REPORT TO
GASCOYNE DEVELOPMENT COMMISSION
NOVEMBER 2019

ECONOMIC BENEFITS ASSESSMENT OF EXMOUTH MARINE INFRASTRUCTURE PROJECT

FINAL REPORT

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C O N T E N T S

CONTENTS

EXECUTIVE SUMMARY

Summary of findings

In June 2019, ACIL Allen Consulting ('ACIL Allen') was engaged by the Gascoyne Development Commission ('GDC') to undertake an Options Assessment and Economic Benefit Assessment of options to invest in new marine infrastructure at Exmouth. Exmouth is a town in the Gascoyne region, in the north west of Western Australia, known for its iconic natural and environmental assets including the Ningaloo Reef.

To assist in the task described above, ACIL Allen engaged marine engineering firm BMT Group ('BMT') to provide engineering advice and analysis throughout the engagement. This included the development of initial concept drawings for two options which were selected as the preferred options.

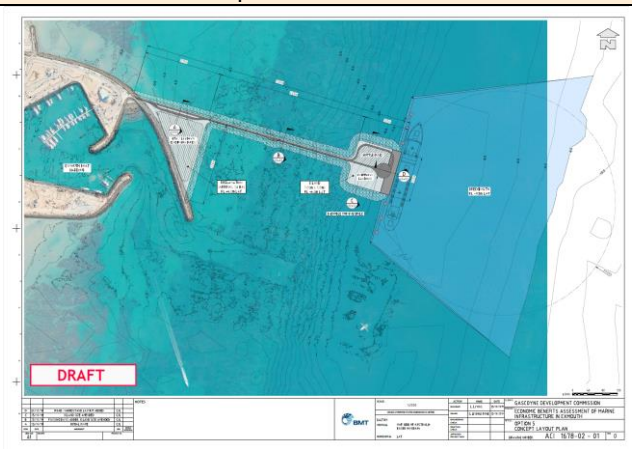
Overall, the study has found that there are likely to be net benefits to Western Australia associated with the provision of new marine infrastructure at Exmouth, in the order of between $128 million and $154.1 million (real 2019 dollars, discounted to present value at seven per cent) over the life of the new infrastructure. In a Benefit Cost Assessment framework, the Benefit Cost Ratio of new infrastructure is estimated to be between 1.994 (higher upfront capital cost option) and 2.525 (lower upfront capital cost option), suggesting the projects represent a sound use of scarce resources across the economy.

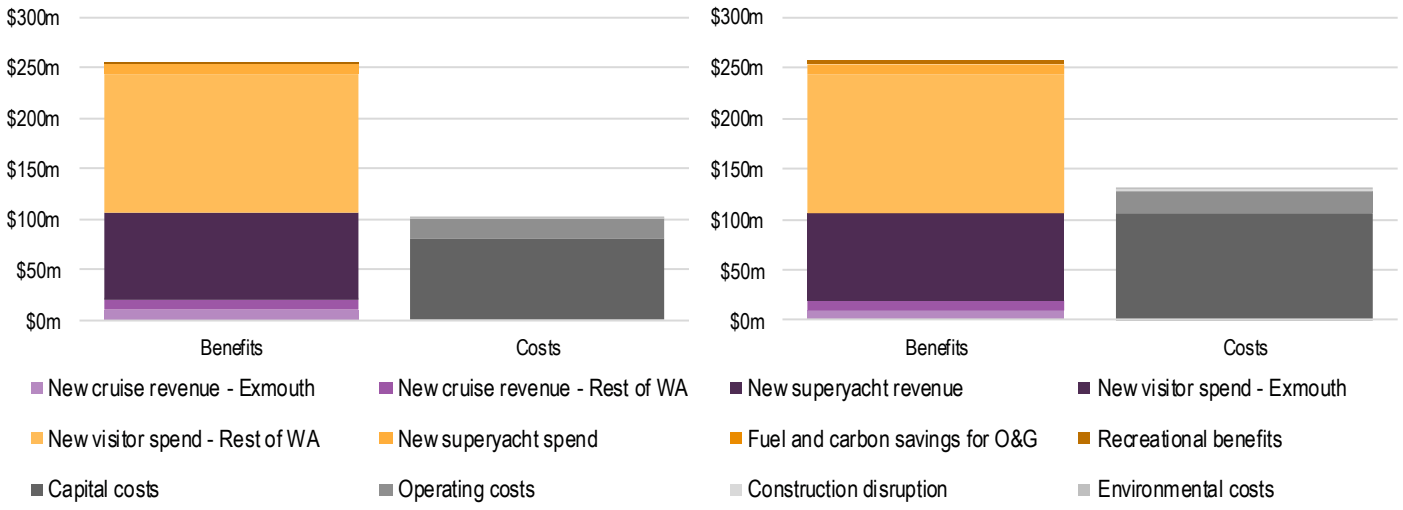
The principal use of the new marine infrastructure is to facilitate cruise vessel-based tourism visitation to the Gascoyne region. Stakeholder feedback suggested development of an adequate infrastructure-based solution would enable the development of a year-round, State-wide cruise itinerary given it is seen as the "missing link" between the northern and southern port destinations in Western Australia. Given this, State-wide cruise vessel-based tourism visitation is also projected to increase as a result of the provision of new infrastructure.

ACIL Allen estimates that nearly 700 full-time equivalent jobs will be created and sustained as a result of the infrastructure. Crucially, it is estimated around 70 of these will be created in the Gascoyne region due to the increased visitor spend and other activities occurring in the region as a result of the infrastructure. The employment benefits are one component of a projected $52 million per annum economic impact across the State enabled by the infrastructure. At a local level, the provision of new marine infrastructure is estimated to provide a boost to the Gascoyne economy equivalent to around 1.2 per cent of the region's Gross Regional Product each year of the project's useful life.

A summary of the engagement outcomes is presented on the next page. The remainder of this Executive Summary provides detail on the process undertaken by ACIL Allen and BMT to reach the final outcomes described above and below.

OPTION 5: ROCK CAUSEWAY PLUS DREDGING Capital cost: $77.6m	OPTION 3: JETTY TO DEPTH Capital cost:$108.3m





Net benefit	BCR	New jobs	Net benefit:	BCR:	New jobs
$154.1m	2.525	663 (WA), 72 (Gascoyne)	$128.0m	1.994	662 (WA), 70 (Gascoyne)

SOURCE: ACIL ALLEN CONSULTING

Situation analysis

The Gascoyne region's total Gross Value Added (GVA) for 2017-18 was $970 million, equating to approximately 0.3 per cent of the WA economy. With few population centres, which themselves have economies built largely on agriculture and tourism, the Gascoyne is the smallest of Western Australia's nine regional economies.

Exmouth, one of the four Local Government Areas that make up the Gascoyne region, is marketed domestically and internationally as part of the Tourism WA marketing region "Australia's Coral Coast".

Total tourism spending in the Coral Coast region reached $979 million in 2015-16, which is estimated to have generated $702 million in GVA to the region's economy. Importantly, this level of tourism spending is estimated to have supported 6,208 direct and indirect FTE jobs across the region. The majority of direct FTE tourism jobs were in "typical" tourism-related industries (eg. accommodation and food services), with the majority of indirect FTE jobs created in "non-typical" tourism-related industries (eg. professional and administrative services).

The seasonal nature of Exmouth's population fluctuates with the peak tourist season. The peak tourist season in Exmouth is March to October. The main tourist attraction for visitors to the Exmouth region is the Ningaloo Marine Park. The region is valued for its remote and self-sufficient recreational and camping regions. Popular activities for tourists in the region include scuba-diving, wildlife watching, boating, fishing, hiking, snorkelling and kayaking. A contributing factor attracting tourists to the

Ningaloo Marine Park is its listing as a UNESCO World Heritage Area. The Ningaloo Marine Park is listed for the outstanding value of the area's diverse and abundant marine life, unique cave fauna and the contrast between the rugged landscapes of the Cape Range and the serene coastline.

The cruise shipping industry is set to play a critical role in the WA Government's desire to increase the value of tourism and attract visitors from interstate and international destinations.

In recognition of the strategic importance of cruise shipping as an economic enabler across WA, a number of regional ports are now exploring ways of attracting cruise ships to their regions, most recently the Port of Broome. A 2018 study completed by ACIL Allen estimated an additional $117 million could be generated for the Broome economy through the additional cruise ship calls that are estimated would be made as a result of the necessary upgrades to the Port of Broome.

The *Western Australian Cruise Shipping Strategic Plan 2012-2020* was developed to *ensure the State's cruise destinations deliver quality experiences for passengers as well as maximising the economic benefit of cruise shipping to Western Australia.* The Strategic Plan outlines a number of strategic weaknesses that need addressing by Government and industry, in order for the industry to realise its potential in the State. These include:

- tourism product is underdeveloped an inadequate to support cruise ship visitation at some regional destinations;
- insufficient regional marine infrastructure to adequately service large cruise vessels;
- seasonal weather conditions impact current cruise itineraries;
- increasing number of WA cruise destinations competing for the same market; and
- cruise lines lack the general awareness of WA's regional destinations in terms of facilities and capabilities.

Since the development of the Strategic Plan, the WA Government has invested in further initiatives to support the cruise shipping industry. These initiatives include hosting the WA Cruise Exchange in June 2019, dredging at the Port of Broome to allow round-the-clock access for cruise ships and upgrades to the Fremantle Passenger Terminal.

Improved marine infrastructure in Exmouth would address a number of the strategic weaknesses outlined by the Strategic Plan that have limited cruise ship visits to Exmouth.

Inadequate marine infrastructure to reliably berth cruise ships has been an issue for Exmouth and the Gascoyne region for decades. More recently, the GDC listed "establishing suitable berthing facilities for cruise ships in Exmouth" as a quick win in its 2014 *Gascoyne Regional Tourism Strategy*.

The Exmouth Boat Harbour has historically been the link between cruise vessels and Exmouth. As it stands, the only way most cruise vessels can access Exmouth is by dropping anchor in the Exmouth Gulf and transhipping their guests to the Exmouth Boat Harbour via tender vessel. This introduces a range of risks to cruise ship visitation to the region, on account of Exmouth's tendency for high winds and challenging tidal conditions. Cruise vessels will only drop anchor in open water when conditions are appropriate.

As a result, there has been a number of missed opportunities for vessels to call at Exmouth in recent years. According to data collated by the Shire of Exmouth, and provided by the GDC, in the seven years to 2019 half of all scheduled cruise visits to Exmouth were aborted. The concern is that over time fewer cruise vessel owners are including Exmouth on their Western Australian itineraries, with just six visits scheduled in the 2018-19 cruise season (which runs October to February). Of these six visits, three were cancelled, and local businesses were provided with just a few hours notice of these cancellations.

This has seen the State Government, through the GDC, resolve to investigate a definitive solution to cruise industry challenges in Exmouth. This Economic Benefits Assessment is part of the initial investigations into a definitive solution.

Options Assessment

As part of the assessment of marine infrastructure at Exmouth, ACIL Allen and BMT Group undertook an Options Assessment. The Options Assessment comprised the following activities.

- A desktop review of **potential sites for an infrastructure solution**, including an assessment of any fatal flaws in identified sites, eliminating sites which were unsuitable due to issues or concerns with their location, environmental impacts or other matters,
- A targeted round of stakeholder consultation, centred on the **identification of uses for the infrastructure** to inform site selection and the basis of design for infrastructure,
- Development of **infrastructure delivery concepts ('the options')** for the selected sites,
- Development and implementation of a Multicriteria Assessment ('MCA') framework, assessment of each option in the framework, and the **identification of two preferred options** for further analysis in the economic benefits assessment framework.

A summary of the Options Assessment, including the two options which were assessed in greater detail in the Economic Benefits Assessment is provided below.

Site selection

From an initial desktop review of previous studies, it emerged there had been some investigation into new or augmented marine infrastructure at four main sites across the region. These were: an expansion at the existing Exmouth Boat Harbour, a site at the Exmouth Light Industrial Area at Mowbowra Creek, the existing Navy Pier to the north of the Exmouth townsite, and a floating dock in the Exmouth Gulf.

These sites were raised with relevant stakeholders during consultation, and were further scrutinised by a more detailed review of previous technical studies. Overall, it emerged the primary drivers for site selection should be:

- All-tide access to navigable water that would allow for reliable berthing of large cruise vessels,
- Any climate protection which may be afforded to users
- Reliable and efficient access to transport infrastructure
- Stakeholder acceptance and any minimisation of impact on environmental and social amenity

Following this review, six definitive sites were considered in an initial high pass filter process. This process examines whether there are any "fatal flaws" associated with the site regardless of any feasible infrastructure solution, based on the priorities and perceptions of stakeholders. The initial six sites are presented in the table below (**Table ES 1**).

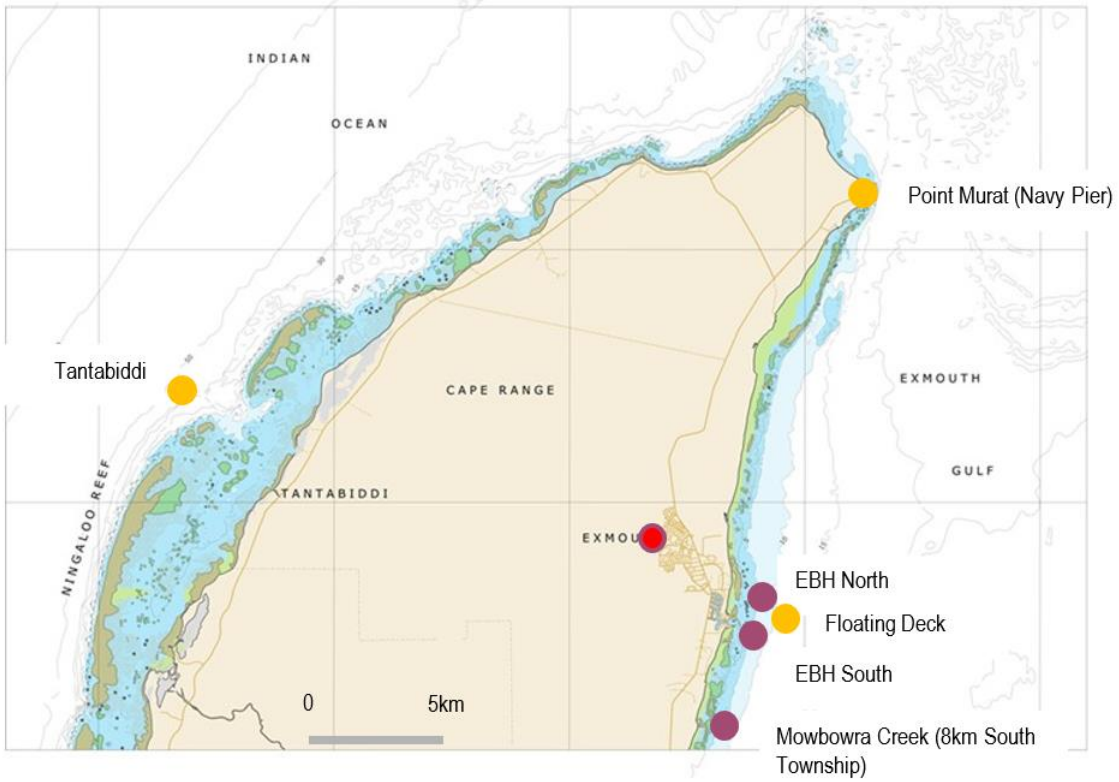
TABLE ES 1 HIGH PASS FILTER SITE SELECTION PROCESS

Site	Discussion
Exmouth Boat Harbour – North	Exmouth Boat Harbour is located close to the town of Exmouth, the boat harbour supports fishing, charter and recreational industries and with large scale resources projects in the region, it supports other marine support services/activities. The southern side of the Exmouth Boat Harbour was recently upgraded in 2018, which included wharf extension, heavy lift facility and upgrade to the southern breakwater. The southern side of the EBH supports commercial and industrial activities and has been identified as potential site for future expansion by the Department of Transport albeit at an early conceptual level.
Exmouth Boat Harbour – South	The northern side of the EBH has a higher focus on more recreational based activities. The northern breakwater, which is approximately 350m in length provides both protection and working platform for building a deep-water marine facility.
Mowbowra Creek	Mowbowra Creek is located 8 km south of Exmouth Town Centre. The land is zoned industrial under the Shire of Exmouth's town planning scheme and is owned by Exmouth Limestone Pty Ltd (EXL). This site has been considered as a potential site by EXL for a deep water barge loading facility and the site was investigated in GDC's Exmouth Deep Water Wharf scoping study. It is also the site proposed in the market-led proposal.

Site	Discussion
Offshore floating dock	The Navy Pier is controlled by the Australian Defence Force and is located at Point Murat, 15 km north of Exmouth. The pier is approximately 135m in length, has a berth face of 35m and is located in the naturally deep part of the Exmouth Gulf.
Navy Pier	The offshore floating deck is located offshore at the Exmouth Boat Harbour. Passengers and cargo will be transferred from the ship unto the deck, then from the deck to land.
Tantabiddi Boat Ramp	The Tantabiddi Boat Launching Facility is located on the west side of the North West Cape and is managed by the Shire of Exmouth. The facility provides access for boat users to the Ningaloo Reef. Based on the stakeholder consultation process, it is understood that an expansion to this facility is currently being considered by the Shire of Exmouth

The location of these sites relative to the Exmouth townsite are presented below (**Figure ES 1**)

FIGURE ES 1 EXMOUTH MARINE INFRASTRUCTURE SITE SELECTION SITES VS EXMOUTH TOWNSITE



SOURCE: BMT GROUP, ACIL ALLEN

NOTE: THIS GRAPHIC WILL BE UPDATED IN THE FINAL REPORT

The desktop review identified fatal flaws with three of the six sites included in the broad consideration of sites. These were:

- Offshore floating dock (unsuitable for cruise industry, limited additional uses)
- Navy Pier (unworkable operating conditions)
- Tantabiddi Boat Ramp (likely environmental impacts exceed acceptable level)

Three sites were selected to progress to a more detailed consideration:

- Exmouth Boat Harbour – North
- Exmouth Boat Harbour – South
- Mobowra Creek

Following a discussion with the Project Steering Committee, it was decided that the floating dock option should continue in the Options Assessment process. This was due to a specific request of State Cabinet to include a floating dock in an assessment of infrastructure options for Exmouth. Given

this, a decision was taken to override the high pass filter process and subject the floating dock to the same scrutiny as infrastructure deliver options at the three sites which did not have fatal flaws.

Identification of uses and infrastructure considerations

Stakeholder consultation identified a list of nine potential use categories for new marine infrastructure at Exmouth. These were:

- Cruise vessels
- Superyachts
- Oil and gas industry support
- Project cargo
- Bulk minerals export
- Horticulture export
- Live animal export
- Australian Border Force support
- Department of Defence vessel support

To assist in the options assessment, the findings of the assessment of potential uses were quantified in a qualitative "star ratings" framework. Each opportunity is assessed on a scale of zero to five with respect to the confidence the project team had in the ability of the use of the infrastructure to deliver both economic value (to the region and to the State), and financial value to the new infrastructure.

The economic value criteria was split into two, with 50 per cent of the score driven by an assessment of the economic value to the region and the remainder by an assessment of the economic value to the State. This was designed to ensure the prioritisation of uses would consider the strategic nature of a new piece of marine infrastructure.

The result of the scoring is a 2x2 matrix for the opportunities, which demonstrates the prospectivity of each use against all other uses. Opportunities which sit in the top right quadrant of the matrix (scoring high on both economic and financial criteria) should be the priority uses for considerations regarding site selection and infrastructure delivery, while those in the bottom left quadrant (scoring low on both economic and financial criteria) should be de-prioritised. Opportunities which sit in the top left quadrant (high financial, low economic) and bottom right quadrant (low financial, high economic) should be secondary to those in the top right, but are important to the overall economic and financial potential of the infrastructure. The matrix plotting the uses presented below (**Figure ES 2**).

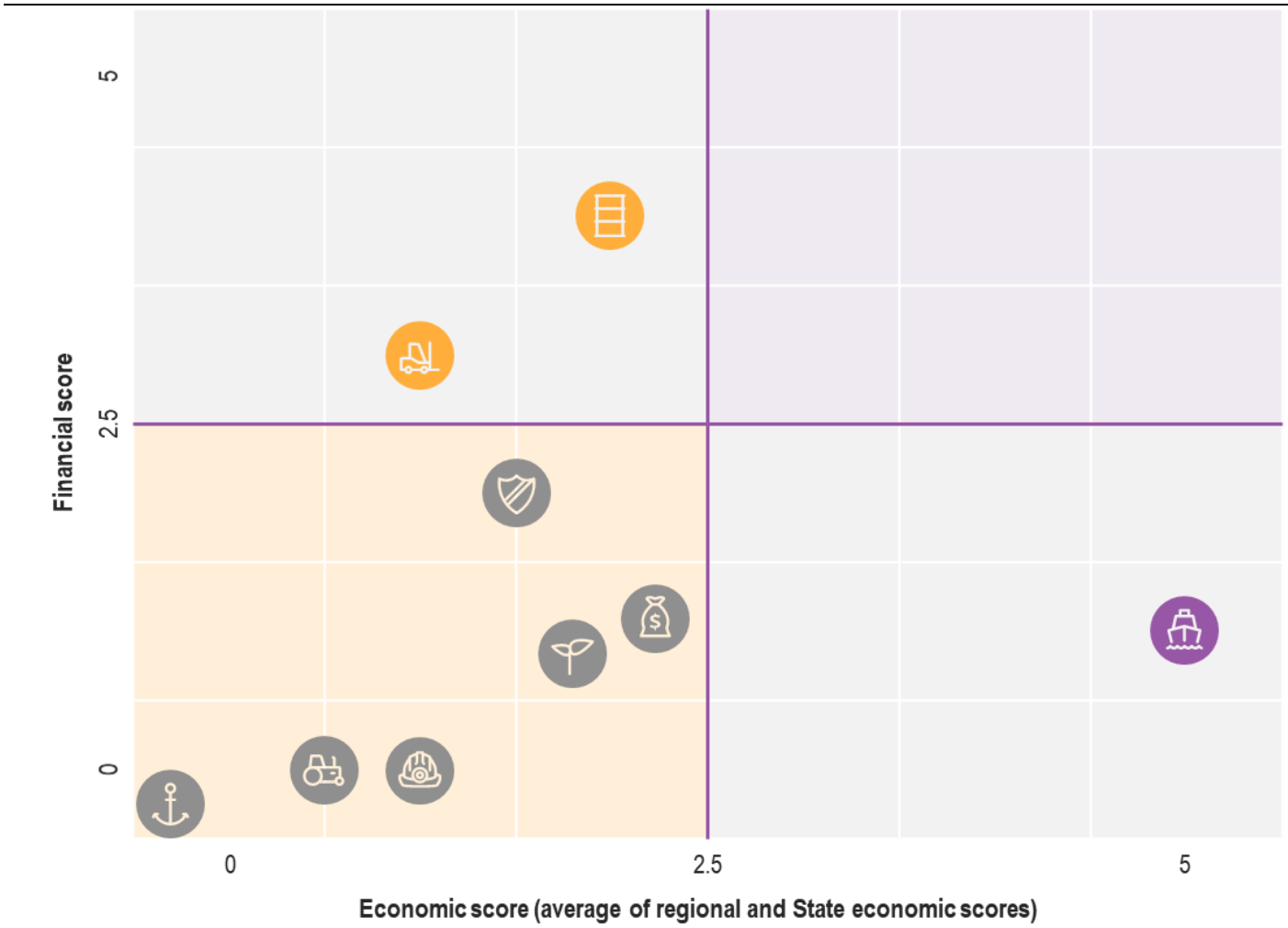
The investigation of potential uses of the infrastructure revealed **cruise industry vessels** should be prioritised in the development of infrastructure options, with secondary considerations being suitability for **oil and gas industry support** and **project cargo** (noting these were primarily identified as being possible financial-based contributors to the facility).

Overall, it emerged the basis of design for new infrastructure that would cater to most – if not all – potential uses in these three grouping was a depth of 9.5 metres LAT, and a wharf interface of at least 120 metres in length. It was noted that there may be some very large cargo vessels that could not access the facility, but breakbulk cargo was secondary consideration against cruise, and a 9.5 metre depth would be suitable for almost all prospective cruise vessels operating in the region.

Following these considerations a long list of options was developed as an input into the Multicriteria Assessment. For the three land-based sites, BMT developed four main infrastructure delivery concepts options. The concepts included:

- 100 per cent rock causeway to required depth of 9.5m to maximise the benefit from the economy of locally available construction material
- Composite rock causeway and jetty to required depth of 9.5m to minimise the additional volumes of rock in deeper water
- Rock causeway and wharf to dredged berthing pocket and turning circle to minimise the structure length and maximise locally available materials

FIGURE ES 2 QUALITATIVE ASSESSMENT OF EMI USES MATRIX



SOURCE: ACIL ALLEN CONSULTING

— Rock causeway with jetty mid section and wharf to dredged berthing pocket and turning circle to minimise structure length and reduce impact on environmental values through disruption of current and wave interactions

Some modest variations on these concepts were also developed for the Exmouth Boat Harbour site, taking stakeholders views with respect to minimisation of environmental impact into account. These included alternative concepts for the wharf infrastructure (ie rockfill versus jetty), and alternative lengths of jetty and rockfill to the base option of an approximate 50/50 split.

In addition, two concepts were developed for the floating dock site. The concepts included:

— A standalone floating dock

— A floating dock linked to fixed rock causeway and jetty infrastructure

The result of the combination of infrastructure solutions and viable sites was the development of a **long list of 23 options** for consideration in the Multicriteria Assessment.

Multicriteria Assessment

To assist in the prioritisation of options, ACIL Allen developed a Multicriteria Assessment ('MCA') framework that sought to rank each option against all other options with respect to the extent to which the option was likely to deliver on a series of assessment criteria. MCA is a commonly used technique as part of an options assessment process, as it seeks to introduce a logical framework for first

determining preferences and then assessing how well options meet preferences compared to all other options on balance across the suite of preferences.

An MCA is a two step process. The first step involves the development of a series of weighted selection criteria, which are intended to reflect the balanced priorities and/or outcomes an investment is seeking to foster. The second step involves scoring each option against each criteria, and then determining an overall score by multiplying the scores by the weights of the criteria.

ACIL Allen has applied a ranking-based scoring system for this MCA, as many of the options prepared represent modest variations on the same concept. This means the weighted score of the MCA represents a weighted ranking of the option against all other options, with the two best ranked (lowest numerical score) options those which are to be subject to more detailed analysis. Further discussion of the scoring system employed is included below.

MCA criteria, weightings and scoring system

The development of selection criteria for an MCA is an important step in the overall Options Assessment process. The determination and subsequent weighting of assessment criteria is the primary opportunity for relevant stakeholder views regarding the priorities of the State Government to be considered when filtering through the high volume of potential ways to address the problem as it has been defined.

The resulting MCA criteria and weightings applied within each of the three headline categories of Economic, Social & Environmental and Financial categories are presented below (**Table ES 2**).

TABLE ES 2 MCA CRITERIA WEIGHTING WITHIN CATEGORIES

Category	Criteria	Final MCA criteria weighting	Discussion
Economic (50% of Category weighting)	Suited to meeting the needs of the cruise industry	25.0%	It was assessed the cruise industry criteria should account for the largest share of the weighting (accounting for the same as the other three criteria combined). However, given the State's preference for additional marine industry development, and the need for this activity to provide a financial benefit to the facility for funding purposes, the multi-user criteria was also considered important.
	Potential to be multi-user	15.0%	
	Likely to advance the development of the Exmouth Marina Precinct	5.0%	
	Likely to promote further economic development in the region	5.0%	
Social & Environmental (30% of Category weighting)	Likely to enhance recreational uses for Exmouth residents	6.0%	The environmental elements of this category were considered the most important as they needed to provide an offset to options which may score similarly on the other criteria in line with the discussion above. From here, it was assessed the positive element of the social criteria (new uses) should be worth more than the criteria limiting impacts given the mandate of the process to investigate a new piece of infrastructure.
	Limited dredging and other direct environmental impacts during construction	10.5%	
	Limited impact on coastal flows	10.5%	
	Limited impact on current Exmouth Boat Harbour operations	3.0%	
Financial (20% of Category weighting)	Upfront capital cost	15.0%	Given the capital cost of the facility was somewhat known, it was given a higher weighting than a subjective assessment of any further investments required. However, where additional investment requirements were a factor it was considered important that this criteria was meaningful enough that it could differentiate options which were similar in other ways.
	Requires limited additional State investment in enabling infrastructure	5.0%	

SOURCE: ACIL ALLEN CONSULTING

Overall, the biggest drivers of the MCA are suitability for the cruise industry, the potential for the facility to be multi-user, and the upfront capital cost (scored as the lowest cost being the best ranked option). When combined, the two environmental impact-based criteria become the second largest

single driver of the MCA outside of the cruise industry suitability ranking. Of lesser importance are criteria related to recreational use, impact on current operations, and additional enabling infrastructure requirements.

MCA scoring and identification of Preferred Options

the MCA scoring was undertaken using a ranking of each option against all other options by the extent to which the option was able to address the criteria. This approach was selected as the scoring as there was limited difference in a number of the options that a traditional sliding scale scoring approach would not have provided the variance in assessment required for an MCA.

In general, the scoring was completed starting with the option which was assessed as having the best prospect of addressing the particular selection criteria, with the ranking proceeding from there. Where there was no identifiable difference in two or more options as the ranking proceeded from first to last, the options were given the same rank and the next best option was given a ranking that reflected the next position in the ranking. For example, if two options were ranked as #1 (and receive a score of one for that criteria), the next best option would receive a rank of #3, not #2 (and receive a score of three for that criteria).

Figure ES 3 presents the scoring of each of the options using the approach to scoring discussed above. The preferred options were the ones with the lowest score as this reflected the options which on balance produced the highest ranking (and lowest numerical score).

The MCA identifies the following two options as the most suited to addressing the balanced criteria of the State Government.

Option 5: Exmouth Boat Harbour North Rock Causeway plus Dredging

This option scored strongly across the main Economic criteria grouping, as well as the Financial criteria, but performed comparatively poorly on the Environmental & Social criteria grouping. With a capital cost of $77.6 million, the option is the second-least expensive of the non-floating dock options, which is primarily a reflection of the comparatively low cost of rockfill options which offsets the additional costs associated with dredging which are not present in other options.

Option 3: Exmouth Boat Harbour North Piled Jetty to Depth

This option scored well across all criteria groupings on average, which is a reflection of the linkage to the northern side of the Exmouth Boat Harbour, plus the minimal environmental impacts associated with the jetty to depth delivery option. However, the option has a capital cost of $108.3 million, placing it in the middle of the cost range (and approximately $31 million more expensive than the other preferred option).

These two Preferred Options were considered in more detail in the Economic Benefits Assessment, which is discussed following the presentation of the MCA results.

FIGURE ES 3 MCA SCORING RESULTS

Criteria	Weight	Exmouth Boat Harbour - North								Exmouth Boat Harbour - South								Mobowra Creek					Floating Dock	
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Suited to meeting the needs of the cruise industry	25.0%	9	9	**9**	9	**1**	1	1	1	13	13	13	13	5	5	5	5	19	19	19	17	17	23	22
Potential to be multi-user	15.0%	13	13	**13**	13	**9**	9	9	9	5	5	5	5	1	1	1	1	19	19	19	17	17	23	22
Likely to advance the development of the Exmouth Marina Precinct	5.0%	1	1	**1**	1	**1**	1	1	1	10	10	10	10	10	10	10	10	19	19	19	19	19	18	9
Likely to promote further economic development in the region	5.0%	5	5	**5**	5	**1**	1	1	1	13	13	13	13	9	9	9	9	19	19	19	17	17	23	22
Likely to enhance recreational uses for Exmouth residents	6.0%	14	9	**5**	7	**14**	11	3	1	14	9	5	7	14	11	3	1	18	18	18	18	18	23	11
Limited dredging and other direct environmental impacts during construction	10.5%	11	7	**5**	9	**22**	19	17	15	11	7	5	9	22	19	17	15	4	2	3	21	14	1	13
Limited impact on coastal flows	10.5%	21	4	**2**	7	**18**	16	13	11	21	4	2	7	18	16	13	11	21	4	7	18	13	1	7
Limited impact on current Exmouth Boat Harbour operations	3.0%	15	15	**15**	15	**15**	15	15	15	7	7	7	7	7	7	7	7	1	1	1	1	1	6	15
Upfront capital cost	15.0%	3	10	**12**	14	**4**	13	18	19	7	15	17	9	5	8	20	22	6	16	11	21	23	1	2
Requires limited additional State investment in enabling infrastructure	5.0%	1	1	**1**	1	**1**	1	1	1	10	10	10	10	10	10	10	10	19	19	19	19	19	18	1
TOTAL WEIGHTED RANKING		9.65	8.20	**7.84**	9.20	**7.84**	8.49	8.23	7.84	11.11	9.81	9.45	9.31	8.85	8.60	9.39	9.15	15.09	14.59	14.26	17.91	16.95	14.07	13.91
MCA rank		14	4	**2**	10	**1**	6	5	3	16	15	13	11	8	7	12	9	21	20	19	23	22	18	17
Estimated CAPEX ($m)		74.6	106.7	**108.3**	110.3	**77.6**	109.1	122.5	123.5	85.1	113.7	120.7	94.1	81.1	86.1	126.2	133.0	83.7	115.9	106.9	130.0	170.9	49.8	65.9

SOURCE: ACIL ALLEN CONSULTING

Economic Benefits Assessment

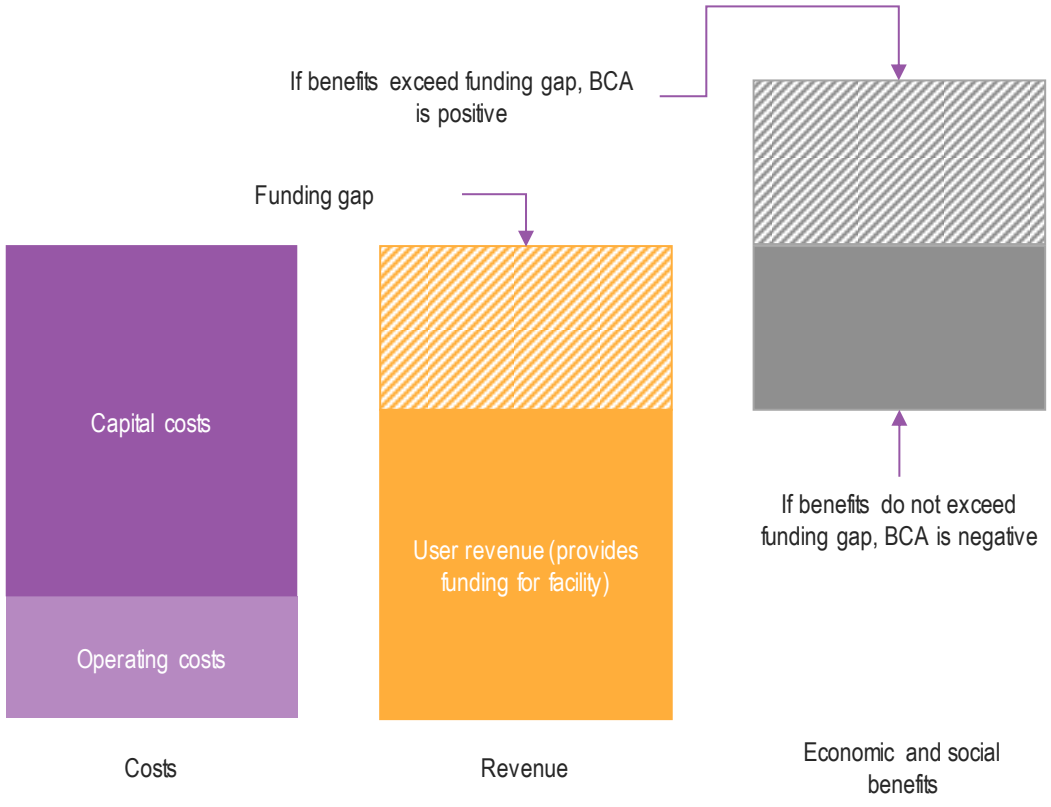
To demonstrate the economic benefits associated with the provision of the new marine infrastructure options at Exmouth, ACIL Allen has undertaken preliminary financial modelling and economic analysis of the two options in three frameworks. These frameworks include:

- **Project Financial Modelling**, to present the total estimated financial position of the new infrastructure considering the estimated capital and operating costs and conservative projections of revenue associated with the use of the infrastructure
- **A Benefit Cost Assessment**, to present (at a whole of Western Australia level) an assessment of the quantifiable benefits and costs (and net benefits) of making an investment in the facility
- **An Economic Impact Assessment**, to present the direct and indirect economic benefits associated with the facility in terms of an estimated future contribution to economic output, incomes, and employment at a Gascoyne and Western Australia level.

Each modelling framework builds on the one which comes before it. The Project Financial Model is a preliminary assessment of the standalone financial viability of each option, taking into account conservative estimates of the use of the facility and applying the pricing framework of a similar facility in Western Australia. The Benefit Cost Assessment ('BCA') then examines which of these financial benefits are incremental (or completely new) to Western Australia, and adds additional social benefits and costs to provide a quantitative view as to whether an investment produces net benefits to Western Australians. The Economic Impact Assessment then adds additional context regarding the scale of economic benefits by deriving the indirect (and therefore the total) economic benefits associated with the investment.

The cascading approach to the modelling task discussed above is summarised below (**Figure ES 4**).

FIGURE ES 4 ECONOMIC BENEFITS ASSESSMENT FRAMEWORK



SOURCE: ACIL ALLEN CONSULTING

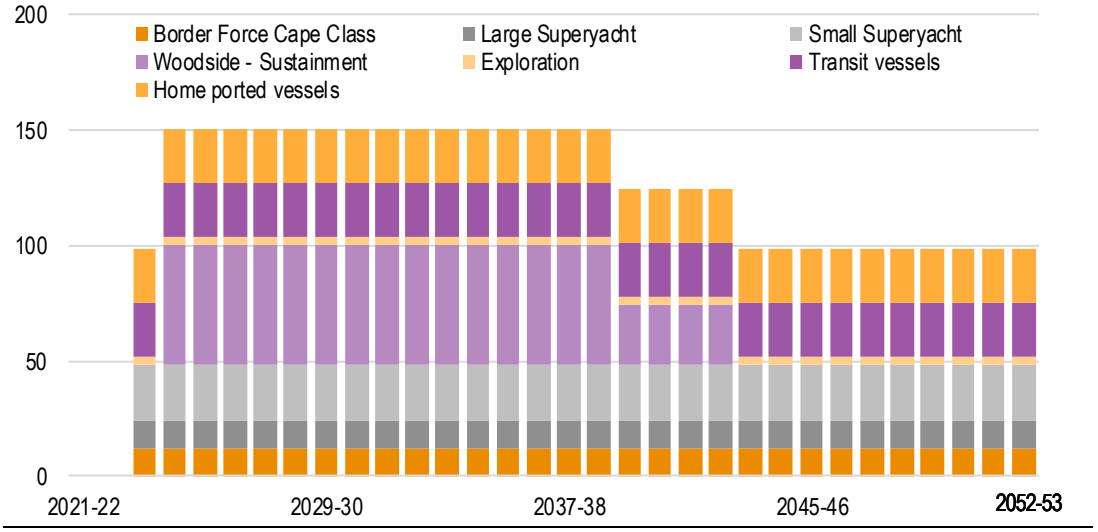
It is important to note at this early stage of the examination of the project that **the economic benefits assessment is explicitly centred on a "success case" for the infrastructure.** This is because the overarching purpose of the engagement is to understand whether further work is justified on the basis that the project has the potential to delivery economic and social benefits to Western Australians. Given this, the modelling discussed in this section should be considered an assessment of **the impact of the investment in a marine infrastructure solution can have if it is successful**, rather than as a projection of what will happen if an investment is made.

Vessel calls

Overall, it is assumed there will be an average of 151 calls to new marine infrastructure at Exmouth once each use is at its assumed full demand level in 2024-25, or around one call every four days in a typical year. The majority of calls are projected to be made by oil and gas support vessels, followed by cruise vessels, with the remainder of demand not equalling one of these top two uses (**Figure ES 5**).

Calls have been modelled annually as there is no benefit associated with modelling at more frequent periods. However, stakeholder feedback suggests uses associated with tourism and visitation (cruise and superyachts) are likely to cluster around the peak season, whereas other uses such as the ABF's Cape Class patrol boats are more likely to be spread throughout the year.

FIGURE ES 5 EMI: TOTAL ASSUMED PORT CALLS PER ANNUM



SOURCE: ACIL ALLEN CONSULTING

In addition to the above calls there is reasonable prospect of the facility being used by major project proponents in the surrounding region as an import terminal. This is because the landside logistics costs associated with facilities further east – such as Onslow and Dampier – are likely to be smaller for companies operating around the Exmouth Peninsula if they bring their goods through the new facility. However, given a number of these projects are yet to be confirmed these have not been included in the base success case modelling.

Project financial model

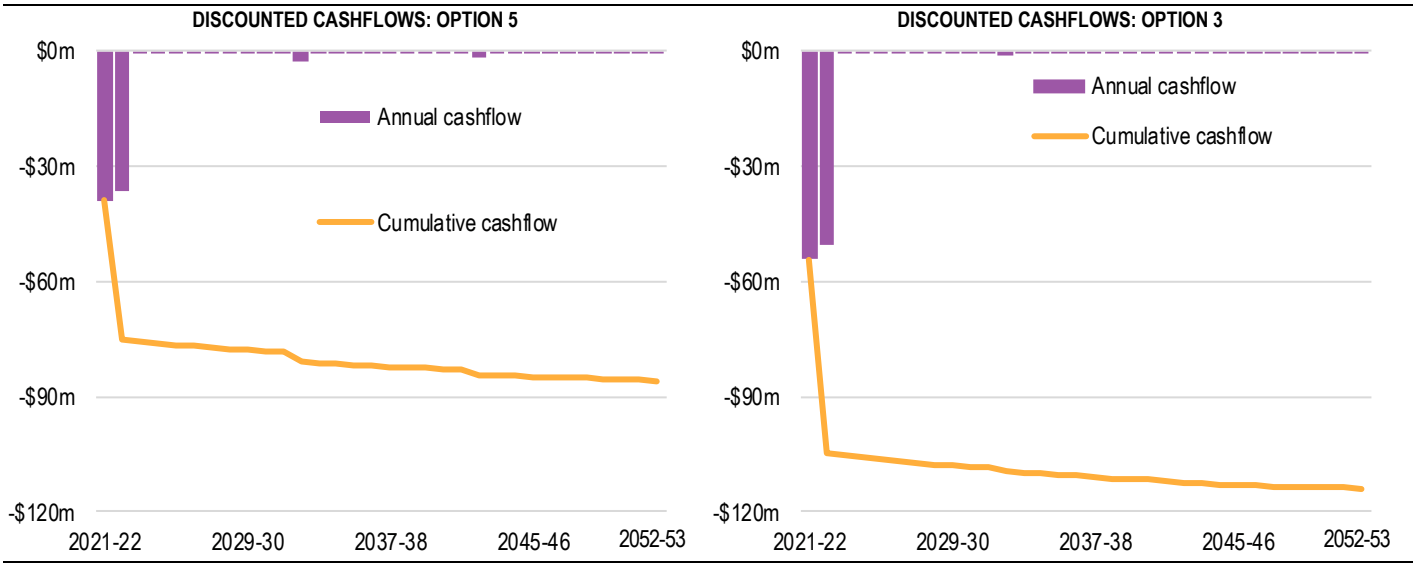
The project financial model uses a discounted cashflow modelling framework to present estimates of the capital and operating costs, operating revenue, and the timing of these payments over the useful life of the facility that is subject to the investment decision. Discounted cashflow analysis is used in the financial assessment of investments of all kinds, and can be used to assess whether an investment in new infrastructure can be self-sustaining through its own revenue generation capacity or whether it requires some form of subsidy to be financially viable.

The overall financial position of the infrastructure in each option reflects the cumulative discounted net cashflows of the infrastructure in each option. A positive figure indicates the option is likely to recover

all of the costs associated with its delivery with the revenue generated from users, while a negative figure indicates the opposite.

Prior to discounting, and after discounting, neither Option delivers a net positive position following capital and operating costs over the modelling period (**Figure ES 6**).

FIGURE ES 6 PROJECT FINANCIAL MODEL OUTPUTS, BY OPTION, $M (2019-20 DOLLARS), DISCOUNTED AT 7%



SOURCE: ACIL ALLEN CONSULTING

For Option 5, the value of the project in 2052-53 is -$109.2 million in real 2019 dollars, while for Option 3 the value is -$135.3 million. The negative values reflect the fact the project does not raise adequate revenue to cover its operating costs in any year of the modelling period, meaning there is no surplus cashflow available to fund sustaining capital or repay the initial capital outlay.

On a discounted cashflow basis (seven per cent discount rate), the net cashflows from Option 5 are -$86.2 million over the 32 year modelling period. This implies at a high discount rate the project requires an initial capital injection of at least $86.2 million to have the prospect of delivering a net zero cashflow at a project financial modelling level.

The discounted cashflows for Option 3 are also in a negative position over the modelling period, which is also a reflection of a weak operating position meaning the infrastructure does not cover the costs associated with capital investment.

On a discounted cashflow basis (seven per cent discount rate), the net cashflows from Option 3 are -$114.2 million over the 32 year modelling period. This implies at a high discount rate the project requires an initial capital injection of at least $114.2 million to have the prospect of delivering a net zero cashflow at a project financial modelling level.

Benefit cost assessment

The financial benefits and costs of new marine infrastructure at Exmouth represent a narrow range of the actual benefits and costs associated with the investment. To capture this larger array of benefits, ACIL Allen has completed a Benefit Cost Assessment ('BCA').

The basis of a BCA is simple: for a given investment proposal or policy reform, a BCA compares the total projected costs to the community and economy of the investment or policy with the total projected benefits. This determines whether the forecast benefits outweigh the forecast costs, and by how much.

All things being equal, the investment option with the highest a Benefit-Cost Ratio (BCR) ratio reflects the best "value for money" as it implies the option is producing the highest value of benefits for the costs incurred. It is possible however for an investment option to produce a greater net benefit

(benefits less costs, instead of benefits divided by costs) than other options with larger BCRs, in which case this option produces the "largest benefit". ACIL Allen reports on both values as both are important metrics when interpreting the results of a BCA.

The quantified benefits and costs included in this BCA are presented below. The Total and Annual Average values presented are in real 2019 dollars, while the discounted value represents the present value of the benefit or cost stream at a seven per cent discount rate (**Table ES 4**).

TABLE ES 3 EMI: BCA BENEFIT AND COST STREAM SUMMARY

	Option 5			Option 3		
Benefit/cost stream	**Total ($m)**	**Average ($m)**	**PV (7%, $m)**	**Total ($m)**	**Average ($m)**	**PV (7%)**
Benefits						
New visitor spend - Exmouth	222.60	7.42	86.05	222.60	7.42	86.05
New visitor spend - Rest of WA	355.17	11.84	137.30	355.17	11.84	137.30
New cruise revenue - Exmouth	26.26	0.88	10.15	26.26	0.88	10.15
New cruise revenue - Rest of WA	24.12	0.80	9.32	24.12	0.80	9.32
New superyacht spend	22.05	0.73	8.52	22.05	0.73	8.52
New superyacht revenue	3.11	0.10	1.20	3.11	0.10	1.20
Fuel and carbon savings for O&G	1.90	0.06	0.70	1.90	0.06	0.70
Recreational benefits	4.85	0.16	1.87	9.19	0.31	3.55
Total benefits	**660.06**	**22.00**	**255.13**	**664.40**	**22.15**	**256.81**
Costs						
Capital costs	95.57	0.60	80.30	114.11	0.19	106.46
Operating costs	52.14	1.74	20.15	56.75	1.89	21.94
Construction disruption*	0.34	0.17	0.33	0.34	0.17	0.33
Environmental costs	0.66	0.02	0.26	0.12	0.00**	0.05
Total costs	**148.71**	**2.36**	**101.04**	**171.32**	**2.09**	**128.77**

SOURCE: ACIL ALLEN CONSULTING

**AVERAGE PRESENTED FOR TWO YEARS WHERE COST IS RELEVANT ONLY*

***VALUE IS GREATER THAN ZERO BUT IS NOT SHOW DUE TO ROUNDING*

Overall, the quantified benefits of an investment in **Option 5** total $660.1 million in real 2019 dollar terms, and $255.1 million on a discounted basis (seven per cent discount rate). On the cost side, the quantified costs of an investment in Option 5 total $148.7 million in real 2019 dollars, and $101 million on a discounted basis (seven per cent discount rate). Combined, the investment in Option 5 is projected to create quantified net benefits of $511.3 million to Western Australia over the 32 year useful life of the asset. This results in a BCR of 4.439 on an undiscounted basis, implying that for every one dollar of costs incurred to Western Australians as a result of this project there are benefits worth $4.44.

On a discounted basis, the quantified net benefits to Western Australia over the 32 year useful life of the asset are $154.1 million. This results in a BCR of 2.525, implying that taking into account the next best available opportunity for investment, and the uncertainty associated with the project, that for every one dollar of costs incurred to Western Australians as a result of the project there are benefits worth $2.53.

Overall, the quantified benefits of an investment in **Option 3** total $664.4 million in real 2019 dollar terms, and $256.8 million on a discounted basis (seven per cent discount rate). On the cost side, the quantified costs of an investment in Option 5 total $171.3 million in real 2019 dollars, and $128.8 million on a discounted basis (seven per cent discount rate). Combined, the investment in Option 3 is projected to create quantified net benefits of $407.6 million to Western Australia over the 32 year useful life of the asset. This results in a BCR of 2.587 on an undiscounted basis, implying that for

every one dollar of costs incurred to Western Australians as a result of this project there are benefits worth $2.59.

On a discounted basis, the quantified net benefits to Western Australia over the 32 year useful life of the asset are $128 million. This results in a BCR of 1.994, implying that taking into account the next best available opportunity for investment, and the uncertainty associated with the project, that for every one dollar of costs incurred to Western Australians as a result of the project there are benefits worth $1.99.

Economic impact assessment

While the Benefit Cost Assessment described in this section suggests there is likely to be net economic and social for Western Australia associated with the provision of new marine infrastructure at Exmouth, another important dimension of impact is the indirect economic benefits created as a result of an increase in economic activity. These benefits can be estimated using an economic impact assessment framework, which traces how a change in underlying economic activity in one or multiple sectors of the economy flow through to the rest of the economy.

The Economic Impact Assessment has been completed using an Input-Output modelling framework, which demonstrates how a change in income and expenditure flow through the economy using a series of inter-industry linkages and multipliers of expenditure. The results are presented below for each Preferred Option separately.

Economic impact assessment results: Option 5

The economic impact assessment results are summarised in the table below (**Table ES 5**). Overall, the impact on the Gascoyne region's economy is equivalent to an annual boost of 1.3 per cent of Gross Regional Product, or equivalent to a $572 annual boost to the real incomes of each resident, which is five times the rate of the boost provided to Western Australian residents outside of the Gascoyne.

TABLE ES 4 ECONOMIC IMPACT ASSESSMENT RESULTS: OPTION 5

Heading	Total	Average	Estimated multiplier
Output (Real Gross Regional Product/Gross State Product), $m (2019-20 dollars)			
Gascoyne region	$172.1m	$5.4m	1.690
Rest of Western Australia	$1,509.0m	$47.2m	2.006
Total Western Australia	$1,681.1m	$52.5m	1.969
Income (Real Incomes), $m (2019-20 dollars)			
Gascoyne region	$340.0m	$10.6m	1.773
Rest of Western Australia	$3,114.9m	$97.3m	2.111
Total Western Australia	$3,454.9m	$108.0m	2.072
Employment (FTE job years)			
Gascoyne region	N/A	71.7	1.662
Rest of Western Australia	N/A	591.3	1.938
Total Western Australia	N/A	663.0	1.904

SOURCE: ACIL ALLEN CONSULTING

Economic impact assessment results: Option 3

The economic impact assessment results are summarised in the table below (**Table ES 6**). Overall, the impact on the Gascoyne region's economy is equivalent to an annual boost of 1.1 per cent of Gross Regional Product, or equivalent to a $551 annual boost to the real incomes of each resident,

which is five times the rate of the boost provided to Western Australian residents outside of the Gascoyne.

TABLE ES 5 ECONOMIC IMPACT ASSESSMENT RESULTS: OPTION 3

Heading	Total	Average	Estimated multiplier
Output (Real Gross Regional Product/Gross State Product), $m (2019-20 dollars)			
Gascoyne region	$165.8m	$5.2m	1.691
Rest of Western Australia	$1,510.9m	$47.2m	2.029
Total Western Australia	$1,676.8m	$52.4m	1.990
Income (Real Incomes), $m (2019-20 dollars)			
Gascoyne region	$328.8m	$10.3m	1.772
Rest of Western Australia	$3,118.4m	$97.5m	2.131
Total Western Australia	$3,447.2m	$107.7m	2.090
Employment (FTE job years)			
Gascoyne region	N/A	70.2	1.647
Rest of Western Australia	N/A	592.2	1.948
Total Western Australia	N/A	662.4	1.911

SOURCE: ACIL ALLEN CONSULTING

1 INTRODUCTION

1.1 Introduction

In June 2019, ACIL Allen Consulting ('ACIL Allen') was engaged by the Gascoyne Development Commission ('GDC') to undertake an Options Assessment and Economic Benefit Assessment of options to invest in new marine infrastructure at Exmouth. Exmouth is a town in the Gascoyne region, in the north west of Western Australia, known for its iconic natural and environmental assets including the Ningaloo Reef.

To assist in the task described above, ACIL Allen engaged marine engineering firm BMT Group ('BMT') to provide engineering advice and analysis throughout the engagement. This included the development of initial concept drawings for two options which were selected as the preferred options

The context of the study is concerns from a number of stakeholders – from local businesses, to cruise ship operators, to the State Government at large – that the current marine infrastructure situation at Exmouth was negatively impacting on the prospects of both current and potential future activities in the cruise ship based tourism industry. The current situation in Exmouth, where cruise vessels are required to drop anchor in deep water and then transfer their passengers to the mainland via tender vessel, is perceived as untenable in the future due to operational risks and the relative weakness of Exmouth as a reliable cruise destination from the perspective of vessel owners relative to other destinations in the State and region more generally.

A number of studies have been completed in recent years investigating this challenge from a specific point of view. The GDC has requested ACIL Allen conduct a process akin to a pre-feasibility study that examines the situation, potential solutions, and early stage financial and economic benefits and costs of these potential solutions, in a way that can demonstrate a rigorous, holistic assessment of the potential options.

The culmination of the services is the detailed economic, financial and early stage engineering considerations of **two preferred options** for addressing the State Government's priorities with respect to the provision of new marine infrastructure at Exmouth. The two main streams of work, and the various component parts that have culminated in the economic benefits assessment, are described in the introductions to the sections where they are contained.

1.2 Structure of this report

The remainder of this report presents the analysis, findings and recommendations which have been conducted by ACIL Allen in this engagement. The report is structured into the following sections.

— **Section 2: Economic and Social Context.** This section presents relevant contextual information on the economic and social profile of the Gascoyne, the Shire of Exmouth, the State Government's

tourism industry development agenda, the cruise industry, and the specific issues and challenges facing Exmouth and the Gascoyne region given the above.

— **Section 3: Options Assessment.** This section presents the analysis and findings associated with the end to end Options Assessment completed by ACIL Allen. This includes progression from an initial examination of appropriate sites for new infrastructure, assessment of the potential uses, design considerations, and initial development costing.

— **Section 4: Multicriteria Assessment.** This section builds up and then presents the results of the Multicriteria Assessment undertaken for the purpose of identifying the two preferred options for further economic and financial consideration. This section also discusses the State's preferred position on a range of relevant economic and infrastructure matters, which helps frame the MCA.

— **Section 5: Project Financial Modelling.** This section builds up a project financial model, which is the initial basis of the Benefit Cost Assessment and Economic Impact Assessment conducted at the end of the report. The Project Financial Model requires the development of projections of use of the infrastructure, as well as adoption of assumptions regarding operational expenditure and prices associated with access to the facility. The analysis provides guidance on the prospect of the infrastructure to recover its costs and deliver a return on investment.

— **Section 6: Economic Benefits Assessment**. This section contains the Benefit Cost Assessment and Economic Impact Assessment.

  The **Benefit Cost Assessment** expands on the project financial model through the consideration of other relevant and quantifiable economic and social benefits as an early stage assessment as to whether there are likely to be net benefits associated with the investment. The Benefit Cost Assessment defines the benefit and cost streams, attributes these to the decision to invest, and quantifies them using a combination of input data and conservative assumptions. This section also discusses some non-quantified economic and social benefits and costs which should figure into the decision to invest.

  The **Economic Impact Assessment** translates the outputs of the project financial model and Benefit Cost Assessment into direct and indirect (and total) economic impacts of the project on the Gascoyne region and Western Australian economies, in terms of real output, real incomes and real employment.

— **Section 7:Summary and Directions**. This section provides a brief summary of the findings of the report, and some indicative directions associated with the next stage of the assessment of the Exmouth Marine Infrastructure project.

1.3 Glossary of terms and abbreviations

The following terms and acronyms are used in this report.

TABLE 1.1 SUMMARY OF TERMS USED

Term used	Meaning
Employment	The number of full-time equivalent jobs years created as a result of a project or expenditure in the economy, which includes direct and indirect (flow-on) employment.
Gross State Product/Gross Regional Product	*A measure of the size of an economy.* Gross product is a measure of the output generated by an economy over a period of time (typically a year). It represents the total dollar value of all finalised goods and services produced over a specific time period and is considered as a measure of the size of the economy. At a national level, it is referred to as Gross Domestic Product (GDP); at the state level, Gross State Product (GSP); while at a regional level, Gross Regional Product (GRP).
Job years	Real employment is measured in job years. A job year is employment of one full time equivalent (FTE) person for one year. Alternatively, it can be expressed as one 0.5 FTE person for two years.

Term used	Meaning
Real income	*A measure of the welfare of residents in an economy through their ability to purchase goods and services and to accumulate wealth* Real income measures the income available for final consumption and saving after adjusting for inflation. An increase in real income means that there has been a rise in the capacity for consumption as well as a rise in the ability to accumulate wealth in the form of financial and other assets. The change in real income from a development is a measure of the change in the economic welfare of residents within an economy.

TABLE 1.2 SUMMARY OF ACRONYMS

Acronym	Meaning
ABF	Australian Border Force
AMC	Australian Marine Complex
BCA	Benefit Cost Assessment
BMT	BMT Group
CGE	Computable General Equilibrium
EBH	Exmouth Boat Harbour
FPSO	Floating Petroleum Storage and Offtake
FTE	Full Time Equivalent
GDC	Gascoyne Development Commission
GRP	Gross Regional Product
GSP	Gross State Product
IO	Input Output
LGA	Local Government Authority
MCA	Multicriteria Assessment
PER	Public Environmental Review

2 ECONOMIC AND SOCIAL CONTEXT

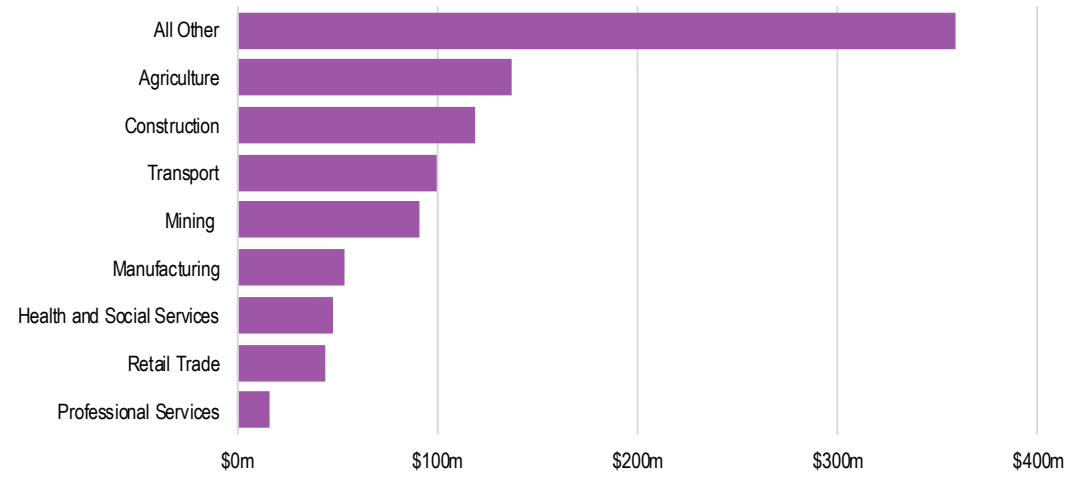
2.1 Economic and social profile of the Gascoyne and Exmouth

The Gascoyne region's total Gross Value Added (GVA) for 2017-18 was $970 million, equating to approximately 0.3 per cent of the WA economy. With few population centres, which themselves have economies built largely on agriculture and tourism, the Gascoyne is the smallest of Western Australia's nine regional economies.

The Gascoyne is comprised of the four Local Government Areas ('LGAs'); the Shires of Carnarvon, Exmouth, Shark Bay and Upper Gascoyne. Carnarvon and Exmouth are the region's largest population centres, and hubs of economic activity.

Agriculture was the Gascoyne's largest industry (excluding the 'All Other' category), accounting for approximately 14.1 per cent ($137 million) of the Gascoyne's total GVA (**Figure 2.1**). Construction was the Gascoyne's second largest industry, accounting for approximately 12.3 per cent ($119.2 million) of the Gascoyne's total GVA, followed by transport services (10.3 per cent).

FIGURE 2.1 GASCOYNE REGION - GROSS VALUE ADDED BY INDUSTRY, 2017-18



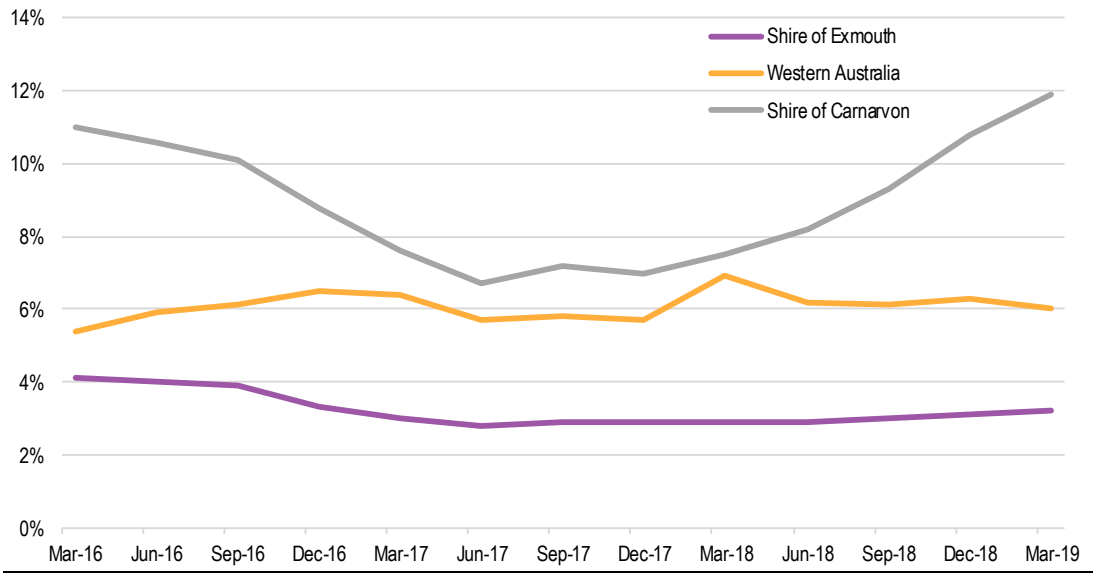
SOURCE: ACIL ALLEN CONSULTING

In recent years, the regions which surround the Gascoyne – both on land and at sea – have seen significant economic and social growth and development on the back of the expansion in the State's

resources sector in the surrounding regions. According to the Department of Mines, Industry Regulation and Safety, the Pilbara (to the east of Exmouth), Mid West (to the south) and offshore (to the north and east) hosted some $121.1 billion of minerals and energy production in 2018-19[1] (up from $73.5 billion in 2015-16), which in turn supported thousands of jobs in these regions.

As of March 2019, the Shire of Exmouth's total labour force was 1,534 people, with an unemployment rate of 3.2 per cent (**Figure 2.2**). The unemployment rate in the Shire of Exmouth has remained relatively stable over the last three years, at a level below the general rate of unemployment across the State. By contrast, the Shire of Carnarvon (the region's other main population centre), has seen its unemployment rate rise to 11.9 per cent in March 2019.

FIGURE 2.2 UNEMPLOYMENT RATES, SELECTED REGIONS, PERCENTAGE OF LABOUR FORCE



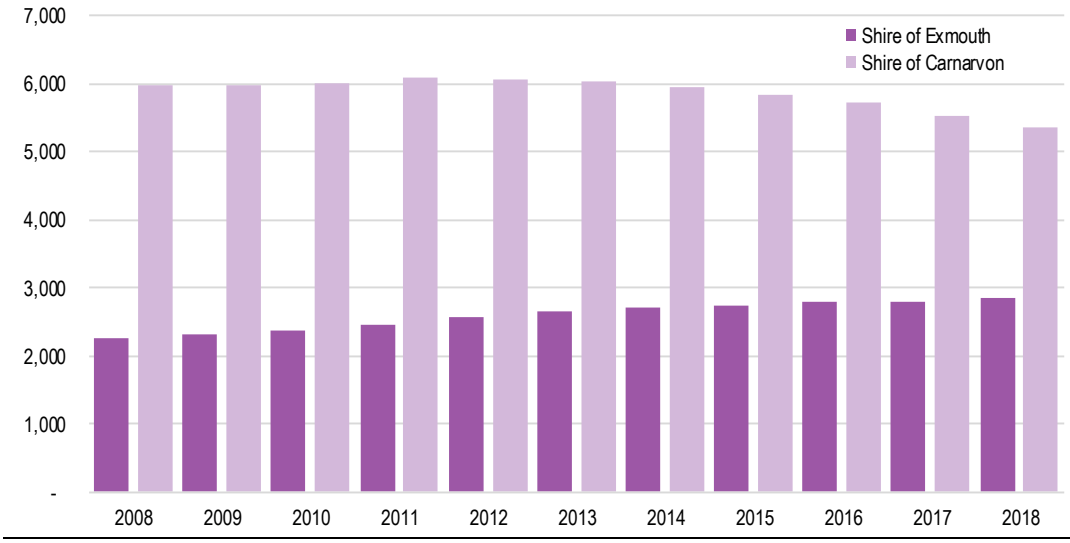
SOURCE: DEPARTMENT OF JOBS AND SMALL BUSINESS – SMALL AREA LABOUR MARKETS DATA, ABS

As presented in **Figure 2.3**, the total population of the Shire of Exmouth has increased by approximately 26 per cent over the past decade, from 2,255 people in 2008 to 2,836 people in 2018. The Shire of Exmouth had the strongest population growth out of all of the local government areas within the Gascoyne region. Over the past decade, the total population increased by seven per cent in the Shire of Shark Bay, increased by three per cent in the Shire of Upper Gascoyne, and decreased by 10 per cent in the Shire of Carnarvon.

Exmouth's population profile is consistent with other regional areas, with proportionately larger population shares below the age of 15 compared to the whole of Western Australia. In the Shire of Exmouth approximately 24.6 per cent of the population is between the age of 15 and 34, compared to 27.9 per cent across Western Australia[2].

[1] WA Department of Mines, Industry Regulation and Safety. 2019. *Regional and spatial resources statistics, 2017-18*. Accessed online at http://www.dmirs.wa.gov.au/
[2] ABS – 2016 Census

FIGURE 2.3 POPULATION PROFILE

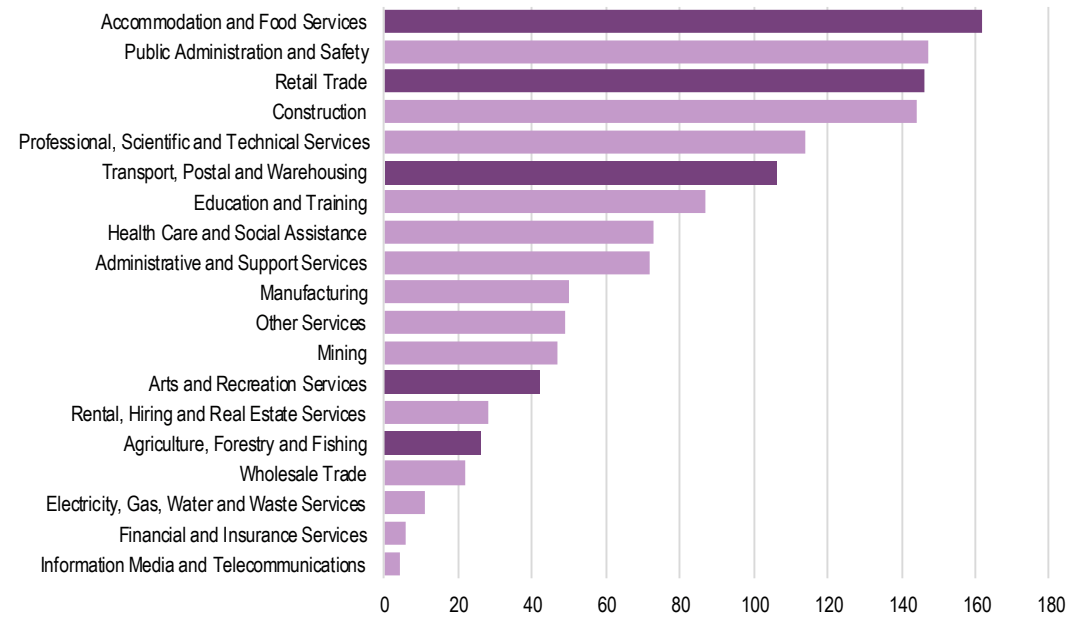


SOURCE: ABS CAT 3218.0

The Shire of Exmouth's Strategic Community Plan to 2030 suggests the community of Exmouth places strong emphasis on the environment, the outdoors, and pursuit of active recreation.[3] The Plan states the Shire will pursue economic development opportunities that can coexist with the region's natural environment and unique lifestyle.

Employment in the Shire already somewhat reflects this objective (**Figure 2.4**). Accommodation and Food Services (which is primarily driven by tourism and visitation) was the largest industry of employment in the Shire of Exmouth in the 2016 Census, with a share of approximately 12.1 per cent.

FIGURE 2.4 INDUSTRY OF EMPLOYMENT – SHIRE OF EXMOUTH



Note: Total residents = 2,727. Chart excludes responses under the following categories: Not applicable, Not stated and Inadequately described.

SOURCE: ABS 2016 CENSUS

[3] Shire of Exmouth. 2018. *Strategic Community Plan: Exmouth 2030*. Accessed online at http://www.exmouth.wa.gov.au/

2.2 Tourism-driven development

Exmouth is marketed domestically and internationally as part of the Tourism WA marketing region "Australia's Coral Coast".

In 2017, ACIL Allen quantified the economic impact of tourism spending in Western Australia and the five tourist regions, with a particular emphasis on the impact of tourism spending on job creation in Western Australia[4]. Total tourism spending in WA reached $11.9 billion in 2015-16. For Australia's Coral Coast, total tourism spending reached $979 million in 2015-16, which is estimated to have generated $702 million in GVA to the region's economy. Importantly, this level of tourism spending is estimated to have supported some 4,272 direct tourism FTE jobs across the tourism region and a further 1,936 indirect FTE jobs resulted from the flow-on activity throughout the region's economy in 2015-16. In total, it is estimated that tourism spending and its flow-on activities supported 6,208 direct and indirect FTE jobs across the region in 2015-16.

The majority of direct FTE tourism jobs were in "typical" tourism-related industries (eg. accommodation and food services), with the majority of indirect FTE jobs created in "non-typical" tourism-related industries (eg. professional and administrative services).

The seasonal nature of Exmouth's population fluctuates with the peak tourist season. The peak tourist season in Exmouth is March to October. The main tourist attraction for visitors to the Exmouth region is the Ningaloo Marine Park. The region is valued for its remote and self-sufficient recreational and camping regions. Popular activities for tourists in the region include scuba-diving, wildlife watching, boating, fishing, hiking, snorkelling and kayaking. A contributing factor attracting tourists to the Ningaloo Marine Park is its listing as a UNESCO World Heritage Area. The Ningaloo Marine Park is listed for the outstanding value of the area's diverse and abundant marine life, unique cave fauna and the contrast between the rugged landscapes of the Cape Range and the serene coastline.

2.3 Western Australia's cruise industry

The cruise shipping industry is set to play a critical role in the WA Government's desire to increase the value of tourism and attract visitors from interstate and international destinations.

ACIL Allen completed an assessment of the economic impact of homeported cruise shipping on the Western Australian economy in 2015-16[5]. ACIL Allen has estimated the total economic footprint from cruise ships ported in Exmouth was $0.83 million in 2015-16. Of this amount, $0.6 million was the direct spending undertaken by passengers, crew and the cruise ships in Exmouth (excluding associated imports and taxes), which generated a flow on impact of $0.22 million across the local economy – implying a regional multiplier of 1.37.

The report found that while the economic contribution of cruise shipping to Exmouth was small, this was a function of the number of calls made to Exmouth in the study year. Overall, ACIL Allen found that homeported cruise ships generated $155 million to the WA economy in 2015-16.

In recognition of the strategic importance of cruise shipping as an economic enabler across WA, a number of regional ports are now exploring ways of attracting cruise ships to their regions, most recently the Port of Broome. A 2018 study completed by ACIL Allen estimated an additional $117 million could be generated for the Broome economy through the additional cruise ship calls that are estimated would be made as a result of the necessary upgrades to the Port of Broome.

The *Western Australian Cruise Shipping Strategic Plan 2012-2020* was developed to *ensure the State's cruise destinations deliver quality experiences for passengers as well as maximising the economic benefit of cruise shipping to Western Australia.* The Strategic Plan outlines a number of

[4] ACIL Allen Consulting: *Tourism Spending & Job Creation in WA* (2017). ACIL Allen used Tourism Research Australia's (TRA) 2015-16 International and National Visitor Survey as the source of tourism spending by tourist type (international, domestic overnight and domestic day) for WA and its five tourism regions.

[5] ACIL Allen Consulting: *WA Homeported Cruise Ships, 2015-16* (2016)

strategic weaknesses that need addressing by Government and industry, in order for the industry to realise its potential in the State:[6]. These include:

- tourism product is underdeveloped an inadequate to support cruise ship visitation at some regional destinations;
- insufficient regional marine infrastructure to adequately service large cruise vessels;
- seasonal weather conditions impact current cruise itineraries;
- increasing number of WA cruise destinations competing for the same market; and
- cruise lines lack the general awareness of WA's regional destinations in terms of facilities and capabilities.

Since the development of the Strategic Plan, the WA Government has invested in further initiatives to support the cruise shipping industry. These initiatives include hosting the WA Cruise Exchange in June 2019, dredging at the Port of Broome to allow round-the-clock access for cruise ships and upgrades to the Fremantle Passenger Terminal.

Improved marine infrastructure in Exmouth would address a number of the strategic weaknesses outlined by the Strategic Plan that have limited cruise ship visits to Exmouth.

2.4 Situation analysis: Cruise ships at Exmouth

Inadequate marine infrastructure to reliably berth cruise ships has been an issue for Exmouth and the Gascoyne region for decades. More recently, the Gascoyne Development Commission ('GDC') listed "establishing suitable berthing facilities for cruise ships in Exmouth" as a quick win in its 2014 *Gascoyne Regional Tourism Strategy*.[7] This precipitated a number of studies, undertaken by both public and private sector organisations, including but not limited to the below activities.

- A floating deck/floating dock, proposed by Australian Floating Docks and examined by Tourism Western Australia and the Gascoyne Development Commission in a preliminary economic study in 2016. The technical feasibility of the infrastructure was assessed by the Pilbara Ports Authority in 2017.
- A multi-purpose deep water wharf at the Exmouth Light Industrial Area, proposed by Exmouth Limestone Pty Ltd (a joint venture of Adelaide Brighton Cement Ltd and Whitecrest Enterprises Pty Ltd). The study was centred on the development of a facility that could cater to cruise vessel needs, while also providing for other uses more in keeping with the intent of the development of the light industrial area (such as oil and gas support)
- A Problem Definition Report, completed by the Department of Transport with the assistance of an external advisory, which examined the issues and challenges associated with further development of a cruise industry in Exmouth beyond the provision of marine infrastructure (such as expansion of Exmouth's potable water supply).

During this time, the State Government also completed Stage Two of the redevelopment of the Exmouth Boat Harbour, which caters for small commercial and recreational vessels plus some other marine services and maintenance activities.

The harbour has historically been the link between cruise vessels and Exmouth. As it stands, the only way most cruise vessels can access Exmouth is by dropping anchor in the Exmouth Gulf and transhipping their guests to the Exmouth Boat Harbour via tender vessel. This introduces a range of risks to cruise ship visitation to the region, on account of Exmouth's tendency for high winds and challenging tidal conditions. Cruise vessels will only drop anchor in open water when conditions are appropriate.

As a result, there has been a number of missed opportunities for vessels to call at Exmouth in recent years. According to data collated by the Shire of Exmouth, and provided by the Gascoyne Development Commission, in the seven years to 2019 half of all scheduled cruise visits to Exmouth were aborted. The concern is that over time fewer cruise vessel owners are including Exmouth on

[6] Tourism Western Australia, *Western Australian Cruise Shipping Strategic Plan, 2012-2020*, http://www.tourism.wa.gov.au/Publications%20Library/Industry%20Support%20and%20Opportunities/Tourism%20WA%20Cruise%20Shipping%20Strategic%20Plan%202012-2020.pdf, p.12.

[7] Gascoyne Development Commission. 2014. *Gascoyne Regional Tourism Strategy*. Accessed online at http://www.gdc.wa.gov.au/

their Western Australian itineraries, with just six visits scheduled in the 2018-19 cruise season (which runs October to February). Of these six visits, three were cancelled, and local businesses were provided with just a few hours notice of these cancellations.

As discussed in Section 2.3, addressing issues and challenges associated with reliable cruise berthing infrastructure across the Western Australian coastline has the potential to benefit the whole of the Western Australian economy, by providing the industry with a network of facilities to build itineraries that maximise the State's natural assets. At a local level, reliable cruise berthing infrastructure has the potential to not only reduce the risk of last minute cruise vessel cancellations at Exmouth, it has the potential to spur further cruise vessel visitation and the economic development this can foster.

3 OPTIONS ASSESSMENT

This section of the report discusses the process undertaken in conjunction with the Project Steering Committee, GDC, and BMT Group with respect to the Options Assessment component of the scope of works. The Options Assessment comprised:

- A desktop review of **potential sites for an infrastructure solution**, including an assessment of any fatal flaws in identified sites, eliminating sites which were unsuitable due to issues or concerns with their location, environmental impacts or other matters,
- A targeted round of stakeholder consultation, centred on the **identification of uses for the infrastructure** to inform site selection and the basis of design for infrastructure,
- Development of **infrastructure delivery concepts ('the options')** for the selected sites,
- Development and implementation of a Multicriteria Assessment ('MCA') framework, assessment of each option in the framework, and the **identification of two preferred options** for further analysis in the economic benefits assessment framework.

This section discusses each of these steps in the process of the formation of options, through to the implementation of the MCA framework and identification of the two preferred options for the economic benefits assessment.

3.1 Site selection

The first step in the Options Assessment was a desktop document review of previous studies into a marine infrastructure solution at Exmouth. The main documents reviewed are in the table below (**Table 3.1**).

TABLE 3.1 PREVIOUS EXMOUTH MARINE INFRASTRUCTURE STUDIES REVIEWED

Report	Author
Exmouth Marine Infrastructure – Project Plan (Draft)	GDC
EMI Options SWOT Analysis	GDC
Exmouth's Future: Problem Definition – Final Report March 2018	Aurecon
Gascoyne Regional Tourism Strategy	GDC
Cruise Ship Survey Results Summary	Shire of Exmouth
Exmouth Deep Water Wharf Project Scoping Study	BMT
Proposed Exmouth Floating Deck Facility Option – Concept Review Report	PPA
Exmouth Floating Deck Facility Option – Concept Design Report (Nov 2016)	AFD
Exmouth Floating Deck Project – Phase Two Report (May 2017)	AFD

Report	Author
Operating Procedures of Seawalk Geiranger (Jan 2015)	Stranda Port Authority
Exmouth Cruise Ship Berths Concept Design Basis Report	AFD | Aurecon
Exmouth Floating Deck Project – Phase 2 Preliminary Basis of Design	AFD
Exmouth Boat Harbour Upgrade – Design Basis Report (Jul 2015)	GHD
Exmouth Boat Harbour Upgrade - Preliminary Design Report	GHD
Exmouth Boat Harbour Geotechnical Investigation (April1995)	Soil & Rock Engineering

SOURCE:

From this review it emerged there had been some investigation into new or augmented marine infrastructure at four main sites across the region. These were: an expansion at the existing Exmouth Boat Harbour, a site at the Exmouth Light Industrial Area at Mobowra Creek, the existing Navy Pier to the north of the Exmouth townsite, and a floating dock in the Exmouth Gulf.

These sites were raised with relevant stakeholders during consultation, and were further scrutinised by a more detailed review of previous technical studies. Overall, it emerged the primary drivers for site selection should be:

- All-tide access to navigable water that would allow for reliable berthing of large cruise vessels,
- Any climate protection which may be afforded to users
- Reliable and efficient access to transport infrastructure
- Stakeholder acceptance and any minimisation of impact on environmental and social amenity

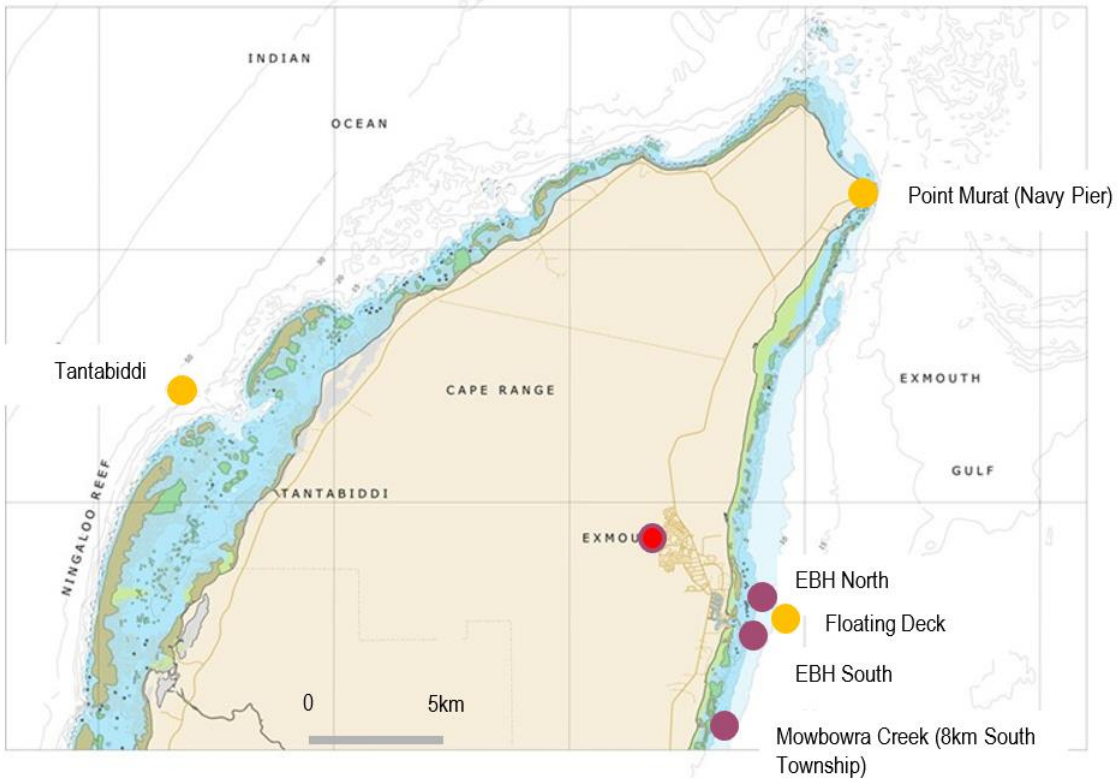
Following this review, six definitive sites were considered in an initial high pass filter process. This process examines whether there are any "fatal flaws" associated with the site regardless of any feasible infrastructure solution, based on the priorities and perceptions of stakeholders. The initial six sites are presented in the table below (**Table 3.2**).

TABLE 3.2 HIGH PASS FILTER SITE SELECTION PROCESS

Site	Discussion
Exmouth Boat Harbour – North	Exmouth Boat Harbour is located close to the town of Exmouth, the boat harbour supports fishing, charter and recreational industries and with large scale resources projects in the region, it supports other marine support services/activities. The southern side of the Exmouth Boat Harbour was recently upgraded in 2018, which included wharf extension, heavy lift facility and upgrade to the southern breakwater. The southern side of the EBH supports commercial and industrial activities and has been identified as potential site for future expansion by the Department of Transport albeit at an early conceptual level.
Exmouth Boat Harbour – South	The northern side of the EBH has a higher focus on more recreational based activities. The northern breakwater, which is approximately 350m in length provides both protection and working platform for building a deep-water marine facility.
Mowbowra Creek	Mowbowra Creek is located 8 km south of Exmouth Town Centre. The land is zoned industrial under the Shire of Exmouth's town planning scheme and is owned by Exmouth Limestone Pty Ltd (EXL). This site has been considered as a potential site by EXL for a deep water barge loading facility and the site was investigated in GDC's Exmouth Deep Water Wharf scoping study. It is also the site proposed in the market-led proposal.
Offshore floating dock	The Navy Pier is controlled by the Australian Defence Force and is located at Point Murat, 15 km north of Exmouth. The pier is approximately 135m in length, has a berth face of 35m and is located in the naturally deep part of the Exmouth Gulf.
Navy Pier	The offshore floating deck is located offshore at the Exmouth Boat Harbour. Passengers and cargo will be transferred from the ship unto the deck, then from the deck to land.
Tantabiddi Boat Ramp	The Tantabiddi Boat Launching Facility is located on the west side of the North West Cape and is managed by the Shire of Exmouth. The facility provides access for boat users to the Ningaloo Reef. Based on the stakeholder consultation process, it is understood that an expansion to this facility is currently being considered by the Shire of Exmouth

The location of these sites relative to the Exmouth townsite are presented below (**Figure 3.1**)

FIGURE 3.1 EXMOUTH MARINE INFRASTRUCTURE SITE SELECTION SITES VS EXMOUTH TOWNSITE



SOURCE: BMT GROUP, ACIL ALLEN
NOTE: THIS GRAPHIC WILL BE UPDATED IN THE FINAL REPORT

BMT Group conducted the initial high pass filter assessment of each site, which is discussed in the table below (**Table 3.3**). The filtering process resulted in the identification of fatal flaws in three of the site sites, being the Offshore Floating Dock, the Navy Pier and the Tantabiddi Boat Ramp.

TABLE 3.3 HIGH PASS FILTER SITE SELECTION PROCESS

Site	High Pass Filter Assessment (Purple = progress, Orange = do not progress)	Discussion
Exmouth Boat Harbour – North		Infrastructure development on the north side of the existing Exmouth Boat Harbour. The north side of the EBH is an ideal site to cater for tourism activities. It will allow tourists to walk on the beach, sit and relax at Mantaray's Beach Resort and Short Order Local.
Exmouth Boat Harbour – South		Development on the south side of the existing Exmouth Boat Harbour. No fatal flaw/show stopper. However, this site is less ideal site for tourism activities if compared to the northern side. Cruise passenger will be highly reliant on buses. This site is better suited for other marine activities such as offshore supply vessels.
Mowbowra Creek		Mowbowra Creek is located approximately 10km south of Exmouth. No fatal flaws identified at this stage. This site able to accommodate the multi-user nature of the development. However, it is noted that this site is less than ideal for cruise tourism.

Site	High Pass Filter Assessment (Purple = progress, Orange = do not progress)	Discussion
Offshore floating dock		Dampier Floating dock (DFD) has been tried in Dampier and failed. DFD has been removed completely. Floating dock is not suited in exposed sea condition, furthermore in cyclone prone areas. The time and costs associated with operational, maintenance and demobilisation in the event of a cyclone are high. To date, ship to floating dock dynamic motion assessment has not been completed to demonstrate that this is a safe option.
Navy Pier		This site is no longer an option for EMI, due to the following considerations: radiation concerns and danger to pregnant women and people with pace makers and false joint , security and manpower issues, indemnity insurance to cover the Navy should there be an incident/accident, requirements to wear PPE and no-guarantee access as the facility must be 100% available for Defence.
Tantabiddi Boat Ramp		Access into the Tantabiddi Boat Ramp is only suited for small recreational and charter vessel. Development of a deep water marine infrastructure will have direct environmental impact and is highly unlikely to be supported by the community.

SOURCE: ACIL ALLEN CONSULTING, BMT GROUP

The three sites selected to progress in this process were:

- Exmouth Boat Harbour – North
- Exmouth Boat Harbour – South
- Mobowra Creek

Following a discussion with the Project Steering Committee, it was decided that the floating dock option should continue in the Options Assessment process. This was due to a specific request of State Cabinet to include a floating dock in an assessment of infrastructure options for Exmouth. Given this, a decision was taken to override the high pass filter process and subject the floating dock to the same scrutiny as infrastructure deliver options at the three sites which did not have fatal flaws.

3.2 Identification of uses

The commencement of the site selection process saw ACIL Allen and BMT begin a process of targeted stakeholder consultation to understand the potential uses of new marine infrastructure in Exmouth. The list of stakeholders consulted and the consultation guide used to assist in framing the discussion are included in Appendix B.

The feedback from stakeholders was combined with analysis of the Gascoyne region's economic and social context to identify nine main categories of potential use of infrastructure. These uses are discussed below.

3.2.1 Discussion of potential infrastructure uses

Cruise ships

The current Exmouth Boat Harbour ('EBH') is designed to service recreational and commercial vessels up to 35 metres in length. Cruise ships cannot enter the EBH and has to be anchored offshore in the Exmouth Gulf and cruise operators has to use tender boats to transfer its passengers from ship to shore. Unfortunately, this mode of transfer is highly dependent upon favourable weather and sea conditions. Due to the higher safety risks associated with ship to boat transfer, this arrangement significantly reduces the number of passengers, who decide to disembark and cancellations of cruise

visit are not uncommon. This results in lost opportunities for tourism industry activity and the local economic benefits this can create in the Exmouth region (see Section 2). Cruise operators have flagged with ACIL Allen strong interest in a lasting solution to these challenges, including potential establishment of a year-round cruise calendar centred on Exmouth. This would in turn create the pre-conditions for further expansion of the cruise industry along the entire Western Australian coastline.

The development of Exmouth for reliable cruise ship berthing could further enable the potential for Fremantle to be a turnaround destination for cruise ship operators, increasing cruise ship activity along the west coast and enhancing the economic contribution of the cruise ship industry to Western Australia. Operators have also expressed the desire to utilize Exmouth as the anchor for a year-round cruise schedule in WA.

Tourism WA provided ACIL Allen with an overview of what a "success case" at Exmouth may mean for the incremental growth in cruise visitation across the remainder of the Western Australian coast (based on its own discussions with cruise ship operators). This has been included below (**Table 3.4**).

Cruise ship operators are seeking close to 100 per cent reliability for cruise ship berthing to enable passengers to disembark, to mitigate against the risk of reputation loss and unrecoverable operating costs for local tour operators and businesses. The Ningaloo Coast World Heritage Area creates an international profile for the region, but infrastructure constraints are limiting the use of Exmouth as a destination.

In the 2018-19 cruise shipping season, six cruise ships arrived in Exmouth, with three of them unable to transport passengers to shore using tender vessels due to adverse weather conditions.

The port density for large cruise ships remains low in the north west of Australia. According to stakeholders:

— the ideal distance between one destination to another is between 160 and 220 nautical miles (296 to 407km), to allow for an overnight sail from one destination to another

— the distance between Geraldton and Broome is 975 nautical miles, highlighting the attractiveness of Exmouth as a stopover destination between the two ports for cruise ship operators.

Cruise ship operators need assurances around the capacity of local tour operators to service the arrival of an influx of passengers. For instance, passengers need to depart on coaches quite quickly after arrival, as they're generally in Exmouth for 8-10 hours.

The average size of cruise ship visiting Australia is anticipated to continue to increase in the near future. Allowing for the capacity of local tour operators and the number of permanent residents in Exmouth, the marine infrastructure will be required is to cater for cruise ships with length of 280+ metres (such as Grand and Radiance class cruise ship).

It is noted that the design of marine infrastructure must consider the accessibility requirements of passengers on cruise ships, who traditionally fall within an older age demographic. Through stakeholder consultation, there have been concerns raised on the safety and reliability implications associated with floating deck infrastructure.

TABLE 3.4 SUCCESS CASE CRUISE SHIP CALLS IN A REPRESENTATIVE YEAR

Vessel	Company	Passengers	Exmouth calls	Fremantle calls	Other regional port calls	Total calls
Volendam	Holland America Line	1,440	1	1	3	**5**
Maasdam	Holland America Line	1,258	1	1	5	**7**
Albatros	Phoenix Reisen	940	1	2	6	**9**
Amadea	Phoenix Reisen	600	1	2	6	**9**
Europa	Hapag Lloyd Cruises	408	1	2	6	**9**
Azamara Quest	Azamara Cruises	686	1	1	3	**5**
Crystal Serenity	Crystal Cruises	1,080	1	1	3	**5**
Crystal Endeavor	Crystal Cruises	200	2	2	10	**14**

Vessel	Company	Passengers	Exmouth calls	Fremantle calls	Other regional port calls	Total calls
Sirena	NCL, Oceania Cruises	826	1	1	5	**7**
Regatta	NCL, Oceania Cruises	824	1	1	3	**5**
Viking Sun	Viking Ocean Cruises	465	1	1	3	**5**
Seabourn Sojourn	Carnival Corporation	445	1	1	4	**6**
Seven Seas Navigator	Regent Seven Seas	490	1	1	2	**4**
Pacific Princess	Princess Cruises UK	826	1	1	2	**4**
Le Laperouse	Ponant	264	2	2	10	**14**
Adventurer	Coral Expeditions	120	2	2	4	**8**
Silver Discoverer	Silversea Cruises	120	1	1	2	**4**
Silver Muse	Silversea Cruises	596	1	1	2	**4**
Caledonian Sky	APT	110	2	2	4	**8**
Vasco da Gama	Cruise & Maritime Voyages	1,258	4	4	20	**28**
Pacific Aria	Carnival Australia, P&O Cruises	1,260	20	20	30	**70**
		Total calls	**47**	**50**	**133**	**230**

SOURCE: TOURISM WA

The development of marine infrastructure to cater for cruise shipping needs to consider the availability of the following supporting onshore facilities and services, such as terminal building/shelter, telecommunications, vehicle parking/bus staging areas, fuel storage and fuel pumping system, water supply and wastewater management/treatment. As cruise ship would often take fuel from its home port location and make water using ship's reverses osmosis facility. The extent of the refuelling facility, water supply and wastewater/sullage management and treatment will be subject to further consultation and appropriate needs assessment at later stage of the project.

Cruise ships are subject to customs, immigration and biosecurity controls when entering and/or departing Australia. This includes requiring permission to enter an Australian Non-Proclaimed First port of Entry and/or to enter subsequent Ports of Call. Maritime Traveller Processing Committee approval is required for cruise ships wanting to enter seaports other than at the approved Ports of entry. Consultation with Australian Border Force representatives highlighted that temporary interport arrangements can be made on a case by case basis and would require a proposal to be put and considered. However, attention to space for temporary security and passenger control would allow development of this opportunity to regional tour operators.

Superyachts

Superyachts are large leisure craft with lengths from 30 metres and to over 100 metres. They generally cater to a small number of passengers, particularly relative to a typical cruise industry vessel. At present the vast majority of superyachts operating in Australia are based on the east coast, or Darwin, and only venture as far west as Broome. This is due to range issues. A "stop over" facility at Exmouth may lead to additional superyacht activities in WA.

Superyachts are a growing class of vessels which are generally owned by high net worth individuals, or companies who lease them for private use (such as corporate charters or luxury holidays). According to consultation with Superyachts Australia the market is split approximately 50/50.

The majority of vessels operating in Australia are based in Sydney and journey to Queensland. Some vessels are based in Darwin, and journey as far into Western Australia as Broome, but a lack of appropriate sheltering infrastructure in the west and north west outside of Broome means vessels do not commonly journey any further.

While many superyachts notionally fit within the parameters of the EBH, Superyachts Australia indicated the high tidal range and high operating and opportunity costs of days lost to bad weather meant it was not seen as a viable destination for superyachts.

There is an opportunity to provide a number of services to superyachts at an appropriate facility, including:

- Sustainment and re-provisioning
- Bunkering and fresh water
- Minor works and maintenance (via existing providers)
- Tourism opportunities for patrons

Superyachts Australia indicated a conservative assumption of between two and five superyacht vessel calls per month at Exmouth (on average throughout the year, noting calls may be clustered around the peak tourism season) would represent a perspective on the success case of any fit for purpose marine infrastructure solution.

In addition, a facility at Exmouth may go some way to providing a "milk run" of appropriate berthing facilities that would allow more superyachts to journey to the south west of Western Australia, including for major servicing and maintenance activities at the Australian Marine Complex ('AMC') at Henderson. There are also superyacht manufacturers at AMC.

It is considered likely that any solution which is fit for purpose for cruise vessels would also be fit for purpose for superyachts in the short to medium term. However superyachts are also likely to demand access to right-sized fresh water and fuel bunkering, particularly if Exmouth is seen as a destination as oppose to a stop off. Superyachts Australia also indicated there was generally a preference for floating dock infrastructure for vessels being docked for long periods (ie greater than one day) as hardstand infrastructure more suited to large cruise vessels.

Oil and gas industry support

There are a range of current and prospective oil and gas extraction projects in the Carnarvon Basin, off the north coast of Exmouth. There is an opportunity for marine infrastructure to better cater to the needs of the offshore oil and gas industry. Industry indicated it is currently using Exmouth as an operational base for small vessels, and would expand use if a larger facility was available.

There is likely to be limited direct economic activity associated with these functions, beyond the operations of the infrastructure. However, this industry could represent a source of funding (via port fees) for the facility, which may improve the financial case in the BCA.

The Carnarvon Basin is a highly productive petroleum basin off the north west coast of Western Australia. It hosts a range of currently operational Floating Production, Storage and Offtake (FPSO) oil projects, and a number of gas projects which feed the domestic gas plants located in the Pilbara region. The Scarborough field is also located in the Basin, which is a large and highly prospective development to feed Woodside's Pluto LNG plant expansion and others such as Western Gas' Equus field and BHP's Macedon field.

Current major users include Santos (5-10 year remaining life), Woodside (10+ years) and BHP (10+ years), with some other private interests.

Stakeholders suggested Exmouth's desirable residential setting and location relative to operational offshore facilities may make it a prospective destination for some activities, including:

- Personnel changeover
- Logistics and platform sustainment
- Heavy logistics during construction of new facilities

Department of Transport indicated the Exmouth Boat Harbour had previously been used heavily as an "overflow" facility during the peak in activity earlier in the decade, when Dampier (300km east) was unavailable.

There are a range of competing facilities in the region which have been established/are being established to provide this kind of service, at Onslow Marine Supply Base (private facility) and

Ashburton MOF Facility (formerly Chevron, now Pilbara Ports). However, for assets in the Carnarvon Basin, the Exmouth option offers significant productivity and cost advantages due to the distance between it and operational areas.

To service this demand, an ideal facility would be land backed with a hard stand area available for lay down of supplies and other materials and suitable loading infrastructure to avoid double handling of cargo. The type of vessel available to be serviced will largely depend on constraints with respect to the depth capabilities of the facility. In ACIL Allen's experience vessels in use in the oil and gas industry are generally getting larger. Prospective users indicated a hardstand area was important to cater to the kind of functions of larger vessels. It is noted that there may be some overlaps with the activities in the Exmouth Boat Harbour and the nearby light industrial area, which may allow for reduction of adjacent laydown area associated with the EMI project.

In the short term, ACIL Allen considers it unlikely any current oil and gas operator would shift a material component of their offshore support to a new Exmouth marine infrastructure facility, as the supply chains are well-established via facilities further east. These facilities have a number of benefits associated with a critical mass of suppliers, which do not exist at Exmouth. However, each oil and gas operator consulted indicated Exmouth's closer proximity to offshore operators would provide substantial benefits (in the form of cost savings and quality improvements) in the provision of fresh food, water and other supplies to operating platforms.

Breakbulk cargo imports

Major resources and energy projects in the north west of Western Australia generally import a large share of their capital and construction materials. A fit for purpose facility at Exmouth could act as a cargo import facility to assist in project logistics. This is particularly relevant for a number of approved and likely major projects in the region, such as Subsea 7, the Scarborough gas development, and K+S Salt's solar salt project.

Major resources and energy projects in Western Australia typically import a large share of capital and construction materials. This is particularly the case for petroleum projects, which import specialist production and processing facilities.

A number of existing facilities in the region can cater for this activity, including Onslow, Dampier and Port Hedland. However, the cargo import facility at Onslow is the western-most facility on the north west coast, with the next capable and publicly accessible facility located at Geraldton some 1,000km further around the coast.

During the resources investment boom project cargos were often shipped to the Port of Fremantle and were either trucked up to the north west via Great Northern Highway or floated up on barges. An appropriate facility would provide an additional option for major project proponents seeking to import cargo in the future.

Subsea 7's bundle fabrication facility is an example of one such project. As it stands Subsea 7 plans to import bulk steel pipe and other components via the Port of Dampier and truck them to its site at Learmonth. It indicated during consultation that an appropriate facility would result in it importing these components via Exmouth given the landside logistics are costly and create risk for the project. Other projects in the region which may use such a facility include Woodside's Scarborough project and K+S Salt's solar salt project.

This is primarily a financial opportunity. However, if a prospective future major project was able to get off the ground due to the presence of a cargo import capability in the region this would prove to be a significant economic stimulus.

A cargo import capability would be best served by fixed infrastructure linked to land. Links to the existing Exmouth Light Industrial Area may increase the prospect of major project owners importing via the facility as the area would be able to provide lay down cargo and plan for landside logistics.

There are other infrastructure considerations in the region surrounding the prospective marine infrastructure. For example, Minilya-Exmouth Road is the only north-south road that links Exmouth to the rest of the north west region, and it is prone to flooding during the wet season. Stakeholders have

also raised concerns regarding its fit for purpose for handling larger volumes of industrial vehicle traffic.

Bulk mineral commodities exports (including limestone)

The land around Exmouth is rich in high grade limestone. A number of active tenements are held by Exmouth Limestone, who have mined them in the past. Limestone is a low value construction material which is abundant throughout South East Asia. DMIRS advises there are limited active opportunities for mineral extraction in the Gascoyne region.

In 2018 the value of minerals production in the Exmouth and Upper Gascoyne Local Government Areas was $0.6 million. This comprised mostly of limestone produced at one of seven active mineral tenements in the area.

The Exmouth region hosts significant high-grade limestone and lime sand deposits. The majority of the existing tenements in the region are held by Exmouth Limestone, a 51:49 joint venture between Adelaide Brighton and Whitecrest Enterprises. These tenements represent strategic reserve for Adelaide Brighton – the extent of actual mining has been limited.

According to Adelaide Brighton there are no viable export market opportunities for the product, as the majority of the product's value is related to transport and logistics and there are deposits in most parts of the world. To that end, Exmouth Limestone has previously investigated establishing marine infrastructure in the region, and did not place great emphasis on export of its own product when building its business case.

Consultation with DMIRS suggests there are limited active opportunities for mineral extraction in the Gascoyne region, with three known projects in the region. One of these, the Yangibana Rare Earths project, operated by ASX-listed Hastings Technology Metals Ltd, is close to production. Hastings is targeting 15,000t of Mixed Rare Earth Carbonate production per annum, and has non-binding Memoranda of Understanding with four offtake partners. The mine received EPA approval in July. There are no details with respect to its outbound logistics but inbound logistics are via Fremantle.

Bulk mineral exports require extensive landside infrastructure, including:

- secure stockpiles,
- conveyors, and
- ship loaders.

Conveyor and ship loader infrastructure can be mobile rather than fixed (as is the case with bulk iron ore export infrastructure at other ports in the region). By contrast, rare earth minerals are typically exported via specialised containers, and do not require additional landside infrastructure.

In considering this opportunity, noise and dust impact from export operation would also need to be considered. The lack of viable mineral and other resources opportunities in the region means this should be considered a secondary opportunity.

Horticulture exports

According to Horticulture Innovation Australia, Carnarvon is one of Australia's leading production areas for bananas, table grapes, capsicums and chillies. The State Government has sought to improve the investment environment for agriculture in the region via the Gascoyne Food Bowl initiative. The path to market for horticulture products is south via Geraldton or further to Perth.

The region currently produces a range of horticulture products. DPIRD statistics from 2016 indicate gross value of production of $97.6 million. In 2016, growers in the region extracted 11.6GL of water to facilitate this production, which was above the five year average of 10.8GL.

In December 2018 the State Government released 300 hectares of land in Carnarvon for intensive irrigated horticulture production, following investment in investigations, water infrastructure and associated works to prepare land for horticulture production.

The State Government's investment in the region is intended to provide an additional 4GL per annum of sustainable draw on groundwater supplies. Depending on the product mix of the new producers in

the region, this additional 4GL of water could produce an extra $30-$40m in horticulture products per annum.

However, it is too early to say whether this will occur, as the expression of interest phase of the land release is yet to conclude. In addition, previous consultation with DPIRD suggests it is unlikely a new port facility would be a critical factor to any future decision of producers in the Carnarvon region. The existing roads infrastructure in the region may also create challenges shipping products to Exmouth from Carnarvon.

Western Australia's trade in horticulture products totalled $3.7 billion (excluding freight costs) in 2018-19. The potential growth in Carnarvon represents less than one per cent of this value. However, if the "right" opportunity emerged and an export-scale project was developed, Exmouth infrastructure may represent a path to market.

We understand most Carnarvon horticulture produce is transported to Perth via truck and is then distributed. Fresh horticulture products require refrigerated shipping containers to travel long distances. It is unlikely an export-scale project will emerge from Carnarvon that would demand its own water-based transport and logistics. However, a facility which can cater for shipping container export would provide the option for a project in the future.

Live animal export

The beef cattle herd in the Gascoyne and surrounding region has grown over the past five years. There are a number of active players in the region seeking opportunities to live export beef cattle to markets in the Middle East and Asia. Existing supply chains are linked primarily to Port Hedland, Broome and Wyndham ports.

The Gascoyne region has a long pastoral industry history, with sheep, goats and beef cattle stations operating at various times since settlement.

The beef cattle herd in the Pilbara and Central Pastoral region (the Meat and Livestock Australia region which captures the Gascoyne) has grown significantly over the past decade. The head of cattle has increased from 2,048 in 2008 to a high of 4,532 in 2016, though it has fallen to 2,912 in 2018. Even considering this drop, this is the fastest growth in the State in an industry where growth takes time due to the need to breed cattle.

Notwithstanding this growth, the Kimberley region hosts the vast majority of the State's beef cattle with a total herd of 13,790 in 2018.

The WA Government's Northern Beef Development program is centred on building the beef supply chain in the Pilbara and Kimberley regions. In 2016 ACIL Allen assisted the Department of Agriculture and Food and Meat and Livestock Australia undertake an audit of infrastructure for beef export in the regions. It found there were significant benefits to reduced transport times in the region, and this could be enabled by targeted investment in road and port infrastructure. The report centred on the Pilbara and Kimberley regions, so did not consider Exmouth as an export terminal. However, the recommendations with respect to Onslow and/or Port Hedland could be applied to Exmouth.

According to the Shire of Exmouth there is likely to be limited public support, and potential public hostility, towards live animal export via a new facility at Exmouth.

While the cattle herd is growing, it is possible additional infrastructure will be required to facilitate live cattle exports at a new facility at Exmouth. This is likely to include: roads, truck wash facilities, stockyard/s, loading facilities and safety and quality checking yards.

In addition, live animal exports may constrain the delivery options for the facility. For instance, a floating dock would be unable to facilitate live animal exports, while export via a hardstand wharf with a narrow link to the land would be problematic and require additional investment to guarantee safety of cattle.

While the herd is increasing, the critical mass of beef cattle is centred further east towards the Kimberley region. It will take some time for the beef cattle herd in the Pilbara and Central Pastoral region to grow large enough for this centre to shift.

Australian Border Force

The Australian Border Force ('ABF') has ten Cape Class vessels based at the Port of Darwin operating in waters north, west and east of Exmouth. There may be opportunities associated with use of a facility of Exmouth, though they are more likely to be financial benefits, and are unlikely to be stable/predictable.

The ABF operates eight Cape Class vessels, which are based at the Port of Darwin, and two larger vessels which are at sea for 80-90 per cent of the year. These vessels undertake a range of services from environmental protection, illegal fishing monitoring and enforcement, and border protection and surveillance activities.

The ten Cape Class vessels have a range of 4,000 nautical miles (~7,400km), meaning they can traverse roughly two thirds of the Australian coastline or journey between Darwin and the Cocos Islands before refuelling. However, given the operational area of a range of ABF activities is to the north, north east and north west of Exmouth, an expanded facility at Exmouth may be of use to vessels for activities such as:

— crew changeover,
— sustainment (refuelling, provisions and consumables), and
— shelter during adverse weather.

An expanded facility may be attractive to ABF given it may offer additional flexibility to the ABF against existing facilities. However, the existing EBH can cater for the majority of the ABF's operational fleet.

Department of Defence

In line with the initial site selection filters applied to the Navy Pier site, use by the Department of Defence has not been assessed in detail due to a lack of engagement from the Department of Defence and the complex operational requirements which may inhibit additional uses.

3.2.2 Qualitative assessment framework

To assist in the options assessment, the findings of the assessment of potential uses were quantified in a qualitative "star ratings" framework. Each opportunity is assessed on a scale of zero to five with respect to the confidence the project team had in the ability of the use of the infrastructure to deliver both economic value (to the region and to the State), and financial value to the new infrastructure.

The economic value criteria was split into two, with 50 per cent of the score driven by an assessment of the economic value to the region and the remainder by an assessment of the economic value to the State. This was designed to ensure the prioritisation of uses would consider the strategic nature of a new piece of marine infrastructure.

Each opportunity is scored 0-5 on the three criteria, as per the below table (**Table 3.5**).

TABLE 3.5 EMI USE QUALITATIVE SCORING

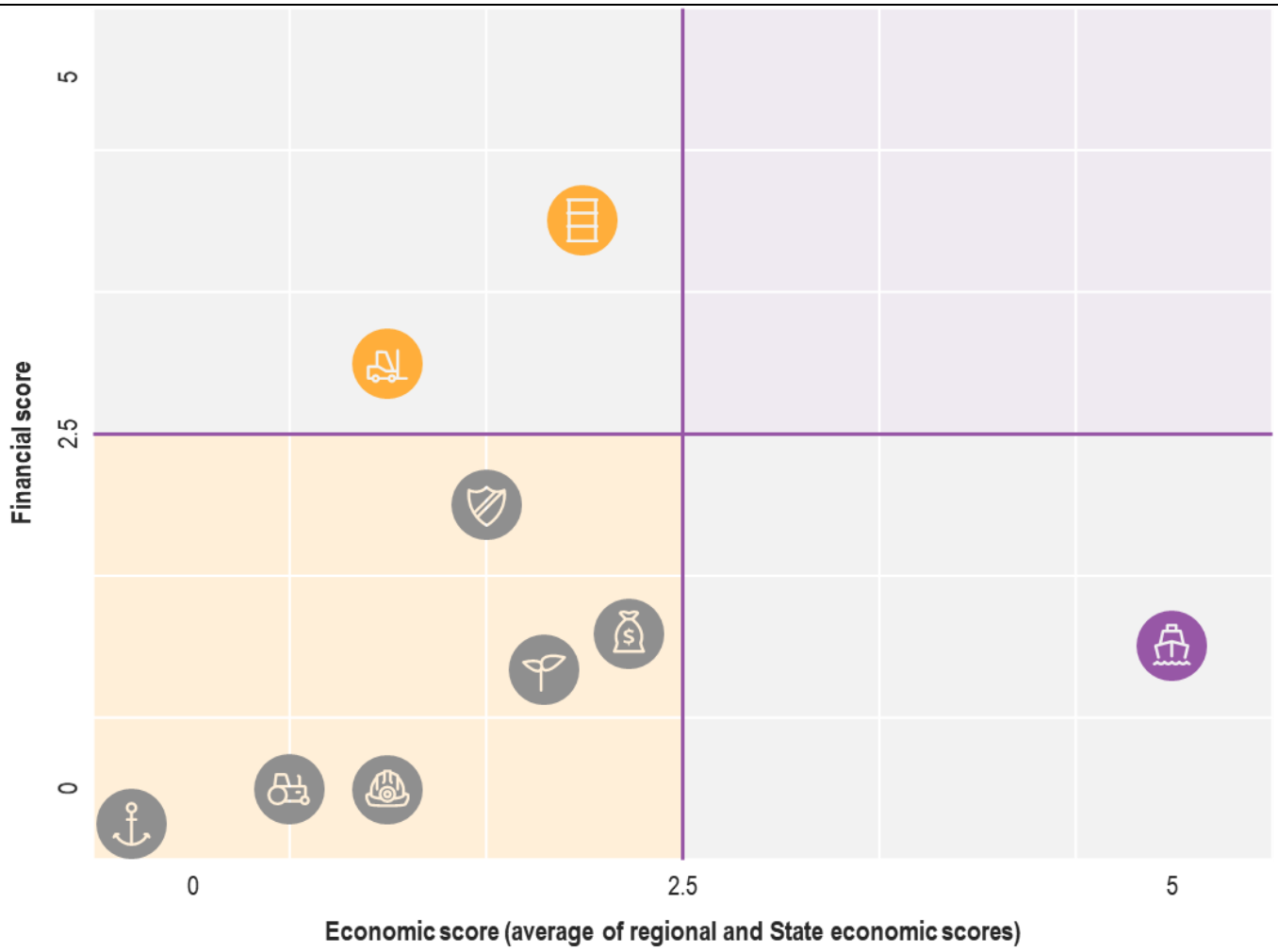
Heading	Cruise	Superyacht	Oil & gas	Cargo	Minerals	Horticulture	Animals	ABF	Defence
Economic (region)	5	2	3	1	1	3	1	2	0
Economic (state)	5	2	1	1	0	1	0	1	0
Financial	1	1	4	3	0	1	0	2	0

SOURCE: ACIL ALLEN CONSULTING

The result of the scoring is a 2x2 matrix for the opportunities, which demonstrates the prospectivity of each use against all other uses. Opportunities which sit in the top right quadrant of the matrix (scoring high on both economic and financial criteria) should be the priority uses for considerations regarding site selection and infrastructure delivery, while those in the bottom left quadrant (scoring low on both

economic and financial criteria) should be de-prioritised. Opportunities which sit in the top left quadrant (high financial, low economic) and bottom right quadrant (low financial, high economic) should be secondary to those in the top right, but are important to the overall economic and financial potential of the infrastructure. The matrix plotting the uses and scores discussed in **Table 3.5** is presented below (**Figure 3.2**).

FIGURE 3.2 QUALITATIVE ASSESSMENT OF EMI USES MATRIX



SOURCE: ACIL ALLEN CONSULTING

3.3 Development of options

As an initial first step in the development of a long list of options for analysis, BMT examined the infrastructure delivery considerations for the three main target user groups as presented in Section 3.2.2. These are presented in the table below (**Table 3.6**). Further detail is included in Appendix C.

Overall, it emerged the basis of design for new infrastructure that would cater to most – if not all – potential uses in these three grouping was a depth of 9.5 metres LAT, and a wharf interface of at least 120 metres in length. It was noted that there may be some very large cargo vessels that could not access the facility, but breakbulk cargo was secondary consideration against cruise, and a 9.5 metre depth would be suitable for almost all prospective cruise vessels operating in the region.

TABLE 3.6 BASIS OF DESIGN CONSIDERATIONS

Type of use	Infrastructure considerations
Cruise	— Few Cruise vessels have draughts greater than 8.5m and requiring access to navigable water depths of approximately 9.5m below low water — The preferred design vessel would lead to access for cruise vessel classes from Expedition, Mid-size Cruise and Large Cruise vessels as shown above — Breasting 0.3 - 0.4L (PIANC) results in 120m wharf face as per Floating Dock Option — 6 – 9m wide wharf apron at a minimum 12 – 22m preferred — Access to lower side shell doors at a minimum – Terminal generally not required but waiting space in GTA 1-2m^2 per passenger – Ground Transport Area for 30-40% of passengers shuttle or tours or >1,500 provision for shuttles to town and tour bus pickup preferable – Shade and public amenities in waiting zones – Lower doors direct to apron tidally constrained — Transportation access to the wharf is required due to long jetty – shuttle bus minimum – coach turnaround Apron + 40m say 50m wide — Interport Facilities (may be temporary) should be able to be accommodated – (receiving and handling the luggage – Federal clearance protocols and additional waiting/screening areas – physical security separation from transiting and interporting passengers & luggage on wharf
Oil & gas	— To service this demand, an ideal facility would be land backed with a hard stand area available for lay down of supplies and other materials and suitable loading infrastructure. — The type of vessel available to be serviced will largely depend on constraints with respect to the depth capabilities of the facility. In ACIL Allen's experience vessels in use in the oil and gas industry are generally getting larger. However, use is likely to be limited to opportunistic throughput of project cargo without further development of local infrastructure for water and fuel etc. — Prospective users indicated a hardstand area was important to cater to the kind of functions of larger vessels. — There is likely to be limited direct economic activity associated with these functions, beyond the operations of the infrastructure. However, this industry could represent a source of funding (via port fees) for the facility, which may improve the financial case in the BCA. — There is some overlap with the activities in the EXBH and the nearby LIA which may allow assumption of reduced need for adjacent laydown area.
Breakbulk cargo	— A cargo import capability would be best served by fixed infrastructure linked to land. — Links to the existing Exmouth Light Industrial Area may increase the prospect of major project owners importing via the facility as the area would be able to provide lay down cargo and plan for landside logistics. — There are other infrastructure considerations in the region surrounding the prospective marine infrastructure. For example, Minilya-Exmouth Road is the only north-south road that links Exmouth to the rest of the north west region, and it is prone to flooding during the wet season. Stakeholders have also raised concerns regarding its fit for purpose for handling larger volumes of industrial vehicle traffic — Key Criteria which all option infrastructure should be able to accommodate for use in siting and options development were: – Access for turnaround heavy vehicles for dockside loading at a minimum 60m plus apron - platform 120m x 120m including the wharf was assumed for option development – Small Bulk ships will require deeper draught than Cruise vessels and depths to -11.5m below low water – Loading would rely on deck gear

SOURCE: BMT GROUP

Following these considerations a long list of options was developed as an input into the Multicriteria Assessment. For the three land-based sites, BMT developed four main infrastructure delivery concepts options. The concepts included:

- 100% rock causeway to required depth of 9.5m to maximise the benefit from the economy of locally available construction material
- Composite rock causeway and jetty to required depth of 9.5m to minimise the additional volumes of rock in deeper water
- Rock causeway and wharf to dredged berthing pocket and turning circle to minimise the structure length and maximise locally available materials
- Rock causeway with jetty mid section and wharf to dredged berthing pocket and turning circle to minimise structure length and reduce impact on environmental values through disruption of current and wave interactions

Some modest variations on these concepts were also developed for the Exmouth Boat Harbour site, taking stakeholders views with respect to minimisation of environmental impact into account. These included alternative concepts for the wharf infrastructure (ie rockfill versus jetty), and alternative lengths of jetty and rockfill to the base option of an approximate 50/50 split.

In addition, two concepts were developed for the floating dock site. The concepts included:

- A standalone floating dock
- A floating dock linked to fixed rock causeway and jetty infrastructure

In total, 23 options were developed and considered as part of the Multicriteria Assessment presented in Section 4. These are summarised in the table below (**Table 3.7**).

TABLE 3.7 LONG LIST OF EMI OPTIONS

Heading	Concept 1: Rock Causeway to Depth	Concept 2: Rock Causeway and Jetty to Depth	Concept 3: Rock Causeway and Dredging	Concept 4: Rock Causeway, Jetty and Dredging	Floating Dock only	Floating Dock plus land link
Exmouth Boat Harbour – North	— Option 1	— Option 2 (50/50) — Option 3 (more jetty than rock) — Option 4 (more jetty than rock, with rock island)	— Option 5 — Option 6 (jetty between land and rock island)	— Option 7 (50/50) — Option 8 (more jetty than rock)		
Exmouth Boat Harbour – South	— Option 9	— Option 10 (50/50) — Option 11 (more jetty than rock) — Option 12 (more jetty than rock, with rock island)	— Option 13 — Option 14 (jetty between land and rock island)	— Option 15 (50/50) — Option 16 (more jetty than rock)		
Mobowra Creek	— Option 17	— Option 18 (50/50) — Option 19 (more jetty than rock, with rock island)	— Option 20	— Option 21 (50/50) — Option 22 (more jetty than rock)		
Floating Dock					— Option 23	— Option 24

SOURCE: BMT GROUP, ACIL ALLEN CONSULTING

4 MULTICRITERIA ASSESSMENT

4.1 Introduction

To assist in the prioritisation of options, ACIL Allen developed a Multicriteria Assessment ('MCA') framework that sought to rank each option against all other options with respect to the extent to which the option was likely to deliver on a series of assessment criteria. MCA is a commonly used technique as part of an options assessment process, as it seeks to introduce a logical framework for first determining preferences and then assessing how well options meet preferences compared to all other options on balance across the suite of preferences.

An MCA is a two step process. The first step involves the development of a series of weighted selection criteria, which are intended to reflect the balanced priorities and/or outcomes an investment is seeking to foster. The second step involves scoring each option against each criteria, and then determining an overall score by multiplying the scores by the weights of the criteria.

ACIL Allen has applied a ranking-based scoring system for this MCA, as many of the options prepared represent modest variations on the same concept. This means the weighted score of the MCA represents a weighted ranking of the option against all other options, with the two best ranked (lowest numerical score) options those which are to be subject to more detailed analysis. Further discussion of the scoring system employed is included below. The identification and discussion of two preferred options is included in Section 4.4.

4.2 Selection criteria and criteria weightings

The development of selection criteria for an MCA is an important step in the overall Options Assessment process. The determination and subsequent weighting of assessment criteria is the primary opportunity for relevant stakeholder views regarding the priorities of the State Government to be considered when filtering through the high volume of potential ways to address the problem as it has been defined.

Determining selection criteria and criteria weightings is a subjective exercise. Given this, it is important to take into account a range of views to ensure as much relevant information can be used to form the criteria and the criteria weightings.

To assist in this process, ACIL Allen has included a two stage criteria weighting process. The process initially groups individual criteria together into categories, and then weights the individual criteria within each category to equal 100 per cent within the category. This reduces the subjectivity of judgement of the relative merits of individual criteria which may be conflicting.

4.2.1 Determining selection criteria

In conjunction with the GDC executive staff, GDC board and EMI Project Steering Committee, ACIL Allen developed a series of assessment criteria that sought to present a balanced view of the State Government's priorities as determined by the following documents:

- Information and documentation associated with discussions of the **Joint Economic Development Sub-committee** of State Cabinet pertaining to the Exmouth Marine Infrastructure project,
- The Exmouth Marine Infrastructure **Project Definition Plan**, prepared by GDC
- Economic Benefits Assessment of the Exmouth Floating dock Project (prepared by ACIL Allen), which discusses the **missed opportunities associated with cruise ship visitation** for the Gascoyne region
- The Gascoyne Development Commission's ***Regional Investment Blueprint***
- The State Government's ***Our Priorities*** State Government objectives

The most significant guiding document used to form the selection criteria and criteria weightings is the feedback provided by JED to the GDC, and the GDC's own Project Definition Plan. In particular, the Project Definition Plan stated six overall objectives for the EMI Project. These are:

1. Facilitate **regional, state and national economic growth** through the delivery of safe and reliable marine infrastructure;
2. Where feasible, **promote and cater for maritime industries**, including offshore oil and gas support, general cargo, cruise shipping, superyacht, fishing and aquaculture, defence and other related service industries;
3. **Facilitate the berthing of the world's largest cruise ships** and adequately plan for the **ongoing growth and development** of this market;
4. Improve Australia's situational awareness and **lower transport and logistic costs**;
5. Maintain **sound and appropriate environmental management practices**; and
6. Delivering **economic growth and a more stable and viable community**; making Exmouth a destination and residential location of choice.

The Project Definition Plan also included a number of desired features of the proposed infrastructure. These are:

1. is **best practice** - to suit dynamic and developing markets;
2. has a **minimal environmental impact** - minimal bottom disturbance and dredging;
3. has **rapid assembly and disassembly** - shorter timeframes than conventional infrastructure;
4. is **robust, safe and flexible** - suitable for use in cyclone prone areas and multi-model vessels; and
5. provides a **workable solution for cruise ships** ensuring cancellation of shore visits is a thing of the past.

In addition, ACIL Allen used the feedback and information provided by a number of stakeholders to assist in the formation of the criteria for the MCA. This feedback is discussed throughout Section 3.2.

On balance, it emerged throughout consultation and through the desktop review of previous reports and relevant guiding policies that **improving the prospect of cruise ship visitation to Exmouth** via a new piece of infrastructure was by far the over-riding motivation of the State to pursue this project. Given this, it was considered appropriate a specific criteria centred on facilitation of cruise ship visitation to Exmouth was included in the MCA, and that it was given the highest weighting of any individual criteria in the assessment.

Promoting the development of **additional marine-based industries** in the region was also considered an important economic objective, and so this was given its own assessment criteria. However, as discussed in Section 3.2.2 the prospect of additional economic activity from non-cruise industries was considered limited as this stage of the development of the infrastructure.

Other important economic considerations included:

- That the option was **likely to advance the development of the Exmouth Marina Precinct**. This was a view expressed by the Shire of Exmouth and the GDC, given it was considered likely the

development of a new piece of marine infrastructure represented one of the final "big bang" opportunities to see further development of the marina on the northern side of the Exmouth Boat Harbour.

— That the option was **likely to promote further economic development in the region**. This criteria was established to give an additional weighting to opportunities that were localised, instead of matters of State-wide significance.

Together, these four criteria formed the **Economic** category of the MCA.

It was decided the other primary driver of the MCA should be **Social and Environmental** matters. These criteria were considered important to ensure the MCA was able to adequately prioritise options which delivered broadly the same economic scores but had a smaller prospect of environmental impacts. Feedback from the GDC and Shire also suggested this group of criteria include some reference to the positive social potential of the infrastructure, in line with the Project Definition Plan objectives and the strong culture of outdoor recreational activity exhibited by residents of the town.

Given this, it was decided four criteria were best able to capture both the upside and express the desire to limit the environmental downside of any preferred option. These criteria are:

— That the option was **likely to enhance recreational uses for Exmouth residents**

— That the option resulted in **limited dredging and other direct environmental impacts during construction**

— That the option **limited impact on coastal flows once established**

— That the option resulted in a **limited impact on current Exmouth Boat Harbour operations**

Finally, it is important that cost-related factors are taken into account in an MCA of this nature. To reflect this, a final category of criteria was included for **Financial** criteria. The two financial criteria included in the MCA were **upfront capital cost** and a subjective assessment of the **likelihood of additional investment in enabling infrastructure** such as roads, bridges or landside infrastructure.

Another important consideration for a project of this kind is **ongoing operations and maintenance costs**, however this was not included in the MCA. Advice from BMT Group indicated there would be limited variance in the operating costs for most options, because most of the options developed were fixed infrastructure which has limited maintenance costs during the useful life of the asset. To the extent there is an ongoing maintenance requirement, the cost of the maintenance is generally forecast as a fixed multiple of the capital cost of the facility. This means the assessment of options based on their capital costs is a sufficient means to address the substance of this criteria without including a standalone criteria.

The one exception to the rule in this case is the floating dock options. Floating dock options are projected to have a much higher operating cost requirement than fixed infrastructure given the need to tow the infrastructure away during adverse weather conditions, and that the infrastructure remains subject to tidal variations which require ongoing monitoring of the strength of piles driven into the seabed.

4.2.2 Weighting the assessment criteria

The first task in weighting the assessment criteria is to assign weightings to the individual criteria within each category. The individual weightings in each category are presented in the table below with a brief rationale for the weighting applied (**Table 4.1**).

TABLE 4.1 MCA CRITERIA WEIGHTING WITHIN CATEGORIES

Category	Criteria	Criteria weighting	Rationale
Economic	Suited to meeting the needs of the cruise industry	50%	It was assessed the cruise industry criteria should account for the largest share of the weighting (accounting for the same as the other three criteria combined). However, given the State's preference for additional marine industry development, and the need for this activity to provide a financial benefit to the facility for
	Potential to be multi-user	30%	
	Likely to advance the development of the Exmouth Marina Precinct	10%	

Category	Criteria	Criteria weighting	Rationale
	Likely to promote further economic development in the region	10%	funding purposes, the multi-user criteria was also considered important.
Social & Environmental	Likely to enhance recreational uses for Exmouth residents	20%	The environmental elements of this category were considered the most important as they needed to provide an offset to options which may score similarly on the other criteria in line with the discussion above. From here, it was assessed the positive element of the social criteria (new uses) should be worth more than the criteria limiting impacts given the mandate of the process to investigate a new piece of infrastructure.
	Limited dredging and other direct environmental impacts during construction	35%	
	Limited impact on coastal flows	35%	
	Limited impact on current Exmouth Boat Harbour operations	10%	
Financial	Upfront capital cost	75%	Given the capital cost of the facility was somewhat known, it was given a higher weighting than a subjective assessment of any further investments required. However, where additional investment requirements were a factor it was considered important that this criteria was meaningful enough that it could differentiate options which were similar in other ways.
	Requires limited additional State investment in enabling infrastructure	25%	

SOURCE: ACIL ALLEN CONSULTING

The final step in this process is the development of the category weights, or the weights for the Economic, Social & Environmental and Financial categories. These category weights sum to 100 per cent, and when applied to the criteria weights within each category ensure the individual criteria sum to 100 per cent. As discussed earlier in this section, ACIL Allen undertakes this two stage process when developing MCA weights as a way to remove some elements of subjectivity in the assessment by introducing a layer of judgement between individual criteria which may be conflicting.

Following discussions with the GDC executive, GDC board and EMI Project Steering Committee, it was decided the following weightings would be applied to the categories in the MCA.

- Economic category: 50 per cent
- Social & Environmental category: 30 per cent
- Financial category: 20 per cent

The category weights reflect the overarching objectives of the State Government in pursuing this project, which is to provide economic growth and development to both the region and the State at large. However, by giving the Social & Environmental category a higher weighting than the Financial category, the MCA should ensure that environmental factors are used to separate options which may have similar scores on the primary Economic criteria.

Applying these category weights to the individual criteria weightings yields the following final weightings across each criteria for use within the MCA.

TABLE 4.2 FINAL CATEGORY WEIGHTINGS APPLIED TO MCA

Category	Criteria	Criteria weighting	Final MCA weighting
Economic (50%)	Suited to meeting the needs of the cruise industry	50%	25.0%
	Potential to be multi-user	30%	15.0%
	Likely to advance the development of the Exmouth Marina Precinct	10%	5.0%
	Likely to promote further economic development in the region	10%	5.0%
Social & Environmental (30%)	Likely to enhance recreational uses for Exmouth residents	20%	6.0%
	Limited dredging and other direct environmental impacts during construction	35%	10.5%
	Limited impact on coastal flows	35%	10.5%

Category	Criteria	Criteria weighting	Final MCA weighting
	Limited impact on current Exmouth Boat Harbour operations	10%	3.0%
Financial (20%)	Upfront capital cost	75%	15.0%
	Requires limited additional State investment in enabling infrastructure	25%	5.0%

SOURCE: ACIL ALLEN CONSULTING

Overall, the biggest drivers of the MCA are suitability for the cruise industry, the potential for the facility to be multi-user, and the upfront capital cost (scored as the lowest cost being the best ranked option). When combined, the two environmental impact-based criteria become the second largest single driver of the MCA outside of the cruise industry suitability ranking. Of lesser importance are criteria related to recreational use, impact on current operations, and additional enabling infrastructure requirements.

The next section discusses ACIL Allen's approach to scoring each of the options against the criteria, and presents the full MCA matrix for information.

4.3 MCA scoring

As discussed in Section 4.1, the MCA scoring was undertaken using a ranking of each option against all other options by the extent to which the option was able to address the criteria. This approach was selected as the scoring as there was limited difference in a number of the options that a traditional sliding scale scoring approach would not have provided the variance in assessment required for an MCA.

In general, the scoring was completed starting with the option which was assessed as having the best prospect of addressing the particular selection criteria, with the ranking proceeding from there. Where there was no identifiable difference in two or more options as the ranking proceeded from first to last, the options were given the same rank and the next best option was given a ranking that reflected the next position in the ranking. For example, if two options were ranked as #1 (and receive a score of one for that criteria), the next best option would receive a rank of #3, not #2 (and receive a score of three for that criteria).

ACIL Allen's approach to ranking each option in each criteria is included in the table below (**Table 4.3**).

TABLE 4.3 MCA SCORING APPROACH SUMMARY

Criteria	Ranking criteria
Suited to meeting the needs of the cruise industry	Options which provided a direct, land-linked berthing solution were preferred to other options. Options which were centred on the Exmouth Boat Harbour were preferred to options centred on Mobowra Creek due to the closer proximity to the Exmouth town site. Options which were centred on a direct link to the northern side of the harbour were preferred to the southern side for this same reason, on account of the linkage to the Exmouth Marina precinct. Options which had a shorter distance between berthing infrastructure and the mainland were preferred to options with a longer distance.
Potential to be multi-user	Options which provided a direct, land-linked berthing solution were preferred to other options. Options which provided a linkage to the Exmouth light industrial area and area on the south side of the Exmouth Boat Harbour zoned for industrial activities were preferred to other options. Options which had a shorter distance between berthing infrastructure and the mainland were preferred to options with a longer distance.
Likely to advance the development of the Exmouth Marina Precinct	Options which were centred on a direct link to the northern side of the harbour were preferred to other options.
Likely to promote further economic development in the region	Options which were more likely to promote local economic opportunities were preferred to other options.

Criteria	Ranking criteria
Likely to enhance recreational uses for Exmouth residents	Jetty-style infrastructure solutions were preferred to rockfill-style infrastructure solutions due to the prospect of marine ecosystem development around the infrastructure. Infrastructure with longer causeways were preferred over infrastructure with shorter causeways due to a higher volume of potential new marine ecosystem development and other uses that can occur. Options closer to Exmouth were preferred to other options.
Limited dredging and other direct environmental impacts during construction	Options with no dredging and minimal seabed impacts were preferred to options with no dredging and some seabed impacts, which were preferred to options with no dredging and major seabed impacts, which were preferred to options with dredging and some seabed impacts, which were preferred to options with dredging and major seabed impacts.
Limited impact on coastal flows	Options with no impact on coastal flows as a result of the infrastructure installation (floating dock) were preferred to options with jetty-based infrastructure (as these have limited impact on coastal flows), which were preferred to options with rockfill structures (as these have an impact on coastal flows). Within the rockfill options, shorter rockfill causeway structures were preferred to longer rockfill causeway structures.
Limited impact on current Exmouth Boat Harbour operations	Options outside of the Exmouth Boat Harbour were preferred to those in the Exmouth Boat Harbour. Within this, options which were on the north side of the harbour were preferred to the south side given the Exmouth Boat Harbour channel and access is to the south side.
Upfront capital cost	Options were ranked in reverse order from lowest cost to highest cost.
Requires limited additional State investment in enabling infrastructure	Options were assessed principally by site, with options on the Exmouth Boat Harbour North side needing no additional investment, options on the Exmouth Boat Harbour South side requiring some limited investment in transport infrastructure, Mobowra Creek options requiring additional investment in transport infrastructure, and a standalone floating dock requiring substantial landing infrastructure to cater for visitors.

SOURCE: ACIL ALLEN CONSULTING

Figure 4.1 presents the scoring of each of the options using the approach to scoring discussed above. The preferred options were the ones with the lowest score as this reflected the options which on balance produced the highest ranking (and lowest numerical score).

FIGURE 4.1 MCA SCORING RESULTS

Criteria	Weight	Exmouth Boat Harbour - North								Exmouth Boat Harbour - South								Mobowra Creek					Floating Dock	
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Suited to meeting the needs of the cruise industry	25.0%	9	9	9	9	1	1	1	1	13	13	13	13	5	5	5	5	19	19	19	17	17	23	22
Potential to be multi-user	15.0%	13	13	13	13	9	9	9	9	5	5	5	5	1	1	1	1	19	19	19	17	17	23	22
Likely to advance the development of the Exmouth Marina Precinct	5.0%	1	1	1	1	1	1	1	1	10	10	10	10	10	10	10	10	19	19	19	19	19	18	9
Likely to promote further economic development in the region	5.0%	5	5	5	5	1	1	1	1	13	13	13	13	9	9	9	9	19	19	19	17	17	23	22
Likely to enhance recreational uses for Exmouth residents	6.0%	14	9	5	7	14	11	3	1	14	9	5	7	14	11	3	1	18	18	18	18	18	23	11
Limited dredging and other direct environmental impacts during construction	10.5%	11	7	5	9	22	19	17	15	11	7	5	9	22	19	17	15	4	2	3	21	14	1	13
Limited impact on coastal flows	10.5%	21	4	2	7	18	16	13	11	21	4	2	7	18	16	13	11	21	4	7	18	13	1	7
Limited impact on current Exmouth Boat Harbour operations	3.0%	15	15	15	15	15	15	15	15	7	7	7	7	7	7	7	7	1	1	1	1	1	6	15
Upfront capital cost	15.0%	3	10	12	14	4	13	18	19	7	15	17	9	5	8	20	22	6	16	11	21	23	1	2
Requires limited additional State investment in enabling infrastructure	5.0%	1	1	1	1	1	1	1	1	10	10	10	10	10	10	10	10	19	19	19	19	19	18	1
TOTAL WEIGHTED RANKING		9.65	8.20	7.84	9.20	7.84	8.49	8.23	7.84	11.11	9.81	9.45	9.31	8.85	8.60	9.39	9.15	15.09	14.59	14.26	17.91	16.95	14.07	13.91
MCA rank		14	4	2	10	1	6	5	3	16	15	13	11	8	7	12	9	21	20	19	23	22	18	17
Estimated CAPEX ($m)		74.6	106.7	108.3	110.3	77.6	109.1	122.5	123.5	85.1	113.7	120.7	94.1	81.1	86.1	126.2	133.0	83.7	115.9	106.9	130.0	170.9	49.8	65.9

SOURCE: ACIL ALLEN CONSULTING

4.4 Identification of preferred options for further assessment

The MCA identifies the following two options as the most suited to addressing the balanced criteria of the State Government as introduced and discussed in Section 4.2. The cost estimates provided at this screen level option assessment are indicative in nature and to be used comparative purposes. The cost estimate provided may be considered as Class 5 cost estimate under the AACE's International Recommended Practice for Process Industries[8].

4.4.1 Option 5: Exmouth Boat Harbour North Rock Causeway plus Dredging

This option scored strongly across the main Economic criteria grouping, as well as the Financial criteria, but performed comparatively poorly on the Environmental & Social criteria grouping. With a capital cost of $77.6 million, the option is the second-least expensive of the non-floating dock options, which as discussed in Section 3.3 is primarily a reflection of the comparatively low cost of rockfill options which offsets the additional costs associated with dredging which are not present in other options.

The particulars of the infrastructure are described below.

- 1.8Ha of reclamation area for GTA and laydown areas located adjacent to the existing Exmouth Boat Harbour's northern breakwater
- 400m of rock causeway, including road way and passing lane
- Fixed wharf structure
- 120m x 120m island for work platform and laydown areas
- Mooring and berthing dolphins
- Dredging down to -9.5m LAT.

The indicative cost breakdown is provided below.

TABLE 4.4 OPTION 5 COSTING BREAKDOWN

Item	Costing
400m rock Causeway	$8.2 million
Road Pavement	$0.2 million
GTA	$1 million
Causeway Head	$13.6 million
Wharf Structure	$15 million
Mooring/Berthing Dolphins	$11.5 million
Dredging	$28.1 million
Total	**$77.6 million**

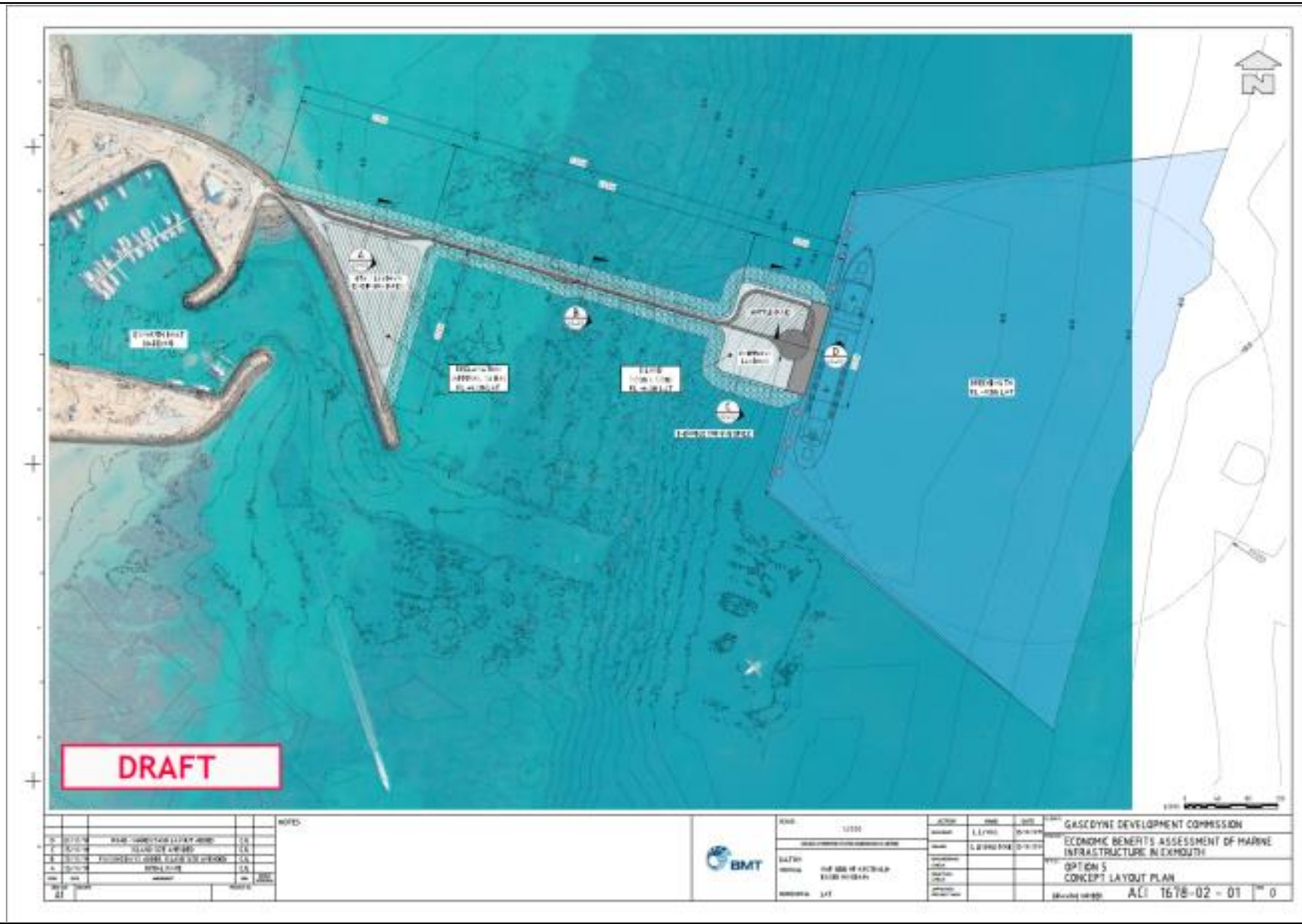
SOURCE: BMT GROUP

Most of the environmental impact and issues would be common to the two options, however this option specifically includes the need for dredging and dredged material management (whether to land for re-use or to sea). If dredged material is to be placed at sea, then a sea dumping permit application and approval would be required. If the dredged spoil is reused on land, then a vegetation clearing assessment/permit and/or contaminated site assessment will be required. Environmental costs have This option will however have some additional environmental costs and impacts which will be quantified in the BCA (see Section 6).

Initial drawings of Option 5 are included on the next two pages.

[8] AACE (2016), Cost Estimate Classification System – As Applied in Engineering, Procurement, and Construction for the Process Industries. TCM Framework: 7.3 – Cost Estimating and Budgeting.

FIGURE 4.2 OPTION 5 INITIAL DRAWINGS



SOURCE: BMT GROUP

4.4.2 Option 3: Exmouth Boat Harbour North Piled Jetty to Depth

This option scored well across all criteria groupings on average, which is a reflection of the linkage to the northern side of the Exmouth Boat Harbour, plus the minimal environmental impacts associated with the jetty to depth delivery option. However, the option has a capital cost of $108.3 million, placing it in the middle of the cost range (and approximately $31 million more expensive than the other preferred option).

The particulars of the infrastructure are described below.

- 1.8Ha of reclamation area for Ground Transport Area (GTA) and laydown areas located adjacent to the existing Exmouth Boat Harbour's northern breakwater
- 840m of jetty
- Fixed wharf structure/Marine Platform (120m x 120m)
- Mooring and berthing dolphins

The indicative cost breakdown is provided below.

TABLE 4.5 OPTION 3 COSTING BREAKDOWN

Item	Costing
Rock Seaway around GTA	$2.6 million
Road Pavement	$100,000
GTA	$1 million
Wharf Platform	$72 million
Jetty	$18.4 million
Mooring/Berthing Dolphins	$14.2 million
Total	**$108.3 million**

SOURCE: BMT GROUP

This option has limited environmental costs, due to the exclusion of dredging. However, there are likely to be noise-related impacts during construction associated with driving piles into the seabed. The difference between this option and the other preferred option will be an important factor in the BCA (see Section 6).

Initial drawings of Option 3 are included on the next two pages.

FIGURE 4.3 OPTION 3 INITIAL DRAWINGS

SOURCE: BMT GROUP

5 PROJECT FINANCIAL MODELLING

The final two sections of the report presents the findings and directions associated with the economic benefits assessment component of the scope of services. This modelling examines the direct and indirect benefits associated with an investment in either of the two options discussed in the previous section.

5.1 Introduction

To demonstrate the economic benefits associated with the provision of the new marine infrastructure options at Exmouth analysed in Section 3, ACIL Allen has undertaken preliminary financial modelling and economic analysis of the two options in three frameworks. These frameworks include:

- **Project Financial Modelling**, to present the total estimated financial position of the new infrastructure considering the estimated capital and operating costs and conservative projections of revenue associated with the use of the infrastructure
- **A Benefit Cost Assessment**, to present (at a whole of Western Australia level) an assessment of the quantifiable benefits and costs (and net benefits) of making an investment in the facility
- **An Economic Impact Assessment**, to present the direct and indirect economic benefits associated with the facility in terms of an estimated future contribution to economic output, incomes, and employment at a Gascoyne and Western Australia level.

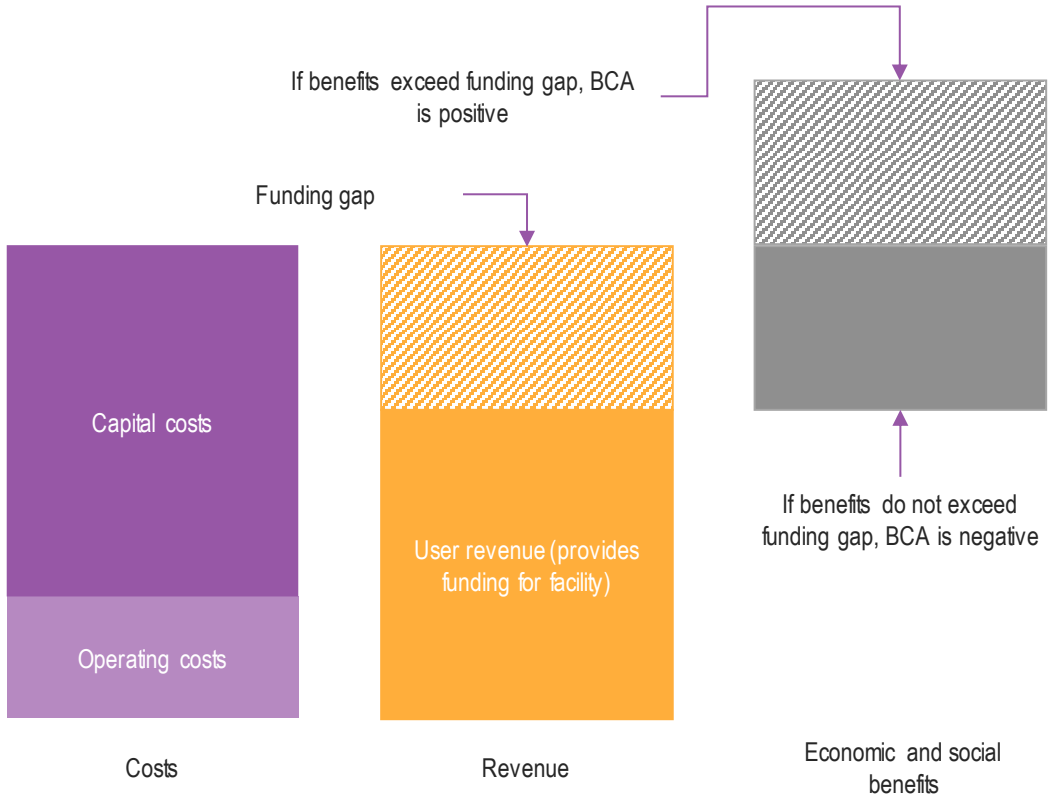
Each modelling framework builds on the one which comes before it. The Project Financial Model is a preliminary assessment of the standalone financial viability of each option, taking into account conservative estimates of the use of the facility and applying the pricing framework of a similar facility in Western Australia. The Benefit Cost Assessment ('BCA') then examines which of these financial benefits are incremental (or completely new) to Western Australia, and adds additional social benefits and costs to provide a quantitative view as to whether an investment produces net benefits to Western Australians. The Economic Impact Assessment then adds additional context regarding the scale of economic benefits by deriving the indirect (and therefore the total) economic benefits associated with the investment.

The cascading approach to the modelling task discussed above is summarised below (**Figure 5.1**). The remainder of this section discusses each of the modelling frameworks introduced above and in the figure in detail, including any assumptions made that have facilitated the calculation of benefits and costs. The final part of the section summarises the findings and provides some additional direction regarding the economic benefits assessment and the key considerations leading into additional work should the State decide to investigate this investment further.

It is important to note at this early stage of the examination of the project that **the economic benefits assessment is explicitly centred on a "success case" for the infrastructure.** This is because the

overarching purpose of the engagement is to understand whether further work is justified on the basis that the project has the potential to delivery economic and social benefits to Western Australians.

FIGURE 5.1 ECONOMIC BENEFITS ASSESSMENT FRAMEWORK



SOURCE: ACIL ALLEN CONSULTING

Given this, the modelling discussed in this section should be considered an assessment of **the impact of the investment in a marine infrastructure solution can have if it is successful**, rather than as a projection of what will happen if an investment is made.

The discussion in each sub-section uses the most preferred Option (Option 5: Exmouth Boat Harbour North Rock Causeway plus Dredging) as the example where relevant, with modelling results presented for both Options at the end of the sub-section.

5.2 User demand for the facility

As discussed in Section 3.2.2, it is considered likely there will be three main user groups for a new marine infrastructure facility at Exmouth: cruise vessels, oil and gas industry support vessels, and breakbulk cargo vessels. In addition, it is considered likely the provision of infrastructure would result in additional superyacht visitation to the region.

Each use of the facility creates economic and financial impacts on the local region, and depending on the nature of the user may create economic and financial impacts on the Western Australian economy at large. Conservative, but realistic, assumptions regarding use of the infrastructure are therefore an important input into the modelling framework.

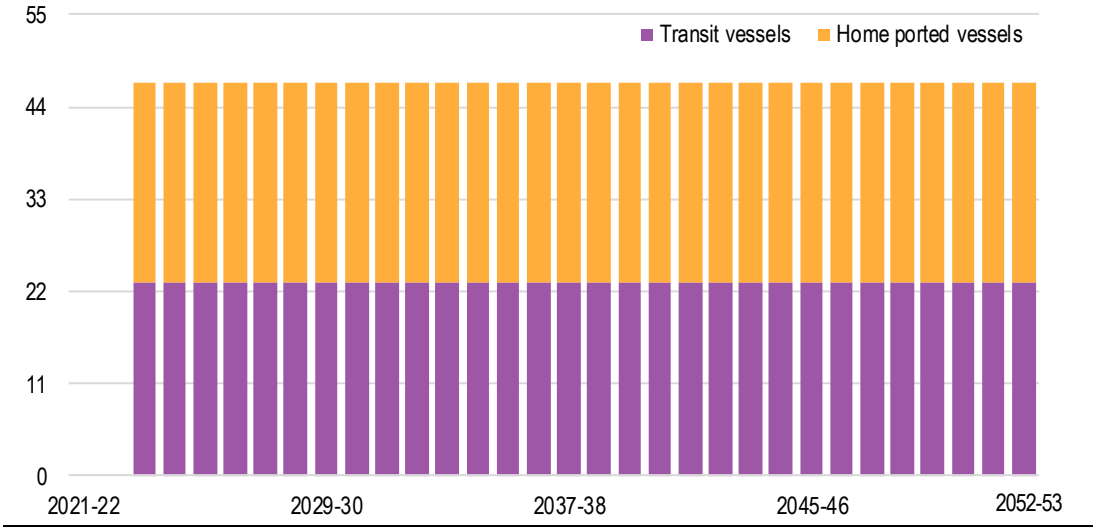
The sub-sections below present ACIL Allen's base case projections for each class of user of the facility, with a consolidated view presented at the end of the section.

Cruise vessels

ACIL Allen has adopted Tourism WA's suggested State-wide representative year cruise ship itinerary as the base success case projection of cruise vessel visitation to the new marine infrastructure at Exmouth. In total, it is projected there will be 47 cruise vessel calls to the new infrastructure in a representative year, with 24 of these coming from two vessels homeported (based) at Fremantle, and the remainder (23) coming from vessels based outside of Western Australia. It is assumed cruise calls will commence in the first operating year of the study, and carry forward through the full modelling period (noting the discounting process of the cashflow model discounts the number of visits heavily more than ten years into the future – which is a reflection of the uncertainty associated with projecting demand).

The annual calls associated with cruise vessels are presented below (**Figure 5.2**).

FIGURE 5.2 EMI CALLS: CRUISE VESSELS



SOURCE: ACIL ALLEN CONSULTING, FROM TOURISM WA

It is important to note the assumption of a flat, regular cruise call schedule is a simplifying assumption which reflects the preliminary nature of this analysis, and the uncertainty associated with developing a call schedule prior to a commitment from the State Government to develop the facility. A second stage of work should examine this issue more thoroughly, and seek commitments from cruise vessel owners that would underpin a more nuanced projection of cruise visitation in the future.

Oil and gas support

It is assumed there will be two types of oil and gas industry support that utilise the new infrastructure at Exmouth: fresh provision sustainment for Woodside Petroleum's Scarborough Floating Petroleum Offtake and Storage ('FPSO') vessel, and a number of offshore petroleum exploration ventures.

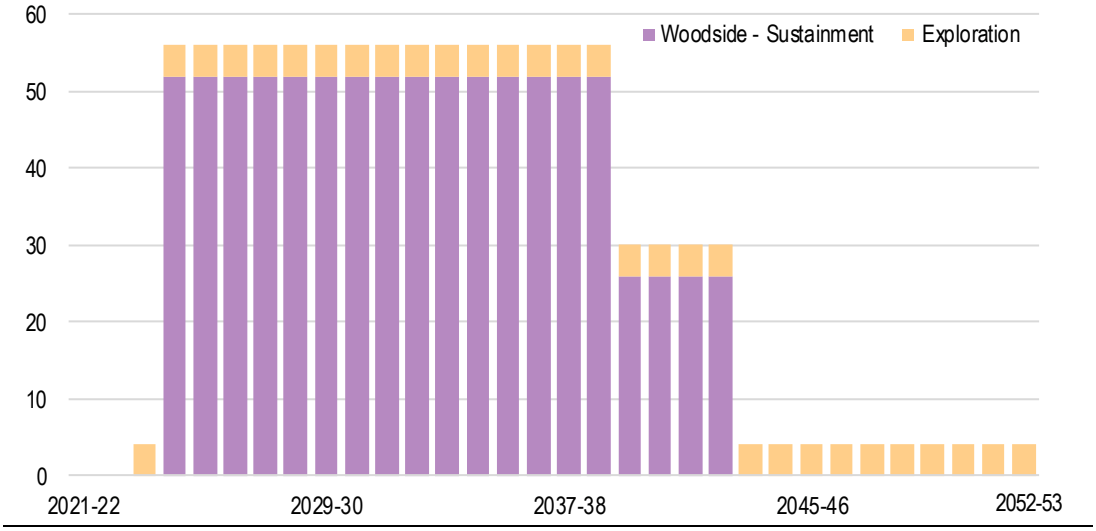
The Woodside use of the facility is based on feedback from Woodside during stakeholder consultation that the facility's location relative to Dampier and Onslow (the two main oil and gas supply bases supporting activity in the region) offered significant benefits when it came to ensuring its FPSO and the personnel working on it have access to fresh food, drinks and other supples. It is estimated Exmouth is around 125 kilometres closer to the Scarborough site than Dampier (where Woodside's current supply chain is based), which at an average vessel speed of 11 knots (~20 kilometres per hour) saves approximately six hours one way (12 hours total) in steaming time from port to operations. It is assumed Woodside's use of the facility begins in 2024-25, when it is thought likely the Scarborough field will be in production, with one call per week required to sustain the FPSO. The activity drops to one call per fortnight in 2039-40 as the Scarborough fields begins to reach the end of their life, before ceasing in 2042-43.

The same logic applied for Woodside holds for the two other major operators in the area (Santos and BHP). However, as a conservative assumption ACIL Allen elected to hold these companies out of the base case modelling as the existing supply chains may prove difficult to disrupt, particularly if the remaining life of these projects is limited in the absence of additional investment. By contrast, Woodside's Scarborough FPSO is not yet established, meaning it represents an opportunity to capture the supply chain before it is captured elsewhere.

In addition to the fresh provision sustainment activities of Woodside, it is assumed four exploration vessels will call to the new infrastructure each year[9], and use the facility to load and unload crew and materials used for exploration ventures. Offshore petroleum exploration activity in Western Australia has ticked up in recent times, on account of higher global oil prices, the looming expansion in the State's LNG production capacity, decline in existing fields and discovery of significant petroleum reserves in the Bedout Basin off the north west coast.[10] Exmouth is well placed to capture a portion of this activity; as a conservative assumption just four calls per annum are assumed.

The annual calls associated with cruise vessels are presented below (**Figure 5.3**).

FIGURE 5.3 EMI CALLS: OIL AND GAS SUPPORT



SOURCE: ACIL ALLEN CONSULTING

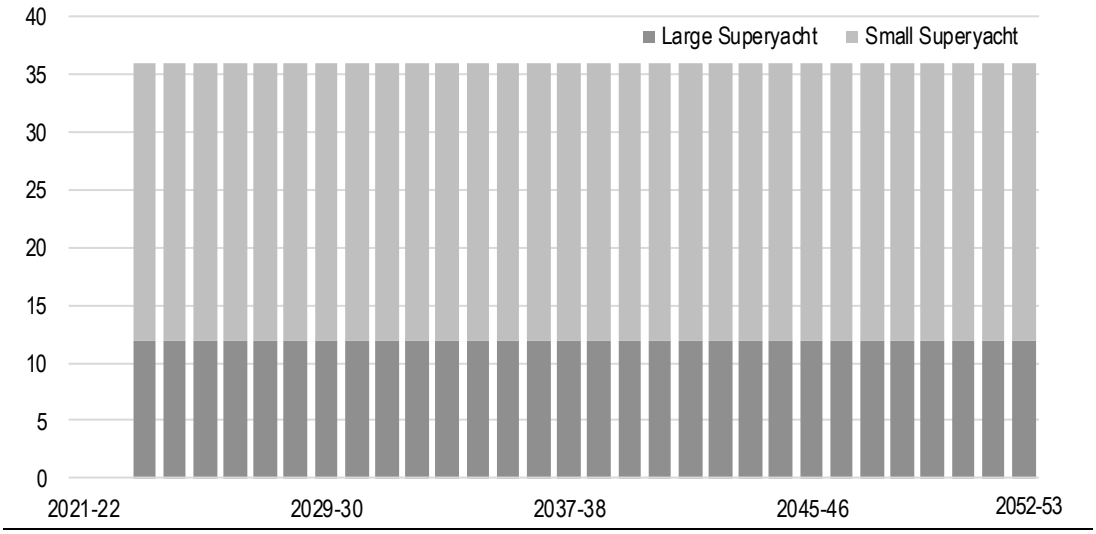
Superyachts

It is assumed there will be two classes of superyacht visiting new marine infrastructure at Exmouth: small craft of around 25 metres in length, and larger craft of around 50 metres in length. Superyachts Australia suggested to ACIL Allen that in a success case between two and five superyachts would visit Exmouth each month, or 24 to 60 per annum. As a conservative assumption ACIL Allen has assumed 50 per cent more than the minimum case (36 calls per annum) worth of calls will be made, with a two thirds/one third split of smaller vessels to larger vessels in line with Superyacht Australia's feedback on the structure of the fleet in Australian waters.[11]

The annual calls associated with cruise vessels are presented below (**Figure 5.3**).

[9] This is a simplifying assumption based on proprietary information, as a means to demonstrate the impact infrequent use of the facility for this purpose may have in an average year.
[10] Macdonald-Smith, A. 2019. *Northern gas shake-up seen triggered by Santos deal*. The Australian Financial Review, 15 October 2019
[11] Superyachts Australia. 2016. *The economic contribution of superyachts in Australia*. Accessed online at http://www.superyacht-australia.com.au/

FIGURE 5.4 EMI CALLS: SUPERYACHTS



SOURCE: ACIL ALLEN CONSULTING

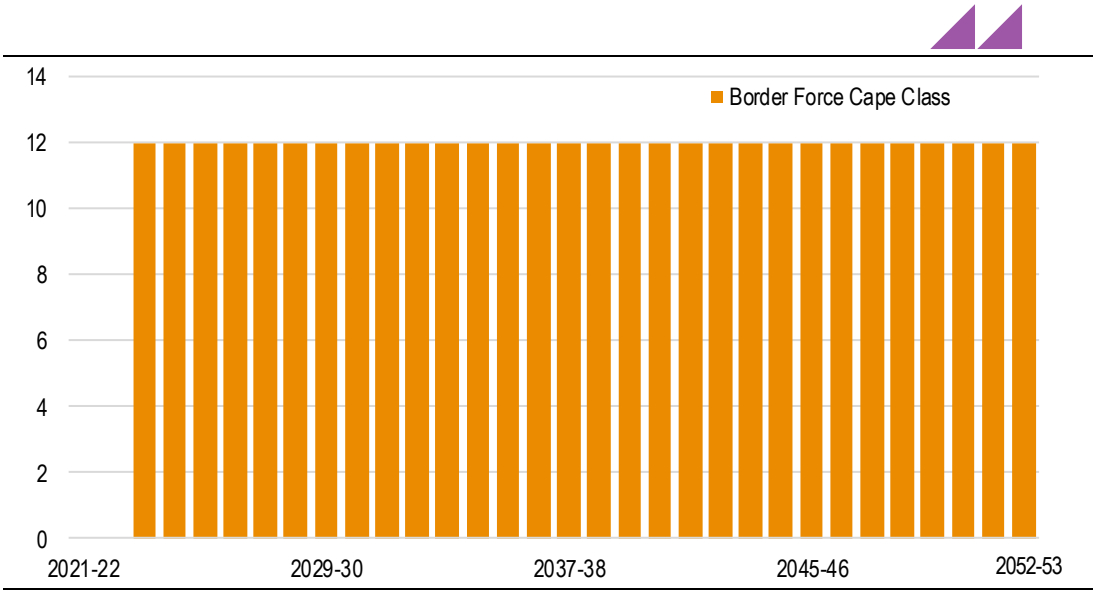
Similar to cruise industry calls, superyacht calls have been projected on a straight line basis at a fixed level, as a means to demonstrate a conservative profile of use of the facility in an average year. In reality it is likely there will be growth in superyacht visitation over time on account of growth in the industry in Australian and globally.

Australian Border Force

It is assumed one Australian Border Force ('ABF') vessel will call to new marine infrastructure at Exmouth each month over the modelling period. This is based on a conservative assumption regarding the current and future operational area of the vessels (which is principally to the north and west of Exmouth), and the role Exmouth could play in matters such as crew changeover, shelter during adverse weather, supply and sustainment, and operational matters for the ABF.

The annual calls associated with cruise vessels are presented below (**Figure 5.3**).

FIGURE 5.5 EMI: AUSTRALIAN BORDER FORCE



SOURCE: ACIL ALLEN CONSULTING

Total vessel calls

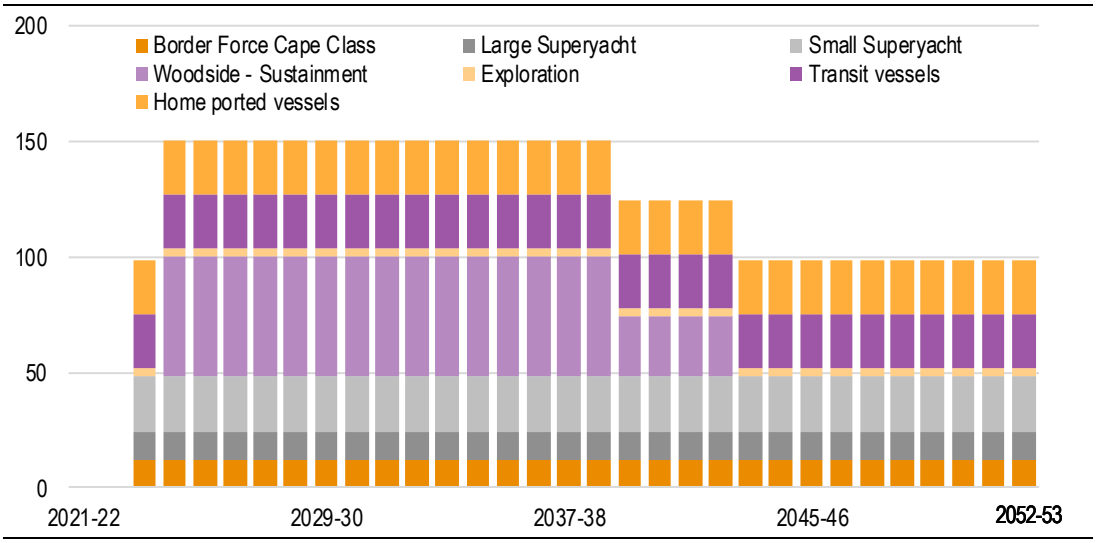
Overall, it is assumed there will be an average of 151 calls to new marine infrastructure at Exmouth once each use is at its assumed full demand level in 2024-25, or around one call every four days in a typical year. The majority of calls are projected to be made by oil and gas support vessels, followed by cruise vessels, with the remainder of demand not equalling one of these top two uses (**Figure 5.6**).

Calls have been modelled annually as there is no benefit associated with modelling at more frequent periods. However, stakeholder feedback suggests uses associated with tourism and visitation (cruise and superyachts) are likely to cluster around the peak season, whereas other uses such as the ABF's Cape Class patrol boats are more likely to be spread throughout the year.

In addition to the above calls there is reasonable prospect of the facility being used by major project proponents in the surrounding region as an import terminal. This is because the landside logistics costs associated with facilities further east – such as Onslow and Dampier – are likely to be smaller for companies operating around the Exmouth Peninsula if they bring their goods through the new facility. However, given a number of these projects are yet to be confirmed these have not been included in the base success case modelling.

The uses of the facility are a key input into each of the three modelling tasks presented in the remainder of this section. Each modelling framework refers to the same source of demand estimates presented above.

FIGURE 5.6 EMI: TOTAL ASSUMED PORT CALLS PER ANNUM



SOURCE: ACIL ALLEN CONSULTING

The uses identified in the figure above represent the potential diversity of calls that can be reasonably assumed to occur at new marine infrastructure at Exmouth in a given year. There are however a range of additional potential uses which have been excluded from this phase of works due to a lack of information or the need for an early stage feasibility study to treat potential uses conservatively. Other uses which could be examined in a second stage of work include:

- Further oil and gas industry activity, which is likely to require additional marine infrastructure investment such as fuel bunkering, fresh water provision, and additional marine services beyond those which are already provided
- Facilitating project cargo importation, for major projects in the region such as Subsea 7's Learmonth Site Bundle Facility (which has not been included in the base case as the project is yet to receive environmental approval)
- Cargo export in a range of sectors, including large scale horticulture or mineral commodities (subject to appropriate environmental controls and infrastructure)
- Further Australian Border Force activities, including the home porting of vessels at Exmouth

5.3 Project financial model

The project financial model uses a discounted cashflow modelling framework to present estimates of the capital and operating costs, operating revenue, and the timing of these payments over the useful life of the facility that is subject to the investment decision. Discounted cashflow analysis is used in the financial assessment of investments of all kinds, and can be used to assess whether an investment in new infrastructure can be self-sustaining through its own revenue generation capacity or whether it requires some form of subsidy to be financially viable.

5.3.1 Introduction

Projecting future cashflows requires a number of inputs and assumptions, many of which ACIL Allen has been able to develop using reliable information from a range of sources. However, there is an element of uncertainty associated with any project financial modelling, which can impact on the overall financial viability of a project. This is addressed in two ways: presentation of a conservative, but realistic, set of assumptions, and through the use of an appropriate discount rate to reflect the uncertainty of future cashflows.

The discounted cashflow model assumptions are discussed below. It is important to note there is limited variation in the discounted cashflow models prepared for the two options, as there is limited difference in what these offer to potential users. The only variation is associated with the capital expenditure, and the ongoing maintenance expenditure (which is set as a multiple of the capital expenditure). Demand and pricing (and therefore revenue) and operational cost (excluding maintenance expenditure) projections are carried over both Options.

This also means the presentation of modelling results is in reverse order than usual, as ACIL Allen would typically discuss capital costs, then operating expenditure, then revenue as a way to build up to the overall analysis. But as the capital cost is the main point of difference this is discussed last prior to the analysis of the total project financial information.

5.3.2 Overall assumptions

A number of assumptions with respect to the overall structure of the discounted cashflow model are made prior to the development of the model. These assumptions set the parameters for the analysis, the discount rate used to account for the uncertainty of future cashflows, among other considerations. These are discussed in the table below (**Table 5.1**).

TABLE 5.1 OVERALL ASSUMPTIONS

Variable	Value	Discussion
Modelling period (start)	2021-22	It is assumed a final investment decision is made regarding the infrastructure in the next financial year, taking into account the State Government's budget cycle.
Modelling period (end)	2052-53	BMT Group advises the infrastructure should be able to be constructed in two years, and has a useful operating life of approximately 30 years. Given this, the modelling period is 32 years (two years construction and 30 years operating)
Discount rate applied in base case	7%	ACIL Allen has elected to apply a higher than usual discount rate (noting Government infrastructure should typically be discounted at a 4% real discount rate) to the discounted cashflow analysis due to the uncertainty regarding future usage of the facility, and the fact the usage forecasts adopted are a significant driver of the results (particularly for cruise vessels)

Variable	Value	Discussion
Values	Real 2019 dollars	The analysis is completed in real 2019 dollars, to present a volume-based estimate of future activity rather than values which can be influenced by prices (and which therefore require a consideration of the future path of prices in the economy)

SOURCE: ACIL ALLEN CONSULTING

5.3.3 Operating revenue

In order to estimate facility revenue, there is a requirement to set fees and charges for the facility which reflect the use of the facility. In a detailed financial assessment these fees and charges would be derived as new as a product of the estimated capital and operating costs of the new facility plus estimated demand. However, given this is a preliminary financial analysis ACIL Allen has used the fees and charges for the Port of Broome as an analogue port given it shares some similarities with the proposed Options as Exmouth.

This results in a pricing framework as presented below **Table 5.2**.

TABLE 5.2 MODELLED PORT FEES AND CHARGES

Category	Charge (2019-20 real $)
Fixed charges	
Small vessel	$2,500 per call
Medium vessel	$4,000 per call
Large vessel	$5,000 per call
Berthage	
Small vessels (rate per vessel length)	$11.34 per metre per day
Large vessels (rate per GT of vessel)	$0.35 per tonne per day
Cargo	
General cargo (per tonne imported)	$8.61 per tonne

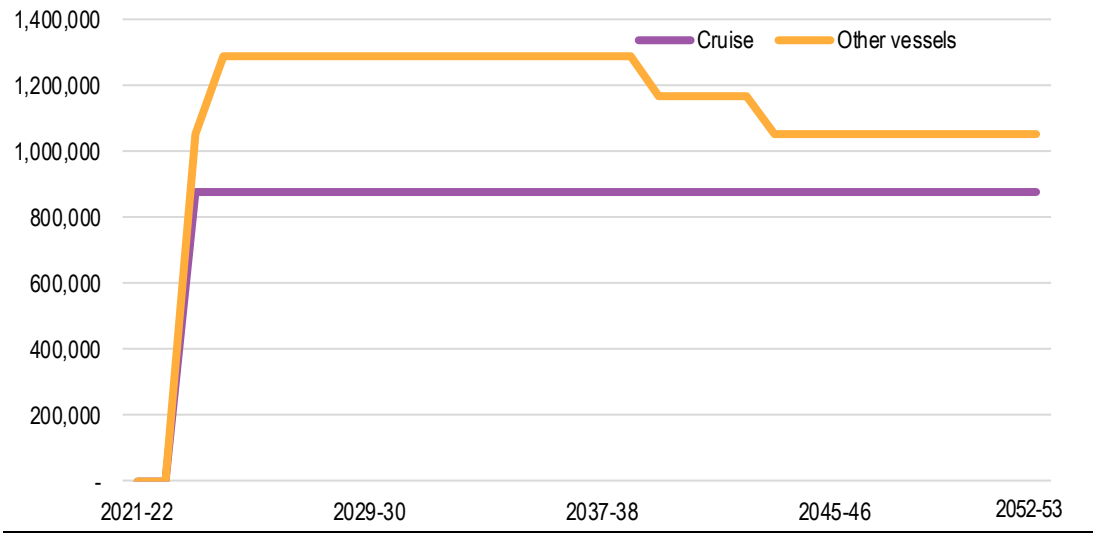
SOURCE: ACIL ALLEN CONSULTING, ADAPTED FROM PORT OF BROOME FEES AND CHARGES

The fees and charges are applied to the assumed uses discussed in Section 5.2 to produce estimates of the operating revenue of the facility in each year of the modelling period. This also requires assumptions regarding the size and weight of vessels, which have been measured using a number of analogue vessels where actual vessel figures are not available. The operating revenue projections for the new marine infrastructure are presented below (**Figure 5.7**).

On average, the new marine infrastructure raises $1.3 million per annum once all uses are active over the operating period. The majority of revenue comes from cruise vessels ($0.9 million) on account of the assumed charging structure being based on vessel weight for larger vessels, and cruise vessels being the heaviest class of vessel outside of bulk carrier vessels.

This revenue is available to the infrastructure to assist in the payment of operating costs and to pay for the cost of capital investment incurred by the State. The next section presents an outlook for the cost of the facility.

FIGURE 5.7 EMI: OPERATING REVENUE (REAL 2019 $)



SOURCE: ACIL ALLEN CONSULTING

5.3.4 Capital and operating costs

Advice from stakeholders and BMT suggests a new marine infrastructure solution at Exmouth will require limited operational spend, given its relatively low utilisation and the relatively simple trades that will occur. Given this, the operational costs of the infrastructure have been modelled on a 100 per cent fixed cost basis and do not vary in line with demand.

The fixed costs assumed in the project financial are outlined in the table below (**Table 5.3**). These costs commence in the first year of operations of the facility (2023-24) and are carried forward in real terms through to the end of the modelling period. They do not differ between scenarios, noting the maintenance expenditure varies due to the capital cost not the ratio discussed in the table.

TABLE 5.3 EMI: OPERATING EXPENDITURE ASSUMPTIONS

Operating expenditure	Value (2019 real $)	Source
Labour		
Facility manager	$250,000	Assumed Director salary outside of PSOG ranges
Operations staff x2	$150,000 each person	Assumed 2x Level 8 PSOG
Non-labour		
Pilotage contract	$500,000	Contract to provide pilotage services to vessels to enter and exit Exmouth Marine Infrastructure, based on pilotage contract at Port of Wyndham, from Department of Transport data
Security and cleaning contracts	$300,000	ACIL Allen assumption from proprietary information
Maintenance expenditure	One per cent of capital cost per annum	BMT assumption based on internal knowledge of similar infrastructure projects

SOURCE: ACIL ALLEN CONSULTING

An additional cost associated with the facility which has not been included in the model is the costs and activities associated with the Commonwealth Department of Immigration and Border Protection

and Department of Agriculture's compliance and administration services for cruise vessels journeying to Australia from overseas.[12] These costs have been excluded from the scope as they are not directly incurred by the facility itself, and are not paid by the facility.

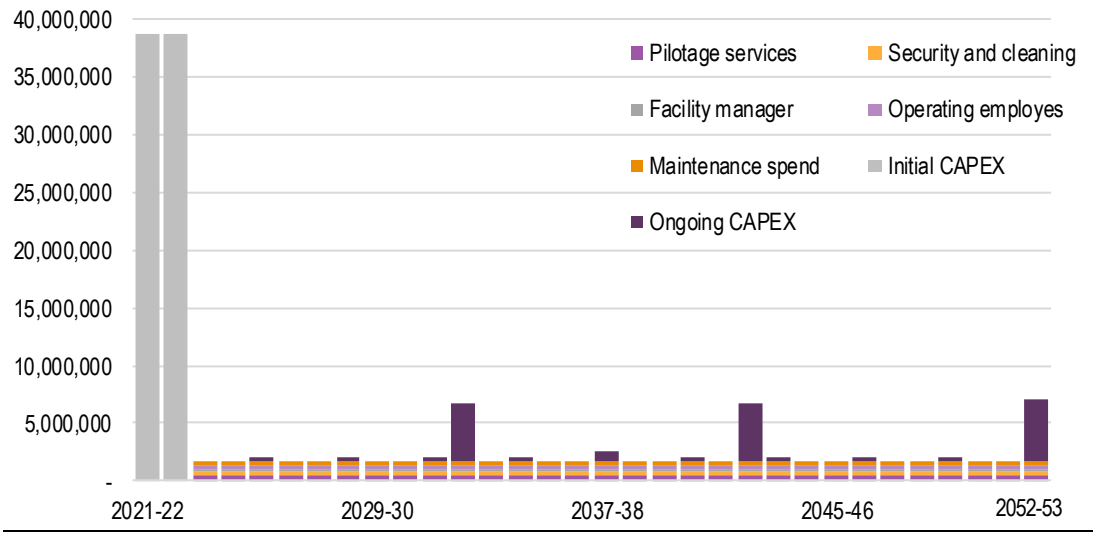
Capital expenditure estimates have been provided by BMT for each option. In addition, BMT provided some preliminary guidance on specific items of sustaining capital works which are likely to be incurred in the modelling period, over and above the general maintenance of the facility which is discussed above. This includes items like re-dredging the berth pocket for Option 5, and replacing the steelwork that is part of the jetty infrastructure in Option 3.

It is assumed construction activity occurs over a two year period, with expenditure allocated equally over the two construction years. The cost profile of each option is presented below (**Figure 5.8**).

The **total lifecycle cost of Option 5 is estimated to be $147.7 million** (real 2019 $), comprising:

- Up front capital cost: $77.6 million
- Sustaining capital cost: $18 million, being:
  - Three re-dredging campaigns at the ten, 20 and 30 year mark ($5 million each)
  - Three yearly sand bypass activities ($250,000 each)
  - One 15 year infrastructure armour replacement ($500,000)
- Operating costs: $52.1 million

FIGURE 5.8 EMI: OPTION 5 COSTING, $M (REAL 2019 $)



SOURCE: ACIL ALLEN CONSULTING

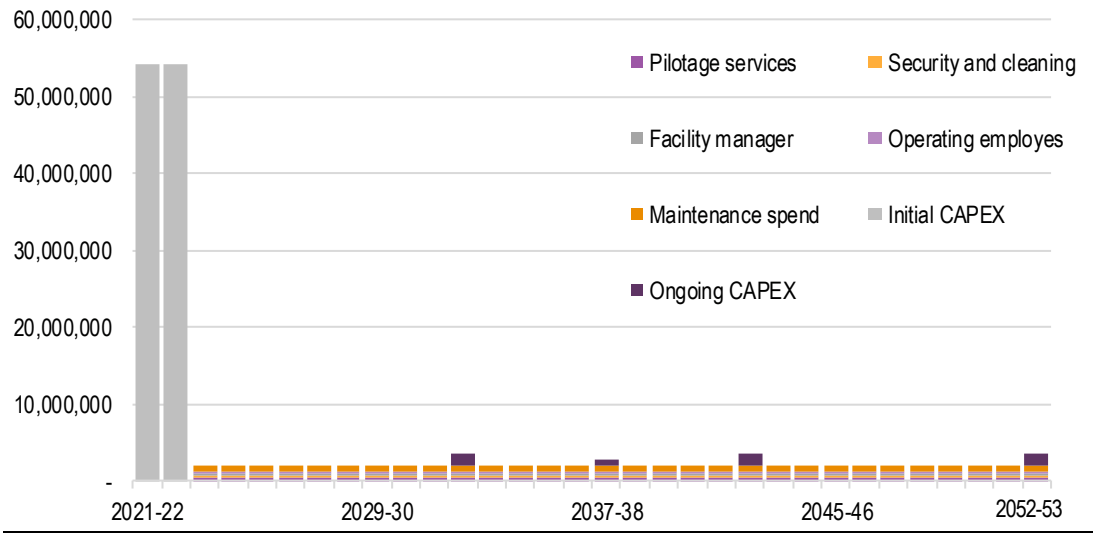
By contrast, **the total lifecycle cost of Option 3 is estimated to be $170.9 million** (real 2019 $), comprising:

- Up front capital cost: $108.3 million
- Sustaining capital cost: $5.8 million, being:
  - One 15 year infrastructure armour replacement ($500,000)
  - Major overhaul of steel components of infrastructure (1.5 per cent of capital cost every ten years)

Operating costs: $56.8 million

[12] ACIL Allen. 2019. *Consultation notes: Department of Immigration and Border Protection, consultation date 23 August 2019*.

FIGURE 5.9 EMI: OPTION 3 COSTING, $M (REAL 2019 $)



SOURCE: ACIL ALLEN CONSULTING

5.3.5 Overall financial position

The overall financial position of the infrastructure in each option reflects the cumulative discounted net cashflows of the infrastructure in each option. A positive figure indicates the option is likely to recover all of the costs associated with its delivery with the revenue generated from users, while a negative figure indicates the opposite.

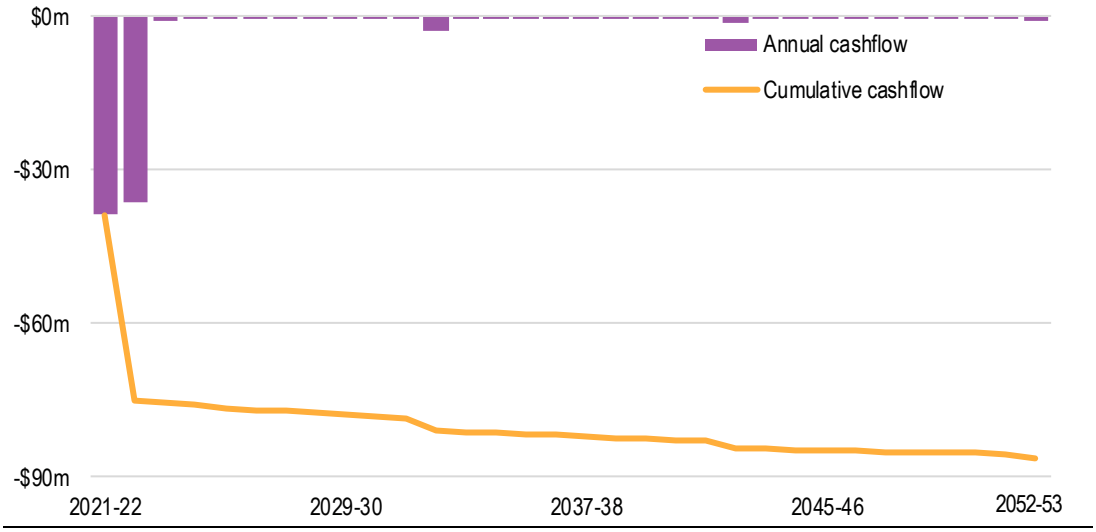
ACIL Allen has applied a discount rate of seven per cent (real terms) for the discounted cashflow analysis as there remains considerable uncertainty regarding future use of the infrastructure. A high discount rate means a dollar raised (or spent) in the future is worth comparatively less than a dollar raised (or spent) with a lower discount rate.

Typically, ACIL Allen would recommend the use of WA Treasury's rate of opportunity cost (four per cent in 2019-20) when analysing an investment from the perspective of the State Government. This is because a four per cent discount rate represents the alternative case for any new capital works funded by the State, being the approximate marginal cost of borrowing. A seven per cent real discount rate therefore accounts for the additional uncertainty associated with this project (three percentage points), in addition to the marginal cost of borrowing (four percentage points).

Prior to discounting, neither Option delivers a net positive position following capital and operating costs over the modelling period. For Option 5, the value of the project in 2052-53 is -$109.2 million in real 2019 dollars, while for Option 3 the value is -$135.3 million. The negative values reflect the fact the project does not raise adequate revenue to cover its operating costs in any year of the modelling period, meaning there is no surplus cashflow available to fund sustaining capital or repay the initial capital outlay.

On a discounted cashflow basis (seven per cent discount rate), the net cashflows from Option 5 are -$86.2 million over the 32 year modelling period. This implies at a high discount rate the project requires an initial capital injection of at least $86.2 million to have the prospect of delivering a net zero cashflow at a project financial modelling level. The position of the project on a discounted basis in each year of the modelling period is presented below (**Figure 5.10**).

FIGURE 5.10 EMI: PROJECTED PROJECT CASHFLOWS, OPTION 5, DISCOUNTED (7%), $M 2019 REAL

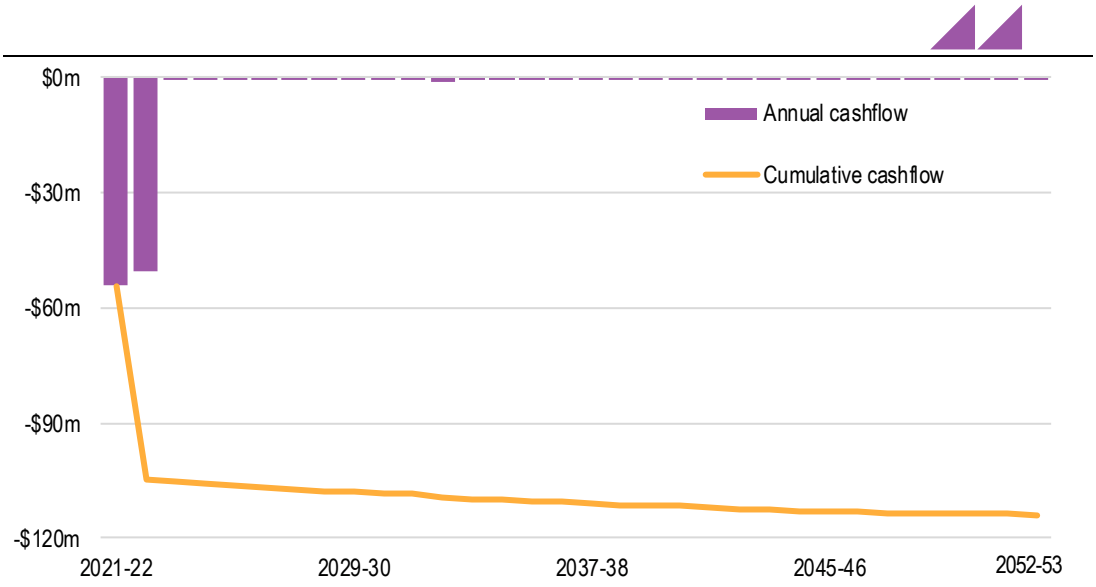


SOURCE: ACIL ALLEN CONSULTING

The discounted cashflows for Option 3 are also in a negative position over the modelling period, which is also a reflection of a weak operating position meaning the infrastructure does not cover the costs associated with capital investment.

On a discounted cashflow basis (seven per cent discount rate), the net cashflows from Option 3 are -$114.2 million over the 32 year modelling period. This implies at a high discount rate the project requires an initial capital injection of at least $114.2 million to have the prospect of delivering a net zero cashflow at a project financial modelling level. The position of the project on a discounted basis in each year of the modelling period is presented below (**Figure 5.11**).

FIGURE 5.11 EMI: PROJECTED PROJECT CASHFLOWS, OPTION 3, DISCOUNTED (7%), $M 2019 REAL



SOURCE: ACIL ALLEN CONSULTING

5.3.6 Summary and implications

Overall, the project financial modelling of the two preferred Options for the Exmouth Marine Infrastructure project suggest the infrastructure will not be in a position of cost recovery over the modelling period. **The negative NPV of Option 5 is -$79.5 million, where the negative NPV of Option 3 is -$107.9 million. All things being equal this means the projects would result in a substantial financial loss to the party that provides the upfront capital funding** to allow the infrastructure to be built.

However, this analysis only considers the financial performance of the infrastructure as a standalone entity. As discussed in Section 2, the State Government's primary motivation for examination of new marine infrastructure at Exmouth is to provide a solution that would generate positive economic benefits for the region and assist in unlocking the potential of the cruise industry at a whole-of-State level. The direct economic impacts of the use of the facility – the berthing of cruise vessels, and the tourists that brings – are considered in the Benefit Cost Assessment which is the subject of the next section.

6 ECONOMIC BENEFITS ASSESSMENT

This section of the report presents the Benefit Cost Assessment and Economic Impact Assessment introduced in Section 5.1 The analysis in this section builds on the project financial model developed in the previous section, through the inclusion and quantification of a range of additional economic and social benefits relevant to the establishment of new marine infrastructure at Exmouth.

6.1 Benefit Cost Assessment

The financial benefits and costs of new marine infrastructure at Exmouth represent a narrow range of the actual benefits and costs associated with the investment. To capture this larger array of benefits, ACIL Allen has completed a Benefit Cost Assessment ('BCA').

6.1.1 Introduction

The basis of a BCA is simple: for a given investment proposal or policy reform, a BCA compares the total projected costs to the community and economy of the investment or policy with the total projected benefits. This determines whether the forecast benefits outweigh the forecast costs, and by how much.

The output of a BCA is typically expressed as a Benefit-Cost Ratio (BCR) where total benefits are divided by total costs. A BCR of greater than one indicates that the net benefits of the policy, project or investment exceed the costs – this suggests there is economic and social value associated with investing in the option. The reverse applies for a BCR below one.

All things being equal, the investment option with the highest ratio reflects the best "value for money" as it implies the option is producing the highest value of benefits for the costs incurred. It is possible however for an investment option to produce a greater net benefit (benefits less costs, instead of benefits divided by costs) than other options with larger BCRs, in which case this option produces the "largest benefit". ACIL Allen reports on both values as both are important metrics when interpreting the results of a BCA.

A BCA provides a framework for analysing information in a logical and consistent way by assisting policymakers to determine which investment option is the most economically effective and efficient in achieving the desired outcomes. A BCR of less than one does not automatically preclude the implementation of the policy, project or investment however the business case would typically require strong alternate reasoning such as a clear social policy mandate.

The streams of benefits and costs, and the method for quantification, are presented below. In summary, there are eight streams of identified economic and social benefits and four streams of economic and social costs.

Incremental benefits to Western Australia

- New cruise visitor spend in Exmouth by interstate and international cruise visitors
- New cruise visitor spend in the rest of Western Australia by interstate and international cruise visitors
- New cruise vessel revenue raised at Exmouth
- New cruise vessel revenue raised at ports in the rest of Western Australia
- New superyacht visitor spend in Exmouth
- New superyacht visitor spend in Western Australia
- Fuel and carbon emissions savings for oil and gas vessels
- Recreational benefits for Exmouth residents

Incremental costs to Western Australia

- Capital costs of establishing the new infrastructure
- Operating costs of the new infrastructure
- Construction-related disruption to existing Exmouth Boat Harbour commercial and recreational vessel users
- Environmental costs

In this instance, the BCA has completed using a **zero base approach**, which limits the benefits and costs included in the investment cases to those which are genuine incremental benefits and costs. This approach has been adopted as it is reasonable to assume in the medium term a lack of infrastructure at Exmouth would result in a cessation of cruise industry visitation to the region.

The streams of benefits and costs included in the BCA are discussed in the next section, before the results are presented for both investment cases. Finally, some scenario analysis is presented at the end of the section before the discussion of the economic impact assessment begins.

6.1.2 Inputs and assumptions

The following section details the methodology and assumptions regarding the benefits and costs calculated in the BCA. The frame of reference for the BCA is **incremental benefits and costs at a whole-of-State level which are incurred as a result of the decision to investment in each of the Exmouth Marine Infrastructure options**. The framing of the BCA is an important overarching assumption as it characterises a number of the benefits and costs. For example, direct cruise visitor expenditure made by Western Australian resident cruise patrons does not produce incremental benefits to the Western Australian economy as the expenditure is likely to occur elsewhere in the State in lieu of the investment option.

A number of additional overarching assumptions are required prior to the calculation of benefits and costs. These are included in the table below.

TABLE 6.1 EMI BCA: OVERARCHING ASSUMPTIONS

Input or assumption	Value	Source
Modelling period	2021-22 to 2052-53	ACIL Allen. Modelling period is in line with the financial modelling, which is prepared to coincide with the useful life of the infrastructure.
BCA discount rate	Seven per cent	ACIL Allen. In line with the uncertain nature of the future cruise ship schedule, ACIL Allen has adopted a higher discount rate as the baseline to reflect this uncertainty.
Values	Real 2019-20 dollars	ACIL Allen

SOURCE: ACIL ALLEN CONSULTING

Unless otherwise stated, the benefits and costs discussed in the remainder of this section apply to both investment options. Where this is not the case, two separate values will be reported at the end of the discussion regarding the benefit or cost.

New cruise visitor spend in Exmouth by interstate and international cruise visitors

The incremental impact of cruise visitor spend has been calculated using the cruise demand schedule discussed in Section 5.2, and by applying a methodology for estimating cruise visitor spend developed by ACIL Allen and applied in a number of cruise-centric economic and financial analysis in recent years. The assumptions are built using The Australian Cruise Association's visitation assumptions in its annual *Cruise Tourism's Contribution to the Australian Economy* report.

The main assumptions which drive the results are presented in the table below.

TABLE 6.2 CRUISE VISITATION MODELLING ASSUMPTIONS

Cruise modelling assumption	Values
Source of passengers	
Intrastate	Five per cent
Interstate	65 per cent
Overseas	30 per cent
Disembarkment rate	
All passengers	95 per cent
Spend per day	
Intrastate	$135.77
Interstate	$140.46
Overseas	$202.38

SOURCE: ACIL ALLEN CONSULTING

In addition, there is some spending associated with the disembarkment of crew from vessels into Exmouth. It is assumed all crew are not residents of Western Australia, that 45 per cent of them disembark while the vessel is docked in port, and that they spend $84 per day. These assumptions are sourced from the same report as cruise visitation.

In a given representative year, the modelling projects 42,343 visitor days will occur at Exmouth as a result of the investment in marine infrastructure, with a further 10,117 crew disembarking. This in turn creates an additional $7.4 million per annum of visitor spend from interstate and overseas visitors. It is assumed 100 per cent of this visitor spend is attributable to the decision to invest in new marine infrastructure, and so **the benefit stream is worth $7.4 million per annum (2019-20 real dollars) over the modelling period**, or $222.6 million over the modelling period. On a discounted basis, the benefit stream is worth $86.1 million (2019-20 real dollars).

New cruise visitor spend in the rest of Western Australia by interstate and international cruise visitors

The same methodology used to derive Exmouth visitor spend has been applied to Tourism WA's cruise schedule for the rest of Western Australia in the investment case. The only difference is related to calls at Fremantle which are undertaken by the two vessels which are assumed to be home ported (the Vasco de Gama and Pacific Aria). For these vessels, according to Tourism Research Australia there is a different structure to the visitor profile and visitor spend values. The values applied for the calls in Fremantle for these two vessels are presented below.

TABLE 6.3 CRUISE VISITATION MODELLING ASSUMPTIONS

Cruise modelling assumption	Values
Source of passengers	
Intrastate	Five per cent
Interstate	65 per cent
Overseas	30 per cent
Disembarkment rate	
All passengers	95 per cent

Cruise modelling assumption	Values
Spend per day	
Intrastate	$300.81
Interstate	$465.05
Overseas	$786.85

SOURCE: ACIL ALLEN CONSULTING

In addition, there is some spending associated with the disembarkment of crew from vessels into other ports. It is assumed all crew are not residents of Western Australia, that 45 per cent of them disembark while the vessel is docked in port, and that they spend $84 per day. These assumptions are sourced from the same report as cruise visitation.

In a given representative year, the modelling projects 141,251 visitor days will occur in non-Exmouth ports as a result of the investment in marine infrastructure, plus 34,041. This in turn creates an additional $32.6 million per annum of visitor spend from interstate and overseas visitors. As a conservative assumption, it is assumed 33 per cent of this visitor spend is attributable to the decision to invest in new marine infrastructure. This figure has been adopted as a further way of accounting for the uncertainty associated with future cruise vessel activity, and the fact that there is a cruise industry operating in Western Australia today without available infrastructure at Exmouth.

The benefit stream is worth $11.8 million per annum (2019-20 real dollars) over the modelling period, or $355.2 million over the modelling period. On a discounted basis, the benefit stream is worth $137.3 million (2019-20 real dollars). This is the largest stream of benefits included in the BCA, and as such is the subject of sensitivity testing at the end of this section.

New cruise vessel revenue raised at Exmouth

Cruise vessel calls at Exmouth are the result of new cruise visitation activity to Western Australia. As a result, the financial benefits created from this visitation are considered a benefit to Western Australia flowing from the investment in the facility. As discussed in Section 5.3.3, cruise visitation generates $0.9 million per annum. 100 per cent of this benefit is attributable to the decision to invest in new marine infrastructure.

The benefit stream is worth $0.9 million per annum (2019-20 real dollars) over the modelling period, or $26.3 million over the modelling period. On a discounted basis, the benefit stream is worth $10.2 million (2019-20 real dollars).

New cruise vessel revenue raised at ports in the rest of Western Australia

Cruise vessel calls at ports in the rest of Western Australia will generate port fees for their owners, creating a financial benefit stream for the State. As a simplifying assumption, it is assumed the rates charged on a per vessel basis at Exmouth are the rates faced by vessels in other ports across the State. Like new cruise visitor spend outside of Exmouth, it is assumed 33 per cent of port fees are attributable to the decision to invest in new marine infrastructure. This figure has been adopted as a further way of accounting for the uncertainty associated with future cruise vessel activity, and the fact that there is a cruise industry operating in Western Australia today without available infrastructure at Exmouth.

The benefit stream is worth $0.8 million per annum (2019-20 real dollars) over the modelling period, or $24.1 million over the modelling period. On a discounted basis, the benefit stream is worth $9.3 million (2019-20 real dollars).

New superyacht visitor spend in Exmouth

As discussed in Section 5.2, according to Superyachts Australia Exmouth represents a highly prospective destination for both small and large superyacht visitation. It is assumed an average of 36 superyacht calls per annum at new marine infrastructure, with 24 of these being small (average of 25 metres length) and 12 being large (50 metres) vessels. The patrons of these vessels are assumed to

provide a benefit to Exmouth – and the State more broadly – associated with their expenditure after disembarking at the new infrastructure.

A similar approach to valuing cruise visitation has been taken for valuing superyacht visitation. A summary of the main assumptions is presented below

TABLE 6.4 SUPERYACHT VISITATION MODELLING ASSUMPTIONS

Cruise modelling assumption	Values
Source of passengers	
Intrastate	20 per cent
Interstate	80 per cent
Overseas	0 per cent
Disembarkment rate	
All passengers	100 per cent
Spend per day	
Intrastate	$1,573.70
Interstate	$1,573.70
Overseas	$0.00

SOURCE: ACIL ALLEN CONSULTING

As a simplifying assumption there have been no overseas visitors assumed for superyacht visitation. This is due to current legislation which limits the ability of non-Australian vessels to operate in Australian waters.

In addition, Superyachts Australia provided guidance that allows for estimates of local vessel sustainment spend to be derived. This sustainment spend centres on purchase of food, beverages and other consumables for consumption on superyachts during their journeys between ports. It is assumed $2,500 of supplies are purchased for every large vessel and $1,000 for every small vessel calling Exmouth, estimates which were provided by Superyachts Australia. Finally, it is assumed the crew of each vessel will disembark at Exmouth, spending an average of $184 per call, with 80 per cent of this spend by non-Western Australians.

The benefit stream is worth $0.7 million per annum (2019-20 real dollars) over the modelling period, or $22.0 million over the modelling period. On a discounted basis, the benefit stream is worth $8.5 million (2019-20 real dollars).

New superyacht vessel revenue raised at Exmouth

Superyacht vessel calls at Exmouth are the result of new superyacht activity to Western Australia. As a result, the financial benefits created from this visitation are considered a benefit to Western Australia flowing from the investment in the facility. As discussed in Section 5.3.3, superyacht visitation generates $0.1 million per annum. 100 per cent of this benefit is attributable to the decision to invest in new marine infrastructure.

The benefit stream is worth $0.1 million per annum (2019-20 real dollars) over the modelling period, or $3.1 million over the modelling period. On a discounted basis, the benefit stream is worth $1.2 million (2019-20 real dollars).

Fuel and carbon emissions savings for oil and gas vessels

As discussed in Section 5.2, it is considered likely that in a conservative success case new marine infrastructure at Exmouth will entice some existing oil and gas industry activity which is occurring at other facilities in Western Australia will locate to the new infrastructure. The activity occurring at Exmouth therefore does not result in an incremental benefit or cost to the Western Australian economy directly, as it is a transfer from one place to another.[13]

[13] There is an economic benefit to the Gascoyne region's economy, however this comes at the expense of activity in another region in the economy and therefore is not included in the BCA. It is however included in the economic impact assessment on the Gascoyne economy.

There are benefits associated with the proximity of Exmouth to the operational area of oil and gas industry activities which transfer to Exmouth from elsewhere. This results in a reduced requirement for the purchase of fuel, and has carbon emissions benefits associated with less fuel being consumed. This can be quantified in the BCA, as it represents a cost saving which accrues to businesses which are owned by Western Australians.

To calculate the benefit, ACIL Allen has made a number of assumptions regarding the nature of the vessels which will be used by oil and gas industry participants to facilitate the activities assumed to transfer to Exmouth. These, and other assumptions related to the calculation of the fuel and carbon emissions benefits, are outlined in the table below.

TABLE 6.5 EMI BCA: FUEL AND CARBON EMISSIONS SAVINGS ASSUMPTIONS

Assumption	Value	Source
Vessel particulars – Platform supply and sustainment activities	Fuel consumption: 795kg/h Average steaming speed: 30kph	Analogue vessel: Mermaid Marine MMA Voyager specifications
Vessel particulars – Exploration ventures	Fuel consumption: 954kg/h Average steaming speed: 30kph	Analogue vessel: Mermaid Marine MMA Vigilant specifications
Average travel distance saved per call	250km (125km each way)	Assumed distance between mid point of operational area in Carnarvon Basin and Port of Dampier versus Carnarvon midpoint and Exmouth
Heavy fuel oil price (AUD/t)	$561.37	Average of Singapore bunker price in October 2019, from www.shipandbunker.com, converted to Australian dollars using average AUD/USD spot price in October 2019
Heavy fuel oil emissions (CO_2/t)	3.17	Psaraftis, H. N. and C. Kontovas. 2009. *CO2 Emission Statistics for the World Commercial Fleet*. WMU Journal of Maritime Affairs, (2009)
Carbon price (AUD/t)	$40.45	Average EU ETS carbon price in October 2019, from www.carbon-pulse.com, converted to Australian dollars using average AUD/EU spot price in October 2019

SOURCE: ACIL ALLEN CONSULTING

The average fuel and carbon emission cost saving per call is therefore estimated to be $4,568.91 for sustainment vessels, and $5,482.69 for exploration vessels. These rates are applied to the vessel call scheduled discussed in Section 5.2 to produce an estimated total fuel and carbon emission saving from the new infrastructure. It is assumed eight per cent of the fuel cost savings benefits are realised in Western Australia (which is a standard assumption ACIL Allen applies when disaggregating oil and gas industry profitability impacts, that reflects the assumed domestic versus overseas ownership of companies, and then Western Australia's share of Australia's population), and 100 per cent of carbon emission benefits are realised in Western Australia (as the emission is occurring principally in Western Australian waters).

The benefit stream is worth $0.1 million per annum (2019-20 real dollars) over the modelling period, or $1.9 million over the modelling period. On a discounted basis, the benefit stream is worth $0.7 million (2019-20 real dollars).

Recreational benefits for Exmouth residents

As discussed in Section 4.2, one of the important considerations for new infrastructure is the extent to which it is able to fit into, and enhance, economic and social conditions in Exmouth. On the benefits side, this has been quantified through the use of a subjective wellbeing assessment of additional opportunities for active recreation that may be enabled by a new piece of infrastructure.

A subjective wellbeing approach is used in the valuation of social impact oriented investments and programs. The approach is centred on assigning a value that consumers of a non-market good or service would pay if they were required to pay market prices. The difference between what a person would be willing to pay (market price) and what they do pay (often no price) is known as the subjective wellbeing value of the consumption of the good or service.

In this case, the subjective wellbeing subject of consideration is what people in Exmouth would pay for each additional year of opportunity to undertake active recreation at the new marine infrastructure at Exmouth. To derive these estimates, a number of assumptions are made regarding participation and the value of the subjective wellbeing created for each new recreational opportunity. These assumptions are below.

TABLE 6.6 RECREATIONAL BENEFITS CALCULATION ASSUMPTIONS

Subjective wellbeing assumptions	Values	Source
Participation rates (% of population)		Australian Bureau of Statistics (2014) Cat. 4177.0: Participation in Sport and Physical Recreation, Australia, 2013-14 Adjusted up 100% following feedback from stakeholders regarding the prevalence of active recreation in Exmouth.
Fishing	2.0 per cent	
Diving/snorkelling	0.4 per cent	
Kayaking/surf skiing	1.4 per cent	
Subjective wellbeing value		ACIL Allen Consulting. 2018. *The economic and social value of club-based football in Western Australia*
All activities	$2,333.63	

SOURCE: ACIL ALLEN CONSULTING

The estimated rates of participation in each activity are multiplied by Exmouth's 2018 population of 2,836 people to produce estimates of the number of people who partake in in each activity. It is then assumed each person has access to one additional instance of fishing in Option 5, and fishing, diving/snorkelling and kayaking/surf skiing in Option 3. The distinction between the two options is due to the mode of the infrastructure: Option 5, being a rockfill causeway, does not provide additional opportunities for diving/snorkelling or kayaking/surf skiing as it is not suitable for these activities. Option 3 by contrast provides all three opportunities.

It is then assumed that each person would pay $2,333.63 for each new active recreation opportunity provided to them, but because the infrastructure is not paid for by them directly they receive this opportunity for free. As a result, a subjective well-being value is generated from this difference.

For Option 5, the recreational benefit is valued at an average of $0.2 million per annum, or $4.8 million over the modelling period. On a discounted basis, the benefit stream is worth $1.9 million (2019-20 real dollars).

For Option 3, the recreational benefit is valued at an average of $0.3 million per annum, or $9.2 million over the modelling period. On a discounted basis, the benefit stream is worth $3.6 million (2019-20 real dollars).

Capital costs of establishing the new infrastructure

Development of new marine infrastructure at Exmouth requires investment in capital, which comes at a cost to one or more parties in Western Australia. For the purposes of this BCA, it is assumed 100 per cent of the capital cost is associated with a Western Australian entity, such as the State Government. The capital cost for each option is presented in Section 5.3.4.

For Option 5, the capital cost totals $95.6 million over the life of the asset, with $77.6 million related to the establishment of the facility and $18 million required in maintenance capital expenditure of the asset's useful life. On a discounted basis, the cost stream is worth $80.3 million.

For Option 3, the capital cost totals $114.1 million over the life of the asset, with $108.3 million related to the establishment of the facility and $5.8 million required in maintenance capital expenditure of the asset's useful life. On a discounted basis, the cost stream is worth $106.5 million.

Operating costs of the new infrastructure

Management and use of new marine infrastructure at Exmouth requires some operations and maintenance (non-capital) expenditure, which comes at a cost to one or more parties in Western Australia. For the purposes of this BCA, it is assumed 100 per cent of the operating cost is associated with a Western Australian entity, such as the State Government. Part of this may be financed via user charges, however given they will be incurred in the course of the use of the facility they are included in the BCA. The operating cost for each option is presented in Section 5.3.4.

For Option 5, the operating cost totals $52.1 million over the life of the asset. On a discounted basis, the cost stream is worth $20.1 million.

For Option 3, the operating cost totals $56.7 million over the life of the asset. On a discounted basis, the cost stream is worth $21.9 million.

Construction-related disruption to existing Exmouth Boat Harbour commercial and recreational vessel users

The Exmouth Boat Harbour and its boat pens were used to dock 34 commercial vessels and 19 recreational vessels in 2018-19, according to data provided to ACIL Allen by the Department of Transport.[14] As the two options for new marine infrastructure are based at the Exmouth Boat Harbour, it is possible that during the construction of the facility there will be some disruption to the regular activities of these users. This produces an economic and social cost which should be quantified in the BCA.

To quantify the cost associated with a potential disruption, ACIL Allen has made two simplifying assumptions that allow it to estimate a notional cost.

The first assumption is that the commercial vessels which utilise the boat pens at Exmouth are all engaged in the region's prawn fishery (in reality there are likely to be commercial vessels catering to fishing charters, oil and gas industry support and emergency search and rescue, among other activities). To estimate the cost of disruption, ACIL Allen has derived a per day rate of revenue generation using Department of Fisheries data[15] and assumptions regarding the wholesale value of prawns, and number of days a vessel may be actively trawling. It is assumed each vessel is rendered inactive for one available trawling day in each year of construction that would have otherwise been available to it due to the impacts associated with construction. The production can not be recovered on future days. This is based on an assumed disruption of one day per annum, which may not materialise if the project proceeds to development, and has been included to illustrate the impact of what an actual disruption to activities may mean for commercial users.

The cost stream is worth $0.1 million per annum (2019-20 real dollars) over the modelling period, or $0.3 million over the modelling period. On a discounted basis, the cost stream is worth $0.3 million (2019-20 real dollars).

The second assumption is that each recreational boat owner utilising a pen at the Exmouth Boat Harbour generates a subjective wellbeing value associated with use of their boat for recreation of $2,333.63 per annum. To illustrate the potential maximum impact during construction, it is assumed users are not able to use their vessel and are therefore unable to obtain their subjective wellbeing value in the two years where the new infrastructure is being constructed.

[14] WA Department of Transport. 2019. *Exmouth Boat Harbour Statistics, provided to ACIL Allen*.
[15] Department of Fisheries. 2018. *Status reports of the fisheries and aquatic resources 2016-17 Gascoyne bioregion*. Accessed online at http://www.fish.wa.gov.au/

The cost stream is worth $0.04 million per annum (2019-20 real dollars) over the modelling period, or $0.1 million over the modelling period. On a discounted basis, the cost stream is worth $0.1 million (2019-20 real dollars).

Environmental costs

Valuation of environmental costs at this stage of the project is challenging, as there is limited information of the nature and magnitude of potential environmental impacts. The most obvious impact at this stage of the project is the likely impact on the seabed of the area associated with establishment of the new infrastructure, which is the result of either relocation of limestone rockfill and/or driving of piles into the seabed depending on which option is progressed. Even though this impact is known, quantification of the environmental cost is challenging as there is no inherent valuation of the seabed in its current state.

To provide an early indication of the environmental costs, ACIL Allen has applied the approach used by the Department of Mines, Industry Regulation and Safety with respect to provisioning for future mine site rehabilitation costs. The Mining Rehabilitation Fund requires annual payments into a fund set aside to cover the cost of future rehabilitation in the event the project owner is unable to fund the cost themselves at the end of the mine's life. The rate of levy contribution is established via a formula which uses the mine's total area of disturbance and a rate per hectare to broadly estimate costs, with the proponent required to contribute a levy equivalent to one per cent of the liability every year.

ACIL Allen has adopted this approach as a proxy measure of the environmental costs associated with impacts on the seabed owing to construction of new marine infrastructure. To estimate the maximum area of disturbance, ACIL Allen has used figures prepared by BMT regarding seabed impact, and multiplied these by an additional 20 per cent as a conservative assumption. An annual environmental cost is then derived by applying the maximum Mining Rehabilitation Fund rate per hectare ($50,000), and levying the infrastructure at the rate of one per cent per annum.

The area of disturbance for each option is presented in the table below.

TABLE 6.7 TOTAL EMI SEABED DISTURBANCE ALLOWANCE FOR ENVIRONMENTAL IMPACT COST ESTIMATE, HECTARES

	Hardstand area	Rock causeway	Platform	Dredging area	Total
Option 5	2.16	1.69	1.73	16.50	22.08
Option 3	2.16	N/A	1.73	N/A	3.89

SOURCE: ACIL ALLEN, FROM BMT

For Option 5, the environmental cost totals $0.7 million over the life of the asset. On a discounted basis, the cost stream is worth $0.3 million.

For Option 3, the capital cost totals $0.1 million over the life of the asset. On a discounted basis, the cost stream is worth $0.05 million.

Summary of benefits and costs

The table below presents the full scope of benefits and costs for each option as described in the section above. The Total and Annual Average values presented are in real 2019 dollars, while the discounted value represents the present value of the benefit or cost stream at a seven per cent discount rate (**Table 6.8**).

TABLE 6.8 EMI: BCA BENEFIT AND COST STREAM SUMMARY

	Option 5			Option 3		
Benefit/cost stream	Total ($m)	Average ($m)	PV (7%, $m)	Total ($m)	Average ($m)	PV (7%)
Benefits						
New visitor spend - Exmouth	222.60	7.42	86.05	222.60	7.42	86.05
New visitor spend - Rest of WA	355.17	11.84	137.30	355.17	11.84	137.30
New cruise revenue - Exmouth	26.26	0.88	10.15	26.26	0.88	10.15

Benefit/cost stream	Option 5 Total ($m)	Option 5 Average ($m)	Option 5 PV (7%, $m)	Option 3 Total ($m)	Option 3 Average ($m)	Option 3 PV (7%)
New cruise revenue - Rest of WA	24.12	0.80	9.32	24.12	0.80	9.32
New superyacht spend	22.05	0.73	8.52	22.05	0.73	8.52
New superyacht revenue	3.11	0.10	1.20	3.11	0.10	1.20
Fuel and carbon savings for O&G	1.90	0.06	0.70	1.90	0.06	0.70
Recreational benefits	4.85	0.16	1.87	9.19	0.31	3.55
Total benefits	**660.06**	**22.00**	**255.13**	**664.40**	**22.15**	**256.81**
Costs						
Capital costs	95.57	0.60	80.30	114.11	0.19	106.46
Operating costs	52.14	1.74	20.15	56.75	1.89	21.94
Construction disruption*	0.34	0.17	0.33	0.34	0.17	0.33
Environmental costs	0.66	0.02	0.26	0.12	0.00**	0.05
Total costs	**148.71**	**2.36**	**101.04**	**171.32**	**2.09**	**128.77**

SOURCE: ACIL ALLEN CONSULTING

**AVERAGE PRESENTED FOR TWO YEARS WHERE COST IS RELEVANT ONLY*

***VALUE IS GREATER THAN ZERO BUT IS NOT SHOW DUE TO ROUNDING*

6.1.3 Benefit Cost Assessment results

The combination of the benefits and costs discussed in the above section represent the quantified benefits and costs associated with an investment in one of the options. The results of the BCA are presented below.

BCA Results: Option 5 (Exmouth Boat Harbour North Rockfill Causeway plus Dredging)

Overall, the quantified benefits of an investment in Option 5 total $660.1 million in real 2019 dollar terms, and $255.1 million on a discounted basis (seven per cent discount rate). The largest benefit flows from the attributable incremental impact on cruise visitation outside of Exmouth ($355.2 million in real 2019 dollars), followed by attributable incremental impact on cruise visitation at Exmouth ($222.6 million), and cruise ship revenue from Exmouth calls ($26.3 million).

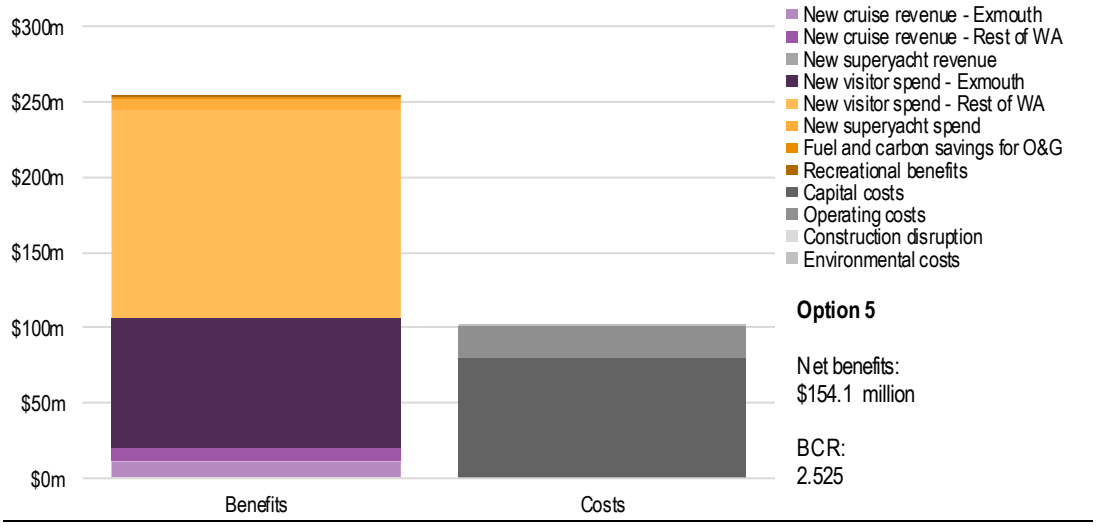
On the cost side, the quantified costs of an investment in Option 5 total $148.7 million in real 2019 dollars, and $101 million on a discounted basis (seven per cent discount rate). The largest cost stream is the capital cost associated with construction of the facility ($95.6 million), followed by the operational costs ($52.1 million).

Combined, the investment in Option 5 is projected to create quantified net benefits of $511.3 million to Western Australia over the 32 year useful life of the asset. This results in a BCR of 4.439 on an undiscounted basis, implying that for every one dollar of costs incurred to Western Australians as a result of this project there are benefits worth $4.44.

On a discounted basis, the quantified net benefits to Western Australia over the 32 year useful life of the asset are $154.1 million. This results in a BCR of 2.525, implying that taking into account the next best available opportunity for investment, and the uncertainty associated with the project, that for every one dollar of costs incurred to Western Australians as a result of the project there are benefits worth $2.53.

The results of the BCA on a discounted basis over the life of the project are presented below.

FIGURE 6.1 BCA RESULTS, OPTION 5, REAL DISCOUNTED (7%) 2019 DOLLARS



SOURCE: ACIL ALLEN CONSULTING

Together, the BCA and BCA for the investment in Option 5 suggest the project is worthwhile from the point of view of the State of Western Australia. This result is principally driven by the assumption that addressing infrastructure issues at Exmouth results in incremental growth in the cruise industry outside of Exmouth in addition to at Exmouth itself.

The combination of the benefits and costs discussed in the above section represent the quantified benefits and costs associated with an investment in one of the options. The results of the BCA are presented below.

BCA Results: Option 3 (Exmouth Boat Harbour North Rockfill Causeway plus Dredging)

Overall, the quantified benefits of an investment in Option 3 total $664.4 million in real 2019 dollar terms, and $256.8 million on a discounted basis (seven per cent discount rate). The largest benefit flows from the attributable incremental impact on cruise visitation outside of Exmouth ($355.2 million in real 2019 dollars), followed by attributable incremental impact on cruise visitation at Exmouth ($222.6 million), and cruise ship revenue from Exmouth calls ($26.3 million).

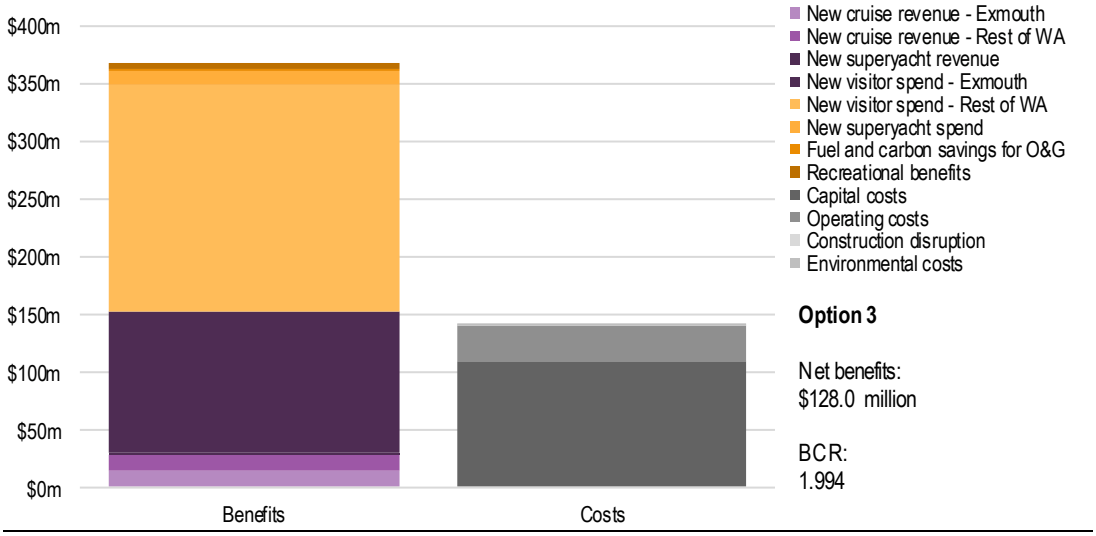
On the cost side, the quantified costs of an investment in Option 5 total $171.3 million in real 2019 dollars, and $128.8 million on a discounted basis (seven per cent discount rate). The largest cost steam is the capital cost associated with construction of the facility ($95.6 million), followed by the operational costs ($52.1 million).

Combined, the investment in Option 3 is projected to create quantified net benefits of $407.6 million to Western Australia over the 32 year useful life of the asset. This results in a BCR of 2.587 on an undiscounted basis, implying that for every one dollar of costs incurred to Western Australians as a result of this project there are benefits worth $2.59.

On a discounted basis, the quantified net benefits to Western Australia over the 32 year useful life of the asset are $128 million. This results in a BCR of 1.994, implying that taking into account the next best available opportunity for investment, and the uncertainty associated with the project, that for every one dollar of costs incurred to Western Australians as a result of the project there are benefits worth $1.99.

The results of the BCA on a discounted basis over the life of the project are presented below.

FIGURE 6.2 BCA RESULTS, OPTION 5, REAL DISCOUNTED (7%) 2019 DOLLARS



SOURCE: ACIL ALLEN CONSULTING

Together, the BCA and BCA for the investment in Option 3 suggest the project is worthwhile from the point of view of the State of Western Australia. This result is principally driven by the assumption that addressing infrastructure issues at Exmouth results in incremental growth in the cruise industry outside of Exmouth in addition to at Exmouth itself.

Overall summary and scenario testing

Overall, the quantitative BCA suggests that either Option is projected to deliver a net benefit to the State, and a benefit which outweighs the costs associated with the project. However, the BCA framework **clearly identifies that Option 5 represents the best option from the perspective of those benefits and costs quantified in the BCA**, and therefore should be considered as the starting point for further analysis.

The result is principally driven by the lower cost of delivery of the infrastructure solution as a rockfill causeway with dredging, as there is limited need for imported component parts, while the major basic raw material – limestone – is in ample supply across the region. By contrast, the two main benefits streams (being Exmouth cruise visitation and rest of WA visitation) do not change between options, which means BCA becomes a function of which option is able to deliver those outcomes for the lower cost to the State.

To demonstrate the impact of key variables on the BCA, ACIL Allen has included five scenario tests associated with both the upside and downside of the assumptions regarding use and cost of the facility in the table below. The net benefits and BCR results in the table reflect what these values would be if the variable modification discussed in the relevant cell took place.

TABLE 6.9 SCENARIO TESTING ON EMI FINANCIAL MODEL

Scenario	What changes	Option 5		Option 3	
		Net benefit ($m)	BCR	Net benefit ($m)	BCR
No non-Exmouth cruise attribution	Change the assumed non-Exmouth cruise attribution from 33% to 0%	$7.5m	1.074	-$18.6m	0.856

Scenario	What changes	Option 5		Option 3	
		Net benefit ($m)	BCR	Net benefit ($m)	BCR
Greater share of cruise vessel passengers are from Western Australia	The assumed share of cruise ship passengers who are Western Australian residents increases to 50 per cent, while the share of international visitors falls to 40 per cent and interstate to 10 per cent.	$54.3m	1.538	$28.3m	1.220
Capital costs are underestimated in base case	Inflate upfront capital cost by 20%. All other costs remain unchanged.	$139.1m	2.198	$107.1m	1.715
Higher discount rate	Changed discount rate to 12%, from 7%	$69.1m	1.776	$41.9m	1.358
Lower discount rate	Changed discount rate to 4%, from 7%	$251.6m	3.203	$227.3m	2.615

SOURCE: ACIL ALLEN CONSULTING

Net benefits versus subsidies

The above frame of reference for the BCA is "Western Australians". That is, the BCA is examining whether the quantified economic and social costs to Western Australia are worth incurring to generate the benefits. An additional, more specific frame of reference is to calculate the BCA from the perspective of the State Government, who it is anticipated will need to make an investment in the financial sustainability of the facility in order to realise any net economic and social benefits discussed below. The value of the investment from the State Government's perspective is not just net benefits and the BCR, it must also consider the direct financial implications of investing in the infrastructure.

To provide a view of whether the State receives value for money from investing in the infrastructure, a supplementary assessment has been completed which compares the net benefits (gross benefits to Western Australia less cost to Western Australians) to the estimated subsidy required to enable the development of the infrastructure, as calculated in Section 5.3.

For **Option 5**, the net benefits are calculated as $154.1 million on a seven per cent discounted basis, while the estimated subsidy required for the facility to break even at a seven per cent discount rate is $86.2 million. Therefore, if the State was to invest this amount to ensure the project reaches breakeven over the useful life of the asset, the return on that investment from a net economic and social benefit perspective is $67.9 million. The ratio of benefit to subsidy is 1.79.

For **Option 3**, the net benefits are calculated as $128.1 million on a seven per cent discounted basis, while the estimated subsidy required for the facility to break even at a seven per cent discount rate is $114.2 million. Therefore, if the State was to invest this amount to ensure the project reaches breakeven over the useful life of the asset, the return on that investment from a net economic and social benefit perspective is $13.9 million. The ratio of benefit to subsidy is 1.12.

This analysis further demonstrates the benefits of pursuing an option which has a lower capital investment requirement.

6.1.4 Non-quantified benefits and costs

While the quantitative benefits and costs demonstrate the project has a positive BCR, it is important to consider benefits and costs which have not or cannot be reliably quantified in a Benefit Cost Assessment. The following non-quantified benefits and costs should also be factored into the investment decision-making process, and should be quantified in subsequent phases of work if further information emerges that would allow this to occur.

Non-quantified benefits

There are two main non-quantified benefits which should also form part of an investment decision making process for new marine infrastructure at Exmouth. These benefits have not been quantified as they rely on third party decision making which cannot be reliably predicted in advance of the decision to invest in the infrastructure.

— **Major project facilitation:** the development of new marine infrastructure in Exmouth may play a role in facilitating the development of major projects, both onshore and offshore, in the region. As it stands, projects seeking to develop in the region must truck materials and supplies into the region via road, with the closest import facilities existing at the Port of Geraldton, the Port of Dampier, and Port of Port Hedland. Provision of an import terminal in the region can assist in reducing the cost of production and operations, which may play a role in facilitating project development. Examples of these projects include Subsea 7's Learmonth Site Bundle project, K+S Salt's solar salt project, and Woodside's Scarborough offshore development

— **Further oil and gas industry activity in the region:** the close proximity of Exmouth to a number of prospective offshore oil and gas production provinces can assist in the development of efficient supply chains in the industry. As demonstrated in the BCA, there are clear benefits associated with reduced sailing time between port facilities and operational areas. The flow on benefit of this is oil and gas operators can undertake more activities for a given operational or exploration budget. In addition, a critical mass of oil and gas activity could spur further development in marine services, maintenance and servicing at Exmouth, which is currently undertaken by Base Marine on small and medium sized vessels

Non-quantified costs

There are two main non-quantified costs which should also form part of an investment decision making process for new marine infrastructure at Exmouth. These costs have not been quantified as they require further investigation and studies to ascertain the nature of the impact so an accurate quantification method can be developed.

— I**mpact on prawn fishery as a result of additional vessel movements in the Exmouth Gulf:** as discussed in the BCA, it is possible there will be an impact on the region's current fisheries industries at the Exmouth Boat Harbour during construction. However, once the facility is operational, there is also the prospect of impacts on the prawn fishery itself due to increased vessel activity in the Exmouth Gulf. This risk has been identified in the environmental approvals process for Subsea 7's Learmonth Site Bundle, but has not been quantified.

— **Impact on Exmouth beachfront north and south of the boat harbour due to dredging operations (Option 5 only):** Option 5 requires dredging to create a berth pocket some 400 metres off the breakwater of Exmouth Boat Harbour, and ongoing sediment bypass and berth pocket maintenance dredging over the life of the infrastructure. This may have impacts on the coastal environment in the region, although the extent of this is unknown and cannot be quantified until more detailed hydrodynamic and dredge plume studies are completed in a subsequent phase of work.

6.2 Economic Impact Assessment

While the Benefit Cost Assessment described in this section suggests there is likely to be net economic and social for Western Australia associated with the provision of new marine infrastructure at Exmouth, another important dimension of impact is the indirect economic benefits created as a result of an increase in economic activity. These benefits can be estimated using an economic impact assessment framework, which traces how a change in underlying economic activity in one or multiple sectors of the economy flow through to the rest of the economy.

6.2.1 Methodology overview

ACIL Allen has used the project financial model discussed in Section 5.3 and the direct economic benefits discussed in Section 6.1 (on a 100 per cent basis) to derive direct, indirect and total (direct plus indirect) economic impacts associated with the provision of new marine infrastructure at Exmouth over the 32 year project period.

There are two main approaches available to modelling economic impacts in this way: a multiplier-based approach using an Input Output ('IO') model of the economy, and a dynamic modelling approach using a Computable General Equilibrium('CGE') modelling framework. The main difference between IO and CGE modelling is that IO assumes constant returns to scale and a lack of constraints on resource availability, which means there is no "crowding out" of existing economy activity associated with the introduction of new economic activity. By contrast, a CGE approach can test for crowing out effects.

While CGE is often seen as the preferred methodology, for projects such as provision of new marine infrastructure at Exmouth an IO approach is suitable as the scale and nature of the project means there is unlikely to be any crowding out effects associated with it. This is because the project is mostly centred on either the tourism industry (which is one of the more flexible industries in the economy and so does not suffer from crowding out effects unless the scale of impacts are very large), or regional Western Australia (where there are no material capacity constraints). In addition, the total annual direct economic impact of the project is of a scale where it is unlikely to crowd out other sectors of the economy.

Given this, an IO approach is a suitable approach to modelling the indirect impacts of the project, as it will still demonstrate how the impact of new activity flow through the economy. The remainder of this section discusses the results of the economic impact assessment modelling. The modelling has been for the Gascoyne region and the rest of Western Australia in terms of its direct and indirect contribution to:

- Regional and State-wide **economic output** (in terms of Gross Regional Product and Gross State Product);
- Regional and State **real income** (wages and salaries earned, plus gross operating surpluses of both the project and its suppliers); and
- **Regional and State** full time equivalent employment (on a FTE job years basis, which measures how many jobs are supported by the economic activity in the given year).

6.2.2 Economic impact results: Option 5

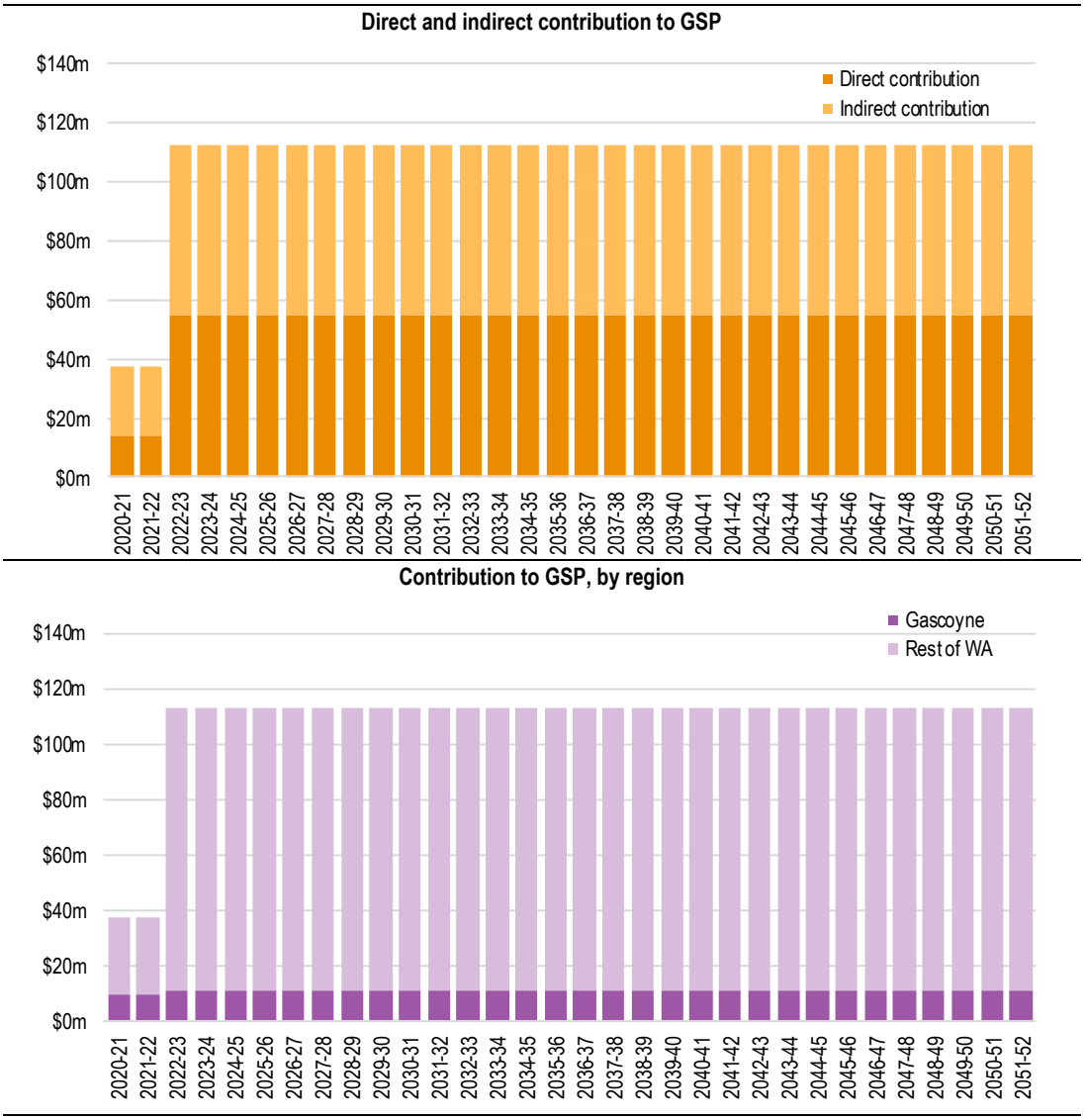
Real output

ACIL Allen estimates that the project will directly contribute $1.67 billion of GSP (2019 real dollars) to the Western Australian economy in over the 32 year project life, at an average of $52.1 million per annum. This level of activity is in turn expected to generate a further $1.78 billion of indirect GSP, or $55.9 million per annum, resulting in **a total contribution of $3.45 billion** over the life of the project, or $107.9 million per annum. This implies the project has an **economic multiplier of 2.07** under this option.

At a local level, ACIL Allen estimates the project will generate direct economic impacts of $191.8 million over the 32 year project life ($6.0 million per annum), which will in turn generate $148.2 million of indirect economic impacts ($4.6 million per annum). The total economic impact of the project over its 32 year operating life is $340 million, meaning approximately 10 per cent of the project's State-wide economic impact flows to the Gascoyne region. The annual economic impact of the project under this option represents a 1.3 per cent boost to the region's economy every year over the project's life. The economic multiplier of the Project in the Gascoyne region is 1.77

The annual estimated economic impact of the project in terms of GSP and GRP is presented below (**Figure 6.3**).

FIGURE 6.3 OPTION FIVE: CONTRIBUTION TO GSP AND GRP PER ANNUM



SOURCE: ACIL ALLEN CONSULTING

Real income

ACIL Allen estimates that the project will directly contribute $854 million of real income (2019 real dollars) to the Western Australian economy in over the 32 year project life, at an average of $26.7 million per annum. This level of activity is in turn expected to generate a further $827.1 million of indirect real income, or $25.9 million per annum, resulting in **a total real income impact of $1.7 billion** over the life of the project, or $52.5 million per annum. This implies the project has an **income multiplier of 1.97** under this option.

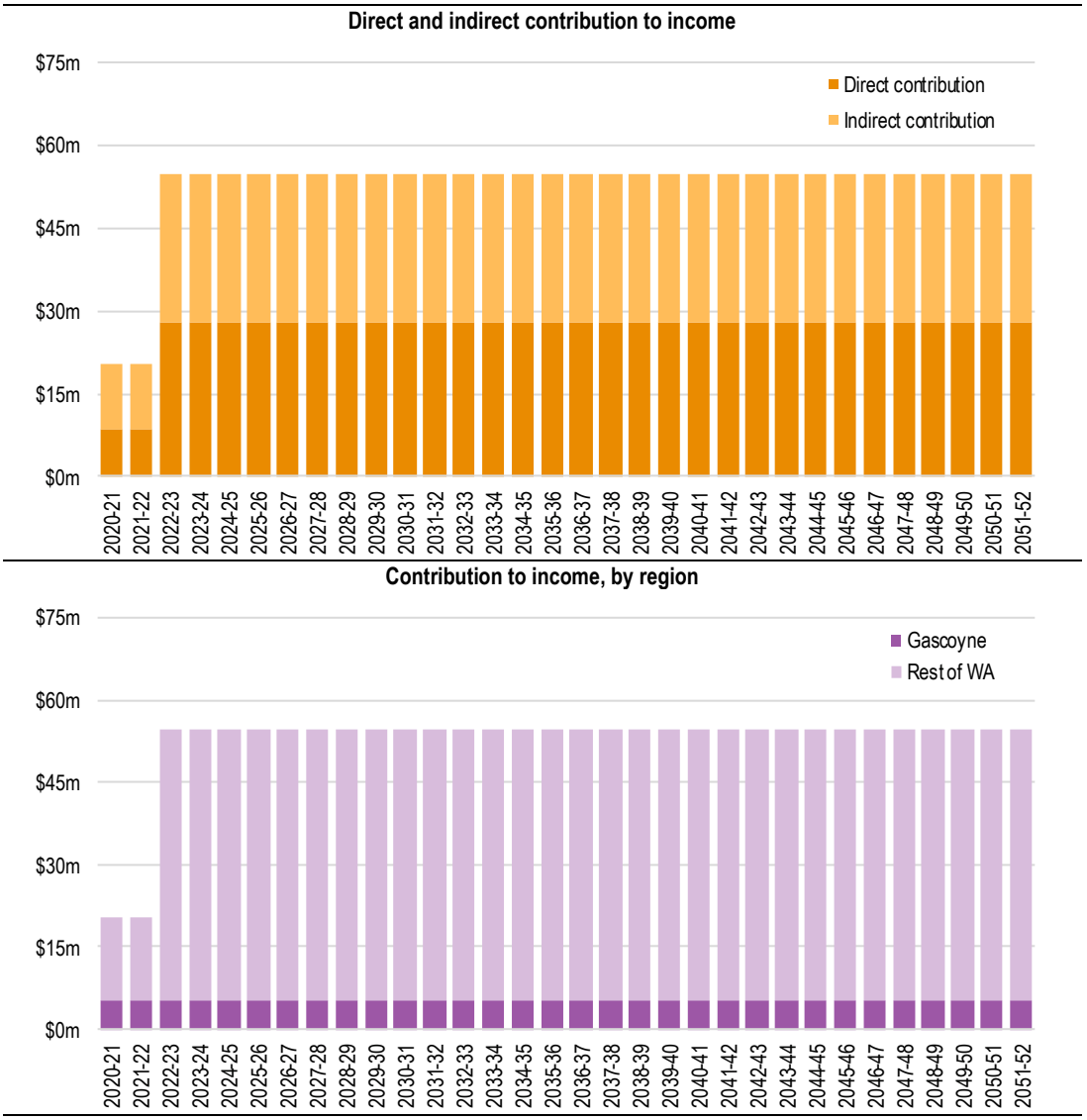
The real income impact estimated for the project is substantially lower than the real output impact. This is due to the economic leakages which occur during the process of attributing the economic activity created by the project to sectors of the economy, associated with the import of retail goods and the ownership of other aspects of tourism spend such as accommodation and visitor experiences.

At a local level, ACIL Allen estimates the project will generate direct real income impacts of $101.8 million over the 32 year project life ($3.2 million per annum), which will in turn generate $70.3 million of indirect real income impacts ($2.2 million per annum). The total real income impact of the project over its 32 year operating life is $172.1 million. On a per capita basis, the real income impact represents a notional boost to the region of $572 per resident, more than five times the rate of

real income impact for Western Australia as a whole. The real income multiplier of the project in this option to the Gascoyne region is 1.69.

The annual estimated real income impact of the project in terms of is presented below

FIGURE 6.4 OPTION FIVE: CONTRIBUTION TO INCOME PER ANNUM



SOURCE: ACIL ALLEN CONSULTING

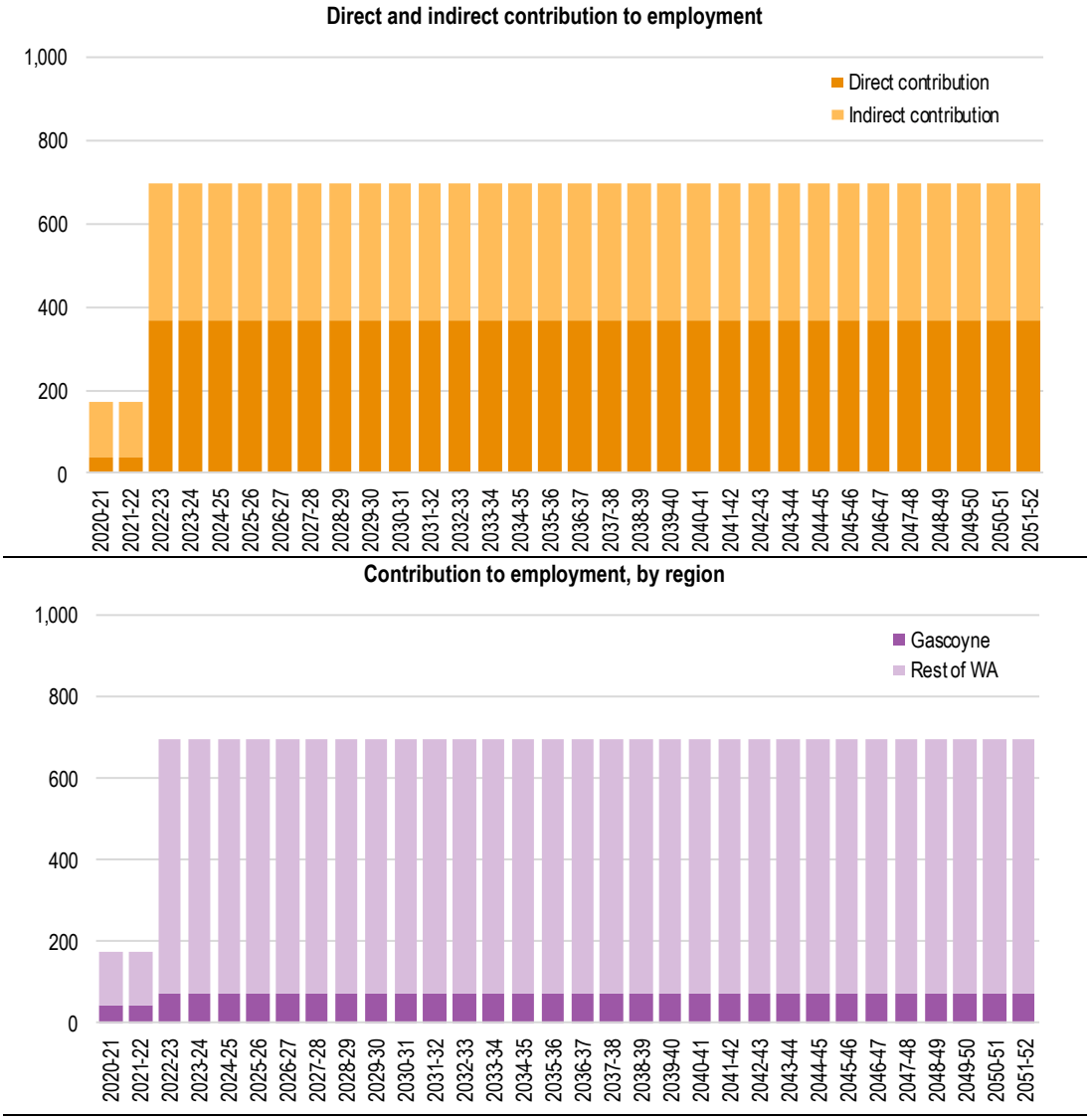
Total employment (FTE job years)

The output and income impacts associated with the project primarily manifest in the form of an increase in employment on both a direct and indirect basis. For the Gascoyne region, the project is expected to support an average of 71.7 direct and indirect FTE employees per annum, with a peak employment of 73.6 FTE during the 30 year operational life of the project. The employment multiplier for the Gascoyne region is 1.66, meaning for every one direct job created there is an additional 0.66 FTE jobs created. On a cruise-only basis, the employment multipliers associated with the project are estimated to be 5.87 FTE job years for every additional one million dollars of cruise visitor spend in the region. This highlights the significant upside benefits to the region associated with the development of fit for purpose marine infrastructure.

The employment impacts the rest of Western Australia are also important, averaging 663.1 FTE job years on average through the life of the project.

The employment impacts of the project are summarised in the figure below (**Figure 6.5**).

FIGURE 6.5 OPTION FIVE: CONTRIBUTION TO EMPLOYMENT, FTE PER ANNUM



SOURCE: ACIL ALLEN CONSULTING

6.2.3 Economic impact results: Option 3

Real output

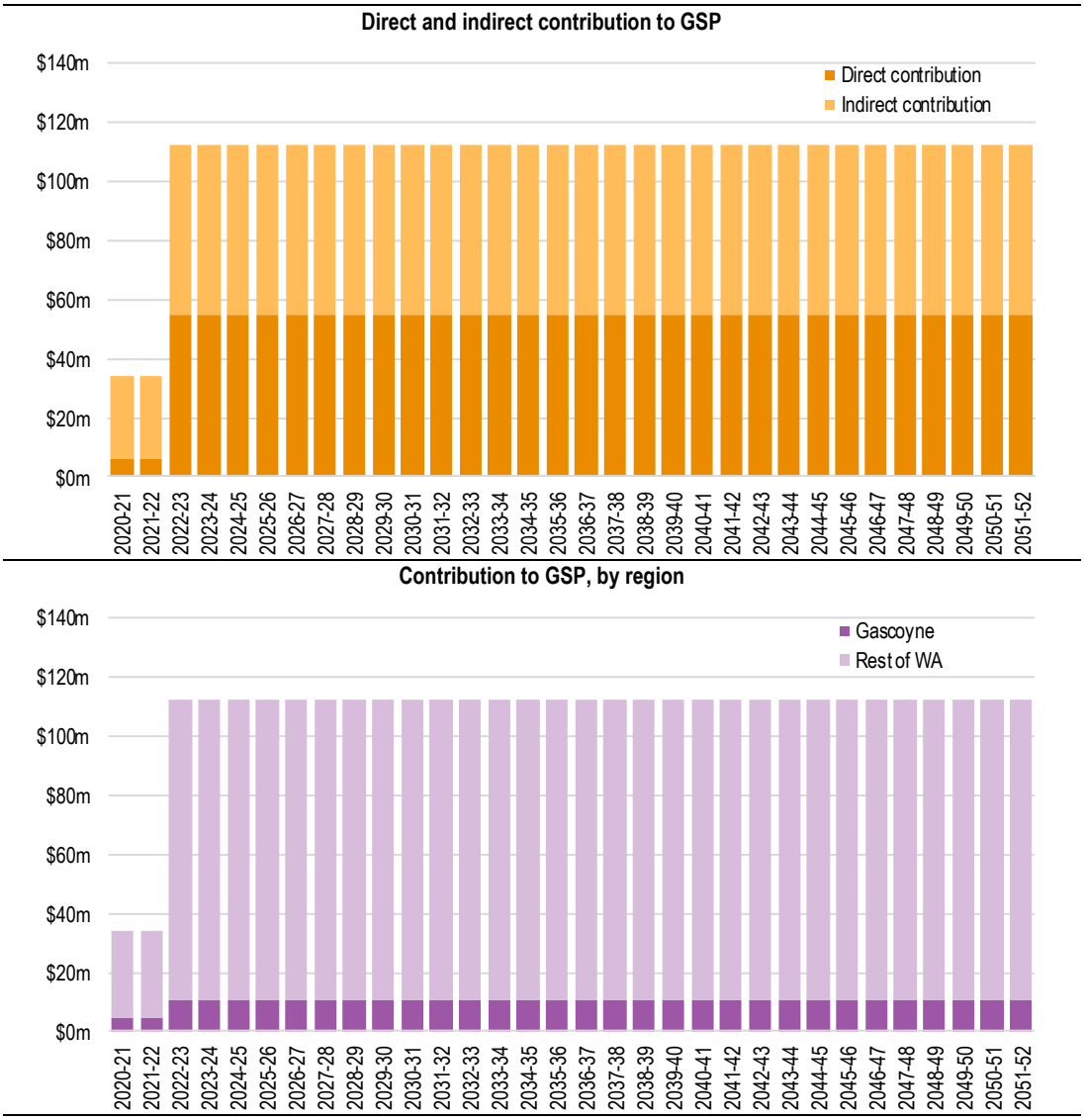
ACIL Allen estimates that the project will directly contribute $1.67 billion of GSP (2019 real dollars) to the Western Australian economy in over the 32 year project life, at an average of $52.2 million per annum. This level of activity is in turn expected to generate a further $1.79 billion of indirect GSP, or $55.9 million per annum, resulting in **a total contribution of $3.46 billion** over the life of the project, or $108.1 million per annum. This implies the project has an **economic multiplier of 2.07** under this option.

At a local level, ACIL Allen estimates the project will generate direct economic impacts of $185.6 million over the 32 year project life ($5.8 million per annum), which will in turn generate $143.2 million of indirect economic impacts ($4.5 million per annum). The total economic impact of the project over its 32 year operating life is $328.8 million, meaning approximately 10 per cent of the project's State-wide economic impact flows to the Gascoyne region. The annual economic impact of the project under

this option represents a 1.1 per cent boost to the region's economy every year over the project's life. The economic multiplier of the Project in the Gascoyne region is 1.77

The annual estimated economic impact of the project in terms of GSP and GRP is presented below (**Figure 6.3**).

FIGURE 6.6 OPTION THREE: CONTRIBUTION TO GSP AND GRP PER ANNUM



SOURCE: ACIL ALLEN CONSULTING

Real income

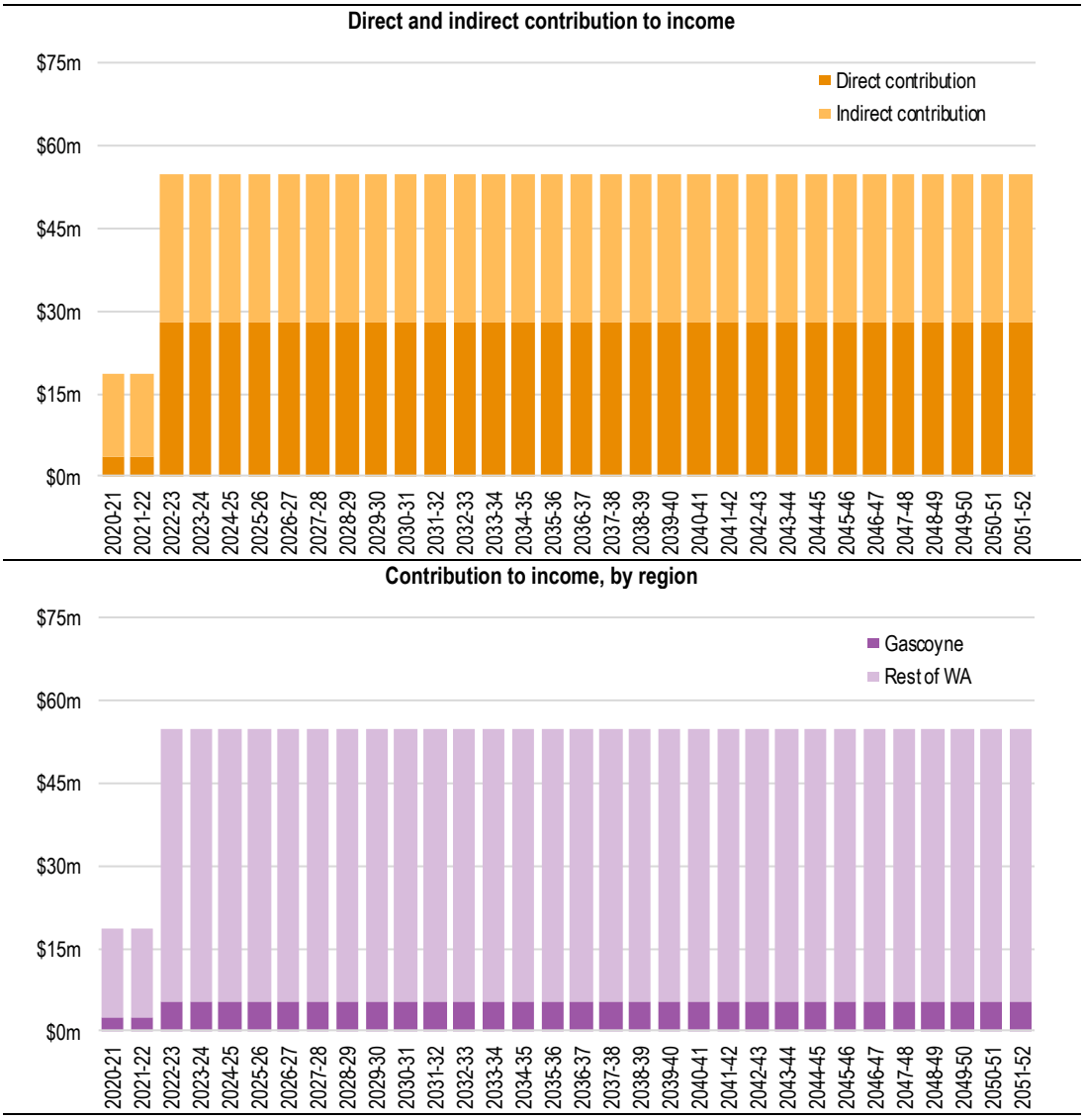
ACIL Allen estimates that the project will directly contribute $842.7 million of real income (2019 real dollars) to the Western Australian economy in over the 32 year project life, at an average of $26.3 million per annum. This level of activity is in turn expected to generate a further $834.1million of indirect real income, or $26.1 million per annum, resulting in **a total real income impact of $1.7 billion** over the life of the project, or $52.4 million per annum. This implies the project has an **income multiplier of 1.98** under this option.

The real income impact estimated for the project is substantially lower than the real output impact. This is due to the economic leakages which occur during the process of attributing the economic activity created by the project to sectors of the economy, associated with the import of retail goods and the ownership of other aspects of tourism spend such as accommodation and visitor experiences.

At a local level, ACIL Allen estimates the project will generate direct real income impacts of $98 million over the 32 year project life ($3.1 million per annum), which will in turn generate $67.8 million of indirect real income impacts ($2.1 million per annum). The total real income impact of the project over its 32 year operating life is $165.8 million. On a per capita basis, the real income impact represents a notional boost to the region of $551 per resident, more than five times the rate of real income impact for Western Australia as a whole. The real income multiplier of the project in this option to the Gascoyne region is 1.69.

The annual estimated real income impact of the project in terms of is presented below

FIGURE 6.7 OPTION THREE: CONTRIBUTION TO INCOME PER ANNUM



SOURCE: ACIL ALLEN CONSULTING

Total employment (FTE job years)

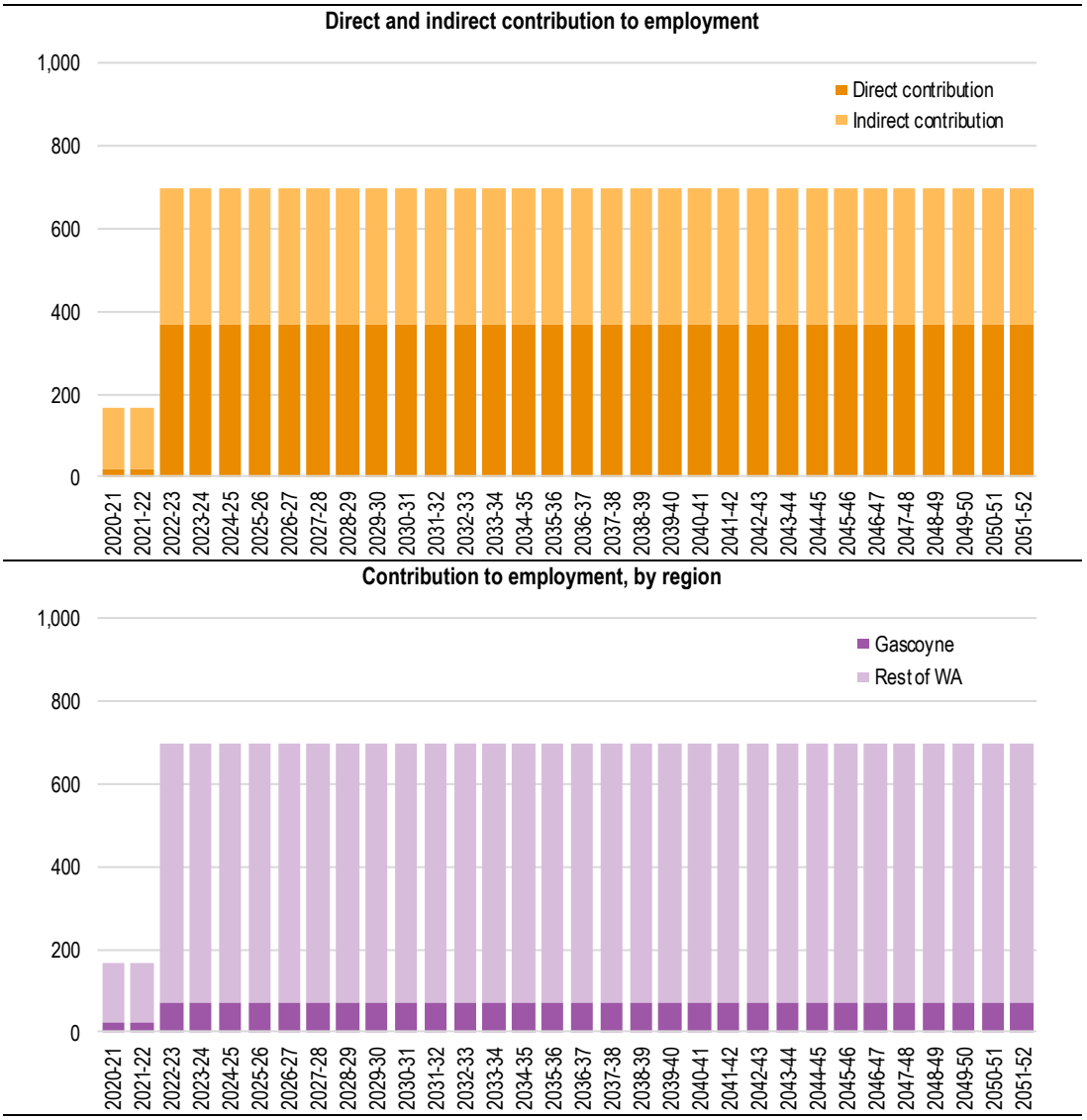
The output and income impacts associated with the project primarily manifest in the form of an increase in employment on both a direct and indirect basis. For the Gascoyne region, the project is expected to support an average of 70.2 direct and indirect FTE employees per annum, with a peak employment of 73.4 FTE during the 30 year operational life of the project. The employment multiplier for the Gascoyne region is 1.64, meaning for every one direct job created there is an additional 0.64 FTE jobs created. On a cruise-only basis, the employment multipliers associated with the project are estimated to be 5.87 FTE job years for every additional one million dollars of cruise visitor spend in the

region. This highlights the significant upside benefits to the region associated with the development of fit for purpose marine infrastructure.

The employment impacts the rest of Western Australia are also important, averaging 662.4 FTE job years on average through the life of the project.

The employment impacts of the project are summarised in the figure below (**Figure 6.5**).

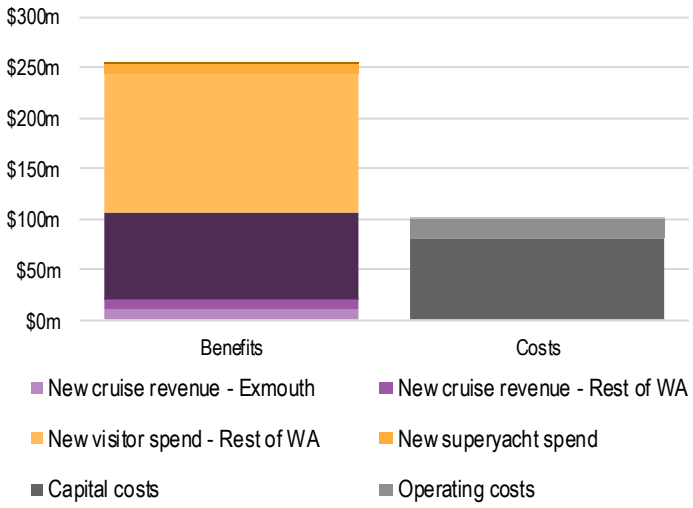
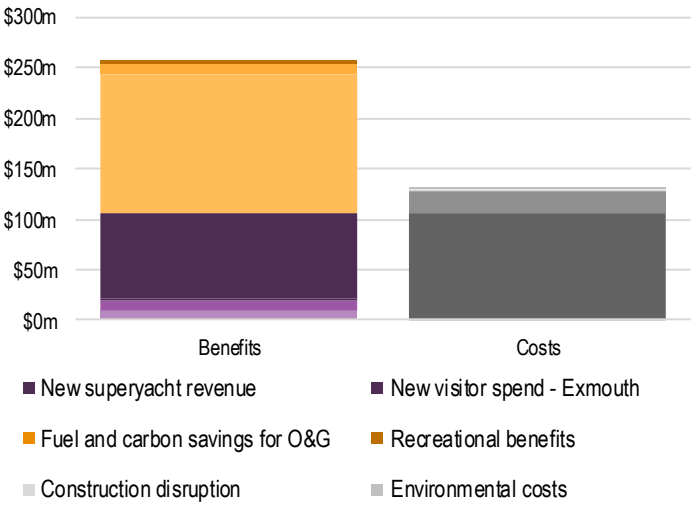
FIGURE 6.8 OPTION THREE: CONTRIBUTION TO EMPLOYMENT, FTE PER ANNUM



SOURCE: ACIL ALLEN CONSULTING

7 SUMMARY AND ADDITIONAL DIRECTIONS

A summary of the Economic Benefits Assessment is presented below.

OPTION 5: ROCK CAUSEWAY PLUS DREDGING Capital cost: $77.6m			OPTION 3: JETTY TO DEPTH Capital cost:$108.3m		
					
					
Net benefit $154.1m	BCR 2.525	New jobs 663 (WA), 72 (Gascoyne)	Net benefit: $128.0m	BCR: 1.994	New jobs 662 (WA), 70 (Gascoyne)

SOURCE: ACIL ALLEN CONSULTING

The economic benefits assessment completed on the Exmouth Marine Infrastructure Project suggests there is a strong prospect of net economic benefits associated with provision of new infrastructure at Exmouth. A benefit cost ratio of between 1.994 (Option 3) and 2.525 (Option 5), with net benefits of between $128 million (Option 3) and $154.1 million (Option 5), suggest the Exmouth Marine Infrastructure Project is worthy of further, detailed consideration by the GDC.

However, as detailed in Section 5, it is likely there are significant commercial and financial risks associated with the provision of the infrastructure, which primarily centre on uncertainty regarding potential use of the facility by fee-paying users. In addition, there are a number of environmental risks which require further investigation and analysis that are beyond the scope of ACIL Allen and BMT to address in a preliminary feasibility study.

As requested by GDC, ACIL Allen and BMT have provided some direction regarding future work that should be done to firm up the initial economic, financial and engineering analysis conducted during this engagement. Our view is summarised in the table below.

TABLE 7.1 STAGE 1 FEASIBILITY STUDY: MAIN WORKSTREAMS

	Overall project management Principal function is to coordinate consultants/Steering Group Maintain project risk register and develop mitigation strategies/controls in conjunction with consultants/Steering Group Responsible for project timing and delivery of final submission to Government		
Workstream	**Community/social impacts**	**Economics and commercial analysis**	**Engineering and environmental impacts and approvals**
Principal Activities	Stakeholder (key user) engagement (with economics/commercial advisor) Public consultation process Working with information obtained in the other two streams to prepare a Community Impact Assessment (mostly centred on building an understanding how an increase in cruise patronage may impact Exmouth)	Stakeholder (key user) engagement (with community/social advisor) Commercial analysis and financial modelling, framed by discussions with potential users (firming up demand analysis and developing pricing frameworks) Preparation of WA Treasury business case and/or funding submissions to Infrastructure Australia, Infrastructure WA or other body inclusive of economic impact and benefit cost assessment	Geotechnical investigations (mostly regarding the seabed) Hydrodynamics studies Flora and fauna studies Dredge plume modelling and analysis Refinement of options following technical analysis, including definitive drawings and artists impressions P50 costing of preferred option or options, taking into account findings of technical analysis and refined options
Deliverable	Community impact assessment report	Business case and/or funding submissions	Definitive Feasibility Study into a refined option/s

SOURCE: ACIL ALLEN CONSULTING

The work programs described above would allow the GDC to develop the feasibility studies associated with the project to a point where the State Government could make a final investment decision with complete information.

BMT Group has provided further guidance with respect to the environmental approvals required by the project in the next stage of its feasibility assessment. These are presented below.

Engagement with environmental regulatory agencies to understand the required level of assessment

Preparation of environmental approval documents, which may include:

- Referral document to the Office of the Environmental Protection Authority ('OEPA') under Section 38(1) of the EP Act
- Environmental Scoping Document
- Public Environmental Review ('PER')
  - it is anticipated the OEPA will set this level of assessment
- Response to the summary of public submissions in response to the PER
- DWER Works Approval application including an environmental risk assessment
- EPBC Referral

Undertake environmental studies/surveys, which may include:

- Environmental Impact Assessment to support PER
- Works Approval Application and EPBC Referral
- Sediment/soil survey
- Baseline shoreline and bathymetric survey
- Benthic habitat survey
- Geotechnical assessment of the project footprint and shoreline
- Setback assessment
- Noise modelling (potentially required)
- Plume modelling associated with dredging works (potentially required)
- Karst survey (potentially required)
- Subterranean fauna survey (potentially required)

Preparation of project Environmental Management Plans ('EMPs'), which may include:

- Construction Environmental Management Plan
- Foreshore Management Plan
- Stormwater and Drainage Management Strategy
- Marine Fauna Management Plan
- Closure/Rehabilitation Plan
- Traffic Management Plan
- Marine Safety Management Plan (including Oil Spill Contingency Plan)
- Additional plans as required by the regulatory authorities.

A

ABOUT ACIL ALLEN

ACIL Allen Consulting ('ACIL Allen') provides specialist professional advice and analysis in economics, public policy and business strategy development. We specialise in economic analysis, and in understanding how policy decisions can translate into socio-economic outcomes. As Australia's largest specialist economics and strategic consulting firm, ACIL Allen has significant resources upon which it can draw. We employ around 80 consultants located in Canberra, Sydney, Brisbane, Melbourne, Adelaide and Perth.

The firm has built a reputation for quality research, credible analysis, and innovative advice on economic, policy and strategic matters over a period of more than twenty years. ACIL Allen operates across a range of industries including energy, mineable resources, water and other infrastructure, education, tourism, health and human services policy and provides specialist advice to companies, governments, regulators and industry associations. ACIL Allen has been at the forefront of analysis of changes and policy issues in these sectors. We have helped governments to develop a number of policy mechanisms applied in response to these changes and policy issues. We have also helped many private corporations to develop responsive business strategies in this dynamic environment.

Our analytical and modelling skills enable us to provide robust quantitative estimates of the impacts of market and regulatory risk. We often use risk-based decision tools such as real options frameworks to advise clients on risk management strategies and opportunities. In part, our experience in these roles relates to major infrastructure assets, supporting feasibility assessments, equity raisings, sale and acquisition processes and funding of infrastructure assets, including natural gas and electricity transmission and distribution systems, power stations, roads, railways, airports and ports.

Our consultants are drawn from a wide variety of disciplines including economics, finance, statistics, geology, physics, environmental science, engineering and mathematics. We also offer a diverse range of professional backgrounds in state and federal government, academia and business.

The Perth office comprises a team of consultants skilled in the areas of economics, strategy and policy. Our consultants have experience in a range of project areas including economic and social impact analysis, stakeholder consultation, economic and other modelling, feasibility studies, business cases, cost benefit analysis, government approvals and program evaluation.

We have a thorough understanding of the Western Australian market. Our suite of services includes:

- economic and financial analyses for companies and government agencies, including benefit-cost analysis;
- feasibility studies and project evaluation;
- regional/spatial modelling and mapping;
- stakeholder consultation, which includes undertaking surveys, interviews and focus groups;
- developing or evaluating programs and projects for a range of clients;
- policy analysis and formulation for government agencies and private sector organisations;
- strategy development for government, private sector organisations and sectors;

- economic impact analysis of specific markets and sectors;
- projections of demand with respect to particular assets or supply systems;
- risk and investment analysis; and
- analysis of regulatory processes governing industries, assets and other infrastructure including the establishment of third-party access arrangements and reference tariffs.

Further information can be found on ACIL Allen's website at www.acilallen.com.au

B STAKEHOLDER CONSULTATION

B.1 Stakeholders consulted

The following table lists the stakeholders ACIL Allen consulted as part of this scope of services. The consultation program was deliberately targeted and centred on those stakeholders who could provide direct, relevant input into the Options Assessment and Economic Benefits Assessment.

In addition to the consultation program described below, ACIL Allen received emails from Base Marine which provided important context regarding the potential of Exmouth from a marine services perspective. ACIL Allen also consulted with the Shire of Exmouth, Gascoyne Development Commission and Project Steering Group on multiple occasions throughout the process of forming the Options Assessment and Economic Benefits Assessment.

TABLE B.1 STAKEHOLDERS CONSULTED FOR ECONOMIC BENEFITS ASSESSMENT OF EXMOUTH MARINE INFRASTRUCTURE PROJECT

Date	Time	Mode	Name	Organisation
Tuesday 23 July	12.30pm-1.30pm	Phone	Vince Valastro	Adelaide Brighton (Exmouth Limestone)
Tuesday 23 July	2.00pm-2.30pm	Phone	Adam Edwards	Department of Primary Industries and Regional Development
Tuesday 23 July	2.30pm-3.30pm	Phone	Michael Dickson	Department of Jobs, Tourism, Science and Innovation
Tuesday 30 July	9.30am-10.30am	Phone	Dean Brazier	Cruise & Maritime Voyages
Wednesday 31 July	9.00am-10.00am	Face-to-face	John Morris	Department of Transport
Wednesday 31 July	2.00pm-2.30pm	Phone	Steve Jenkins	Department of Transport
Thursday 1 August	1.00pm-1.30pm	Phone	Hailey Adams-Packer	Department of Mines, Industry Regulation and Safety
Thursday 1 August	2.00pm-3.00pm	Phone	Matthew Bird Keith Woodward	Shire of Exmouth
Tuesday 6 August	11.00am-11.30am	Phone	Geoff Mackin	Mid West Ports Authority
Tuesday 6 August	12.30pm-1.00pm	Phone	Roger Johnston	Pilbara Ports Authority
Tuesday 6 August	1.30pm-2.30pm	Face-to-face	Christine Cole	Tourism WA
Wednesday 7 August	2.30pm-3.00pm	Face-to-face	Anthony Smith	Santos
Thursday 8 August	1.00pm-2.00pm	Phone	David Good	Superyacht Australia

Date	Time	Mode	Name	Organisation
Thursday 8 August	2.00pm-2.30pm	Phone	Nicole Irvine	Subsea 7
Friday 9 August	10.00am-10.30am	Phone	Jill Abel	Australian Cruise Association
Monday 12 August	11.00am-12.00pm	Phone	Mike Drake	Carnival Australia
Tuesday 13 August	9.30am-10.00am	Phone	Barry Sullivan	Exmouth Chamber of Commerce and Industry (ECCI)
Friday 16 August	9.30am-10.00am	Phone	Andrew Winter	Woodside
Friday 23 August	12.30pm-1.00pm	Phone	Carla Giuca	Australian Border Force (ABF)
Monday 26 August	4.30pm-5.00pm	Phone	Natalee Connor	BHP
Wednesday 28 August	11.00am-11.30am	Phone	Wayne Hamilton	True North Services

B.2 Consultation guide

ACIL Allen's consultation guide used to frame the discussions with stakeholders has been reproduced on the next page.

ECONOMIC BENEFITS ASSESSMENT OF MARINE INFRASTRUCTURE IN EXMOUTH

CONSULTATION GUIDE

Background

In June 2019, ACIL Allen Consulting ('ACIL Allen') and BMT Group ('BMT') were engaged by the Gascoyne Development Commission ('GDC') to develop an options assessment and economic impact assessment of marine infrastructure in Exmouth, Western Australia.

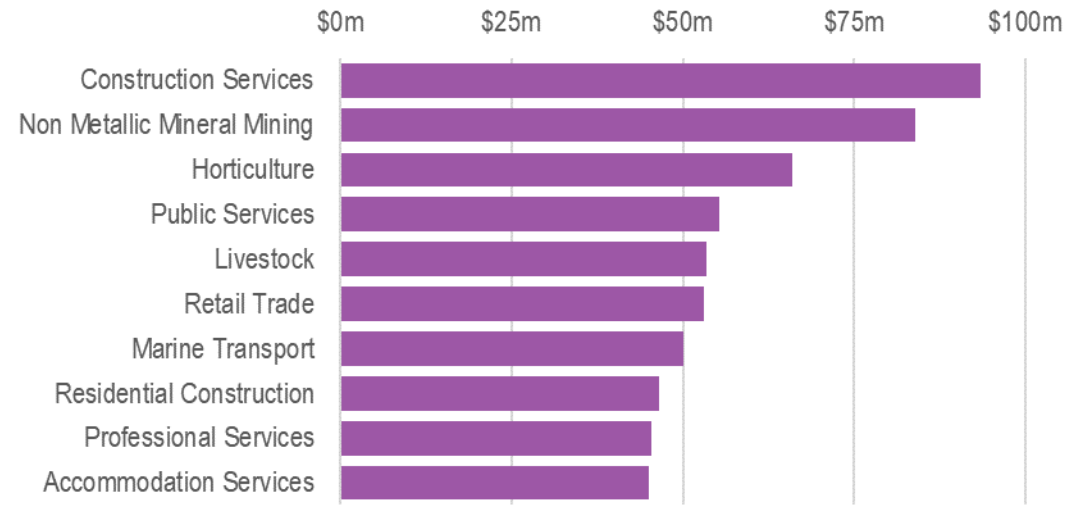
The project requires a blend of economics, financial analysis and engineering. As a result, ACIL Allen and BMT have combined our relative organisation's strengths in these areas to complete the project. Both organisations have extensive experience working on analysis of the Gascoyne region, having completed engagements centred on previous infrastructure options considered by the GDC (a floating deck in the case of ACIL Allen, and a hardstand wharf in the case of BMT).

In order to gain qualitative and quantitative insights to support the research, ACIL Allen and BMT are undertaking a targeted round of stakeholder consultation, guided by the GDC, informed by this **Consultation Guide**. The Guide provides important contextual information about the Project, the scope of works and the proposed methodology to stakeholders. The Guide includes a brief set of questions to ensure feedback collected at consultation meetings is gathered in a uniform manner.

Situation analysis

ACIL Allen estimates the Gross Regional Product of the Gascoyne region was $691.9 million in 2017-18, accounting for 0.3 per cent of the Western Australian economy. In Gross Value Added ('GVA') terms, the major industries in the Gascoyne were construction services (7.5 per cent of GVA), non-metallic mineral mining (6.7 per cent), horticulture (5.3 per cent), public services (4.4 per cent) and livestock industries (4.3 per cent) (**Figure 1**).

FIGURE 1 GASCOYNE REGION KEY INDUSTRIES, 2017-18, $M,



SOURCE: ACIL ALLEN CONSULTING

The *Gascoyne Regional Investment Blueprint* ('the Blueprint') identifies "improving regional accessibility and connectivity" as one of the six transformational pillars that will help the Gascoyne region reach the vision of the Blueprint. The Blueprint identifies that a boat harbour expansion would provide opportunity for cruise shipping potential in the region. Successive WA Governments have established the desire to increase the value of tourism in WA to $12 billion by 2020.

The current Exmouth Boat Harbour is designed to service recreational and commercial vessels up to 35 metres in length, with cruise ships needing to be anchored offshore, transporting patrons to shore using tender vessels. Strong winds and/or unfavourable sea conditions often cause aborted or cancelled cruise visits, resulting in significant economic loss and reputational damage to Exmouth and more broadly Western Australia's cruise industry.

This research is centred on finding a lasting solution to Exmouth's maritime infrastructure challenge, to create opportunities for local business and employment in the Gascoyne region. It will be underpinned by a comprehensive economic and engineering analysis of the problem, and assessment of the potential scale of industry development and activity that could be enabled by a new piece of maritime infrastructure, and a formal options assessment process to determine the best solution. Should a viable solution be found, the associated economic and financial modelling and technical design, will form the basis of a business case to progress the solution.

About ACIL Allen

ACIL Allen Consulting is the largest independent economics and public policy consulting firm in Australia, with a specialisation in economics, policy and strategy advice. With over 60 consultants across five offices, we have an established reputation for providing sound and independent advice on economic, public policy and organisational issues for all levels of government and business.

Further information about ACIL Allen can be found on our website: www.acilallen.com.au

About BMT

BMT provides engineering and scientific services and solutions to industry, commerce, policy makers, regulators and public sector operators. BMT offer specialised support to customers to provide solutions to their challenges and deliver engineering and project management services in key sectors that include built environment, coast infrastructure, defence and security, mining and machinery, offshore, rail transport, specialised ship design, surveys, vessel performance, water and environment.

Further information about BMT can be found on their website: www.bmt.org/

Further enquiries

If you have any questions in relation to the project, the role of ACIL Allen or BMT, and the consultation process that is being undertaken, please contact:

John Nicolaou (Project Director)
Executive Director, WA & NT
T: (08) 9449 9616
M: 0412 499 355
E: j.nicolaou@acilallen.com.au

Ryan Buckland (Project Manager)
Senior Consultant
T: (08) 9449 9621
M: 0407 443 193
E: r.buckland@acilallen.com.au

For Gascoyne Development Commission related matters for this project, please contact:

Odile May

Principal Regional Development Officer
T: (08) 6552 2093
E: odile.may@gdc.wa.gov.au

CONSULTATION QUESTIONS

About you

* *Can you please introduce yourself and your organisation? What are your links to Exmouth, and the broader Gascoyne region?*
* *Has your organisation been involved in previous work with respect to a marine infrastructure solution in Exmouth? What was the nature of this work and your involvement?*

Limitations of existing marine infrastructure

At present, the primary marine infrastructure in the Gascoyne region is the Exmouth Boat Harbour, in Exmouth. The Exmouth Boat Harbour was developed primarily to support recreational vessels and small commercial vessels of <35 metres length (with berthing available for vessels under 25 metres in length). The tidal range of the harbour measures -0.4 metres to 5.9 metres, meaning the facility can at times have limits on access.

The State Government's recently completed $18 million upgrade of the harbour increased the capacity of the hardstand service wharf, added new commercial fishing pens, and expanded the breakwater by two metres. A private company, Base Marine, has also invested in the facility in recent years to provide additional marine support options for recreational and commercial vessel owners.

Exmouth is a critical destination for cruise ship itineraries in Western Australia. The limitations of the Exmouth Boat Harbour see cruise vessels calling to Exmouth dock in the Exmouth Gulf and transhipping passengers to shore via tender vessels. Analysis by GDC suggests over the past five years approximately half of all shore visits planned by cruise ships calling Exmouth were cancelled due to the limitations of this approach.

Access to Exmouth is limited to a single road (Minilya-Exmouth Road), while the regions is also serviced by the Learmonth Airport (approximately 40 kilometres south of Exmouth). ACIL Allen and BMT are interested in exploring the current marine infrastructure in place at Exmouth and any specific limitations associated with it.

* *Has your organisation accessed the Exmouth Boat Harbour over the past one to two years? What was your experience?*
* *How does your organisation move goods and/or people into or out of Exmouth or the broader Gascoyne region? Does Exmouth Boat Harbour impact on your organisation's decision-making in this respect?*
* *What are the costs (either actual costs or missed opportunities) associated with the Exmouth Boat Harbour from your organisation's perspective?*

Economic opportunities in the Gascoyne region

The Gascoyne region is Western Australia's smallest Regional Development Commission area by both population and Gross Regional Product. However, the region is host to a range of diverse industries, including tourism, agriculture, aquaculture, oil and gas production and support, mining, and quarrying.

One of the primary motivations of the research is to address the challenges associated with cruise ship docking at Exmouth, given the historic challenges associated with bringing patrons to shore in the Exmouth Boat Harbour via tender vessels. However, ACIL Allen and BMT understand there are other significant economic opportunities associated with new marine infrastructure in the region.

* *What are some of the major economic development opportunities in Exmouth and the broader Gascoyne region which would benefit from the installation of new marine infrastructure? How do these fit into the existing economic structure of the region?*
* *Does the existing economic infrastructure of the Exmouth and/or Gascoyne region limit the potential attainment of these opportunities? Are these opportunities linked explicitly with the provision of new marine infrastructure, or could they occur without it?*
* *What are some of the verifiable economic and social benefits that could be generated by these opportunities? Do you have any data or analysis you can share which could support our investigation?*
* *Do you have any concerns about the environmental or community impact of development in the region, or in particular places? If so what are these concerns and how can they best be addressed?*

Future marine infrastructure options

There have been a number of investigations into marine infrastructure in Exmouth over the past ten years. These include development of a hardstand wharf at Mobowra Creek, expansion of the Exmouth Boat Harbour, redevelopment and shared use of the existing Navy Pier, development of a land-linked deep water berth or installation of a floating deck in the Exmouth Gulf.

All of these options have inherent strengths and weaknesses, both on a standalone basis and against each other. Some options are likely to have challenges which are too significant to overcome (such as high cost or competing uses). As part of this engagement ACIL Allen and BMT are undertaking a thorough assessment of all potential options to consider which is most likely to deliver the largest net benefits.

* *From your organisation's perspective, what are the critical factors that will lead to successful provision of marine infrastructure in Exmouth for the broader Gascoyne regions? Some examples of critical factors include reliability of access, cost of access, timely provision (ie can be built quickly), and flexibility of use.*
* *What form of infrastructure is going to best able to achieve the economic development opportunities discussed previously?*
* *Are there any "non-negotiable" aspects of a future piece of marine infrastructure in Exmouth from your organisation's persepctive? What would happen if a piece of infrastructure was developed that did not suit your specifications?*

Technical matters

In addition to general principles with respect to potential future marine infrastructure, there are a number of more specific technical matters that should be considered. These are to be subject to more detailed consideration in the second part of the engagement but are important to be aware of at this early stage as they could limit the options under consideration.

* *Are there any technical considerations with respect to the provision of marine infrastructure in Exmouth that ACIL Allen and BMT should be aware of from your perspective? These can be financial (ie cost or project delivery models), environmental (ie tidal or flora/fauna issues) or spatial (ie competing land use) in nature.*

General issues

The following questions are more general in nature.

* *What would the provision of fit-for-purpose marine infrastructure in Exmouth mean for your organisation? For Exmouth, and the region more broadly?*
* *Are there any other matters ACIL Allen and BMT should consider as part of its assessment of marine infrastructure options for Exmouth and the Gascoyne region more broadly?*

C FUNCTIONAL DESIGN CONSIDERATIONS – LONG LIST REQUIREMENTS

The following tables present the more detailed engineering-related infrastructure design considerations which were used as the basis to develop infrastructure delivery options for the Exmouth Marine Infrastructure project. These are summarised in Section 3.3.

TABLE C.1 FUNCTIONAL DESIGN CONSIDERATIONS – LONG LIST

Consideration	Importance
General	
All-tide access to navigable water that would allow for reliable berthing of large cruise vessels up to in the order of 280m+ LOA	Must have
No navigation restriction due to tide restrictions that impede the identified trade (unless otherwise noted see Bulk) and other facilities such as EBH	Must have
Allow for vessel drift during turning and mooring due to wind and currents leading to N-S berth orientation and open basin to allow ease of arrival and departure in tide or prevailing winds	Must have
Multiuser berth face allowing access for a variety of vessels including small bulk vessels, O&G Supply vessels, Border Force and Naval Patrol vessels that are larger than 35m as able to access the EXBH	Must have
Minimum berth clearance of 10 % of the vessel length (LOA) at both bow and stern up to a maximum of 30 m (98')	Must have
Not constrain future development for future larger cruise vessels (350m LOA) should the need/market develop	Must have
Reliable safe access from shore to berth for heavy vehicles passenger shuttle to GTA as a minimum (inc.. vehicle turnaround)	Must have
Reliable safe access from shore to berth for bulk or project cargo as a minimum	Must have
Account for future sea level rise within the 100 year design life	Must have
Cruise vessels	
Berthing of large cruise vessels in the order of 300m LOA and minimum 9.5m available water depth	Must have
No navigation restriction to and from the site, such as tide restrictions to reliability for daily disembarkation and re-embarkation to eliminate the need for the offshore anchoring and tendering/tranship passengers	Must have

Consideration	Importance
Harbour protection from prevailing waves and currents - Alongside berthing with acceptable ship to berth movement for typical gangway (limited swell exposure and vessel to vessel interaction – eg tender/shuttle small vessel motions in typical gulf sea unacceptable)	Must have
Transit Port only with some possibility for Interporting with development of a Tour market requiring limited landside infrastructure and services	Must have
Minimum berth clearance of 10 % of the vessel length (LOA) at both bow and stern up to a maximum of 30 m or L = 1.2 x 300 = 360m (PIANC, 2016)	Must have
Wharf apron minimum width of 12m (22m preferred for access to higher doors and temporary interporting facilities) (PIANC, 2016)	Must have
Access to lower side shell doors at a minimum for limited Apron width with Wharf width for large cruise vessels in the order of over 100m for servicing passenger doors – adopt Floating Deck analogy width for comparative analyses	Must Have
Access to the wharf for shuttle bus service to Ground Transport Area (GTA) tour pickup and service parking	Must have
Any climate protection/shelter which may be afforded to users at reasonable cost for the temporal nature of the proposed Transit Port use	Must have
Transportation access and turnaround at the wharf for passenger shuttle bus as a minimum and coach turnaround outside the Apron + 40m say 50m	Must have
Ground Transport Area (GTA) 30-40% passengers shuttle or tours or up to 1,500 pax excursion pickup area of at least 5,000m^2 in addition to shuttle needs for local visits and small vehicle and service parking	Must have
Close proximity to attractions/town centre for passenger transport/shuttle	Should have
Access to the higher passenger doors with an adjustable and transportable gangway ramp with minimum 22m Wharf Apron width	Should have
Sufficient space on the wharf or associated platform for Interporting (temporary) security arrangements of customs and border control	Should have
Supply of services – refuelling, shore-power, water (as short-stay not included)	Excluded
Oil & gas/project cargo	
Proximity to deep water with few navigational constraints: Berthing for Supply Vessels or Project Cargo Vessels/Heavy Lift vessels generally not constrained within Cruise vessel draft as LOA <90m and 8m Draught; Occasional SSV up to 100m LOA and 9m draught may be constrained	Must have
Harbour protection from prevailing waves and currents is less constrained than Cruise vessel requirements	Must have
Proximity/access for highway haulage for wharf access and turnaround alongside (minimum Double B) for direct lift on of service level project cargos and containers (no heavy lift) principally from ship's deck gear	Must have
Hard stand area available for lay down of supplies and other materials and suitable loading infrastructure.	Must have
Service cranage to allow vessel maintenance and lifting palletised and small container cargo at a minimum	Must have
Minor Services such as Power, Water.	Must have
Bulk water and fuel supplies to attract more visits – No fuelling need identified for opportunistic short visit project trade that would warrant investment and would require major infrastructure upgrades and import of bulk fuel by sea	Should have

Consideration	Importance
Supply of services – bulk power, water – vessels are assumed to be self-sufficient for power and water supply for offshore resupply is assumed to require headworks capacity would have to be developed at a scale unable to be serviced by the current small networks and include fire services	Excluded
Bulk fuelling for large supply vessels is not assumed available at the site	Excluded
Break Bulk	
Proximity to deep water with few navigational constraints: Berthing for Small Bulk Cargo Vessels Exmouth Limestone's active and valid environmental approval for the construction of a barge loading facility with limited available depth however, international export may require ships with their own deck cranes for loading and unloading cargo. Most of these vessels are handy size and Handymax class and are used for smaller volume trade products and/or servicing ports without quayside ship loaders and unloaders. Handysize Vessels 15,000 to 35,000 dwt have been considered with draughts in the order of 8 to 11m. (PIANC WG-184).	Must have
Harbour protection from prevailing waves and currents is less constrained than Cruise vessel requirements	Must have
Proximity to product sources and/or heavy haul transport access	Must have
Availability of suitable land for stockpiling for surge capacity during loading nearby the port facility. It is assumed that this will be ashore nearby if required and only loading from trucks is considered for opportunistic trades at present.	Must have
Wharf Access for highway haulage turnaround alongside the ship (minimum Double B) for direct loading using ships deck gear	Must have
Environmental sealed grabs available for loading	Must have
Manageable environmental and social impact for temporary episodic loading	Must have
Vessels in the order of 25,000 to 30,000 DWT are in the order of 160m LOA with draught of 10.5m and will require a deepened berth pocket at the berth to approximately -11.5 to -12m LAT and tidal sailing.	Should have
Platform Apron area for possible future loading infrastructure (portable telescopic loader) and service equipment and perhaps specialised containerised product limited surge storage for loading. Proposed volumes do not indicate need for conveyor loading from a dedicated shore facility and assumed ships gear and some storage capacity.	Should have
Straight berth face to allow warping of ships during loading.	Should have
Supply of services – power, water – as this headworks capacity would have to be developed at a scale unable to be serviced by the current small networks	Excluded
Other trades	
Proximity to deep water with few navigational constraints: All-tide access to navigable water that would allow for reliable berthing without tidal constraint: generally seen as unconstrained by catering for Cruise vessel	Should have
Harbour protection from prevailing waves and currents may be more constrained than Cruise vessel requirements with the identified vessels in this category but may be less constrained by daily visits and may be able to utilise for service on weather dependant basis	Should have
Ability to accommodate a range of vessels larger than 35m as able to access the EXBH up to the large design vessel generally unconstrained by available draught of the design vessel (Cruise) – fendering to suit 35m to 100m vessels and the tidal range at the site	Should have

Consideration	Importance
Short term Berthing to suit opportunistic Superyacht visits and possibility of fuelling and watering preferable. Vessels can be assumed as self-sufficient otherwise. Preferably in addition to Cruise ship Berth which could include additional inner berths on T Head designs or quayside.	Should have
Social/environmental	
Stakeholder acceptance	Must have
Minimisation of impact on environmental and social amenity	Must have
Minimise impact on cultural site significance (none identified)	Must have
Maximise use of current facilities (EXBH)	Must have
Minimise impact on navigation for current users (EXBH)	Must have
Minimise impact on marine fauna during construction and operation	Must have
Facilities balance between capital expenditure and maintenance cost and impact (eg dredging) for the infrastructure	Must have

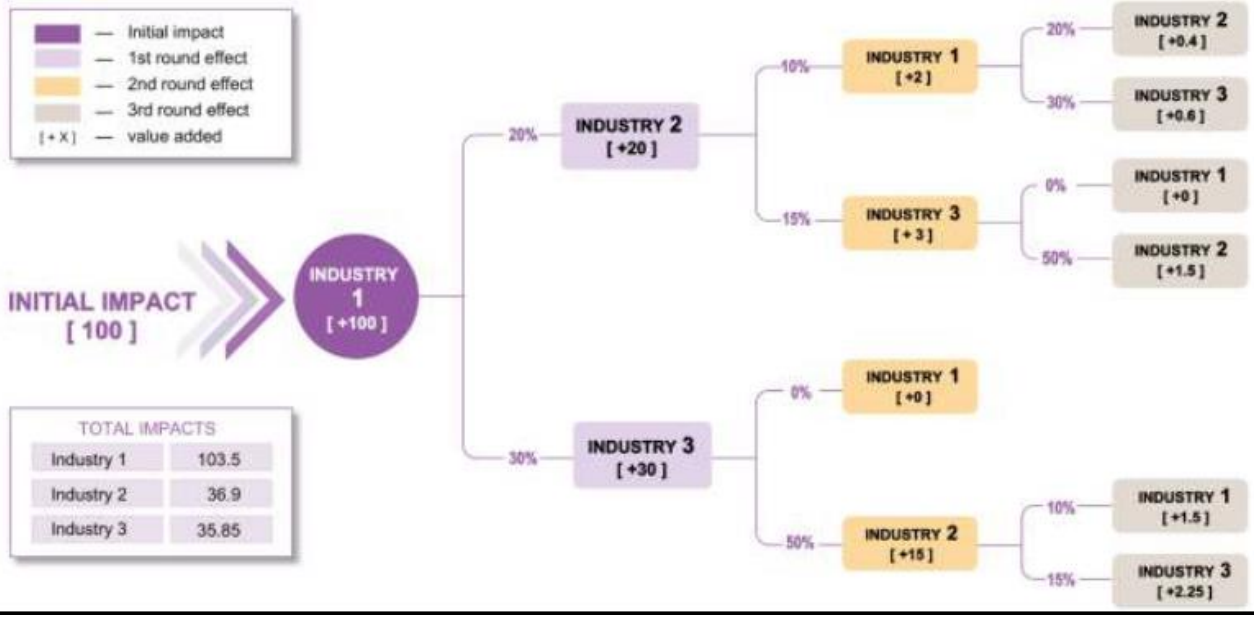
SOURCE: BMT GROUP, ACIL ALLEN CONSULTING

D

INPUT OUTPUT MODELLING

IO models capture the direct and indirect effects of expenditure by capturing, for each industry, the industries it purchases inputs from and also the industries it sells it outputs to. For example, the IO model for Western Australia captures purchases from and sales to industries located in Western Australia, as well as imports from outside Western Australia. Figure B.1 depicts how an impact is traced through a (very simple) economy with three industries (1,2 and 3), and is described below.

FIGURE D.1 "TRACE THROUGH" OF AN INPUT OUTPUT MODEL



SOURCE: ACIL ALLEN CONSULTING

1. The initial impact occurs in Industry 1 where an additional 100 units of value are added to its output. In order to generate this additional output, Industry 1 requires additional inputs from Industry 2 and Industry 3.
2. Therefore, Industry 2 and 3 increase their output as well. This in turn requires input from Industry 1 and 3 and Industry 1 and 2 respectively which increase their output to satisfy this additional demand, and so on.

   The impacts grow smaller with each iteration and ultimately converge to zero. This is because they always only share the impact that occurred in the preceding iteration.

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ABOUT ACIL ALLEN CONSULTING

ACIL ALLEN CONSULTING IS THE LARGEST INDEPENDENT, AUSTRALIAN OWNED ECONOMIC AND PUBLIC POLICY CONSULTANCY.

WE SPECIALISE IN THE USE OF APPLIED ECONOMICS AND ECONOMETRICS WITH EMPHASIS ON THE ANALYSIS, DEVELOPMENT AND EVALUATION OF POLICY, STRATEGY AND PROGRAMS.

OUR REPUTATION FOR QUALITY RESEARCH, CREDIBLE ANALYSIS AND INNOVATIVE ADVICE HAS BEEN DEVELOPED OVER A PERIOD OF MORE THAN THIRTY YEARS.