Takutai Kāpiti.

Central Adaptation Area

Shortlisted Pathway information for MCDA process

Presentation: CAP Workshop 30th August 2023

Information compiled by the Takutai Kāpiti Technical Advisory Group
(KCDC, GWRC, Mitchell Daysh, Jacobs)

Short-list Adaptation Options

OPTIONS

ENHANCE

We maintain and improve what we are already doing

ACTIONS

- Enhance existing erosion protection structures
- Enhance existing inundation protection
- Enhance access and ramps
- Dune and wetland enhancement/resilience
- Emergency management
- Community education and risk awareness
- Private owners' responsibility

ACCOMMODATE

We live with the hazard

- Relocatable buildings
- Raising floor levels
- Flood-proofing buildings
- Flood-proofing infrastructure

PROTECT

We keep the hazard away

Soft Engineering (Erosion)

- Dune Reconstruction
- Renourishment

Hard Engineering (Erosion)

- Sea walls (vertical, revetment, buried, interlocking)
- Detached breakwater (submerged, exposed)

Inundation controls

- Flapped culvert outfalls
- Flood gates
- Pump stations
- Stopbanks
- Earth bunds

RETREAT

We move away from the hazard

- Retreat

AVOID

We don't move into the way of the hazard in the first place

- Raising minimum floor levels of new builds
- Reduce further intensification or development
- Trigger-based or time limited land use consents
- Zoning and setback controls

Beach Scraping vs Dune Reconstruction

- Last CAP meeting, CAP discussed that beach scraping should not be considered as an option - **We have now removed beach scraping from the menu for the CAA.**
- It has been replaced with the option of **'Dune Reconstruction'**
- Dune reconstruction is when sand is redistributed across the dune profile to reconstruct an appropriate dune crest level and volume – this can sometimes require additional sand to be brought into the system to help build up volume if there is not enough sand locally available. The new dune can be replanted to help build resilience and encourage further growth of the dune.
- Beach scraping can be used to assist in dune reconstruction; however given CAP's feedback on the dune reconstruction option, the dune reconstruction option for the CAA has been tailored. Therefore the dune reconstruction option is proposed to only involve importing sediment to be placed directly onto the dune system, which would be redistributed with machinery on the upper beach and backshore.
- Therefore - the sand used to reconstruct the dune would **not** be sourced from the lower foreshore and pushed up the beach (i.e. beach scraping).

How to read the Adaptation Area Draft Pathways sheets

High Level Adaptation Option agreed July 2023 workshop

NB: Signals and triggers determined by CAP to transition from one action to the next.

Refers to menu of Adaptation options (from July 2023 workshop).
NB: Some pathway options comprise of more than one adaptation action.

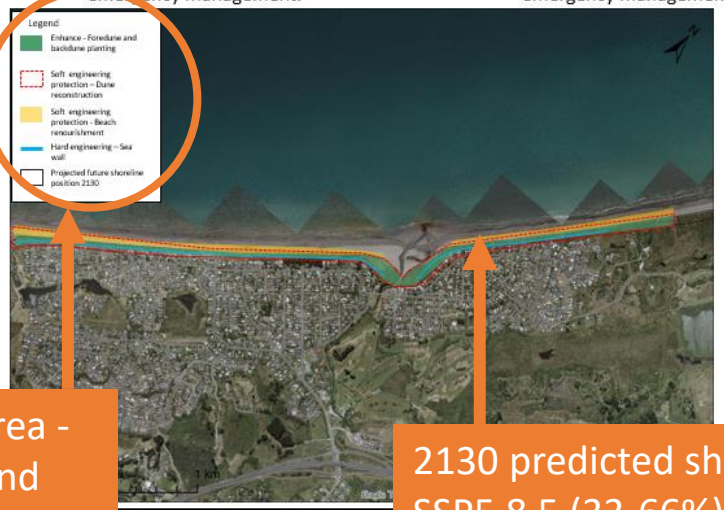
Number of dwellings at risk (*Range indicates the lower SSP2-4.5 and higher SSP5-8.5 scenario; no range if the same number of properties is effected for each scenario)*

Central Adaptation Area Draft Pathways

Management Unit:	5A Waikanae Beach (erosion unit)	Pathway:	2

RSLR 0.2 m (~ 2050) – 27 Properties at risk of erosion
RSLR 0.35 – 0.45 (~ 2070) – 27 Properties at risk of erosion
RSLR 0.85 – 1.25 (~ 2130) – 39-107 Properties at risk of erosion

Short term	Medium term	Long term
Enhance [3,4] & Protect [10] Package	**Enhance [3,4] & Protect [9] Package**	**Protect – Sea Wall [11]**
Increased **dune resilience** by foreshore and backshore planting and **dune reconstruction**, increased community education and emergency management.	Increased **dune resilience** by foreshore and backshore planting and **beach renourishment**, increased community education and emergency management.	Sea wall along the front of the settlement.



Notes:

In the short term the dune system could be reconstructed and planted to optimise the dune elevation and width to provide protection. Extensive foredune and backdune planting over the short-medium term with weed and pest control to enhance the existing dune system, and to provide good protection in storms and faster recovery.

Over the medium term, dune planting and enhancement could continue to be undertaken, and imported sand would be distributed along the foredune to add volume to the beach and reduce erosion. Additional replenishments and dune maintenance would be undertaken as required to maintain dune volumes which provide sufficient protection.

In the longer term when dune resilience, dune reconstruction and beach renourishment is no longer effective at managing the erosion risk, a sea wall could be constructed along the front of the settlement to protect property, and effectively 'hold the line'.

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Explanatory technical notes

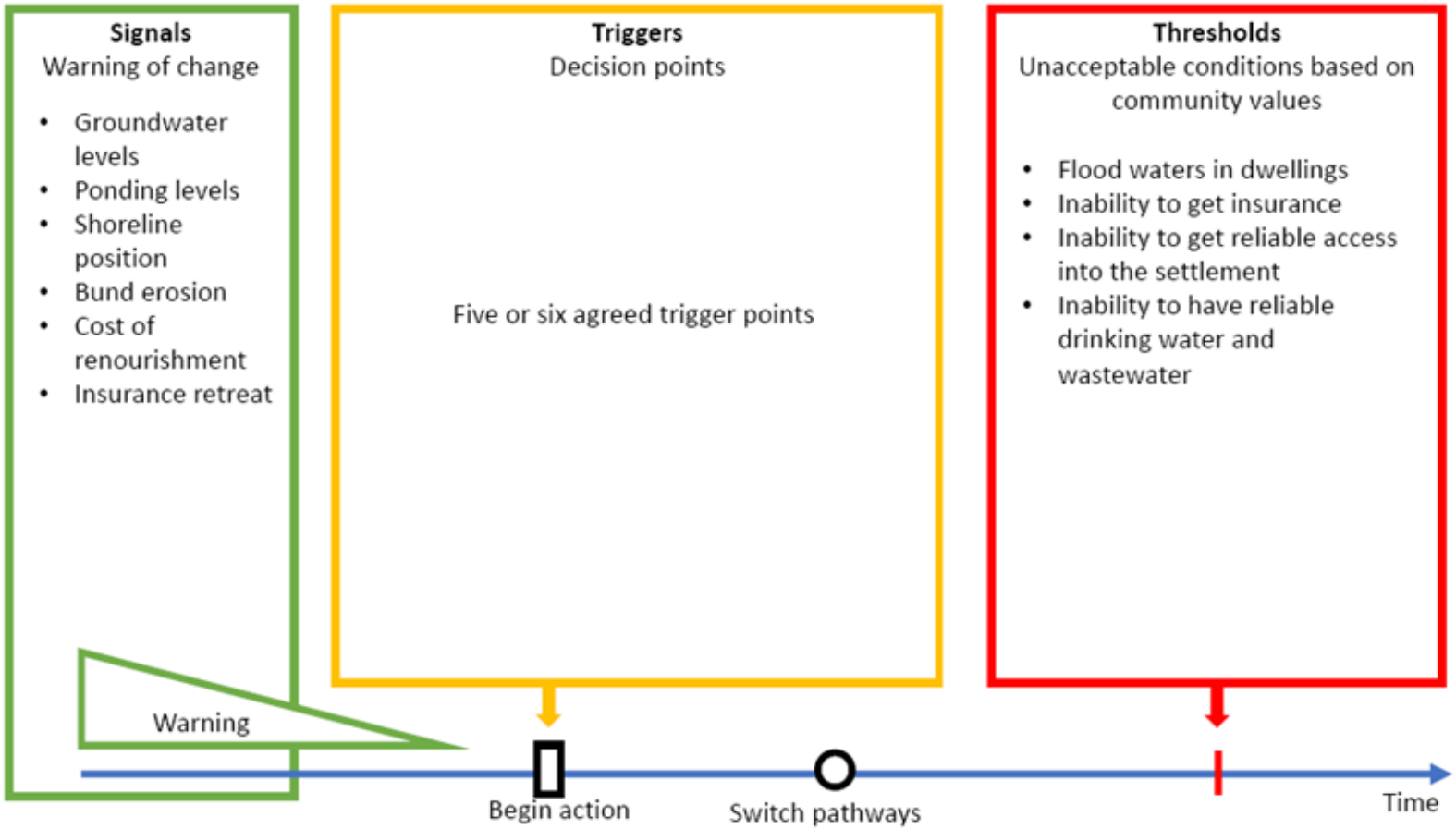
Map of area - with legend

2130 predicted shoreline at SSP5 8.5 (33-66%) – with no adaptation actions

Other steps in Decision-making process

= Signals and triggers determined by CAP to transition from one action to the next.

Note for CAP: This process will be covered in the 3 April 2024 workshop for whole Kāpiti Coast District.



Source: Hurunui District Council. *Example of symbols for adaptation pathways.*

RESULTS OF DECISION MAKING

Te Awanga

MITCHELL DAYSH

The Decision-Making Process: Steps to Come

Te Awanga Coastal Unit Example

Unit K2: Te Awanga												
Pathway	**Short term**	→	**Medium term**	→	**Long term**	**MCDA Score**	**MCDA ranking**	**Cost + Loss[1] ($m)**	**Cost + Loss[1] ranking**	**VFM[2] ($'000/ point)**	**VFM[2] ranking**	**Short Term build costs[3] ($m)**
PW 1	Renourishment	→	Retreat the Line	→	Managed Retreat	50	4	24.15	6	403	6	8.84 (0.55 / yr)
PW 2	Renourishment + Control Structures	→	Renourishment + Control Structures	→	Retreat the Line	58	2	17.08	2	194	2	8.98 (0.60 / yr)
PW 3	Renourishment + Control Structures	→	Renourishment + Control Structures	→	Renourishment + Control Structures	62	1	16.77	1	171	1	8.98 (0.60 / yr)
PW 4	Renourishment + Control Structures	→	Renourishment + Control Structures	→	Sea wall	53	3	18.48	3	232	3	8.98 (0.60 / yr)
PW 5	Renourishment	→	Sea wall	→	Retreat the Line	43	5=	20.00	5	329	5	8.84 (0.55 / yr)
PW 6	Sea wall	→	Sea wall	→	Sea wall	43	5=	18.67	4	291	4	9.08 (0.66 / yr)
PW 30	Retreat the Line					–	–	14.94	–	--	–	

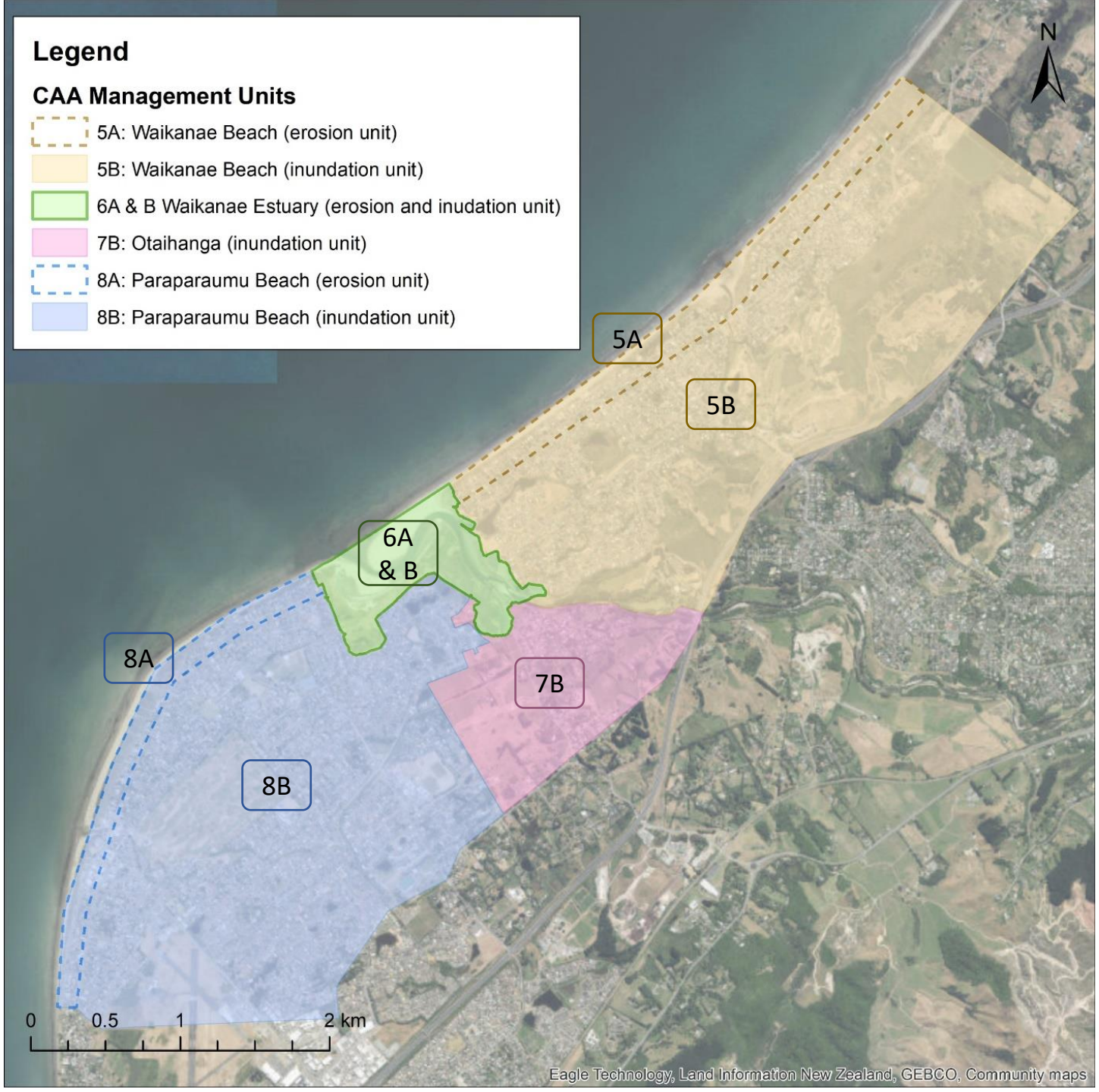
RESULTS OF DECISION MAKING

Westshore

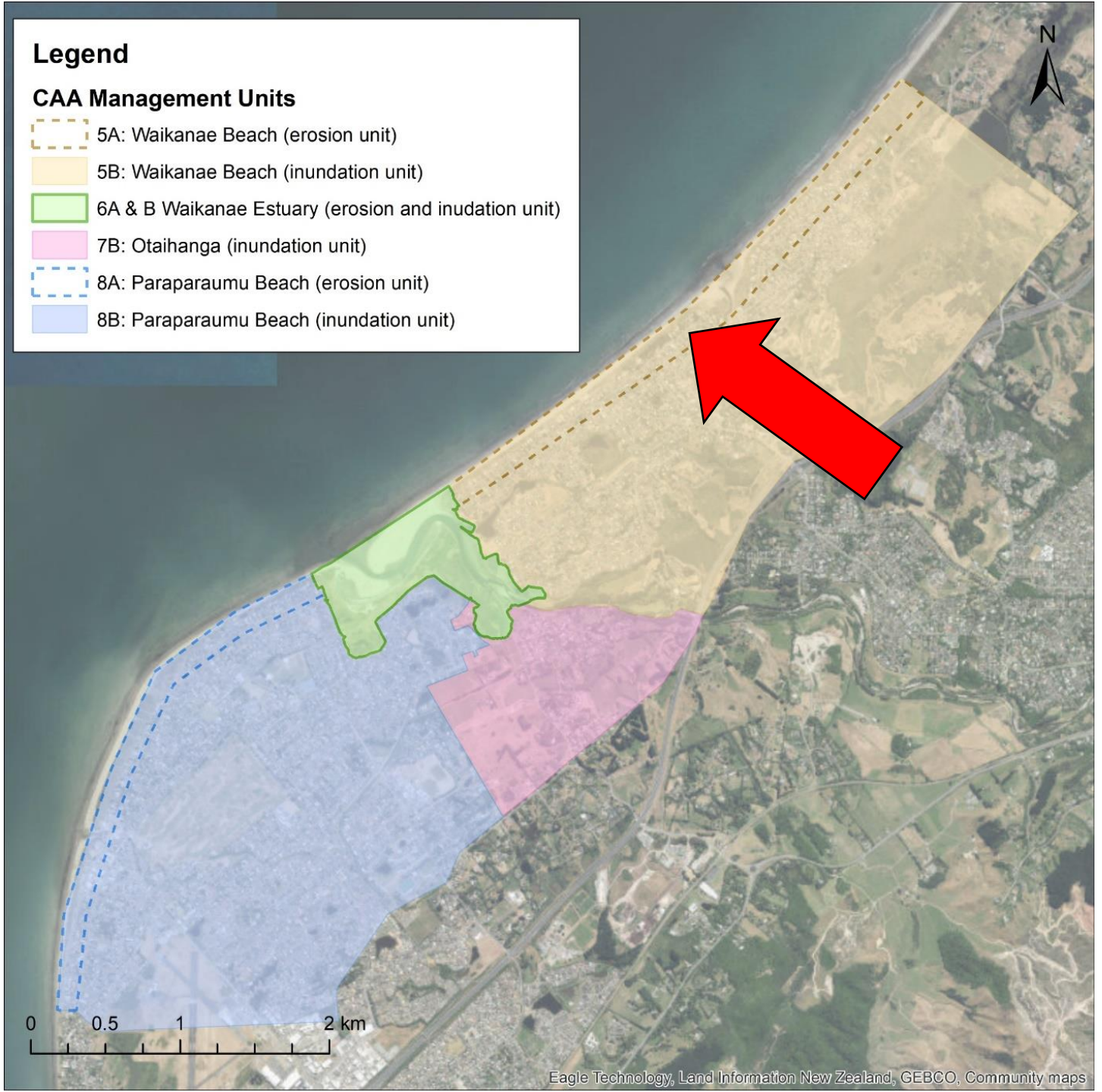
Westshore Coastal Unit Example

Unit D: Westshore												
Pathway	**Short term**	→	**Medium term**	→	**Long term**	**MCDA Score**	**MCDA ranking**	**Cost + Loss[1] ($m)**	**Cost + Loss[1] ranking**	**VFM[2] ($'000/ point)**	**VFM[2] ranking**	**Short Term build costs[3] ($m)**
PW 1	Renourishment	→	Managed Retreat	→	Managed Retreat	65	1	91.6	6	1392	6	13.26 (0.71 / yr)
PW 2	Renourishment	→	Renourishment + Control Structures	→	Managed Retreat	60	2	53.2	5	839	5	13.26 (0.71 / yr)
PW 3	Renourishment	→	Renourishment + Control Structures	→	Renourishment + Control Structures	51	4=	25.2	1	387	1	13.26 (0.71 / yr)
PW 4	Renourishment	→	Renourishment + Control Structures	→	Sea wall	54	3	28.9	2	432	2	13.26 (0.71 / yr)
PW 5	Renourishment + Control Structures	→	Renourishment + Control Structures	→	Sea wall	51	4=	29.0	3	459	3	16.17 (1.09 / yr)
PW 6	Sea wall	→	Sea wall	→	Sea wall	47	5	31.2	4	546	4	21.96 (1.59 / yr)
PW 9	Renourishment + Control Structures		Renourishment + Control Structures		Renourishment + Control Structures	--	--	25.3	--	--	--	--

Central Adaptation Area Management Units



Unit 5A: Waikanae Beach (erosion unit)



Management Unit:	**5A Waikanae Beach (erosion unit)**	Pathway:	1

RSLR 0.2 m (~ 2050) – 27 Properties at risk of erosion
RSLR 0.35 – 0.45 (~ 2070) – 27 Properties at risk of erosion
RSLR 0.85 – 1.25 (~ 2130) – 39-107 Properties at risk of erosion

Short term	Medium term	Long term

Enhance [3,4] Package

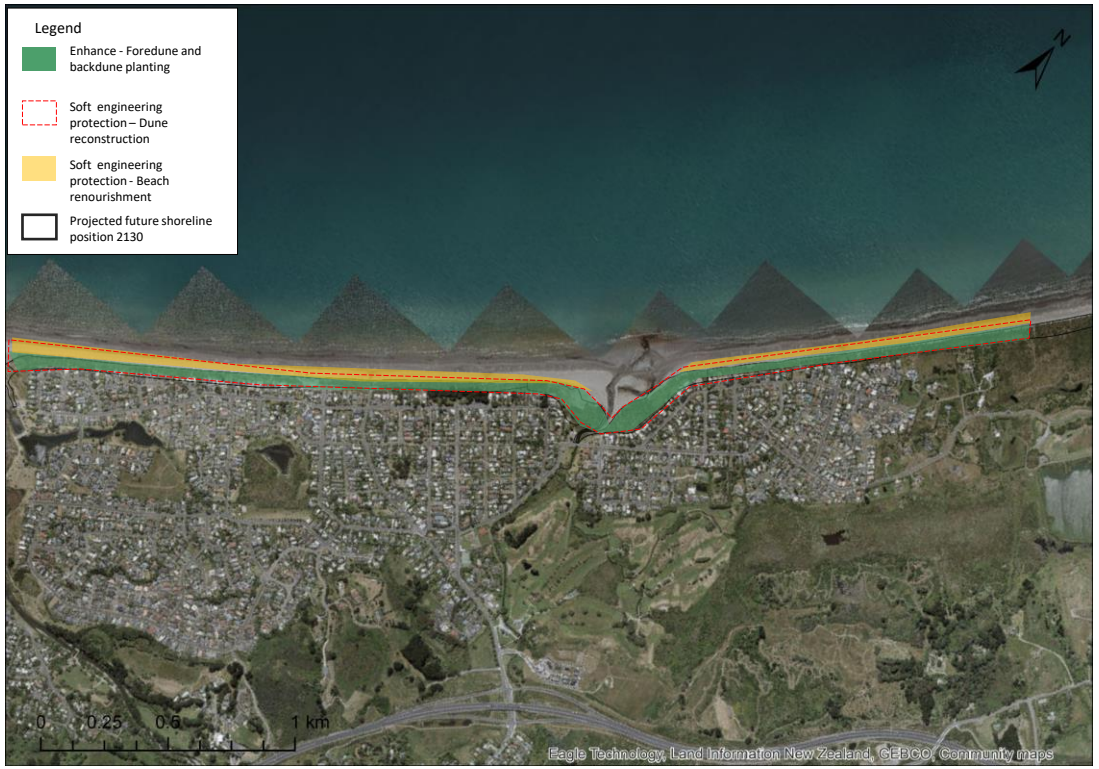
Increased dune resilience by foreshore and backshore planting, increased community education and emergency management.

Protect – Dune Reconstruction [10]

Reconstructing the dune by distributing imported sand across the existing dune and reshaping to improve crest elevation and volume. The reshaped dune could be planted to optimise protection.

Protect - Beach Renourishment [9]

Importing sand and distributing it on the foreshore to supply more bulk to the beach profile.



Notes:

Extensive foredune and backdune planting over the short term with weed and pest control to enhance the existing dune system, and to provide good protection in storms and faster recovery. Increased community awareness of the long-term hazards, and increased emergency management.

As sea level rises, reconstruction of the existing dune could be undertaken as required to optimise dune elevation and width to provide protection. This could include bringing in additional sand to help build up the beach volume and dune crest.

Over the longer term, additional imported sand could be distributed along the foredune to add volume to the beach and reduce erosion. Additional replenishments and dune maintenance would need to be undertaken as required.

Management Unit:	**5A Waikanae Beach (erosion unit)**	Pathway:	2

RSLR 0.2 m (~ 2050) – 27 Properties at risk of erosion
RSLR 0.35 – 0.45 (~ 2070) – 27 Properties at risk of erosion
RSLR 0.85 – 1.25 (~ 2130) – 39-107 Properties at risk of erosion

Short term	Medium term	Long term

Enhance [3,4] & Protect [10] Package

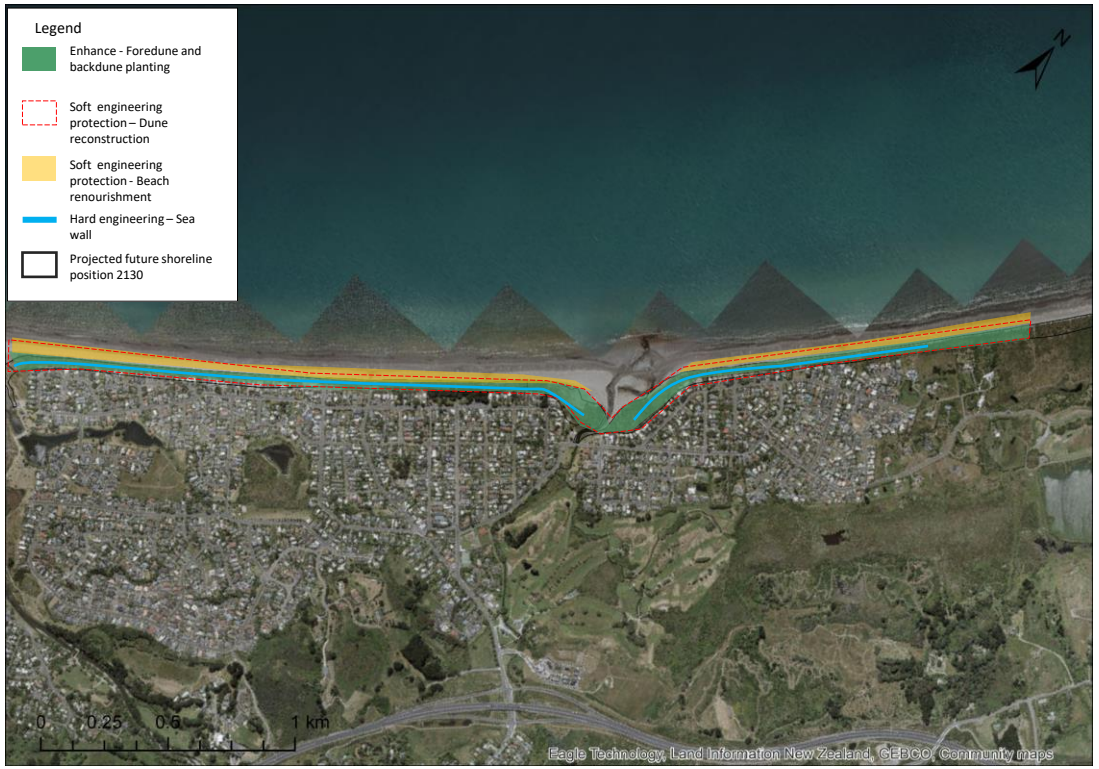
Increased **dune resilience** by foreshore and backshore planting and **dune reconstruction**, increased community education and emergency management.

Enhance [3,4] & Protect [9] Package

Increased **dune resilience** by foreshore and backshore planting and **beach renourishment**, increased community education and emergency management.

Protect – Sea Wall [11]

Sea wall along the front of the settlement.



Notes:

In the short term the dune system could be reconstructed and planted to optimise the dune elevation and width to provide protection. Extensive foredune and backdune planting over the short-medium term with weed and pest control to enhance the existing dune system, and to provide good protection in storms and faster recovery.

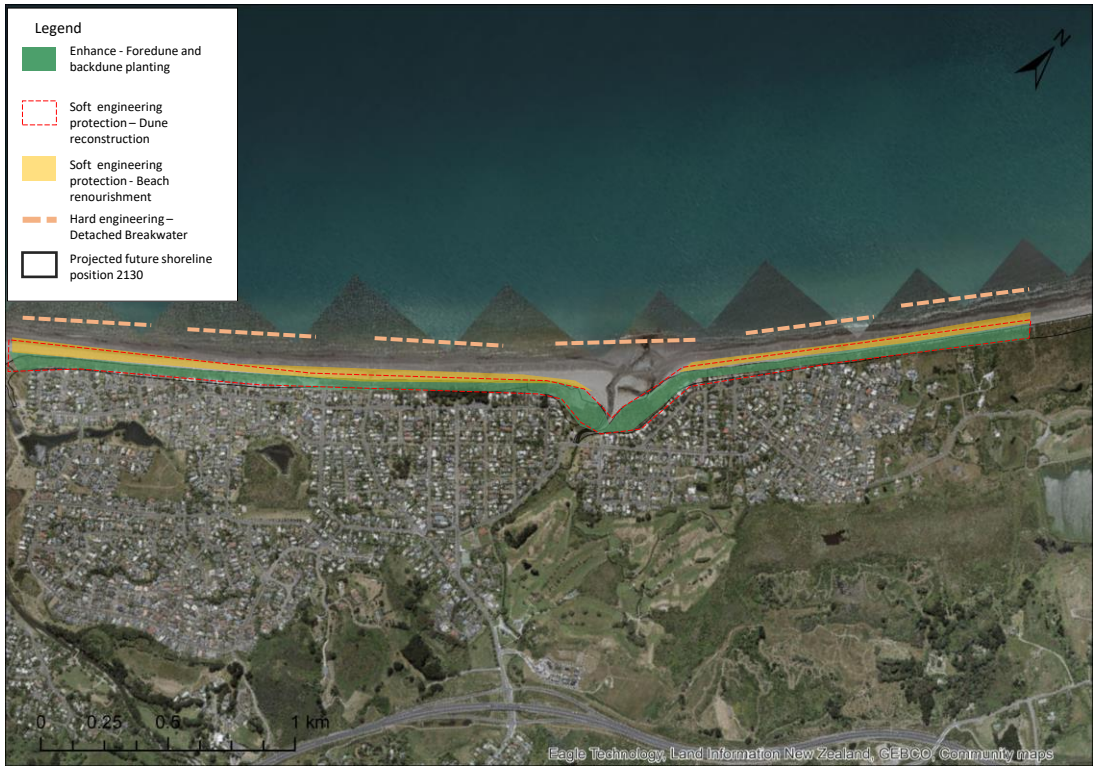
Over the medium term, dune planting and enhancement could continue to be undertaken, and imported sand would be distributed along the foredune to add volume to the beach and reduce erosion. Additional replenishments and dune maintenance would be undertaken as required to maintain dune volumes which provide sufficient protection.

In the longer term when dune resilience, dune reconstruction and beach renourishment is no longer effective at managing the erosion risk, a sea wall could be constructed along the front of the settlement to protect infrastructure and property, and effectively 'hold the line'.

Management Unit:	**5A Waikanae Beach (erosion unit)**	Pathway:	3

RSLR 0.2 m (~ 2050) – 27 Properties at risk of erosion
RSLR 0.35 – 0.45 (~ 2070) – 27 Properties at risk of erosion
RSLR 0.85 – 1.25 (~ 2130) – 39-107 Properties at risk of erosion

Short term	Medium term	Long term
Enhance [3,4] & Protect [10] Package	**Enhance [3,4] & Protect [9] Package**	**Protect – Detached Breakwater [14]**
Increased **dune resilience** by foreshore and backshore planting and **dune reconstruction**, increased community education and emergency management.	Increased **dune resilience** by foreshore and backshore planting and **beach renourishment**, increased community education and emergency management.	Detached Breakwater constructed in the nearshore



Notes:

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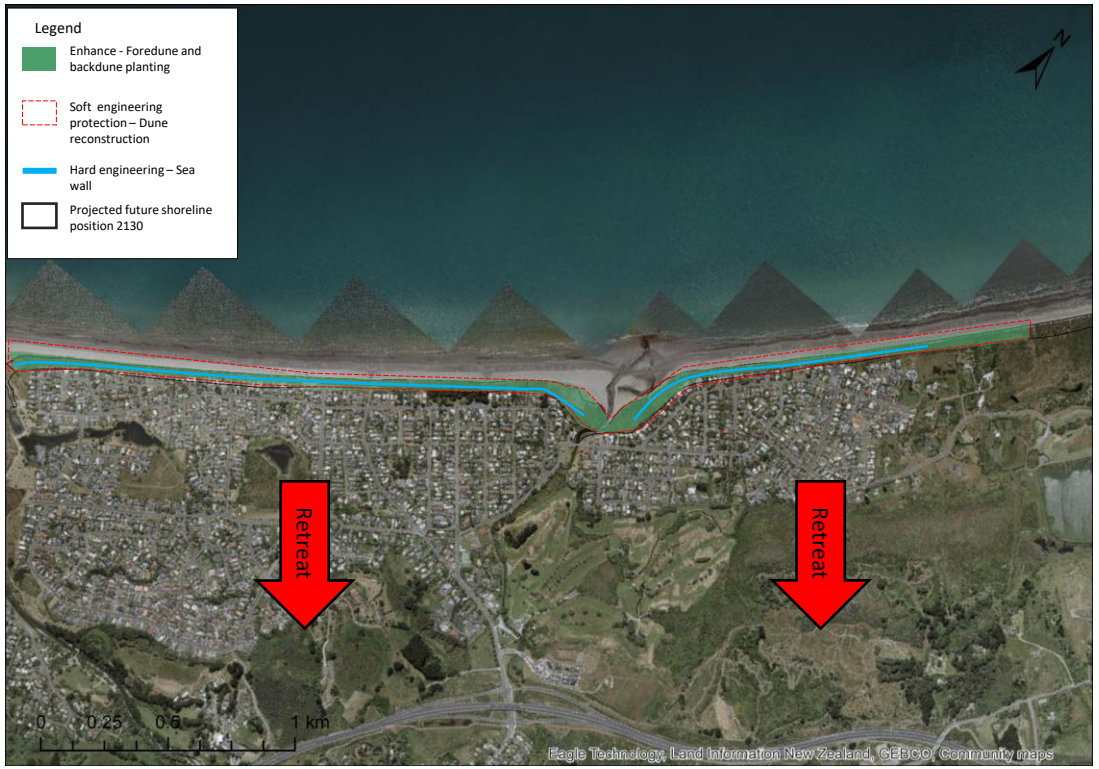
Over the medium term, dune planting and enhancement could continue to be undertaken, and imported sand would be distributed along the foredune to add volume to the beach and reduce erosion. Additional replenishments and dune maintenance would be undertaken as required to maintain dune volumes which provide sufficient protection.

In the longer term when dune resilience, dune reconstruction and beach renourishment are no longer effective at managing the erosion risk, a detached breakwater could be constructed on the nearshore in front of Waikanae Beach to help break up onshore wave energy and promote onshore sediment deposition.

Management Unit:	**5A Waikanae Beach (erosion unit)**	Pathway:	4

RSLR 0.2 m (~ 2050) – 27 Properties at risk of erosion
RSLR 0.35 – 0.45 (~ 2070) – 27 Properties at risk of erosion
RSLR 0.85 – 1.25 (~ 2130) – 39-107 Properties at risk of erosion

Short term	Medium term	Long term
Enhance [3,4] & Protect [10] Package	**Protect – Sea Wall [11]**	**Retreat [8]**
Increased **dune resilience** by foreshore and backshore planting and **dune reconstruction**, increased community education and emergency management.	Sea wall along the front of the settlement.	Proactively and progressively retreating properties as they become impacted by the hazard



Notes:
In the short term the dune system could be reconstructed and planted to optimise the dune elevation and width to provide protection. Extensive foredune and backdune planting over the short-medium term with weed and pest control to enhance the existing dune system, and to provide good protection in storms and faster recovery.

When the dune is no longer providing effective erosion protection, a sea wall could be constructed in front of the settlement to prevent landward movement of the shoreline into private property and public assets.

Over the long term, following failure of the sea wall, private properties and infrastructure exposed to the erosion hazard would undergo progressive managed retreat and be proactively relocated away from the hazard.

Management Unit:	**5A Waikanae Beach (erosion unit)**	Pathway:	5

RSLR 0.2 m (~ 2050) – 27 Properties at risk of erosion
RSLR 0.35 – 0.45 (~ 2070) – 27 Properties at risk of erosion
RSLR 0.85 – 1.25 (~ 2130) – 39-107 Properties at risk of erosion

Short term	Medium term	Long term

Enhance [3,4] & Protect [10] Package

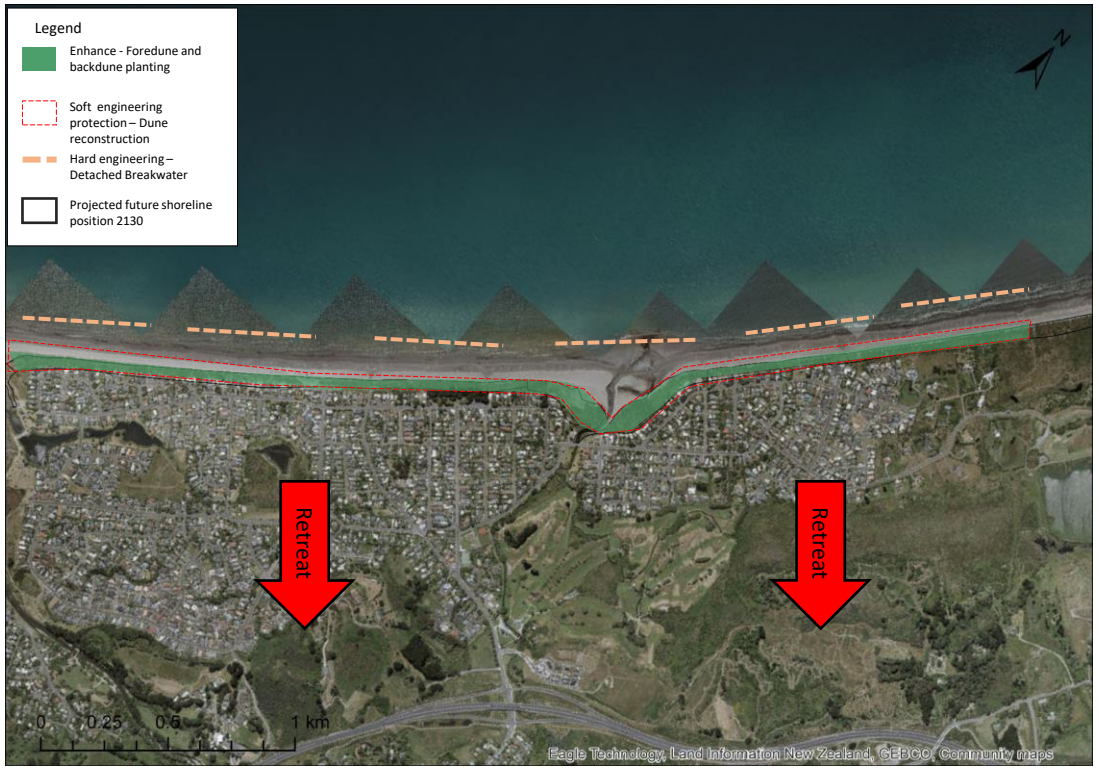
Increased **dune resilience** by foreshore and backshore planting and **dune reconstruction**, increased community education and emergency management.

Protect – Detached Breakwater [14]

Detached Breakwater constructed in the nearshore

Retreat [8]

Proactively and progressively retreating properties as they become impacted by the hazard



Notes:
In the short term the dune system could be reconstructed and planted to optimise the dune elevation and width to provide protection. Extensive foredune and backdune planting over the short-medium term with weed and pest control to enhance the existing dune system, and to provide good protection in storms and faster recovery.

When the dune is no longer providing effective erosion protection, a detached breakwater could be constructed in the nearshore in front of Waikanae Beach to help break up onshore wave energy and promote onshore sediment deposition.

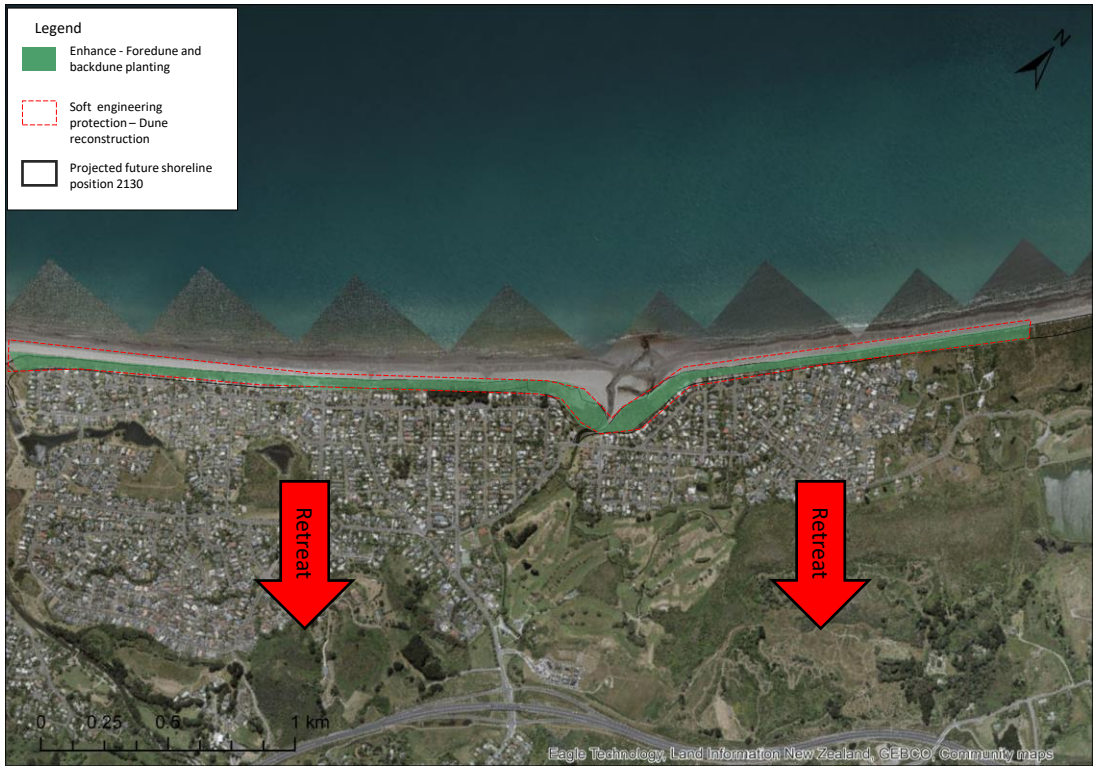
Over the long term when the detached breakwater is no longer effective, private properties and infrastructure exposed to the erosion hazard could undergo progressive managed retreat and be proactively relocated away from the hazard.

Central Adaptation Area Draft Pathways

Management Unit:	**5A Waikanae Beach (erosion unit)**	Pathway:	6

RSLR 0.2 m (~ 2050) – 27 Properties at risk of erosion
RSLR 0.35 – 0.45 (~ 2070) – 27 Properties at risk of erosion
RSLR 0.85 – 1.25 (~ 2130) – 39-107 Properties at risk of erosion

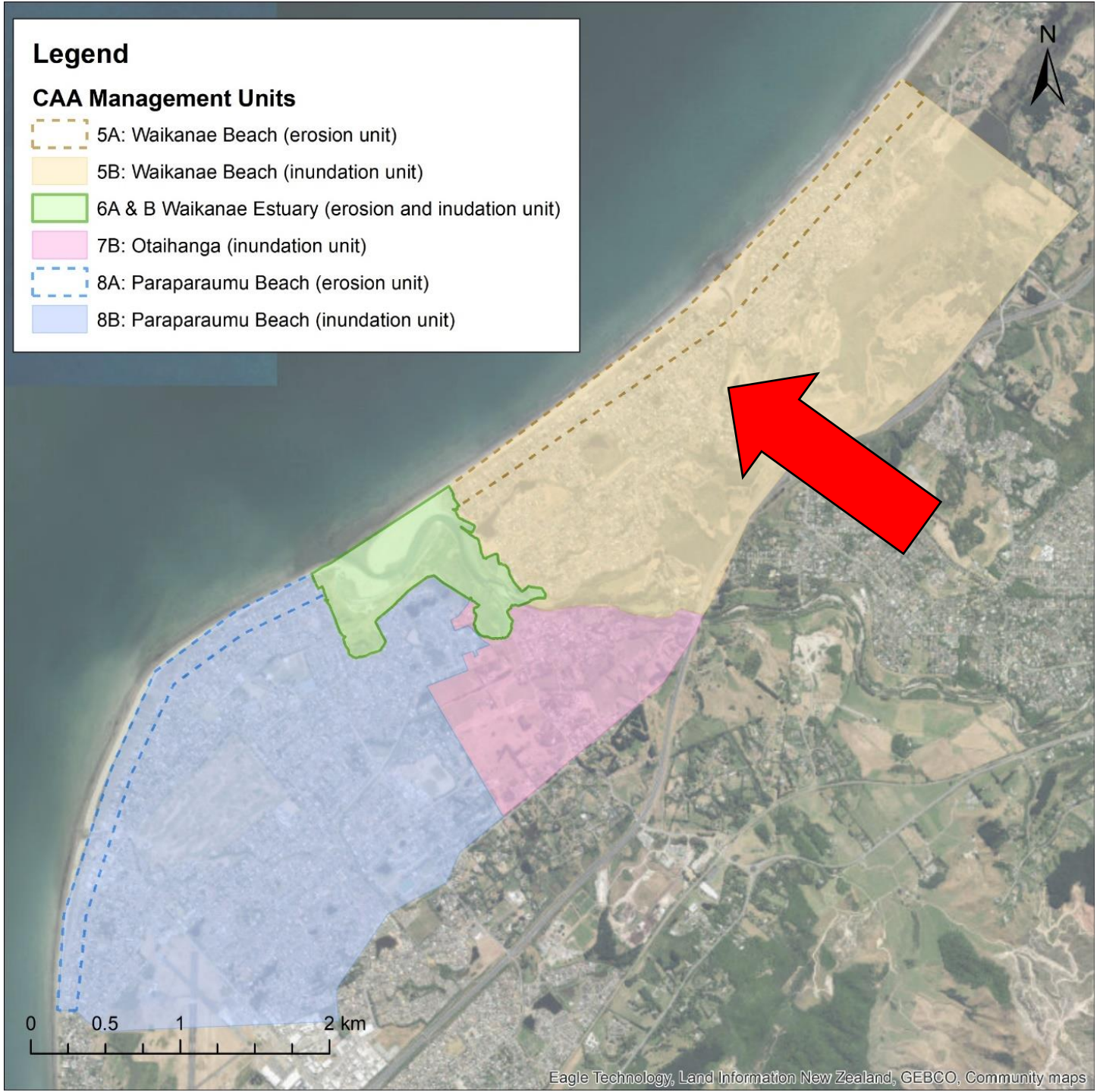
Short term	Medium term	Long term
Enhance [3,4] & Protect [10] Package	**Retreat [8]**	**Retreat [8]**
Increased **dune resilience** by foreshore and backshore planting and **dune reconstruction**, increased community education and emergency management.	Proactively and progressively retreating properties as they become impacted by the hazard	Proactively and progressively retreating properties as they become impacted by the hazard



Notes:
In the short term the dune system could be reconstructed and planted to optimise the dune elevation and width to provide protection. Extensive foredune and backdune planting over the short-medium term with weed and pest control to enhance the existing dune system, and to provide good protection in storms and faster recovery.

When the dune is no longer providing effective erosion protection private properties and infrastructure exposed to the erosion hazard would undergo managed retreat and be proactively relocated away from the hazard.

Unit 5B: Waikanae Beach (inundation unit)



Central Adaptation Area Draft Pathways

Management Unit:	**5B Waikanae Beach (inundation unit)**

Pathway:	1

Current (~ 2020) - 107 Properties at risk of inundation
RSLR 0.2 m (~ 2050) – 210 Properties at risk of inundation
RSLR 0.35 – 0.45 (~ 2070) – 332-396 Properties at risk of inundation
RSLR 0.85 – 1.25 (~ 2130) – 721-926 Properties at risk of inundation

Short term	Medium term	Long term
Status Quo[1] & Enhance [4] Package Maintain existing management infrastructure, increase community education and emergency management	**Status Quo[1] & Enhance [4] Package** Maintain existing management infrastructure, increase community education and emergency management	**Enhance [2, 3, 4] Package** Enhance **existing inundation protection**, and coastal wetlands, and increase community education and emergency management

Notes:
Over the short-medium term, continue to maintain existing flood management infrastructure, and increase community education and awareness about longer term hazards. Also increase community preparedness and emergency management.

Over the longer term, undertake upgrades and maintenance of existing infrastructure to manage the flood risk for the settlement. This could include enhancing the existing estuary embankment; increasing drainage capacity of the existing stormwater outfalls; and enhancing coastal wetlands through effective planting and management.

Central Adaptation Area Draft Pathways

Management Unit:	**5B Waikanae Beach (inundation unit)**	Pathway:	2

Current (~ 2020) - 107 Properties at risk of inundation
RSLR 0.2 m (~ 2050) – 210 Properties at risk of inundation
RSLR 0.35 – 0.45 (~ 2070) – 332-396 Properties at risk of inundation
RSLR 0.85 – 1.25 (~ 2130) – 721-926 Properties at risk of inundation

Short term	Medium term	Long term

Status Quo[1] & Enhance [4] Package

Maintain existing management infrastructure, increase community education and emergency management

→

Enhance [2, 3, 4] Package

Enhance **existing inundation protection**, and coastal wetlands, and increase community education and emergency management

→

Hard Protection[12, 13, 15] Package

Installation of **floodgates**, **pump stations** and **stopbanks** to prevent sea water entering the settlements

Notes:
Over the short term, continue to maintain existing flood management infrastructure, and increase community education and awareness about longer term hazards. Also increase community preparedness and emergency management.

Over the medium term, undertake upgrades and maintenance of existing infrastructure to manage the short-medium term flood risk for the settlement. This could include enhancing the existing estuary embankment; increasing drainage capacity of the existing stormwater outfalls; and enhancing coastal wetlands through effective planting and management.

Over the longer term, feasibility of increased hard protection schemes including stopbanks and pump stations would be investigated, and if feasible could be installed to manage coastal water entering the settlement via low lying waterways and the stormwater network.

Central Adaptation Area Draft Pathways

Management Unit:	5B Waikanae Beach (inundation unit)

Pathway:	3

Current (~ 2020) - 107 Properties at risk of inundation
RSLR 0.2 m (~ 2050) – 210 Properties at risk of inundation
RSLR 0.35 – 0.45 (~ 2070) – 332-396 Properties at risk of inundation
RSLR 0.85 – 1.25 (~ 2130) – 721-926 Properties at risk of inundation

Short term	Medium term	Long term
Enhance [2, 3, 4] Package	**Enhance [2, 3, 4] Package**	**Accommodate [5, 7] Package**
Enhance **existing inundation protection**, and coastal wetlands, and increase community education and emergency management	Enhance **existing inundation protection**, and coastal wetlands, and increase community education and emergency management	Pro-actively **raise floors** of homes which could be flooded, **flood proof** homes and infrastructure

Notes:
Over the short-medium term, undertake upgrades and maintenance of existing infrastructure to manage the flood risk for the settlement. This could include enhancing the existing estuary embankment; increasing drainage capacity of the existing stormwater outfalls; and enhancing coastal wetlands through effective planting and management. This could also involve increasing community education and awareness about longer term hazards and improving community preparedness and emergency management.

In the long term, dwellings where the flood risk is not being effectively managed through the broader flood protection scheme would be proactively raised so floor levels were above projected water levels in large storms to avoid being flooded. Although dwellings would be protected, access to properties and services may still be impacted.

Central Adaptation Area Draft Pathways

Management Unit:	5B Waikanae Beach (inundation unit)	Pathway:	4

Current (~ 2020) - 107 Properties at risk of inundation
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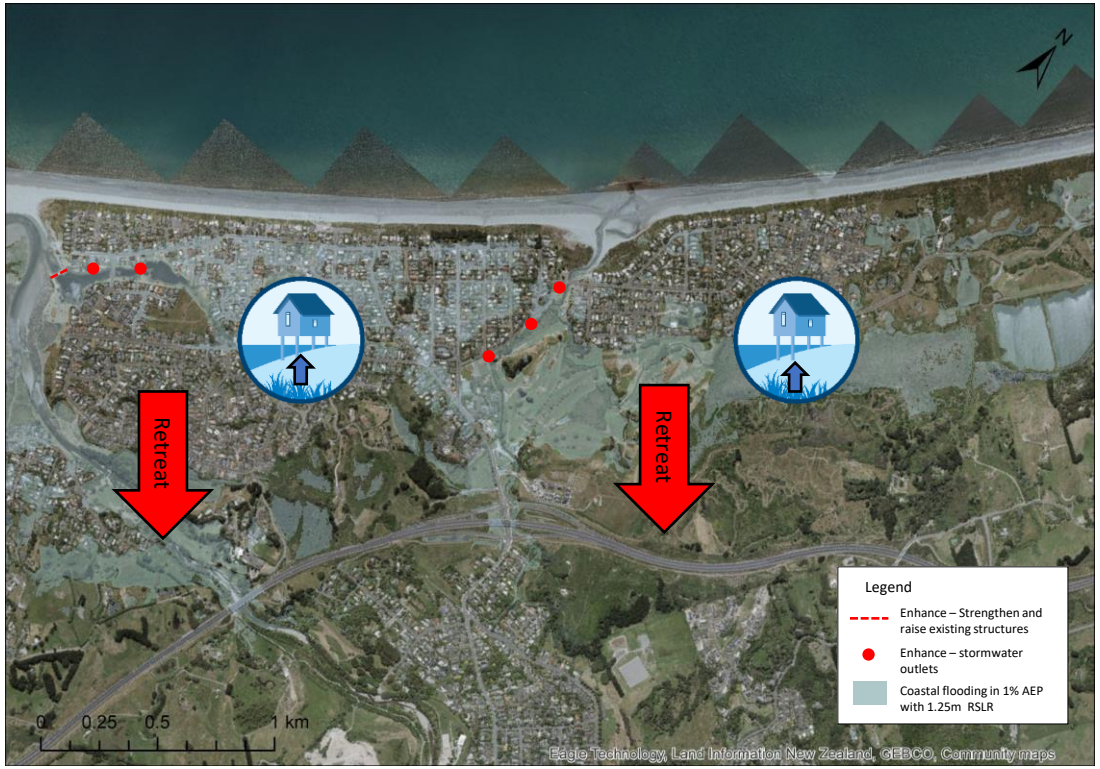
RSLR 0.85 – 1.25 (~ 2130) – 721-926 Properties at risk of inundation

Short term	Medium term	Long term
Enhance [2, 3, 4] Package	**Accommodate [5, 7] Package**	**Retreat [8]**
Enhance **existing inundation protection**, and coastal wetlands, and increase community education and emergency management	Pro-actively **raise floors** of homes which could be flooded, **flood proof** homes and infrastructure	Proactively and progressively retreating properties as they become impacted by the hazard



Notes:
Over the short term, undertake upgrades and maintenance of existing infrastructure to manage the flood risk for the settlement. This could include enhancing the existing estuary embankment; increasing drainage capacity of the existing stormwater outfalls; and enhancing coastal wetlands through effective planting and management. This could also involve increasing community education and awareness about longer term hazards and improving community preparedness and emergency management.

In the medium term, dwellings where the flood risk is not being effectively managed through the broader flood protection scheme would be proactively raised so floor levels were above projected water levels in large storms to avoid being flooded. Although dwellings would be protected, access to properties and services may still be impacted.

Over the longer term, private property and infrastructure that are still at significant risk of flooding or having access and services impacted by flooding would undergo managed retreat and be proactively relocated away from the hazard.

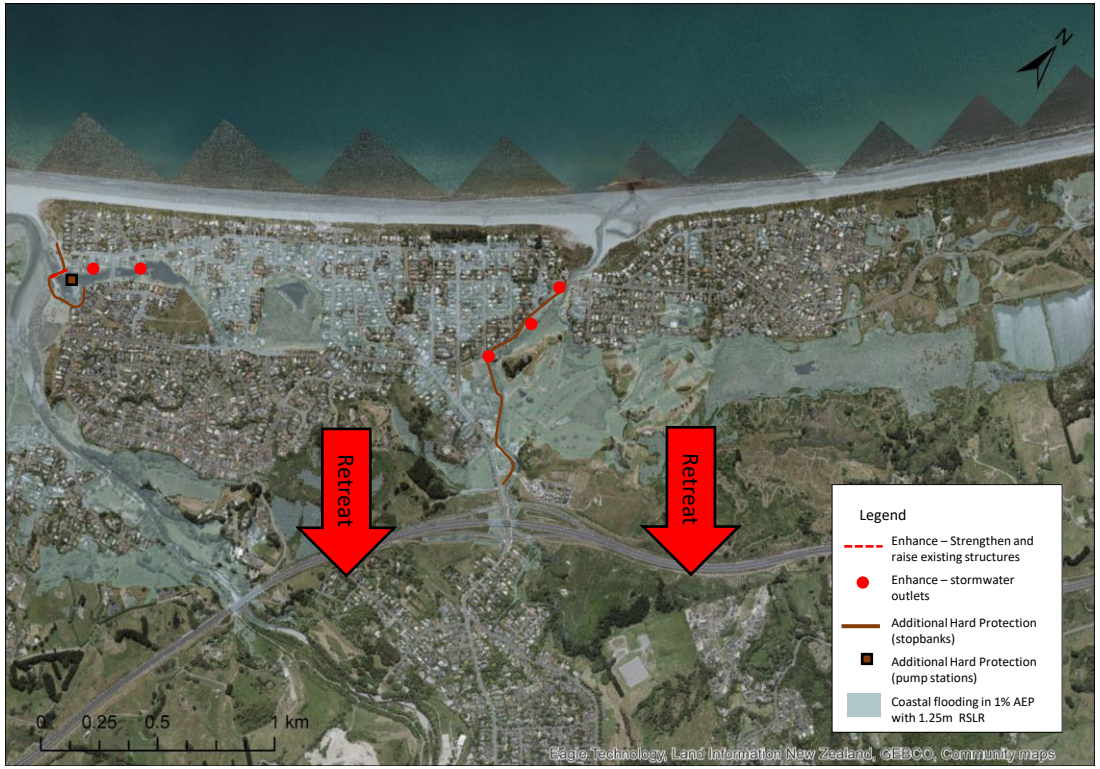
Central Adaptation Area Draft Pathways

Management Unit:	**5B Waikanae Beach (inundation unit)**

Pathway:	5

Current (~ 2020) - 107 Properties at risk of inundation
RSLR 0.2 m (~ 2050) – 210 Properties at risk of inundation
RSLR 0.35 – 0.45 (~ 2070) – 332-396 Properties at risk of inundation
RSLR 0.85 – 1.25 (~ 2130) – 721-926 Properties at risk of inundation

Short term	Medium term	Long term
Enhance [2, 3, 4] Package Enhance **existing inundation protection**, and coastal wetlands, and increase community education and emergency management	**Hard Protection [12, 13, 15] Package** Installation of **floodgates**, pump stations and **stopbanks** to prevent sea water entering the settlements	**Retreat [8]** Proactively and progressively retreating properties as they become impacted by the hazard

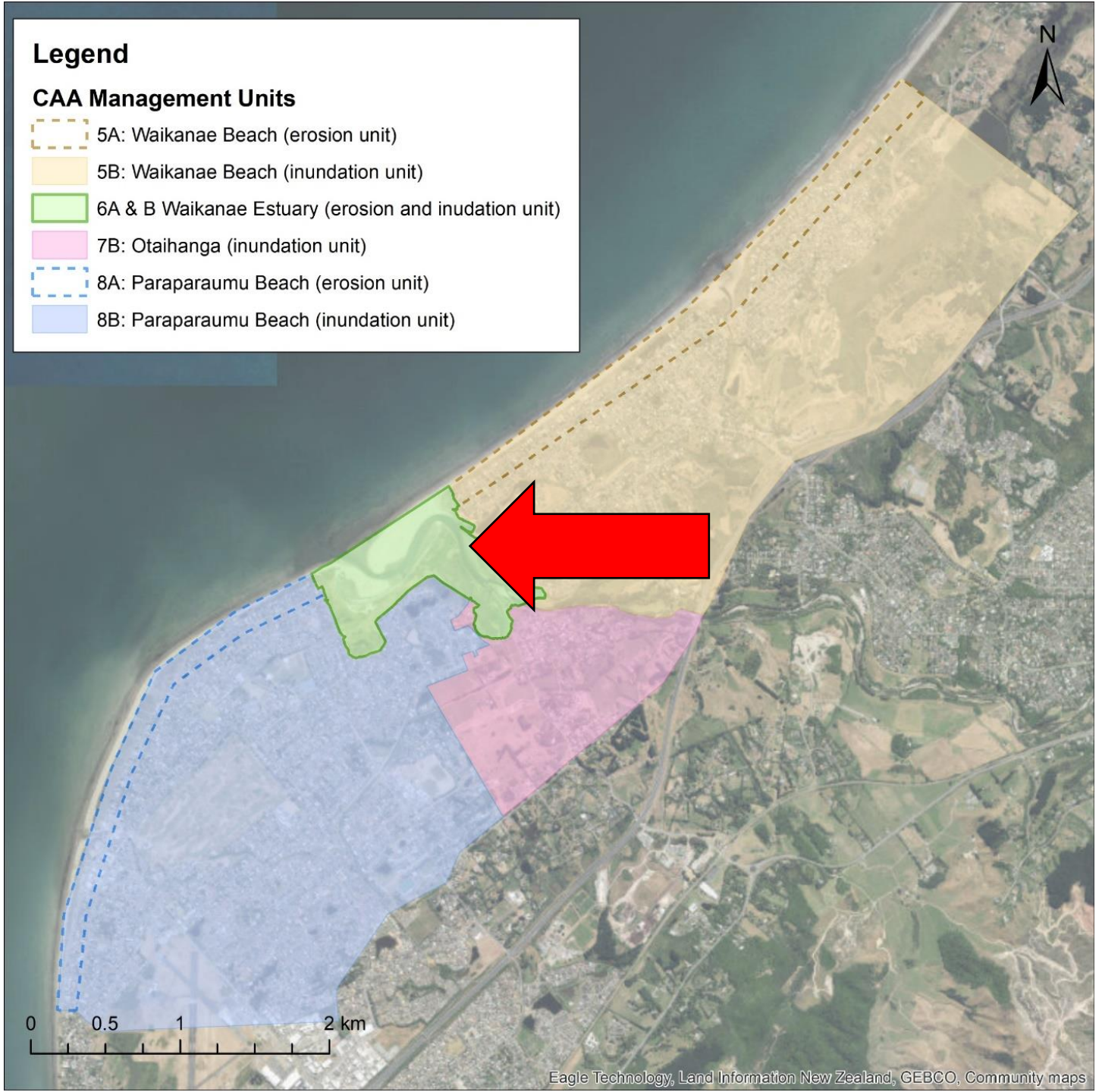


Notes:
Over the short term, undertake upgrades and maintenance of existing infrastructure to manage the short-medium term flood risk for the settlement. This could include enhancing the existing estuary embankment; increasing drainage capacity of the existing stormwater outfalls; and enhancing coastal wetlands through effective planting and management. This could also involve increasing community education and awareness about longer term hazards and improving community preparedness and emergency management.

Over the medium term, feasibility of increased hard protection schemes including stopbanks and pump stations would be investigated, and if feasible could be installed to manage coastal water entering the settlement via low lying waterways and the stormwater network.

As sea levels continue to rise, where the flood protection scheme is not longer effective in managing the risks to coastal inundation, private property and infrastructure that are still at significant risk of flooding or having access and services impacted by flooding would undergo managed retreat and be proactively relocated away from the hazard.

Unit 6A & B: Waikanae Estuary (erosion and inundation unit)



Management Unit:	**6A & B Waikanae Estuary (erosion and inundation unit)**	Pathway:	1

RSLR 0.2 m (~ 2050) – 0 Properties at risk of erosion/inundation
RSLR 0.35 – 0.45 (~ 2070) – 0 Properties at risk of erosion/inundation
RSLR 0.85 – 1.25 (~ 2130)– 0 Properties at risk of erosion/inundation

Short term	Medium term	Long term
Status Quo[1] & Enhance [4] Package Maintain existing management of infrastructure/wetlands, increase community education and emergency management	**Enhance [3, 4] Package** **Wetland planting** and management to increase resilience, increase community education and emergency management	**Enhance [3, 4] Package** **Wetland planting** and management to increase resilience, increase community education and emergency management

Notes:
In the short term, continue existing management of infrastructure and planting efforts in the reserve to manage current coastal hazards in the estuary; and increase community education and emergency management.

Over the medium-long term as sea levels rise, increase planting efforts and estuary edge management using nature based solutions to increase resilience. Continue to educate the community and provide emergency management where required.

Management Unit:	**6A & B Waikanae Estuary (erosion and inundation unit)**	Pathway:	2

RSLR 0.2 m (~ 2050) – 0 Properties at risk of erosion/inundation
RSLR 0.35 – 0.45 (~ 2070) – 0 Properties at risk of erosion/inundation
RSLR 0.85 – 1.25 (~ 2130)– 0 Properties at risk of erosion/inundation

Short term	Medium term	Long term
Status Quo[1] & Enhance [4] Package Maintain existing management of infrastructure/wetlands, increase community education and emergency management	**Enhance [3, 4] Package** **Wetland planting** and management to increase resilience, increase community education and emergency management	**Protect – Bank Protection [11]** Hard bank protection around the edge of the estuary to stabilise the edge

Notes:
In the short term, continue existing management of infrastructure and planting efforts in the reserve to manage current coastal hazards in the estuary; and increase community education and provide emergency management.

Over the medium term as sea levels rise, increase planting efforts and estuary edge management using nature based solutions to increase wetland resilience. Continue to educate the community and provide emergency management where required.

Over the long term as sea levels rise and the estuary edge begins to erode, construct hard protection around the estuary edge to protect public assets and recreational facilities around the edge.

Management Unit:	**6A & B Waikanae Estuary (erosion and inundation unit)**	Pathway:	3

RSLR 0.2 m (~ 2050) – 0 Properties at risk of erosion/inundation
RSLR 0.35 – 0.45 (~ 2070) – 0 Properties at risk of erosion/inundation
RSLR 0.85 – 1.25 (~ 2130)– 0 Properties at risk of erosion/inundation

Short term	Medium term	Long term
Enhance [3, 4] Package	**Enhance [3, 4] Package**	**Protect – Bank Protection [11]**
Wetland planting and management to increase resilience, increase community education and emergency management	**Wetland planting** and management to increase resilience, increase community education and emergency management	Hard bank protection around the edge of the estuary to stabilise the edge

Notes:
In the short-medium term increase planting efforts and estuary edge management using nature based solutions to increase wetland resilience. Continue to educate the community and provide emergency management where required.

Over the long term as sea levels rise and the estuary edge begins to erode, construct hard protection around the estuary edge to protect public assets and recreational facilities around the edge.

Management Unit:	**6A & B Waikanae Estuary (erosion and inundation unit)**	Pathway:	4

RSLR 0.2 m (~ 2050) – 0 Properties at risk of erosion/inundation
RSLR 0.35 – 0.45 (~ 2070) – 0 Properties at risk of erosion/inundation
RSLR 0.85 – 1.25 (~ 2130)– 0 Properties at risk of erosion/inundation

Short term	Medium term	Long term
Enhance [3, 4] Package	**Protect – Bank Protection [11]**	**Protect – Bank Protection [11]**
Wetland planting and management to increase resilience, increase community education and emergency management	Hard bank protection around the edge of the estuary to stabilise the edge	Hard bank protection around the edge of the estuary to stabilise the edge

Notes:
In the short term increase planting efforts and estuary edge management using nature based solutions to increase wetland resilience and reduce inland shoreline migration. Continue to educate the community and provide emergency management where required.

As sea level begins to rise over the medium term and significantly erode the estuary edge, construct hard protection around the estuary edge to protect public assets and recreational facilities around the edge. This form of protection would be maintained into the long term.

Central Adaptation Area Draft Pathways

Management Unit:	**6A & B Waikanae Estuary (erosion and inundation unit)**	Pathway:	5

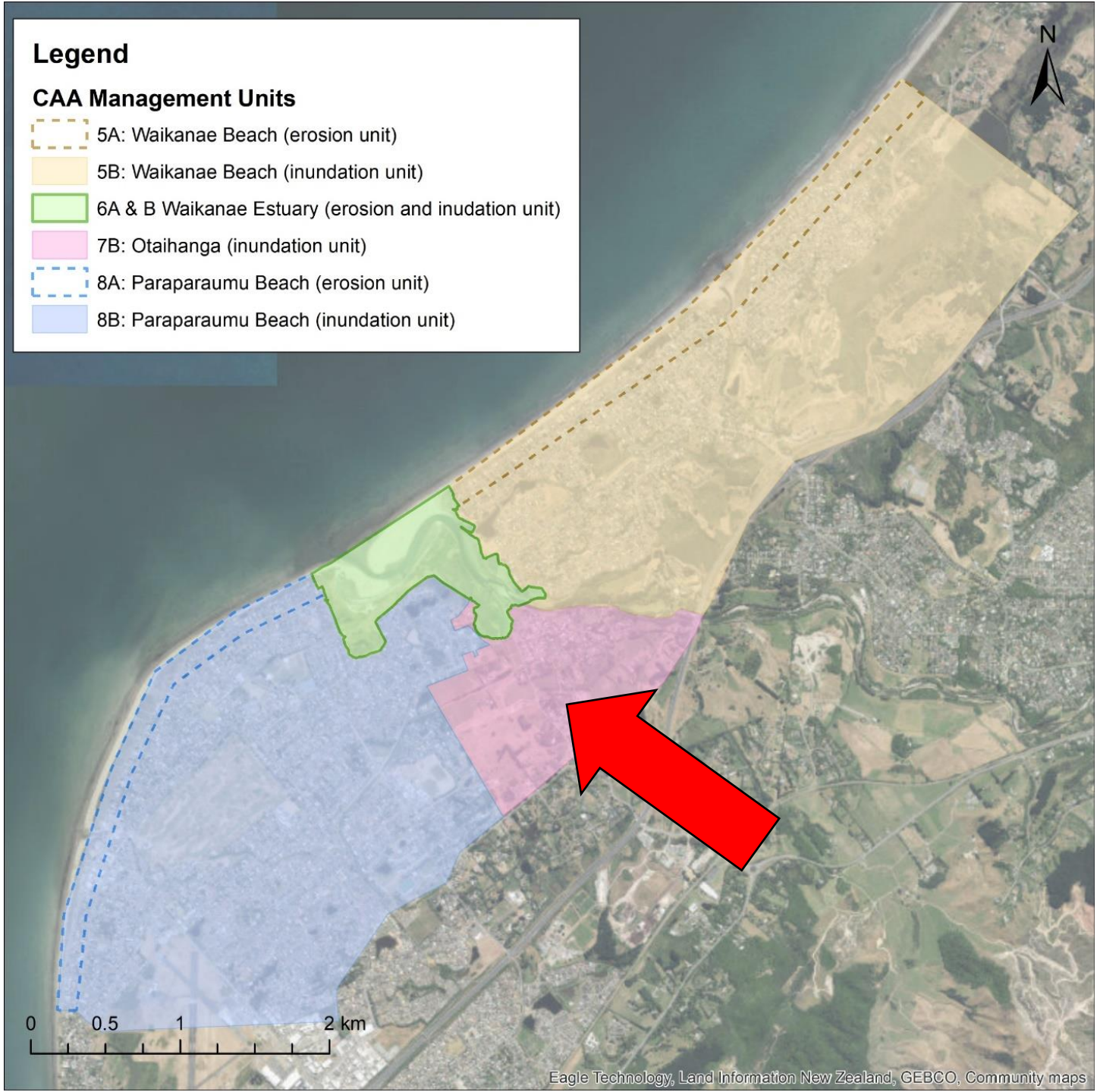
RSLR 0.2 m (~ 2050) – 0 Properties at risk of erosion/inundation
RSLR 0.35 – 0.45 (~ 2070) – 0 Properties at risk of erosion/inundation
RSLR 0.85 – 1.25 (~ 2130)– 0 Properties at risk of erosion/inundation

Short term	Medium term	Long term
Enhance [3, 4] Package	**Retreat [8]**	**Retreat [8]**
Wetland planting and management to increase resilience, increase community education and emergency management	Retreating recreational infrastructure to make way for wetland migration	Retreating recreational infrastructure to make way for wetland migration

Notes:
In the short term increase planting efforts and estuary edge management using nature based solutions to increase wetland resilience and reduce inland shoreline migration. Continue to educate the community and provide emergency management where required.

Over the medium to long term as sea level rises, recreational infrastructure (e.g. walking tracks, car parks) would be retreated away from the edges to make way for wetland migration inland.

Unit 7B: Otaihanga (inundation unit)



Management Unit:	**7B Otaihanga (inundation unit)**	Pathway:	1

Current (~ 2020) - 73 Properties at risk of inundation
RSLR 0.2 m (~ 2050) – 94 Properties at risk of inundation
RSLR 0.35 – 0.45 (~ 2070)– 111-122 Properties at risk of inundation
RSLR 0.85 – 1.25 (~ 2130) – 139-159 Properties at risk of inundation

Short term	Medium term	Long term

Status Quo[1] & Enhance [4] Package

Maintain existing management infrastructure, increase community education and emergency management

→

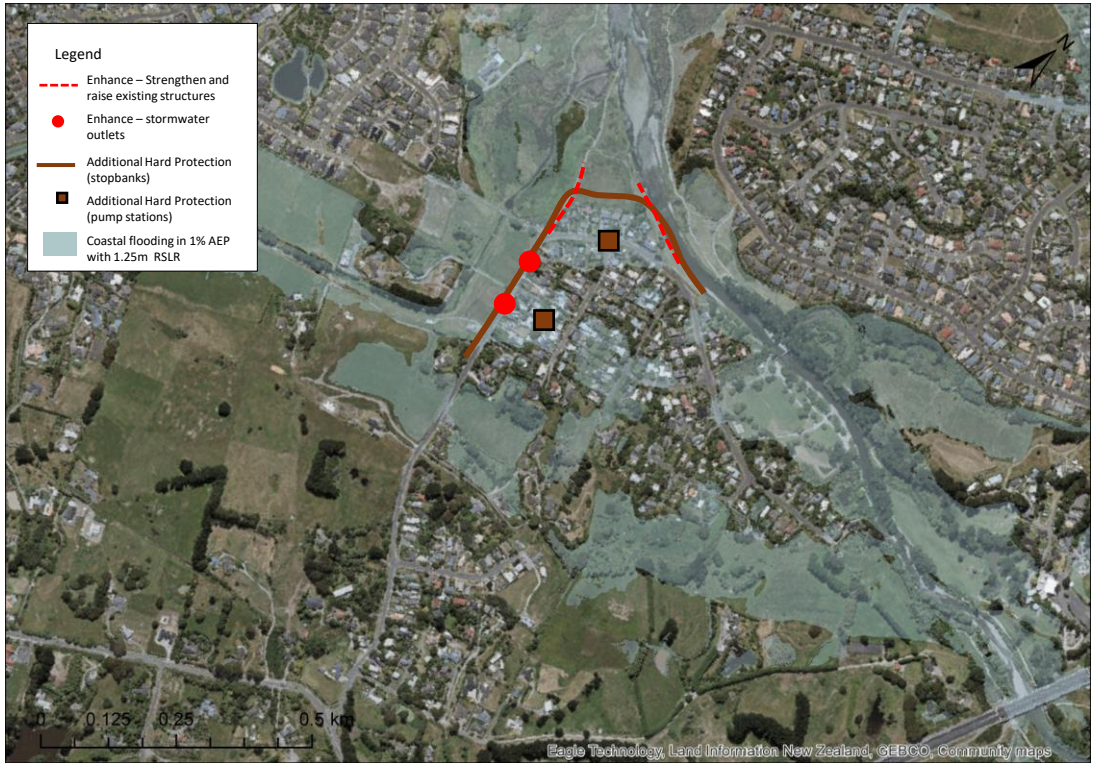
Enhance [2, 3, 4] Package

Enhance **existing inundation protection**, and wetlands, and increase community education and emergency management

→

Hard Protection [12, 13, 15] Package

Installation of **floodgates**, **pump stations** and **stopbanks** to prevent sea water entering the settlements



Notes:
Over the short term, continue to maintain existing flood management infrastructure, and increase community education and awareness about longer term hazards. Also increase community preparedness and emergency management.

Over the medium term, existing infrastructure could be upgraded to be more resilient at managing the increased flood hazard, including upgrading stormwater network pipes and outfalls, increasing the elevation of existing embankments; and enhancing coastal wetlands through effective planting and management. This could also involve increasing community education and awareness about longer term hazards and improving community preparedness and emergency management.

In the long term, feasibility of increased hard protection schemes would be investigated and if feasible, installed to manage coastal water entering the settlement via low lying waterways or the stormwater network. This could include stop banking and pump stations.

Central Adaptation Area Draft Pathways

Management Unit:	**7B Otaihanga (inundation unit)**

Pathway:	2

Current (~ 2020) - 73 Properties at risk of inundation
RSLR 0.2 m (~ 2050) – 94 Properties at risk of inundation
RSLR 0.35 – 0.45 (~ 2070)– 111-122 Properties at risk of inundation
RSLR 0.85 – 1.25 (~ 2130) – 139-159 Properties at risk of inundation

Short term	Medium term	Long term

Enhance [2, 3, 4] Package

Enhance **existing inundation protection**, and wetlands, and increase community education and emergency management

→

Enhance [2, 3, 4] Package

Enhance **existing inundation protection**, and wetlands, and increase community education and emergency management

→

Accommodate [5, 7] Package

Pro-actively **raise floors** of homes which could be flooded, **flood proof** homes and infrastructure

Notes:

Over the short-medium term, existing infrastructure could be upgraded to be more resilient at managing the increased flood hazard, including upgrading stormwater network pipes and outfalls, and increasing elevation of existing embankments; and enhancing coastal wetlands through effective planting and management. This could also involve increasing community education and awareness about longer term hazards and improving community preparedness and emergency management.

In the long term, dwellings where the flood risk is not being effectively managed through the broader flood protection scheme would be proactively raised so floor levels were above projected water levels in large storms to avoid being flooded. Although dwellings would be protected, access to properties and services may still be impacted.

Central Adaptation Area Draft Pathways

Management Unit:	**7B Otaihanga (inundation unit)**

Pathway:	3

Current (~ 2020) - 73 Properties at risk of inundation
RSLR 0.2 m (~ 2050) – 94 Properties at risk of inundation
RSLR 0.35 – 0.45 (~ 2070)– 111-122 Properties at risk of inundation
RSLR 0.85 – 1.25 (~ 2130) – 139-159 Properties at risk of inundation

Short term	Medium term	Long term

Enhance [2, 3, 4] Package

Enhance **existing inundation protection**, and wetlands, and increase community education and emergency management

→

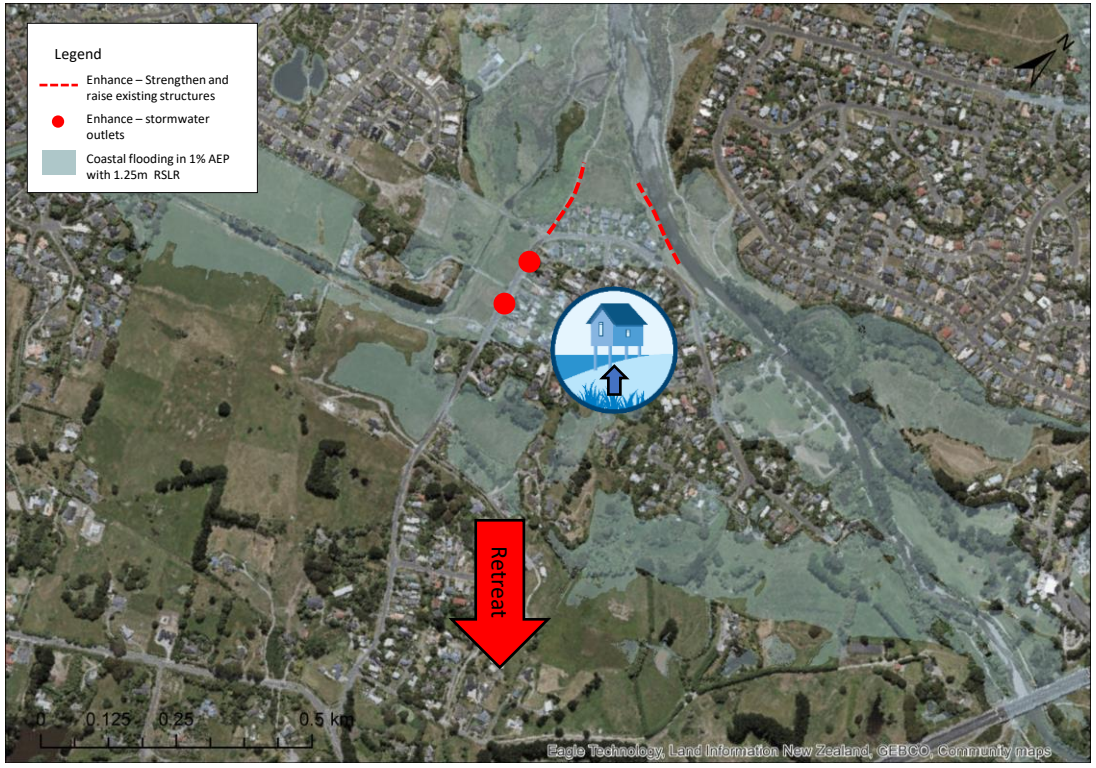
Accommodate [5, 7] Package

Pro-actively **raise floors** of homes which could be flooded, **flood proof** homes and infrastructure

→

Retreat [8]

Proactively and progressively retreating properties as they become impacted by the hazard



Notes:
Over the short term, existing infrastructure could be upgraded to be more resilient at managing the increased flood hazard, including upgrading stormwater network pipes and outfalls, and increasing elevation of existing embankments; and enhancing coastal wetlands through effective planting and management. This could also involve increasing community education and awareness about longer term hazards and improving community preparedness and emergency management.

In the medium term, dwellings where the flood risk is not being effectively managed through the broader flood protection scheme could be proactively raised so floor levels were above projected water levels in large storms to avoid being flooded. Although dwellings would be protected, access to properties and services may still be impacted.

As sea levels continue to rise, where the flood protection scheme is no longer effective in managing the risks to coastal inundation, private property and infrastructure that are still at significant risk of flooding or having access and services impacted by flooding would undergo managed retreat and be proactively relocated away from the hazard.

Central Adaptation Area Draft Pathways

Management Unit:	**7B Otaihanga (inundation unit)**

Pathway:	4

Current (~ 2020) - 73 Properties at risk of inundation
RSLR 0.2 m (~ 2050) – 94 Properties at risk of inundation
RSLR 0.35 – 0.45 (~ 2070)– 111-122 Properties at risk of inundation
RSLR 0.85 – 1.25 (~ 2130) – 139-159 Properties at risk of inundation

Short term	Medium term	Long term

Hard Protection [12, 13, 15] Package

Installation of **floodgates**, **pump stations** and **stopbanks** to prevent sea water entering the settlements

→

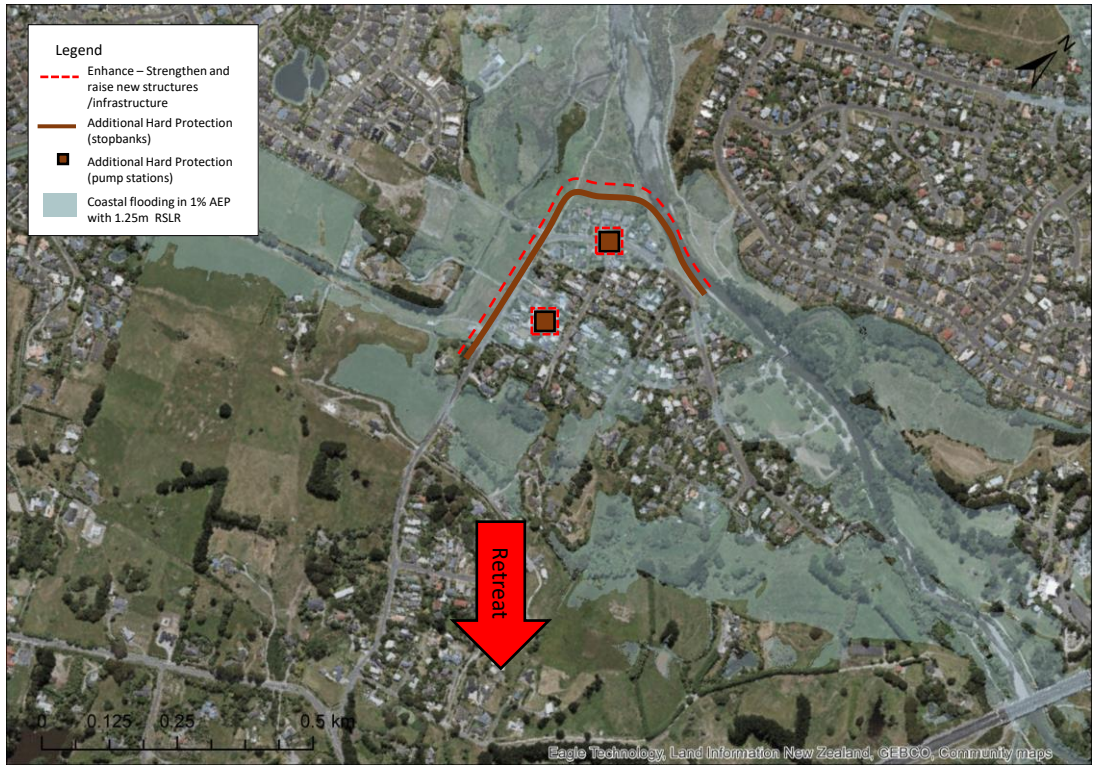
Enhance [2, 3, 4] Package

Enhance new inundation protection, and wetlands, increase community education and emergency management

→

Retreat [8]

Proactively and progressively retreating properties as they become impacted by the hazard



Notes:
In the short term, feasibility of increased hard protection schemes would be investigated and if feasible, installed to manage coastal water entering the settlement via low lying waterways or the stormwater network. This could include stop banking and pump stations.

This new and existing infrastructure would be maintained and enhanced over the medium term. The resilience of wetlands will be managed through effective planting and management. This could also involve increasing community education and awareness about longer term hazards and improving community preparedness and emergency management.

As sea levels continue to rise, where the flood protection scheme is no longer effective in managing the risks to coastal inundation, private property and infrastructure that are still at significant risk of flooding or having access and services impacted by flooding would undergo managed retreat and be proactively relocated away from the hazard.

Management Unit:	**7B Otaihanga (inundation unit)**

Pathway:	5

Current (~ 2020) - 73 Properties at risk of inundation
RSLR 0.2 m (~ 2050) – 94 Properties at risk of inundation
RSLR 0.35 – 0.45 (~ 2070)– 111-122 Properties at risk of inundation
RSLR 0.85 – 1.25 (~ 2130) – 139-159 Properties at risk of inundation

Short term

Enhance [2, 3, 4] Package

Enhance **existing inundation protection**, and wetlands, and increase community education and emergency management

Medium term

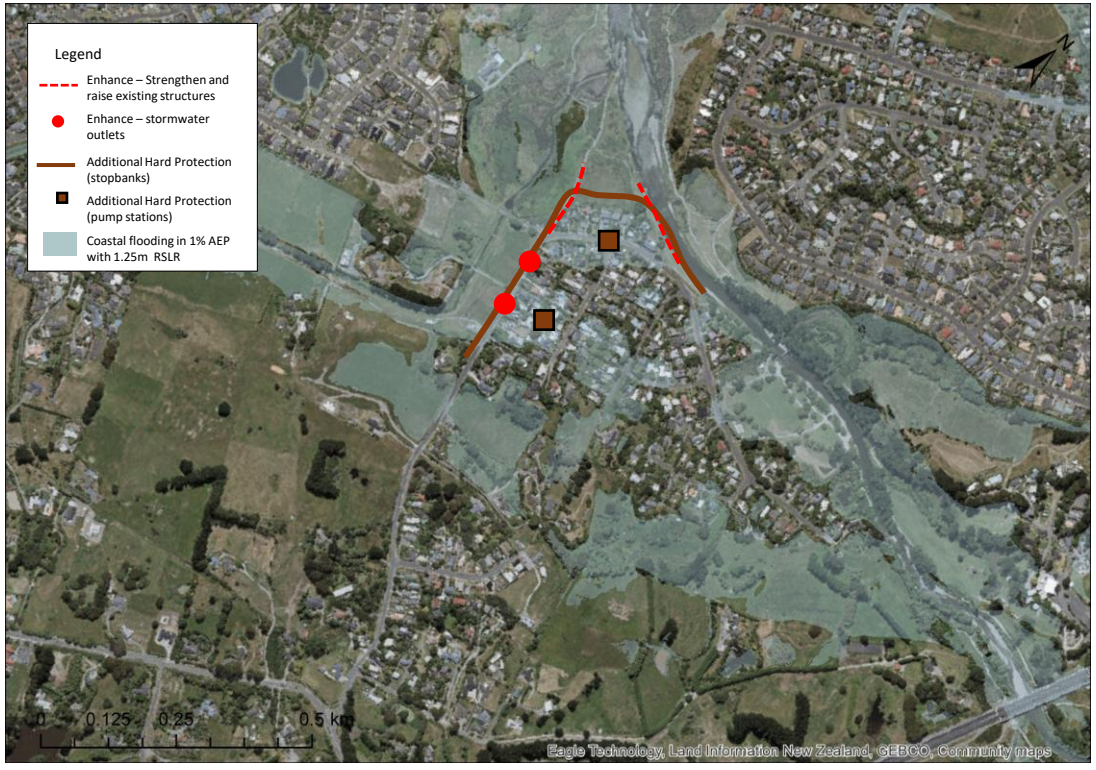
Hard Protection [12, 13, 15] Package

Installation of **floodgates**, **pump stations** and **stopbanks** to prevent sea water entering the settlements

Long term

Hard Protection [12, 13, 15] Package

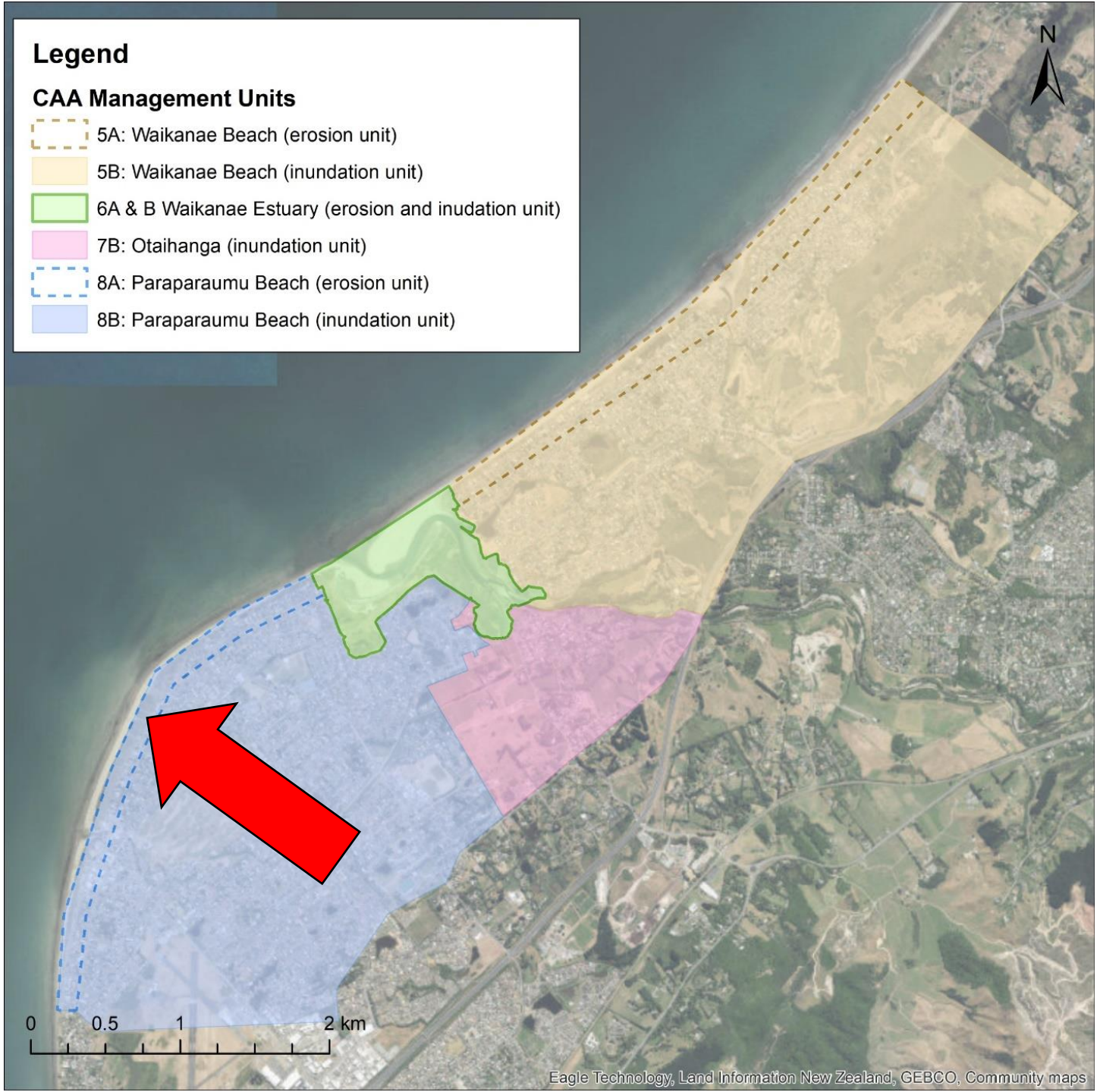
Installation of **floodgates**, **pump stations** and **stopbanks** to prevent sea water entering the settlements



Notes:
Over the short term, existing infrastructure will be upgraded to be more resilient at managing the increased flood hazard, including upgrading stormwater network pipes and outfalls, and increasing elevation of existing embankments; and enhancing coastal wetlands through effective planting and management. This could also involve increasing community education and awareness about longer term hazards and improving community preparedness and emergency management.

Over the medium to long term, feasibility of increased hard protection schemes would be investigated and if feasible, installed to manage coastal water entering the settlement via low lying waterways or via the stormwater network. This could include stop banking and pump stations.

Unit 8A: Paraparaumu Beach (erosion unit)



Management Unit:	**8A Paraparaumu Beach (erosion unit)**	Pathway:	1

RSLR 0.2 m (~ 2050) – 7 Properties at risk of erosion
RSLR 0.35 – 0.45 (~ 2070) – 34-46 Properties at risk of erosion
RSLR 0.85 – 1.25 (~ 2130) – 90-121 Properties at risk of erosion

Short term

Enhance [3, 4] Package

Increased dune resilience by foreshore and backshore planting, increased community education and emergency management.

Medium term

Protect – Dune Reconstruction [10]

Reconstructing the dune by distributing imported sand across the existing dune and reshaping to improve crest elevation and volume. The reshaped dune could be planted to optimise protection.

Long term

Protect – Beach Renourishment [9]

Beach renourishment - Importing sand and distributing it on the foreshore to supply more bulk to the beach profile.

Notes:

Extensive foredune and backdune planting over the short term with weed and pest control to enhance the existing dune system, and to provide good protection in storms and faster recovery. Increased community awareness of the long-term hazards, and increased emergency management.

As sea level rises, reconstructing the existing dune will be undertaken as required to optimise dune elevation and width to provide protection. This could include bringing in additional sand to help build up the beach volume and dune crest.

Over the longer term, additional imported sand will be distributed along the foredune to add volume to the beach and reduce erosion. Additional replenishments and dune maintenance would be undertaken as required.

Management Unit:	**8A Paraparaumu Beach (erosion unit)**	Pathway:	2

RSLR 0.2 m (~ 2050) – 7 Properties at risk of erosion
RSLR 0.35 – 0.45 (~ 2070) – 34-46 Properties at risk of erosion
RSLR 0.85 – 1.25 (~ 2130) – 90-121 Properties at risk of erosion

Short term

Enhance [3,4] & Protect [10] Package

Increased **dune resilience** by foreshore and backshore planting and **dune reconstruction**, increased community education and emergency management.

Medium term

Enhance [3,4] & Protect [9] Package

Increased **dune resilience** by foreshore and backshore planting and **beach renourishment**, increased community education and emergency management.

Long term

Protect – Sea Wall [11]

Sea wall along the front of the settlement.

Notes:

In the short term the dune system will be restructured and planted to optimise the dune elevation and width to provide protection. Extensive foredune and backdune planting over the short-medium term with weed and pest control to enhance the existing dune system, and to provide good protection in storms and faster recovery.

Over the medium term, dune planting and enhancement will continue to be undertaken, and imported sand could be distributed along the foredune to add volume to the beach and reduce erosion. Additional replenishments and dune maintenance would be undertaken as required to maintain dune volumes which provide sufficient protection.

In the longer term when soft engineering and dune enhancement is no longer effective at managing the erosion risk, a seawall could be constructed along the front of the settlement to protect infrastructure and property, and effectively 'hold the line'.

Central Adaptation Area Draft Pathways

Management Unit:	8A Paraparaumu Beach (erosion unit)	Pathway:	3

RSLR 0.2 m (~ 2050) – 7 Properties at risk of erosion
RSLR 0.35 – 0.45 (~ 2070) – 34-46 Properties at risk of erosion
RSLR 0.85 – 1.25 (~ 2130) – 90-121 Properties at risk of erosion

Short term	Medium term	Long term
Enhance [3,4] & Protect [10] Package	**Enhance [3,4] & Protect [9] Package**	**Protect – Detached Breakwater [14]**
Increased **dune resilience** by foreshore and backshore planting and **dune reconstruction**, increased community education and emergency management.	Increased **dune resilience** by foreshore and backshore planting and **beach renourishment**, increased community education and emergency management.	Detached Breakwater constructed in the nearshore

Notes:

In the short term the dune system will be reconstructed and planted to optimise the dune elevation and width to provide protection. Extensive foredune and backdune planting over the short-medium term with weed and pest control to enhance the existing dune system, and to provide good protection in storms and faster recovery.

Over the medium term, dune planting and enhancement would continue to be undertaken, and imported sand could be distributed along the foredune to add volume to the beach and reduce erosion. Additional replenishments and dune maintenance would need to be undertaken as required to maintain dune volumes which provide sufficient protection.

In the longer term when dune resilience, dune reconstruction and beach renourishment are no longer effective at managing the erosion risk, a detached breakwater could be constructed in the nearshore in front of Paraparaumu Beach to help break up onshore wave energy and promote onshore sediment deposition.

Management Unit:	**8A Paraparaumu Beach (erosion unit)**	Pathway:	4

RSLR 0.2 m (~ 2050) – 7 Properties at risk of erosion
RSLR 0.35 – 0.45 (~ 2070) – 34-46 Properties at risk of erosion
RSLR 0.85 – 1.25 (~ 2130) – 90-121 Properties at risk of erosion

Short term	Medium term	Long term
Enhance [3,4] & Protect [10] Package	**Protect – Sea Wall [11]**	**Retreat [8]**
Increased **dune resilience** by foreshore and backshore planting and **dune reconstruction**, increased community education and emergency management.	Sea wall along the front of the settlement.	Proactively and progressively retreating properties as they become impacted by the hazard

Notes:
In the short term the dune system could be reconstructed and planted to optimise the dune elevation and width to provide protection. Extensive foredune and backdune planting over the short-medium term with weed and pest control to enhance the existing dune system, and to provide good protection in storms and faster recovery.

When the dune is no longer providing effective erosion protection, a sea wall could be constructed in front of the settlement to prevent landward movement of the shoreline into private property and public assets.

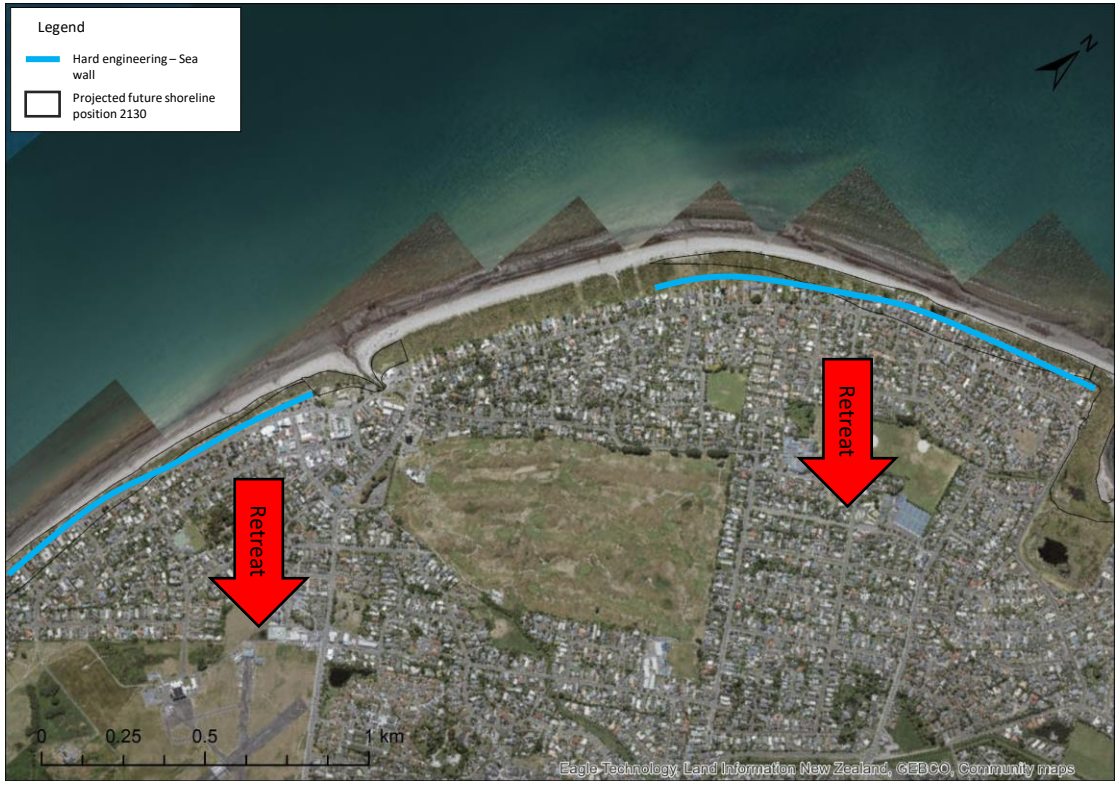
Over the long term, following failure of the sea wall, private properties and infrastructure exposed to the erosion hazard would undergo managed retreat and be proactively relocated away from the hazard.

Central Adaptation Area Draft Pathways

Management Unit:	**8A Paraparaumu Beach (erosion unit)**	Pathway:	5

RSLR 0.2 m (~ 2050) – 7 Properties at risk of erosion
RSLR 0.35 – 0.45 (~ 2070) – 34-46 Properties at risk of erosion
RSLR 0.85 – 1.25 (~ 2130) – 90-121 Properties at risk of erosion

Short term	Medium term	Long term
Protect – Sea Wall [11]	**Protect – Sea Wall** [11]	**Retreat** [8]
Sea wall along the front of the settlement. →	Sea wall along the front of the settlement. →	Proactively and progressively retreating properties as they become impacted by the hazard



Notes:
In the short-medium term, a sea wall could be constructed in front of the settlement to prevent landward movement of the shoreline into private property and public assets. This sea wall would be maintained over the medium term into the future as the main form of protection.

Over the long term, following failure of the sea wall, private properties and infrastructure exposed to the erosion hazard would undergo managed retreat and be proactively relocated away from the hazard.

Central Adaptation Area Draft Pathways

Management Unit:	**8A Paraparaumu Beach (erosion unit)**

Pathway:	6

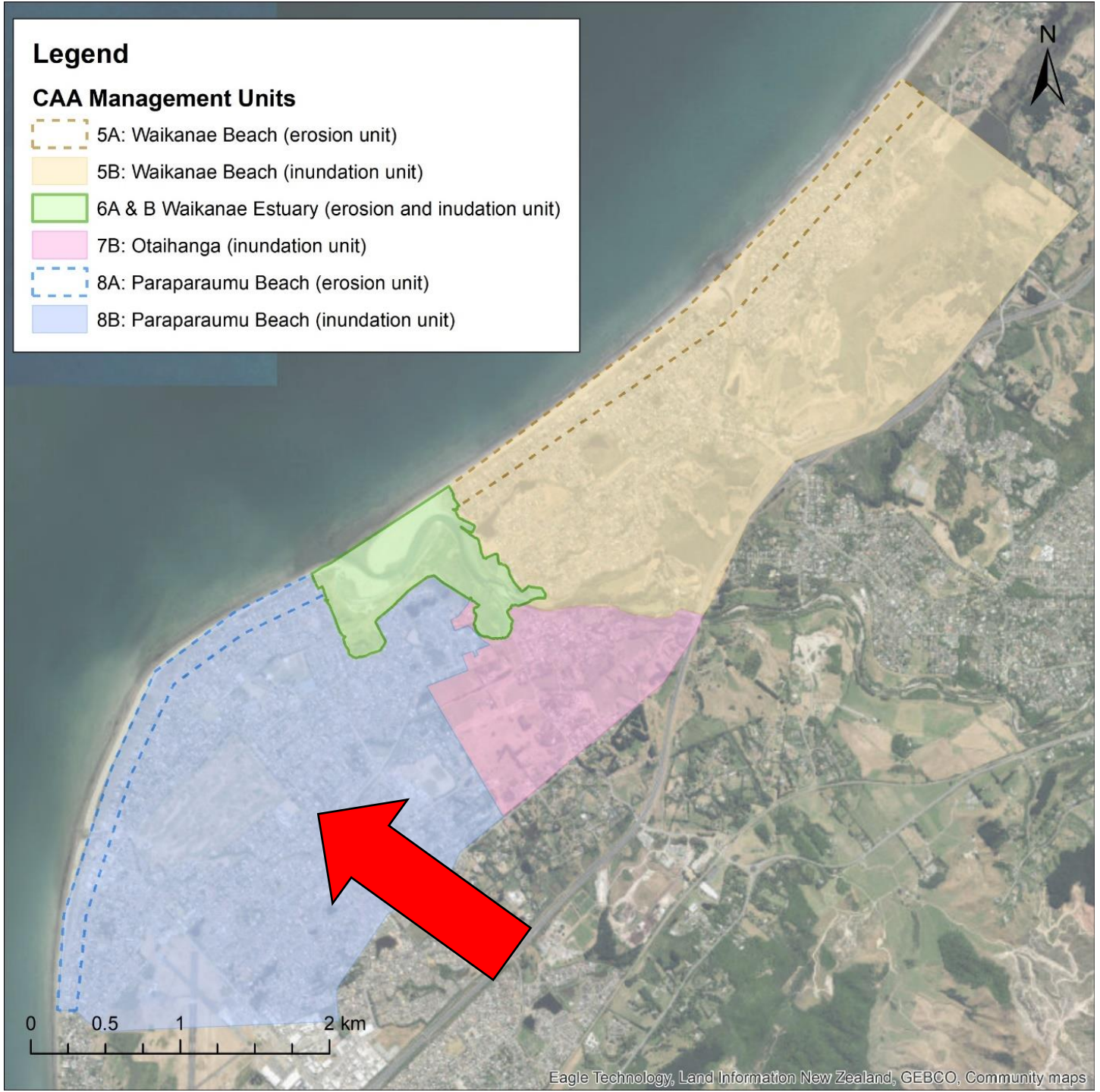
RSLR 0.2 m (~ 2050) – 7 Properties at risk of erosion
RSLR 0.35 – 0.45 (~ 2070) – 34-46 Properties at risk of erosion
RSLR 0.85 – 1.25 (~ 2130) – 90-121 Properties at risk of erosion

Short term	Medium term	Long term
Enhance [3,4] & Protect [10] Package	**Retreat [8]**	**Retreat [8]**
Increased **dune resilience** by foreshore and backshore planting and **dune reconstruction**, increased community education and emergency management.	Proactively and progressively retreating properties as they become impacted by the hazard	Proactively and progressively retreating properties as they become impacted by the hazard

Notes:
In the short term the dune system could be reconstructed and planted to optimise the dune elevation and width to provide protection. Extensive foredune and backdune planting over the short-medium term with weed and pest control to enhance the existing dune system, and to provide good protection in storms and faster recovery.

As sea levels rise over the medium-long term, private properties and infrastructure exposed to the erosion hazard would undergo progressive managed retreat and be proactively relocated away from the hazard.

Unit 8B: Paraparaumu Beach (inundation unit)



Central Adaptation Area Draft Pathways

Management Unit:	**8B Paraparaumu Beach (inundation unit)**

Pathway:	1

Current (~ 2020) - 107 Properties at risk of inundation
RSLR 0.2 m (~ 2050) – 201 Properties at risk of inundation
RSLR 0.35 – 0.45 (~ 2070) –277-370 Properties at risk of inundation
RSLR 0.85 – 1.25 (~ 2130) – 692-1120 Properties at risk of inundation

Short term	Medium term	Long term
Status Quo[1] & Enhance [4] Package Maintain existing management infrastructure, increase community education and emergency management	**Status Quo[1] & Enhance [4] Package** Maintain existing management infrastructure, increase community education and emergency management	**Enhance [2, 3, 4] Package** Enhance **existing inundation protection**, and coastal wetlands, and increase community education and emergency management

Notes:
Over the short-medium term, continue to maintain existing flood management infrastructure, and increase community education and awareness about longer term hazards. Also increase community preparedness and emergency management.

Over the longer term, undertake upgrades and maintenance of existing infrastructure to manage the flood risk for the settlement. This could include enhancing existing stopbanks, increasing drainage capacity of the existing stormwater outfalls. Enhance coastal wetlands through effective planting and management.

Central Adaptation Area Draft Pathways

Management Unit:	8B Paraparaumu Beach (inundation unit)

Pathway:	2

Current (~ 2020) - 107 Properties at risk of inundation
RSLR 0.2 m (~ 2050) – 201 Properties at risk of inundation
RSLR 0.35 – 0.45 (~ 2070) –277-370 Properties at risk of inundation
RSLR 0.85 – 1.25 (~ 2130) – 692-1120 Properties at risk of inundation

Short term	Medium term	Long term

Status Quo [1] & Enhance [4] Package

Maintain existing management infrastructure, increase community education and emergency management

→

Enhance [2, 3, 4] Package

Enhance **existing inundation protection**, and coastal wetlands, and increase community education and emergency management

→

Hard Protection [12, 13, 15] Package

Installation of **floodgates**, **pump stations** and **stopbanks** to prevent sea water entering the settlements

Notes:
Over the short term, continue to maintain existing flood management infrastructure, and increase community education and awareness about longer term hazards. Also increase community preparedness and emergency management.

Over the medium term, undertake upgrades and maintenance of existing infrastructure to manage the flood risk for the settlement. This could include enhancing existing stopbanks, increasing drainage capacity of the existing stormwater outfalls. Enhance coastal wetlands through effective planting and management.

In the long term, feasibility of increased hard protection schemes would be investigated and if feasible, installed to manage coastal water entering the settlement via low lying waterways or via the stormwater network.

Central Adaptation Area Draft Pathways

Management Unit:	8B Paraparaumu Beach (inundation unit)

Pathway:	3

Current (~ 2020) - 107 Properties at risk of inundation
RSLR 0.2 m (~ 2050) – 201 Properties at risk of inundation
RSLR 0.35 – 0.45 (~ 2070) –277-370 Properties at risk of inundation
RSLR 0.85 – 1.25 (~ 2130) – 692-1120 Properties at risk of inundation

Short term	Medium term	Long term
Enhance [2, 3, 4] Package	**Enhance [2, 3, 4] Package**	**Accommodate [5, 7] Package**
Enhance **existing inundation protection**, and coastal wetlands, and increase community education and emergency management	Enhance **existing inundation protection**, and coastal wetlands, and increase community education and emergency management	Pro-actively **raise floors** of homes which could be flooded, **flood proof** homes and infrastructure

Notes:
Over the short-medium term, undertake upgrades and maintenance of existing infrastructure to manage the short-medium term flood risk for the settlement. This could include enhancing existing stopbanks, increasing drainage capacity of the existing stormwater outfalls. Enhance coastal wetlands through effective planting and management. This could also involve increasing community education and awareness about longer term hazards and improving community preparedness and emergency management.

In the long term, dwellings where the flood risk is not being effectively managed through the broader flood protection scheme would be proactively raised so floor levels were above projected water levels in large storms or flood proofed to avoid being flooded. Flood proofing would involve wetproofing where water is allowed to enter the structure but flood resistant materials prevent structural damage or dry proofing where buildings are made watertight. Although dwellings would be protected, access to properties and services may still be impacted.

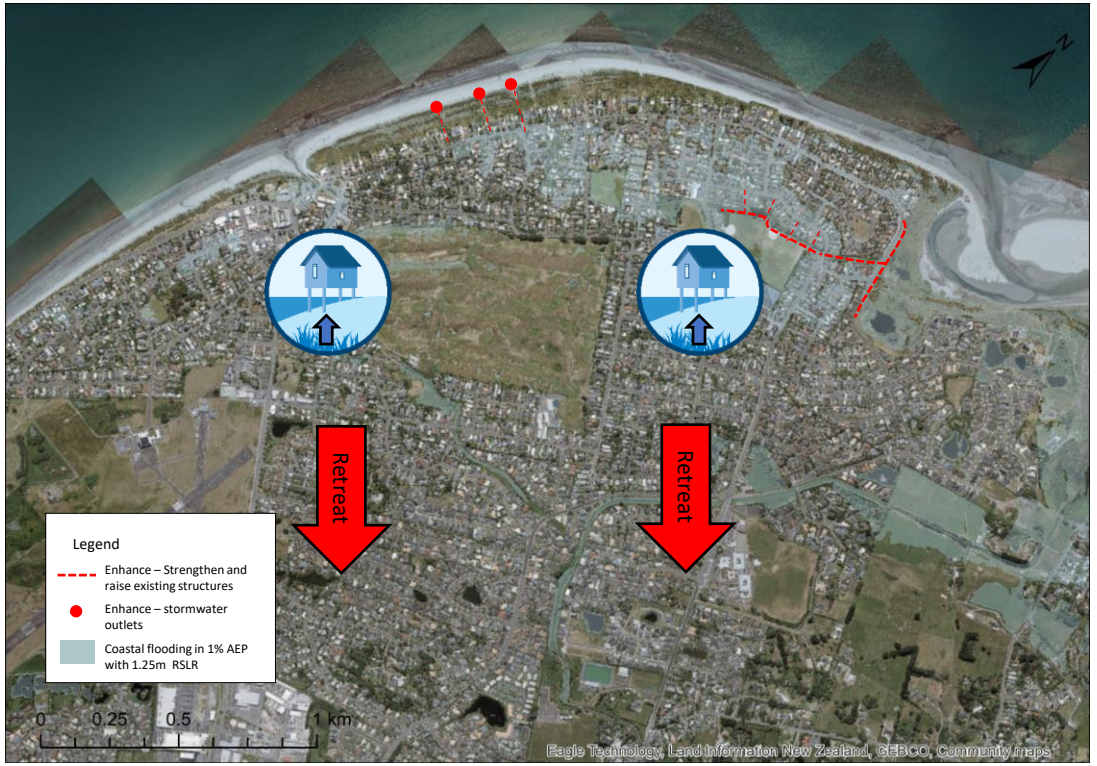
Central Adaptation Area Draft Pathways

Management Unit:	8B Paraparaumu Beach (inundation unit)

Pathway:	4

Current (~ 2020) - 107 Properties at risk of inundation
RSLR 0.2 m (~ 2050) – 201 Properties at risk of inundation
RSLR 0.35 – 0.45 (~ 2070) –277-370 Properties at risk of inundation
RSLR 0.85 – 1.25 (~ 2130) – 692-1120 Properties at risk of inundation

Short term	Medium term	Long term
Enhance [2, 3, 4] Package	**Accommodate [5, 7] Package**	**Retreat [8]**
Enhance **existing inundation protection**, and coastal wetlands, and increase community education and emergency management	Pro-actively **raise floors** of homes which could be flooded, **flood proof** homes and infrastructure	Proactively and progressively retreating properties as they become impacted by the hazard



Notes:
Over the short term, undertake upgrades and maintenance of existing infrastructure to manage the short-medium term flood risk for the settlement. This could include enhancing existing stopbanks, increasing drainage capacity of the existing stormwater outfalls. Enhance coastal wetlands through effective planting and management. This could also involve increasing community education and awareness about longer term hazards and improving community preparedness and emergency management.

In the long term, dwellings where the flood risk is not being effectively managed through the broader flood protection scheme could be proactively raised so floor levels were above projected water levels in large storms or flood proofed to avoid being flooded. Flood proofing would involve wetproofing where water is allowed to enter the structure but flood resistant materials prevent structural damage or dry proofing where buildings are made watertight. Although dwellings would be protected, access to properties and services may still be impacted.

Over the longer term, private property and infrastructure that are still at significant risk of flooding or having access and services impacted by flooding would undergo managed retreat and be proactively relocated away from the hazard.

Central Adaptation Area Draft Pathways

Management Unit:	8B Paraparaumu Beach (inundation unit)

Pathway:	5

Current (~ 2020) - 107 Properties at risk of inundation
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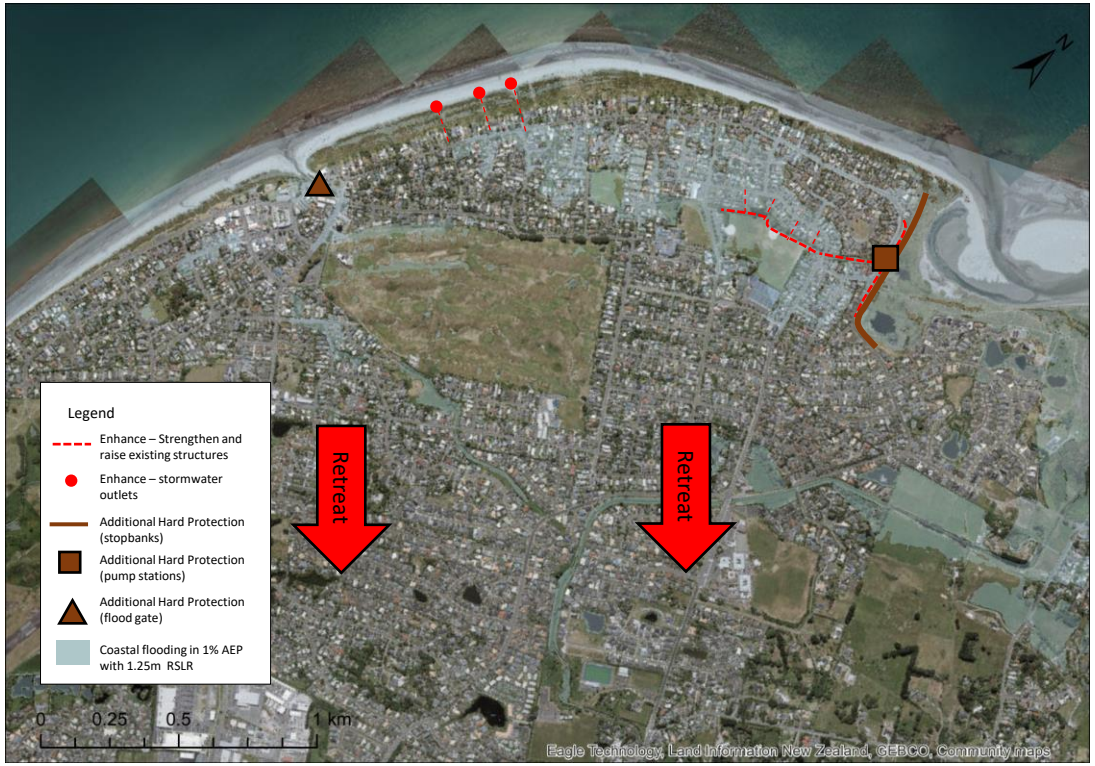
Short term	Medium term	Long term
Enhance [2, 3, 4] Package	**Hard Protection [12, 13, 15] Package**	**Retreat [8]**
Enhance **existing inundation protection**, and coastal wetlands, and increase community education and emergency management	Installation of **floodgates**, **pump stations** and **stopbanks** to prevent sea water entering the settlements	Proactively and progressively retreating properties as they become impacted by the hazard



Notes:
Over the short term, undertake upgrades and maintenance of existing infrastructure to manage the short-medium term flood risk for the settlement. This could include enhancing existing stopbanks, increasing drainage capacity of the existing stormwater outfalls. Enhance coastal wetlands through effective planting and management. This could also involve increasing community education and awareness about longer term hazards and improving community preparedness and emergency management.

Over the medium term, feasibility of increased hard protection schemes would be investigated and if feasible, installed to manage coastal water entering the settlement via low lying waterways or via the stormwater network.

As sea levels continue to rise, where the flood protection scheme is not longer effective in managing the risks to coastal inundation, private property and infrastructure that are still at significant risk of flooding or having access and services impacted by flooding would undergo managed retreat and be proactively relocated away from the hazard.