DBCT Capacity Estimates

Integrated Logistics COMPANY PTY LTD

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IntegratedLogistics
COMPANY PTY LTD

Document and Quality Information

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Contents	Estimate of the Existing Terminal Capacity and System Capacity for DBCT
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Revision History

Revision	**Revision Date**	**Details**	**Prepared by**	
			Name	**Position**
0	18/10/2018	Issued for DBCTM use	Cameron Lock	Master Planning and Simulation
1	19/10/2018	Minor amendments	Cameron Lock	As above
2	19/10/2018	Minor amendments	Cameron Lock	As above

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Executive Summary

DBCT Management is obliged under the DBCT Access Undertaking to provide estimates of Existing Terminal Capacity (on a "nameplate capacity" basis) and System Capacity, with the latter being the limit to which capacity can be contracted to Access Holders and Access Seekers. These capacity estimates are required for the current financial year and for each of the following two financial years.

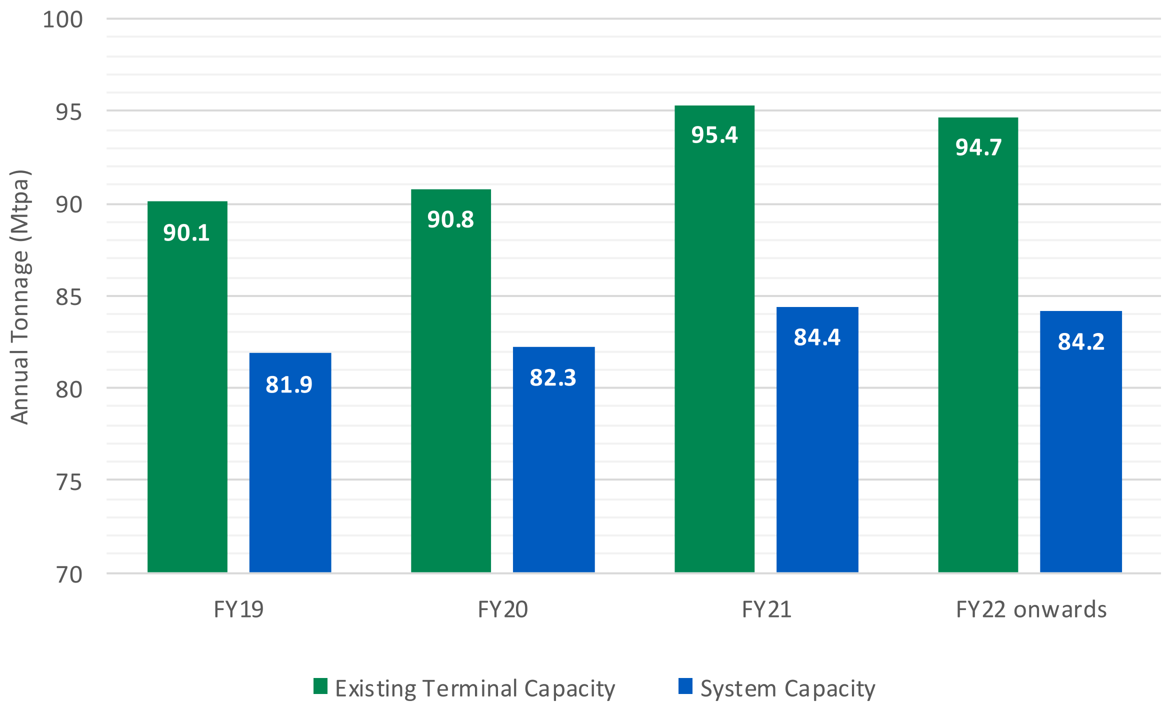
DBCT Management has appointed the Integrated Logistics Company (ILC) as it's independent expert to provide these estimates using its Dynamic Simulation Model of the Dalrymple Bay Coal Chain.

Capacity estimates are provided here using contracted demand received by DBCT Management and forecast shiploader maintenance over the assessment periods of FY19, FY20 and FY21, and for FY22 and beyond.

Table 1 Capacity Estimates over assessment period

Financial Year	Contracted Demand (Mtpa)	Existing Terminal Capacity Estimate (Mtpa)	System Capacity Estimate (Mtpa)
FY19	79.3	90.1 ± 1	81.9 ± 1
FY20	81.1	90.8 ± 1	82.3 ± 1
FY21	83.6	95.4 ± 1	84.4 ± 1
FY22 onwards	86.1	94.7 ± 1	84.2 ± 1

Figure 1 Capacity Estimates over assessment period



1.0 Introduction

Over recent years the contracted volumes at Dalrymple Bay Coal Terminal (DBCT) have reduced from around 85 Mtpa to 76.3 Mtpa by mid 2018. New Access Seekers have made requests to take up contracted capacity, triggering the Access Undertaking's *Notifying Access Seeker* (NAS) process, whereby the queue of existing and new Access Seekers are given the opportunity to take up some contracted capacity.

As owners of the terminal, DBCT Management is obliged under the DBCT Access Undertaking to provide estimates of the Existing Terminal Capacity (on a "name-plate capacity" basis) and System Capacity, with the latter being an objective of maximum reasonably achievable capacity for the Terminal without unduly increasing vessel waiting times as a result of operation of the Terminal. This being the limit to which capacity can be contracted to Access Holders and Access Seekers. A further requirement of the Access Undertaking is that these capacity estimates are provided for the current financial year and for each of the following two financial years.

On the 3rd of September 2018, DBCT Management appointed the Integrated Logistics Company (ILC) as it's independent expert to provide these estimates using its Dynamic Simulation Model of the Dalrymple Bay Coal Chain.

This model is used by the ILC for Master Planning, biannual Capacity Statements, monthly Capability Forecasts, shareholder studies, and identifying asset and operational mitigations to throughput losses, and is the only model capable of providing a fully integrated supply chain assessment.

This report documents the estimation of the Existing Terminal Capacity (on a "name-plate capacity" basis) and the System Capacity, and the assumptions and methods used by the ILC to provide these estimates.

2.0 ILC Dynamic Simulation Model

This section describes the ILC's Dynamic Simulation Model and its key assumptions and input settings.

2.1 Model

The ILC's Dynamic Simulation Model is a Discrete Event Simulation (DES) model that uses stochastic methods to generate the randomness of operational events occurring over time. The model is then capable of capturing the dynamic interactions within the system.

The model was developed through a rigorous approach including stakeholder consultation to understand current operating methodologies and planning practices, in order to determine and apply operating logic definition.

Input data has been sourced from various stakeholders, as well as the actual performance of the system as recorded in the Supply Chain Analytics (SCA) system.

The model logic and input data are continually checked and verified to confirm their validity and currency. Producers and Service Providers regularly provide updated information to the ILC for simulation modelling purposes. ILC model results are published monthly and discussed at industry forums.

The scope of the model is from the TLOs to the Port Channel, and includes DBCT, HPSCT and AAPT; the below rail infrastructure of the Goonyella and Newlands Systems; and additional traffic from Blackwater trains in the Goonyella System and non-coal traffic. This scope is described further in the following Section.

2.2 Model Extent

The extent of the ILC's Dynamic Simulation Model is as follows:

- From the train load-outs at the mines for all mines exporting through DBCT, HPSCT and AAPT; and
- Rail transport for coal and non-coal trains arriving at, departing from and travelling within the network points of:

Table 2 Extent of Rail Network Modelled

Goonyella System	• DBCT to Jilalan; and	
	• HPSCT to Jilalan; and	
	• Jilalan to Coppabella; and	(the Trunk)
	• Coppabella to Wotonga; and	(the Trunk)
	• South Walker Junction to Hail Creek; and	
	• 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)
GAP System	• North Goonyella Junction to Newlands Junction; and	(formerly referred to as the Northern Missing Link)
	• Newlands to Pring; and	
	• Pring to Durroburra; and	
	• Durroburra to Kaili; and	(includes North Coast Line)
	• Kaili to AAPT.	

- All associated infrastructure and processes from the inloading circuit through to the vessel hatch at DBCT and AAPT;
- Higher level representation of the terminal operations at HPSCT; and
- The infrastructure and processes required to facilitate the movement of ships between the ship queue and the berths at DBCT, HPSCT and AAPT, and vice versa.

2.3 General Assumptions

The following assumptions have been made in general:

- All operations will operate 365 days a year unless otherwise specified.
- All figures in this document are on a wet basis (including moisture) unless otherwise indicated.
- There will be no additional transfer of moisture into the product within the supply chain.
- Coal is always available subject to the constraints of the Load Point Capability Statements.
- Stakeholder commercial/contractual arrangements are not considered.
- Each coal terminal will have its own ship queue.
- Catastrophic equipment and infrastructure failures will not be included in the model.
- Events that stop the production of the supply chain in multiple locations (whole system strike, popular uprising, war or act of God) will not be considered.
- Infrequent extreme weather events that disrupt operations in part or all of the supply chain (e.g., cyclones) will not be considered.
- Reference period settings for Payload, Inloading Rates and Outloading rates are selected from the Calendar year of 2016.

2.4 Key Input Settings

General

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

System Demand

- Port of Hay Point: DBCT as per Section 3.1 "Demand Profile"+ HPSCT 55 Mtpa
- Port of Abbot Point: AAPT(T1) 28 Mtpa, with 15.4 Mtpa being sourced from Goonyella System train load outs
- Demand is spread relatively uniformly throughout the year

Train Load-outs

- Actual performance data, including reference period trends in train payloads
- 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
- Actual reference period 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
- Reference train sectional run times for Goonyella System and GAP System
- Background traffic in the Goonyella System includes Blackwater trains and non-coal traffic
- Background traffic in the GAP System includes non-AAPT coal traffic, non-coal traffic, and NCL traffic between Kaili and Durroburra
- Speed restrictions, Failures and Faults included
- Track maintenance based on the April 2018 Capacity Statement for the 2018/19 financial year

DBCT Inloading

- Pre- and post-unloading delays totalling 30 mins
- Actual reference period performance data for net unloading rates from Inloaders to Stackers
- Maintenance plan provided by DBCT PL

DBCT Stockyard

- Hybrid yard including Cargo Assembly and Dedicated Stockpile operation
- DBSCC operating methodology fully implemented
- Three zone dynamic stockyard (Zone 1 = Rows 1 & 2, Zone 2 = Rows 3 & 4, Zone 3 = Rows 5 & 6), with remnants area (Zone 4 = Rows 7 & 8)
- Vessel Selection planning is as described in DBCT Terminal Regulations

DBCT Outloading

- Zone 1 to OL2, Zone 2 to OL1, Zone 3 to OL3
- Activity delays based on actual performance
- Actual reference period performance data for net loading rates from Reclaimers to Shiploaders
- Maintenance plan provided by DBCT PL

Harbours – Port of Hay Point and Port of Abbot Point

- Modelled in detail
- 1 pair of tugs per terminal
- No pilot restrictions

Ship Stems for DBCT, HPSCT and AAPT

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

AAPT (T1)

- Modelled in detail
- Stockyard has 6 rows with 6 Stacker/Reclaimers on 3 bunds (two machines per bund)
- 2 Berths and 2 Shiploaders
- Inloading rates, Outloading rates and maintenance plan based on information provided by Abbot Point Bulk Coal P/L

BMA and HPSCT

- 55 Mtpa
- 2 Inloaders
- 3 Berths and 3 Shiploaders
- HPSCT modelled with the following parameters:
    - Inloading rate: [redacted] tph for each of 2 Inloaders
    - Stockyard volume: [redacted] Mt of usable space
    - Outloading rate: [redacted] tph (based on Japmax) for each of 3 Shiploaders
- Regular railings

3.0 Using the Model to Estimate Capacity

Given the model logic, extent, assumptions and input settings, the model is able to capture the behaviour of the Dalrymple Bay Coal Chain, and it's response to the two primary drivers of **Demand Profile** and Equipment Availability, as governed by **Planned Maintenance**.

3.1 Demand Profile

The **Demand Profile**, or demand composition, influences the performance of the supply chain in several ways. The Demand Profile is used to generate the modelled ship arrivals. Ships then require particular cargos to be made up using either Cargo Assembly stockpiles or longer term Dedicated Stockpiles, and these piles require coal products to be railed to them. Thus the Demand Profile dictates the number of Train Load-outs (TLOs) from which coal is sourced, the total annual demand for each TLO, and the variation of demand over time. Note that for Capacity Estimates, demand is spread reasonably uniformly over time.

Demand profile influences include the following:

- Each TLO is limited in the number of trains that it can load per day. When there are few 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 many TLOs in the Demand Profile, this demand diversity can provide more railing opportunities and hence higher utilisation of rail assets.
- Some TLOs share their availability between more than one terminal. When a TLO is providing cargos for say Abbot Point Coal Terminal, then DBCT 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 is longer than for short haul TLOs.
- 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.

This Capacity Estimate uses contracted demand levels and profiles provided by DBCT Management, including existing Access Holder and Access Seeker tonnages.

Contracted demand for the current financial year (FY19) and the next two financial years are shown in Figure 2 below. The FY22 demand is representative of contracted demand for FY22 and beyond.

Generally, each of these contracted demand profiles are spread over the Goonyella System as shown in Figure 3 below, varying from year to year by ±1%.

Figure 2 Growth in contracted demand over assessment period

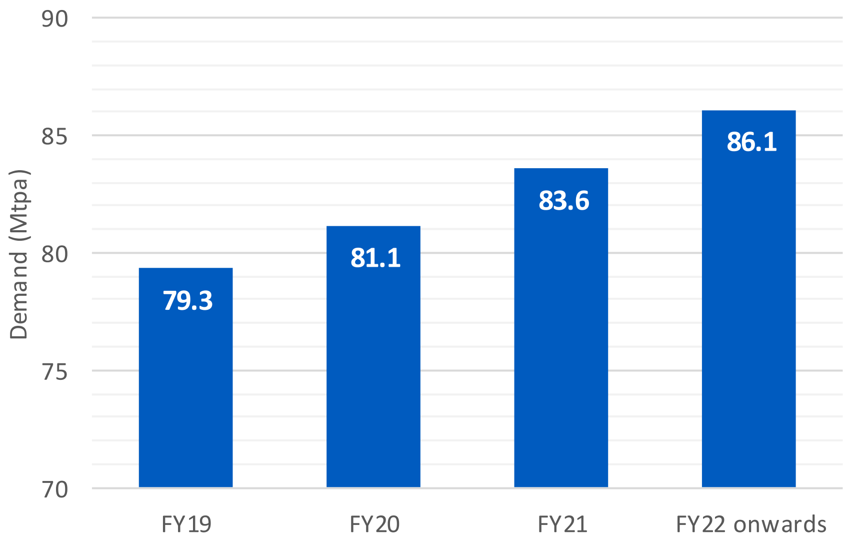
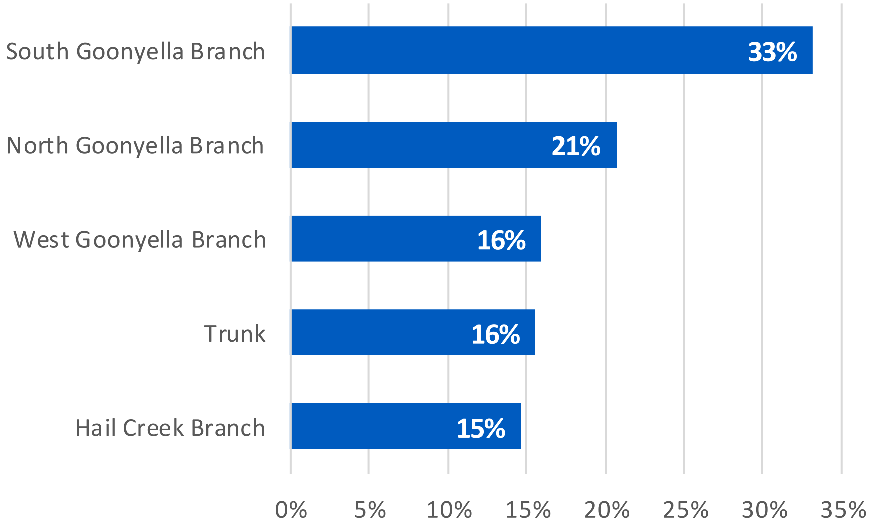


Figure 3 Typical composition of demand by Goonyella System branch



3.2 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.

DBCT PL have provided the forecast Shiploader maintenance requirements across the assessment period. Shiploader maintenance load is higher in the first few financial years reflecting the lower contracted volumes for this period.

3.3 Estimating Capacity

The Existing Terminal Capacity (on a "nameplate capacity" basis) is a measure of the Terminal's ability alone, **without** the interacting, constraining effects of the upstream supply chain of Above Rail, Below Rail and TLOs. The Terminal inloaders essentially need to be continually fed, and therefore the model inputs are set to allow trains to present to the inloaders as required without being constrained. To ensure that the capacity estimate is not demand constrained, a ship stem of 120 Mtpa is used in the model.

The **System Capacity** is a measure of the performance of the whole supply chain, **with** the interacting, constraining effects of the upstream supply chain of Above Rail, Below Rail and TLOs. Model inputs for Above Rail, Below Rail and TLOs therefore more closely represent real world conditions.

3.4 Estimate Precision

When the Dynamic Simulation Model is used to run a scenario, more than 20 replications of that scenario are performed, providing a statistical spread of all output parameters.

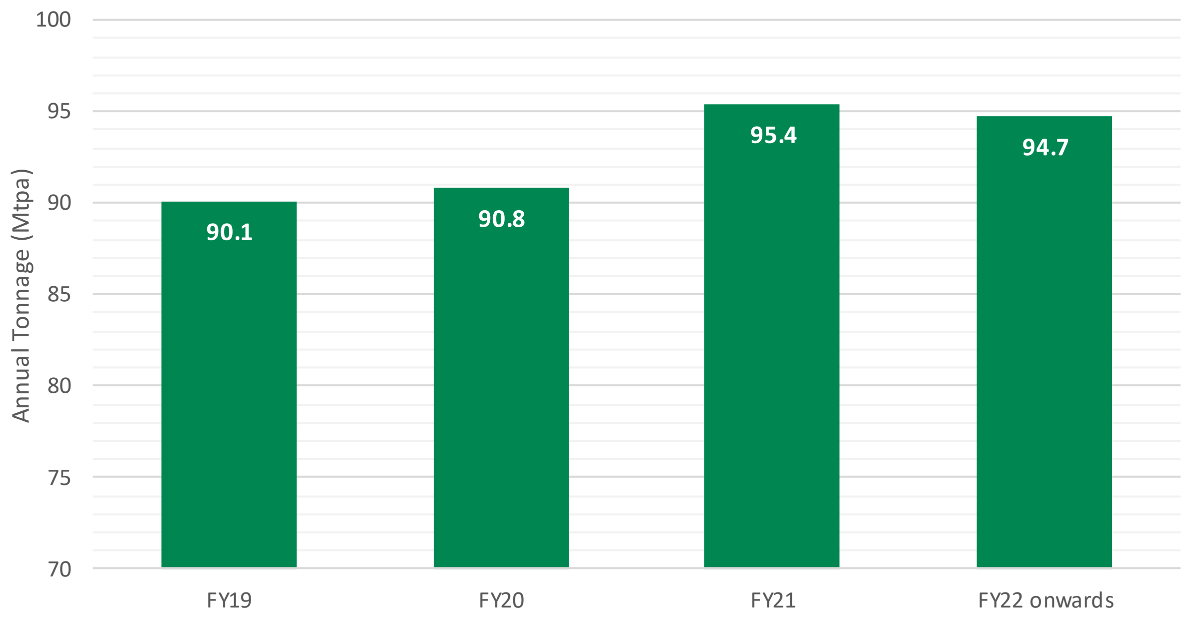
All capacity estimates provided here are average values with a precision of ± 1 Mtpa.

4.0 Capacity Estimates

4.1 Existing Terminal Capacity Estimates

When the upstream Rail and TLO performance is unconstrained, and a demand of 120 Mtpa is applied to the supply chain, the following terminal throughput responses are achieved. The throughputs represent the Existing Terminal Capacity estimates.

Figure 4 DBCT Existing Terminal Capacity Estimates[1]

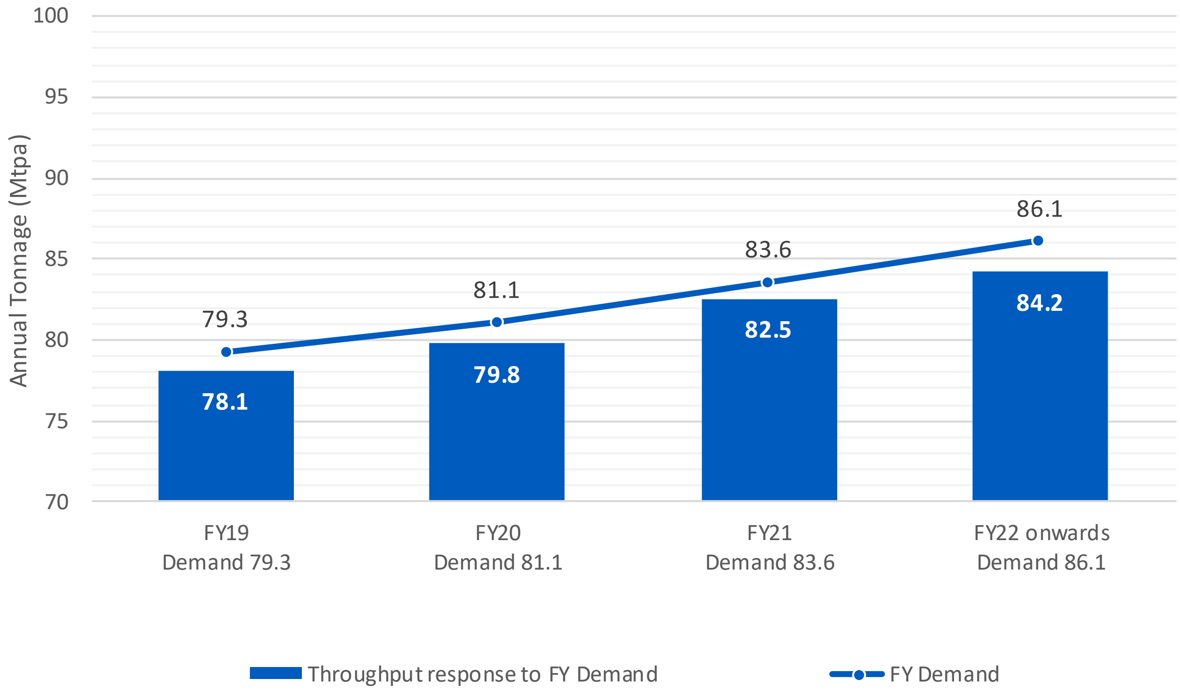


[1] All capacity estimates have a precision of ± 1 Mtpa.

4.2 System throughput response to FY Demand

Figure 5 shows the system throughput in response to the specified FY Contracted Demand. This throughput is an initial measure of System Capacity.

Figure 5 DBCT System Capacity Estimates[2]



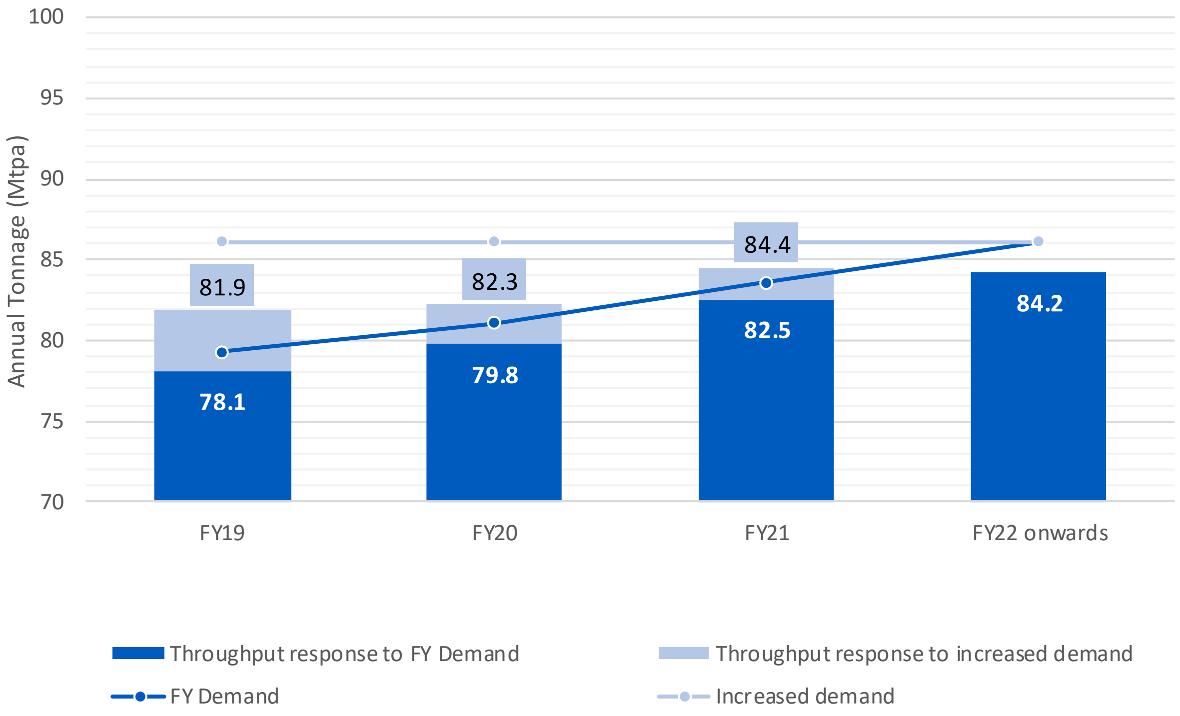
[2] All capacity estimates have a precision of ± 1 Mtpa.

4.3 Test for Demand Constraints

To test whether any of the scenarios in Section 4.2 above were Demand Constrained, a higher demand level was applied to each scenario, as shown in Figure 6.

The throughputs achieved here are considered to be the System Capacity Estimates, and are summarised in the following Section 4.4 “Capacity Estimates”.

Figure 6 DBCT System Capacity Estimates[3]



[3] All capacity estimates have a precision of ± 1 Mtpa.

4.4 Capacity Estimates

Existing Terminal Capacity and System Capacity estimates are summarised below.

Table 3 Capacity Estimates over assessment period

Financial Year	Contracted Demand (Mtpa)	Existing Terminal Capacity Estimate (Mtpa)	System Capacity Estimate (Mtpa)
FY19	79.3	90.1 ± 1	81.9 ± 1
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