# **Central Adaptation Area: Draft Adaptation Pathways**

CAP Meeting 26<sup>th</sup> July 2023

Information prepared by TAG



# **Central Adaptation Area is separated into four sub-areas:**

- Waikanae Beach (5)
- Waikanae Estuary (6)
- Otaihanga (7)
- Paraparaumu Beach (8)

Each sub-area has been further split into 'management units' based on the hazard source (e.g. erosion (A) and inundation (B)).

Possible high–level pathways of adaptation options which give effect to the Draft CAA Objective (from CAP workshop, 29<sup>th</sup> June 2023) have been formed for CAP discussion.

The aim of this workshop session is for CAP to:

- 1. Select a short-list of pathways for each sub area that they think require further consideration (MCDA scoring);
- 2. Define what package of actions could be used for each option in the short-listed pathways.



# **Re-cap – Central Adaptation Area Draft Adaptation Objective**

Draft Adaptation Pathways should be formed to achieve this draft objective:

Plan and implement sensible adaptation solutions that recognise the natural and relaxed coastal community feel as the coastline evolves over time by:

- protecting the mana of the coast, dunes, biodiversity, and river and wetland areas;
- utilising natural solutions where practical; and
- adapting our public recreation assets and services;
- keeping the community informed and involved about the types of solutions and associated costs.



## **Overview of Management Units**

Split into 6 management units:

- 5A Waikanae Beach (erosion unit)
- 5B Waikanae Beach (inundation unit)
- 6A & B Waikanae Estuary (erosion & inundation unit)
- 7B Otaihanga (inundation unit)
- 8A Paraparaumu Beach (erosion unit)
- 8B Paraparaumu Beach (inundation unit)

\*Otaihanga does not have an erosion unit, as it is setback from the coastline and erosion hazard in the estuary.

\*Waikanae Estuary should consider the erosion and inundation hazard together, as processes that cause both hazards in the estuary are largely integrated – being primarily high water levels in the estuary

\*The Waikanae Estuary area is a scientific reserve managed by DOC and GWRC.

#### Legend

#### **CAA Management Units**

- 5A: Waikanae Beach (erosion unit) 5B: Waikanae Beach (inundation unit)
  - 6A & B Waikanae Estuary (erosion and inudation unit)
  - 7B: Otaihanga (inundation unit)
- 8A: Paraparaumu Beach (erosion unit)
  - 8B: Paraparaumu Beach (inundation unit)



# **OPTIONS**

# **ENHANCE**

## ACCOMODATE

## PROTECT

We keep the hazard away

#### RETREAT

#### **AVOID**

We maintain and improve what we are already doing



- Enhance existing erosion ٠ protection structures
- Enhance existing inundation protection
- Enhance access and ramps
- Dune and wetland enhancement/resilience
- Emergency management .
- Environmental monitoring ٠
- Community education . and risk awareness
- Private owners' responsibility

We live with the hazard



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

٠

٠

٠

- Flood proofing ٠ infrastructure

- - Detached breakwater ٠

#### Inundation controls

- Flapped culvert outfalls
- Flood gates .
- Pump stations ٠
- Stopbanks .
- Earth bunds

We move away from the hazard



Retreat

٠

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

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- Trigger-based or time • limited land use consents
- Zoning and setback controls

Soft Engineering (Erosion)

Beach scraping Renourishment

#### Hard Engineering (Erosion)

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

ACTIONS

#### Pathways Template (Blank)

Sub-area:

For each pathway, include the possible adaptation option and example of possible action under that option



Management Unit	Pathway	Short term	$\rightarrow$	Medium term	$\rightarrow$	Long term
pen tion			$\rightarrow$		$\rightarrow$	
nit A: C nunda			$\rightarrow$		$\rightarrow$	
ent Ur ssion/I			$\rightarrow$		$\rightarrow$	
lagem ast Erc			$\rightarrow$		$\rightarrow$	
Man Coa			$\rightarrow$		$\rightarrow$	
3: ion			$\rightarrow$		$\rightarrow$	
Unit E lundat			$\rightarrow$		$\rightarrow$	
lanagement ets/Rivers in			$\rightarrow$		$\rightarrow$	
			$\rightarrow$		$\rightarrow$	
			$\rightarrow$		$\rightarrow$	

- All pathways at all timeframes to include "<u>Avoid</u>" option through land-use planning (e.g short term is new coastal hazard provisions in Coastal Environment District Plan Change).
- Under existing RMA legislation, the success of planning actions is limited to re-developments and new developments by existing use rights. For re-development, this is dependent on the "turn-over" of building stock.

# **Draft Adaptation Pathways for Each Management Unit**



- All pathways at all timeframes to include "<u>Avoid</u>" option through land-use planning (e.g short term is new coastal hazard provisions in Coastal Environment District Plan Change).
- Under existing RMA legislation, the success of planning actions is limited to re-developments and new developments by existing use rights. For re-development, this is dependent on the "turn-over" of building stock.

## Management Unit 5A & 5B Waikanae Beach

	Coast	al Flood	Coastal Erosion		
	На	zard	Ha	zard	
	5507.4 9	5505.8 5	\$\$07.4 5	5505.8 5	
	Dick	niek	Dick	Dick	
	RISK	RISK	RISK	RISK	
Elements	0.85 m	1.25 m	0.85 m	1.25 m	
Built Environment					
Properties	L	M	м	м	
Properties (Waikanae)	M	м	м	ε	
Properties (Otaihanga)	M	E	L	L	
Properties (Paraparaumu)	L	м	м	н	
Water Supply Infrastructure	L	м	L	м	
Wastewater Infrastructure	M	м	м	м	
Stormwater Infrastructure	м	м	м	н	
Roads and Bridges	E	ε	L	м	
Electrical transmission and supply infrastructure	M	м	м	м	
Natural gas supply mains	L	L	м	м	
Ecologcial					
Dunes	L	L	н	ε	
Ecological Sites	E	ε	L	L	
Wetlands	н	н	L	L	
Significant bird habitat	н	н	м	м	
Key indigenous trees	L	L	L	L	
Human					
Displacement	н	ε	м	м	
Inequities	н	ε	L	м	
Health	E	ε	м	м	
Daily Routines	M	н	M	м	
Natural Character					
CTA2: Paraparaumu and Waikanae	м	м	н	н	
Peka Peka Dunes (South) - High Natural Character	M	м	L	L	
Waikanae Estuary - High Natural Character	н	н	M	M	

#### Legend

0.25

0.5

#### **CAA Management Units**

- 5A: Waikanae Beach (erosion unit)
- 5B: Waikanae Beach (inundation unit)
- Erosion Hazard 1.25m SLR (2130 SSP5-8.5)
- Inundation Hazard 1.25m SLR (2130 SSP5-8.5)

Properties Exposed in Waikanae Beach										
RSLR	Coastal	erosion	Coastal flooding							
(metres)	SSP2-4.5	SSP5-8.5	SSP2-4.5	SSP5-8.5						
-	0	0	107	107						
0.2 m (~ 2050)	27	27	210	210						
0.35 – 0.45 (~ 2070)	27	27	332	396						
0.85 – 1.25 (~ 2130)	39	107	721	926						

#### Retreat Avoid Enhance Accommodate Protect **Pathways Template** All pathways at all timeframes to include "Avoid" option through land-use planning Sub-area: 5A Waikanae Beach ..... Managemen Pathway Short term Medium term Long term $\rightarrow$ $\rightarrow$ t Unit Dune and/or Wetland Resilience<sup>3</sup>, Community Beach Renourishment<sup>9</sup> Status Quo<sup>1</sup> and Community Education and Education and Emergency Management<sup>4</sup> Pathway 1 $\rightarrow$ $\rightarrow$ Emergency Management<sup>4</sup> (Protect – Soft Engineering) (Enhance) Dune and/or Wetland Resilience<sup>3</sup>. Community Beach Scraping<sup>10</sup> Sea wall<sup>11</sup> Pathway 2 Education and Emergency Management<sup>4</sup> $\rightarrow$ $\rightarrow$ (Protect – Soft Engineering) (Protect - Hard Engineering) Management Unit 5A: Waikanae Beach Open Coast Erosion Unit (Enhance) Dune and/or Wetland Resilience<sup>3</sup>, Community Beach Renourishment<sup>9</sup> Sea wall<sup>11</sup> Pathway 3 Education and Emergency Management<sup>4</sup> $\rightarrow$ $\rightarrow$ (Protect – Soft Engineering) (Protect - Hard Engineering) (Enhance) Dune and/or Wetland Resilience<sup>3</sup>, Community Beach Scraping<sup>10</sup> Detached Breakwater<sup>14</sup> Pathway 4 Education and Emergency Management<sup>4</sup> $\rightarrow$ $\rightarrow$ (Protect – Soft Engineering) (Protect – Hard Engineering) (Enhance) Dune and/or Wetland Resilience<sup>3</sup>, Community Beach Renourishment<sup>9</sup> Detached Breakwater<sup>14</sup> Education and Emergency Management<sup>4</sup> Pathway 5 $\rightarrow$ $\rightarrow$ (Protect – Soft Engineering) (Protect – Hard Engineering) (Enhance) Dune and/or Wetland Resilience<sup>3</sup>, Community Sea wall<sup>11</sup> Education and Emergency Management<sup>4</sup> Retreat<sup>8</sup> Pathway 6 $\rightarrow$ $\rightarrow$ (Protect - Hard Engineering) (Enhance) Dune and/or Wetland Resilience<sup>3</sup>, Community Detached Breakwater<sup>14</sup> Education and Emergency Management<sup>4</sup> Pathway 7 Retreat<sup>8</sup> $\rightarrow$ $\rightarrow$ (Protect – Hard Engineering) (Enhance) Dune and/or Wetland Resilience<sup>3</sup>, Community Beach Scraping<sup>10</sup> Education and Emergency Management<sup>4</sup> Pathway 8 Retreat<sup>8</sup> $\rightarrow$ $\rightarrow$ (Protect – Soft Engineering) (Enhance) Dune and/or Wetland Resilience<sup>3</sup>, Community Dune and/or Wetland Resilience<sup>3</sup>, Community Education and Emergency Management<sup>4</sup> Pathway 9 Retreat<sup>8</sup> $\rightarrow$ $\rightarrow$ Education and Emergency Management<sup>4</sup> (Enhance) Beach Scraping<sup>10</sup> Sea wall<sup>11</sup> Pathway 10 Retreat<sup>8</sup> $\rightarrow$ (Protect – Soft Engineering) (Protect - Hard Engineering)

Sub-area: 5B Waikanae Beach

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All pathways at all timeframes to include "Avoid" option through land-use planning



Management Unit	Pathway	Short term	$\rightarrow$	Medium term	$\rightarrow$	Long term
nundation Unit	Pathway 1	Status Quo <sup>1</sup> and Community Education and Emergency Management <sup>4</sup>	$\rightarrow$	Status Quo <sup>1</sup> and Community Education and Emergency Management <sup>4</sup>	$\rightarrow$	Enhance Existing Inundation Protection <sup>2</sup> and Community Education and Emergency Management <sup>4</sup> (Enhance)
	Pathway 2	Status Quo <sup>1</sup> and Community Education and Emergency Management <sup>4</sup>	$\rightarrow$	Enhance Existing Inundation Protection <sup>2</sup> and Community Education and Emergency Management <sup>4</sup> (Enhance)	$\rightarrow$	Additional Hard Protection (e.g. Stopbanks <sup>12</sup> , Culverts <sup>13</sup> , Pumpstations <sup>15</sup> ) (Protect)
anae Beach	Pathway 3	Status Quo <sup>1</sup> and Community Education and Emergency Management <sup>4</sup>	$\rightarrow$	Enhance Existing Inundation Protection <sup>2</sup> and Community Education and Emergency Management <sup>4</sup> (Enhance)	$\rightarrow$	Elevate floor levels of buildings <sup>7</sup> (Accommodate)
Management Unit 5B: Waika	Pathway 4	Status Quo <sup>1</sup> and Community Education and Emergency Management <sup>4</sup>	$\rightarrow$	Enhance Existing Inundation Protection <sup>2</sup> and Community Education and Emergency Management <sup>4</sup> (Enhance)	$\rightarrow$	Flood proofing buildings and infrastructure <sup>5</sup> (Accommodate)
	Pathway 5	Enhance Existing Inundation Protection <sup>2</sup> and Community Education and Emergency Management <sup>4</sup> (Enhance)	$\rightarrow$	Enhance Existing Inundation Protection <sup>2</sup> and Community Education and Emergency Management <sup>4</sup> (Enhance)	$\rightarrow$	Retreat <sup>8</sup>
	Pathway 6	Enhance Existing Inundation Protection <sup>2</sup> and Community Education and Emergency Management <sup>4</sup> (Enhance)	$\rightarrow$	Additional Hard Protection (e.g. Stopbanks <sup>12</sup> , Culverts <sup>13</sup> , Pumpstations <sup>15</sup> ) (Protect)	$\rightarrow$	Additional Hard Protection (e.g. Stopbanks <sup>12</sup> , Culverts <sup>13</sup> , Pumpstations <sup>15</sup> ) (Protect)

						Properties Exposed in Waikanae Estuary					
lanagement Unit 6A & B Waikanae Estuary							Coastal erosion		Coastal flooding		
					(metres)	(metres) SSP2-4.5 SSP5-8.5			SSP5-8.		
					-	0	0	0	0		
	Coa	stal Flood Hazard	Coast	tal Erosion Iazard	0.2 m (~ 2050)	0	0	0	0		
	SSP2-4 Risk	4.5 SSP5-8.5 Risk	5 SSP2-4 Risk	1.5 SSP5-8.5 Risk	0.35 – 0.45 (~ 2070)	5 0	0	0	0		
Elements	0.85	m 1.25 m	n 0.85	m,1.25 m	<sup>3.5)</sup> 5-8.5) 0.85 - 1.25 (~ 2130)	5 0	0	0	0		
Built Environment			<u> </u>						-!		
Properties	L	M	M	M		S. S. S. Contra		1			
Properties (Waikanae)	M	м	M	E		and shares	all and the second	14			
Properties (Otaihanga)	M		L	L	1	33 SZ SZ SZ	1 Section	1.1			
Properties (Paraparaumu)	L	M	м	н	A PARA	1 2 2 2 2		1 20			
Water Supply Infrastructure	L	M	L	M		State Back	Start and the second				
Wastewater Infrastructure	M	м	M	M			S. C. Smith				
Stormwater Infrastructure	M	M	M	н			REA. OF	HAR P.			
Roads and Bridges	E	ε	L	M		LAT ME		2 Series			
Electrical transmission and supply infrastructure	M	M	M	M	1 miles			A.			
Natural gas supply mains	L	L	M	M	ain	Proceeding	State State				
Ecologcial						and the second	ATT DAY	S. L.			
Dunes	L	L	н	E	A GIN	AN KEL	A DELEN	340			
Ecological Sites	E	ε	L	L		Mar and	A Company				
Wetlands	н	н	L	L			The state	W N			
Significant bird habitat	н	н	M	M			ATRA IN				
Key indigenous trees	L	L	L	L	and the same		13 A. 17				
Human					1 Martin Call			- 3 m			
Displacement	н	E	м	M			READ.				
Inequities	н	E	L	M	THE PERSON			5.8			
Health	E	ε	M	M			ALCON.				
Daily Routines	M	н	M	M		Sur Caller In					
Natural Character						THE AL	REAL PLAN	1			
CTA2: Paraparaumu and Waikanae	м	M	н	н	STO FRAN			(sta)			
Peka Peka Dunes (South) - High Natural Character	м	м	L	L	18 18	- Carlo	and a start of the				
Waikanae Estuany - High Natural Character		4					Aller and				

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Sub-area: 6A & B Waikanae Estuary

All pathways at all timeframes to include "Avoid" option through land-use planning



Management Unit	Pathway	Short term	$\rightarrow$	Medium term	$\rightarrow$	Long term
Management Unit 6A & B: Waikanae Estuary Erosion and inundation Unit	Pathway 1	Status Quo <sup>1</sup> and Community Education and Emergency Management <sup>4</sup>	$\rightarrow$	Status Quo <sup>1</sup> and Community Education and Emergency Management <sup>4</sup>	$\rightarrow$	Status Quo <sup>1</sup> and Community Education and Emergency Management <sup>4</sup>
	Pathway 2	Status Quo <sup>1</sup> and Community Education and Emergency Management <sup>4</sup>	$\rightarrow$	Dune and/or Wetland Resilience <sup>3</sup> , Community Education and Emergency Management <sup>4</sup> (Enhance)	$\rightarrow$	Dune and/or Wetland Resilience <sup>3</sup> , Community Education and Emergency Management <sup>4</sup> (Enhance)
	Pathway 3	Status Quo <sup>1</sup> and Community Education and Emergency Management <sup>4</sup>		Dune and/or Wetland Resilience <sup>3</sup> , Community Education and Emergency Management <sup>4</sup> (Enhance)	$\rightarrow$	Bank Protection <sup>11</sup> (Protect)
	Pathway 4	Dune and/or Wetland Resilience <sup>3</sup> , Community Education and Emergency Management <sup>4</sup> (Enhance)	$\rightarrow$	Dune and/or Wetland Resilience <sup>3</sup> , Community Education and Emergency Management <sup>4</sup>	$\rightarrow$	Bank Protection <sup>11</sup> (Protect)
	Pathway 5	Dune and/or Wetland Resilience <sup>3</sup> , Community Education and Emergency Management <sup>4</sup> (Enhance)	$\rightarrow$	Bank Protection <sup>11</sup> (Protect)	$\rightarrow$	Bank Protection <sup>11</sup> (Protect)
	Pathway 6	Dune and/or Wetland Resilience <sup>3</sup> , Community Education and Emergency Management <sup>4</sup> (Enhance)	$\rightarrow$	Retreat <sup>8</sup> (making space for wetland migration)	$\rightarrow$	Retreat <sup>8</sup> (making space for wetland migration)

#### Additional notes:

- Bank protection would be made of the same material listed under menu item 11 (seawall) either rock, gabions, or concrete, which would run parallel to the bank edge, like a seawall would on the open coast.
- Only other form of hard protection which could be considered is mouth control structures (e.g training walls), but these would act like groynes, which have already been discounted due to down coast effects

## Management Unit 7B Otaihanga

	Coasta	al Flood	Coastal Erosion		
	Ha	zard	Haz	ard	
	55P2-4-5	55P5-8.5	55P2-4-5	55P5-8.5	
	RISK	RISK	RISK	RISK	
Flements	0.05	1.05 ml	0.95 m	1.25 m	
Ruilt Environment	0.85 m	1.23 111	0.05 11	1.23 11	
Properties	1	м	M	M.	
Properties (Waikanae)	M	м	M	=	
Properties (Otaihanga)	M	-			
Properties (Paraparaumu)		M	M	H	
Water Supply Infrastructure	-	м		M	
Watewater Infrastructure	M	м	M	M	
Stormwater Infrastructure	M	M	M	н	
Roads and Bridges	F	-		м	
Electrical transmission and supply infrastructure	M	M	M	M	
Natural gas supply mains	1		M	M	
Ecologial	-	-			
Dunes	L		н	E	
Ecological Sites	-	ε	L		
Wetlands	н	н	ī.	ī.	
Significant bird habitat	н	н	м	м	
Key indigenous trees	L	L	L	L	
Human	-				
Displacement	н	E	м	м	
Inequities	н	Ε	L	м	
Health	E	ε	м	м	
Daily Routines	M	н	м	м	
Natural Character					
CTA2: Paraparaumu and Waikanae	M	м	н	н	
Peka Peka Dunes (South) - High Natural Character	M	м	L	L	
Waikanae Estuary - High Natural Character	н	н	M	м	

	Properties Exposed in Otaihanga								
	RSLR	Coastal	erosion	Coastal flooding					
	(metres)	SSP2-4.5	SSP5-8.5	SSP2-4.5	SSP5-8.5				
	-	0	0	73	73				
Legend	0.2 m (~ 2050)	0	0	94	94				
7B: Otaihanga	0.35 – 0.45 (~ 2070)	0	0	111	122				
Inundation Hazard 1.25m SLR (2130 SSP5-8.5)	0.85 - 1.25	0	0	139	159				



Sub-area: 7B Otaihanga

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All pathways at all timeframes to include "<u>Avoid"</u> option through land-use planning



Management Unit	Pathway	Short term	$\rightarrow$	Medium term	$\rightarrow$	Long term
2B: Otaihanga Inundation Unit	Pathway 1	Status Quo <sup>1</sup> and Community Education and Emergency Management <sup>4</sup>	$\rightarrow$	Status Quo <sup>1</sup> and Community Education and Emergency Management <sup>4</sup>	$\rightarrow$	Enhance Existing Inundation Protection <sup>2</sup> and Community Education and Emergency Management <sup>4</sup> (Enhance)
	Pathway 2	Status Quo <sup>1</sup> and Community Education and Emergency Management <sup>4</sup>	$\rightarrow$	Enhance Existing Inundation Protection <sup>2</sup> and Community Education and Emergency Management <sup>4</sup> (Enhance)	$\rightarrow$	Additional Hard Protection (e.g. Stopbanks <sup>12</sup> , Culverts <sup>13</sup> , Pumpstations <sup>15</sup> ) (Protect)
	Pathway 3	Status Quo <sup>1</sup> and Community Education and Emergency Management <sup>4</sup>	$\rightarrow$	Enhance Existing Inundation Protection <sup>2</sup> and Community Education and Emergency Management <sup>4</sup> (Enhance)	$\rightarrow$	Elevate floor levels of buildings <sup>7</sup> (Accommodate)
	Pathway 4	Status Quo <sup>1</sup> and Community Education and Emergency Management <sup>4</sup>	$\rightarrow$	Enhance Existing Inundation Protection <sup>2</sup> and Community Education and Emergency Management <sup>4</sup> (Enhance)	$\rightarrow$	Flood proofing buildings and infrastructure <sup>5</sup> (Accommodate)
gement Unit	Pathway 5	Enhance Existing Inundation Protection <sup>2</sup> and Community Education and Emergency Management <sup>4</sup> (Enhance)	$\rightarrow$	Elevate floor levels of buildings <sup>7</sup> (Accommodate)	$\rightarrow$	Retreat <sup>8</sup>
Manaç	Pathway 6	Additional Hard Protection (e.g. Stopbanks <sup>12</sup> , Culverts <sup>13</sup> , Pumpstations <sup>15</sup> ) (Protect)	$\rightarrow$	Enhance New Inundation Protection <sup>2</sup> and Community Education and Emergency Management <sup>4</sup> (Enhance)	$\rightarrow$	Retreat <sup>8</sup>
	Pathway 7	Enhance Existing Inundation Protection <sup>2</sup> and Community Education and Emergency Management <sup>4</sup> (Enhance)	$\rightarrow$	Additional Hard Protection (e.g. Stopbanks <sup>12</sup> , Culverts <sup>13</sup> , Pumpstations <sup>15</sup> ) (Protect)	$\rightarrow$	Additional Hard Protection (e.g. Stopbanks <sup>12</sup> , Culverts <sup>13</sup> , Pumpstations <sup>15</sup> ) (Protect)

						Properties	Exposed in (	Dtaihanga	
anagement Unit	ΩΛ 2	<b>2</b> . Q	R Daran	araumu Roach	RSLR	Coasta	erosion	Coastal	I flooding
anagement ont	UA		Бгагар	arauniu Deach	(metres)	SSP2-4.5	SSP5-8.5	SSP2-4.5	SSP5-
					-	0	0	107	107
	Coas	stal Flood	Coastal Erosion Hazard	Legend	0.2 (~ 2050)	7	7	201	201
	SSP2-4	1.5 SSP5-8.5	SSP2-4.5 SSP5-8.5	Management_Unit 8B: Paraparaumu Beach	0.35 – 0.45 (~ 2070)	34	46	277	370
Flements	0.85 r	m 1.25 m	0.85 m 1.25 m	8A: Paraparaumu Beach Erosion Hazard 1.25m SLR (2130 SSP5-8.5)	0.85 – 1.25 (~ 2130)	90	121	692	1120
Built Environment		4		Inundation Hazard 1.25m SLR (2130 SSP5-8.5)			and the second		
Properties	L	M	M		Sector and the sector	Con Hilly			
Properties (Waikanae)	M	м	M		and the second		State State		
Properties (Otaihanga)	M	E	L L		5. 2 S S		and the second sec		
Properties (Paraparaumu)	L	M	мн		THE PIC	State of the state		6	
Water Supply Infrastructure	L	M	L M		Y State	1046/4		2	
Wastewater Infrastructure	M	M	M M				AN		
Stormwater Infrastructure	M	M	мн		6 19 19 19 19 19 19 19 19 19 19 19 19 19	San Part			
Roads and Bridges	E	ε	L M					E	
Electrical transmission and supply infrastructure	M	м	M M		12 35 25	and the second	12 miles		
Natural gas supply mains	L	L	M M			1 6	J' F A TH		
Ecologcial						1 18 29 C	- ALLA	E.	
Dunes	L	L	H E		AN SUN GARA	E A A SH	Lot Lot 14	1	
Ecological Sites	E	ε	L	the second s		198 A. 1987 - 7487 - 2	A CONTRACTOR	M	
Wetlands	н	н	L L		and the second second	1			
Significant bird habitat	н	н	M M			· Par Sugar			
Key indigenous trees	L	L	L				of Really	d.	
Human						5 1 1 1 1	And the state		
Displacement	н	E	M M			Colora Col	BINGS.	0	
Inequities	н	E	L M		the spinst weeks	1	and the second	8	
Health	E	E	M M				And the shirt of	8	
Daily Routines	M	н	M M		1. 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Service Station	A PARTY		
Natural Character							10-11-11	0	
CTA2: Paraparaumu and Waikanae	M	м	нн			At a share	A State	1	
Peka Peka Dunes (South) - High Natural Character	M	м	L L		A Contraction		Stall Stan		
Waikanae Estuary - High Natural Character	н	н	M M				3/1 5	×2	

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SSP5-8.5

All pathways at all timeframes to include "Avoid" option through land-use planning Enhance Accommodate Retreat Protect

Avoid

## Sub-area: 8A Paraparaumu Beach

Management Unit	Pathway	Short term	$\rightarrow$	Medium term	$\rightarrow$	Long term
	Pathway 1	Status Quo <sup>1</sup> and Community Education and Emergency Management <sup>4</sup>	$\rightarrow$	Dune and/or Wetland Resilience <sup>3</sup> , Community Education and Emergency Management <sup>4</sup> (Enhance)	$\rightarrow$	Beach Renourishment <sup>9</sup> (Protect – Soft Engineering)
each Open Coast Erosion Unit	Pathway 2	Dune and/or Wetland Resilience <sup>3</sup> , Community Education and Emergency Management <sup>4</sup> (Enhance)	$\rightarrow$	Beach Scraping <sup>10</sup> (Protect – Soft Engineering)	$\rightarrow$	Sea wall <sup>11</sup> (Protect – Hard Engineering)
	Pathway 3	Dune and/or Wetland Resilience <sup>3</sup> , Community Education and Emergency Management <sup>4</sup> (Enhance)	$\rightarrow$	Beach Renourishment <sup>9</sup> (Protect – Soft Engineering)	$\rightarrow$	Sea wall <sup>11</sup> (Protect – Hard Engineering)
	Pathway 4	Dune and/or Wetland Resilience <sup>3</sup> , Community Education and Emergency Management <sup>4</sup> (Enhance)	$\rightarrow$	Beach Scraping <sup>10</sup> (Protect – Soft Engineering)	$\rightarrow$	Detached Breakwater <sup>14</sup> (Protect – Hard Engineering)
	Pathway 5	Dune and/or Wetland Resilience <sup>3</sup> , Community Education and Emergency Management <sup>4</sup> (Enhance)	$\rightarrow$	Beach Renourishment <sup>9</sup> (Protect – Soft Engineering)	$\rightarrow$	Detached Breakwater <sup>14</sup> (Protect – Hard Engineering)
araumu E	Pathway 6	Dune and/or Wetland Resilience <sup>3</sup> , Community Education and Emergency Management <sup>4</sup> (Enhance)	$\rightarrow$	Sea wall <sup>11</sup> (Protect – Hard Engineering)	$\rightarrow$	Retreat <sup>8</sup>
A: Parap	Pathway 7	Dune and/or Wetland Resilience <sup>3</sup> , Community Education and Emergency Management <sup>4</sup> (Enhance)	$\rightarrow$	Detached Breakwater <sup>14</sup> (Protect – Hard Engineering)	$\rightarrow$	Retreat <sup>8</sup>
ent Unit 8	Pathway 8	Dune and/or Wetland Resilience <sup>3</sup> , Community Education and Emergency Management <sup>4</sup> (Enhance)	$\rightarrow$	Beach Scraping <sup>10</sup> (Protect – Soft Engineering)	$\rightarrow$	Retreat <sup>8</sup>
lanageme	Pathway 9	Dune and/or Wetland Resilience <sup>3</sup> , Community Education and Emergency Management <sup>4</sup> (Enhance)	$\rightarrow$	Dune and/or Wetland Resilience <sup>3</sup> , Community Education and Emergency Management <sup>4</sup>	$\rightarrow$	Retreat <sup>8</sup>
Z	Pathway 10	Beach Scraping <sup>10</sup> (Protect – Soft Engineering)	$\rightarrow$	Sea wall <sup>11</sup> (Protect – Hard Engineering)	$\rightarrow$	Retreat <sup>8</sup>
	Pathway 11	Sea wall <sup>11</sup> (Protect – Hard Engineering)	$\rightarrow$	Sea wall <sup>11</sup> (Protect – Hard Engineering)	$\rightarrow$	Retreat <sup>8</sup>

All pathways at all timeframes to include "Avoid" option through land-use planning



Sub-area: 8B Paraparaumu Beach

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Management Unit	Pathway	Short term	$\rightarrow$	Medium term	$\rightarrow$	Long term
aparaumu Beach Inundation Unit	Pathway 1	Status Quo <sup>1</sup> and Community Education and Emergency Management <sup>4</sup>	$\rightarrow$	Status Quo <sup>1</sup> and Community Education and Emergency Management <sup>4</sup>	$\rightarrow$	Enhance Existing Inundation Protection <sup>2</sup> and Community Education and Emergency Management <sup>4</sup> (Enhance)
	Pathway 2	Status Quo <sup>1</sup> and Community Education and Emergency Management <sup>4</sup>	$\rightarrow$	Enhance Existing Inundation Protection <sup>2</sup> and Community Education and Emergency Management <sup>4</sup> (Enhance)	$\rightarrow$	Additional Hard Protection (e.g. Stopbanks <sup>12</sup> , Culverts <sup>13</sup> , Pumpstations <sup>15</sup> ) (Protect)
	Pathway 3	Status Quo <sup>1</sup> and Community Education and Emergency Management <sup>4</sup>	$\rightarrow$	Enhance Existing Inundation Protection <sup>2</sup> and Community Education and Emergency Management <sup>4</sup> (Enhance)	$\rightarrow$	Elevate floor levels of buildings <sup>7</sup> (Accommodate)
	Pathway 4	Status Quo <sup>1</sup> and Community Education and Emergency Management <sup>4</sup>	$\rightarrow$	Enhance Existing Inundation Protection <sup>2</sup> and Community Education and Emergency Management <sup>4</sup>	$\rightarrow$	Flood proofing buildings and infrastructure <sup>5</sup> (Accommodate)
t Unit 8B: Pa	Pathway 5	Enhance Existing Inundation Protection <sup>2</sup> and Community Education and Emergency Management <sup>4</sup> (Enhance)	$\rightarrow$	Enhance Existing Inundation Protection <sup>2</sup> and Community Education and Emergency Management <sup>4</sup> (Enhance)	$\rightarrow$	Retreat <sup>8</sup>
Management	Pathway 6	Enhance Existing Inundation Protection <sup>2</sup> and Community Education and Emergency Management <sup>4</sup> (Enhance)	$\rightarrow$	Additional Hard Protection (e.g. Stopbanks <sup>12</sup> , Culverts <sup>13</sup> , Pumpstations <sup>15</sup> ) (Protect)	$\rightarrow$	Additional Hard Protection (e.g. Stopbanks <sup>12</sup> , Culverts <sup>13</sup> , Pumpstations <sup>15</sup> ) (Protect)
	Pathway 7	Additional Hard Protection (e.g. Stopbanks <sup>12</sup> , Culverts <sup>13</sup> , Pumpstations <sup>15</sup> ) (Protect)	$\rightarrow$	Enhance New Inundation Protection <sup>2</sup> and Community Education and Emergency Management <sup>4</sup> (Enhance)	$\rightarrow$	Enhance Existing Inundation Protection <sup>2</sup> and Community Education and Emergency Management <sup>4</sup> (Enhance)