25 August 2023

Mr George Passmore
Director of Business Performance
Queensland Competition Authority

QCA review of the appointment of the independent expert

Dear George

Dalrymple Bay Infrastructure Management Pty Ltd (**DBIM**) appreciates the opportunity to make a submission to this review in respect of the current independent expert's performance in meeting its responsibilities and obligations under Aurizon Network's 2017 access undertaking (**UT5**).

Please find attached DBIM's submission, which includes the DBCC Master Plan 2023 by the Integrated Logistics Company (**ILC**) which is the independent expert appointed for Dalrymple Bay Terminal in accordance with the DBCT 2021 Access Undertaking.

DBIM has provided a complete version of its submission for the QCA's consideration, and a version suitable for publication on the QCA website which has removed any material DBIM considers confidential. Please contact me directly if you have any queries in relation to DBIM's submission.

Yours sincerely

Jonathan Blakey
Chief Commercial & Sustainability Officer
Dalrymple Bay Infrastructure Management Pty Ltd

Attachment: DBIM submission on the QCA review of the appointment of the independent expert

Review of the appointment of the independent expert

DBIM submission to the QCA

25 August 2023

Dalrymple Bay Infrastructure Management Pty Ltd
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Contents

1 Executive summary

1 Aurizon Network's 2017 access undertaking (**UT5**)[1] provides for the appointment of an independent expert (**IE**) to be responsible for various assessments and duties relating to the capacity of the Central Queensland Coal Network (**CQCN**). The Coal Network Capacity Company (**CNCC**)[2] was appointed as the independent expert in 2020. As required by UT5, the QCA is in the process of reviewing the appointment of CNCC as the IE and has invited submissions from stakeholders by 25 August 2023 on CNCC's performance in meeting its responsibilities and obligations under UT5.[3]

2 Dalrymple Bay Infrastructure Management Pty Ltd (**DBIM**) welcomes the opportunity to provide a submission to this review in its role as the access provider for Dalrymple Bay Terminal (**DBT**),[4] and particularly in the context of the current and future capacity of the Goonyella System and relevantly the availability of system capacity to match the proposed 8X Expansion of DBT (**8X**).[5]

3 The IE is commissioned to conduct the Initial Capacity Assessment Report (**ICAR**), the ongoing Annual Capacity Assessment Reports (**ACAR**) and other secondary activities. In DBIM's view, these are important activities which provide transparency to coal miners currently utilizing or seeking to utilize the CQCN.

4 However, DBIM requests that the QCA consider whether the modelling by CNCC (as set out in the ICAR and ACARs)[6] is consistent with the requirements of UT5, in regard to the current and future capacity of the Goonyella System. In particular, DBI raises the following concerns which are discussed in further detail in this submission:

4.1 **Insufficient consultation and inaccurate analysis** – in its preparation of the ICAR and the ACARs, CNCC may not have taken into consideration key information in respect of the System Operating Parameters (**SOP**) for the Goonyella System.[7]

4.2 **Inadequate auditing and validation of results** – CNCC has not taken into account in its modelling the relevant capacity assessments of the Dalrymple Bay Coal Chain (**DBCC**) by the Integrated Logistics Company (**ILC**), and did not have appropriate regard to the key considerations adopted by the ILC in its modelling which are informed by the ILC's extensive experience with the operation of the DBCC.[8] There are material discrepancies between the results and conclusions provided by the ILC and by the CNCC

DBT expansion capacity

5 DBIM is currently undertaking feasibility studies in relation to 8X which is expected to be able to expand DBT's system capacity to 99.1 Mtpa. DBT's Access Seekers have been willing to underwrite these expansion feasibility studies and enter into conditional access agreements but DBIM expects that if Access Seekers are unable to obtain certainty as to the availability of matched rail infrastructure rights associated with their 8X capacity, the Access Seekers may have little choice but to terminate their conditional access agreements for 8X.

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[1] Aurizon website Aurizon Network 2017 Access Undertaking clause 7A.3.3
[2] CNCC website Coal Network Capacity Company
[3] QCA website Review of the independent expert
[4] DBI website Terminal Overview and DBI Sustainability Report 2022 Figure 1 Key Stakeholder Relationships, p. 9
[5] QCA website Application for price ruling – 8X expansion and DBI website DBT Master Plan 2023
[6] QCA website Aurizon Network – Capacity Assessment including ICAR, ACARs, SOPs.
[7] QCA website Aurizon Network – Capacity Assessment CNCC publication 2023 System Operating Parameters
[8] ILC website Integrated Logistics Company. The ILC is the independent expert appointed in accordance with s.12.1 of the DBCT 2021 Access Undertaking (**AU**) to assess system capacity for the DBCC, including the system capacity assessments relevant to 8X.

Impacts of incorrect capacity assessments

6 If capacity assessments generated by the CNCC are erroneous or inadvertently serve to artificially reduce assessed capacity, there may be negative outcomes for the Queensland coal export industry, namely:

6.1 New, competitive, profitable and cost efficient coal mine developments may not be able to commence operations if they are unable to secure below rail capacity.[9] In effect, this means that if available below rail capacity is erroneously modelled and artificially low, DBIM may be unable to expand to satisfy this new demand.

6.2 Additional costs may be incurred by existing and future Access Holders in order to rectify any capacity deficits identified by erroneous modelling, which may affect the competitiveness of the industry. DBIM understands that significant capital expenditure[10] may be required to be incurred.

[9] Pursuant to the DBT 2021 AU, DBIM may only contract to system capacity

[10] Aurizon website Aurizon Network 2017 Access Undertaking clause 7A.5(w) Existing Capacity Deficit

2 Consultation and analysis by the CNCC

2021 ICAR

7 Prior to the release of the ICAR in November 2020, the CNCC's consultation with DBIM was limited to clarifying the SOP for the Goonyella System and DBT. The final released ICAR reduced the Deliverable Network Capacity (**DNC**) to below the Committed (contracted) capacity, and indicated an Existing Capacity Deficit (**ECD**) of 10-11 Mtpa in the Goonyella System. Prior to, and following the release of that result, there was limited discussion with DBIM or the Operator of DBT in relation to the operation of Cargo Assembly at DBT to ensure that the modelling reflected the way the Goonyella System operates in practice.

8 The ICAR provided in-depth analysis of metrics that had little apparent impact on the DNC. A major contributor to the ECD was the activation of Cargo Assembly, and by extension, campaign railings. The activation of cargo assembly/campaign railings alone contributed a theoretical modelling loss of approximately 5-6 Mtpa to the greater ECD. This material impact received no apparent in-depth analysis. DBIM understands that significant potential capital expenditure could be incurred by Goonyella System users to rectify the ECD. DBIM considers that an in-depth analysis would be prudent for the major contributors to the CNCC's assessment of capacity losses.

2023 ACAR

9 DBIM is of the view that the time allowed for the SOP consultation process in relation to the 2023 ACAR was insufficient. The abbreviated SOP consultation timeline did not allow for sufficient interrogation and challenging of the critical and complex SOP assumptions relating to the operations of DBT.

Operation and Intent of Part 7A of UT5 premised on the way each Coal System "operates in practice"

10 The CNCC is appointed pursuant to Part 7A of the UT5. [11] The intent of this Part is premised upon a fundamental expectation that the DNC of the Rail Infrastructure in each Coal System and the System Capacity of each Coal System is independently and *realistically assessed having regard to the way in which that Coal System operates in practice* in determining the maximum number of Train Paths (calculated on a Monthly and annual basis) that *can be utilised* in each Coal System. DBIM is concerned that in modelling the DNC of the Goonyella System, the CNCC has not had appropriate regard to the way in which the Goonyella System operates in practice or necessarily modelled those Train Paths *that can be utilised.*

11 The lack of definition of "the way in which each Coal System operates in practice", in particular the limited guidance on what may be included and excluded by the CNCC, has led to inconsistent modelling outcomes and results. For example, DBIM understands that the CNCC includes in its modelling rail tonnages and Rail Paths associated with a below rail haulage contract that may have no matching terminal capacity, no associated train load out infrastructure, may have not been utilised for some time, and may not reasonably expected to be used in the future. The origin mine for this contract was located in the Goonyella System and was intended to underpin the haulage of coal to the Newlands System. DBIM is concerned that the modelling of this below rail contract as utilised capacity in the Goonyella System does not reflect how it "operates in practice" in reflecting Train Paths that *can be utilised*, but rather how it "was contracted to operate". The consequence may be to introduce significant traffic and congestion into the Goonyella System modelling, which has artificially reduced the DNC of the Goonyella system.

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[11] Clause 7A.1(a) of UT5: "The purpose of this Part 7A is to provide for the independent and realistic assessment of…[the DNC and System Capacity of each Coal System]…having regard to the way in which that Coal System operates in practice (and in the context of the interfaces between each element of the Supply Chains within that Coal System) and making allowances that reflect operational parameters."

3 Audits and results validation by the IE

12 DBIM acknowledges the separate roles of the independent experts under UT5 and the DBT 2021 AU. DBIM accepts that the difference in approach to capacity assessments may cause minor variations in assessment results. However, DBIM considers that significant variations between the modelling by the CNCC and the ILC of the Goonyella System under the ACARs warrant further scrutiny to ensure the appropriateness of the CNCC's approach to the performance of its duties.

CNCC assessment of Goonyella rail capacity

13 The CNCC has concluded that the Goonyella Rail System is not capable of servicing the Committed Capacity of both DBT and Hay Point Coal Terminal (**HPCT**). Combined, these terminals have 140 Mtpa of capacity already built and operating in the Goonyella Coal Chain.

ILC assessment of Goonyella rail capacity

14 The ILC, in its DBCC Master Plan 2023,[12] concludes that no expansion of the rail system is necessary to service up to a total system capacity of 99.7 Mtpa at DBT. This conclusion also allows for sufficient rail deliveries to HPCT such that it is able to fully utilize its 55 Mtpa nameplate capacity, meaning the ILC has concluded that the existing Goonyella System is capable of servicing the 140 Mtpa of existing terminal capacity (DBT 84.2 Mtpa and HPCT 55 Mtpa), plus an additional 15.5 Mtpa of expanded DBT capacity.

15 The DBCC Master Plan 2023 raises significant questions in regard to the CNCC modelling conclusions. DBI refers the following sections for the attention of the QCA.

15.1 Section 4.4.2 Rail (Sensitivity Analysis)

Figure 26 shows that the System Capacity of the Goonyella System is not particularly sensitive to Section Run Times. For example, a system-wide improvement of 20% in Section Run Times for the Goonyella System yields only a 2.1% improvement in overall system capacity. The ILC concludes that the network cannot be the constraint in the system yet the CNCC concludes that capital improvement of the network is necessary to address the ECD.

15.2 Section 5.2 Continuous Assets – the Trunk

Figure 31 shows that the CNCC estimate of DNC only makes use of 50% of the train paths in the Goonyella trunk.

15.3 Section 5.3 Specialised Continuous Assets – the Terminal (DBT)

The ILC concludes that "without [the] coordination of the right mix of asset engagement [and] activation [that the terminal establishes], the supply chain will not operate to the right level necessary to reach its full potential". This means that without expressly modelling the terminal the way it operates in practice, the CNCC's capacity assessments will likely underestimate the full potential of the system.

15.4 Section 5.4 Operating Methodology

The ILC describes the continuum of operating modes from full Dedicated Stockpiles through to full Cargo Assembly. The chart shows the use rate of each of Train Load Out (**TLO**) the ILC models in the Goonyella System. There is no regular pattern that fits all of the TLOs all of the time. The variance in the patterns indicates that the ILC model is utilising the TLOs and therefore the network in various operating modes. The ILC concludes that "For the Goonyella Supply Chain, it is essential to accurately model the driving force behind supply chain activation, the Terminal, to allow a full comprehensive understanding of the planning dynamics and the constraints navigated to maximise the Supply Chain throughput." The CNCC models the system

[12] Refer Appendix 1 – DBCC Master Plan 2023

as either Even Railings (Dedicated Stockpile) or Cargo Assembly. According the ILC's analysis this modelling practice would not capture the full potential of supply chain assets.

Appendix 1 DBCC Master Plan 2023

DBCC Master Plan 2023

Prepared For:	ILC Board
Release Date:	15th August 2023
Report Version:	Rev 0

[redacted]

REDACTED VERSION

IntegratedLogistics
COMPANY PTY LTD

Document Information

Document Name:	DBCC Master Plan 2023
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Revision:	Rev 0

Revision History

Rev	Revision Date	Details	Document Lead	Reviewer
0	15-Aug-2023	Issued for use	C. Lock	R. Norman

Disclaimer

Table of Contents

Abbreviations

The following abbreviations may appear throughout this document.

Table 1 Abbreviations

Abbreviation	Meaning
ACAR	Annual Capacity Assessment Report
CHPP	Coal Handling and Preparation Plant
CNCC	Coal Network Capacity Company
CQCN	Central Queensland Coal Network
DBCC	Dalrymple Bay Coal Chain
DBIM	Dalrymple Bay Infrastructure Management
DBT	Dalrymple Bay Terminal
DNC	Deliverable Network Capacity
ECD	Existing Capacity Deficit
GLR	Gross Load Rate
GUR	Gross Unload Rate
HPT	Hay Point Terminal
IL	Inloading
ILC	Integrated Logistics Company
MTTF	Mean Time to Fail
MTTR	Mean Time to Repair
NLR	Net Load Rate
NUR	Net Unload Rate
NQXT	North Queensland Export Terminal
OL	Outloading
PoHP	Port of Hay Point
QCA	Queensland Competition Authority
RL	Reclaimer
ROM	Run of Mine
RRP	Rail Receival Pit
RRS	Rail Receival Station
SAP	Stockyard Augmentation Project
SL	Shiploader
SR	Stacker Reclaimer
ST	Stacker
TLO	Train Load Out
TTF	Time to Fail, Trips to Fail
TTR	Time to Repair

References

[1] QCA Website, https://www.qca.org.au/our-role/, accessed July 2023.

[2] Aurizon Network's **2017 Access Undertaking (UT5)**, Reset Schedule F Preliminary Values, approved on 25 May 2023; and FY24 Electric Energy Charge, approved on 21 June 2023.

[3] Dalrymple Bay Infrastructure Management's **Dalrymple Bay Coal Terminal 2021 Access Undertaking**, approved by the QCA on 1 July 2021.

https://www.qca.org.au/wp-content/uploads/2021/08/2021-au.pdf, accessed 20th July 2023.

[4] **DBCC Strategic Master Plan 2012**, Integrated Logistics Company, June 2012

[5] **Central Queensland Coal Network, 2023 Annual Capacity Assessment Report**, Coal Network Capacity Company, June 2023

https://www.qca.org.au/wp-content/uploads/2023/06/final-acar-report-2023_redacted.pdf

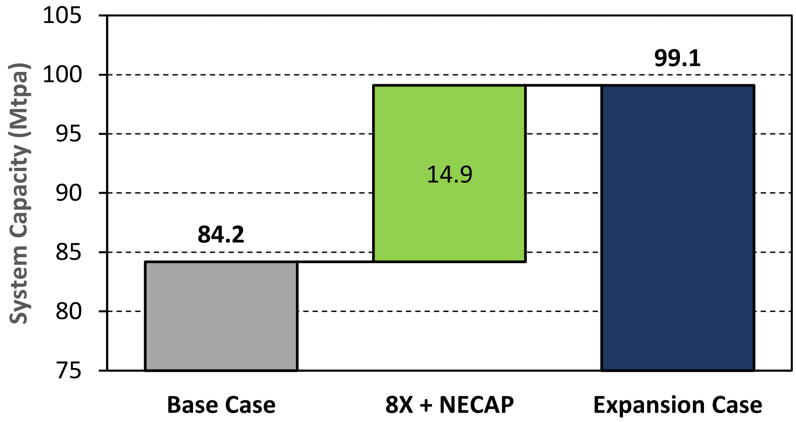
1.0 Executive Summary

DBCC Master Plan 2023: *Enhancing Terminal Efficiency and Capacity through 8X Expansion and NECAP Projects.*

The 8X Terminal Expansion and accompanying Non-Expansion Capital Expenditure (NECAP) projects build upon the prior 7X Expansion (2007-09) and subsequent NECAP projects, collectively aimed at bolstering operational efficacy.

The overall assessment determines that the expansions deliver a System Capacity, from the TLOs to the Port Channel, as below.

Figure 1 System Capacity Assessment[1]



Inloading Advancements

IL2 will receive an upgrade and Rail Receival Pit 1 (RRP1) discontinues operations, facilitating the introduction of Inloader IL4. All 3 inloaders will function at 7,800 tonnes per hour (tph). ST1 and its S5 conveyor will be upgraded to 8,000 tph.

Stockyard Augmentation

The Stockyard Augmentation Project (SAP) augments storage in Rows 1-3 by 36%.

Outloading and Shiploading Efficiency

Optimisation of Outloading Systems results in an increase in average reclaim rates from 3,175 tph to 3,607 tph. OL1 and SL1 are upgraded to 8,650 tph design rates. Shiploader SL4, with an 8,650 tph design rate, is installed exclusively on Berth 3. OL1 and OL3 will have design rates of 8,650 tph, as will SL1, SL3, and SL4.

NECAP

Concurrently, NECAP projects replace SL1 with SL1A (8,650 tph) and introduce RL4 to replace SR2.

[1] All capacity assessments provided here are specified with a precision of ±1Mtpa.

This collective effort introduces increased opportunities to the Supply Chain to access the very areas that have proven to be substantial in delivering supply chain performance in the past, these being Space and asset activation of TLOs and the Single Track Branchlines whilst also providing a step change in the practice of Shiploader Maintenance.

Supporting Train Load Out (TLO) Capacity

This Master Plan will explore the ability of the TLOs to service the demand of the Terminal expansion and will determine the suitability of the existing and proposed TLO capacity to service this demand.

Supporting Below Rail Capacity

This Master Plan will also investigate the capability of the Below Rail Capacity to service the demand of the Terminal expansion, and will provide understanding of the rationale on why this study does not identify the need for any additional Below Rail Expansions, other than the spur lines and balloon loops required for new TLOs. It will also provide an understanding as to why there is no identified existing capacity deficit in the Base Case (7X terminal configuration) or indeed in the Expansion Case (8X Configuration).

Different Objectives and Different Assessments

As there are different objectives for determining the saleable capacity between the two regulated asset groups (Below Rail and DBT), this report will endeavour to explain this difference and the overall impact of this misalignment and the principles for the discrepancies. Moreover, it is important to provide an understanding of the different approaches in Modelling Scope of the two regulated assets and the ultimate consequences to delivering Supply Chain throughput conclusions and on Supply Chain operations.

2.0 Industry Context

2.1 Capacity Assessments

Capacity assessments of large-scale infrastructure coal supply chains exhibit variability contingent on the specific definition of capacity, which, in turn, relies on the purpose, scope, and level of detail encompassed within the assessment framework.

In the context of evaluating the capacity of such complex supply chains, it is essential to first identify the purpose of the assessment. This purpose may encompass multiple dimensions, each catering to different stakeholders and objectives. Commercial use cases might entail conducting varying levels of feasibility studies or business cases, aiming to ascertain the economic viability and potential profitability of the coal supply chain project. Regulatory and contractual considerations, on the other hand, might necessitate the public declaration of capacity for the purpose of selling access to the regulated assets, adhering to legal requirements, and meeting contractual obligations. Lastly, the instructional purpose serves to provide valuable insights into the supply chain's intricacies and identify opportunities for improvement, thereby enhancing operational efficiency.

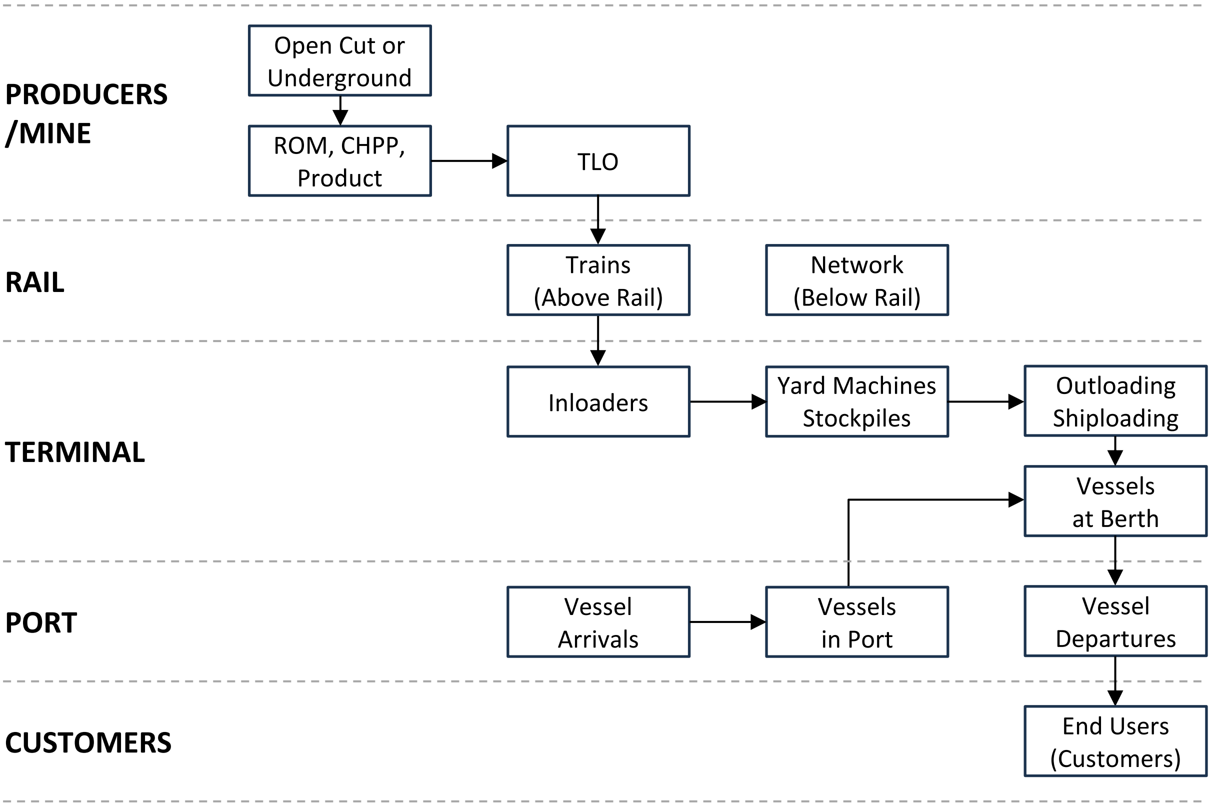
Subsequently, the scope of the capacity assessment comes into play, determining the extent to which the evaluation will delve into the supply chain's complexities. Three primary scopes are commonly considered, each with its advantages and limitations. The first, a comprehensive end-to-end evaluation of the entire supply chain (as shown in Figure 2 below), provides a holistic perspective but may prove impractical for highly intricate supply chains due to the vast amount of data and complexity involved. The second scope involves focusing on multiple components within the supply chain, striking a balance between comprehensiveness and feasibility. This approach allows for a thorough analysis while managing the intricacies more effectively. The third scope entails targeting a single critical component, which might suffice for relatively straightforward supply chains, streamlining the assessment process.

Upon defining the purpose and scope of the capacity assessment, the development of a dynamic simulation model assumes a central role in enabling a thorough evaluation. The dynamic simulation model takes into account various factors, including uncertainties, interactions, and real-world dynamics, to provide accurate and reliable results. A key consideration during model development is the level of detail required for each component within the supply chain. While some components might not fall within the primary scope of assessment, their influence on the overall supply chain can still be captured through the implementation of boundary conditions. However, it is essential to acknowledge the limitations of boundary conditions in representing complex interactions with bidirectional information flow and feedback dependencies on external processes.

Additionally, some components might be considered within the model's scope but represented in a simplified "black box" manner, reducing computational complexity while still contributing to overall assessments. Conversely, certain critical components, significantly affecting the supply chain's behaviour, necessitate inclusion at a higher level of detail to ensure accurate modelling and precise outcomes.

By adhering to these methodological principles and employing appropriate dynamic simulation models with an awareness of purpose, scope, and detail, capacity assessments of large-scale infrastructure coal supply chains can yield valuable insights and drive informed decision-making. Such assessments play a pivotal role in optimising resource allocation, identifying potential bottlenecks, and enhancing the overall efficiency and resilience of these vital supply chains.

Figure 2 End-to-End Coal Supply Chain: from Producers to Customers



2.2 Regulatory Requirements

The Queensland Competition Authority (QCA) encourages responsible and fair operations for certain monopoly businesses in situations where normal competitive market forces are absent. This is particularly relevant in cases where the provision of services requires significant capital investment, making market competition impractical or unfeasible due to the presence of large-scale infrastructure and the resultant prohibitive high-cost barrier to entry.

The primary role of the QCA is to establish pricing and regulatory arrangements that prevent the abuse of market power stemming from the lack of competition. To achieve this, the QCA oversees specific regimes related to infrastructure-owning or operating businesses, including those providing declared coal handling services at the Dalrymple Bay Coal Terminal and the tracks and associated below-rail infrastructure of the Central Queensland Coal Network operated by Aurizon Network Pty Ltd.

Access Undertakings are submitted by infrastructure-owning businesses to prescribe the process for negotiating and providing access to their infrastructure and services. In the case of the Dalrymple Bay Coal Terminal, this includes the Dalrymple Bay Coal Terminal 2021 Access Undertaking by DBIM. Similarly, for the Central Queensland Coal Network, it involves Aurizon Network's 2017 Access Undertaking (UT5). These Access Undertakings are publicly available on the QCA website.

Analysing the Access Undertakings for both the Dalrymple Bay Coal Terminal and the Central Queensland Coal Network, it becomes apparent that the Capacity Assessments required by each Undertaking for providing capacity to Access Holders/Seekers differ in purpose, scope, and level of detail. Consequently, a direct comparison between these Capacity Assessments is not straightforward, necessitating a nuanced understanding of the differences to appreciate the variations presented to the industry.

In this context, it is relevant to consider the Capacity Assessment requirements of both Access Undertakings and compare them to the ILC Master Plan Capacity Assessments. This comparison will shed light on the distinctive aspects and implications of each Capacity Assessment, providing valuable insights for industry stakeholders and regulatory decision-making.

2.3 DBIM's 2021 Access Undertaking

DBIM's 2021 Access Undertaking (**"Dalrymple Bay Coal Terminal 2021 Access Undertaking")** specifies two types of Capacity to be estimated by an appointed Independent Expert: the maximum reasonably achievable capacity (measured in million tonnes of coal per annum) of the **Terminal** and of the **System**. System Capacity is the limit to which capacity can be contracted to Terminal Access Holders and Terminal Access Seekers.

The ILC has been appointed as the Independent Expert under the Access Undertaking.

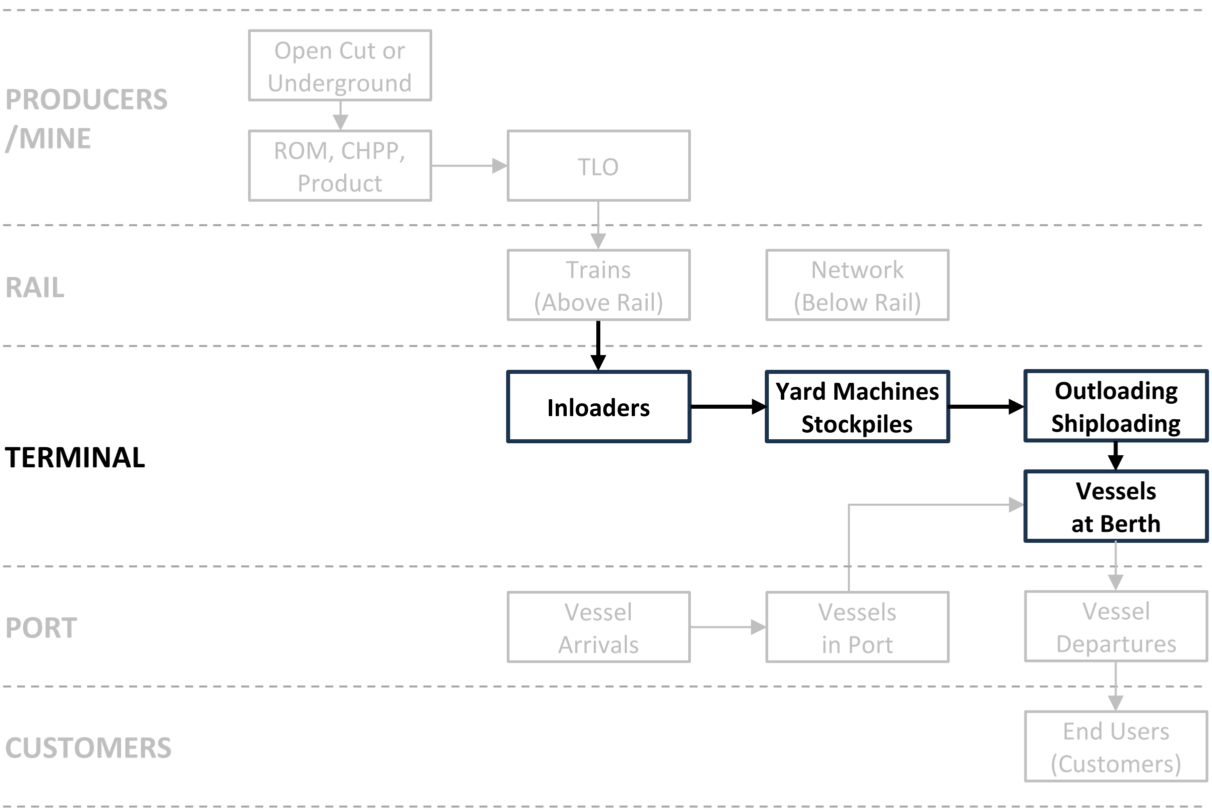
<u>**TERMINAL CAPACITY**</u>

The **Terminal Capacity** is a measure of the Terminal's ability to provide throughput with the assumption that the Terminal Inloaders can be choke fed with trains, thereby eliminating any other supply chain constraints. It considers inloading, stacking, stockpiling, reclaiming, throughloading, outloading, shiploading and berthing, and other associated handling facilities.

This is a measure of what the Terminal alone is capable of, however, it is not practically achievable under the current operating methodology, upstream supply chains constraints, and demand profile, and hence cannot be contracted in full to Terminal Access Holders and Terminal Access Seekers.

This is an example where only one component of the Supply Chain would need to be modelled for a Capacity Assessment, as shown in Figure 3. The greyed sections are therefore not necessary.

Figure 3 Component of the Coal Supply Chain modelled for <u>Terminal Capacity Assessment</u>



System Capacity

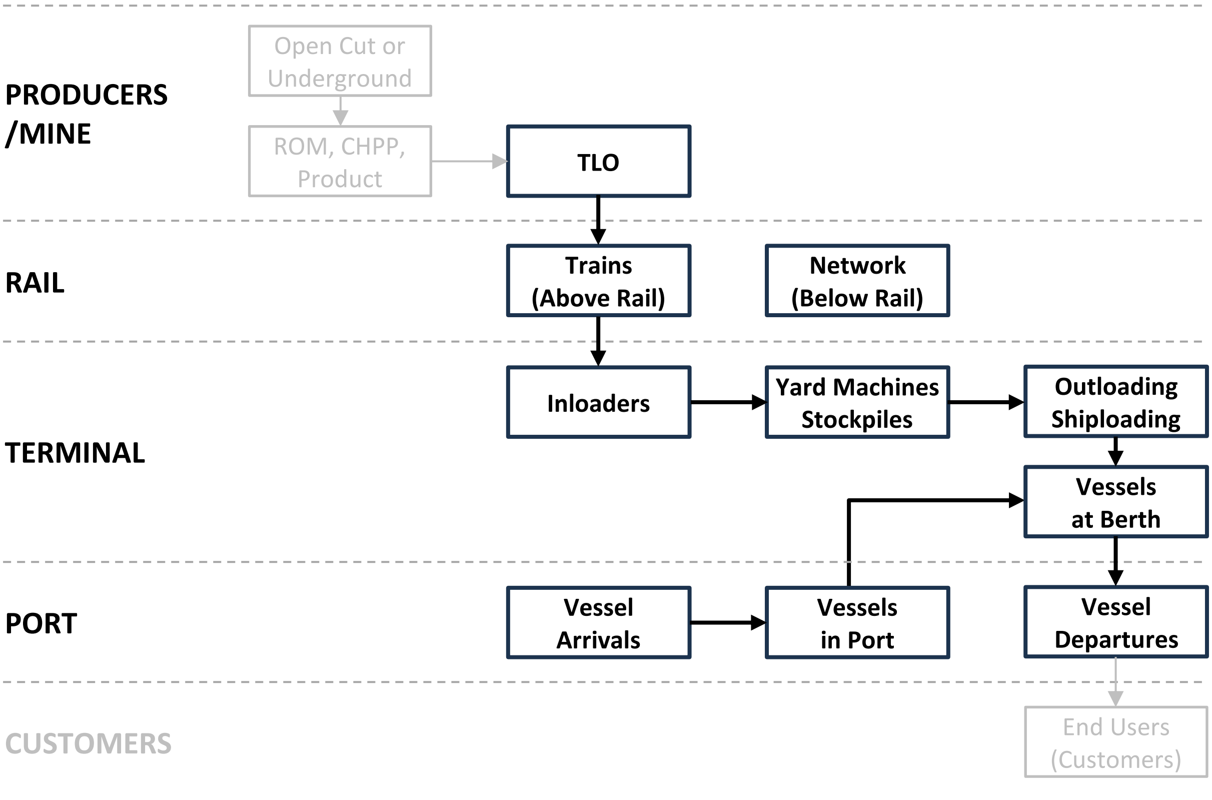
The **System Capacity** is a measure of the performance of the whole supply chain, i.e., the **Dalrymple Bay Coal Chain**, which, according to the Access Undertaking, means all infrastructure relating to railing and shipping of coal (from mine outloaders to Terminal shiploaders and adjacent infrastructure), excluding Hay Point. However, since the **Goonyella to Abbot Point Coal Chain** and the **Hay Point Coal Chain** (and to a lesser extent the **Gladstone Coal Chains**) each overlap the DBCC by using common System Infrastructure, the influence of these Coal Chains on the DBCC System Capacity must be considered.

System Capacity must consider:

- the operating modes of the System; and
- the tonnes to be loaded by or on behalf of an Access Holder at each relevant TLO facility; and
- the capacity and performance of mine loading facilities; and
- the rail infrastructure characteristics (e.g., double track, single track with passing loops, speed restraints); and
- quantity, configuration, and performance characteristics of locomotives and rolling stock; and
- the Terminal Capacity as assessed above, and the capacity and performance implications arising out of Terminal interfaces with rail unloading and vessel loading.

Feasibility Studies performed by DBIM identify possible Terminal Expansion Components that will create additional Terminal Capacity, *including any potential System Capacity expansions that may be required to create complementary additional System Capacity*. This is an example where multiple components of the Supply Chain would need to be modelled for a Capacity Assessment, as shown in Figure 4.

Figure 4 Components of the Coal Supply Chain modelled for System Capacity Assessment



2.4 Aurizon Network's 2017 Access Undertaking (UT5)

Aurizon Network's 2017 Access Undertaking (**UT5**), as approved by the QCA, requires Capacity Assessments of each of the CQCN's Coal Systems to be performed by an appointed Independent Expert, as detailed in **Part 7A: Capacity** of the Undertaking. The Undertaking specifies two types of Capacity Assessment – the **Deliverable Network Capacity (DNC)**, and the **System Capacity**.

The **Coal Network Capacity Company** (CNCC) has been appointed as the Independent Expert under the Access Undertaking. At present, the CNCC assesses only DNC.

DELIVERABLE NETWORK CAPACITY

Deliverable Network Capacity (DNC) considers the capacity of the *rail infrastructure of each Coal System*, having regard to the following factors:

- Operations
  - the way in which each Coal System operates in practice.
  - the Supply Chain operating mode.
  - the obligations to provide access to non-coal traffic.
  - the terms of Access Agreements.
- Availability
  - planned and unplanned maintenance.
  - rollingstock planned and unplanned delays.
  - delays associated with Temporary Speed Restrictions and required dwells.
- Boundary Conditions
  - the context in which each Coal System interfaces with other parts of the Supply Chain (including loading facilities, load out facilities and coal export terminal facilities).
  - interfaces with other Coal Systems.

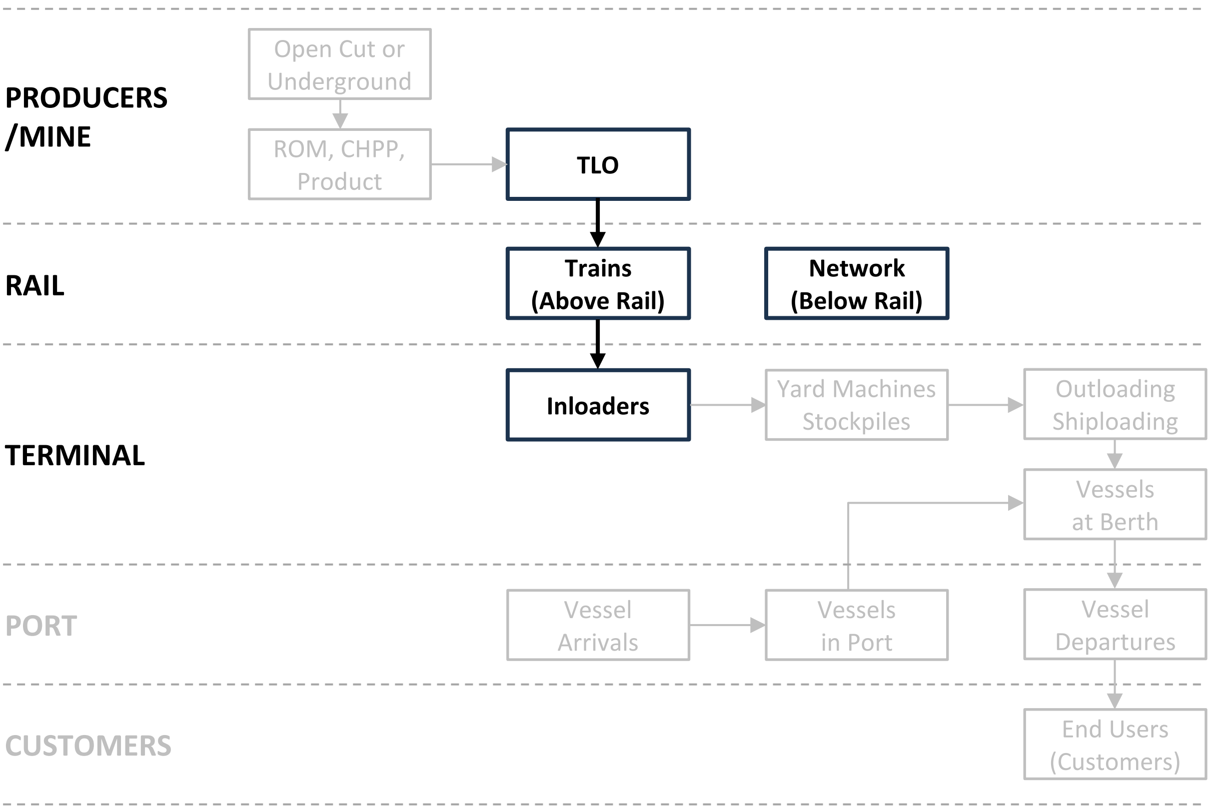
Note that UT5 defines:

- **Rail Infrastructure** as "*Rail transport infrastructure as defined under the Transport Infrastructure Act 1994 (Qld) for which Aurizon Network is the owner or lessee, the use of which is taken to be a service declared for the purposes of Part 5 of the Queensland Competition Authority Act 1997 (Qld) pursuant to section 250(1)(a) of the Queensland Competition Authority Act 1997 (Qld).*"
- **Coal System** as "*Any one of the following: (a) the Newlands System; (b) the Goonyella System; (c) the Blackwater System; (d) the Moura System; or (e) the Goonyella to Abbot Point System.*"
- **Supply Chain** as "*All aspects that affect the transportation of coal from a mine to the end customer, including loading facilities, Rail Infrastructure, Railway Operators, load out facilities and coal export terminal facilities. For clarity, a number of supply chains can exist within a Coal System and can be denoted by reference to the destination coal export terminal.*"

Under these definitions, examples of **Supply Chain** would include the Abbot Point Coal Chain, Hay Point Coal Chain, Dalrymple Bay Coal Chain, RG Tanna Coal Chain and Wiggins Island Coal Chain.

This is an example where fewer sub-components of the Supply Chain would need to be modelled for a Capacity Assessment, as shown in Figure 5.

Figure 5 Components of the Coal Supply Chain modelled for <u>Deliverable Network Capacity Assessment</u>



Where the DNC is exceeded by the Committed Capacity, an Existing Capacity Deficit (ECD) arises. If the Independent Expert identifies that there is an ECD with respect to a Coal System, they must specify:

- the relevant Coal System and the location in that Coal System where the ECD arises; and
- the quantum of the ECD; and
- the Access Holders affected by the ECD.

The Independent Expert must describe any constraints that have been identified which reduce the DNC of each Coal System, including:

- any constraints identified within the Supply Chains operating within that Coal System (including in respect of loading facilities, load out facilities and coal export terminal facilities); and
- any constraints identified within the whole of the Rail Infrastructure; and
- any solutions (in reasonable detail) which could effectively and efficiently address the ECD.

SYSTEM CAPACITY

From the following clauses of the Access Undertaking, it can be seen that **System Capacity** is provided for information only: there are no stated regulatory, contractual, or commercial implications arising from the **System Capacity** Assessment.

- **7A.2(b):** "***System Capacity*** *means the capacity of the Supply Chain in its entirety*", and considers each element of the DNC, together with "*the capacity and operations of other elements of the Supply Chain (including loading facilities, load out facilities and coal export terminal facilities).*"
- **7A.4.3(b):** *"A System Capacity Assessment will be produced by the Independent Expert* ***for information purposes only*** *for the benefit of Aurizon Network, Access Holders and Access Seekers (and their respective Customers and Train Operators) for a Coal System."*
- **7A.4.3(f):** *"Nothing in this Undertaking obliges Aurizon Network to implement any changes to its provision of Access as a result of any System Capacity Assessment; or allows the Independent Expert to alter the … Capacity Assessment as a result of the System Capacity Assessment."*

The Sub-Components of the Supply Chain that would need to be modelled for a System Capacity Assessment would be as shown previously in Figure 4.

2.5 ILC Master Planning Capacity Assessments

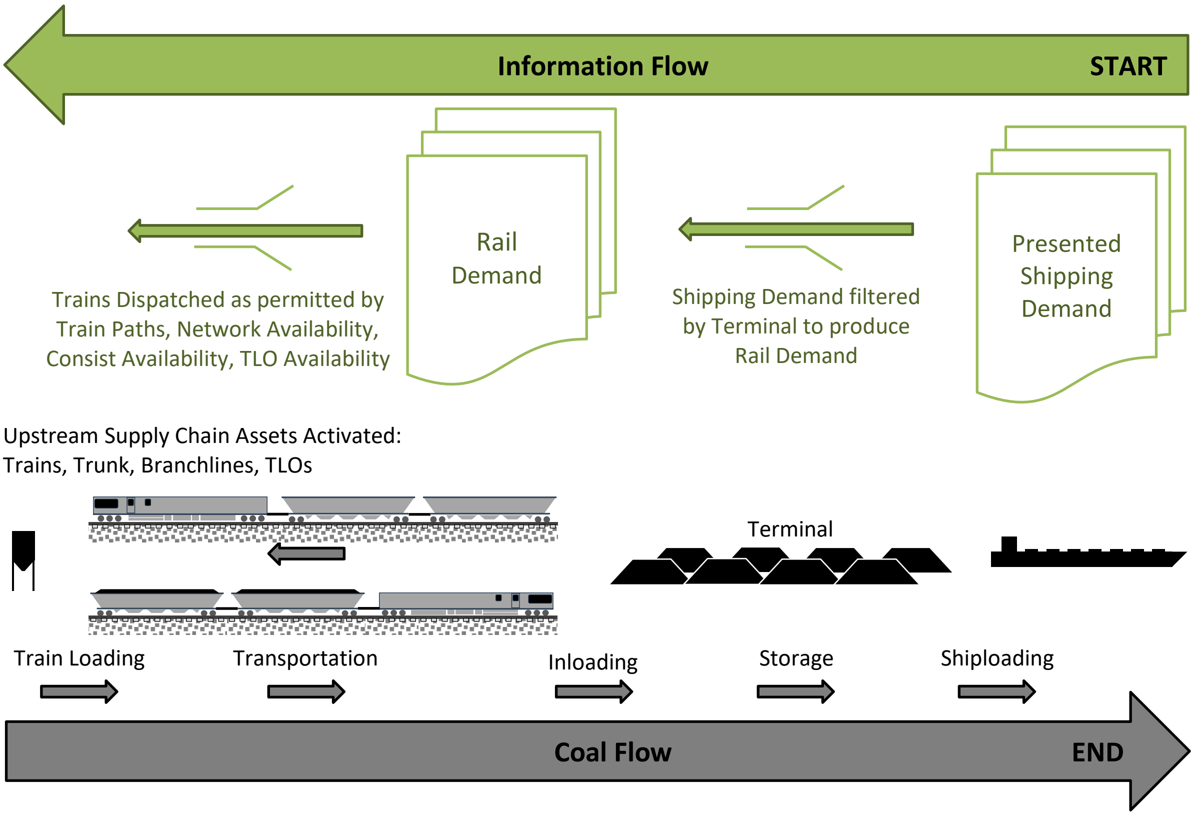
The ILC, as an independent body for the whole of supply chain and its shareholders, performs the duties of ILC Master Planning Capacity Assessments to identify constraints across the supply chain, whether they be Asset or Demand, and advice on how to mitigate these constraints to bring the supply chain into a state of Balance, where there is just enough Asset to service the Demand.

The ILC Capacity Assessments focus on evaluating the capacity of the DBCC from TLOs (Train Loadouts) to Vessel Arrivals/Departures. The Supply Chain's components that undergo modelling for ILC Capacity Assessments are depicted in Figure 4 as previously presented. Consequently, the ILC Capacity Assessments are closely aligned with the System Capacity defined in DBIM's 2021 Access Undertaking.

The ILC Model employs logic simulating how the Supply Chain operates in practice. As illustrated in Figure 6 below, the ILC Model commences with the information process flow and ultimately results in the activation of the Supply chain assets at a sufficient rate to test the true capacity of the supply chain assets.

Without this, the supply chain does not and cannot reach its full potential; there is the possibility and probability that the Supply Chain will be activated in a way that does not mimic how the supply chain operates in practice.

Figure 6 Information Flow and Coal Flow in the DBCC



The Deliverable Network Capacity Assessments conducted by CNCC in 2021, 2022, and 2023 have identified the presence of an ECD (Existing Capacity Deficit) in the Rail Infrastructure of the Goonyella System feeding DBCT. In collaboration with Aurizon Network, CNCC is actively working on devising Transitional Arrangements to mitigate the identified ECD.

As outlined in this Master Plan, the ILC's DBCC Capacity Assessment has determined that no expansions in the Goonyella System Rail Infrastructure are necessary to create complementary additional System Capacity to accommodate the increase attributed to DBT's 8X Expansion.

The ILC employs a Dynamic Simulation Model to conduct Capacity Assessments, with detailed information provided in Section 6.0 “Appendix – ILC Dynamic Simulation Model”.

Capacity Assessments using the model are performed to evaluate the modelled Master Plan Scenarios. Additionally, the model is utilized for testing extremes, wherein certain parts of the supply chain are unconstrained to assess the maximum capacity of other parts. This approach serves both informative and instructional purposes, providing quantitative assessments and highlighting capacity deficits within the complex supply chain. It aids in identifying root causes and exploring potential capital or operational solutions to address these deficits.

Furthermore, the ILC undertakes simple static calculations to verify the assessed capacity magnitude.

2.6 Summary

The Capacity Assessments prescribed by the DBCT and CQCN Access Undertakings are summarised in Table 2 below.

Table 2 Access Undertaking Capacity Purposes

Access Undertaking	For provision of Capacity to Access Holders	For information purposes only
DBCT	System Capacity	Terminal Capacity
CQCN	Deliverable Network Capacity	System Capacity

Capacity Statements and DBCC Master Plans prepared by the ILC are based on System Capacity Assessments.

To clarify the distinctions between:

- Coal System vs Supply Chain vs Coal Chain; and
- Goonyella Coal System vs DBT Coal Chain,

the ILC considers, for the purpose of Capacity Assessments:

- the **Dalrymple Bay Coal Chain (DBCC)** to consist of:
  - Goonyella Coal System TLOs that rail to DBCT;
  - Below Rail and Above Rail for the Goonyella Coal System;
  - Dalrymple Bay Coal Terminal; and
  - Port of Hay Point (PoHP) with Vessel Arrivals/Departures.
- the **Goonyella Coal System** to include all track within the boundary limits of:
  - the North Goonyella Balloon Loop;
  - the Blair Athol Balloon Loop;
  - the Hail Creek Balloon Loop;
  - the Gregory Balloon Loop;
  - DBT Rail Receival Stations (Inloaders); and
  - HPT Rail Receival Stations (Inloaders).
- the impact of the following overlapping Coal Chains, including the Terminals and the TLOs in the Goonyella, GAPE and Newlands Coal Systems that feed them:
  - the Hay Point Coal Chain;
  - the Abbot Point Coal Chain; and
  - the Gladstone Coal Chains.
- the impact of overlapping non-coal traffic.

3.0 DBCC Master Plans

3.1 Purpose of DBCC Master Plans

DBCC Master Plans are intended to provide a comprehensive overview of the long-term future developments, direction, and growth options of the DBCC. This is done in part by providing an independent, quantitative throughput assessment of the DBCC for various scenarios, taking into consideration capital expansions, asset procurement plans, and operational improvement initiatives that will be realised by the start of the Master Planning time horizon of 2 to 10 years out.

DBCC Master Plans assess operational and capital options to increase the overall throughput of the coal chain to meet future demand requirements.

3.2 Background of DBCC Master Plans

The previous comprehensive Master Plan for the Dalrymple Bay Coal Chain (DBCC), developed by the ILC in 2013, was a response to a period characterized by a sustained interest in expansion and capital investment. Subsequently, due to market conditions, the need for a new DBCC Master Plan focused on capital expansion did not arise. Instead, the ILC has provided semi-annual capacity assessments to the ILC Shareholders over the past decade, examining demand and asset changes that might trigger significant future performance requirements for the DBCC, thereby necessitating a comprehensive review of DBCC assets, operations, and the development of a new Master Plan.

From 2010 to 2013, annual DBCC Master Plans were formulated to address specific market conditions at the time. The initial Master Plan, generated in June 2010, marked the first independent and comprehensive plan for the entire DBCC system. It entailed the establishment of the ILC's Dynamic Simulation Model and the Master Planning Base Case (MPBC), which served as the foundation for long-term planning (2 to 10 years) of the DBCC. The MPBC was evaluated to have a capacity of 81 million metric tonnes per annum (Mtpa), contingent upon successful implementation of proposed industry improvements. An Addendum in September 2010 further explored system constraints and alternative Capital Projects to surpass the 81 Mtpa capacity.

In June 2011, the second Master Plan was developed to assess the impact of various factors on the DBCC, including the connection between the Goonyella and Newlands Systems, the expansion of HPCT (Hay Point Coal Terminal), involvement of a second Above Rail Operator (Pacific National), and the effects of seasonality. The third Master Plan, formulated in June 2012, aimed to evaluate the impact of the Port of Hay Point (PoHP) expansion, HPCT expansion, the addition of terminals at Dudgeon Point, a rail connection from the Galilee Basin, trunk triplication between Jilalan and Coppabella, and a comparison of traditional mitigation options with an Inland Stockyard. The development of the inland stockyard concept aimed to demonstrate that operating the existing assets in the Goonyella System differently could meet the requirements of the PoHP and the Cross System traffic resulting from the inclusion of the GAPE system. Essentially, the Master Plans demonstrated that if the existing assets were operated in a different manner, they could effectively handle the demands of the PoHP and the GAPE System.

Subsequently, market conditions shifted, resulting in reduced interest in expanding throughput for the Goonyella System, the Dudgeon Point Terminals, the North Queensland Bulk Ports' proposed expansion of Abbot Point Terminals with numerous new terminals, and the necessary rail infrastructure to support them. The Strategic Master Plan, also produced in June 2012, incorporated the findings from the previous three Master Plans and provided an independent assessment of the DBCC. It identified key performance drivers, root causes of throughput losses, and proposed a robust supply chain logistics solution for recovery and future expansion, primarily based on operational methodologies rather than traditional asset-based options.

The Strategic Master Plan highlighted that operational measures could replicate the benefits of capital solutions, effectively recovering capacity to the nameplate 85 Mtpa. It was understood that the existing DBCC assets had sufficient capacity, and operational changes were necessary to achieve the target of 85 Mtpa. As a result, the DBCC Master Plan 2013 was developed in June 2013 to outline mitigation strategies. It encompassed operational measures that could be refined, trialled, and implemented within the prevailing demand environment, along with investigations into cost-effective asset solutions addressing identified root causes.

The insights gained during this Master Planning period led to the implementation of several changes within the DBCC. These included reporting Process Metrics from the ILC's Supply Chain Analytics system, adopting the Dalrymple Bay Supply Chain Coordination (DBSCC) Operating Methodology, modifying the DBCT (Dalrymple Bay Coal Terminal) Regulations, and establishing Delivery Windows.

3.3 The Need for a 2023 DBCC Master Plan

Over time, market conditions improved, and new demand signals have been identified by DBIM, potentially necessitating increased terminal capacity. While past enhancements in terminal capacity were achievable through operational solutions, meeting these new demand requirements would require asset-based solutions resembling traditional approaches. Moreover, these solutions would build upon the findings and learnings from previous ILC Master Plans, aiming to enhance supply chain performance by employing assets that amplify these accrued benefits. The combination of new demand and proposed asset-based solutions necessitated a comprehensive assessment of the supply chain, a new Master Plan.

4.0 Master Planning Scenarios

4.1 Base Case

The System Capacity of 84.2 Mtpa remains valid and current, in line with the previous Independent Expert assessments. This is the Base Case from which the Expansion Case capacity is assessed for this Master Plan. In the Base Case, the Goonyella System achieves 84.2 (DBT) + 55 (HPT) = 139.2 Mtpa.

The supply chain constraint for the Base Case is the Terminal, resulting in the remainder of the supply chain being demand constrained, when the assumption is made that there will be enough consists provided to service the demand.

4.2 Expansion Case

The Expansion Case primarily involves changes to the following areas:

- Asset Expansions
- Demand Profile
- Planned Maintenance (i.e., asset availability, particularly in asset bottlenecks)

Each of these is addressed in turn.

4.2.1 Asset Expansions

The Expansion Case builds upon the 7X Terminal Expansion of 2007-09 and subsequent NECAP (Non-Expansion Capital Expenditure). The Expansion Case includes the 8X Expansion and further NECAP projects.

The 8X Expansion includes:

Inloading

- Shut down and decommission Rail Receival Pit 1 (RRP1).
- Install new Inloader IL4 with a rate to match IL3 (net rate of [redacted] tph) and allow throughloading from IL4 via one conveyor per Zone.
- Upgrade IL2 to match IL3 (net rate of [redacted] tph).

Stockyard, Yard Machines and Conveyors

- The Stockyard Augmentation Project (SAP), comprising the following elements:
  - ➢ Storage volume of Rows 1-3 increased by around [redacted]%, as shown in Figure 7 below.
  - ➢ RL1 net rate benefits by around +[redacted]% (+[redacted] tph) due to new stockpile geometry, while SR2 and SR3A net reclaim rates benefit by +[redacted]% (+[redacted] tph).
  - ➢ Zone to Outloading assignments swapped: Zone 1 to [redacted], Zone 3 to [redacted], Zone 2 to [redacted].
- Increased stockyard volume can accommodate an increase in Dedicated Stockpile Pairs from [redacted] to [redacted], for high volume products.

- ST1 (and S5 conveyor) upgraded to have the same rate as ST3 and ST4 (net rate of [redacted] tph)
- RL3 (and R2 conveyor) upgraded to a net rate of [redacted] tph, to be commensurate with the paired [redacted] tph RL1.

Outloading, Shiploading and Berths

- The optimisation of the outloading systems, yielding improvements to reclaim rates of the order of [redacted]-[redacted] tph per reclaiming machine (RLs and SRs), or, on average across all reclaiming machines, from around [redacted] tph to [redacted] tph.
- OL1 upgraded to a design rate of [redacted] tph.
- The installation of a new 4th Shiploader SL4 that operates on Berth [redacted] only, with a design rate of [redacted] tph, and is connected to Outloading String [redacted] only.

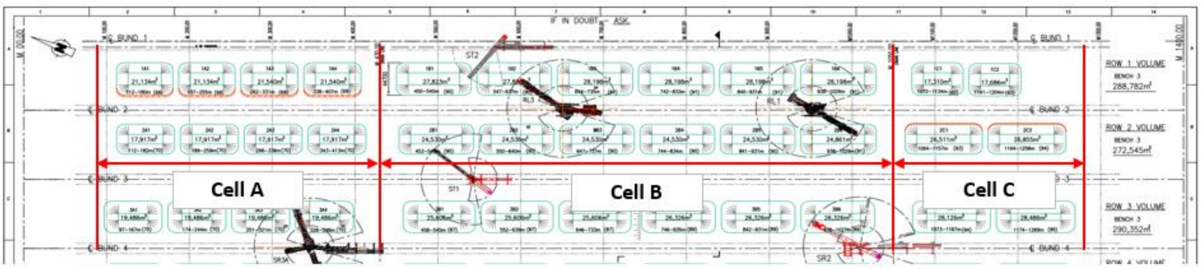
The concurrent NECAP projects include:

- SL1 replaced with SL1A with a design rate [redacted] tph.
- SR2 replaced with a reclaimer, RL4, with a reclaim rate of [redacted] tph.

The combination of the 8X Expansion and the concurrent NECAP Projects will result in:

- [redacted]x Inloaders each with a Net Rate of [redacted] tph.
- [redacted] of [redacted] Stackers to operate at a Net Rate of [redacted] tph.
- All Stacker-Reclaimers to Stack with a Net Rate of around [redacted] tph.
- All Reclaimers and Stacker-Reclaimers (excluding those in the remnants zone) to Reclaim with a Net Rate of around [redacted] tph on average.
- Increase in Stockyard Volume and the number of products serviced by Dedicated Stockpiles.
- [redacted]x Outloading systems each with a design rate of [redacted] tph and [redacted]x Outloading systems with a design rate of [redacted] tph, feeding [redacted]x [redacted] tph design rate Shiploaders and [redacted]x [redacted] tph design rate Shiploaders on [redacted]x Berths, with a step change in the Shiploader maintenance regime to increase the availability of [redacted] Shiploaders to [redacted]%.

Figure 7: Volume increases associated with SAP



Volume Increases	Row 1			Row 2			Row 3		
Terminal State	Cell A	Cell B	Cell C	Cell A	Cell B	Cell C	Cell A	Cell B	Cell C
Existing Condition	100%	100%	100%	100%	100%	100%	100%	100%	100%
SAP Complete	[redacted]%	[redacted]%	[redacted]%	[redacted]%	[redacted]%	[redacted]%	[redacted]%	[redacted]%	[redacted]%

Terminal Equipment Rates

Equipment Rates can be specified in the model as either Gross, Net or Design Rates, depending on how Delays during operation are handled. The rates are calculated as follows, and are listed in ascending order of rate:

- Gross Load Rate = Tonnes Loaded / (End Load Time – Start Load Time)
- Net Load Rate = Tonnes Loaded / ((End Load Time – Start Load Time) – Delay Time)
- Design Rate = Maximum Achievable Net Rate when there are no Delays (refer item (1) below)

Gross Load Rate and Net Load Rate can be calculated from historical operating data.

For modelling, it is typical to capture the Gross Load Rate, which includes the effects of delays during machine operation. Delays can be represented in the model as explicit events that cause the machine to stop, or by the application of a Reliability Factor to the rate.

- Gross Load Rates can be used in the model with no delays modelled and no Reliability Factor.
- Net Load Rates can be used in the model combined with either explicitly modelled delay events or a Reliability Factor.
- Design Rates can be used in the model in two ways:
  1. With no Reliability Factor and no delays modelled, as per the definition above, or
  2. With delays modelled explicitly or a Reliability Factor.

For the purpose of estimating Capacity, the Gross Rates are captured here as follows:

- Inloaders use a Net Rate with explicitly modelled delay events that produce a reliability of around [redacted]%, based on historical performance. The Inloading rates have been modelled using a distribution, derived from historical data, including delay events for both Inloading and Stacking. The distribution of rates, including these delays, are applied to the Inloaders only, to avoid double counting, and primarily to preserve interactions with trains and the upstream supply chain.
- Stackers use a Net Rate with no delays and no Reliability Factor. Flow-on effects from inloader delays effectively capture the Gross stacking rate.
- Reclaimers use a Net Rate with a Reliability Factor of [redacted]% then applied, based on historical performance.
- Outloading and Shiploading use Design Rates with a Reliability Factor of [redacted]% then applied, based on historical performance.

The Terminal equipment rates change from the Base Case to the Expansion Case as shown in Table 3 below.

Table 3: Terminal Equipment Rates from Base Case to Expansion Case

Equipment Function	Equipment	Base Case	Expansion Case
Inloading[2]	[redacted]	[redacted]	[redacted]
	[redacted]	[redacted]	[redacted]
	[redacted]	[redacted]	[redacted]
	[redacted]	[redacted]	[redacted]
Stacking	[redacted]	[redacted]	[redacted]
	[redacted]	[redacted]	[redacted]
	[redacted]	[redacted]	[redacted]
	[redacted]	[redacted]	[redacted]
	[redacted]	[redacted]	[redacted]
	[redacted]	[redacted]	[redacted]
	[redacted]	[redacted]	[redacted]
	[redacted]	[redacted]	[redacted]
	[redacted]	[redacted]	[redacted]
Reclaiming	[redacted]	[redacted]	[redacted]
	[redacted]	[redacted]	[redacted]
	[redacted]	[redacted]	[redacted]
	[redacted]	[redacted]	[redacted]
	[redacted]	[redacted]	[redacted]
	[redacted]	[redacted]	[redacted]
	[redacted]	[redacted]	[redacted]
	[redacted]	[redacted]	[redacted]
Outloading	[redacted]	[redacted]	[redacted]
	[redacted]	[redacted]	[redacted]
	[redacted]	[redacted]	[redacted]
Shiploading	[redacted]	[redacted]	[redacted]
	[redacted]	[redacted]	[redacted]
	[redacted]	[redacted]	[redacted]
	[redacted]	[redacted]	[redacted]

[2] Inloading distribution mode is quoted. Inloading rates are represented in the model by a distribution fit to historical data.

4.2.2 Demand Profile

The **Demand Profile**, or demand composition, influences the performance of the supply chain in several ways, as follows:

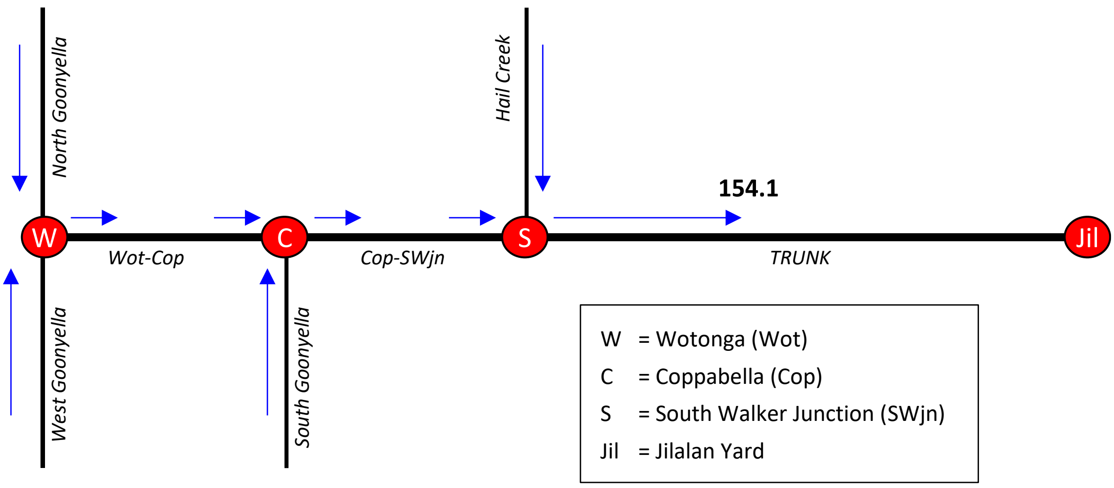
- The Demand Profile governs the choice of cargos to be made up using either Cargo Assembly stockpiles or longer-term Dedicated Stockpiles. High demand TLOs with suitable product mix profiles may be serviced better by dedicated stockpiles than by cargo assembly stockpiles, affecting the use of stockyard space.
- Each TLO is limited in the number of trains that it can load per day.
  - When there are fewer TLOs in the Demand Profile, the maximum trains per day summed across the number of TLOs may not provide sufficient utilisation of both Above Rail consists and Below Rail departure slots.
  - When there are more TLOs in the Demand Profile, this demand diversity can provide more railing opportunities and hence higher utilisation of rail assets.
  - In general, the System Capacity increases with increasing Demand Profile diversity, i.e., when there is a greater choice of TLOs to which trains can be dispatched.
- Some TLOs share their availability between more than one terminal. When a TLO is providing cargos for say NQXT, then DBT cannot send trains to this TLO, limiting railing opportunities.
- The distribution of demand over distance can also influence supply chain capacity. The cargo build time for long haul TLOs can be longer than for short haul TLOs.

The Capacity Assessment provided in this report uses, and is dependent on, the Contracted Demand levels and profiles provided by DBIM, which include both existing Access Holder tonnages and the queue of New Access Seeker tonnages.

To ensure that both the System Capacity Assessments are not demand constrained, a ship stem with total demand greater than the respective capacity is used, such that the ship queue never reduces to zero but rather continues to be sustained, or grow, throughout the simulation run.

A summary of the Port of Hay Point Demand (i.e., 154.1 Mtpa = 99.1 Mtpa DBT + 55 Mtpa HPT) by Branchline for the Expansion Case is shown below.

Figure 8 PoHP Demand, by Branchline (Mtpa) (REDACTED)



4.2.3 Planned Maintenance

Planned Maintenance causes equipment to be unavailable for periods of time. While the supply chain may have latent capacity to work around shorter equipment outages, larger outages can significantly disrupt the capacity of the supply chain, causing the supply chain to be constrained by Asset capability.

The maintenance schedule used for the **Terminal** was based on information provided by DBIM:

- For the Base Case, the Terminal maintenance patterns (variation in outage durations and frequencies) were based on the FY23 Terminal EOS (Equipment Outage Schedule). The maintenance patterns reflect current scheduling practises. In brief, as well as short outages, the Terminal maintenance calendar includes a major outage for each machine and ensures that Inloader shuts are aligned to network Full System Shuts.
- For the Expansion Case, the Terminal maintenance calendar provided by DBIM reflects current scheduling practises. This Terminal maintenance calendar includes at least one major outage for each machine in addition to short outages. The addition of a 4th Shiploader allows for a different maintenance regime to be considered providing more total maintenance hours while at the same time increasing available Shiploading hours.

Network maintenance for the Base Case and Expansion Case was based on information provided by Aurizon Network for the same period (FY23).

Table 4 Planned Maintenance: Full System Shuts, Inloaders and Shiploader

	FSS	Inloaders				3 Shiploaders					4 Shiploaders				
Month	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Jul	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Aug	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Sep	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Oct	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Nov	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Dec	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Jan	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Feb	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Mar	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Apr	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
May	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Jun	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

Table 5 Planned Maintenance: Ballast Cleaning and Other Track Maintenance

	Ballast Cleaning						Other Track Maintenance					
Month	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Jul	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Aug	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Sep	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Oct	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Nov	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Dec	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Jan	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Feb	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Mar	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Apr	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
May	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Jun	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

4.3 Assessment Results

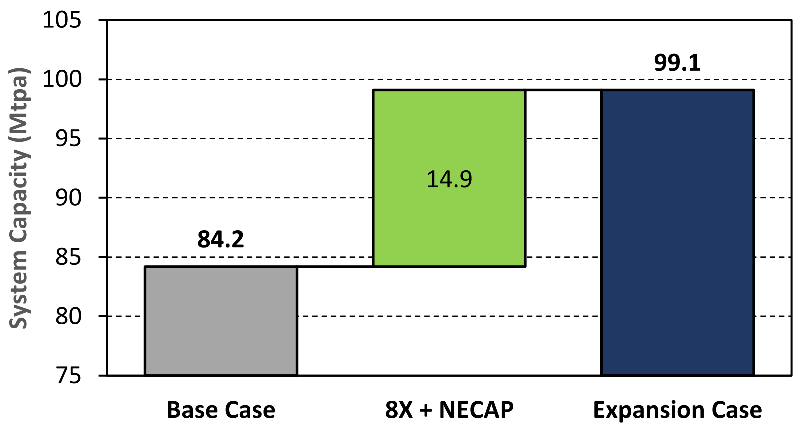
The DBCC System Capacity increases from 84.2 Mtpa for the Base Case to 99.1 Mtpa for the Expansion Case.

All capacity assessments provided here are specified with a precision of ±1Mtpa.

Table 6: DBCC System Capacity Assessment

Terminal Condition	System Capacity (Mtpa)
Base Case	84.2
Expansion Case	+14.9 = 99.1

Figure 9 DBCC System Capacity Assessment



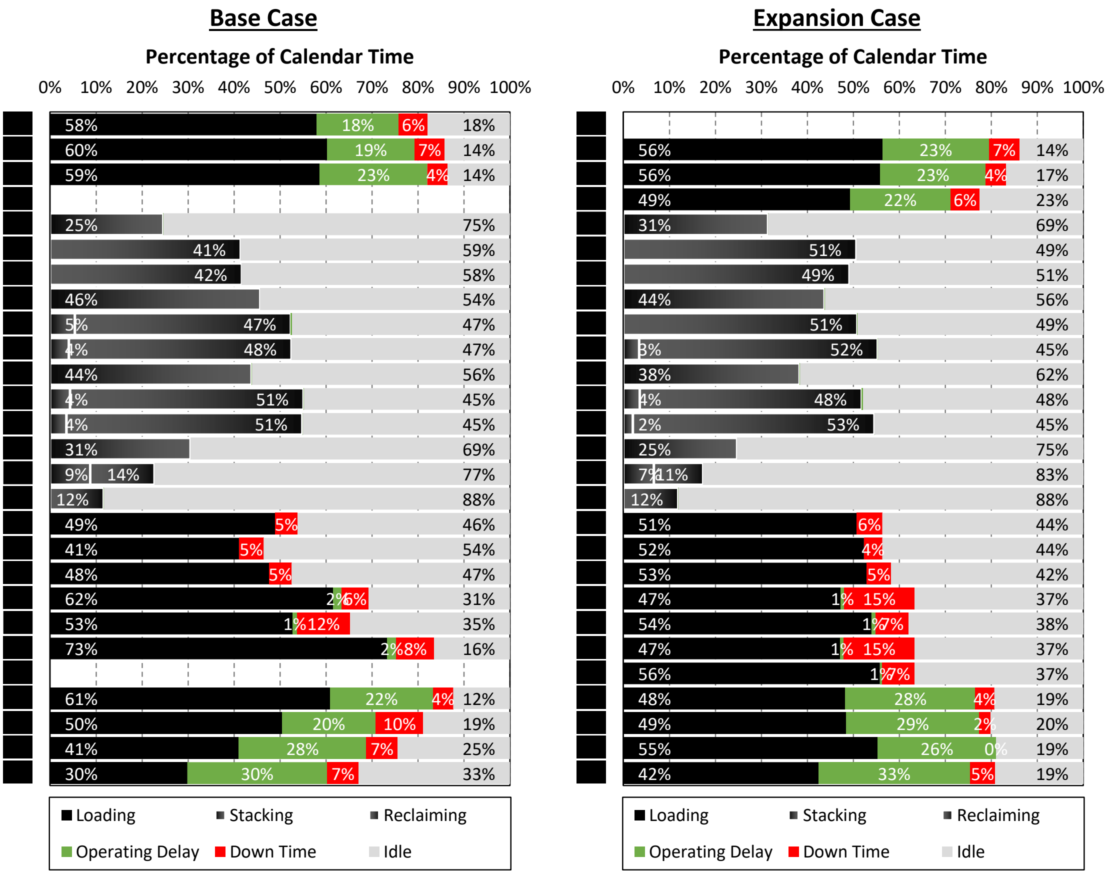
Key drivers of this increase in capacity include:

- Increase in Inloader Rates.
- Increase in Stockyard Volumes.
- Increase in Shiploader rates and availability.
- Increase in the number of TLOs in the Demand Profile.
- Decrease in the chance for condensed demand.
- Increase in the activation of batch assets including TLOs and Single Track Branchlines.

Terminal Asset Utilisation

The following charts show the utilisation of each major item of equipment at the Terminal.

Figure 10 DBT Equipment Utilisation



Legend

Loading: Inloading, Outloading, Shiploading.

Operating Delay: Shoulder Activities, Wait for Route to become Available.

Down Time: Planned Maintenance and Failures.

Idle: Not in use.

Terminal Space Utilisation

The following charts show the Pile Space Allocated into the Stockyard, measured in kt.

This measure indicates how much of the shipping demand that has been presented has been *planned into the stockyard* and is able to generate train jobs, i.e., the tonnage of demand being pulled from the upstream supply chain, over time.

Figure 11 Pile Space Allocated in Stockyard by Mine

In both the Base Case and the Expansion Case, the tan area at the base represents the Space Allocated for one Dedicate Stockpile Pair that is common to both cases.

The second colour from the base, light blue, shows that in the Base Case there are significant periods of time where much of the stockyard space is required to service this high-volume product. In the Expansion Case, this product is assigned to a Dedicated Stockpile Pair, and its demands on Stockyard Space are markedly reduced.

The total Pile Space Allocated for the Base Case and Expansion Case are represented in the following two Figures.

Figure 12 Pile Space Allocated in Stockyard, measured in Mt

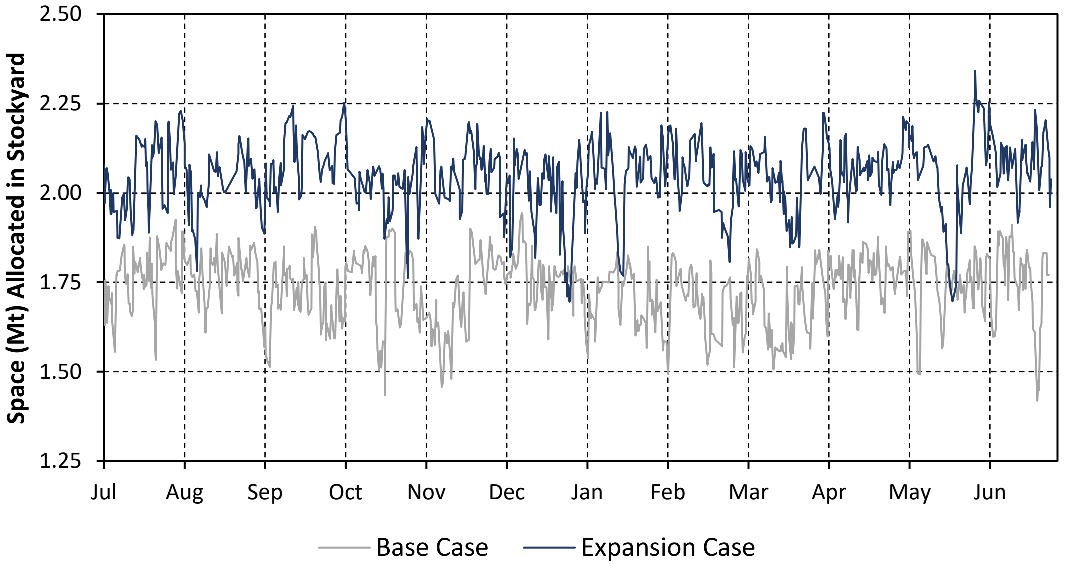
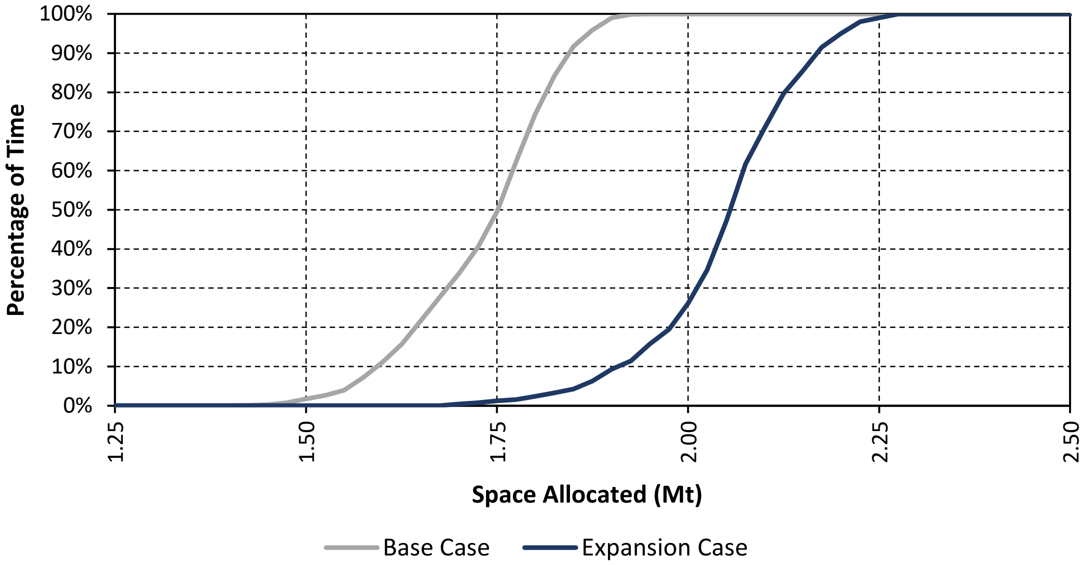


Figure 13 Cumulative Distribution of Pile Space Allocated in Stockyard



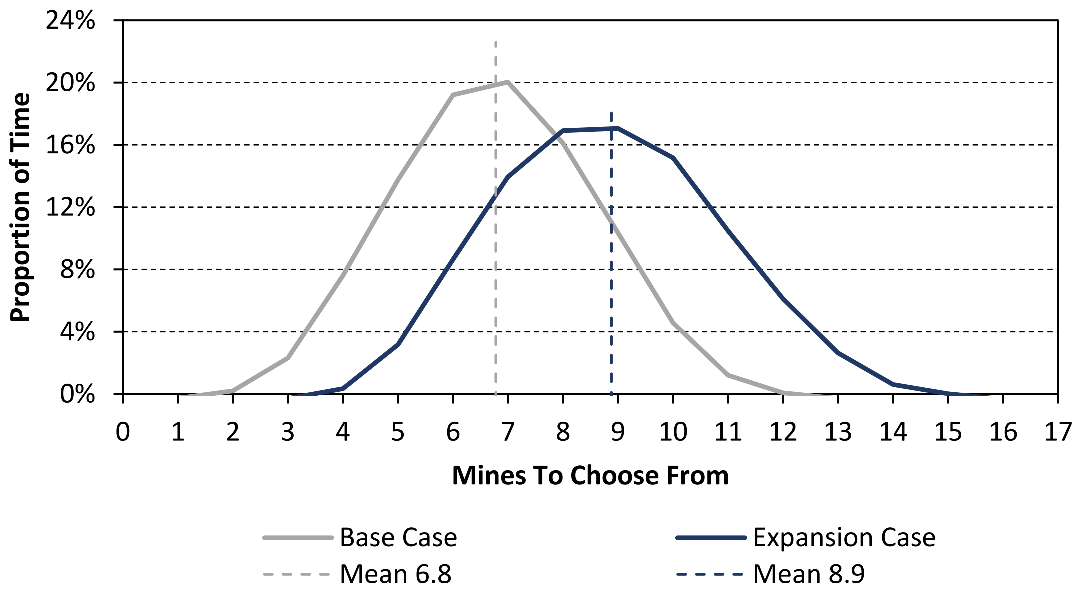
The median Space Allocated increases by 0.30 Mt, from 1.75 Mt in the Base Case to 2.05 Mt in the Expansion Case.

In the Base Case, Space Allocated ranges from 1.42 to 1.94 Mt; a working range of 0.52 Mt.

In the Expansion Case, Space Allocated ranges from 1.70 to 2.35 Mt; a working range of 0.65 Mt.

There is a significant uplift in Space Allocated in the stockyard, resulting in a significant increase in the number of parcels being built at any time.

Figure 14 Distribution of Mines to Choose From



The mean Mines To Choose From over time increases by 2.1, from 6.8 in the Base Case to 8.9 in the Expansion Case.

This is a consequence of having more TLOs in the demand profile, but more importantly, of having a larger stockyard that can accommodate a higher number of parcels being built in parallel, increasing the number of TLOS that will be activated.

Figure 15 Trains Dumped per Day at DBT

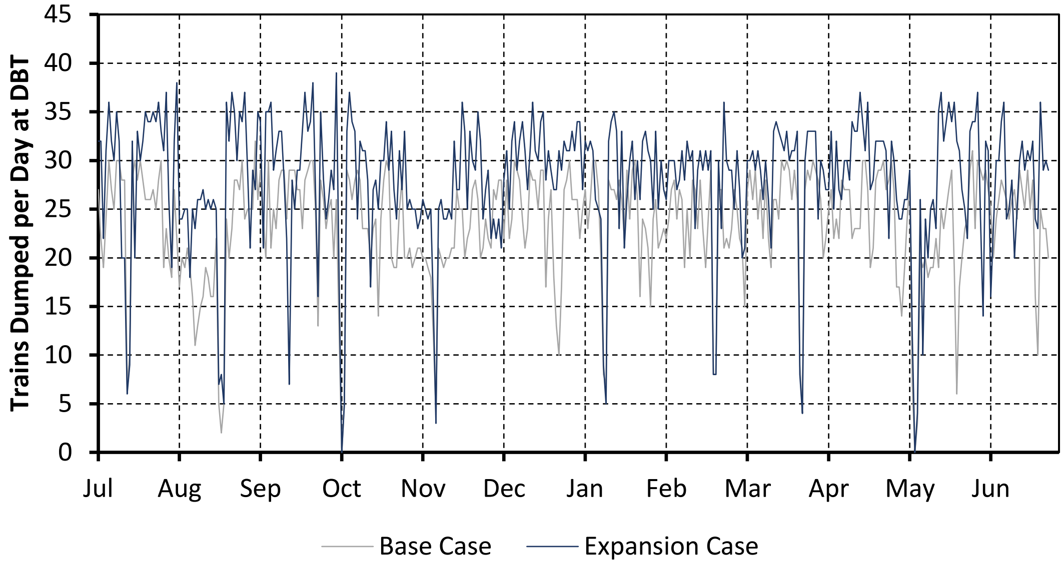
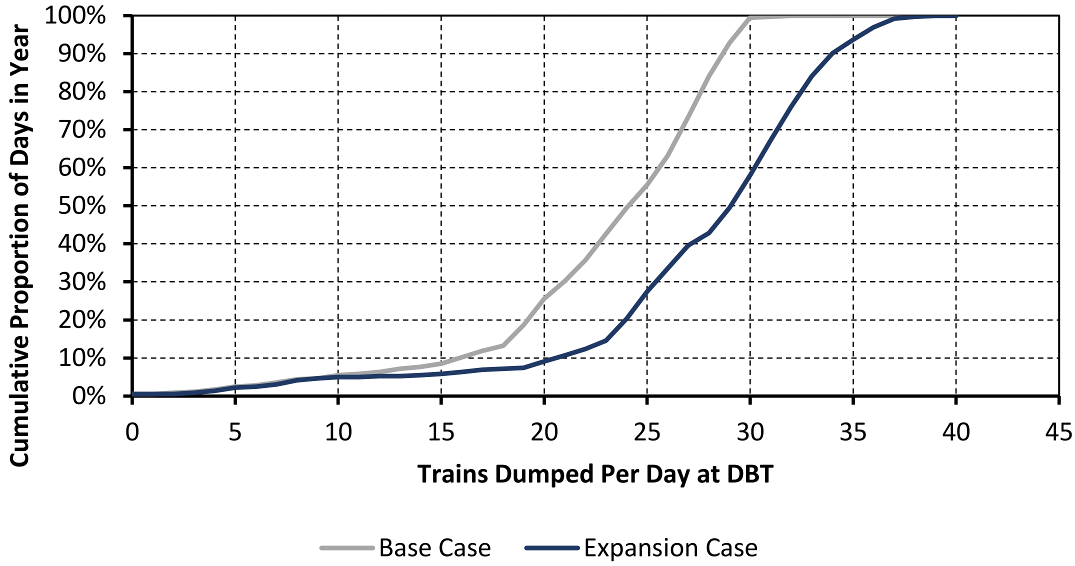


Figure 16 Trains Dumped per Day at DBT

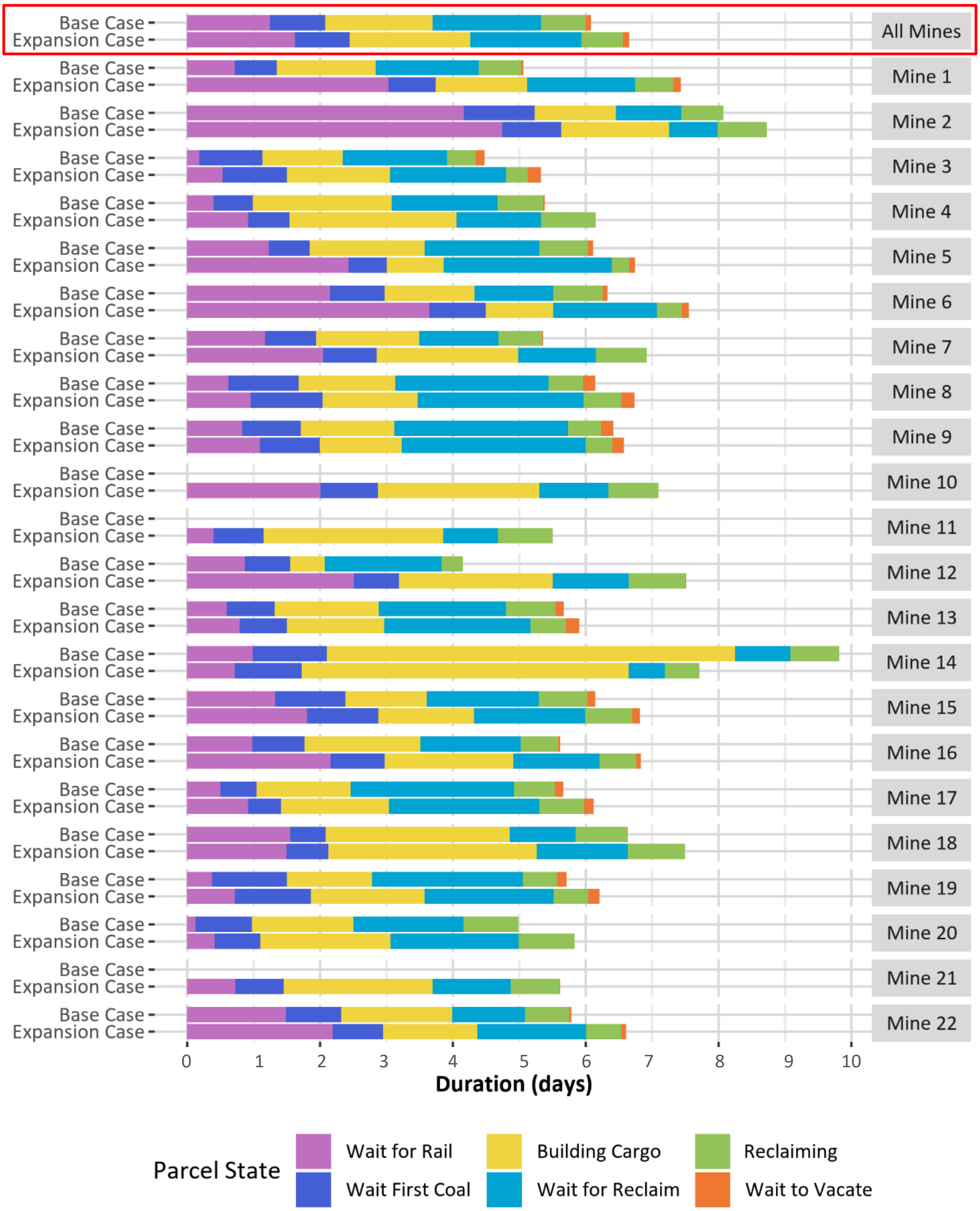


The average trains dumped per day at DBT increases by around 5, from 23 in the Base Case to 28 in the Expansion Case.

While the assumption could be made that an increase in trains dumped per day is a consequence of the increase in daily slots resulting from increased Inloading rates, it also needs to be understood that this is also a direct result of the simultaneous gain in stockyard space; this enables a significant increase in the number of TLOs activated which activates more single track branchlines, encouraging higher performance out of the remainder of the supply chain.

The following figures show the Parcel Lifecycles, by Components (see Figure 18 below for a description of the Parcel Lifecycle Components), for each Mine (de-identified). This represents the average across all parcels built for each Mine across a year. Naturally, there will be fluctuations around this average. The Parcel Lifecycles shown at the top, and outlined in red, indicate the average Parcel Lifecycle across all Parcels across all Mines across a year.

Figure 17 Average Parcel Lifecycles by Mine (de-identified)



The parcel lifecycle has been defined as the time between when the space for a parcel is allocated in the stockyard through to when the space is reallocated after the vessel has been loaded. This is then broken up into six components: the time until the first train order is made, the time until the first train is delivered and stacked, the time building the parcel, the time until the parcel is first reclaimed, the time spent reclaiming the parcel and the time until the space is vacated.

Figure 18 Parcel Lifecycle Components

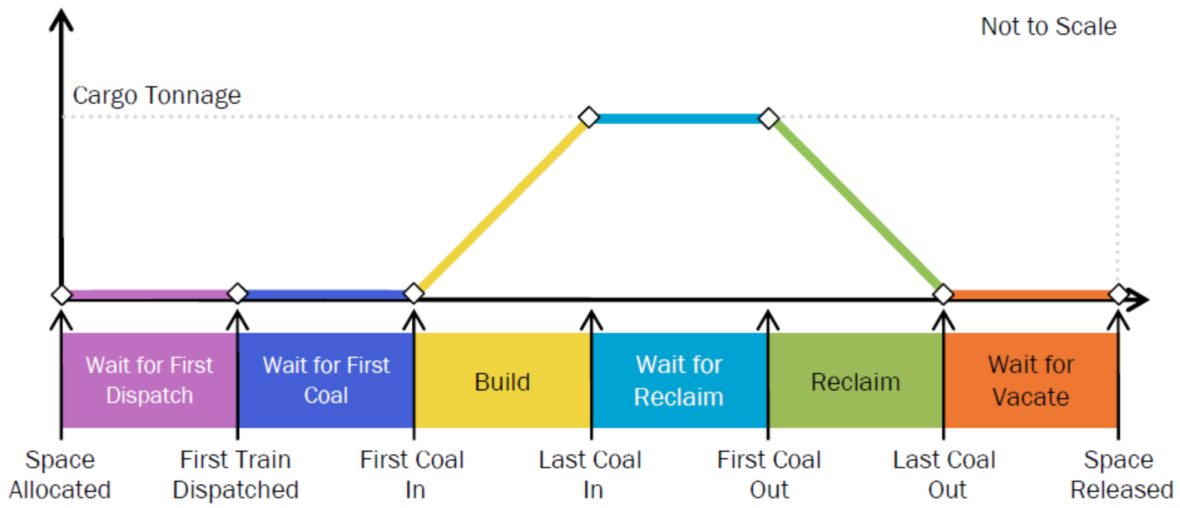
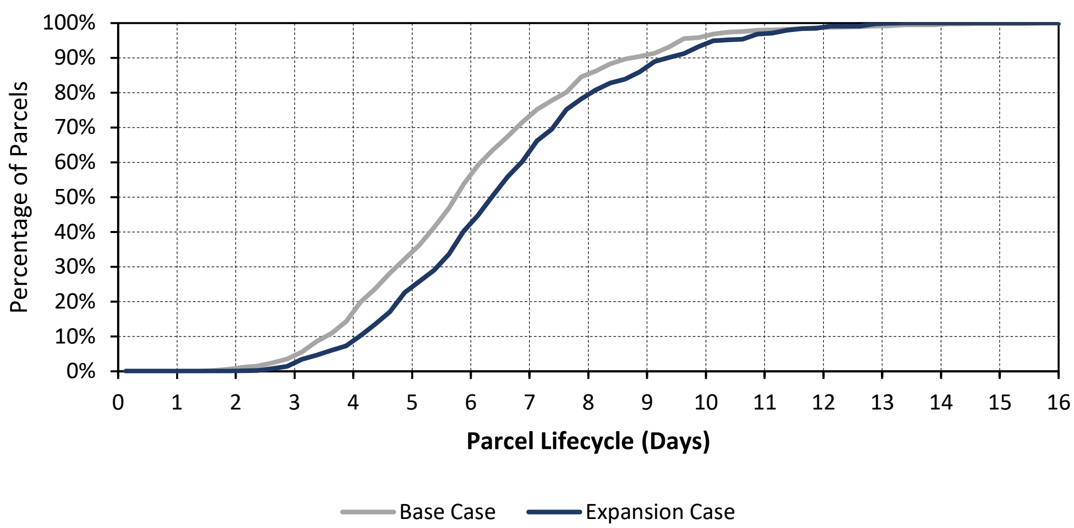


Figure 19 Cumulative Distribution of Parcel Lifecycles



Considering the Lifecycles of all Parcels built across a year, the median Parcel Lifecycle increases by 0.6 days from 5.7 days in the Base Case to 6.4 days in the Expansion Case.

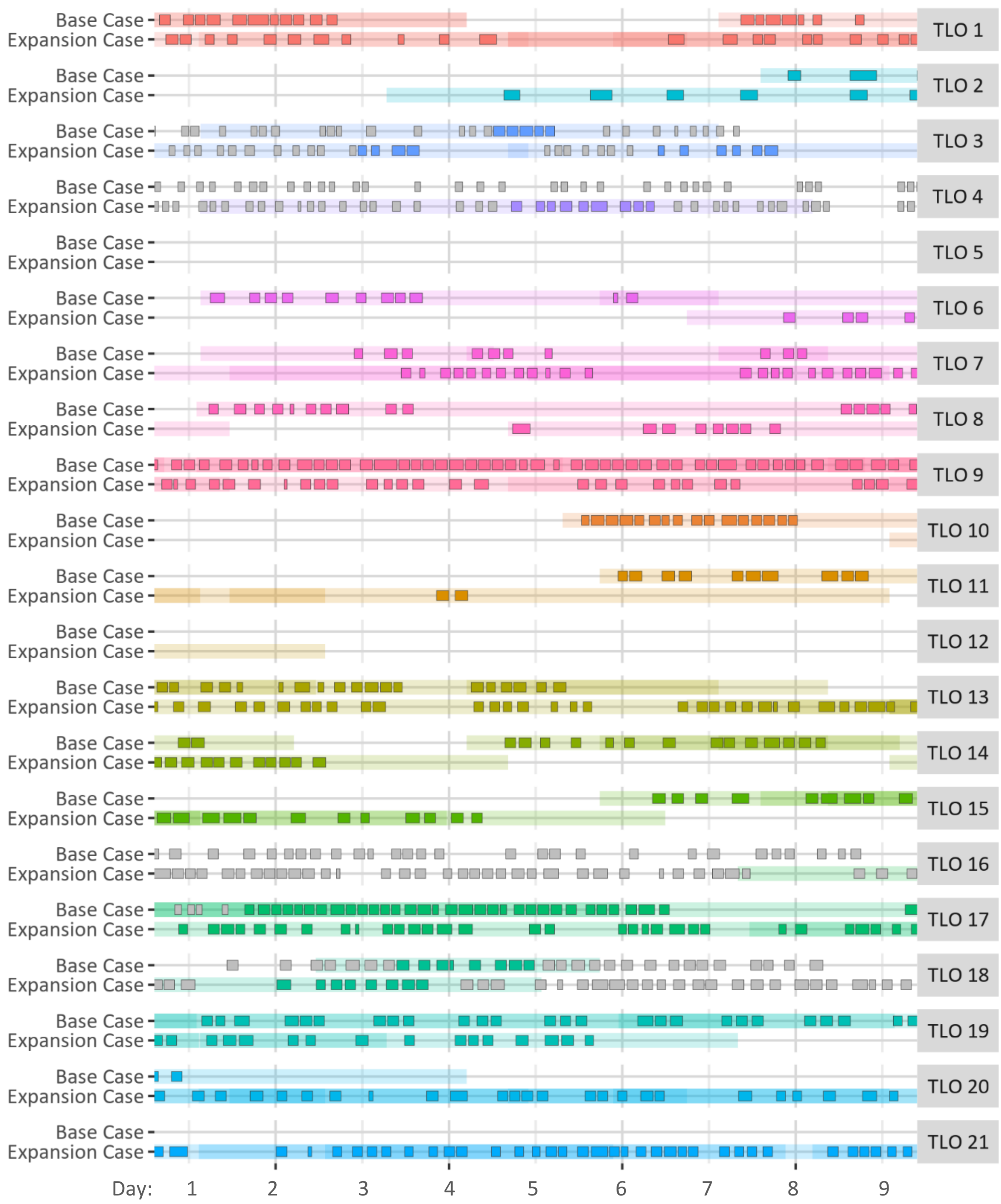
The following chart shows a vertical line for every train loaded at a TLO (de-identified) across a year. Grey lines represent those trains destined for other Terminals apart from DBT.

This chart shows that TLOs can be pulled from, and TLOs can push trains into the Trunk and Terminal at varying frequencies over varying time periods, as required by the Terminal's operating methodology, i.e., use of stockyard space to accommodate throughput. This clearly demonstrates the difference in the Cargo Assembly frequency and methodology as a result of the increase in stockyard space.

Figure 20 Time Series of Trains Loaded at TLOs, by TLO (de-identified)

The following chart shows a 9-day sample period from the previous chart, so that the detail can be inspected more closely. Each box represents the duration of a train load at each TLO. The DBT Parcel Lifecycle is superimposed as a shaded area. Those boxes shown in grey represent those trains destined for other Terminals apart from DBT.

Figure 21 Time Series of a 9-day Period of Trains Loaded, with Yard Space Allocated Superimposed, by TLOs (de-identified)



4.4 Sensitivity Analyses

4.4.1 Terminal

The following charts show Sensitivity Analyses on various Terminal parameters, including the Inloading Rates, Outloading/Shiploading Rates and Stockyard Size.

Figure 22 Sensitivity Analysis: Inloading Rates

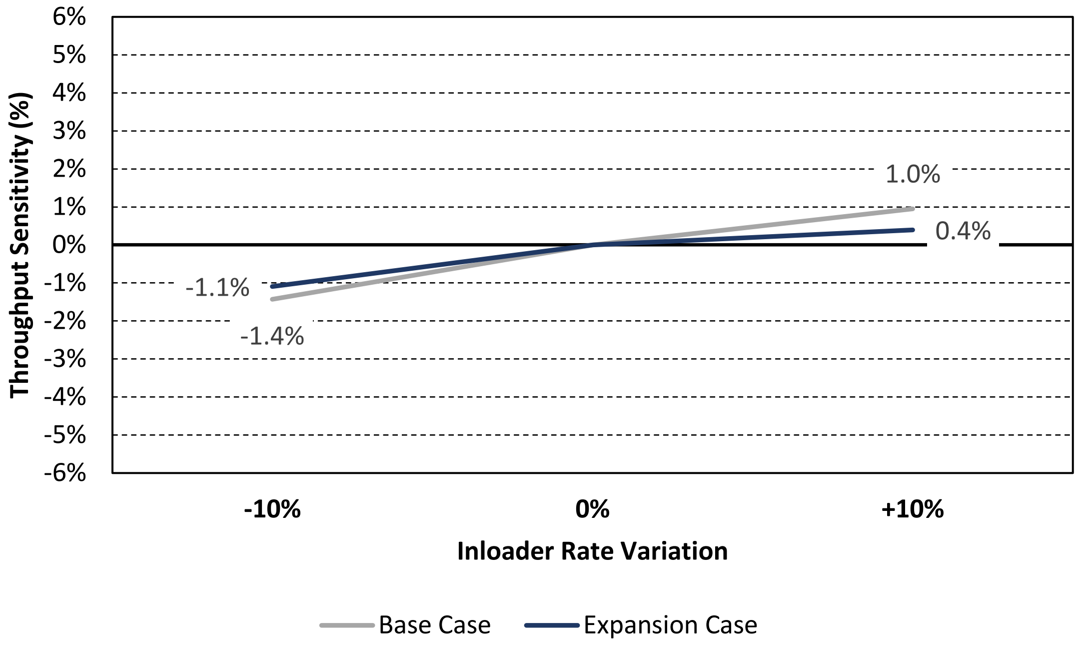


Figure 23 Sensitivity Analysis: Outloading and Shiploading Rates

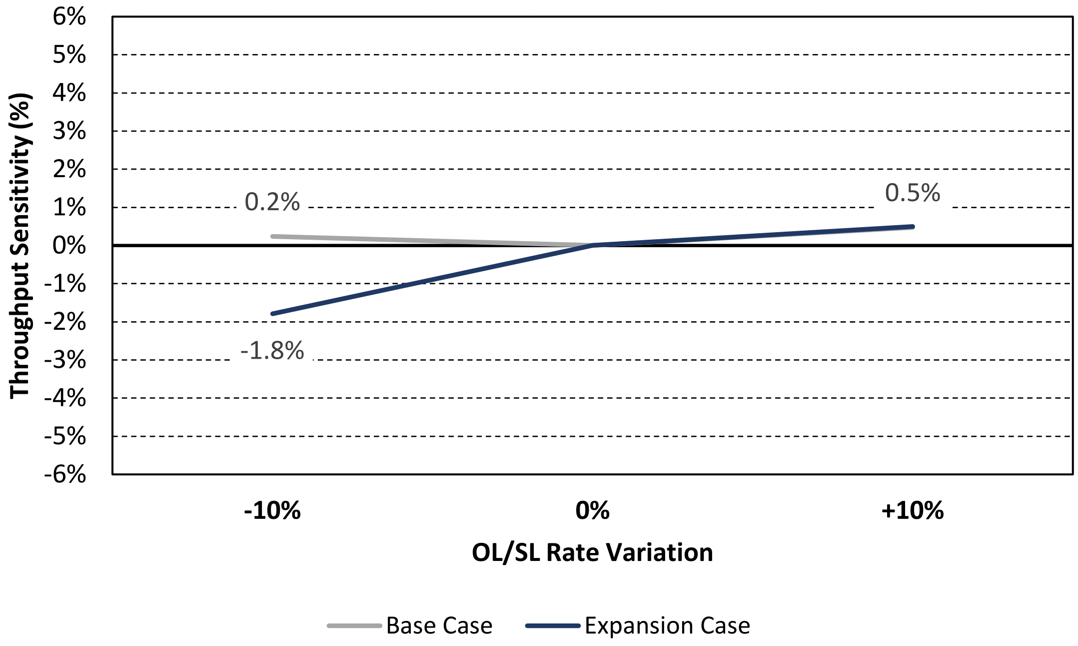
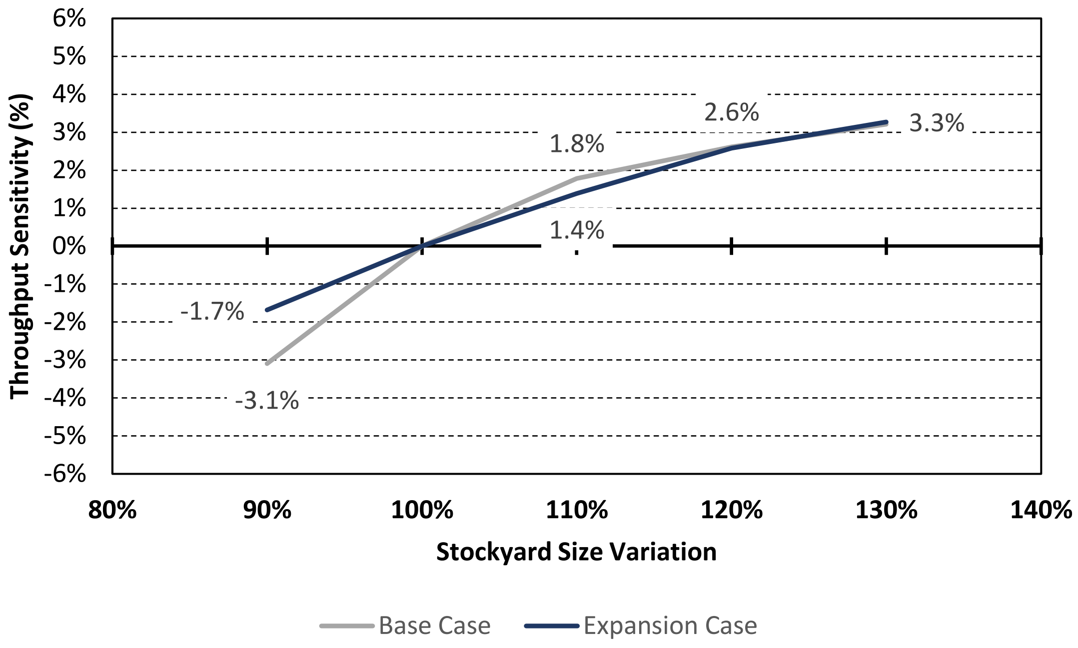


Figure 24 Sensitivity Analysis: Stockyard Size



The sensitivities show that the increases in Asset capacities across the terminal, from Inloading to Stockyard to Shiploading have the right balance across these Asset Classes, without over investing in any single area, which would have only provided surplus and under-utilised capacity of one Asset Class.

4.4.2 Rail

The following charts show Sensitivity Analyses on various Rail parameters, including the Duration of Track Planned Maintenance Events across the whole modelled rail system, Temporary Speed Restrictions, and Unplanned Failures and Faults.

Figure 25 Sensitivity Analysis: Track Planned Maintenance Event Duration

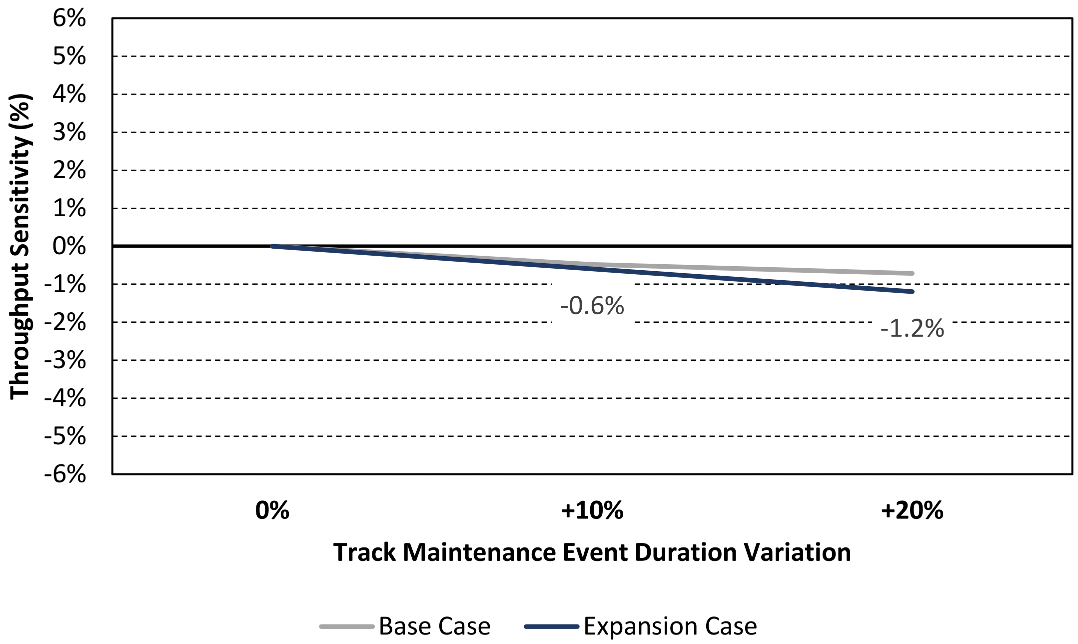
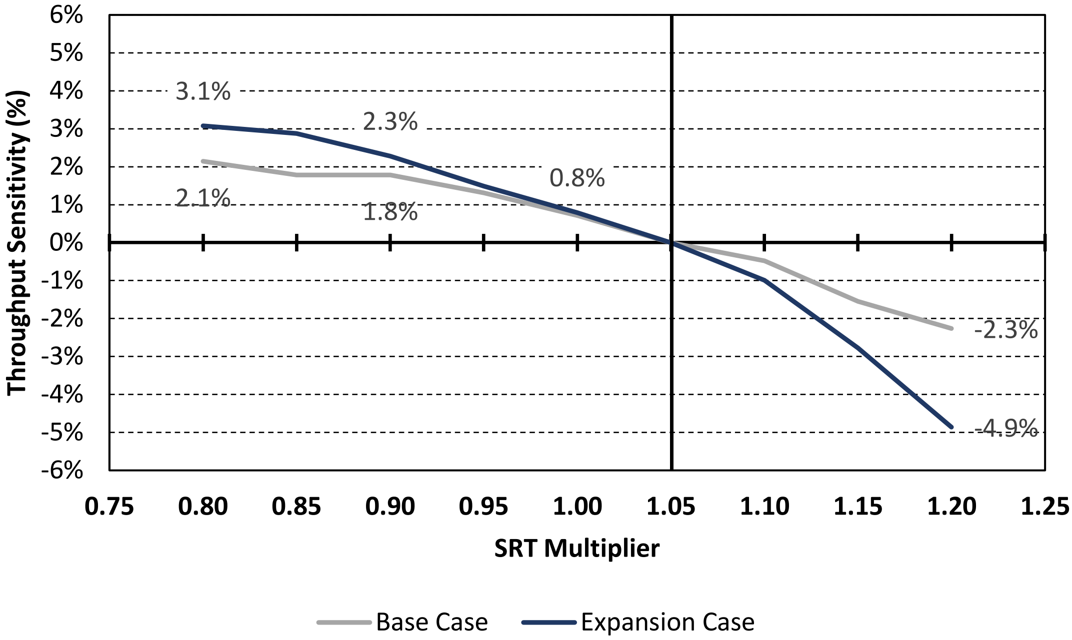


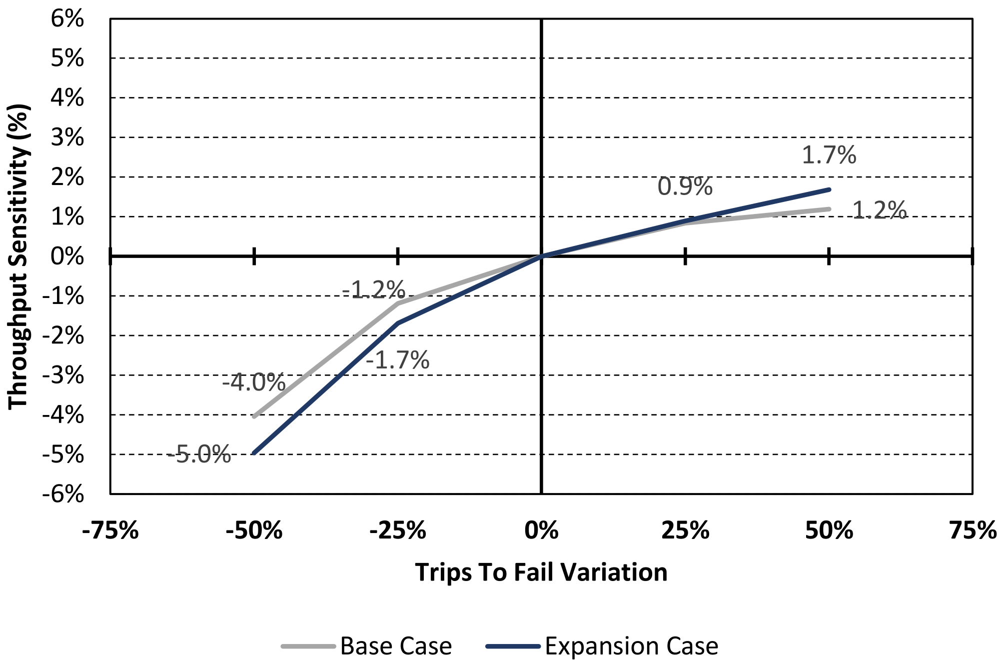
Figure 26 Sensitivity Analysis: Temporary Speed Restrictions

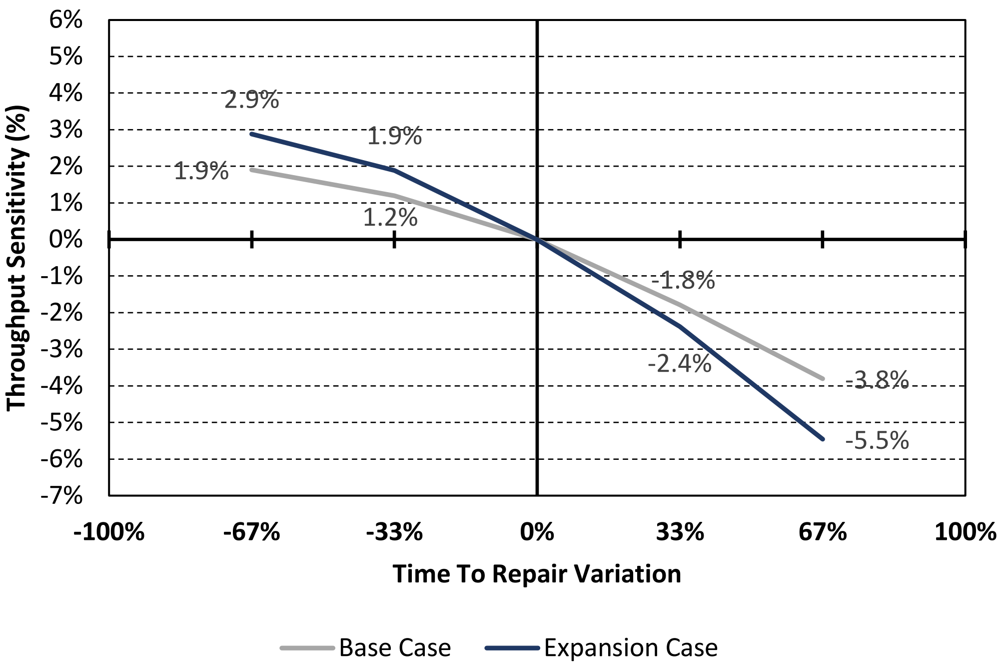


The ILC models Temporary Speed Restrictions (TSRs) across the modelled network by applying a multiplier of 1.05 to all Sectional Run Times (SRTs), i.e., an SRT Multiplier, hence distributing the effects of TSRs across the network. This approximation is done in lieu of trying to capture specific locations and timings of TSRs which are inherently unpredictable.

This sensitivity shows that the Network is not particularly sensitive to a reduction in TSRs, and also that it requires a very significant increase in TSRs to substantially affect throughput, demonstrating that investing in decreasing SRTs is somewhat futile, as the Network is not the constraint in the system.

Figure 27 Sensitivity Analysis: Failures (Trips to Fail, and Time To Repair)





The ILC models Failures across the modelled network using two parameters: the number of trips across a track section before a failure will occur (**Trips To Fail**), and the duration of the failure (**Time To Repair**), hence distributing the effects of failures across the network. This approximation is done in lieu of trying to capture specific locations and timings of failures which are inherently unpredictable.

This sensitivity shows that the Network is not overly sensitive to changes in Failure parameters, as it requires very significant changes to Duration and Frequency of Failures to substantially affect throughput.

5.0 Discussion

The results of this ILC Supply Chain assessment may seem surprising to many since there has been an independent assessment (by the CNCCC) of the Below Rail capacity that indicates that there is presently an Existing Capacity Deficit (ECD). This necessitates an explanation for the discrepancy which will be outlined in this section.

As described in this report there are differing supply chain asset groups. The following extract from the **ILC's Strategic Master Plan 2012** is still relevant today and is reproduced here.

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Asset Types

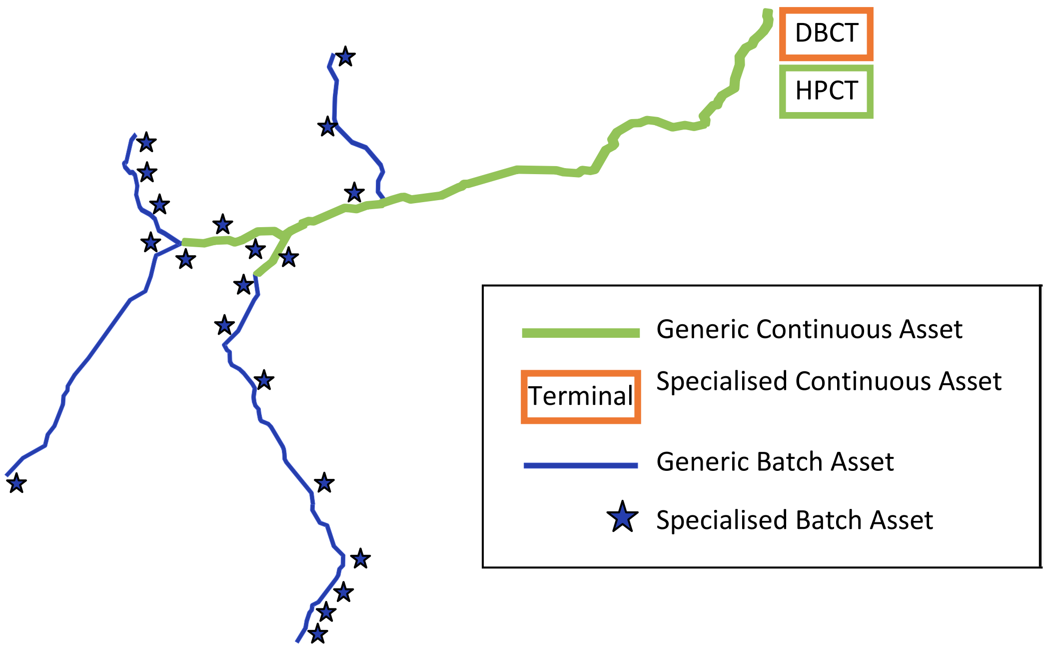
The different manner in which assets operate can be used as a basis for separating the assets into distinct groups, namely:

1. *Continuous Assets: those that are able to supply a continuous rate on an hour-by-hour basis (Trunk, Terminals), and*

2. *Batch Assets: those that are unable to maintain an even rate of supply on an hour-by-hour basis (TLOs, Single Track Branchlines)*

In Figure 28 "Continuous and Batch Assets", blue represents Batch assets and green represents Continuous assets.

Figure 28 Continuous and Batch Assets



The trunk can be accessed on a continuous basis and receives its tonnes from the single track branchlines, and as the trunk simply performs the function of aiding the movement of trains, it does not matter which product is on the train. This below rail asset can therefore be defined as a Generic Continuous Asset.

Similar to the trunk, DBCT also is a continuous asset, but with one important distinction. As there are multiple grades of product to be handled, to service the order of vessel arrival and co-shipping requirements the velocity of arrival must also be combined with the expectation of grade and time. If the correct tonnes are supplied in the right order and at the correct rate then DBCT can utilise its strength as a continuous asset and exceed the target throughput. DBCT can therefore be best described as a Specialised Continuous Asset.

The single-track branchlines are limited by the amount of stops and starts required to allow oncoming traffic to safely pass, and are further limited by the number of TLOs that are providing the tonnes. These characteristics make single track branchlines Batch Assets.

The TLOs are used only when cargos are being assembled from that mine. Their rate of supply is low, but their capacity is high. These characteristics make TLOs Specialised Batch Assets.

What happens when different asset types work together?

All assets in the supply chain are required to work together to deliver coal from the mines to the terminals.

For the continuous assets to deliver the targeted throughput, enough batch assets need to be employed at once to provide sufficient coal velocity to meet the needs of the targeted throughput.

❖❖❖

Let us consider each Asset Class in turn.

5.1 Batch Assets – the TLOs and Branchlines

The Batch Assets include the TLOs and Single Track Branchlines. Enough batch assets need to be employed at once to feed the Continuous Assets to deliver the targeted throughput.

When the TLOs and Branchlines are considered as feeders to the Trunk, together the capacity of these batch assets represent:

- Geographical distribution of demand (for Capacity Assessments, demand is relatively uniform over time), i.e., the push of empty trains to a TLO/Branchline.
- TLO capacities, i.e., the ability of TLOs to push loaded trains into their respective Branchline.
- Branchline capacities, i.e., the ability of a Branchline to deliver the loaded trains from the TLO to the Trunk.

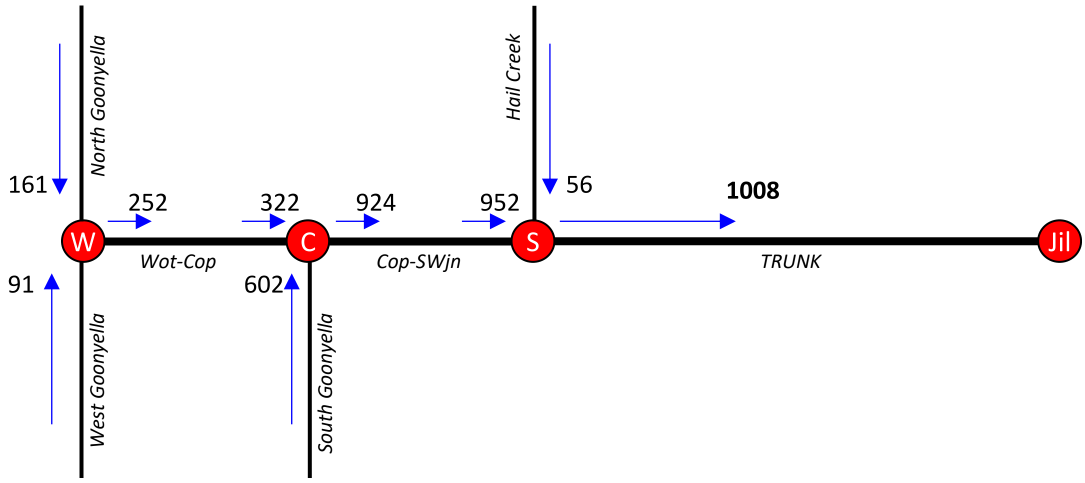
The variability in the available **Mines To Choose From** when a train is dispatched from Jilalan or Nebo is determined by the combination of the above three points together with the predominantly Cargo Assembly operating mode of DBT.

The TLOs and Branchlines considered here are those of the Goonyella System that feed the two Terminals at the Port of Hay Point (DBT and HPT).

Maximum TLO Capacities by Branchline

A key parameter describing the Capacity of a TLO is the **Maximum Number of Trains per Day** that can be loaded. If this parameter is summed along each branchline, we get the following, in terms of **Maximum Number of Trains per Week** that the TLOs can push onto the branchlines and into the Trunk.

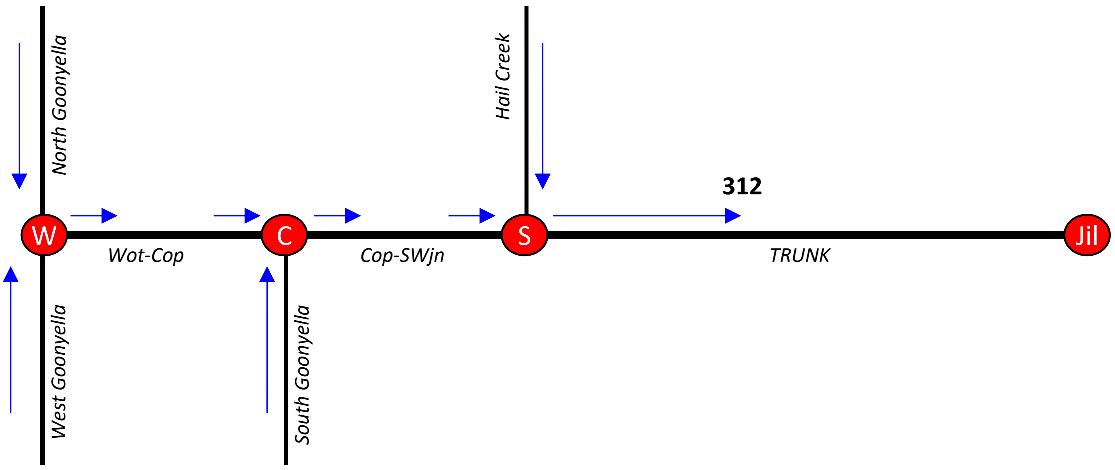
Figure 29 Maximum Capacity of TLOs to feed Trains into the Trunk, by Branchline (trains per week)



Note that with 72 paths available up and down the Trunk each day, the maximum that the Trunk could deliver in a week is 72 x 7 = 504. Coincidentally, the combined TLO capacity is double the Trunk capacity.

The trains required per week to service the Port of Hay Point demand identified previously in **Figure 8 "PoHP Demand, by Branchline (Mtpa)"** is shown as trains required per week by Branchline in the figure below assuming a representative payload of 9,500 tonnes which provides for day of operations losses.

Figure 30 Average Trains Required per Week to Service PoHP Demand, by Branchline (REDACTED)



In conclusion the TLO Asset Class has an extraordinary amount of capacity available relative to the Trunk and the Demand, and this level of capacity lends itself to be very advantageous to meeting the needs of a variable Cargo Assembly Operation.

5.2 Continuous Assets – the Trunk

There are other ways to demonstrate the capacity of the Goonyella System aside from using a Dynamic Simulation Model. Static Calculations can be used to give a high-level sense and reasonability check, particularly in situations where there is ample spare capacity.

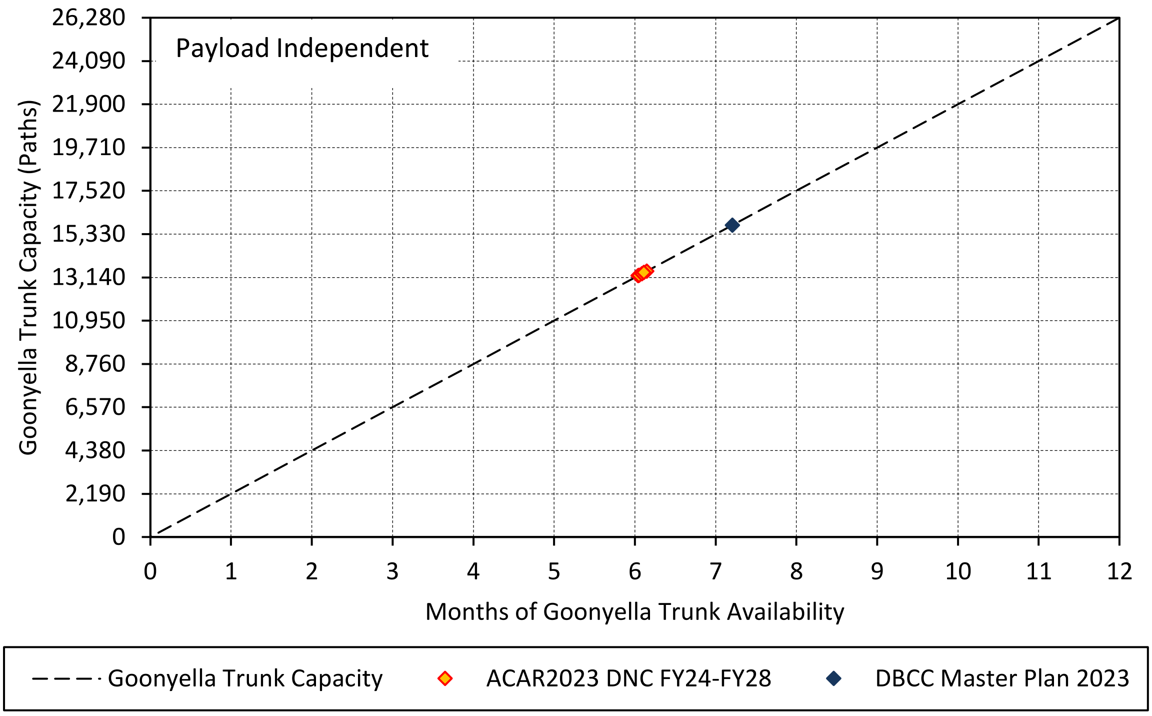
The maximum available capacity of the Goonyella Trunk can be determined as:

72 paths per day x 365 days per year = 26,280 maximum available paths

If it is assumed that these available paths are evenly distributed across 12 months (i.e., 2,190 paths per month), then:

- Relative to the **Annual Capacity Assessment Report** (Reference [5]) for FY24-28 completed by the CNCC in June 2023, it would take just over 6 months of Goonyella Trunk availability, or a Trunk Path Utilisation of 51%, to achieve the ACAR DNC FY24-28 results. That is, there would be almost 6 months allowance to account for maintenance, failures, weather disruption, non-coal traffic, etc.
- It would take just over 7 months of Goonyella Trunk availability, or a Trunk Path Utilisation of 60%, to achieve the DBCC Master Plan 2023 result. That is, there would be almost 5 months allowance to account for maintenance, failures, weather disruption, non-coal traffic, etc.

Figure 31 Months of Goonyella Trunk Availability Required to Deliver Various Capacities



In conclusion this asset class also has an extraordinary amount of capacity available, and this level of capacity lends itself to be very advantageous to meeting the needs of a variable Cargo Assembly Operation.

5.3 Specialised Continuous Assets – the Terminal

The PoHP has two separate terminals serviced by the Goonyella Coal Chain. For the sake of explanation here we will simply focus on the Dalrymple Bay Terminal knowing that this explanation will somewhat mirror the circumstances for the Hay Point Terminal albeit to differing levels of variation.

The DBT needs to build cargos and handle many differing grades of product. The terminal is classed as a Specialised High Velocity asset. If the correct tonnes are supplied in the right order and at the correct rate (velocity), then DBT can utilise its strength as a continuous asset and exceed the target throughput. DBT also plays an extremely important function in the supply chain: DBT establishes the rate of engagement or activation of the specialised and generic batch assets to feed the generic and specialised high velocity assets. Without this coordination of the right mix of asset engagement/activation, the supply chain will not operate to the right level necessary to reach its full potential.

5.4 Operating Methodologies

All coal terminals operate in a manner that allows coal to be assembled at the terminal and ultimately delivered to the customer. These differing operating manners reflect the type of railing that will occur to satisfy the terminal operating principles, e.g., Even Railing, Occasional Railing or Campaign Railing or Sprint Railing. These different operating methods can be considered as a strategy that sits along a Supply Chain continuum as the following points will describe.

Dedicated Stockpile

At one end of the continuum, we have the Dedicated Stockpile strategy. In this approach, coal is allocated to specific stockpiles based on various criteria such as coal type, quality, origin, or customer requirements. Each stockpile is dedicated to a particular coal specification, which allows for efficient segregation and management of different coal grades. Dedicated Stockpile strategy prioritises maintaining distinct coal qualities and minimising intermixing.

Buffered Stockpile

Moving along the continuum, Buffered Stockpile strategy introduces a level of flexibility. It involves creating stockpiles that can accommodate multiple coal grades or qualities. This strategy aims to provide a buffer zone where various coal types can be stored temporarily, allowing for smoother transitions between different coal grades based on market demands.

Mixed Stockpile

Further along the continuum is the Mixed Stockpile strategy. This approach involves blending different coal grades within a single stockpile. The goal is to create a homogeneous blend of coal that meets specific customer requirements or market specifications. Mixed Stockpile strategy enhances flexibility and responsiveness to changing demand patterns, as it enables rapid adjustments in coal blends.

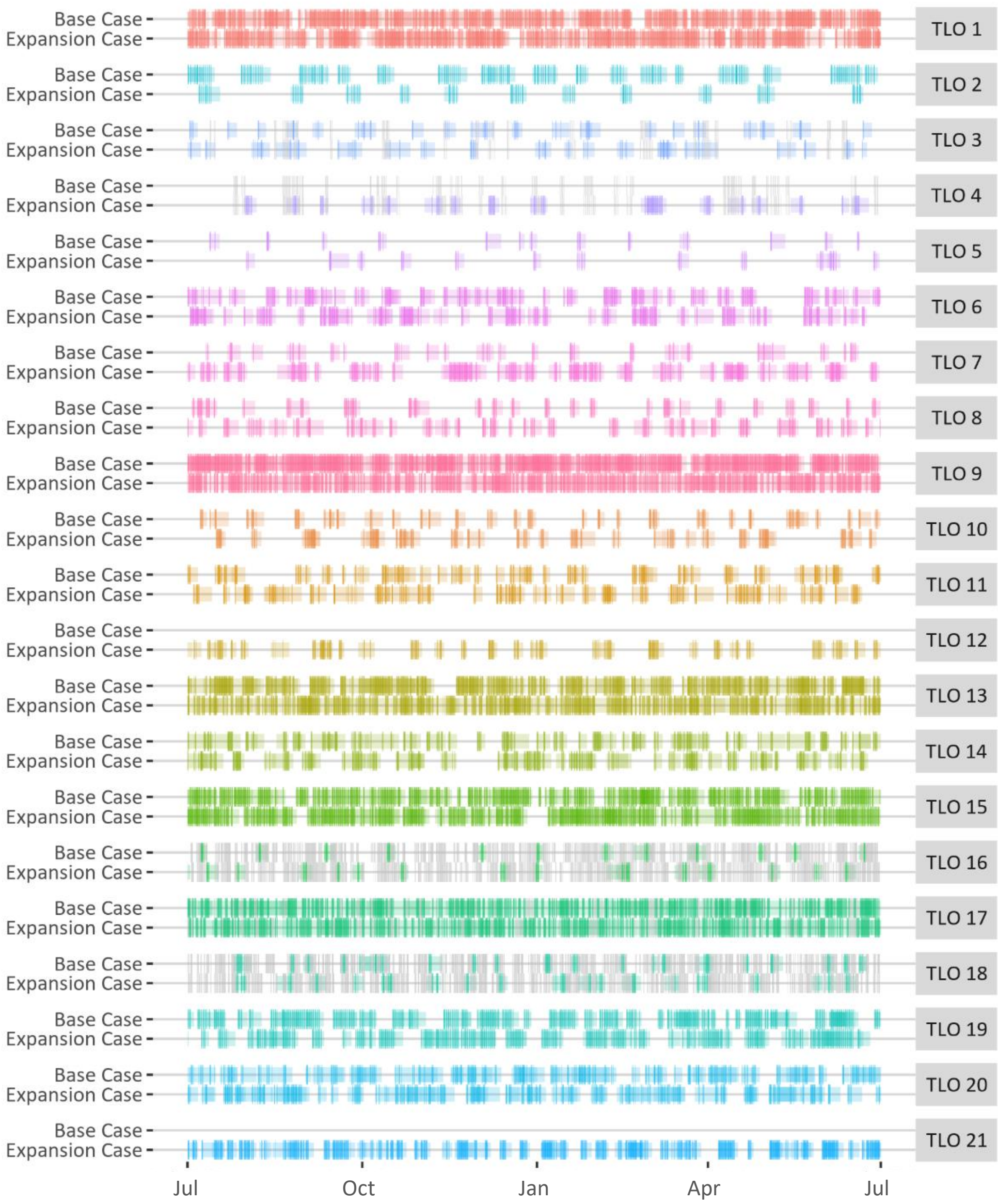
Dynamic Blending

Advancing towards the middle of the continuum, we encounter Dynamic Blending, which takes the concept of blending to a more sophisticated level. Dynamic Blending involves real-time mixing of coal from different stockpiles, often guided by computerised systems and algorithms. This strategy allows for precise customisation of coal blends based on immediate requirements, optimising coal quality and composition.

Cargo Assembly

Finally, at the other end of the continuum, we reach the Cargo Assembly strategy. Here, the focus shifts from stockpiling to assembling coal cargos just before loading onto transportation vessels. This approach involves pulling coal from different stockpiles or TLOs to create specific coal blends for immediate shipping. Cargo Assembly strategy maximises flexibility and responsiveness, enabling the supply chain to meet diverse customer needs efficiently.

The below chart demonstrates that virtually every TLO and therefore Railing traverses a large component of the Operating Methodology continuum, demonstrating that simulation modelling of only one approach on the continuum would not capture the full potential of these supply chain assets. Moreover, the below chart demonstrates the unique contribution that 8X provides in altering the operating methodology between the Base Case and the Expansion Case.



In essence, these strategies represent a spectrum of approaches to managing coal stocks in terminals, each offering a unique balance between coal segregation, flexibility, and responsiveness. The choice of strategy depends on factors such as coal diversity, market demand patterns, terminal infrastructure, and the desire for operational agility. Understanding this continuum empowers coal terminal operators to make informed decisions that align with their supply chain goals and objectives.

So how does this work within the DBCC? The answer is complex. Some parcels are well suited to dedicated stockpiles in nature because of their high volume, low variety of product mix and somewhat generic product grade.

Some are full Cargo Assembly, as there is extremely high product diversity, low frequency of vessels, and frequent co-shipping. Finally, there are some mines that operate all along the Supply Chain continuum. It’s even fair to say that at times, many of the mines and producers will operate along the full range of this continuum and this will be reflected in their railings.

To say that the DBCC is full cargo assembly is somewhat misleading. DBT operates at all levels across this continuum, it needs to, and is very capable of doing this. To maximise this potential, the DBCC introduced extended delivery windows which allows the differing mines and producers to operate along the full range of the continuum while still maintaining one common velocity for the supply chain as called for in the 2012 Strategic Master Plan, to address the root cause of the supply chain from getting to its full potential capacity. This Root Cause was defined as “The inability of the assets to align to one common velocity” and was the driving mechanism behind the DBSCC Operating Methodology that we operate today.

The ILC Model employs the logic that allows the Model to operate in the DBSCC Operating methodology. Not as an input, but as an output. The terminal space, the product diversity, the co-shipping partners, the differing asset classes are all employed and are activated within the model in a mimic of the real-world scheduling of the planners and schedulers of the DBCC. Each Planner and Scheduler is chasing the maximum from the Supply Chain. The result being that this methodology consistently activates the different Batch Assets at a maximum and sufficient rate to feed the High Velocity assets. Without this, the supply chain does not and cannot reach its full potential.

It’s for this reason that the operation of the terminal, which employs operating practices that traverse the full range of the Dedicated Stockpile to Cargo Assembly continuum, is essential to understand.

For the Goonyella Supply Chain, it is essential to accurately model the driving force behind supply chain activation, the Terminal, to allow a full comprehensive understanding of the planning dynamics and the constraints navigated to maximise the Supply Chain throughput.

The 8X expansion has been cleverly designed to maximise the potential of the supply chain to provide the capability of the terminal assets to activate even more of the Specialised and Generic batch assets. This has been achieved in several ways.

- By increasing the space available which allows for more TLOs to be activated.
- By adding new mines to the Demand profile to service, and therefore additional TLOs (Specialised Batch Assets) to be employed and contributing to the supply chain rate.
- By increasing the inloading rates which therefore increases the amount of DBCC System paths available to be used from the total of the Network paths. And
- Ultimately, by providing increased shiploading rates and shiploading availability which in turn turns over the terminal stockyard at a more consistent and reliable rate.

5.5 Two different simulation studies and two different results

In a simulation modelling study, the demand for capacity consumption in the extremes of the continuum of either “Cargo Assembly” rail networks versus "Even Railings" would depend on several factors and assumptions made in the simulation. Here are some considerations:

Cargo Assembly Rail Networks: If the simulation model accurately represents the operations and constraints of cargo assembly rail networks, it is possible that they would require more capacity consumption compared to "Even Railings." Cargo assembly involves collecting coal from multiple sources and consolidating it into a single shipment, which may result in concentrated demand peaks for transportation resources and infrastructure. This concentration of activity can lead to higher capacity requirements during specific periods when coal shipments are assembled and dispatched.

"Even Railings": "Even Railings" suggests a scenario where coal shipments are distributed more evenly over time, without significant peaks or concentrated demand periods. In such a case, the simulation model would likely indicate a more balanced utilization of rail network capacity throughout the simulation period. The capacity consumption in "Even Railings" would not experience the same intense peaks as cargo assembly, potentially resulting in lower overall capacity demands.

However, it is essential to note that the specific design, assumptions, and objectives of the simulation model can significantly influence the results. Factors such as the frequency and magnitude of cargo assembly activities, the variability of coal shipments, the efficiency of rail network operations, the number of cargos that the terminal can accommodate in parallel, and the scheduling policies implemented can all impact the capacity consumption patterns observed in the simulation.

To obtain accurate insights, it is recommended to gather detailed data, calibrate the simulation model with real-world data, and consider various scenarios and sensitivities to evaluate the capacity consumption differences between “Cargo Assembly” rail networks and "Even Railings."

In determining the results of a simulation study, the users of the simulation model are looking for the following result categories in general:

- Asset Constraint: Whereby the Supply Chain assets capability is less than total demand.
- Demand Constraint: Whereby the Supply Chain assets capability exceeds the total demand.

In a simulation model aimed at finding the true amount of supply chain capacity, the demand profile that would be more representative and accurate is the intermittent demand profile. Here's why:

Intermittent Demand: (Cargo Assembly)

Intermittent demand involves unpredictable surges in activity followed by periods of low or no demand for selected assets.

Simulating intermittent demand in a model allows for the capture of variability and uncertainty that real-world supply chains often face. This can help one to identify potential capacity constraints and bottlenecks that may arise during peak demand periods.

By simulating intermittent demand, one can test the supply chain's ability to handle sudden spikes in orders or requests, ensuring that sufficient capacity is available to meet customer needs during these peak periods.

This demand profile provides a more comprehensive and realistic assessment of the supply chain's performance under various demand scenarios, making it a better candidate for accurately determining the true amount of supply chain capacity required.

Stable Demand: (Even Railings)

Simulating stable demand might not fully challenge the supply chain's capacity because it assumes a relatively consistent and predictable flow of orders.

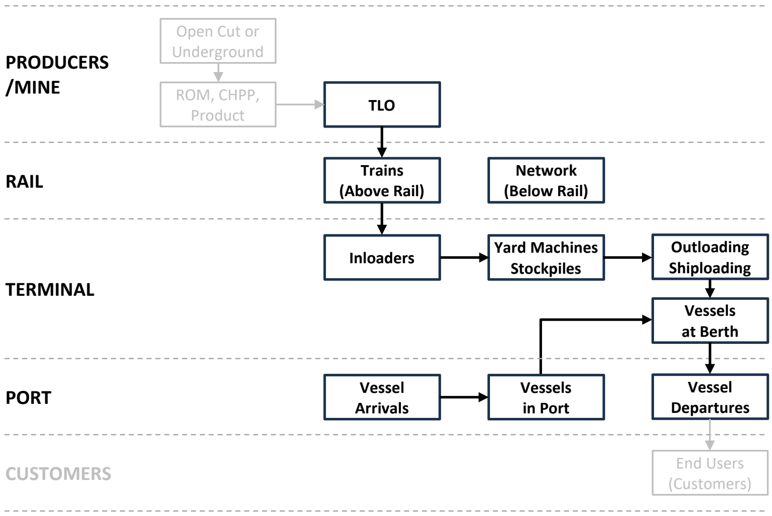
While stable demand simulations can help optimise resource allocation and efficiency, they might not uncover potential issues that arise during intermittent demand spikes.

Choosing this demand profile may underestimate the actual capacity needs of the supply chain during more challenging periods of demand variability.

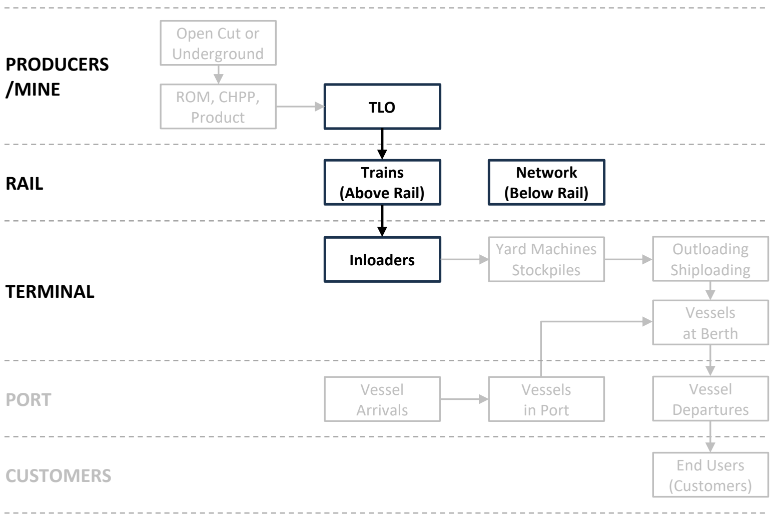
The differing approaches in the scope of the two simulation models results in the differing operations of the supply chain assets and how these assets are engaged and required to peak and trough in utilisation and rates, hence differing Supply Chain throughput results.

This has the potential for the simulation modelling result to replicate an Asset constraint rather than a genuine Demand constraint.

Components of the Coal Supply Chain modelled for **System Capacity Assessment.**



Components of the Coal Supply Chain modelled for **Deliverable Network Capacity Assessment.**



5.6 Summary

The ILC simulation model captures the planning and logic from the terminal through to the remainder of the Supply Chain, mimics the desire of the schedulers and planners to order the most from the supply chain and ultimately uses a considerable and wide variety of Cargo building practices. It is the capture of this detail that allows the ILC to simulate the Supply Chain, its activities, assets, and processes as it operates in practice. It's these differing components that call for considerable peaking capacity from the remainder of the Supply Chain that better reflect the true nature of the Supply Chain asset capacity.

There really isn't a way to adequately model the true capacity of the Supply Chain without the full planning and logic from the terminal through to the rest of the Supply Chain. Without this, the Supply Chain will operate in a very narrow field of the continuum, perhaps even in a couple of fields, and hence remain Demand constrained. This can be misinterpreted as a genuine Asset constraint.

It is primarily for this very reason that there is a difference between the two independent Supply Chain assessments.

6.0 Appendix – ILC Dynamic Simulation Model

6.1 Model

The ILC's Dynamic Simulation Model of the DBCC is a sophisticated Discrete Event Simulation (DES) model developed using the AnyLogic modelling platform. Stochastic methods are employed within the model to introduce randomness in operational events occurring over time, enabling the capture of dynamic interactions within the system.

A team of experts possessing extensive knowledge in DBCC, and simulation modelling meticulously developed the model. This development process involved thorough stakeholder consultation to comprehend current operating methodologies and planning practices, thereby facilitating the application of accurate operating logic definitions.

Data inputs were sourced from diverse stakeholders and the Supply Chain Analytics (SCA) system, which maintains actual supply chain performance data. The validity and currency of model logic and input data are consistently scrutinized and verified. Stakeholders, including Producers and Service Providers, actively contribute updated information to the ILC for simulation modelling purposes. The ILC model results are regularly published monthly and subjected to discussions at industry forums.

The scope of the ILC's Dynamic Simulation Model encompasses the following key aspects:

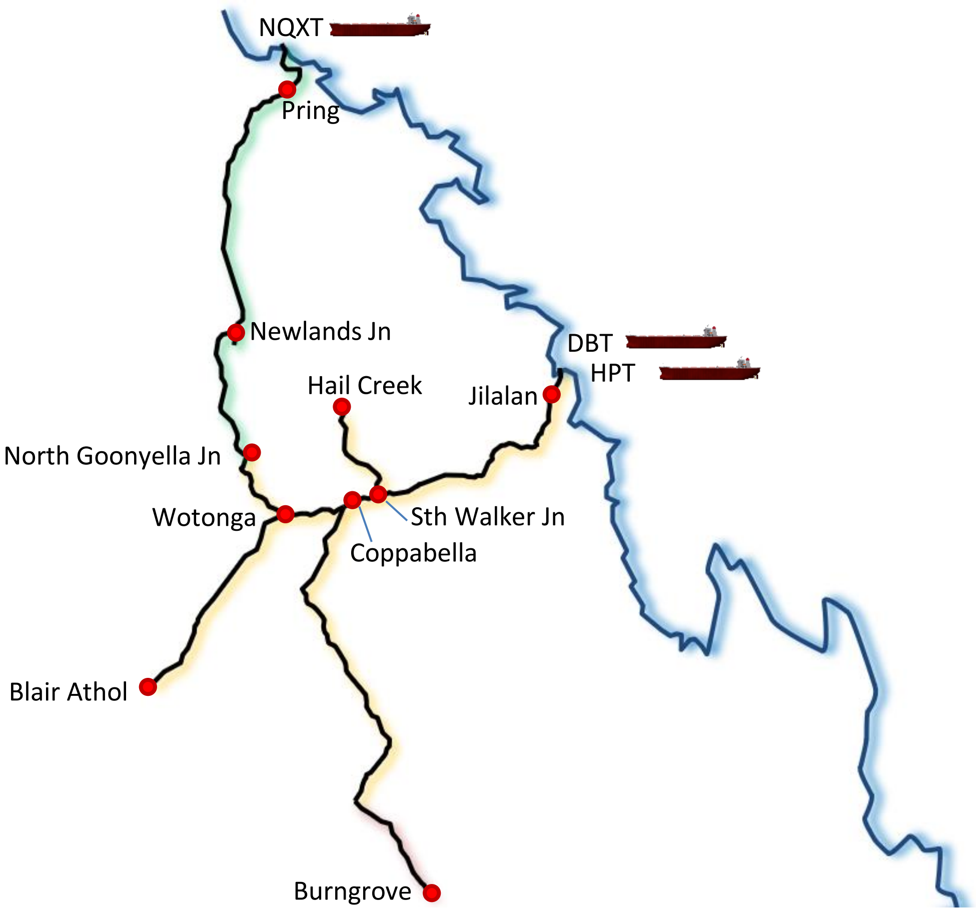
- From the Train Loadouts (TLOs) at all mines exporting through DBT (Dalrymple Bay Terminal), HPT (Hay Point Terminal), and NQXT (North Queensland Export Terminal).
- Rail transportation encompassing both coal and non-coal trains, considering their arrivals, departures, and movements within the network as described in Table 7 and Figure 32.
- All associated infrastructure and processes, starting from the inloading circuit to the vessel hatch at DBT and NQXT.
- A higher-level representation of terminal operations at HPT.
- The infrastructure and processes essential for facilitating ship movement between the ship queue and the berths at DBT, HPT, and NQXT, and vice versa.

This comprehensive model offers a powerful analytical tool to assess and understand the dynamic behaviour of the DBCC, aiding stakeholders in making informed decisions and optimising the overall efficiency and performance of the complex coal supply chain.

Table 7 Extent of Rail Network Modelled

Goonyella System	• DBT to Jilalan; and	
	• HPT to Jilalan; and	
	• Jilalan to Coppabella; and	(the Trunk)
	• Coppabella to Wotonga; and	(the Trunk)
	• South Walker Junction to Hail Creek; and	(the Hail Creek branch)
	• Coppabella to Burngrove; and	(the South Goonyella branch)
	• Wotonga to Blair Athol; and	(the West Goonyella branch)
	• Wotonga to North Goonyella; and	(the North Goonyella branch)
GAPE[3] System	• Goonyella to Newlands Connection; and	(formerly the "Northern Missing Link")
	• Newlands to Pring; and	
	• Pring to Durroburra; and	
	• Durroburra to Kaili; and	(includes North Coast Line)
	• Kaili to NQXT.	

Figure 32 Extent of Rail Network Modelled



[3] Goonyella to Abbot Point Expansion

6.2 General Assumptions and Exclusions

The following assumptions have been made in general:

- All operations will operate 365 days a year unless otherwise specified.
- Coal is always available subject to the constraints of the Load Point Capability.
- Stakeholder commercial/contractual arrangements are not considered.
- The Above Rail Operators will provide sufficient consists to deliver the System Capacity.
- Above Rail Contract capacity is always assumed to be available when a train is dispatched.
- Ad hoc services with an Above Rail Operator that does not hold the primary haulage contract are not included in the model.
- Each coal terminal will have its own ship queue.
- Force Majeure events are not modelled. Capacity Assessments made using the model will be based on typical operations. Hence:
  - Infrequent extreme weather events that disrupt operations in part or all of the supply chain (e.g., cyclones) are not included in the model.
  - Catastrophic equipment and infrastructure failures are not included in the model.

6.3 Key Input Settings

General

- Impacts of seasonality are included, but extreme weather events are not included.

System Demand

- Port of Hay Point: Base Case DBT 84.2 Mtpa + HPT 55 Mtpa = 139.2 Mtpa

  Expansion Case DBT 99.1 Mtpa + HPT 55 Mtpa = 154.1 Mtpa
- Port of Abbot Point: NQXT 28 Mtpa, with [redacted] Mtpa being sourced from Goonyella System TLOs.
- For Capacity Assessments, demand is spread relatively uniformly throughout the year.

Train Load Outs

- Historical performance data for train payloads and load rates.
- Planned maintenance is aligned with network shutdowns.

Above Rail

- Above Rail contracts and therefore consists to service Terminal contract volumes on a basis capable of servicing the Terminal operations.
- Historical performance data for payloads from existing Goonyella System mines, with light loading performance spread across all mines.
- Crew rostering and availability is excluded.
- Cancellations and diversions are not explicitly modelled but are accounted for in the Day of Operations losses.

- Multiple above rail fleets.

Below Rail

- Rail yards at Jilalan, Nebo, Coppabella and Pring.
- 20 mins train separation for trains on the dual track trunk of the Goonyella System.
- Reference train sectional run times for *Goonyella System* and *Goonyella to Abbot Point System.*
- Background traffic in the Goonyella System includes Blackwater trains and non-coal traffic.
- Background traffic in the GAP System includes non-coal traffic and North Coast Line traffic between Kaili and Durroburra.
- Speed restrictions, Failures and Faults included.
- Updated information provided by Aurizon Network regarding Network operations employed for the mainline trunk between Jilalan and Coppabella.
- Aurizon Network's forecast maintenance for FY2023.

Base Case: DBT Inloading

- Pre- and post-unloading delays included.
- Historical performance data for net unloading rates from Inloaders to Stackers.
- 8X Expansion equipment rates provided by DBIM.
- Maintenance plan based on the FY23 Terminal EOS (Equipment Outage Schedule).

Base Case: DBT Stockyard

- Hybrid yard including Cargo Assembly and Dedicated Stockpile operation.
- Operating methodology as outlined in the approved DBCT Terminal Regulations.
- [redacted] zone dynamic stockyard (Zone [redacted] = [redacted], Zone [redacted] = [redacted], Zone [redacted] = [redacted]), with remnants area (Zone [redacted] = [redacted]).

Base Case: DBT Outloading

- Activity delays based on actual performance.
- Historical performance data for net loading rates from Reclaimers to Shiploaders.
- 8X Expansion equipment rates provided by DBIM.
- Maintenance plan provided by DBIM.

DBT 8X Expansion

- Includes upgrades to Inloading, Stacking, Reclaiming, Outloading/Shiploading and Stockyard volume, as detailed in Section 4.2 "Expansion Case".

Harbours – Port of Hay Point and Port of Abbot Point

- Modelled in detail.
- [redacted] tugs per terminal.
- No pilot restrictions.

Ship Stems for DBT, HPCT and NQXT

- Current trends in vessel mix, parcel sizes and co-shipping patterns included, based on historical data.

NQXT

- Modelled in detail.
- Stockyard has [redacted] rows with [redacted] Stacker/Reclaimers on [redacted] bunds ([redacted] machines per bund).
- [redacted] Berths and [redacted] Shiploaders.
- Inloading rates, Outloading rates and maintenance plan based as previously provided.

BMA and HPT

- 55 Mtpa.
- [redacted] Inloaders.
- [redacted] Berths and [redacted] Shiploaders.