CCA5 Emerging Preferred Option Multi Criteria Analysis

Core Criteria	Sub Criteria	Option 1	Option 1 Narrative (Do Nothing)	Option 2	Option 2 Narrative (Do Minimum)
Economy	Land Use and Third Party Assets		No impact on third party land and property as there would be no works.		No impact on third party land and property as there would be no additional works not already being carried out by Irish Rail.
	Capital Expenditure		This Option would not include any capital costs.		This Option would include minimal capital costs.
	Maintenance Expenditure		No maintenance required for this option.		This Option would rely on reactive maintenance, which would become more frequent and expensive over time.
	Health and Safety (Construction)		This Option would present the lowest Health and Safety risk for construction as no major works would take place.		This Option would result in localised remedial works being required with a mixture of marine and land based plant. Minor works of this nature would be risk assessed by the contractor. However these works may be undertaken under poor working conditions due to immediate risk to the railway.

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Core Criteria	Sub Criteria	Option 1	Option 1 Narrative (Do Nothing)	Option 2	Option 2 Narrative (Do Minimum)
Safety	Health and Safety (Design Life)		There are currently no coastal defences along the majority of CCA5 as the railway line is on top of the cliffs. Under the Do Nothing scenario no intervention will be undertaken to stabilise the cliffs and prevent cliff falls and landslides. This will lead to sudden and potentially catastrophic cliff falls onto the railway line and the beaches below.		This Option will involve reactive works such as placing rock armour at the toe of the cliffs to prevent further landslides. These works will not be planned or considered in a holistic way for the whole frontage and could result in limited access to certain parts of the frontage leading to increased potential for people becoming trapped or cut off by the tide.
Accessibility and Social Inclusion	Community		Option 1 (Do Nothing Scenario) is considered to have significant disadvantages over other options as any maintenance programmes currently taking place will cease under this scenario (however 'make safe' works would continue) with occurrences of coastal erosion and/or damage or collapse of existing erosion measures continuing and potentially getting worse in line with climate change predictions. Furthermore, the continuation of such coastal erosion has the potential to impact operational train services using the rail line in future years.		Option 2 (Do Minimum Scenario) is considered to have some disadvantages over other options as while any maintenance programmes currently taking place will continue under this scenario, occurrences of coastal erosion and/or damage or collapse of existing erosion measures will continue and potentially get worse in line with climate change predictions. Furthermore, the continuation of such coastal erosion has the potential to impact operational train services using the rail line in future years.
	Access		Option 1 (Do Nothing Scenario) is considered to have significant disadvantages over other options as it will likely remove current access to the beach amenity area while also be detrimental to the Bray to Greystones Coastal Cliff Walk that runs behind it, ultimately leading to its complete loss.		Option 2 (Do Minimum Scenario) is considered to have some disadvantages over other options as it will likely result, in time, of the eventual removal of the current access to the beach amenity area while also be detrimental to the Bray to Greystones Coastal Cliff Walk that runs behind it, ultimately leading to its eventual complete loss.
	Social and Recreation Facilities		Option 1 (Do Nothing) is considered to have significant disadvantages over other options as under this option there would likely be the loss of the Bray to Greystones Coastal Cliff Walk.		Option 2 (Do Minimum) is considered to have some advantages over other options as under this option there would be no effects on existing social and recreational facilities (i.e. beach amenity areas) in this CCA. However the effects of unmitigated climate change will eventually impact these resources.

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Core Criteria	Sub Criteria	Option 1	Option 1 Narrative (Do Nothing)	Option 2	Option 2 Narrative (Do Minimum)
Integration	Compatibility with Development Plans		Do Nothing would provide a significant disadvantages over other options as development/local area plans identify coastal zone management and protection of coastal area is important. Wicklow County Council have a number of Development Plan objectives relating to coastal defence/protection.		Do Minimum would provide some disadvantages over other options as coastal zone management and coastal area protection are identified as important within the relevant development plans. The disadvantage relating to this option is that as the minimum works rely on repairs it would not fully achieve the objectives of the plans. 'Patching up' existing infra and not addressing long term climate issues doesn't address this.
	Compatibility with Climate Adaptation Plans		Do Nothing would provide significant disadvantages over other options as it would contravene climate objectives such as Eastern and Midlands Region RSES "RPO 7.3 EMRA will support the use of Integrated Coastal Zone Management (ICZM) to enable collaborative and stakeholder engagement approaches to the management and protection of coastal resources against coastal erosion, flooding and other threats."		Do Minimum would provide some disadvantages over other options as coastal zone management and coastal area protection are identified as important within the relevant development plans. The disadvantage relating to this option is that the minimum works rely on repairs, not a full upgrade so would not fully achieve the objectives of the plans which include the need for climate adaptation. The Climate Action Plan 2023 sets out under 15.3.6 (Adaptation) the challenges related to the operation and resilience of the inter alia the rail network. There is a need to go beyond 'patching up' and to prepare for current and future change.
	Compatibility with Transport Plans		The NTA's Greater Dublin Area Transport Strategy 2022-2042 outlines the need to ensure resiliency of the public transport network to climate change effects, and specifically mentions potential flooding along the Dublin and Wicklow coastline. Do Nothing will mean no interventions being made to prevent flooding and coastal erosion, events of which may become increasingly more frequent in the future due to climate change. While there may be little short-term impact, in the longer term this will put increasing pressure on the public transport to accommodate passengers displaced from rail services. Disruptions to the rail service may result in an unreliable public transport system, causing a mode shift to car travel rather than public transport. This goes against the Transport Strategy's focus on facilitating increased use of sustainable modes.		Do Minimum is expected to involve disruptions to public transport in the short to medium term to conduct repairs as the need arises. The ad hoc repairs will address damage that may occur, but won't build longer-term resilience against potential impacts of flooding or erosion. As per Do Nothing, this is likely to put increasing pressure on the public transport system and challenge its reliability, going against the Transport Strategy's focus on facilitating increased use of sustainable modes.

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Core Criteria	Sub Criteria	Option 1	Option 1 Narrative (Do Nothing)	Option 2	Option 2 Narrative (Do Minimum)
Environmental	Biodiversity		Do Nothing would provide an advantage as there would be no construction work and therefore no impact on biodiversity/ protected areas from habitat loss/degradation and disturbance (noise/pollution). There are no Ramsar sites, one SAC (Bray Head SAC), no SPA within CCA5 and one SPA to the south SPA (The Murrough SPA being the closest), no pNHA and one pNHA (Bray Head) that could be effected in a beneficial way. The natural process of habitat expansion of vegetated sea cliffs and European dry heaths (QI of Bray Head SAC) and creation of fissures providing supporting habitat for the important sea bird colony at Bray Head and SPA bird species of the nearby Mur rough SPA (whose QI bird species utilise this area). No impacts to any QI, from construction and operation as natural processes overall would progress unconstrained.		Do Minimum would provide a slight disadvantage in comparison to the 'Do Nothing' option as there would be little/limited/targeted construction work and therefore minimal impact on biodiversity/ protected areas. There are no Ramsar sites, one SAC (Bray Head SAC) within CCA5 and one outside (Lambay Island). No SPA within CCA5 and one SPA to the south SPA (The Mur rough SPA being the closest), no pNHA, one pNHA (Bray Head) that could be effected in a minor negative way. Repair works could cause damage and/or loss to QI habitats of the Bray Head SAC and loss of nesting habitat from gully works. Disturbance could be caused to the important sea bird colony and the SPA bird species of the nearby Mur rough SPA (whose QI bird species utilise this area) and to a lesser extent marine mammals (seals in particular) that are known to haul out in this area (these QI are designated features of Lambay Island SAC (designated for marine habitats (not impacted) and grey and harbour seals). Natural processes overall would progress relatively unconstrained.
	Landscape and Visual and Seascape		Continued degradation and coastal erosion as a result of no works being undertaken would result in continued loss of elevated coastal farmland, generating significant adverse landscape/seascape and visual effects. Significant disadvantages over all ‘Do Minimum’ options.		Continued reactive interventions would compromise the character and quality of this stretch of coastline and its amenity, with ongoing works generating adverse landscape/seascape and visual effects. Given the scale of this section of coastline and the elevation of visual receptors in locations away from the immediate edge, this ongoing state of repair and disruption is comparatively less impactful than in other parts of the coastline where it is experienced at grade and at closer proximity.
	Archaeology, Architectural and Cultural Heritage		Continued degradation and coastal flooding as a result of no works being undertaken would generate significant adverse Archaeology, Architectural and Cultural Heritage effects. Similar to, with disadvantages over Option 2 and significant disadvantages over all 'Do Minimum' options.		Continued degradation, and piecemeal, reactive interventions, would generate a coastline that is in a constant state of repair and disruption, with constant adverse Archaeology, Architectural and Cultural Heritage effects. Similar to, with advantages over option 1. Some disadvantages over ‘Do Minimum’ options 3-8
	Marine Archaeology		Do Nothing would provide some advantage as there would be no proposed construction and therefore no potential impact on archaeological features in the intertidal and marine elements.		Do Minimum would provide some advantage as there would be limited/targeted construction and therefore no potential impact on archaeological features in the intertidal and marine elements.
	Noise and Vibration		Do Nothing would provide some advantages as there would be no construction or maintenance works and therefore no construction related noise or vibration impacts on noise sensitive population receptors. The long term operational scenario would have some disadvantages compared to other options if rail services are suspended and road traffic on surrounding road network increases. Due to the longer term duration of potential impacts, this is weighted as less advantageous over other options		Do Minimum would provide some advantages due to absence of temporary - short term noise and vibration impacts from any construction works. The existing maintenance works will continue as necessary which will be of neutral impact, albeit these will likely intensify in frequency. The long term operational scenario is neutral compared to other options, although the rail service will likely be less reliable and has potential for increased traffic on surrounding road network. Due to the longer term duration of potential impacts, this is weighted as less advantageous over other options.

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Core Criteria	Sub Criteria	Option 1	Option 1 Narrative (Do Nothing)	Option 2	Option 2 Narrative (Do Minimum)
	Air Quality		No construction phase impacts. Potential for long term local operational phase impacts should the rail line be suspended in future. If rail services are suspended this has the potential to increase local road traffic.		Lower or not significant construction phase impacts. General construction dust emissions and heavy Machinery have the potential to be used for reactive Do Minimum construction works, resulting sources of dust and air pollution. Potential for long term local operational phase impacts should the rail line be suspended in future. If rail services are suspended this has the potential to increase local road traffic.
	Carbon Management		GHG emissions from embodied carbon is lower due to no construction. However, the potential for long term local operational phase impacts should the rail line be suspended in future. If rail services are suspended this has the potential to increase local road traffic.		GHG emissions from embodied carbon is minimised lower due to no construction. General construction works and heavy Machinery used are sources of dust and air pollution. However, the potential for long term local operational phase impacts should the rail line be suspended in future. If rail services are suspended this has the potential to increase local road traffic.
	Water Resources		Do Nothing would provide a significant advantage as it there would be no construction work and therefore no impact on groundwater		Do Minimum would provide a significant advantage as it there would be minimal construction work and therefore negligible impact on groundwater
	Geology and Soils		In the short term, there will be no impacts to geological resources. However, the effects of climate change may result in the erosion of the local geology in the long term.		There will be some advantages in the short term as a result of the minimal disturbance during the construction phase of the Scheme. However, the mitigation installed may not be sufficient to address erosion of geological resources caused by climate change.
	Material and Circular Economy		Do Nothing would provide significant advantages over other options as it avoids the consumption and use of material resources. However, some materials would still be consumed in managing the HSE risks of the structures failing (e.g. signage or fencing to prevent access).		Do Minimum would provide significant advantages over other options as it minimises the consumption and use of material resources through maximising the use of existing assets to reduce the extent of any new construction required (i.e. during the current maintenance regime of ongoing monitoring and reactive repairs).
	Waste		Do Nothing would provide significant advantages over other options as it avoids the generation and disposal of waste. However, waste is still likely to be generated during any future works involved with managing the HSE risks of the structures failing (e.g. targeted removal of existing site assets).		Do Minimum would provide significant advantages over other options as it minimises the generation and disposal of waste through maximising the use of existing assets to reduce the extent of any new construction required (i.e. during the current maintenance regime of ongoing monitoring and reactive repairs).
	Traffic and Transport		Potential for significant disruption or severing of rail transport in the longer term if no intervention is made. Rail service impacts/loss may lead to overcrowding on buses and/or increased road congestion.		Potential unexpected disruptions to transport to make ad hoc repairs. Rail service impacts may lead to overcrowding on buses and/or increased road congestion.
	Constructability		Do Nothing requires no construction works (other than making the area safe)		This Option is likely to require ad hoc emergency repairs to the defences
	Rail Service Impact		Do Nothing requires no construction works (other than making the area safe)		This Option is likely to require ad hoc and emergency works to the defences, which may impact rail operations. It will be difficult to plan ahead for these works as there will be no strategy in place for routine maintenance works

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Core Criteria	Sub Criteria	Option 1	Option 1 Narrative (Do Nothing)	Option 2	Option 2 Narrative (Do Minimum)
Engineering/ Technical	Reliance on Maintenance Maintenance burden		No requirement for maintenance or adaptation but significant monitoring would be required to keep the public safe.		This Option would rely heavily on monitoring and maintenance.
	Adaptation		No opportunity for adaptation.		This Option has minimal opportunities for adaptation.
	Residual Risk		Defence will likely slowly degrade and would then fail very quickly/catastrophically during an event.		Reactive measure could include small scale works to manage the risk, such as localised placement or rock armour.
Planning Risk	Consenting Risk		Do Nothing would provide a significant advantage as it would require no consents.		Do Minimum would provide a significant advantage as it would require no consents.

Core Criteria	Sub Criteria	Option 4	Option 4 Narrative (Rock Revetments)	Option 5	Option 5 Narrative (Rock Revetments with managed realignment)
Economy	Land Use and Third Party Assets		This Option is similar to other options as the rock bolting and netting proposed on Bray Head will impact on Wicklow County Council lands. There are no impacts on third party lands.		This Option is similar to other options as the rock bolting and netting proposed on Bray Head will impact on Wicklow County Council lands. There are no impacts on third party lands.
	Capital Expenditure		This Option would require large volumes of rock. It is assumed that the rock would be delivered from overseas by barge and stockpiled directly onto the beach (depending on vessel draught it may come in smaller or larger barges depending on the contractors methodology). The rock would then be moved into place using land based plant which would be less costly than marine based plant.		This Option has advantages over Option 4 as it requires significantly less rock which will reduce the capital expenditure.
	Maintenance Expenditure		Operational maintenance costs for this option should be relatively low. Some maintenance in the form of repositioning of rocks may be required within the design life but this should be infrequent. Repair works could be undertaken from the beach with excavators mitigating the need for specialist or marine based plant.		Operational maintenance costs for this option should be relatively low. Some maintenance in the form of repositioning of rocks may be required within the design life but this should be infrequent. Repair works could be undertaken from the beach with excavators mitigating the need for specialist or marine based plant. Although this option requires less rock armour than Option 4 the maintenance costs will mostly be associated with mobilising the plant so there are not expected to be significant differences between the costs of the two options
	Health and Safety (Construction)		This Option has advantages over other options as the rock revetments can be constructed using land based plant which has less construction risks compared to marine based plant. The construction of rock revetments is also less complex than detached breakwaters and concrete structures.		This Option is similar to Option 4 but is smaller in scope. This reduces the Health and Safety risk exposure.

Core Criteria	Sub Criteria	Option 4	Option 4 Narrative (Rock Revetments)	Option 5	Option 5 Narrative (Rock Revetments with managed realignment)
Safety	Health and Safety (Design Life)		Rock armour revetments comprise interlocking rocks. The rocks are placed in such a way that they have voids between them to reduce the wave energy. This does pose a Health and Safety risk of members of the public climbing on the rocks and becoming trapped. If constructed correctly the size of the voids will be limited and 'chimneys' through multiple layers of rocks will be avoided. Warning signs should be installed to deter the public from climbing on the revetments. A revetment will also reduce the useable area of the beach and could therefore lead to increased risk of being cut off by the tide. Maintenance of the revetments should be very limited and therefore maintenance related Health and Safety risks should be minimal.		The rock armour revetments could pose a risk of people becoming trapped if they climb on the revetments. Warning signs should be installed to deter the public from climbing on the revetments. The rock revetments will be placed at the toe of the cliffs which will initially limit access along the beach due to the footprint of the revetments. In time the cliffs will erode either side of the revetments and then begin to outflank the revetments and in time erode the cliffs behind the revetments, albeit at a slower rate. As this happens, access along the beach will be created on the landward side of the revetments. Maintenance of the revetments should be very limited and therefore maintenance related Health and Safety risks should be minimal. As the cliffs either side of the rock revetments will be left undefended there is potential for landslides in these areas as the cliffs erode and become undermined.
Accessibility and Social Inclusion	Community		This Option is considered to have disadvantages to other options as it would place rock revetment along the entire southern extent of the coastline, which would likely have a detrimental effect on the local community. This is because the rock revetment would be placed along the length and breadth of the existing beach area, restricting its use and general amenity value for the local community. This Option is likely to be less attractive to the public than other options.		This Option is considered to have some advantages over other options as it would only place rock revetment at defined locations along the coastline, as such only limiting any impacts on the beach amenity area.
	Access		This Option is considered to have some disadvantages over other options as the placement of rock revetment will considerably restrict access to and along the existing beach amenity area.		This Option is considered to have some advantages over other options as while there will be the imposition of rock revetments along specific sections of the coastline of this CCA which will likely restrict access to and along the beach amenity area, the remaining beach amenity area will remain accessible as it is currently.
	Social and Recreation Facilities		This Option is considered to have some disadvantages over other options as the rock revetment will be placed along the length and breadth of the southern half of the coastline within this CCA. This would likely remove the ability of the public to use this beach amenity area as an area for social and recreational activities.		This Option is considered to have some advantages over other options as the rock revetment will only be placed at specific locations along the coastline of this CCA, which could potentially result in the curtailment or removal of social and recreational facilities (i.e. beach amenity areas) at these locations however the majority of the existing social and recreational facilities (i.e. beach amenity areas) will be unaffected under this option (when operational).

Core Criteria	Sub Criteria	Option 4	Option 4 Narrative (Rock Revetments)	Option 5	Option 5 Narrative (Rock Revetments with managed realignment)
Integration	Compatibility with Development Plans		This Option would have some advantages over other options. It aligns with coastal protection, coastal area management objectives and protection of the rail line objectives within the development plans. However, there is no enhancement of the areas - utilising naturally occurring green infrastructure, impacting natural habitats, large amount of hard standing, providing coastal recreation amenities or incorporating pedestrian/cycling infrastructure. The depth of the hard engineering works into the beach area is more significant than other options therefore reducing existing amenity. Within a candidate SAC, SAAO (Special Amenity Area) and public right of way. It is an objective to protect all listed views. It is an objective to not permit development that would reduce existing heathland, maritime grassland and wooded areas (except in cases of public interest). NOTE Cell2 (Bray Head) Development Plan Objective "To facilitate coastal protection works (natural, soft or hard engineered), to protect both the amenity value of the Cliff Walk and the significant economic and social value of the railway line." Note that Wicklow County Council Development Plan Cell 4 (Greystones Town) has an objective for a "high quality integrated harbour/marina mixed development linked to a linear coastal public park and any future heritage park." It goes on to say "The development shall provide a link to the coastline with public access and coastal protection works provided to preserve the landscape from further erosion." It also specifies an objective to "facilitate the development and enhancement of visitor and recreational facilities along the coastal area."		This Option would have significant advantages as it requires less material and less surface area when compared with Option 4. Less infrastructure required on the beach area. Reduced areas of impact along the coast. This Option aligns with high level coastal protection and coastal area management objectives within the development plans. Note that Wicklow County Council Dev Plan Cell 4 (Greystones Town) has an objective for a "high quality integrated harbour/marina mixed development linked to a linear coastal public park and any future heritage park." It goes on to say "The development shall provide a link to the coastline with public access and coastal protection works provided to preserve the landscape from further erosion." It also specifies an objective to "facilitate the development and enhancement of visitor and recreational facilities along the coastal area." Within a candidate SAC, SAAO (Special Amenity Area) and public right of way.
	Compatibility with Climate Adaptation Plans		This Option is similar to Option 5 but would required more material to be brought to site. This Option would align with the Transport Climate Change Sectoral Adaptation Plan (Transport Climate Change Sectoral Adaptation Plan) by protecting the existing rail infrastructure through a complete upgrade of existing defences.		This Option would have some advantages over other options as it requires significantly less material than other options. This Option would align with the Transport Climate Change Sectoral Adaptation Plan in terms of protecting the coastline and transport assets.
	Compatibility with Transport Plans		This Option will improve the protection of the rail line against climate change impacts, in line with the Transport Strategy's aim to "provide a sustainable, accessible and effective transport system for the Greater Dublin Area which meets the region’s climate change requirements, serves the needs of urban and rural communities, and supports economic growth". The Greater Dublin Area Cycle Network Plan proposes a National Cycle Route, the East Coast Trail, with an indicative route along part of the coastline south of Bray Head (CCA5-B). Providing the intervention works can accommodate the East Coast Trail, this option will support the Transport Strategy.		This Option will improve the protection of the rail line against climate change impacts, in line with the Transport Strategy's aim to "provide a sustainable, accessible and effective transport system for the Greater Dublin Area which meets the region’s climate change requirements, serves the needs of urban and rural communities, and supports economic growth". GDATS also has Measure PT2 - Climate Proofing New Public Transport Infrastructure and Measure PT3 - Resilience of Public Transport Services. Both aims are met by Option 5 by future proofing the Dublin to Wexford rail corridor by implementing coastal erosion measures. The Greater Dublin Area Cycle Network Plan proposes a National Cycle Route, the East Coast Trail, with an indicative route along part of the coastline south of Bray Head (CCA5-B). Providing the intervention works can accommodate the East Coast Trail, this option will support the Transport Strategy.

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Core Criteria	Sub Criteria	Option 4	Option 4 Narrative (Rock Revetments)	Option 5	Option 5 Narrative (Rock Revetments with managed realignment)
Environmental	Biodiversity		This Option is similar to Option A would be similar to 'Do Minimum' in that there would be little/limited/targeted construction work and therefore minimal impact on biodiversity/ protected areas. There are no Ramsar sites, one SAC (Bray Head SAC) within CCA5 and one outside (Lambay Island), no SPA within CCA5 and one SPA to the south SPA (The Mur rough SPA being the closest), no pNHA one pNHA (Bray Head) that could be effected in a minor negative way. Repair works could cause damage and/or loss to QI habitats of the Bray Head SAC and loss of nesting habitat from gully works. Disturbance could be caused to the important sea bird colony and the SPA bird species of the nearby Mur rough SPA (whose QI bird species utilise this area) and to a lesser extent marine mammals (seals in particular) that are known to haul out in this area (these QI are designated features of Lambay Island SAC (designated for marine habitats (not impacted) and grey and harbour seals). Natural processes could be impacted through netting and changes in drainage but overall could progress relatively unconstrained. This Option is similar to other options. The revetment works would be undertaken using land based plant but rock would be delivered using marine plant. Night working may be required due to tidal working and this would cause disturbance to QI species. During wintering bird surveys at Bray Head it was noted that there was a clear aversion for the rip/rap along Bray Head. No birds were seen using these sites for nesting or even resting. The construction of the revetment would cause disturbance to birds and QI species (birds and marine mammals) of nearby SPA/SAC and operation may cause habitat loss to birds.		Option A would be similar to 'Do Minimum' in that there would be little/limited/targeted construction work and therefore minimal impact on biodiversity/ protected areas. There are no Ramsar sites, one SAC (Bray Head SAC) within CCA5 and one outside (Lambay Island), no SPA within CCA5 and one SPA to the south SPA (The Mur rough SPA being the closest), no pNHA one pNHA (Bray Head) that could be effected in a minor negative way. Repair works could cause damage and/or loss to QI habitats of the Bray Head SAC and loss of nesting habitat from gully works. Disturbance could be caused to the important sea bird colony and the SPA bird species of the nearby Mur rough SPA (whose QI bird species utilise this area) and to a lesser extent marine mammals (seals in particular) that are known to haul out in this area (these QI are designated features of Lambay Island SAC (designated for marine habitats (not impacted) and grey and harbour seals). Natural processes could be impacted through netting and changes in drainage but overall could progress relatively unconstrained. This Option is similar to Option 4 but with advantages due to the reduced footprint of the work.
	Landscape and Visual and Seascape		As a natural material, rock revetements would tie in comparatively successfully with the rocky, cliffed context of this stretch of coastline, and the nature of the shingle beach material present. The placement of material would be more robust and considered than reactionary measures, and as such would complement and enhance those rock revetements already present. When used consistently, the continuous feature will have a scale and uniformity that will complement the large sweeping nature of this stretch of coastline, moderating landscape and visual effects. Although the cliffs lining the coastal edge will moderate the scale of these features, in places they require a large land take, which will result in the loss of a large areas of beach which is considered adverse, and which will be noticeable in all states of the tide. With time, the rock material will naturalise at the base of the cliff edge, and form a congruous part of the coastal edge as observed where revetements are present.		Intermittent use of rock revetements at specific locations would mitigate the loss of sections of beach, and generate headlands and bays that would contribute to the rugged and natural qualities of this section of coastline. However, when compared to Option 4 and 6, the managed erosion, together with the intermittent use of rock revetements will generate an inconsistency along the coastline that is considered to be detrimental in terms of its impact on the character and visual qualities of this section of coastline.
	Archaeology, Architectural and Cultural Heritage		A potential direct impact on one SMR Site (WI008-011003; Midden) and one SMR Zone of Notification associated with (WI008-011; Castle - unclassified, WI008-011001; Moated site, WI008-011002; Settlement deserted - medieval and WI008-011003; Midden) have been identified, there is also the potential for direct impacts to occur on previously unrecorded archaeological heritage. There is the potential for significant indirect setting and visual impacts to occur on four SMR sites (WI008-011; Castle - unclassified, WI008-011001; Moated site, WI008-011002; Settlement deserted - medieval and WI008-011003; Midden) and the associated Zone of Notification. There is the potential for indirect setting and visual impacts to occur on 2 RPS Sites (RPS ref 08-79). Significant advantages over Options 1 and 2.		A potential direct impact on one SMR Site (WI008-011003; Midden) and one SMR Zone of Notification associated with (WI008-011; Castle - unclassified, WI008-011001; Moated site, WI008-011002; Settlement deserted - medieval and WI008-011003; Midden) have been identified, there is also the potential for direct impacts to occur on previously unrecorded archaeological heritage. There is the potential for significant indirect setting and visual impacts to occur on four SMR sites (WI008-011; Castle - unclassified, WI008-011001; Moated site, WI008-011002; Settlement deserted - medieval and WI008-011003; Midden) and the associated Zone of Notification. There is the potential for indirect setting and visual impacts to occur on 2 RPS Sites (RPS ref 08-79). Significant advantages over Options 1 and 2.
	Marine Archaeology		There are no direct impacts on previously unrecorded wrecks, paleoenvironmental landscapes and material culture, and therefore no potential impact on archaeological features in the intertidal and marine elements.		There are no direct impacts on previously unrecorded wrecks, paleoenvironmental landscapes and material culture, and therefore no potential impact on archaeological features in the intertidal and marine elements.
	Noise and Vibration		Area of works set back from population Noise Sensitive Locations with potential for any significant noise or vibration impacts. Likely require night-time works to work around tides. Highest potential impact during night-time works in CCA5-B towards Greystones. Overall works will be temporary at any affected NSL. No long term operational noise or vibration impacts. Overall option is similar to other Do Minimum options in this area		Area of works set back from population Noise Sensitive Locations with potential for any significant noise or vibration impacts. Likely require night-time works to work around tides. Highest potential impact during night-time works in CCA5-B towards Greystones. Overall works will be temporary at any affected NSL. No long term operational noise or vibration impacts. Overall option is similar to other Do Minimum options in this area

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Core Criteria	Sub Criteria	Option 4	Option 4 Narrative (Rock Revetments)	Option 5	Option 5 Narrative (Rock Revetments with managed realignment)
	Air Quality		No operational phase impacts. This Option would facilitate operational phase reliance on public transport and reduce reliance on private vehicles for the long term. Potential for construction phase impacts but lower potentially dusty activities compared to other options and some construction vehicle emissions. Construction phase impacts would be likely considered short term and dust mitigation can be put in place.		No operational phase impacts. This Option would facilitate operational phase reliance on public transport and reduce reliance on private vehicles for the long term. Potential for construction phase impacts associated but lower potentially dusty activities compared to other options and some construction vehicle emissions. Construction phase impacts would be likely considered short term and dust mitigation can be put in place. This Option has significant advantages over other options to less construction works being required
	Carbon Management		Whole Life Carbon (tonnes CO2e) was 19% of average across the 9 options, therefore it is more preferable of the options. This Option would facilitate operational phase reliance on public transport and reduce reliance on private vehicles for the long term.		Whole Life Carbon (tonnes CO2e) was 7% of average across 9 options, therefore it is most preferable of the options. This Option would facilitate operational phase reliance on public transport and reduce reliance on private vehicles for the long term.
	Water Resources		Minimal impacts to groundwater as minimal below ground construction required		Minimal impacts to groundwater as minimal below ground construction required
	Geology and Soils		Minimal/moderate disturbance to geological resources is expected within CCA5-B as result of continuous rock revetments.		Minimal/moderate disturbance to geological resources is expected within CCA5-B as result of discontinuous rock revetment. However, erosion of unprotected areas between the rock revetment sections may lead to long term impacts of geological resources.
	Material and Circular Economy		This Option would provide some advantages over other options due to its comparatively low materials consumption score (112,942t). The materials consumption score has been calculated based on the application of the Ellen MacArthur Foundation's Material Circularity Indicators (a value between 0 and 1 where higher values indicate a higher circularity) to the quantities of each material that is likely to used in constructing the option. The Material Circularity Indicator provides a measure of how circular/restorative the material flows of a material/product is likely to be.		This Option would provide significant advantages over other options due to its comparatively low materials consumption score (40,262t).
	Waste		This Option would provide some advantages over other options. There should be minimal waste for all options at CCA5 as there are no existing structures and all options involve works in front of the existing cliffs. In addition, no wastage is likely to be associated with constructing this option. Wastage from damaged materials has been estimated based on the application of material-specific wastage rates to the quantities of concrete materials that are likely to be used in constructing the option.		This Option would provide some advantages over other options. There should be minimal waste for all options at CCA5 as there are no existing structures and all options involve works in front of the existing cliffs. In addition, no wastage is likely to be associated with constructing this option.
	Traffic and Transport		Minimal operational impact expected to traffic and transport; the intervention works will be localised to the coast and are not anticipated to affect transport systems or travel demand.		Minimal operational impact expected to traffic and transport; the intervention works will be localised to the coast and are not anticipated to affect transport systems or travel demand.
	Constructability		This Option requires significant volumes of rock armour. It is assumed that rock will be delivered from overseas by barge. Construction is relatively simple but would be slow. Several work fronts could be opened up to improve construction duration.		This Option is similar to, but with advantages over Option 4 due to less rock armour being required.
	Rail Service Impact		Minimal impact on operation of railway line.		Minimal impact on operation of railway line.

Core Criteria	Sub Criteria	Option 4	Option 4 Narrative (Rock Revetments)	Option 5	Option 5 Narrative (Rock Revetments with managed realignment)
Engineering/ Technical	Reliance on Maintenance Maintenance burden		This Option has significant advantages over other options as the revetments only require routine and post storm monitoring and should require minimal maintenance during the design life. This Option is a hard defence and would be designed to accommodate future lowering of beach levels and climate change. Therefore maintenance of the beach would be less important.		This Option is similar to Option 4 but would require some additional monitoring of the areas between the rock headlands to monitor the rate of erosion in these locations.
	Adaptation		This Option has disadvantages compared to other options as it involves a hard engineering structure which has limited options for future adaptation. Future nourishment of the beach in front of the revetments could be undertaken to account for climate changes but additional structures would then be required to hold the beach.		This Option has some advantages over other options as additional rock could be added to the bays in between the rock headlands to account for additional climate change
	Residual Risk		This Option has advantages over Option 6 as failure of a rock revetment is very unlikely to be sudden, failure would be progressive in the form of some loss of rock from the structure or slumping/settlement of the revetment which would compromise its performance but would not lead to sudden or catastrophic failure.		This Option has some disadvantages compared to Option 4 as there is a slightly higher residual risk at the locations between the rock headlands where the rate of erosion of the coastline could vary.
Planning Risk	Consenting Risk		This Option is in accordance with planning policy as it will protect the area for a longer time. Works are carried out in Natura 2000 site with potential for temporary and permanent impacts on qualifying interests which could invoke IROPI. Works will likely require a Maritime Area Consent.		This Option is in accordance with planning policy as it will protect the area for a longer time. Works are carried out in Natura 2000 site with potential for temporary and permanent impacts on qualifying interests which could invoke IROPI. Works will likely require a Maritime Area Consent.

Core Criteria	Sub Criteria	Option 6	Option 6 Narrative (Concrete seawall)	Option 7	Option 7 Narrative (Detached Breakwaters)
Economy	Land Use and Third Party Assets		This Option is similar to other options as the rock bolting and netting proposed on Bray Head will impact on Wicklow County Council lands. There are no impacts on third party lands.		This Option is similar to other options as the rock bolting and netting proposed on Bray Head will impact on Wicklow County Council lands. There are no impacts on third party lands.
	Capital Expenditure		This Option could be complex to construct which could increase the costs. Cofferdams may be required for construction of the seawalls.		This Option has disadvantages over Option 4 and 5 as the breakwaters would need to be constructed entirely by marine based plant which is more expensive than land based plant.
	Maintenance Expenditure		This Option would have higher maintenance costs than Options 4 and 5 as the concrete seawall will require frequent maintenance and repairs. However, these activities would be relatively straightforward and should not require any specialised plant and therefore the maintenance costs are considered lower than for the Options involving beach nourishment and detached breakwaters.		This Option should require infrequent maintenance but this maintenance would have high costs implications due to the need for marine based plant to undertake the maintenance repairs.
	Health and Safety (Construction)		This Option would carry significant construction risk due to the need to excavate to formation to install the concrete sea wall and scour protection. Works of this nature may need a cofferdam to create a dry environment to work in. This would be costly, risky and time consuming.		This Option includes offshore breakwaters which may be challenging to construct in open water and would require the exclusive use of marine equipment to construct which carries increased safety risks.

Core Criteria	Sub Criteria	Option 6	Option 6 Narrative (Concrete seawall)	Option 7	Option 7 Narrative (Detached Breakwaters)
Safety	Health and Safety (Design Life)		This Option includes a concrete seawall with rock toe protection in place of the existing revetments. The rock toe protection will generally be buried but may become exposed if/when beach levels lower following storm events which could cause some trip hazards and potential for people to become trapped if they climb on the rocks. The footprint of the seawall and toe protection will reduce access along the beach as there will be less beach width available. As the tide comes in people may end up walking along the rocks or even the top of the seawall which could lead to falls from height, particularly in wet conditions.		This Option includes detached breakwaters but without any beach nourishment, therefore although the breakwaters should lead to beach material being retained on the beach they are unlikely to lead to large beach bays forming which would connect the beaches to the breakwaters. Therefore access to the breakwaters at low tide should not be possible. At higher tide conditions members of the public might attempt to swim out to the breakwaters, or access from kayaks/boats etc. This could lead to members of the public getting trapped in the voids between the rocks. Warning signs should be installed to deter access. Detached breakwaters can also lead to changes and increases in currents around the structures which could pose a risk to swimmers in the area.
Accessibility and Social Inclusion	Community		This Option is considered to be similar to other options as while the initial impact on the beach amenity area would be limited (i.e. concrete sea wall and rock toe protection would be limited to the back of the beach), the beach amenity area would eventually be lost as a result of reflection against these structures.		This Option is considered to have advantages over other options as the beach amenity area would largely remain as it is now albeit with some disadvantages to its recreational use (see social and recreation below).
	Access		This Option is considered to have some disadvantages over other options as reflection of structure will eventually lead to the loss of the beach amenity area.		This Option is considered to have some advantages to other options as it does not impact any formal or informal existing access points to the beach amenity area along its length.
	Social and Recreation Facilities		This Option is considered to have some disadvantages over other options as reflection from the concrete seawall and rock toe protection would likely result in the eventual loss of the beach amenity area and thereby the ability of the public to use it for social and recreational activities.		This Option is considered to be similar to other options as while there would be limited impacts on the beach itself, this option is likely to make water-based activities unsafe and dangerous with the placement of detached breakwaters offshore.

Core Criteria	Sub Criteria	Option 6	Option 6 Narrative (Concrete seawall)	Option 7	Option 7 Narrative (Detached Breakwaters)
Integration	Compatibility with Development Plans		This Option would have some advantages, as it aligns with high level coastal protection and coastal area management objectives within the development plan. Although this option appears to require less material and less surface area when compared with other options and will therefore have reduced impacts on the SAC and SAAO. in the longer term it is expected that the beach in front of the seawall would be lost therefore reducing the amenity area.		This Option has some disadvantages as it would impact on Marine Policy/Map Based objectives as it has potential for impact on Marine Sites. Fisheries Policy 1, Protected Marine Sites Policy 2. This Option appears to require much less concrete than other options but would require a significant volume of rock. This Option would impacts upon the amenity area of the beach and water sports and over time access may be impacted.
	Compatibility with Climate Adaptation Plans		This Option is similar to other options as it would align with the Transport Climate Change Sectoral Adaptation Plan in terms of protecting the coastline and transport assets.		This Option has some advantages to other options as it does not require any material for beach nourishment however it does have disadvantages compared to Option 5 due to marine based impacts from the detached breakwaters. This Option would align with Transport Climate Change Sectoral Adaptation Plan in terms of protecting the coastline and transport assets. However it has negative marine based impacts.
	Compatibility with Transport Plans		This Option will improve the protection of the rail line against climate change impacts, in line with the Transport Strategy's aim to "provide a sustainable, accessible and effective transport system for the Greater Dublin Area which meets the region's climate change requirements, serves the needs of urban and rural communities, and supports economic growth". The Greater Dublin Area Cycle Network Plan proposes a National Cycle Route, the East Coast Trail, with an indicative route along part of the coastline south of Bray Head (CCA5-B). Providing the intervention works can accommodate the East Coast Trail, this option will support the Transport Strategy.		This Option will improve the protection of the rail line against climate change impacts, in line with the Transport Strategy's aim to "provide a sustainable, accessible and effective transport system for the Greater Dublin Area which meets the region's climate change requirements, serves the needs of urban and rural communities, and supports economic growth". The Greater Dublin Area Cycle Network Plan proposes a National Cycle Route, the East Coast Trail, with an indicative route along part of the coastline south of Bray Head (CCA5-B). Providing the intervention works can accommodate the East Coast Trail, this option will support the Transport Strategy.

CCA5 Emerging Preferred Option Multi Criteria Analysis

Core Criteria	Sub Criteria	Option 6	Option 6 Narrative (Concrete seawall)	Option 7	Option 7 Narrative (Detached Breakwaters)
Environmental	Biodiversity		Option A would be similar to 'Do Minimum' in that there would be little/limited/targeted construction work and therefore minimal impact on biodiversity/ protected areas. There are no Ramsar sites, one SAC (Bray Head SAC) within CCA5 and one outside (Lambay Island), no SPA within CCA5 and one SPA to the south SPA (The Murrough SPA being the closest), no pNHA one pNHA (Bray Head) that could be effected in a minor negative way. Repair works could cause damage and/or loss to QI habitats of the Bray Head SAC and loss of nesting habitat from gully works. Disturbance could be caused to the important sea bird colony and the SPA bird species of the nearby Murrough SPA (whose QI bird species utilise this area) and to a lesser extent marine mammals (seals in particular) that are known to haul out in this area (these QI are designated features of Lambay Island SAC (designated for marine habitats (not impacted) and grey and harbour seals). Natural processes could be impacted through netting and changes in drainage but overall could progress relatively unconstrained. This Option is similar to other options as it would cause disturbance to birds and QI species (birds and marine mammals) of nearby SPA/SAC in the short term. The loss of habitat is considerably less though and there is potential for enhancement of the wall during operation. During wintering bird surveys at Bray Head it was noted that there was a clear aversion for the rip/rap along Bray Head. No birds were seen using these sites for nesting or even resting. The construction of the sea wall and rock toe		Option A would be similar to 'Do Minimum' in that there would be little/limited/targeted construction work and therefore minimal impact on biodiversity/ protected areas. There are no Ramsar sites, one SAC (Bray Head SAC) within CCA5 and one outside (Lambay Island), no SPA within CCA5 and one SPA to the south SPA (The Mur rough SPA being the closest), no pNHA one pNHA (Bray Head) that could be effected in a minor negative way. Repair works could cause damage and/or loss to QI habitats of the Bray Head SAC and loss of nesting habitat from gully works. Disturbance could be caused to the important sea bird colony and the SPA bird species of the nearby Mur rough SPA (whose QI bird species utilise this area) and to a lesser extent marine mammals (seals in particular) that are known to haul out in this area (these QI are designated features of Lambay Island SAC (designated for marine habitats (not impacted) and grey and harbour seals). Natural processes could be impacted through netting and changes in drainage but overall could progress relatively unconstrained. This Option is similar to other options. The breakwaters are situated outside Bray Head SAC and Bray Head pNHA. There would be disturbance during construction and limited loss of bird and mammal foraging marine habitat during operation. Potential for loss/change of European and Nationally designated habitat through changes in hydrology possible. Potential for changes in tidal movement due to presence of breakwaters which may alter feeding opportunities for QI bird species though loss or change in habitat reducing prey species availability
	Landscape and Visual and Seascape		A concrete seawall bound by rock toe protection would have similar benefits to Option 4, and is anticipated to have a comparatively reduced land take, facilitating a greater retention of the shoreline. In comparison to Option 4 a concrete wall would have contrast with the natural character of the slumping cliffs, and introduce an engineered element into a section of coastline where such features are comparatively limited. The visual influence of any walling could be reduced through mitigation, and rock toe protection would help moderate impacts, integrating the walling with the rocky, cliffed context and the shingle beach material present.		Whilst this option requires less intensive intervention at the coastal edge, and therefore facilitates the substantive retention of the existing beach and intertidal areas, large scale detached breakwaters applied consistently within the local coastal waters would be conspicuous, and would generate significant adverse landscape/seascape and visual effects.
	Archaeology, Architectural and Cultural Heritage		A potential direct impact on one SMR Site (WI008-011003; Midden) and one SMR Zone of Notification associated with (WI008-011; Castle - unclassified, WI008-011001; Moated site, WI008-011002; Settlement deserted - medieval and WI008-011003; Midden) have been identified, there is also the potential for direct impacts to occur on previously unrecorded archaeological heritage. There is the potential for significant indirect setting and visual impacts to occur on four SMR sites (WI008-011; Castle - unclassified, WI008-011001; Moated site, WI008-011002; Settlement deserted - medieval and WI008-011003; Midden) and the associated Zone of Notification. There is the potential for indirect setting and visual impacts to occur on 2 RPS Sites (RPS ref 08-79). There is also the potential for significant direct impacts to occur on previously unrecorded material culture. Significant advantages over Options 1 and 2.		No potential direct impacts on SMR Sites have been identified, there is the potential for direct impacts to occur on previously unrecorded archaeological heritage. There is the potential for significant indirect setting and visual impacts to occur on four SMR sites (WI008-011; Castle - unclassified, WI008-011001; Moated site, WI008-011002; Settlement deserted - medieval and WI008-011003; Midden) and the associated Zone of Notification. There is the potential for indirect setting and visual impacts to occur on 2 RPS Sites (RPS ref 08-79). Significant advantages over Options 1 and 2.
	Marine Archaeology		There are no direct impacts on previously unrecorded wrecks, paleoenvironmental landscapes and material culture, and therefore no potential impact on archaeological features in the intertidal and marine elements.		There is the potential for significant direct impacts to occur on previously unrecorded wrecks, paleoenvironmental landscapes and material culture within the sub-tidal areas within the footprint of the breakwaters and associated construction activity. Has disadvantages compared with other options because it is a
	Noise and Vibration		Area of works set back from population Noise Sensitive Locations with potential for significant noise or vibration impacts. Likely require night-time works to work around tides. Cofferdams may be required for construction of the seawalls. Overall works will be temporary to short-term at any affected NSL. No long term operational noise or vibration impacts. Overall option has some disadvantages over other Do Minimum options due to the nature and duration of the proposed works required and their potential noise impacts		Area of works set back from airborne Noise Sensitive Locations with potential for any significant noise or vibration impacts. Likely require night-time works to work around tides. Any potential impacts will be temporary. Depending on construction methodology, potential for temporary underwater high noise levels affecting habitats. No long term operational noise or vibration impacts. Overall option is similar to other Do Minimum options in this area

CCA5 Emerging Preferred Option Multi Criteria Analysis

Core Criteria	Sub Criteria	Option 6	Option 6 Narrative (Concrete seawall)	Option 7	Option 7 Narrative (Detached Breakwaters)
	Air Quality		No operational phase impacts. This Option would facilitate operational phase reliance on public transport and reduce reliance on private vehicles for the long term. This Option has disadvantages over other options construction of the concrete seawall has higher potential for dust impact on sensitive ecological receptors in proximity to the works being carried out seawall installation use heavy Machinery to carry out. Construction phase impacts would be likely considered short term and dust mitigation can be put in place.		No operational phase impacts. This Option would facilitate operational phase reliance on public transport and reduce reliance on private vehicles for the long term. This Option has significant advantages over other options as it has lower potential for impact on sensitive receptors due to the works being further offshore.
	Carbon Management		Whole Life Carbon (tonnes CO2e) was 281% of average across 9 options, therefore it is least preferable of the options. This Option would facilitate operational phase reliance on public transport and reduce reliance on private vehicles for the long term.		Whole Life Carbon (tonnes CO2e) was 47% of average across 9 options, preferable to some options but similar to some options. This Option would facilitate operational phase reliance on public transport and reduce reliance on private vehicles for the long term.
	Water Resources		Below ground structures and potential excavations could impact groundwater levels, flows and quality at Greystone Cliffs		Minimal impacts to groundwater as minimal below ground construction required
	Geology and Soils		Very high disturbance of geological resources is expected in CCA5-B as a result of the concrete seawalls with rock toe protection. Furthermore, the intrusive nature of the works may release contaminated materials into the wider environment.		The detached breakwaters will moderate disturbance to geological resources in CCA5-B during the construction phase works.
	Material and Circular Economy		This Option provides some advantages over other options due to its comparatively low materials consumption score (110,693t).		This Option provides significant disadvantages over other options due to its comparatively high materials consumption score (277,739t).
	Waste		This Option provides some disadvantages over other options as it is likely to be associated with comparatively high wastage (216t). There should be minimal waste for all options at CCA5 as there are no existing structures and all options involve works in front of the existing cliffs.		This Option provides some advantages over other options. There should be minimal waste for all options at CCA5 as there are no existing structures and all options involve works in front of the existing cliffs. In addition, no wastage is likely to be associated with constructing this option.
	Traffic and Transport		Minimal operational impact expected to traffic and transport; the intervention works will be localised to the coast and are not anticipated to affect transport systems or travel demand.		Minimal operational impact expected to traffic and transport; the intervention works will be localised to the coast and are not anticipated to affect transport systems or travel demand.
	Constructability		This Option has significant disadvantages as it would be challenging to construct due to location of the wall and the need to excavate to the toe level of the wall. Works of this nature may need a cofferdam to create a dry environment to work in. This would be costly, risky and time consuming. Furthermore the temporary works requirements would be complex.		This Option has disadvantages compared to other options as it is challenging to construct in open water and depending on water depth at high tide bottom dumping of material to form the core may not be possible. Will require specialist marine equipment and knowledge of building similar structures. Weather risk is higher and general risk profile for construction is higher in comparison to other options which can be constructed with land based plant.
	Rail Service Impact		Minimal impact on operation of railway line.		Minimal impact on operation of railway line.

CCA5 Emerging Preferred Option Multi Criteria Analysis

Core Criteria	Sub Criteria	Option 6	Option 6 Narrative (Concrete seawall)	Option 7	Option 7 Narrative (Detached Breakwaters)
Engineering/ Technical	Reliance on Maintenance Maintenance burden		This Option has some advantages over other options as concrete structures typically need more maintenance than rock structures, however this maintenance should be relatively minor with increased maintenance expected towards the end of the design life.		Minimal maintenance of the breakwaters is expected but maintenance of the breakwaters would be more complex compared to the revetments.
	Adaptation		This Option has advantages over other options as, although the concrete wall are hard engineered structures, it would not be too complex to raise the height of the walls in the future if required.		This Option has disadvantages over other options as changes to the breakwaters would not be practical. However, additional beach nourishment could be implemented but additional beach control structures would be required to hold a larger beach in place
	Residual Risk		This Option would likely result in loss of the beach in front of the new seawall, therefore if the seawall then failed there could be significant erosion of the cliffs over a short period as there would be no beach to protect the cliffs.		Breakwaters will reduce wave energy at the shoreline, making shoreline structures less likely to fail quickly. Breakwater failure is generally slow and not catastrophic.
Planning Risk	Consenting Risk		This Option is in accordance with planning policy as it will protect the area for a longer time. Works are carried out in Natura 2000 site with potential for temporary and permanent impacts on qualifying interests which could invoke IROPI. Works will likely require a Maritime Area Consent.		This Option involves less hard structures along the length of the coastline which may be more preferable to some potential third party objectors, however the potential for a significant visual impact would likely make consenting more difficult. This Option is in accordance with planning policy as it will protect the area for a longer time. Works are carried out in Natura 2000 site with potential for temporary and permanent impacts on qualifying interests which could invoke IROPI. Works will likely require a Maritime Area Consent.

CCA5 Emerging Preferred Option Multi Criteria Analysis

Core Criteria	Sub Criteria	Option 8	Option 8 - (Breakwaters with nourishment)	Option 9	Option 9 Narrative (Groynes with Nourishment)
Economy	Land Use and Third Party Assets		This Option is similar to other options as the rock bolting and netting proposed on Bray Head will impact on Wicklow County Council lands. There are no impacts on third party lands.		This Option is similar to other options as the rock bolting and netting proposed on Bray Head will impact on Wicklow County Council lands. There are no impacts on third party lands.
	Capital Expenditure		This Option would involve the same costs as Option 7 to construct the breakwaters with the addition of the beach nourishment. The breakwaters would need to be constructed prior to the beaches being nourished otherwise the beach material would be washed away, therefore marine based plant would still be required for construction of the breakwaters.		This Option requires less rock armour than the other rock options and the groynes could be constructed from land avoiding the need for marine based plant other than for delivery of the rock armour. The beach nourishment will increase the costs of this option compared to Option 4.
	Maintenance Expenditure		This Option would require marine based plant for maintenance of the breakwaters along with frequent monitoring of the beaches and potentially beach recharge within the design life which would have high costs.		This Option has advantages over Option 8 because any maintenance of the groynes could be undertaken using land based plant. However, the beaches would still require regular monitoring and maintenance and potential nourishment within the design life meaning this option has disadvantages over Options 4 to 7.
	Health and Safety (Construction)		This Option is similar to Option 7 but with beach nourishment. Beach nourishment would require specialist marine equipment, however this would be considered as a low safety risk.		This Option is similar to Option 8 but with groynes. The groynes would be easier to construct than the detached breakwaters and could be constructed from land and overall would present a lower Health and Safety construction risk.

Core Criteria	Sub Criteria	Option 8	Option 8 - (Breakwaters with nourishment)	Option 9	Option 9 Narrative (Groynes with Nourishment)
Safety	Health and Safety (Design Life)		This Option includes detached breakwaters and beach nourishment. In the lee of the breakwaters the beach material will build up creating larger wider beaches. Warning signs should be installed to deter people from accessing the breakwaters. The beaches will improve access along the frontage and reduce the possibility of people getting cut off by the tide. The beaches will also create some more sheltered areas in the lee of the breakwaters and will reduce the impacts of currents from the breakwaters. The larger beaches will improve access and reduce the potential for people getting cut off by the tide. The renourished beaches may require reprofiling or renourishing during the design life which will require plant on the beach which would need to be managed to mitigate Health and Safety risks with the public.		This Option has significant advantages over other options as the larger beaches will improve access and reduce the potential for people getting cut off by the tide. The renourished beaches may require reprofiling or renourishing during the design life which will require plant on the beach which would need to be managed to mitigate Health and Safety risks with the public. The groynes hold the beach material in the bay and as such material will build up on one side of the groyne which can lead to a larger difference in beach levels either side of the groynes.
Accessibility and Social Inclusion	Community		This Option is considered to have some advantages over other options as it provides enhanced beach amenity areas along the southern section of the CCA. This would contribute positively to the amenity value of the area as well as the general public perception of the area.		This Option is considered to have some advantages over other options as it provides enhanced beach amenity areas along the southern section of the CCA. This would contribute positively to the amenity value of the area as well as the general public perception of the area.
	Access		This Option is considered to have significant advantages over other options as it would not affect any access to the beach but it would enhance access along the length of the beach amenity area.		This Option is considered to have some advantages over other options as while the provision of groynes will improve the beach amenity area and thereby improving access to it, groynes also somewhat limit access along the length of the beach area.
	Social and Recreation Facilities		This Option is considered to have some advantages over other options as it provides for enhanced/additional beach amenity areas (extending all along North Beach Greystones to the northern extent of the Rathdown Lower Bay Beach) with the provision of beach nourishment and detached breakwaters close to shore. The detached breakwaters may result in some water-based activities becoming unsafe and dangerous to undertake.		This Option is considered to have some advantages over other options as it provides for enhanced/additional beach amenity areas (extending all along North Beach Greystones to the northern extent of the Rathdown Lower Bay Beach) with the provision of beach nourishment and groynes close to shore. The placement of groynes will enhance the beach amenity area but also limit access along its length.

Core Criteria	Sub Criteria	Option 8	Option 8 - (Breakwaters with nourishment)	Option 9	Option 9 Narrative (Groynes with Nourishment)
Integration	Compatibility with Development Plans		This Option would have some advantages compared to other options as it includes enhancement of the area with beach amenity, coastal recreation amenity and elements of green infrastructure. This Option also has less concrete and hard infrastructure than other options. The disadvantages of this option include the impact on Marine Policy /Map based objectives such as SAC and SAAO.		This Option would have some advantages compared to other options as it includes enhancement of the area with beach amenity, coastal recreation amenity and elements of green infrastructure. This Option also has less concrete and hard infrastructure than other options. The disadvantages of this option include the impact on Marine Policy /Map based objectives such as SAC and SAAO. The use of groynes could split the beach and therefore impact upon amenity.
	Compatibility with Climate Adaptation Plans		This Option is similar to other options, it generally aligns with Transport Climate Change Sectoral Adaptation Plan in terms of protecting the coastline and transport assets. However it has negative marine based impacts. Requires significant volumes of rock to be transported offshore for the breakwaters. Requires a significant volume of beach nourishment material to be transported to site. However, it has less hard infrastructure to other options.		This Option would have some advantages as it generally aligns with Transport Climate Change Sectoral Adaptation Plan in terms of protecting the coastline and transport assets. However potentially fewer negative marine based impacts. On comparison with Option 8 it requires less beach nourishment and a significantly lower volume of rock for breakwaters. However, it does require a significant volume of concrete for the revetments. In comparison to other options there is no offshore option i.e. no rocks to be transported.
	Compatibility with Transport Plans		This Option will improve the protection of the rail line against climate change impacts, in line with the Transport Strategy's aim to "provide a sustainable, accessible and effective transport system for the Greater Dublin Area which meets the region's climate change requirements, serves the needs of urban and rural communities, and supports economic growth". The Greater Dublin Area Cycle Network Plan proposes a National Cycle Route, the East Coast Trail, with an indicative route along part of the coastline south of Bray Head (CCA5-B). Providing the intervention works can accommodate the East Coast Trail, this option will support the Transport Strategy.		This Option will improve the protection of the rail line against climate change impacts, in line with the Transport Strategy's aim to "provide a sustainable, accessible and effective transport system for the Greater Dublin Area which meets the region's climate change requirements, serves the needs of urban and rural communities, and supports economic growth". The Greater Dublin Area Cycle Network Plan proposes a National Cycle Route, the East Coast Trail, with an indicative route along part of the coastline south of Bray Head (CCA5-B). Providing the intervention works can accommodate the East Coast Trail, this option will support the Transport Strategy.

CCA5 Emerging Preferred Option Multi Criteria Analysis

Core Criteria	Sub Criteria	Option 8	Option 8 - (Breakwaters with nourishment)	Option 9	Option 9 Narrative (Groynes with Nourishment)
Environmental	Biodiversity		Option A would be similar to 'Do Minimum' in that there would be little/limited/targeted construction work and therefore minimal impact on biodiversity/ protected areas. There are no Ramsar sites, one SAC (Bray Head SAC) within CCA5 and one outside (Lambay Island), no SPA within CCA5 and one SPA to the south SPA (The Mur rough SPA being the closest), no pNHA one pNHA (Bray Head) that could be effected in a minor negative way. Repair works could cause damage and/or loss to QI habitats of the Bray Head SAC and loss of nesting habitat from gully works. Disturbance could be caused to the important sea bird colony and the SPA bird species of the nearby Mur rough SPA (whose QI bird species utilise this area) and to a lesser extent marine mammals (seals in particular) that are known to haul out in this area (these QI are designated features of Lambay Island SAC (designated for marine habitats (not impacted) and grey and harbour seals). Natural processes could be impacted through netting and changes in drainage but overall could progress relatively unconstrained. This Option is similar to other options. The breakwaters are situated outside Bray Head SAC and Bray Head pNHA. There would be disturbance during construction and limited loss of bird and mammal foraging marine habitat during operation. Potential for loss/change of European and Nationally designated habitat through changes in hydrology possible. The nourishment may stabilise erosion which could prevent loss/change of European and Nationally designated habitat however there is potential for changes in tidal movement due to presence of breakwaters which may alter feeding opportunities for QI bird species though loss or change in habitat reducing prey species availability. Replenishment of beach material in future may be needed causing disturbance in the long term.		Option A would be similar to 'Do Minimum' in that there would be little/limited/targeted construction work and therefore minimal impact on biodiversity/ protected areas. There are no Ramsar sites, one SAC (Bray Head SAC) within CCA5 and one outside (Lambay Island), no SPA within CCA5 and one SPA to the south SPA (The Mur rough SPA being the closest), no pNHA one pNHA (Bray Head) that could be effected in a minor negative way. Repair works could cause damage and/or loss to QI habitats of the Bray Head SAC and loss of nesting habitat from gully works. Disturbance could be caused to the important sea bird colony and the SPA bird species of the nearby Mur rough SPA (whose QI bird species utilise this area) and to a lesser extent marine mammals (seals in particular) that are known to haul out in this area (these QI are designated features of Lambay Island SAC (designated for marine habitats (not impacted) and grey and harbour seals). Natural processes could be impacted through netting and changes in drainage but overall could progress relatively unconstrained. This Option is similar to other options as the groynes are situated partially within Bray Head SAC and Bray Head pNHA. There would be disturbance during construction. Potential for loss/change of European and Nationally designated habitat through changes in hydrology possible. Nourishment combined with rock groyne could prevent loss/change of European and Nationally designated habitat. Replenishment of beach material in future may be needed causing disturbance in the long term.
	Landscape and Visual and Seascape		Whilst beach nourishment has potential to enhance the character and recreational amenity of this section of coastline, detached breakwaters within the local coastal waters would be conspicuous, and would generate significant adverse landscape/seascape and visual effects. Like other sections of this coastline, a key landscape and visual characteristic is its long sweeping nature, terminated by the prominent Bay Head. These combine to generate a large scale. In addition to the creation of detached breakwaters, the formation of a series of smaller bays through the disposition of beach nourishment would appear artificial and would adversely influence the natural characteristics of the coastline.		Whilst beach nourishment has potential to enhance the character and recreational amenity of this section of coastline, groynes protruding out into the coastal waters, and the resulting accumulation of beach material, would contrast the long sweeping nature of this section of coastline. The groynes would however be conspicuous mainly in lower states of the tide. Effects would be similar to Option 6, albeit linear protrusions out to sea, rather than following the coastal edge, are considered comparatively adverse in their influence.
	Archaeology, Architectural and Cultural Heritage		A potential direct impact on one SMR Site (WI008-011003; Midden) and one SMR Zone of Notification associated with (WI008-011; Castle - unclassified, WI008-011001; Moated site, WI008-011002; Settlement deserted - medieval and WI008-011003; Midden) have been identified, there is also the potential for direct impacts to occur on previously unrecorded archaeological heritage. There is the potential for significant indirect setting and visual impacts to occur on four SMR sites (WI008-011; Castle - unclassified, WI008-011001; Moated site, WI008-011002; Settlement deserted - medieval and WI008-011003; Midden) and the associated Zone of Notification. There is the potential for indirect setting and visual impacts to occur on 2 RPS Sites (RPS ref 08-79). Significant advantages over Options 1 and 2.		A potential direct impact on one SMR Site (WI008-011003; Midden) and one SMR Zone of Notification associated with (WI008-011; Castle - unclassified, WI008-011001; Moated site, WI008-011002; Settlement deserted - medieval and WI008-011003; Midden) have been identified, there is also the potential for direct impacts to occur on previously unrecorded archaeological heritage. There is the potential for significant indirect setting and visual impacts to occur on four SMR sites (WI008-011; Castle - unclassified, WI008-011001; Moated site, WI008-011002; Settlement deserted - medieval and WI008-011003; Midden) and the associated Zone of Notification. There is the potential for indirect setting and visual impacts to occur on 2 RPS Sites (RPS ref 08-79). Significant advantages over Options 1 and 2.
	Marine Archaeology		There is the potential for significant direct impacts to occur on previously unrecorded wrecks, paleoenvironmental landscapes and material culture both within the sub-tidal areas within the footprint of the breakwaters and associated construction activity; and in connection with beach nourishment with the use of plant such as dredgers and associated activities during the transfer of shingle onto the beach.		There is the potential for significant direct impacts to occur on previously unrecorded wrecks, paleoenvironmental landscapes and material culture in connection with the groyne construction in the intertidal zone and beach nourishment with the use of plant such as dredgers and associated activities during the transfer of shingle onto the beach.
	Noise and Vibration		Area of works set back from airborne Noise Sensitive Locations with low potential for any significant noise or vibration impacts. Likely require night-time works to work around tides. Short-term noise disturbance underwater during breakwater construction. Beach nourishment works will involve low noise activity, this will require more frequent intervention in the longer term. Overall option is similar to other Do Minimum options in this area		Proposed works involve low noise/vibration activities and are set back from airborne Noise Sensitive Locations with low potential for any significant noise or vibration impacts. Likely require night-time works to work around tides. Beach nourishment works will involve low noise activity, this will require more frequent intervention in the longer term. Overall option is similar to other Do Minimum options in this area.

CCA5 Emerging Preferred Option Multi Criteria Analysis

Core Criteria	Sub Criteria	Option 8	Option 8 - (Breakwaters with nourishment)	Option 9	Option 9 Narrative (Groynes with Nourishment)
	Air Quality		This Option has disadvantages over other options as it would need ongoing monitoring and maintenance requirements to maintain the beach to the design levels. The maintenance has the potential for dust emissions but can be mitigated. This Option would facilitate operational phase reliance on public transport and reduce reliance on private vehicles for the long term. Construction phase impacts would be similar to Option 7 but with the addition of beach nourishment activities which would require use of heavy Machinery closer to sensitive receptors.		This Option has disadvantages over other options as it would need ongoing monitoring and maintenance requirements to maintain the beach to the design levels. The maintenance has the potential for dust emissions but can be mitigated. This Option would facilitate operational phase reliance on public transport and reduce reliance on private vehicles for the long term. Construction phase impacts would be similar to Option 7 but with the addition of beach nourishment activities which would require use of heavy Machinery closer to sensitive receptors.
	Carbon Management		Whole Life Carbon (tonnes CO2e) was 34% of average across 9 options, preferable to some options but similar to some options. This Option would facilitate operational phase reliance on public transport and reduce reliance on private vehicles for the long term.		Whole Life Carbon (tonnes CO2e) was 181% of average across the 9 options, therefore it is one of the less preferable of the options. This Option would facilitate operational phase reliance on public transport and reduce reliance on private vehicles for the long term.
	Water Resources		Minimal impacts to groundwater as minimal below ground construction required		Minimal impacts to groundwater as minimal below ground construction required.
	Geology and Soils		The combination of detached breakwaters and beach nourishment is expected to result in moderate disturbance to geological resources in CCA5-B during the construction phase works.		The combination of beach nourishment and groynes is expected to result in moderate disturbance to geological resources in CCA5-B during the construction phase works.
	Material and Circular Economy		This Option would provide significant disadvantages over other options due to its comparatively high materials consumption score (284,589t).		This Option would provide some disadvantages over other options due to its comparatively high materials consumption score (183,033t).
	Waste		This Option would provide some advantages over other options. There should be minimal waste for all options at CCA5 as there are no existing structures and all options involve works in front of the existing cliffs. In addition, no wastage is likely to be associated with constructing this option.		This Option would provide some disadvantages over other options as it is likely to be associated with comparatively high wastage (136t). There should be minimal waste for all options at CCA5 as there are no existing structures and all options involve works in front of the existing cliffs.
	Traffic and Transport		Minimal operational impact expected to traffic and transport; the intervention works will be localised to the coast and are not anticipated to affect transport systems or travel demand.		Minimal operational impact expected to traffic and transport; the intervention works will be localised to the coast and are not anticipated to affect transport systems or travel demand.
	Constructability		This Option includes detached breakwaters and beach nourishment. The detached breakwaters would be easier to construct than Option 5 as they are smaller however would still be subject to the same construction risks. Beach nourishment is relatively straightforward and could be completed with suitable marine equipment using dredged material.		This Option has advantages over Options 7 and 8 as the groynes are relatively small structures and can be constructed using land based plant. Beach nourishment is relatively straightforward and could be completed with suitable marine equipment using dredged material but provides an added complexity compared to Option 3.
	Rail Service Impact		Minimal impact on operation of railway line.		Minimal impact on operation of railway line.

CCA5 Emerging Preferred Option Multi Criteria Analysis

Core Criteria	Sub Criteria	Option 8	Option 8 - (Breakwaters with nourishment)	Option 9	Option 9 Narrative (Groynes with Nourishment)
Engineering/ Technical	Reliance on Maintenance Maintenance burden		This Option relies on a nourished beach to provide the erosion protection to the cliffs and the breakwaters to reduce the wave energy so that the design beach is maintained. Regular monitoring and possible post storm maintenance of the beach is likely. Beach recharge may be required during the design life to prevent loss of the beach. The detached breakwaters should require minimal maintenance but routine inspections and post storm inspections should be undertaken.		This Option relies on a nourished beach to provide the erosion protection to the cliffs and the groynes to hold the design beach in place. Regular monitoring and possible post storm maintenance of the beach is likely. Beach recharge may be required during the design life to prevent loss of the beach. The groynes should require minimal maintenance but routine inspections and post storm inspections should be undertaken.
	Adaptation		This Option has significant advantages as the nourished beaches could be adapted to account for changes in climate change, either through increased nourishment and maintenance or through adding additional material to increase the size of the beaches		This Option has significant advantages as the nourished beaches could be adapted to account for changes in climate change, either through increased nourishment and maintenance or through adding additional material to increase the size of the beaches.
	Residual Risk		This Option relies on a nourished beach to provide the erosion protection to the cliffs and the breakwaters to reduce the wave energy so that the design beach is maintained and erosion of the cliffs is prevented. If the beach does not provide sufficient protection end erosion of the cliffs still occurs, the beach could be renourished		This Option relies on a nourished beach to provide the erosion protection to the cliffs and the groynes to maintain the beach. If the beach does not provide sufficient protection and erosion of the cliffs still occurs, the beach could be renourished or additional groynes could be added to hold a larger beach.
Planning Risk	Consenting Risk		This Option could be more preferable to potential third party objectors due to the beach nourishment and less hard structures along the length of the coastline, however the potential for a significant visual impact would likely make consenting more difficult. This Option is in accordance with planning policy as it will protect the area for a longer time. Works are carried out in Natura 2000 site with potential for temporary and permanent impacts on qualifying interests which could invoke IROPI. Works will likely require a Maritime Area Consent.		This Option could be more preferable to potential third party objectors due to the beach nourishment. The use of groynes could be considered to 'dissect the beach' and impact upon its amenity value but they are considered to have less visual impact than the breakwaters. This Option is in accordance with planning policy as it will protect the area for a longer time. Works are carried out in Natura 2000 site with potential for temporary and permanent impacts on qualifying interests which could invoke IROPI. Works will likely require a Maritime Area Consent.

Core Criteria	Sub Criteria	Option 10	Option 10 Narrative (Groynes and Breakwaters with Nourishment)
Economy	Land Use and Third Party Assets		This Option is similar to other options as the rock bolting and netting proposed on Bray Head will impact on Wicklow County Council lands. There are no impacts on third party lands.
	Capital Expenditure		This Option is expected to have similar costs to Options 6 and 7.
	Maintenance Expenditure		This Option has advantages over Option 8 because any maintenance of the groynes and the breakwater could be undertaken using land based plant. However, the beaches would still require regular monitoring and maintenance and potential nourishment within the design life meaning this option has disadvantages over Options 4 to 7.
	Health and Safety (Construction)		This Option is a hybrid of options 8 and 9. The detached breakwater adds to the Health and Safety risk for this option as it would require working in open water.

Core Criteria	Sub Criteria	Option 10	Option 10 Narrative (Groynes and Breakwaters with Nourishment)
Safety	Health and Safety (Design Life)		This Option has significant advantages over other options as the larger beaches will improve access and reduce the potential for people getting cut off by the tide. The renourished beaches may require reprofiling or renourishing during the design life which will require plant on the beach which would need to be managed to mitigate Health and Safety risks with the public. The groynes hold the beach material in the bay and as such material will build up on one side of the groyne which can lead to a larger difference in beach levels either side of the groynes. Warning signs should be installed to deter people from accessing the breakwaters.
Accessibility and Social Inclusion	Community		This Option is considered to have some advantages over other options as it provides enhanced beach amenity areas along the southern section of the CCA. This would contribute positively to the amenity value of the area as well as the general public perception of the area.
	Access		This Option is considered to have some advantages over other options as while the provision of groynes will improve the beach amenity and thereby improving access to it, groynes also somewhat limit access along the length of the beach area.
	Social and Recreation Facilities		This Option is considered to have some advantages over other options as it provides for enhanced/additional beach amenity areas (extending all along North Beach Greystones to the northern extent of the Rathdown Lower Bay Beach) with the provision of groynes, a detached breakwater close to shore and beach nourishment. However, the placement of a detached breakwater may make water-based activities unsafe and dangerous while the placement of groynes along the beach will limit access along its length.

Core Criteria	Sub Criteria	Option 10	Option 10 Narrative (Groynes and Breakwaters with Nourishment)
Integration	Compatibility with Development Plans		It would impact on Marine Policy /Map based objectives. Advantages include: enhancement of the area with beach amenity, coastal recreation amenity and elements of green infrastructure. Use of groynes could split the beach and impact upon its amenity value. Requires more material compared to Option 9.
	Compatibility with Climate Adaptation Plans		This Option is similar to other options, it generally aligns with Transport Climate Change Sectoral Adaptation Plan in terms of protecting the coastline and transport assets. However it would have negative marine based impacts. It requires a significant volume of rock to be transported offshore for the breakwaters. Requires a significant volume of beach nourishment to be transported to site. In comparison to Options 7 and 8, there is less rock required for breakwaters.
	Compatibility with Transport Plans		This Option will improve the protection of the rail line against climate change impacts, in line with the Transport Strategy's aim to "provide a sustainable, accessible and effective transport system for the Greater Dublin Area which meets the region's climate change requirements, serves the needs of urban and rural communities, and supports economic growth". The Greater Dublin Area Cycle Network Plan proposes a National Cycle Route, the East Coast Trail, with an indicative route along part of the coastline south of Bray Head (CCA5-B). Providing the intervention works can accommodate the East Coast Trail, this option will support the Transport Strategy.

CCA5 Emerging Preferred Option Multi Criteria Analysis

Core Criteria	Sub Criteria	Option 10	Option 10 Narrative (Groynes and Breakwaters with Nourishment)
Environmental	Biodiversity		Option A would be similar to 'Do Minimum' in that there would be little/limited/targeted construction work and therefore minimal impact on biodiversity/ protected areas. There are no Ramsar sites, one SAC (Bray Head SAC) within CCA5 and one outside (Lambay Island), no SPA within CCA5 and one SPA to the south SPA (The Mur rough SPA being the closest), no pNHA one pNHA (Bray Head) that could be effected in a in a minor negative way. Repair works could cause damage and/or loss to QI habitats of the Bray Head SAC and loss of nesting habitat from gully works. Disturbance could be caused to the important sea bird colony and the SPA bird species of the nearby Mur rough SPA (whose QI bird species utilise this area) and to a lesser extent marine mammals (seals in particular) that are known to haul out in this area (these QI are designated features of Lambay Island SAC (designated for marine habitats (not impacted) and grey and harbour seals)). Natural processes could be impacted through netting and changes in drainage but overall could progress relatively unconstrained. This Option is similar to other options as one groyne is situated within Bray Head SAC and Bray Head pNHA. There would be disturbance during construction and limited loss of bird and mammal foraging marine habitat during operation of breakwater. Potential for loss/change of European and Nationally designated habitat through changes in hydrology possible. Nourishment stabilised with rock groynes and breakwaters could prevent loss/change of European and Nationally designated habitat. There is potential for changes in tidal movement due to presence of breakwaters which may alter feeding opportunities for QI bird species though loss or change in habitat reducing prey species availability. Replenishment of beach in future may be needed causing disturbance in the long term.
	Landscape and Visual and Seascape		Whilst beach nourishment has potential to enhance the character and recreational amenity of this section of coastline, a detached breakwater within the local coastal waters would be conspicuous, and would generate significant adverse landscape/seascape and visual effects. Compared with Option 7 and 8, this option is comparatively less extensive, with a single breakwater located centrally within the bay, albeit it would remain conspicuous, and the creation of separate bays would be inconsistent with the natural characteristics of the coastline.
	Archaeology, Architectural and Cultural Heritage		A potential direct impact on one SMR Site (WI008-011003; Midden) and one SMR Zone of Notification associated with (WI008-011; Castle - unclassified, WI008-011001; Moated site, WI008-011002; Settlement deserted - medieval and WI008-011003; Midden) have been identified, there is also the potential for direct impacts to occur on previously unrecorded archaeological heritage. There is the potential for significant indirect setting and visual impacts to occur on four SMR sites (WI008-011; Castle - unclassified, WI008-011001; Moated site, WI008-011002; Settlement deserted - medieval and WI008-011003; Midden) and the associated Zone of Notification. There is the potential for indirect setting and visual impacts to occur on 2 RPS Sites (RPS ref 08-79). Significant advantages over Options 1 and 2.
	Marine Archaeology		There is the potential for significant direct impacts to occur on previously unrecorded wrecks, paleoenvironmental landscapes and material culture both within the sub-tidal areas within the footprint of the breakwaters and associated construction activity; and in connection with the groyne construction in the intertidal zone and beach nourishment with the use of plant such as dredgers and associated activities during the transfer of shingle onto the beach.
	Noise and Vibration		Area of works set back from airborne Noise Sensitive Locations with low potential for any significant noise or vibration impacts. Likely require night-time works to work around tides. Depending on construction methodology, potential for temporary underwater high noise levels affecting habitats. Beach nourishment works will involve low noise activity, this will require more frequent intervention in the longer term. Overall option is similar to other Do Minimum options in this area.

CCA5 Emerging Preferred Option Multi Criteria Analysis

Core Criteria	Sub Criteria	Option 10	Option 10 Narrative (Groynes and Breakwaters with Nourishment)
	Air Quality		This Option has disadvantages over other options as it would need ongoing monitoring and maintenance requirements to maintain the beach to the design levels. The maintenance has the potential for dust emissions but can be mitigated. This Option would facilitate operational phase reliance on public transport and reduce reliance on private vehicles for the long term. Construction phase impacts would be similar to Option 7 but with the addition of beach nourishment activities which would require use of heavy Machinery closer to sensitive receptors.
	Carbon Management		Whole Life Carbon (tonnes CO2e) was 132% of average across the 9 options, therefore it is one of the less preferable of the options. This Option would facilitate operational phase reliance on public transport and reduce reliance on private vehicles for the long term.
	Water Resources		Minimal impacts to groundwater as minimal below ground construction required.
	Geology and Soils		The combination of breakwater, groynes and beach nourishment is expected to result in moderate disturbance to geological resources in CCA5-B during the construction phase works.
	Material and Circular Economy		This Option would provide some disadvantages over other options due to its comparatively high materials consumption score (236,875t).
	Waste		This Option would provide some disadvantages over other options as it is likely to be associated with comparatively high wastage (88t). There should be minimal waste for all options at CCA5 as there are no existing structures and all options involve works in front of the existing cliffs.
	Traffic and Transport		Minimal operational impact expected to traffic and transport; the intervention works will be localised to the coast and are not anticipated to affect transport systems or travel demand.
	Constructability		Similar to Option 9 but with a detached breakwater. The breakwater is smaller than other options but would still require works in open water which adds to the complexity of this option.
	Rail Service Impact		Minimal impact on operation of railway line.

Core Criteria	Sub Criteria	Option 10	Option 10 Narrative (Groynes and Breakwaters with Nourishment)
Engineering/ Technical	Reliance on Maintenance Maintenance burden		This Option relies on a nourished beach to provide the erosion protection to the cliffs and the breakwaters and groynes to hold the design beach in place. Regular monitoring and possible post storm maintenance of the beach is likely. Beach recharge may be required during the design life to prevent loss of the beach. The breakwaters and groynes should require minimal maintenance but routine inspections and post storm inspections should be undertaken.
	Adaptation		This Option has significant advantages as the nourished beaches could be adapted to account for changes in climate change, either through increased nourishment and maintenance or through adding additional material to increase the size of the beaches.
	Residual Risk		This Option relies on a nourished beach to provide the erosion protection to the cliffs and the groynes and breakwaters to maintain the beach. If the beach does not provide sufficient protection and erosion of the cliffs still occurs, the beach could be renourished.
Planning Risk	Consenting Risk		A full upgrade of existing defences would protect the area for a longer time in line with planning policy Works are carried out in Natura 2000 site with potential for temporary and permanent impacts on qualifying interests which could invoke IROPI. Works will likely require a Maritime Area Consent. Could be less visual impacts and could be considered to 'feel' more like an amenity space and integrate more appropriately.