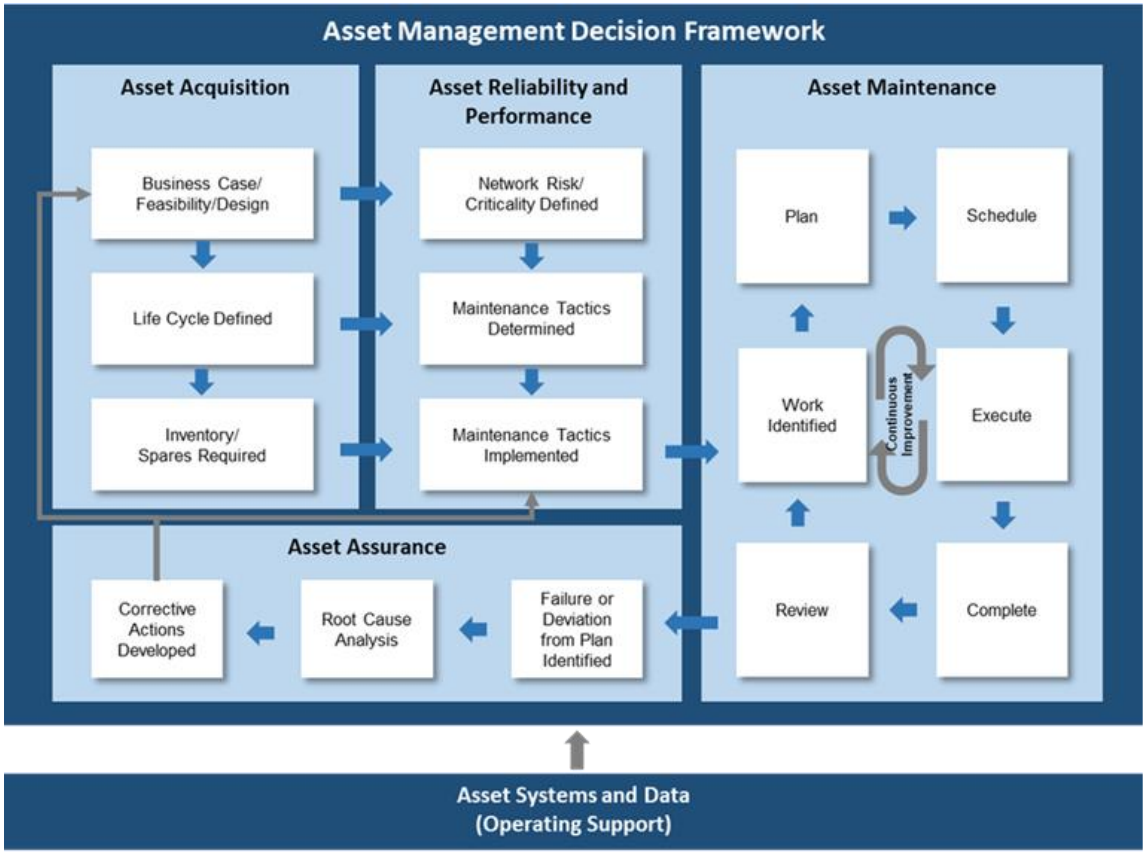

Figure 7-2 - Asset Management Framework

measurements, digital video, LiDAR and Ground Penetrating Radar (GPR).

Ultrasonic Inspection Car (UIC)

The Ultrasonic Inspection Car provides mandatory ultrasonic rail testing to identify internal rail flaws. The frequency of testing is set out in the Civil TMP and is based on the management of tonnage demand, rail break frequencies and rail flaw frequencies.

Instrumented Coal Wagons (ICW)

ARTC have four ICW units operating on the Hunter Valley Coal network. The ICW platform delivers; daily track condition data; notifications to relevant stakeholders for urgent repairs; allows for identification and early intervention of track condition issues; data analysis with long and short-term trends monitored to optimise planned maintenance programs; and assists in avoiding unnecessary maintenance.

Ground Penetrating Radar (GPR)

The AK Car is newly fitted with GPR equipment. GPR is an inspection process using ground penetrating radar equipment to detect Ballast Fouling Index, free draining layer, ballast pockets, fouled ballast, mud spots and wet track beds. The data produced from this process is a key input to decisions and justification for formation and ballast maintenance work. The target frequency is a two-year cycle.

Digital Mapping (LiDAR)

The AK Car is fitted with LiDAR equipment. The use of this data is currently focussed on clearance infringement checks and track centre measurements however its purpose may be expanded in the future. Future uses may include using digital terrain contour data for concept planning and estimating purposes. Further uses may also include level crossing sighting checks and for the validation of asset locations.

Real Time Bridge Monitoring

ARTC have installed bridge mounted electronic monitoring systems on several critical steel bridges on the Hunter Valley Network. The electronic monitoring systems will provide real□time monitoring and flag issues by way of exception reports for detailed investigation by the structures team.

Points Condition Monitoring (PCM)

Points failures are the second biggest contributor to infrastructure reliability issues (after rail breaks). PCM provides detailed diagnosis of points machine behaviour; drive proactive maintenance interventions thereby reducing the number of failures; and will allow our asset management teams to aggregate data sets to identify deeper insights into required maintenance. These may include identification of track, civil or signalling issues.

Level Crossing Monitoring

Level crossing monitors are installed at actively protected level crossings and provide alarms and in most cases remote diagnostics for faulty lamps, booms, batteries and signalling logic. The alarms and data allow emergency response teams to diagnose problems before attending site and hence allowing for the fastest possible return to service. Failure records also assist in the prioritisation of longer-term work programs.

Geographic Information System (GIS) Visualisation

The Geographic Information System (GIS) is a framework for gathering, managing, and analysing data spatially. ARTC collects and maintains large datasets necessary to manage the asset. ARTC also uses datasets produced by various government organisations. In order to make effective use of this data, it must be available to users in a clear, accurate and consistent manner, ARTC's GIS Platform provides this function.

Decision Support Platform

The DSP rationalises the many models and data sources on the asset into a single analysis system, thereby enabling efficient, reliable, objective and robust asset management decision-making. This includes data from inspections, monitoring systems and work activity history to deliver more efficient maintenance and improve asset reliability. The DSP has been utilised to identify and refine scope for activities such as tamping, ballast cleaning, grinding and track upgrades. Additionally, the DSP is also utilised daily to determine network priorities and identify sections with rapid deterioration, as well as determining the maintenance effectiveness.

8

RECOMMENDED PROJECTS AND NETWORK CAPACITY

Recommended Projects

There are no projects required to meet contracted network volumes. The Gunnedah Line is the only location where project recommendations are detailed to meet Most Likely and Prospective scenarios in the Strategy.

This Chapter summarises the projects required under each of the volume scenarios and the outcomes in terms of saleable paths and saleable coal tonnage.

In general, 'required by' dates reflect the timing required to deliver capacity in advance of the demand as per a given volume scenario. As discussed elsewhere in this Strategy, and detailed in Chapter 6 for each project, there can be a considerable period between approval by the RCG for a project to proceed to the next delivery phase, and the earliest realistic time that it can be delivered. 'Proposed by' dates in this Chapter are the latter of the required by date and the earliest the project could be expected to be delivered as at the time of this Strategy.

Where a project could be delivered in a certain timeframe, but another project with a later feasible delivery date dictates the capacity limit, the 'Proposed by' date of the first project is assumed to be the same as the project required to enhance the capacity limiting section.

A summary of the recommended projects for contracted volumes comparing previous and new proposed delivery timeframes, together with estimated costs, is shown in Table 8-1.

Saleable coal path capacity and coal tonnage capacity by sector for the contracted volume scenario is shown in tables 8-2 and 8-3 respectively.

Table 8-4 shows the same detail as Table 8-1, for the scope of work required for the most likely volume scenario.

Saleable coal path capacity and coal tonnage capacity by sector for the most likely volume scenario is shown in tables 8-5 and 8-6 respectively.

Table 8-7 is equivalent to table 8-6 for the prospective volume scenario. Saleable coal train capacity and coal tonnage capacity by sector for this scenario is shown in tables 8-8 and 8-9 respectively.

Costs shown in the tables are unescalated, $2023-24 orders of magnitude only. Costs are not ARTC's anticipated outturn costs as there are too many unknowns at the strategy phase to attach any reliability to the estimates. Scope and construction conditions are progressively better defined until a project cost is established for approval by the RCG in accordance with the HVAU.

Note also that projects in tables 8-1, 8-4 and 8-7 assume ANCO and a 73.5% utilisation between Q1 2022 and Q4 2026.

Recommended projects - Contracted Volume	2023 Strategy – Proposed by	2024 Strategy – Required by	2024 Strategy – Proposed by	Estimated Cost ($m) Present Value
No projects are required under the Contracted volume scenario				

Table 8-1 - Recommended Projects, Delivery Schedule and Costs for Contracted Volumes

General Notes: All projects (including scope, timing, and funding arrangements) are subject to consultation with and endorsement by the industry.

Dollar estimates are based on current known: Scope; survey and geotechnical knowledge; legislation and tax regimes. Project dollars are order of magnitude estimates only and do not represent concluded project dollars unless the project has proceeded, to Phase 5, delivery.

	2024				2025				2026	2027	2028	2029	2030	2031	2032	2033
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q1	Q1	Q1	Q1	Q1	Q1	Q1
Narrabri - Boggabri	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.4	4.4	4.4	4.4	4.4	4.4	4.4
Boggabri - Vickery	15.1	15.1	15.1	15.1	15.1	15.1	15.1	15.1	15.1	14.2	14.2	14.2	14.2	14.2	14.2	14.2
Vickery - Gunnedah	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.6	16.5	16.5	16.7	16.7	16.7	16.7	16.7
Gunnedah - Watermark Jct	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.2	10.2	10.2	10.2	10.2	10.2	10.2
Watermark Jct - Werris Creek	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	12.2	12.2	12.2	12.2	12.2	12.2	12.2
Werris Creek - Scone	13.3	13.3	13.3	13.3	13.3	13.3	13.3	13.3	13.3	12.4	12.4	12.4	12.4	12.4	12.4	12.4
Scone - Dartbrook	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.7	11.8	11.8	11.7	11.7	11.7	11.7	11.7
Dartbrook - Muswellbrook	45.5	45.5	45.5	45.5	45.5	45.5	45.5	45.5	45.5	43.1	43.1	43.1	43.1	43.1	43.1	43.1
Ulan - Moolarben	13.3	13.3	13.3	13.3	13.3	13.3	13.3	13.3	13.5	12.8	12.8	12.8	13.2	13.6	13.6	13.6
Moolarben - Wilpinjong	13.3	13.3	13.3	13.3	13.3	13.3	13.3	13.3	13.5	12.8	12.8	12.8	13.2	13.6	13.6	13.6
Wilpinjong - Bylong	16.4	16.4	16.4	16.4	16.4	16.4	16.4	16.4	16.5	15.6	15.6	15.6	15.6	15.8	15.8	15.8
Bylong - Ferndale	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	13.5	13.5	13.5	13.5	13.5	13.5	13.5
Ferndale - Mangoola	21.5	21.5	21.5	21.5	21.5	21.5	21.5	21.5	21.7	20.7	20.7	20.8	21.2	20.6	21.2	21.2
Mangoola - Mt Pleasant	29.6	29.6	29.6	29.6	29.6	29.6	29.6	29.6	29.6	28.2	28.2	28.2	28.2	28.2	28.1	28.1
Mt Pleasant - Bengalla	20.5	20.5	20.5	20.5	20.4	20.4	20.4	20.4	20.3	19.1	19.1	19.1	18.8	18.6	18.5	18.5
Bengalla - Muswellbrook	39.6	39.6	39.6	39.6	39.6	39.6	39.6	39.6	39.7	37.7	37.7	37.7	37.7	37.8	37.8	37.8
Muswellbrook -Drayton	92.4	92.4	92.4	92.4	92.4	92.4	92.4	92.4	92.4	92.4	92.4	92.4	92.4	92.4	92.4	92.4
Drayton - New dell	80.9	80.9	80.9	80.9	80.9	80.9	80.9	80.9	80.9	80.9	80.9	80.9	80.9	80.9	80.9	80.9
New dell - Mt Owen	114.7	114.7	114.7	114.7	114.7	114.7	114.7	114.7	114.7	114.7	114.7	114.7	114.7	114.7	114.7	114.7
Mt Owen - Camberwell	87.9	87.9	87.9	87.9	87.9	87.9	87.9	87.9	87.9	87.9	87.9	87.9	87.9	87.9	87.9	87.9
Camberwell - Whittingham	87.9	87.9	87.9	87.9	87.9	87.9	87.9	87.9	87.9	87.9	87.9	87.9	87.9	87.9	87.9	87.9
Whittingham - Maitland	92.4	92.4	92.4	92.4	92.4	92.4	92.4	92.4	92.4	92.4	92.4	92.4	92.4	92.4	92.4	92.4
Maitland - Bloomfield	149.0	149.0	149.0	149.0	149.0	149.0	149.0	149.0	149.0	149.0	149.0	149.0	149.0	149.0	149.0	149.0
Bloomfield - Hexham	149.0	149.0	149.0	149.0	149.0	149.0	149.0	149.0	149.0	149.0	149.0	149.0	149.0	149.0	149.0	149.0

Table 8-2 - Saleable capacity in coal train numbers (paths per day) assuming volumes and the recommended scope of work as per the contracted volume scenario.

	2024				2025				2026	2027	2028	2029	2030	2031	2032	2033
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q1	Q1	Q1	Q1	Q1	Q1	Q1
Narrabri - Boggabri	14.3	14.3	14.3	14.3	14.3	14.3	14.3	14.3	14.3	12.8	12.8	12.8	12.8	12.8	12.8	12.8
Boggabri - Vickery	44.0	44.0	44.0	44.0	44.0	44.0	44.0	44.0	44.0	41.2	41.2	41.2	41.2	41.2	41.2	41.2
Vickery - Gunnedah	50.7	50.7	50.7	50.7	50.7	50.7	50.7	50.7	51.1	47.9	47.9	48.5	48.5	48.5	48.5	48.5
Gunnedah - Watermark Jct	31.6	31.6	31.6	31.6	31.6	31.6	31.6	31.6	31.6	29.5	29.5	29.5	29.5	29.5	29.5	29.5
Watermark Jct - Werris Creek	37.8	37.8	37.8	37.8	37.8	37.8	37.8	37.8	37.8	35.4	35.4	35.4	35.4	35.4	35.4	35.4
Werris Creek - Scone	38.7	38.7	38.7	38.7	38.7	38.7	38.7	38.7	38.6	36.1	36.1	36.0	36.0	36.0	36.0	36.0
Scone - Dartbrook	37.1	37.1	37.1	37.1	37.1	37.1	37.1	37.1	36.8	34.2	34.2	34.1	34.1	34.1	34.1	34.1
Dartbrook - Muswellbrook	132.2	132.2	132.2	132.2	132.2	132.2	132.2	132.2	132.2	125.0	125.0	125.0	125.0	125.0	125.0	125.0
Ulan - Moolarben	44.1	44.1	44.1	44.1	44.3	44.3	44.3	44.3	44.8	42.4	42.4	42.4	43.7	45.0	45.0	45.0
Moolarben - Wilpinjong	44.1	44.1	44.1	44.1	44.3	44.3	44.3	44.3	44.8	42.4	42.4	42.4	43.7	45.0	45.0	45.0
Wilpinjong - Bylong	53.8	53.8	53.8	53.8	53.9	53.9	53.9	53.9	54.1	51.4	51.4	51.4	51.4	52.0	52.0	52.0
Bylong - Ferndale	46.7	46.7	46.7	46.7	46.8	46.8	46.8	46.8	46.8	44.5	44.5	44.5	44.5	44.6	44.6	44.6
Ferndale - Mangoola	70.6	70.6	70.6	70.6	70.7	70.7	70.7	70.7	71.2	68.0	68.0	68.5	69.7	68.2	70.2	70.2
Mangoola - Mt Pleasant	97.4	97.4	97.4	97.4	97.4	97.4	97.4	97.4	97.7	92.8	92.8	92.8	92.7	93.2	93.0	93.0
Mt Pleasant - Bengalla	67.3	67.3	67.3	67.3	67.2	67.2	67.2	67.2	66.9	63.0	63.0	62.9	61.9	61.7	61.0	61.0
Bengalla - Muswellbrook	129.6	129.6	129.6	129.6	129.7	129.7	129.7	129.7	129.9	123.5	123.5	123.4	123.1	123.6	123.4	123.4
Muswellbrook -Drayton	291.6	291.6	291.6	291.6	291.5	291.5	291.5	291.5	292.3	291.7	291.7	292.0	290.3	289.7	288.4	288.4
Drayton - New dell	255.8	255.8	255.8	255.8	255.9	255.9	255.9	255.9	256.6	256.2	256.2	256.5	254.8	253.6	252.5	252.5
New dell - Mt Owen	364.7	364.7	364.7	364.7	364.9	364.9	364.9	364.9	365.8	365.4	365.4	365.8	364.3	363.5	362.5	360.6
Mt Owen - Camberwell	280.0	280.0	280.0	280.0	279.6	279.6	279.6	279.6	280.3	280.0	280.0	280.3	279.1	278.5	277.8	276.6
Camberwell - Whittingham	280.1	280.1	280.1	280.1	279.8	279.8	279.8	279.8	280.5	280.2	280.2	280.5	279.4	278.9	278.1	276.9
Whittingham - Maitland	295.2	295.2	295.2	295.2	295.0	295.0	295.0	295.0	295.3	295.1	295.1	295.4	294.5	294.2	293.5	292.3
Maitland - Bloomfield	476.1	476.1	476.1	476.1	475.8	475.8	475.8	475.8	476.4	475.9	475.9	476.4	475.0	474.5	473.4	471.5
Bloomfield - Hexham	476.1	476.1	476.1	476.1	475.7	475.7	475.7	475.7	476.3	475.9	475.9	476.4	475.0	474.5	473.4	471.5

Table 8-3 - Saleable capacity in million tonnes assuming volumes and the recommended scope of work as per the contracted volume scenario. This tonnage capacity is equal to table 8-2 times average train size times 365.

Recommended projects - Most Likely Volume Scenario	2023 Strategy – Proposed by	2024 Strategy – Required by	2024 Strategy – Proposed by	Estimated Cost ($m) Present-Value
Scope as per contracted volume, plus				
Gunnedah Basin Line				
South Gunnedah loop	Q1 2026	Q1 2027	Q1 2027	$20
414 km loop (Werris Creek North)	Q1 2027	-	-	-
Bells Gate south extension	Q1 2028	-	-	-
Wingen loop	Q1 2027	-	-	-
Togar North Loop	Q1 2027	-	-	-
Ulan Line				
Nil	-	-	-	-
Port—Muswellbrook				
Nil	-	-	-	-
Congestion Projects				
Train Parkup	See Note 1	See Note 1	TBD	-

Table 8-4- Recommended Projects, Delivery Schedule and Costs for Most Likely Volumes

General Notes:

All the above projects (including scope, timing, and funding arrangements) are subject to consultation with and endorsement by the industry.

Dollar estimates are based on current known: Scope; Survey and geotechnical knowledge; legislation and tax regimes. Project dollars are order of magnitude estimates only and do not represent concluded project dollars.

Note 1: ARTC continue to work with HVCCC to identify the requirements for this project

	2024				2025				2026	2027	2028	2029	2030	2031	2032	2033
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q1	Q1	Q1	Q1	Q1	Q1	Q1
Narrabri - Boggabri	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	4.9	4.4	4.3	4.3	4.3	4.3	4.3	4.3
Boggabri - Vickery	15.1	15.1	15.1	15.1	15.0	15.0	15.0	15.0	14.8	13.7	13.6	13.4	13.3	13.3	13.3	13.4
Vickery - Gunnedah	17.5	17.5	17.5	17.5	17.6	17.6	17.6	17.6	17.8	16.7	16.7	16.7	16.7	16.7	16.7	16.7
Gunnedah - Watermark Jct	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	17.7	17.7	17.7	17.7	17.7	17.7	17.7
Watermark Jct - Werris Creek	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	12.2	12.2	12.2	12.2	12.2	12.2	12.2
Werris Creek - Scone	13.3	13.3	13.3	13.3	13.3	13.3	13.3	13.3	13.3	12.4	12.4	12.4	12.4	12.4	12.4	12.4
Scone - Dartbrook	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.8	12.0	12.0	12.1	12.1	12.1	12.1	12.1
Dartbrook - Muswellbrook	45.5	45.5	45.5	45.5	45.5	45.5	45.5	45.5	45.5	43.1	43.1	43.1	43.1	43.1	43.1	43.1
Ulan - Moolarben	13.3	13.3	13.3	13.3	13.4	13.4	13.4	13.4	13.6	12.7	12.8	12.7	12.8	13.2	12.9	12.7
Moolarben - Wilpinjong	13.3	13.3	13.3	13.3	13.4	13.4	13.4	13.4	13.6	12.7	12.8	12.7	12.8	13.2	12.9	12.7
Wilpinjong - Bylong	16.4	16.4	16.4	16.4	16.4	16.4	16.4	16.4	16.5	15.6	15.6	15.6	15.6	15.8	15.8	15.8
Bylong - Ferndale	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	13.5	13.5	13.5	13.5	13.5	13.5	13.5
Ferndale - Mangoola	21.4	21.4	21.4	21.4	21.4	21.4	21.4	21.4	21.3	20.5	20.6	20.2	20.5	19.9	21.0	21.0
Mangoola - Mt Pleasant	29.6	29.6	29.6	29.6	29.6	29.6	29.6	29.6	29.6	28.2	28.2	28.2	28.2	28.2	28.1	28.1
Mt Pleasant - Bengalla	20.4	20.4	20.4	20.4	20.3	20.3	20.3	20.3	20.3	19.2	18.7	19.0	18.8	18.7	18.1	18.0
Bengalla - Muswellbrook	39.6	39.6	39.6	39.6	39.6	39.6	39.6	39.6	39.7	37.7	37.7	37.7	37.7	37.8	37.8	37.8
Muswellbrook -Drayton	92.4	92.4	92.4	92.4	92.4	92.4	92.4	92.4	92.4	92.4	92.4	92.4	92.4	92.4	92.4	92.4
Drayton - New dell	80.9	80.9	80.9	80.9	80.9	80.9	80.9	80.9	80.9	80.9	80.9	80.9	80.9	80.9	80.9	80.9
New dell - Mt Owen	114.7	114.7	114.7	114.7	114.7	114.7	114.7	114.7	114.7	114.7	114.7	114.7	114.7	114.7	114.7	114.7
Mt Owen - Camberwell	87.9	87.9	87.9	87.9	87.9	87.9	87.9	87.9	87.9	87.9	87.9	87.9	87.9	87.9	87.9	87.9
Camberwell - Whittingham	87.9	87.9	87.9	87.9	87.9	87.9	87.9	87.9	87.9	87.9	87.9	87.9	87.9	87.9	87.9	87.9
Whittingham - Maitland	92.4	92.4	92.4	92.4	92.4	92.4	92.4	92.4	92.4	92.4	92.4	92.4	92.4	92.4	92.4	92.4
Maitland - Bloomfield	149.0	149.0	149.0	149.0	149.0	149.0	149.0	149.0	149.0	149.0	149.0	149.0	149.0	149.0	149.0	149.0
Bloomfield - Hexham	149.0	149.0	149.0	149.0	149.0	149.0	149.0	149.0	149.0	149.0	149.0	149.0	149.0	149.0	149.0	149.0

Table 8-5 - Saleable capacity in coal train numbers (paths per day) assuming volumes and the recommended scope of work as per the most likely volume scenario .

	2024				2025				2026	2027	2028	2029	2030	2031	2032	2033
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q1	Q1	Q1	Q1	Q1	Q1	Q1
Narrabri - Boggabri	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.3	12.7	12.6	12.6	12.6	12.6	12.6	12.6
Boggabri - Vickery	44.0	44.0	44.0	44.0	43.5	43.5	43.5	43.5	42.9	39.9	39.5	39.0	38.6	38.5	38.6	39.0
Vickery - Gunnedah	50.9	50.9	50.9	50.9	51.2	51.2	51.2	51.2	51.7	48.5	48.5	48.5	48.5	48.5	48.5	48.5
Gunnedah - Watermark Jct	31.6	31.6	31.6	31.6	31.6	31.6	31.6	31.6	31.6	51.5	51.5	51.5	51.5	51.5	51.5	51.5
Watermark Jct - Werris Creek	37.8	37.8	37.8	37.8	37.8	37.8	37.8	37.8	37.8	35.4	35.4	35.4	35.4	35.4	35.4	35.4
Werris Creek - Scone	38.7	38.7	38.7	38.7	38.7	38.7	38.7	38.7	38.6	36.1	36.1	36.0	36.0	36.0	36.0	36.0
Scone - Dartbrook	37.0	37.0	37.0	37.0	37.0	37.0	37.0	37.0	37.1	34.7	34.9	35.0	35.2	35.2	35.2	35.0
Dartbrook - Muswellbrook	132.2	132.2	132.2	132.2	132.2	132.2	132.2	132.2	132.2	125.0	125.0	125.0	125.0	125.0	125.0	125.0
Ulan - Moolarben	44.3	44.3	44.3	44.3	44.6	44.6	44.6	44.6	45.2	42.1	42.6	42.1	42.5	43.8	42.7	0.0
Moolarben - Wilpinjong	44.3	44.3	44.3	44.3	44.6	44.6	44.6	44.6	45.2	42.1	42.6	42.1	42.5	43.8	42.7	42.1
Wilpinjong - Bylong	54.0	54.0	54.0	54.0	54.1	54.1	54.1	54.1	54.3	51.5	51.7	51.5	51.6	51.6	51.5	51.3
Bylong - Ferndale	46.9	46.9	46.9	46.9	46.9	46.9	46.9	46.9	47.0	44.6	44.7	44.5	44.6	44.3	44.1	44.0
Ferndale - Mangoola	70.4	70.4	70.4	70.4	70.6	70.6	70.6	70.6	70.3	67.7	68.0	66.4	67.6	65.3	68.7	68.5
Mangoola - Mt Pleasant	97.4	97.4	97.4	97.4	97.6	97.6	97.6	97.6	97.7	92.9	93.1	92.8	92.8	92.5	91.7	91.4
Mt Pleasant - Bengalla	67.0	67.0	67.0	67.0	67.0	67.0	67.0	67.0	66.8	63.2	61.8	62.6	61.9	61.4	59.1	58.5
Bengalla - Muswellbrook	129.8	129.8	129.8	129.8	129.9	129.9	129.9	129.9	130.0	123.6	123.4	123.3	123.2	123.0	122.3	122.1
Muswellbrook -Drayton	291.9	291.9	291.9	291.9	291.6	291.6	291.6	291.6	291.2	290.3	290.0	290.5	289.4	288.7	285.6	284.9
Drayton - Newdell	255.2	255.2	255.2	255.2	255.7	255.7	255.7	255.7	255.3	255.0	255.2	254.8	253.2	252.3	249.4	248.4
Newdell - Mt Owen	363.7	363.7	363.7	363.7	364.6	364.6	364.6	364.6	364.2	363.7	363.9	363.7	362.0	361.0	358.1	355.2
Mt Owen - Camberwell	277.5	277.5	277.5	277.5	278.1	278.1	278.1	278.1	279.5	279.1	279.1	278.9	277.7	276.9	274.9	272.8
Camberwell - Whittingham	277.8	277.8	277.8	277.8	278.3	278.3	278.3	278.3	279.7	279.3	279.3	279.1	277.9	277.2	275.2	273.2
Whittingham - Maitland	293.2	293.2	293.2	293.2	293.6	293.6	293.6	293.6	294.9	294.6	294.5	294.2	293.2	292.6	291.2	289.4
Maitland - Bloomfield	472.5	472.5	472.5	472.5	473.6	473.6	473.6	473.6	475.6	475.1	475.0	474.5	472.9	472.0	469.7	466.8
Bloomfield - Hexham	472.5	472.5	472.5	472.5	473.6	473.6	473.6	473.6	475.6	475.1	475.0	474.5	472.9	472.0	469.7	466.8

Table 8-6 - Saleable capacity in tonnes assuming volumes and the recommended scope of work as per the most likely volume scenario. This tonnage capacity is equal to table 8-5 times average train size times 365.

Recommended projects - Prospective Volume Scenario	2023 Strategy – Proposed by	2024 Strategy – Required by	2024 Strategy – Proposed by	Estimated Cost ($m) Present Value
Scope as per contracted volume, plus				
Gunnedah Basin Line				
South Gunnedah loop	Q1 2025	Q1 2027	Q1 2027	$20
Burilda north extension	-	-	-	-
414 km loop (Werris Creek North)	Q1 2027	Q1 2030	Q1 2030	$27
Bells Gate south extension	Q1 2028	-	-	-
Wingen loop	Q1 2027	-	-	-
Togar North Loop	Q1 2027	Q1 2030	Q1 2030	$19
Ulan Line				
Nil	-	-	-	-
Port—Muswellbrook				
Nil	-	-	-	-
Congestion Projects				
Train Parkup	TBM	See Note 1	TBD	-

Table 8-7 - Recommended Projects, Delivery Schedule and Costs for Prospective Volumes

General Notes:

All the above projects (including scope, timing, and funding arrangements) are subject to consultation with and endorsement by the industry.

Dollar estimates are based on current known: Scope; Survey and geotechnical knowledge; legislation and tax regimes. Project dollars are order of magnitude estimates only and do not represent concluded project dollars.

Note 1: ARTC continue to work with HVCCC to identify the requirements for this project

	2024				2025				2026	2027	2028	2029	2030	2031	2032	2033
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q1	Q1	Q1	Q1	Q1	Q1	Q1
Narrabri - Boggabri	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.4	4.3	4.3	4.3	4.3	4.3	4.3
Boggabri - Vickery	15.1	15.1	15.1	15.1	15.0	15.0	15.0	15.0	14.8	13.7	13.6	13.4	13.3	13.3	13.3	13.4
Vickery - Gunnedah	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.6	16.5	16.6	16.7	16.7	16.7	16.7	16.7
Gunnedah - Watermark Jct	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	17.7	17.7	17.7	17.7	17.7	17.7	17.7
Watermark Jct - Werris Creek	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	12.2	12.2	12.2	17.2	17.2	17.2	17.2
Werris Creek - Scone	13.3	13.3	13.3	13.3	13.3	13.3	13.3	13.3	13.3	12.4	12.4	12.4	12.4	12.4	12.4	12.4
Scone - Dartbrook	12.8	12.8	12.8	12.8	15.6	12.9	12.9	12.9	12.8	12.0	12.1	12.1	14.7	14.7	14.7	14.7
Dartbrook - Muswellbrook	45.5	45.5	45.5	45.5	45.5	45.5	45.5	45.5	45.5	43.1	43.1	43.1	43.1	43.1	43.1	43.1
Ulan - Moolarben	13.3	13.3	13.3	13.3	13.4	13.4	13.4	13.4	13.5	12.7	12.7	12.6	12.8	13.2	13.2	13.7
Moolarben - Wilpinjong	13.3	13.3	13.3	13.3	13.4	13.4	13.4	13.4	13.5	12.7	12.7	12.6	12.8	13.2	13.2	13.7
Wilpinjong - Bylong	16.4	16.4	16.4	16.4	16.4	16.4	16.4	16.4	16.5	15.6	15.6	15.6	15.6	15.8	15.8	15.8
Bylong - Ferndale	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	13.5	13.5	13.5	13.5	13.5	13.5	13.5
Ferndale - Mangoola	21.3	21.3	21.3	21.3	21.4	21.4	21.4	21.4	21.3	20.5	20.5	20.2	20.5	20.0	21.1	21.0
Mangoola - Mt Pleasant	29.6	29.6	29.6	29.6	29.6	29.6	29.6	29.6	29.6	28.2	28.2	28.2	28.2	28.2	28.1	28.1
Mt Pleasant - Bengalla	20.4	20.4	20.4	20.4	20.4	20.4	20.4	20.4	20.3	19.2	18.9	19.1	18.9	18.8	18.4	18.2
Bengalla - Muswellbrook	39.6	39.6	39.6	39.6	39.6	39.6	39.6	39.6	39.7	37.7	37.7	37.7	37.7	37.8	37.8	37.8
Muswellbrook -Drayton	92.4	92.4	92.4	92.4	92.4	92.4	92.4	92.4	92.4	92.4	92.4	92.4	92.4	92.4	92.4	92.4
Drayton - New dell	80.9	80.9	80.9	80.9	80.9	80.9	80.9	80.9	80.9	80.9	80.9	80.9	80.9	80.9	80.9	80.9
New dell - Mt Owen	114.7	114.7	114.7	114.7	114.7	114.7	114.7	114.7	114.7	114.7	114.7	114.7	114.7	114.7	114.7	114.7
Mt Owen - Camberwell	87.9	87.9	87.9	87.9	87.9	87.9	87.9	87.9	87.9	87.9	87.9	87.9	87.9	87.9	87.9	87.9
Camberwell - Whittingham	87.9	87.9	87.9	87.9	87.9	87.9	87.9	87.9	87.9	87.9	87.9	87.9	87.9	87.9	87.9	87.9
Whittingham - Maitland	92.4	92.4	92.4	92.4	92.4	92.4	92.4	92.4	92.4	92.4	92.4	92.4	92.4	92.4	92.4	92.4
Maitland - Bloomfield	149.0	149.0	149.0	149.0	149.0	149.0	149.0	149.0	149.0	149.0	149.0	149.0	149.0	149.0	149.0	149.0
Bloomfield - Hexham	149.0	149.0	149.0	149.0	149.0	149.0	149.0	149.0	149.0	149.0	149.0	149.0	149.0	149.0	149.0	149.0

Table 8-8 - Saleable capacity in coal train numbers (paths per day) assuming volumes and the recommended scope of work as per the prospective volume scenario

	2024				2025				2026	2027	2028	2029	2030	2031	2032	2033
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q1	Q1	Q1	Q1	Q1	Q1	Q1
Narrabri - Boggabri	14.3	14.3	14.3	14.3	14.3	14.3	14.3	14.3	14.3	12.7	12.6	12.6	12.6	12.6	12.6	12.6
Boggabri - Vickery	44.0	44.0	44.0	44.0	43.5	43.5	43.5	43.5	42.9	39.9	39.5	39.0	38.6	38.6	38.6	39.0
Vickery - Gunnedah	50.7	50.7	50.7	50.7	50.8	50.8	50.8	50.8	51.1	48.0	48.1	48.5	48.5	48.5	48.5	48.5
Gunnedah - Watermark Jct	31.6	31.6	31.6	31.6	31.6	31.6	31.6	31.6	31.6	51.5	51.5	51.5	51.5	51.5	51.5	51.5
Watermark Jct - Werris Creek	37.8	37.8	37.8	37.8	37.8	37.8	37.8	37.8	37.8	35.4	35.4	35.4	49.8	49.8	49.8	49.8
Werris Creek - Scone	38.7	38.7	38.7	38.7	38.7	38.7	38.7	38.7	38.6	36.1	36.1	36.0	36.0	36.0	36.0	36.0
Scone - Dartbrook	37.3	37.3	37.3	37.3	45.4	37.4	37.4	37.4	37.3	34.9	35.1	35.1	42.7	42.7	42.7	42.7
Dartbrook - Muswellbrook	132.2	132.2	132.2	132.2	132.2	132.2	132.2	132.2	132.2	125.0	125.0	125.0	125.0	125.0	125.0	125.0
Ulan - Moolarben	44.2	44.2	44.2	44.2	44.4	44.4	44.4	44.4	45.0	42.1	42.3	42.0	42.4	43.8	43.8	45.4
Moolarben - Wilpinjong	44.2	44.2	44.2	44.2	44.4	44.4	44.4	44.4	45.0	42.1	42.3	42.0	42.4	43.8	43.8	45.4
Wilpinjong - Bylong	53.8	53.8	53.8	53.8	53.9	53.9	53.9	53.9	54.1	51.5	51.4	51.3	51.4	51.5	51.5	52.0
Bylong - Ferndale	46.7	46.7	46.7	46.7	46.8	46.8	46.8	46.8	46.8	44.5	44.5	44.4	44.4	44.2	44.2	44.6
Ferndale - Mangoola	70.1	70.1	70.1	70.1	70.3	70.3	70.3	70.3	70.2	67.6	67.5	66.3	67.4	65.3	68.8	69.5
Mangoola - Mt Pleasant	97.3	97.3	97.3	97.3	97.3	97.3	97.3	97.3	97.5	92.7	92.7	92.6	92.5	92.3	91.8	92.7
Mt Pleasant - Bengalla	67.0	67.0	67.0	67.0	67.0	67.0	67.0	67.0	66.8	63.1	62.1	62.7	61.9	61.6	60.1	59.8
Bengalla - Muswellbrook	129.6	129.6	129.6	129.6	129.6	129.6	129.6	129.6	129.8	123.4	123.1	123.1	123.0	122.9	122.5	123.1
Muswellbrook -Drayton	291.2	291.2	291.2	291.2	290.5	290.5	290.5	290.5	290.6	289.8	289.6	290.3	289.2	288.7	286.8	286.9
Drayton - New dell	255.2	255.2	255.2	255.2	255.0	255.0	255.0	255.0	255.3	254.8	254.6	254.9	253.6	252.0	250.2	251.3
New dell - Mt Owen	364.0	364.0	364.0	364.0	363.8	363.8	363.8	363.8	364.1	363.5	363.4	364.0	362.8	361.3	359.6	359.3
Mt Owen - Camberwell	277.2	277.2	277.2	277.2	277.2	277.2	277.2	277.2	279.7	279.2	279.1	279.5	278.6	277.6	276.5	276.4
Camberwell - Whittingham	277.6	277.6	277.6	277.6	277.5	277.5	277.5	277.5	280.0	279.5	279.4	279.8	279.0	278.0	276.9	276.8
Whittingham - Maitland	292.9	292.9	292.9	292.9	292.8	292.8	292.8	292.8	295.1	294.6	294.5	294.8	294.1	293.3	292.5	292.3
Maitland - Bloomfield	472.1	472.1	472.1	472.1	472.3	472.3	472.3	472.3	475.9	475.2	475.0	475.4	474.4	473.0	471.8	471.5
Bloomfield - Hexham	472.0	472.0	472.0	472.0	472.3	472.3	472.3	472.3	475.9	475.2	475.0	475.4	474.3	473.0	471.8	471.5

Table 8-9 - Saleable capacity in tonnes assuming volumes and the recommended scope of work as per the prospective volume scenario. This tonnage capacity is equal to table 8-8 times average train size times 365.

Refer to ARTC's website for more information on ARTC.

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