

Stage 2: Management Options Assessment

Councillor Information Session

In association:
Coastal Environment
Advisian

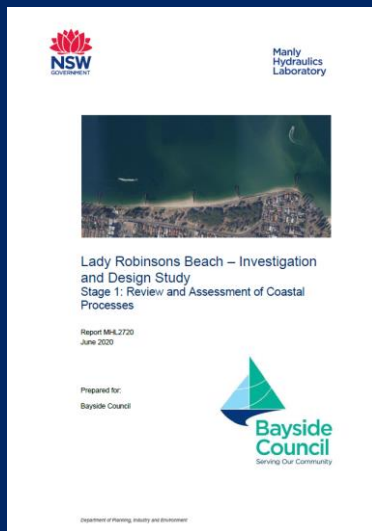
Balmoral Group Australia

17 May 2023

Agenda

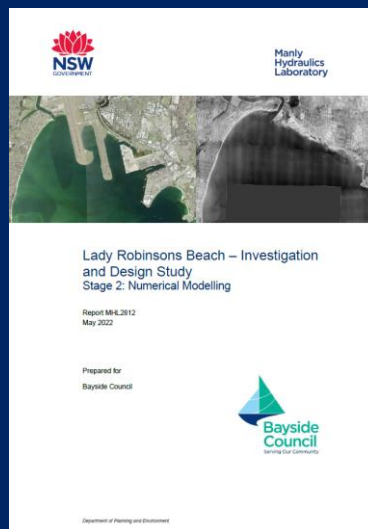
- Summary of studies to date
- Description of issue at hand
- Overview of management options assessed
- Targeted foreshore amenity management approach
- Next steps
- General Discussion

Summary of Studies to date



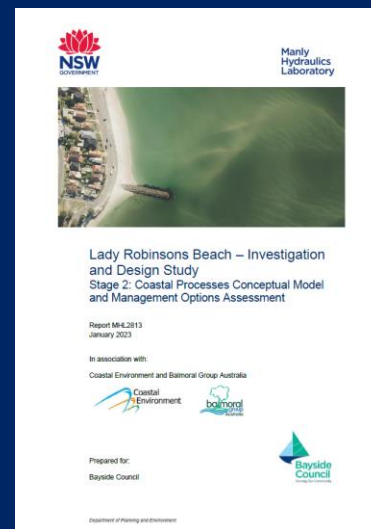
Stage 1 Works - 2019/2020:

- Review of previous studies with a focus on recent works
- Condition survey of existing coastal infrastructure and restoration works
- Analysis of beach profile changes spanning 2001 to 2019



Stage 2 Works - 2021/2022:

- Numerical model investigation of historical developments
- Conceptual model of coastal processes
- Development of management options
- Multi-criteria assessment of management options including cost-benefit analysis



Stage 2 Aims

Lady Robinsons Beach – Investigation and Design Study

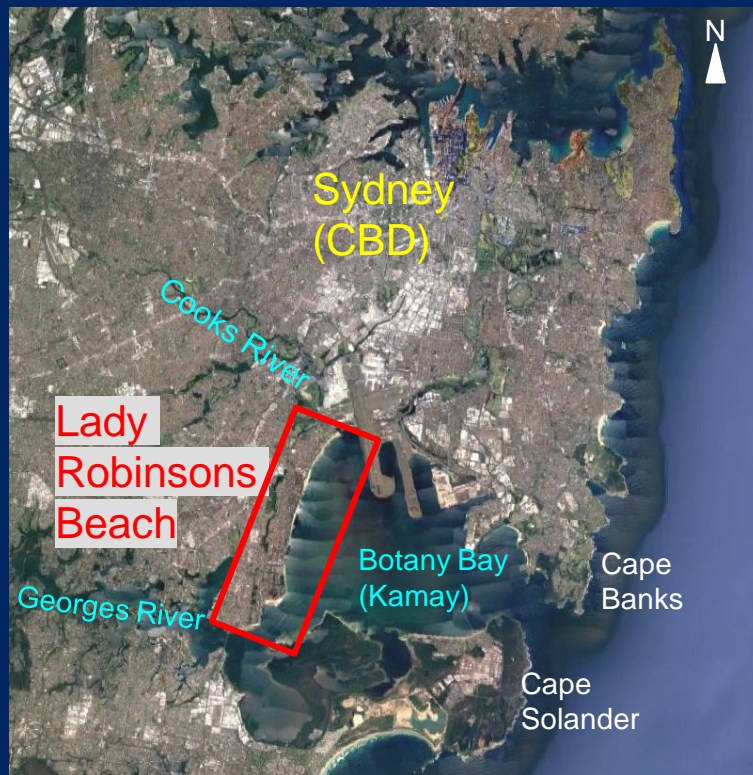
Stage 2: Coastal Processes and Management Options Assessment

The primary **aims** of this study are to:

1. Synthesise a present-day understanding of coastal processes at Lady Robinsons Beach.
2. Investigate impacts of historical developments on present day coastal processes.
3. Assess coastal management options to enhance and maintain the sandy beach amenity at Lady Robinsons Beach where practicable and valuable over the next 50 year design planning period.



Background – Lady Robinsons Beach



Background - Coastal Assets

- Was Sydney's longest stretch of sandy beach
- Popular recreational public spaces
 - Foreshore walk, playgrounds, picnicking swimming, sun bathing, fishing, sailing, carparks, exercise, ...
- High regional residential and commercial value
- Major transport route (to/from city)
- Historical significance – Aboriginal history, post-first fleet
- Environmental values – Botany Bay ecology, dunes, neighbouring Ramsar listed Wetlands
- Local and regional tourism



Australia's international gateway

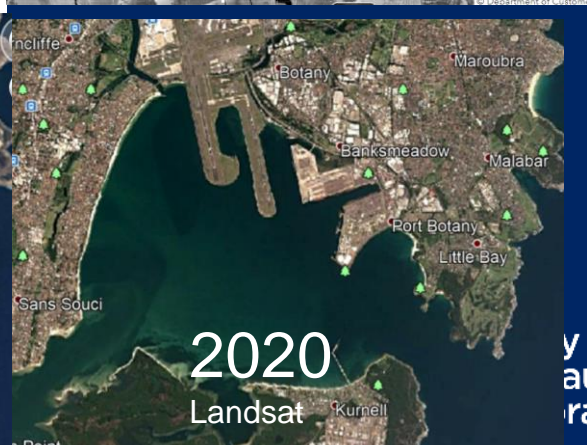
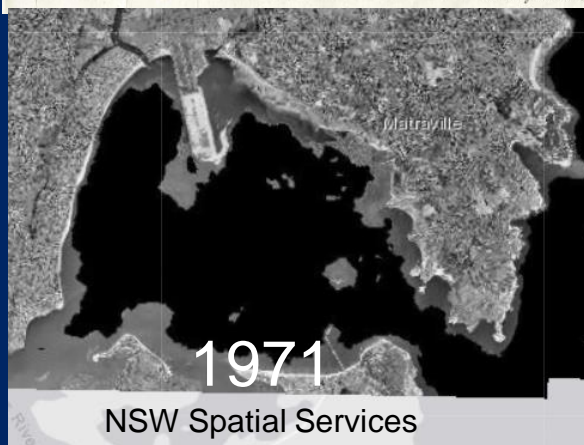
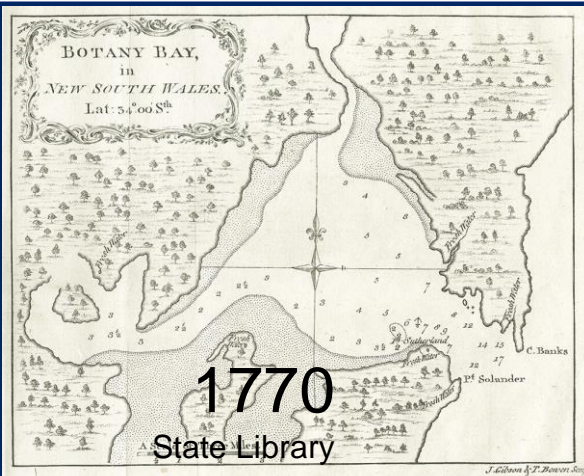
First beach people see when flying into
Australia's most visited city

WHAT FUTURE DO WE WANT?

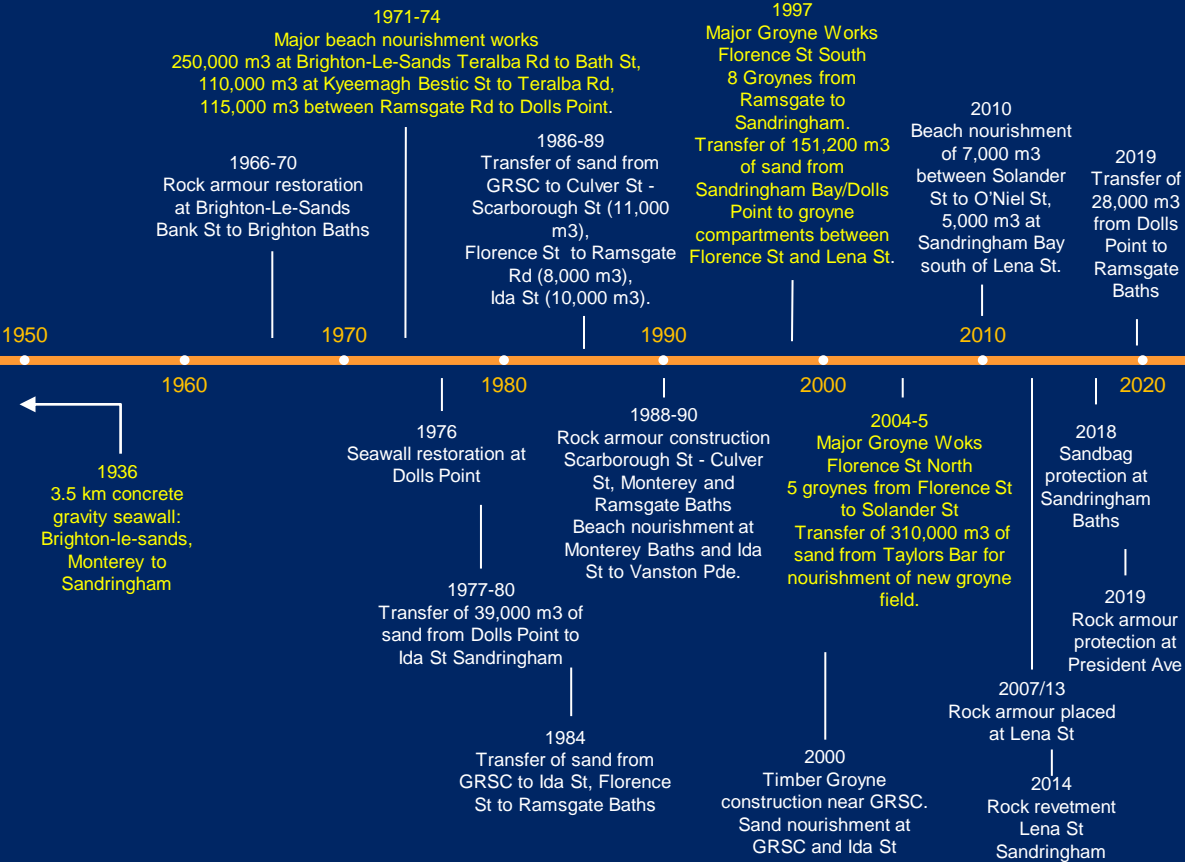


Manly
Hydraulics
Laboratory

Background – History of major developments



Background – History of Coastal Management

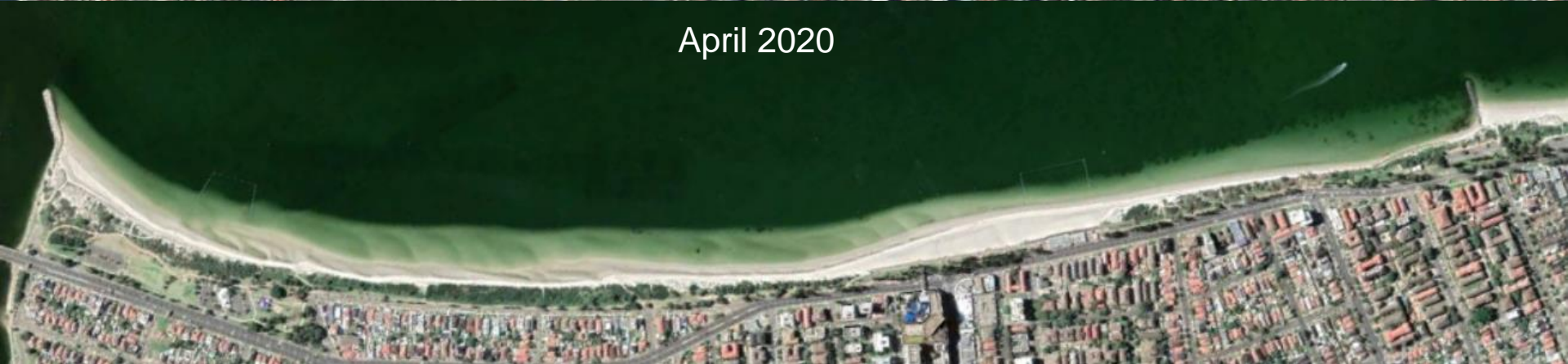


Beach changes since 2006

September 2005



April 2020



President Ave Erosion

WHAT FUTURE DO WE WANT?

27 April 2022



Since 2006 loss of over 50m of beach width
Shoreline retreat on average 2-5 m/year

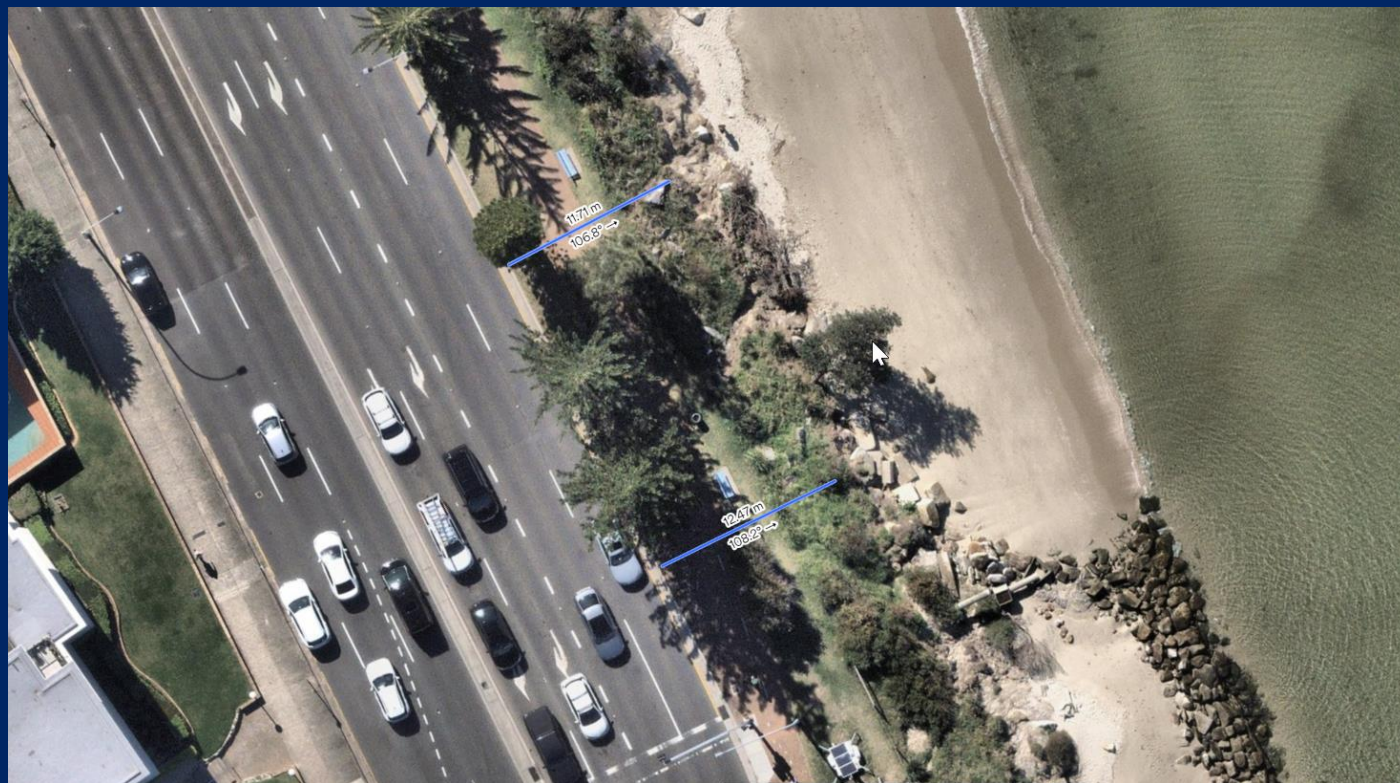


Manly
Hydraulics
Laboratory

President Ave Erosion

Nearmaps
1 May 2023

Scarp line ~12m
from kerbside
Grand Pde



President Ave Erosion – 2050 and 2100 Hazard Lines



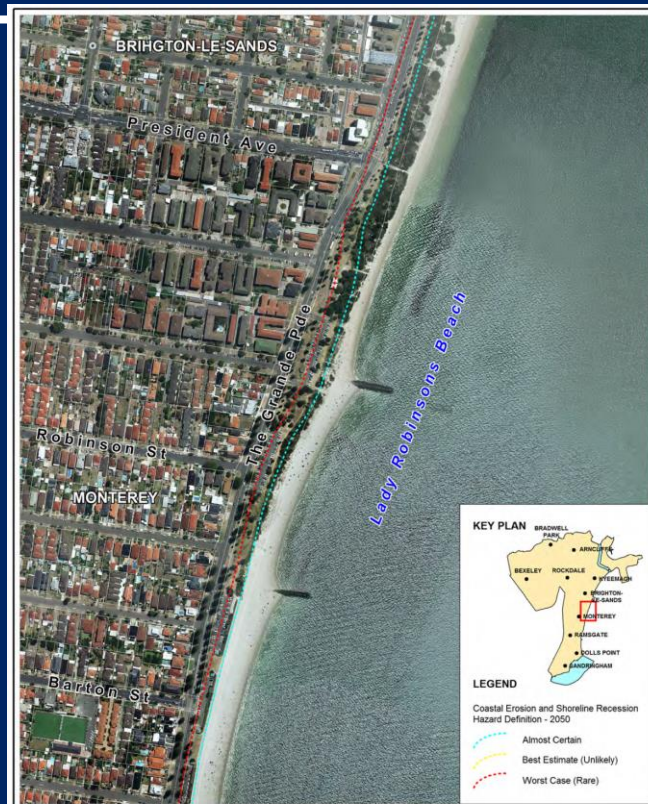
Title: **Erosion and Recession Hazard Definition 2050 Planning Horizon - Monterey**

Figure: **B-3**
 Rev: **A**

BMT WBM endeavours to ensure that the information provided in this map is correct at the time of publication. BMT WBM does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.



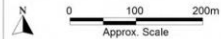
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Title: **Erosion and Recession Hazard Definition 2100 Planning Horizon - Monterey**

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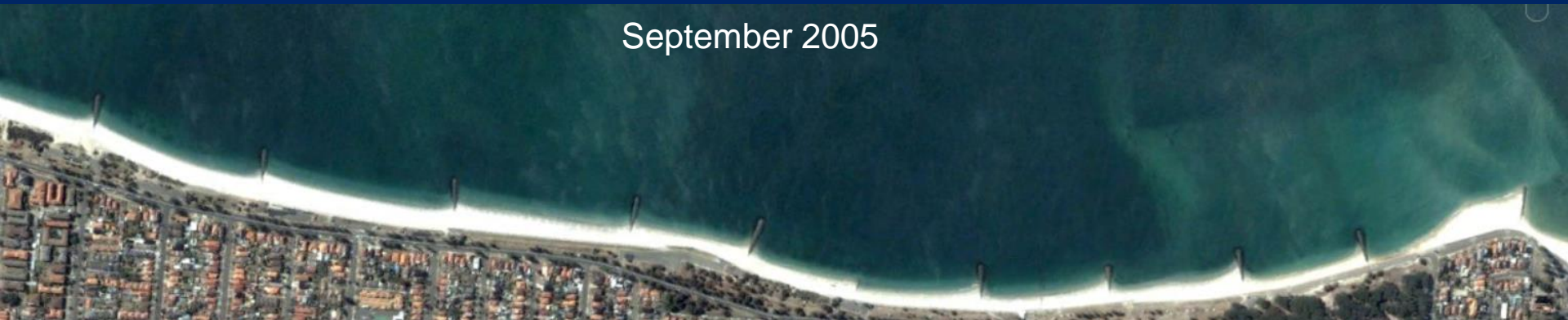
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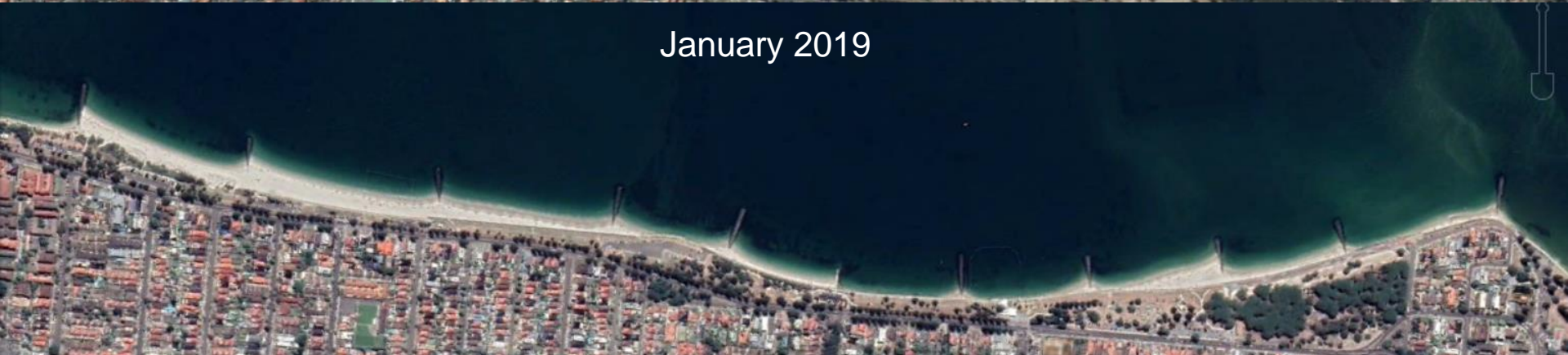
Manly Hydraulics Laboratory

Beach changes since 2006

September 2005



January 2019



Beach changes since 2006



September 2005



January 2019



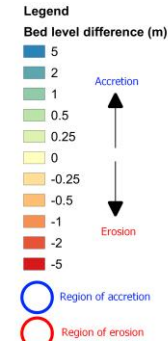
Manly
Hydraulics
Laboratory

Background - Beach Changes 2006-2018

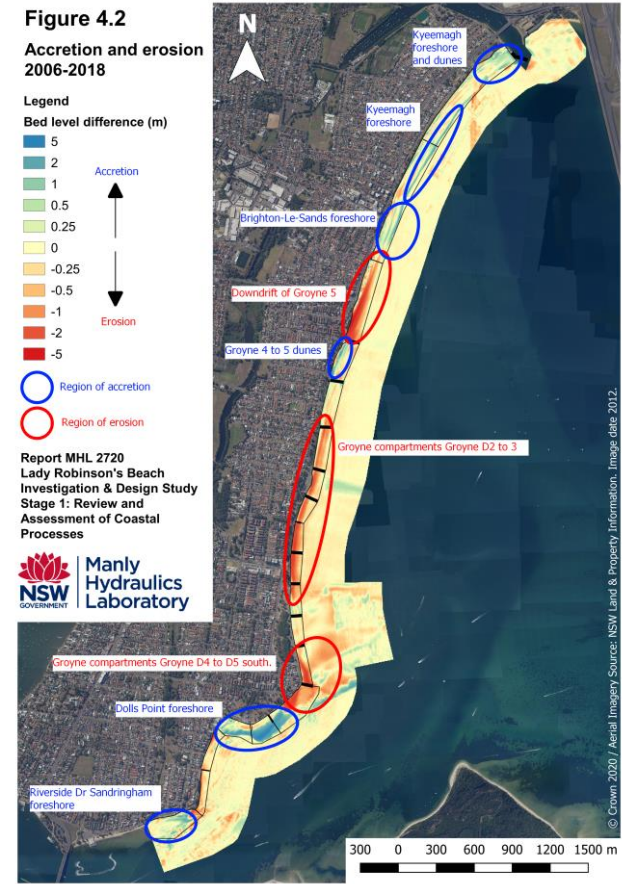
- Shoreline has continued to evolve - patterns of erosion and accretion
 - Approximate nearshore volume changes 2006 to 2018:
 - Groyne 4 to 5, Kyeemagh + Brighton-Le-Sands: **+73,200 m³**
 - North of Groyne 5: **-89,400 m³** (up to 50 m width lost)
 - Groyne Compartments D5 to Groyne 4: **-130,000 m³***
 - Dolls Point South to Corner of Sandringham Bay: **+78,500 m³***
 - Sandringham Bay to Groyne D8: **-6,700 m³**
 - Lena St south of Groyne D8: **-9,600 m³**
 - Riverside Dr. Georges River northern foreshore: **+12,500 m³**
- * Does not include 2019 sand transfer of +28,000 m³ to Ramsgate Baths from Dolls Point*

Figure 4.2

Accretion and erosion 2006-2018



Report MHL 2720
Lady Robinson's Beach
Investigation & Design Study
Stage 1: Review and
Assessment of Coastal
Processes



Management Options

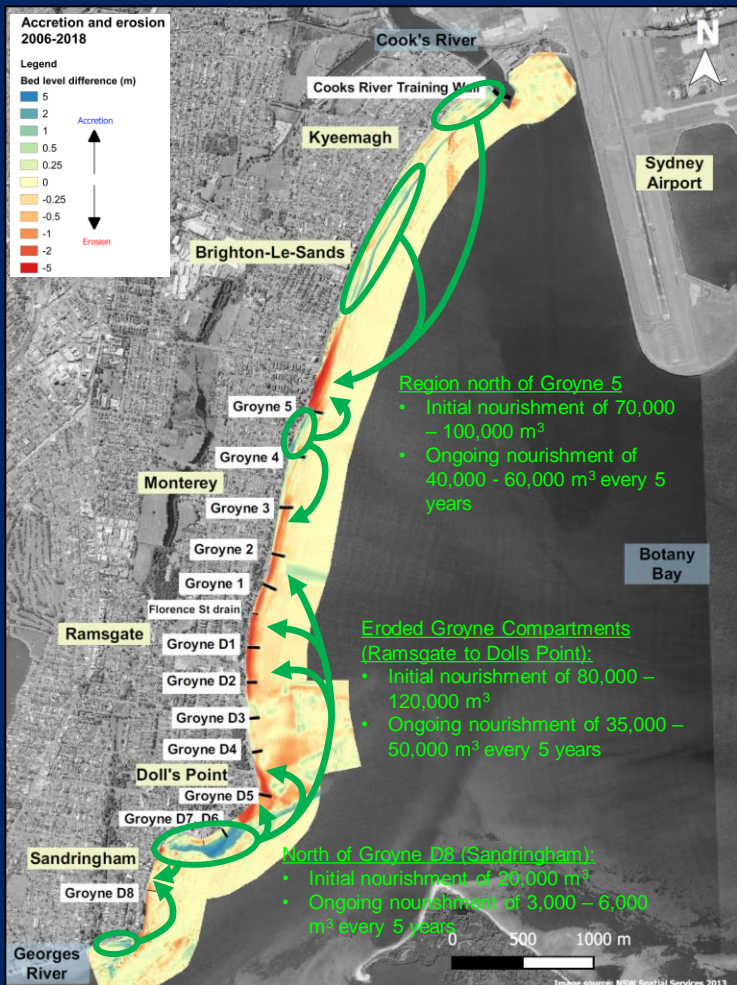
Base Case: no sand transfer and expand shore protection

1. Active beach management via sand transfer (major ongoing)
2. Lengthening groynes and sand transfer (moderate ongoing)
3. Groyne shape alteration and sand transfer (moderate ongoing)
4. Lengthening groynes, additional end groynes and sand transfer (low ongoing)
5. Lengthening groynes, detached breakwaters and sand transfer (minor ongoing)
6. Sand Pumping System
7. Active beach management with initial mass sand nourishment
8. Targeted foreshore amenity management approach

Maintaining a design sandy beach Brighton to Sandringham Bay

Amenity driven approach





1. Active Beach Management

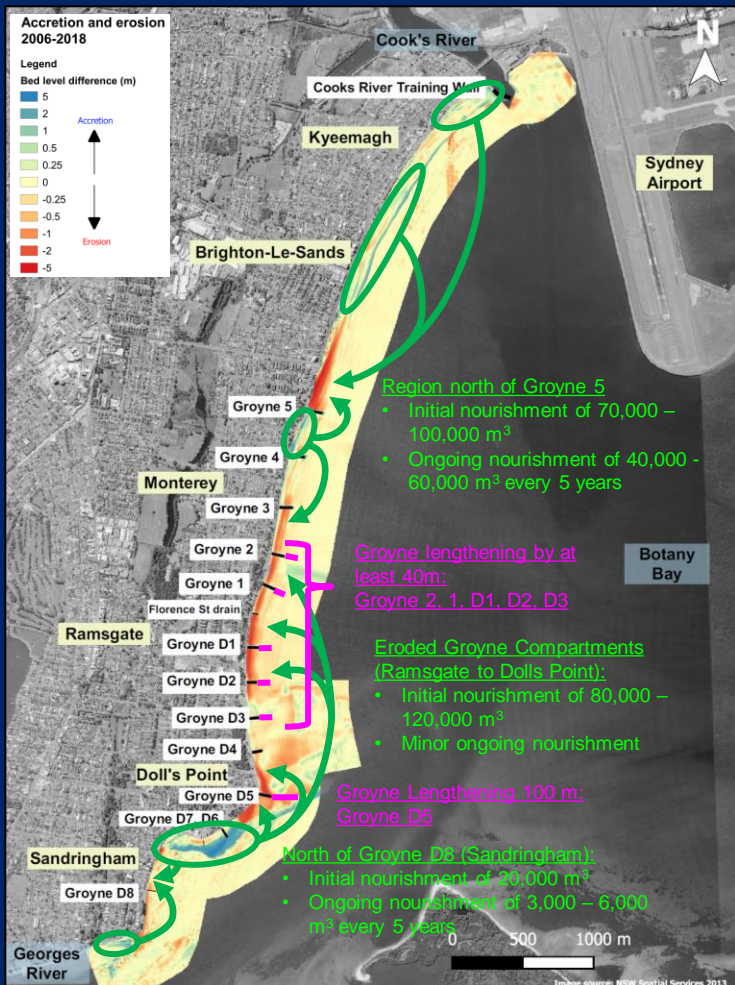
- Restore beach to design reference profile
- Active beach monitoring – regular basis and around events
 - Triggers for repeat sand transfer & nourishment

Pro's

- Maintains sandy beach amenity
- Utilises native sand within the system

Cons

- Potential high ongoing \$ for repeat works
- Uncertain longevity of sand transfer works



2. Lengthening Groynes + Sand Transfer (ongoing)

- Lengthening of Groynes 2, 1, D1, D2 and D3 by at least 40 m – Rock armour
- Lengthening of Groyne D5 by 100m – Submerged fibre reinforced sheet pile (below)

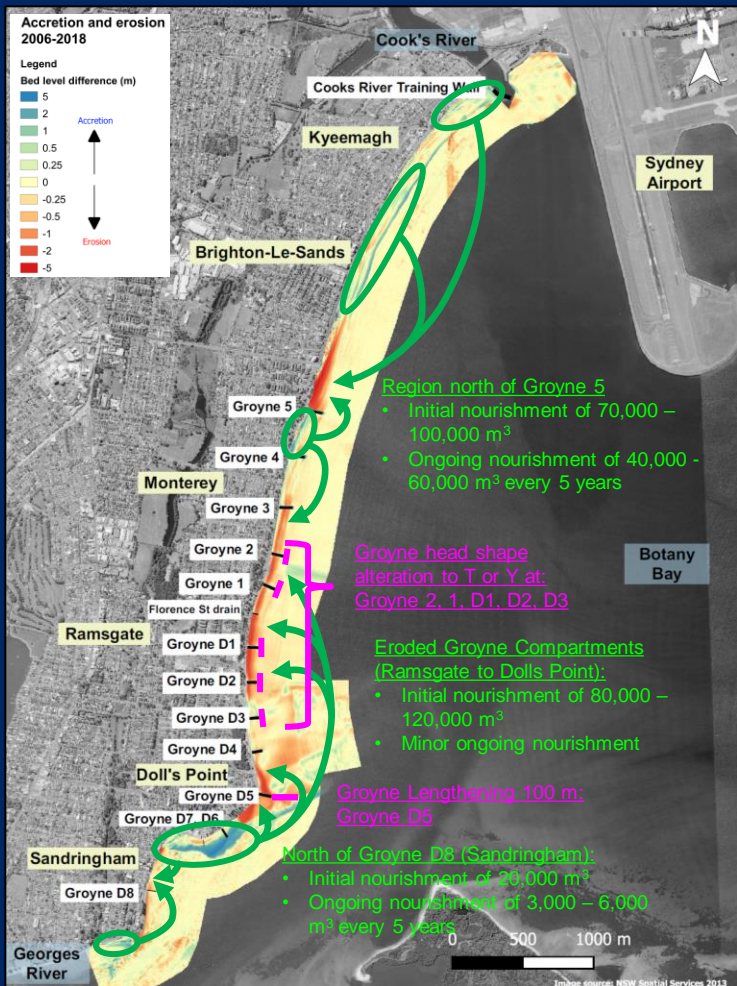
Pro's

- Maintains sandy beach amenity
- Utilises native sand within the system
- Improved sand retention time / lower ongoing \$

Cons

- Higher capital costs
- Downdrift erosion
- Uncertain efficacy





3. Groyne shape alteration + Sand Transfer (ongoing)

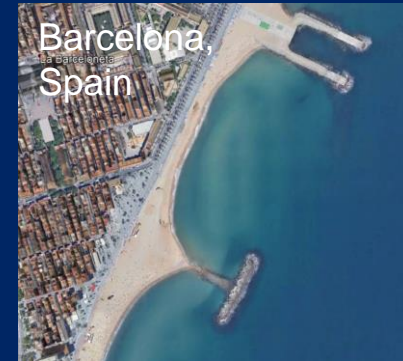
- T or Y (fishtail) designs, above or below water

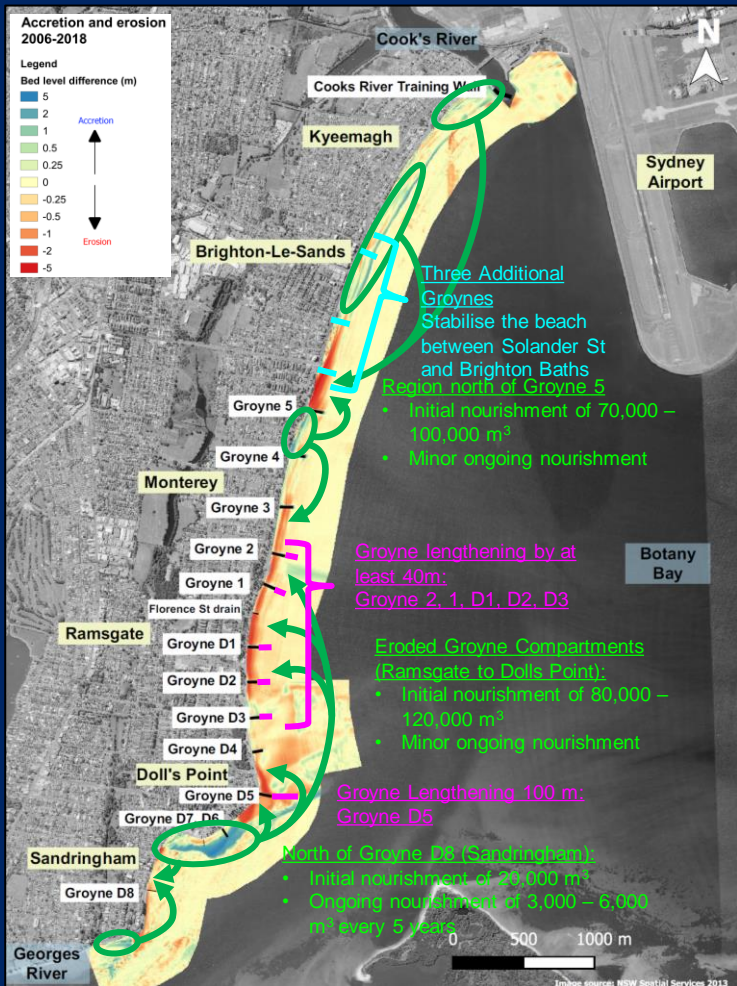
Pro's

- Maintains sandy beach amenity
- Utilises native sand within the system
- Improved sand retention time / lower ongoing \$

Cons

- Higher capital costs
- Downtdrift erosion
- Requires narrow spacing
- Uncertain efficacy





4. Lengthening Groynes + Sand Transfer (ongoing) + Additional groynes

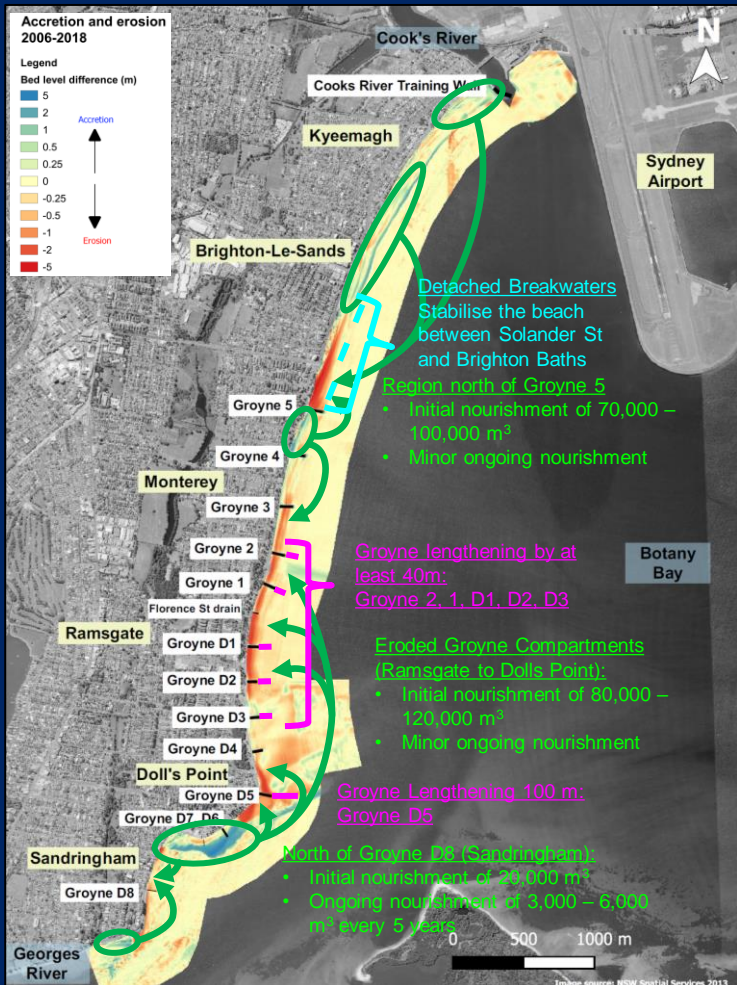
- Stabilise beach north of Groyne 5 via 3 new rock groynes at Brighton-Le-Sands
- Lengthening existing groynes to reduce ongoing sand requirements

Pro's

- Maintains sandy beach amenity
- Utilises native sand within the system
- Improved sand retention time / lower ongoing \$
- Retains sand downdrift of groynes

Cons

- High capital costs
- Reduced visual amenity
- Uncertain efficacy



5. Lengthening Groynes + Sand Transfer (ongoing) + Detached Breakwaters

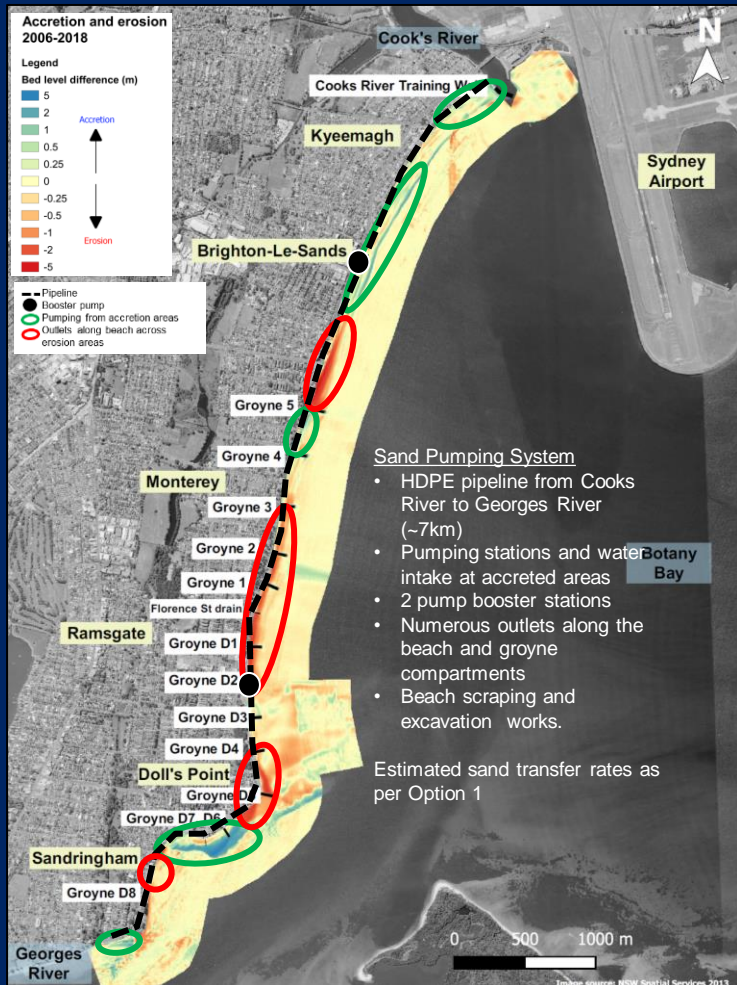
- Stabilise beach north of Groyne 5 via 3 detached breakwaters at Brighton-Le-Sands
- Lengthening existing groynes to reduce ongoing sand requirements

Pro's

- Maintains sandy beach amenity
- Utilises native sand within the system
- Improved sand retention time / lower ongoing \$
- Retains sand downdrift of groynes

Cons

- High capital costs
- Reduced visual amenity
- Uncertain efficacy



6. Sand Pumping System

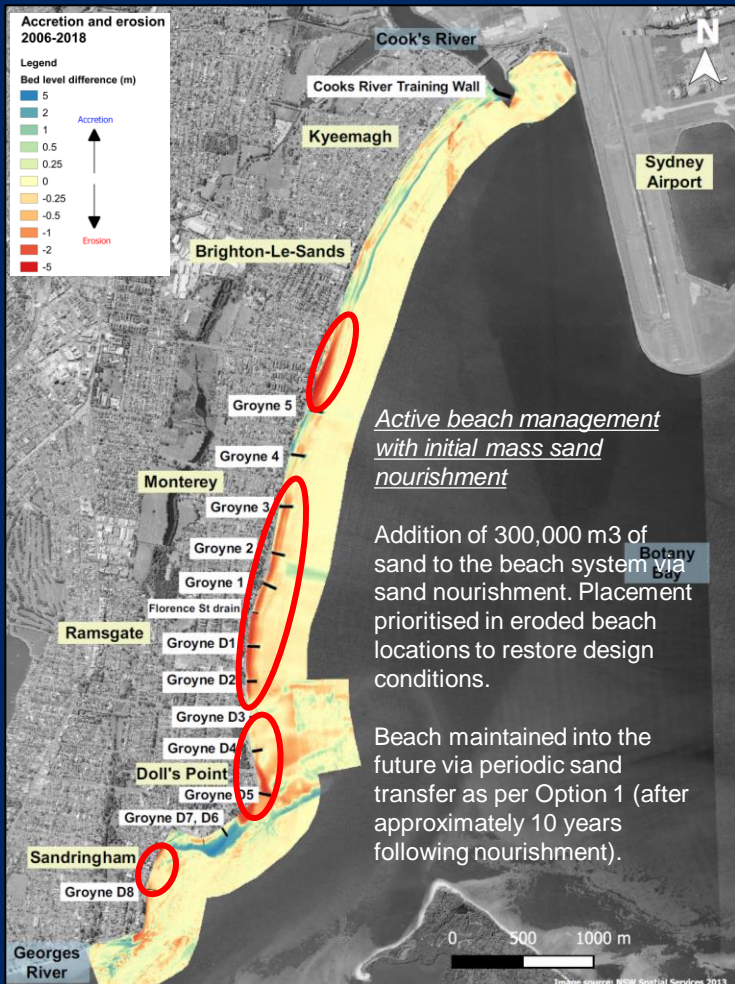
- Permanent sand pumping system with pipeline, pumping stations and outlets along beach

Pro's

- Maintains sandy beach amenity
- Utilises native sand within the system
- Reduces onsite plant and trucking costs for repeat works

Cons

- High capital costs
- Uncertainty in sand source locations (accretion regions may vary in location)
- Visual amenity and noise during operation



7. Mass sand nourishment

- Mass nourishment from M6 Tunnel spoils
- Restore beach to design reference profile
- Active beach monitoring – regular basis and around events
 - Triggers for repeat sand transfer & nourishment

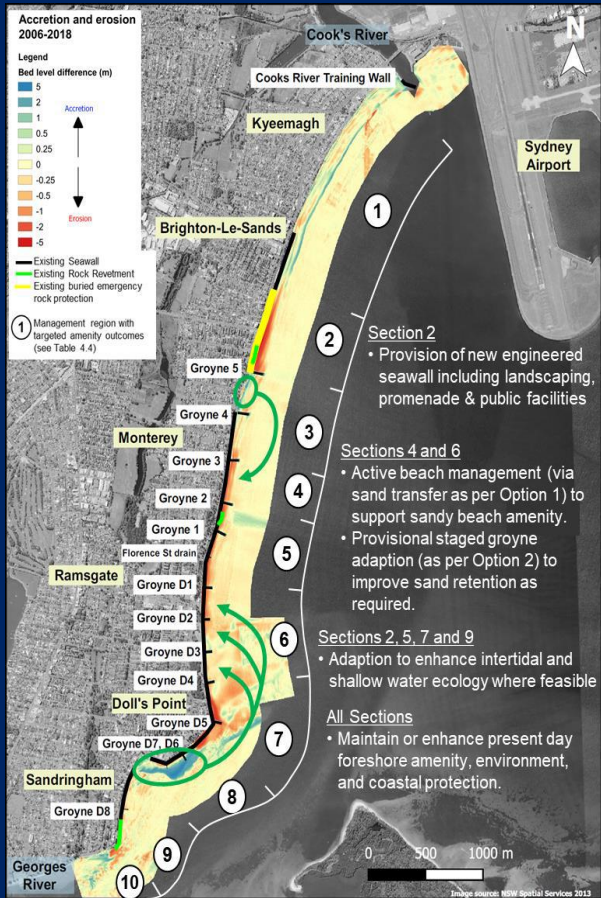
Pro's

- Maintains sandy beach amenity
- Potential low cost / high volume sand source

Cons

- Tunnel spoil sediment quality not known
- Potential costs for onsite spoil crushing & grading
- Potential contaminants

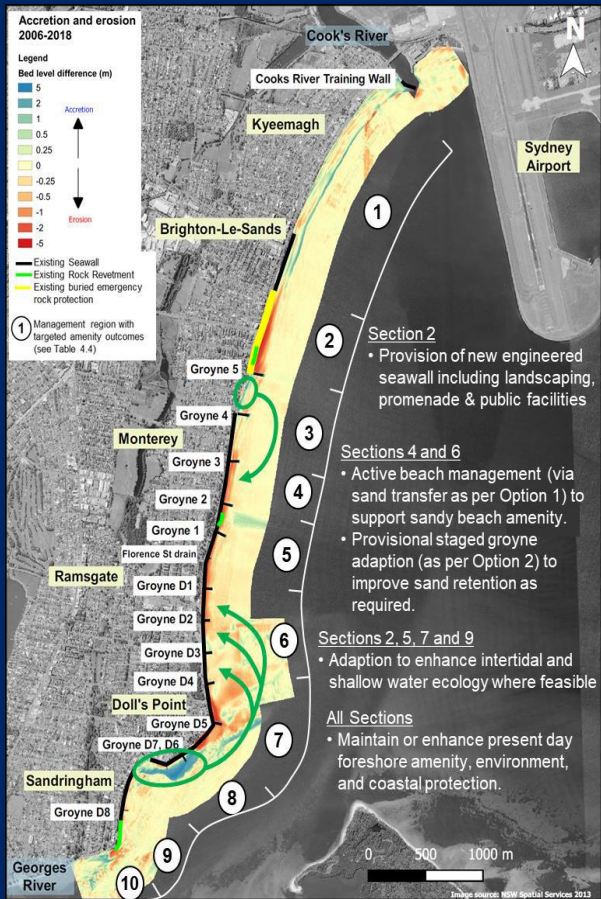
Option 8 Targeted foreshore amenity management approach



An alternate approach rather than fight to maintain a full 7km stretch of sandy beach that is continuing to change...

Management approach that adapts to ongoing shoreline change and targets key user amenity in certain location.

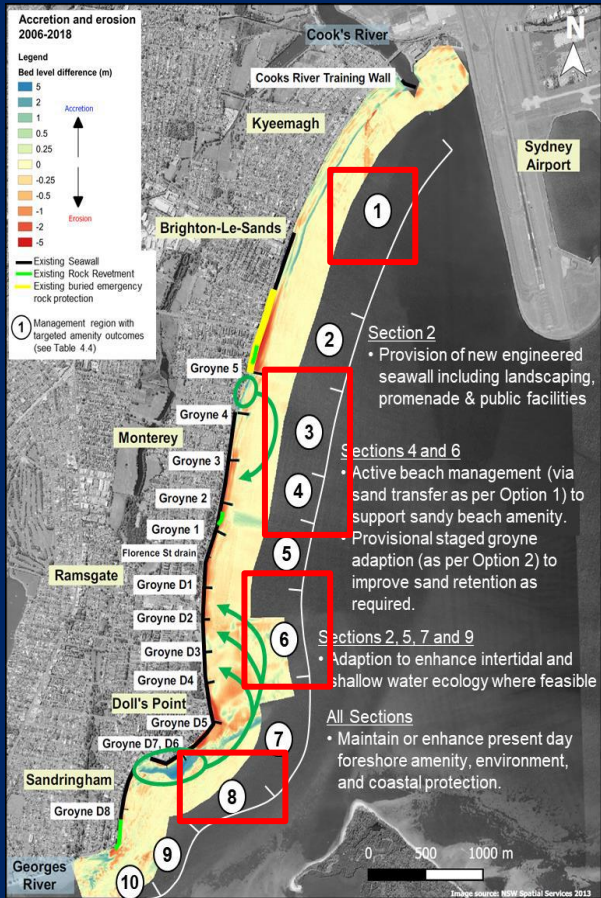
Option 8 Targeted foreshore amenity management approach



How it was developed?

- Knowledge of coastal processes and behaviour – how we can better work with ongoing shoreline change
- First-pass estimate of present day foreshore amenity values (based on previous site inspection)
- Objective to achieve sustainable outcomes
- Division of beach into preliminary management regions (10) with local targeted management outcomes

Option 8 Targeted foreshore amenity management approach



Targeted sandy beach regions:

Section 1 Brighton-Le-Sands to Kyeemagh (stable/accretion)

Section 3 Groyne 3 to 5, Monterey (stable)

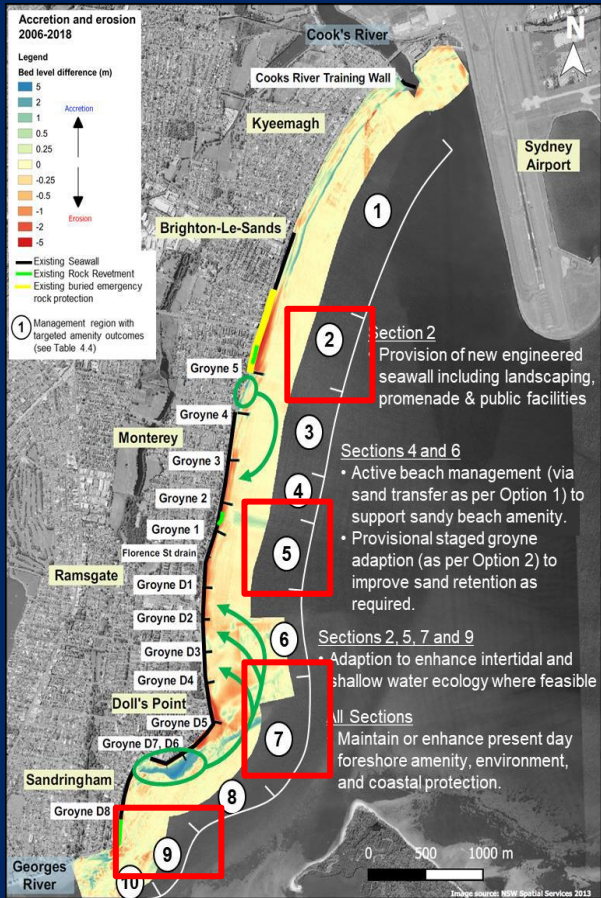
Section 4 Groyne 2 to 3, Monterey (minor sand transfer)

Section 6 Groyne D1 to 2, Ramsgate (sand transfer)

Section 8 Primrose Ave to Russell Ave, Dolls Point (accretion)

- Reduction of sand transfer requirement by 50-75% compared with Option 1.
- Potential for staged adaption of targeted groyne structures to improve sand retention at Ramsgate.

Option 8 Targeted foreshore amenity management approach



Non-sandy beach amenity driven outcomes

Section 2 Groyne 5 to Seawall, Brighton-Le-Sands (eroding)

Section 5 Groyne D1 to 2, Ramsgate (eroding)

Section 7 Russell Ave to D4, Dolls Point

Section 9 Riverside Dr to Primrose Ave, Sandringham

- Maintenance of existing seawall protection
- Amenity: promenade, picnic areas, playgrounds, open space, water front walkway/cycleway, fishing, non-sandy entry to water for swimming.
- Potential adaption from historic amenity uses.
- Purse adaption where feasible to enhance intertidal ecology

Summary of revised results

Management Option	Initial costs (\$M)	Ongoing costs every 5 years (\$M) ^b	Benefit-Cost Ratio ^c (NPV, \$M)	Multi-Criteria Analysis Rank/Score
1 Active beach management via sand transfer (major ongoing)	\$6.0	\$2.7 (1.5 - 3.9)	2.60 (\$24.2)	2 / 46
2 Lengthening groynes and sand transfer (moderate ongoing)	\$11.7	\$1.4 (0.8 - 2.2)	2.28 (\$22.0)	4 / 39
3 Groyne shape alteration and sand transfer (moderate ongoing)	\$14.3	\$1.4 (0.8 - 2.2)	1.98 (\$19.5)	7 / 17
4 Lengthening groynes, additional end groynes and sand transfer (minor ongoing)	\$16.9	\$0.3	2.02 (\$19.9)	5 / 33
5 Lengthening groynes, detached breakwaters and sand transfer (minor ongoing)	\$15.6	\$0.2	2.20 (\$21.5)	6 / 27
6 Sand Pumping System	\$17.9	\$1.6	1.64 (\$15.3)	8 / 1
7 Active beach management (Option 1) with initial mass sand nourishment	\$3.0 ^d	\$2.7 (1.5 – 3.9) Beginning after year 10	3.31 ^d (\$27.4)	3 / 42
8 Targeted foreshore amenity management approach	\$14.5	\$0.6 (0.3 - 0.9)	2.99 (\$34.0)	1 / 73

^a Costs do not include additional expenditure required for the upkeep of existing structures, sand nourishment to offset sea level rise impacts and beach profile monitoring (refer to Section 4.1.9 and 4.3 for additional cost estimates).

^b Costs for ongoing sand nourishment are indicative and may vary. Ongoing beach monitoring is recommended to evaluate and optimise future nourishment works.

^c 7% discount rate and 50-year horizon

^d Costs may vary depending on tunnel spoil processing requirements prior to nourishment. Additional costs would be required for onsite crushing/screening, environmental approvals and removal of contaminant materials. Additional tunnel spoil crushing and screening costs for Option 7 is estimated to reduce the Net Present Value (7% discount rate, 50-year horizon) for this option to approximately \$21.5M (Benefit-Cost Ratio 2.23).



Summary of revised results

Base case: 'Maintain Status Quo'

Option 1: Active beach management via sand transfer (major ongoing)

Option 2: Lengthening groynes and sand transfer (moderate ongoing)

Option 3: Groyne shape alteration and sand transfer (moderate ongoing)

Option 4: Lengthening groynes, additional end groynes and sand transfer (minor ongoing)

Option 5: Lengthening groynes, detached breakwaters and sand transfer (minor ongoing)

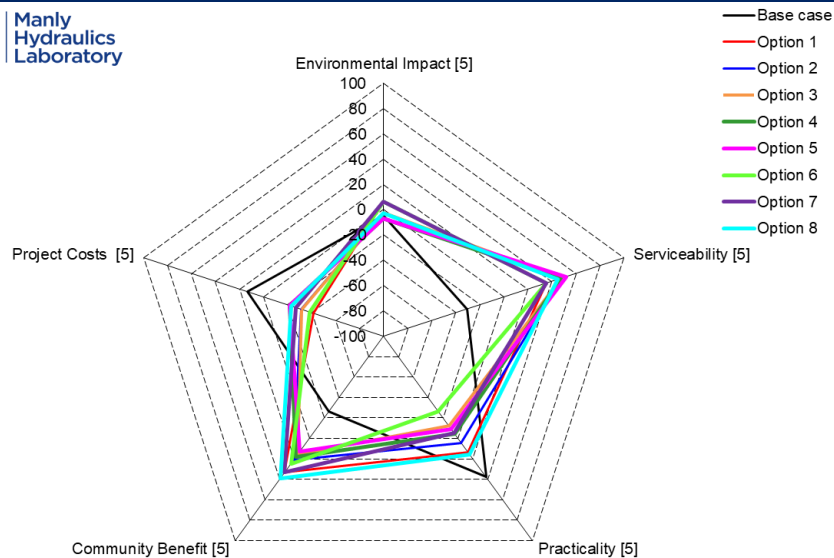
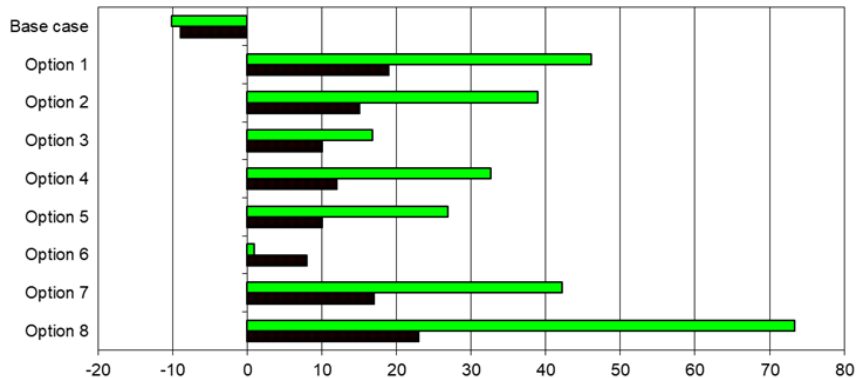
Option 6: Sand pumping system

Option 7: Active beach management with initial mass sand nourishment

Option 8: Targeted foreshore amenity management approach

Overall Assessment Scores

■ Weighted ■ Unweighted



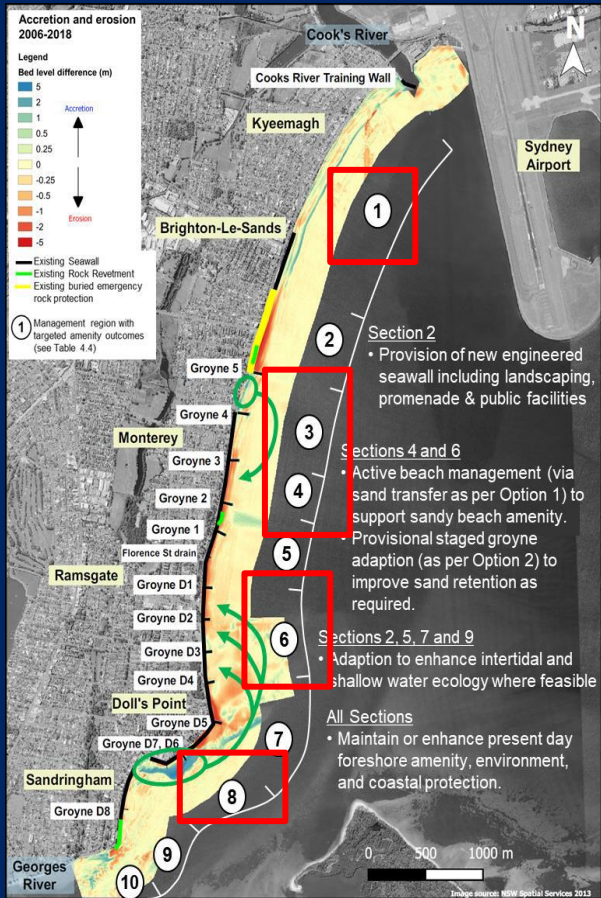
Option 8 Targeted foreshore amenity management approach

Redefined management approach:

- Prioritise maintenance of the sandy beach in targeted regions where this has beneficial amenity outcomes.
- Prioritise other forms of foreshore amenity (e.g., promenade foreshore areas) in regions with low sandy beach use that are prone to trends of shoreline/erosion.
 - Not as cost effective to maintain as compared with more stable or accreting parts of the foreshore.
- Approach primarily driven by desired (present and future adaption) foreshore amenity outcomes.



Option 8 Targeted foreshore amenity management approach



Targeted sandy beach regions:

Section 1 Brighton-Le-Sands to Kyeemagh (stable/accretion)

Section 3 Groyne 3 to 5, Monterey (stable)

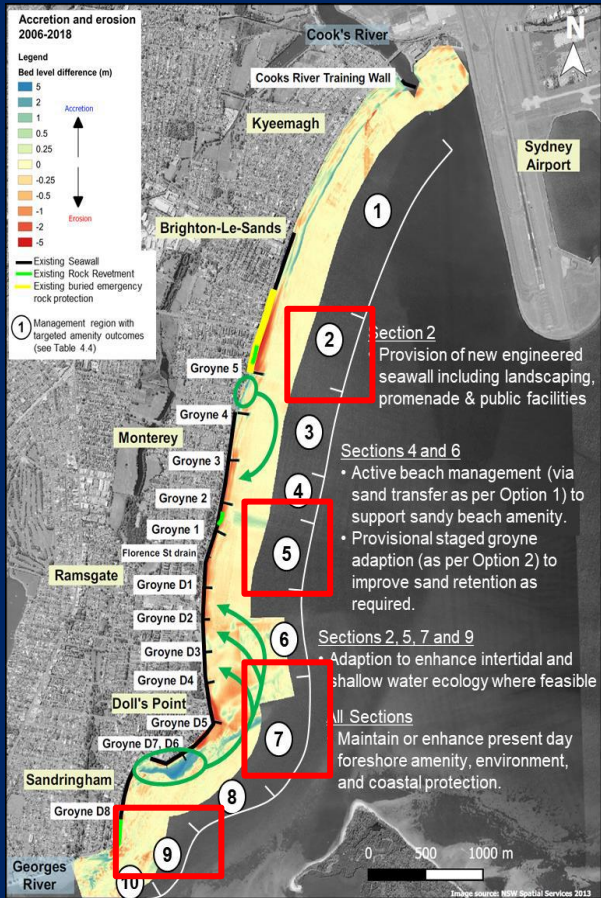
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Option 8 Targeted foreshore amenity management approach



Non-sandy beach amenity driven outcomes

Section 2 Groyne 5 to Seawall, Brighton-Le-Sands (eroding)

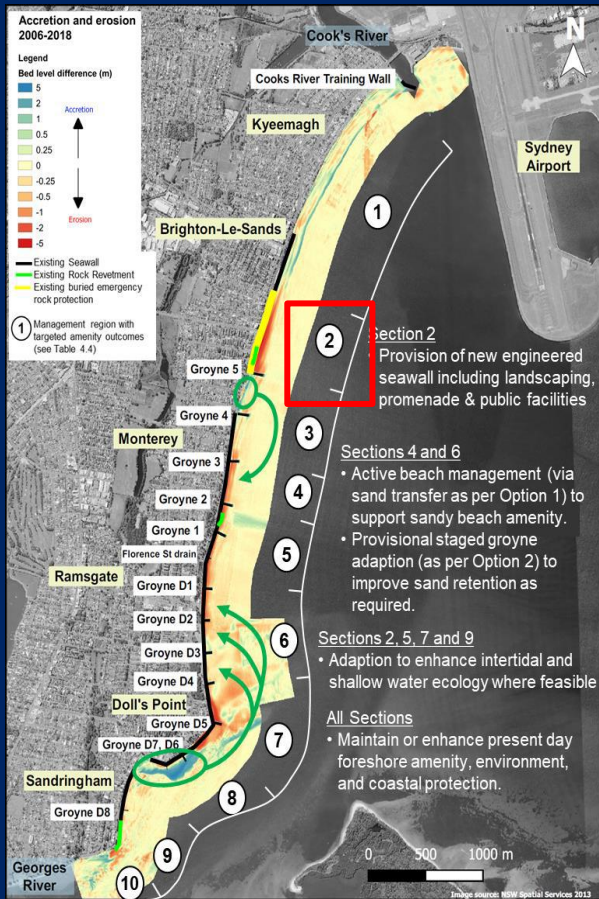
Section 5 Groyne D1 to 2, Ramsgate (eroding)

Section 7 Russell Ave to D4, Dolls Point

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- Maintenance of existing seawall protection
- Amenity: promenade, picnic areas, playgrounds, open space, water front walkway/cycleway, fishing, non-sandy entry to water for swimming.
- Potential adaption from historic amenity uses.
- Purse adaption where feasible to enhance intertidal ecology

Option 8 Targeted foreshore amenity management approach



Section 2: Groyne 5 to Seawall, Brighton-Le-Sands

- Removal of present foreshore hazards
- Provision of a new engineered seawall, with promenade, landscaping, viewing platforms, public facilities and environmental (living seawall) design features.
- Added foreshore promenade amenity, public recreation.
- Improved coastal protection for transport routes, The Grand Parade.
- Adapt to enhanced intertidal and shallow water ecology.

President Ave Erosion

WHAT FUTURE DO WE WANT?



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Option 8 Targeted foreshore amenity management approach



Option 8 preliminary cost estimate breakdown

Option 8: Targeted foreshore amenity management approach

Capital

Item

	Quantity	Rate	Cost estimate(\$)
New Engineered Seawall, Viewing platform and Landscaping for Public			
1 Recreation between Groyne 5 to Brighton-Le-Sands Seawall South End	700 m	\$18,440 per m	\$ 12,910,000
2 Sand Transfer 2: Groyne 2 to 3, Groyne D4 to D1.	50,000 m ³	\$30 per cubic m	\$ 1,500,000
3 Adaption of seawalls to support intertidal and shallow water ecology	50 m	\$2300 per m	\$ 115,000
		TOTAL	\$ 14,525,000

Provisional Future Items

1 Provisional Staged Lengthening x1 Groyne by at least 40 m in Year 10	1	\$770,000 per groyne	\$770,000 provisional/future
2 Provisional Staged Lengthening x1 Groyne by at least 40 m in Year 30	1	\$770,000 per groyne	\$770,000 provisional/future

Ongoing (every 5 years)

Item

	Quantity	Rate	Cost estimate(\$)	
			Lower	Upper
1 New seawall maintenance	700 m	-	\$ 15,400	-
2 Sand Transfer 2: Groyne 2 to 3, Groyne D4 to D1.	10000-25000 m ³	\$20-35 per cubic m	\$ 200,000	\$ 875,000
3 Adaption of seawalls to support intertidal and shallow water ecology	25 m	\$2000 per m	\$ 60,000	-
		TOTAL	\$ 275,400	\$ 875,000



Summary

- Managing the issues of ongoing shoreline changes (associated with substantial past developments in the Botany Bay) with an adaptable management approach.
- Management approach that works with coastal processes and that targets desired user amenity values for different foreshore regions of Lady Robinsons Beach with the ability to adapt to future amenity and shoreline changes.
- Developed in close consultation with the community and stakeholders.
- Potential benefits of a Foreshore Master Plan to confirm desired outcomes and inform the detailed design of a preferred option in subsequent works.

Next Steps

- Workshopping details of preferred option
 - Identify potential funding sources
 - Community and interested party engagement program
 - Development of draft foreshore master plan to inform detailed design
- Brighton to Cook Park Restoration Project
- Stage 3: Detailed design, REF, Business Case, Economic distributional analysis.



General Discussion
