Version	Details	Date	Prepared	Checked
1	Draft for client review	02/04/2024	BT	JS
2	Update following review	22/04/2024	BT	JS

General notes
- The sea level rise trigger thresholds are relative to the present day sea level (2024)
- The defence condition trigger threshold of 'poor' is for an the overall asset. However, there may be local variations in the condition of defence assets that could mean that localised repairs are needed before the trigger threshold is reached.
- Defence maintenance should be guided by detailed condition assessments undertaken regularly and this action plan should not be relied upon to inform maintenance requirements / timing
- The adaptive pathway figures are to be updated for all units so the epoch dates match those within this spreadsheet
- The cost profiles have been obtained directly from the 'Christchurch FCERM Strategy funding profiles_v5_240130' and the same limitations / assumptions apply (i.e. strategic level costing, subject to change)
- ODU 8 is not included as it has been agreed with the Environment Agency that future River Avon projects will appraise this area

Decision tree notes
- The decision tree diagrams are for illustrative purposes only and may not include all key decisions that need to be made when delivering the Strategy
- The decision tree diagrams have been produced to provide more detail for epoch 1. However, if key decisions within an ODU are due in epoch 2 or 3, the decision tree also provides this information

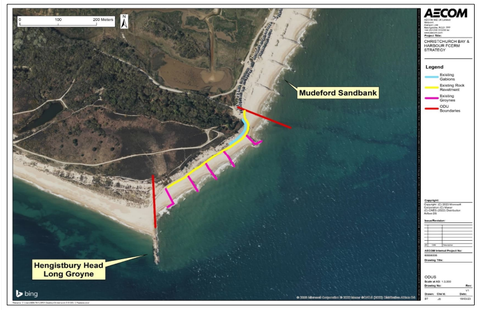
ODU 1 - Hengistbury Head East

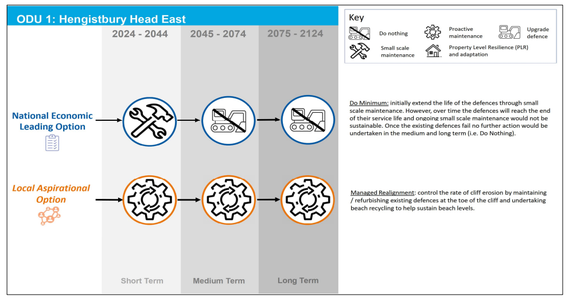
Key features / risks

-No flooding / erosion risk to properties
-Erosion risk to headland and scheduled monument / environmental designations (SSSI, SAC, SPA, LNR)
-Existing rock defences at base of cliff including rock revetment and rock groynes
-Unmanaged erosion of headland 'anchor point' could threaten Mudeford Sandbank and wider morphology

Strategy Leading Options
-National and Local Option identified
-National Option is Do Minimum whereas Local Option is Managed Realignment
-Local Option (Managed Realignment) provides more confidence in future coastline position and would involve refurbishing existing rock defences over time. Some limited erosion expected to occur due to cliff slope processes
-National Option (Do Minimum) would not involve replacing existing defences when they fail and erosion would be expected

Map of Leading Options
- Alignments are indicative and will vary subject to further appraisal





Works required to deliver leading options*

Option	Epoch 1				Epoch 2	Epoch 3
	Years 2025 - 2029	Years 2030 - 3034	Years 2035 - 2039	Years 2040 - 2044	Years 2045-2074	Years 2075-2124
National	- No planned works other than small scale patch & repair and ensuring H&S compliance - Review SMP policy to align to with this option if this is the option delivered					
Local	- Develop funding strategy - Undertake defence condition assessments - Begin planning defence refurbishments (as condition is already poor for some assets) - Secure funding and consenting for refurbishments - Undertake beach management as required		- Refurbish existing rock defences - Undertake beach management as required	- Undertake beach management as required	- Further refurbishments of existing defences	- Further refurbishments of existing defences

**note: not shown in table above, but monitoring and small scale / patch repair maintenance on existing defences and assets should be undertaken annually / as required*
**timings of works subject to trigger points such as funding and condition of existing defences*

Cost profile for capital works and maintenance (not including pre-business case / support work)

Leading Option	Indicative option cost (£k) - cash															
	Epoch 1 (years)				Epoch 2 (years)							Epoch 3 (years)					Total
	2025-2029	2030-2034	2035-2039	2040-2044	2045-2049	2050-5054	2055-2059	2060-2064	2065-2069	2070-2074	2075-2084	2085-2094	2095-2104	2105-2114	2115-2124	
National	23	46	91	91	183	183	37	0	0	0	0	0	0	0	0	654
Local	40	54	2,098	54	40	54	40	2,112	40	54	94	2,152	94	2,152	94	9,172

**note that defence refurbishments timing may need to be adjusted if refurbishments are required sooner (to be informed by detailed defence condition assessment)*

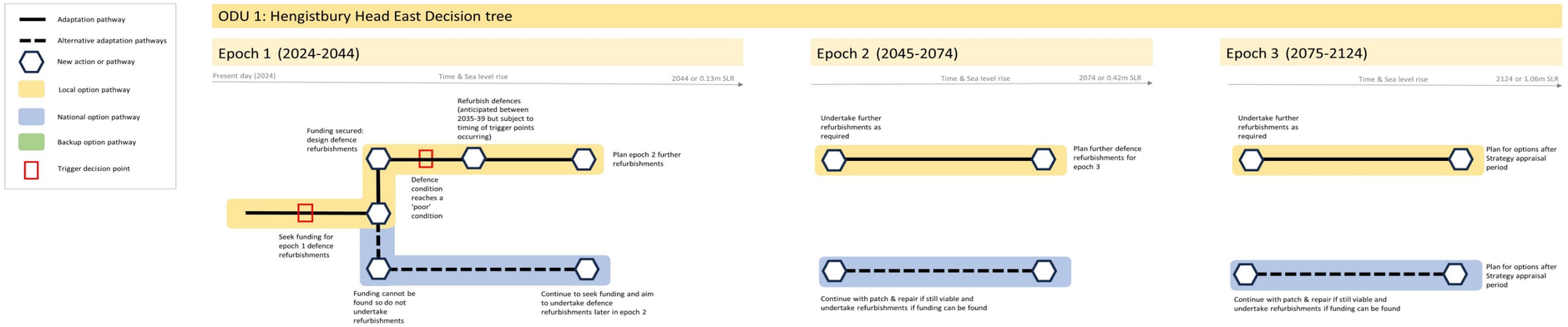
FCERM GiA funding availability

- FCERM GiA funding unlikely to be available for defence works due to BCR < 1 on national basis

Trigger Points

Category	Influence on	Details of key decisions when implementing options	Triggers
Defence condition	Timing of defence refurbishments in Local Option	- If implementing the Local Option: - The existing rock defences were assessed to have a 'Poor' or 'Fair' condition in the Strategy defence condition assessment, with an estimated residual life (without maintenance) of <10 for the 'poor' defences and 10-15 years for the 'fair' defences - Ongoing small scale / patch repair maintenance would be expected to extend the life of these asset but they are still expected to require a refurbishment during epoch 1 - More detailed defence condition assessments are required to inform the exact timing of defence refurbishments. - The timing of the refurbishments should be based on these detailed condition inspections and may need to be brought forward or delayed accordingly - It is recommended that when the condition reaches a 'poor' rating then a refurbishment is undertaken as soon as possible once funding is secured. - Given the Strategy defence condition assessment identified that some of the defences are already in a poor condition, it is recommended that planning for the refurbishments begins in the first years of the Strategy implementation	- Condition rating of Poor
Funding	Decision on Local vs National Option and timing of embankment improvements	- The Local Option will have a funding shortfall for the defence refurbishment works - The Funding Strategy will need to outline how the defence refurbishments will be funded. If funding is not likely, then these refurbishment works could be delayed until the funding is secured or the National Option delivered instead	- Funding availability - Revert to National Option if funding for refurbishments is not secured

Decision Tree

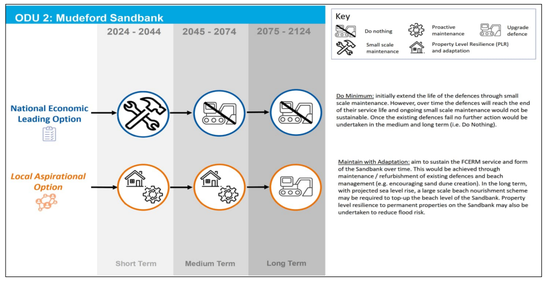


ODU 2 - Mudeford Sandbank

Key features / risks

-Six properties at risk from flooding (2124 0.5% AEP) so therefore there is only limited economic benefits on a national basis
-Large number of beach huts and recreational / amenity resource on the Sandbank providing local benefit to the area
-With no further interventions the Sandbank is expected to rollback over time. Risk of breaching
-Buried services beneath the Sandbank which could be damaged if the Sandbank rolls back significantly
-Uncertain impact on coastal morphology should Sandbank roll back in an unconstrained manner

Strategy Leading Options
-National and Local Option identified
-National Option is Do Minimum whereas Local Option is Maintain with Adaptation
-Local Option (Maintain with Adaptation) aims to sustain the FCERM service of the Sandbank by holding its form over time and aiming to keep it broadly in its current position. Achieved through beach nourishment, defence refurbishments and property level resilience.
-National Option (Do Minimum) would not involve replacing existing defences when they fail and rollback of the Sandbank would be expected



Do Minimum: initially extend the life of the defences through small scale maintenance. However, over time the defences will reach the end of their service life and ongoing small scale maintenance would not be sustainable. Once the existing defences fail no further action would be undertaken in the medium and long term (i.e. Do Nothing).

Maintain with Adaptation: aim to sustain the FCERM service and form of the Sandbank over time. This would be achieved through maintenance / refurbishment of existing defences and beach management (e.g. encouraging sand dune creation). In the long term, with projected sea level rise, a large scale beach nourishment scheme may be required to top-up the beach level of the Sandbank. Property level resilience to permanent properties on the Sandbank may also be undertaken to reduce flood risk.

Map of Leading Options
- Alignments are indicative and will vary subject to further appraisal
- PLR requirements to be determined on property by property basis as required

Works required to deliver leading options*

Option	Epoch 1				Epoch 2	Epoch 3
	Years 2025 - 2029	Years 2030 - 3034	Years 2035 - 2039	Years 2040 - 2044	Years 2045-2074	Years 2075-2124
National	- No planned works other than small scale patch & repair and ensuring H&S compliance - Review SMP policy to align to with this option if this is the option delivered					
Local	- Develop funding strategy - Undertake defence condition assessments - Undertake beach management as required - Review SMP policy to align to with this option if this is the option delivered	- Begin planning defence refurbishments - Secure funding and consenting for refurbishments - Undertake beach management as required	-Refurbish existing defences on the Sandbank - Undertake beach management as required	-Undertake beach management as required	Further refurbishments of existing defences	Beach hourishment scheme and further refurbishments of existing defences

note: not shown in table above, but monitoring and small scale / patch repair maintenance on existing defences and assets should be undertaken annually / as required
timings of works subject to trigger points such as funding and condition of existing defences

Cost profile for capital works and maintenance (not including pre-business case / support work)

Leading Option	Indicative option cost (£k) - cash															
	Epoch 1 (years)				Epoch 2 (years)						Epoch 3 (years)						Total
	2025-2029	2030-2034	2035-2039	2040-2044	2045-2049	2050-5054	2055-2059	2060-2064	2065-2069	2070-2074	2075-2084	2085-2094	2095-2104	2105-2114	2115-2124	
National	46	91	183	183	365	365	73	0	0	0	0	0	0	0	0	1,306
Local	23	37	3,688	37	37	37	3,688	37	37	37	3,057	3,725	1,566	3,725	74	19,805

*note that defence refurbishments timing may need to be adjusted if refurbishments are required sooner (to be informed by detailed defence condition assessment)

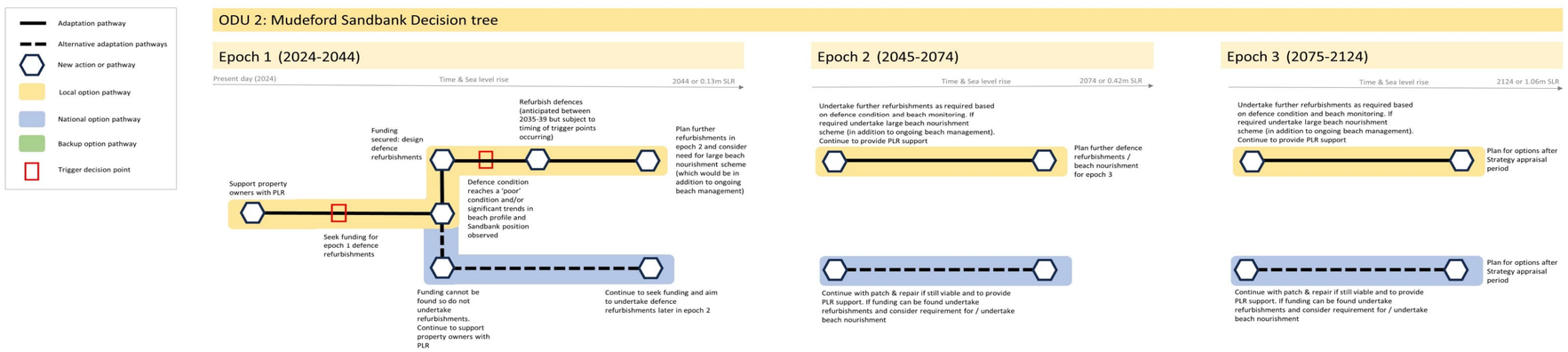
FCERM GiA funding availability

- FCERM GiA funding unlikely to be available for defence works due to BCR < 1 on national basis

Trigger Points

Category	Influence on	Details of key decisions when implementing options	Triggers
Defence condition	Timing of defence refurbishments in Local Option	- If implementing the Local Option: - The existing rock defences were assessed to have a 'Good' or 'Fair' condition in the Strategy defence condition assessment, with an estimated residual life (without maintenance) of >10 years - Ongoing small scale / patch repair maintenance would be expected to extend the life of these asset but they are still expected to require a refurbishment during epoch 1 - The requirement for a refurbishment will need to be determined based on detailed condition inspections and may need to be brought forward or delayed accordingly based on the results of the inspections - It is recommended that when the condition reaches a 'Poor' rating then a refurbishment is undertaken	- Condition rating of Poor
Sandbank beach monitoring	Timing of defence refurbishments in Local Option	- If implementing the Local Option: - The existing defences (rock groynes) currently help control beach levels and the position of the Sandbank - There is a risk that the existing defences could become less effective over time in response to storms / sea level rise. - It is recommended that the Sandbank beach profiles continues to be monitored on a regular basis (i.e. every 6 months) to identify any trends in the beach profile / Sandbank movement. - If the beach profile trends indicate that the beach profile is changing beyond the typical range or there is evidence of the Sandbank position moving significantly then this could be a trigger for refurbishing / modifying the existing defences - A long term record of monitoring is required to enable long term significant trends to be identified relative to typical seasonal variations	- A consistent trend in beach profile change / Sandbank position (not typical seasonal changes)
Funding	Decision on Local vs National Option and timing of defence refurbishments	- The Local Option will have a funding shortfall for the defence refurbishment works and beach nourishment (in epoch 3) - The Funding Strategy will need to outline how the defence refurbishments will be funded. If funding is not likely, then these refurbishment works could be delayed until the funding is secured or the National Option could be delivered instead	- Funding availability - Revert to National Option if funding for refurbishments is not secured

Decision Tree

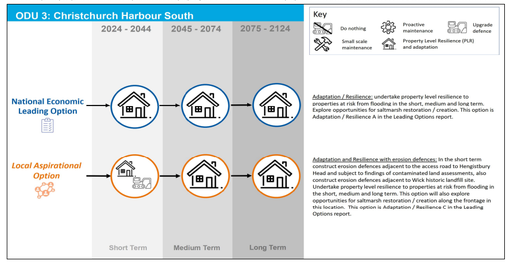


ODU 3 - Christchurch Harbour South

Key features / risks

-Eight properties at risk from flooding (2124 0.5% AEP event) so therefore there is limited economic benefits on a national basis
-Two historic landfill sites (Wick and to east of Double Dykes) adjacent to the shoreline and potentially at risk from erosion
-Contamination status of historic landfill sites is unknown at this stage
-Only access road onto Hengistbury Head also adjacent to shoreline and potentially at risk from erosion

Strategy Leading Options
-National and Local Option identified
-National Option is Adaptation / Resilience (A) whereas Local Option is Adaptation / Resilience (C) with erosion defences
-Local Option (Adaptation / Resilience C with defences) aims to provide property level resilience measures to properties at risk of flooding and new defences to wick historic landfill as well as refurbished defences to the access road to Hengistbury Head (also defending Double Dykes historic landfill site)
-National Option (Adaptation / Resilience A) would include property level resilience measures to properties at risk but would not include defences to landfill / access road



Map of Leading Options
- Alignments are indicative and will vary subject to further appraisal
- PLR requirements to be determined on property by property basis as required

Works required to deliver leading options*

Option	Epoch 1				Epoch 2	Epoch 3
	Years 2025 - 2029	Years 2030 - 3034	Years 2035 - 2039	Years 2040 - 2044	Years 2045-2074	Years 2075-2124
National	-Identify properties that would benefit from property level resilience measures -Engage with property owners and support property level resilience funding applications / implementation as required - Review SMP policy to align to with this option if this is the option delivered					
Local	- Develop funding strategy - Undertake historic landfill investigations to determine contamination status of the landfill sites - Identify properties that would benefit from property level resilience measures -Engage with property owners and support property level resilience funding applications / implementation as required - Review SMP policy to align to with this option if this is the option delivered	-Business case development, outline design and secure funding for erosion defences at Wick historic landfill and Hengistbury Head Access Road (if required pending contaminated land assessment) - Approval of business case - Detailed design, consenting and procurement for erosion defences - Construction of erosion defences			-Maintenance / refurbishment of erosion defences as required - Continued support for PLR measures to property owners	-Maintenance / refurbishment of erosion defences as required - Continued support for PLR measures to property owners

**note: not shown in table above, but monitoring and small scale / patch repair maintenance on existing defences and assets should be undertaken annually / as required*
**timings of works subject to trigger points such as funding and condition of existing defences*

Cost profile for capital works and maintenance (not including pre-business case / support work)

Leading Option	Indicative option cost (£k) - cash															
	Epoch 1 (years)				Epoch 2 (years)							Epoch 3 (years)					Total
	2025-2029	2030-2034	2035-2039	2040-2044	2045-2049	2050-5054	2055-2059	2060-2064	2065-2069	2070-2074	2075-2084	2085-2094	2095-2104	2105-2114	2115-2124	
National	11	11	51	11	11	11	11	51	11	11	23	63	23	63	23	385
Local	11	11	557	23	23	23	23	557	23	23	46	579	46	579	46	2,570

**note that defence upgrades / refurbishments timing may need to be adjusted if works are required sooner (to be informed by detailed defence condition assessment and historic landfill investigations)*

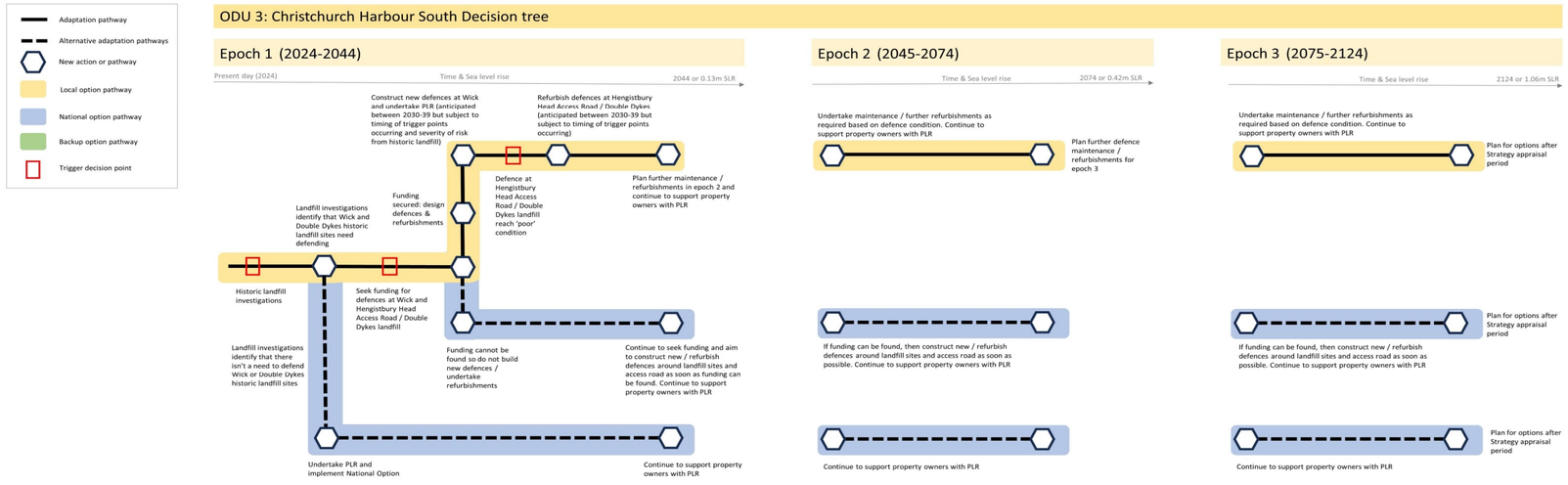
FCERM GiA funding availability

- FCERM GiA funding likely to be limited for defence works due to very few properties being at risk and lack of funding typically available for historic landfill defences

Trigger Points

Category	Influence on	Details of key decisions when implementing options	Triggers
Historic landfill status	Decision on Local vs National Option	- It is recommended that site investigations into the contaminated land status of the historic landfill sites are undertaken - This will inform whether the new defences are required around the historic landfill sites and help steer the decision on whether the Local Option or National Option is delivered - If the land is found to be contaminated then the Local Option should be delivered as a preference / if funding allows - The investigations will also help better inform environmental assessments, such as WFD assessment, at scheme level appraisal	-Contaminated land status
Defence condition	Timing of defence refurbishments / upgrades at Hengistbury Head Access Road in local option	- If implementing the Local Option: - There is currently a gabion basket wall adjacent to the Hengistbury Head Access road at the location where it is closest to the shoreline - The gabion basket wall is not included in the Strategy defence condition assessment and therefore the condition status is not known - It is recommended that routine defence condition assessments are undertaken on this structure to determine its initial condition status and change over time - Ongoing small scale / patch repair maintenance would be expected to extend the life of this asset but it is likely that a refurbishment would be needed during epoch 1 - It is recommended that when the condition reaches a 'Poor' rating then a refurbishment is undertaken	- Condition rating of Poor
Funding	Decision on Local vs National Option and timing of defence refurbishments	- The Local Option will have a funding shortfall for the defences around Wick historic landfill and any refurbishments to the defence at the Hengistbury Head Access Road - The Funding Strategy will need to outline how the defences will be funded. If funding is not likely, then these defences works could be delayed until the funding is secured or the National Option could be delivered instead	- Funding availability - Revert to National Option if funding for refurbishments is not secured

Decision Tree



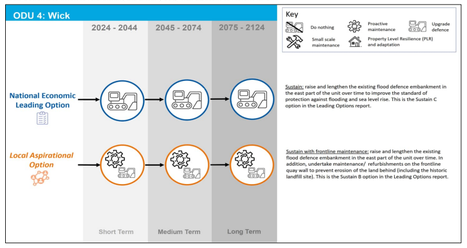
ODU 4 - Wick

Key features / risks

-Flood risk to residential area in east part of unit expected to increase over time with sea level rise
- Two properties at risk from flooding from present day 0.5% AEP event, 121 properties at risk in 2124 0.5% AEP event
-Existing earth embankment defence originally constructed to 2070 200yr SoP (EA comms)
-Latest modelling indicates embankment would be outflanked to the south, increasing in severity over time
-Historic landfill site north of Wick Lane. Contamination status of land unknown
-Quay wall adjacent to historic landfill site will fail at end of service life, leading to erosion of historic landfill
-Adjacent to environmental designations, including LNR & SSSI

Strategy Leading Options

-National and Local Option identified
-Both options involve raising and lengthening the setback embankment in the east part of the unit over time
-Raising and lengthening would be done incrementally
- Approx changes to embankment required:
Epoch 1 - subject to alignment, between 100m to 420m lengthening to the south (low height <0.5m)
Epoch 2 - 170m lengthening and raising of full structure (<0.5m)
Epoch 3 - 100m lengthening and raising of full structure (0.6m)
-Exact dimensions and phasing of works to be determined during scheme design / business case development
-Local Option also involves refurbishing the existing quay wall adjacent to historic landfill



Map of Leading Options

- Alignments are indicative and will vary subject to further appraisal

Works required to deliver leading options*

Option	Epoch 1				Epoch 2	Epoch 3
	Years 2025 - 2029	Years 2030 - 3034	Years 2035 - 2039	Years 2040 - 2044	Years 2045-2074	Years 2075-2124
National	- Develop funding strategy - Pre-business case appraisal to determine phasing / economic case / design life for embankment improvements - Review SMP policy to align to with this option if this is the option delivered	-Business case development, outline design and secure funding for embankment improvements -Approval of business case -Detailed design, consenting and procurement for embankment improvements -Construction	-Historic landfill / contaminated land investigations		-Lengthen and raise embankment	-Lengthen and raise embankment
Local	- Develop funding strategy - Pre-business case appraisal to determine phasing / economic case / design life for embankment improvements	-Business case development, outline design and secure funding for embankment improvements -Approval of business case -Detailed design, consenting and procurement for embankment improvements -Construction	-Historic landfill / contaminated land investigations - Secure funding and consents for quay wall refurbishment - Construction of quay wall refurbishment		-Lengthen and raise embankment. Further refurbishments on quay wall	-Lengthen and raise embankment. Further refurbishments on quay wall

**note: not shown in table above, but monitoring and small scale / patch repair maintenance on existing defences and assets should be undertaken annually / as required*
**timings of works subject to trigger points such as funding and condition of existing defences*

Cost profile for capital works and maintenance (not including pre-business case / support work)

Leading Option	Indicative option cost (£k) - cash														
	Epoch 1 (years)				Epoch 2 (years)						Epoch 3 (years)					Total
	2025-2029	2030-2034	2035-2039	2040-2044	2045-2049	2050-5054	2055-2059	2060-2064	2065-2069	2070-2074	2075-2084	2085-2094	2095-2104	2105-2114	2115-2124	
National	34	606	34	34	905	34	34	34	34	34	1,929	68	68	68	68	3,984
Local	34	606	34	1,962	870	34	34	34	1,962	34	1,905	1,996	68	68	1,996	11,637

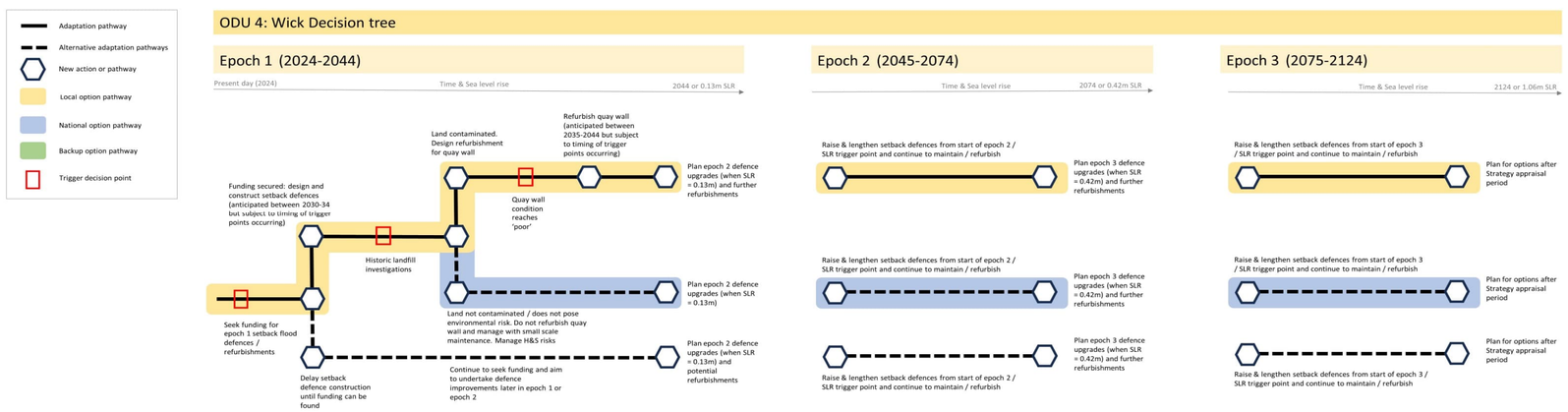
FCERM GiA funding availability

- Indicative FCERM GiA funding availability calculated for largest scheme as part of the national / local option (epoch 3 defence upgrades)
- Indicative amount of FCERM GiA available for epoch 3 upgrades estimated to be in region of £735-809k
- GiA also likely to be available for defence upgrades in epoch 1 and 2, but fewer benefits so amount of GiA likely to be considerably less
- See economics report for assumptions when calculating indicative GiA availability (such as baseline year)

Trigger Points

Category	Influence on	Details of key decisions when implementing options	Triggers
Sea level rise	Embankment improvements for Local and National Options	- The Strategy National and Local Options follow a managed adaptive approach whereby the setback embankment is raised / lengthened incrementally over time in response to rising sea levels. - For each embankment improvement, the target SoP is for a SoP at the end of the epoch. For example, the epoch 2 improvement undertaken at the start of the epoch will aim to achieve a target SoP for 2074. - (note that more work to define the SoP will need to be revisited during business case development) - In the National and Local options, estimates have been made as to when the embankment will need improving based on projections for sea level rise (UKCP18, RCP 8.5, 70%tile). - Should sea level rise occur faster / slower than projected, this will change the timing of when embankment improvements are required - The projected sea level rise between present day and the start of epoch 2 is 0.13m. - The projected sea level rise between present day and the start of epoch 3 is 0.42m. - The embankment improvement in epoch 1 is not related to sea level rise but due to outflanking risk identified in the River Avon model for present day model simulations. Therefore the timing of this intervention will remain unchanged (i.e. midway through epoch 1). - The planning / business case development for the second and third rounds of defence improvements (in epochs 2 and 3 respectively) should be undertaken when the structure design life is close to falling below the design SoP of the previous round of defence upgrades. - Based on existing UKCP18 sea level rise projections, and assuming the defences are designed to a target SoP at the start of each epoch, the planning / business case development should begin when sea level rise reaches 0.13m (epoch 2) and 0.42m (epoch 3).	- Commencement of second round of embankment planning / upgrades when SLR is 0.13m - Commencement of third round of embankment planning / upgrades when SLR is 0.42m
Historic landfill status	Decision on Local vs National Option	- It is recommended that site investigations into the contaminated land status of the historic landfill site are undertaken - This will help inform how important it is to refurbish the quay wall adjacent to the historic landfill site and help steer the decision on whether the Local Option or National Option are delivered - The Local Option includes a provision for refurbishing the frontline quay wall over time to ensure that it continues to provide erosion protection to the historic landfill behind - If the land is found to be contaminated then the Local Option should be delivered as a preference / if funding allows - The investigations will also help better inform environmental assessments, such as WFD assessment, at scheme level appraisal	Contaminated land status
Defence condition	Timing of quay wall refurbishments in Local Option	- If implementing the Local Option: - The frontline quay wall was assessed to have an 'Fair' condition in the Strategy defence condition assessment, with an estimated residual life (without maintenance) of 10-15 years - Ongoing small scale / patch repair maintenance would be expected to extend the life of this asset but it is still expected to require a refurbishment during epoch 1 (assumed to be around year 15 in the appraisal) - The requirement for a refurbishment will need to be determined based on detailed condition inspections and may need to be brought forward or delayed accordingly based on the results of the inspections - It is recommended that when the condition reaches a 'Poor' rating then a refurbishment is undertaken	- Condition rating of Poor
Funding	Decision on Local vs National Option and timing of embankment improvements	- The National and Local Options will have a funding shortfall for the embankment improvement works in each epoch (i.e. FCERM GiA will not cover the full cost) - The funding shortfall is likely to be most significant for the earlier interventions (i.e. epochs 1 and 2) because the benefits are not expected to have increased significantly yet, relative to epoch 3 - The Funding Strategy will need to outline how the epoch 1 embankment improvements will be funded. If funding is not likely, then these embankment improvement works could be delayed until the funding is secured. - This will increase the residual risk to properties at risk from outflanking prior to the works being completed, but it is not until epoch 3 when significant numbers of properties are expected to be at risk here (with current SLR projections) and therefore risks could be managed on an individual property by property basis. - With existing FCERM-GiA funding rules, for the Local Option, it is unlikely that FCERM GiA will cover a significant proportion (if any) of the refurbishment costs as the primary benefit will be to defend historic landfill from erosion (and not properties). - The Funding Strategy will need to outline how the quay wall refurbishment works will be funded. If funding is not likely then the National Option could be delivered as a fallback in the interim. This could lead to the failure of the quay wall and therefore health and safety compliance measures would be needed in this location.	- Funding availability - Revert to National Option if funding for quay wall refurbishment is not secured

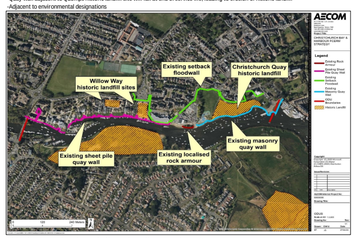
Decision Tree



ODU 5 - Willow Drive and the Quomps

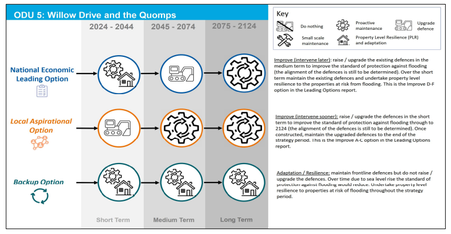
Key features / risks

-Flood risk to residential area
- 37 properties at flood risk from present day 0.5% AEP event primarily in the west part of the unit. 562 properties at risk in 2124 0.5% AEP event across entire unit
-Existing setback flood defence scheme in east part of unit. West part of unit has a quay wall but this is not raised so at risk from flooding
-Outflanking risk of existing flood defence scheme in the future
-Multiple historic landfill sites including beneath the Quomps recreation ground in the east part of the unit
-Quay wall adjacent to Quomps historic landfill site will fail at end of service life, leading to erosion of historic landfill
-Adjacent to environmental designations



Strategy Leading Options

-National, Local and Backup Options identified
-Both of the National and Local options involve raising and lengthening the defences to improve the SoP (National Option is Improve D-F and Local Options is Improve A-C)
-Further work is required after the Strategy to confirm the alignment of the new defences, and this will impact the economic case / timing of interventions
-Provisionally the Local Option involves intervening sooner whereas the National Option involves waiting until the medium term (epoch 2) to raise defences
-Both the National and Local Options have significant funding shortfalls and therefore a Backup Option has been identified (Adaptation / Resilience)
-The Backup option involves PLR to manage flood risk and repeat refurbishments of defences. It does not have a large one-off scheme cost like the National / Local Options



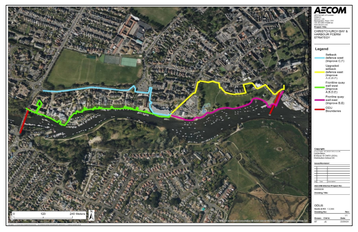
Improve (intervene later): raise / upgrade the existing defences in the medium term to improve the standard of protection against flooding (the alignment of the defences is still to be determined). Over the short term maintain the existing defences and undertake property level resilience to the properties at risk from flooding. This is the Improve D-F option in the Leading Options report.

Improve (intervene sooner): raise / upgrade the defences in the short term to improve the standard of protection against flooding through to 2124 (the alignment of the defences is still to be determined). Once constructed, maintain the upgraded defences to the end of the strategy period. This is the Improve A-C, option in the Leading Ljptions report.

Adaptation / Resilience: maintain frontline defences but do not raise / upgrade the defences. Over time due to sea level rise the standard of protection against flooding would reduce. Undertake property level resilience to properties at risk of flooding throughout the strategy period.

Map of Leading Options

- Alignments are indicative and will vary subject to further appraisal



Works required to deliver leading options*

Option	Epoch 1				Epoch 2	Epoch 3
	Years 2025 - 2029	Years 2030 - 3034	Years 2035 - 2039	Years 2040 - 2044	Years 2045-2074	Years 2075-2124
National	Develop funding strategy Plan quay wall refurbishments, acquire consenting and funding for refurbishment - Undertake refurbishment of quay wall - Identify properties that would benefit from property level resilience measures Engage with property owners and support property level resilience funding applications / implementation as required - Undertake historic landfill investigations to inform future design			Business case development for capital scheme to improve defences Undertake stakeholder / community engagement to decide on preferred alignment for the defences (i.e.frontline / setback / including or excluding the west part of the unit) - Acquire consents and funding for the scheme	Capital scheme to improve defences, alignment TBC	Ongoing maintenance
Local	- Undertake stakeholder / community engagement to decide on preferred alignment for the defences. This needs to identify if the community in the west part of the unit support a defence / PLR in this location (if not, there is limited economic justification for upgrading / raising flood defences early and National Option should be followed). - Undertake pre-business case appraisal to determine alignment / economic case / design life for scheme, incorporating stakeholder feedback - If upgrades to the defences / PLR are supported in the west part of the unit, proceed with a scheme in epoch 1. This will involve: historic landfill investigations - Business case development, outline design and secure funding for embankment improvements - Approval of business case - Procurement, contracting, conserning and procurement for embankment improvements - Construction			Depending on alignment of scheme, potential requirement to refurbish existing frontline quay walls	Ongoing maintenance and defence refurbishments	Ongoing maintenance and defence refurbishments
Backup	Develop funding strategy Plan quay wall refurbishments, acquire consenting and funding for refurbishment - Undertake refurbishment of quay wall Identify properties that would benefit from property level resilience measures Engage with property owners and support property level resilience funding applications / implementation as required			Plar further quay wall refurbishments if required, acquire consenting and funding for refurbishment - Undertake refurbishment of quay wall if required Identify properties that would benefit from property level resilience measures Engage with property owners and support property level resilience funding applications / implementation as required	Ongoing maintenance and defend refurbishments and support to property owners for PLR	Ongoing maintenance and defend refurbishments and support to property owners for PLR

note: not shown in table above, but monitoring and small scale / patch repair maintenance on existing defences and assets should be undertaken annually / as required
timings of works subject to trigger points such as funding and condition of existing defences

Cost profile for capital works and maintenance (not including pre-business case / support work)

Leading Option	Indicative option cost (£k) - cash														Total
	Epoch 1 (years)				Epoch 2 (years)						Epoch 3 (years)				
	2025-2029	2030-2034	2035-2039	2040-2044	2045-2049	2050-5054	2055-2059	2060-2064	2065-2069	2070-2074	2075-2084	2085-2094	2095-2104	2105-2114	2115-2124	
National	3,356	23	23	23	19,439	23	23	23	2,590	23	46	2,613	2,806	46	2,613	33,670
Local (Improve B shown)	19,936	23	23	23	23	23	23	23	23	23	4,401	46	46	46	46	24,728
Backup	2,826	23	23	6,221	23	23	23	6,201	3,583	46	6,224	5,666	46	6,224		39,275

note - costing for defence refurbishments / upgrades conservatively assumed in first 5 years, but actual delivery time may be later subject to time taken to acquire funding / undertake design / investigate landfill etc

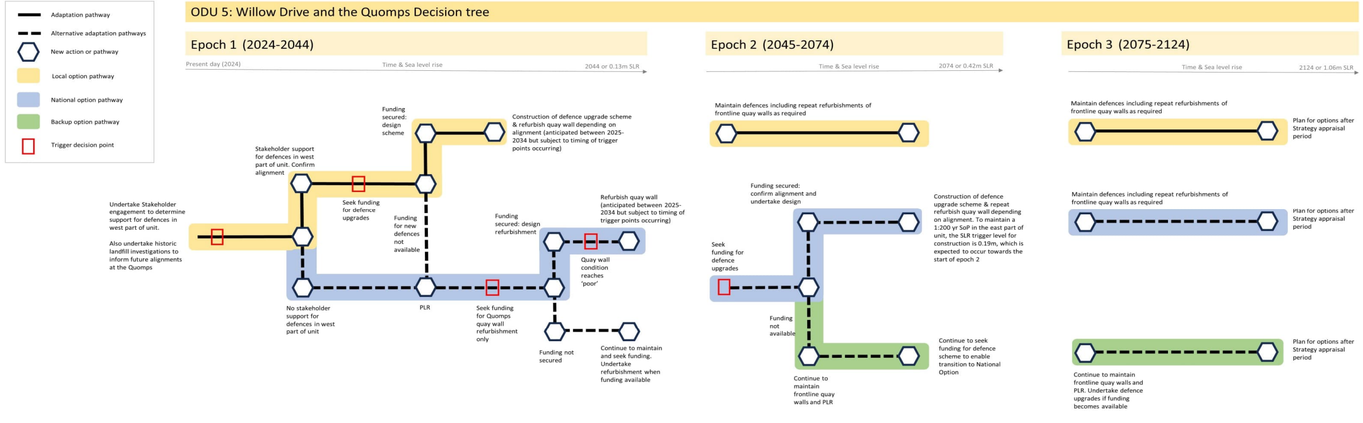
FCERM GiA funding availability

- Indicative FCERM GiA funding availability calculated for initial defence upgrade scheme as part of the national / local option
- Indicative amount of FCERM GiA available for defence upgrade scheme estimated to be in region of £2.5 million to £4.3 million
- See economics report for assumptions when calculating indicative GiA availability (such as baseline year)

Trigger Points

Category	Influence on	Details of key decisions when implementing options	Triggers
Stakeholder engagement	Choice of Local or National Option, and defence alignment	- Currently there is a setback flood defence in the east part of the unit that reduces the risk of flooding to a large number of residential properties in the east part of the unit (this was constructed in the 1990s). However, there is no raised flood defence in the west part of the unit and therefore this area is at increased risk of flooding. It is understood that during the scheme construction in the east part of the unit, the residents in the west part of the unit opted out and didn't support extending the flood defences to the west. Hence this area remained undefended. - It is important that stakeholder / community engagement is undertaken before making a decision on future schemes in this location because a) to understand the support for a scheme to reduce the risk of flooding in the west part of the unit and b) preferred alignments for a scheme need to be identified - For the Strategy, the economic case for the leading options is based on delivering a combined scheme / PLR across both the west and east parts of the unit. However, the feedback from the stakeholder engagement will determine if the leading options are delivered in this way. This will have an impact on the economic case and potential timing of schemes that can be delivered: - If defences / property level resilience measures to reduce flood risk in the west part of the unit are not supported (as outlined by the leading options), then this significantly reduces the economic case for the leading options in ODU 5 in the short term. This is because most of the economic benefits of the leading options in ODU 5 in epoch 1 are associated with the properties in the west part of the unit and removing these benefits reduces the overall economic case for a scheme. If this is the case then the National Option should be followed so that flood defence improvements are delayed and delivered in future epochs. - by waiting to deliver the scheme, the flood risk will get worse over time in the east part of the unit due to sea level rise and deteriorating condition of the defences. This will increase the amount of benefits that can be associated with the defence upgrades in the east part of the unit and improve the economic case for the scheme. It is likely that the defence improvements would be delayed until epoch 2 but the exact timing will need to be determined from sea level rise triggers and defence condition triggers for the existing setback defence). - However, if new flood defences and/or property level resilience in the west part of the unit is supported, then this improves the economic case for delivering a scheme across the full unit and can help justify improving the defences in the east in epoch 1 (i.e. the Local Option), subject to funding	Stakeholder support / opposition to defences in the west part of the unit and overall alignment decisions
Sea level rise	Timing of scheme for National Option	- The Strategy Local Option involves upgrading defences early in epoch 1 and therefore a sea level rise trigger level for implementing this defence as part of this option is not relevant - However, the National Option involves upgrading the defences at a later point in time (most likely in epoch 2). The exact timing of this should be informed by rates of sea level rise and the onset of flood risk in the future. - According to the Environment Agency AIMS dataset, the existing defences in the east part of the unit have a crest level of approximately 2.5m OD which is in excess of a present day 1 in 1000 year AEP water level in the harbour (not considering any defence freeboard or water level gradients up the River Stour). However, with sea level rise, the SoP of the defence will fall over time and the risk of overflow / outflanking will increase. - In the east part of the unit (currently defended), should the objective be to sustain a 1 in 200 year SoP and if a 0.3m freeboard is assumed, the defence will need to be raised once the 200 year extreme water level in the harbour reaches within 0.3m of the existing crest elevation. This equivalent water level is approximately 2.2m OD which is approximately 0.19m sea level rise from the 200 year present day water level. - Based on UKCP18 projections, this amount of SLR is expected to occur during epoch 2. However, the actual rate of sea level rise will need to be monitored and once the 0.19m trigger level has been reached then planning for the defence raising should begin.	- Begin National Option scheme planning / business case development when SLR is 0.19m
Historic landfill status	Defence alignment	- It is recommended that site investigations into the contaminated land status of the historic landfill sites in ODU 5 are undertaken - This will help inform the choice of defence alignment and design for the flood defence scheme - The information will also inform the design of any frontline quay wall refurbishments if esues such as leaching need to be considered. - The investigations will also help better inform environmental assessments, such as WFD assessment, at scheme level appraisal	Contaminated land status
Defence condition	Timing of scheme / quay wall refurbishments	- The condition of the defences in ODU 5 varies but is typically "fair" or "poor". - For defence refurbishments it is recommended that refurbishments are undertaken once defences reach a 'poor' condition. However, the requirement for refurbishment works should consider the outcomes of broader work (such as stakeholder engagement) which will inform the choice of scheme alignment. It may not be appropriate to refurbish defences that are likely to be replaced as part of a scheme alignment a few years later. - If defences reach a 'poor' condition and are on the proposed alignment of the emerging scheme, then this is also a trigger for undertaking the scheme as soon as possible. - It is recommended that detailed defence condition surveys are undertaken on a regular basis to inform the defence condition and changes over time.	- Condition rating of Poor
Funding	Decision on Local vs National vs Backup Option	- The National, Local and Backup Options will have a funding shortfall (i.e. FCERM GiA will not cover the full cost) - The Funding Strategy will need to outline how the scheme / refurbishments will be funded. If funding is not likely, then the scheme could be delayed until the funding is secured. - Delaying the scheme will increase the residual risk to properties prior to the works being completed, but the risks could be managed on an individual property by property basis using PLR. - The availability of funding should be a key point of discussion with stakeholders and will also inform scheme alignment decisions	- Funding availability - Revert to National Option if funding not initially available - Revert to Backup option is funding not available in medium term

Decision Tree



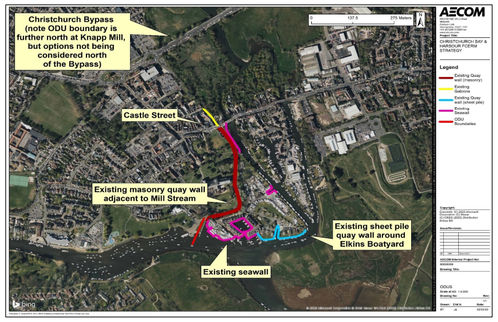
ODU 6 - River Avon West Bank

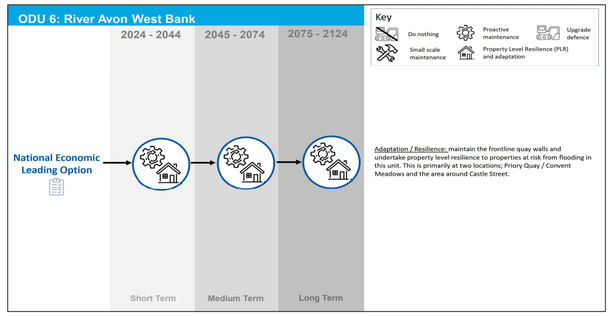
Key features / risks

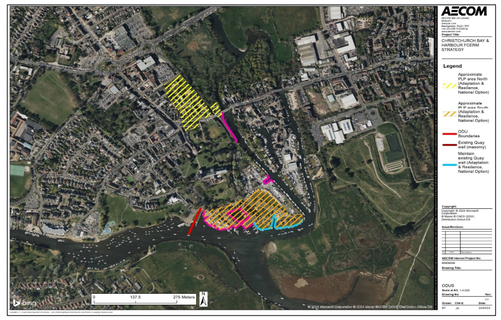
-126 properties at risk from flooding in the future (2124 0.5% AEP event).
-Flooding also in proximity to key historic environment designations such as scheduled monument
-Economic case for new defences is weak due to length of defences required
-Two main areas of flood risk; Elkins Boatyard / Priory Quay and adjacent to Castle Street. Risk comes from River Avon and Millstream

Strategy Leading Options
-National Option is Adaptation / Resilience which involves PLR and maintenance of defences
-No Local Option identified here

Map of Leading Options
- Alignments / areas for PLR are indicative and will vary subject to further appraisal







Works required to deliver leading options*

Option	Epoch 1				Epoch 2	Epoch 3
	Years 2025 - 2029	Years 2030 - 3034	Years 2035 - 2039	Years 2040 - 2044	Years 2045-2074	Years 2075-2124
National	-Identify properties that would benefit from property level resilience measures -Engage with property owners and support property level resilience funding applications / implementation as required - Develop funding strategy for defence refurbishments			-Ongoing PLR measures - Plan quay wall refurbishments, acquire consenting and funding for refurbishment - Undertake refurbishment of quay wall	Ongoing PLR, maintenance and defence refurbishments	Ongoing PLR, maintenance and defence refurbishments

**note: not shown in table above, but monitoring and small scale / patch repair maintenance on existing defences and assets should be undertaken annually / as required*
**timings of works subject to trigger points such as funding and condition of existing defences*

Cost profile for capital works and maintenance (not including pre-business case / support work)

Leading Option	Indicative option cost (£k) - cash															
	Epoch 1 (years)				Epoch 2 (years)						Epoch 3 (years)					Total
	2025-2029	2030-2034	2035-2039	2040-2044	2045-2049	2050-5054	2055-2059	2060-2064	2065-2069	2070-2074	2075-2084	2085-2094	2095-2104	2105-2114	2115-2124	
National	641	11	11	1,589	701	11	11	11	11	1,589	953	23	2,900	23	23	8,508

**note that defence refurbishments timing may need to be adjusted if refurbishments are required sooner (to be informed by detailed defence condition assessment)*

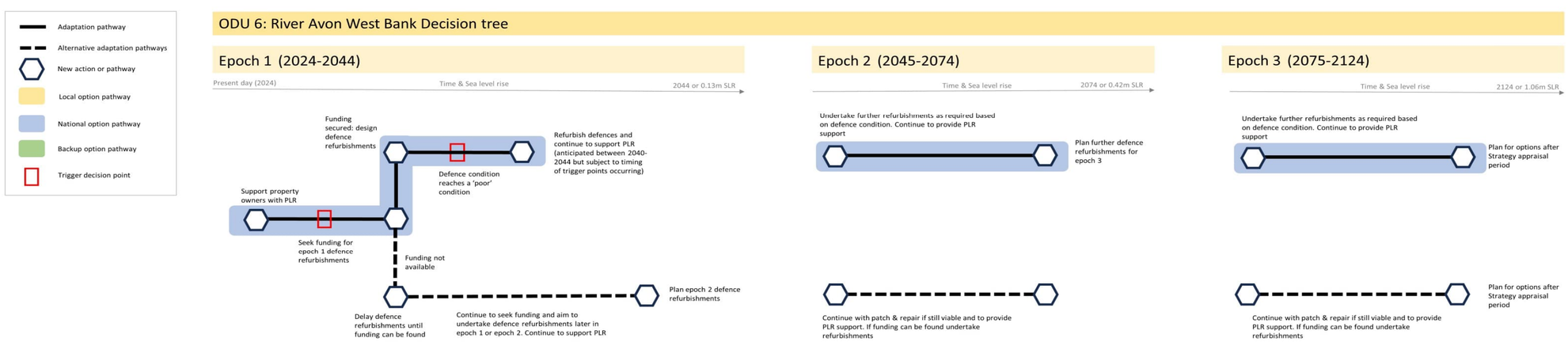
FCERM GiA funding availability

- FCERM GiA funding unlikely to be available for PLR as part of the leading option. Other sources of funding could be available

Trigger Points

Category	Influence on	Details of key decisions when implementing options	Triggers
Defence condition	Timing of defence refurbishments	- There are currently quay walls and sheet pile walls in this unit that will need refurbishing over time - Generally in fair / good condition based on Strategy defence condition assessment - In the Strategy costing estimates have been made with regards to the timing of defence refurbishments based on estimated residual life - It is recommended that routine defence condition assessments are undertaken on the structures to determine initial condition status and change over time - Ongoing small scale / patch repair maintenance would be expected to extend the life of these assets but it is likely that a refurbishment would be needed during epoch 1 - It is recommended that when the condition reaches a 'Poor' rating then a refurbishment is undertaken	- Condition rating of Poor
Funding	Timing of defence refurbishments	- The National Option may have a funding shortfall for the defence refurbishment works (unlikely FCERM-GiA will cover this work) - The Funding Strategy will need to outline how the defence refurbishments will be funded. If funding is not likely, then these refurbishment works could be delayed until the funding is secured	- Funding availability - Delay refurbishments if funding is not secured

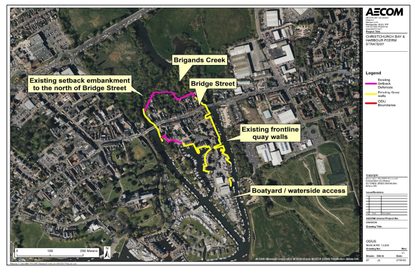
Decision Tree



ODU 7 - Rossiters Quay

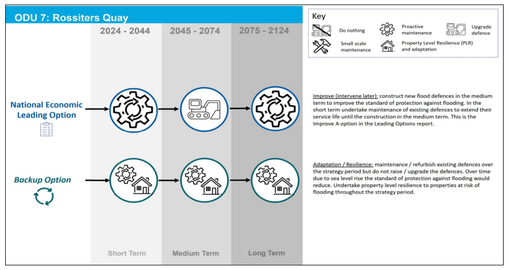
Key features / risks

-Island within the River Avon. Residential / non-residential properties either side of Bridge Street
-Area has a high SoP for the present day but over time due to SLR the SoP will fall.
-By 2124 there are 57 properties expected to be at risk from 0.5% AEP event
-A lack of space to construct new defences in parts of this unit and waterside alignments therefore likely to be required
-During design key issues to consider include access to the water and the natural creek (Brigands Creek) that pass through the defences



Strategy Leading Options

-National Option and Backup Option identified
-National Option is Improve (A) that involves raising existing defences / new defences from epoch 2
-Backup option is Adaptation / Resilience which involves undertaking PLR and maintaining existing defences through refurbishments



Map of Leading Options

- Alignments are indicative and will vary subject to further appraisal

Works required to deliver leading options*

Option	Epoch 1			Epoch 2	Epoch 3
	Years 2025 - 2029	Years 2030 - 3034	Years 2035 - 2039	Years 2040 - 2044	Years 2045-2074	Years 2075-2124
National	- Develop funding strategy for defence improvements / scheme scheduled for epoch 2			-Business case development, outline design and secure funding for defence improvements from epoch 2 - Approval of business case - Detailed design, consenting and procurement for defence improvements	-Construction for defence improvements	Ongoing maintenance
Backup	-Identify properties that would benefit from property level resilience measures -Engage with property owners and support property level resilience funding applications / implementation as required - Develop funding strategy for defence refurbishments			-Ongoing PLR measures - Plan defence refurbishments, acquire consenting and funding for refurbishment -Undertake refurbishment of quay wall	-Ongoing maintenance and defence refurbishments and support to property owners for PLR	-Ongoing maintenance and defence refurbishments and support to property owners for PLR

note: not shown in table above, but monitoring and small scale / patch repair maintenance on existing defences and assets should be undertaken annually / as required
timings of works subject to trigger points such as funding and condition of existing defences

Cost profile for capital works and maintenance (not including pre-business case / support work)

Leading Option	Indicative option cost (£k) - cash															
	Epoch 1 (years)				Epoch 2 (years)						Epoch 3 (years)					Total
	2025-2029	2030-2034	2035-2039	2040-2044	2045-2049	2050-5054	2055-2059	2060-2064	2065-2069	2070-2074	2075-2084	2085-2094	2095-2104	2105-2114	2115-2124	
National	11	11	11	11	8,014	23	23	23	23	23	46	46	46	46	46	8,403
Backup	41	11	11	1,821	746	11	11	11	1,821	821	23	1,833	878	23	1,833	9,895

*note that defence refurbishments timing may need to be adjusted if refurbishments are required sooner (to be informed by detailed defence condition assessment)

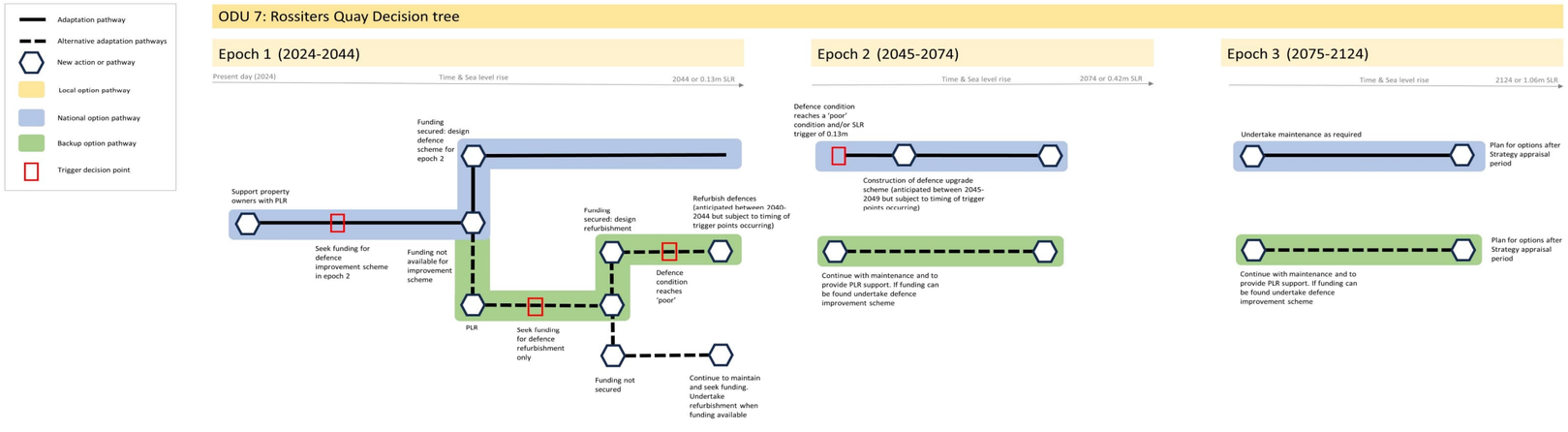
FCERM GiA funding availability

- Indicative FCERM GiA funding availability calculated for initial defence upgrade scheme as part of the national option
- Indicative amount of FCERM GiA available for defence upgrade scheme estimated to be in region of £630k
- See economics report for assumptions when calculating indicative GiA availability (such as baseline year)

Trigger Points

Category	Influence on	Details of key decisions when implementing options	Triggers
Defence condition	Timing of scheme for National Option / refurbishments for Backup Option	- There are currently quay walls / raised defences in this unit that provide flood defence - Generally in fair / good condition based on Strategy defence condition assessment - It is recommended that routine defence condition assessments are undertaken on the structures to determine initial condition status and change over time - Ongoing small scale / patch repair maintenance would be expected to extend the life of these assets - However, when the condition of the defences / quay walls deteriorates then either construction of the defence improvement scheme will be required (national option) or a refurbishment required (backup) - It is recommended that when the condition reaches a 'Poor' rating then the scheme / refurbishment is undertaken	- Condition rating of Poor
Sea level rise	Timing of scheme for National Option	- The National Option involves upgrading the defences in the future (most likely in epoch 2). The exact timing of this should be informed by rates of sea level rise and the onset of flood risk in the future (as well as the defence condition) - According to the Environment Agency AIMS dataset, the raised defences in the unit typically have a crest level of approximately 2.4-2.5m OD (although this does vary and there are some sections with a lower crest level, particularly on the west side). - 2.4m OD is in excess of a present day 1 in 1000 year AEP water level in the harbour (not considering any defence freeboard or water level gradients up the River Avon). However, with sea level rise, the SoP of the defence will fall over time and the risk of overflow / outflanking will increase. - Should the objective be to sustain a 1 in 200 year SoP and if a 0.3m freeboard is assumed, the defences will need to be raised once the 200 year extreme water level in the harbour reaches within 0.3m of the existing crest elevation. This equates to a water level of approximately 2.1-2.2m OD which is approximately 0.09-0.19m sea level rise from the 200 year present day water level. - Existing UKCP18 SLR projections indicate 0.13m of sea level rise is expected to occur by the start of epoch 2 and this represents an approximate mid-point for the 0.09m-0.19m range. Therefore it is suggested that a 0.13m trigger for sea level rise is used for undertaking planning / construction for the defence raising. - It should be noted that the crest level in parts of this unit is lower than 2.4-2.5m and therefore some sections may need raising sooner if the desire is to sustain a 1 in 200yr SoP before a scheme is constructed. However, there is not sufficient detail available to assess the need for this in the Strategy and detailed analysis of flow paths / defacto defences would be required to draw any conclusions.	- Begin National Option scheme planning / business case development when SLR is 0.13m
Funding	Timing of scheme for National Option / choice switching to Backup Option	- The National Option may have a funding shortfall for the scheme / defence improvement works (unlikely FCERM-GIA will cover all of this work) - The Funding Strategy will need to outline how the scheme will be funded. If funding is not likely, then the scheme could be delayed or the option choice switched to the Backup Option. - Funding will still be required for the defence refurbishments as part of the Backup Option but this amount is expected to be less	- Funding availability - Delay refurbishments if funding is not secured

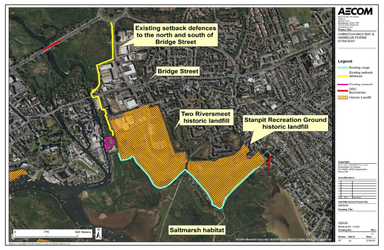
Decision Tree



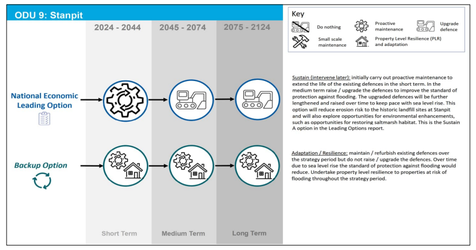
ODU 9 - Stanpit

Key features / risks

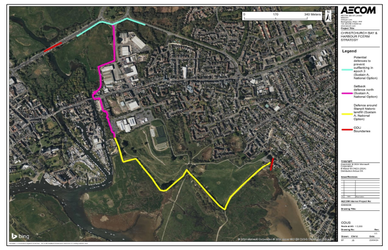
-East bank of the River Avon and the North side of Christchurch Harbour
-Large areas of historic landfill sites at Two Riversmeet and Stanpit Recreation Ground that are adjacent to the harbour
-Potentially contaminated land status of landfill sites is unknown
-Also there are expected to be a large number of properties at risk from flooding in the future
-By 2124 expected that 867 properties would be at risk from 0.5% AEP event



Strategy Leading Options
-National Option and Backup Option identified
-National Option is Sustain (A) that involves raising defences over time to keep pace with SLR (200 yr SoP) from epoch 2.
- Sustain A also involves defences around the historic landfill and will seek opportunities for saltmarsh enhancement
-Backup option is Adaptation / Resilience which involves undertaking PLR and maintaining existing defences (including around the historic landfill sites) through refurbishments



Map of Leading Options
- Alignments are indicative and will vary subject to further appraisal



Works required to deliver leading options*

Option	Epoch 1				Epoch 2	Epoch 3
	Years 2025 - 2029	Years 2030 - 3034	Years 2035 - 2039	Years 2040 - 2044	Years 2045-2074	Years 2075-2124
National	- Undertake historic landfill investigations to determine contamination status of the landfill sites Develop funding strategy for defence improvements / scheme scheduled for epoch 2 Review SMP policy to align to with this option if this is the option delivered			- Determine scheme arrangement (subject to outcome of historic landfill investigations) - Business case development, outline design and secure funding for defence improvements from epoch 2 - Appraisal of business case - Detailed design, consenting and procurement for defence improvements	Construction for defence improvements	Future moving of defences as required. Ongoing maintenance
Backup	- Undertake historic landfill investigations to determine contamination status of the landfill sites Identify properties that would benefit from property level resilience measures Engage with property owners and support property level resilience funding applications / implementation as required Develop funding strategy for defence refurbishments Review SMP policy to align to with this option if this is the option delivered			- Ongoing PLR measures - Determine need for defence maintenance around historic landfill sites (subject to outcome of historic landfill investigations). Refurbishments of other defences along the bank of the Avon would still be required if historic landfill defences not needed - Plan defence refurbishments, acquire consenting and funding for refurbishment - Undertake refurbishment of defences	Ongoing maintenance and defence refurbishments and support to property owners for PLR	Ongoing maintenance and defence refurbishments and support to property owners for PLR

Note: not shown in table above, but monitoring and small scale / patch repair maintenance on existing defences and assets should be undertaken annually / as required
timings of works subject to trigger points such as funding and condition of existing defences

Cost profile for capital works and maintenance (not including pre-business case / support work)

Leading Option	Indicative option cost (£k) - cash														
	Epoch 1 (years)				Epoch 2 (years)						Epoch 3 (years)				Total
	2025-2029	2030-2034	2035-2039	2040-2044	2045-2049	2050-5054	2055-2059	2060-2064	2065-2069	2070-2074	2075-2084	2085-2094	2095-2104	2105-2114	2115-2124	
National	34	34	34	34	18,910	34	34	34	34	34	6,504	68	68	68	68	25,952
Backup	34	34	34	1,811	8,945	34	34	34	1,811	34	4,528	1,845	8,738	68	1,845	29,849

**Note that defence refurbishments timing may need to be adjusted if refurbishments are required sooner (to be informed by detailed defence condition assessment)

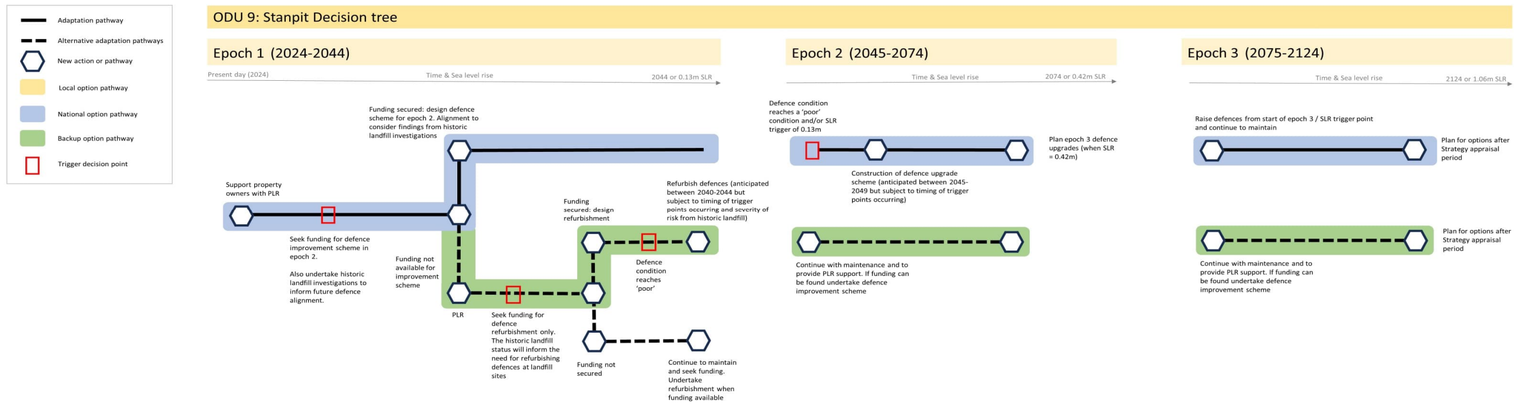
FCERM GiA funding availability

- Indicative FCERM GiA funding availability calculated for initial defence upgrade scheme as part of the national option
- Indicative amount of FCERM GiA available for defence upgrade scheme estimated to be in region of £2.9 million
- See economics report for assumptions when calculating indicative GiA availability (such as baseline year)

Trigger Points

Category	Influence on	Details of key decisions when implementing options	Triggers
Historic landfill status	Decision on defence alignment for National Option	- It is recommended that site investigations into the contaminated land status of the historic landfill sites are undertaken - This will inform whether the new defences are required around the historic landfill sites and help steer the decision on the defence alignment for the National Option - If the land is found to be contaminated then defences around the landfill sites should be delivered as a preference / if funding allows - The investigations will also help better inform enviromental assessments, such as WFD assessment, at scheme level appraisal	- Contaminated land status
Defence condition	Timing of scheme for National Option / refurbishments for Backup Option	- There are currently raised defences in this unit that provide flood defence - The condition for the majority of the defence length is unknown (data not available for the Strategy defence condition assessment). The AIMS dataset suggests a 'Fair' condition although this needs to be confirmed - It is recommended that routine defence condition assessments are undertaken on the structures to determine initial condition status and change over time - Ongoing small scale / patch repair maintenance would be expected to extend the life of these assets - However, when the condition of the defences deteriorates then either construction of the defence improvement scheme will be required (national option) or a refurbishment required (backup) - It is recommended that when the condition reaches a 'Poor' rating then the scheme / refurbishment is undertaken	- Condition rating of Poor
Sea level rise	Timing of scheme for National Option	- The National Option involves upgrading the defences in the future (most likely in epoch 2). The exact timing of this should be informed by rates of sea level rise and the onset of flood risk in the future (as well as the defence condition) - According to the Environment Agency AIMS dataset, the raised defences in the unit typically have a crest level of approximately 2.4-2.5m OD. - 2.4m OD is in excess of a present day 1 in 1000 year AEP water level in the harbour (not considering any defence freeboard or water level gradients up the River Avon). However, with sea level rise, the SoP of the defence will fall over time and the risk of overflow / outflanking will increase. - Should the objective be to sustain a 1 in 200 year SoP and if a 0.3m freeboard is assumed, the defences will need to be raised once the 200 year extreme water level in the harbour reaches within 0.3m of the existing crest elevation. This equates to a water level of approximately 2.1-2.2m OD which is approximately 0.09-0.19m sea level rise from the 200 year present day water level. - Existing UKCP18 SLR projections indicate 0.13m of sea level rise is expected to occur by the start of epoch 2 and this represents an approximate mid-point for the 0.09m-0.19m range. Therefore it is suggested that a 0.13m trigger for sea level rise is used for undertaking planning / construction for the defence raising. - It should be noted that the crest level in parts of this unit is lower than 2.4-2.5m and therefore some sections may need raising sooner if the desire is to sustain a 1 in 200yr SoP before a scheme is constructed. However, there is not sufficient detail available to assess the need for this in the Strategy and detailed analysis of flow paths / defacto defences would be required to draw any conclusions. - The planning / business case development for the second round of defence improvements (in epoch 3) should be undertaken when the structure design life is close to falling below the design SoP of the previous round of defence upgrades undertaken in epoch 2. - Based on existing UKCP18 sea level rise projections, and assuming the defences are designed to a target SoP at the start of epoch 3, the planning / business case development for the second round of upgrades should begin when sea level rise reaches 0.42m.	- Begin National Option scheme planning / business case development when SLR is 0.13m
Funding	Timing of scheme for National Option / choice switching to Backup Option	- The National Option may have a funding shortfall for the scheme / defence improvement works (unlikely FCERM-GiA will cover all of this work) - The Funding Strategy will need to outline how the scheme will be funded. If funding is not likely, then the scheme could be delayed or the option choice switched to the Backup Option. - Funding will still be required for the defence refurbishments as part of the Backup Option but it does not include one-off capital scheme costs that are as large (as the National Option) and therefore could be more deliverable.	- Funding availability - Delay refurbishments if funding is not secured

Decision Tree



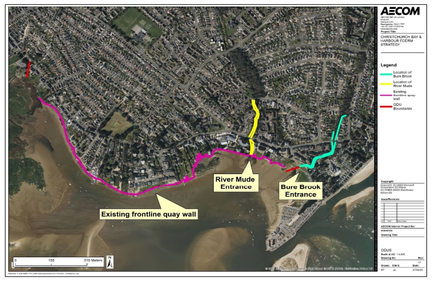
ODU 10 - Mudeford

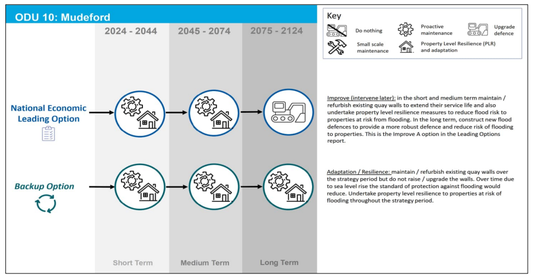
Key features / risks

-North side of Christchurch Harbour. Main land use is residential properties / gardens which back onto the shoreline
-River Mude and Bure Brook located at the eastern end of the unit
-Privately owned / maintained quay wall along length of unit
- 25 properties at risk for a present day 0.5% AEP event, increasing to 370 properties by 2124
-Future flood risk is relatively linear along the frontage

Strategy Leading Options
-National Option and Backup Option identified
-National Option is Improve (A) that involves raising defences in epoch 3 when the flood risk begins to increase significantly
- In epochs 1 and 2 Improve A also involves PLR measures and quay wall refurbishments as required
-Backup option is Adaptation / Resilience which involves undertaking PLR and maintaining existing defences through refurbishments

Map of Leading Options
- Alignments / PLR areas are indicative and will vary subject to further appraisal





Works required to deliver leading options*

Option	Epoch 1				Epoch 2	Epoch 3
	Years 2025 - 2029	Years 2030 - 3034	Years 2035 - 2039	Years 2040 - 2044	Years 2045-2074	Years 2075-2124
National	Identify properties that would benefit from property level resilience measures - Engage with property owners and support property level resilience funding applications / implementation as required - Develop funding strategy for defence refurbishments in epochs 1 and 2. Also consider potential funding for scheme in epoch 3 although this will be highly uncertain.			- Ongoing PLR measures - Plan quay wall refurbishments, acquire consenting and funding for refurbishment - Undertake refurbishment of quay wall	Ongoing PLR and maintenance / refurbishments.	Defence upgrade scheme to raise SoP. Ongoing maintenance
Backup	Identify properties that would benefit from property level resilience measures - Engage with property owners and support property level resilience funding applications / implementation as required - Develop funding strategy for defence refurbishments			- Ongoing PLR measures - Plan quay wall refurbishments, acquire consenting and funding for refurbishment - Undertake refurbishment of quay wall	Ongoing maintenance and defence refurbishments and support to property owners for PLR	Ongoing maintenance and defence refurbishments and support to property owners for PLR

**note: not shown in table above, but monitoring and small scale / patch repair maintenance on existing defences and assets should be undertaken annually / as required*
**timings of works subject to trigger points such as funding and condition of existing defences*

Cost profile for capital works and maintenance (not including pre-business case / support work)

Leading Option	Indicative option cost (£k) - cash														
	Epoch 1 (years)				Epoch 2 (years)						Epoch 3 (years)					Total
	2025-2029	2030-2034	2035-2039	2040-2044	2045-2049	2050-5054	2055-2059	2060-2064	2065-2069	2070-2074	2075-2084	2085-2094	2095-2104	2105-2114	2115-2124	
National	763	23	23	3,056	1,333	23	23	23	23	23	25,533	46	46	46	46	31,030
Backup	761	23	23	3,056	1,333	23	23	23	3,056	23	1,856	3,079	4,136	46	3,079	20,540

**note that defence refurbishments timing may need to be adjusted if refurbishments are required sooner (to be informed by detailed defence condition assessment)*

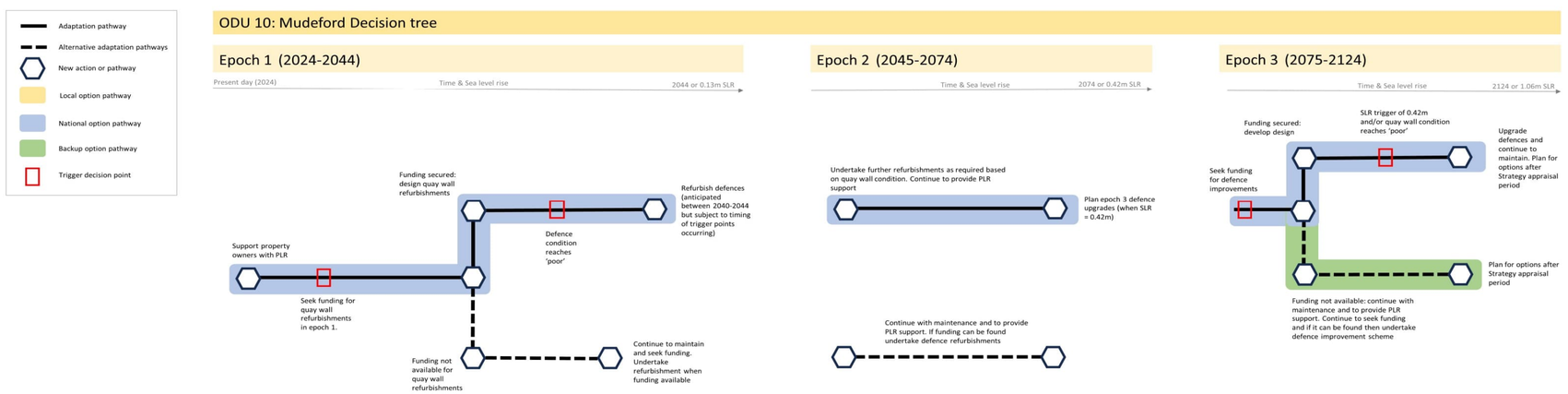
FCERM GiA funding availability

- Indicative FCERM GiA funding availability calculated for defence upgrade scheme as part of the national option in epoch 3
- Indicative amount of FCERM GiA available for defence upgrade scheme estimated to be in region of £2 million
- See economics report for assumptions when calculating indicative GiA availability (such as baseline year)

Trigger Points

Category	Influence on	Details of key decisions when implementing options	Triggers
Defence condition	Timing of refurbishments for National and Backup Option. Timing of scheme in epoch 3 for National Option	- There is currently a quay wall along this frontage that provides stability to the land behind and prevents erosion - The condition for the quay wall is unknown (data not available for the Strategy defence condition assessment). - It is recommended that routine defence condition assessments are undertaken on the structures to determine initial condition status and change over time - Ongoing small scale / patch repair maintenance would be expected to extend the life of these assets - However, when the condition of the defences deteriorates then refurbishments will be required with the National and Backup options. - It is recommended that when the condition reaches a 'Poor' rating then the refurbishments are undertaken - In epoch 3 the National Option recommends a new defence scheme. The condition of the quay wall during this time period will also help determine the timing of the scheme in epoch 3	- Condition rating of Poor
Sea level rise	Timing of scheme for National Option	- The National Option involves upgrading the defences in epoch 3 when the flood risk is expected to increase significantly and there is a stronger economic case to improve the defences. - The exact timing of the defence scheme with the National Option should be informed by the observed rates of sea level rise and the onset of flood risk in the future (as well as the defence condition). - The UKCP18 sea level rise projections estimate 0.42m of sea level rise by the start of epoch 3 (2074) relative to today. It is therefore recommended that planning / business case development for the scheme begins when observed sea level rise is around 0.42m	- Begin National Option scheme planning / business case development when SLR is 0.42m
Funding	Timing of refurbishments for National Option / Backup Option. Timing of defence improvement scheme with the National Option	- The National and Backup Options may have a funding shortfall for the quay wall refurbishment works (unlikely FCERM-GiA will cover all of this work) - The Funding Strategy will need to outline how these refurbishments will be funded. If funding is not likely, then the refurbishments could be delayed until funding is secured. However, this will increase the residual risk and localised impacts, such as erosion, could occur in locations where defences fail. - In the long term, there is also expected to be a funding shortfall for the defence scheme as part of the National Option. If funding cannot be secured then the scheme could be delayed until funding can be found. Alternatively the Strategy could implement the Backup option in the long term but there would be increased uncertainty with this due to increased residual risk and deeper flooding and the effectiveness of PLR would reduce.	- Funding availability - Delay refurbishments if funding is not secured

Decision Tree



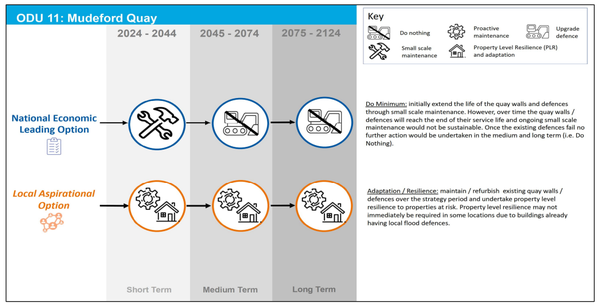
ODU 11 - Mudeford Quay

Key features / risks

-Small number of properties at risk from flooding / erosion so therefore there is limited economic benefits on a national basis for defence improvements / maintenance
-Mudeford Quay at risk from flooding currently and depth of flooding expected to increase significantly over next 100 years
-Three properties at risk for a present day 0.5% AEP event, increasing to 12 by 2124
-The quay is a strategically important features for overall morphology of the area, for example, in acting as a training wall for 'the Run' channel
-Uncertain impact on coastal morphology should quay walls around the quay be left to fail in the future
-Key infrastructure passes beneath 'the Run' from the quay

Strategy Leading Options

-National and Local Option identified
-National Option is Do Minimum whereas Local Option is Adaptation / Resilience
-Local Option (Adaptation / Resilience) would involve maintaining the quay walls with refurbishments and manage flood risk on the quay using PLR
-National Option (Do Minimum) would not involve replacing existing defences when they fail and long term morphology is uncertain



Map of Leading Options

- Defence maintenance assumed along existing alignments, however this may vary subject to further appraisal
- PLR requirements to be determined on property by property basis as required

Works required to deliver leading options*

Option	Epoch 1				Epoch 2	Epoch 3
	Years 2025 - 2029	Years 2030 - 3034	Years 2035 - 2039	Years 2040 - 2044	Years 2045-2074	Years 2075-2124
National	- No planned works other than small scale patch & repair and ensuring H&S compliance - Review SMP policy to align to with this option if this is the option delivered					
Local	- Develop funding strategy for quay wall refurbishments - Undertake defence condition assessments - Undertake historic landfill investigations to determine contamination status of landfill site identify properties that would benefit from property level resilience measures -Engage with property owners and support property level resilience funding applications / implementation as required	- Begin planning defence refurbishments - Secure funding and consenting for refurbishments - Continue to provide PLR support	-Refurbish existing quay walls - Continue to provide PLR support	-Continue to provide PLR support	Further refurbishments of existing defences and PLR	Further refurbishments of existing defences and PLR

note: not shown in table above, but monitoring and small scale / patch repair maintenance on existing defences and assets should be undertaken annually / as required
timings of works subject to trigger points such as funding and condition of existing defences

Cost profile for capital works and maintenance (not including pre-business case / support work)

Leading Option	Indicative option cost (£k) - cash															
	Epoch 1 (years)				Epoch 2 (years)						Epoch 3 (years)					Total
	2025-2029	2030-2034	2035-2039	2040-2044	2045-2049	2050-5054	2055-2059	2060-2064	2065-2069	2070-2074	2075-2084	2085-2094	2095-2104	2105-2114	2115-2124	
National	23	46	91	91	183	183	37	0	0	0	0	0	0	0	0	654
Local	101	11	7,517	11	121	11	11	7,517	11	11	143	7,529	143	7,529	23	30,689

*note that defence refurbishments timing may need to be adjusted if refurbishments are required sooner (to be informed by detailed defence condition assessment)

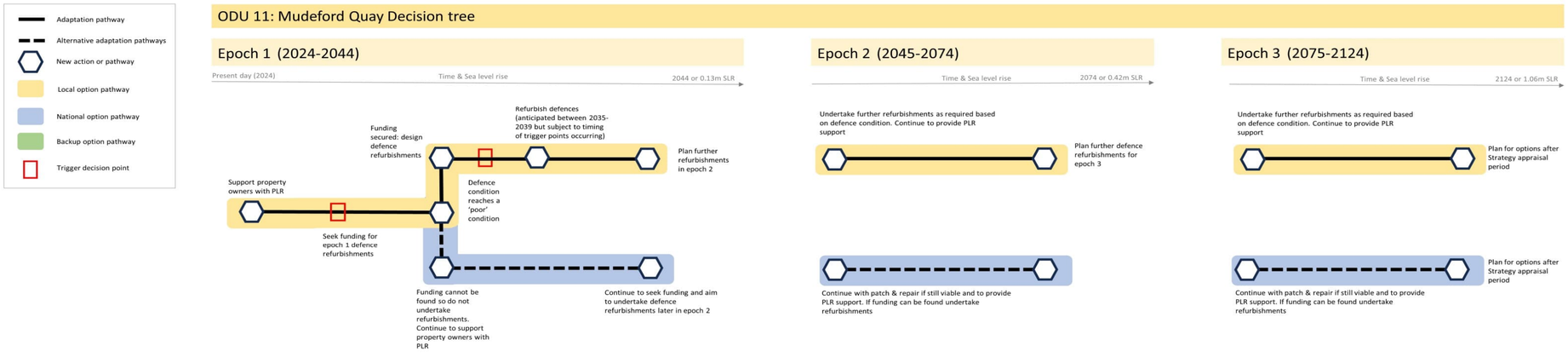
FCERM GiA funding availability

- FCERM GiA funding unlikely to be available for defence works due to BCR < 1 on national basis. Funding may be available for PLR from separate funding routes

Trigger Points

Category	Influence on	Details of key decisions when implementing options	Triggers
Defence condition	Timing of defence refurbishments in Local Option	- If implementing the Local Option: - The existing quay wall around Mudeford Quay was assessed to have a 'Fair' condition in the Strategy defence condition assessment, with an estimated residual life (without maintenance) of 10-15 years - Ongoing small scale / patch repair maintenance would be expected to extend the life of these asset but they are still expected to require a refurbishment during epoch 1 - The timing of a refurbishment will need to be determined based on further detailed condition inspections and may need to be brought forward or delayed accordingly based on the results of the inspections - It is recommended that when the condition reaches a 'Poor' rating then a refurbishment is undertaken	- Condition rating of Poor
Funding	Decision on Local vs National Option and timing of defence refurbishments	- The Local Option will have a funding shortfall for the defence refurbishment works - The Funding Strategy will need to outline how the defence refurbishments will be funded. If funding is not likely, then these refurbishment works could be delayed until the funding is secured or the National Option could be delivered instead. - The residual risk of defence failure will increase if refurbishments are delayed or not undertaken and the consequences of this could be erosion / uncertain morphological change.	- Funding availability - Delay refurbishments or revert to National Option if funding for refurbishments is not secured

Decision Tree

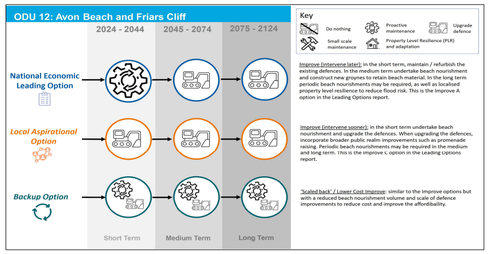


ODU 12 - Avon Beach and Friars Cliff

Key features / risks

-Open coast frontage between Mudeford Quay and Steamer Point
-Variety of coastal defences including rock groynes, timber groynes, rock revetment and seawall
-Key area for coastal recreation / tourism
-Main risk is from coastal erosion, with some minor localised flood risk. Initially erosion risk is low, increasing over time
-Nine properties expected to be at risk from erosion during epoch 1. However, this increases to 172 properties over the next 100 years (cumulative)

Strategy Leading Options
-National (Improve A), Local (Improve C) and Backup Options (scaled back Improve A) identified
-Each of the leading options involve upgrading the defences to provide erosion defence over the Strategy period
-Further work is required after the Strategy to confirm the alignment of the new defences, and this will impact the economic case / timing of interventions
- The National Option (Improve A) involves maintaining / refurbishing defences in epoch 1. Then in epoch 2 upgrade defences / beach nourishment
-The Local Option (Improve C) is the same as the National Option but it involves upgrading defences in epoch 2 and also undertaking public realm enhancements
-The Backup option is the same as the National Option (Improve A) but is 'scaled back' and involves smaller defence upgrades / less beach nourishment material



Map of Leading Options
- Alignments are indicative and will vary subject to further appraisal

Works required to deliver leading options*

Option	Epoch 1				Epoch 2	Epoch 3
	Years 2025 - 2029	Years 2030 - 3034	Years 2035 - 2039	Years 2040 - 2044	Years 2045-2074	Years 2075-2124
National	- Develop funding strategy - Undertake beach management as required	- Plan epoch 1 defence refurbishments, acquire consenting and funding for refurbishments and undertake design - Undertake beach management as required	- Undertake refurbishment of defences - Undertake beach management as required	-Business case development for capital scheme to improve defences and beach nourishment - Acquire consents and funding for the scheme and undertake design - Undertake beach management as required	Capital scheme to improve defences and beach nourishment	Ongoing maintenance and beach management
Local	- Develop funding strategy - Undertake beach management as required	-Business case development for capital scheme to improve defences and beach nourishment, and public realm enhancements - Acquire consents and funding for the scheme and undertake design - Undertake beach management as required	-Undertake capital scheme to upgrade defences and beach nourishment -If funding allows include works to improve public realm	- Undertake beach management as required	Ongoing maintenance and beach management	Ongoing maintenance and beach management
Backup	- Develop funding strategy - Undertake beach management as required	- Plan epoch 1 defence refurbishments, acquire consenting and funding for refurbishments and undertake design - Undertake beach management as required	- Undertake refurbishment of defences - Undertake beach management as required	-Business case development for capital scheme to improve defences and beach nourishment. This would be a 'scaled back' version of the defence upgrades and a smaller beach nourishment scheme compared to the National Option - Acquire consents and funding for the scheme and undertake design - Undertake beach management as required	Capital scheme to improve defences and beach nourishment	Ongoing maintenance and beach management

note: not shown in table above, but monitoring and small scale / patch repair maintenance on existing defences and assets should be undertaken annually / as required
timings of works subject to trigger points such as funding and condition of existing defences

Cost profile for capital works and maintenance (not including pre-business case / support work)

Leading Option	Indicative option cost (£k) - cash															
	Epoch 1 (years)				Epoch 2 (years)						Epoch 3 (years)					Total
	2025-2029	2030-2034	2035-2039	2040-2044	2045-2049	2050-5054	2055-2059	2060-2064	2065-2069	2070-2074	2075-2084	2085-2094	2095-2104	2105-2114	2115-2124	
National	49	49	3,499	49	9,737	49	49	49	49	2,097	213	97	2,145	97	2,145	20,373
Local	49	49	18,216	49	49	49	49	49	49	2,097	256	140	2,188	140	2,188	25,617

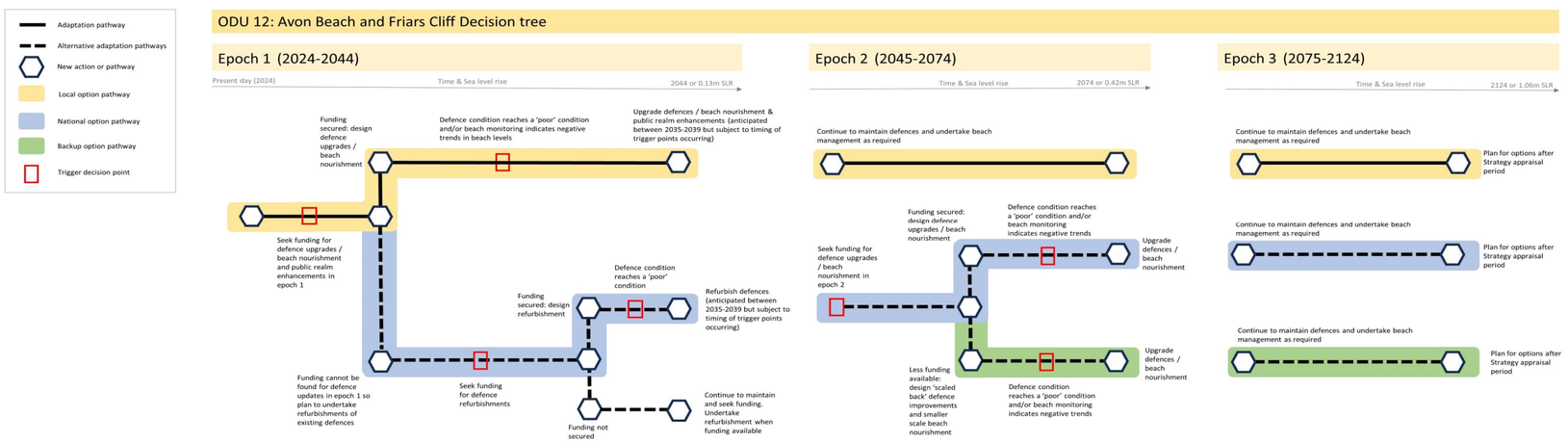
FCERM GiA funding availability

- Indicative FCERM GiA funding availability calculated for defence upgrade scheme as part of the national option in epoch 2
- Indicative amount of FCERM GiA available for defence upgrade scheme estimated to be in region of £1.4 million
- See economics report for assumptions when calculating indicative GiA availability (such as baseline year)

Trigger Points

Category	Influence on	Details of key decisions when implementing options	Triggers
Beach monitoring	Timing of defence upgrades / beach nourishment in Leading Options	- The beach is a key component of the defence system in this location and the existing defences (groynes) currently help control beach levels - There is a risk that the beach profile could change over time in response to storms / sea level rise which could reduce the effectiveness of the defence system - It is recommended that the beach profiles in ODU 12 continues to be monitored on a regular basis (i.e. every 6 months) to identify any trends in the beach profile movement. - If the beach profile trends indicate that the beach profile is lowering beyond the typical range then this could be a trigger for upgrading / modifying the existing defences to help retain more beach material and undertaking a beach nourishment scheme. - A long term record of monitoring is required to enable long term significant trends to be identified relative to typical seasonal variations	- A consistent trend in beach profile change (not typical seasonal changes)
Defence condition	Timing of defence refurbishments and defence upgrades in Leading Options	- The condition of the defences in ODU 12 varies but are typically "fair". There are some defences in a 'poor' or 'good' condition. - The condition of the defences can also inform the timing of refurbishments and defence upgrades - For defence refurbishments it is recommended that refurbishments are undertaken once defences reach a 'poor' condition. - Similarly, if a defence upgrade scheme is scheduled within several years and the defences reach a 'poor' condition then this could also be a trigger for undertaking the scheme sooner. - It is recommended that detailed defence condition surveys are undertaken on a regular basis to inform the defence condition and changes over time.	- Condition rating of Poor
Funding	Decision on Local vs National vs Backup Option	- The National, Local and Backup Options will have a funding shortfall (i.e. FCERM GiA will not cover the full cost) - The Funding Strategy will need to outline how the scheme / refurbishments will be funded. - If funding for undertaking the defence improvements and beach nourishment for the Local Option in epoch 1 is not available, then the Strategy could revert to the National Option and refurbish existing defences instead during epoch 1 (with the aspiration to then undertake the defence improvements in epoch 2). - If funding for the defence improvements and beach nourishment for the National Option in epoch 2 is not available, then the Strategy could revert to the Backup option and reduce the scale of defence improvements / beach nourishment to reduce the overall cost. - If funding is not likely for the refurbishments, then the refurbishments / scheme could be delayed until the funding is secured. However, delaying the refurbishments / scheme will increase the residual risk of erosion and damage to properties prior to the works being completed.	- Funding availability - Revert to National Option if funding not available for scheme in epoch 1 - Revert to Backup option if not enough funding is available in medium term

Decision Tree



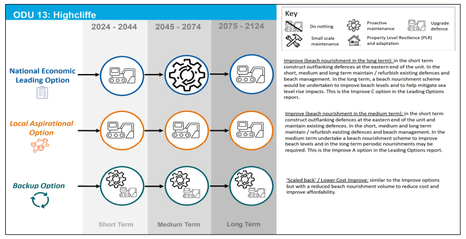
ODU 13 - Highcliffe

Key features / risks

-Open coast frontage between Steamer Point and Chewton Bunny
- Variety of coastal defences including rock groynes, rock revetment and cliff stabilisation / drainage
-Key area for coastal recreation / tourism
-Main risk is from coastal erosion. Initially erosion risk is low, increasing over time
-191 properties expected to be at risk from erosion over the next 100 years (cumulative)
-Risk of outflanking at the eastern end of the unit at undefended Naish Cliff

Strategy Leading Options

-National (Improve C), Local (Improve A) and Backup Options (scaled back Improve C) identified
-Each of the leading options involve upgrading the defences to provide erosion defence over the Strategy period and this will also support ongoing maintenance of the cliff drainage and stabilisation system at Highcliffe
-Further work is required after the Strategy to confirm the alignment of the new defences, and this will impact the economic case / timing of interventions
- The National Option (Improve C) involves constructing an outflanking defence in epoch 1 and then maintaining / refurbishing existing defences in epoch 1 and 2. Then in epoch 3 upgrade defences / beach nourishment.
-The Local Option (Improve A) is the same as the National Option but it involves undertaking the beach nourishment from epoch 2 (rather than epoch 3)
-The Backup option is the same as the National Option (Improve C) but is 'scaled back' and involves smaller defence upgrades / less beach nourishment material



Map of Leading Options

- Alignments are indicative and will vary subject to further appraisal

Works required to deliver leading options*

Option	Epoch 1				Epoch 2	Epoch 3
	Years 2025 - 2029	Years 2030 - 3034	Years 2035 - 2039	Years 2040 - 2044	Years 2045-2074	Years 2075-2124
National	- Develop funding strategy - Undertake beach management as required	- Plan epoch 1 outflanking defence, acquire consenting and funding, and undertake design - Undertake beach management as required	- Construct outflanking defence - Undertake beach management as required	-Planning and business case development for defence refurbishments in epoch 2 if required - Acquire consents and funding for the defence refurbishments - Undertake beach management as required	Undertake defence refurbishments as required and ongoing beach management	Beach nourishment scheme and further defence maintenance / upgrades as required and ongoing beach management
Local	- Develop funding strategy - Undertake beach management as required	- Plan epoch 1 outflanking defence, acquire consenting and funding, and undertake design - Undertake beach management as required	- Construct outflanking defence - Undertake beach management as required	-Begin planning for beach nourishment in epoch 2 if required - Undertake beach management as required	beach nourishment scheme and further defence maintenance / and ongoing beach management	Further defence maintenance and upgrade defences if required Ongoing beach management
Backup	- Develop funding strategy - Undertake beach management as required	- Plan epoch 1 outflanking defence, acquire consenting and funding, and undertake design - Undertake beach management as required	- Construct outflanking defence - Undertake beach management as required	-Planning and business case development for defence refurbishments in epoch 2 if required - Acquire consents and funding for the defence refurbishments - Undertake beach management as required	Undertake defence refurbishments as required and ongoing beach management	'scaled back' beach nourishment scheme and further defence maintenance / upgrades as required and ongoing beach management

note: not shown in table above, but monitoring and small scale / patch repair maintenance on existing defences and assets should be undertaken annually / as required
timings of works subject to trigger points such as funding and condition of existing defences

Cost profile for capital works and maintenance (not including pre-business case / support work)

Leading Option	Indicative option cost (£k) - cash																Total
	Epoch 1 (years)				Epoch 2 (years)							Epoch 3 (years)					
	2025-2029	2030-2034	2035-2039	2040-2044	2045-2049	2050-5054	2055-2059	2060-2064	2065-2069	2070-2074		2075-2084	2085-2094	2095-2104	2105-2114	2115-2124	
National	60	60	740	60	5,919	60	60	60	60	60		7,698	120	1,676	120	120	16,873
Local	60	60	740	60	9,032	60	60	60	60	60		6,142	120	1,676	120	120	18,430

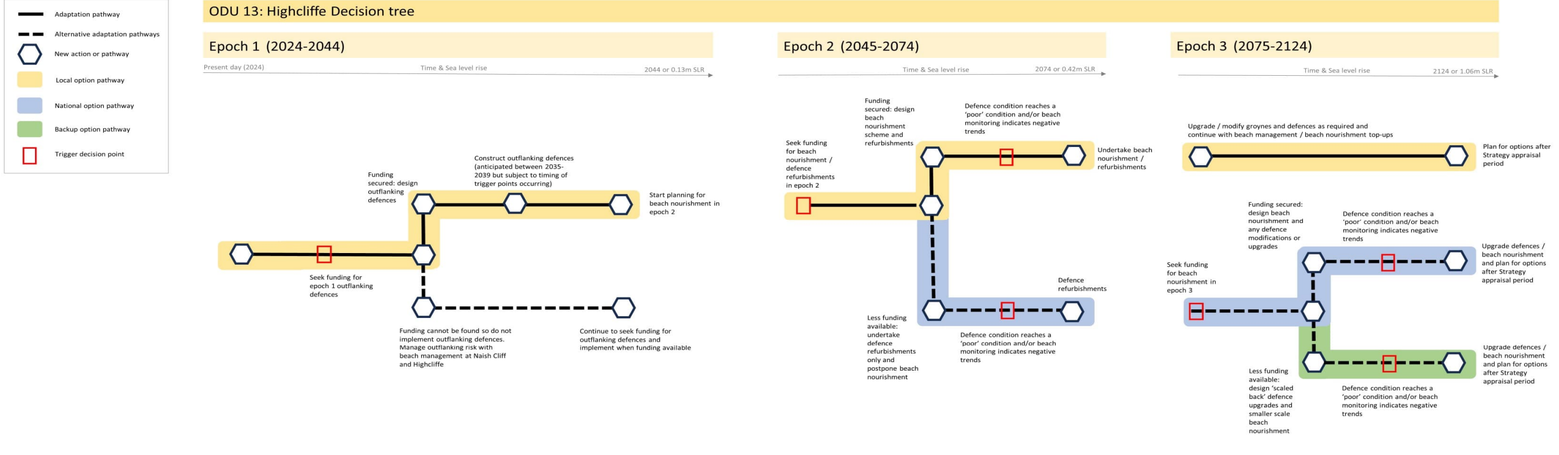
FCERM GiA funding availability

- Indicative FCERM GiA funding availability calculated for scheme as part of the local option in epoch 2, and the national option in epoch 3
- Indicative amount of FCERM GiA available for defence scheme estimated to be in region of £1.5 million (local option scheme) to £2.2million (national option scheme)
- See economics report for assumptions when calculating indicative GiA availability (such as baseline year)

Trigger Points

Category	Influence on	Details of key decisions when implementing options	Triggers
Beach monitoring	Timing of defence upgrades / beach nourishment in Leading Options	- The beach is a key component of the defence system in this location and the existing defences (groynes) currently help control beach levels - There is a risk that the beach profile could change over time in response to storms / sea level rise which could reduce the effectiveness of the defence system - It is recommended that the beach profiles in ODU 13 continues to be monitored on a regular basis (i.e. every 6 months) to identify any trends in the beach profile movement. - If the beach profile trends indicate that the beach profile is lowering beyond the typical range then this could be a trigger for upgrading / modifying the existing defences to help retain more beach material and undertaking a beach nourishment scheme. - A long term record of monitoring is required to enable long term significant trends to be identified relative to typical seasonal variations	- A consistent trend in beach profile change (not typical seasonal changes)
Defence condition	Timing of defence refurbishments and defence upgrades in Leading Options	- The condition of the defences in ODU 13 varies but are typically 'good'. - The condition of the defences can also inform the timing of refurbishments and defence upgrades - For defence refurbishments it is recommended that refurbishments are undertaken once defences reach a 'poor' condition. - Similarly, if a defence upgrade scheme is scheduled within several years and the defences reach a 'poor' condition then this could also be a trigger for undertaking the scheme sooner. - It is recommended that detailed defence condition surveys are undertaken on a regular basis to inform the defence condition and changes over time.	- Condition rating of Poor
Funding	Decision on Local vs National vs Backup Option	- The National, Local and Backup Options will have a funding shortfall (i.e. FCERM GiA will not cover the full cost) - The Funding Strategy will need to outline how the scheme / refurbishments will be funded. - If funding for undertaking the beach nourishment for the Local Option in epoch 2 is not available, then the Strategy could revert to the National Option and undertake the beach nourishment in epoch 3. - If funding for the defence improvements and beach nourishment for the National Option in epoch 3 is not available, then the Strategy could revert to the Backup option and reduce the scale of defence improvements / beach nourishment to reduce the overall cost. - If funding is not available for the outflanking defences in epoch 1 (recommended in each of the leading options) then the defences could be delayed and beach management could be utilised instead at Naish Cliff to help control rates of erosion at the eastern end of ODU 13 (i.e. moving material from Highcliffe to Naish Cliff).	- Funding availability - Revert to National Option if funding not available for scheme in epoch 1 - Revert to Backup option if not enough funding is available in medium term

Decision Tree



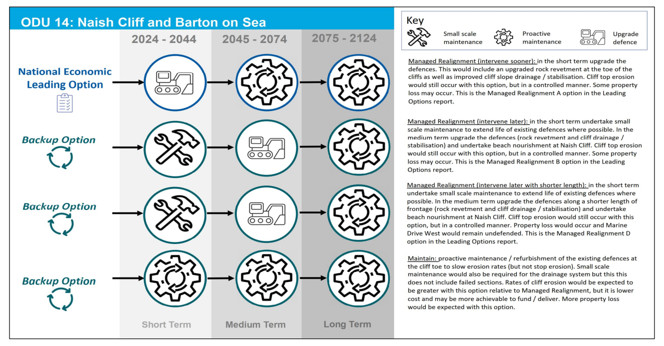
ODU 14 - Naish Cliff and Barton on Sea

Key features / risks

-Open coast frontage between Chewton Bunny and the eastern end of Barton on Sea. Characterised by eroding steep cliffs
- Variety of coastal defences including rock groynes, rock revetment and cliff stabilisation / drainage
-Main risk is from coastal erosion. Complex cliff geology with erosion / land sliding caused by wave action and groundwater / rainfall
- SSSI designation along the cliff face due to geological importance
- Erosion risk to properties increases over time, with ten properties at risk in epoch 1 but 607 at risk by 2124 (cumulatively)
-Uncertainty around technical viability of new defences at Marine Drive West due to slump zone

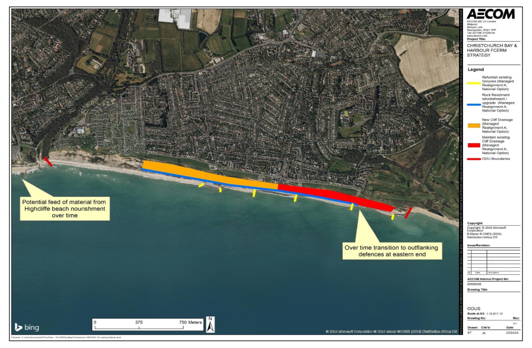
Strategy Leading Options

-National (Managed Realignment A) and multiple Backup Options identified (Managed Realignment B, Managed Realignment D, Maintain)
-The National Option (Managed Realignment A) involves new / upgraded defences between Marine Drive West and Marine Drive East (main urban area of BoS), undertaken in epoch 1. Erosion would not be stopped entirely due to geology of cliff
- Backup Option (Managed Realignment B) is the same as the National Option (Managed Realignment A) but would delay the defence scheme until epoch 2
-Backup Option (Managed Realignment D) involves defending a smaller length of the frontage between Marine Drive and Marine Drive East from epoch 2. This is the currently defended area and defences would be upgraded
-Backup Option (Maintain) involves maintaining existing defences and the functioning drainage, but no new defences would be constructed. More erosion would be expected relative to the Managed Realignment options as SoP of defences fall over time



Map of Leading Options

- Alignments are indicative and will vary subject to further appraisal
- Only National Option shown in figure (Backup options not shown)



Works required to deliver leading options*

Option	Epoch 1: Years 2025 - 2029	Epoch 1: Years 2030 - 3034	Epoch 1: Years 2035 - 2039	Epoch 1: Years 2040 - 2044	Epoch 2: Years 2045-2074	Epoch 3: Years 2075-2124
National (Managed Realignment A)	- Develop funding strategy and engage with potential funding partners - Complete drainage trial and incorporate results to help identify preferred drainage solution - Undertake further appraisal of defences at Marine Drive West and confirm scheme alignment / area defended. If further appraisal confirms requirement for Marine Drive West defences, include these as part of scheme planning - Review SMP policy to align to with this option if this is the option delivered	- Develop business case and design of scheme design - Raise awareness of scheme and residual risk with key stakeholders and community (i.e. erosion of cliff will still occur) - Acquire funding and consents for scheme - Begin construction of scheme	- Complete construction of scheme and undertake maintenance as required - Develop plan for adaptation in the medium and long term	-Undertake maintenance as required	Undertake defence maintenance as required. Manage consequences of residual risk / continued erosion with adaptation plan	Undertake defence refurbishments as required. Manage consequences of residual risk / continued erosion with adaptation plan
Backup (Managed Realignment B)	- Develop funding strategy and engage with potential funding partners for epoch 2 scheme - Complete drainage trial - Undertake defence maintenance as required and informed from condition assessments - Review SMP policy to align to with this option if this is the option delivered			- Develop business case and design of scheme design for epoch 2, including further appraisal of Marine Drive West and drainage solution. - If further appraisal confirms requirement for Marine Drive West defences, include these as part of scheme alignment - Raise awareness of scheme and residual risk with key stakeholders and community (i.e. erosion of cliff will still occur) - Acquire funding and consents for scheme	Scheme / beach nourishment construction and ongoing maintenance. Manage consequences of residual risk / continued erosion with adaptation plan	Undertake defence refurbishments as required. Manage consequences of residual risk / continued erosion with adaptation plan
Backup (Managed Realignment D)	- Develop funding strategy and engage with potential funding partners for epoch 2 scheme - Complete drainage trial - Undertake defence maintenance as required and informed from condition assessments			- Develop business case and design of scheme design for epoch 2, including further appraisal of Marine Drive West and drainage solution. - If further appraisal identifies that there is no benefit to defending Marine Drive West, exclude from scheme alignment. - Raise awareness of scheme and residual risk with key stakeholders and community (i.e. erosion of cliff will still occur) - Acquire funding and consents for scheme	Scheme / beach nourishment construction and ongoing maintenance. Manage consequences of residual risk / continued erosion with adaptation plan	Undertake defence refurbishments as required. Manage consequences of residual risk / continued erosion with adaptation plan
Backup (Maintain)	- Develop funding strategy - Complete drainage trial - Undertake defence maintenance as required and informed from condition assessments - Review SMP policy to align to with this option if this is the option delivered		- Begin planning defence refurbishments - Secure funding and consenting for refurbishments - Raise awareness on residual risk to stakeholders and community (i.e. cliff erosion will still continue to occur after refurbishments completed)	-Undertake defence refurbishments as required / informed by defence condition assessments	Undertake further defence refurbishments as required. Manage consequences of residual risk / continued erosion with adaptation plan	Undertake further defence refurbishments as required. Manage consequences of residual risk / continued erosion with adaptation plan

*note: not shown in table above, but monitoring and small scale / patch repair maintenance on existing defences and assets should be undertaken annually / as required
*timings of works subject to trigger points such as funding and condition of existing defences

Cost profile for capital works and maintenance (not including pre-business case / support work)

Leading Option	Indicative option cost (£k) - cash															
	Epoch 1 (years)				Epoch 2 (years)						Epoch 3 (years)					Total
	2025-2029	2030-2034	2035-2039	2040-2044	2045-2049	2050-5054	2055-2059	2060-2064	2065-2069	2070-2074	2075-2084	2085-2094	2095-2104	2105-2114	2115-2124	
National (Managed Realignment A)	255	270	26,370	270	383	383	383	383	383	383	653	12,936	765	765	765	45,347
Backup (Managed Realignment B)	255	255	255	255	32,011	284	284	374	397	1,564	794	794	15,778	681	1,960	55,941
Backup (Managed Realignment D)	255	255	255	255	21,639	284	284	374	397	1,564	794	794	13,142	681	1,960	42,933
Backup (Maintain)	255	255	255	5,361	180	180	240	255	2,770	180	420	5,616	360	495	2,950	19,772

*note that objective for defence upgrades as part of national option is to undertake these as soon as possible. Therefore the costs outlined in years 2035-39 could occur sooner

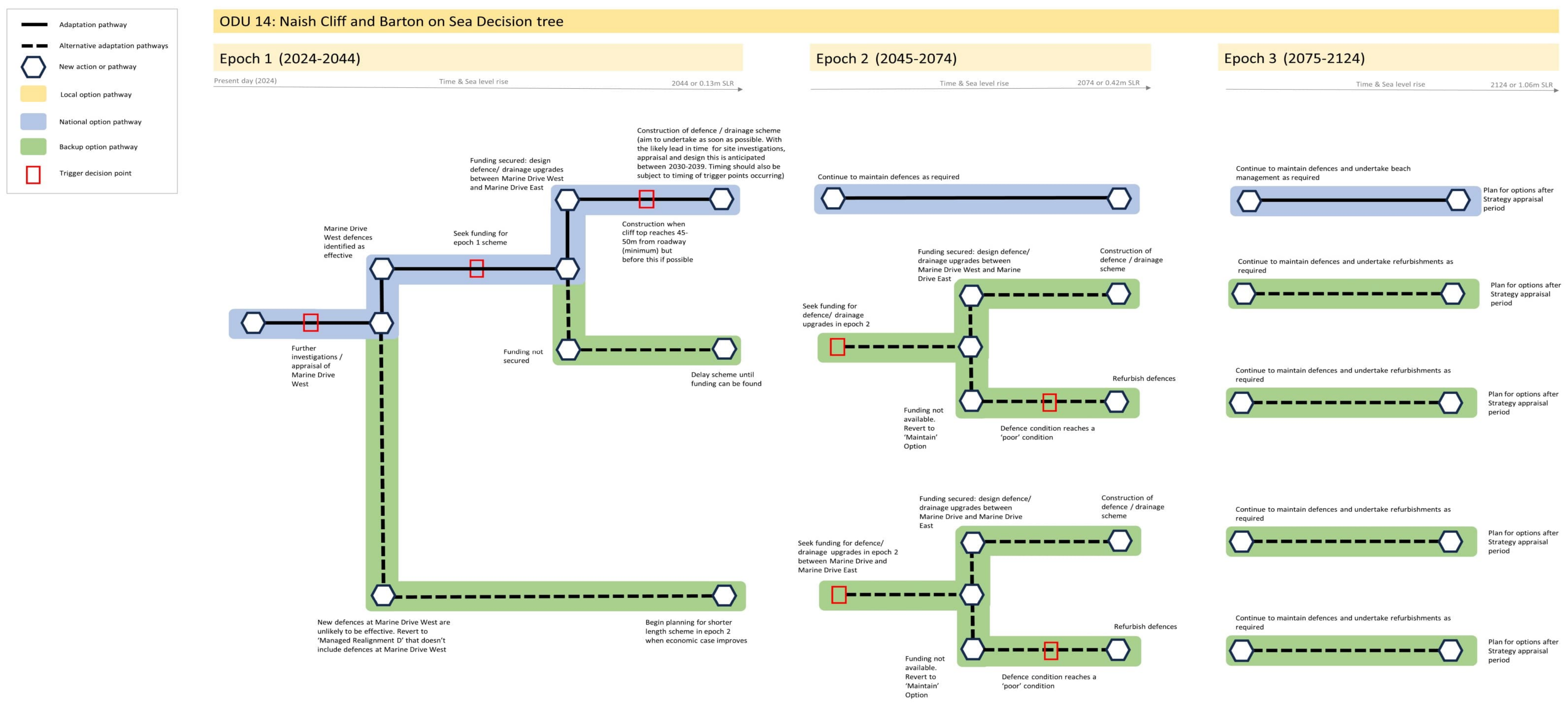
FCERM GiA funding availability

- Indicative FCERM GiA funding availability calculated for defence upgrade scheme as part of the national option in epoch 1
- Indicative amount of FCERM GiA available for defence scheme estimated to be in region of £3.2 million
- FCERM GiA would not be eligible to cover cliff stabilisation / drainage part of the scheme cost. FCERM GiA could be used on cliff toe defences
- See economics report for assumptions when calculating indicative GiA availability (such as baseline year)

Trigger Points

Category	Influence on	Details of key decisions when implementing options	Triggers
Marine Drive West feasibility	Defence alignment for scheme (include or exclude Marine Drive West) and therefore choice of Strategic option	-As outlined in the SMP, the cliff at Marine Drive West is in the wider slump zone of the adjacent Naish Cliff. The effectiveness of new toe defences / cliff drainage in this location is therefore uncertain. - Prior to, or during the development of a business case / scheme design for the Barton on Sea frontage, it is recommended that further appraisal of constructing new defences at Marine Drive West is undertaken. - If the appraisal indicates that defences would be effective and provide sufficient cost: benefit then it is recommended that they are included in the scheme alignment. This would deliver the National Option that currently assumes that defences would be included here. - If the appraisal indicates that defences would not be effective / not provide sufficient cost: benefit the it is recommended that they are excluded from the scheme alignment. This would mean that the Strategy reverts to the Managed Realignment D option that is currently a backup option.	- Findings from further appraisal at Marine Drive West (during or prior to business case development)
Observed erosion and space at top of cliff	Timing of defence / drainage scheme as part of the National Option	-As outlined in the Barton on Sea option review, as much space as possible is required at the top of the cliff between the cliff line and the roadway in order to implement the emerging drainage solution being developed by NFDC. - As a minimum 45m of space is required and should the width reduce to less than this (due to erosion) then it could make the implementation of the emerging drainage solution challenging. - Erosion of the cliff typically occurs in increments and is not a linear process i.e. typically sections of cliff erode in response to storm / rainfall events rather than a gradual loss every year. - The planning and design for the defence and drainage scheme should therefore begin before the cliff reaches 45m of the roadway to account for any erosion events that could occur during the planning and design process. - It is recommended that planning / scheme development begins when the cliff is between 55-60m from the roadway and construction starts when the cliff is between 45-50m from the roadway (at the latest) - Some parts of the cliff are already at this trigger threshold and therefore the National Option recommends planning / starting on the scheme delivery as soon as possible	Begin scheme planning / development when clifftop is 55-60m from Roadway and construction begins when clifftop is 45-50m from Roadway (at the latest)
Defence condition	Timing of defence refurbishments / upgrades as part of the Leading Options	- The condition of the defences in ODU 14 varies but are typically 'good' and 'fair' although some groynes are in a 'poor' condition - The condition of the defences can also inform the timing of refurbishments and defence upgrades - For defence refurbishments it is recommended that refurbishments are undertaken once defences reach a 'poor' condition. - Similarly, if a defence upgrade scheme is scheduled within several years and the defences reach a 'poor' condition then this could also be a trigger for undertaking the scheme sooner. - It is recommended that detailed defence condition surveys are undertaken on a regular basis to inform the defence condition and changes over time.	- Condition rating of Poor
Funding	Decision on National vs Backup Options	- The National and Backup Options will have a funding shortfall (i.e. FCERM GiA will not cover the full cost) - The Funding Strategy will need to outline how the scheme / refurbishments will be funded. - If funding for undertaking National Option in epoch 1 is not available, then the Strategy could revert to the Backup Option (Managed Realignment B) and undertake the scheme in epoch 2. - If funding for the Backup option scheme in epoch 2 (Managed Realignment B) is not available, then the Strategy could revert to the other Backup option (Maintain) and undertake defence refurbishments rather than defence / drainage upgrades - In the event of funding not being available for refurbishments then small scale maintenance could be continued but the residual risk would be high and erosion would be expected to occur in line with the NAI scenario once defences fail.	- Funding availability - Revert to Backup Options if funding not available for National Option

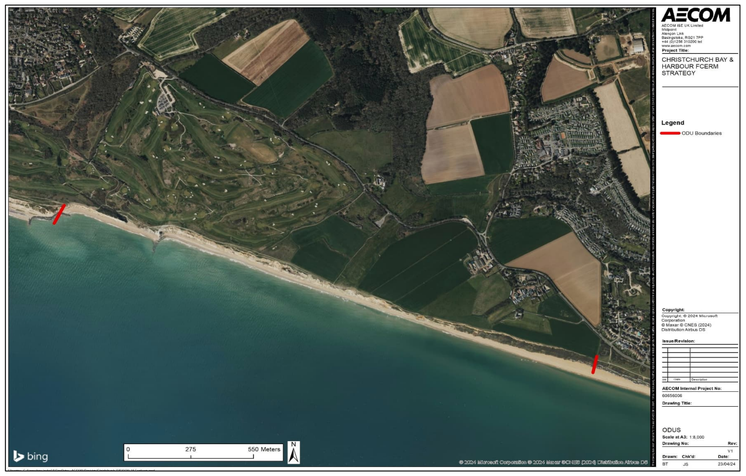
Decision Tree



ODU 15 - Barton on Sea to Hordle Cliff

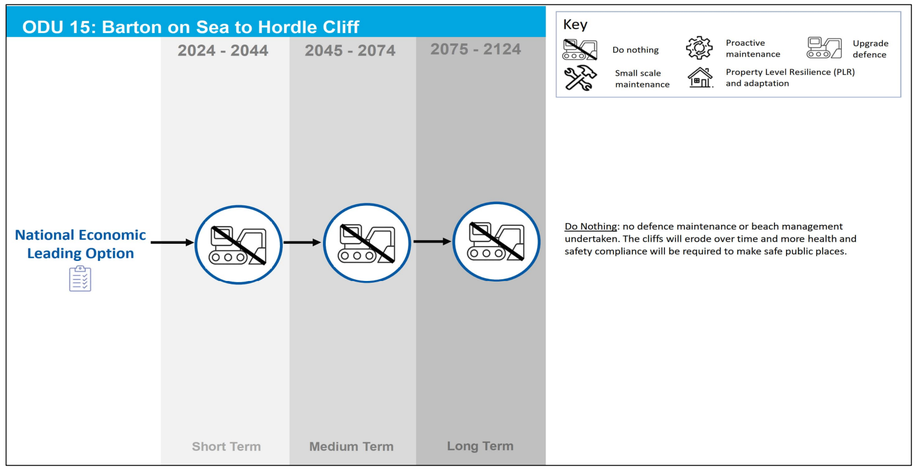
Key features / risks

- Undefended open coast frontage between Barton on Sea and Hordle Cliff
- No properties or other assets at risk until epoch 3 (only 1 property at risk in epoch 3)



Strategy Leading Options

-National option is Do Nothing
- Allow natural processes to occur, supporting the features of the environmental designations found in this area



Map of Leading Options

-No map of Leading Options provided as Do Nothing does not include any interventions

Works required to deliver leading options*

Option	Epoch 1				Epoch 2	Epoch 3
	Years 2025 - 2029	Years 2030 - 3034	Years 2035 - 2039	Years 2040 - 2044	Years 2045-2074	Years 2075-2124
National	- No defence maintenance or beach management undertaken. - Undertake health and safety activities following cliff erosion events to make safe public spaces					

Cost profile for capital works and maintenance (not including pre-business case / support work)

Leading Option	Indicative option cost (£k) - cash															
	Epoch 1 (years)				Epoch 2 (years)						Epoch 3 (years)					Total
	2025-2029	2030-2034	2035-2039	2040-2044	2045-2049	2050-5054	2055-2059	2060-2064	2065-2069	2070-2074	2075-2084	2085-2094	2095-2104	2105-2114	2115-2124	
National	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

FCERM GiA funding availability

- Not applicable with Do Nothing option

Trigger Points

Category	Influence on	Details of key decisions when implementing options	Triggers
NA	NA	NA	

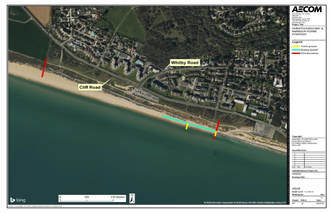
Decision Tree

- Not applicable with Do Nothing option

ODU 16 - Cliff Road

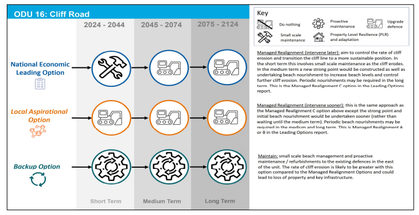
Key features / risks

-Open coast frontage between Hordle beach huts and the western end of the defences at Rook Cliff, used extensively for recreation / amenity
-Most of the unit is undefended and the beach in front of the cliffs provides the main protection to the cliff toe
-However, at the eastern end of the unit there is a wall and groynes that provide local protection
-Main risk is from coastal erosion. Beach huts at base of cliff currently being lost and there is a risk of erosion to the cliff and main road
-Also risk to public amenity features, toilets, car parking and beach access
-Over the next 100 years 238 properties at risk of erosion, but majority of the properties at risk are expected during epoch 3
-Cliffs designated as SSSI due to geological importance
-Dominant sediment transport direction is from west to east



Strategy Leading Options

-National (Managed Realignment C), Local (Managed Realignment A/B) and Backup Options (Maintain) identified
- The National Option (Managed Realignment C) involves constructing a local strong point and undertaking beach nourishment in epoch 2. The aim will be to let erosion of the cliff line occur and cliff line to reach more sustainable position. However, with the defence interventions this will be done in a controlled manner to avoid property loss / loss of road in the future
-The Local Options (Managed Realignment A/B) are the same as the National Option but it involves undertaking the beach nourishment and construction of local strong point sooner (in either epoch 1 or the start of epoch 2)
-The Backup option involves maintenance of existing defences and beach recycling. However, in the long term the erosion risk is likely to be greater than the National / Local options and property loss could occur
-Further work is required after the Strategy to confirm the alignment of the new defences, and this will impact the economic case / timing of interventions



Map of Leading Options

- Alignments are indicative and will vary subject to further appraisal

Works required to deliver leading options*

Option	Epoch 1				Epoch 2	Epoch 3
	Years 2025 - 2029	Years 2030 - 3034	Years 2035 - 2039	Years 2040 - 2044	Years 2045-2074	Years 2075-2124
National	Develop funding strategy Undertake defence maintenance as required The cliffs will continue to erode so support beach hut owners as required			Begin planning for defence upgrades and beach nourishment in epoch 2 (likely mid epoch) Undertake defence maintenance as required The cliffs will continue to erode so support beach hut owners as required	Business case development, funding and consenting, design and construction of local strong point and beach nourishment scheme in epoch 2	Defence maintenance as required and ongoing beach nourishment / management
Local (Managed Realignment A shown for reference)	Develop funding strategy Plan defence upgrades (local strong point) and beach nourishment scheme and develop business case Acquire funding and consents for scheme The cliffs will continue to erode so support beach hut owners as required	Design defence upgrades (local strong point) and beach nourishment scheme Construct scheme The cliffs will continue to erode so support beach hut owners as required	Maintain defences and ongoing beach management as required Continue to monitor rates of cliff erosion following the scheme construction The cliffs will continue to erode so support beach hut owners as required		Defence maintenance as required and ongoing beach nourishment / management	Defence maintenance as required and ongoing beach nourishment / management
Backup	Develop funding strategy >1 funding for local strong point / beach nourishment in the future is unlikely then plan epoch 1 defence refurbishments, acquire consenting and funding for refurbishments and undertake design The cliffs will continue to erode so support beach hut owners as required	Undertake refurbishment of defences The cliffs will continue to erode so support beach hut owners as required	Maintain defences and ongoing beach management as required The cliffs will continue to erode so support beach hut owners as required. Assist in adaptation for local community if properties / road way is at risk		Defence maintenance / refurbishments as required and ongoing beach management. Assist in adaptation for local community if properties / road way is at risk	Defence maintenance / refurbishments as required and ongoing beach management. Assist in adaptation for local community if properties / road way is at risk

Note: not shown in table above, but monitoring and small scale / patch repair maintenance on existing defences and assets should be undertaken annually / as required
timings of works subject to trigger points such as funding and condition of existing defences

Cost profile for capital works and maintenance (not including pre-business case / support work)

Leading Option	Indicative option cost (£k) - cash														
	Epoch 1 (years)				Epoch 2 (years)					Epoch 3 (years)					Total
	2025-2029	2030-2034	2035-2039	2040-2044	2045-2049	2050-5054	2055-2059	2060-2064	2065-2069	2070-2074	2075-2084	2085-2094	2095-2104	2105-2114	2115-2124	
National	98	98	98	98	348	264	264	10,357	264	137	274	1,948	274	1,948	271	16,614
Local	98	4,660	137	137	137	137	1,813	137	137	137	1,948	274	274	1,948	274	12,248
Backup	98	491	98	98	348	264	741	264	348	264	1,005	612	612	1,005	612	6,880

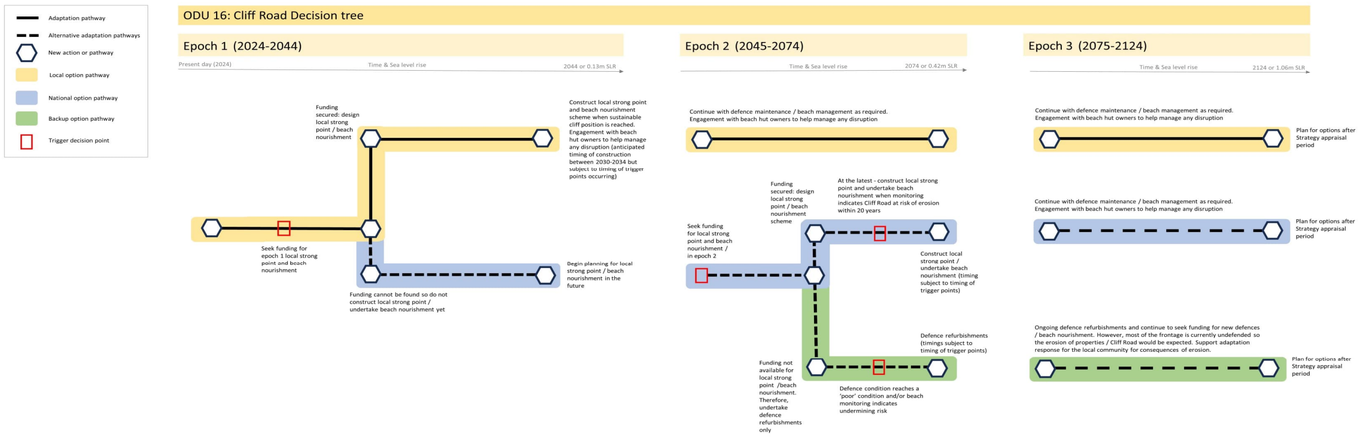
FCERM GiA funding availability

- Indicative FCERM GiA funding availability calculated for scheme as part of the local option in epoch 1, and the national option in epoch 2
- Indicative amount of FCERM GiA available for defence scheme estimated to be in region of £1.3 million (local option scheme) to £1.9million (national option scheme)
- See economics report for assumptions when calculating indicative GiA availability (such as baseline year)

Trigger Points

Category	Influence on	Details of key decisions when implementing options	Triggers
Beach monitoring / rates of cliff erosion	Timing of local strong point construction / beach nourishment in National / Local Options	- The beach is a key component of the defence system in this location and it helps to control rates of cliff erosion. Where the beach is narrower it provides less protection to the cliff toe - At the eastern part of the unit where the beach is narrower, there is already an increased risk of cliff erosion. Beach huts in this section at the base of the cliff have recently been lost due to erosion - Over time there is a risk that the beach profile could change further in response to storms / sea level rise which could reduce the effectiveness of the defence system further - It is recommended that rates of cliff erosion and the beach profiles in ODU 16 continue to be monitored on a regular basis (i.e. every 6 months and in response to storms). This will help to identify any long term trends. - The National / Local options aim to allow some erosion of the cliff to occur in the future to create more space for a wider beach. However, the options will ensure that this erosion will be in a controlled manner with the aim of stopping erosion reaching Cliff Road and the properties landward of this. - The cliff erosion / beach profile trends should therefore be monitored so that the local strong point / beach nourishment scheme as part of these options can be timed appropriately so that the roadway / properties do not become at risk. - The timing of the local strong point / beach nourishment will need to be carefully considered so that a buffer zone of land is retained seaward of Cliff Road. This will ensure that any further erosion in the future (after the scheme is in place) does not threaten the Road and properties - It is recommended that the trigger for undertaking the local strong point / beach nourishment is when the cliff line reaches a distance from Cliff Road that puts the road at risk from erosion within a 20 year period. This will need to consider the rate of erosion that is occurring and beach profile changes based on monitoring results, as well as the distance between the cliff top and Cliff Road. - The local strong point / beach nourishment could be undertaken sooner (for example it is the aspiration to do this in epoch 1 if funding allows), but it should be undertaken no later than the trigger level in order to retain a buffer zone of open space at the cliff top after the scheme is constructed. - A long term record of beach profile / cliff erosion monitoring is required to enable long term significant trends to be identified relative to typical seasonal variations. This will also be important after the local strong point / beach nourishment is undertaken because the cliffs / beach may continue to erode and the monitoring will inform future interventions to help manage this process	- Cliff erosion & beach profile trends that threatens Cliff Road & properties within 20 years (i.e. need to intervene before the road is projected to be at risk within a 20 year period of time)
Defence condition	Timing of defence refurbishments and defence upgrades	- The condition of the defences in ODU 16 varies but are typically "fair" or "poor" and are sensitive to presence and supply of beach material to protect the toe - The condition of the defences can inform the timing of refurbishments and defence upgrades - For defence refurbishments it is recommended that refurbishments are undertaken once defences reach a 'poor' condition. - Similarly, if a defence upgrade scheme is scheduled within several years and the defences reach a 'poor' condition then this could also be a trigger for undertaking the scheme sooner. - It is recommended that detailed defence condition surveys are undertaken on a regular basis to inform the defence condition and changes over time.	- Condition rating of Poor
Funding	Decision on Local vs National vs Backup Option	- The timing of the scheme for the Local and National Options should primarily be determined by the beach profile / cliff erosion trigger threshold. However it is recognised that funding availability may delay the construction of the scheme if funding is not available. If the scheme is delayed, then there is risk of an increased cost for the scheme as more works may be required to stabilise the cliff position if it gets closer to Cliff Road. - The National, Local and Backup Options will have a funding shortfall (i.e. FCERM GiA will not cover the full cost) - The Funding Strategy will need to outline how the scheme / refurbishments will be funded. - If funding for undertaking the local strong point / beach nourishment for Managed Realignment A (local option) in epoch 1 is not available, then the Strategy could revert to the undertaking these improvements at later date - i.e. either Managed Realignment B (also a local option) or Managed Realignment C (National Option). The exact timings will need to be determined by the erosion risk / beach profile trends. There is a risk that the longer the defence scheme is left, the greater the cost of the scheme as more works may be needed to stabilise the cliff position. - If funding for the local strong point / beach nourishment as part of the Local / National options is not available, then the Strategy could revert to the Backup option (Maintain) and only undertake defence refurbishments. - However, this would likely result in increased risk of erosion to Cliff Road / properties and adaptation plans would be required to manage the consequences of this erosion	- Funding availability - Undertaking the local strong point / beach nourishment scheme at a later date if funding is not likely to be immediately available - Revert to Backup option if it is unlikely that any funding can be found for the local strong point / beach nourishment in the future

Decision Tree



ODU 17 - Rook Cliff

Key features / risks

-Open coast frontage between the start of the Rook Cliff defences and the Hurst Road West car park (including the White House)
-Variety of coastal defences including a concrete seawall fronted by a rock revetment, timber and rock groynes
-Recent emergency work completed at Westover to stabilise the defences following a failure. Undermining risk with falling beach levels
-Main risk is from coastal erosion, with 287 properties expected to be at risk over the next 100 years (cumulative)
- Car parks and open space between the defence line and the properties at risk

Strategy Leading Options
-National (Improve C), Local (Improve A/B) and Backup Options (Maintain) identified
- The National Option (Improve C) involves refurbishing existing defences in epoch 1. Then upgrade the defences from approximately the second half of epoch 2. Aim of option is to hold the line
-The Local Options (Improve A/B) are similar to the National Option but involve undertaking the defence upgrades sooner if funding allows (in either epoch 1 or the start of epoch 2) to provide more confidence and reduce residual risk of failure in the short / medium term.
-The Backup option involves maintenance of existing defences through successive refurbishments. However, in the long term there is uncertainty as how successful this would be without upgrading the defences and the residual risk of erosion is expected to increase

Improve (intervene later): aims to minimise erosion of the cliff by upgrading defences at cliff toe in the medium term. In the short term the existing toe defences would be refurbished and then in the medium term the rock structures (revetment / groynes) would be upgraded. This would involve making the structures more robust against sea level rise. This is the Improve C option in the Leading Options report.

Improve (intervene sooner): same approach as Improve C option above aiming to minimise erosion of the cliff, except the upgrades to the rock structures at the cliff toe would be undertaken sooner. This would provide greater certainty in the short and medium term protection. This is Improve A or B in the Leading Options report.

Maintain: proactive maintenance / refurbishments to the existing defences. Due to falling beach levels in this location there is uncertainty as to how sustainable this approach may be in the future and whether long term protection could be provided.

Map of Leading Options
- Alignments are indicative and will vary subject to further appraisal

Works required to deliver leading options*

Option	Epoch 1				Epoch 2	Epoch 3
	Years 2025 - 2029	Years 2030 - 3034	Years 2035 - 2039	Years 2040 - 2044	Years 2045-2074	Years 2075-2124
National	- Develop funding strategy - Plan epoch 1 defence refurbishments, acquire consenting and funding for refurbishments and undertake design - Review SMP policy to align to with this option if this is the option delivered	-Undertake refurbishment of defences	-Undertake defence maintenance as required	-Begin planning for defence upgrades and beach nourishment in epoch 2 (likely mid epoch) - Undertake defence maintenance as required	Business case development, funding and consenting, design and construction of defence upgrade scheme in epoch 2	Defence maintenance / refurbishments as required
Local (Improve A shown for reference)	- Develop funding strategy - Plan defence upgrades and develop business case - Acquire funding and consents for scheme - Review SMP policy to align to with this option if this is the option delivered	- Design defence upgrades - Construct scheme	-Undertake defence maintenance as required		Defence maintenance / refurbishments as required	Defence maintenance / refurbishments as required
Backup	- Develop funding strategy. '- If funding for defence upgrades in the future is unlikely then plan epoch 1 defence refurbishments, acquire consenting and funding for refurbishments and undertake design - Review SMP policy to align to with this option if this is the option delivered	- Undertake refurbishment of defences	-Undertake defence maintenance as required		Defence maintenance / refurbishments as required. Without defence upgrades there may be increased risk of defence failure and erosion occurring so assist in adaptation for local community if this occurs	Defence maintenance / refurbishments as required. Without defence upgrades there may be increased risk of defence failure and erosion occurring so assist in adaptation for local community if this occurs

*note: not shown in table above, but monitoring and small scale / patch repair maintenance on existing defences and assets should be undertaken annually / as required
*timings of works subject to trigger points such as funding and condition of existing defences

Cost profile for capital works and maintenance (not including pre-business case / support work)

Leading Option	Indicative option cost (£k) - cash															
	Epoch 1 (years)				Epoch 2 (years)						Epoch 3 (years)					Total
	2025-2029	2030-2034	2035-2039	2040-2044	2045-2049	2050-5054	2055-2059	2060-2064	2065-2069	2070-2074	2075-2084	2085-2094	2095-2104	2105-2114	2115-2124	
National	50	3,836	50	50	50	50	50	17,521	50	50	100	100	100	2,828	100	24,985
Local	50	13,675	50	50	50	50	50	50	50	50	2,828	100	100	100	100	17,353
Backup	50	2,778	50	1,107	50	50	1,414	50	50	50	2,828	1,157	100	1,464	100	11,298

FCERM GiA funding availability

- Indicative FCERM GiA funding availability calculated for scheme as part of the local option in epoch 1, and the national option in epoch 2
- Indicative amount of FCERM GiA available for defence scheme estimated to be in region of £2.4 million (local option scheme) to £3.4million (national option scheme)
- See economics report for assumptions when calculating indicative GiA availability (such as baseline year)

Trigger Points

Category	Influence on	Details of key decisions when implementing options	Triggers
Beach monitoring	Timing of defence refurbishments and defence upgrades	- The beach is a key component of the defence system as it helps to defend the toe of the defences - When the beach level falls and the toe of the defences becomes exposed, it can increase the risk of the defences failing. - This frontage has a rock revetment along its full length and undermining risk can cause rocks in the lower section of the rock slope to slump or collapse into the scoured zone, decreasing the defence performance - It is recommended that the beach profiles in ODU 17 continue to be monitored on a regular basis (i.e. every 6 months and in response to storms). This will help to identify any trends in beach levels and identify undermining risk - If a trend in beach levels develops which increases undermining risk and threatens the integrity of the defences then this should be a trigger for undertaking defence refurbishments to rebuild the rock slope or upgrades that could improve the toe protection	- Beach profile trends that increase undermining risk and threaten defence integrity
Defence condition	Timing of defence refurbishments and defence upgrades	- The condition of the defences in ODU 17 varies between 'very good' and 'poor' - The condition of the defences can inform the timing of refurbishments and defence upgrades - For defence refurbishments it is recommended that refurbishments are undertaken once defences reach a 'poor' condition. - Similarly, if a defence upgrade scheme is scheduled within several years and the defences reach a 'poor' condition then this could also be a trigger for undertaking the scheme sooner. - It is recommended that detailed defence condition surveys are undertaken on a regular basis to inform the defence condition and changes over time.	- Condition rating of Poor
Funding	Decision on Local vs National vs Backup Option	- The National, Local and Backup Options will have a funding shortfall (i.e. FCERM GiA will not cover the full cost) and if funding cannot be secured then this could delay the timing of defence upgrades and refurbishments. - The Funding Strategy will need to outline how the scheme / refurbishments will be funded. - If funding for undertaking the defence upgrades for Improve A (local option) in epoch 1 is not available, then the Strategy could revert to the undertaking these improvements at later date - i.e. either Improve B (also a local option) or Improve C (National Option). - If funding for the defence upgrades as part of the Local / National options is not available, then the Strategy could revert to the Backup option (Maintain) and only undertake defence refurbishments. - However, this could result in increased risk of erosion in the future as it is uncertain how long existing defences could be refurbished for without compromising performance. Adaptation plans would be required to manage the consequences of any erosion that occurs with this option	- Funding availability - Undertaking the defence upgrade scheme at a later date if funding is not likely to be immediately available - Revert to Backup option if it is unlikely that any funding can be found for the defence upgrades in the future

Decision Tree

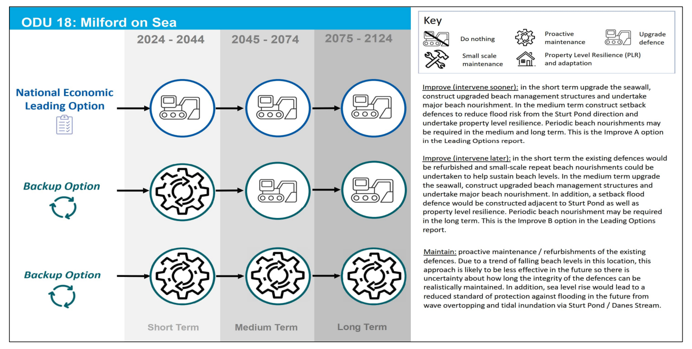
ODU 18 - Milford on Sea

Key features / risks

-Open coast frontage between Hurst Road West car park and the eastern end of Hurst Road (start of Hurst Spit revetment)
-Variety of coastal defences including timber and rock groynes and a concrete seawall / revetment.
-Estimated residual life for many of the defences in this unit < 10 years and a trend of lowering beach levels increases undermining risk
- Main risk is from coastal erosion, however, there is also a risk of coastal flooding from wave overtopping (open coast) and tidal inundation (Sturt Pond)
-137 properties expected to be at risk from erosion over the next 100 years. 78 properties at risk from flooding during 2124 0.5% AEP event.
- The beach is important for recreation / amenity and has disabled access
- Hurst spit is located to the east of this unit and the link with the spit is integral to the management of this feature

Strategy Leading Options

-National (Improve A) and Backup Options (Improve B or Maintain) identified
- The National Option (Improve A) involves upgrading the seawall, constructing new beach control structures (e.g. groynes) and undertaking beach nourishment from epoch 1.
- The National Option would also include a setback tidal defence at the eastern end of the unit in epoch 2 to reduce risk of flooding from Sturt Pond
-The Backup option (Improve B) follows a similar approach to Improve A, except the defence upgrades and beach nourishment would be in epoch 2. In the interim during epoch 1, existing defences would be refurbished
- The second Backup option (Maintain) would involve refurbishing existing defences and undertaking beach management.
-Due to the lowering beach levels there is significant uncertainty as to how effective this option would be in the long term and there is increased risk of defences failing / erosion occurring



Map of Leading Options

- Alignments are indicative and will vary subject to further appraisal
- Only National Option shown

Works required to deliver leading options*

Option	Epoch 1				Epoch 2	Epoch 3
	Years 2025 - 2029	Years 2030 - 3034	Years 2035 - 2039	Years 2040 - 2044	Years 2045-2074	Years 2075-2124
National	- Develop funding strategy and engage with potential funding partners - Develop business case and design of scheme / beach nourishment - The business case / design should include numerical modelling to determine most appropriate beach control structures (i.e. groynes / nearshore breakwaters / fishtail groynes etc) - Acquire funding and consents for scheme - Ongoing beach management as required - Review SMP policy to align to with this option if this is the option delivered	- Construction of scheme / beach nourishment	-Undertake defence maintenance and ongoing beach management as required		Business case development, funding and consenting, design and construction of setback flood defences in epoch 2. Ongoing beach management along the open coast	Defence maintenance / beach management and property level resilience as required
Backup (Improve B)	- Develop funding strategy - Plan defence refurbishments for epoch 1, acquire consents and funding for refurbishments and undertake design - Ongoing beach management as required - Review SMP policy to align to with this option if this is the option delivered	- Undertake refurbishment of defences - Ongoing beach management as required	-Undertake defence maintenance and beach management as required	- Develop business case and design of scheme for upgraded defences / beach nourishment / setback flood defences - The business case / design should include numerical modelling to determine most appropriate beach control structures (i.e. groynes / nearshore breakwaters / fishtail groynes etc) - Acquire funding and consents for scheme - Ongoing beach management as required	-Construction of scheme / beach nourishment / setback flood defences. Ongoing beach management as required	Defence maintenance / beach management and property level resilience as required
Backup (Maintain)	- Develop funding strategy. - Plan epoch 1 defence refurbishments, acquire consenting and funding for refurbishments and undertake design - Ongoing beach management as required - Review SMP policy to align to with this option if this is the option delivered	- Undertake refurbishment of defences - Ongoing beach management as required	-Undertake defence maintenance and beach management as required		Defence maintenance / refurbishments / beach management as required. Without defence upgrades there may be increased risk of defence failure and erosion occurring so assist in adaptation for local community if this occurs	Defence maintenance / refurbishments / beach management as required. Without defence upgrades there may be increased risk of defence failure and erosion occurring so assist in adaptation for local community if this occurs

**note: not shown in table above, but monitoring and small scale / patch repair maintenance on existing defences and assets should be undertaken annually / as required*
**timings of works subject to trigger points such as funding and condition of existing defences*

Cost profile for capital works and maintenance (not including pre-business case / support work)

Leading Option	Indicative option cost (£k) - cash															
	Epoch 1 (years)				Epoch 2 (years)						Epoch 3 (years)					Total
	2025-2029	2030-2034	2035-2039	2040-2044	2045-2049	2050-5054	2055-2059	2060-2064	2065-2069	2070-2074	2075-2084	2085-2094	2095-2104	2105-2114	2115-2124	
National	803	4,331	6,741	89	89	89	3,796	89	89	89	2,557	429	429	1,652	414	21,686
Backup (Improve B)	803	3,998	250	250	10,982	89	2,572	89	89	1,312	1,259	179	1,602	429	429	24,332
Backup (Maintain)	1,328	4,672	376	376	376	376	4,497	376	376	376	4,873	752	752	4,873	451	24,830

FCERM GiA funding availability

- Indicative FCERM GiA funding availability calculated for scheme as part of the national option in epoch 1
- Indicative amount of FCERM GiA available for defence scheme estimated to be in region of £1.3 million
- See economics report for assumptions when calculating indicative GiA availability (such as baseline year)

Trigger Points

Category	Influence on	Details of key decisions when implementing options	Triggers
Beach monitoring	Timing of defence refurbishments / defence upgrades and beach management	- The beach is a key component of the defence system as it helps to defend the toe of the defences - When the beach level falls and the toe of the defences becomes exposed, it can increase the risk of the defences failing. - This frontage has a seawall / revetment along its full length and undermining risk can cause instability at the toe of the defences leading to collapse and defence failure - It is recommended that the beach profiles in ODU 18 continue to be monitored on a regular basis (i.e. every 6 months and in response to storms). This will help to identify any trends in beach levels and identify undermining risk - If a trend in beach levels develops which increases undermining risk and threatens the integrity of the defences then this should be a trigger for undertaking defence refurbishments / upgrades that could improve the toe protection, and/or undertaking beach management to increase beach levels and provide better protection to the toe.	- Beach profile trends that increase undermining risk and threaten defence integrity
Defence condition	Timing of defence refurbishments and defence upgrades	- The condition of the defences in ODU 18 varies between 'good' and 'poor' - The condition of the defences can inform the timing of refurbishments and defence upgrades - For defence refurbishments it is recommended that refurbishments are undertaken once defences reach a 'poor' condition. - Similarly, if a defence upgrade scheme is scheduled within several years and the defences reach a 'poor' condition then this could also be a trigger for undertaking the scheme sooner. - It is recommended that detailed defence condition surveys are undertaken on a regular basis to inform the defence condition and changes over time.	- Condition rating of Poor
Sea level rise	Timing of flood defence scheme for Improve A (National) and Improve B (Backup) options	- The National and Local options involve upgrading the defences along the open coast to reduce wave overtopping risk, and constructing a setback flood defence adjacent to Sturt Pond to reduce the tidal flood risk from this direction. - The defence upgrades along the open coast should be undertaken when the seawall / revetment is upgraded in epoch 1 or 2. Any residual flood risk from wave overtopping prior to the scheme construction should be managed with property level resilience measures (in epoch 1 and 2 there is unlikely to be an economic case to do works to reduce wave overtopping risk at a separate time to the broader defence upgrades which also provide an erosion benefit). - The construction of the setback flood wall adjacent to Sturt Pond should be informed by rates of sea level rise and the onset of flood risk in the future. The flood modelling of this area suggests that the flooding from the Sturt Pond direction increases in severity in epoch 2 due to sea level rise. - Existing UKCP18 SLR projections indicate 0.13m of sea level rise is expected to occur by the start of epoch 2. Therefore a 0.13m trigger for sea level rise is recommended for undertaking planning / construction for the setback defence construction. - Any residual risk of flooding in this location prior to the defences being upgraded / setback defence construction should be managed with property level resilience measures. Subject to alignment of the setback defence, it may also be necessary to continue with property level resilience measures after construction as it may not be possible to include all properties at risk from flooding within the scheme alignment.	- Begin scheme planning / business case development for setback flood defence when SLR is 0.13m
Funding	Decision on National vs Backup Options	- The National and Backup Options will have a funding shortfall (i.e. FCERM GiA will not cover the full cost) and if funding cannot be secured then this could delay the timing of defence upgrades and refurbishments. - The Funding Strategy will need to outline how the scheme / refurbishments will be funded. - If funding for undertaking the defence upgrades for Improve A (National option) in epoch 1 is not available, then the Strategy could revert to the undertaking these improvements at later date - i.e. Improve B (a Backup option). - If funding for the defence upgrades at a later date is not available (Improve B), then the Strategy could revert to the alternative Backup option (Maintain) and only undertake defence refurbishments. - However, due to the trend of lowering beach levels in this location, this approach could result in increased risk of erosion in the future as it is uncertain how long existing defences could be refurbished for before it no longer becomes feasible. Adaptation plans would be required to manage the consequences of any erosion that occurs with this option	- Funding availability - Undertaking the defence upgrade scheme at a later date if funding is not likely to be immediately available - Revert to Maintain option if it is unlikely that any funding can be found for the defence upgrades in the future

Decision Tree