Assessing the cost of frequent flooding on public infrastructure

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Introduction to presenters

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Overview

Topic	Presenter
Lake Macquarie's approach to adaptation planning	Alice Howe
Adaptation options	Alice Howe
Testing a scenario with the tool	Julian Barbi
What we learned	Julian Barbi
Q&A	Alice Howe, Julian Barbi

Snapshot of Lake Macquarie

Project rationale

Large coastal community

Extensive Asset base

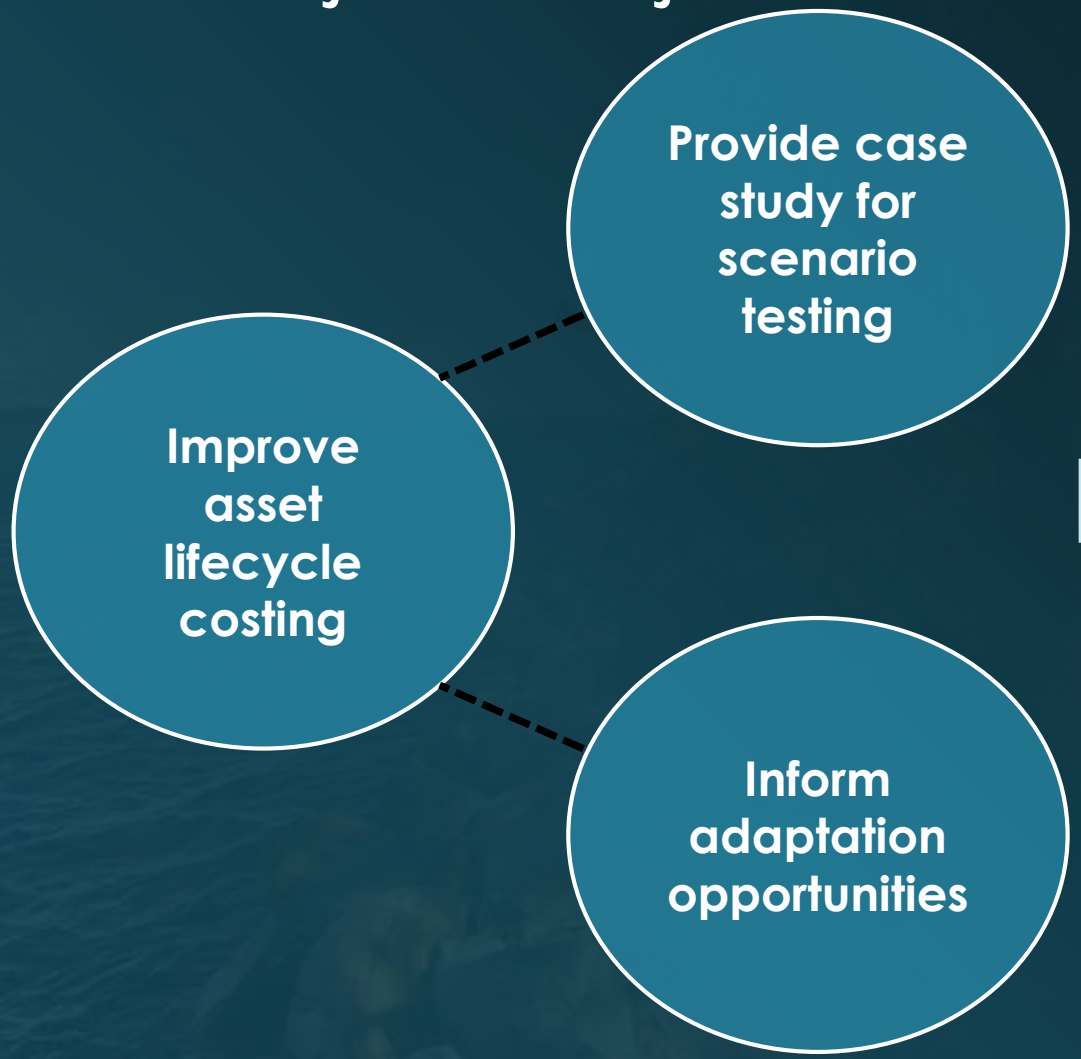
Ensure successful service delivery

What if..?

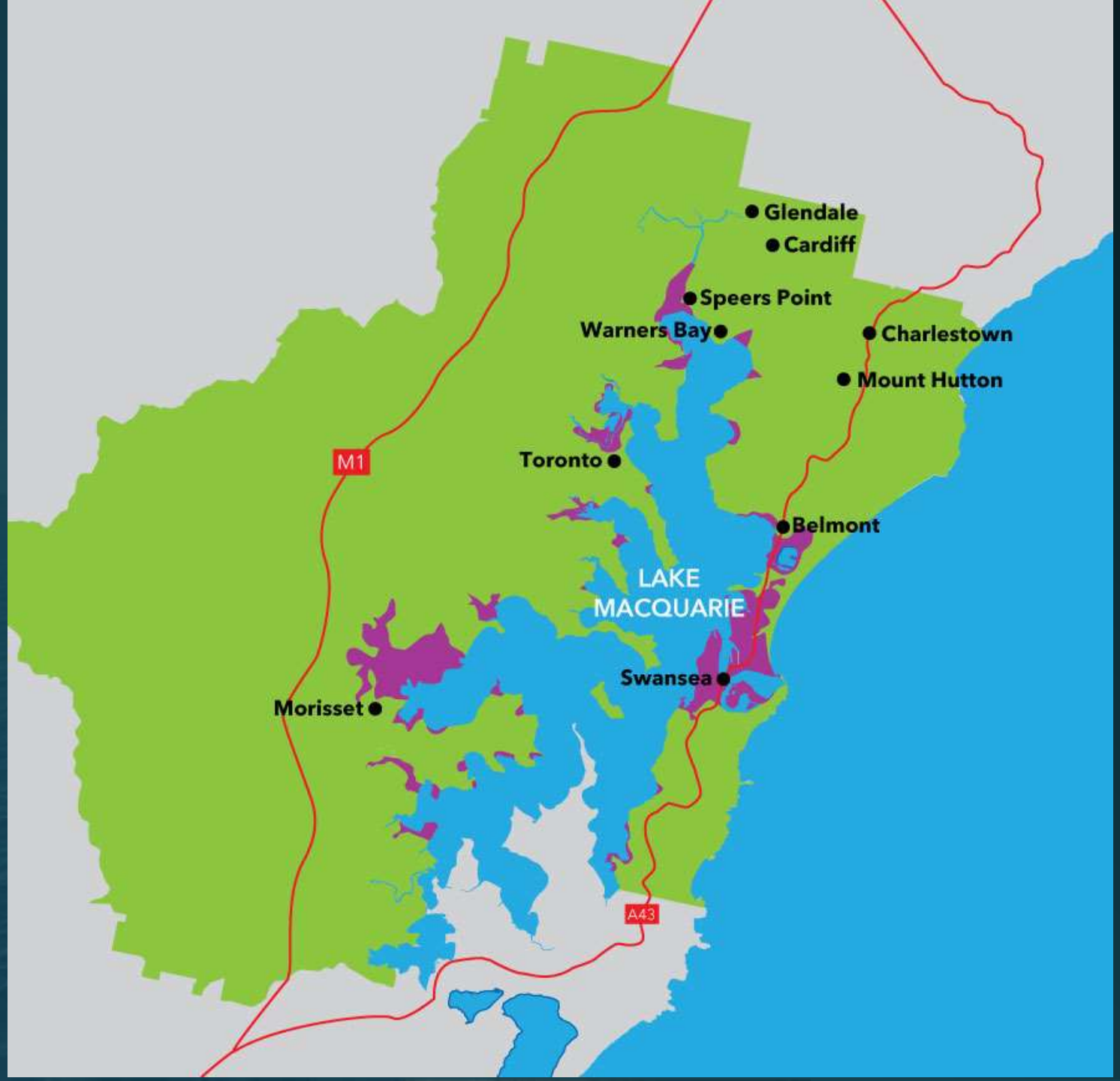
Sea levels are rising

How will Council manage assets?

Project objective



- Strategic asset planning
- Asset management improvement
- Levels of service
- Risk adaptation planning
- Decision making



Areas of low lying land

Case Study Areas – Now and Future

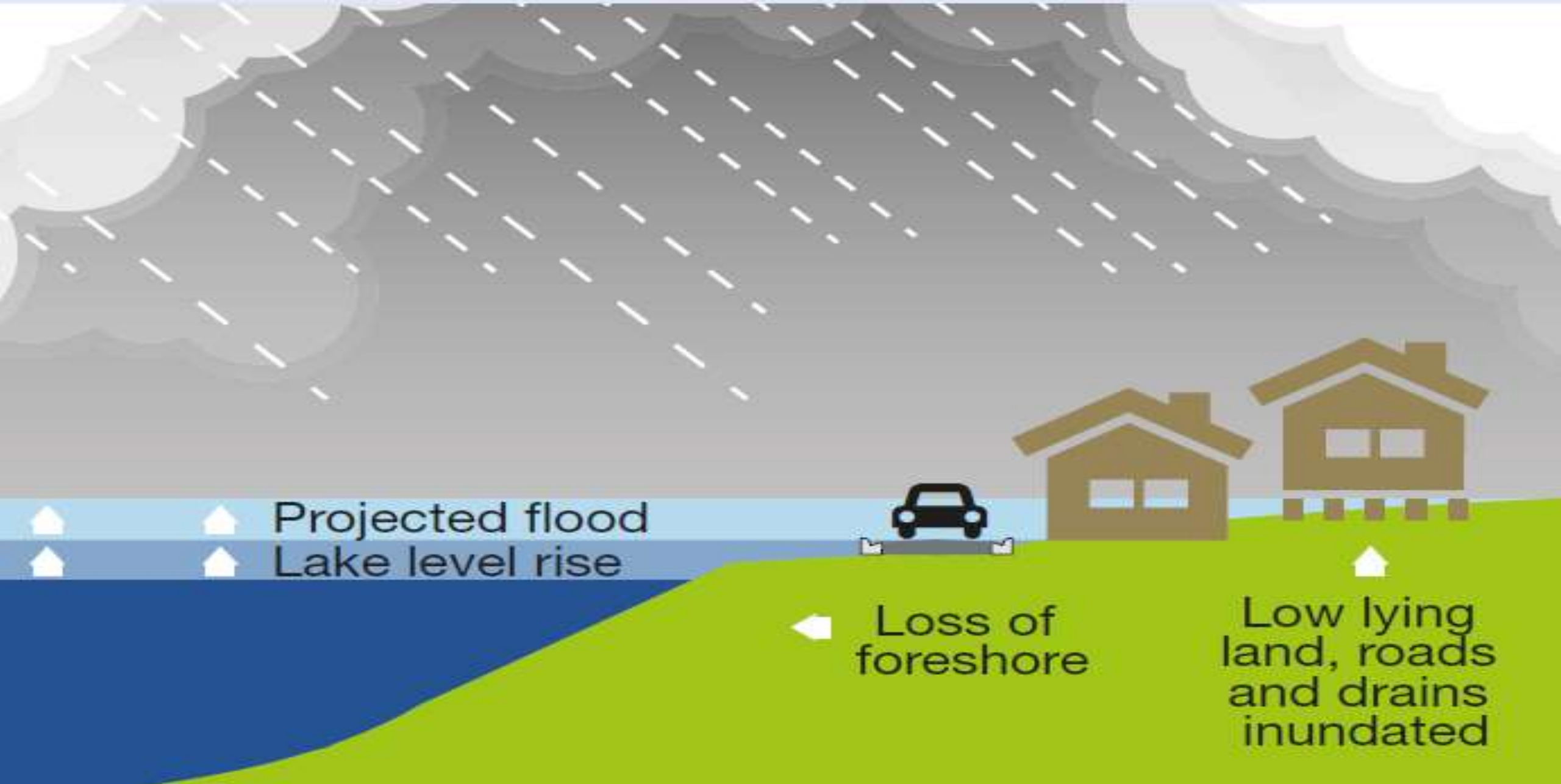
Byrnes Reserve High Tide – 2016

Pelican foreshore in flood - April 2015

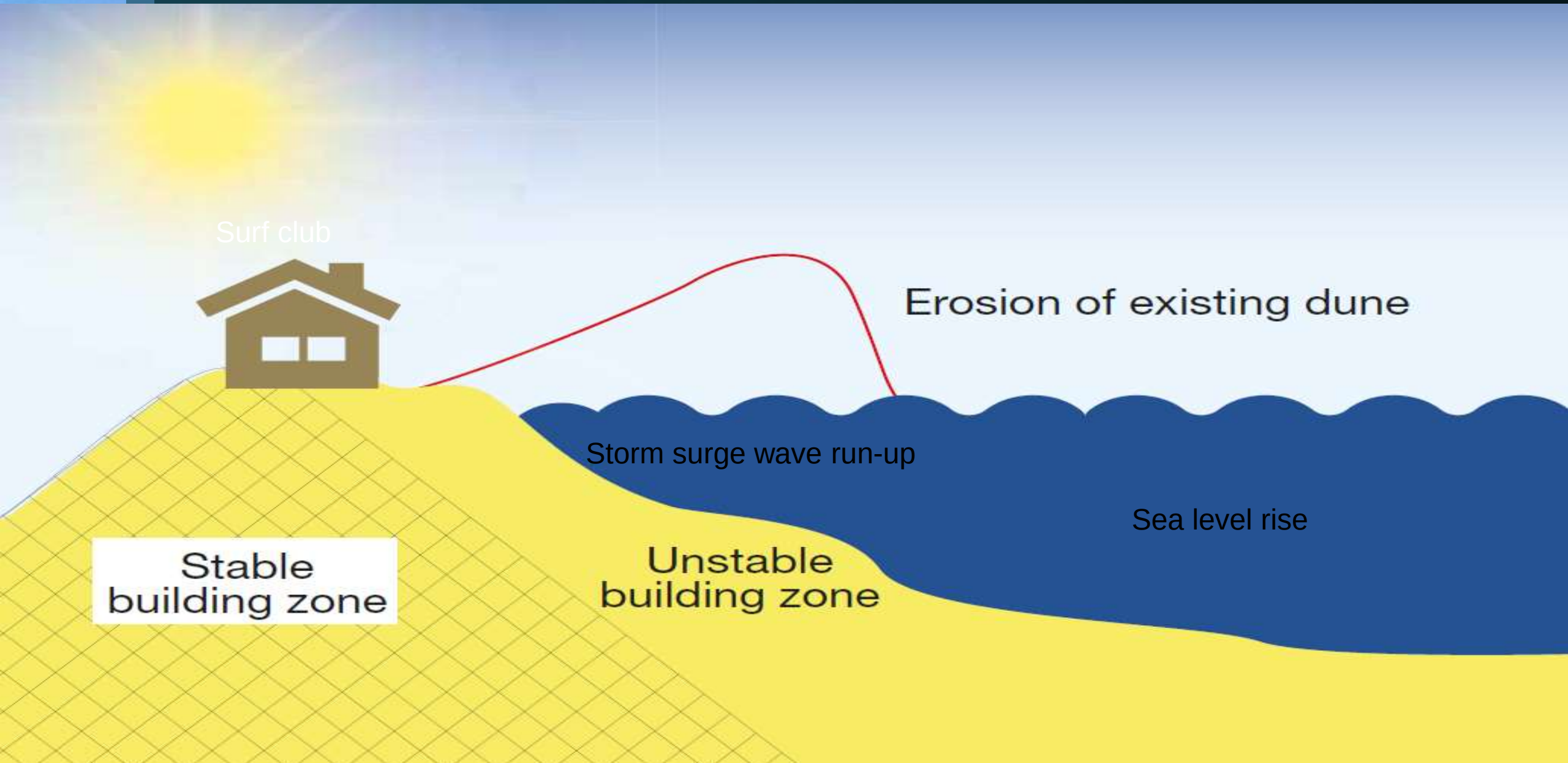
Blacksmiths – 2016(East Coast Low Event)


Swansea Channel High Tide - 2016

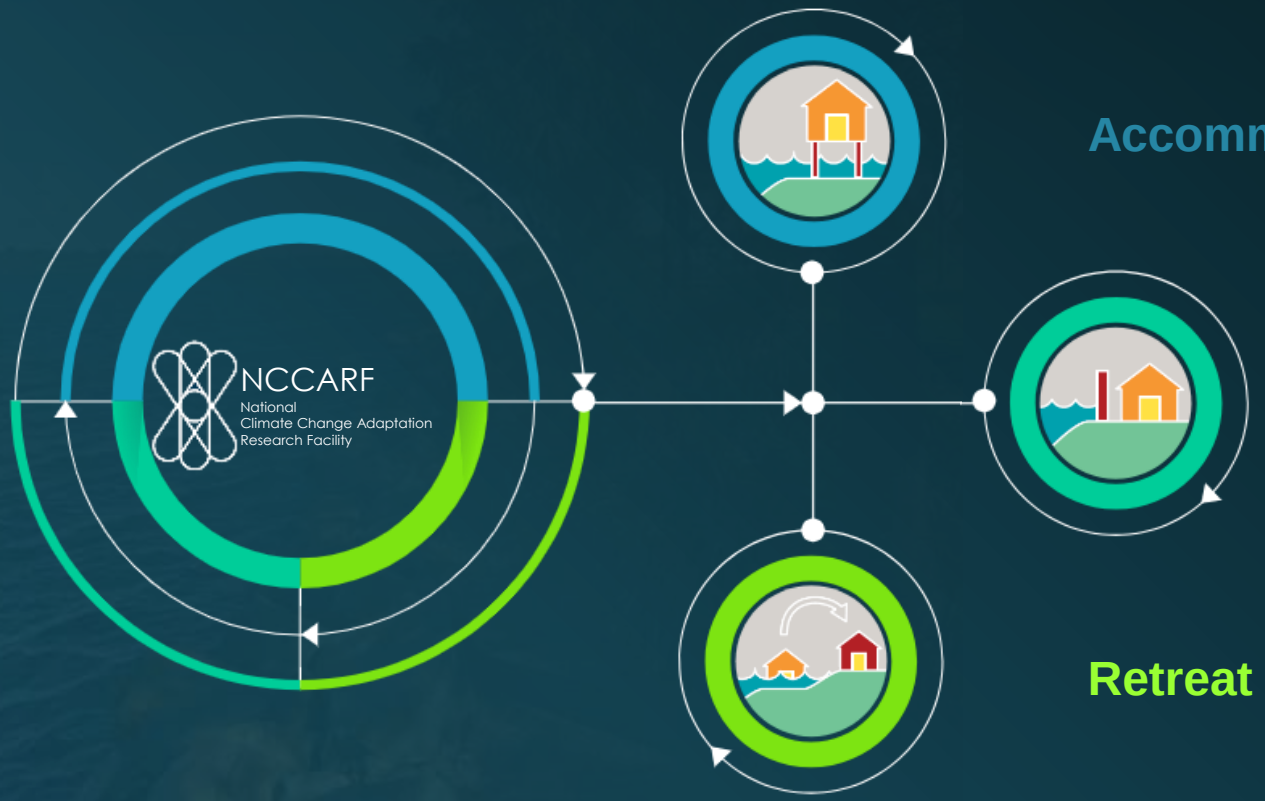
If we do nothing…



If we do nothing…



Adaptation options

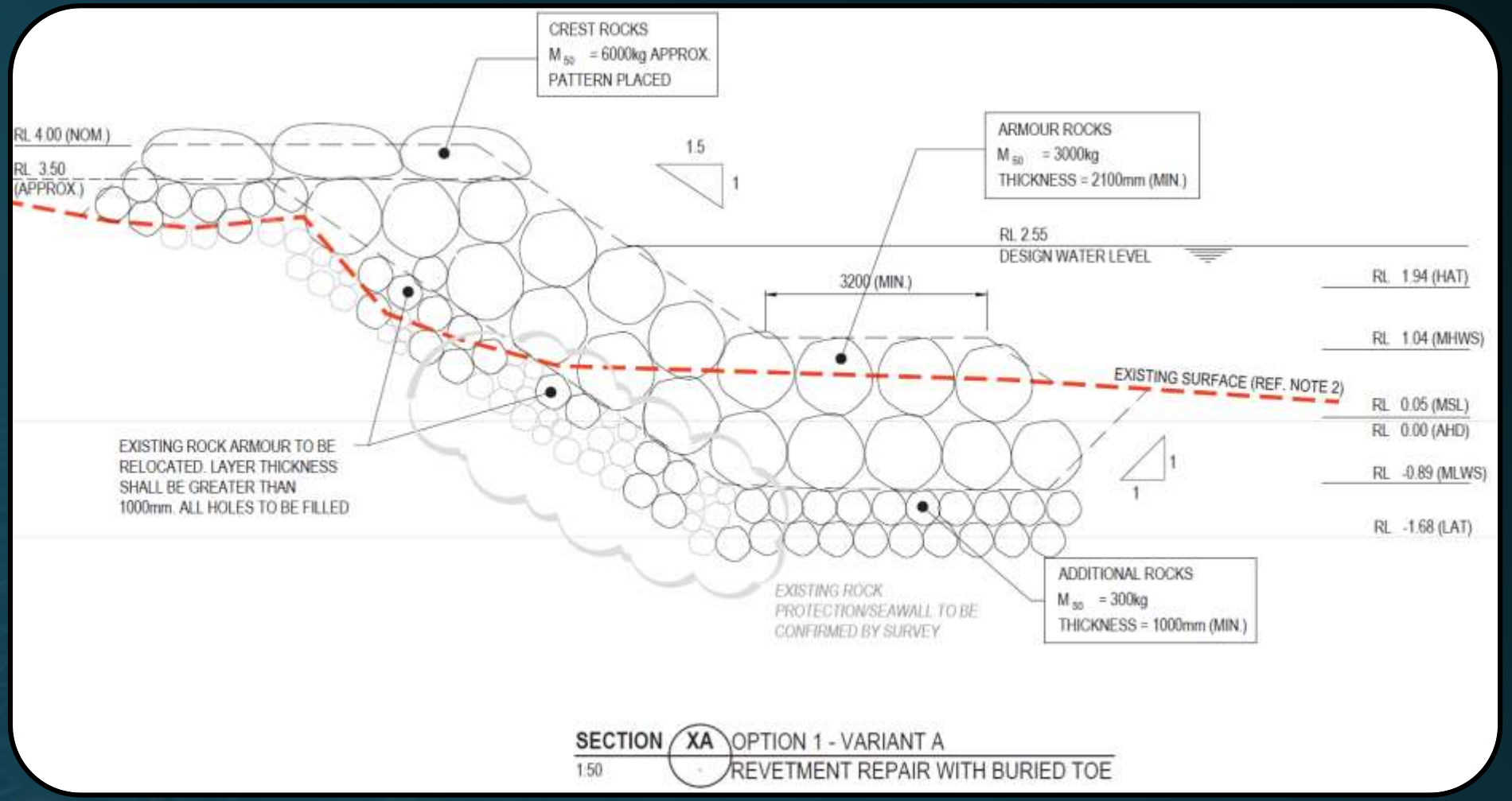


Accommodate

Protect

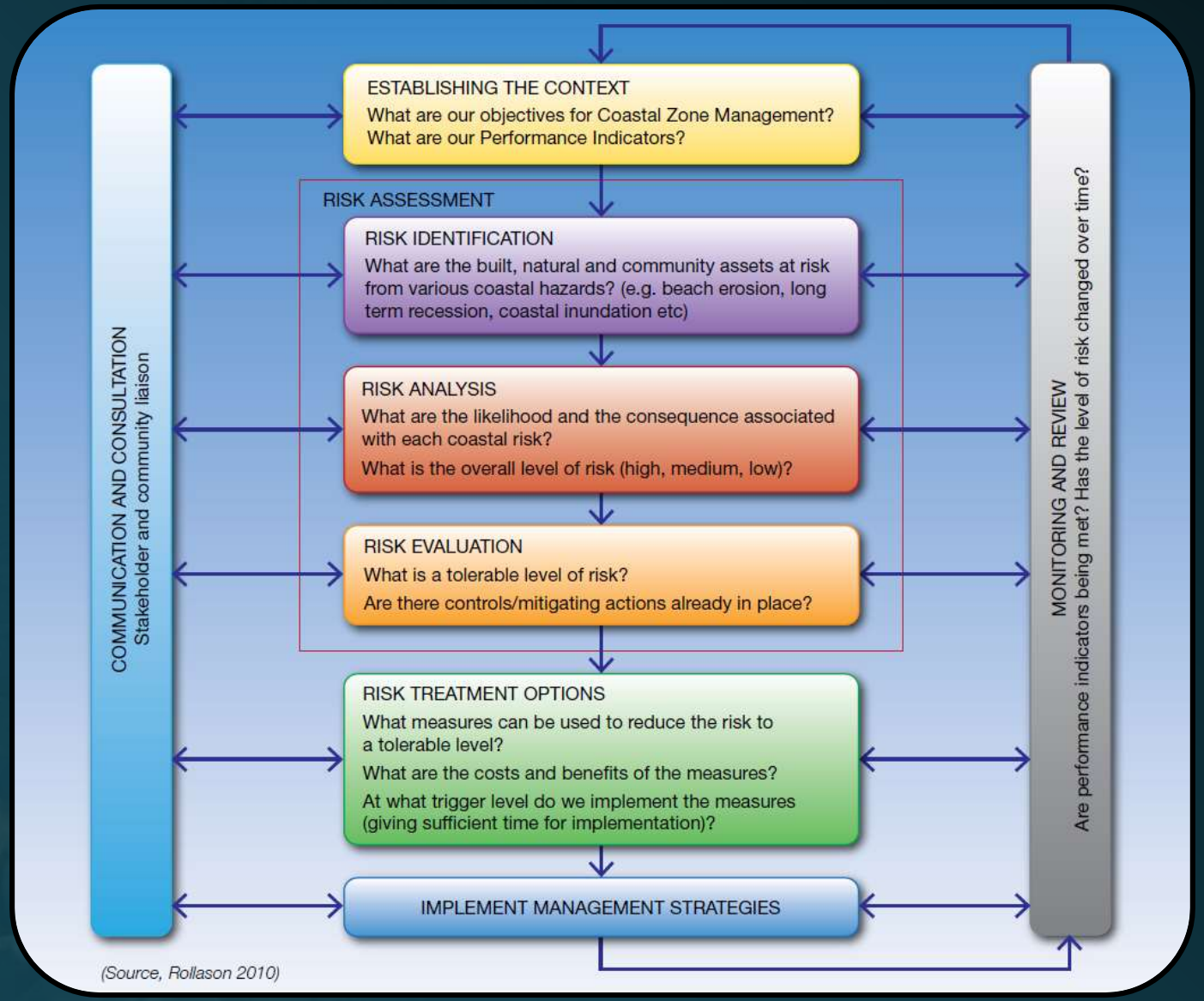
Retreat

Adaptation options



Source: *Preliminary Design of Tully Heads Seawall - Option Assessment Report* - Aurecon

Adaptation options - risk



Source: Coastal hazard risk management and adaptation planning guidelines - WAPC

Example adaptation option – decade 2

None

Asset Type	Suburb	Default Useful Life	Condition Assessment Year	Condition Rating from Assessment	Quantity (unit)	Unit	Intervention Selected	Intervention Period	Likelihood of Failure (1 to 5)	Adopted Useful Life	Asset Risk after Intervention
Foreshore Stabilisation	Marks Point	30	2016	1.0	80.00	LM	None	Decade 2	3.0	30	46
Landscaping	Marks Point	30	2016	1.0	400.00	M2	None	Decade 2	3.0	30	55

Relocate

Foreshore Stabilisation	Marks Point	30	2016	1.0	80.00	LM	Relocate	Decade 2	3.0	30	31
Landscaping	Marks Point	30	2016	1.0	400.00	M2	Relocate	Decade 2	3.0	30	31

Accommodate

Foreshore Stabilisation	Marks Point	30	2016	1.0	80.00	LM	Accommodate	Decade 2	3.0	30	26
Landscaping	Marks Point	30	2016	1.0	400.00	M2	Accommodate	Decade 2	3.0	30	26

Protect

Foreshore Stabilisation	Marks Point	30	2016	1.0	80.00	LM	Protect	Decade 2	3.0	30	19
Landscaping	Marks Point	30	2016	1.0	400.00	M2	Protect	Decade 2	3.0	30	19

Example adaptation option – decade 4

None

Asset Type	Suburb	Default Useful Life	Condition Assessment Year	Condition Rating from Assessment	Quantity (unit)	Unit	Intervention Selected	Intervention Period	Likelihood of Failure (1 to 5)	Adopted Useful Life	Asset Risk after Intervention
Foreshore Stabilisation	Marks Point	30	2016	1.0	80.00	LM	None	Decade 4	3.0	30	53
Landscaping	Marks Point	30	2016	1.0	400.00	M2	None	Decade 4	3.0	30	62

Relocate

Foreshore Stabilisation	Marks Point	30	2016	1.0	80.00	LM	Relocate	Decade 4	3.0	30	41
Landscaping	Marks Point	30	2016	1.0	400.00	M2	Relocate	Decade 4	3.0	30	41

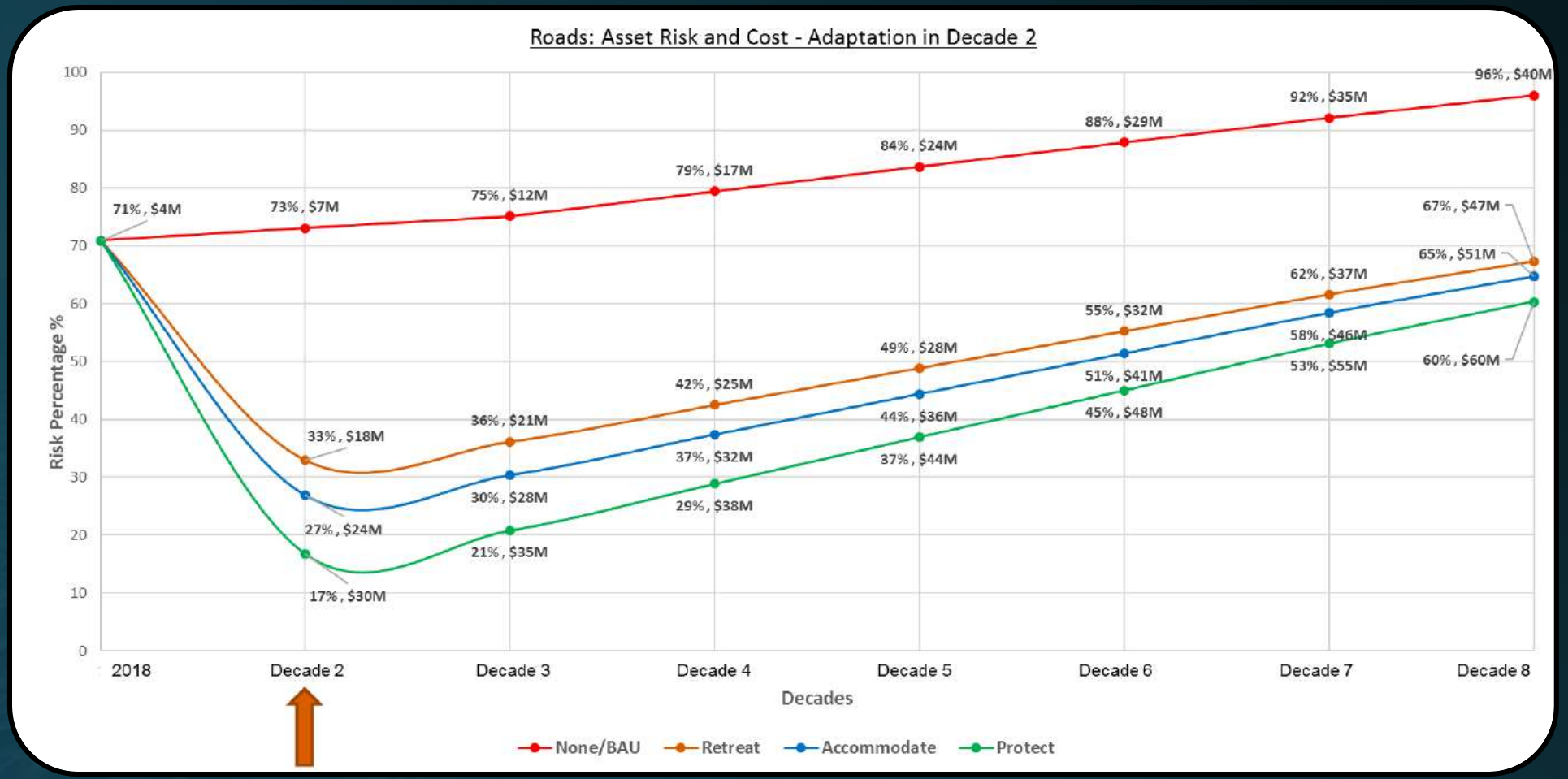
Accommodate

Foreshore Stabilisation	Marks Point	30	2016	1.0	80.00	LM	Accommodate	Decade 4	3.0	30	38
Landscaping	Marks Point	30	2016	1.0	400.00	M2	Accommodate	Decade 4	3.0	30	38

Protect

Foreshore Stabilisation	Marks Point	30	2016	1.0	80.00	LM	Protect	Decade 4	3.0	30	32
Landscaping	Marks Point	30	2016	1.0	400.00	M2	Protect	Decade 4	3.0	30	32

Example cost summary - decade 2



Summary of example scenario

Adaptation action has been recommended to be implemented in 2030–2039 (decade 2)

Estimated risk from inundation to road assets if no action taken in decade 2 is 73%

Depending on the type of asset adaptation option chosen, the risk can be reduced (usually dependant on cost)

The estimated cost for adaptation options for foreshore assets in the case study areas vary from $18-30 million

What we learned

- Council wide asset management approach needs to be integrated into our adaptation planning by considering sequencing, design and maintenance elements and lifecycle costs.
- Community and stakeholder engagement during level of service discussions, highlight the sea level rise impacts on infrastructure, risks and translated costs to the end user.
- The tool developed by Cardno will help inform Council's information technology upgrade project

Questions

Thank you

For more information:

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Appendix

<39	LOW
40 to <52	MEDIUM
53 to <77	HIGH
78+	EXTREME

Condition Rating \ Likelihood of Failure Rating	1	2	3	4	5
5	53	66	77	89	100
4	47	57	69	80	92
3	38	49	60	72	83
2	29	40	52	63	75
1	20	32	43	55	66

The matrix is based on industry accepted approaches to achieve a granularity of risk ratings. In the example given the ratings range from 20 – 100 and in four broad categories (red, orange, yellow and green).

The choice of parameters can be varied to result in a different level of granularity – both steps between risk ratings and the total number of ratings. Our experience is that this combination of parameters gives a reasonable ability to distinguish different risk levels without giving a false sense of precision.

Core adaptation actions	Hazard		
	Current and future lake flooding	Permanent tidal inundation from rising lake levels	Local nuisance flooding from stormwater
Construct revetments to protect the foreshore from tidal inundation and erosion	Does not provide protection against major floods	Prevents foreshore erosion resulting from rising lake levels When combined with filling, prevents tidal inundation of foreshore land	Does not prevent or reduce the risk from local nuisance flooding
Fill land to maintain ground levels above the lake and groundwater	Does not provide protection against major floods	Land is raised progressively above the rising lake levels, preventing tidal inundation	Will change stormwater drainage and, with good design, could improve local drainage
Raise and improve the design of stormwater drains to match landfilling and maintain function as lake levels rise	Does not provide protection against major floods	Maintains the function of stormwater infrastructure as lake and groundwater levels rise	Re-design and relocation of stormwater infrastructure could improve local drainage
Raise and improve the design of roads to match landfilling and maintain function as lake and groundwater levels rise	Will not protect local roads from major floods Some major roads may be upgraded to ensure emergency access during major floods	Maintains the safety of roads as lake and groundwater levels rise	Re-design and raising of roads (including kerbing and guttering) could improve local drainage
Construct new buildings with floor levels above projected flood levels	Prevents over-floor flooding in most major floods Provides temporary safe refuge for residents during major floods	Does not prevent permanent inundation affecting the land surrounding and beneath buildings	Does not prevent or reduce the risk from local nuisance flooding
Raise homes with floors below inundation and filling levels	Prevents over-floor flooding	Enables filling to prevent tidal inundation	Enables land filling and raising of infrastructure to improve local drainage

Source: Planning for Future Flood Risks - Marks Point and Belmont South, Local Adaptation Plan

Attributes, Attachments and Links

- Attributes

- Attachments

- Links