

12. Appendices

12.1 Appendix A – Workshop materials

Figure 34: Material used for workshop

Attendees

Workshop details and attendees		
Date and Time	Friday, 15 July 2021, 2:30 – 5:00 pm	
Location	TBC - Charles Darwin Centre DCXL7 Meeting Room D	
Attendees	NT Government • [REDACTED] • [REDACTED] • [REDACTED] • [REDACTED] • [REDACTED] • [REDACTED] Land Development Corp • [REDACTED] • [REDACTED]	Infrastructure (Commonwealth) • [REDACTED] • [REDACTED] EY • [REDACTED] • [REDACTED] [REDACTED] tt [REDACTED] [REDACTED]

Agenda

Topic
Purpose of the workshop
Project scope and objectives
Infrastructure Stage2 process
Project scope and objectives (IA Stage2 process)
Problem identification and prioritisation
Next steps: Evaluation methods and criteria

Purpose of workshop

The purpose of today's workshop is to:

- ▶ Test, validate and develop on existing findings to date to progress the development of the Middle Arm Infrastructure Australia Stage 2 Submission

Workshop goals

- ▶ Verify the problem statements and investment objectives associated with the Middle Arm project

Output

- ▶ A finalised set of problems and opportunities associated with the Middle Arm project
- ▶ Agreed investment objectives

- ▶ A Multi-Criteria Assessment (MCA) provides a structured framework for assessing and scoring a set of options' against a set of decision criteria.
- ▶ The criteria can be weighted to reflect their relative importance or alignment with the Projects objectives.
- ▶ MCA helps to reduce a long list of projects down to a realistic or feasible project list.
- ▶ It involves subjective decision making based on evidence available
- ▶ Consensus helps build the narrative on those short listed projects taken through to a Rapid CBA in a Stag2 submission to Infrastructure Australia(IA).

MCA Methodology - Criteria themes (to be discussed)

Based on previous Middle Arm submissions and EY's previous submissions the MCA criteria for discussion has been categorised into four (4) different themes. The four themes include:

Strategic fit with NT
& Commonwealth
Policies



Economic



Social &
Environment



Deliverability



MCA Methodology - How the criteria will be applied WORKSHOP MATERIALS ONLY

Criteria Weightings:	Description - Example	Score	
- Workshop participants may discuss the weightings for each pre-determined criteria and allocate a weighting based on its relative importance to the Project and alignment to the Project's objectives - Each Project option will be scored against the MCA criteria in the 'Scoring Matrix', with the weighted sum of each criteria providing a 'Total Score' - the scoring system is a seven point system: - Workshop participants should recognise that the MCA should act as a guide to support common-sense decision making, rather than being relied upon as a 'standalone' final output	Does not to marginally meet any project objectives relative to the base case	1-2	—
	Meets most project objectives relative to the base case	3	—/+
	Adequately meets almost to all project objectives relative to the base case	4-5	+

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Table 33: Criterial workshop materials

Criteria Workshop - Discussion and weighting allocation (1/2) WORKSHOP MATERIALS ONLY

Category	Element of Assessment Criteria	Description	Weightings
Strategic fit with Commonwealth and NT policies	Policy alignment	To what degree does the option facilitate strategic policy objectives? (supply chain resilience, critical minerals manufacturing, energy transition, net zero)	4%
	Multi-user, multi-industry benefit enablement	The options ability to encourage diverse industry investment	2%
	Value adding	To what degree does the option accelerate the value adding of NT resources?	2%
	Long term utility of option	Ability to scale up and decarbonise as demand increase, taking into account commercial users and NT long-term objectives	2%
Economic	Indicative capital costs and funding sources	Is the options nature one that is likely to require Government capital and oversight to enable wide economic activity across multiple proponents?	7%
	Number of potential beneficiaries	The number of potential users to a price of common - user infrastructure	6%
	Competitiveness of NT to investment opportunities	Relative impact of option that enhances NT competitive advantage for private sector investment	7%
	Local employment	Potential impact on local jobs and employment	5%
	Indigenous employment	Potential impact on indigenous jobs and employment opportunities	5%

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Criteria Workshop - Discussion and weighting allocation (2/2)

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Category	Element of Assessment Criteria	Description	Weighting	
Social, cultural and environment	Environmental approvals	To what degree does the option align with precinct environmental thresholds, targets and outcomes?	7%	30%
	Future environmental and cultural risks	Cumulative impact of option on future environment and cultural scenarios	7%	
	Social and community impacts	To what degree does the option make a positive impact and align with the community's expectations?	7%	
	Land use compatibility	Impact on surrounding and existing precinct planning framework	9%	
Deliverability	Construction difficulty	Does the option require mature/future technical knowledge or execution technology?	4%	30%
	Workforce and material availability	To what degree does the option require the availability of a specialist workforce or construction materials?	3%	
	Delivery complexity	Execution reliant on funding, governance or approval requirements across multiple stakeholder groups	3%	
	Activation	To what degree does the option activate the precinct in relation to: 1. Timing: Does the option fall in line with industry current and future investment timelines and demand 2. Dependence: Does the option directly enable various industries and proponents To ensure the successful industry uptake of the precinct	20%	

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Table 34: long lists development during workshop

Long list development (1/2)

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Option #	Description	Existing Investigations
Business as usual		
1	Maintain current state - Land development activities and private sector investment only	
Marine, common -user investments (assets)		
4	Appropriate dredging, common -user wharf + product jetty and/or Modular offloading facility (MOF)	Draft Stage 2
Decarbonisation, common -user investments (assets)		
6	Co2 Carbon capture utilisation and storage (CCUS) infrastructure - Underground manifold for Co 2 transmission	Middle Arm/CSIRO
7	*Further develop and enable Channel Island to generate renewable energy (dual gas - hydrogen generation)	-
8	Industrial electrical network to transmit industrial green energy supply	Middle Arm / EY
Utilities, common -user investments (assets)		
10	Water - common use or module desalination available for industry proponents	-
11	Power generation - common use dual -fuel power plant (LNG & hydrogen) offtake to proponents	-
12	Waste water treatment and disposal plant	Draft Stage 2
13	Power supply augmentation (combine and enable a variety sources of energy generation)	Draft Stage 2
14	Gas and hydrogen precinct pipeline (current APA pipelines are at limited capacity)	

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Long list development (2/2)

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Option #	Description	Existing investigations
Logistics		
15	Rail infrastructure - Build upon existing rail lines and connection into East Arm precinct (e.g. line and track extension, railroad conveyor/unloading pit, rollingstock maintenance yard and provisioning facilities)	-
16	Supply chain warehouse, tank storage, lay down and heavy machine area	-
Transport and related services		
18	Supporting transport infrastructure required for marine development connectivity - Common user landside facility (CULF), Corridors, roads and services to CULF, Causeway to Kittyhawk (Middle Arm only)	Stage 2 draft
19	Primary industrial roads connecting major land parcels with existing and planned common-user infrastructure - Kittyhawk Road, services and corridor, Spitfire western access road, Channel Island Road upgrades, Infill between Spitfire and Kittyhawk, roadlink across infill	Stage 2 draft
20	Precinct corridor ownership and management	
21	Workers accommodation, barracks and common facilities	

Table 35: MCA methodology scoring and examples for workshop

MCA Methodology - Scoring

WORKSHOP
MATERIALS ONLY

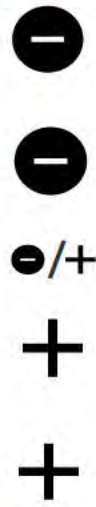
- Criteria Weightings:**
- ▶ Workshop participants are asked to assign a single score for each infrastructure solution based on how effectively that option is likely to address the identified criteria relative to the base case.
 - ▶ Each Project option will be scored against the MCA criteria in the 'Scoring Matrix ', with the weighted sum of each criteria providing a 'Total Score' - the scoring system is a seven point system.
 - ▶ Workshop participants should recognise that the MCA should act as a guide to support common -sense decision making, rather than being relied upon as a 'standalone ' final output.



MCA Methodology - Scoring

WORKSHOP
MATERIALS ONLY

Assessment Rating	Description	Score
Strongly Negative	Severe negative impact relative to the Base Case	-3
Moderately Negative	- Moderate negative impact / outcome - Impacts may be manageable	-2
Slightly Negative	- Minimal negative impact / outcome - Short term impact / outcome - Impacts can be managed or mitigated	-1
Neutral	No discernible impact / outcome	0
Slightly Positive	- Minor positive impact / outcome - Possible only short term - Confined to a limited area	+1
Moderately Positive	- Moderate positive impact / outcome - May provide new opportunities or improvements	+2
Strongly Positive	- Major positive impact / outcome - Long-term improvements	+3



BASE CASE

Maintain current state: Land development activities and private sector investment only

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MCA Scoring: Strategic fit

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Element of Assessment Criteria	Description	Low score examples	High score examples
1.1 - Policy alignment	To what degree does the option facilitate strategic policy objectives? (supply chain resilience, critical minerals manufacturing, energy transition, net zero)	The objectives and intended outcomes of the option do not closely align with a majority of policies or plans	- The option is closely related to energy transition policies and plans - It supports and accelerates the energy transition and net zero target
1.2 - Multi-user, multi-industry benefit enablement	The options ability to encourage diverse industry investment	The option only fits industry specific/specialist operations with low benefit potential	The option is industry agnostic with minimal limitations for industry use to maximise benefits
1.3 - Value adding	To what degree does the option accelerate the value adding of NT resources?	- The option provides limited/inefficient functional infrastructure for value adding production - These common used infrastructure are not able to be accessed within reasonable period for value adding activities	- The option provides accessible infrastructure for different type users - It is flexible to fit different value adding production models - The option is easy to adjust to meet future developing requirements
1.4 - Long term utility of option	Ability to scale up and decarbonise as demand increase, taking into account commercial users and NT long-term objectives	- The option is unable/ difficult to upgrade to meet users needs in the future - It is not feasible to extend or increase the capacity and capability in the future	The option is easy to strengthen and refurbish utility facilities to meet decarbonisation trends and industry development (eg: from grey hydrogen to blue hydrogen)

-3	-2	-1	0	+1	+2	+3
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MCA Scoring: Economic

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Element of Assessment Criteria	Description	Low score examples	High score examples
2.1 - Indicative capital costs and funding sources	Is the options nature one that is likely to require Government capital and oversight to enable wide economic activity across multiple proponents?	- The option is not commonly used by multiple proponents (i.e. one proponent) - It is irresponsible to be underwritten by Government due the nature - Commercially favours one industry type	Option fall inline with reasonable funding expectations
2.2 Number of potential beneficiaries	The number of potential users to a price of common user infrastructure	- One potential proponents/user - Relative low marginal value for various beneficiaries (low benefits for individual, industry and government)	3-6 potential proponents - Wide ranges of groups receive significant benefits from this development (direct users and supply chain services) - Cumulative benefits to different beneficiaries increase exponentially in long term
2.3 Competitiveness of NT to investment opportunities	Relative impact of option that enhances NT competitive advantage for private sector investment	- Inefficient infrastructure development unable to meet the private sector needs to make investments - Additional benefits/ impacts added from the option are less attractive comparing with other locations	- The option significantly reduce the risks and costs of private investment - Large benefits from the options to spurred NT to be the favourite investment location both short and long terms
2.4 Local employment	Potential impact on local jobs and employment	- The option does not sustainably increase employment rate and on going employment opportunities in the long term - Limited job opportunities in current local workplace as local workers unable to meet the skills requirements in certain period	- Significantly increase number of local jobs - Significantly increase the participate rate of local workforce - Attract high skilled worker from other region - Provide ongoing jobs not previously available in the Territory
2.5 Indigenous employment	Potential impact on indigenous jobs and employment opportunities	The option is unlikely to provide indigenous workforce opportunities	Increasing the share of Aboriginal workers employed in the Territory, associated with positive social impacts and breaking the cycle of disadvantage in Indigenous communities

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MCA Scoring: Social, Culture and Environment

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Element of Assessment Criteria	Description	Low score examples	High score examples
3.1 - Environmental approvals	To what degree does the option align with precinct environmental thresholds, targets and outcomes?	- The option primarily encourages high emitting industries - The option brings negative impact to quality of water and surrounding benefiers - construction, dredging programs and operations impact the marine ecosystems	Enables industry proponents to decarbonise products or services in the short or long term
3.2 - Future environmental and cultural risks	Cumulative impact of option on future environment and cultural scenarios	- The option posses significant risk to meeting NT net zero objectives - Likely to conflict with future cultural and heritage sensitivities	Enables and aligns with environmental and cultural NT policies and objectives
3.3 - Social and community impacts	To what degree does the option make a positive impact and align with the community 's expectations?	- Hinders diverse workforce opportunities - Negatively impacts social licence to operate	Aligns with communities expectations
3.4 - Land use compatibility	Impact on surrounding and existing precinct planning framework	- Misalignment with existing and planned land-development investigations - Options which could potentially jeopardise future proponents precinct interest	- Aligns with proponents expectations relating to precinct development - Option compliments existing Government expectations

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MCA Scoring: Deliverability

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Element of Assessment Criteria	Description	Low score examples	High score examples
4.1 - Construction difficulty	Does the option require mature/future technical knowledge or execution technology?	The option requires execution technology which is costly to imply or take time to develop	There is accessible existing technologies are ready to use to support each stage of the development
4.2 - Workforce and material availability	To what degree does the option require the availability of a specialist workforce or construction materials?	- Significant shortage of skilled workers or construction material to support the development of the option in a short or median term - Current supply chain or logistic issues could cause significantly delay of option development.	- There is an established workforce to support the development - It is easier to obtain construction materials and the existing facilities able to support the construction
4.3 - Delivery complexity	Execution reliant on funding, governance or approval requirements across multiple stakeholder groups	- There are no/insufficient funds available for this option - Complex processes with long waiting period to receive approvals	There are sufficient expertise and effective approval processes to support the development of the option
4.4 - Activation	To what degree does the option activate the precinct in relation to: - Timing: Does the option fall in line with industry current and future investment timelines and demand? - Dependence: Does the option directly enable various industries and proponents? To ensure the successful industry uptake of the precinct	Timing: - Option does not align with the current time horizon to meet industry demand and investment - Immature industries linked to the option Dependence: - The options does not sufficiently enable other common user infrastructure or proponents/industries	Timing: - The industry the option supports is mature and sufficient demand is known Dependence: - The option directly supports the development of diverse industries over the precinct life

-3	-2	-1	0	+1	+2	+3
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12.2 Appendix B – Climate considerations

Climate factors considered when assessing options

Climate factors are inherent to a number of the criteria used in the MCA as outlined below:

Strategic fit with Commonwealth and the Territory policies

- Policy alignment considered, amongst other policy initiatives the net zero targets of both the Commonwealth and the Territory governments.
- Long term utility of option the option went to how well the option supported the ability to scale and decarbonise over time. Options that supported decarbonisation objectives scored highest.

Economic

- Competitiveness of the Territory to investment opportunities included discussion around the attractiveness of some options which are positive for net zero pathways to investment, e.g. the renewable industrial network.

Social, cultural and environment

- Future environmental and cultural risks considered both emissions and environmental impacts such as vegetation loss.
- Social and community impacts consider community expectations including that development must support a net zero pathway.

Deliverability

- Climate change adaptability was not directly assessed in the MCA process. However, it was considered in the overall scoring of 'Activation' of the precinct. Both 'Timing' and 'Dependence' of the common-use infrastructure solutions were assessed with climate risks and increasing volatility in mind relative to the 'do nothing' scenario.
- The stage 3 business case will provide design details of the progressed options. The option designs will be assessed based their climate change resilience.

Net zero achievability

The Middle Arm Sustainable Development Precinct's highest scoring program package, Package 2, includes both the multi-GW renewable power network and Carbon Capture Storage (CCS). These two projects within the program are central to the achievability of net zero and are examples of emissions reduction technology at scale.

Concurrent to the development of this business case is the development of inputs for a Strategic Environmental Assessment of the precinct. A concurrent Green House Gas (GHG) modelling process is underway to develop a baseline and modelling of development precinct options. The modelling indicates that for certain precinct industrial options (including the balanced scenario contemplated by this submission) CCS and integrated large-scale renewables can mitigate emissions otherwise expected to be released into the environment by up to >67% and >25% respectively.

In addition to other efficiencies, modelling suggests minimal residual emissions requiring offsets – as low as 2-3%. While the industry mix at the precinct is not yet certain, there are several GHG emissions reduction planning pathways that support Net Zero by 2050 in-line with Commonwealth and Northern Territory emissions targets.

The precinct is currently home to two LNG export facilities, Darwin LNG and Ichthys LNG. Parent companies of these facilities Santos and Inpex emit between 6 and 8 million tonnes of CO₂¹⁰⁴ in Australia. While the development of the precinct is expected to enable new renewable fuels such as Hydrogen, this precinct will also create a pathway for the

¹⁰⁴ <https://www.cleanenergyregulator.gov.au/NGER>

Darwin based LNG operations to significantly reduce their emissions through access to renewable electricity for processing and carbon capture technology. This outcome, compared to the base case achieves a nationally significant reduction in emissions.

Emissions measurement and reporting

Emissions have been estimated for the construction of the shared use infrastructure that is the subject of the business case. Scope 3 estimates have been omitted at this stage but will be considered in later stages.

The construction of the shared infrastructure at the precinct is expected to trigger the Northern Territory's Large Emitters Policy¹⁰⁵. This policy requires large emitters to provide a GHG abatement plan. An abatement plan is also a possible condition within the Strategic Environmental Assessment for Middle Arm industries. The Strategic Environment Assessment will provide a full GHG abatement plan as required under the *Environment Protection Act (NT) 2019* and the *Environment Protection and Biodiversity Conservation (Cth) Act 1999*. This will include comprehensive emissions profiles of the precinct under different development scenarios.

Measurement and forecasting of emissions is compliant with *National Greenhouse and Energy Reporting (Cth) Act 2007*. In addition, an estimate of blue carbon is being developed to measure the impact of the dredging program that is required for the marine infrastructure.

The Stage 3 business case will include and analyse further detail on emissions. This Stage 2 submission includes a Rapid CBA and as such has only included the direct and significant avoided emissions from the renewable network and captured emissions from CCS. The Rapid CBA quantifies the primary benefit and cost streams directly associated with CO₂. The CO₂ benefit considerations for Infrastructure Project's 7 (Power network, green energy distribution) and 3 (Carbon Capture Utilisation and Storage) was reported on. Further Scope 3 investigations relating to impacts will be further investigated in a Stage 3 business case and when the MASDP Environmental Approvals are made public.

Problem and opportunities sustainability considerations

Opportunity 2: The precinct has an opportunity to be an early mover in developing a modern, net zero capable manufacturing hub (in a first world environmental regime) for future focused minerals and energy closest to growing market demand

Opportunity 3: The Territory has the fundamentals to deliver a diverse range of energy sources to lead energy transition to lower emissions on the pathway net zero

The above opportunity statements directly refer to developing an early mover net zero manufacturing hub. The problems and opportunities have been directly considered in the optioneering process throughout the Stage 2 report flowing into both MCA processes. Opportunity 2 was developed to ensure the Middle Arm precinct takes advantage of future low emissions industry processing including processing minerals of the future required to manufacture technologies to aid in the reduction of greenhouse gases. Additionally, the opportunity considers the existing Brownfields LNG facilities local to Middle Arm and the development by these industries of dedicated large-scale renewables and CCS (both key GHG mitigation technologies). Middle Arm Precinct is expected to capitalise on these critical heavy industrial decarbonisation technologies "at the gate" and will provide a critical pathway for future minerals and advanced manufacturing to decarbonise their operations.

Opportunity 3 recognises the ability for the precinct to develop renewable energy sources in an export ready format which will support our neighbours in their decarbonisation efforts.

¹⁰⁵ Northern Territory Large Emitters Policy - https://depws.nt.gov.au/__data/assets/pdf_file/0018/1042164/factsheet-large-emitters-policy-and-the-community.pdf

12.3 Appendix C – Infrastructure Projects MCA-1 and MCA-2 Results

Table 36: MCA

Theme	Criteria	Aggregated score	Score evidence
Modular Offloading Facility (MOF): Appropriate dredging, and/or MOF and common user hardstand/laydown facility			
Strategic fit with Commonwealth and the Territory policies	1.1 - Policy alignment	7	The role of this infrastructure is pivotal to help proponents (and their products and services) achieve outcomes which align with a wide range government policy. Policies include, but not limited to: Territory Economic Reconstruction Commission – A common-user MOF will strengthen the Territory to be at the forefront of importing modules for renewable energy generation. Our North, Our Future: White Paper on Developing Northern Australia, a focal point to the Territory specific paper outlines the need for infrastructure to support growth. With the existing Inpex owned MOF is not available for future proponent use combined with the Darwin Port operating at levels which currently remain optimised, any additional demand such as large-scale solar panel import to the region could pose a significant risk for reaching growth to new industries and investment opportunities.
	1.2 - Multi-industry benefit enablement	7	This infrastructure is commonly needed by different types of industries to obtain input and distribute output. 100% Industry proponents surveyed indicated that MOF and jetty access is the number one enabling infrastructure ¹⁰⁶ .

¹⁰⁶ EY/DIPL industry survey feedback

Theme	Criteria	Aggregated score	Score evidence
	1.3 - Value adding	7	The MOF would support value adding and product development (primary through importing and exporting) of goods and investments in the NT. Infrastructure Australia's the Territory Regional Strengths and Infrastructure Gaps report details the downstream minerals processing and strengthening the gas production supply chain as key growth industries¹⁰⁷ The MOF and association with industry proponent's beneficiation of resources across the value chain directly aligns with the findings in this report. Lowering the barrier for entry for mid or downstream proponents will encourage proponents which can value-add the Territory resources such as LNG, green energy through photovoltaic or the power network and mineral processing and manufacturing.
	1.4 - Long term utility of option	7	MOF and dredging will be required regardless of changing demands of energy and products. It supports and attracts private sector proponents who will bring more sustainable or carbon efficient products and services in/out of the Territory. Australia conducts 98% of its trade through ports ¹⁰⁸ , added with the strategic placement of the Territory to SE Asia the Long-term utility of a MOF is extremely high.
Economic	2.1 - Indicative capital costs and funding sources	7	The indicative cost and whether it is reasonable for Government funds to underwrite the capital costs is considered a high priority category: Government investment is critical to ensure equitable use of the MOF across precinct proponents and industries. Indicative costs of +\$600 m is in line with budget expectations.
	2.2 - Number of potential beneficiaries	7	This infrastructure will be the critical to attract private sector investments as it is commonly needed by many potential proponents/users. 100% industry proponents have indicated the use of the MOF.
	2.3 - Competitiveness of the Territory to investment opportunities	7	The MOF will make the precinct more desirable to national and foreign investment. This has been communicated by potential industry participants through the industry survey.
	2.4 - Local employment	7	There are mining companies want to use this for large loads and put it onto roads, these derived projects would support ongoing local employment.
	2.5 - Indigenous employment	4	There is limited information about the impact on Indigenous employment - neutral effect

¹⁰⁷ [Infrastructure Australia - Regional Strengths and Infrastructure, 2022](#)

¹⁰⁸ [Ports Australia - Ports take Australia to the world, 2022](#)

Theme	Criteria	Aggregated score	Score evidence
Social, cultural and environment	3.2 - Future environmental and cultural risks	4	Indirectly the MOF could reduce environmental impacts through benefiting many users to import/export greener products, but it may have direct negative impacts on marine environment and ecosystem. • Further environmental studies will be completed to minimise the impact. • The indirect benefits associated with the import of modules to enable decarbonising infrastructure development.
	3.3 – Social and community impacts	5	There are indications some members of the Territory community are against the development due to the impact on the marine environment. As reported in the New Daily publication ¹⁰⁹ .
	3.4 - Land use compatibility	7	The MOF (and dredging) will allow more land to be used and heighten precinct efficiency. The MOF directly aligns with existing precinct development expectations. Expected in DIPL's current planning.
Deliverability	4.1 - Construction difficulty	6	The construction difficulty and knowledge base are mature, due to similar project execution in the region. However, the scale of the undertaking is significant and reflected in scoring.
	4.2 - Workforce and material availability	5	• The workforce requires a reasonably specialised skillset to deliver however this workforce will be in the Territory for the Shiplift. • The Shiplift project being executed will provide specialist, renewable knowledge¹¹⁰.
	4.3 - Delivery complexity	5	The delivery complexity is relatively advanced but is not unique and can be managed accordingly by the project owner ¹¹¹ .
	4.4 - Activation	7	It is critical infrastructure to ensure the successful industry uptake of the precinct and attract future private sector interments. • All industry proponents looking to invest in Middle Arm have indicated this project as a top priority. • Timing wise, directly aligns with what the Territory companies require in the short and medium term. • The MOF will enable other infrastructure in the precinct including the wider the Territory supply chain.

¹⁰⁹ Newdaily - Significant adverse impacts': Proposed Darwin gas hub labelled a risk to health and environment, 2022

¹¹⁰ Invest the Territory – Shiplift, 2022

¹¹¹ DIPL engineering team

Theme	Criteria	Aggregated score	Score evidence
Product export jetties			
Strategic fit with Commonwealth and the Territory policies	1.1 - Policy alignment	7	The role of this infrastructure is pivotal to help proponents (and their products and services) achieve outcomes which align with a wide range government policy. Common-user jetties will strengthen the Territory to be at the forefront of importing modules for renewable energy generation. Our North, Our Future: White Paper on Developing Northern Australia, a focal point to the Territory specific paper outlines the need for infrastructure to support growth. With the Darwin Port operating at levels which currently remain optimised, any additional demand such as large-scale solar panel import to the region could pose a significant risk for reaching growth to new industries and investment opportunities.
	1.2 - Multi-industry benefit enablement	7	This infrastructure is commonly needed by different types of industries to obtain input and distribute output. Similar to the MOF, 100% of industry proponents surveyed indicated that product jetties access is the number a top enabling piece of common-user infrastructure.
	1.3 - Value adding	7	It would support value adding and product development (primary through importing and exporting). 100% ¹¹² all of industry proponents surveyed conveyed a product jetty (along with the MOF) the most significant enabling infrastructure required for beneficiation.
	1.4 - Long term utility of option	7	Export jetties and dredging will be required regardless of changing demands of energy and products. It supports and attracts private sector proponents who will bring more sustainable or carbon efficient products and services in/out of the Territory. Australia conducts 98% of its trade through ports ¹¹³ , added with the strategic placement of the Territory to SE Asia the Long-term utility of a MOF is extremely high.
Economic	2.1 - Indicative capital costs and funding sources	7	Essential for Government capital to maximise total volume of products from the precinct and benefits received by different users, even though some private proponents will be able to self-fund.
	2.2 - Number of potential beneficiaries	6	100% of precinct occupiers wouldn't necessarily use the jetties unlike the MOF. It is expected 70% of industry proponents would be exporting products through a common-user product jetty.

¹¹² EY/DIPL industry survey feedback

¹¹³ Ports Australia - Ports take Australia to the world, 2022

Theme	Criteria	Aggregated score	Score evidence
	2.3 - Competitiveness of the Territory to investment opportunities	7	This infrastructure will be critical to attracting private sector investments as it is commonly needed by many potential proponents/users. - With the investment pipeline in the Territory, extremely high with 13 private industry, major projects being planned and delivered over the coming years. There are concerns that the current port capacity will be unable to meet demand. - The products produced for export in the precinct are vast and significant including Titanium, Vanadium, Ammonia, Hydrogen and fertiliser to name a few. 90% of industry respondents surveyed¹¹⁴ for the precinct indicated common-user export product jetties are critically essential for exporting products to the market. Some noted that using existing port facilities could limit export quantities.
	2.4 - Local employment	7	Some mining companies want to use this for large loads and put it onto roads, these projects would support ongoing local employment.
	2.5 - Indigenous employment	4	There is limited information about the impact on Indigenous employment - neutral effect.
Social, cultural and environment	3.2 - Future environmental and cultural risks	4	Indirectly, the dredging and jetties could reduce environmental impacts through benefiting many users to import/export greener products, but it may have direct negative impacts on marine environment and ecosystem. - Further environmental studies will be completed to minimise the impact. - The indirect benefits associated with the import of modules to enable decarbonising infrastructure development.
	3.3 - Social and community impacts	5	There are indications some members of the Territory community are against the development due to the impact on the marine environment. As reported in the New Daily publication ¹¹⁵ .
	3.4 - Land use compatibility	7	The Jetties (and dredging) will allow more land to be used and heighten precinct efficiency. The jetties and dredging directly aligns with existing precinct development expectations. Expected in DIPL's current planning.
Deliverability	4.1 - Construction difficulty	6	The construction difficulty and knowledge base are mature, due to similar project execution in the region. However, the scale of the undertaking is significant.

¹¹⁴ DIPL Industry surveys, 2022

¹¹⁵ NewDaily - 'Significant adverse impacts': Proposed Darwin gas hub labelled a risk to health and environment, 2017

Theme	Criteria	Aggregated score	Score evidence
	4.2 - Workforce and material availability	5	The workforce requires a reasonably specialised skillset to deliver however this workforce will be in the Territory for the Shiplift. The Shiplift project being executed will provide specialist, renewable knowledge ¹¹⁶ .
	4.3 - Delivery complexity	5	The delivery complexity is relatively advanced but is not unique and can be managed accordingly by the project owner ¹¹⁷ .
	4.4 - Activation	6	- It would strongly support activation. This is marked as moderate as a lack of export jetties is not seen an insurmountable supply chain issue from the private sector. - All industry proponents looking to invest in Middle Arm have indicated this project as a top priority. - Timing wise, directly aligns with what Territory companies require in the short and medium term. - The MOF will enable other infrastructure in the precinct including the wider Territory supply chain.
CO2 Common user - Carbon capture utilisation and storage (CCUS) infrastructure – Underground manifold (series of pipes underground) for CO2 transmission and supporting infrastructure - capacity/open access control			
Strategic fit with Commonwealth and the Territory policies	1.1 - Policy alignment	6	CCUS enabling infrastructure aligns with multiple the Territory developed strategies: - Net zero by 2050 – the Territory Government has confirmed a goal of achieving net zero emissions by 2050. - Large emitters policy – a policy outlining the Territory Government's expectations for the mitigation and management of emissions from new and expanding large greenhouse gas emitters is targeted for the end of 2020. - Emissions Reduction Strategy – the development of an Emissions Reduction Strategy (ERS) by mid-2022. The ERS will identify stages, interim targets, timeframes, and potential approaches and mechanisms to achieve the net zero emissions target by 2050. - Greenhouse Gas Emissions Offsets Policy - develop a Greenhouse Gas Emissions Offsets Policy to guide the application and administration of carbon offsets by mid-2022.

¹¹⁶ Invest the Territory – Shiplift, 2022

¹¹⁷ DIPL engineering team

Theme	Criteria	Aggregated score	Score evidence
	1.2 - Multi-industry benefit enablement	7	CCUS Infrastructure offers the opportunity to allow different types of industries to access carbon storage and transmission, including heavy industries, natural gas power generation, ammonia production, methanol production, ethylene production, condensate refining and titanium vanadium, as well as power generation, hydrogen production, agriculture, aquaculture and transport ^{118, 119} .
	1.3 - Value adding	5	The infrastructure is valuable for processing, although it may have limited contribution directly accelerating the value add of the Territory resources. Evidence from elsewhere suggests carbon capture and storage is not only a proven emissions reduction solution, but also brings environmental, economic and social benefits ¹²⁰ .
	1.4 - Long term utility of option	7	This infrastructure has the ability to future proof Middle Arm, enabling industries one pathway to transition to net zero. CCUS infrastructure will play an important role in meeting net zero targets, as one of the few solutions to remove carbon from the atmosphere and tackle emissions from energy-intensive industries such as power generation and industrial plants ¹²¹ . As per the Northern Territory Infrastructure Plan 221, infrastructure is a key enabler of economic development, underpinning the capacity to create jobs, increase productivity and stimulate growth ¹²² .
Economic	2.1 - Indicative capital costs and funding sources	5	Government capital and oversight, at both Territory and Federal levels, will maximise benefits of common user operations and achieve the objectives of a diverse industry precinct. Through the Carbon Capture and Storage Hub Study and Report, policy and regulatory options to incentivise private investment have been analysed, including the identification of options to address barriers to carbon capture and storage investment ¹²³ .
	2.2 - Number of potential beneficiaries	7	The infrastructure could provide approximately 2-4 proponents options to transmit CO2 once fully utilised. Through the development of the Business Case to assess the viability of a large-scale low-emission CCUS Hub, CSIRO partnered with key industry and engineering companies, including INPEX, Santos, Woodside, Eni, Origin Energy and Xodus, who could be potential local proponents, in addition to Darwin LNG, notwithstanding the options for foreign investors ¹²⁴ .

¹¹⁸ Global CCS Institute for the Government of the Northern Territory of Australia - Carbon Capture and Storage Hub Study, 2020

¹¹⁹ Territory Gas the Territory - Carbon Capture Utilisation and Storage Hub, 2022

¹²⁰ Earth Resources – Benefit of CCS, 2022

¹²¹ Territory Gas - Carbon Capture Utilisation and Storage Hub, 2022

¹²² NT Infrastructure Plan 2021 - Annual review, 2022

¹²³ Global CCS Institute for the Government of the Northern Territory of Australia - Carbon Capture and Storage Hub Study, 2020

¹²⁴ Global CCS Institute for the Government of the Northern Territory of Australia - Carbon Capture and Storage Hub Study, 2020

Theme	Criteria	Aggregated score	Score evidence
	2.3 - Competitiveness of the Territory to investment opportunities	7	Will improve attractiveness of MASDP and offer a point of differentiation in global context, as well as provide a gateway to South-East Asia. Unlocking investment in carbon capture and storage can support high-value jobs and economic growth, as well as provide opportunities for the establishment of new industrial sectors in the Territory ¹²⁵ . Location within the MASDP will open opportunities within a globally competitive location for low-emission petrochemical, renewable hydrogen and minerals processing ¹²⁶ .
	2.4 - Local employment	4	While the initial construction of the CCUS infrastructure may temporarily create job opportunities, the infrastructure is not expected to directly contribute to local employment in a substantial way.
	2.5 - Indigenous employment	4	There is limited information about the impact on Indigenous employment - neutral effect.
Social, cultural and environment	3.2 - Future environmental and cultural risks	6	While environmentally positive given the carbon capture and support for the transition to a net-zero future, this infrastructure may have issues with geology until further environmental and engineering investigations are undertaken. This position can be improved through: • Further undertaking of environmental studies to minimise the impact, including risks posed to native flora and fauna. • The identification of learnings and best practice from other similar projects on how to address environmental and cultural risks. The indirect benefits associated with the import of modules to enable decarbonising infrastructure development.
	3.3 – Social and community impacts	5	Despite general community support, there are pockets of minor community concern around the CO2 storage and utilisation technology. Effective public engagement will be key for the success of CCUS infrastructure development and implementation ¹²⁷ .

¹²⁵ Global CCS Institute for the Government of the Northern Territory of Australia - Carbon Capture and Storage Hub Study, 2020

¹²⁶ Global CCS Institute for the Government of the Northern Territory of Australia - Carbon Capture and Storage Hub Study, 2020

¹²⁷ International Journal of Greenhouse Gas Control - Community compensation in the context of Carbon Capture and Storage: Current debates and practices, 2020

Theme	Criteria	Aggregated score	Score evidence
	3.4 - Land use compatibility	7	Industrial components within the MASDP will have a carbon footprint. Without CCUS infrastructure and technology, these private sectors would need to explore other offset options that could impact land use compatibility. Shared infrastructure is more efficient land use, and in line with the current intentions of DIPL through strategic land use. Integrated land use and infrastructure planning provides certainty for the community, landowners and decision makers through creating a framework to manage and guide growth and development ¹²⁸ .
Deliverability	4.1 - Construction difficulty	4	The technology delivery is relatively immature for this type of infrastructure. Proposed co-location of the CCUS Infrastructure within the MASDP is enhanced due to the offshore geological storage which may reduce pipeline and transport costs ¹²⁹ .
	4.2 - Workforce and material availability	4	Available workforce will be required to have some specialised skillsets to deliver the CCUS infrastructure. The Territory construction industry is heavily supported throughout the NTG, and private sector infrastructure investment, but characterised by recurring workforce shortages, with the growing adoption of advanced technology having the potential to create training gaps and exacerbate existing workforce challenges ¹³⁰ . Currently, there is uncertainty of material availability due to supply chain challenges, due to the ongoing constraints of COVID-19 and the Russia-Ukraine conflict which may impact material availability and sector growth ¹³¹ .
	4.3 - Delivery complexity	4	The delivery complexity is high, however manageable on the basis of the current governance planning model. The proposed co-location of the CCUS hub and MASDP may enable the minimisation of capital-intensive construction and ongoing operating costs ¹³² .
	4.4 - Activation	7	The infrastructure highly aligns with current industry investment horizons and demands demonstrated across all potential industry mixes. This includes the NTG's target of net zero emissions by 2050 ¹³³ .

¹²⁸ NT Infrastructure Plan 2021 - Annual review, 2022

¹²⁹ Global CCS Institute for the Government of the Northern Territory of Australia - Carbon Capture and Storage Hub Study, 2020

¹³⁰ ISACNT - Construction, Accessed in 2022

¹³¹ The Northern Territory Budget 2022 - Construction, Accessed in 2022

¹³² Territory Gas - Carbon Capture Utilisation and Storage Hub, 2022

¹³³ Northern Territory Government - Delivering the Climate Change Response: Towards 2050 A Three-Year Action Plan for the Northern Territory Government, 2020

Theme	Criteria	Aggregated score	Score evidence
CO2 for Inpex and Santos - Carbon capture utilisation and storage (CCUS) infrastructure – for CO2 transmission and supporting infrastructure – manifold for Inpex and Santos to access precinct CO2			
Strategic fit with Commonwealth and the Territory policies	1.1 - Policy alignment	3	The infrastructure does not strongly align with the objectives of policies as it limits CCUS to primary proponents. It may preclude other types of emitting industry proponents from access to carbon storage and transition, which will limit the ability of the Territory to reduce greenhouse gas emissions through a large-scale investment that delivers economies of scale ¹³⁴ .
	1.2 - Multi-user, multi-industry benefit enablement	1	There is significant risk as the option precludes other types of industries ability to access carbon storage. If limited to the primary proponents, the CCUS Infrastructure will not be strategically aligned with the intention for it to be multi-user, multi-access investment ¹³⁵ .
	1.3 - Value adding	5	The infrastructure is valuable for processing, though it may have limited contribution to directly accelerating the value add of the Territory's resources. Evidence suggests carbon capture and storage is not only a proven emissions reduction solution, but also brings environmental, economic and social benefits ¹³⁶ . This may be limited due to the preclusion of other types of proponents.
	1.4 - Long term utility of option	3	This option contributes to decarbonisation generally but does not provide more utility options for proponent's over time. CCUS infrastructure will play an important role in meeting net zero targets, as one of the few solutions to remove carbon from the atmosphere and tackle emissions, although this potential will be somewhat constrained due to being limited to the primary proponents ¹³⁷ .
Economic	2.1 - Indicative capital costs and funding sources	4	It is highly likely the primary proponents utilising the infrastructure will self-fund it, limiting the requirement for initial and ongoing government or foreign investment.
	2.2 - Number of potential beneficiaries	3	Due to the structure of having two primary proponents as opposed to multi-user, benefits may be reduced and limited to investing parties only.

¹³⁴ Global CCS Institute for the Government of the Northern Territory of Australia - Carbon Capture and Storage Hub Study, 2020

¹³⁵ Global CCS Institute for the Government of the Northern Territory of Australia - Carbon Capture and Storage Hub Study, 2020

¹³⁶ Earth Resources – Benefit of CCS, 2022

¹³⁷ Territory Gas – Carbon Capture Utilisation and Storage Hub, 2022

Theme	Criteria	Aggregated score	Score evidence
	2.3 - Competitiveness of the Territory to investment opportunities	4	Should the primary proponents have capacity control over the infrastructure, this significantly limits the competitive advantage for the Territory. There will be limited opportunities for other local or foreign investment outside the primary proponents.
	2.4 - Local employment	4	The infrastructure is not expected to directly contribute to local employment in a substantial way, if limited to the primary proponents.
	2.5 - Indigenous employment	4	The infrastructure is not expected to directly contribute to Indigenous employment in a substantial way.
Social, cultural and environment	3.2 - Future environmental and cultural risks	5	While environmentally positive given the carbon capture and contribution for a transition towards net zero, this infrastructure could have issues with geology until further environmental and engineering investigations are undertaken. This position can be improved for the primary proponents through: Further undertaking of environmental studies to minimise the impact, including risks posed to native flora and fauna. The identification of learnings and best practice from other similar projects on how to address environmental and cultural risks.
	3.3 – Social and community impacts	5	Despite general community support, there are pockets of minor community concern around the CO2 storage and utilisation technology. Effective public engagement by the primary proponents and the Territory government will be key for the success of CCUS infrastructure development and implementation ¹³⁸ .
	3.4 - Land use compatibility	1	If it is not common use, Inpex and Santos would control land use capacity which risks precluding the involvement of other proponents, which will impact land use compatibility for others. This is not aligned with the current intentions of DIPL, who recommend shared infrastructure for more efficient land use.
Deliverability	4.1 - Construction difficulty	3	The technology delivery is relatively immature for this type of infrastructure, although the primary proponents bring experience to the area. Proposed co-location of the CCUS Infrastructure within the MASDP is enhanced due to the offshore geological storage which may reduce pipeline and transport costs ¹³⁹ .

¹³⁸ International Journal of Greenhouse Gas Control - Community compensation in the context of Carbon Capture and Storage: Current debates and practices, 2020

¹³⁹ Territory Gas - Carbon Capture Utilisation and Storage Hub, 2022

Theme	Criteria	Aggregated score	Score evidence
	4.2 - Workforce and material availability	3	Available workforce will be required to have some specialised skillsets to deliver the infrastructure, it is anticipated the primary proponents will have access to these specialised skillsets during their previous and current work in the sector. Currently, there is uncertainty regarding material availability due to supply chain challenges, as a result of the ongoing constraints of COVID-19 and the Russia-Ukraine conflict, which may impact sector growth ¹⁴⁰ .
	4.3 - Delivery complexity	3	The delivery complexity is high however manageable on the basis of the current governance planning model. It is anticipated the primary proponents will bring lessons learned and best practice from the delivery of other complex infrastructure projects they have been involved in.
	4.4 - Activation	4	This option would be less attractive for future private sector investment, due to having a low dependence on alternative industry utility beyond the primary proponents.
Digital subterranean cabling of precinct to support digital communications and automation			
Strategic fit with Commonwealth and the Territory policies	1.1 - Policy alignment	7	This will support the outcomes and objectives of numerous the Territory and Commonwealth polices, including digital advancements within the Digital Territory Strategy that will provide jobs for the future, enable businesses to transform and open up new economic opportunity ¹⁴¹ . At a National level, the Digital Government Strategy outlines the intention to seek opportunity for the consolidation, integration and automation of processes ¹⁴² .
	1.2 - Multi-industry benefit enablement	7	High rates of traditional and new heavy industry technology adoption indicate network and telecommunication uptake for business operations across all sectors is likely, enhancing the collective ability for government, business and community to undertake digital advancement. This uptake may extend beyond the proponents within the MASDP.
	1.3 - Value adding	7	Digital infrastructure is essential to support the development of value adding products and processes relating to the Territory resources. Digital advances also present opportunity to open up access of the Territory to global markets through a secure, connected and thriving digital economy ¹⁴³ .

¹⁴⁰ The Northern Territory Budget 2022 – Construction, Accessed in 2022

¹⁴¹ Digital Territory- Digital Territory Strategy, 2022

¹⁴² Digital Government Strategy - Accelerating the digital future of our Australian Public Service, 2021

¹⁴³ Digital Territory- Digital Territory Strategy, 2022

Theme	Criteria	Aggregated score	Score evidence
	1.4 - Long term utility of option	7	Industry 4.0 and the opportunities for mechanisation of high-quality digital connectivity will support the long-term utilisation of the MASDP. Adoption of technological and digital advancements are pivotal to long term advancement, enabling smarter communities and growing jobs and business across the Territory ¹⁴⁴ .
Economic	2.1 - Indicative capital costs and funding sources	4	There is the potential for either private or government investment, or a combination of both.
	2.2 - Number of potential beneficiaries	7	This would be commonly used by a large range of potential proponents/users regardless of industry, the benefits being reaped both within and beyond the MASDP.
	2.3 - Competitiveness of the Territory to investment opportunities	7	This infrastructure will be critical to attract private sector and foreign investments as it is commonly needed by many potential proponents to enhance digital communications and automation processes through the high-quality speed and security of data transfer ¹⁴⁵ .
	2.4 - Local employment	5	The infrastructure is not expected to directly contribute to local employment in a substantial way.
	2.5 - Indigenous employment	5	The infrastructure is not expected to directly contribute to Indigenous employment in a substantial way.
Social, cultural and environment	3.2 - Future environmental and cultural risks	4	There is the potential for minimal environmental and cultural risks due to the underground nature of the subterranean cable which will exist under the proposed infrastructure within the MASDP.
	3.3 – Social and community impacts	6	Digital infrastructure aligns with community expectations, connecting, creating, and supporting safe, sustainable and vibrant communities ¹⁴⁶ .
	3.4 - Land use compatibility	7	Digital infrastructure is a common expectation for an industrial precinct, and will build on the Northern Territory Infrastructure Plan to focus on Sustainable Development Precincts that focus on integrated land use and infrastructure planning ¹⁴⁷ .
Deliverability	4.1 - Construction difficulty	7	The construction difficulty and knowledge base are mature, due to similar project execution in the region.

¹⁴⁴ Digital Territory- Digital Territory Strategy, 2022

¹⁴⁵ What is a submarine cable? Subsea fiber explained, 2021

¹⁴⁶ Digital Territory- Digital Territory Strategy, 2022

¹⁴⁷ Northern Territory Infrastructure Plan 2021 - Annual review, 2022

Theme	Criteria	Aggregated score	Score evidence
	4.2 - Workforce and material availability	6	This is no specific common activity, however workforce and civils are the same skills required for many other projects.
	4.3 - Delivery complexity	7	The delivery complexity is relatively low, due to similar project execution in the region.
	4.4 - Activation	7	Digital subterranean cabling is critical infrastructure to ensure the successful industry uptake of the MASDP and attract future private sector and foreign investments. Inclusion in the MASDP will support the drive for industry diversification, exports, job creation and play a pivotal role in growing the Territory economy ¹⁴⁸ .
High capacity, networked power distribution to Middle Arm connected to DKIS			
Strategic fit with Commonwealth and the Territory policies	1.1 - Policy alignment	4	It does not strongly support the net zero and low emission policies as the nature of traditional provision of power network is a large carbon emitter. If connected to the DKIS as a network, there are possible benefits in injecting greater resilience across the whole network.
	1.2 - Multi-industry benefit enablement	7	The energy generated from power stations is commonly needed by private sector, regardless of the type of industries. All industry users will require access to power, this solution will reduce duplication.
	1.3 - Value adding	6	It would support value adding, but it is recognised that this is not the optimal energy solution.
	1.4 - Long term utility of option	5	There is limited impact on development of extending utility in the long term as emissions targets for products and services increases.
Economic	2.1 - Indicative capital costs and funding sources	7	Government needs to facilitate as network must be open access, and proponents are encouraged to use it. Interaction with DKIS can provide additional benefits to community.
	2.2 - Number of potential beneficiaries	7	Potential to benefit all MASDP new industries.
	2.3 - Competitiveness of the Territory to investment opportunities	6	A network is positive for investment however it is also a minimum expectation. Traditional energy mix (predominantly gas) does not strongly enhance the Territory's competitive advantage for private sector investment.

¹⁴⁸ Northern Territory Government - Middle Arm Sustainable Development Precinct, 2022

Theme	Criteria	Aggregated score	Score evidence
	2.4 - Local employment	4	Minimal contribution to additional local employment.
	2.5 - Indigenous employment	4	Minimal contribution to additional Indigenous employment.
Social, cultural and environment	3.2 - Future environmental and cultural risks	4	Installing network has minimal environmental risk. Due to being energy mix agnostic, gas or renewable has not been ranked.
	3.3 - Social and community impacts	4	Neutral impact as social licence depends on the type of energy utilised.
	3.4 - Land use compatibility	6	A network approach rather than individual power stations is more efficient use of the strategic industrial land at the precinct.
Deliverability	4.1 - Construction difficulty	7	Mature technology established for infrastructure delivery. Demonstrated by advanced systematic integrated systems across Australia ¹⁴⁹ .
	4.2 - Workforce and material availability	6	Mature workforce knowledge and material is available to support this construction.
	4.3 - Delivery complexity	7	The delivery complexity is low. This is demonstrated by the advanced systematic integrated systems across Australia ¹⁵⁰ .
	4.4 - Activation	7	It is essential to ensure the successful industry uptake of the precinct.
Middle Arm specific industrial electrical distribution network to transmit industrial green energy supply and secured supply of energy			
Strategic fit with Commonwealth and the Territory policies	1.1 - Policy alignment	4	No direct specification detailed across policies, however, a neutral position due to the positive enabling nature of the option. The green energy transmission and distribution will encourage and reduce barrier for proponents in the precinct to produce green hydrogen, aligning with the Northern Territory Renewable Hydrogen Strategy ¹⁵¹
	1.2 - Multi-industry benefit enablement	6	The option will enable multiple industry proponents to access green energy throughout the precinct - uptake across sectors will be high especially with the proponents looking to value add in the hydrogen related spaces.

¹⁴⁹ IBIS World, IBIS World Industry report, Electricity Distribution in Australia, 2014

¹⁵⁰ IBIS World, IBIS World Industry report, Electricity Distribution in Australia, 2014

¹⁵¹ Northern Territory Government - Northern Territory Renewable Hydrogen Strategy, 2022

Theme	Criteria	Aggregated score	Score evidence
	1.3 - Value adding	6	Will support proponents to package and re-produce low emissions products and services to the market. Beneficiation of the Territory captured and produced resources will be both feedstock and output in many proponents expected to reside in MASDP. Goldman Sachs reported green hydrogen could supply up to 25% of global energy requirements by 2050 to become a US\$10 trillion market by 2050 ¹⁵² . With the significant green hydrogen demand and associated products such as Methanol and Ammonia, access to green energy from renewables will be essential.
	1.4 - Long term utility of option	7	This option ranks very high as green energy demand will only increase over time as proponents respond to market demands. Without a common-use and open access power option, each proponent would likely investigate individual energy generation options. Under this scenario, if five of the expected proponents sourced medium capacity gas fired power generators such as Siemens SGT5-2000E. As a conservative estimate, operating at maximum capacity for 20% of the year emits an estimated 228,000 tonnes/annum ¹⁵³ . 228,000 tonnes of CO2-emissions multiplied by five totals 1,140,000 tonnes/annum, equivalent to over 220,000 residential homes' electricity use per year ¹⁵⁴ . The individual uptake of energy solutions has the potential to jeopardise the Territory emissions targets the sustainability element of the precinct.
Economic	2.1 - Indicative capital costs and funding sources	4	Neutral to whether the government should be providing the necessary capital outlay.
	2.2 - Number of potential beneficiaries	7	Based on proponents across all sectors medium to long term emissions targets, uptake potential is very high.
	2.3 - Competitiveness of the Territory to investment opportunities	7	Providing access to green energy transmission sources will make the Territory precinct very attractive for multiple proponents and sectors.
	2.4 - Local employment	6	The local workforce required to develop this large-scale capital works will provide significant local employment opportunity (in generating the renewable energy, not the network necessarily).

¹⁵² Goldman Sachs - Green Hydrogen The next transformational driver of the Utilities industry, 2020

¹⁵³ GHD - Power station and associated costs, 2021

¹⁵⁴ EPA - Greenhouse Gas Equivalencies Calculator, 2022

Theme	Criteria	Aggregated score	Score evidence
	2.5 - Indigenous employment	6	The local workforce required to develop this large-scale capital works will provide significant local employment opportunity.
Social, cultural and environment	3.2 - Future environmental and cultural risks	4	The option requires large and intrusive development if renewable source is solar; which possess some environmental risk, softened by the macro decarbonisation benefits. Network will have some footprint but minimal impact.
	3.3 - Social and community impacts	7	Society expects large scale access to green energy for sectors and proponents to offer greener products and services.
	3.4 - Land use compatibility	7	The options directly align with current planning expectations for the precinct ¹⁵⁵ .
Deliverability	4.1 - Construction difficulty	4	Option technology and specialist knowledge to execute delivery is advanced.
	4.2 - Workforce and material availability	3	There is some risk to sourcing materials and labour to deliver the option.
	4.3 - Delivery complexity	4	A number of parties involved in delivery but will be on commercial terms.
	4.4 - Activation	6	This option falls directly in line with sector and societies timeline expectations.
Upgrade Channel Island power station turbines to accommodate both natural gas and hydrogen			
Strategic fit with Commonwealth and the Territory policies	1.1 - Policy alignment	7	Aligns with the objectives of low emissions and net zero policies. Australia along with the Territory targets to reduce emissions to net zero by 2050 ¹⁵⁶ .
	1.2 - Multi-industry benefit enablement	7	The energy generated from hydrogen is commonly needed by private sector regardless of industry. Will also enable a proof-of-concept hydrogen project in the MASDP by committing to offtake. It has a wider application and is used by various industries in private sector. ¹⁵⁷
	1.3 - Value adding	6	Establishing a hydrogen industry in the Territory will provide a way to export our renewable energy more extensively.

¹⁵⁵ DIPL engineering team

¹⁵⁶ Australia's Long-Term Emissions Reduction Plan - A whole-of-economy plan to achieve net zero emissions by 2050, 2021

¹⁵⁷ WHA - Hydrogen industry applications: past, present, and future, Accessed in 2022

Theme	Criteria	Aggregated score	Score evidence
			Australia plans to be a top-three exporter of hydrogen to Asian markets by 2030 ¹⁵⁸ .
	1.4 - Long term utility of option	7	Hydrogen is a central pillar of new energy security. This option will enable the DKIS to blend hydrogen and support the transition to net zero. Diversifying Australia's energy infrastructure is key to energy security. Supported by an economic stretch goal of A\$2 per kilogram, the Australian Government is prioritising investments to support the growth of Australian hydrogen industry. ¹⁵⁹
Economic	2.1 - Indicative capital costs and funding sources	7	Government needs to facilitate as currently owned by government; current regulations maybe not encourage private funding ¹⁶⁰ .
	2.2 - Number of potential beneficiaries	7	Potential to benefit all MASDP new industries ¹⁶¹ .
	2.3 - Competitiveness of the Territory to investment opportunities	7	This infrastructure will provide a point of difference for the MASDP. Not only to supply greener energy to precinct but offer Hydrogen producers the opportunity to supply hydrogen within 20 km of production site.
	2.4 - Local employment	4	Slightly positive, minimal contribution to additional local employment. Installation only – specialist field, not common.
	2.5 - Indigenous employment	4	Minimal contribution to additional Indigenous employment. Channel island operations could employ additional Indigenous workforce.
Social, cultural and environment	3.2 - Future environmental and cultural risks	5	There are some potential environmental risks of storing and transporting it safely to avoid leakage, as hydrogen is an indirect greenhouse gas with a potential global warming effect ¹⁶² . There is a potential impact on water resources, as it requires a significant amount of water to generate hydrogen. Hydrogen production requires secure, long-term access to water, which may prove challenging in Australia as it is known for variable rainfall and frequent droughts ¹⁶³ .

¹⁵⁸ The Conversation - Australia plans to be a big green hydrogen exporter to Asian markets – but they don't need it, 2022

¹⁵⁹ Business envoy July 2021, Diversifying Australia's energy infrastructure: hydrogen technology, 2021

¹⁶⁰ The National Law Review - Updates to Hydrogen Policy and Funding in Australia, 2021

¹⁶¹ Land development Corporation - Middle Arm Sustainable Development Precinct, Accessed in 2022

¹⁶² Science for Environmental Policy - Environmental Impacts of Hydrogen-based Energy Systems, 2006

¹⁶³ Allens - Water access for hydrogen projects: don't let your options dry up, 2021

Theme	Criteria	Aggregated score	Score evidence
	3.3 – Social and community impacts	5	Potentially there is an impact on water resources as it requires a significant amount of water to generate hydrogen which may trigger community concern ¹⁶⁴ . Overall, this is of community benefit, providing opportunity for greening the energy mix.
	3.4 - Land use compatibility	6	It aligns with the objectives of precinct planning framework; it could be an enabler for land development as the development of hydrogen industry. The precinct has an extensive product corridor network for the transmission of utilities, gas, feedstock and products. All lots will be serviced with power, water and communications infrastructure. There is also potential for high- and low-pressure gas to be reticulated throughout the estate. With gas feedstock being supplied through product corridors, high- and low-pressure gas availability throughout the estate will support co-location of various downstream manufacturing proponents. ¹⁶⁵
Deliverability	4.1 - Construction difficulty	7	Mature technology, upgrading Channel Island has already commenced indicating there is already local knowledge to install, operate and maintain. ¹⁶⁶
	4.2 - Workforce and material availability	5	The current workforce may not have specialised skillset which may require some training. Requires further analysis.
	4.3 - Delivery complexity	6	This requires a counter party to supply hydrogen, this offtake could be fulfilled by Middle Arm precinct proponents.
	4.4 – Activation	7	It will support and attract future potential industries in the long term and will be an important proof of concept for the Territory hydrogen industry.
Water desalination solution available for industry proponents			
Strategic fit with Commonwealth and the Territory policies	1.1 - Policy alignment	6	Desalination given proximity to the sea is an option that supports sustainability of water resources To increase water security for all Territorians and as part of the development of a Strategic Water Plan, the Territory Government is considering infrastructure solutions for the Darwin Region. Darwin region future water supply describes the aim of the option of desalination is to provide a short-term solution to support industrial growth where there may be a high willingness and capacity to pay for the water ¹⁶⁷ .

¹⁶⁴ Allens - Water access for hydrogen projects: don't let your options dry up, 2021

¹⁶⁵ Land development Corporation - Middle Arm Sustainable Development Precinct, Accessed in 2022

¹⁶⁶ General Electric - TM2500 and Channel Island Power Station: supporting hydrogen, 2022

¹⁶⁷ Department of Industry, Tourism and Trade - Darwin region future water supply, Accessed in 2022

Theme	Criteria	Aggregated score	Score evidence
	1.2 - Multi-industry benefit enablement	4	Water will be a key input; the source is less concern to industry than availability and price. In Australia, based on current prices charged for water, desalination is currently only competitive with traditional water sources in remote locations ¹⁶⁸ .
	1.3 - Value adding	7	Water is critical to value adding aspirations. The NTG has an ambitious target to achieve a \$40 billion economy by 2030. The Territory Economic Reconstruction Commission final report (November 2020) identified that a step change in the Territory's approach to water is needed to support the Territory's plans for increased private investment and economic growth of the region ¹⁶⁹ .
	1.4 - Long term utility of option	6	This option is scalable and future proofs the precinct by de-risking water supply. As the Territory grows, water security is critical, for people, agriculture, and industry. By 2050, it is forecast that an additional supply of 11,000 ML p.a. is required to meet future population growth and having only one major surface water source creates water security risks and exposure to climatic factors ¹⁷⁰ .
Economic	2.1 - Indicative capital costs and funding sources	4	Neutral to whether the government should be providing the necessary capital outlay. A business case was prepared; funded by the Federal Government through the National Water Grid Fund, a \$3.5 billion investment program for water infrastructure projects to help secure Australia's water future ¹⁷¹ .
	2.2 - Number of potential beneficiaries	4	As needed. Enable significant growth in the Darwin region's agricultural and horticultural industry, which is currently constrained by a lack of available groundwater and enablement of downstream processing and manufacturing ¹⁷² .
	2.3 - Competitiveness of the Territory to investment opportunities	5	Critical to attractiveness, but investors somewhat agnostic to source. ¹⁷³
	2.4 - Local employment	4	Modularised technology, minimal direct jobs. ¹⁷⁴
	2.5 - Indigenous employment	4	Modularised technology, minimal direct jobs. ¹⁷⁵

¹⁶⁸ ResearchGate - The Economics of Desalination and It's Potential Application to Australia, 2002

¹⁶⁹ Northern Territory Government - Darwin region future water supply, Accessed in 2022

¹⁷⁰ Department of Industry, Tourism and Trade - Adelaide River Off-stream Water Storage Project, Accessed in 2022

¹⁷¹ Australian Water - Northern Territory infrastructure plans explore region's water future, 2021

¹⁷² Department of Industry, Tourism and Trade - Darwin region future water supply, Accessed in 2022

¹⁷³ DIPL Project Working Group and SMEs

¹⁷⁴ DIPL Project Working Group and SMEs

¹⁷⁵ DIPL Project Working Group and SMEs

Theme	Criteria	Aggregated score	Score evidence
Social, cultural and environment	3.2 - Future environmental and cultural risks	3	There are potential environmental challenges with discharging brine into the harbour. Generally, environmental impacts can be generated both in the construction and operation of desalination plants. The production and growth of marine organisms is severely affected by discharge of brine in the desalination process. These organisms are interrelated with each other so any distraction in their population has extreme impacts on all marine life in the area. ¹⁷⁶ In addition to brine, other main issues are the high energy consumption of the desalination and brine treatment technologies as well as the air pollution due to emissions of greenhouse gasses and air pollutants. Other issues include entrainment and entrapment of marine species, and heavy use of chemicals ¹⁷⁷ .
	3.3 – Social and community impacts	2	There is community concern about the health of Darwin harbour particularly among the Territory community. The potential threats were identified in a risk assessment the NTG was required to submit under the environmental approvals process: • Soil and water quality could also suffer if erosion, leaks, discharge of wastewater or spills of hazardous materials occur. • Threatened species and sensitive vegetation may be adversely affected when the site; which is about the size of 750 AFL ovals, is cleared. • Potential damage to the seabed and marine ecosystems during dredging, infrastructure construction and shipping operations. • The slated development would also likely prevent the Territory from achieving its greenhouse gas emissions targets. • Indigenous sacred sites could be affected during dredging, land clearing, shipping and industrial operations¹⁷⁸.
	3.4 - Land use compatibility	4	Neutral position related to the existing precinct planning framework ¹⁷⁹ .
Deliverability	4.1 - Construction difficulty	6	Proven technology. Modern industrial-scale desalination uses reverse osmosis to remove salt and other impurities from sea water. Water is forced under high pressure through a series of membranes through which salt and other impurities cannot pass ¹⁸⁰ .
	4.2 - Workforce and material availability	3	Challenge in long lead items and current supply chain issues.

¹⁷⁶ Researchgate - An Assessment of the Environmental Impact of Brine Disposal in Marine Environment, 2021

¹⁷⁷ Researchgate - An Assessment of the Environmental Impact of Brine Disposal in Marine Environment, 2021

¹⁷⁸ Guardian - Fears second Darwin port and industrial hub could have 'significant adverse impacts' on health, 2022

¹⁷⁹ DIPL Middle Arm Engineering Department

¹⁸⁰ The Conversation - Cities turn to desalination for water security, but at what cost, 2019

Theme	Criteria	Aggregated score	Score evidence
			Design, construction and maintenance costs of these industrial plants are high. They also use large amounts of electricity, which increases greenhouse gas emissions unless renewable energy sources are used ¹⁸¹ .
	4.3 - Delivery complexity	3	A number of stakeholder groups will need to be consulted, and approvals sought. Requirement for assessment and approval processes that protect the environment, without creating unnecessary duplication and delay that may cost the economy millions of dollars ¹⁸² . Further investigations are required internally in the NTG to consult with independent Darwin water projects and participants.
	4.4 – Activation	7	This option secures water for the full activation of the precinct. If not done, the precinct will not reach full potential. The Darwin region's water supply is currently operating at, or above its sustainable supply level and cannot grow without an additional water supply ¹⁸³ .
Wastewater handling: collection, treatment, recycle and disposal plant able to receive wastewater, treat (recycle) and discharge common-user infrastructure			
Strategic fit with Commonwealth and the Territory policies	1.1 - Policy alignment	7	Circular economy policies, environmental expectations and MASDP overarching objectives. As per the Territory Circular Economy strategy, the Territory government is exploring options for a growing waste management sector in which it suggests treated wastewater can be reused in industrial processes or green space irrigation ¹⁸⁴ .
	1.2 - Multi-industry benefit enablement	7	Under hybrid mixed ecology case there will be several users required to treat wastewater. Benefits are captured when mid-tier parties are able to access this kind of facility, improving their initial capital raising requirements. Water authorities remain the main purchasers and users of goods and services in this sector ¹⁸⁵ .
	1.3 - Value adding	7	Supports a sustainable value adding supply chain ¹⁸⁶ .
	1.4 - Long term utility of option	6	Improves water utilisation with reuse. Wastewater reuse is a solution for the future to combat water scarcity. After treatment, wastewater can be used for a variety of applications including watering green spaces and golf courses, crop irrigation, fire-fighting and street-cleaning, or it can be used to recharge aquifers ¹⁸⁷ .
Economic	2.1 - Indicative capital costs and funding sources	6	Need to ensure multiuser access and associated infrastructure. High need for government intervention.

¹⁸¹ The Conversation - Cities turn to desalination for water security, but at what cost, 2019

¹⁸² Guardian - Fears second Darwin port and industrial hub could have 'significant adverse impacts' on health, 2022

¹⁸³ Northern Territory Government - Northern Territory Balanced Environment Strategy, 2016

¹⁸⁴ Northern Territory Circular Economic Strategy - Waste as a Resource - Transitioning to a Circular Economy, Accessed in 2022

¹⁸⁵ Australia - Country Commercial Guide - Water and Wastewater Treatment, 2022

¹⁸⁶ ResresearchGate - Consolidated Value Chain, 2017

¹⁸⁷ Open Edition Journals - Wastewater reuse: a solution with a future, 2020

Theme	Criteria	Aggregated score	Score evidence
			The Australian Government has established the National Water Grid Fund as a US\$2.5 billion rolling 10-year infrastructure program to fund water infrastructure investments. Australia spends an estimated US\$6 billion each year on water and wastewater treatment services. Direct capital purchases and equipment maintenance account for 20% of total spending ¹⁸⁸ .
	2.2 - Number of potential beneficiaries	6	Positively impacts but some may develop inhouse capabilities. Will be subject to scale. There are a small number of large Australian suppliers (employing 100 or more) but most of the players are smaller companies (employing 1-20 people). There are also some well-established local manufacturers and assemblers of water and wastewater treatment package plants ¹⁸⁹ .
	2.3 - Competitiveness of the Territory to investment opportunities	6	The PWG scored Positive, particularly for mid-tier players ¹⁹⁰ .
	2.4 - Local employment	4	A neutral score was provided as limited workforce data available for this specific industry. An assumption was made that there would be some opportunities for constructing, operating and maintaining the facility ¹⁹¹ .
	2.5 - Indigenous employment	4	A neutral score was provided as limited workforce data available for this specific industry. An assumption was made there would be some opportunities for constructing, operating and maintaining the facility ¹⁹² .
Social, cultural and environment	3.2 - Future environmental and cultural risks	6	Positive, as provides pathways for recycling as opposed to discharge. Some environmental risks. Due to the material and energy consumption, the wastewater treatment process has impacts on both air and solid pollution. The biochemical treatment stage of sewage and the sludge disposal stage can lead to greenhouse gas emissions ¹⁹³ .
	3.3 - Social and community impacts	6	Likely to see some community concerns around risks, particularly transporting to facility. The transport of hazardous substances with wastewater is not only critical issue for receiving water, but also for managing wastewater sludge ¹⁹⁴ .
	3.4 - Land use compatibility	7	Highly aligned. Treated wastewater can be reused in industrial processes or for green space irrigation ¹⁹⁵ .
Delivery >	4.1 - Construction difficulty	4	Neutral, technology is maturing but still relatively new ¹⁹⁶ .

¹⁸⁸ Australia - Country Commercial Guide - Water and Wastewater Treatment, 2022

¹⁸⁹ Australia - Country Commercial Guide - Water and Wastewater Treatment, 2022

¹⁹⁰ DIPL Project Working Group

¹⁹¹ DIPL Project Working Group

¹⁹² DIPL Project Working Group

¹⁹³ Journal of Cleaner Production - Environmental impacts assessment of wastewater treatment and sludge disposal systems under two sewage discharge standards, 2021

¹⁹⁴ Doctoral thesis - Hazardous Substances in Wastewater management, 2004

¹⁹⁵ Northern Territory Circular Economic Strategy, 2022

¹⁹⁶ CleanaWater - New technology in wastewater treatment, 2020

Theme	Criteria	Aggregated score	Score evidence
			Most new water treatment systems in Australia these days incorporate some form of organics removal. The three commonly used processes for dealing with removal of organics from drinking water in Australia incorporate ion exchange, activated carbon, and advanced oxidation processes ¹⁹⁷ .
	4.2 - Workforce and material availability	2	Possible long lead time and specialist skill challenges. From the past experience, we can see that a long time period is required as after 18 months of construction and 65,000 work hours, the Leanyer Sanderson Waste Stabilisation Ponds Inlet Works was opened in December 2018 ¹⁹⁸ .
	4.3 - Delivery complexity	3	Multiple parties and stakeholders. Planning for wastewater use typically requires the involvement of several government agencies covering health, water, sanitation, agriculture and irrigation, as well as researchers, community groups and the private sector ¹⁹⁹ .
	4.4 - Activation	6	This item particularly supports diverse mid-tier proponents who will deepen the industrial mix at the precinct including further value adding. The PWG have spoken to potential precinct proponents and this Infrastructure Project will help them achieve FID and considerably lower the investment hurdle rate.
Gas pipeline into Middle Arm for proponents to access			
Strategic fit with Commonwealth and the Territory policies	1.1 - Policy alignment	6	A gas connection for offtake for proponents to laterally connect into a gas pipeline to provide feedstock for operations aligns with overarching the Territory policies ²⁰⁰ . Notably, the precinct gas pipeline aligns with the Northern Territory gas strategy: five-point plan to enable the Territory to be a world-class gas production, manufacturing and services hub by 2030 ²⁰¹ . • Grow the Northern Territory's service and supply industry • Establish gas-based processing and manufacturing • Grow research, innovation and training capacity • Contribute to Australia's energy security

¹⁹⁷ Australia - Country Commercial Guide - Water and Wastewater Treatment, 2022

¹⁹⁸ Utility - Improved outcomes from new water infrastructure, 2019

¹⁹⁹ Multi-Stakeholder Processes for Managing Wastewater Use in Agriculture, Accessed in 2022

²⁰⁰ DIPL Project Working Group

²⁰¹ The Northern Territory Government - Northern Territory gas strategy: five point plan, Accessed in 2022

Theme	Criteria	Aggregated score	Score evidence
	1.2 - Multi-user, multi-industry benefit enablement	7	Strong positive result given the potential to convert gas feedstock into a number of various projects in the precinct. These include ²⁰² : • Liquefied Natural Gas (LNG) Train • Blue hydrogen project • CCUS Project • Methanol export plant • Condensate refinery
	1.3 - Value adding	5	The value-added products produced by the projects above include: • CO2 sequestration • Blue Hydrogen • Methanol • Gasoline, Kerosene, Diesel, Marine Fuel, Heavy Fuels A moderate strong scoring has been allocated because as demands change there could be some limitations on the current local LNG dependence ²⁰³ .
	1.4 - Long term utility of option	3	There is a slightly negative score assigned due to the longevity of local consumption for LNG over the long term ²⁰⁴ . Short to medium term Australia's LNG consumption will remain steady, however as key trading partners look to lower CO2 emissions and green products becomes in higher demand LNG as a local feedstock will become less desired ²⁰⁵ .
Economic	2.1 - Indicative capital costs and funding sources	3	A slightly negative score is assigned. Government funding and investment in an LNG gas pipeline is commercially unwise based on reflection with the project's problems and opportunities ²⁰⁶ . Local LNG producers in the area could build a business case and deliver independently of Government support.

²⁰² The Northern Territory Government –Potential precinct projects, 2022

²⁰³ DIPL Project Working Group

²⁰⁴ DIPL Project Working Group

²⁰⁵ IGCG - Changing pathways for Australian gas, 2022

²⁰⁶ DIPL Project Working Group

Theme	Criteria	Aggregated score	Score evidence
	2.2 - Number of potential beneficiaries	3	27% of the proposed industrial precinct projects would directly benefit from access to LNG pipeline ²⁰⁷ . Score is below average and does not align strongly with the project's problems, opportunities, and objectives.
	2.3 - Competitiveness of the Territory to investment opportunities	6	A moderate positive score was assigned by the PWG. The score was based on expert knowledge of the PWG and SMEs. The justification of the score is based on the scale of value from particular industries who use gas as a key input to their operations.
	2.4 - Local employment	5	A slightly positive score was assigned due to the scale of the proposed undertaking and the existing skills base already present in the Territory. APA Group are Australia's largest pipeline and associated infrastructure asset holders and operations. They have been operating in the Territory for over 30 years with a local team of over 50 skilled pipeline specialists ²⁰⁸ . APA's long-standing history in the Territory, combined with the scale of the workforce required to construct and operate the score is positive.
	2.5 - Indigenous employment	4	A neutral score was assigned. There is no available Indigenous pipeline specialist data available to be benchmarked. An assumption has been made there is some opportunity.
Social, cultural and environment	3.2 - Future environmental and cultural risks	3	A neutral score was assigned based against the base case. Should the common-user gas pipeline not be considered, it would be reasonable to assume the precinct would be utilised by existing LNG focused proponents already in the region ²⁰⁹ . Natural gas pipelines can impact the environment in multiple ways ²¹⁰ : • Natural habitat loss and fragmentation • Changes in species movement • Sedimentation • Air emissions.
	3.3 - Social and community impacts	3	A neutral score assigned for the precinct gas pipeline. This is because there are some social and community members who disagree with the Government funding additional gas infrastructure. As evidence by recent the Territory protests against Santos ²¹¹ .

²⁰⁷ The Northern Territory Government

²⁰⁸ APA Group – APA in the Northern Territory, 2014

²⁰⁹ DIPL Project Working Group

²¹⁰ The Nature Conservancy - Natural Gas Pipelines, 2011

²¹¹ Green Left - Climate activists target Santos' the Territory expansion plans, 2022

Theme	Criteria	Aggregated score	Score evidence
	3.4 - Land use compatibility	4	The PWG scored a slightly positive score on the basis of existing pipelines already surrounding the precinct. Inpex and Santos already have pipeline infrastructure adjacent to Middle Arm. This Infrastructure Project could be easily incorporated into the existing master plan ²¹² .
Deliverability	4.1 - Construction difficulty	5	A slightly positive score by the PWG aligns with the mature pipeline industry knowledge that exists in Darwin. APA have been operating pipelines for over 30 years while Inpex's Bayu-Undan pipeline flows directly into the Darwin LNG facility ²¹³ . Pipeline construction in Australia is common-practice and presents a low level of risk.
	4.2 - Workforce and material availability	6	A moderate positive score by the PWG was recognised due the mature workforce skillsets, knowledge and participation in the oil and gas and construction sectors in the NT. These sectors make up 12% of total the Territory employment ²¹⁴ . A strongly positive score was not assigned because there remains materials supply chain uncertainty in the market.
	4.3 - Delivery complexity	5	A slightly positive response was provided by the PWG based on internal government knowledge about approvals and administration relating to pipeline project development and execution.
	4.4 - Activation	5	A slightly positive score was assigned by the PWG based on their prior knowledge and dealings with a large range of interested precinct proponents ²¹⁵ . Timing wise, this Infrastructure Project aligns with current industry demand. Long term is less clear.
Rail infrastructure - Build upon existing rail lines and connection into East Arm precinct (e.g. line and track extension, railroad conveyor, *rail spur, unloading pit, rolling stock maintenance yard and provisioning facilities)			
Strategic fit with Commonwealth and the	1.1 - Policy alignment	7	Rail will support the delivery of modern metals incoming and outgoing of the precinct. ²¹⁶ Transport and logistics support both economic and social outcomes and aligns to the Territory Infrastructure strategy 2022-2030. ²¹⁷

²¹² Project Working Group

²¹³ Inpex - Bayu-Undan and Darwin LNG, Accessed in 2022

²¹⁴ The Northern Territory Government - Labour market economics, Accessed in 2022

²¹⁵ DIPL Project Working Group

²¹⁶ The Department of Industry, Science and Resources - Make it Happen: The Australian Government's Modern Manufacturing Strategy, Accessed in 2022

²¹⁷ The NT Infrastructure strategy 2022-2030, 2022

Theme	Criteria	Aggregated score	Score evidence
	1.2 - Multi-user, multi-industry benefit enablement	7	Rail into the precinct will provide opportunities for all proponents. The precinct houses Darwin's East Arm Wharf, the terminus of the Australasia Railway, the Darwin Business Park, the Marine Supply Base and the proposed Marine Industry Park with more than 100 service and supply businesses are operating in it ²¹⁸ .
	1.3 - Value adding	7	Rail will support the delivery of modern metals incoming and outgoing of the precinct. Australian mines contain about 2.8% of the world's total rare earth minerals. Australia has the fifth highest reserves of rare earth minerals in the world. The country could become the world's next big supplier ²¹⁹ .
	1.4 - Long term utility of option	7	Long term horizon will strengthen the utilisation of rail as population and vehicle density in the precinct increases, therefore the business case for rail is strengthened. Rail-linked cities are one of eight concepts floated to address population growth as Australia's population is tipped to increase to 53 million by 2101, mainly due to immigration, according to the ABS. Rail will be required to address the increase in road freight congestion ²²⁰ .
Economic	2.1 - Indicative capital costs and funding sources	7	Typically, rail requires Government coordination to enable multi-user benefits. The Australian Government commits billions of dollars to rail as part of its annual budget. In 2022, the Australian government committed to a \$A17.9bn (\$US 13.6bn) infrastructure package in the annual budget ²²¹ .
	2.2 - Number of potential beneficiaries	3	A neutral score was assigned. Further investigations into the potential proponents requiring rail needs to be realised ²²² .
	2.3 - Competitiveness of the Territory to investment opportunities	6	Attractive for proponents relative to the base case, however, not an option differentiator ²²³ .
	2.4 - Local employment	5	Minimal contribution to additional local employment. However, a slightly positive score was assigned due to the ongoing operational and maintenance workforce opportunities this Infrastructure Project presents.

²¹⁸ Darwin Convention Centre – Supply and support services, Accessed in 2022

²¹⁹ BizlatinHub - Australia's Promising 'Value-Added' Mining Future, 2019

²²⁰ ABC News – Planning for Australia's population growth rail linked cities, 2020

²²¹ IRJ -Australian government commits billions to rail in annual budget, 2022

²²² DIPL Project Working Group

²²³ The NT Infrastructure Plan and Pipeline, 2022

Theme	Criteria	Aggregated score	Score evidence
	2.5 - Indigenous employment	5	Minimal contribution to additional Indigenous employment opportunities. However, a slightly positive score was assigned due to the ongoing operational and maintenance workforce opportunities this Infrastructure Project presents.
Social, cultural and environment	3.2 - Future environmental and cultural risks	6	Reduced environmental risk when compared to vehicle emissions and scale of potential material movements. Additional macro benefits to enable lower emission bulk movement of rare earths and modern manufacturing products. The Australian Rail Association has documented that only 2.6% of Australia's transport greenhouse gas emissions are attributable to rail. This 2.6% includes both passenger and freight rail, so in fact passenger rail contributes even less ²²⁴ .
	3.3 – Social and community impacts	7	Reducing vehicle congestion and particularly large road freight trucks through smaller local community roads is welcomed by society. Road congestion is costing Australia more than an avoidable A\$16 billion every year. This is set to almost double to A\$30 billion by 2030. It also causes impact on drivers' health as it takes a longer time to reach the destination ²²⁵ .
	3.4 - Land use compatibility	5	In line with the planning framework for an optimal outcome within the precinct. Substantial areas of industrial land adjacent to transport infrastructure in the precinct are available to store equipment and coordinate operations across the Territory ²²⁶ .
Deliverability	4.1 - Construction difficulty	6	The option delivery knowledge is mature, scale required will be large. Successive reforms and investment have modernised and electrified these railways, and established a standard interstate rail network and a single national rail safety regime in Australia ²²⁷ .
	4.2 - Workforce and material availability	2	Restrictions on supply of specialist workforce and materials poses some risk. The rail industry is facing a workforce skills shortage crisis, risking significant cost and delivery blowouts on major train and tram projects nationwide during the next decade. 20 per cent of the sector's existing workforce is expected to retire before 2028 ²²⁸ .

²²⁴ Transport for NSW - Why is rail travel a better choice for the environment?, Accessed in 2022

²²⁵ The conversation – PM wants to bust congestion, 2018

²²⁶ Darwin Convention Centre – Supply and support services, Accessed in 2022

²²⁷ Australasian Railway Association - Finding the fast track for innovation in the Australasian rail industry, 2020

²²⁸ Financial Review - Skill shortage looming for Australian rail industry, 2018

Theme	Criteria	Aggregated score	Score evidence
	4.3 - Delivery complexity	3	Moderate response because not wholly government controlled and will require private cooperation to connect with existing lines.
	4.4 - Activation	7	The option meets the direct timing needs to support the immediate operations of proponents and is essential across all sectors ²²⁹ .
Supporting transport infrastructure required for marine development connectivity with industrial parcels roads and services to MOF and Export Jetty and services corridor			
Strategic fit with Commonwealth and the Territory policies	1.1 - Policy alignment	7	Connecting roads to activate industry direct aligns with a wide range of the Territory and Commonwealth policies ²³⁰ .
	1.2 - Multi-user, multi-industry benefit enablement	7	Roads are critical to enable multi-use, with strategic land at Middle Arm already owned by Government there would be substantial costs and risks to allowing third parties to develop private roads to key areas of the precinct. Roads are typically, the role of Government to build, maintain and govern and unlikely to be delivered by the market. Risks of private roads include: • Privatisation - Jeopardise common-use and open access nature of key roads within the precinct • Governance - Decision making power over types of transport construction, resulting in a more indirect route. • Transparency and confidence - Hinder precinct and industry participants long term view of how the infrastructure could be managed. • Activation - the precinct could become less desirable due to industry uncertainty and increased level of security required and investment risks.
	1.3 - Value adding	7	Utility of roads to key locations within the precinct adds large amount of value in terms of transporting people, resources and materials. The roads within the precinct to enable proponents to get to and from marine infrastructure carrying essential imported or exported products and materials. In this case, the public common user roads industrial roads offer productivity benefits to support the movement of products and people²³¹.

²²⁹ DIPL Project Working Group

²³⁰ DIPL Project Working Group

²³¹ Infrastructure Magazine - Australian roads create \$236 billion, support 1.4 million workers, 2021

Theme	Criteria	Aggregated score	Score evidence
			Retaining ownership and control over the roads and corridors will provide the Government with security and contingency should global demand for products dramatically shift, the Government can adapt and respond by providing the necessary transport solution without approval or governance obstacles.
	1.4 - Long term utility of option	7	Roads will remain essential across all time horizons. Appropriate Government management and maintenance of key road infrastructure and transport corridors is essential for controlling environmental impacts. Monitoring use, wear-and-tear, and damage of roads can reduce the risk of environmental impacts such as increased emissions caused by poor surface conditions and noise pollution to nearby residential areas ²³² . Government funded and operated roads provide future ability to adapt to changing industry landscapes and make informed decisions based on historical evidence and road/transport corridor performance.
Economic	2.1 - Indicative capital costs and funding sources	7	A strong positive score was assigned by the PWG. Government coordination is expected especially given the relatively minor capital expense and ownership of the existing land corridors.
	2.2 - Number of potential beneficiaries	7	Roads will be accessible for all proponents to transport materials, products and workforce from origin to destination within the precinct.
	2.3 - Competitiveness of the Territory to investment opportunities	7	Roads for connecting and enabling movement is an expected minimum, foregoing multi-user road movement would significantly hinder competitiveness.
	2.4 - Local employment	5	The option will have a relatively low impact on local employment.
	2.5 - Indigenous employment	5	The option will have a relatively low impact on local Indigenous employment ²³³ .
Social, cultural and environment	3.2 - Future environmental and cultural risks	6	Roads commonly have low impact on the environment ²³⁴ .
	3.3 - Social and community impacts	7	The Infrastructure Project was scored as a strong positive. It is widely understood and accepted the need for connecting roads by the community.

²³² Infrastructure Australia - Corridor Protection: Planning and investing for the long term, 2017

²³³ DIPL Project Working Group

²³⁴ DIPL Project Working Group

Theme	Criteria	Aggregated score	Score evidence
	3.4 - Land use compatibility	7	The PWG assigned a strong positive score. Roads are considered essential in the existing masterplan precinct planning framework ²³⁵ .
Deliverability	4.1 - Construction difficulty	7	Technology available for road delivery is mature and easily coordinated.
	4.2 - Workforce and material availability	6	The score is reflective of the current labour shortages in Darwin. However, this is expected to only be in the short term. Some difficulties related to material availability and workforce may arise in the short term.
	4.3 - Delivery complexity	6	Minor hurdles relating to coordination of invested stakeholder groups are present but immaterial.
	4.4 - Activation	7	Roads must be adopted early and are critical to the precinct success. Highly critical to enable multiple infrastructure utility.
Shared workforce transport / transit system – including parking and connections to worksites			
Strategic fit with Commonwealth and the Territory policies	1.1 - Policy alignment	6	The PWG scored a moderately positive score based on specialist knowledge within Government. For example, this Infrastructure Project directly aligns with the Northern Territory workforce boost to assist in filling workforce shortages ²³⁶ , the need to attract additional workers recognises that additional transport systems and parking is required to meet the demand. Additionally, The Territory Infrastructure Strategy 2022 to 2030, supports developing infrastructure which support increased growth, productivity and innovation ²³⁷ .
	1.2 - Multi-industry benefit enablement	7	A strong positive score was assigned by the PWG, recognising parking and the supporting transit system will be required to accommodate the expected workforce influx associated with the full occupancy of a diverse precinct.
	1.3 - Value adding	5	A slightly positive score reflects the inherent value-add associated with providing members of the community with common user accessibility and amenity in the form of indirect benefits. Benefit was unable to be quantified prior to the workshop.
	1.4 - Long term utility of option	7	A strong positive score was allocated to the potential long-term utility of the precinct transport and park and ride system by the PWG.

²³⁵ DIPL engineering department

²³⁶ The Northern Territory Government - Northern Territory workforce boost, 2022

²³⁷ The Northern Territory Government - the Territory Infrastructure Strategy 2022 to 2030, 2022

Theme	Criteria	Aggregated score	Score evidence
Economic	2.1 - Indicative capital costs and funding sources	6	A moderately positive score was assigned due to the inductive low cost of a workforce carpark and supporting transit infrastructure to allow for park and ride operations and services to be considered by industries in the future ²³⁸ .
	2.2 - Number of potential beneficiaries	7	A strong positive score assigned on the basis that Middle Arm will create a significant number of jobs. With no public transport offering, it is assumed that majority of the industry proponents will utilise a common user carpark, supporting the park and ride transit system ²³⁹ .
	2.3 - Competitiveness of the Territory to investment opportunities	7	A strong positive score reflects the attractiveness which a common user car park and supporting transit system can offer the precinct proponents and employees. Given the limited land availability this could be used to entice workers. A recent survey found that 78% of workers would likely remain with their employer because of their benefits ²⁴⁰ and found that a company car park is one of the most desirable employee benefits.
	2.4 - Local employment	5	The PWG scored this a slightly positive as the construction will have a relatively low impact on local employment. Potentially there may be opportunities for inspectors and operators, especially if this would enable and park and ride service in the future.
	2.5 - Indigenous employment	5	The PWG scored this as slightly positive as the construction will have a relatively low impact on local employment.
Social, cultural and environment	3.2 - Future environmental and cultural risks	6	Carparks commonly have low impact on the environment ²⁴¹ . Further investigations will be required if this Infrastructure Project enables a 'Park and Ride' type system in the future.
	3.3 - Social and community impacts	4	A neutral score was assigned due to the lack of information relating to community expectations surrounding vehicle car parks and adverse effects related to the environment and potential park and ride service offering.
	3.4 - Land use compatibility	6	The PWG assigned a strong positive score. A common use parking area and supporting transit system is considered essential in the existing masterplan precinct planning framework ²⁴² .
Deliverability	4.1 - Construction difficulty	7	Technology available for road delivery is mature and easily coordinated ²⁴³ .
	4.2 - Workforce and material availability	6	The score is reflective of the current labour shortages in Darwin. However, this is expected to only be in the short term. Some difficulties related to material availability and workforce may arise in the short term.

²³⁸ DIPL Project Working Group

²³⁹ DIPL Project Working Group

²⁴⁰ Parkalot - Company car park – one of the most desirable employee benefits, 2020

²⁴¹ DIPL Project Working Group

²⁴² DIPL engineering department

²⁴³ DIPL Project Working Group

Theme	Criteria	Aggregated score	Score evidence
	4.3 - Delivery complexity	6	Minor hurdles relating to coordination of invested stakeholder groups, are present but immaterial.
	4.4 - Activation	6	A carpark and supporting transit system is moderately positive and aligns with proponents timeline expectations ²⁴⁴ .
Worker's accommodation to enable MA workers (residential land release and costs)			
Strategic fit with Commonwealth and the Territory policies	1.1 - Policy alignment	5	Directly aligns with policies to grow the Territory economy through population and industry growth. ²⁴⁵ The volatility of the Northern Territory residential market puts pressure on the land development industry to deliver product to meet spikes in demand, and can adversely impact the end-consumer. At a macro-level this boom-bust cycle also negatively impacts private investment and growth in the economy, and more broadly and impacts overall population growth ²⁴⁶ .
	1.2 - Multi-industry benefit enablement	6	Provide places to live for the project workforce. The Territory economy is growing fast, and Territorian employers are offering top working conditions to attract skilled workers to move up ²⁴⁷ .
	1.3 - Value adding	5	the Territory will benefit from an increase in labour force and skill uptake for new or existing residents. Employment in the Territory increased by 1.6% in year-on-year original terms, reflecting a 3.0% increase in full-time employment, partly offset by a 2.5% decrease in part-time employment ²⁴⁸ .
	1.4 - Long term utility of option	6	Accommodation is necessary regardless of industry changes and demands over time ²⁴⁹ .
Economic	2.1 - Indicative capital costs and funding sources	6	Housing, accommodation and residential land release are largely coordinated by and the responsibility of, the Government. Roles of the three levels of governments with regard to housing are ²⁵⁰ : The federal government is responsible for national housing and homelessness policy, financial sector regulations and taxation settings, which have some influence on housing affordability.

²⁴⁴ DIPL Project Working Group

²⁴⁵ The Northern Territory Population Growth Strategy 2018-2028, Accessed in 2022 , City of Darwin – Economic Development Strategy, Accessed in 2022

²⁴⁶ The Northern Territory Independent - the Territory Government eyes bringing more land to market following review, 2022

²⁴⁷ The Northern Territory boundless possible, Accessed in 2022

²⁴⁸ Department of Treasury and Finance – Northern Territory Economy, 2022

²⁴⁹ DIPL Project Working Group

²⁵⁰ Research Publications - Parliament of Australia

Theme	Criteria	Aggregated score	Score evidence
			- State and territory governments are responsible for land use and supply policy, urban planning and development policy, housing-related taxes and residential tenancy legislation and regulation, each of which have impact on housing affordability. - Local governments are mostly responsible for building approval, urban planning and development approval processes, and rates and charges.
	2.2 - Number of potential beneficiaries	6	This option has the potential to indirectly benefit a large range of industries through the ability to source a local workforce. Australian governments have increased their commitments to infrastructure and construction to stimulate the national economy. Additionally, new social procurement policies aim to create social value for targeted populations like Indigenous peoples and unemployed youth ²⁵¹ .
	2.3 - Competitiveness of the Territory to investment opportunities	5	This option will provide a slight increase in sector competitiveness should workforce availability increase.
	2.4 - Local employment	6	This option will provide employment opportunities across the construction, land development, government services etc.
	2.5 - Indigenous employment	5	Some opportunities for Indigenous employment.
Social, cultural and environment	3.2 - Future environmental and cultural risks	6	Accommodation and residential land releases are common practice with extremely low environmental impacts and high cultural benefits. Land release acts as an indirect driver of deforestation and land degradation by allowing access to previously inaccessible land for infrastructure construction. If land release takes place in an environmentally sensitive areas, or in proximity to a protected area of biodiversity, it may encourage agricultural encroachment into these areas, and adversely affect local biodiversity. In such instances, there is the need to ensure that post-clearance land use is protective of the environment ²⁵² .
	3.3 – Social and community impacts	7	Positively impacts the local community and commonly accepted basic right for residential housing and land. Media reports that the community is calling out for additional land release in the Territory ²⁵³ .

²⁵¹ How Construction Employment Can Create Social Value and Assist Recovery from COVID-19, 2021

²⁵² Humanitarian Law and Policy - Mitigating the environmental impacts of explosive ordnance and land release, 2021

²⁵³ NT News - To fix the housing crisis, give us more land, 2022

Theme	Criteria	Aggregated score	Score evidence
	3.4 - Land use compatibility	6	Projections for workforce and job creation increases are expected and aligned with the current precinct framework. The Territory has the potential to be a \$40 billion economy by 2030 – with 35,000 new jobs for Territorians ²⁵⁴ .
Deliverability	4.1 - Construction difficulty	7	Housing, accommodation and land release is a mature and developed process with little constraints. The NTG is providing development opportunities through land releases across the Territory, providing land to accommodate 6,500 homes and support economic development ²⁵⁵ .
	4.2 - Workforce and material availability	6	There are currently some challenges in the construction sector, relief is expected in the medium term. The construction industry is one of Australia's biggest sectors, but due to COVID-19, the sector's performance has been turbulent during the past two years. Construction demand consistently outpaces both supply for labour and raw materials, and is further worsened by global supply chain issues which have caused delays in projects, and added to construction costs ²⁵⁶ .
	4.3 - Delivery complexity	6	Housing, accommodation and land release is mature and developed process with little constraints. The NTG is providing development opportunities through land releases across the Territory, providing land to accommodate 6,500 homes and support economic development ²⁵⁷ .
	4.4 - Activation	6	Aligns with the timing horizon and is an essential dependency to house workers due to the proposed increase in jobs created from the precinct. Middle Arm precinct is expected to bring 20,000 new jobs by 2040 ²⁵⁸ .
Local emergency response infrastructure – local fire station / medical clinic / EMS			
Strategic fit with Commonwealth and the	1.1 - Policy alignment	6	A moderate positive score was assigned evidenced by general emergency alignment with the NT Infrastructure Strategy 2022-2030 which supports emergency management. ²⁵⁹ The policy specifically references:

²⁵⁴ The NT – Jobs First Plan, Accessed in 2022

²⁵⁵ Department of Infrastructure, Planning and Logistics – Land Release, Accessed in 2022

²⁵⁶ BDO Australia - Building for the future: opportunities and challenges in construction, 2022

²⁵⁷ Department of Infrastructure, Planning and Logistics – Land Release, Accessed in 2022

²⁵⁸ ABC News – Northern Territory businesses hope proposed port facilities at Darwin harbours middle-arm will mean new-jobs, 2022

²⁵⁹ The NT Infrastructure Strategy 2022 to 2030, Accessed in 2022

Theme	Criteria	Aggregated score	Score evidence
			- Health – Providing additional infrastructure support in the healthcare space for the Middle Arm workforce, and broader community directly aligns with the social infrastructure objectives outlined in this policy. - Education and Training – Education to support the availability of future healthcare professionals and provide services for Middle Arm workforce in case of emergencies. - Civic Services – Any additional funding and investment in the vicinity of Middle Arm aligns with emergency response timeliness. This could include fire station upgrades and capacity increases.
	1.2 - Multi-industry benefit enablement	7	The PWG assigned a strong positive score given the need for accessible emergency response support regardless of industry types within Middle Arm.
	1.3 - Value adding	4	A neutral score was assigned due to limited evidence of value-adding the Territory resources that directly aligns with Middle Arm providing funding to improve emergency services. There is an assumption investment in the emergency services offerings in the Territory will value add on existing expertise.
	1.4 - Long term utility of option	6	A moderate positive score was assigned by the PWG. It is the responsibility of Government to ensure public emergency services can support the increase in population ²⁶⁰ . In this case the precinct will attract additional workforce to the region.
Economic	2.1 - Indicative capital costs and funding sources	5	The PWG scored this sub-criterion as slightly positive. The option is expected to be relatively affordable, relative to the capital costs of other Infrastructure Project considerations ²⁶¹ .
	2.2 - Number of potential beneficiaries	4	A neutral score was assigned by the PWG as its unknown if the potential precinct proponents will invest in emergency services and infrastructure independently.
	2.3 - Competitiveness of the Territory to investment opportunities	3	This sub-criterion is ranked slightly negative. Evidence received from potential industry surveys indicate this is not a considerable priority for investment ²⁶² .
	2.4 - Local employment	5	Upgrades and construction of new emergency services would increase local employment opportunities for construction and operations ²⁶³ . Typically, employment opportunities in the emergency services space will provide skilled and long-term job opportunities.

²⁶⁰ Commonwealth Government - Emergency management and disaster resilience, 2019

²⁶¹ DIPL Project Working Group

²⁶² EY/DIPL industry survey feedback

²⁶³ DIPL Project Working Group

Theme	Criteria	Aggregated score	Score evidence
	2.5 - Indigenous employment	5	Upgrades and construction of new emergency services would increase local Indigenous employment opportunities for construction and operations ²⁶⁴ . Typically, employment opportunities in the emergency services space will provide skilled and long-term job opportunities.
Social, cultural and environment	3.2 - Future environmental and cultural risks	5	Not many environmental risks to upgrading health and emergency services. Health care generates 1–5 percent of total global environmental impacts in the domains of greenhouse gas emissions, particulate matter, nitrogen oxide and sulphur dioxide. A 2019 estimate places health care's global carbon footprint at 4.4 percent of the world's total greenhouse gas emissions, whereas health expenditure accounts for some 10 percent of global economic output ²⁶⁵ .
	3.3 – Social and community impacts	6	Upgrading local emergency responses – health and civil services aligns with the community's expectations as population increases. Over the next 45 years the Australian population will increase and age rapidly. As the population increases and ages there will be substantial growth in the demand for hospital bed-days, placing a corresponding demand on infrastructure and staffing ²⁶⁶ .
	3.4 - Land use compatibility	3	The PWG has scored slightly negative as on-site emergency services have not been considered in the existing master plans for the precinct. This would fall on the central Territories Governments responsibility to ensure existing emergency response services have capacity.
Deliverability	4.1 - Construction difficulty	6	Construction difficulty for emergency services infrastructure was scored moderately strong by the PWG. Social infrastructure such as emergency services and civil service infrastructure is mature and common practice in all States and Territories in Australia ²⁶⁷ .
	4.2 - Workforce and material availability	4	Workforce and materials availability was scored neutral by the PWC. This is evidenced by a number of emergency services professions listed as 'hard to fill jobs' in the Territory ²⁶⁸ . The assigned score also reflects the supply chain issues and disruptions ²⁶⁹ currently being faced across the medical and emergency services sector.

²⁶⁴ DIPL Project Working Group

²⁶⁵ Health Affair - Health Care Sustainability Metrics: Building A Safer, Low-Carbon Health System, 2020

²⁶⁶ ResearchGate, Demographic change and the future demand for public hospital care in Australia, 2005 to 2050, 2006

²⁶⁷ DIPL Project Working Group

²⁶⁸ The Territory Northern Territory Government - 2022 Northern Territory skilled occupation priority list, 2022

²⁶⁹ Hall & Wilcox - Supply chain delays and materials shortages in the construction industry, 2021

Theme	Criteria	Aggregated score	Score evidence
	4.3 - Delivery complexity	5	A slightly positive score was assigned by the PWG. The PWG have history and experience in Government processes and administration working with the private sector on social infrastructure projects and civil services. General consensus is that processes are low in complexity.
	4.4 - Activation	3	Activation on timing and dependence scored slightly negative on the basis that industry do not immediately signal the importance for upgrades to the current emergency services model ²⁷⁰ . Additionally, there is currently no proposed Infrastructure Project currently dependant on the success of Emergency Services Infrastructure and upgrade ²⁷¹ .
Beneficial re-use of dredge soil for additional economic land			
Strategic fit with Commonwealth and the Territory policies	1.1 - Policy alignment	6	Positively aligned with the Territory's 40 by 30 vision, land release programs etc. ²⁷²
	1.2 - Multi-user, multi-industry benefit enablement	6	Unlocks a large amount of industry agnostic economic land. Dredged material may be used to develop commercial sites (e.g. rehabilitation of brownfield sites, agriculture land and recreational sites), construction of islands and other man-made land ²⁷³ .
	1.3 - Value adding	7	Value adding from the perspective of repurposing dredge soil associated with precinct development to enable greater utility of land ²⁷⁴ .
	1.4 - Long term utility of option	7	Significant long-term utility of unlocking additional industry agnostic land ²⁷⁵ .
Economic	2.1 - Indicative capital costs and funding sources	6	This option is unlikely to be developed without the central coordination of Government and the environmental considerations associated with repurposing dredge soil. This type of disposal is usually more expensive. Other major constraints are the difficulty in finding suitable locations for its use, and complex and inconsistent legislation ²⁷⁶ .
	2.2 - Number of potential beneficiaries	7	Significant beneficiaries are not isolated to industrial, but include social, commercial etc. Dredging projects can provide the greatest public benefit by addressing multiple economic and environmental objectives simultaneously ²⁷⁷ .

²⁷⁰ EY/DIPL Industry survey feedback

²⁷¹ DIPL Project Working Group

²⁷² The NT Infrastructure Strategy 2022 to 2030, Accessed in 2022

²⁷³ CEDA IADC Factsheet -Beneficial Use of Dredged Material, Accessed in 2022

²⁷⁴ Department of Infrastructure, Planning and Logistics Middle Arm Sustainable Development Precinct, 2022

²⁷⁵ CEDA IADC Factsheet -Beneficial Use of Dredged Material, Accessed in 2022

²⁷⁶ CEDA IADC Factsheet -Beneficial Use of Dredged Material, Accessed in 2022

²⁷⁷ Identifying, Planning, and Financing Beneficial Use Projects Using Dredged Material -Beneficial Use Planning Manual, 2007

Theme	Criteria	Aggregated score	Score evidence
	2.3 - Competitiveness of the Territory to investment opportunities	4	Neutral due to the nature of the option and low desirability and benefit to industry ²⁷⁸ .
	2.4 - Local employment	7	Significant employment opportunities given the scale (approx. 22 million tonnes) and nature of the operation.
	2.5 - Indigenous employment	5	Some opportunities for Indigenous employment.
Social, cultural and environment	3.2 - Future environmental and cultural risks	6	High from the perspective of the alternative scenario of placing on the seabed. It creates societal, environmental and financial benefits with its reuse. Because large volumes are involved, being able to potentially use dredged material represents a significant sustainability contribution ²⁷⁹ .
	3.3 - Social and community impacts	6	High from the perspective of the alternative scenario of placing on the seabed. It creates societal, environmental and financial benefits with its reuse. Because large volumes are involved, being able to potentially use dredged material represents a significant sustainability contribution ²⁸⁰ .
	3.4 - Land use compatibility	6	High from the perspective of the alternative scenario of placing on the seabed. It creates societal, environmental and financial benefits with its reuse. Because large volumes are involved, being able to potentially use dredged material represents a significant sustainability contribution ²⁸¹ .
Deliverability	4.1 - Construction difficulty	4	Neutral on the basis the technology is mature, challenges on scale. Logistics and economics are the biggest issues ^{282 283} .
	4.2 - Workforce and material availability	3	Specialist machinery is difficult to source in the current climate as the class and types of dredging equipment to be utilised depends upon the type of soil to be dredged ²⁸⁴ .
	4.3 - Delivery complexity	3	Multiple stakeholder and logistics required for execution of the option.

²⁷⁸ CEDA IADC Factsheet -Beneficial Use of Dredged Material, Accessed in 2022

²⁷⁹ CEDA IADC Factsheet -Beneficial Use of Dredged Material, Accessed in 2022

²⁸⁰ CEDA IADC Factsheet -Beneficial Use of Dredged Material, Accessed in 2022

²⁸¹ CEDA IADC Factsheet -Beneficial Use of Dredged Material, Accessed in 2022

²⁸² CEDA IADC Factsheet -Beneficial Use of Dredged Material, Accessed in 2022

²⁸³ Identifying, Planning, and Financing Beneficial Use Projects Using Dredged Material -Beneficial Use Planning Manual, 2007

²⁸⁴ ScienceDirect – Dredging, 2003

Theme	Criteria	Aggregated score	Score evidence
			Planning and decision-making processes for beneficial use projects can become complicated and unwieldy given that federal and state natural resource and wildlife agencies, local agencies, private parties, and public interest groups are often involved ²⁸⁵ . There is often no legislation specifically for dredging or for dredged material management, decision-makers need to deal with a patchwork of different rules, such as regulations to protect the ocean, inland water, residential areas, the environment, nature and for the handling of waste. Many different permits may be required ²⁸⁶ .
	4.4 – Activation	6	Aligns with the current demand forecast for land on the precinct. Timing was ranked high; soil re-use will be available immediately after dredging occurs ²⁸⁷ . This Infrastructure Project is highly dependent on the MOF and associated dredging occurring.

Table 37: MCA-2 scoring sheet

Theme	Criteria	Aggregated score	Score evidence and justification
Program 1			
Strategic fit	1.1 – Common user, multi-industry enablement	4	Moderate positive 50% of respondents noted the common-user precinct roads as 'no other option'. >90% industry proponents surveyed respondents scored the MOF (including dredging and laydown area) and the product jetties as the most beneficial common-use infrastructure options.
	1.2 – The Northern Territory resources value add	4	Neutral 82% of expected industry proponents will utilise common-use product jetty to export products which have undergone value add processes from the Territory feedstock. 27% of expected industry proponents producing Ammonia and green Hydrogen will directly benefit from renewable energy distributed from the power network.

²⁸⁵ Identifying, Planning, and Financing Beneficial Use Projects Using Dredged Material -Beneficial Use Planning Manual, 2007

²⁸⁶ CEDA IADC Factsheet -Beneficial Use of Dredged Material, Accessed in 2022

²⁸⁷ Department of Infrastructure, Planning and Logistics Middle Arm Sustainable Development Precinct, 2022

Theme	Criteria	Aggregated score	Score evidence and justification
	1.3 – Future proofing	4	Moderate positive - Australia conducts 98% of its trade through marine infrastructure²⁸⁸. - The product jetties will remain resilient and required regardless of macro and micro factors potential effecting industrial chemical and resources production markets. - Green power distribution network: Demand for green hydrogen and associated chemicals is expected to grow to 500-680 million metric tonnes by 2050²⁸⁹, requiring an abundance of green energy for years to come. - Additionally, the Territory is expecting to capture a 15% share of global hydrogen exports by 2035, equivalent to its current share of LNG export²⁹⁰.
Social & Environmental Impact	2.1 - Contribution to carbon neutral economy	4	Moderate positive \$42 million in environmental (forgone use of gas as a feedstock) benefits²⁹¹ have been associated to the MOF and product jetties attracting a range of interested proponents. - MOF has wider macro decarbonisation benefits associated with the import of large solar panel modules for use across the Territory.
	2.2 – Workforce amenity	3	Neutral The score is neutral, precinct roads will provide workforce accessibility relative to the base case.
	2.3 – Land optimisation	4	Neutral - A neutral score was decided and agreed upon by PWG and SMEs. - There is only one strategic location the MOF and dredging can be located in the precinct. - Roads are necessary as the corridors land are owned by the Government. - The power network will provide relief where proponents can purchase energy instead of seeking to utilise potential gas fired power option.
Deliverability	3.1 – Capital costs	5	Strong positive \$2.3 bn in capital costs²⁹². - Program 1 has the closest capital costs to the estimated funding amount.

²⁸⁸ Ports Australia, 2022

²⁸⁹ IEA (for the G20) - The Future of Hydrogen, 2019

²⁹⁰ Northern Territory Government - Northern Territory Renewable Hydrogen Master Plan, 2021

²⁹¹ EY MASDP Cost- Benefit Analysis

²⁹² EY MASDP Cost-Benefit Analysis

Theme	Criteria	Aggregated score	Score evidence and justification
	3.2 – Construction risk	4	Strong positive - MOF, dredging and proposed laydown area within the precinct have extremely low risk. - Inpex's East Arm MOF (next door to MASDP) has successfully been constructed and operated locally – the preliminary MASDP designs are similar in specifications²⁹³. - Precinct roads and transport system, product jetties and power network design, delivery and expertise are mature.
	3.3 – Precinct activation	4	Moderate positive - Program 1 includes a universal mix common user infrastructure items. - MOF, product jetties, precinct roads and green energy power distribution pose no risk of being outdated or obsolete in the next 50 years. - Modular construction popularity is expected to increase at CAGR of 6.1% over the next 6 years²⁹⁴ demonstrating medium term utility demand. - The attractiveness response from industry for components of Program 1 indicate a high activation rate from multiple proponents²⁹⁵.
Program 2			
Strategic fit	1.1 – Common user, multi-industry enablement	5	Moderate positive - High network capabilities provided for industry to utilise and improve productivity aligns with the Digital Territory Strategy that will enable businesses to transform and open up new economic opportunity²⁹⁶. >50%²⁹⁷ of the industry survey respondents ranked upgrading Channel Island power plant to accommodate hydrogen generation beneficial as upgrades will provide an opportunity for precinct occupants to supply Hydrogen <20 km to Channel Island. - Scoring reflected is only moderately positive as there is lack of quantifiable evidence available for remaining Program 1 components.

²⁹³ The Northern Territory DIPL engineering team

²⁹⁴ Fortune business insights, 2021

²⁹⁵ EY/DIPL industry survey feedback

²⁹⁶ Digital Territory Strategy, Accessed in 2022

²⁹⁷ EY/DIPL Industry survey feedback

Theme	Criteria	Aggregated score	Score evidence and justification
	1.2 – the Territory resources value add	5	Strong positive - Inclusive of Program 1 infrastructure value add opportunities, digital subterranean cabling to support automatable activities of proponents is expected to value-add internal productivity through streamlining activities²⁹⁸. 50% of industry respondents indicated digital network available is beneficial to their operations²⁹⁹ supported by evidence that typically 30% of activities could be automated³⁰⁰. - CCUS will directly utilise the disposal of CO2 captured from numerous proponent's activities which derive from gas feedstock, evidence suggests carbon capture and storage is not only a proven emissions reduction solution, but also brings environmental, economic and social benefits³⁰¹.
	1.3 – Future proofing	4	Moderate positive - In addition to Programs 1's evidence, digital network accessibility to enable AI, IoT, predictive analytics will shape the manufacturing industry for years to come as technology and software advances³⁰². - CCUS enabling infrastructure offer significant strategic value in the transition to net-zero and collectively has the ability to defer an estimated 8 billion tonnes of CO2 by 2050³⁰³, however, as electrolysis becomes cheaper over time long term future demand (2050 onwards highlights its limitations – justifying a moderate future proof score.
Social & Environmental Impact	2.1 - Contribution to carbon neutral economy	5	Strong positive - Inclusive of Program 1 infrastructure value add opportunities, occupants in the MASDP will have a carbon footprint. Without CCUS infrastructure and technology, these private sectors would need to do explore other offset options. - The combination of CCUS and green energy distribution provided by the power network will have the ability forgo CO2 emissions relative to the base case. \$39 billion - The economic environmental benefit modelled by the inclusion of precinct CCUS enabling infrastructure over the project period³⁰⁴.

²⁹⁸ McKinsey & Company – A Future That Works: Automation, Employment, and Productivity, 2017

²⁹⁹ EY/DIPL Industry survey feedback

³⁰⁰ McKinsey & Company – A Future That Works: Automation, Employment, and Productivity, 2017

³⁰¹ Earth Resources – Benefits of CCS, Accessed in 2022

³⁰² Brain Vire – Digital Enablement, Future Proofing Manufacturing Industry, 2022

³⁰³ IEA – CCUS in clean energy transitions, 2020

³⁰⁴ EY MASDP Cost-Benefit Analysis

Theme	Criteria	Aggregated score	Score evidence and justification
	2.2 – Workforce amenity	5	Strong positive - Program 2 addresses the influx of an estimated 11,000 strong workforce by 2030 associated with a full industry capacity MASDP enabled by the range of proposed infrastructure³⁰⁵. - Addressing the lack of development-ready residential land in proximity of 20-40 km from the precinct, Program 2 includes the release, earthworks, and administration for housing³⁰⁶.
	2.3 – Land optimisation	5	Moderate positive In addition to Programs 1's evidence: High network capabilities provided for industry to utilise and improve productivity aligns with the Digital Territory Strategy that will enable businesses to transform and open up new economic opportunity³⁰⁷
Deliverability	3.1 – Capital costs	2	Slightly negative \$3.7 bn in capital costs³⁰⁸. - Program 2 has the second most expensive capital costs relative to estimated funding amount in stage 1.
	3.2 – Construction risk	3	Neutral - A neutral score was decided and agreed upon by PWG and SMEs. - A majority of Program 2's infrastructure is mature and has limited construction risk. - Infrastructure to enable CCUS applications is relatively immature evidenced by only one Australian project in operation³⁰⁹. - Additionally, the proposed CCUS manifold is reliant on private stakeholders, which exposes some risk related to project timelines. - Scoring considered this position to be neutral.

³⁰⁵ MASDP CGE economic modelling

³⁰⁶ The Northern Territory Government PWG and SMEs

³⁰⁷ Digital Territory Strategy, Accessed in 2022

³⁰⁸ EY MASDP Cost-Benefit Analysis

³⁰⁹ Chevron - Gorgon Carbon Capture and Storage, 2022

Theme	Criteria	Aggregated score	Score evidence and justification
	3.3 – Precinct activation	5	Strong positive - The inclusion of digital enablement, workforce accommodation, precinct transit system Channel Island power plant upgrade provides precinct proponents the option to utilise common-user infrastructure on a per use-basis instead of outlaying capital costs. - A combined indication from industry proponents, PWG and SMEs agree the project mix is welcomed by industry³¹⁰
Program 3			
Strategic fit	1.1 – Common user, multi-industry enablement	4	Moderate positive In addition to Programs 1's evidence, 50%³¹¹ of industry survey participants stated a common-user wastewater treatment facility would be critical for operations.
	1.2 – the Territory resources value add	4	Moderate positive \$43 million monetised benefit³¹² associated with the recycle and re-use of wastewater from industry proponents reducing pressure on existing water supplies. 82% of expected industry proponents will utilise common-use product jetty to export products which have undergone value add processes from the Territory's feedstock.

³¹⁰ Industry survey feedback and specialist knowledge from PWG and SMEs

³¹¹ EY/DIPL Industry survey feedback

³¹² EY MASDP Cost-Benefit Analysis

Theme	Criteria	Aggregated score	Score evidence and justification
	1.3 – Future proofing	4	- Australia conducts 98% of its trade through marine infrastructure³¹³. - The product jetties will remain resilient and required regardless of macro and micro factors potentially affecting industrial chemical and resources production markets. - Green power distribution network: Demand for green hydrogen and associated chemicals is expected to grow to 500-680 million metric tonnes by 2050³¹⁴, requiring an abundance of green energy for years to come - The Territory is expecting to capture a 15% share of global hydrogen exports by 2035, equivalent to its current share of LNG export³¹⁵. - Additionally, the common-use wastewater facility could be used to relieve water scarcity pressures in the Territory³¹⁶, with over 50% of potential precinct industries expected to consume significant portions of water (Hydrogen and Methanol). - High water consuming products manufactured in the precinct will increase as global demand for Hydrogen increases over the long term³¹⁷.
Social & Environmental Impact	2.1 - Contribution to carbon neutral economy	4	Moderate positive \$42 million in environmental (forgone use of gas as a feedstock) benefits³¹⁸ have been associated to the MOF and product jetties attracting a range of interested proponents. - MOF has wider macro decarbonisation benefits associated with the import of large solar panel modules for use across the Territory.
	2.2 – Workforce amenity	3	Neutral - The score is neutral, as agreed by PWG and SMEs. - Precinct roads will provide workforce accessibility relative to the base case.
	2.3 – Land optimisation	5	Moderate positive In addition to Program 1: 50% of industry proponents will require significant volumes of water for operations.

³¹³ Ports Australia, 2022

³¹⁴ IEA (for the G20) The Future of Hydrogen, 2019

³¹⁵ The Northern Territory Government - Northern Territory Renewable Hydrogen Master Plan, 2021

³¹⁶ The Strategist - Water management in northern Australia is a national security issue, 2019

³¹⁷ IEA – Hydrogen, 2021

³¹⁸ EY MASDP Cost-Benefit Analysis

Theme	Criteria	Aggregated score	Score evidence and justification
			- Assuming 4 of 8 considered developing individual facilities at an average space requirement of 9 km per facility³¹⁹, would reduce current available land in the precinct by 27 km². - Wastewater facility aligns with current precinct planning development.
Deliverability	3.1 – Capital costs	4	Moderate positive - Program 3 has the second closest capital costs to the estimated funding amount \$2.3 bn in capital costs³²⁰
	3.2 – Construction risk	3	Moderate positive - MOF, dredging and proposed laydown area within the precinct have extremely low risk. - Inpex's East Arm MOF (next door to MASDP) has successfully been constructed and operated locally – the preliminary MASDP designs are similar in specifications³²¹. - Precinct roads and transport system, product jetties and power network design, delivery and expertise are mature. - Wastewater solution poses some construction risk due to material and chemical supply chain disruption in the current global environment, however, it is anticipated to be short to medium term risk³²².
	3.3 – Precinct activation	5	Moderate positive - MOF, product jetties, precinct roads and green energy power distribution pose no risk of being outdated or obsolete in the next 50 years. - Modular construction popularity is expected to increase at CAGR of 6.1% over the next 6 years³²³ demonstrating medium term utility demand. - The attractiveness response from industry for components of Program 1 indicate a high activation rate from multiple proponents³²⁴.
Program 4			

³¹⁹ Mininni et. al.- An innovative sludge management system based on separation of primary and secondary sludge treatment, 2004

³²⁰ EY MASDP Cost-Benefit Analysis

³²¹ The Northern Territory DIPL Engineering team

³²² The Northern Territory DIPL Engineering department

³²³ Fortune business insights, 2021

³²⁴ EY/DIPL Industry survey feedback

Theme	Criteria	Aggregated score	Score evidence and justification
Strategic fit	1.1 – Common user, multi-industry enablement	5	Moderate positive In addition to Programs 1's evidence: - High network capabilities provided for industry to utilise and improve productivity aligns with the Digital Territory Strategy that will enable businesses to transform and open up new economic opportunity³²⁵. >50%³²⁶ of the industry survey respondents ranked upgrading Channel Island power plant to accommodate hydrogen generation beneficial as upgrades will provide an opportunity for precinct occupants to supply Hydrogen <20 km to Channel Island. - Scoring reflected is only moderately positive as there is lack of quantifiable evidence available for remaining program one components.
	1.2 – the Territory resources value add	5	Strong positive - Program 4 includes all common-use infrastructure which provide value adding across feedstock, energy, transportation, water and digital enablement. - Preliminary investigations indicate no discernible impacts preventing the value add of the Territory's resources.
	1.3 – Future proofing	4	Moderate positive - Program 4 includes all common-use infrastructure solutions investigated. - Digital network accessibility to enable AI, IoT, predictive analytics will shape the manufacturing industry for years to come as technology and software advances³²⁷. - CCUS enabling infrastructure offers significant strategic value in the transition to net-zero and collectively has the ability to defer an estimated 8 billion tonnes of CO2 by 2050³²⁸, however, as electrolysis becomes cheaper over time, long term future demand (2050 onwards) highlights its limitations – justifying a moderate future proof score. - The inclusion of wastewater aligns expectations of increased global future demand.
Social & Environmental Impact	2.1 - Contribution to carbon neutral economy	5	Strong positive With the inclusion of all infrastructure projects producing value add opportunities, occupants in the MASDP will have a carbon footprint. Without CCUS infrastructure and technology, these private sectors would need to do explore other offset options.

³²⁵ Digital Territory Strategy, Accessed in 2022

³²⁶ EY/DIPL Industry survey feedback

³²⁷ Brainvire - Digital Enablement, Future Proofing Manufacturing Industry, 2022

³²⁸ IEA - CCUS in clean energy transitions, 2020

Theme	Criteria	Aggregated score	Score evidence and justification
			- The combination of CCUS and green energy distribution provided by the power network will have the ability forgo CO2 emissions relative to the base case. \$39 billion - The economic environmental benefit modelled by the inclusion of precinct CCUS enabling infrastructure over the project period³²⁹. - However, further investigations into the trade-offs between wastewater treatment and alternative sources are required.
	2.2 – Workforce amenity	5	Strong positive - Program 2 addresses the influx of an estimated 11,000 strong workforce by 2030 associated with a full industry capacity MASDP enabled by the range of proposed infrastructure³³⁰. - Addressing the lack of development-ready residential land in proximity of 20-40 km from the precinct, Program 2 includes the release, earthworks, and administration for housing³³¹.
	2.3 – Land optimisation	5	Strong positive - Program 4's full suite of infrastructure projects offers the most beneficial use of existing land. - High network capabilities provided for industry to utilise and improve productivity aligns with the Digital Territory Strategy that will enable businesses to transform and open up new economic opportunity³³². - Additionally, 50% of industry proponents will require significant volumes of water for operations. - Assuming 4 of 8 considered developing individual facilities at an average space requirement of 9 km per facility³³³ would reduce current available land in the precinct by 27 km². - All infrastructure items within Program 4 aligns with current precinct planning expectations.
Deliverability	3.1 – Capital costs	1	Strong negative \$3.8 bn in capital costs³³⁴. - Program 3 has the highest closest capital costs relative to the estimated funding amount.

³²⁹ EY MASDP Cost-Benefit Analysis

³³⁰ MASDP CGE economic modelling

³³¹ The Northern Territory Government PWG and SMEs

³³² Digital Territory Strategy, Accessed in 2022

³³³ Mininni et. al.- An innovative sludge management system based on separation of primary and secondary sludge treatment , 2004

³³⁴ EY MASDP Cost-Benefit Analysis

Theme	Criteria	Aggregated score	Score evidence and justification
	3.2 – Construction risk	2	Strong negative - Achieving full suite of common user infrastructure projects in the same timeline for the beginning of proponent's operations and requirements will be challenging. - As shown below, the Territory is going through a workforce and skills shortage particularly in the construction sector. - Demonstrated by high recruitment turnover and difficulty rates. Figure 35: Rates of recruitment and recruitment difficulty by region (12 months to March 2022)³³⁵ Legend: ● Capital cities ● Rest-of-state areas
	3.3 – Precinct activation	5	Strong positive - The inclusion of digital enablement, workforce accommodation, precinct transit system, Channel Island power plant upgrade and wastewater provides precinct proponents the option to utilise common-user infrastructure on a per use-basis instead of outlaying capital costs - A combined indication from industry proponents, PWG and SMEs agree the project mix is welcomed by industry³³⁶

³³⁵ NSC, Recruitment Experience and Outlook Survey, 2021 and 2022

³³⁶ Industry survey feedback and specialist knowledge from PWG and SMEs

12.4 Appendix D – Project Working Group credentials

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

- [REDACTED]
- [REDACTED]
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[REDACTED]

[REDACTED]

12.5 Appendix E – Stakeholder Initial Feed back

Feedback to date from the various stakeholder groups has covered some key themes as outlined below.

Rationale and the economy

- Why are we focusing on a gas precinct when we have a commitment to net zero? Is there a better alternative for this land and for an economy and community solution?
- How will the activity of MASDP impact on the viability of Darwin Port activities and commercial sustainability?
- How will this project help to build better overall outcomes for Darwin, Darwin Harbour, our economy and community?
- Is there actually a commercial demand for this precinct?
- Economic opportunity – what opportunities will there be for the Territory businesses and industry? Do we need to diversify industry, how do we ensure that local industry has the capacity and capability to meet the opportunity needs?
- Workforce – what assurances are there that the focus will be on local workforce opportunity – and related training and development – rather than FIFO?

Social and cultural

- Sacred sites – how are we identifying and working with First Nation's people to protect? How will this precinct impact on Indigenous land and sea – cultural values, social, heritage – as well as economic opportunity.
- Traffic noise during and beyond construction – noise emissions and buffers also fall into this. Extra harbour traffic – safety and amenity.
- Impact on recreational use of the Harbour – safety and amenity – also including fishing from both a cultural and social perspective.
- From construction to operation – short- and long-term impact on the availability and cost of housing stock – to buy and rent.

Environmental

- The impact on Darwin's water supplies – where is the water coming from. How will we ensure the quality of the Darwin Harbour water?
- Marine ecosystems – how will construction, dredging programs and operations impact the marine ecosystems.
- Are we planning offsets and investing in technology that encourages and protects local habitats?
- Terrestrial Ecosystems – how many mangroves are being removed, what about other flora and fauna. Are protected species impacted and what are we doing in response.

Other

- How do we avoid the mistakes of the past? The Northern Territory Government does not have a good reputation as a proponent. There is little trust in the NTG as developers and in relation to transparency and accountability.
- Perceived lack of visibility about the project.
- Is Carbon Capture and Storage just a pipedream – and is it a deal breaker?
- What is the role of the approval holder? Who will be managing the precinct and accountable to its operations and performance within approved parameters?

12.6 Appendix F– Industry survey and aggregated responses



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Industry Consultation for Middle Arm Sustainable Development Precinct (MASDP) Infrastructure Australia Submission (IA)

The Northern Territory Department of Infrastructure, Planning and Logistics (DIPL) has engaged Ernst and Young (EY) to assist in preparing a Stage 2 IA submission for the MASDP development. Part of this engagement requires consultation with industry and potential proponents to gain perspective on the preferred long list infrastructure options in order to identify the most valued and impactful common-user infrastructure options. The engagement with stakeholders and subsequent options development will provide IA and DIPL with visibility on what industry requires and seeks when considering MASDP infrastructure.

You have been identified as a business with a potential interest in accessing land at Middle Arm in the MASDP.

We would be grateful for your time to inform this process. We will ask a few questions relating to the long list of common-user infrastructure options to understand which would have the greatest impact to your business operations. This list can be located on the pages following this letter. Questions will be related to a range of criteria including criticality of the infrastructure to your proposed operation and timing requirements.

The scheduled period for the consultations to take place on is from August 15 to August 17, 2022. We appreciate your time and effort required to respond to this request with your nominated contact.

Please note the purpose of this consultation is to obtain a view of the most in-demand common-user infrastructure from within industry and why. Responses received or insight obtained from this engagement does not imply or obligate DIPL to action based on this engagement.

For further information, contact:

[Redacted contact information]

[Redacted contact information]

MASDP Industry questionnaire

General questions:

1. What sector is your company and operations associated with? (State multiple if suitable)

2. What year are you intending to begin construction and for how long?

Year commencing: _____

Expected duration: _____

3. Please indicate your commissioning and operational timeframe

Year commencing: _____

Expected duration: _____

4. Please review the below list of common-user infrastructure options (1-14) below and indicate any missing you would like to be considered.

Suggestion 1: _____

Suggestion 2: _____

Table 38: Industry questionnaire



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ey.com/au

Infrastructure questions, please fill in the table below:

#	Option description	Expanded description	Q5) What are the most beneficial common-user infrastructure options to your operations? (Please rank 1, 2, 3) if not beneficial, leave blank	Q6) What options (if any) are critical for your project business case to achieve FID? (Select CRITICAL options only)	Please provide any additional detail of requirements and comments
1	Common-user MOF: Appropriate dredging, and/or Modular offloading facility (MOF) and common user hardstand/laydown facility	- Dredging of harbour to allow Panamax vessels with all tide depth - Modular Offloading Facility - Marine side hardstand and lay down area of [x] hectares			
2	Appropriate dredging, common-user product export jetties	- Dredging of harbour to allow Panamax vessels with all tide depth, and - Common user product export jetties			
3	Co2 Common user - Carbon capture utilisation and storage (CCUS) infrastructure - Underground manifold (series of pipes underground) for Co2 transmission and supporting infrastructure - capacity/open access control	The manifold connects the supply of carbon to Petrel sub-Basin in the Joseph Bonaparte Gulf or Bayu Undan for carbon sequestration			
4	Co2 for Inpex and Santos - Carbon capture utilisation and storage (CCUS) infrastructure - for Co2 transmission and supporting infrastructure - manifold to access	The manifold connects the supply of carbon to Inpex (Petrel sub-Basin in the Joseph Bonaparte Gulf) and Santos (for Bayu Undan) for carbon sequestration	DO NOT USE		
5	Digital subterranean cabling of precinct to support digital communications and automation	Cabling of a fibre network loop around Middle Arm			



Page 4

6	Power generation to Middle Arm proponents via a high load power extension of DKIS	Agnostic to renewable or non-renewable, this network would provide firm industrial load power to the fence of proponents. This option will provide an alternative to each proponent developing their own power station.			
7	Upgrade Channel Island power station turbines to accommodate both natural gas and hydrogen	Upgrade channel island power station and early offtake for hydrogen domestic supply			
8	Middle Arm specific industrial electrical network to transmit industrial green energy supply and secured supply of energy	(Similar to option 6 but standalone network with renewables) Middle arm specific high load and reliability electrical network independent of DKIS delivering firm renewable energy			
9	Desalination solution available for industry proponents	Middle Arm desalination plant to service additional demand beyond AROWS			
10	Wastewater treatment, recycle and disposal plant able to receive wastewater, treat (recycle) and discharge common-user infrastructure	Common user waste-water recycling, treatment and disposal facility able to accommodate expected waste from 'hybrid/mixed ecology' case			
11	Rail infrastructure - Build upon existing rail lines and connection into East Arm precinct (e.g., line and track extension, railroad conveyor, rail spur, unloading pit, rollingstock maintenance yard and provisioning facilities)	- Rail spur to MASDP - Siding at middle arm to enable material offloading - Common user land side facility which includes hardstand and lay down areas and tanks.			
12	Supporting transport infrastructure required for marine development connectivity with industrial parcels roads and services to MOF and Export Jetty and services corridor	- Primary industrial roads connecting the proposed MOF and CULF Killyhawk Road - Spitfire western access road - Channel Island Road upgrades - Road link across infill - Services corridor			

13	Worker's accommodation to enable MA workers (residential land release and costs)	* Middle arm specific (but not necessarily at MA) workers accommodation solution			
14	Beneficial re-use of dredge soil for additional economic land	Potential activation of strategic developable land - dredge			

Table 39: summary of responses

	Industry proponent 1 – Green energy products	Industry proponent 1 – Green energy products	Industry proponent 3 – Hydrogen	Industry proponent 4 – Hydrogen	Industry proponent 5 – Gas production	Industry proponent 6 – Green energy products
Modular Offloading Facility (MOF): Appropriate dredging, and/or MOF and common user handstand/laydown facility	5	2	2	2	3	2
Product export jetties	3	3	3	3	2	1
Co2 Common user - Carbon capture utilisation and storage (CCUS) infrastructure – Underground manifold (series of pipes underground) for Co2 transmission and supporting infrastructure - capacity/open access control			4			
Digital subterranean cabling of precinct to support digital communications and automation		11	10	4		3
Middle Arm specific industrial electrical distribution network to transmit industrial green energy supply and secured supply of energy	4	1	9	5		
High capacity, networked power distribution to Middle Arm connected to DKIS		10	11		6	
Upgrade Channel Island power station turbines to accommodate both natural gas and hydrogen	6	9	5	10	4	
Water desalination solution available for industry proponents	2	4	13	-		
Wastewater handling: collection, treatment, recycle and disposal plant able to receive wastewater, treat (recycle) and discharge common-user infrastructure	1	5	1			
Gas pipeline into Middle Arm for proponents to access						
Rail infrastructure - Build upon existing rail lines and connection into East Arm precinct (e.g., line and track extension, railroad conveyor, "rail spur, unloading pit, rolling stock maintenance yard and provisioning facilities)			6	6	1	
Supporting transport infrastructure required for marine development connectivity with industrial parcels roads and services to MOF and Export Jetty and services corridor	7	6	7	7	5	2
Shared workforce transport / transit system – including parking and connections to worksites	8			8		
Worker's accommodation to enable MA workers (residential land release and costs)		8	12	9		
Local emergency response infrastructure – local fire station / medical clinic / EMS	9	7	8		7	
Beneficial re-use of dredge soil for additional economic land			14			

12.7 Appendix G – Methodology and Assumption

Benefit – Land leasing

Description

The benefits for all program packages, including the base case, as the scale of land development remains constant. The benefit is applied as a conservative benchmark. The total land leasing value is appreciated or depreciated based on each program's cumulative common user infrastructure variation. To be conservative, assumptions of 25% and 20% decreasing in land value are applied in Program 1 and Program 3 to reflect the less land leasing benefit received as the result of less common user infrastructure in these Programs.

A \$15 per square meter calculation is used to calculate the land value in Base Case which is the current highest industrial land leasing price in Darwin based on the information from real estate agents.

The annual land leasing revenue is calculated based on a fixed 5% leased yield of total land value, where the total land value is determined by size of leasing land per year and the value of land per unit, these inputs are forecasted by DIPL.

General formula

Annual lease revenue = Total hectare of leasing land each year × the value per hectare × rental yield (5%) × percentage of land value variation based on program.

Input

- Total hectare of leasing land is calculated based on the size of land required by each project and also reflects the different starting time of each project. The size of leasing land for each project is assumed to stay the same during the 50-year forecasting period.

The MOF benefits are calculated based on conservative assumptions of a 2% annual growth rate in charge fee and a 5% annual increase in MOF requirements and the number of ships visiting. These growth rates could increase as the proponent's activities and productivity increase.

Benefit - MOF

Description

The annual wharfage revenue is calculated based on the total size of MOF import requirements and wharfage charge, the port due revenue, berthage revenue and pilotage revenue is generated based on the annual total number of visiting ships of different projects and charged for a fee, per unit. The calculations also take into account a 5% annual growth rate in fees, and 10% annual increasing rate of MOF demands, as the increase of productions and further development of different projects in Middle Arms precinct. The MOF revenues are estimated using the equation below. This approach is in line with the methodology used by DIPL.

General formula

Annual MOF revenue = Wharfage revenue + Port due revenue + Berthage revenue + Pilotage revenue.

- Wharfage revenue = Total cubic meters of MOF import requirements per year $\times$ Wharfage fee per cubic meter $\times$ (1+ increasing rate on fee per year) $^{\wedge}$ forecast years.
- Port due revenue = Total number of visiting ships per year $\times$ Gross tonnes per ship $\times$ Port due fee per gross tonne (large vessels > 20,000GT) $\times$ (1+ fee increasing rate per year) $^{\wedge}$ forecast years.
- Berthage revenue = Total number of visiting ships per year $\times$ Average hours at berthage per ship $\times$ MOF berthage fee per hour $\times$ (1+ increasing rate on fees per year) $^{\wedge}$ forecast years.
- Pilotage revenue = Total number of visiting ships per year $\times$ Pilotage fee per call + Total number of visiting ships per year $\times$ Gross tonnes per ship $\times$ Port due fee per gross tonne (large vessels > 4,500GT) $\times$ (1+ increasing rate on fees per year) $^{\wedge}$ forecast years.

Input

- Total cubic meters of MOF import requirements are calculated by summarising the size required by each project per year, the annual volume also takes account the different starting time of each project. A 10% annual increasing rate of MOF import requirement demand is applied through the 50-year forecasting period.
- Total number of visiting ships is calculated by summarising the size required by each project per year and reflects the different starting time of each project. A 10% annual increasing rate of MOF import requirement demand is applied through the 50-year forecasting period.

Benefit – Jetties

The CBA Jetties benefits include incomes from wharfage, Port due, berthage and pilotage and is estimated using input from DIPL. The annual wharfage revenue was calculated based on the total amount of annual bulk and liquid throughput and fee was charged per unit of bulk and liquid respectively. The port due revenue, berthage revenue and pilotage revenue were generated based on the annual total number of ships required based on the annual bulk and liquid throughput separately and fees were charged per ship call. The Jetties revenues are estimated using the equation below.

General formula

Annual Jetties revenue = Wharfage revenue + Port due revenue + Berthage revenue + Pilotage revenue.

- Wharfage revenue = (Total million tonnes of bulk product throughput $\times$ Bulk fee per million tonnes) + (Total million kilolitres of imported liquid throughput $\times$ liquid import charge per million kilolitres) + (Total million kilolitres of exported liquid throughput $\times$ liquid export charge per million kilolitres).
- Port due revenue = Total number of visiting ships per year $\times$ Gross tonnes per ship $\times$ Port due fee per gross tonne (large vessels > 20,000GT).
- Berthage revenue = Total number of visiting ships per year $\times$ Average fixed berthage charge per ship + Total number of visiting ships per year $\times$ Gross tonnes per ship $\times$ Berthage charge per gross tonne.
- Pilotage revenue = Total number of visiting ships per year (bulk ships and liquid ships) $\times$ Pilotage fee per call + Total number of visiting ships per year (bulk ships and liquid ships) $\times$ Gross tonnes per ship $\times$ Port due fee per gross tonne ship (large vessels > 4,500GT).

Input

- Total million tonnes of bulk product throughput are calculated by summarising the million tonnes of bulk product throughput by each project per year, the total volume also takes account different starting time of each project. A 10% annual increasing rate of MOF import requirement demand is applied through the 50-year forecasting period.

- Total million kilolitres of liquid throughput for import and export are calculated by applying the same methodology as total million tonnes of bulk product throughput above.
- Total number of visiting ships for import and export are calculated by dividing the total bulk and liquid throughput by the bulk and liquid cargo capacity respectively.

Benefits – Road

Road infrastructure development includes several roads required for marine development connectivity with industrial parcels roads and services to MOF and Export Jetty and services corridor.

Benefit – Precinct Roads

This infrastructure is an integral part of supporting the development of other infrastructure. No direct income will be generated from the road infrastructure, but the infrastructure does increase the program's benefits which will be reflected as a part of land leasing benefit.

Benefit - Power networks

The power network infrastructure is essential to support the development of the precinct. The benefits from power networks included two components, the daily system access fee and the demand charges for power usages during peak demand hours. The assumptions and methodology are developed based on the Network Pricing Proposal 2022-2023 of Power and Water³³⁷.

General formula

Power networks revenue = The system access revenues + Demand charge revenue.

- The system access revenues = Daily system access fee × The number of days per year × (1+The annual growth rate) ^The forecasting year × The number of projects per year.
- The annual power usages of projects assumptions are made based on inputs from DIPL's engineering team.

Benefit – Digital networks

The digital network is a commonly used critical infrastructure for industry operations. Benefits associated from digital network accessibility will be calculated based on a 4.4% percentage of the capital costs. This indicative assumption is aligned with the percentage of access revenues contributed to line access charges stated in AARNet Annual Report 2021³³⁸.

- Digital network revenue = Total capital costs × percentage of the capital costs.

Input

- The percentage of the capital costs assumption is aligned with the percentage of access revenues contributed to line access charges stated in AARNet Annual Report 2021³³⁹.

Benefits – CCUS

The CCUS supporting infrastructure strongly aligns with the sustainability objectives and outcomes of the project, supporting the Territory's transition and precinct proponent's products towards a net zero target. The supporting CCUS infrastructure benefit is expected to be \$3,005 and \$589 million on NPV terms. To avoid double counting, the

³³⁷ Power and Water Corporation -Power Services- Extra of Network Pricing Proposal 2022-23 (powerwater.com.au)

³³⁸ ARNet Annual Report 2021

³³⁹ ARNet Annual Report 2021

CCUS benefits associated with revenues only count the income generated from accessing the pipelines of CCUS as this infrastructure only includes channels, and the industries will develop other facilities themselves. It is calculated based on the percentage of total CO2 emissions that are transported through the pipelines, and the fee charged to access the pipelines.

Additionally, CCUS technology unlocks a range of benefits difficult to quantify. The most significant non-quantifiable benefits are associated to CCUS' contribution to the macro circular economy.

General formula

CCUS benefit = Total tonnes of annual CO2 emissions from industries × Percentage of CO2 transported through the pipelines × Pipelines access fee per tonnes of CO2 emission.

Input

- Total annual CO2 emissions from industries are calculated by summarising the annual CO2 emissions by each project per year, the total volume also takes into account different starting time of each project.
- The percentage of CO2 captured by CCUS is assumed to be 90% which is indicated in IEA's CCUS In the Transition to Net-Zero Emissions report³⁴⁰.

Benefits – Shared workplace transit system

The shared workplace transit system revenue is part of worker support infrastructure to enable available transit systems to support the development of Middle Arm and associated industries. The benefits generated from the shared workplace transit system are quantified through car parking revenue, calculated based on Darwin's average fixed daily parking fee and the number of car parks required for workers. Including a contingency of an extra 20% of car spaces for other purposes such as guest car parks, company vehicles, etc. it also takes account the car parks filling rate.

General formula

Shared workforce transport/ transit system benefits = Number of car parks × Car parks filling rate × Average parking fee in Darwin.

Input

- The total car parks are calculated based on the potential jobs stated in Middle Arm Sustainable Development Precinct report 2022³⁴¹. To be conservative, it assumed the car parking spaces only around 30% of total 11,000 jobs stated in the report. Considering the small percentage applied, the car park filling rate is assumed to be 100%
- The average parking fee in Darwin assumption is based on online research of City Parking in Australian Capital Cities³⁴².

Benefit –land releasing for workers' accommodation

The precinct will attract a large amount of skilled workforce required to relocate to the Territory to support the construction of the Middle Arm Precinct and industry development. Based on the information from the Middle Arm Sustainable Development Precinct report 2022³⁴³, a total of 11,000 new jobs will be created through the development of Middle Arm by 2030, which will require residential accommodation. However, Darwin has limited

³⁴⁰ CCUS in clean energy transitions (windows.net)

³⁴¹ Power and Water Corporation -Power Services- Extra of Network Pricing Proposal 2022-23 (powerwater.com.au)

³⁴² City Parking Rates in Australian Capital Cities | Savings.com.au

³⁴³ Middle Arm Sustainable Development Precinct | Department of Infrastructure, Planning and Logistics

available housing³⁴⁴. Therefore, the land release for workers' accommodation plays a vital role as a support infrastructure to enable the development of the MASDP Project and industries.

The revenue from land release within the precinct contributes \$410 million, or \$96 million, on an NPV term to Programs 2 and 4. To be conservative, the revenues are calculated based on the assumption that only 70% of total new workers will lease the accommodations resulting from this land-releasing area. The land leasing price per lot is 3% of the current market asset value, which is aligned with NT's Lease of Crown Land Policy³⁴⁵.

General formula

Worker's accommodation land leasing benefit = Number of new accommodations × land leasing fee per lot.

Input

- This number of new accommodations is calculated based on the number of 4 bedrooms accommodations required based on the number of new potential jobs. To be conservative, it assumed that there are only 70% of these new employees will require new accommodation. It also takes into account the current available accommodation in Darwin and assumes this current accommodation will be filled first.
- The land leasing fee is based on the Darwin median house price and percentage of land leasing yield, the assumptions and approach are aligned with Lease of Crown Land Policy³⁴⁶.

Benefits – wastewater treatments

The wastewater treatment facility will provide a complete packaging wastewater service, including collection, treatment, recycling, and discharge. Therefore, the wastewater treatment revenues will include a fixed annual connecting charge and package charge, calculated based on the wastewater volume. The approach used to quantify the revenue from wastewater treatment system is derived from the Hunter Water's Pricing of Water, Wastewater and Stormwater Services Technical Paper ³⁴⁷.

General formula

Wastewater system benefits = Fixed annual connecting revenues and wastewater treatments package revenues.

- Fixed annual connecting revenues = Fixed annual connecting fee × The total number of proponents × Percentage of proponents who will use this common wastewater system.
- Wastewater treatments package revenues= Total water used in Middle Arm Precinct by industries × Percentage of water used required treatment × Wastewater treatments package fee per unit of wastewater.

Input

- These inputs and assumptions are made based on information from Pricing of Water, Wastewater and Stormwater Services published by Hunter Water³⁴⁸.

³⁴⁴ Dwelling type | City of Darwin | Community profile (id.com.au)

³⁴⁵ Leases of Crown Land Policy (nt.gov.au)

³⁴⁶ Leases of Crown Land Policy (nt.gov.au)

³⁴⁷ technical-paper-08-pricing-of-water-wastewater-and-stormwater-service.pdf (nsw.gov.au)

³⁴⁸ Leases of Crown Land Policy (nt.gov.au)

- The amount of water used in Middle Arm Precinct is based on the forecast by PWC³⁴⁹.

Benefit – Channel Island

No direct revenue will be generated from this infrastructure, but the infrastructure does increase the program's benefits which will be reflected as a part of land leasing benefits.

Benefits – Environmental benefits

The environmental benefits are calculated based on the volume of CO₂ emissions reduced resulting from CCUS and green power network infrastructure development. The monetised environmental and social benefit realised is calculated on the volume of CO₂ emissions reduced from operational industries, the costs based on the forgone CO₂ emissions. To avoid double counting, the environmental benefits do not include the fee for transporting CO₂ emissions through the pipelines under CCUS infrastructure. The benefits include two components. The benefit is generated from the program by avoiding costs of CO₂ emission to the environment and society as the result of providing green power to some potential proponents, such as solar power. Another benefit is the reduction of CO₂ emissions through CCUS infrastructure by collecting the emissions from gas users.

General formula

Environment benefits = Avoiding costs of CO₂ emissions from green energy supply + Reduction of CO₂ emissions through CCUS infrastructure.

- Avoiding costs of CO₂ emissions from green energy supply = The CO₂ emissions avoid through green energy supply × the costs to social and environment per tonnes of CO₂ emissions.
- Reduction of CO₂ emissions through CCUS infrastructure= Reduction of CO₂ emissions through CCUS infrastructure× the costs to social and environment per tonnes of CO₂ emissions.

Input

- The inputs of CO₂ reduction through CCUS and power networks based on information obtained from DIPL.
- The costs of CO₂ emissions to environment and social is made based on online research.

12.8 Appendix H – Rapid CBA assumptions

Table 40: Rapid CBA assumptions

Description	Unit	Assumption	Source
MACRO			
Project start	Year	June 2023	DIPL
Project finish	Year	June 2073	DIPL
Forecast Period	Years	50	DIPL
Discount rate	% (real)	7.0	IA
Total number of potential proponents	#	11	DIPL
MOF Benefits			
Total MOF requirement	M3	1,339,715	DIPL
Total MOF ship calls	#	55	DIPL

³⁴⁹ Adelaide River Off-stream Water Storage Project detailed business case (nt.gov.au)

Description	Unit	Assumption	Source
Gross tonnage per call	GT	26,500	DIPL
Time at berthage per call	Hours	6	DIPL
Wharfage charge	AUD\$/m3	13	DIPL
Port dues based on ship calls (Large vessels > 20,000GT)	AUD\$/GT ships	0.032	DIPL
MOF berthage charges	\$/hour	759	DIPL
Pilotage fees, fixed minimum charge	AUD\$/call	1,783	DIPL
MOF requirements annual growth rate	%	5%	Estimated in discussion with DIPL
MOF ships calls annual growth rate	%	5%	Estimated in discussion with DIPL
Growth rate of fee charged	%	2%	Estimated in discussion with DIPL
Jetties Benefits			
Bulk liquid fuels	Tonnes	30,000	DIPL
Bulk throughput	Kilolitres	72,455	DIPL
Cargo capacity - bulk	GT	26,500	DIPL
Cargo capacity - liquids	Hours	6	DIPL
Bulk products (import/export)	AUD\$/tonne	6	DIPL
Bulk liquid fuels (import)	AUD\$/kilolitre	6	DIPL
Bulk liquid fuels (export)	AUD\$/kilolitre	8	DIPL
Fixed charge- Berthage& moorings	AUD\$/call	2,134	DIPL
Berthage charge per GT	AUD\$/gross tonnage of ship	0.32	DIPL
Port dues based on ship calls (Large vessels > 4500GT)	AUD\$/GT of ship	0.32	DIPL
Land Lease Revenue			
Size of land	Ha	743	DIPL
Land value- Project Case	\$/m2	40	DIPL
Land value-Base Case	\$/m2	15	O'Donoghue's first nation
Lease yield	%	5%	DIPL
CO2 Emission Revenue- CCUS Pipelines			
CO2 emissions	Tonnes/Year	3,285,000	DIPL
Percentage of CO2 emission transported through CCUS pipelines	%	90%	CCUS in clean energy transitions (windows.net) from IEA
Pipelines access fee	USD\$/tCO2	35	Is carbon capture too expensive? – Analysis - IEA
Power Network Revenue			
Average power usage per project	MW hr/year	2,102,400	DIPL

Description	Unit	Assumption	Source
Number of hours in peak demand period	Hours	9	Number of Hours from 12pm to 9pm
Power throughput precinct charge- Daily system access charge	AUD \$/day/ NMI	85	Power and Water Corporation -Power Services- Extra of Network Pricing Proposal 2022-23 (powerwater.com.au)
Demand charge	AUD\$/KVA	8	Power and Water Corporation -Power Services- Extra of Network Pricing Proposal 2022-23 (powerwater.com.au)
Growth rate of fee charged	%	2%	Estimated in discussion with DIPL
Digital Networks Benefits			
Digital revenue % of total digital capital costs	%	4.4%	Based on the access revenue % PPE assets stated in Primex Manufacturing Inc's report
Shared Workforce Transit System Revenue			
Total number of parking required by employees	#	1,409	Estimated in discussion with DIPL On a conservative basis, 25% of 11,000 new potential new jobs are forecasted in MASDP Final Report
Percentage of additional car parks	%	20%	Estimated in discussion with DIPL On a conservative basis, 20% of additional car parking spaces are needed for other using purpose (e.g. guests parking, company vehicles etc)
Land Releasing Revenue			
Total current available accommodation	#	1,409	Based on the unoccupied dwellings in 2021 from City of Darwin
Total number of potential employees require accommodation	#	700	11,000 new potential new jobs are forecasted in MASDP Final Report, 70% employees need accommodation which is estimated in discussion with DIPL on a conservative basis
Average bedrooms per accommodation	#	4	2016 Darwin City, Census All persons QuickStats Australian Bureau of Statistics (abs.gov.au)
Median house price in Darwin	AUD\$	583,750	Housing - Northern Territory Economy
Land leasing yield % market housing price	%	3%	Leases of Crown Land Policy (nt.gov.au)
Wastewater system benefits			
Total water usage	ML	27,000	Adelaide River Off-stream Water Storage Project detailed business case (nt.gov.au)
Percentage of wastewater out of total water used	%	40%	Based on percentage of wastewater out of total raw water used stating in Water for Hydrogen – GHD
Percentage of proponents use common wastewater treatment system	%	50%	Estimated in discussion with DIPL

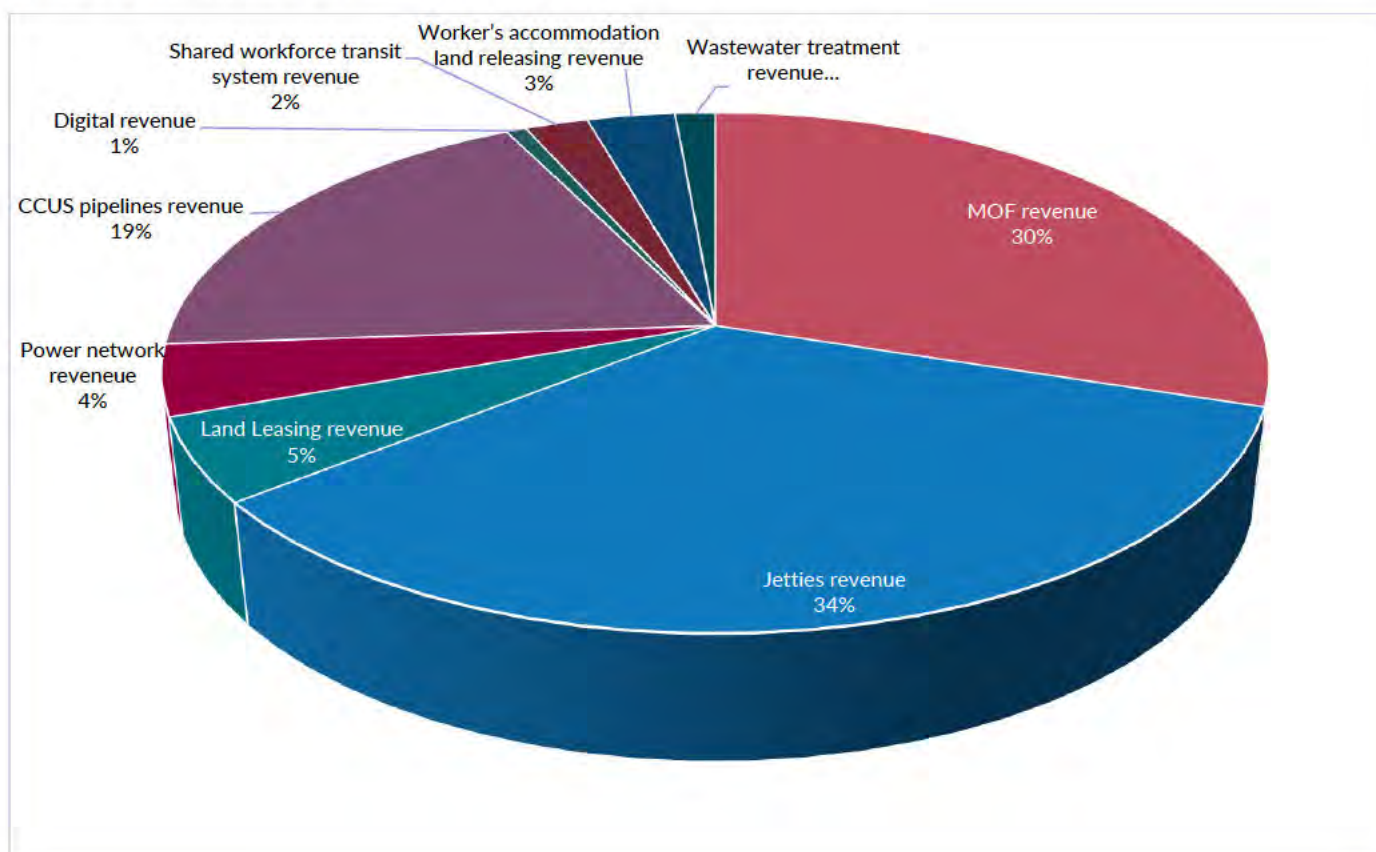
Description	Unit	Assumption	Source
Average connection charge	AUD\$	762	Hunter Water's Pricing of Water, Wastewater and Stormwater Services Technical Paper
Wastewater treatment package charge (collection, treatment, recycle and discharge)	AUD\$/KL	0.45	Hunter Water's Pricing of Water, Wastewater and Stormwater Services Technical Paper
Environment Benefits			
Avoid CO2 emissions from using solar power	Tonnes/year	132,926	prior public and engineering reports related to the potential industries. A range of Subject Matter Experts (SME) within DPIL's engineering department were consulted to support the assumptions
Reduction of CO2 emissions from using CCUS	Tonnes/year	2,956,500	DIPL
Emission costs to social and environment	AUD	50	The true cost of carbon pollution - Environmental Defence Fund (edf.org)

12.9 Appendix I – Benefit result summary

Table 41: Benefit Result Summary

Descriptions	Base case	Program 1	Program 2	Program 3	Program 4
Total benefits (AUD\$m, real)	255	11,815	23,604	12,752	23,813
Total present value of benefits (AUD\$m, PV)	61	1,815	3,992	1,968	4,035
Net benefit relative to Base Case (AUD\$m, real)		11,357	18,786	12,293	18,995
Net present value of benefits relative to Base Case (AUD\$m, PV)		1,754	3,931	1,907	3,974

Figure 36: Benefits profile by the benefits type



12.10 Appendix J – Capex Costs

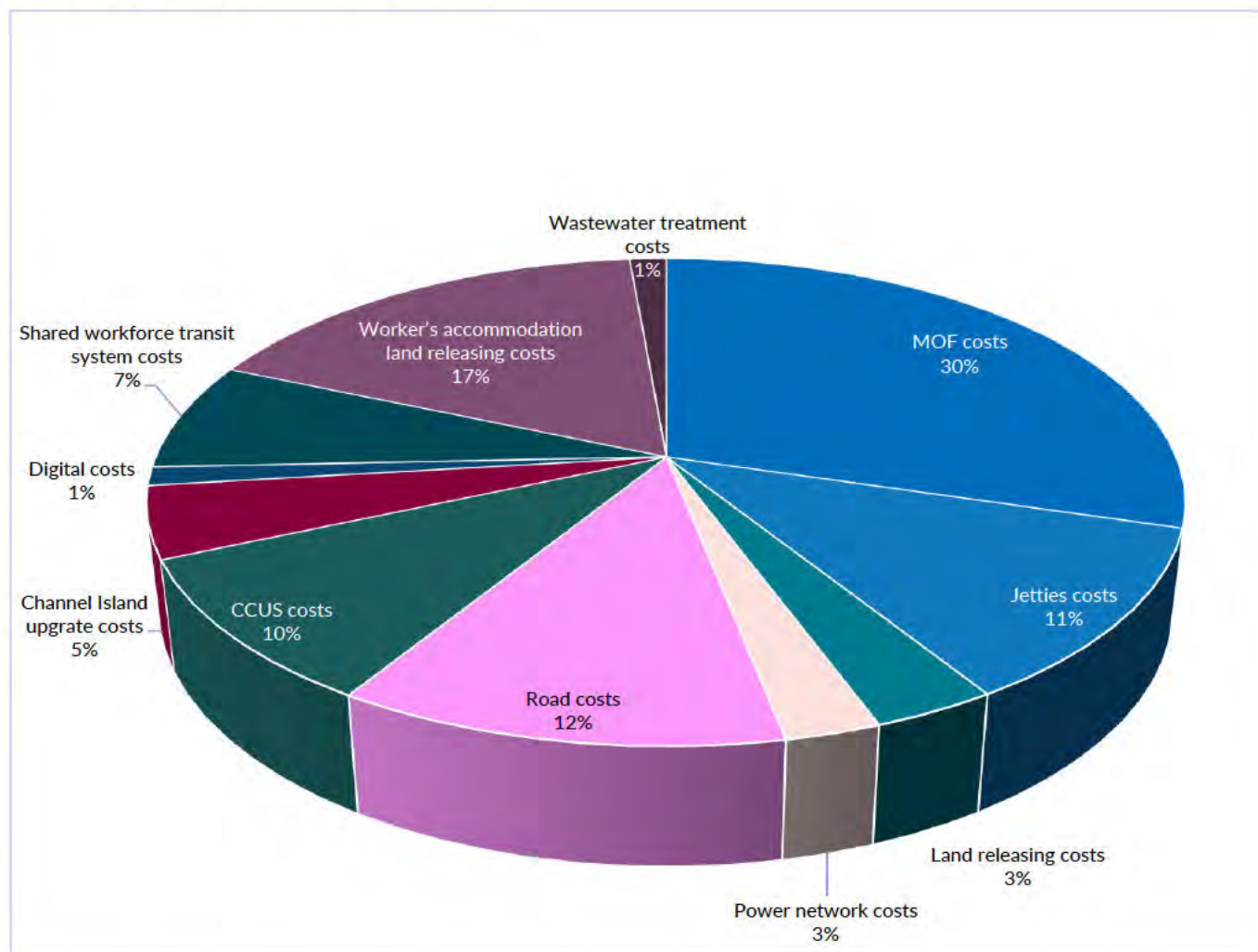
Table 42: P50 capital costs summary

Descriptions	Base case	Program 1	Program 2	Program 3	Program 4
Capex (AUD\$m, real) – P50	119	2,117	3,552	2,166	3,601
Present value of capex (AUD\$m, PV) – P50 ³⁵⁰	100	1,788	3,001	1,830	3,043
Net capex relative to base case (AUD\$m, real) – P50		1,998	3,433	2,047	3,483
Net capex relative to base case (AUD\$m, PV)- P50		1,688	2,901	1,729	2,942

Figure 37 illustrates the percentages of total capital costs contributed by each infrastructure option, where all the infrastructure options have been considered. The marine infrastructure (MOF and Jetties) are the main drivers of the total capital costs, accounting for 41% of total capex. The scale of these infrastructure options primarily drives the high costs to meet the high demands required by potential proponents.

³⁵⁰ Discounted at 7% per annum over a 50-year appraisal period

Figure 37: P50 Capex profile by infrastructure



Opex and maintenance capex

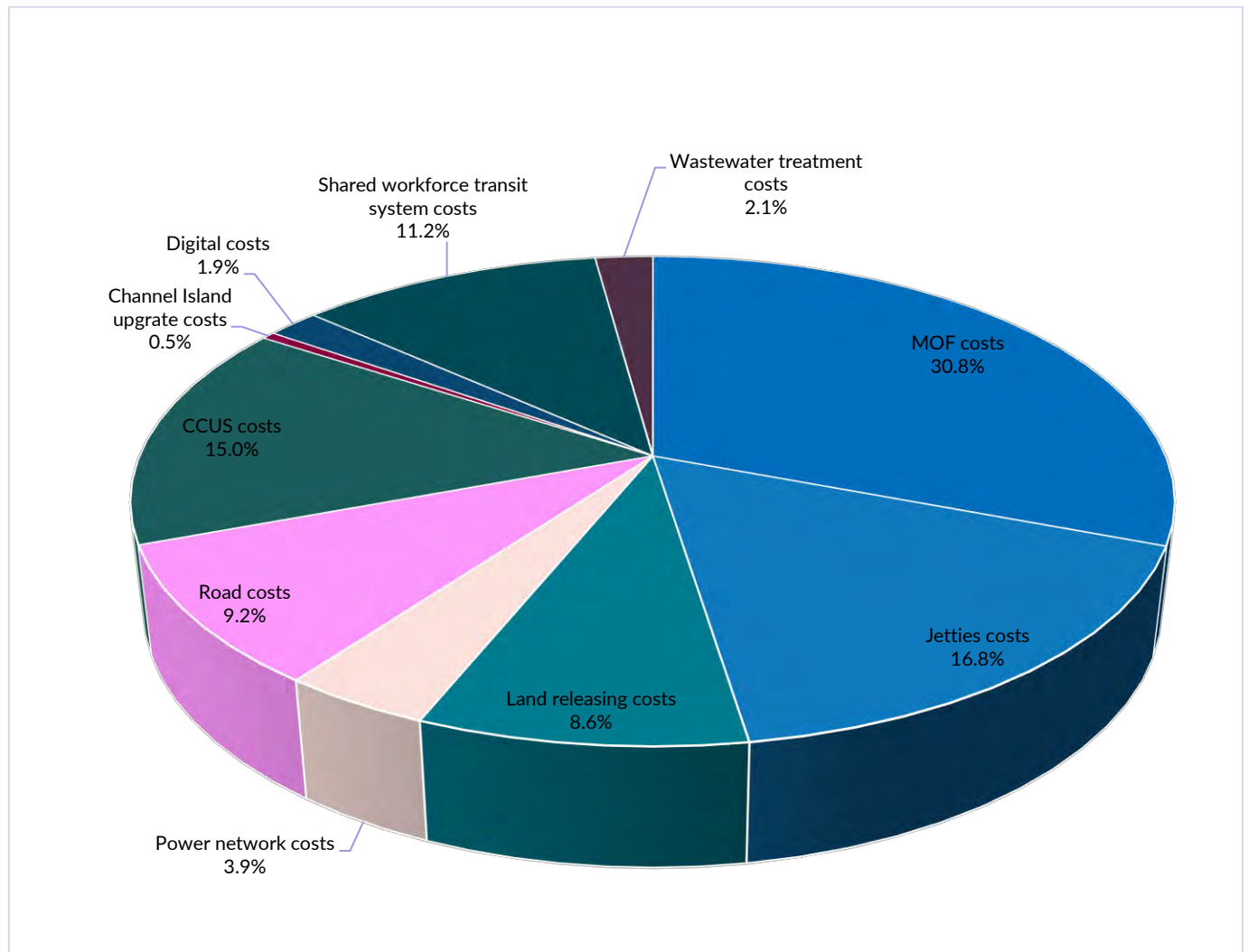
Total operational and maintenance costs commence from the operating period FY2028. The core economic appraisal results are forecasted on a year-by-year basis for each infrastructure option, through the appraisal period and presented using P50 costs, discounted at 7% per annum back to the end of FY2023 over a 50-year appraisal period. The operational costs based on the assumption that all the infrastructure will be continuously operating throughout the appraisal period.

Table 43: Opex and maintenance summary

Descriptions	Base case	Program 1	Program 2	Program 3	Program 4
Opex (AUD\$m, real) – P50	273	2,208	3,126	2,276	3,194
Present value of opex (AUD\$m, PV) – P50	66	535	755	551	772
Net opex relative to base case (AUD\$m, real) -P50		1,935	2,852	2,003	2,920
Net opex relative to base case (AUD\$m, PV) – P50		468	689	485	705

Figure 38 illustrates the percentages of total operational costs contributed by each infrastructure option where all the infrastructure options are considered. The marine infrastructure (MOF and Jetties) are the main drivers of the opex, which accounts for 47% of the total operational costs. As a result of high demands, the increased usage frequency of marine infrastructure would likely result in high operating and maintenance costs.

Figure 38: P50 Opex Profile by infrastructure



12.11 Appendix K – Real value of benefits and costs results summary

Table 44: Real value of benefits and costs results summary

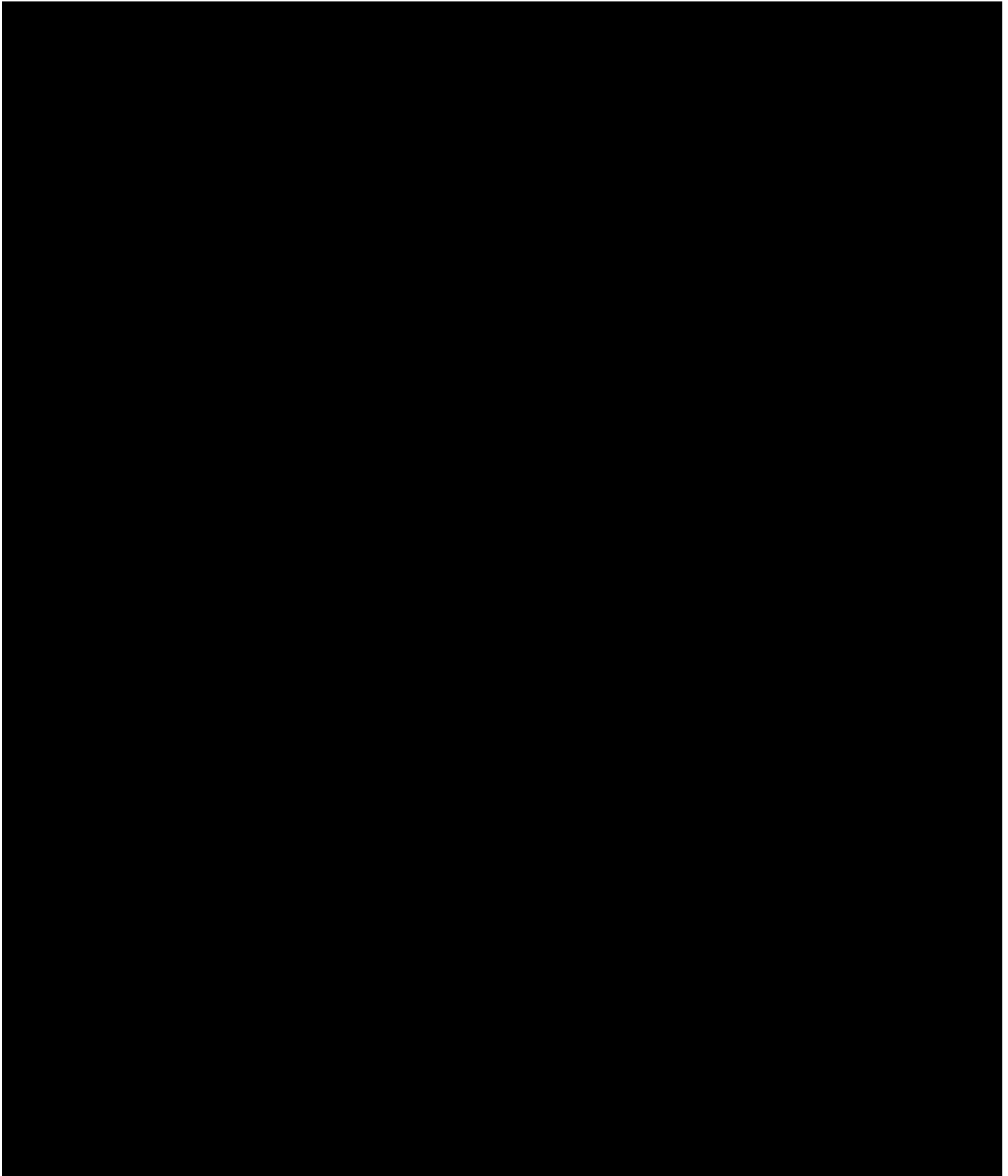
Description	Base case	Program 1	Program 2	Program 3	Program 4
Total benefits (AUD\$m, real)	255	11,815	23,604	12,752	23,813
Total costs (AUD\$m, real) – P50 ³⁵¹	392	4,325	6,678	4,442	6,795
Net value (AUD\$, real)	(137)	7,491	16,926	8,309	17,018
Net value relative to base case (AUD\$, real)		7,628	17,064	8,447	17,156

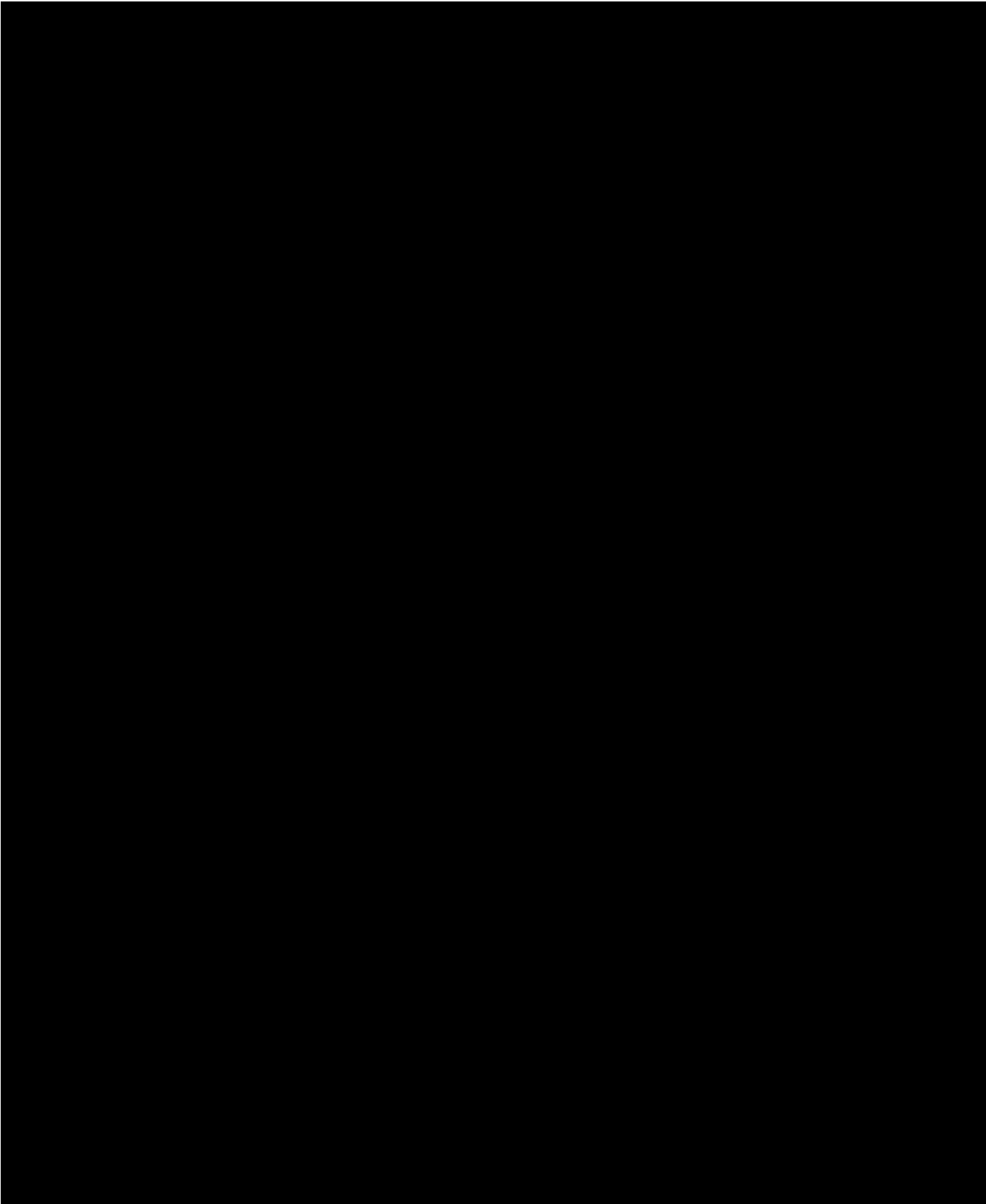
³⁵¹ The present value includes both opex and capex

12.12 Appendix L – Middle Arm Sustainable Development Projects

	Project	Inputs	Outputs	Related Projects
1	Carbon capture and storage common-user hub	Waste or by-product streams from SMR and other hydrocarbon processes	Carbon dioxide	Output of Blue Hydrogen Feedstock to Methanol export plant Feedstock to Urea
2	Liquefied Natural Gas (LNG) Train	Natural gas	Liquefied natural gas, carbon dioxide (nitrogen, helium and natural gas liquids as potential by-products)	All except lithium and phosphoric acid.
3	Blue Hydrogen	Natural gas, water	Hydrogen Carbon dioxide	Feedstock to Methanol export plant Feedstock to Ammonia export plant
4	Green Hydrogen	Renewable energy, water	Hydrogen	Feedstock to Methanol export plant Feedstock to Ammonia export plant
5	Ammonia export plant	Hydrogen, Zinc Oxide and air (Nitrogen)	Ammonia, Zinc Sulphide	Output of Hydrogen Feedstock to Urea
6	Methanol export plant	Hydrogen, carbon dioxide OR synthesis gas	Methanol, water	Feedstock from Hydrogen
7	Condensate refinery	Condensate, water, gas, renewable energy	Gasoline, Kerosene, Diesel, Marine, Heavy	
8	Phosphoric acid production facility	Phosphate rock, sulphuric acid	Phosphoric acid, calcium sulphate (gypsum)	Output of Ammonia export plant to produce fertiliser products
9	Ethane cracker	Ethane, propane	Ethylene	
10	Urea	Ammonia, carbon dioxide	Urea	Feedstock from Ammonia export plant Feedstock from Carbon capture and storage common-user hub
11	Lithium Hydroxide	Lithium carbonate, calcium hydroxide	Lithium hydroxide	

12.13 Appendix M – Letters of support from possible proponents





Tamboran Resources

110-112 The Corso
Manly, NSW 2095



5 October 2022

Infrastructure Commissioner of the Northern Territory
Infrastructure NT
Department of Infrastructure, Planning and Logistics
Northern Territory Government
Floor 7, Charles Darwin Centre, Smith Street Mall, Darwin NT

Dear [REDACTED]

Thank you for the opportunity to express Tamboran's support for common-user facilities in the proposed Middle Arm Sustainable Development Precinct (MASDP) in Darwin. The proposed precinct is an integral part of Tamboran's aim to maximise the benefits to the Northern Territory from the Beetaloo Basin development: it provides long-term high value jobs to the local workforce; it enables direct economic benefit to local communities and the Northern Territory Government; it facilitates the development of a secure low-carbon energy source to allow global communities an orderly transition towards net-zero carbon aspirations; it provides a new source of gas to stabilise the east-coast energy shortage. The MASDP is a key element to the Northern Territory and Australia managing a stable and cost-efficient transition towards net-zero carbon commitments.

Tamboran Resources Limited (Tamboran) is a next-generation gas producer with a vision of supporting the net-zero carbon energy transition in Australia through developing the low CO₂ gas resource in the Beetaloo Basin. Tamboran is listed on the Australian Stock Exchange (ASX:TBN), and is the owner and operator of the largest and most advanced project within the basin. Our global management team holds deep experience in the successful commercialisation of unconventional gas throughout North America and is complemented by domestic expertise and industry leading community relationships. Tamboran is committed to moving rapidly to finalise appraisal and commit to a pilot development to deliver gas to the NT and east coast domestic markets. Tamboran is in discussions with local gas customers with operations in the Northern Territory. We have a binding gas sales agreement with Origin Energy Ltd, the largest gas retailer in Australia, for 100TJ/d and a binding MOU with Jemena Ltd to transport this gas along their Northern Gas Pipeline. We anticipate our first sales under these agreements in 2025.

The initial gas production from Tamboran's fields will flow along existing pipelines to supply the local market and the east-coast market which is currently facing a gas shortfall next year. However, this existing infrastructure cannot accommodate the large volumes that the market requires, which could reach 1,000-2,000TJ/d by the end of this decade - and new pipelines to the east-coast and/or a new pipeline and new gas demand in Darwin is required: new demand in Darwin, such as a new LNG facility in the MASDP, would be a geographically and economically advantaged destination for Beetaloo gas. Therefore, Tamboran proposes to construct new LNG facilities in the MASDP as part of a broader integrated project which also

includes development in the Beetaloo Basin and a large diameter pipeline connecting the Basin to industries in the MASDP.

Common-user facilities in the MASDP are important to create stakeholder support, to minimise public and environmental impacts, and to drive economic efficiencies. Tamboran applauds the foresight of the Northern Territory Government to propose the MASDP and the efficient common-access approach to key utilities. Access to key utilities, such as power, water, waste systems, and transport infrastructure streamline our development proposal by creating synergies with other users and minimising the environmental impact. Because Tamboran is committed to being a net-zero carbon gas producer we are constantly pursuing opportunities to reduce our carbon footprint: common-user facilities in the MASDP allow us to do this by reducing demand and overspend, and through access to a common power supply which could be connected to a renewable generation source.

The Beetaloo Basin has the ability to rebuild the Northern Territory economy, to transform Northern Territory communities, and to underpin a stable east-coast and global transition to meet its net-zero carbon commitments. The MASDP, and associated common-user facilities, are a core enabler for the success of the Basin. Tamboran has been actively engaged with local and international institutional investors and has received consistent feedback that Governmental and Departmental support for new LNG facilities in the MASDP is viewed very favourably in their decision making to finance projects. If Infrastructure Australia supported the common-user infrastructure in the MASDP, and Tamboran is awarded land in the Precinct, then we feel confident - subject to the standard Final Investment Decision review process - that we could secure funding for the project.

Tamboran sees significant economic and intangible value in the development of common-user facilities in the MASDP, and strongly supports this application.

Please contact me directly [REDACTED] if you would like further information.

Sincerely,



Managing Director & CEO

tamboran
RESOURCES

[tamboran.com](https://www.tamboran.com)

Next Generation E&P Company with a Vision of
Supporting the Net Zero CO₂ Energy Transition

Tamboran Resources Limited. ASX:TBN
ABN 28 135 299 062

Tamboran Resources Ltd

