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Barangaroo Delivery Authority

Harbour Control Tower Options Assessment Report 23 July 2014

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Foreword

Value Network Pty Ltd was engaged to undertake an Options Assessment for the Harbour Control Tower (HCT) at Headland Park. The scope of the assignment required an independent assessment which:

- Assesses three (3) options for the facility – retain as is, adaptive reuse (two sub options) and removal
- Identifies the advantages and disadvantages of each option to assist in identifying the preferred option
- Considers qualitative and quantitative factors in the assessment.

In completing the assessment, we have relied on source material provided by the Barangaroo Delivery Authority, which is referenced in Appendix A.

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1 Executive Summary

1.1 Background

At the request of the Barangaroo Delivery Authority, Value Network Pty Ltd (VN) has undertaken an independent options assessment of the future management options for the Harbour Control Tower (HCT).

Barangaroo's Headland Park is an important component of the transformation of one of Sydney's oldest industrial sites. Headland Park will provide space for recreation, expression, celebration, and community. It will feature bush walks, grassed areas, lookouts, walking and cycle paths, and a new harbour cove. It will also feature unique tidal rock pools created from sandstone excavated directly from the Barangaroo site, offering the closest connection to Sydney Harbour than that of any other foreshore park.

The HCT represents a visual vestige of 1970s maritime control arrangement of the Port of Sydney. The tower was included on the Sydney Ports Corporation Section 170 Heritage and Conservation Register ('Ports Operations and Communications Centre' No 4560017). However, the heritage value of the tower was assessed as part of the approval of the Headland Park Concept Plan (Modification 3) and approval to remove the tower was provided. The associated advice / recommendation included:

- Heritage Branch of the NSW Department of Planning and Environment *'raised no objection to the removal of the Harbour Control Tower'*
- The Department *'accepts that the removal of the Harbour Control Tower ... is required to achieve a more naturalised form of the northern headland in response to the Concept Plan terms of approval'*.

At the time of the approval for the Headland Park Main Works, and recognising that the tower still has some operational role and was on heritage register of Sydney Ports Corporation, the approval noted:

- *The Harbour Control Tower would be retained as part of the main Works pending determination of its longer term future, including possible demolition / partial burying*
- *As part of any longer term decision, a Heritage Impact Assessment would be completed, including potential adaptive reuse and measures to be taken to mitigate any adverse impact.*

The Barangaroo Delivery Authority has now made an application to demolish the HCT and the Department of Planning and Environment publicly exhibited the application for the period 30 April 2014 to 30 May 2014. Seventeen (17) submissions were received as follows:

- Five (5) submissions from Agencies (EPA, TfNSW, WorkCover and Heritage Division of NSW Department of Planning and Environment)
- Eleven (11) public submission, including eight (8) objections
- One (1) submission from the National Trust of Australia (NSW).

Submissions from the Heritage Division and the National Trust in particular, raised concern at the proposed demolition. This advice stands apart from the tenor of previous advice, as reflected in the National Trust's submission that it *'believes that the HCT is an important*

historic structure which has a positive aesthetic impact upon the character of Sydney Harbour and is an important relic of the use of Sydney Harbour for shipping’.

1.2 Options description

The future options identified for the Harbour Control Tower, are described and expanded in Section 3 as follows:

Option 1: Retain ‘as is’

Option 2A: Retain current height and reuse as a Viewing Platform

Option 2B: Reduce the height to 50m and provide basic artistic treatment

Option 3: Removal / demolition.

1.3 Assessment methodology

The challenge in the assessment of the options for the HCT is valuing non-market outcomes such as, the non-tangible benefits that might be attached to a cultural reuse of the tower. Accordingly, the following qualitative and quantitative assessment has been completed as follows:

- Qualitative: Each option has been considered on the basis of advantages and disadvantages. A multi criteria assessment was then used to test the advantages and disadvantages of each option based on alignment with the Headland Park Project Objectives.
- Quantitative: Option costs are in July 2014 dollars. These costs are presented on an ‘order of magnitude’ capital basis, as well as the long-term cost of ownership in terms of 20-year cumulative cost. The Net Present Value (7% discount rate) of the 20 year ownership cost is also provided.

1.4 Assessment outcome summary

Qualitative – Multi Criteria Analysis (MCA)

Multi criteria decision making or multiple criteria decision analysis is a discipline that explicitly considers multiple criteria to be evaluated in making decisions. The MCA criteria developed reflects the Headland Park aims / objectives as well as the wider stakeholder interests. The adopted criteria are:

| | |
|---|---|
| 1 | Design Excellence Recreate a memorable Headland Park that captures the community’s imagination and pride through design excellence |
| 2 | Stimulate Patronage Encourage interest in the parkland and enhance way finding |
| 3 | Parkland Experience Value of the parkland as a space for recreation, expression, celebration, and community |

| | |
|----|---|
| 4 | Public enjoyment / amenity Provide parklands that have a range of diverse uses that are enjoyable and accessible |
| 5 | Public Safety Enhance public safety through good management |
| 6 | Heritage Asset Value of the asset as a stand-alone heritage representation |
| 7 | Heritage Context Asset as a component of development and the local area |
| 8 | Long Term Sustainability Improve the sustainability of the parklands and surrounding area of influence |
| 9 | Total Asset Management Long term asset ownership and management implications |
| 10 | Value for Money Option cost implications |

The MCA assessed the Options using the following rating scale: 50: Exceptional, 40: Very Good, 30: Good, 20: Average, 10: Low, 0: Fail (Refer Section 5.2).

The assessment identified Option 3 as the preferred option by a significant margin. The option priority / ranking of the MCA is summarised in the following table:

| Option | Rank | Comment |
|---|------|---|
| Option 1 Retain 'as is' | 4 | MCA Score 200 Rated as 'Fail' for the 'Long Term Sustainability' criteria as the HCT detracts from sustainability outcomes in requiring ongoing Operation and Maintenance (O&M) investment for no operational benefit Rated a 'Low' for Design Excellence criteria as the HCT detracts from achievement of the naturalised headland. Also rated as low against the criterion of Public Safety, Total Asset Management as the HCT will require ongoing whole of life investment to ensure the integrity of the structure |
| Option 2A Current height and reuse as a Viewing Platform | 3 | MCA Score 220 Rated 'Fail' for Value for Money criteria as the option cost is prohibitive Rated as 'Low' for Heritage Context as the heritage value is diminished by the reuse activity but at the same time retains a structure of sufficient scale to disproportionately outweigh other aspects of the ports overall history |

| Option | Rank | Comment |
|--|------|--|
| Option 2B Reduce height to 50m and provide basic artistic treatment | 2 | MCA Score 270 Represents a substantial improvement over Option 1 and Option 2A Scores 'Low' Public Enjoyment Amenity as the reduced HCT height and basic artistic treatment adds little or nothing to the diversity of use of the parkland. Rated as 'Average' or 'Good' for the remaining assessment criteria |
| Option 3 Removal / demolition | 1 | MCA Score 340 Achieves an overall superior level of performance compared to the other options. Only option to be rated as 'Exceptional' for design excellence by optimising the achievement of the design goals for the Headland Park |

The MCA outcome was tested by weighted sensitivity, wherein the Heritage Asset criteria were afforded an average of 30% of the total weighting or on average three times the value of any of the other criteria. The sensitivity test confirmed Option 3 as the best performing option.

Quantitative – Cost Assessment

The following table lists the capital costs (\$ July 2014) of the options plus the operational and maintenance costs over the evaluation period of 20 years. In addition, Net Present Value (NPV) of the costs has been assessed.

| Description | Cumulative 20 Year Undiscounted Costs | 20 Year NPV Cost (7% Discount Rate) |
|---|--|-------------------------------------|
| Option 1 Retain as is | Capital \$3,464,103 O&M \$4,749,068 Total \$8,213,171 | \$5,400,000 |
| Option 2A Reuse the HCT at its current height for Viewing Platform | Capital \$23,568,000 O&M \$7,834.00 Total \$31,402,000 | \$25,193,000 |
| Option 2B Reduce the HCT to 50m with basic artistic treatment | Capital \$6,824,000 O&M \$2,500,000 Total \$9,324,000 | \$7,099,000 |
| Option 3 Removal / demolition | Capital \$6,621,888 O&M \$0 Total \$6,621,888 | \$5,783,000 |

The assessment outcomes are summarised as follows:

- Retaining the HCT as is (Option 1) is some \$1.6M dearer than removal of the HCT (Option 3) in terms of whole of life (undiscounted) costs
- In NPV terms, there is little difference between Option 1 and Option 3, to the point where they could be considered equal. The advantage reflected in the NPV of Option 3 is part removal of the cost risks associated with long term ownership / retention of the tower
- While Option 1 is the less expensive in terms of capital outlay, there remains considerable uncertainty on costs associated with long-term retention of HCT. The potential of the dilapidation cost risk is demonstrated by the long term ownership costs (undiscounted dollars) exceeding the cost of removal of the tower
- Option 2A is the most expensive both initially and over the 20-year assessment period. Importantly, the 20 year cumulative cost of reusing the tower is almost four (4) times the cost of other Option 1 and Option 2B, and almost 5 times the cost of Option 3. The option retains some of the long term ownership cost risks identified for Option 1
- While the cost of Option 2B has been capped to improve its affordability, it is only the third best performing option based on the 20 year cumulative cost. The option retains, albeit to a lesser extent, some of the long-term ownership cost risks associated with Option 1 and Option 2A.

Overall Assessment

The MCA outcome should be preferred as it provides the overall assessment that is based on the criteria considered most relevant to the decision making process. This includes the cost, which underpins the Value for Money Criteria.

The MCA has confirmed that Option 3 Removal / Demolition is the most advantageous option by a considerable margin. In comparison, Option 1 scores 'Fail' for one (1) and 'Low' for four (4) of the ten (10) assessment criteria. On the basis that 'Low' can be considered a threshold viability score, Option 1 scoring 'Fail' borders on the option not warranting further consideration.

In respect of cost, Option 1 and Option 3 are on parity in NPV terms. Option 3, while initially more expensive than Option 1 is the least cost of all options in terms of the 20-year cumulative cost of ownership / retention.

2 Barangaroo Context

2.1 A snapshot of Barangaroo

Sydney is Australia's leading global city and Australia's economic and tourism gateway, producing around a quarter of the nation's GDP and attracting 36 per cent of tourists to Australia. It has a highly educated, multilingual workforce with close links to growing Asia Pacific markets. Sydney is ranked the seventh most liveable city in the world, according to the Economist Intelligence Unit (EIU) global 'liveability' rankings (August 2013).

Barangaroo (formerly East Darling Harbour) is a site of state significance. Its renewal will help Sydney reinforce its position as a financial and investment hub in the Asia Pacific region. Barangaroo will create a new public, residential, retail, cultural and commercial precinct on the western side of the CBD where people can work, live and play, deliver a vast exemplary harbourside park in the heart of a global city and a connected 14 kilometre harbour foreshore walk from Woolloomooloo to Pyrmont.

Barangaroo is being progressively delivered with the precinct expected to be completed by 2025. The economic contribution in additional Gross State Product is approximately \$2.3 billion over the construction stages (average \$205 million contribution per annum for 15 years) including 8,555 on site jobs and 21,281 jobs off site. Over time, 23,000 people will work in the precinct, with 33,000 people expected to visit Barangaroo each day.

Barangaroo covers a 22-hectare area of the Sydney foreshore, with a harbour foreshore frontage located on the north-west edge of the CBD. The site is bounded by Sydney Harbour foreshore to the west and north, the historic precincts of Millers Point, The Rocks and Sydney Harbour Bridge approach to the east, and Darling Harbour to the south. The objectives for Barangaroo are to:

- Be a precinct that will be studied for generations to come as a world benchmark for its bold and inspiring design, architecture and public domain, awarded for its authenticity, integration and diversity
- Re-establish a dynamic place for all of Sydney's people which is integrated, connected, secure – defined by its waterfront and CBD location
- Operate as an exemplar of the next generation in sustainable development by being climate positive. Barangaroo will uphold community wellbeing including health and fitness, and will value what matters to people and the planet
- Be financially viable with continuing profitability, maximising public returns and value to the people and businesses of Sydney
- Add a new dimension to Australia's financial capital by integrating mixed-use commercial, residential, retail, educational, civic, and cultural and entertainment activities into an extended financial hub.

Barangaroo is a waterfront precinct comprising three distinct areas:

- Headland Park, which includes the Northern Cove
- Barangaroo Central is the heart of the site and will provide key public domain space and link Barangaroo South with Headland Park
- Barangaroo South (also known as Barangaroo Stage 1) is the commercial centre of the site, developed by Lend Lease.

2.2 Barangaroo Headland Park Planning Approvals

Headland Park (6 hectares) is located at the northern end of Barangaroo, immediately adjacent to Walsh Bay and Millers Point. It will be a naturalistic harbour headland in the spirit of places including Mrs Macquarie's Chair, Balls Head, Ballast Point and Goat Island. In addition to picnic areas, walking paths, water access and tidal pools and a car park, Headland Park will include a cultural centre built within the headland, with an expected floor area of between up to 18,000m².

The planning / delivery approvals for the Barangaroo Development relevant to this assessment is summarised as follows:

- *2005*: The NSW Government announced the stevedoring wharves at east Darling Harbour would be transformed into a new urban precinct, which would be the subject of an international urban design competition. The competition attracted 137 entries
- *March 2006*: The winning design was selected and evolved into a Concept Plan
- *February 2007*: The then Minister for Planning approved the Barangaroo Concept Plan, which made provision for mixed use commercial, tourist, retail, residential and community uses. The Concept Plan proposed development in stages, with a separate stage for the Headland Park and the separate commercial development of Stage 1 (Barangaroo South)
- *July 2007*: The then Minister for Planning approved an application to have Barangaroo listed as a State Significant site in Schedule 3 to the Major Projects SEPP. This application identified the site as a development parcel to which Part 3A of the *Environmental Planning and Assessment Act 1979* applies
- *September 2007*: Modification No. 1 was approved to correct a number of minor typographical errors
- *October 2007*: The land was rezoned to facilitate its redevelopment via an amendment to Schedule 3 of the Major Projects SEPP. A 'Consolidated Concept Plan' was also produced addressing issues raised in the Conditions of Consent imposed with that approval. Any work on the site is subject to project applications and determination by the Minister for Planning
- *June 2008*: The Concept Plan was modified to add 120,000m² of commercial floor space to Blocks 1 to 5, to the approved 388,300m². This amendment was subsequently approved in February 2009
- *February 2009*: On 25 February 2009, the then Minister for Planning approved Modification No. 2 to the Concept Plan. The Approved Concept Plan as modified allowed for a mixed-use development involving a maximum of 508,300m² of gross floor area (GFA) contained within 8 blocks on a total site area of 22 hectares
- *November 2009*: On 11 November 2009, the Minister approved Modification No. 3 to the Concept Plan to allow for a modified design for the Headland Park and Northern Cove. The Approved Concept Plan as modified, removed the requirement for the 'retention of existing Sydney Ports Corporation Port Safety Operations and Harbour Control Operations ...'

- *March 2011:* On 3 March 2011, the then Minister for Planning approved the Main Works for Barangaroo Headland Park & Northern Cove. This Director General's report on which the Minister's approval was based, noted that the proponent (Barangaroo Delivery Authority) had submitted that the Harbour Control Tower would *'remain on site and be operational in accordance with Sydney Ports Corporation's requirements until future modification for reuse or demolition is required. Any changes to the Sydney Harbour Control Tower will be the subject of a separate application.'*

2.3 Harbour Control Tower Planning Conditions / Requirements

The approach and requirements for determining the future of the Harbour Control Tower (HCT) has changed with the evolution of the project. This change can be characterised as moving:

- From acceptance, that removal of the tower was required to achieve the naturalised headland concept as per the approval of Concept Plan Modification No. 3. A summary of the heritage assessment which was accepted at the time of the Concept Plan approval is provided in Appendix A
- To a view, that while demolition was one option, a heritage impact assessment would consider options for reuse and the mitigation of any adverse impact.

The way in which the foregoing change in expectations has occurred is summarised below.

Concept Plan

The Concept Plan Modification No. 3 approval (11 November 2009) was in response to a Part 3A Modification Report / Submission (31 August 2009) by the then proponent, the Sydney Harbour Foreshore Authority. The submission report noted Sydney Port's view regarding the significance of the Harbour Control Tower and in response *'proposed that a HIS be prepared prior to any decision regarding its demolition'*.

The Ministerial approval (Major Project 06_0162 (MOD3)) on 11 November 2009, removed the requirement to retain the *Harbour Control Tower* having regard for the Director General's Environmental Assessment Report (October 2009). The advice provided in respect of the Tower is summarised as follows:

- Heritage Branch of the NSW Department of Planning *'raised no objection to the removal of the Harbour Control Tower'*
- The Department *'accepts that the removal of the Harbour Control Tower ... is required to achieve a more naturalised form of the northern headland in response to the Concept Plan terms of approval'*.

Main Works Approval

The Authority's request (March 2010) for the Director General's (Department of Planning) requirements for early works and main works project applications included:

- Any indication that the HCT would be retained as part of the Main Works pending determination of its longer term future, including possible demolition / partial burying

- As part of any longer term decision, a Heritage Impact Assessment would be completed, including potential adaptive reuse and measures to be taken to mitigate any adverse impact.

The Ministerial approval of the Main Works for Barangaroo Headland Park & Northern Cove (MP 10_0048) (3 March 2011) was based on the Director General's Major Project Assessment Report (March 2011). The report noted that:

- The approved modified design for Headland Park and Northern Cove (MP 06_0162 (MOD3)) included in principle agreement to the demolition of three items, which are listed on Sydney Ports and Sydney Water Section 170 Heritage Registers – the Sydney Ports Harbour Control Tower, the Sydney Water Sewage Pumping Station and the sandstone seawall along the north-western edge of the site. The in principle agreement is subject to heritage impact assessment and consideration of options for reuse / relocation
- The Project Application for the main works for Headland Park and Northern Cove included the treatment of heritage elements on site, including the retention of the Harbour Control Tower.

Independent Review

The independent review of Barangaroo (Meredith Sussex AM & Shelly Penn) Report (1 August 2011) noted:

- Section 2 Modification 3 – Headland Park and Northern Cove
‘proposed work in relation to three locally significant heritage items, being the sandstone sea wall, the Sydney Ports Harbour Control Tower and the MSW&DB Sewage Pumping Station’
- Section 9.2 Heritage and Archaeology
‘Above ground, there are several elements of local heritage significance. These include the Sewerage Pumping Station; the 1913 sea wall; Sydney Harbour Control Tower, amongst others ... Any proposal to alter the Tower will be subject to a further project application. The treatment of these items has been considered as part of the Concept Plan Approvals (Modification 3 and Modification 4), which includes conditions and requirements of the Statement of Commitments for work such as Heritage Impact Statements to guide the work’.

2.4 Heritage Assessment

The Barangaroo Delivery Authority engaged Rintoul Associates to review the current heritage listings for the former HCT. The review included advice on the heritage process that may be required if the HCT is proposed for partial or full demolition.

The Rintoul Associates Report (February 2013) concluded that the *‘specialised function of the Sydney Harbour Control Tower has left it with limited adaptive reuse options and its short period of use and subsequent disposal by the Sydney Ports Corporation has essentially made redundant its thematic heritage significance as listed in the SHI Listing 4560017. The Tower should be re-assessed within its current situation.’*

3 Harbour Control Tower Options

3.1 HCT Issues and Constraints

The following outline of the HCT issues and constraints is provided as context to the options outlined in Sections 3.2 to 3.4.

The HCT comprises a three-level control centre on top of a reinforced concrete tower, which is 87 metres high, the operations level being 82 metres. The HCT is constructed on a bedrock foundation. Rock anchors, 38 millimetres in diameter, are driven 7.9 metres down to provide adequate anchorage.

Wind pressure loading was a critical factor in designing the HCT. The structure was originally designed in prestressed concrete but was finally built in reinforced concrete to improve damping of wind generated vibration.

Today, the dynamic nature of the tower combined with its age, imposes a number of issues that impact to varying degrees on the cost and / or viability of all options. The scope of these issues is reflected in the following summaries and excerpts from the various assessment reports.

3.1.1 Harbour Control Tower Structural Assessment Report – Robert Bird Group

The purpose of the Robert Bird Group Report (December 2012) was *‘to inform the BDA of the relevant criteria that needs to be considered when assessing potential adaptive re-use schemes for the existing tower’*.

The report refers to and cites the outcomes of two previous studies, which assessed the dynamic performance of the HCT, i.e. the movement characteristics or performance of the HCT in varying wind conditions. These reports suggest that in high wind conditions the structure responds in such a way that presents unfavourable conditions to human comfort and in turn indicates mitigation measures that would be required to allow adaptive reuse.

Key excerpts of the studies are:

- *The Wind-Induced Dynamic Response of an 84M High Control Tower: Engineering Master's Thesis, Roy O Denoon*
The accelerations experienced in the tower under strong wind conditions were found to be unacceptable with reference to the latest human comfort acceptability criteria. Indeed, there is anecdotal evidence of employee absence due to motion in strong winds.
- *Field Experiments to Investigate Occupant Perception and Tolerance of Wind-Induced Building Motion Research Report No. R803, Roy O. Denoon BEng ME(Res), Richard D. Roberts BA PhD, Christopher, W. Letchford BE DPhil, Kenny C.S. Kwok BE PhD.*
‘Motion perception was found to be dependent on peak accelerations. It was found that the factors affecting motion tolerance are: magnitude of motion leading to fear and alarm; and the frequency of occurrence of perceptible motion’.

From a structural perspective, as opposed to the above human comfort concern, the report identifies that any reuse scheme which does not fit within the current facility envelope will *‘require the Tower to be structurally modified’*. The identified constraints are:

- **Current Structural Condition:** It is to be stressed that the building was built in the early 1970s and thus it is nearing the end of its probable design life. The actual design life of the building is as yet unknown. This will require an assessment of any reuse in terms of vertical and lateral load carrying capacity
- **Adapting the HCT to Present Day Codes of Practice Requirements:** To adequately certify an adaptive re-use scheme the whole structure will need to be assessed and brought in line with present day codes of practice and standards
- **Internal Load Carrying Capacity:** The likely governing lateral force would be from the effects due to wind however the effects of both wind and earthquake actions will need to be assessed. Adaptive re-use schemes that add additional area and mass, especially at the top of the structure, will increase its adaptive re-use load carrying requirements.
- **Lateral Dynamic Performance:** Previous studies have suggested that in high wind conditions the structure responds in such a way that presents unfavourable conditions to human comfort. The mitigation of these effects is likely to be expensive. The possibilities to mitigate these effects include installing active or passive dampening to the structure, i.e. adding a tuned mass damper or the addition of extra mass
- **Safety in Design:** Some aspects of safety for consideration include protection of the public from falling objects, recognising that it could be a potential site for self-harm, recognising the poor dynamic performance and preparing for potential user discomfort and illness, provision of safety barriers, safety while on the HCT with respect to environmental conditions, establishing means of egress in an emergency, and provision of safety and maintenance equipment
- **Constructability:** Constraints of the construction of an adaptive re-use scheme need to be considered including site access, working at heights, craneage, dynamic stability during construction, suitable working platform
- **Maintenance:** maintenance program would need to be established to ensure the HCT is maintained fit for purpose during its intended design life.

3.1.2 Harbour Control Tower Demolition Review – Evans and Peck

While the report (May 2013) is focussed on reviewing the demolition options for the HCT, it provides further insight into the potential difficulties on undertaking any major refurbishment or construction activities. The following extract highlights the structural issues associated with scaffolding the structure and the impacts of wind loading:

The Robert Bird Group Structural Assessment Report notes that the existing structure has limitations in regard to additional areas that can accommodate wind loads. The proposed scaffolding exceeds the area nominated in the report as 152m² of additional wind bearing structure – would need to reconcile the quantity of temporary additional area that the tower could capture.

3.2 Option 1 – retain as is



Retention of the HCT would require significant investment to ensure the ongoing integrity of the facility and address public safety issues, which are anticipated to emerge over the next 3 to 5 years. The Barangaroo Delivery Authority engaged the following consultants to provide advice on the condition of the tower and the scope of any required remedial work:

- BSE: Report on the Structural Condition of the Harbour Control Tower, September 2012
- Northrop: Structural, Mechanical, Electrical, Hydraulics and Fire Services Report, November 2013
- Mahaffey Associates, Condition Survey of the Sydney Harbour Control Tower, December 2013
- Robert Bird Group: Review of Mahaffey Associates Condition Survey of the Sydney Harbour Control Tower, December 2013
- Boulderstone: Capital and Maintenance Works Cost Estimate, 11 July 2014.

The scope of required work to retain the facility is summarised below:

- Structural
 - Replacing / repair elements of the control centre roof frame and cladding
 - Replacing elements of the control centre glazing
 - Repair / upgrade to the window cleaning apparatus
- Mechanical
 - Decommission existing air conditioning systems
 - Replacement of the switch board, upgrade lighting
 - Lighting repairs / upgrade
- Electrical
 - Switchboard replacement and submain cabling repairs
 - Emergency lighting maintenance
 - Lift maintenance

- Hydraulics and Fire
 - Fire detection / services repairs
 - Hydrant booster replacement
 - Hydrant pipework and valve connection replacement
 - Smoke detection system repairs
- Code Compliance: Work additional to the above scope required to meet current code requirements.

Based on the foregoing, the following costs have been identified for Option 1.

| Description | Budget | Cumulative 5 Years | Cumulative 10 years | Cumulative 20 Years |
|--------------------------------|-------------|-----------------------|------------------------|------------------------|
| Capital | | | | |
| Immediate upgrade requirements | \$2,411,107 | \$2,411,107 | \$2,411,107 | \$2,411,107 |
| Code compliance requirements | \$1,052,996 | \$1,052,996 | \$1,052,996 | \$1,052,996 |
| Operation & Maintenance | | | | |
| Utilities | \$15,000 | \$45,000 | \$150,000 | \$300,000 |
| Minor maintenance | \$55,000 | \$275,000 | \$550,000 | \$825,000 |
| Major maintenance | | | | |
| • 5 years | \$826,855 | \$826,855 | \$826,855 | \$826,855 |
| • 10 years | \$967,179 | | \$967,179 | \$967,179 |
| • 15 years | \$1,830,034 | | | \$1,830,034 |
| Total Costs | | \$4,610,958 | \$5,958,137 | \$8,213,171 |

The major maintenance allowances have been compared to the general maintenance requirement of between 1% and 2% of the capital value. Using the replacement estimate¹ of \$10 million to replace the structure and using an allowance of 1.5% for maintenance, equates to an annual requirement of \$150,000. This requirement translates to \$3 million over 20 years and compares with the above major maintenance assessment cost of \$3,624,068. It is considered that the comparison validates the above assessment, given the range of issues associated with the tower.

¹ HCT Replacement Cost, Altus Page Kirkland, 5 June 2013

3.3 Option 2 – adaptive reuse

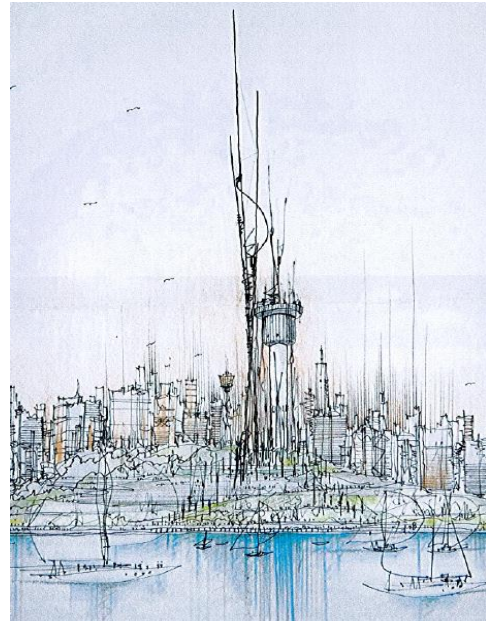
3.3.1 Cultural / Commercial Concept ‘Envelope’

The Barangaroo Delivery Authority explored the potential scope of adaptive reuse and public art options. The following ‘rendered impressions’ are provided to indicate the potential option ‘envelope’.

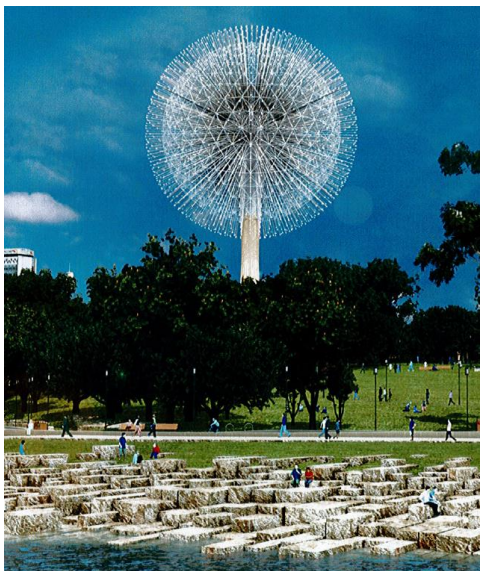
Viewing Platform



The Spears



The Wish



Tower Restaurant²



The Robert Bird Group report observed following requirements in respect of any reuse options:

² Not an option provided by Robert Bird Group. Included to indicate potential range available

- Adaptive reuse schemes that do not fit within the current structural limits of the tower to accommodate the imposed loads would require the tower to be structurally modified in some manner. The structural modifications and / or additions could be significant, and naturally being dependent on the preferred option
- Options need to consider the Lateral Dynamic Performance of the tower as previous studies have suggested that in high wind conditions the structure responds in such a way that presents unfavourable conditions to human comfort
- Some work is also likely to be required to comply with BCA requirements and a regular maintenance reinspection procedure initiated.

The potential cost of the options identified to represent the reuse envelop was assessed by Altus Page Kirkland³ having regard for the foregoing and the range of wider issues described in Section 3.1. While the costings are preliminary (not based on a specific design), they are based on the sketch designs that were prepared by the Robert Bird Group and are sufficient to indicate the scale of required investment. The identified costs are:

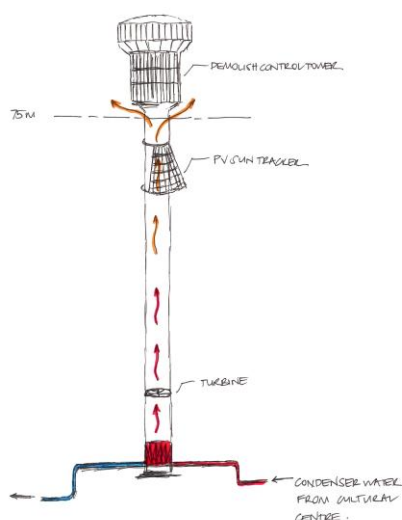
- | | |
|--------------------|---------|
| • The Spears | \$34.0M |
| • The Wish | \$42.6M |
| • Viewing Platform | \$23.6M |

Given the size of the required investments and the design uncertainty associated with 'The Spears' and 'The Wish' this assessment has adopted the 'Viewing Platform' as the most likely viable reuse option.

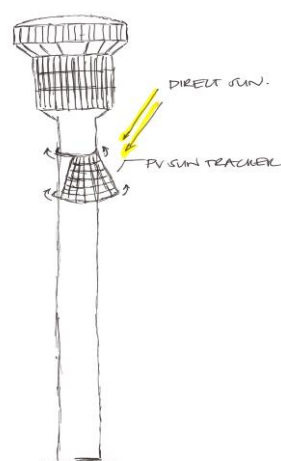
3.3.2 Sustainability Options

The potential to utilise the HCT for sustainability outcomes has been assessed by the Authority. As part of this assessment, Flux Consultants Pty Ltd identified the following options aimed at supplementing the energy required for the Headland Park Cultural Space.

Natural Draft Cooling

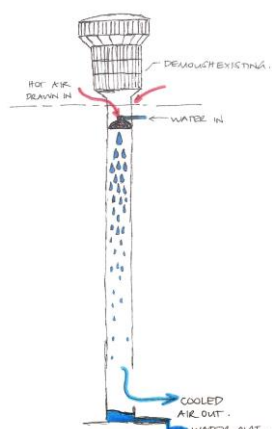


PV Sun Tracking Skirt

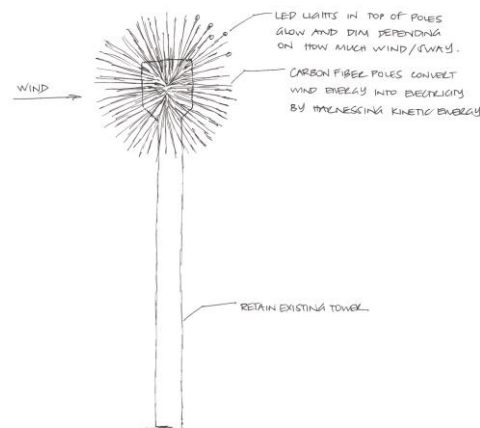


³ HCT Reuse Options Estimate, Altus Page Kirkland, 9 September 2013

Shower Towers



Kinetic Energy Harvesting



The assessment considered the option impact upon energy demands for the Cultural Space assuming museum usage scenario. The assessment identified that there would be limited annual savings. It should be noted that the identified savings do not consider the capital investment required to retain and adapt the HCT. In the case of the Kinetic Energy Harvesting Option, this includes the need to prove the experimental technology required.

| Option | Annual Saving |
|-------------------------------|---------------|
| Cooling Tower + PV + Turbines | \$0 |
| PV Sun Tracking Skirt | \$1,187 |
| Shower Tower | \$10,550 |
| Kinetic Energy Harvesting | \$2,827 |

Given the relatively modest identified savings potential compared to anticipated and substantial capital investment, it was considered that the sustainability options should not be considered further in this assessment.

3.3.4 Option 2A: Reuse the Tower at its current height for Viewing Platform

Given the cultural option costs identified in Section 3.2.1 above, the Viewing Platform was identified as the option likely to be the most advantageous being some \$10M cheaper than the next best option. The attributes of the option were noted as follows:

- Benefits would accrue and can be assessed for use of the Tower as viewing platform
- Preservation of a significant component of the Tower as the 1970s maritime activity / facility at Millers Point.

Based on the foregoing, the following costs have been identified for this option:

| Description | Budget | Cumulative 5 Years | Cumulative 10 Years | Cumulative 20 Years |
|--|--------------|--------------------|---------------------|---------------------|
| Capital | | | | |
| Viewing Platform Construction | \$23,568,000 | \$23,568,000 | \$23,568,000 | \$23,568,000 |
| Operation & Maintenance | | | | |
| General annual maintenance: 1.5% of the capital cost – consistent with allowances used in the Business Case for Headland Park and Central Barangaroo Stage 1 | \$354,000 | \$1,770,000 | \$3,540,000 | \$7,080,000 |
| Refurbishment: 10 and 20 Year allowance for refurbishment of the Viewing Platform i.e. in addition to the annual maintenance cost | \$354,000 | | \$354,000 | \$354,000 |
| Operational: Safety / Security allowance for using the viewing platform | \$175,000 | \$875,000 | \$1,750,000 | |
| Utilities – notional allowance | \$20,000 | \$100,000 | \$200,000 | \$400,000 |
| Totals | | \$26,313,000 | \$29,212,000 | \$31,402,000 |

3.3.5 Option 2B: Reduce the HCT to 50m with basic artistic treatment

The option reduces the height of the HCT for adaptive reuse of the structure. While no specific use was identified for the assessment, a range of opportunities potentially exist including:

- Cultural / Public Art / Sculpture / Light Feature
- Greened 'vertical' garden – softening the impact of the remaining structure and creating a vertical bird habitat space.

However, drawing on the cost implications of Option 2A, the assessment has considered a 'minimum' cost option which:

- Reduces the tower height from 87 metres to 50 metres
- The reduced height still provides a structure that extends some 30 metres above Merriman Street
- Sets an 'affordability' cap of \$2.5 million for treatment of the remaining tower so that it better blends with the parkland environment.

The cost for this option used in the evaluation are summarised as follows:

| Description | Budget | Cumulative 5 Years | Cumulative 10 Years | Cumulative 20 Years |
|---|-------------|-----------------------|------------------------|------------------------|
| Capital | | | | |
| Demolition cost – proportion of full demolition cost | \$4,324,000 | \$4,324,000 | \$4,324,000 | \$4,324,000 |
| Reuse budget – indicative 'affordability' cap for the cultural, public art and / or sustainable reuse | \$2,500,000 | \$2,500,000 | \$2,500,000 | \$2,500,000 |
| Operation & Maintenance | | | | |
| General annual maintenance: 1.5% of the capital cost | \$100,000 | \$500,000 | \$1,000,000 | \$2,000,000 |
| Refurbishment: 10 and 20 Year allowance for refurbishment in addition to the annual maintenance cost | | | \$100,000 | \$100,000 |
| Utilities – notional allowance | \$20,000 | \$100,000 | \$200,000 | \$400,000 |
| Totals | | \$7,424,000 | \$8,124,000 | \$9,324,000 |

3.4 Option 3 – removal / demolition of the Tower



With the HCT



Without the HCT

This option demolishes and removes the HCT. The removal of the HCT opens up the potential to integrate a massive oculus (skylight) into the design of the cultural space. Accessible from the cliff top park, this oculus would directly interpret the scale and footprint of the former tower, and present opportunities to view the cliff cuttings below that are themselves a physical legacy of the working harbour.

The Authority has undertaken an assessment of the cost of removing the tower including:

- Harbour Control Tower Demolition Review – Evans and Peck (May 2013)
- Boulderstone – Budget Estimate for HCT Demolition. This priced the removal of the tower as part of a variation to the Headland Park contract
- Barangaroo Delivery Authority Budget Assessment. This assessment used inputs provided by the two preceding assessments and identified an open tender approach

with a budget of \$6,621,888. This also represents the 5, 10 and 20-year cumulative costs, as there are no ongoing costs associated with this option.

4 Option Discussion

4.1 General Discussion

The following discussion is provided as context to the option advantages and disadvantages identified in Section 4.2 below.

4.1.1 Usability / Utility

The HCT was designed and constructed for a highly specific working purpose that leaves a number of legacy issues, particularly when considering any adaptive reuse or public access. Two significant issues are:

- Access to the tower is via a narrow lift that only accommodates a few people at a time. The lift was never designed for public use and is a confined space that many public users would find challenging. It is a single shaft, leaving no contingency for overflow, maintenance or breakdown. Further, the lift does not reach all levels of the upper tower, raising access equity issues
- The HCT is designed to “flex” in conditions of high wind, creating movement within the tower that is perceptible to users, and which is considered beyond comfortable (i.e. capable of creating fear or alarm). There is anecdotal evidence of increased employee absence, during the tower’s working life, in periods of high wind and this is likely to have a disturbing impact on members of the public.

4.1.2 Heritage Status

The HCT engenders a range of views on its heritage significance with some strongly advocating the value of the tower whereas others are much more modest in the value they see in retaining the tower. Without seeking to diminish the personal significance of the HCT to many Sydneysiders, nor the alternative arguments regarding its social significance, the actual heritage status of the tower is as follows:

- The HCT is not listed as a heritage item in its own right in either State or local planning instruments.
- It is not listed as a heritage item within the State Heritage Inventory or within the City of Sydney LEP 2012
- It is not located within the Millers Point Heritage area
- The Tower was listed on the Sydney Ports Section 170 Register (SHI 4560017), however such listings are agency-specific and the listing lapsed with Sydney Ports Corporation’s decision to transfer the HCT in 2012.

The heritage analysis prepared for the Barangaroo Delivery Authority notes that the social and working heritage significance of the tower cited in Sydney Ports listing has significantly diminished, following the transfer of its ports working function to Port Botany.

4.1.3 Social Significance of the HCT

Some stakeholder groups advocate the HCT as being a signifier of Sydney’s economic and social history. Advocacy in favour of the ‘working heritage’ value of the tower as a symbol of Sydney’s maritime story that exists outside established heritage and planning assessment frameworks and may broadly be summarised as follows:

- The HCT is an important infrastructure item in the development of Sydney as a working port
- The HCT demonstrates the technical achievement of obtaining oversight of Port Jackson for the purposes of controlling shipping movements
- The HCT has the potential to act as an important symbol of Sydney's working harbour story, educating future generations on this history.

While the working harbour 'symbol' aspect is appreciated, it needs to be considered in the context of how the HCT sits within the broader, two-century narrative of Sydney as a maritime port. In this regard, the following is offered:

- Sydney has two significant ports (Jackson and Botany) within reach of its central area, delivering choices in the location of maritime infrastructure from the outset of settlement. During the 19th and 20th centuries, Port Jackson dominated, due to location and topography being suited to the shipping technology of the day
- With the evolution of container-based shipping Port Jackson's use as an import / export port became more problematic in the long term. The original advantages of location and topography that suited smaller ships, made it difficult for container shipping, with large flat surrounding loading and storage zones now required.

The foregoing was addressed as early as 1966 in the Maritime Services Board 10 Year Master Plan, which identified Port Botany as the future focus of commercial shipping to Sydney. The plan recognised the lead-time required for development of Port Botany, and initiated an interim solution for containerised shipping in Port Jackson. The plan included the HCT, as part of the infrastructure necessary for Port Jackson to act as the interim container port.

Given that the HCT was created as part of the relocation of Sydney's primary stevedoring to Port Botany, there is a strong argument that the HCT is not symbolic of the growth and success of Port Jackson as an import/export port, but rather a symbol of the diminishing importance of Port Jackson as a commercial port.

While understanding the resonance of the HCT with many stakeholders, the wider context means that the maritime story of Sydney should be celebrated and interpreted in its totality, rather than the dominance that the scale imposed by the HCT when compared to other symbols / representations of the historic port activity.

4.1.3 Environmental Significance of the HCT

The HCT represents a significant intervention into both the built and natural form of the Millers Point area. Together with the caisson wharf and broad area wharfage that necessitated the cliff cutting, required demolition of significant sections of the Millers Point heritage landscape. To this end, Fitzgerald and Keating's substantial history of the area, Millers Point, notes of the Tower:

'its incongruity when viewed above the roofs of the houses in Dalgety Road or in conjunction with the Merriman Street cottages is so enormous that subsequent [heritage] studies of the area tend to ignore it altogether, as if disbelieving that it is actually there.'

Significant to this discussion is the creation by way of Headland Park of a new, naturalistic headland park form on the Harbour. The conflict created is the stark comparison or interplay

between the size and mass of the HCT and the contribution of Headland Park to the natural headland estate of Sydney Harbour, and its ability to visually interplay with surrounding green headlands and Goat Island.

4.2 Option Advantages / Disadvantages

4.2.1 Option 1A: Retain as is

| Advantages | Disadvantages |
|--|--|
| Retains a symbolic, visual reference to the 1970s maritime activity of the Sydney Port | HCT only represents a small part of the maritime history of the Barangaroo site Scale of the structure disproportionately overshadows / outweighs the other aspects / eras of the ports activity i.e. tower represents only 40 of 225 years in the history of the port |
| Satisfies stakeholders who wish to see the HCT retained 'as is' | Detracts from the vision of the naturalised headland, which forms the basis of the Concept Plan terms of approval Dissatisfies other stakeholders who see the HCT diminishing the visual amenity of Headland Park |
| Likely to attract some additional visitation to Headland Park | While the tower is a 'landmark' structure, retention in mothballed state does not add to the diversity of use of the parkland |
| Avoids costs and risks associated with demolition | Will require substantial initial capital investment safe guard the tower and significant on-going investment to ensure the integrity of the facility including: <ul style="list-style-type: none"> • Partial roof / cladding replacement • Glazing joint remediation • Mechanical systems upgrade • Fire system upgrade • General maintenance and security Precludes potential to integrate a massive oculus (skylight) into the design of the cultural space |
| Will enhance wayfinding for Headland Park | HCT intrudes on the experience aims of the parkland space |

4.2.2 Option 2A: Reuse the HCT at its current height for a Viewing Platform

| Advantages | Disadvantages |
|--|---|
| Retains a symbolic, visual reference to the 1970s maritime control of the Sydney Port | Detracts from the achievement of the naturalised headland required by the terms of the Concept Plan approval |
| May favourably mitigate the attitude of the stakeholders who wish to see the HCT retained in its original form | Pro HCT stakeholders may disagree with adaptive reuse amendments to the tower e.g. enlarged control space for restaurant or viewing platform |
| Likely to attract some additional visitation to Headland Park | Competing venues (e.g. Harbour Bridge Climb) might limit the range or viability of revenue opportunities from reuse option |
| Value derived from use of the HCT as a viewing platform | |
| Sustainable benefits / operating cost reduction by possible removal of elements of mechanical and electrical systems not required for Viewing Platform use | <p>Adaptive reuse works cost prohibitive including works required to:</p> <ul style="list-style-type: none"> • Mitigation work required to provide a space people are comfortable in occupying • Structure upgrade to allow new use • Ensure integrity of the facility <p>Precludes potential to integrate a massive oculus (skylight) into the design of the cultural space</p> |
| Offsets on-going maintenance liability of an ageing piece of infrastructure i.e. it is approaching the end of its original 40 year design life | Retains an ongoing recurrent cost liability |
| Will enhance wayfinding for Headland Park | HCT intrudes on the experience aims of the parkland space |

4.2.3 Option 2B: Reduce the HCT to 50m with basis artistic treatment

| Advantages | Disadvantages |
|--|---|
| Retains some degree of a visual reference to the 1970s maritime control of the Sydney Port | Pro HCT stakeholders more likely to disagree with this reuse option i.e. reduction in height and removal of the maritime observation facility |
| Satisfies stakeholders who wish to see some form of the HCT retained | |
| Reduction in height likely to mitigate the extent to which the tower detracts from the achievement of a naturalised headland form Visual impact reduced through treatment designed to blend with the parkland | Remaining tower intrudes on the experience aims of the parkland space |
| Reduced high and removal of mechanical systems reduces maintenance and energy demand | Requires ongoing operation and maintenance expenditure |
| Sustainable benefits / operating cost reduction by way of potential energy / cooling offsets for the cultural space | Precludes potential to integrate a massive oculus (skylight) into the design of the cultural space |
| Will enhance wayfinding in Headland Park | |

4.2.4 Option 3: Removal / demolition of the Tower

| Advantages | Disadvantages |
|--|---|
| Present an opportunity to interpret not only the role of the HCT from 1992 until 2009 but the complete story of the evolution of the Port of Sydney and Australia's oldest working harbour | Loses a symbolic visual reference to 1970s maritime control of the Port of Sydney |
| Removes an element that significantly detracts from the achievement of the naturalised headland form required by the approved Concept Plan | Dissatisfied stakeholders who wish to see the HCT retained |
| Removes the need for potentially high cost remediation works, including that associated with the on-going integrity of the facility | Cost and disruption associated with demolition work |
| Enhance not only intimate vistas from within Millers Point but views of Millers Point from the harbour and adjacent headlands | May deter visitors who would have come because of the existence of the HCT |
| Removes the on-going maintenance liability of an ageing piece of infrastructure i.e. a | |

| Advantages | Disadvantages |
|--|---|
| structure approaching the end of its 40 year design life | |
| Sustainable benefits / operating cost reduction by way of removal of operational and maintenance costs Creates the potential to integrate a massive oculus (skylight) into the design of the cultural space | |
| Increase amenity of the parkland | Loss of significant neighbourhood way finding attribute |

5 Multi Criteria Assessment (MCA)

5.1 Assessment Methodology

Multi Criteria Analysis (MCA) is a tool developed for complex multi criteria problem(s) for within decision-making. MCA includes qualitative as well as quantitative aspects of the problem(s) in the decision making process.

In most decision making situations where multiple criteria is involved, confusion can arise unless there is a logical well-structured decision making process in place. In the context of Barangaroo, MCA provides a tool that can help evaluate the relative importance of the project options in achievement of the project objectives.

Each option, in particular the non market outcomes, has been considered on the basis of advantages and disadvantages. The commentary provides an indication of the challenges and the outcomes that may be possible; to assist in informing the strategy needed to resolve option selection.

A multi criteria assessment was then used to test the advantages and disadvantages of each option based on alignment with the Headland Park Project Objectives.

5.2 MCA Assessment

The option advantages and disadvantages discussed in Section 4 have been used as the basis for a Multi Criteria Analysis (MCA) of the Control Tower options. Given the HCT's prominence to the Headland Park Concept Plan approval, the MCA used the Project Objectives identified in the Business Case for the Headland Park as the assessment criteria.

The assessment used the following ratings:

| | |
|----|-------------|
| 50 | Exceptional |
| 40 | Very Good |
| 30 | Good |
| 20 | Average |
| 10 | Low |
| 0 | Fail |

| Criteria | Option 1 Retain as is | Option 2 Adaptive Reuse | | Option 3 Demolition / removal |
|---|---|---|---|---|
| | | 2A Current height Viewing Platform | 2B Reduced height (50m) Basic Artistic Treatment | |
| Criteria 1 Design Excellence Recreate a memorable Headland Park that captures the community's imagination and pride through design excellence | Low 10 Detracts from achievement of the naturalised headland as per the approved Concept Plan | Average 20 Detracts from achievement of the naturalised headland Will provide additional perspective of the parkland | Good 30 Reduced detracting from natural parkland Visual impact reduced through treatment designed to blend with the parkland | Exceptional 50 Consistent with approved Concept Plan Removal will enhance quality / amenity (lighting) of cultural space |
| Criteria 2 Stimulate Patronage Encourage interest in the parkland and enhance way finding | Very Good 40 Retention of maritime symbol may attract some additional visitation Will enhance wayfinding | Very Good 40 Identifiable aspect of the maritime symbol retained Will enhance wayfinding May attract some additional visitation | Good 30 Some aspect of the maritime symbol retained Will enhance wayfinding | Average 20 Consistent with approved Concept Plan |
| Criteria 3 Parkland Experience Value of the parkland as a space for recreation, expression, celebration, and community | Average 20 HCT intrudes on the experience aims of the parkland space | Average 20 HCT intrudes on the experience aims of the parkland space | Good 30 Reduced intrusion / impact on the experience aims of the parkland space | Very Good 40 Consistent with approved Concept Plan |

| Criteria | Option 1 Retain as is | Option 2 Adaptive Reuse | | Option 3 Demolition / removal |
|---|--|--|---|---|
| | | 2A Current height Viewing Platform | 2B Reduced height (50m) Basic Artistic Treatment | |
| Criteria 4 Public enjoyment / amenity Provide parklands that have a range of diverse uses that are enjoyable and accessible to the public and local communities | Average 20 While the HCT is a 'landmark' structure, retention in mothballed state does not add to the diversity of use of the parkland | Very Good 40 Viewing platform reuse will provide additional amenity to the parkland | Low 10 Reduced height of the HCT Artistic use of tower may add to the enjoyment of visitors to the parkland | Good 30 Optimises use goals for the parkland May enhance parkland amenity |
| Criteria 5 Public Safety Enhance public safety through good management | Low 10 Historical use of the site afforded minimal public access up to and around the tower, meaning that any safety issue had little or no public exposure The status of the HCT and the public access to the parkland means that tower represents an ongoing risk that must be managed | Average 20 Viewing platform will remove risk associated with the maritime observation component While this will reduce the building age risk, it will create / impose its own form of operational risk | Very Good 40 Removes the risk associated with the maritime observation component | Very Good 40 Removes any public safety issue Any issues associated with the light void to the cultural space will be resolved by safety in design |

| Criteria | Option 1 Retain as is | Option 2 Adaptive Reuse | | Option 3 Demolition / removal |
|---|--|--|---|--|
| | | 2A Current height Viewing Platform | 2B Reduced height (50m) Basic Artistic Treatment | |
| Criteria 6 Heritage Asset Value of the asset as a stand-alone heritage representation | Very Good 40 Retains structure seen by some stakeholder as of significant heritage value – symbol of Sydney Harbour container shipping activities | Good 30 Retains a substantial component of the structure Reduces the value somewhat by removal of the maritime observation component | Average 20 Retains a substantial component of the structure Substantially reduces the value somewhat by removal of the maritime observation component | Average 20 Removes the structure but offsets loss through interpretive measures |
| Criteria 7 Heritage Context Asset as a component of development and the local area | Average 20 Scale of the structure disproportionately overshadows / outweighs the other aspects / eras of the ports activity i.e. HCT represents the very last phase the ports (40 of 220 years) history | Low 10 Scale of the structure disproportionately overshadows / outweighs the other aspects / eras of the ports activity | Good 30 Reduced scale places the structure in better proportion contextually | Very Good 40 Remove the contextual inconsistency |
| Criteria 8 Long Term Sustainability Improve the sustainability of the parklands and surrounding area of influence | Fail 0 Does not add to sustainability outcomes Mothballed structure requires funding for no operational benefit | Average 20 Simplified structure will remove aging tower mechanical systems which will reduce energy demand | Good 30 Reduced high and removal of mechanical systems reduces energy demand | Very Good 40 Removal avoids the need for ongoing maintenance outlay Light well to cultural void will reduce lighting energy demand |

| Criteria | Option 1 Retain as is | Option 2 Adaptive Reuse | | Option 3 Demolition / removal |
|---|---|---|--|---|
| | | 2A Current height Viewing Platform | 2B Reduced height (50m) Basic Artistic Treatment | |
| Criteria 9 Total Asset Management Long term asset ownership and management implications | Low 10 HCT will require ongoing inspection / maintenance / investment regime Signification future costs likely as tower passes its design life e.g. observation component has substantially shorter life that the reinforced concrete tower component | Average 20 Conversion to viewing platform will reduce some of the long term potential issues / costs e.g. replacement of the observation component with a viewing platform Viewing platform use will require its own inspection / maintenance / investment regime | Good 30 Removes the observation deck component of the structure Minimises the ongoing inspection / maintenance / investment regime | Very Good 40 Removes the need for an ongoing inspection / maintenance / investment regime Removes the future liability for major refurbishment of the tower |
| Criteria 10 Value for Money Option cost implications | Good 30 Lower upfront capital cost but higher 20 year cost of ownership than Option 3 Likely to incur substantial costs as design like of key components of the tower is exceeded | Fail 0 Option is cost prohibitive | Average 20 Dearer than Option 1 but substantially more affordable than Option 2A Comparable (initial capital cost) with Option 3 | Average 20 Dearer initial outlay than Option 1 but lower 20 cost of ownership and has a comparable NPV Substantially more affordable than Option 2A Comparable (initial capital cost) with Option 2B |
| MCA Score | 200 | 220 | 270 | 340 |
| Option Ranking | 4 | 3 | 2 | 1 |

5.3 MCA Weighted Sensitivity

The MCA score was tested by applying a weighting to the project priorities.

The greatest weighting (30%) was given to Criteria 6, Heritage Asset to ensure that the diverse stakeholder views were tested in the overall assessment.

| Criteria | Option 1 Retain as is | | Option 2A Reuse at current height | | Option 2B Partial demolition (50m) | | Option 3 Demolition / removal | |
|---|--------------------------|-----|--------------------------------------|-----|---------------------------------------|-----|----------------------------------|-----|
| Criteria 1: 10% Design Excellence | Raw Score | 10 | Raw Score | 20 | Raw Score | 30 | Raw Score | 50 |
| | Weighed Score | 1 | Weighed Score | 2 | Weighed Score | 3 | Weighed Score | 5 |
| Criteria 2: 10% Stimulate Patronage | Raw Score | 40 | Raw Score | 40 | Raw Score | 30 | Raw Score | 20 |
| | Weighed Score | 4 | Weighed Score | 4 | Weighed Score | 3 | Weighed Score | 2 |
| Criteria 3: 5% Parkland Experience | Raw Score | 20 | Raw Score | 20 | Raw Score | 30 | Raw Score | 40 |
| | Weighed Score | 1 | Weighed Score | 1 | Weighed Score | 1.5 | Weighed Score | 2 |
| Criteria 4: 5% Public enjoyment / amenity | Raw Score | 20 | Raw Score | 40 | Raw Score | 10 | Raw Score | 30 |
| | Weighed Score | 1 | Weighed Score | 2 | Weighed Score | 0.5 | Weighed Score | 1.5 |
| Criteria 5: 15% Public safety | Raw Score | 10 | Raw Score | 20 | Raw Score | 40 | Raw Score | 40 |
| | Weighed Score | 1.5 | Weighed Score | 3 | Weighed Score | 6 | Weighed Score | 6 |
| Criteria 6: 30% Heritage asset | Raw Score | 40 | Raw Score | 30 | Raw Score | 20 | Raw Score | 20 |
| | Weighed Score | 12 | Weighed Score | 9 | Weighed Score | 6 | Weighed Score | 6 |
| Criteria 7: 5% Heritage context | Raw Score | 20 | Raw Score | 10 | Raw Score | 30 | Raw Score | 40 |
| | Weighed Score | 1 | Weighed Score | 0.5 | Weighed Score | 1.5 | Weighed Score | 2 |

| Criteria | Option 1 Retain as is | | Option 2A Reuse at current height | | Option 2B Partial demolition (50m) | | Option 3 Demolition / removal | |
|---|--------------------------|-----|--------------------------------------|----|---------------------------------------|-----|----------------------------------|----|
| Criteria 8: 5% Long term sustainability | Raw Score | 0 | Raw Score | 20 | Raw Score | 30 | Raw Score | 40 |
| | Weighed Score | 0 | Weighed Score | 1 | Weighed Score | 1.5 | Weighed Score | 2 |
| Criteria 9: 5% Total Asset Management | Raw Score | 10 | Raw Score | 20 | Raw Score | 30 | Raw Score | 40 |
| | Weighed Score | 0.5 | Weighed Score | 1 | Weighed Score | 1.5 | Weighed Score | 2 |
| Criteria 10: 10% Value for Money | Raw Score | 30 | Raw Score | 0 | Raw Score | 20 | Raw Score | 20 |
| | Weighed Score | 3 | Weighed Score | 0 | Weighed Score | 2 | Weighed Score | 2 |
| Total Weighted Score | 25 | | 23.5 | | 26.5 | | 30.5 | |
| Sensitivity Ranking | 3 | | 4 | | 2 | | 1 | |

5.4 MCA Outcome Summary

The assessment identified Option 3 as the preferred option by a significant margin. Importantly, the assessment has demonstrated:

- Option 1 rated as 'Fail' for the 'Long Term Sustainability' criteria as the HCT detracts from sustainability outcomes in requiring ongoing O&M investment for no operational benefit. The option was also rated as:
 - 'Low' for Design Excellence criteria as the HCT detracts from achievement of the naturalised headland
 - 'Low' against the criterion of Public Safety, Total Asset Management as the HCT will require ongoing whole of life investment to ensure the integrity of the structure

It is 'Low' is a threshold score for the viability of any option i.e. scoring 'Fail' for any option of the means that the option does not warrant further consideration

- Option 2A scores Rated 'Fail' for Value for Money criteria as the option cost is prohibitive. The option was also rated as 'Low' for Heritage Context as the heritage value is diminished by the reuse activity but at the same time retains a structure of sufficient scale to disproportionally outweigh other aspects of the ports overall history.

While Option 2A is marginally better than Option 1 in achieving fewer 'Low' scores, its overall rating is poorer

- Option 2B represents a substantial improvement over Option 1 and Option 2A. However, the option scores 'Low' Public Enjoyment Amenity as the reduced HCT height and basic artistic treatment adds little or nothing to the diversity of use of the parkland.

The option is rated as 'Average' or 'Good' for the remaining assessment criteria

- Option 3 achieves an overall superior level of performance compared to the other options. Option 3 is the option that achieves 'Exceptional' for Design Excellence as it optimises the achievement of the design goals for the Headland Park
- The weighted sensitivity test confirmed Option 3 as the best performing option.

6 Option Cost Assessment

6.1 Option Cost Comparison

| Description | Cumulative 20 Year Undiscounted Costs | 20 Year NPV Cost (7% Discount Rate) |
|---|--|-------------------------------------|
| Option 1 Retain as is | Capital \$3,464,103 O&M \$4,749,068 Total \$8,213,171 | \$5,400,000 |
| Option 2A Reuse the HCT at its current height for Viewing Platform | Capital \$23,568,000 O&M \$7,834.00 Total \$31,402,000 | \$25,193,000 |
| Option 2B Reduce the HCT to 50m with basic artistic treatment | Capital \$6,824,000 O&M \$2,500,000 Total \$9,324,000 | \$7,099,000 |
| Option 3 Removal / demolition | Capital \$6,621,888 O&M \$0 Total \$6,621,888 | \$5,783,000 |

6.2 Option Cost Discussion

6.2.1 Option 1 Retain as is

While the estimates are based on the Northrop Report and the Boulderstone Capital and Maintenance Cost Estimates, there remains considerable uncertainty on costs associated with long term retention of HCT. The basis for this uncertainty includes:

- The building was built in the early 1970s and thus it is nearing the end of its original probable design life
- While the assessments have indicated that the actual design life of the building will extend for a substantial period, the tower has to be looked at in its key component parts:
 - The concrete tower portion will have the longest design life as reflected in the robust report assessment provided by Mahaffey Associates
 - The mechanical, electrical and fire services upgrades will have to be revisited in the next twenty or so years
 - The maritime observation component is showing evidence of aging and despite the foregoing repairs; it is evident that it is much closer to the end of

its design life than the concrete tower portion of the structure. It is the part of the HCT that is most sensitive to the harsh maritime environment.

It should be anticipated that major refurbishment works, beyond the repair scope identified above, would be required within the next twenty-year period. The difficulty with this scenario is that the rate of deterioration of this part of the structure can be anticipated to accelerate as it continues to age and the investment requirement may come sooner rather than later.

6.2.2 Option 2A Reuse the HCT at its current height for Viewing Platform

The option is the most expensive both initially and over the 20-year assessment period. Importantly, the 20 year cumulative cost of reusing the tower is almost four (4) times the cost of either Option 1 or Option 2B, and almost 5 times the cost of Option 3.

The option retains some of the long-term ownership cost risks identified for Option 1.

6.2.3 Option 2B Reduce the height of the Tower to 50m with basic artistic treatment

While the option cost has been capped to improve its affordability, it remains only the third best performing option based on the 20 Year Cumulative Costs.

The option retains, albeit to a lesser extent, some of the long-term ownership cost risks identified for Option 1.

6.2.4 Option 3 Removal / demolition

The option is some \$3.2 million dearer in capital cost than Option 1, but it is the cheapest option in terms of the 20 year cumulative cost of ownership. Importantly, it removes the risk associated with long-term ownership of Option 1.

Appendix A: Source Materials

Boulderstone: Capital and Maintenance Works Cost Estimate, 11 July 2014

Robert Bird Group: Review of Mahaffey Associates Condition Survey of the Sydney Harbour Control Tower, December 2013

Mahaffey Associates, Condition Survey of the Sydney Harbour Control Tower, December 2013

Northrop: Structural, Mechanical, Electrical, Hydraulics and Fire Services Report, November 2013

HCT Reuse Options Estimate, Altus Page Kirkland, 9 September 2013

HCT Replacement Costs, Altus Page Kirkland, 5 June 2013

Sydney Harbour Control Tower Demolition Review – Evans and Peck (May 2013)

Sydney Harbour Control Tower, Planning Pathway – Rintoul Associates, 11 February 2013

Harbour Control Tower Structural Assessment Report – Robert Bird Group (December 2012)

BSE: Report on the Structural Condition of the Harbour Control Tower, September 2012

Independent review of Barangaroo (Meredith Sussex AM & Shelly Penn) Report (1 August 2011)

Millers Point, the Urban Village – Shirley and Fitzgerald Christopher John Keating, Hadstead Press, 2009, p.121

Headland Park and Northern Cove Part 3A Modification Preferred Project Report August 2009 – Addendum 7, Statement of Heritage Impact, August 2009

The Wind-Induced Dynamic Response of an 84M High Control Tower: Engineering Master's Thesis, Roy O Denoon

Field Experiments to Investigate Occupant Perception and Tolerance of Wind-Induced Building Motion Research Report No. R803, Roy O. Denoon BEng ME(Res), Richard D. Roberts BA PhD, Christopher, W. Letchford BE DPhil, Kenny C.S. Kwok BE PhD.

Appendix B: Previous Heritage Perspective

Below are extracts from the relevant previous assessment reports that present the Tower as being of limited heritage value.

Environmental Assessment Appendix 6: Addendum to Heritage Impact Statement, 28 September 2008 (MP 06-0162 MOD 3 – Headland Park and Northern Cove)

Constructed in c1973, the tower is listed on the Sydney Ports Section 170 Register under the Heritage Act for its role as the first Tower constructed in over 150 years after the European settlement in Sydney Harbour. The Statement of Significance provided in the Sydney Port Corporation Heritage Inventory (2004) identifies the Control Tower as “evidence of the long process of establishing visual control and guidance over maritime operations for the Port of Sydney”. The Harbour Control Tower is not listed on any other statutory instruments.

It is constructed on bedrock foundation in reinforced concrete to improve damping of wind generated by vibration. The Tower is 87m high with a three-level control centre on the top. Its listing on the Section 170 Register does not identify the structure’s construction technique or design as of engineering or aesthetic importance. Its identified significance relates primarily to its role as a symbol of efforts associated in building a Tower for visual control of Sydney Port. Due to its relatively recent construction and physical association with the late 20th Century wharves of the Barangaroo site it has some ability to demonstrate a strong association with the key historic phase and maritime operations of the site.

The tower, however, is a dominant and recognised feature in the landscape of Darling Harbour and Walsh Bay. Furthermore, all sheds and structures associated with the late 20th Century commercial operations of the site have been demolished as part of the redevelopment of Barangaroo, making the Control Tower the sole remaining evidence of recent operational phases of the site. It is recognised that the Control Tower may have some social significance due to its landmark presence in the landscape of Darling Harbour and Walsh Bay. However, this is not an established significance and is not considered to be of such strong importance to exclusively retain the structure within a new naturalised form and generously landscaped Headland Park.

It is clear that the HCT does not stand out within the towers itemised here in terms of historical, technical and aesthetic qualities. Therefore its conservation and retention within the new configuration of the Northern Headland Park where it will be a detracting element in the naturalised landform is not warranted.

The historical associations of the Barangaroo site is largely intangible and its future interpretation will not be affected by the demolition of the Control Tower. Mitigative measures to adequately interpret the Harbour Control Tower should be taken possibly in the form of a high sculptural element that would reflect its landmark presence in the future landscape of Darling Harbour and Walsh Bay.

Headland Park and Northern Cove Part 3A Modification Preferred Project Report August 2009

The Control Tower has been identified by City Plan Heritage in their Addendum Report as not being of significant historical, technical or aesthetic quality. It is also noted that the Tower

is less than 50 years old and has not been the recipient of a Royal Australian Institute of Architecture award.

Both the Heritage Branch and Urban Assessments Branch of the Department of Planning have not objected to the proposed demolition of the Tower. The Heritage Branch has acknowledged that the role the Tower has played in its association with the maritime operations of the Barangaroo site can be interpreted without the need for the physical retention of the Tower. The Heritage Branch supports the archival recording of the Tower prior to its demolition and the Tower's interpretation as part of an Interpretation Strategy for the Barangaroo site.

However, given Sydney Port's view regarding the significance of the Harbour Control Tower it is proposed that a HIS be prepared prior to any decision regarding its demolition.

Headland Park and Northern Cove Part 3A Modification Preferred Project Report August 2009 – Addendum 7 Statement of Heritage Impact, August 2009

The City Plan Heritage addendum to the Heritage Impact Statement has provided the following conclusion (City Plan Heritage, p 14):

'It is clear that the Harbour Control Tower does not stand out within the towers itemised here in terms of historical, technical and aesthetic qualities. Therefore its conservation and retention within the new configuration of the Northern Headland Park where it will be a detracting element in the naturalised landform is not warranted. The historical associations of the Barangaroo site is largely intangible and its future interpretation will not be affected by the demolition of the Control Tower'.

Without further assessment, this report is in agreement with the above City Plan Heritage conclusion. There is also an argument that the Tower, being in the vicinity of a State Heritage listed conservation area, has at present an intrusive impact on the heritage values of that precinct. The only qualification to demolition is if an alternative feasible use can be investigated. This however is outside the scope of this report.

If the proposal is to demolish the Tower, then it can be incorporated into the interpretation of the site. The base of the Tower, in combination with the exposure of the sandstone cutting can be used as an interpretation of the maritime/port facilities in their most recent and final form. The Tower can be demolished down to approximate Merriman Street level and used as a focal point viewing platform with the incorporation of interpretive panels, as well as for a point of access from the bottom of the cutting to the top of the headland.

Seen from any proposed underground carpark or facility, the concrete Tower provides a dramatic rising structure set against the contrasting mottled colour and texture of the sandstone wall. This will provide a technological juxtaposition of the 19th century stone quarry and 20th century concrete technology, particularly of the 1970s. This juxtaposition provides an overview of the maritime development of the city. The existing Port Authority exposed aggregate +concrete sign and bronze plaque in Merriman Street at the entrance to the Tower should remain.