



Photo courtesy of Fremantle Ports

**In Westport Beacon 6, we shared the details of the 25 port and supply chain options that made our long-list. Each had benefits and challenges, pros and cons.**

To determine the best options among the 25, the performance of each was tested across a range of important criteria shaped by all your views and input to date. This process – known as a multi-criteria analysis – allows all of the options to be ranked in terms of how they best meet the long-term freight needs of Western Australia.

The first multi-criteria analysis (MCA-1) has now been completed and the top five options – which now forms Westport's shortlist – are:

- three stand-alone Kwinana options; and
- two shared Fremantle/Kwinana options.

This shortlist will now go through a second, even more rigorous multi-criteria analysis (MCA-2) and a cost-benefit analysis to determine the strongest option. This work will form the basis of Westport's recommendations for managing Perth's expanding freight task long-term.

In this Beacon, we share with you the details of the shortlisted options, explain how the top options were determined and why the other options did not perform as well.

# What criteria were used to assess the options?

With the benefit of input from stakeholders, a list of assessment criteria was identified that would assist in separating and emphasising the differences between the options, and help determine a clear ranking.

The purpose of MCA-1 was to:

1. measure how well the options performed against the essential components that make up a successful port and supply chain;
2. highlight the strengths and weaknesses of each option;
3. test each option's reliance on just one or two areas of strength – rather than an acceptable or high ranking across all criteria – by conducting sensitivity testing; and
4. allocate scores which would allow the top-ranked options to be taken forward to the next stage of testing.

The diagram below shows the final list of criteria and sub-criteria used to assess the long-list in MCA-1:

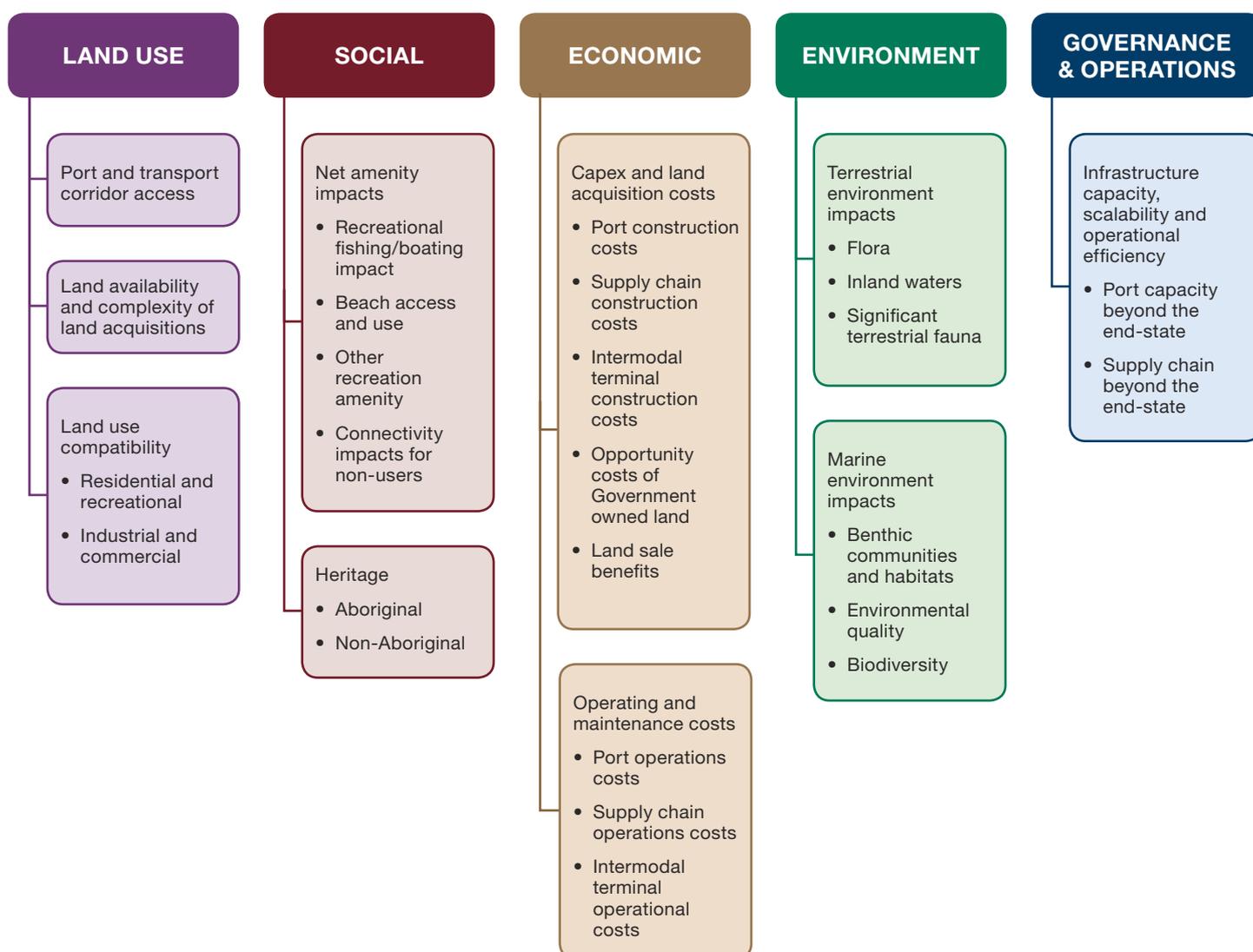


Diagram 1: Criteria and sub-criteria used to assess the 25 long-list options in MCA-1

## Are some criteria more important than others?

**Yes. Some criteria are essential if the anticipated freight demand is to be managed, while others are less critical in terms of achieving that fundamental requirement but are still desirable in the outcome. To represent this, the criteria were assigned different weightings relative to Westport’s overall objectives.**

The weightings for the MCA-1 criteria were determined with the benefit of a series of workshops with subject matter experts from the Westport Taskforce; by wider stakeholder and community feedback; and Westport’s own investigations.

It is worth noting that the environmental and social criteria (marine environmental impacts, terrestrial environmental impacts and net amenity impacts) make up nearly one third of the total weightings (30.9 per cent). This is in response to the high number of community members and stakeholders who have voiced their concerns over these values.

To accurately reflect this feedback, Westport assigned these criteria higher weightings to ensure that options with lower environmental and social impacts would score better than options with more detrimental impacts. Westport will continue to make environmental and social outcomes a priority for the project, with further investigations and assessments being undertaken for MCA-2.

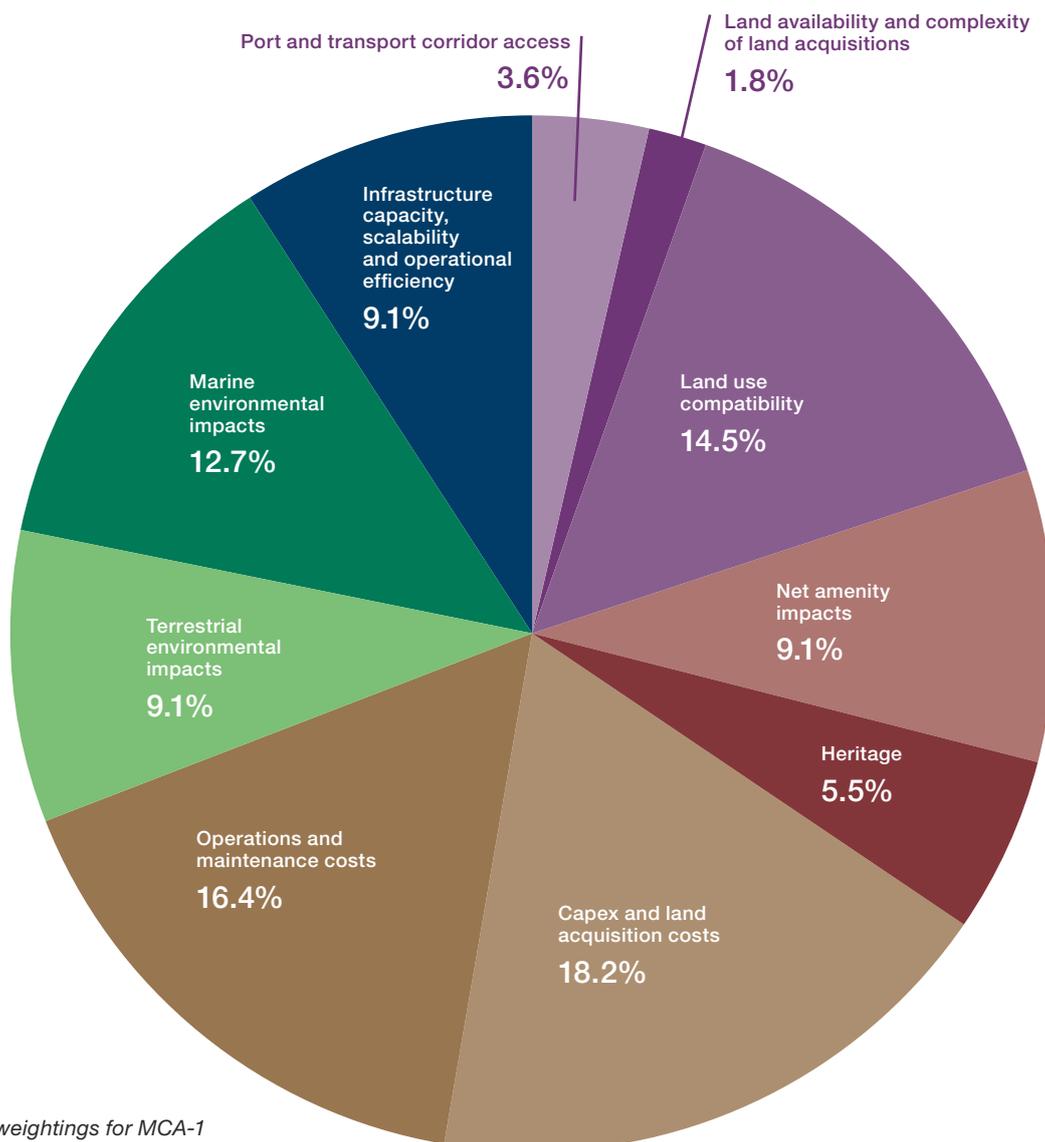


Diagram 2: Criteria weightings for MCA-1

# An explanation of the assigned weightings

**While all of the assessment criteria were deemed to be of high importance, the assigned weightings shown in Diagram 2 are further explained below:**

1. Capital expenditure and land acquisition costs, as a combined criterion, was weighted highest (18.2 per cent) as affordability was considered the most important criterion for the State. It is critical that Westport delivers an outcome that is financially responsible for the State.
2. Similarly, operations and maintenance costs received the second highest weighting of 16.4 per cent, as the final option must be commercially viable and affordable for the long-term.
3. Land use compatibility was weighted third at 14.5 per cent, as the impacts of expanded road and rail corridors, increased freight movement and/or a new port would be significant on nearby residences.
4. Marine environmental impacts were weighted highly at 12.7 per cent as a result of strong community support for this criterion.
5. Terrestrial environmental impacts were also weighted highly at 9.1 per cent, again in acknowledgment of the importance of this value to the community.
6. Net amenity impacts – such as impacts on recreation, visual amenity and beach use – were weighted equally at 9.1 per cent, based on strong community feedback around these issues.
7. The ability to expand the infrastructure (scalability) in the long-term if required and operational efficiency was similarly weighted at 9.1 per cent.
8. Other determining factors were deemed to be heritage impacts (5.5 per cent), port and transport corridor access (3.7 per cent) and land availability and complexity of acquisitions (1.8 per cent).

## Ranking the options

**To apply the assessment criteria to the 25 options to determine their scores and ranking, Westport held more than 16 hours of workshops with subject matter experts. For every option, a score of one-to-five was assigned for each criterion; one being the worst performing option and five the best performing option (with at least one best- and worst-performing option assigned for every criterion). This allocated the options a final score out of 500 points.**

It is worth noting that as options were compared against each other, the scoring was relative against the other option. So, for example, when we say that some options have 'low environmental impacts', this is true when compared to some of the other options, which may have much higher environmental impacts.

These scores were then sensitivity tested. This is an important process to determine if any options are reliant on only one or two strengths rather than being strong across all criteria. This process ensured the robustness of the shortlist.

# Westport's shortlist

– to be explored and tested further

## #1

### Kwinana Option 23 – ranked 1st

**Option 23 was the top-ranked option in MCA-1.**

**The strengths of this option are:**

- Scored highly on all criteria, except land availability and beach access/use.
- Good land transport connections.
- Low environmental impacts in comparison to other options.
- Tried-and-tested conventional port design.
- Frees up Fremantle for alternative use.

**Potential weaknesses of this option are:**

- Connecting the last kilometre of Anketell Road and the rail line through to the port may be challenging given existing land holdings and infrastructure in the area.
- The port will displace the Kwinana horse beach.
- Hydrodynamic impacts on Cockburn Sound still to be thoroughly tested.

This option (23) is a stand-alone conventional land-backed port handling the full forecasted container task of 3.8 million TEU\*. It has an intermodal terminal (IMT) as part of the port precinct and is more reliant on road transport over rail. The port extends along the coastline between the Kwinana Bulk Terminal and the Alcoa jetty. It is serviced by an extended Anketell Road that connects through to Tonkin Highway, and a rail track duplication between the Cockburn Triangle and Kwinana Industrial Area.

This option was strong across all criteria and topped the rankings regardless of which criteria were given the highest weighting.

\*TEU = Twenty-foot equivalent unit – the volume measurement for containers.



Map 1: Kwinana Option 23

## #2

### Fremantle Option 2 and Kwinana Option 24 Shared port scenario – ranked 2nd

**The shared-port combination of Kwinana Option 24 and Fremantle Option 2 was the second-highest scoring option in MCA-1.**

**The strengths of this option are:**

- Scored highly on all criteria, except land availability and beach access/use.
- Good land transport connections.
- Low environmental impacts.
- Can be an end-state or transitional scenario.
- May allow Fremantle to continue handling containers.

**Potential weaknesses of this option are:**

- Connecting the last kilometre of Anketell Road and the rail line through to the port may be challenging.
- The port will displace the Kwinana horse beach.
- Hydrodynamic impacts on Cockburn Sound still to be thoroughly tested.
- The commercial feasibility of having two container ports within close proximity is still being investigated.
- The ongoing operational expenditure of maintaining and managing two container ports must be considered.
- Requires investment in a new port in Kwinana without the potential value capture offsets of making the Fremantle land available for alternative uses.

Options 24 and 2 were the highest ranked shared-port option. The Kwinana port component is essentially the same design as Option 23, but with a slightly smaller port footprint as it would handle the freight task in partnership with Fremantle. It has an IMT as part of the port precinct, is reliant on roads over rail, and is serviced by an extended Anketell Road and duplicated rail track between the Cockburn Triangle and Kwinana Industrial Area.

The Fremantle component (Option 2) is the existing Inner Harbour footprint but with some additional road, rail and operational enhancements.

This option also performed strongly across all criteria and ranked within the top four on all further tests.



Map 2: Kwinana Option 24

### #3

## Fremantle Option 2 and Kwinana Option 24 Shared port scenario featuring the Blue Highway

**This option is the same as the second-ranked option on the previous page except it incorporates the Blue Highway concept of transporting containers from Fremantle to Kwinana on shallow draught barges.**

This scenario has been included in the shortlist to allow Westport to thoroughly investigate the viability of the Blue Highway – which is a common method of transporting containers upstream in other countries – for this particular scenario.

For the purposes of MCA-2, the Blue Highway concept will be tested as an end-state. However, it is more likely feasible as a temporary mode of transporting containers from Fremantle to Kwinana during a transition phase, due to its low capital cost requirements.

The Blue Highway concept proposes containers being moved directly from the large container ships onto small barges using specially-designed loading equipment. The barges would then transport the containers directly down to the Kwinana port for offloading onto trucks.

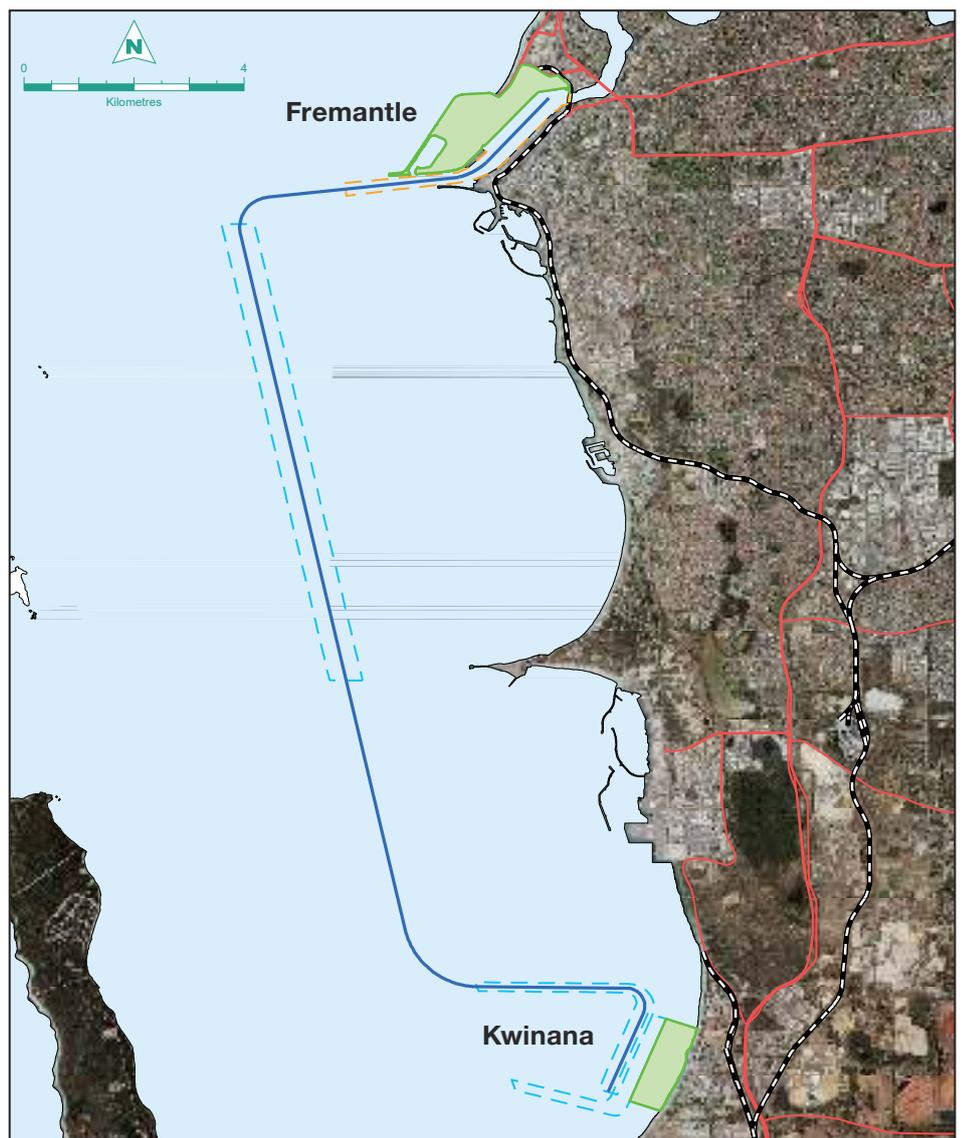
A benefit of the Blue Highway is that less dredging may be required due to the shallower depth of the barges.

The intermodal facility on the Kwinana port would allow for containers to be shifted directly from the barge gantry onto trucks, as shown in Image 1 (top right). This would save on time and infrastructure costs.

For additional investigation is whether the shipping conditions along the coast of Perth may require a breakwater to be built to protect the barges and container transfer operations. Further, the operational costs of this option are likely to be high given the requirement to invest in specialised equipment and barges.



*Image 1: Artist's impression of the barge-to-truck intermodal operations*



Map 3: Fremantle to Kwinana 'Blue Highway'

# #4

## Kwinana Option 11 – ranked 4th\*

**Option 11 was the fourth-ranked option overall and the top-ranked light footprint port.**

### The strengths of this option are:

- Scored highly on most criteria across the board.
- Innovative narrow design that could deliver superior marine environmental outcomes.
- Good land use outcomes.
- Utilises Latitude 32 industrial estate as an intermodal terminal, which is the purpose for which that land was acquired by Government.
- Enables Westport to investigate the viability of light footprint container ports.

### Potential weaknesses of this option are:

- Connecting the land bridge from the port to Latitude 32 will be challenging.
- Light footprint ports are a new concept and have not yet been tested in Australian conditions; an extensive amount of research will need to be done to see whether this design is viable.
- Some unknowns in relation to the capital and operational costs.
- Hydrodynamic impacts on Cockburn Sound still to be thoroughly tested.

This light footprint port is a stand-alone option handling the full 3.8 million TEU container task. It has a physically smaller footprint than a conventional port as the IMT operations are decoupled and located in a separate area – in this instance, at Latitude 32. The theory is that a narrower port will have better marine environmental outcomes, however this concept is relatively new for container ports and must be further tested. Containers would be moved to or from the ship via Automated Guided Vehicles (AGV) that transfers them over a 4km 'land bridge' to the IMT at Latitude 32, where they are then transferred to trains or trucks.

This option is located in the north of Cockburn Sound. It will be serviced by an expanded Rowley Road linking directly through to Tonkin Highway, and a freight rail duplication between the Cockburn Triangle and the Kwinana Industrial Area. It connects to land immediately south of the Naval Base shacks and extends south-west into Cockburn Sound past the Alcoa jetty utilising the existing channel. Ships would enter and leave the port from the south.

\*The third-ranked option was Kwinana Option 13 (hybrid conventional port), which is an expanded end-state of Option 14 (see next page). Even though Option 13 scored slightly higher, it was decided to test Option 14 in the shortlist as it would meet the end-state container-handling requirement of 3.8 million TEU without the additional land-backed component of the hybrid design (which could be added in the future if needed).



Map 4: Kwinana Option 11

## #5

### Kwinana Option 14 – ranked 5th

**Option 14, a stand-alone conventional island port, ranked 5th in the overall rankings.**

**The strengths of this option are:**

- Scored highly on all criteria, except land availability and beach access/use.
- Good land transport connections.
- Relatively low environmental impacts.
- Can be an end-state or transitional scenario to hybrid Option 13.

**Potential weaknesses of this option are:**

- Connecting the last kilometre of Anketell Road and the rail line through to the port will be challenging given numerous land holdings and existing infrastructure in the area.
- Hydrodynamic impacts on Cockburn Sound still to be thoroughly tested.
- More impact on the marine environment due to the area of infill when compared to land-backed or light footprint ports.

This port could handle the full 3.8 million TEU with an IMT facility as part of the island port precinct. The port connects to land adjacent to the Kwinana Industrial Area and the island extends north-westerly in Cockburn Sound towards the Alcoa jetty. Ships enter the channel from the north.

This port is mainly road-reliant and serviced by an expanded Anketell Road, but also requires a duplicated freight rail track between the Cockburn Triangle and Kwinana Industrial Area.



Map 5: Kwinana Option 14

# Filling the knowledge gaps

## Westport’s shortlist has delivered a varied selection of options to test in more detail:

- two shared-port options featuring Kwinana and Fremantle;
- a land-backed conventional port in Kwinana;
- a conventional island port in Kwinana;
- an innovative new light footprint port in Kwinana that utilises Latitude 32 as an IMT; and
- a possible new mode of container transportation with the Blue Highway barging concept.

There are still a number of knowledge gaps that exist around these options, which Westport will now endeavor to fill before undertaking MCA-2.

These include, but are not limited to:

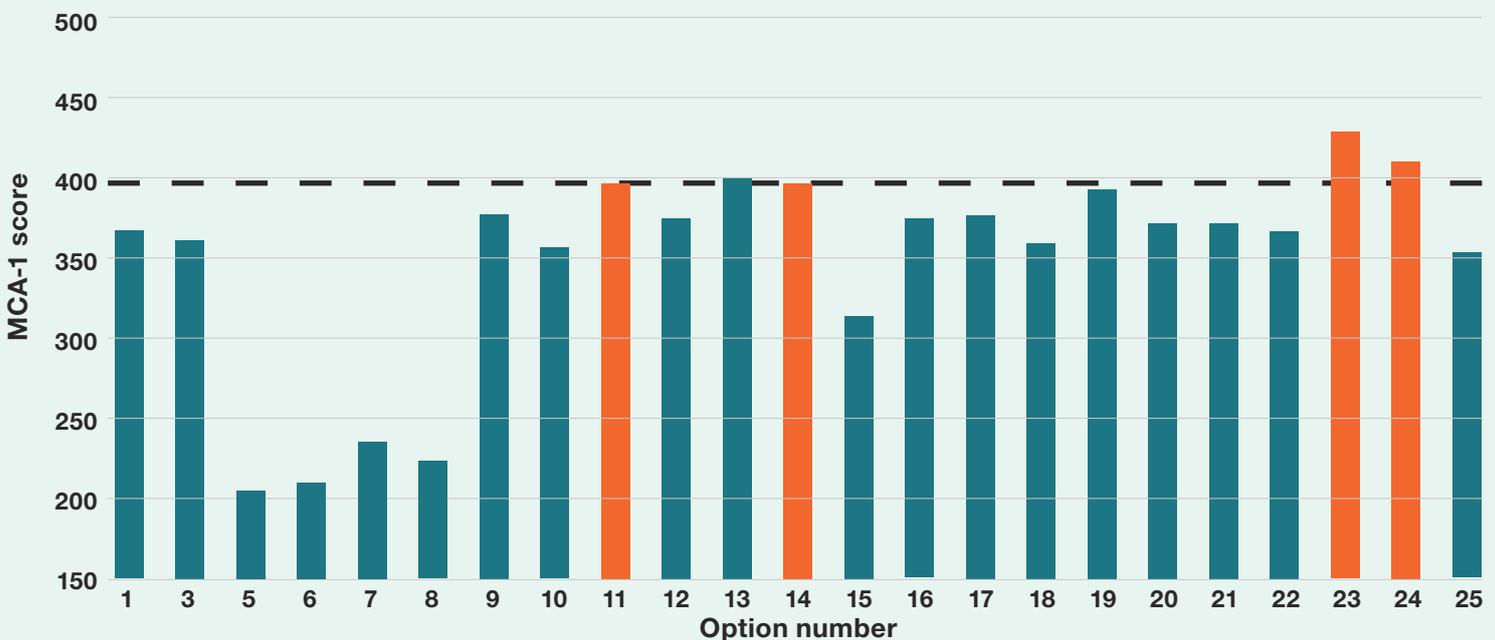
- More detailed investigations on the land impacts and existing holdings in the areas required for the ports and supply chain links.
- Detailed costings on the capital and operational expenditure required for each option.
- Potential transitional timings and trigger points (when will certain parts of the supply chain reach capacity and require new infrastructure?).
- Detailed social impact investigations and mitigation/offset packages.
- Hydrodynamic modelling of Cockburn Sound and relative impacts of the four Kwinana options.
- Supply chain and berth capacity of the Inner Harbour.
- Investigation into the commercial viability of having two container ports working in close proximity.
- Further work on the decommissioning and rehabilitation costs of existing infrastructure and land.
- Timing and quantum of land sale benefits.

# Why didn’t the other options make the cut?

The graph below compares every option (apart from Fremantle Options 2 and 4, which are actually ‘sub options’ as they can only be paired with other options).

The dotted line across the graph shows the cut-off score for the shortlist. The four columns in orange depict the four options which made the shortlist. The aqua columns are the options which did not meet the cut-off score to make the shortlist, with the exception of Option 13. The reason why Option 13 was not shortlisted despite a high ranking is explained on page 8.

Diagram 3: Total weighted scores for Westport’s long-list of options



## Here is a summary of why the other options did not make the shortlist. Please note that the rankings are out of 23.

### Fremantle

Option 1 – ranked 12th

Option 3 – ranked 14th

#### The significant issues with the Fremantle options were:

- Limited land availability for upgrading and expanding road and rail corridors.
- Impacts on residents, heritage buildings and Aboriginal heritage sites when the supply chain routes are expanded.
- High capital costs for the construction of a rail tunnel.
- Inability of the existing berths along the Swan River to reach a port depth of 18m; additional deep-water berths requiring a breakwater parallel to North Mole would need to be constructed.
- Concerns about the effects on social amenity around the port especially mobility and congestion.
- Even when accounting for committed and funded improvements and upgrades, the road and rail links will reach capacity before they will be able to handle the end-state 3.8 million TEU.

It's important to recognise that Fremantle will **continue to be Perth's primary container port until a new port is established**. Westport are working on the timing for new infrastructure, based primarily on the road and rail capacity for the Inner Harbour.

More information on the reasons why Fremantle Options 1 and 3 were not carried through to the shortlist are explained in more depth in *Westport Beacon 8: Why Fremantle can't handle the long-term freight task alone*.

### Bunbury

Option 5 – ranked 23rd

Option 6 – ranked 22nd

Option 7 – ranked 20th

Option 8 – ranked 21st

#### The significant issues with the Bunbury options were:

- High capital cost of duplicating the South West Main rail line.
- High operational costs due to the distance from Perth (which is the destination for the vast majority of shipping containers).
- Inability to reach the 18m channel depth required due to a layer of basalt sitting at a depth of around 14m below sea level. This would require blasting, which is expensive and potentially detrimental to the environment.
- Concerns about the impacts on flora, fauna, inland waters (due to the rail duplication) and biodiversity, as well as Aboriginal heritage impacts.
- Inability to expand the port to the scale required to handle the full container task.

While acknowledging that some stakeholders were hoping to see a Bunbury option in the shortlist, the low scores across the board made this difficult to justify. However, Westport, Southern Ports and other local stakeholders all see a bright future for Bunbury Port, and work will begin soon on realising a number of opportunities that have emerged as a result of Westport's investigations to date. These are explained in *Westport Beacon 9: Bunbury supply chain opportunities*.

## Kwinana

### Option 9 – ranked 7th

### Option 10 – ranked 16th

#### The significant issues with these options were:

- Land transport connections not as strong as other options.
- Performed poorly on social criteria due to the proximity to the Beelias Regional Park, Mount Brown, Challenger Beach, Naval Base shacks and Henderson cliffs.
- Weak performance on environmental criteria due to the area of infill in Cockburn Sound required, and additional dredging.

These two options were both conventional island ports in the north of Cockburn Sound, serviced by Rowley Road. Option 9 is a stand-alone port handling the full 3.8 million TEU, while Option 10 is a smaller port that would handle the container task in partnership with Fremantle.

These options did not make the shortlist as Option 11 was a better light footprint, northern port option, and these options showed more serious environmental and social impacts.

Map 6: Kwinana Option 9



## Kwinana

### Option 17 – ranked equal 8th

### Option 18 – ranked 15th

#### The significant issues with these options were:

- Performed poorly on environmental criteria, specifically due to the land bridge connecting the port to the IMT at Latitude 32 being adjacent to Beelias Regional Park.
- Potential detrimental impacts on the Australian Marine Complex (AMC).
- Weak performance on social criteria, specifically due to the proximity to the Beelias Regional Park, Mount Brown and Henderson cliffs.
- Land transport connections not as strong as other options.

These options are the same light footprint design; Option 17 is a stand-alone port while Option 18 is shared with Fremantle, so it is slightly smaller. These options connect to land just south of the AMC with the port extending north-west in the Sound in front of the AMC. Ships would enter from the north. The IMT would be located at Latitude 32 on the other side of Beelias Regional Park, so the transport connection from the port to Latitude 32 would run through the reserve.

## Kwinana

### Option 19 – ranked 6th

### Option 20 – ranked 10th

#### The significant issues with these options were:

- Performed poorly on social, amenity and recreational criteria, specifically due to the proximity to the Beelias Regional Park, Mount Brown, Naval Base shacks, Challenger Beach and Henderson cliffs.
- Land transport connections not as strong as other options.

These options are the same light footprint design; Option 19 is a stand-alone port handling the full 3.8 million TEU capacity while Option 20 is shared with Fremantle and is slightly smaller. These options connect to land south of the Naval Base shacks and extend north along the coast, which would be directly in front of the shacks and Henderson cliffs. Ships would enter from the north. The IMT would be located at Latitude 32 on the other side of Beelias Regional Park with the transport connection from the port to the IMT skirting along the southern boundary of the reserve.

## Kwinana

Option 21 – ranked 11th

Option 22 – ranked 13th

The significant issues with these options were:

- Performed poorly on social, amenity and recreational criteria due to significant impacts on the Naval Base shacks, Challenger Beach and Henderson cliffs, and being close to the Beeliar Regional Park and Mount Brown.
- Land transport connections not as strong as other options.

These two options were both land-backed full capacity ports that extend along the coast between the Alcoa refinery and the AMC. Option 21 is a light footprint port with an IMT located at Latitude 32 and the transport connection from the port to the IMT skirting along the southern boundary of the reserve. Option 22 is a conventional port design with an onsite IMT and larger port precinct.

## Kwinana

Option 25 – ranked 17th

The significant issues with this option was:

- Performed weakly on social, amenity and recreational criteria, due to significant impacts on the Naval Base shacks, Challenger Beach, Henderson cliffs, Beeliar Regional Park and Mount Brown.
- Land transport connections not as strong as other options.

Like Option 22, this option is a conventional land-backed port but is a shared option with Fremantle. The port extends along the coast between the Alcoa refinery and the Henderson cliffs with an onsite IMT.

## Options being investigated by default

While going through MCA-1, it was determined that some of the options were transitional or expanded states of other options. In shortlisting those other options, a number of options will continue to be investigated by default. These options are:

## Kwinana

Option 12 – ranked equal 8th

This is the smaller version of shortlisted Option 11 (the light footprint port in the north of Cockburn Sound serviced by Rowley Road) and would serve as a transition state for that option.

## Kwinana

Option 13 – ranked 3rd

Option 13 is a hybrid port – a combination of a conventional land-backed and conventional island port – which would be the expanded version of shortlisted Kwinana Option 14. While Option 13 was ranked third in the scoring process, it was determined that Option 14 would be the first step in achieving this hybrid design (which would only be needed if capacity grew beyond the 3.8 million TEU forecast). As such, Option 14 was shortlisted ahead of Option 13, even though it scored higher.

## Kwinana

Option 16 – ranked 9th

This is a smaller version of shortlisted Option 14, and would be a transition state in reaching the full-capacity port featured in that option.

Map 7: Kwinana Option 13



## Next steps

**Now that the five shortlisted options have been determined, the next steps involve testing these options further to determine a prioritised ranking.**

Westport will put the shortlist through a more granular and rigorous multi-criteria analysis (MCA-2). This process will be similar to the first MCA but have a much greater level of detail, and will also be followed by a cost-benefit analysis to determine which option/s offer the greatest value and return-on-investment to the State.

The Westport Taskforce is currently working on collating the additional data and figures required for MCA-2, as well as implementing lessons learned from MCA-1.



*Photo courtesy of Southern Ports*

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