# Appendix D – Sydney Harbour Bridge Cycle Ramp Options Feasibility Study (2012)



PREPARED FOR ROADS AND MARITIME SERVICES



# SYDNEY HARBOUR BRIDGE CYCLE RAMP OPTIONS FEASIBILITY STUDY MILSONS POINT OCTOBER 2012

# **SYDNEY**

# HARBOUR

# BRIDGE

# CYCLE

# RAMP

### **OPTIONS FEASIBILITY STUDY**

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### **MILSONS POINT**

ER 2012

Date

20.11.2012



Existing step access at Sydney Harbour Bridge

# EXECUTIVE SUMMARY

The Sydney Harbour Bridge cycleway is one of the most well used cycleways in Sydney. There is currently at peak 497 cyclists per hour (over 8 people per minute). Currently the cycleway only has stair access to the Bridge at Milsons Point. Roads and Maritime Services (RMS) have engaged the NSW Government Architect's Office (GAO) to explore options for well designed solution to this issue that will respect the heritage and urban design paramaters in addition to considering safe access and connectivity for cyclists.

Resolving this issue will inform the design of other cycle networks north of the Bridge, in particular connections through to Cammeray.

While cyclists are expected to dismount to use the stairs, as directed by existing signage, some have been observed riding down the steep ramp which is provided in the centre of the staircase for pushing bikes up and down. This creates hazardous conditions for both cyclists riding down the ramp and riders pushing their bikes up the stairs. It is also hazardous at the base of the stairs, where mounted riders can enter the road system at speed, and incidents of cyclists colliding with signs and signposts have been received and acknowledged. The requirement for cyclists to dismount and push a bike up or down the stairs can also be seen as a disruption to the cycle network and strategy.

This report has been prepared as an early feasibility study building on the 1999 Department of Public Works report. Its purpose is to ascertain whether any option for avoiding the steps have merit and whether further detailed studies should proceed.

This report investigates 5 options to provide accessible connections from Sydney Harbour Bridge to Milsons Point. These connections will service both commuter cyclists as well as recreational users.

#### **OPTION 1**

Cycle ramp from the SHB approach, North of the Fitzroy St arch, down to just south of Burton Street. Ramp is supported on free standing steel columns.

#### **OPTION 2**

Cycle ramp from the SHB approaches, just north of the Fitzroy Street arch, down to just south of Burton Street. The ramp is supported on steel brackets cantilevered from the SHB approach walls.

#### **OPTION 3**

Cycle ramp from south of the top of the existing SHB stairs to Bradfield Park North is supported on free standing steel columns it travels at the highest level over the Milsons Point Railway station entrance before ramping down.



#### **OPTION 4**

Cycle ramp from top of existing SHB stairs (blocking stair access) to Bradfield Park North is supported on steel brackets cantilevered from the SHB approach walls. It travels at the higher level untill after it passes over Milsons Point station entrance before ramping down.

#### **OPTION 5**

Cycle ramp regraded within existing SHB ramp and steps from the SHB approaches, north of the Fitzroy Street arch down to just south of Burton Street

These Five Options have been short listed from an initial list of 10 Options considered in the GAO Report in June 2012. The remaining 7 options were not pursued due to their failure to achieve good outcomes for cycleway improvement, heritage and visual impact and safety requirements. See Appendix A on page 49.

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Sydney Harbour Bridge Cycle Ramp OCTOBER 2012

## 1. DESIGN **PRINCIPLES**

The following principles were formulated for this the study. These principles were used to inform the development of the 3 current cycle ramp options:

- Respect heritage
- Innovative urban design and improved amenity

OCTOBER 2012 Sydney Harbour Bridge Cycle Ramp

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- Improve safe access and connectivity

#### **RESPECT HERITAGE**



The new cycle ramp should respect the heritage value of the Sydney Harbour Bridge and of Bradfield Park including:

- · respect the integrity of the Sydney Harbour Bridge in its setting
- have minimal impact on aesthetic & technical heritage values
- have minimal impact on heritage fabric -
- be as reversible as possible in accordance with the Australia ICOMOS Burra Charter 1999.
- have minimal heritage impact on Bradfield Park & . the Milsons Point train station entry

#### **INNOVATIVE URBAN DESIGN & IMPROVED AMENITY**



Improve amenity and apply sound urban design principles including:

- minimise impact on Bradfield Park, e.g. integrate . cycleway into circulation pattern
- respect current and future pedestrian and recreational use
- apply innovative design principles
- consider opportunities to integrate services for the park eg. lighting



#### IMPROVE SAFE ACCESS AND CONNECTIVITY

The cycle ramp should improve the connectivity between the Sydney Harbour Bridge, Bradfield Park and beyond including:

- connection with the North Sydney Cycle Network compliance where possible with Austroads Guide
- to Road Design Part 6A: (Pedestrian and Cyclist Paths)
- minimise conflicts between vehicles, cyclists and pedestrians
- address other safety & security concerns & deter vandalism

Lightweight structure Brick Pit Ring, Sydney Olympic Park

The following aesthetic approach is in keeping with the 3 main principles for the design of the new cycle ramp:

- Maximise transparency

PRECEDENTS

- Lightweight structure
- · Fine detailing
- Clean contemporary structural design

The images on this page illustrate precedents for such an approach.



Maximise transparency Kolumba Museum, Cologne





Open Bridge Deck Nordpol Bridge Westpark, Bochum, Germany

Clean contemporary structural design Cycle ramp extension, Cahill Freeway, Sydney







### SITE

### ANALYSIS

ACCESS AND CIRCULATION







SHB CYCLEWAY (OFF-ROAD) ON-ROAD CYCLEWAY



SHB PEDESTRIAN WALK



VEHICULAR ACCESS (SHB EXCLUDED FOR LEGIBILITY FRED S

STAIR/RAMP ACCESS TO SHB





3.

### SITE

### ANALYSIS

LAND USE







BRADFIELD PARK COMMUNITY SERVICE CENTRE







### SITE

### ANALYSIS

HERITAGE MAPPING



KEY



HERITAGE LISTED ITEM



SHB AND APPROACHES: NATIONAL AND STATE HERITAGE LIST











1943 Aerial of the site (Source LPMA)



This diagram is from the interpretive signage in Bradfield Park (Copyright North Sydney Council). The line of the Bridge constructed in 1942 has been higlighted in red on this image.



View through Bradfield Park with the Station entry in the background. Note the recent interpretive signage and mature palm plantings.

The former Willoughby Street and the foootprints of the former buildings have been interpreted in the ground plain of Bradfield Park.



The Burton Street Arch and the Station entrance with the platform awning above form an important heritage ensemble in the SHB approach walls.



the ensemble of heritage details for the SHB at Milson's Point.



The Kirribilli neighbourhood centre is a former Bowling Club, now community open space used for recreation and market days. (Copyright North Sydney Council)



Looking up to Fitzroy Street Arch with the Kirribilli Neighbourhood Centre on the left.





The entrance to Milsons Point Stage constructed as part of the Bridge works in 1942 has an elegant simplicity. Note the details such as the flanking wall lights and the central parapet feature above the awning.

The Bridge Stairs (now the cycle way access) also adds to

The views from Alfred Park to the 'Bridge in Curve' are an important urban design feature of Bradfield Park. Note the Kirribilli Neighbourhood centre in the centre ground.

View looking south down the cycleway from the top of the Cycle/Stairs. Security screens to the ralway line will need to be extended for ramp option 2 and 4.

### SITE

### ANALYSIS

#### TOPOGRAPHY AND LEVELS



#### KEY



LOW ELEVATIONS

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NEW CYCLE RAMP SUPPORTED ON STEEL COLUMNS PARALLEL WITH THE SYDNEY HARBOUR BRIDGE APPROACHES COMMENCING NORTH OF THE FIZROY STREET ARCH AND ARRIVING SOUTH OF BURTON

![](_page_15_Picture_2.jpeg)

Government Architect's Office

![](_page_16_Picture_0.jpeg)

Government Architect's Office

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### **OPTION 1 DESCRIPTION**

With a grade of 1:7.5 (13.3%) the cycle ramp takes cyclists from the bridge deck level (RL44.500) down to Burton Street (RL33.500). The steepness of ramp for this proposed option is outside the recommended grade 5% stated in Austroads. The existing steps are retained. Except where it meets the Bridge approach wall, the ramp is supported on free standing steel columns positioned to avoid conflicts with the existing landscape and structures below. Ramp moves out to allow continuing use of the shared access road to the Kirribilli Neighbourhood Centre.

#### ESTIMATED COST \$8MILLION

![](_page_17_Figure_4.jpeg)

![](_page_17_Figure_5.jpeg)

![](_page_17_Figure_7.jpeg)

4.

### **OPTION 1**

### SECTION

# STAND ALONE CYCLE RAMP ON COLUMNS

#### DESCRIPTION

From bridge deck down to Burton St supported on free standing steel posts

![](_page_18_Figure_6.jpeg)

![](_page_19_Picture_0.jpeg)

![](_page_19_Picture_1.jpeg)

![](_page_19_Figure_2.jpeg)

Fig. Cross Section through Fitzroy St Bridge.

Option 1: Posted cycleway set out from the SHB approach walls viewed from Fitzroy Street. The break in the parapet to access the cycleway should be a suitable distance north of the Fitzroy Street archway to suit the parapet detailing

Section through the Fitzroy Street Arch

OPTION 1	DATA			ACCESS / SAFETY / AMENITY ISSUES	FABRIC IMPACTS / BUILDABILITY	
	CYCLEWAY WIDTH	GRADIENT	LENGTH		(including heritage fabric impacts)	
Pt 6A AustRoads	2.5-4m	5%	No max.			
From bridge deck down to Burton st, supported on free standing steel posts.	No width 13. restriction	13.3%	81m	<ul> <li>SHB / Cycleway</li> <li>POSITIVE</li> <li>Separation of ramp from SHB approach walls discourages attempts to apply graffiti or scale walls.</li> <li>Negates cycle/pedestrian/vehicle. conflicts that occur when ramp arrives at Burton St.</li> </ul>	<ul> <li>SHB / Cycleway</li> <li>POSITIVE</li> <li>Free standing solution has less impact along the length of rendered SHB approach walls.</li> <li>Cycleway can remain in use for most of construction period.</li> </ul>	
				<ul> <li>NEGATIVE</li> <li>Does not connect directly into the existing cycle route at Burton St. Possible cycle/pedestrian conflicts through Bradfield Park or cycle traffic conflicts if on Alfred Street South.</li> <li>New Structure imposed on park.</li> <li>Grade of ramp steep at 13.3%.</li> <li>Throw screen required.</li> <li>Safety / security concern with building over neighbourhood centre.</li> </ul> OTHER <ul> <li>Existing stairs can remain operational (subject to safety analysis).</li> <li>Station entry not impacted.</li> </ul>	<ul> <li>NEGATIVE</li> <li>Section of rendered balustrade removed at junction with SHB. This section may also require large cantilever brackets.</li> <li>Temporary closure to Kirribilli Neighbourhood Centre during construction.</li> </ul>	
					<b>Station Entry</b> POSITIVE • Allows better lighting of entrance.	Station Entry POSITIVE • Station entry not impacted.
				<ul> <li>Bradfield Park / Neighbourhood Centre POSITIVE</li> <li>Park lighting can be incorporated under ramp.</li> <li>Only minor impact on Bradfield Park.</li> <li>No impact on Neighbourhood Centre.</li> </ul>	<ul> <li>Bradfield Park / Neighbourhood Centre</li> <li>POSITIVE</li> <li>Minor impact on Neighbourhood Centre.</li> </ul>	
					<ul> <li>NEGATIVE</li> <li>Impacts on land belonging to North Sydney Council.</li> <li>Grassed areas and possibly some plantings in Park impacted on.</li> <li>Compulsory acquisition required .</li> <li>Difficult to construct over Neighbourhood centre.</li> </ul>	
'S					OTHER <ul> <li>Possible archaeological issues for post</li> </ul>	

#### VISUAL IMPACTS (including aesthetic heritage impacts)

#### SHB / Cycleway

POSITIVE

- Less visual / heritage conflicts with SHB approach walls and Burton Street Arch for closer views compared with Option 3 & 4.
- · It is a separate engineered structure.

#### Station Entry

POSITIVE

- Does not impact on the Station Entry.

#### Bradfield Park / Neighbourhood Centre POSITIVE

- Visual impacts to Bridge from within Park have better resolution compared with Option 3 & 4.
- Trees provide some screening to northern end of the ramp for more distant views.

#### NEGATIVE

positions in Bradfield Park North.

- · Creates some clutter in the Park.
- May impact Neighbourhood Centre.

NEW CYCLE RAMP ATTACHED TO THE BRIDGE APPROACHES COMMENCING FROM BRIDGE DECK DOWN TO BURTON ST, SUPPORTED ON CANTILEVERED BRACKETS FROM SHB APPROACH WALLS.

![](_page_21_Picture_2.jpeg)

Government Architect's Office

#### **OPTION 2 DESCRIPTION**

The cycle ramp takes cyclists from the bridge deck level (RL44.500) down to Burton Street (RL33.500) with a grade of 1:7.5 (13.3%). The steepness of ramp for this proposed option is outside the recommended grade 5% stated in Austroads. From bridge deck down to Burton St (over Fitzroy St) supported on cantilevered brackets from

SHB approach walls. The construction of the Northern Approaches of the SHB, south of Burton Street, (Mass Gravity retaining Wall with Backfill) make this option not feasable due to structural issues. Refer to the RMS Structural Drawings and Structural Feasibility Assessment on page 38.

Refer Option 1 Sketch, page 17 for illustration of cycleramp ramp steepness. ESTIMATED COST \$10MILLION

![](_page_22_Figure_4.jpeg)

![](_page_22_Figure_5.jpeg)

FROM BRIDGE DECK DOWN TO BURTON ST, SUPPORTED ON CANTILEVERED BRACKETS FROM SHB APPROACH WALLS.

![](_page_23_Figure_2.jpeg)

![](_page_23_Figure_3.jpeg)

![](_page_24_Picture_0.jpeg)

![](_page_24_Picture_1.jpeg)

![](_page_24_Picture_2.jpeg)

Section through the Parapet wall. The cantilver brackets need to allow for the cycleway to carry past the 'cornice' details of the pilasters.

Option 2: Cantilevered cycleway cantilivered out from the SHB approach walls viewed from Fitzroy Street. The Break in the parapet to access the cycleway should be a suitable distance north of the Fitzroy Street archway to suit the parapet detailing.

![](_page_24_Figure_6.jpeg)

OPTION 2	DATA			ACCESS / SAFETY / AMENITY ISSUES	FABRIC IMPACTS / BUILDABILITY	
	CYCLEWAY WIDTH	GRADIENT	LENGTH		(including heritage fabric impacts)	
Pt 6A AustRoads	2.5·4m	5%	No max.			
From bridge deck down to Burton st, supported on cantilevered brackets from SHB approach walls.	No width restriction	13.3%	81m	<ul> <li>SHB / Cycleway</li> <li>POSITIVE <ul> <li>Ramp ends at the existing cycle route at Burton Street.</li> </ul> </li> <li>Separation of ramp from SHB approach walls discourages attempts to apply graffiti or scale walls.</li> <li>Negates cycle/pedestrian/vehicle conflicts that occur when ramp arrives at Burton Street.</li> </ul>	<ul> <li>SHB / Cycleway</li> <li>POSITIVE</li> <li>Cycleway can remain in use for most of the construction period.</li> </ul>	
	NEGATIVE         Does not connect directly into the existing cycle route at Burton St.         Possible cycle/pedestrian conflicts         through Bradfield Park or cycle traffic         conflicts if on Alfred Street South.         New structure imposed on park.         Cycle / pedestrian / traffic conflict at         Burton St needs resolution, particularly         on Market Days.         Gradient is steep at 13.3%.         Throw screen required.         OTHER         Existing stairs can remain operational (subject to safety analysis).         Station Entry         POSITIVE         Allows better lighting of entrance.			<ul> <li>NEGATIVE</li> <li>Does not connect directly into the existing cycle route at Burton St. Possible cycle/pedestrian conflicts through Bradfield Park or cycle traffic conflicts if on Alfred Street South.</li> <li>New structure imposed on park.</li> <li>Cycle / pedestrian / traffic conflict at Burton St needs resolution, particularly on Market Days.</li> <li>Gradient is steep at 13.3%.</li> <li>Throw screen required.</li> </ul>	<ul> <li>NEGATIVE</li> <li>Section of rendered balustrade removed at junction with SHB. Top section may also require large cantilever brackets.</li> <li>Cantilever needs to be located at least 3m from the top of retaining wall.</li> <li>Temporary closure to Kirribilli Neighbourhood Centre during construction.</li> </ul>	
				<ul> <li>Existing stairs can remain operational (subject to safety analysis).</li> <li>Station entry not impacted.</li> </ul>		
		Station Entry POSITIVE • Allows better lighting of entrance.	Station Entry POSITIVE • Station Entry not impacted on.			
				<ul> <li>Bradfield Park / Neighbourhood Centre POSITIVE</li> <li>Only minor impact on Bradfield Park near Burton Street.</li> <li>No impact to Neighbourhood Centre. Park lighting can be incorporated under ramp.</li> </ul>	<ul> <li>Bradfield Park / Neighbourhood Centre</li> <li>POSITIVE</li> <li>Minor impact on Bradfield Park near Burton Street.</li> </ul>	
				<ul> <li>NEGATIVE</li> <li>Safety / security concerns with building over Neighbourhood Centre.</li> </ul>	<ul> <li>NEGATIVE</li> <li>Difficult to construct over Neighbourhood centre.</li> <li>Strata acquisition required.</li> </ul>	
					OTHER - Possible archaeological issues for post	

#### VISUAL IMPACTS (including aesthetic heritage impacts)

### SHB / Cycleway

POSITIVE

 Less visual / heritage conflicts with SHB approach walls and Fitzroy Street Arch for closer views compared with Option 3 & 4.

#### **Station Entry**

POSITIVE

- Does not impact on the Station Entry.

### Bradfield Park / Neighbourhood Centre

POSITIVE

- Visual impacts to Bridge from within Park have better resolution compared with Option 3 & 4.
- Only minor impact on Bradfield Park near Burton Street.

#### NEGATIVE

- May impact Neighbourhood centre.

#### OTHER

positions in Bradfield Park North.

- Additional plantings could help screen for more distant views.

itect's Office

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NEW CYCLE RAMP SUPPORTED ON STEEL COLUMNS PARALLEL WITH THE SYDNEY HARBOUR BRIDGE APPROACHES THROUGH BRADFIELD PARK

![](_page_27_Picture_2.jpeg)

### **OPTION 3 DESCRIPTION**

Ramp commences just to the south of the top of the existing stair and takes cyclists from the bridge deck level (RL42.50) down to Bradfield Park (RL38.60) running parallel to the Bridge approach wall. The ramp stays at the level of the parapet wall until it is north of the station entrance and only then ramps down. Except where it meets the Bridge approach wall, the ramp is supported on free standing steel columns positioned to avoid conflicts with the existing landscape below. The ramp is alligned with the pedestrian path below.

The ramp arrives at a recreated Willoughby Street which becomes a dedicated cycle area. A new pedestrian path is required through Bradfield Park when the ramp is lower than 3m.

#### ESTIMATED COST \$10MILLION

![](_page_28_Figure_5.jpeg)

![](_page_28_Figure_6.jpeg)

![](_page_28_Figure_8.jpeg)

4.

### **OPTION 3**

SECTION

# STAND ALONE CYCLE RAMP ON COLUMNS

#### DESCRIPTION

Cycle ramp is supported by a series of columns and is completely independent of the bridge (except at connection point).

![](_page_29_Figure_6.jpeg)

![](_page_30_Picture_0.jpeg)

![](_page_30_Picture_1.jpeg)

![](_page_30_Picture_2.jpeg)

Option 3: The posted ramp set away from the SHB approach walls and stays at parapet level until past the Milsons Point Station entrance and only then ramps down. Having the ramp horizontal (or parallel with the parapet) above the station entrance means that there is less visual disruption to the symmetrical presentation of the entrance.

Option 3: The posted ramp set away from the SHB approach walls would run approximately over the existing pathway with the support posts off-set in the garden bed. In this view having the ramp at a high level parallel to the parapet means that it has less visual disruption to this important view corridor through to the curving Bridge approach spans.

OPTION 3	DATA			ACCESS / SAFETY / AMENITY ISSUES	FABRIC IMPACTS / BUILDABILITY	
	CYCLEWAY WIDTH	GRADIENT	LENGTH		(including heritage fabric impacts)	
Pt 6A AustRoads	2.5-4m	5%	No max.			
Cycle ramp suppoted on steel columns parallel with the Sydney Harbour Bridge approaches through Bradfield Park	No width restriction	4.6%	187m	<ul> <li>SHB / Cycleway / Burton St</li> <li>POSITIVE</li> <li>Separation of ramp from SHB approach walls discourages attempts to apply graffiti or scale walls.</li> <li>Negates cycle/pedestrian/vehicle conflicts that occur when ramp arrives at Burton St.</li> </ul>	<ul> <li>SHB / Cycleway / Burton St</li> <li>POSITIVE</li> <li>Free standing solution has less impact along the length of rendered SHB approach walls.</li> </ul>	
				<ul> <li>NEGATIVE</li> <li>Does not connect directly into the existing cycle route at Burton St. Possible cycle/pedestrian conflicts through Bradfield Park or cycle traffic conflicts if on Alfred Street South.</li> <li>New Structure imposed on park.</li> </ul> OTHER <ul> <li>Existing stairs can remain operational (which is a first part of the pa</li></ul>	<ul> <li>NEGATIVE</li> <li>Section of rendered balustrade removed at junction with SHB. This section may also require large cantilever brackets.</li> </ul>	
				(Subject to salety analysis).	Station Entry	
				<ul> <li>POSITIVE</li> <li>Allows better lighting of entrance.</li> </ul>	<ul> <li>POSITIVE</li> <li>Ramp does not physically conflict with detail of Station Entry Canopy.</li> </ul>	
				<ul> <li>Bradfield Park / Neighbourhood Centre POSITIVE</li> <li>Park lighting can be incorporated under ramp.</li> <li>No impact on Neighbourhood Centre.</li> </ul>	<ul> <li>Bradfield Park / Neighbourhood Centre</li> <li>POSITIVE</li> <li>No impact on Neighbourhood Centre.</li> </ul>	
			<ul> <li>NEGATIVE</li> <li>Impacts on land belonging to North Sydney Council.</li> <li>Grassed areas and some plantings in Park impacted on.</li> <li>Property aquisition.</li> </ul>			
					<ul><li>OTHER</li><li>Possible archaeological issues for post positions in Bradfield Park North.</li></ul>	

#### VISUAL IMPACTS (including aesthetic heritage impacts)

#### SHB / Cycleway / Burton St

POSITIVE

- Less visual / heritage conflicts with SHB approach walls and Burton Street Arch for closer views compared with Option 4.
- · It is a separate engineered structure.

#### **Station Entry**

POSITIVE

 Less visual / heritage conflict with the Milsons Pt Station entry from within Park compared with Option 4.

#### Bradfield Park / Neighbourhood Centre POSITIVE

- Trees provide some screening to northern end of the ramp for more distant views.
- No impact on Neighbourhood Centre.

#### NEGATIVE

- Creates clutter in the Park.

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NEW CYCLE RAMP FROM TOP OF EXISTING STAIRS DOWN TO BRADFIELD PARK, SUPPORTED ON BRACKETS FROM BRIDGE APPROACH WALLS

![](_page_33_Picture_2.jpeg)

### **OPTION 4 DESCRIPTION**

Ramp commences at top of existing stair and continues over the full width of the stairwell (making the stairs redundant).

It is supported from the SHB approach walls by steel brackets. It takes cyclists from the bridge deck level (RL42.500) across above the Burton Street arch and the Milsons Point station entry then down to Bradfield Park (RL38.600).

The ramps stays at the level of the parapet until just north of the station entrance and only then ramps down. The construction of the Northern Approaches of the SHB, (Mass Gravity retaining Wall with Backfill and Steel Beams OPTION 3)

support on piers with external Masonry Walls) make this option not feasable due to structural issues. Refer to the RMS Structural Drawings and Structural Feasibility Assessment on page 38.

ESTIMATED COST \$8MILLION (BASED ON COLUMN OPTION 3)

![](_page_34_Figure_7.jpeg)

![](_page_34_Figure_8.jpeg)

![](_page_34_Figure_10.jpeg)

#### CANTILEVERED CYCLE RAMP

#### DESCRIPTION

From top of existing stairs down to Bradfield Park (over Burton St), supported on brackets from the SHB approach walls

![](_page_35_Figure_4.jpeg)

![](_page_36_Picture_0.jpeg)

![](_page_37_Figure_0.jpeg)

#### **Description:**

![](_page_37_Figure_2.jpeg)

The new cycle ramp is proposed to be supported on the existing external walls of Sydney Harbour Bridge Northern Approach between P4 to P12 (refer Fig 1). The width of the cycle ramp is 3.0 meters and 0.8 meters offset from the wall (refer Fig 2). Spacing of the supports is approximately 3.0 meters centre to centre. Cycle ramps are formed by structural steel frames with Fibreglass Reinforced Plastic (FRP) deck.

The existing walls in the proposed area have two different types of structure - structural wall and non-structural wall indicated as gravity retaining wall (Zone 1, Fig 1) and a masonry wall (Zone 2, Fig 1) respectively.

![](_page_37_Figure_5.jpeg)

- <sup>1.</sup> The new cycle ramp located at Zone 1 (refer Fig 1) is proposed to be supported on the gravity retaining wall between P4 to P6 and the proposed steel supports are intended to be inserted into the gravity wall approximately at road/rail level (refer Fig 2). To be able to achieve the fixed support for the cantilever structure, the existing gravity wall requires adequate capacity to balance the ultimate bending moment and shear forces from the proposed cantilever structure. As the result of engineering calculations for the position of the steel supports on the existing retaining wall, the distance from top of the retaining wall should not be less than 3.0 meters. (refer Section A-A)
- 2. For the cycle ramp located at Zone 2 (refer Fig 1), it is not feasible to insert the new steel support into the wall due to the existing longitudinal steel beams, which are approximate 0.5 meters from the external face of wall (see Section B-B). Therefore it does not have sufficient depth to embed the steel supports.
- 3. Based on the existing drawing, the masonry wall also does not have sufficient capacity to carry the additional loads as it is a non-structural wall.

### **Conclusions:**

The existing gravity retaining wall and masonry wall do not have the adequate capacity to carry the additional loads from the proposed cantilever structure.

Therefore it is concluded that the proposed options 4 is not a feasible option.

![](_page_37_Figure_12.jpeg)

![](_page_37_Figure_14.jpeg)

OPTION 4	DATA			ACCESS / SAFETY / AMENITY ISSUES	FABRIC IMPACTS / BUILDABILITY						
	CYCLEWAY WIDTH	GRADIENT	LENGTH		(including heritage fabric impacts)						
Pt 6A AustRoads	2.5-4m	5%	No max.								
From top of existing stairs down to Bradfield Park (over Burton st), supported on brackets 	<ul> <li>SHB / Cycleway / Burton St</li> <li>POSITIVE <ul> <li>Continues line of existing cycleway.</li> </ul> </li> <li>Negates cycle/pedestrian/vehicle conflicts that occur where the existing cycleway ramp arrives at Burton St.</li> </ul>	<ul> <li>SHB / Cycleway / Burton St</li> <li>POSITIVE</li> <li>Top of ramp above existing stair can be detailed to be 'reversible' (although stair closed to public). No SHB balustrade removed.</li> </ul>									
	waiis.			<ul> <li>Does not connect directly into the existing cycle route at Burton St. Possible cycle/pedestrian conflicts through Bradfield Park or cycle traffic conflicts if route via Alfred Street South.</li> <li>Existing stair made redundant – needs screening, potential for vandalism.</li> <li>May encourage graffiti or scaling of SHB approach walls.</li> </ul>	<ul> <li>Engineered ramp brackets attached to SHB approach walls may need to be substantial. This is a major intervention in the rendered façade.</li> <li>Cycleway cannot be used during construction period. Temporary scaffold stair required.</li> <li>Cantilever needs to be located 3m below retaining wall.</li> </ul>						
								<ul> <li>OTHER</li> <li>Will need additional screening at top of ramp to provide security to railway corridor.</li> </ul>	<ul> <li>OTHER</li> <li>Brackets need to be positioned to avoid impacts on cornice and pilaster rendered detail.</li> </ul>		
			Station Entry POSITIVE - Reduced conflict.	<b>Station Entry</b> NEGATIVE - Has to be positioned so the steel and							
		<ul> <li>NEGATIVE</li> <li>Security issue of being able to access Station Entry awning from cycleway.</li> </ul>	<ul> <li>copper awning to station entry is not impacted on.</li> <li>Difficult to avoid impact on rendered detailing and lighting around station entry.</li> </ul>								
		<ul> <li>Bradfield Park / Neighbourhood Centre</li> <li>POSITIVE</li> <li>Park lighting can be incorporated under ramp.</li> <li>No impact on Neighbourhood Centre.</li> </ul>	<ul> <li>Bradfield Park / Neighbourhood Centre</li> <li>POSITIVE</li> <li>No impact on Neighbourhood Centre.</li> </ul>								
											<ul> <li>NEGATIVE</li> <li>At lower end cycleway takes up existing pedestrian path adjacent to the SHB Approach walls in Park requiring redesign of Park (loss of grassed area).</li> </ul>

#### VISUAL IMPACTS (including aesthetic heritage impacts)

#### SHB / Cycleway / Burton St

POSITIVE

- Top of ramp fits neatly into existing stairwell.

#### NEGATIVE

 Visual / heritage conflict with: cornice and pilaster rendered detail on Bridge approach and the Burton Street arch. Also 'Bridge Stairs' sign.

#### **Station Entry**

NEGATIVE

- Visual / heritage conflict with and the Milsons Pt Station entry.
- Obscures rendered detailing and light brackets around entry.

#### Bradfield Park / Neighbourhood Centre

POSITIVE

- Trees provide some screening to northern end of the ramp.
- · No impact on Neighbourhood Centre.

#### NEGATIVE

- 1940s park design may be disrupted.

CYCLE RAMP REGRADED WITHIN EXISTING CYCLEWAY AND STAIR-WELL ARRIVING AT BURTON STREET

![](_page_39_Picture_2.jpeg)

### **OPTION 5 DESCRIPTION**

With a constant grade of 1:7.5 (13.3%) the cycle ramp takes cyclists from the bridge deck level (RL44.500) down to Burton Street (RL33.500).

While the construction is technically possible this option is not feasable due to the impact and closure of railway operation during the construction of a new retaining wall. Refer to the RMS Structural Drawings and Structural Feasibility Assessment on page 43.

#### ESTIMATED COST \$97MILLION

![](_page_40_Figure_4.jpeg)

![](_page_40_Figure_5.jpeg)

![](_page_40_Figure_7.jpeg)

4.

**OPTION 5** 

SECTION

CYCLE RAMP REGRADED WITHIN EXISTING CYCLEWAY AND STAIRWELL ARRIVING AT BURTON STREET

![](_page_41_Figure_4.jpeg)

![](_page_42_Figure_0.jpeg)

### Description

- 1. The new cycle ramp is proposed to be regraded within the existing cycleway and stairwell, and takes cyclist from the bridge deck level (RL 44.880). down to Burton Street (RL33.500).
- 2. The width of the proposed cycle ramp remains the same as the existing cycleway and stairwell with a constant grade of 1:11.5 (8.7%).
- The existing cycleway and supported on gravity walls at road/ railway level (RL4 backfill, which is retained (refer Section B-B)

![](_page_42_Figure_5.jpeg)

	.lob ref		
	sheet no.	Rev01	
	Ву	Date	Check by
	YG	9/10/2012	
d stairwell between	P4 and F	P5 are	
(refer Section A-A)	and cyc	cleway	
44.8) between P1 to	P4 is o	n the	
by the gravity wall.			
_			

Sydney Harbour Bridge-Northern Approach--New Cycle Ramp Proposal

Roads & Maritime Part of Structure Services

**Structural Feasibility Assessment** 

## **Option 5**- Sheet 2 of 3

### **Construction Sequence:**

- A1 Rail closure is required prior to construction of the new retaining walls.
- A2 Construct a new retaining wall R1 from road/railway level socketed into the rock. (refer Fig 2 and Section B-B)
- A3 Excavate behind the wall R1 to the proposed new cycle ramp level and cut the existing retaining wall to a vertical line to provide a space for the new cycle ramp. (refer Section B-B)
- A4 Temporary remove railway tracks-T2 (between P1 and P2) for the construction of the new gravity retaining on top of arch underpass.
- A5 Construct a temporary retaining wall over the existing arch underpass prior to excavate.
- A6 Excavate to the top of arch underpass, drill the dowel bars into the concrete arch (refer Section C-C) then construct the new gravity retaining wall R2.

Backfill and re-install railway tracks.

- A7 Backfill behind wall R2 to the level and cut the existing reprovide a space for new control of the s
- A8 Remove existing gravity w access (refer Fig 2) and c wall to a vertical line. (refe
- A9 Remove existing stairs. (r

![](_page_43_Figure_17.jpeg)

	Job ref		
	sheet no.	Rev01	
	By YG	Date 9/10/2012	Check by
the proposed new retaining wall to a	w cycle r a vertical	amp line to	
ycle ramp. (refer	Section	C-C)	
all ER1 for the n	ew cycle	ramp	
ut the existing ex	ternal re	taining	
efer Fig 2)			
A 4 )			
<b>y wali kz</b> i)			

- of tracks for the construction of the new wall R1 and R2 respectively.
- strengthening if the free standing is more than 2m height.

![](_page_44_Figure_11.jpeg)

OPTION 5	DATA			ACCESS / SAFETY / AMENITY ISSUES	FABRIC IMPACTS / BUILDABILITY (including heritage fabric impacts)	
	CYCLEWAY GRADIENT LENGTH WIDTH					
Pt 6A AustRoads	2.5-4m	5%	No max.			
Ramp excavated behind the SHB approach wall within the same allignment of the existing stair (Part of existing cycleway and stair demolished)	2.8m Limited by existing stair- well width.			<ul> <li>SHB / Cycleway</li> <li>POSITIVE <ul> <li>Continues line of existing cycleway.</li> </ul> </li> <li>Ramp ends at the existing cycle route at Burton Street.</li> </ul>	<ul> <li>SHB / Cycleway</li> <li>POSITIVE</li> <li>No impact on external detailing of SHB approach walls and their detail.</li> </ul>	
				<ul> <li>Gradient is steep at 13.3%.</li> <li>Much of the ramp will be dark and will require lighting.</li> <li>Security risk due to lack of public surveillance, particularly at night.</li> </ul>	<ul> <li>Requires removal of at least 50% of the concrete treads and risers of SHB stairs.</li> <li>Cycleway cannot continue in use during construction. Temporary scaffold stair required.</li> <li>New internal retaining wall required.</li> <li>Rail closure required during construction.</li> </ul>	
					<ul> <li>OTHER</li> <li>Requires further investigation of ability to excavate behind SHB approach wall and stabilise it. May be very difficult to construct and engineer.</li> </ul>	
				Station Entry POSITIVE - Does not impact on the Station Entry.	<b>Station Entry</b> POSITIVE - Does not impact on the Station Entry.	
				<ul> <li>Bradfield Park / Neighbourhood Centre</li> <li>POSITIVE</li> <li>Does not change current status for Bradfield Park and Neighbourhood Centre.</li> </ul>	<ul> <li>Bradfield Park / Neighbourhood Centre</li> <li>POSITIVE</li> <li>Does not change current status for Bradfield Park and Neighbourhood Centre.</li> <li>No aquisition required.</li> </ul>	

#### VISUAL IMPACTS (including aesthetic heritage impacts)

### SHB / Cycleway

POSITIVE

· Very little impact on views to SHB.

#### **Station Entry**

POSITIVE

- Does not impact on the Station Entry.
- Bradfield Park / Neighbourhood Centre POSITIVE
- Does not change current status for Bradfield Park and Neighbourhood Centre.

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## CONCLUSION

Each cycle ramp option is slightly different in terms of its impact on the access, heritage, physical and visual amenity of Sydney Harbour Bridge, Bradfield Park and its surrounds. There are impacts associated with this project, particularly in relation to the heritage and visual quality of the area. To address these issues, a sensitive high quality design will be needed.

There are customer benefits in regards to removing the use of the existing 55 steps which includes improving the safety requirements and journey times. The existing cycle access limits the age and type of bicycles that can be used due to the existing steps, as cyclist are required to haul their bikes up and down the steep steps. The benefits of the proposed cycle ramp options permits all cyclist to utilise the cycle ramp. This will encourage more cyclist who were reluctant to use the cycle way. In addition the propose ramp connects the SHB cycle access onto the connecting streets which inturn improves accessibility.

While all the options seek to optimise the width of the cycleway, the width is limited to the maximum available on the Sydney Harbour Bridge.

In addition when considering the proposed grade for the new ramp, it should be remembered that the surrounding topography presents less than optimal grades for cyclists.

Option 1 has the more positive outcomes. However the more detailed design of the posted structure and the potential conflict with the Kirribilli Neighbourhood Centre requires resolution. In addition with exceeding the max grade of 5%.outlined in the Ausroad guidelines.

For the remaining options – Option 3 is also freestanding away from the SHB 'approaches' are more favourable in heritage and aesthetic terms than those bracketed from the walls (Options 2 and 4). This is because the bracketed options will obscure the cornice and balustrade detail of the SHB Approaches they will also require significant fabric interventions. These attributes are of importance to the National, State and local heritage values of the Bridge. The 2007 RMS Conservation Management Plan (page 51) notes:

The consistent detail treatment of the components that make up the approaches (ie arched and flat topped voids utilised as tenancies, retaining walls, balustrades, steps, lighting) is of a high quality and makes a major contribution to the streetscapes of Milsons Point and The Rocks/Millers Point. [1]

In addition Policy 13 in the 2007 CMP states:

13.3 Views of the original form of the rendered masonry approaches should be maintained and not obscured.

#### NEXT STEPS

Sho rec	ould the project proceed the following steps are ommended:	
1.	This report should be circulated to stakeholders for comment.	5.
2.	Further investigate the feasibility of Option 1. Progress concept design (including engineering input) to enable further assessment against criteria.	6. 7.
3.	Consult with North Sydney Council re the potential conflicts of Option 1 with the Kirribilli Neighbourhood Centre.	8. 9.
4.	Prepare a preliminary heritage impact	

Once approvals are obtained proceed to tender documentation.

assessment (HIA) and further visual assessment (in accordance with RMS guidelines) for the

preferred option. Note an archaeological assessment may also be required.

Consult with the relevant Commonwealth, State and local heritage authorities explaining the preferred option.

Prepare business case and obtain funding approval.

Community Consultation

Prepare final REF/SEE and HIA for the preferred option

6.

**APPENDIX A** 

PHASE 1 REPORT - ANALYSIS AND 10 OPTION SUDY

![](_page_49_Picture_0.jpeg)

# **SYDNEY HARBOUR** BRIDGE CYCLE RAMP MILSONS POINT

PREPARED FOR ROADS AND MARITIME SERVICES

![](_page_49_Picture_3.jpeg)

**Transport** Roads & Maritime Services

29 JUNE 2012

### A NUMBER OF DESIGN OPTIONS HAVE BEEN INVESTIGATED

#### **DESIGN OPTIONS**

OPTION 1	Long ramp, attached to SHB Approaches to bradfield park
OPTION 2	Ramp, attached to SHB approaches to burton street
OPTION 3	Ramp with existing ramp and step access way to Burton street
OPTION 4	Medium ramp, attached to SHB Approaches to bradfield park
OPTION 5	Lift from Burton st to SHB deck
OPTION 6	Spiral ramp to Burton street
OPTION 7	Ramp, detached from SHB to Bradfield Park
OPTION 8	Ramp, detached from SHB to Bradfield Park
OPTION 9	Switchback ramp to Burton street
OPTION 10	Ramp and step arrangements within existing ramp and step access way

### DESIGN

### **OPTION 1**

LONG RAMP, ATTACHED TO SHB APPROACHES TO **BRADFIELD PARK** 

LENGTH

Long Ramp attached to SHB approaches takes cyclists from the bridge deck level (RL42.500) across the Burton Street and Milsons Point Station Entries then down to Bradfield Park (RL38.800).

![](_page_51_Figure_5.jpeg)

CHANGE IN LEVEL FROM MAX GRADIENT

5.3M (approx.) 1:35 (approx.) 185M

RAMP ATTACHED TO SHB APPROACHES TO BURTON STREET

![](_page_52_Figure_5.jpeg)

### DESIGN

### **OPTION 3**

**RAMP WITHIN EXISTING RAMP** AND STEP ACCESS WAY TO **BURTON STREET** 

![](_page_53_Figure_5.jpeg)

### DESIGN

### **OPTION 4**

MEDIUM RAMP, ATTACHED TO SHB APPROACHES TO BRADFIELD PARK

LENGTH

Medium Ramp attached to SHB approaches takes cyclists from the bridge deck level (RL42.500) across the Burton Street and Milsons Point Station Entries then down to Bradfield Park (RL37.200).

![](_page_54_Figure_5.jpeg)

CHANGE IN LEVEL FROM 5.3M MAX GRADIENT 1:8 185M

LIFT FROM BURTON ST TO SHB DECK

![](_page_55_Figure_5.jpeg)

SPIRAL RAMP TO BURTON STREET

CHANGE IN LEVEL FROM8.9MMAX GRADIENT1:38LENGTH296M

With a constant grade of 1:38 (>3%) the Spiral Ramp takes cyclists from the bridge deck level (RL42.500) down to the existing kerb ramp at Burton Street (RL33.600).

![](_page_56_Figure_5.jpeg)

RAMP, DETACHED FROM SHB TO BRADFIELD PARK

![](_page_57_Figure_5.jpeg)

SWITCHBACK RAMP TO BURTON STREET

With a constant grade of 1:33 (3%) the Switchback Ramp takes cyclists from the bridge deck level (RL42.500) down to Burton Street in close proximity to Alfred Street South (RL33.600). The Switchback takes up the majority of the open space to the north of the Kirribilli Neighbourhood Centre

![](_page_58_Figure_5.jpeg)

CHANGE IN LEVEL FROM MAX GRADIENT LENGTH

8.9M 1:33 296M

### DESIGN

### **OPTION 9 & 10**

RAMP AND STEP ARRANGE-MENTS WITHIN EXISTING RAMP AND STEP ACCESS WAY

![](_page_59_Figure_5.jpeg)

### DESIGN

### MATRIX

CYCLEWAY RAMP OPTIONS MATRIX KEY Y YES		DESIGN OPTIONS		FEASIBILITY		PHYSICAL IMPACTS TO PARK AND URBAN SETTING			HERITAGE IMPACT		CIRCULATION			VISUAL AMENITY	
				Compliance with part 6A (Pedestrian and Cyclist Paths)	Compatibility with the North Sydney Cycle Network	Bradfield Park	SHB approaches	Station entry	Heritage Impact	Heritage Fabric	Entrance to Burton Street tunnel	Entrance to Fitzroy Street tunnel	Entrance Milsons Point Station	Bradfield Park setting	Sydney Harbour Bridge
N	NO	1	Long Ramp attached to the Sydney Harbour Bridge approaches to Bradfield Park	Y	Y										
	LOW IMPACT	2	Ramp attached to the Sydney Harbour Bridge	Y	Y										
			Burton Street												
	HIGH IMPACT	3	Ramp within existing ramp and step access way to burton street	Y	Y										
		4	Medium Ramp attached to the Sydney Harbour Bridge approaches to Bradfield Park	Y	Y				•						
		5	Lift to service cyclists from Burton Street to SHB Cycle way	N	N										
		6	'Spiral' Ramp to Burton Street	Y	Y										
		7	Ramp detached from the Sydney Harbour Bridge approaches to Bradfield Park	Y	N	•		•	•				•		•
		8	Switchback Ramp to Burton Street	Y	Y										
NOTE All opt and de	: tions to be designed leveloped in	9	Step/Ramp/Step envelope replaced with Ramp/Ramp/ Step arrangement	Ν	Y										
accordance with the CMP Policies		10	Step/Ramp/Step envelope replaced with ramp only arrangement	Ν	Y										

# ACCESS AND SAFETY Pedestrian Safety Ease of access for Cycle conflicts cyclists

![](_page_61_Picture_0.jpeg)

contactus@rms.nsw.gov.au

Customer feedback Roads and Maritime Locked Bag 928, North Sydney NSW 2059

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