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# TOWNSVILLE CONCERT HALL DETAILED BUSINESS CASE

ECONOMIC ANALYSIS

DEPARTMENT OF INFRASTRUCTURE, TRANSPORT, REGIONAL  
DEVELOPMENT, COMMUNICATIONS AND THE ARTS

AUGUST 2023

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## GLOSSARY

Acronym/ Term	Description
AFCM	Australian Festival of Chamber Music
ANZSIC	Australian and New Zealand Standard Industry Classification
BCR	Benefit Cost Ratio
CBA	Cost Benefit Analysis
DBC	Detailed Business Case
EIA	Economic Impact Assessment
FTE	Full time equivalent
FTE job year	Equivalent to one person working full time for a period of one year.
FY	Financial Year
GRP	Gross Regional Product
km	Kilometres
LGA	Local Government Area
NPV	Net Present Value
PV	Present Value
TCH	Townsville Concert Hall
TCT	Townsville Civic Theatre
Townsville Events Calendar	A calendar of events which includes events which are currently held in Townsville and events which are not held in Townsville due to capacity constraints on existing venues or lack of an appropriate acoustic facility.

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# 1. INTRODUCTION

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## 1.1 BACKGROUND

Signed in December 2016, the Townsville City Deal is a 15-year commitment between all three tiers of government that aims to support a prosperous economic future for Townsville, position Townsville as a vibrant, liveable and innovative city, and unlock the potential for business and industry development.

The Townsville City Deal is being delivered through a range of commitments across six key initiatives. One of these initiatives includes a focus on establishing Townsville as the capital of North Queensland, including a commitment to the delivery of new cultural and entertainment infrastructure.

The Townsville City Deal aims to realise its commitments by consolidating and building on existing research and analysis undertaken by Townsville City Council and the Queensland and Australian Governments. Over the past 20 years, a series of position papers, planning reports and feasibility assessments have been commissioned outlining the need for additional arts facilities in Townsville (including both visual and performing arts). The key findings from work completed to date highlights a need for investment in arts infrastructure, to accommodate the growing demand for performing and visual arts in the Townsville region. A significant gap in cultural infrastructure has been identified through this past research, with the establishment of a concert hall identified as a need and, potentially, a broader cultural and entertainment precinct.

The Townsville City Deal Partners have commissioned a Detailed Business Case (DBC) into the development of a concert hall in Townsville to allow the group to evaluate the proposed development and determine their support. AEC, AECOM and Blight Rayner have been engaged by the Australian Government (on behalf of the Townsville City Deal Partners) to deliver the DBC.

## 1.2 PURPOSE OF REPORT

This purpose of this report is to provide an economic analysis of the impacts resulting from the proposed Townsville Concert Hall (TCH) development, with comparisons to a 'without project' scenario (i.e., base case). The results of this analysis will present the incremental additional benefits and costs of the TCH to the Townsville regional community. The report is developed as a technical appendix to support the DBC for the TCH.

## 1.3 APPROACH AND REPORT STRUCTURE

In assessing the economic impacts of the TCH a Cost Benefit Analysis (CBA) and an Economic Impact Analysis (EIA) have been conducted.

- CBA is a widely used tool for economic evaluation to allow and support comparison of project options by assessing the total costs and benefits of options discounted to today's dollar terms. The methodology used in conducting the CBA is in line with various State and National guidelines. A description of the CBA process is provided in Appendix B.
- An EIA using Input-Output modelling is used to quantify the direct and flow-on activity estimated to be supported by the development and operation of the TCH within the local and regional economy. Input-Output modelling examines the direct and flow-on economic activity supported by a project using a multiplier-based approach. A description of the Input-Output process is provided in Appendix D.

The report is structured as follows:

- **Chapter 2:** Provides an overview of the proposed development, the site options considered for the TCH, summary of the service need for which the TCH is proposed to meet, as well as demand for the TCH and TCT.
- **Chapter 3:** Outlines the CBA modelling approach and general assumptions, costs and benefits examined, results of the CBA and sensitivity of results to assumptions used.
- **Chapter 4:** Outlines the Input-Output assumptions used in modelling, as well as modelling results.
- **Chapter 5:** Summarises the gaps and limitations of the analysis as well as key conclusions.

## 2. SERVICE NEED, PROJECT OVERVIEW & DEMAND

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### 2.1 SERVICE NEED TO BE ADDRESSED

Analysis of the service need for a concert hall was undertaken by AEC (2023a) based on desktop literature review, comprehensive consultation with a number of performing arts companies (both local and touring) and venue operators (both in Townsville and in capital cities), as well as development of projections of demand for theatre and concert facilities in the Townsville region.

The Service Needs Assessment (AEC, 2023a) identified a clear need for additional cultural infrastructure and that Townsville's current cultural infrastructure is limiting the development of the performing arts industry in Townsville. The current performing arts facilities in Townsville were not designed to cater to a local population of nearly 200,000 people, nor a broader regional population of nearly 400,000 people.

Townsville's main performing arts venues are owned and operated by Townsville City Council, with the premier performing arts facility in the region being the Townsville Civic Theatre (TCT), a 1,066-seat proscenium arch theatre located in Reid Park which was built in 1978. Despite its age, a number of significant refurbishments since its initial construction (including most recently in 2017/18) means the TCT remains a high-quality theatre venue and the only purpose-built, large-scale performing arts venue in Townsville. In addition to the primary theatre space, the TCT also has a black-box style performance space – C2 theatre (an adjunct to the Townsville Civic Theatre – 240 seat capacity), which is the only black-box performance space in Townsville.

While other facilities are available in Townsville that are suitable for performing arts, these facilities are generally of smaller scale and not purpose-built for performing arts, limiting their attractiveness (in particular for large scale productions).

The shortage of appropriate supply is a key factor in the TCT currently being heavily over-subscribed. Both literature review and consultation identified the TCT is commonly booked out at least two years in advance, primarily by community groups whose activities are planned well in advance with a predictable calendar and can secure bookings years into the future. Consultation revealed that community arts organisations are often forced to find alternative sub-optimal venues such as school halls which, rightly or wrongly, is perceived locally to show a lack of support from government for the arts.

As a result of this supply shortage, a number of potential bookings are missed each year, including touring companies and major events, due to a lack of available dates at the TCT to meet potential booking times and a lack of suitable alternative venues in Townsville.

The Service Needs Assessment also identified a lack of suitable venues catering to a full spectrum of performing arts activities, which is a key barrier to growing Townsville's arts and cultural sector. In particular, it was identified that there is a gap in provision of acoustic-based venues, as well as high quality, purpose-built small and/ or medium-sized performing arts facilities to support the TCT.

The primary service need identified was to provide a facility (or facilities) capable of meeting the current and future needs of Townsville's cultural and performing arts sector. The most significant gap in the city's performing arts facilities was identified to be a large venue suitable for acoustic performances (a concert hall). This is particularly needed considering that Townsville is the host city of nationally renowned acoustic performance events.

Based on the findings of the demand assessment conducted as part of the Service Needs Assessment, there is expected to be sufficient demand for a stand-alone acoustic-based facility in Townsville, while maintaining high utilisation of the existing TCT.

A small black-box performance space to support additional local or smaller touring productions was identified as a secondary service need. If co-located with the new acoustic facility, it could also be used as a rehearsal/ warm-up space. Consultation indicated that while this space would be considered highly beneficial for users, it was not required to support the functioning of the main concert hall and could potentially be delivered at a later stage.

The new performing arts facility should be located within Townsville's entertainment precincts to allow the facility to become a community hub and act as a catalyst for economic growth. The facility has the potential to activate the Townsville city centre and support the Townsville City Deal's aim to deliver a prosperous economic future for the region and to position Townsville as a vibrant, liveable and innovative city.

## 2.2 PROJECT OVERVIEW

### 2.2.1 Project Description

The Project is the proposed solution to the need for a large acoustic music venue in Townsville, a concert hall of approximately 1,000 seats. The TCH is proposed to feature a large stage sufficient to support a full orchestra, supplementary amplification for non-acoustic performances, recording facilities and digital screens. The venue is proposed to include an independent ticket office, a large foyer space, meeting rooms or break-out spaces, and food and beverage facilities. Various preparation and storage rooms are recommended to be included in back of house.

A 300-seat black-box performance space co-located with the main hall is also recommended to be included as part of the TCH facility. The ancillary theatre may form part of the initial development of the TCH or may be delivered at a later date, after the initial development of the TCH. The analysis in this report primarily considers the TCH development with the black-box performance space included, however, a secondary analysis has been performed for the TCH without the black-box performance space (with the potential for this to be delivered at a later date, but not included in the assessment).

Construction of the TCH is anticipated to begin in August 2025 with the venue expected to begin operations almost three years later in July 2028.

### 2.2.2 Site Options Considered

The TCH is proposed to be centrally located to allow patrons to easily access Townsville's entertainment districts. Following a detailed Site Options Analysis (AEC, 2022), the following sites have been shortlisted for consideration in this economic analysis:

- **The Strand:** a beachside promenade in the North Ward Suburb less than 2 kilometres (km) from Townsville's city centre.
- **The Hive:** a placemaking project connecting the Strand to Townsville CBD via on the eastern end of Flinders Street.
- **Dean Street:** currently hosting a carpark, the Dean Street Site is near the Queensland Country Bank Stadium less than 2 km from Townsville's City Centre.

These sites were shortlisted based on consideration of the following key features:

- **Site Accessibility:** the degree to which the site can accommodate general vehicle movement, parking and public transport accessibility. These measures are important to enable facility use.
- **Site Ownership and Tenure:** the ease and ability of the site to be transferred and developed.
- **Environment and Geotech:** The capacity of the site to have a minimal environmental impact, and storm surge and flood resilience.
- **Cost and Financial Performance:** The extent to which the future development of the site is impacted by costs.
- **Site and Spatial Fit:** The size, siting and complementarity with surrounding uses.
- **Place, Culture and Community Value:** The level to which the project enhances placemaking values, catalyses cultural development and creates public benefit.

### 2.2.3 Project Construction Costs

Construction cost estimates were developed by AECOM (2023a; 2023b) for each of the three site options. Estimates were provided in terms of the capital costs to develop the full facility, including the 1,000-seat concert hall and a 300-seat black-box performance space, as well as for the 1,000 seat concert hall without the black-box performance space.

A summary of construction costs by financial year (FY) is presented in Table 2.1 below, based on information in the *Townsville Concert Hall – Staged Option Order of Magnitude Capital Cost Advice* (AECOM, 2023b). The estimates presented exclude development of underground car-parking, as well as escalation.

**Table 2.1. Estimated Construction Costs by Year (\$M), Excluding Escalation**

Site Option	FY2026	FY2027	FY2028	Total
<b>Full Facility</b>				
The Hive	\$60.68	\$98.55	\$21.82	\$181.05
The Strand	\$41.71	\$108.08	\$40.17	\$189.97
Dean Street	\$62.61	\$101.88	\$22.36	\$186.85
<b>Excluding Black-Box</b>				
The Hive	\$54.09	\$87.45	\$19.95	\$161.49
The Strand	\$35.44	\$90.80	\$34.57	\$160.80
Dean Street	\$54.58	\$88.33	\$20.09	\$162.99

Source: AECOM (2023b).

Additional detail regarding the breakdown of construction costs across cost items is presented in the *Concept Design Cost Plan Report* (AECOM, 2023a), noting that some items were removed (e.g. underground car-parking) and some cost estimates adjusted to deliver the final cost estimates used in the *Townsville Concert Hall – Staged Option Order of Magnitude Capital Cost Advice* (AECOM, 2023b) which are used in the DBC.

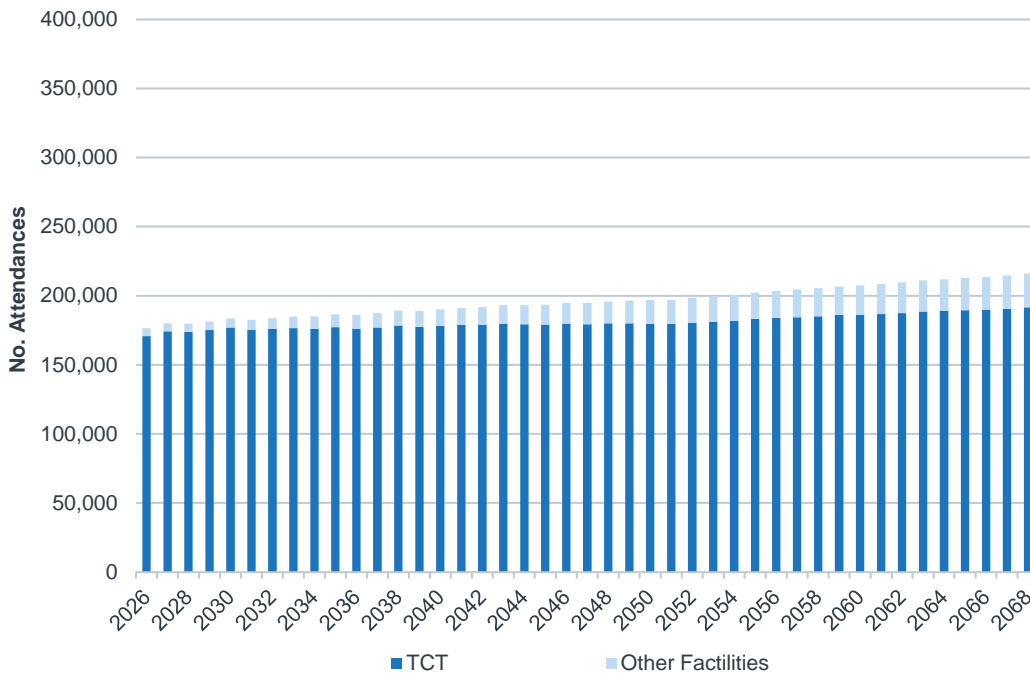
### 2.2.4 Demand for the TCH and TCT

Under the Base Case, in which Townsville does not construct an additional performing arts facility, the limited capacity for additional performances at TCT is expected to lead to low growth in the number of performances held in Townsville, thereby also limiting the number of attendances. Under the Project Case, in which the TCH is established in Townsville, the region is expected to see a substantial net increase in the number of performances and attendance. It should be noted that demand for the TCH is assumed to be consistent between each of the proposed sites (i.e. the choice of site is not anticipated to have a tangible impact on the attraction of performances or attendees to the TCH).

Under the Base Case, Townsville is expected to host approximately 176,513 event attendances in the financial year ending June (FY) 2026, with approximately 170,827 (96.8%) attendances hosted by the TCT and the remaining 5,686 attendances (3.2%) hosted by other Townsville venues. TCT is expected to reach its booking day capacity in FY2027 causing the number of attendances at the venue to largely stagnate with slight year-to-year increases in total attendance due to increased audience size at each performance and the mix of performances each year, with some years attracting performances with higher audience attraction. By FY2068, Townsville is expected to host 216,196 event attendances including 191,624 attendances at the TCT (88.6%) and 24,572 attendances (11.4%) at other venues in Townsville.



**Figure 2.1. Base Case Performing Arts Event Attendance, FY2026 to FY2068**

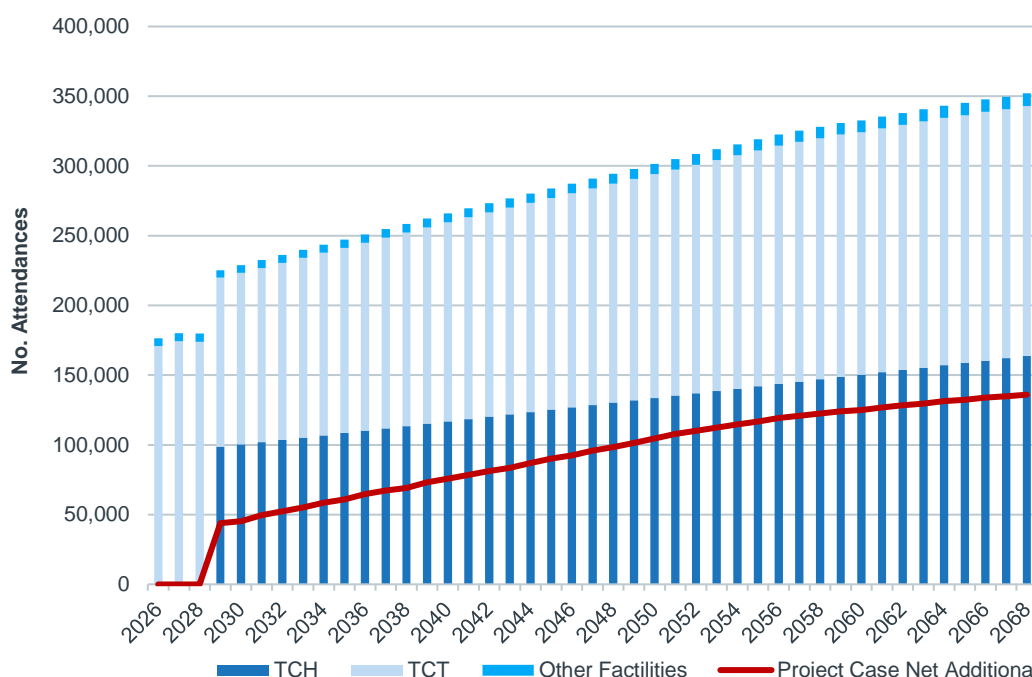


Source: AEC

Under the Project Case, the addition of the concert hall is expected to attract additional acoustic-based performances to Townsville and alleviate demand for the TCT, thereby enabling the TCT to host additional theatre-based performances and increasing the total number of performance attendances in Townsville. When the concert hall becomes operational in FY2029, the TCT is expected to host fewer attendances as some of the performances hosted by TCT move to the new venue. In the first full year of operation for the concert hall, Townsville is expected to host 225,296 event attendances with the TCT expected to host 121,180 attendances (53.8%) while the concert hall is expected to host 98,692 attendances (43.8%) and other venues in Townsville are expected to host 5,424 attendances (2.4%). By FY2068, the TCH is expected to host 163,790 attendances (46.5% of attendances), TCT is expected to host 179,243 attendances (50.9%), and other venues are expected to host 9,081 attendances (2.6%), totalling 352,114 event attendances across Townsville.

As a result of the addition of the concert hall, there is expected to be a net increase in the number of performances in Townsville and an associated net increase in performance attendance. The concert hall is estimated to result in a net additional 43,885 attendances in FY2029 and an additional 135,918 attendances by FY2068.

**Figure 2.2. Project Case Performing Arts Event Attendance, FY2026 to FY2068**



Source: AEC

Further information regarding the demand for performances and booking days as well as the demand for the TCH without a black-box performance space can be found in **Appendix A**.

## 2.2.5 Project Operating Activity

### 2.2.5.1 Operating Revenue

The revenue generated by the TCT and TCH was estimated in consideration of the following:

- Estimates of booking fees/ charges for facilities applied to estimates of booking days for facilities outlined in the demand assessment (section 2.2.4 and Appendix A).
- Estimates of ticket prices by performance type and proportion of ticket revenues captured by the facility applied to attendees by performance type outlined in the demand assessment (section 2.2.4 and Appendix A).
- Estimates of spend on food, beverages and merchandise per patron applied to the number of attendees outlined in the demand assessment (section 2.2.4 and Appendix A).

In undertaking the assessment of revenues for the TCT, historic (FY2023) revenue data was used as a starting point and grown in line with projected growth in booking days and attendance for the TCT under the Base Case and Project Case, based on the most relevant measure for revenue items.

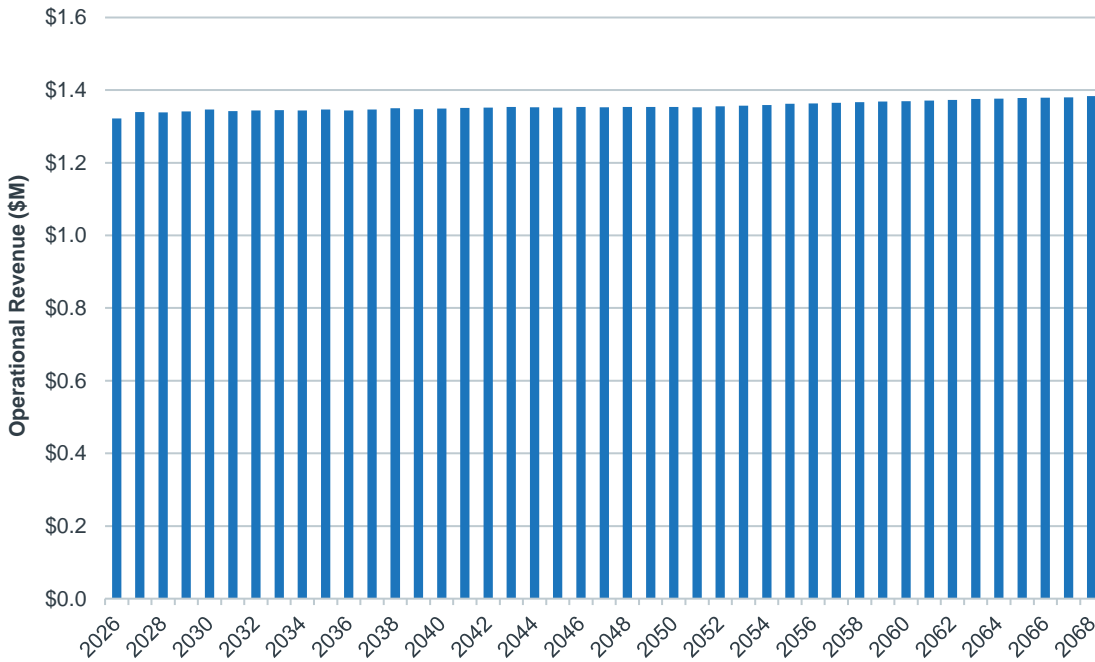
In undertaking the assessment of revenues for the TCH, a venue hire model was assumed in which the performance group retains the majority of ticket sales revenue and pays the facility a hire fee for their space and services, plus a percentage of ticket revenue.

Estimates of food and beverage spending was based largely on information provided by comparable performing arts venues while venue and staff hire fees were based off the publicly available fee structure for the TCT (Townsville City Council, 2022). Further information regarding the estimation of facility revenues can be found in the *Townsville Concert Hall Detailed Business Case: Financial Appraisal* (AEC, 2023b).

Under the Base Case, operating revenue of the TCT is expected to be largely stagnant after FY2027 when the venue reaches its booking day capacity. Slight year-to-year increases are expected to occur due to increased audience size at each performance and the mix of performances each year, with some years attracting performances with higher audience attraction. In FY2026 the TCT is expected to generate operational revenue of \$1.3 million, increasing to \$1.4 million by FY2068.



**Figure 2.3. Base Case TCT Operational Revenue, FY2026 to FY2068**

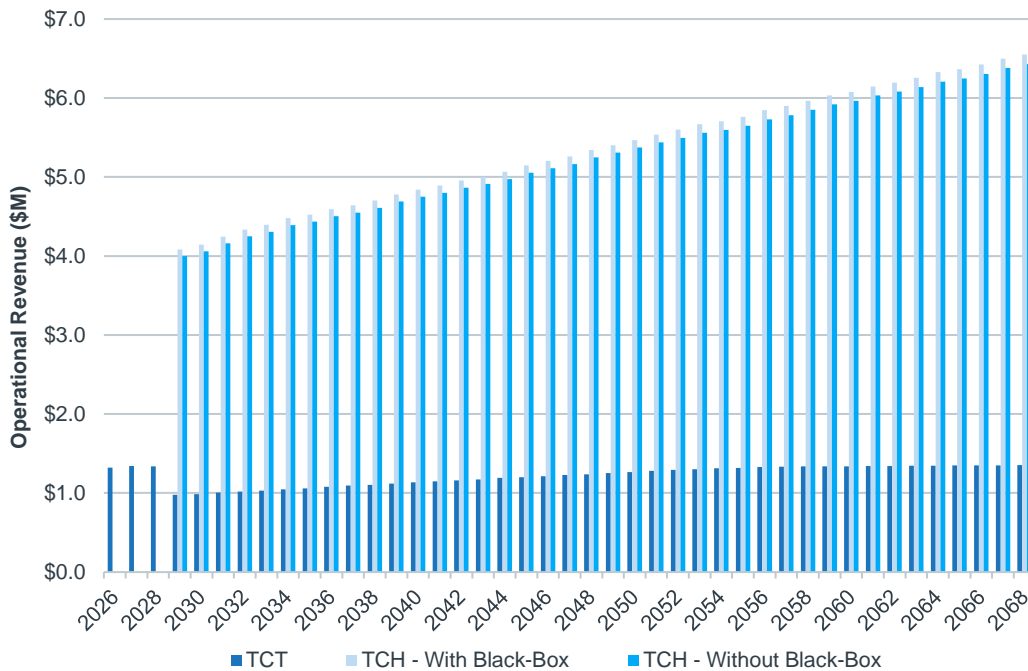


Source: AEC.

The estimated operating revenue under the Project Case is as follows:

- The TCT is expected to generate operating revenue of \$1.0 million in FY2029, increasing to \$1.4 million in FY2068.
- The TCH with the black-box performance space is expected to generate operating revenue of \$4.1 million in FY2029, increasing to \$6.5 million in FY2068.
- The TCH without the black-box performance space is expected to generate operating revenue of \$4.0 million in FY2029, increasing to in \$6.4 million FY2068.

**Figure 2.4. Project Case Operational Revenue, FY2026 to FY 2068**



Source: AEC.

It was assumed that each site option would generate the same operating revenue.

Due to insufficient information regarding the revenue of other existing facilities in Townsville, such facilities have not been included in the estimate of facility revenues. It is assumed, however, that the impacts in operating activity of these facilities due to the TCH would be minimal.

### 2.2.5.2 Operating and Maintenance Costs

Facility operating activity (revenues and operating costs) was examined for both TCT (project Case and Base Case) and the TCH (Project Case with and without black-box for each site option) as part of the *Townsville Concert Hall Detailed Business Case: Financial Appraisal* (AEC, 2023b).

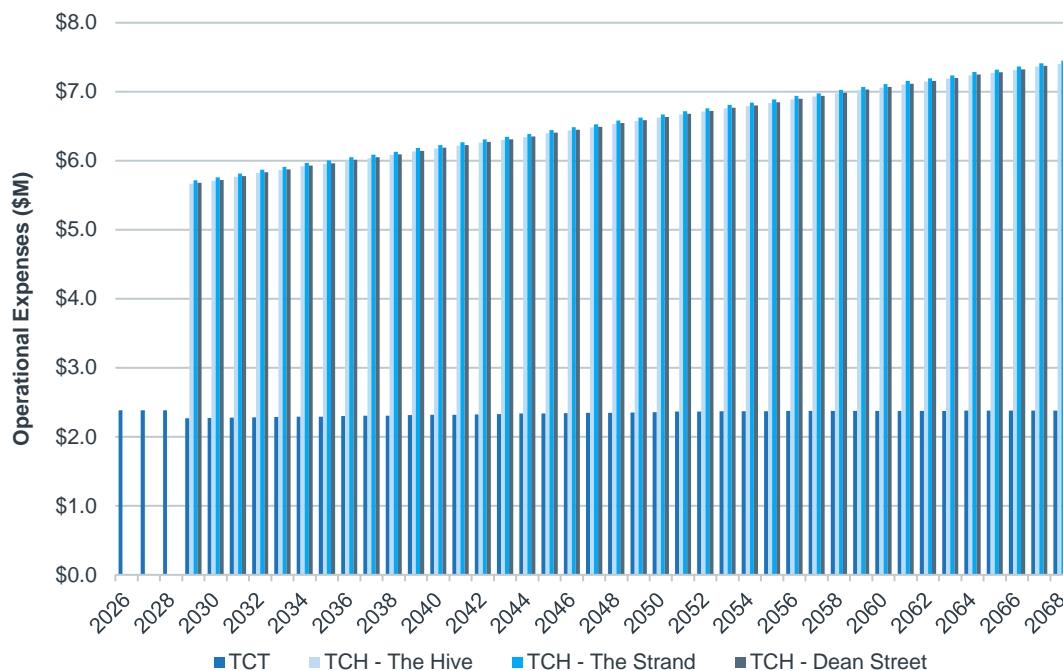
TCT operating activity was estimated based on historic (FY2023) estimates of operating revenue and costs for the facility provided by TCC (unpublished b).

As the TCT is expected to reach its booking day capacity in FY2027 under the Base Case, operating expenses of the venue are largely consistent across the assessment period. The increased audience size at each performance and the change in the mix of performances is expected to have a negligible impact on operating costs. From FY2026 onwards, the TCT is expected to incur operating costs of \$2.4 million per annum.

Under the Project Case, with the black-box performance space included in the initial development of the TCH:

- The TCT is expected to generate operating costs of \$2.27 million in FY2029, increasing to \$2.38 million in FY2068.
- The TCH at the Hive site is expected to generate operating costs of \$5.67 million in FY2029, increasing to \$7.40 million in FY2068.
- The TCH at the Strand site is expected to generate operating costs of \$5.2 million in FY2029, increasing to \$7.45 million in FY2068.
- The TCH at the Dean Street site is expected to generate operating costs of \$5.68 million in FY2029, increasing to \$7.41 million in FY2068.

**Figure 2.5. Project Case with Black-Box, Estimated Operating Costs, FY2026 to FY2068**

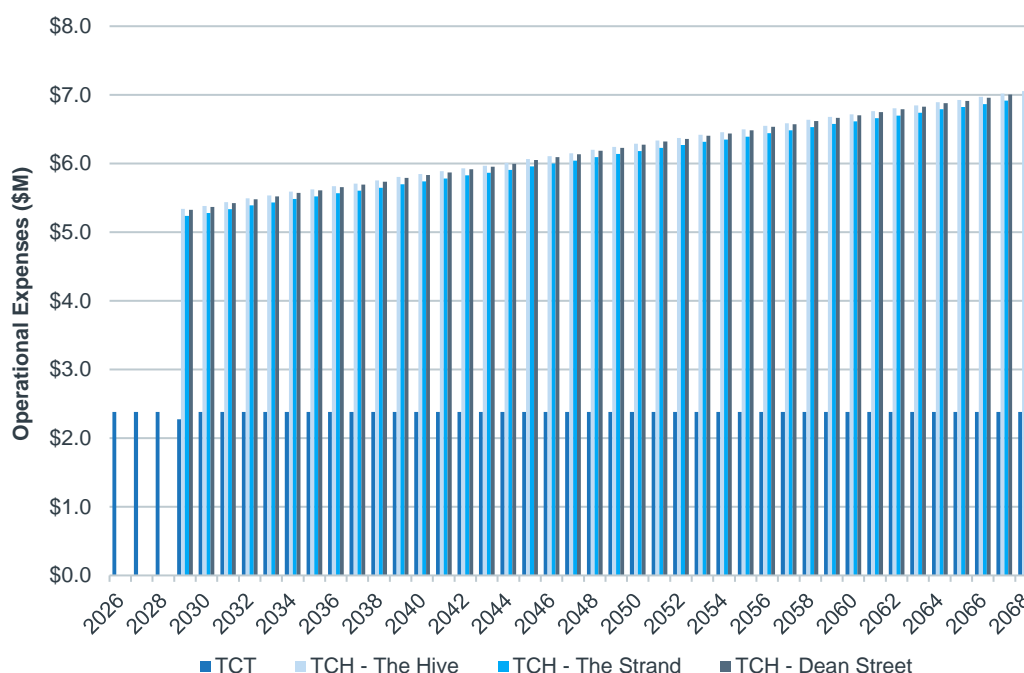


Source: AEC.

Under the Project Case, without the black-box performance space included in the initial development of the TCH:

- The TCT is expected to generate operating costs of \$2.27 million in FY2029, increasing to \$2.38 million in FY2068.
- The TCH at the Hive site is expected to generate operating costs of \$5.34 million in FY2029, increasing to \$7.06 million in FY2068.
- The TCH at the Strand site is expected to generate operating costs of \$5.24 million in FY2029, increasing to \$6.95 million in FY2068.
- The TCH at the Dean Street site is expected to generate operating costs of \$5.33 million in FY2029, increasing to \$7.04 million in FY2068.

**Figure 2.6. Project Case without Black-Box, Estimated Operating Costs, FY2026 to FY2068**



Source: AEC.

Due to insufficient information regarding the operating costs of other performing arts facilities in Townsville, such facilities have not been included in the estimate of Base Case operating costs. It is assumed, however, that the operating activity of these facilities would be minimal relative to the TCT which is the primary performing arts facility in Townsville and impacts of the TCH on these other venues will be minimal.

### 2.2.6 Induced Visitation and Visitor Spend

Events held in Townsville attract visitors to the region and stimulate the economy through the associated increased visitor spending. To understand the impact of performances held in Townsville on visitation and visitor spending under the Base Case and Project Case, each performance on the Townsville Events Calendar<sup>1</sup> (AEC, 2023a) was first identified as attracting high, low or no visitation from outside Townsville LGA. The allocation was performed as follows:

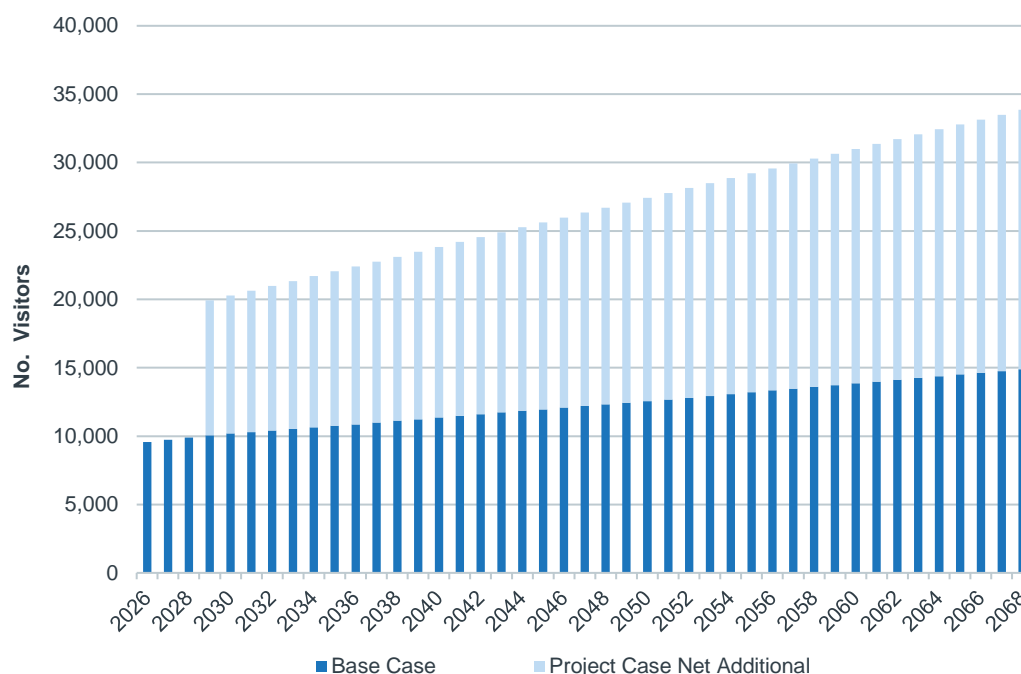
- As one of the most significant cultural events in Townsville, the Australian Festival of Chamber Music (AFCM) is considered to attract high visitation from outside Townsville LGA. Information provided by the AFCM indicated that 60.5% of the festival's audience is visiting from outside Townsville LGA.

<sup>1</sup> A calendar of events developed in the Service Need Assessment (AEC, 2023a) which includes events which are currently held in Townsville and events which are not held in Townsville due to capacity constraints on existing venues or lack of an appropriate acoustic facility.

- Other events which are of national significance are estimated to attract low visitation from outside Townsville LGA. Such events include performances which are part of the Australian Concerto and Vocal Competition and State and National organisations. Based on information provided by TCT regarding the residential suburb of TCT audiences, attendees from outside Townsville LGA were estimated to represent 3.7% of the audience for events attracting low visitation.
- To avoid overestimation, events which are not of state significance are assumed to attract no visitors from outside Townsville LGA.

To estimate the total number of event attendees visiting from outside Townsville LGA, the total attendance for each event on the Townsville Events Calendar was multiplied by the assumed proportion of the audience residing outside Townsville LGA. Under the Base Case, approximately 9,561 event attendees are estimated to reside outside Townsville LGA in FY2026, by FY2068 this is projected to increase to 14,896 attendees. Under the Project Case, approximately 19,932 event attendees are estimated to reside outside Townsville LGA in FY2029 (in comparison to 10,049 attendees under the base case), with this projected to increase to 33,852 by FY2068. This is illustrated in Figure 2.7 below.

**Figure 2.7. Induced Visitation, FY2026 to FY2068**



Source: AEC

Visitor types were used to understand the spending behaviours of event attendees from outside Townsville. Visitor attendees were disaggregated into domestic daytrip visitors, domestic overnight visitors and international visitors based on the information provided by TCT and AFCM and desktop research. According to information provided by the AFCM, international visitors make up approximately 4.1% of visitor attendees of the AFCM (the only events considered to have high visitor attraction). The breakdown of domestic visitors into daytrip and overnight visitors was not available, therefore, each category was assumed to represent an equal share of domestic visitor attendees. Events with low visitor attraction were assumed to have a similar visitor type breakdown as Townsville LGA more broadly with 48.1% of domestic visitors staying overnight and 51.9% of visitors staying for a daytrip. Based on the information provided by TCT, international visitors are assumed not to travel to Townsville to attend a low visitor attraction event. Under the Project Case, the share of each visitor types was assumed to be consistent across each proposed site (i.e., the choice of site is not anticipated to have a tangible impact on the attraction of visitors to the TCH).

The proportions outlined in Table 2.2 were applied to the relevant visitor attendee estimates to understand the number of event attendees under each visitor type.

**Table 2.2. Visitor Event Attendees by Visitor Type**

Visitor Type	High	Low
Domestic Daytrip	47.9%	51.9%
Domestic Overnight	47.9%	48.1%
International	4.1%	0.0%

Source: AFCM (unpublished), TRA (2023a; 2023b), TCT (unpublished)

Estimates of visitor expenditure were developed using the national average expenditure per visitor for visitors attending theatre, concerts, or other performing arts by visitor type. On average, domestic daytrip visitors attending such events were estimated to spend \$159.05 per visitor, domestic overnight visitors were estimated to spend \$927.09 and international visitors were estimated to spend \$6,663.34 in Australia in the year ending June 2019<sup>2</sup> (Tourism Research Australia (TRA), 2023a; 2023b). The spending behaviour of each visitor type was assumed to be consistent across each site proposed under the Project Case.

Average expenditure per visitor undertaking performing arts activities disaggregated by item/ industry (TRA, 2023a; 2023b) were allocated to the most relevant industries in the Input-Output model. The table below provides the expenditure breakdown across each item/ industry for each visitor type. Expenditure on airfares has been excluded on the basis that this expenditure would not be captured locally.

**Table 2.3. Expenditure per Visitor by Industry**

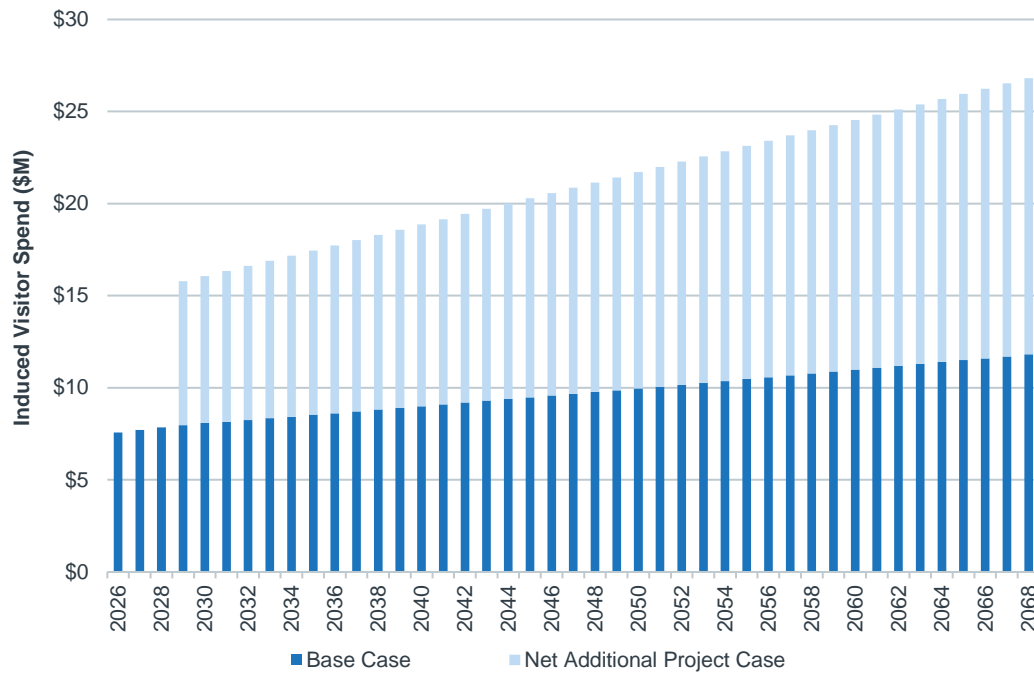
Industry	Domestic Day	Domestic Overnight	International Overnight
Road Transport	\$2.5	\$22.7	\$227.6
Rail Transport	\$0.3	\$1.1	\$9.6
Water, Pipeline and Other Transport	\$0.8	\$38.9	\$360.9
Accommodation	\$0.0	\$223.6	\$1,552.6
Food and Beverage Services	\$49.6	\$252.6	\$1,220.4
Retail Trade	\$35.8	\$215.4	\$1,129.0
Personal Services	\$0.7	\$5.5	\$112.7
Heritage, Creative and Performing Arts	\$34.7	\$73.3	\$98.4
Sports and Recreation	\$33.8	\$72.3	\$89.4
Gambling	\$0.0	\$1.8	\$22.6
Postal and Courier Pick-up and Delivery Service	\$0.7	\$5.5	\$87.6
Rental and Hiring Services (except Real Estate)	\$0.1	\$11.1	\$86.1
Automotive Repair and Maintenance	\$0.0	\$2.6	\$0.0
Primary and Secondary Education Services	\$0.0	\$0.1	\$231.1
Technical, Vocational and Tertiary Education Services	\$0.0	\$0.4	\$1,155.6
Arts, Sports, Adult and Other Education Services	\$0.0	\$0.1	\$279.9
<b>Total</b>	<b>\$159.1</b>	<b>\$927.1</b>	<b>\$6,663.3</b>

Source: AEC, TRA (2023a; 2023b)

To understand the total induced visitor spend, the estimated spend per visitor in Table 2.3 was multiplied by the number of induced visitors for each visitor type under the Base Case and Project Case. Under the Base Case in FY2026, visitors to Townsville LGA attending performing arts events are expected to spend a total of approximately \$7.6 million, this is expected to increase to \$11.8 million by FY2068. In FY2029, the first full year of TCH operations under the Project Case, induced visitor spend is expected to reach approximately \$15.8 million, \$7.8 million more than the same year under the Base Case. By FY2068 this is expected to increase to \$26.8 million.

<sup>2</sup> The policy actions undertaken during the COVID-19 pandemic had a significant impact on tourism across Australia. As a result, the future visitor economy is best estimated using 2019 tourism data (i.e., the year before the pandemic).

**Figure 2.8. Induced Visitor Spend, FY2022 to FY2069**



Source: AEC, TRA (2023a; 2023b)



## 3. COST BENEFIT ANALYSIS

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### 3.1 APPROACH

The below sub-sections provide a description of some of the key parameters and general assumptions used in the CBA, the scenarios examined, and the costs and benefits examined. Additional details are presented in Appendix B.

#### 3.1.1 Modelling Timeframe

The CBA examined the impacts of the project across the construction period, as well as 40 years of operations of the TCH. In total, the CBA covers 43 years, from FY2026 to FY2068. This timeframe was used to reflect the anticipated likely life of the TCH before requiring major refurbishment and upgrades, in line with the approximate timeframes before the TCT required major refurbishment (commenced operation in 1978, with major refurbishment in FY2018).

All dollar values presented in this section are expressed in FY2023 Australian dollars.

#### 3.1.2 Choice of Discount Rates

A base discount rate of 7% has been used for demonstration purposes (in line with Queensland Government and national standards for real discount rates used in economic appraisal of projects), with additional discount rates also examined (4% and 10%). As all values used in the CBA are in real terms, the discount rate does not incorporate inflation (i.e., it is a real discount rate, as opposed to a nominal discount rate). This differs from the financial assessment (AEC, 2023b), which uses nominal discount rates with all values including inflation.

State and national CBA guidelines typically outline that a standard discount rate of 7% should be applied, with comparisons to 4% and 10% for sensitivity. The basis of the choice of discount rates outlined in most CBA guidelines for socio-economic CBA is based on the opportunity cost of capital, with the long-term average rate of return on government bond rates commonly used in setting State and national recommended discount rates for CBA. This differs from financial analysis which typically sets discount rates based on the weighted average cost of capital (WACC)<sup>3</sup>.

Whilst a standard discount rate of 7% is generally recommended in most CBA guidelines, a lower discount rate may be considered reasonable for a number of reasons, including:

- Projects which have large social benefits (i.e., performance arts facilities), long asset lives and a strategic focus, which may place more emphasis on the project's value to society in the future (TfNSW, 2021). High discount rates can significantly understate the potential longer-term benefits or benefits to society of a project and thereby prompt decision makers to prioritise short term financial benefits over longer term community benefits, resulting in longer term, community supporting projects (such as the TCH) appearing less desirable than shorter term projects (Grattan Institute, 2018).
- Projects where the time preference for money, which is based on the rate at which society is willing to trade present consumption for future consumption, may be below the opportunity cost of capital. This may be the case for projects where the WACC is below the recommended guideline for opportunity cost of capital, which can be the case for community infrastructure that commonly requires a subsidy such as performing arts facilities.
- Periods where the opportunity cost of capital may be expected to be below the recommended guideline for opportunity cost of capital (e.g., periods where interest rates are very low). While interest rates have recently been increasing, interest rates remain historically low (i.e., the opportunity cost of capital is low), and so a lower discount rate may better reflect the existing environment.

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<sup>3</sup> The WACC reflects the required return on capital for a project in order to finance its operations and deliver the minimum acceptable return to investors.

Given the above, while results have been assessed using the 7% discount rate, a 4% discount rate (or lower) may be considered more appropriate for the TCH.

### 3.1.3 Scenarios Examined

In undertaking the CBA, the three shortlisted site options (as described in Section 2.2.2) have been examined as three distinct scenarios under the Project Case. The three scenarios are compared to a Base Case (without project) scenario that assumes business as usual.

#### 3.1.3.1 Base Case Scenario

The Base Case refers the scenario in which the Project does not proceed and the existing performing arts infrastructure in Townsville is maintained with no additional facilities developed. As a result, the existing issues of capacity constraints and insufficient acoustic quality for some performance types are assumed to continue, constraining future activity. The projected total attendance at performing arts events in Townsville under the Base Case is detailed in Section 2.2.4. Appendix A provides further details regarding the estimated number of performances and booking days under the Base Case.

#### 3.1.3.2 Project Case Scenarios

The Project Case refers to the scenario in which the TCH is developed in Townsville as per the description outlined in Section 2.2.1, while other performing arts facilities are maintained. The analysis in this chapter focuses on scenarios of full facility development, including the 300-seat black-box performance space. Alternative scenarios assessing the costs and benefits for each site where the 300-seat black-box performance space is excluded from the development (with potential to be added at a later date) are examined in Section 3.5.1. Low and high demand scenarios are examined in Section 3.5.3 to understand the sensitivity of the results to demand assumptions.

The Project will result in increased capacity for performances in Townsville and the attraction of performances which were previously unable to visit Townsville due to the lack of an acoustic facility. The projected total attendance at performing arts events in Townsville under the Project Case is detailed in Section 2.2.4. Appendix A provides further details regarding the estimated number of performances and booking days under the Project Case, as well as demand where the 300-seat black-box performance space is excluded from the initial development.

The Project Case is assessed for the three site options described in Section 2.2.2; The Hive, The Strand and Dean Street.

## 3.2 COSTS

### 3.2.1 Capital Expenditure

#### **Base Case Scenario**

The Base Case assumes no capital expenditure to develop the TCH or any alternative facility.

#### **Project Case Scenarios**

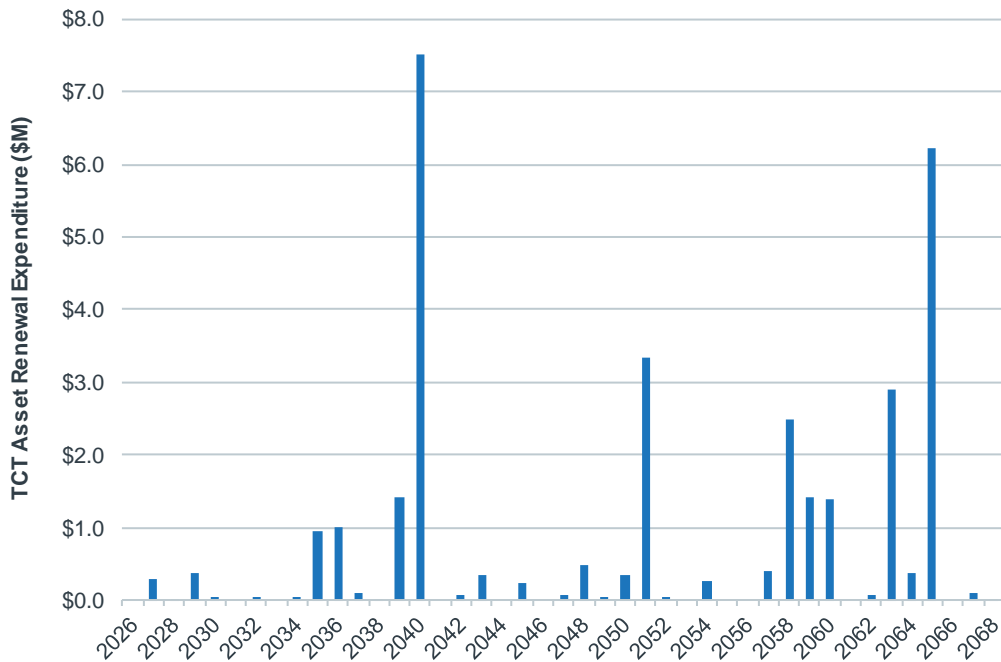
Estimates of capital expenditure by year under each of the site options is presented in section 2.2.3.

### 3.2.2 Lifecycle/ Renewal Capital Expenditure

#### **Base Case Scenario**

The Base Case includes projected lifecycle/ renewal capital cost estimates for the TCH between FY2026 and FY2068, based on asset register data provided by Townsville City Council (unpublished a). A summary of annual (by financial year) lifecycle/ renewal expenditure for the TCH in the Base Case is presented in Figure 3.1 below.

**Figure 3.1. Projected Annual Lifecycle/ Asset Renewal Costs, TCT (\$M)**



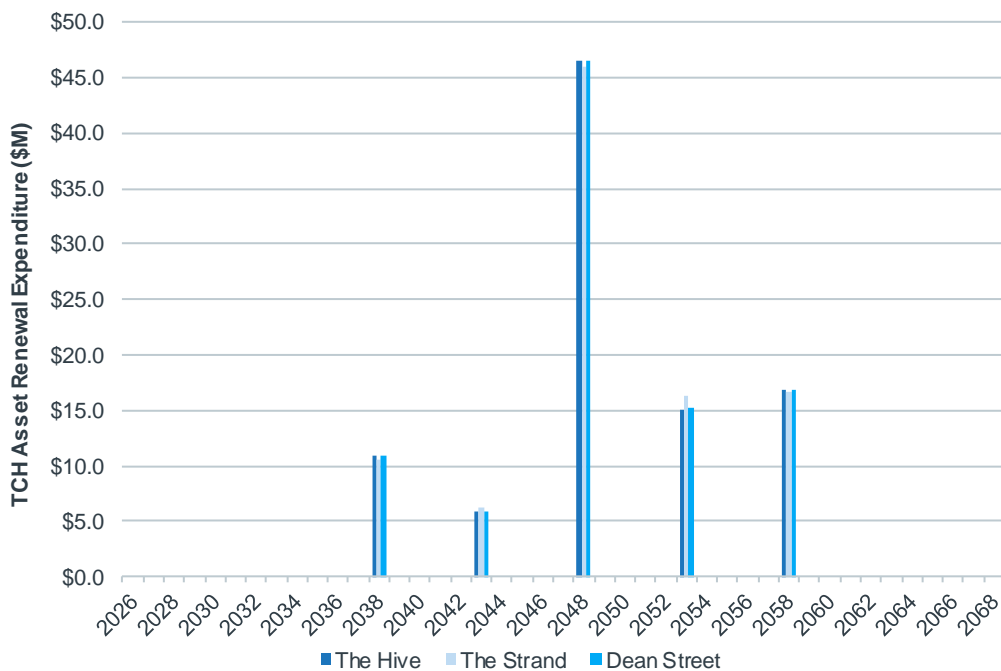
Source: Townsville City Council (unpublished a).

The Base Case assumes no lifecycle/ asset renewal capital expenditure for the TCH or any alternative facility.

**Project Case Scenarios**

Estimates of lifecycle/ asset renewal capital costs for the three site options were developed by AEC based on information from AECOM on the capital costs and expected life of assets (AECOM, 2023a; 2023b). A summary of estimated capital renewal costs by financial year for the TCH across the three site options is presented in Figure 3.2 below.

**Figure 3.2. Projected Annual Lifecycle/ Asset Renewal Costs, TCH (\$M)**



Source: AEC, AECOM (2023a; 2023b).

In addition to the renewal costs for the TCH, the Project Case also includes estimated renewal costs for the TCT. Renewal costs for the TCT in the Project Case is estimated to be the same as in the Base Case, presented in Figure 3.1.

### 3.2.3 Operations and Maintenance Expenditure

#### **Base Case Scenario**

Annual operating and maintenance costs for the TCT under the Base Case are as per those presented in section 2.2.5.2.

#### **Project Case Scenarios**

Annual operating and maintenance costs for the TCT as well as each site option under the Project Case are as per those presented in section 2.2.5.2. In the Project Case, the operating and maintenance costs of the TCT and relevant site option of the TCH are combined.

## 3.3 BENEFITS

### 3.3.1 Facility Revenues

#### **Base Case Scenario**

Annual revenues for the TCT under the Base Case are as per those presented in section 2.2.5.1.

#### **Project Case Scenarios**

Annual revenues for the TCT and TCH under the Project Case are as per those presented in section 2.2.5.1. In the Project Case, the revenues of the TCT and TCH are combined.

### 3.3.2 Facility Employee Benefits

Gainful employment provides a benefit to those employed through the incomes earned and the utility provided through having an income. For the purposes of the CBA it has been assumed that 25% of the wages and salaries of TCT and TCH employees represents a net economic benefit to reflect that not all employment supported represents net new incomes and that people employed due to the project that would otherwise be unemployed would still contribute to economic activity without the project.

#### **Base Case Scenario**

Estimates of labour costs were developed as part of the operating and maintenance costs outlined in section 2.2.5.2. An assumption of 25% was applied to these incomes to represent the benefit to these employees.

#### **Project Case Scenarios**

Estimates of labour costs for each site option and the TCT under the Project Case were developed as part of the operating and maintenance costs outlined in section 2.2.5.2. An assumption of 25% was applied to these incomes to represent the benefit to these employees.

### 3.3.3 Event Organiser/ Performer Net Profit

As well as the venue, event organisers/ performers generally generate profit from their performances. Revenue from ticket and merchandise sales are considered to capture this benefit.

The average ticket price of each performance type was estimated using desktop research and is outlined in Table 3.1. This price was then compared to the average price derived from the publicly available *2021 Ticket Attendance and Revenue Report - Final Report* (EY, 2021). Ticket prices by performance type were applied to the estimated annual attendance at the relevant ticketed events to understand total ticket sales revenue. After administration fees, event organisers/ performers are estimated to retain 85% of the ticket sales revenue.

**Table 3.1. Average Ticket Prices by Performance Type**

Performance Type	Average Ticket Price
Eisteddfod	\$20.00
Childrens	\$16.67
Film	\$18.94
Drama	\$24.57
Variety	\$25.31
Dance	\$34.87
Classical	\$100.00
Opera	\$110.00
Musical	\$39.17
Music Folk / Acoustic	\$45.00
Orchestral	\$55.00
Comedy	\$60.00
Other	\$73.93
Magic	\$84.62
Awards	\$20.00
Cabaret	\$39.17
Psychi-Medium	\$73.93
<b>Average ticket price</b>	<b>\$50.84</b>

Source: AEC.

In addition to the ticket revenue, some performances are also assumed to sell merchandise as part of the event. Using relevant benchmarks, merchandise sales (including sales of performance programs and other merchandise provided by the event organiser/ performer) were assumed to average \$5 per attendee. This average was applied to the estimated annual attendance to each event held in Townsville under the Base Case and Project Case to understand the total merchandise sales revenue under each scenario. All revenue generated through merchandise sales was considered to be a benefit to event organisers/ performers.

The provision of performances is not costless, and only the producer surplus (or gross operating surplus) for event coordinators/ performers has been included as a net benefit. Producer surplus realised by event organisers/ performers has been estimated based on the ratio of output to gross operating profit for the Heritage, Creative and Performing Arts industry in AEC's Input-Output model (refer to Appendix D for details regarding the Input-Output model).

### **Base Case Scenario**

Under the Base Case, event organiser/ performer profit is constrained by the capacity and acoustic quality constraints of the existing infrastructure. In FY2026 is estimated to be around \$0.83 million. This is expected to increase with increased event attendance to \$0.96 million in FY2068.

### **Project Case Scenarios**

Under the Project Case, event organiser/ performer profit is expected to increase as a result of increased capacity and attraction of events. Up to FY2029, event organiser/ performer profit is expected to be consistent with the Base Case. With the TCH operational in FY2029 event/ performer profit is expected to increase to \$1.33 million. By FY2068, increased event attendance is expected to result in event organiser/ performer profit of approximately \$2.11 million.

Ticket revenues and merchandise consumption are assumed to be consistent across each site option and as such event organise/ performer profit is also considered to be consistent across Project Case scenarios.

### 3.3.4 Benefits from Induced Recreational Spend of Patrons

Patrons of performing arts facilities will often undertake leisure activities before or after attending performances and events. The activities undertaken are most likely to include spending on retail or food and beverage goods and services. Food and beverage services are assumed to attract the majority of spending at 80% of the total, while retail trade is assumed to make up the remaining 20%.

Different types of events are considered to attract different propensities for ancillary spending. Community events and non-ticketed events are assumed to attract the lower ancillary spending in comparison to ticketed commercial events. To account for such differences, each event on the Townsville Event Calendar is allocated to one of the following categories:

- **Non-ticketed Community Events:** Community events which do not sell tickets for attendance.
- **Non-ticketed Commercial Events:** Commercial events which do not sell tickets for attendance.
- **Ticketed Community Events:** Community events which sell tickets for attendance.
- **Supported Ticketed Commercial Events:** Ticketed commercial events which require support from the council/venue.
- **Ticketed Commercial Events:** Ticketed commercial events which do not receive support from the council/venue.

#### **Base Case Scenario**

The assumed recreational spend per attendee under the Base Case is detailed in Table 3.2 below. The spend estimates were applied to the attendance demand estimates outlined in Section 2.2.4 to understand the total annual recreational spend induced from performances and events at the TCT and other venues in Townsville.

**Table 3.2. Base Case Recreational Spend by Event Type**

Event Type	Spend Per Attendee
Non-ticketed Community Events	\$5
Non-ticketed Commercial Events	\$5
Ticketed Community Events	\$5
Supported Ticketed Commercial Events	\$10
Ticketed Commercial Events	\$10

Source: AEC

To account for the cost of providing goods and services, only the producer surplus has been included as a net benefit, as well as a portion of the wages and salaries paid to labour. It has been assumed that 25% of the wages and salaries represents a net economic benefit to reflect that not all employment supported would represent net new incomes and that people employed due to the project that would otherwise be unemployed would still contribute to economic activity without the project.

Producer surplus and wages and salaries generated through induced recreational spending has been estimated based on the ratio of output to gross operating profit/ wages and salaries for the Food and Beverage Services industry and the Retail Trade industry in AEC's Input-Output model (refer to Appendix D for details regarding the Input-Output model). Once removing the cost of providing these goods and services and including the labour benefit, the recreational spend net benefit is anticipated to be approximately \$200,600 in FY2026 and is expected to increase to \$246,200 by FY2068.

#### **Project Case Scenarios**

Under the Project Case, recreational spend per attendee at the TCT is expected to be consistent with Base Case. The proposed site options for the TCH facility have material differences in their positioning relative to entertainment precincts which are expected to impact induced recreational spending. With the Strand and the Hive being close to entertainment precincts, recreational spending per attendee has been assumed to be 40% greater than attendees at the TCT. The Dean Street location is further away from entertainment precincts in comparison to the Strand and the Hive but is closer relative to the TCT. Therefore, recreational spending per attendee at Dean Street

has been assumed to be 20% greater than the TCT. The estimated recreational spending per attendee is detailed in Table 3.3 below.

**Table 3.3. Project Case TCH Recreational Spend by Event Type and Site Option**

Event Type	The Hive	The Strand	Dean Street
Non-ticketed Community Events	\$7	\$7	\$6
Non-ticketed Commercial Events	\$7	\$7	\$6
Ticketed Community Events	\$7	\$7	\$6
Supported Ticketed Commercial Events	\$14	\$14	\$12
Ticketed Commercial Events	\$14	\$14	\$12

Source: AEC

The spend estimates were applied to the attendance demand estimates outlined in Section 2.2.4 to understand the total annual recreational spend induced from performances and events at the TCH, TCT and other venues in Townsville.

As in the Base Case, only the producer surplus has been included as a net benefit, as well as a portion of the wages and salaries paid to labour (25%). The recreational spend net benefit for each site option is listed below.

- **The Hive:** The recreational spend net benefit is anticipated to be approximately \$325,500 in FY2029. By FY2068, this is expected to increase to \$511,400.
- **The Strand:** Recreational spend net benefit with the TCH located at the Strand is anticipated to be consistent with the net benefit derived from the TCH located at the Hive.
- **Dean Street:** The recreational spend net benefit is anticipated to be approximately \$296,000 in FY2029. By FY2068, this is expected to increase to \$511,400.

### 3.3.5 Benefits from Induced Visitor Spend

The annual additional visitor spend delivered by the performances attracted to the region due to the project has been estimated as per Section 2.2.6. However, the provision of goods and services to visitors is not costless, and only the producer surplus has been included as a net benefit, as well as a portion of the wages and salaries paid to labour (25%, as per the employee benefit from recreational spend above). Producer surplus generated through visitor expenditure has been estimated based on the ratios of output to gross operating profit/ wages and salaries for the industries outlined in section 2.2.6 in AEC's Input-Output model (refer to Appendix D for details regarding the Input-Output model).

#### **Base Case Scenario**

As illustrated in Figure 2.8, visitors to Townsville LGA attending performing arts events are expected to spend a total of approximately \$7.6 million in FY2026 under the Base Case; this is expected to increase to \$11.8 million by FY2068. After removing the cost of providing these goods and services and including the labour benefit, the retained visitor spend net benefit is anticipated to increase from approximately \$1.4 million in FY2026 to \$2.1 million by FY2068.

#### **Project Case Scenarios**

Under the Project Case, visitors to Townsville LGA attending performing arts events are expected to spend a total of approximately \$15.8 million in FY2029; this is expected to increase to \$26.8 million by FY2068. With the cost of providing the goods and services removed and including the labour benefit, the additional visitor attraction resulting from the TCH is expected to result in a retained visitor spend net benefit of approximately \$2.9 million in FY2029. The net benefit from visitor spend is expected to increase to \$4.9 million by FY2068.

The net benefit from visitor is assumed to be consistent across each site option.

### 3.3.6 Public Benefit to Patrons from Facility Use/ Attendance at Performances

Patrons of performing arts venues often value their attendance at a performance at more than the price of a ticket. In this sense, there is a consumer surplus from attending performances.

For ticketed performances, consumer surplus was estimated using a proportion of the ticket price which represented the value attendees placed on the ticket above the ticket price. Based on a conservative benchmark of the consumer surplus estimated by assessments of comparable venues (Econtext, 2015), the consumer surplus was assumed to be equal to 50% of the ticket price. The consumer surplus generated by ticketed events was estimated by applying the benchmark ratio of consumer surplus (50%) to the ticket revenue estimated in Section 3.3.1 (noting this was applied to the full ticket price/ revenue, not just the ticket revenue captured by the event organiser/ performers).

The consumer surplus generated by attendance at non-ticketed events was quantified by estimating the value of the leisure time spent attending such performances. Leisure time is commonly valued based on the willingness to accept for trading leisure time for paid work. Using a benchmark from a Danish study regarding the value of leisure time (Verboj, et al., 2018; OECD, 2023), leisure time was estimated to be valued at 49.9% of the average hourly income, while data from the 2021 Census indicates Townsville had an average hourly wage of \$29.5 in 2021 (\$32.9 in 2023 dollars) (ABS 2022; ABS, 2023a). The value of leisure time in Townsville was, therefore, estimated to average \$16.4 per hour in 2023 dollars.

Using benchmarks informed by a study of Cowes Community and Cultural Centre (SGS Economics & Planning, 2019), attendees were estimated to spend 1.3 hours at each community event, leading to an estimated consumer surplus of \$21.9 per attendee at community events. This value was applied to the attendance of non-ticketed events as per the demand estimates in Section 2.2.4 and the disaggregation of events detailed in Section 3.3.4.

#### **Base Case Scenario**

Under the Base Case, ticketed and non-ticketed events at the TCT and other venues in Townsville are estimated to generate \$3.1 million of benefit to patrons from facility use/ attendance at performances in FY2026; by FY2068 this is expected to increase to \$3.7 million.

#### **Project Case Scenarios**

With the addition of the TCH, in FY2029 ticketed and non-ticketed events in Townsville are estimated to generate \$4.1 million of benefit to patrons from facility use/ attendance at performances. By FY2068, this is anticipated to increase to \$6.4 million of benefit to patrons.

This benefit to patrons from facility use/ attendance at performances is expected to be consistent across all site options.

### 3.3.7 Facility Non-Use Benefits

In addition to the use benefit patrons receive from attending performances, the existence of high quality performing arts facilities in a region generates utility for residents whether or not they use the facilities. The non-use benefit of the facility refers to the benefit to the community of having the option to use the performing arts facilities if they wish, and the pride in place that comes with living in an area with good access to amenities. This value is expected to be most prevalent for the TCT and the proposed TCH, with other, less prominent, venues in Townsville eliciting minimal non-use benefit.

The non-use benefit per resident was estimated using the non-use benefit prescribed to comparable venues in comparable regions as benchmarks (Econtext, 2015; SGS Economics & Planning, 2019). Averaging such benchmarks resulted in an annual non-use benefit of \$30 per resident.

In valuing the non-use benefit, consideration was given to the size of the population the facilities are approximately designed to service. Where the population in a region exceeds the designed service capacity, it was assumed the utility derived per person would diminish commensurate with the proportional increase in population over designed service capacity (e.g., if the population in the service catchment exceeds the designed capacity by 50%, it has been assumed the non-use utility derived by each resident is approximately halved). In this manner, it is assumed



that once a population equals or exceeds the designed service capacity, the overall aggregate community value remains constant.

Benchmarks from a variety of regions in Australia indicates performing arts facilities of the size and scale of the TCT and proposed TCH could service between 100,000 and 200,000 people. For the purposes of this study it is assumed the service capacity for each venue is approximately 175,000 people, with the service area encompassing the Townsville SA4.

**Base Case Scenario**

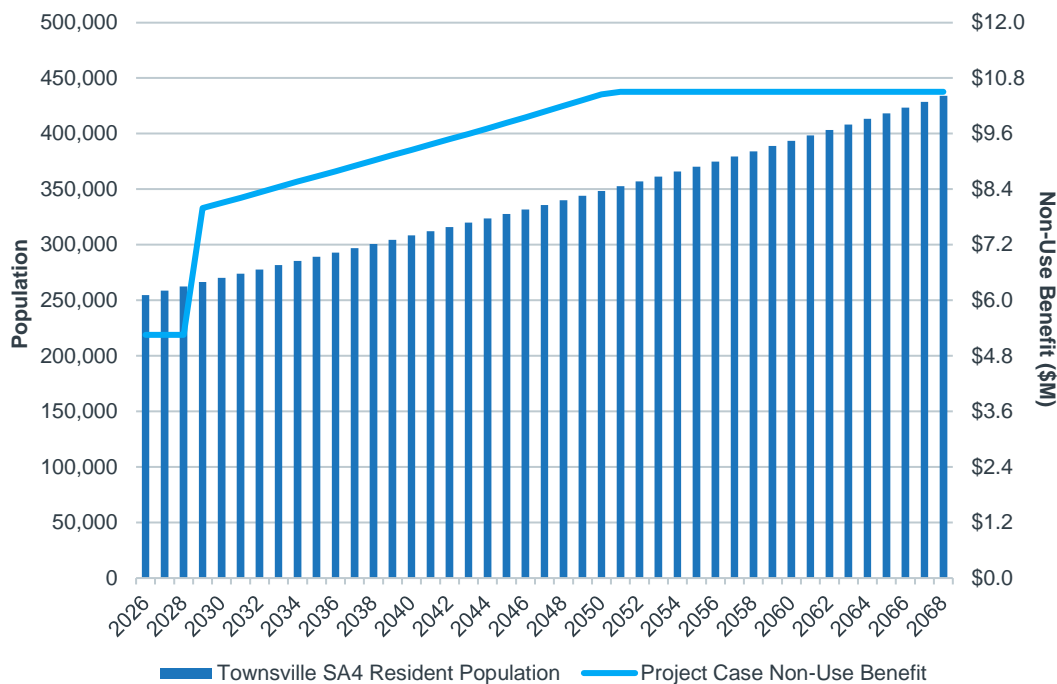
Under the Base Case scenario, Townsville has one performing arts facility (the TCT) which is estimated to service 175,000 residents. Because the population of Townsville SA4 is expected to exceed 175,000 residents by FY2026, the non-use benefit generated from the TCT is constant over the assessment period at \$5.25 million per annum.

**Project Case Scenarios**

Under the Project Case scenario, the non-use benefits are expected to be consistent with the Base Case until FY2029, when the TCH becomes operational. From FY2029 onwards, with two major performing arts facilities, the number of residents serviced by the performing arts infrastructure in Townsville is expected to increase to 350,000. As illustrated in Figure 3.3, the two performing arts facilities in Townsville are expected to generate non-use benefits valued at \$8.0 million in FY2029. The non-use benefits are expected to increase with population growth until Townsville SA4 reaches a population of 350,000 in FY2051, at which point the value of non-use benefits will stabilise at \$10.5 million per annum.

The non-use benefits are expected to be consistent across the three site options.

**Figure 3.3. Townsville SA4 Population and Project Case Non-Use Benefit, FY2026 to FY2068**



Source: AEC

**3.4 COST BENEFIT ANALYSIS RESULTS**

Summary results for each of the Base Case and Project Case scenarios is provided in Appendix C; as well as a comparison of the CBA results for the three site options as an incremental change from the Base Case to understand the net benefit/ cost of the TCH across the three site options. The analyses presented in Appendix C include assessment across the discount rates of 4%, 7% and 10%, in line with standard CBA guidelines. However, as outlined in section 3.1.2, it is considered that a 4% discount rate is most relevant for the TCH.

The table below provides a summary of the CBA results for the three site options in terms of incremental change from the Base Case using a 4% discount rate. For results at 7% and 10% discount rates, refer to Appendix C.

At a 4% discount rate, all site options return a negative Net Present Value (NPV) and Benefit Cost Ratio (BCR) below 1, indicating the present value (PV) of costs outweigh the PV of benefits for each site option and that the TCH is not assessed to deliver a net socio-economic benefit under any of the three options based on the assumptions used in the analysis. The up-front capital costs represent the largest cost across each of the three site options, accounting for more than half the total PV of costs. The most significant benefits include facility revenues, non-use benefits, use benefits and benefits from induced visitor expenditure.

Of note, the difference in the NPV and BCR between site options is minimal, with the results of the CBA unable to strongly distinguish one site as a preference over any other.

Some benefits have not been included in the assessment due to insufficient information to be appropriately quantified and valued or to avoid potential double counting (in particular with the non-use benefit), such as:

- The potential utility benefit for performers from performing at a high quality, fit-for-purpose facility such as the TCH as well as benefits from expenditure of non-local performers in Townsville while in the region.
- Potential benefits in terms of encouraging increased development and participation of locals in the Arts.
- Potential for the TCH to result in a lift in property values and investment.
- A potential reduction in travel expenses for Townsville residents to access high quality performances that may otherwise not be hosted in Townsville.
- Potential benefits in terms of supply chain impacts for Townsville.

Inclusion of these benefits can be expected to result in a lift in the overall benefits assessed for the TCH.

**Table 3.4. CBA Results – Comparison of Site Options at 4%, Incremental Change from the Base Case, Full Facility Development**

Input	The Hive	The Strand	Dean Street
<b>Costs (Present Value, \$M)</b>			
Capital Expenditure	\$156.1	\$162.5	\$161.1
Lifecycle/ Renewal Capital Expenditure	\$35.2	\$35.2	\$35.2
Operations and Maintenance Expenditure	\$102.0	\$102.8	\$102.1
<b>Total Costs</b>	<b>\$293.3</b>	<b>\$300.5</b>	<b>\$298.5</b>
<b>Benefits (Present Value, \$M)</b>			
Facility Revenue	\$79.0	\$79.0	\$79.0
Facility Employee Benefits	\$6.6	\$6.6	\$6.6
Event Organiser/ Performer Profit	\$12.4	\$12.4	\$12.4
Induced Recreational Spend of Patrons	\$3.0	\$3.0	\$2.4
Induced Visitor Spend	\$31.1	\$31.1	\$31.1
Use Benefits	\$48.3	\$48.3	\$48.3
Non-Use Benefits	\$67.8	\$67.8	\$67.8
<b>Total Benefits</b>	<b>\$248.2</b>	<b>\$248.2</b>	<b>\$247.6</b>
<b>Summary</b>			
<b>Net Present Value (\$M)</b>	<b>-\$45.1</b>	<b>-\$52.3</b>	<b>-\$50.9</b>
<b>Benefit Cost Ratio</b>	<b>0.85</b>	<b>0.83</b>	<b>0.83</b>

Source: AEC.

## 3.5 SENSITIVITY AND SCENARIO ANALYSIS

### 3.5.1 Scenario of Initial Development Excluding Black-Box Performance Space

As outlined in section 2.1, consultation indicated the TCH can initially be developed without the 300-seat black-box performance space, with potential to be developed at a later date. AECOM (2023b) provided cost estimates for the TCH where the black-box is excluded from the initial development though designed to enable future development of the black-box; cost estimates for this initial development without the black-box are presented in section 2.2.3.

This section examines a scenario where the black-box is not developed as part of the initial development, and examines the costs and benefits over 40 years of operations in isolation of the black-box (i.e. without consideration of the black-box being developed at a later stage).

Projected implications on demand where the black-box is excluded are presented in Appendix A. All costs and benefits were developed using the same approach outlined in sections 3.2 and 3.3, but based on the changes in capital costs for each site option and demand where the black-box is excluded.

Summary results for each of the Base Case and Project Case scenarios excluding the black-box is provided in Appendix C; as well as a comparison of the CBA results for the three site options as an incremental change from the Base Case to understand the net benefit/ cost of the TCH across the three site options. The table below provides a summary of the CBA results for the three site options in terms of incremental change from the Base Case using a 4% discount rate. For results at 7% and 10% discount rates, refer to Appendix C.

When excluding the black-box, the reduction in the initial capital costs (as well as corresponding reduction in renewal costs and maintenance costs) results in a sizeable reduction in the overall costs for the TCH, with only a small reduction in demand and overall benefits. As a result, the BCR increases from around 0.83 to 0.85 for each site option for the full facility development to around 0.91 to 0.93 for each site option. While the TCH is still assessed to not realise a net socio-economic benefit under the assumptions assessed, removal of the black-box from the initial development is assessed to provide an improved socio-economic outcome.

**Table 3.5. CBA Results – Comparison of Site Options at 4%, Incremental Change from the Base Case, Excluding Black-Box**

Input	The Hive	The Strand	Dean Street
<b>Costs (Present Value, \$M)</b>			
Capital Expenditure	\$139.2	\$137.5	\$140.5
Lifecycle/ Renewal Capital Expenditure	\$31.7	\$30.3	\$31.1
Operations and Maintenance Expenditure	\$96.7	\$95.0	\$96.4
<b>Total Costs</b>	<b>\$267.7</b>	<b>\$262.8</b>	<b>\$268.1</b>
<b>Benefits (Present Value, \$M)</b>			
Facility Revenue	\$77.5	\$77.5	\$77.5
Facility Employee Benefits	\$6.6	\$6.6	\$6.6
Event Organiser/ Performer Profit	\$12.2	\$12.2	\$12.2
Induced Recreational Spend of Patrons	\$2.9	\$2.9	\$2.4
Induced Visitor Spend	\$31.1	\$31.1	\$31.1
Use Benefits	\$47.6	\$47.6	\$47.6
Non-Use Benefits	\$67.8	\$67.8	\$67.8
<b>Total Benefits</b>	<b>\$245.7</b>	<b>\$245.7</b>	<b>\$245.1</b>
<b>Summary</b>			
<b>Net Present Value (\$M)</b>	<b>-\$21.9</b>	<b>-\$17.1</b>	<b>-\$23.0</b>
<b>Benefit Cost Ratio</b>	<b>0.92</b>	<b>0.93</b>	<b>0.91</b>

Source: AEC.

### 3.5.2 Sensitivity to Key Parameters

Sensitivity analysis of key cost and benefit parameters was undertaken using a Monte Carlo analysis examining variance in the values for identified cost and benefit items in the CBA modelling. See Appendix B for more details regarding Monte Carlo analysis.

Sensitivity analysis was conducted at a 4% discount rate for the incremental change in CBA results between each Project Case scenario against the Base Case, for both the full facility and for development excluding the black-box performance space. The 90% confidence interval (i.e., between 5% and 95%) for NPV and BCR are reported in Table 3.6 below. Change in NPV and BCR are reported as the combined variance in the final values examining changes in values for all costs and benefits simultaneously. Variance ranges tested for each cost and benefit are outlined under the table below.

Sensitivity analysis shows that a positive NPV and BCR above 1 can be achieved for all site options, both under the full facility development and excluding black-box scenarios, where assumptions of benefits and costs are more favourable than the base assumptions used in the modelling.

Under the full development scenario, the Hive site option returned a positive NPV and BCR above 1 across 20% of the simulations run, with the Strand achieving a positive NPV on 16% of iterations and Dean Street on 17%. Excluding the black-box, the Strand returned the highest number of iterations with a positive NPV/ BCR above 1 at 37%, followed by the Hive at 35% and Dean Street at 34%.

**Table 3.6. Sensitivity Analysis Summary, 4% Discount Rate, Full Facility and Excluding Black-Box**

Variable	NPV (\$M)		BCR	
	5%	95%	5%	95%
<b>4% Discount Rate, Full Facility</b>				
The Hive	-\$130.3	\$42.5	0.57	1.16
The Strand	-\$140.5	\$34.4	0.55	1.12
Dean Street	-\$136.6	\$35.2	0.55	1.12
<b>4% Discount Rate, Excluding Black Box</b>				
The Hive	-\$107.9	\$64.4	0.61	1.25
The Strand	-\$105.6	\$69.2	0.61	1.28
Dean Street	-\$109.0	\$62.7	0.61	1.25

Notes: The percent distributions used for each variable are provided below:

- Capital Expenditure: pert distribution with a maximum 20% higher, minimum 20% lower.
- Lifecycle/ Renewal Capital Expenditure: pert distribution with a maximum 20% higher, minimum 20% lower.
- Operations and Maintenance Expenditure: normally distributed with standard deviation of 10% from the mean.
- Facility Revenue: normally distributed with standard deviation of 10% from the mean.
- Facility Employee Benefits: normally distributed with standard deviation of 10% from the mean.
- Event Organiser/ Performer Profits: normally distributed with standard deviation of 10% from the mean.
- Induced Recreation Spend of Patrons: normally distributed with standard deviation of 20% from the mean.
- Induced Visitor Spend: normally distributed with standard deviation of 20% from the mean.
- Use Benefits: normally distributed with standard deviation of 20% from the mean.
- Non-Use Benefits: normally distributed with standard deviation of 20% from the mean.

Source: AEC

### 3.5.3 Sensitivity to Demand

To understand the sensitivity of the CBA results to changes in the projected demand, an assessment of the Project under low and high demand scenarios was performed. The low demand scenario assumes the growth rate of the events on the Townsville Events Calendar to be 50% lower than the medium demand scenario (i.e., the baseline demand established in the Service Needs Assessment (AEC 2023a)). The high demand scenario assumes the growth rate of the events on the Townsville Events Calendar to be 50% greater than the medium demand scenario.

#### **Full Facility Development**

The alternative demand scenarios are expected to impact the BCR of the full TCH facility as a result of the impact of demand on event organiser/ performer profit, induced recreational spend of patrons, induced visitor spend, and use benefits. Under a low demand scenario, the BCR is expected to range from 0.75 to 0.77 while the high demand scenario is expected to result in a BCR of 0.89 to 0.91, depending on the site selected. While the TCH is still

assessed to not realise a net socio-economic benefit under the assumptions assessed, greater demand for the TCH is expected to provide an improved socio-economic outcome.

**Table 3.7. CBA Results – Comparison of Site Options at 4%, Incremental Change from the Base Case, Full Facility Development, Low Demand Scenario**

Input	The Hive	The Strand	Dean Street
<b>Costs (Present Value, \$M)</b>			
Capital Expenditure	\$156.1	\$162.5	\$161.1
Lifecycle/ Renewal Capital Expenditure	\$35.2	\$35.2	\$35.2
Operations and Maintenance Expenditure	\$102.0	\$102.8	\$102.1
<b>Total Costs</b>	<b>\$293.3</b>	<b>\$300.5</b>	<b>\$298.5</b>
<b>Benefits (Present Value, \$M)</b>			
Facility Revenue	\$79.0	\$79.0	\$79.0
Facility Employee Benefits	\$6.6	\$6.6	\$6.6
Event Organiser/ Performer Profit	\$9.1	\$9.1	\$9.1
Induced Recreational Spend of Patrons	\$2.2	\$2.2	\$1.7
Induced Visitor Spend	\$25.4	\$25.4	\$25.4
Use Benefits	\$36.1	\$36.1	\$36.1
Non-Use Benefits	\$67.8	\$67.8	\$67.8
<b>Total Benefits</b>	<b>\$226.2</b>	<b>\$226.2</b>	<b>\$225.7</b>
<b>Summary</b>			
<b>Net Present Value (\$M)</b>	<b>-\$67.1</b>	<b>-\$74.3</b>	<b>-\$72.8</b>
<b>Benefit Cost Ratio</b>	<b>0.77</b>	<b>0.75</b>	<b>0.76</b>

Source: AEC.

**Table 3.8. CBA Results – Comparison of Site Options at 4%, Incremental Change from the Base Case, Full Facility Development, High Demand Scenario**

Input	The Hive	The Strand	Dean Street
<b>Costs (Present Value, \$M)</b>			
Capital Expenditure	\$156.1	\$162.5	\$161.1
Lifecycle/ Renewal Capital Expenditure	\$35.2	\$35.2	\$35.2
Operations and Maintenance Expenditure	\$102.0	\$102.8	\$102.1
<b>Total Costs</b>	<b>\$293.3</b>	<b>\$300.5</b>	<b>\$298.5</b>
<b>Benefits (Present Value, \$M)</b>			
Facility Revenue	\$79.0	\$79.0	\$79.0
Facility Employee Benefits	\$6.6	\$6.6	\$6.6
Event Organiser/ Performer Profit	\$15.0	\$15.0	\$15.0
Induced Recreational Spend of Patrons	\$3.5	\$3.5	\$2.8
Induced Visitor Spend	\$36.9	\$36.9	\$36.9
Use Benefits	\$58.2	\$58.2	\$58.2
Non-Use Benefits	\$67.8	\$67.8	\$67.8
<b>Total Benefits</b>	<b>\$266.9</b>	<b>\$266.9</b>	<b>\$266.3</b>
<b>Summary</b>			
<b>Net Present Value (\$M)</b>	<b>-\$26.3</b>	<b>-\$33.5</b>	<b>-\$32.2</b>
<b>Benefit Cost Ratio</b>	<b>0.91</b>	<b>0.89</b>	<b>0.89</b>

Source: AEC.

### **Excluding Black-Box Performance Space**

As in section 3.5.1, exclusion of the black-box performance space is expected to result in a sizeable reduction in the overall costs of the TCH and a small reduction in demand and overall benefits relative to the full facility development. Under a low demand scenario, the BCR is expected to range from 0.83 to 0.85 while the high demand

scenario is expected to result in a BCR of 0.98 to 1.01, depending on the site. Exclusion of the black-box is expected to improve socio-economic outcomes under both alternative demand scenarios, relative to the full facility development. The Project is expected to result in a positive net socio-economic benefit under the high demand scenario at the Strand.

**Table 3.9. CBA Results – Comparison of Site Options at 4%, Incremental Change from the Base Case, Excluding Black-Box, Low Demand Scenario**

Input	The Hive	The Strand	Dean Street
<b>Costs (Present Value, \$M)</b>			
Capital Expenditure	\$139.2	\$137.5	\$140.5
Lifecycle/ Renewal Capital Expenditure	\$31.7	\$30.3	\$31.1
Operations and Maintenance Expenditure	\$96.7	\$95.0	\$96.4
<b>Total Costs</b>	<b>\$267.7</b>	<b>\$262.8</b>	<b>\$268.1</b>
<b>Benefits (Present Value, \$M)</b>			
Facility Revenue	\$77.5	\$77.5	\$77.5
Facility Employee Benefits	\$6.6	\$6.6	\$6.6
Event Organiser/ Performer Profit	\$8.9	\$8.9	\$8.9
Induced Recreational Spend of Patrons	\$2.2	\$2.2	\$1.7
Induced Visitor Spend	\$25.3	\$25.3	\$25.3
Use Benefits	\$35.5	\$35.5	\$35.5
Non-Use Benefits	\$67.8	\$67.8	\$67.8
<b>Total Benefits</b>	<b>\$223.9</b>	<b>\$223.9</b>	<b>\$223.4</b>
<b>Summary</b>			
<b>Net Present Value (\$M)</b>	<b>-\$43.7</b>	<b>-\$38.9</b>	<b>-\$44.7</b>
<b>Benefit Cost Ratio</b>	<b>0.84</b>	<b>0.85</b>	<b>0.83</b>

Source: AEC.

**Table 3.10. CBA Results – Comparison of Site Options at 4%, Incremental Change from the Base Case, Excluding Black-Box, High Demand Scenario**

Input	The Hive	The Strand	Dean Street
<b>Costs (Present Value, \$M)</b>			
Capital Expenditure	\$139.2	\$137.5	\$140.5
Lifecycle/ Renewal Capital Expenditure	\$31.7	\$30.3	\$31.1
Operations and Maintenance Expenditure	\$96.7	\$95.0	\$96.4
<b>Total Costs</b>	<b>\$267.7</b>	<b>\$262.8</b>	<b>\$268.1</b>
<b>Benefits (Present Value, \$M)</b>			
Facility Revenue	\$77.5	\$77.5	\$77.5
Facility Employee Benefits	\$6.6	\$6.6	\$6.6
Event Organiser/ Performer Profit	\$14.7	\$14.7	\$14.7
Induced Recreational Spend of Patrons	\$3.5	\$3.5	\$2.8
Induced Visitor Spend	\$36.9	\$36.9	\$36.9
Use Benefits	\$57.3	\$57.3	\$57.3
Non-Use Benefits	\$67.8	\$67.8	\$67.8
<b>Total Benefits</b>	<b>\$264.3</b>	<b>\$264.3</b>	<b>\$263.6</b>
<b>Summary</b>			
<b>Net Present Value (\$M)</b>	<b>-\$3.4</b>	<b>\$1.5</b>	<b>-\$4.5</b>
<b>Benefit Cost Ratio</b>	<b>0.99</b>	<b>1.01</b>	<b>0.98</b>

Source: AEC.

## 4. ECONOMIC IMPACT ASSESSMENT

### 4.1 APPROACH

Economic modelling in this section uses Input-Output modelling to estimate the economic activity supported by construction of the TCH, post construction from TCH operations, as well as induced economic activity from increased local and visitor spending. This section also considers the economic activity supported by the TCH excluding the 300-seat black-box performance space. All site options (as detailed in Section 2.2.2) have been examined. Input-Output modelling is used to examine the direct and flow-on<sup>4</sup> activity expected to be supported within the Townsville SA4 economy. A description of the Input-Output modelling framework used is provided in Appendix D.

Input-output modelling describes economic activity by examining four types of impacts:

- **Output:** Refers to the gross value of goods and services transacted, including the costs of goods and services used in the development and provision of the final product. Output typically overstates the economic impacts as it counts all goods and services used in one stage of production as an input to later stages of production, hence counting their contribution more than once.
- **Gross product:** Refers to the value of output after deducting the cost of goods and services inputs in the production process. Gross product (e.g., Gross Regional Product (GRP)) defines a true net economic contribution and is subsequently the preferred measure for assessing economic impacts.
- **Income:** Measures the level of wages and salaries paid to employees of the industry under consideration and to other industries benefiting from the project.
- **Employment:** Refers to the part-time and full-time employment positions generated by the economic stimulus, both directly and indirectly through flow-on activity, expressed in full time equivalent (FTE) positions/ FTE job years<sup>5</sup>.

### 4.2 MODELLING ASSUMPTIONS

In undertaking the assessment of the economic activity supported by the TCH, the analysis examines the net incremental additional activity supported by the TCH in consideration of impacts on the TCT and other facilities (the Project Case), relative to what would otherwise be expected to occur without the TCH (the Base Case). The Project Case and Base Case are assumed to be as defined for the CBA in section 3.1.3. Five components have been examined for each of the site options:

- Construction phase: TCH construction: Economic activity supported through the initial construction of the TCH.
- Post-construction phase/ ongoing activity:
  - Facility operations: Economic activity supported through ongoing operational activities of the TCH and TCT, relative to expected operating activity of the TCT without the TCH (operations of other facilities have not been examined due to data limitations, but is expected to be minimal).
  - Event organiser/ performer activity: Economic activity supported through organising and performing the additional events hosted in Townsville as a result of the TCH.
  - Induced recreation spend: Economic activity supported through additional spend on recreational activities pre- and post-events by attendees as a result of additional events hosted in Townsville as a result of the TCH.

<sup>4</sup> Both production induced (Type I) and consumption induced (Type II) flow-on impacts have been presented in this report. Refer to Appendix C for a description of each type of flow-on impact.

<sup>5</sup> Where one FTE job year is equivalent to one person working full time for a period of one year.

- o Induced visitor spend: Economic activity supported through additional visitation and visitor spend in Townsville as a result of additional events hosted in Townsville as a result of the TCH.

The Economic Impact Assessment (EIA) has focused on impacts of the full facility development. Specific assumptions used in the analysis for the above components for each of the site options are outlined below.

#### 4.2.1 TCH Construction

Estimates of TCH construction costs for each site option were provided by AECOM (2023a; 2023b). Annual costs are summarised in section 2.2.3. For modelling purposes, construction cost items were allocated to relevant industries within the Input-Output model based on ANZSIC industry classifications. The allocation process included consideration of both purchases of materials, goods and services, as well as installation.

Table 4.1 below outlines the construction costs by industry for each site option.

**Table 4.1. TCH Construction Costs by Industry (\$M)**

Industry	The Hive	The Strand	Dean Street
Non-Residential Building Construction	\$67.84	\$71.59	\$69.04
Heavy and Civil Engineering Construction	\$0.09	\$0.40	\$0.15
Construction Services	\$42.46	\$44.31	\$45.78
Other Wood Product Manufacturing	\$2.86	\$3.11	\$2.91
Glass and Glass Product Manufacturing	\$2.22	\$2.31	\$2.24
Cement, Lime and Ready-Mixed Concrete Manufacturing	\$2.14	\$2.39	\$2.18
Plaster and Concrete Product Manufacturing	\$4.37	\$4.65	\$4.43
Structural Metal Product Manufacturing	\$15.55	\$16.83	\$15.73
Professional, Scientific, Computer and Electronic Equipment Manufacturing	\$2.98	\$2.90	\$3.00
Electrical Equipment Manufacturing	\$8.46	\$8.35	\$8.62
Furniture Manufacturing	\$4.16	\$4.10	\$4.19
Electricity Transmission and Distribution	\$0.81	\$0.85	\$0.84
Accommodation	\$0.08	\$0.08	\$0.08
Food and Beverage Services	\$0.04	\$0.04	\$0.04
Road Transport	\$0.01	\$0.01	\$0.01
Air and Space Transport	\$0.04	\$0.04	\$0.04
Professional, Scientific and Technical Services	\$22.52	\$23.34	\$23.02
Public Administration and Regulatory Services	\$4.10	\$4.31	\$4.24
Public Order and Safety	\$0.31	\$0.32	\$0.32
<b>Total</b>	<b>\$181.05</b>	<b>\$189.97</b>	<b>\$186.85</b>

Source: AEC, AECOM (2023a; 2023b).

Input-Output modelling of TCH construction has examined the total construction activity in aggregate, rather than on an annual basis.

Only the construction activity expected to be undertaken within the Townsville SA4 economy has been included in the economic impact assessment. For the purposes of this assessment, the following assumptions outlined in Table 4.2 were made regarding how much of construction activity occurs within the Townsville SA4 for each industry, as well as how much of each industry is sourced from the Townsville LGA. The proportion of activity occurring within the Townsville SA4 and sourced from the Townsville SA4 are assumed to be the same for all industries except the construction industry, where all activity will occur on site but some construction labour and services are assumed to be sourced from outside the region.

In undertaking modelling, construction businesses and workers sourced from outside Townsville SA4 may be expected to spend some money within the Townsville SA4 economy during the contract period. For the purposes of modelling, 25% of non-Townsville SA4 construction industry production induced flow-on impacts (Type I impacts) were assumed to be captured within the Townsville SA4, and 5% of household consumption flow-on impacts (Type II impacts).



**Table 4.2. TCH Construction Source of Goods and Services**

Industry	Occurs Locally	Sourced Locally
Non-Residential Building Construction	100%	90%
Heavy and Civil Engineering Construction	100%	90%
Construction Services	100%	90%
Other Wood Product Manufacturing	75%	75%
Glass and Glass Product Manufacturing	75%	75%
Cement, Lime and Ready-Mixed Concrete Manufacturing	90%	90%
Plaster and Concrete Product Manufacturing	75%	75%
Structural Metal Product Manufacturing	50%	50%
Professional, Scientific, Computer and Electronic Equipment Manufacturing	50%	50%
Electrical Equipment Manufacturing	50%	50%
Furniture Manufacturing	75%	75%
Electricity Transmission and Distribution	100%	100%
Accommodation	100%	100%
Food and Beverage Services	100%	100%
Road Transport	100%	100%
Air and Space Transport	50%	50%
Professional, Scientific and Technical Services	50%	50%
Public Administration and Regulatory Services	100%	100%
Public Order and Safety	100%	100%

Source: AEC, AECOM (2023a; 2023b).

## 4.2.2 Post Construction/ Ongoing Operations

### 4.2.2.1 Facility Operations

Facility operations activity has examined the net additional revenue, operating costs and labour for operating the TCH and TCT relative to revenue, operating costs and labour for the TCT in the Base Case. Estimates of facility revenues and operating costs used for the TCT and TCH (for each site option) are as per those outlined in the *Townsville Concert Hall Detailed Business Case: Financial Appraisal* (AEC, 2023b).

In terms of facility employment:

- It is estimated that the TCT currently employs approximately 19 FTE employees based on estimates of wages and salaries for the TCT and average wages for the Heritage, Creative and Performing Arts industry outlined in the Input-Output model. This includes permanent staff as well as temporary staff to support performances, which has been assumed to vary based on changes in labour costs over time in the Project Case and Base Case.
- The TCH is assumed to employ 9 FTE staff for general operations of the facility, as well as temporary staff throughout operations to support performances, providing a total of 16 FTE staff in FY2029 and increasing to 19 FTE staff by FY2068.

Base Case TCT operating activity was subtracted from the Project Case operating activity of TCH and TCT combined to estimate the direct net incremental facility operations activity. For modelling purposes, all flow-on activity has been modelled based on the typical level of activity in the Input-Output model associated with the non-labour operating expenses for facility operations.

In reporting impacts, average annual operating activity between FY2029 and FY2068 has been used.

#### 4.2.2.2 Event Organiser/ Performer Activity

Estimates of event organiser/ performer activity were developed as per the approach outlined in the CBA in section 3.3.3. It was assumed 75% of event organiser/ performers are sourced from the Townsville SA4, with the remainder non-local event organisers/ performers that are assumed to provide 25% of production induced flow-on impacts (Type I impacts) within the Townsville SA4 and 5% of household consumption flow-on impacts (Type II impacts). Estimates of revenue were allocated to the Heritage, Creative and Performance Arts industry.

In reporting impacts, average annual event organiser/ performer activity between FY2029 and FY2068 has been used.

#### 4.2.2.3 Induced Recreation Spend

Estimates of induced recreation spend were developed as per the approach outlined in the CBA in section 3.3.4. Estimates of spend were allocated 80% to the Food and Beverage Services industry and 20% to the Retail Trade industry.

In reporting impacts, average annual induced recreation spend between FY2029 and FY2068 has been used.

#### 4.2.2.4 Induced Visitor Spend

The annual additional visitor spend delivered by the performances attracted to the region due to the project has been estimated as per Section 2.2.6, with expenditure allocated as per the industry structure outlined in Table 2.3.

In reporting impacts, average annual induced visitor spend between FY2029 and FY2068 has been used.

### 4.3 MODELLING RESULTS

#### 4.3.1 TCH Construction

In interpreting the results of the economic modelling, it should be recognised the results refer to the aggregate economic activity supported over the entire construction phase (i.e., not annual averages). Economic analysis indicates construction of the TCH is estimated to support the following within the Townsville SA4 economy:

- Between \$88.3 million and \$92.7 million in Gross Regional Product (GRP).
- Between 633 and 663 FTE job years, paying between \$59.4 million and \$62.3 million in wages and salaries.

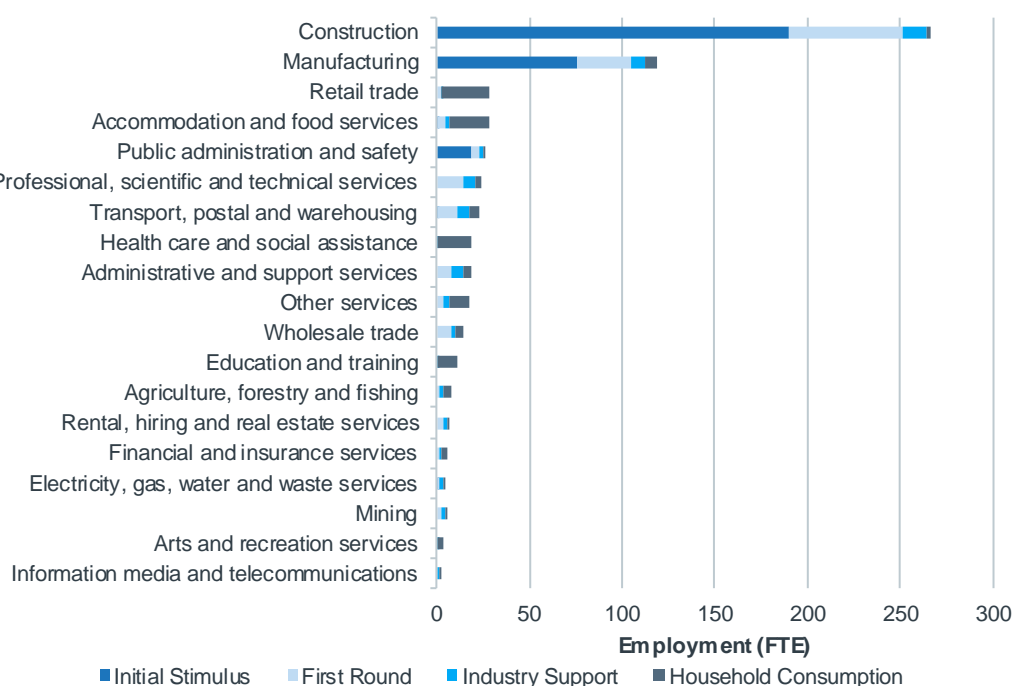
**Table 4.3. Total Economic Contribution of TCH Construction Activity, Townsville SA4**

Impact	Output (\$M)	GRP (\$M)	Incomes (\$M)	Employment (FTEs)
<b>The Hive</b>				
Initial Stimulus in Local Economy	\$130.4	\$38.8	\$27.9	285
Direct Requirements Impacts	\$55.0	\$21.1	\$15.3	158
Industry Support Impacts	\$21.0	\$8.9	\$6.0	62
Household Consumption Impacts	\$34.4	\$19.5	\$10.1	127
<b>Total Impacts in Local Economy</b>	<b>\$240.8</b>	<b>\$88.3</b>	<b>\$59.4</b>	<b>633</b>
<b>The Strand</b>				
Initial Stimulus in Local Economy	\$137.1	\$40.8	\$29.3	299
Direct Requirements Impacts	\$57.8	\$22.2	\$16.1	166
Industry Support Impacts	\$22.0	\$9.3	\$6.3	65
Household Consumption Impacts	\$36.1	\$20.5	\$10.6	133
<b>Total Impacts in Local Economy</b>	<b>\$253.0</b>	<b>\$92.7</b>	<b>\$62.3</b>	<b>663</b>
<b>Dean Street</b>				
Initial Stimulus in Local Economy	\$135.0	\$40.3	\$29.0	297
Direct Requirements Impacts	\$56.7	\$21.8	\$15.8	163
Industry Support Impacts	\$21.6	\$9.2	\$6.2	64
Household Consumption Impacts	\$35.6	\$20.2	\$10.5	131
<b>Total Impacts in Local Economy</b>	<b>\$248.9</b>	<b>\$91.4</b>	<b>\$61.5</b>	<b>655</b>

Note: Totals may not sum due to rounding. Flow-on contribution has been disaggregated by direct requirements (first round Type I), industry support (subsequent round Type I) and household consumption induced (Type II) impacts. See Appendix D for definitions of flow-on impacts. Source: AEC.

A breakdown of FTE job years supported by construction of the TCH for the Hive option is presented in Figure 4.1, showing the construction and manufacturing industries are expected to receive the largest share of employment supported by construction activities in Townsville SA4. As all options provide a similar level of activity, the Hive has been used as an example of the approximate FTE job years supported in each industry for all options.

**Figure 4.1. Total Jobs Supported (FTE Job Years) from TCH Construction, FY2026 to FY2028, Townsville SA4, the Hive**



Source: AEC.

#### 4.3.2 Post-Construction/ Ongoing Operations

The following analysis examines the annual average impact delivered by operation of the TCH between FY2029 and FY2068. This section examines the annual impacts of the TCH at each site option in terms of contribution to economic output, GRP and employment, inclusive of facility operations, event organiser/ performer activity, induced recreation spend and induced visitor spend. Economic analysis indicates ongoing operations of the TCH is estimated to support the following within the Townsville SA4 economy on average each year:

- Between \$16.6 million and \$16.8 million in GRP.
- Between 171 and 174 FTE jobs, paying between \$12.8 million and \$12.9 million in wages and salaries.

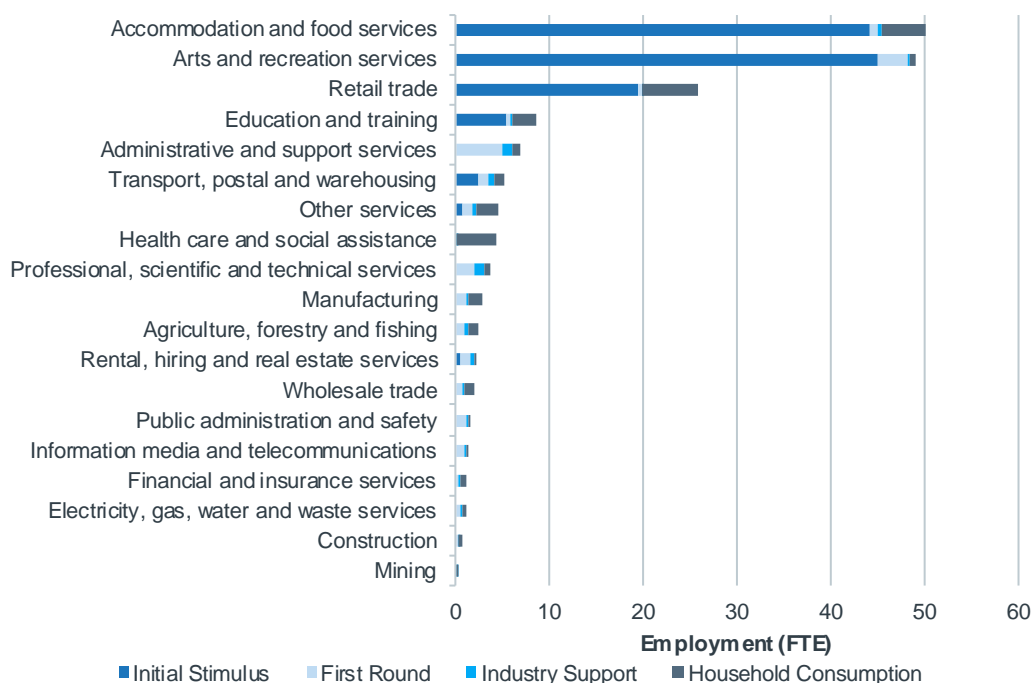
**Table 4.4. Average Annual Economic Contribution of TCH Post-Construction/ Ongoing Operations, Townsville SA4**

Impact	Output (\$M)	GRP (\$M)	Incomes (\$M)	Employment (FTEs)
<b>The Hive</b>				
Initial Stimulus in Local Economy	\$22.0	\$8.8	\$8.1	118
Direct Requirements Impacts	\$5.6	\$2.7	\$2.0	22
Industry Support Impacts	\$1.8	\$0.8	\$0.6	6
Household Consumption Impacts	\$7.8	\$4.5	\$2.3	29
<b>Total Impacts in Local Economy</b>	<b>\$37.3</b>	<b>\$16.8</b>	<b>\$12.9</b>	<b>174</b>
<b>The Strand</b>				
Initial Stimulus in Local Economy	\$22.0	\$8.8	\$8.1	118
Direct Requirements Impacts	\$5.6	\$2.7	\$2.0	22
Industry Support Impacts	\$1.8	\$0.9	\$0.6	6
Household Consumption Impacts	\$7.9	\$4.5	\$2.3	29
<b>Total Impacts in Local Economy</b>	<b>\$37.3</b>	<b>\$16.8</b>	<b>\$12.9</b>	<b>174</b>
<b>Dean Street</b>				
Initial Stimulus in Local Economy	\$21.8	\$8.7	\$8.0	116
Direct Requirements Impacts	\$5.6	\$2.7	\$2.0	21
Industry Support Impacts	\$1.8	\$0.8	\$0.6	6
Household Consumption Impacts	\$7.8	\$4.4	\$2.3	29
<b>Total Impacts in Local Economy</b>	<b>\$36.9</b>	<b>\$16.6</b>	<b>\$12.8</b>	<b>171</b>

Note: Totals may not sum due to rounding. Flow-on contribution has been disaggregated by direct requirements (first round Type I), industry support (subsequent round Type I) and household consumption induced (Type II) impacts. See Appendix D for definitions of flow-on impacts. Source: AEC.

A breakdown of FTE jobs supported each year on average by ongoing operations of the TCH for the Hive option is presented in Figure 4.2, showing the accommodation and food services and arts and recreation services industries are expected to receive the largest share of employment supported by ongoing operations activities in Townsville SA4. As all options provide a similar level of activity, the Hive has been used as an example of the approximate FTE jobs supported in each industry for all options.

**Figure 4.2. Average Annual Jobs Supported (FTE Jobs) from Post Construction/ Ongoing Operations Activity, FY2029 to FY2068, Townsville SA4, The Hive**



Source: AEC.

### 4.3.3 Present Value Contribution to GRP

Using annualised estimates of activity and discounting to present value terms highlights that the TCH is estimated to support a present value contribution to GRP (including direct and flow-on activity) of approximately between \$325 million and \$330 million at a 4% discount rate, which exceed the present value of construction and operational costs over the same period.

**Table 4.5. Present Value Contribution to GRP of Each Site Option**

Site Option	4% Discount Rate	7% Discount Rate	10% Discount Rate
The Hive	\$325.7	\$205.5	\$145.0
The Strand	\$328.6	\$207.8	\$146.7
Dean Street	\$325.3	\$206.2	\$146.1

Source: AEC.

### 4.3.4 Excluding Black-Box Performance Space

This section evaluates the construction and operation of the TCH under the scenario in which the black-box is not developed as part of the initial development, and examines the economic benefit over 40 years of operations in isolation of the black-box (i.e. excluding the black-box development in the modelling period). Cost estimates provided by AECOM (2023b), which exclude the black-box space were used in this assessment and are presented in section 2.2.3.

Projected implications on demand where the black-box is excluded are presented in Appendix A.

### **TCH Construction Excluding Black-Box**

In interpreting the results of the economic modelling, it should be recognised the results refer to the aggregate economic activity supported over the entire construction phase (i.e., not annual averages). Economic analysis

indicates construction of the TCH excluding the black-box is estimated to support the following within the Townsville SA4 economy:

- Between \$78.3 million and \$79.6 million in GRP.
- Between 561 and 571 FTE job years, paying between \$52.6 million and \$53.6 million in wages and salaries.

**Table 4.6. Total Economic Contribution of TCH Construction Activity, Excluding Black-Box, Townsville SA4**

Impact	Output (\$M)	GRP (\$M)	Incomes (\$M)	Employment (FTEs)
<b>The Hive</b>				
Initial Stimulus in Local Economy	\$115.8	\$34.6	\$24.9	255
Direct Requirements Impacts	\$48.9	\$18.8	\$13.6	141
Industry Support Impacts	\$18.7	\$7.9	\$5.3	55
Household Consumption Impacts	\$30.7	\$17.4	\$9.0	113
<b>Total Impacts in Local Economy</b>	<b>\$214.1</b>	<b>\$78.7</b>	<b>\$52.9</b>	<b>564</b>
<b>The Strand</b>				
Initial Stimulus in Local Economy	\$115.5	\$34.4	\$24.8	253
Direct Requirements Impacts	\$48.7	\$18.7	\$13.6	140
Industry Support Impacts	\$18.6	\$7.9	\$5.3	55
Household Consumption Impacts	\$30.5	\$17.3	\$9.0	112
<b>Total Impacts in Local Economy</b>	<b>\$213.2</b>	<b>\$78.3</b>	<b>\$52.6</b>	<b>561</b>
<b>Dean Street</b>				
Initial Stimulus in Local Economy	\$117.2	\$35.1	\$25.3	259
Direct Requirements Impacts	\$49.3	\$19.0	\$13.7	142
Industry Support Impacts	\$18.8	\$8.0	\$5.4	56
Household Consumption Impacts	\$31.0	\$17.6	\$9.1	114
<b>Total Impacts in Local Economy</b>	<b>\$216.4</b>	<b>\$79.6</b>	<b>\$53.6</b>	<b>571</b>

Note: Totals may not sum due to rounding. Flow-on contribution has been disaggregated by direct requirements (first round Type I), industry support (subsequent round Type I) and household consumption induced (Type II) impacts. See Appendix D for definitions of flow-on impacts. Source: AEC.

The breakdown of FTE job years supported by construction of the TCH excluding the black-box is consistent with the breakdown presented in Figure 4.1, showing the construction and manufacturing industries are expected to receive the largest share of employment supported by construction activities in Townsville SA4.

#### **Post-Construction/ Ongoing Operations Excluding Black-Box**

The following analysis examines the annual average impact delivered by operation of the TCH without the black-box between FY2029 and FY2068. Economic analysis indicates ongoing operations of the facility is estimated to support the following within the Townsville SA4 economy on average each year:

- Between \$15.4 million and \$15.7 million in GRP.
- Between 157 and 160 FTE jobs, paying between \$11.7 million and \$11.8 million in wages and salaries.

**Table 4.7. Average Annual Economic Contribution of TCH Post-Construction/ Ongoing Operations, Excluding Black-Box, Townsville SA4**

Impact	Output (\$M)	GRP (\$M)	Incomes (\$M)	Employment (FTEs)
<b>The Hive</b>				
Initial Stimulus in Local Economy	\$20.3	\$8.4	\$7.5	109
Direct Requirements Impacts	\$5.1	\$2.5	\$1.8	19
Industry Support Impacts	\$1.6	\$0.8	\$0.5	5
Household Consumption Impacts	\$7.1	\$4.0	\$2.1	26
<b>Total Impacts in Local Economy</b>	<b>\$34.1</b>	<b>\$15.6</b>	<b>\$11.8</b>	<b>160</b>
<b>The Strand</b>				
Initial Stimulus in Local Economy	\$20.3	\$8.5	\$7.5	109
Direct Requirements Impacts	\$5.0	\$2.4	\$1.8	19
Industry Support Impacts	\$1.6	\$0.8	\$0.5	5
Household Consumption Impacts	\$7.1	\$4.0	\$2.1	26
<b>Total Impacts in Local Economy</b>	<b>\$34.0</b>	<b>\$15.7</b>	<b>\$11.8</b>	<b>159</b>
<b>Dean Street</b>				
Initial Stimulus in Local Economy	\$20.1	\$8.3	\$7.4	107
Direct Requirements Impacts	\$5.0	\$2.4	\$1.8	19
Industry Support Impacts	\$1.6	\$0.8	\$0.5	5
Household Consumption Impacts	\$7.0	\$4.0	\$2.1	26
<b>Total Impacts in Local Economy</b>	<b>\$33.8</b>	<b>\$15.4</b>	<b>\$11.7</b>	<b>157</b>

Note: Totals may not sum due to rounding. Flow-on contribution has been disaggregated by direct requirements (first round Type I), industry support (subsequent round Type I) and household consumption induced (Type II) impacts. See Appendix D for definitions of flow-on impacts. Source: AEC.

The breakdown of FTE jobs supported each year on average by ongoing operations of the TCH without the black-box is consistent with the breakdown presented in Figure 4.2, showing the accommodation and food services and arts and recreation services industries are expected to receive the largest share of employment supported by ongoing operations activities in Townsville SA4.

### Present Value Contribution to GRP

Using annualised estimates of activity and discounting to present value terms highlights that the TCH, without the black-box, is estimated to support a present value contribution to GRP (including direct and flow-on activity) of approximately between \$314.9 million and \$317.0 million at a 4% discount rate, which exceed the present value of construction and operational costs over the same period.

**Table 4.8. Present Value Contribution to GRP of Each Site Option**

Site Option	4% Discount Rate	7% Discount Rate	10% Discount Rate
The Hive	\$317.0	\$197.9	\$138.1
The Strand	\$316.8	\$197.1	\$137.1
Dean Street	\$314.9	\$197.0	\$137.8

Source: AEC.

## 5. FINDINGS AND CONSIDERATIONS

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The CBA shows that at a 4% discount rates the PV of costs outweigh the PV of benefits for all site options, for both full facility development (with BCRs ranging between 0.83 and 0.85) and development of the facility excluding the black-box performance space (BCRs ranging between 0.91 and 0.93).

The up-front capital costs represent the largest cost across each of the three site options, accounting for more than half the total PV of costs. The most significant benefits include facility revenues, non-use benefits, use benefits and benefits from induced visitor expenditure.

The difference in the NPV and BCR between site options is minimal, with the results of the CBA unable to strongly distinguish one site as a preference over any other. However, the CBA results indicate an initial development excluding the black-box performance space provides a better socio-economic outcome. Consultation indicated that while this space would be considered highly beneficial for users, it was not required to support the functioning of the main concert hall and could potentially be delivered at a later stage.

Sensitivity analysis of the key cost and benefit parameters indicates that a positive NPV and BCR above 1 can be achieved for all site options, both under the full facility development and excluding black-box scenarios, where assumptions of benefits and costs are more favourable than the base assumptions used in the modelling. Under the full development scenario, the Hive site option returned a positive NPV and BCR above 1 across 20% of the simulations run, with the Strand achieving a positive NPV on 16% of iterations and Dean Street on 17%. Excluding the black-box, the Strand returned the highest number of iterations with a positive NPV/ BCR above 1 at 37%, followed by the Hive at 35% and Dean Street at 34%.

Some benefits have not been included in the assessment due to insufficient information to be appropriately quantified and valued or to avoid potential double counting (in particular with the non-use benefit), such as:

- The potential utility benefit for performers from performing at a high quality, fit-for-purpose facility such as the TCH as well as benefits from expenditure of non-local performers in Townsville while in the region.
- Potential benefits in terms of encouraging increased development and participation of locals in the Arts.
- Potential for the TCH to result in a lift in property values and investment.
- A potential reduction in travel expenses for Townsville residents to access high quality performances that may otherwise not be hosted in Townsville.
- Potential benefits in terms of supply chain impacts for Townsville.

Inclusion of these benefits can be expected to result in a lift in the overall benefits assessed for the TCH.

Using annualised estimates of activity and discounting to present value terms highlights that at a 4% discount rate, the TCH is estimated to support a present value contribution to GRP (including direct and flow-on activity) of approximately between \$325 million and \$330 million at a 4% discount rate. This contribution to GRP is higher than the total present value of costs at a 4% discount rate outlined in the CBA for each site option and excludes the social utility benefits delivered from use and non-use benefits. This indicates that where contribution of the project to economic activity in the Townsville SA4 is considered the overall project benefits may be expected to outweigh the costs.



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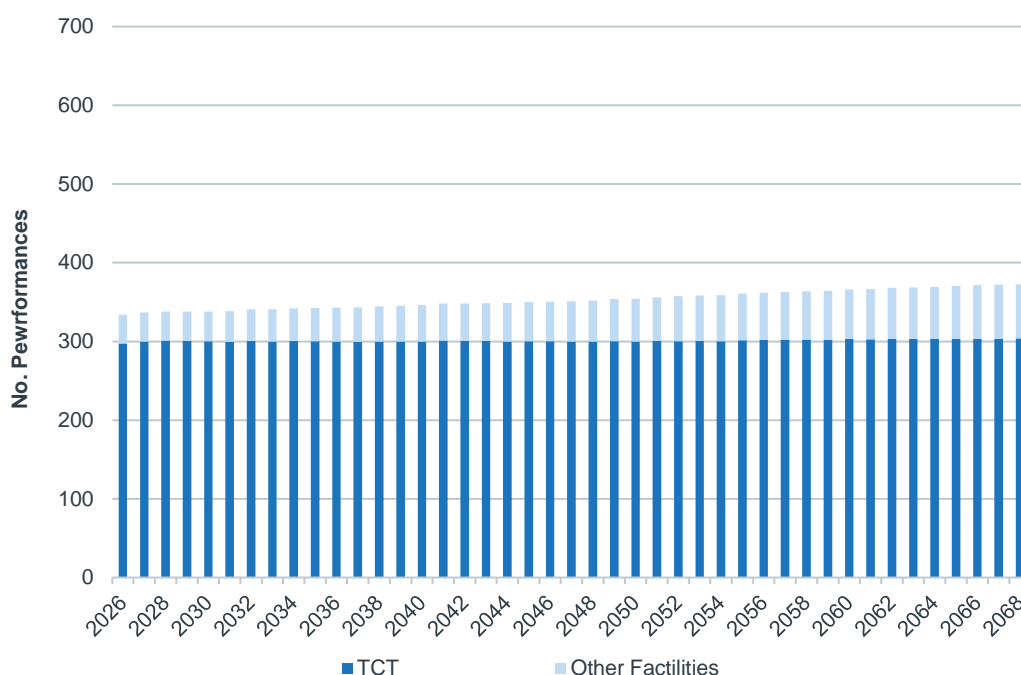
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## APPENDIX A: PERFORMING ARTS FACILITY DEMAND

### PERFORMANCES

Under the Base Case, Townsville is expected to host approximately 334 performances in FY2026, of which TCT is expected to host 298 (89.1%) and other venues in Townsville are expected to host the remaining 37 performances (10.9%). The number of performances in Townsville is expected to increase slightly to reach 373 performances in FY2068, of which 304 (81.5%) are expected to be held in TCT and 69 (18.5%) are expected to be held in other venues in Townsville.

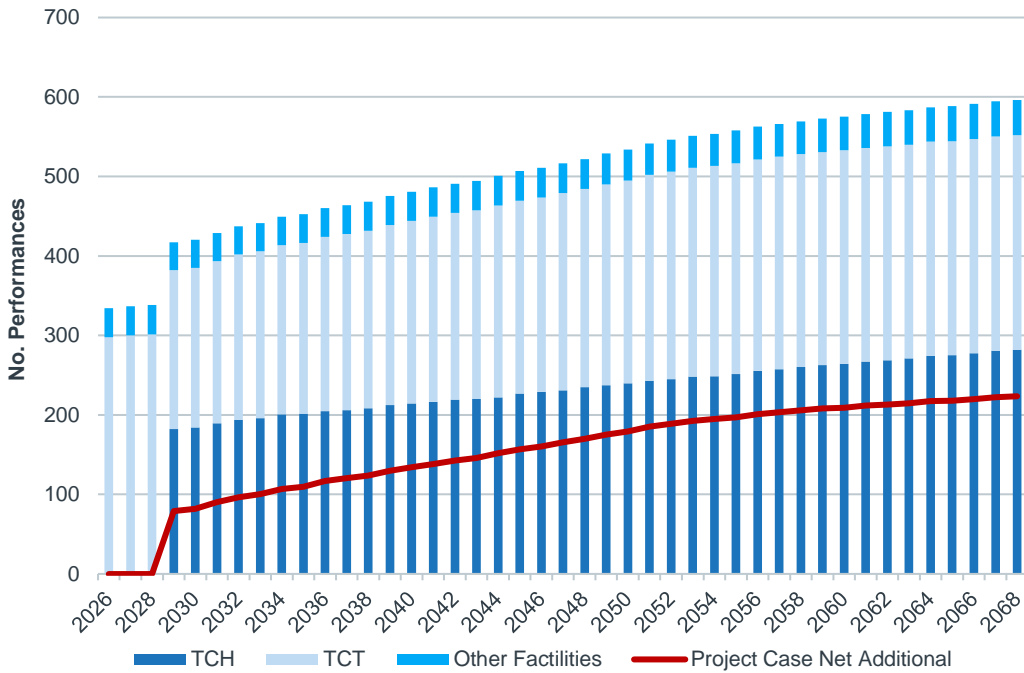
**Figure A. 1. Base Case Performance Demand, FY2026 to FY2068**



Source: AEC

Under the Project Case, with a new acoustic facility and additional capacity for performances, Townsville is expected to see a net increase in performances. In FY2029, the first full year of concert hall operations, Townsville is expected to host approximately 417 performances, representing a net increase of 79 performances from the Base Case in the same year. The TCH is expected to host 182 of the 417 performances (43.7%) while the TCT is expected to host 200 (47.9%) and 35 (8.4%) are expected to be hosted by other venues. By FY2068, Townsville is expected to host 596 performances representing a net increase of 224 performances from the Base Case. TCH is expected to host 282 performances (47.3% of total performances), the TCT is expected to host 270 performances (45.3%), and 44 performances (7.4%) are expected to be held in other venues.

**Figure A. 2. Project Case Performance Demand, FY2026 to FY2068**

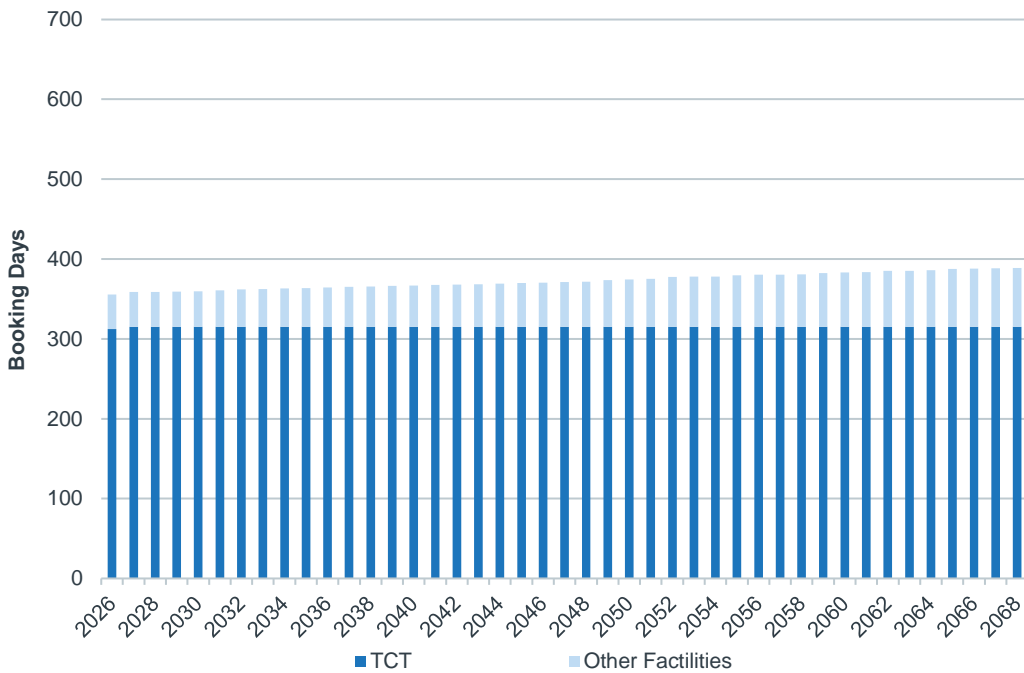


Source: AEC

### BOOKING DAYS

Booking days refers to any day on which a performance occurs as well as the bump-in bump-out time required. Under the Base Case, 356 booking days are expected to be required in FY2026. This is comprised of 312 booking days for TCT (87.8% of total booking days) and 43 booking days at other venues in Townsville (12.2%). With TCT expected to reach its booking day capacity in FY2027, the increase in booking days to FY2068 is expected to be limited. There are expected to be 389 booking days required in Townsville in FY2068, including 315 booking days in TCT (81.1% of total booking days) and 74 booking days (18.9%) in other venues in Townsville.

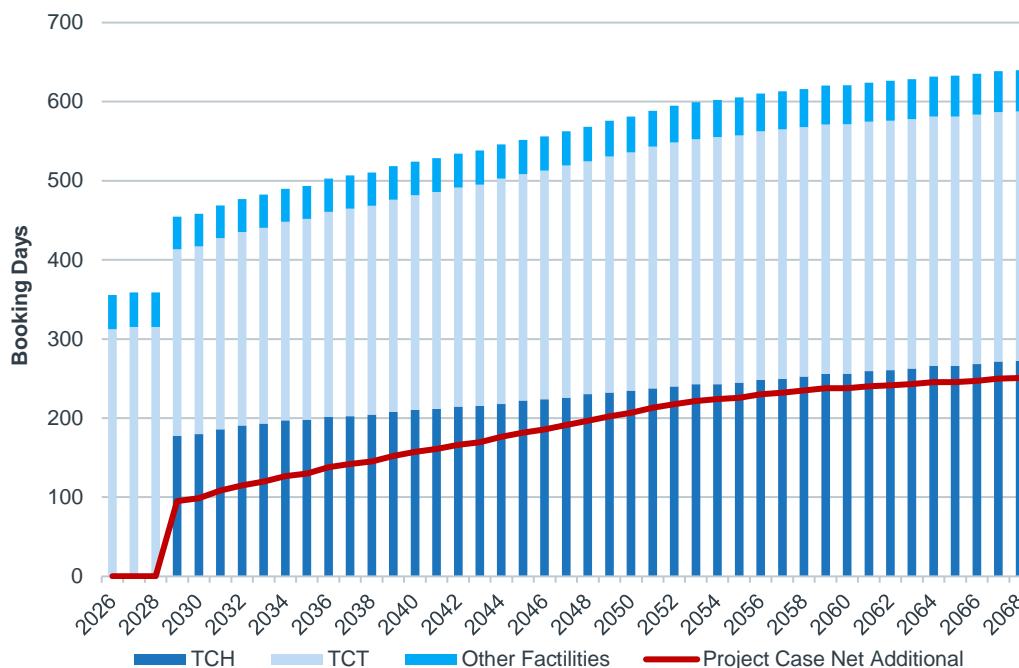
**Figure A. 3. Base Case Booking Days Demand, FY2026 to FY2068**



Source: AEC

Under the Project Case, 455 booking days are expected to be required in FY2029, a net addition of 95 booking days from the Base Case. This is comprised of 178 booking days in the TCH (39.1% of total booking days), 236 booking days in TCT (51.8%) and 41 booking days in other venues in Townsville (9.1%). By 2068, 640 booking days are expected to be required for performances in Townsville, a net addition of 251 booking days from the Base Case. This is comprised of 315 booking days in the TCT (49.3% of total booking days), 272 booking days in the concert hall (42.6%), and 52 booking days (8.1%) in other venues in Townsville.

**Figure A. 4. Project Case Booking Days Demand, FY2026 to FY2068**



Source: AEC

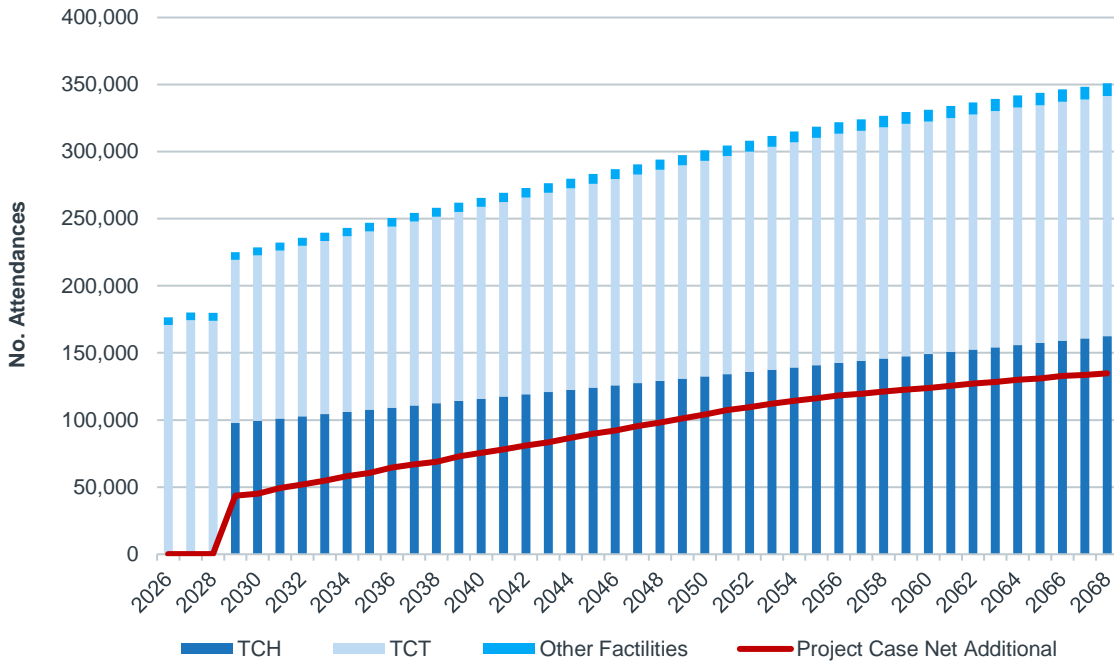
## EXCLUDING THE BLACK-BOX PERFORMANCE SPACE

Without the ancillary black-box performance space, there is expected to be slightly fewer performances attracted to the TCH and, therefore, slightly fewer attendances. Some of the performances previously allocated to the black-box performance space were assumed to be able to utilise the C2 theatre as a second preference, others were understood to require the co-location of the black-box performance space to the TCH or its unique features and, as such, were assumed to be unable to perform in Townsville without the black-box facility.

Overall, the demand assessment for the TCH without the black-box performance space demonstrates a minimal impact of the black-box performance space on the total demand for the TCH, as outlined below.

Without the black-box performance space, Townsville is expected to host approximately 225,002 performing arts event attendances in FY2029, 293 fewer attendances than with the black-box performance space and 43,592 attendances more than under the Base Case. The TCH is expected to host 97,882 of the 225,002 attendances (43.5%) while the TCT is expected to host 121,406 (54.0%) and 5,714 (2.5%) are expected to be hosted by other venues. By FY2068, Townsville is expected to facilitate 350,936 performing arts event attendances, 1,177 fewer than with the black-box performance space and 134,740 more than under the Base Case. TCH is expected to host 162,414 attendances (46.3% of all attendances), the TCT is expected to host 178,949 attendances (51.0%), and 9,573 (2.7%) are expected to be hosted by other venues.

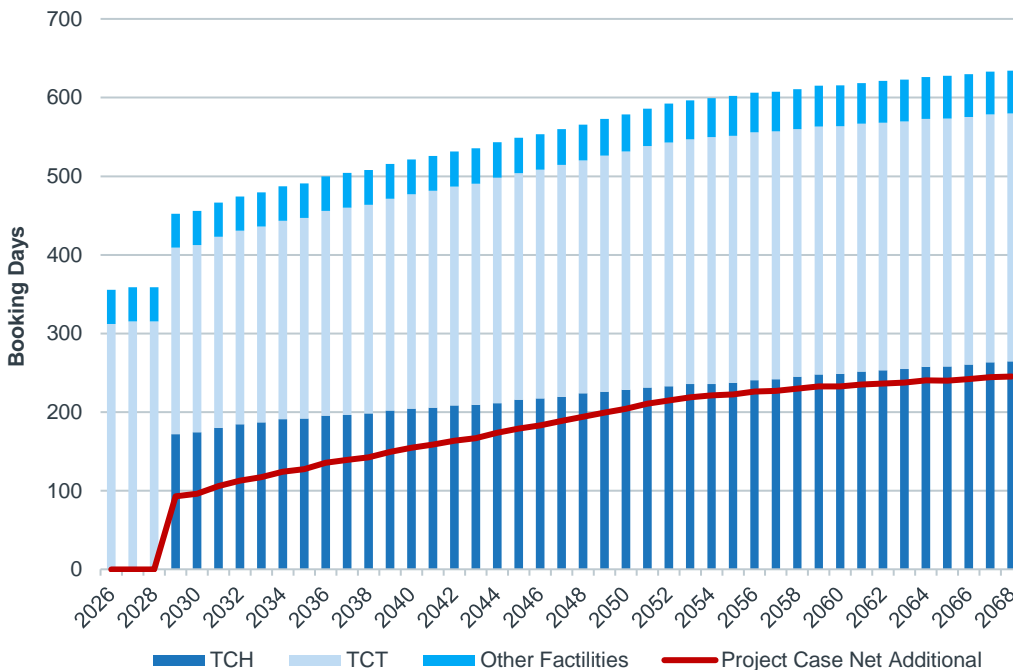
**Figure A. 5. Project Case Without Black-Box Space, Performing Arts Event Attendance, FY2026 to FY2068**



Source: AEC

Fewer performances without the black-box performance space will also lead to fewer booking days at the TCH. Without the black-box performance space, Townsville is expected to host approximately 452 booking days in FY2029, three fewer booking days than with the black-box performance space and 93 booking days more than under the Base Case. The TCH is expected to host 172 of the 452 booking days (38.0%) while the TCT is expected to host 237 (52.4%) and 43 (9.5%) are expected to be hosted by other venues. By FY2068, Townsville is expected to host 634 booking days, six booking days fewer than with the black-box performance space and 245 booking days more than under the Base Case. TCH is expected to host 265 booking days (41.7% of total performances), the TCT is expected to host 315 booking days (49.7%), and 55 booking days (8.6%) are expected to be held in other venues.

**Figure A. 6. Project Case Without Black-Box Space, Booking Days Demand, FY2026 to FY2068**



Source: AEC.

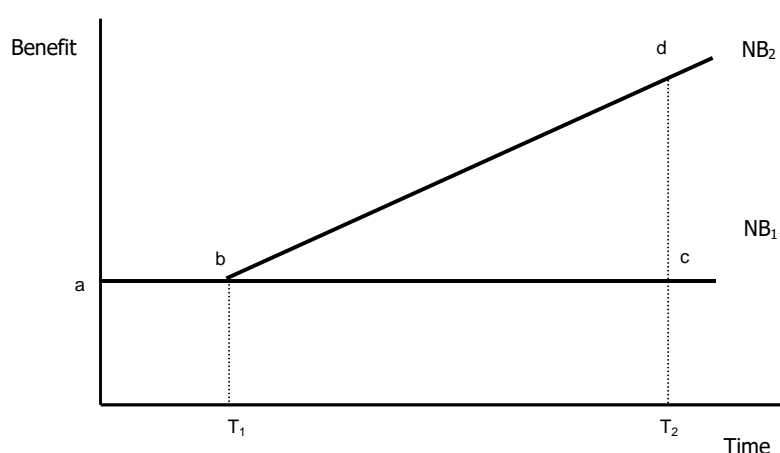
## APPENDIX B: CBA METHODOLOGY

### STEP 1: DEFINE THE SCOPE AND BOUNDARY

To enable a robust determination of the net benefits of undertaking a given project, it is necessary to specify base case and alternative case scenarios. The base case scenario represents the ‘without project’ scenario and the alternative or ‘with project’ scenario examines the impact with the project in place.

The base case (without) scenario is represented by line  $NB_1$  (bc) over time  $T_1$  to  $T_2$  in the figure below. The investment in the project at time  $T_1$  is likely to generate a benefit, which is represented by line  $NB_2$  (bd). Therefore the net benefit flowing from investment in the project is identified by calculating the area (bcd) between  $NB_1$  and  $NB_2$ .

**Figure B. 1. With and Without Scenarios**



Source: AEC

### STEP 2: IDENTIFY COSTS AND BENEFITS

A comprehensive quantitative specification of the benefits and costs included in the evaluation and their various timings is required and includes a clear outline of all major underlying assumptions. These impacts, both positive and negative, are then tabulated and where possible valued in dollar terms.

Some impacts may not be quantifiable. Where this occurs the impacts and their respective magnitudes will be examined qualitatively for consideration in the overall analysis.

Financing costs are not included in a CBA. As a method of project appraisal, CBA examines a project’s profitability independently of the terms on which debt finance is arranged. This does not mean, however, that the cost of capital is not considered in CBA, as the capital expenses are included in the year in which the transaction occurs, and the discount rate (discussed below in Step 5) should be selected to provide a good indication of the opportunity cost of funds, as determined by the capital market.

### STEP 3: QUANTIFY AND VALUE COSTS AND BENEFITS

CBA attempts to measure the value of all costs and benefits that are expected to result from the activity in economic terms. It includes estimating costs and benefits that are ‘unpriced’ and not the subject of normal market transactions but which nevertheless entail the use of real resources. These attributes are referred to as ‘non-market’ goods or impacts. In each of these cases, quantification of the effects in money terms is an important part of the evaluation.

However, projects frequently have non-market impacts that are difficult to quantify. Where the impact does not have a readily identifiable dollar value, proxies and other measures should be developed as these issues represent real costs and benefits.

One commonly used method of approximating values for non-market impacts is 'benefit transfer'. Benefit transfer (BT) means taking already calculated values from previously conducted studies and applying them to different study sites and situations. In light of the significant costs and technical skills needed in using the methodologies outlined in the table above, for many policy makers utilising BT techniques can provide an adequate solution.

Context is extremely important when deciding which values to transfer and from where. Factors such as population, number of households, and regional characteristics should be considered when undertaking benefit transfer. For example, as population density increases over time, individual households may value nearby open space and parks more highly. Other factors to be considered include, depending on the location of the original study, utilising foreign exchange rates, demographic data, and respective inflation rates.

Benefit transfer should only be regarded as an approximation. Transferring values from similar regions with similar markets is important, and results can be misleading if values are transferred between countries that have starkly different economies (for example a benefit transfer from the Solomon Islands to Vancouver would likely have only limited applicability). However, sometimes only an indicative value for environmental assets is all that is required.

#### STEP 4: TABULATE ANNUAL COSTS AND BENEFITS

All identified and quantified benefits and costs are tabulated to identify where and how often they occur. Tabulation provides an easy method for checking that all the issues and outcomes identified have been addressed and provides a picture of the flow of costs, benefits and their sources.

#### STEP 5: CALCULATE THE NET BENEFIT IN DOLLAR TERMS

As costs and benefits are specified over time it is necessary to reduce the stream of benefits and costs to present values. The present value concept is based on the time value of money – the idea that a dollar received today is worth more than a dollar to be received in the future. The present value of a cash flow is the equivalent value of the future cashflow should the entire cashflow be received today. The time value of money is determined by the given discount rate to enable the comparison of options by a common measure.

The selection of appropriate discount rates is of particular importance because they apply to much of the decision criteria and consequently the interpretation of results. The higher the discount rate, the less weight or importance is placed on future cash flows.

A base discount rate of 7% is commonly used to represent the minimum rate of return, in line with Australian Government and State Government guidelines. As all values used in the CBA are in real terms, the discount rate does not incorporate inflation (i.e., it is a real discount rate, as opposed to a nominal discount rate).

To assess the sensitivity of the project to the discount rate used, discount rates either side of the base discount rate (7%) are also examined (4% and 10%, in line with Australian Government and State Government guidelines).

The formula for determining the present value is:

$$PV = \frac{FV_n}{(1+r)^n}$$

Where:

$PV$  = present value today

$FV$  = future value  $n$  periods from now

$r$  = discount rate per period

$n$  = number of periods

Extending this to a series of cash flows the present value is calculated as:

$$PV = \frac{FV_1}{(1+r)^1} + \frac{FV_2}{(1+r)^2} + \dots + \frac{FV_n}{(1+r)^n}$$



Once the stream of costs and benefits have been reduced to their present values the Net Present Value (NPV) can be calculated as the difference between the present value of benefits and present value of costs. If the present value of benefits is greater than the present value of costs then the option or project would have a net economic benefit.

In addition to the NPV, the internal rate of return (IRR) and benefit-cost ratio (BCR) can provide useful information regarding the attractiveness of a project. The IRR provides an estimate of the discount rate at which the NPV of the project equals zero, i.e., it represents the maximum WACC at which the project would be deemed desirable. However, in terms of whether a project is considered desirable or not, the IRR and BCR will always return the same result as the NPV decision criterion.

## STEP 6: SENSITIVITY ANALYSIS

Sensitivity analysis allows for the testing of the key assumptions and the identification of the critical variables within the analysis to gain greater insight into the drivers to the case being examined.

A series of Monte Carlo analyses has been conducted in order to test the sensitivity of the model outputs to changes in key variables. Monte Carlo simulation is a computerised technique that provides decision-makers with a range of possible outcomes and the probabilities they will occur for any choice of action. Monte Carlo simulation works by building models of possible results by substituting a range of values – the probability distribution – for any factor that has inherent uncertainty. It then calculates results over and over, each time using a different set of random values from the probability functions. The outputs from Monte Carlo simulation are distributions of possible outcome values.

During a Monte Carlo simulation, values are sampled at random from the input probability distributions. Each set of samples is called an iteration, and the resulting outcome from that sample is recorded. Monte Carlo simulation does this hundreds or thousands of times, and the result is a probability distribution of possible outcomes. In this way, Monte Carlo simulation provides a comprehensive view of what may happen. It describes what could happen and how likely it is to happen.

## APPENDIX C: CBA RESULTS

This Appendix provides a breakdown of CBA results for the Base Case and Project Case scenarios for each site option. In understanding the relative economic merits of the Project Case scenarios, the Base Case results should be subtracted from the Project Case results for each site option (this is presented in the 'Incremental Change of Project Case Scenarios from Base Case' section below).

### BASE CASE

Table C. 1. CBA Results – Base Case

Input	4% Discount Rate	7% Discount Rate	10% Discount Rate
<b>Costs (Present Value, \$M)</b>			
Capital Expenditure	\$0.0	\$0.0	\$0.0
Lifecycle/ Renewal Capital Expenditure	\$11.6	\$6.2	\$3.7
Operations and Maintenance Expenditure	\$44.9	\$28.1	\$19.4
<b>Total Costs</b>	<b>\$56.5</b>	<b>\$34.3</b>	<b>\$23.0</b>
<b>Benefits (Present Value, \$M)</b>			
Facility Revenue	\$25.4	\$15.9	\$10.9
Facility Employee Benefits	\$6.4	\$4.0	\$2.7
Event Organiser/ Performer Profit	\$16.5	\$10.2	\$7.0
Induced Recreational Spend of Patrons	\$4.1	\$2.5	\$1.7
Induced Visitor Spend	\$31.3	\$18.9	\$12.6
Use Benefits	\$58.3	\$36.2	\$24.8
Non-Use Benefits	\$98.9	\$61.9	\$42.7
<b>Total Benefits</b>	<b>\$240.9</b>	<b>\$149.7</b>	<b>\$102.5</b>
<b>Summary</b>			
<b>Net Present Value (\$M)</b>	<b>\$184.3</b>	<b>\$115.4</b>	<b>\$79.5</b>
<b>Benefit Cost Ratio</b>	<b>4.26</b>	<b>4.36</b>	<b>4.45</b>

Source: AEC.

## PROJECT CASE SCENARIOS

### Full Facility Development

**Table C. 2. CBA Results – The Hive, Full Facility Development**

Input	4% Discount Rate	7% Discount Rate	10% Discount Rate
<b>Costs (Present Value, \$M)</b>			
Capital Expenditure	\$156.1	\$140.3	\$126.4
Lifecycle/ Renewal Capital Expenditure	\$46.8	\$23.9	\$12.9
Operations and Maintenance Expenditure	\$146.8	\$86.3	\$55.9
<b>Total Costs</b>	<b>\$349.8</b>	<b>\$250.4</b>	<b>\$195.2</b>
<b>Benefits (Present Value, \$M)</b>			
Facility Revenue	\$104.4	\$59.9	\$38.0
Facility Employee Benefits	\$13.0	\$7.8	\$5.2
Event Organiser/ Performer Profit	\$28.9	\$16.9	\$11.0
Induced Recreational Spend of Patrons	\$7.0	\$4.1	\$2.7
Induced Visitor Spend	\$62.4	\$36.1	\$23.1
Use Benefits	\$106.6	\$62.5	\$40.6
Non-Use Benefits	\$166.7	\$99.2	\$65.2
<b>Total Benefits</b>	<b>\$489.0</b>	<b>\$286.4</b>	<b>\$185.7</b>
<b>Summary</b>			
<b>Net Present Value (\$M)</b>	<b>\$139.2</b>	<b>\$36.0</b>	<b>-\$9.5</b>
<b>Benefit Cost Ratio</b>	<b>1.40</b>	<b>1.14</b>	<b>0.95</b>

Source: AEC.

**Table C. 3. CBA Results – The Strand, Full Facility Development**

Input	4% Discount Rate	7% Discount Rate	10% Discount Rate
<b>Costs (Present Value, \$M)</b>			
Capital Expenditure	\$162.5	\$145.1	\$130.1
Lifecycle/ Renewal Capital Expenditure	\$46.9	\$23.9	\$12.9
Operations and Maintenance Expenditure	\$147.6	\$86.8	\$56.1
<b>Total Costs</b>	<b>\$357.0</b>	<b>\$255.8</b>	<b>\$199.1</b>
<b>Benefits (Present Value, \$M)</b>			
Facility Revenue	\$104.4	\$59.9	\$38.0
Facility Employee Benefits	\$13.0	\$7.8	\$5.2
Event Organiser/ Performer Profit	\$28.9	\$16.9	\$11.0
Induced Recreational Spend of Patrons	\$7.0	\$4.1	\$2.7
Induced Visitor Spend	\$62.4	\$36.1	\$23.1
Use Benefits	\$106.6	\$62.5	\$40.6
Non-Use Benefits	\$166.7	\$99.2	\$65.2
<b>Total Benefits</b>	<b>\$489.0</b>	<b>\$286.4</b>	<b>\$185.7</b>
<b>Summary</b>			
<b>Net Present Value (\$M)</b>	<b>\$132.0</b>	<b>\$30.7</b>	<b>-\$13.4</b>
<b>Benefit Cost Ratio</b>	<b>1.37</b>	<b>1.12</b>	<b>0.93</b>

Source: AEC.

Table C. 4. CBA Results – Dean Street, Full Facility Development

Input	4% Discount Rate	7% Discount Rate	10% Discount Rate
<b>Costs (Present Value, \$M)</b>			
Capital Expenditure	\$161.1	\$144.8	\$130.5
Lifecycle/ Renewal Capital Expenditure	\$46.9	\$23.9	\$13.0
Operations and Maintenance Expenditure	\$147.0	\$86.4	\$55.9
<b>Total Costs</b>	<b>\$355.0</b>	<b>\$255.1</b>	<b>\$199.4</b>
<b>Benefits (Present Value, \$M)</b>			
Facility Revenue	\$104.4	\$59.9	\$38.0
Facility Employee Benefits	\$13.0	\$7.8	\$5.2
Event Organiser/ Performer Profit	\$28.9	\$16.9	\$11.0
Induced Recreational Spend of Patrons	\$6.4	\$3.8	\$2.5
Induced Visitor Spend	\$62.4	\$36.1	\$23.1
Use Benefits	\$106.6	\$62.5	\$40.6
Non-Use Benefits	\$166.7	\$99.2	\$65.2
<b>Total Benefits</b>	<b>\$488.4</b>	<b>\$286.1</b>	<b>\$185.5</b>
<b>Summary</b>			
<b>Net Present Value (\$M)</b>	<b>\$133.4</b>	<b>\$31.0</b>	<b>-\$13.9</b>
<b>Benefit Cost Ratio</b>	<b>1.38</b>	<b>1.12</b>	<b>0.93</b>

Source: AEC.

## Excluding Black-Box

Table C. 5. CBA Results – The Hive, Excluding Black-Box

Input	4% Discount Rate	7% Discount Rate	10% Discount Rate
<b>Costs (Present Value, \$M)</b>			
Capital Expenditure	\$139.2	\$125.1	\$112.8
Lifecycle/ Renewal Capital Expenditure	\$43.4	\$22.2	\$12.1
Operations and Maintenance Expenditure	\$141.5	\$83.2	\$53.9
<b>Total Costs</b>	<b>\$324.2</b>	<b>\$230.5</b>	<b>\$178.7</b>
<b>Benefits (Present Value, \$M)</b>			
Facility Revenue	\$102.9	\$59.0	\$37.4
Facility Employee Benefits	\$13.0	\$7.8	\$5.1
Event Organiser/ Performer Profit	\$28.7	\$16.8	\$10.9
Induced Recreational Spend of Patrons	\$7.0	\$4.1	\$2.7
Induced Visitor Spend	\$62.4	\$36.1	\$23.1
Use Benefits	\$105.9	\$62.1	\$40.3
Non-Use Benefits	\$166.7	\$99.2	\$65.2
<b>Total Benefits</b>	<b>\$486.6</b>	<b>\$285.1</b>	<b>\$184.9</b>
<b>Summary</b>			
<b>Net Present Value (\$M)</b>	<b>\$162.4</b>	<b>\$54.6</b>	<b>\$6.2</b>
<b>Benefit Cost Ratio</b>	<b>1.50</b>	<b>1.24</b>	<b>1.03</b>

Source: AEC.

Table C. 6. CBA Results – The Strand, Excluding Black-Box

Input	4% Discount Rate	7% Discount Rate	10% Discount Rate
<b>Costs (Present Value, \$M)</b>			
Capital Expenditure	\$137.5	\$122.8	\$110.1
Lifecycle/ Renewal Capital Expenditure	\$41.9	\$21.4	\$11.6
Operations and Maintenance Expenditure	\$139.8	\$82.2	\$53.3
<b>Total Costs</b>	<b>\$319.3</b>	<b>\$226.5</b>	<b>\$175.0</b>
<b>Benefits (Present Value, \$M)</b>			
Facility Revenue	\$102.9	\$59.0	\$37.4
Facility Employee Benefits	\$13.0	\$7.8	\$5.1
Event Organiser/ Performer Profit	\$28.7	\$16.8	\$10.9
Induced Recreational Spend of Patrons	\$7.0	\$4.1	\$2.7
Induced Visitor Spend	\$62.4	\$36.1	\$23.1
Use Benefits	\$105.9	\$62.1	\$40.3
Non-Use Benefits	\$166.7	\$99.2	\$65.2
<b>Total Benefits</b>	<b>\$486.6</b>	<b>\$285.1</b>	<b>\$184.9</b>
<b>Summary</b>			
<b>Net Present Value (\$M)</b>	<b>\$167.2</b>	<b>\$58.6</b>	<b>\$9.9</b>
<b>Benefit Cost Ratio</b>	<b>1.52</b>	<b>1.26</b>	<b>1.06</b>

Source: AEC.

Table C. 7. CBA Results – Dean Street, Excluding Black-Box

Input	4% Discount Rate	7% Discount Rate	10% Discount Rate
<b>Costs (Present Value, \$M)</b>			
Capital Expenditure	\$140.5	\$126.3	\$113.8
Lifecycle/ Renewal Capital Expenditure	\$42.8	\$21.9	\$11.9
Operations and Maintenance Expenditure	\$141.3	\$83.1	\$53.8
<b>Total Costs</b>	<b>\$324.6</b>	<b>\$231.2</b>	<b>\$179.5</b>
<b>Benefits (Present Value, \$M)</b>			
Facility Revenue	\$102.9	\$59.0	\$37.4
Facility Employee Benefits	\$13.0	\$7.8	\$5.1
Event Organiser/ Performer Profit	\$28.7	\$16.8	\$10.9
Induced Recreational Spend of Patrons	\$6.4	\$3.8	\$2.5
Induced Visitor Spend	\$62.4	\$36.1	\$23.1
Use Benefits	\$105.9	\$62.1	\$40.3
Non-Use Benefits	\$166.7	\$99.2	\$65.2
<b>Total Benefits</b>	<b>\$486.0</b>	<b>\$284.7</b>	<b>\$184.7</b>
<b>Summary</b>			
<b>Net Present Value (\$M)</b>	<b>\$161.4</b>	<b>\$53.5</b>	<b>\$5.2</b>
<b>Benefit Cost Ratio</b>	<b>1.50</b>	<b>1.23</b>	<b>1.03</b>

Source: AEC.

## INCREMENTAL CHANGE OF PROJECT CASE SCENARIOS FROM BASE CASE

### Full Facility Development

**Table C. 8. CBA Results – The Hive, Incremental Change from the Base Case, Full Facility Development**

Input	4% Discount Rate	7% Discount Rate	10% Discount Rate
<b>Costs (Present Value, \$M)</b>			
Capital Expenditure	\$156.1	\$140.3	\$126.4
Lifecycle/ Renewal Capital Expenditure	\$35.2	\$17.6	\$9.3
Operations and Maintenance Expenditure	\$102.0	\$58.2	\$36.5
<b>Total Costs</b>	<b>\$293.3</b>	<b>\$216.1</b>	<b>\$172.2</b>
<b>Benefits (Present Value, \$M)</b>			
Facility Revenue	\$79.0	\$44.0	\$27.0
Facility Employee Benefits	\$6.6	\$3.8	\$2.4
Event Organiser/ Performer Profit	\$12.4	\$6.7	\$4.0
Induced Recreational Spend of Patrons	\$3.0	\$1.6	\$1.0
Induced Visitor Spend	\$31.1	\$17.2	\$10.5
Use Benefits	\$48.3	\$26.2	\$15.7
Non-Use Benefits	\$67.8	\$37.2	\$22.5
<b>Total Benefits</b>	<b>\$248.2</b>	<b>\$136.7</b>	<b>\$83.2</b>
<b>Summary</b>			
<b>Net Present Value (\$M)</b>	<b>-\$45.1</b>	<b>-\$79.4</b>	<b>-\$89.0</b>
<b>Benefit Cost Ratio</b>	<b>0.85</b>	<b>0.63</b>	<b>0.48</b>

Source: AEC.

**Table C. 9. CBA Results – The Strand, Incremental Change from the Base Case, Full Facility Development**

Input	4% Discount Rate	7% Discount Rate	10% Discount Rate
<b>Costs (Present Value, \$M)</b>			
Capital Expenditure	\$162.5	\$145.1	\$130.1
Lifecycle/ Renewal Capital Expenditure	\$35.2	\$17.6	\$9.2
Operations and Maintenance Expenditure	\$102.8	\$58.7	\$36.8
<b>Total Costs</b>	<b>\$300.5</b>	<b>\$221.4</b>	<b>\$176.1</b>
<b>Benefits (Present Value, \$M)</b>			
Facility Revenue	\$79.0	\$44.0	\$27.0
Facility Employee Benefits	\$6.6	\$3.8	\$2.4
Event Organiser/ Performer Profit	\$12.4	\$6.7	\$4.0
Induced Recreational Spend of Patrons	\$3.0	\$1.6	\$1.0
Induced Visitor Spend	\$31.1	\$17.2	\$10.5
Use Benefits	\$48.3	\$26.2	\$15.7
Non-Use Benefits	\$67.8	\$37.2	\$22.5
<b>Total Benefits</b>	<b>\$248.2</b>	<b>\$136.7</b>	<b>\$83.2</b>
<b>Summary</b>			
<b>Net Present Value (\$M)</b>	<b>-\$52.3</b>	<b>-\$84.7</b>	<b>-\$92.9</b>
<b>Benefit Cost Ratio</b>	<b>0.83</b>	<b>0.62</b>	<b>0.47</b>

Source: AEC.

Table C. 10. CBA Results – Dean Street, Incremental Change from the Base Case, Full Facility Development

Input	4% Discount Rate	7% Discount Rate	10% Discount Rate
<b>Costs (Present Value, \$M)</b>			
Capital Expenditure	\$161.1	\$144.8	\$130.5
Lifecycle/ Renewal Capital Expenditure	\$35.2	\$17.7	\$9.3
Operations and Maintenance Expenditure	\$102.1	\$58.3	\$36.6
<b>Total Costs</b>	<b>\$298.5</b>	<b>\$220.7</b>	<b>\$176.3</b>
<b>Benefits (Present Value, \$M)</b>			
Facility Revenue	\$79.0	\$44.0	\$27.0
Facility Employee Benefits	\$6.6	\$3.8	\$2.4
Event Organiser/ Performer Profit	\$12.4	\$6.7	\$4.0
Induced Recreational Spend of Patrons	\$2.4	\$1.3	\$0.8
Induced Visitor Spend	\$31.1	\$17.2	\$10.5
Use Benefits	\$48.3	\$26.2	\$15.7
Non-Use Benefits	\$67.8	\$37.2	\$22.5
<b>Total Benefits</b>	<b>\$247.6</b>	<b>\$136.4</b>	<b>\$83.0</b>
<b>Summary</b>			
<b>Net Present Value (\$M)</b>	<b>-\$50.9</b>	<b>-\$84.3</b>	<b>-\$93.4</b>
<b>Benefit Cost Ratio</b>	<b>0.83</b>	<b>0.62</b>	<b>0.47</b>

Source: AEC.

## Excluding Black-Box

Table C. 11. CBA Results – The Hive, Incremental Change from the Base Case, Excluding Black-Box

Input	4% Discount Rate	7% Discount Rate	10% Discount Rate
<b>Costs (Present Value, \$M)</b>			
Capital Expenditure	\$139.2	\$125.1	\$112.8
Lifecycle/ Renewal Capital Expenditure	\$31.7	\$15.9	\$8.4
Operations and Maintenance Expenditure	\$96.7	\$55.1	\$34.5
<b>Total Costs</b>	<b>\$267.7</b>	<b>\$196.1</b>	<b>\$155.7</b>
<b>Benefits (Present Value, \$M)</b>			
Facility Revenue	\$77.5	\$43.1	\$26.5
Facility Employee Benefits	\$6.6	\$3.8	\$2.4
Event Organiser/ Performer Profit	\$12.2	\$6.6	\$3.9
Induced Recreational Spend of Patrons	\$2.9	\$1.6	\$1.0
Induced Visitor Spend	\$31.1	\$17.2	\$10.5
Use Benefits	\$47.6	\$25.8	\$15.5
Non-Use Benefits	\$67.8	\$37.2	\$22.5
<b>Total Benefits</b>	<b>\$245.7</b>	<b>\$135.4</b>	<b>\$82.3</b>
<b>Summary</b>			
<b>Net Present Value (\$M)</b>	<b>-\$21.9</b>	<b>-\$60.8</b>	<b>-\$73.3</b>
<b>Benefit Cost Ratio</b>	<b>0.92</b>	<b>0.69</b>	<b>0.53</b>

Source: AEC.

Table C. 12. CBA Results – The Strand, Incremental Change from the Base Case, Excluding Black-Box

Input	4% Discount Rate	7% Discount Rate	10% Discount Rate
<b>Costs (Present Value, \$M)</b>			
Capital Expenditure	\$137.5	\$122.8	\$110.1
Lifecycle/ Renewal Capital Expenditure	\$30.3	\$15.2	\$8.0
Operations and Maintenance Expenditure	\$95.0	\$54.1	\$33.9
<b>Total Costs</b>	<b>\$262.8</b>	<b>\$192.1</b>	<b>\$152.0</b>
<b>Benefits (Present Value, \$M)</b>			
Facility Revenue	\$77.5	\$43.1	\$26.5
Facility Employee Benefits	\$6.6	\$3.8	\$2.4
Event Organiser/ Performer Profit	\$12.2	\$6.6	\$3.9
Induced Recreational Spend of Patrons	\$2.9	\$1.6	\$1.0
Induced Visitor Spend	\$31.1	\$17.2	\$10.5
Use Benefits	\$47.6	\$25.8	\$15.5
Non-Use Benefits	\$67.8	\$37.2	\$22.5
<b>Total Benefits</b>	<b>\$245.7</b>	<b>\$135.4</b>	<b>\$82.3</b>
<b>Summary</b>			
<b>Net Present Value (\$M)</b>	<b>-\$17.1</b>	<b>-\$56.8</b>	<b>-\$69.6</b>
<b>Benefit Cost Ratio</b>	<b>0.93</b>	<b>0.70</b>	<b>0.54</b>

Source: AEC.

Table C. 13. CBA Results – Dean Street, Incremental Change from the Base Case, Excluding Black-Box

Input	4% Discount Rate	7% Discount Rate	10% Discount Rate
<b>Costs (Present Value, \$M)</b>			
Capital Expenditure	\$140.5	\$126.3	\$113.8
Lifecycle/ Renewal Capital Expenditure	\$31.1	\$15.6	\$8.2
Operations and Maintenance Expenditure	\$96.4	\$55.0	\$34.4
<b>Total Costs</b>	<b>\$268.1</b>	<b>\$196.9</b>	<b>\$156.5</b>
<b>Benefits (Present Value, \$M)</b>			
Facility Revenue	\$77.5	\$43.1	\$26.5
Facility Employee Benefits	\$6.6	\$3.8	\$2.4
Event Organiser/ Performer Profit	\$12.2	\$6.6	\$3.9
Induced Recreational Spend of Patrons	\$2.4	\$1.3	\$0.8
Induced Visitor Spend	\$31.1	\$17.2	\$10.5
Use Benefits	\$47.6	\$25.8	\$15.5
Non-Use Benefits	\$67.8	\$37.2	\$22.5
<b>Total Benefits</b>	<b>\$245.1</b>	<b>\$135.0</b>	<b>\$82.1</b>
<b>Summary</b>			
<b>Net Present Value (\$M)</b>	<b>-\$23.0</b>	<b>-\$61.8</b>	<b>-\$74.3</b>
<b>Benefit Cost Ratio</b>	<b>0.91</b>	<b>0.69</b>	<b>0.52</b>

Source: AEC.



## APPENDIX D: INPUT-OUTPUT METHODOLOGY

### INPUT-OUTPUT MODEL OVERVIEW

Input-Output analysis demonstrates inter-industry relationships in an economy, depicting how the output of one industry is purchased by other industries, households, the government and external parties (i.e. exports), as well as expenditure on other factors of production such as labour, capital and imports. Input-Output analysis shows the direct and indirect (flow-on) effects of one sector on other sectors and the general economy. As such, Input-Output modelling can be used to demonstrate the economic contribution of a sector on the overall economy and how much the economy relies on this sector or to examine a change in final demand of any one sector and the resultant change in activity of its supporting sectors.

The economic contribution can be traced through the economic system via:

- **Initial stimulus (direct) impacts**, which represent the economic activity of the industry directly experiencing the stimulus.
- **Flow-on impacts**, which are disaggregated to:
  - **Production induced effects (type I flow-on)**, which comprise the effects from:
    - Direct expenditure on goods and services by the industry experiencing the stimulus (direct suppliers to the industry), known as the first round or direct requirements effects.
    - The second and subsequent round effects of increased purchases by suppliers in response to increased sales, known as the industry support effects.
  - **Household consumption effects (type II flow-on)**, which represent the consumption induced activity from additional household expenditure on goods and services resulting from additional wages and salaries being paid within the economic system.

These effects can be identified through the examination of four types of impacts:

- **Output:** Refers to the gross value of goods and services transacted, including the costs of goods and services used in the development and provision of the final product. Output typically overstates the economic impacts as it counts all goods and services used in one stage of production as an input to later stages of production, hence counting their contribution more than once.
- **Gross product:** Refers to the value of output after deducting the cost of goods and services inputs in the production process. Gross product (e.g., Gross Regional Product) defines a true net economic contribution and is subsequently the preferred measure for assessing economic impacts.
- **Income:** Measures the level of wages and salaries paid to employees of the industry under consideration and to other industries benefiting from the project.
- **Employment:** Refers to the part-time and full-time employment positions generated by the economic shock, both directly and indirectly through flow-on activity, and is expressed in terms of full time equivalent (FTE) positions.

Input-Output multipliers can be derived from open (Type I) Input-Output models or closed (Type II) models. Open models show the direct effects of spending in a particular industry as well as the indirect or flow-on (industrial support) effects of additional activities undertaken by industries increasing their activity in response to the direct spending.

Closed models re-circulate the labour income earned as a result of the initial spending through other industry and commodity groups to estimate consumption induced effects (or impacts from increased household consumption).

## MODEL DEVELOPMENT

Multipliers used in this assessment are derived from sub-regional transaction tables developed specifically for this project. The process of developing a sub-regional transaction table involves developing regional estimates of gross production and purchasing patterns based on a parent table, in this case, the 2018/19 Australian transaction table (ABS, 2021a).

Estimates of gross production (by industry) in the study areas were developed based on the percent contribution to employment (by place of work) of the study areas to the Australian economy (ABS, 2012; ABS, 2017; ABS, 2023b; DoESE, 2023), and applied to Australian gross output identified in the 2018/19 Australian table.

Industry purchasing patterns within the study area were estimated using a Flegg Location Quotient approach, as described in Flegg *et al.* (2021), with a fixed degree of convexity applied to the regional size scalar. Regional final demand estimates (except exports) developed based on the regional inter-industry sales estimated using the Flegg Location Quotient relative to national inter-industry sales and final demand estimates for each industry (noting regional exports are assumed to reflect the remainder of total uses).

Employment estimates were rebased from 2018/19 (as used in the Australian national Input-Output transaction tables) to current year values using the Wage Price Index (ABS, 2023c).

## MODELLING ASSUMPTIONS

The key assumptions and limitations of Input-Output analysis include:

- **Lack of supply-side constraints:** The most significant limitation of economic impact analysis using Input-Output multipliers is the implicit assumption that the economy has no supply-side constraints so the supply of each good is perfectly elastic. That is, it is assumed that extra output can be produced in one area without taking resources away from other activities, thus overstating economic impacts. The actual impact is likely to be dependent on the extent to which the economy is operating at or near capacity.
- **Fixed prices:** Constraints on the availability of inputs, such as skilled labour, require prices to act as a rationing device. In assessments using Input-Output multipliers, where factors of production are assumed to be limitless, this rationing response is assumed not to occur. The system is in equilibrium at given prices, and prices are assumed to be unaffected by policy and any crowding out effects are not captured. This is not the case in an economic system subject to external influences.
- **Fixed ratios for intermediate inputs and production (linear production function):** Economic impact analysis using Input-Output multipliers implicitly assumes that there is a fixed input structure in each industry and fixed ratios for production. That is, the input function is generally assumed linear and homogenous of degree one (which implies constant returns to scale and no substitution between inputs). As such, impact analysis using Input-Output multipliers can be seen to describe average effects, not marginal effects. For example, increased demand for a product is assumed to imply an equal increase in production for that product. In reality, however, it may be more efficient to increase imports or divert some exports to local consumption rather than increasing local production by the full amount. Further, it is assumed each commodity (or group of commodities) is supplied by a single industry or sector of production. This implies there is only one method used to produce each commodity and that each sector has only one primary output.
- **No allowance for economies of scope:** The total effect of carrying on several types of production is the sum of the separate effects. This rules out external economies and diseconomies and is known simply as the “additivity assumption”. This generally does not reflect real world operations.
- **No allowance for purchasers’ marginal responses to change:** Economic impact analysis using multipliers assumes that households consume goods and services in exact proportions to their initial budget shares. For example, the household budget share of some goods might increase as household income increases. This equally applies to industrial consumption of intermediate inputs and factors of production.
- **Absence of budget constraints:** Assessments of economic impacts using multipliers that consider consumption induced effects (type two multipliers) implicitly assume that household and government consumption is not subject to budget constraints.

Despite these limitations, Input-Output techniques provide a solid approach for taking account of the inter-relationships between the various sectors of the economy in the short-term and provide useful insight into the quantum of final demand for goods and services, both directly and indirectly, likely to be generated by a project.

In addition to the general limitations of Input-Output analysis, there are three other factors that need to be considered when assessing the outputs of sub-regional transaction table developed using the above approach, namely:

- It is assumed the sub-region has similar technology and demand/ consumption patterns as the parent (Australia) table (e.g. the ratio of employee compensation to employees for each industry is held constant).
- Intra-regional cross-industry purchasing patterns for a given sector vary from the national tables depending on the prominence of the sector in the regional economy compared to its input sectors. Typically, sectors that are more prominent in the region (compared to the national economy) will be assessed as purchasing a higher proportion of imports from input sectors than at the national level, and vice versa.
- The size of the regional economy is assumed to have an inverse relationship with the requirement to import goods/ services to meet its needs (i.e. the smaller the economy, in general the greater the reliance on imports).

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