CCA1 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 incur minimal capital costs.
	Maintenance Expenditure		No maintenance required for this option.		This Option would rely on reactive repairs and maintenance. Maintenance would be ad hoc and emergency repairs.
Safety	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. 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.
	Health and Safety (Design Life)		As the defences deteriorate over time, health and safety risks to the public increase as parts of the defences fail, such as undermining of the concrete walkway at Seapoint leading to collapse of the structure. Failure of the defences could be sudden and catastrophic as the Do Nothing scenario does not include any monitoring or maintenance of the defences. As the defences fail, parts of the failed defences will likely create debris on the foreshore and in publicly accessible areas. The defences themselves will also become hazards. Climate change will lead to increased overtopping and flooding of the railway line and the hinterland, which without intervention will become extremely dangerous		This Option will involve maintaining the defences through reactive repairs. Therefore as there will be no proactive monitoring or maintenance, deterioration of the defences will occur and there are likely to be periods where there are Health and Safety risks in the defence prior to repair works being undertaken. The frequency and scale of the damage and repair works will increase over time. This Option does not include any improvement or upgrades to the defences to account for climate change therefore increased overtopping and flooding of the railway line will occur over time which poses Health and Safety Risks

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Core Criteria	Sub Criteria	Option 1	Option 1 Narrative (Do Nothing)	Option 2	Option 2 Narrative (Do Minimum)
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). The defences will quickly degrade, eventually leading to failure and collapse of existing flood defences and the requirement to close the railway. Defence failure combined with climate change impacts will lead to increasing occurrences of coastal flooding.		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 flooding and/or damage collapse of existing flood defences will continue and potentially get worse in line with climate change predictions.
	Access		Option 1 (Do Nothing Scenario) is considered to have some disadvantages over other options. Although existing formal and informal accesses to the beach amenity area will not be altered and will remain as they are now, in the longer term access is likely to be lost as the defence deteriorate		Option 2 (Do Minimum Scenario) is considered to have some advantages over other options as existing formal and informal accesses to the beach amenity area will not be altered and will remain as they are now. Long-shore access is also unlikely to be affected under this option.
	Social and Recreation Facilities		Option 1 (Do Nothing) is considered to have some disadvantages over other options as under this option there would be no effects on existing social and recreational facilities (i.e. beach amenity areas) in the short term. However the effects of unmitigated climate change will eventually impact these resources.		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.
	Compatibility with Development Plans		Do Nothing would provide significant disadvantages over other options as coastal zone management and coastal area protection are identified as important within the relevant development plans. Dublin City Council include the following policy "SMT21 – 'The Rail Network and Freight Transport'," which supports working with Iarnród Éireann to achieve a coordinated approach to improving the rail network. Whilst the project is not specifically mentioned within the development plan coastal defence is supported within the plan. A number of distinct map based objectives are relevant to the cells within the DLR functional area. It is an objective of the Dublin City Council Plan under SMT01 to 'Transition to more Sustainable travel modes" and this includes rail. Also under SMT23 it is the policy of the council to work with IE to improve the rail network.		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 it would not fully achieve the objectives of the plans. DC Policy CA9 for example "Climate Adaptation in the Built Environment' sets out that proposals must demonstrate climate adaptation. 'Patching up' existing infrastructure and not addressing long term climate issues doesn't address this.

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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 Climate Adaptation Plans		Do Nothing would provide significant disadvantages over other options as it would contravene climate objectives such as Dublin City Council policy objective "CA30 Coastal Zone Management -To support coastal zone management measures for adapting to climate change which include restoration of degraded ecosystems, increased flood resilience, water quality improvement, habitat conservation and provision of amenities for the residents and visitors of Dublin city" and 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. This 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 network 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. Eventually this will lead to abandonment of the railway line. 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.
	Biodiversity		Do Nothing would provide significant advantage over other options as there would be no construction work and therefore no impact on biodiversity/ protected areas from habitat loss/degradation and disturbance (noise/pollution). However, given the potential for in and around the tracks to be polluted with oils and other pollutants there is a risk that as structures collapse these pollutants could be released. There is one Ramsar site (Sandymount Strand/Tolka Estuary), one SAC (South Dublin Bay SAC) and several SPA (South Dublin and River Tolka Estuary SPA being the closest), pNHA (Booterstown Marsh) and one pNHA (South Dublin Bay) that could be effected in a beneficial way. The natural process of spit expansion will provide supporting habitat for SPA bird species of the South Dublin and River Tolka Estuary SPA (and other SPA at further distance but whose QI bird species utilise Dublin Bay). Alternatively, the spit expansion appears to be having a negative effect on the eel grass bed area by appearing reducing the extent of the bed which is QI habitat of the South Dublin Bay SAC and relatively discrete in nature and thus of greater importance if impacted. No impacts to other QI, such as reef habitat, from construction and operation as natural processes overall would progress unconstrained. Eventually degradation of existing structure may cause damage to the environment in the long term.		Do Minimum would provide a slight disadvantage in comparison to the 'Do Nothing' option as there would be limited/targeted construction work and therefore minimal impact on biodiversity/ protected areas. Upgrade works would prevent potential pollution events. There is one Ramsar site (Sandymount Strand/Tolka Estuary), one SAC (South Dublin Bay SAC) and several SPA (South Dublin and River Tolka Estuary SPA being the closest), one pNHA (Booterstown Marsh) and one pNHA (South Dublin Bay) that could be effected in a minor negative way. Repair works could cause disturbance to QI bird species for example. If unhindered, the natural process of spit expansion will provide supporting habitat for SPA bird species of the South Dublin and River Tolka Estuary SPA and may provide protection to eel grass bed QI habitat of the South Dublin Bay SAC in vicinity and which is relatively discrete in nature and thus of greater importance if impacted. Limited impacts to other QI from construction are likely. Nature process overall would progress mainly unconstrained.

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Core Criteria	Sub Criteria	Option 1	Option 1 Narrative (Do Nothing)	Option 2	Option 2 Narrative (Do Minimum)
Environment	Landscape, Visual and Seascape		Continued degradation and coastal flooding as a result of no works being undertaken would generate significant adverse landscape/seascape and visual effects.		Continued degradation, and piecemeal, reactive interventions, would compromise the character and quality of this frontage and its amenity. Continued and ongoing works would generate a coastline that is in a constant state of repair and disruption, with constant adverse landscape/seascape and visual effects.
	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.		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.
	Marine Archaeology		There are two recorded wrecks (ID WO1960 and WO1961). 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.		There are two recorded wrecks (ID WO1960 and WO1961). 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. However 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. However, the long term operational scenario 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.
	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		This Option has significant disadvantages over other options due to 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.		This Option has significant disadvantages over other options due to 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.

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Core Criteria	Sub Criteria	Option 1	Option 1 Narrative (Do Nothing)	Option 2	Option 2 Narrative (Do Minimum)
	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 to geological resources during the construction phase of the Scheme. However, the mitigation installed may be 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 short-term 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 short-term 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		This Option has significant disadvantages compared to other options due to the potential for significant disruption to transport in the longer term if no intervention is made. Rail service impacts may lead to overcrowding on buses and/or increased road congestion.		This Option has some disadvantages compared to other options due to the 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 has disadvantages compared to other options as it is likely to require ad hoc emergency repairs to the defences which could be more complex than planned protection works.
	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 wall alongside the railway, 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		This Option has 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.		This Option would not eliminate weaknesses in the existing hard defence, which could lead to rapid failure.
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.

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Core Criteria	Sub Criteria	Option 3	Option 3 Narrative (Concrete Armour unit revetments)	Option 4	Option 4 Narrative (Rock Revetment (with raised wall where needed))
Economy	Land Use and Third Party Assets		No direct impact on private third party lands with this option. Potential impact on Dun Laoghaire Rathdown County Council land at Salthill and Monkstown Station.		No direct impact on private third party lands with this option. Potential impact on Dun Laoghaire Rathdown County Council land at Salthill and Monkstown Station.
	Capital Expenditure		This Option would likely incur the highest construction cost as the concrete amour units would need to be fabricated 'on-site', most likely on the quayside and then transported to the workface via flat top barges. Heavy marine plant would be needed to handle them and also sizeable mobile cranes landside. Specialist contractors and skillsets would be needed to install them. The concrete units would be fabricated under a sub license contract from the armour unit designers increasing cost and stakeholders to the project. In addition to the concrete amour unit a significant amount of rock amour would still be needed for the underlayers which would also need to be transported by barge.		This Option would be a mixture of landside construction on the shoreline and marine works to bring the material in. 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). This Option would be quicker to install than a concrete amour unit revetment, so has a lower risk profile overall.
	Maintenance Expenditure		This Option has significant advantages over other options as it would only require a routine and post storm monitoring plan and should require minimal maintenance during the design life. Minimal maintenance of the beach should be required		This Option has significant advantages over other options as it would only require a routine and post storm monitoring plan and should require minimal maintenance during the design life. Minimal maintenance of the beach should be required
Safety	Health and Safety (Construction)		This Option has disadvantages compared to Option 4, 7 and 8 due to the production of, transportation and handling of heavy concrete armour units which would require large equipment to transport, handle and place heavy concrete armour units and rock armour.		This Option has significant advantages over other options as the rock armour can be handled exclusively by proprietary marine equipment and should not require land based handling and transportation. The revetment will be constructed by land based equipment although some marine works will be required to transport the rock to the workface. The construction of rock revetments is also less complex than detached breakwaters and concrete structures.
	Health and Safety (Design Life)		This Option has advantages over other options as the potential Health and Safety risks posed by this option can be more easily managed. This Option could pose some Health and Safety risks of people climbing on the revetments and becoming trapped. Warning signs should be installed to mitigate this. The revetments will significantly reduce the useable area of the beach in which could lead to people becoming trapped by the tides. This can be mitigated through increased access points through the revetments. A concrete armour unit revetment at Seapoint Beach could pose additional safety issues due to this being a popular amenity frontage. The revetment would limit access in and out of the water and safe use of the area for swimming and bathing would be reduced.		This Option has advantages over other options as the potential Health and Safety risks posed by this option can be more easily managed. This Option could pose some Health and Safety risks of people climbing on the rock revetments and becoming trapped. Warning signs should be installed to mitigate this. The revetments will significantly reduce the useable area of the beach in which could lead to people becoming trapped by the tides. This can be mitigated through increased access points through the revetments. A rock revetment at Seapoint Beach could pose additional safety issues due to this being a popular amenity frontage. The revetment would limit access in and out of the water and safe use of the area for swimming and bathing would be reduced.

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Core Criteria	Sub Criteria	Option 3	Option 3 Narrative (Concrete Armour unit revetments)	Option 4	Option 4 Narrative (Rock Revetment (with raised wall where needed))
Accessibility and Social Inclusion	Community		This Option is considered to have some disadvantages to other options as it would place concrete armour revetment along the extent of the coastline within this CCA, 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, particularly at Seapoint. This Option is likely to be less attractive to the public than other options.		This Option is considered to have some disadvantages to other options as it would place rock revetment along the extent of the coastline within this CCA, 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, particularly at Seapoint. This Option is likely to be less attractive to the public than other options.
	Access		This Option is considered to have disadvantages over other options as there will be some imposition from the concrete armour unit revetment. However access steps will be incorporated into the revetment to ensure any formal and informal access points to the beach amenity that currently exist and are used by members of the public (for example the pedestrian access to the beach amenity area at Booterstown train station) are maintained. Long-shore access is also unlikely to be affected under this option.		This Option is considered to have disadvantages over other options as there will be some imposition from the rock revetment. However access steps will be incorporated into the revetment to ensure any formal and informal access points to the beach amenity that currently exist and are used by members of the public (for example the pedestrian access to the beach amenity area at Booterstown train station) are maintained. Long-shore access is also unlikely to be affected under this option.
	Social and Recreation Facilities		This Option is considered to have some disadvantages over other options as the placement of concrete armour unit revetment along the entire coastline of this CCA would likely remove the public's ability to use this coastline as areas for social and recreational activities, particularly at Seapoint.		This Option is considered to have some disadvantages over other options as the placement of rock revetment along the entire coastline of this CCA would likely remove the public's ability to use this coastline as areas for social and recreational activities, particularly at Seapoint.
	Compatibility with Development Plans		This Option is similar to other options as it aligns with high level coastal protection and coastal area management objectives within the development plans. The disadvantages relating to this option are: Development within an SPA, SAC and pNHA. Dublin City Council Plan CA8: 'Climate mitigation actions in built environment' seeks to "require low carbon development and use of construction materials that have low to zero embodied energy and CO2. 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 (no provision for east coast cycle route). The Toe = loss of some of the beach for amenity. Raising of wall/ rock armour over existing wall may impact map based objectives such as protected views. It also reduces the amenity value of travelling along the railway line and is likely to be objected to by third parties on this point alone. Extends into the Proposed Boundary of the Dun Laoghaire Rathdown County Council Development Plan. Public Right of Way Martello Tower - Coal Quay Bridge (North of Rail Line) Objective GIB14.		This Option would have some disadvantages to others. It aligns with high level coastal protection and coastal area management objectives within the development plans. The disadvantages relating to this option are similar to Option 3 but the rock revetment extends further into the beach area resulting in increased loss of the beach as an amenity, greater development area and therefore more potential impacts upon SPA/SAC and PNHA, etc. The raised sea wall will impact on protected views and amenities within the Dun Laoghaire Rathdown County Council Development Plan.

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Core Criteria	Sub Criteria	Option 3	Option 3 Narrative (Concrete Armour unit revetments)	Option 4	Option 4 Narrative (Rock Revetment (with raised wall where needed))
Integration	Compatibility with Climate Adaptation Plans		This Option would have some disadvantages over other options. It would align with the Transport Climate Change Sectoral Adaptation Plan by protecting the existing rail infrastructure through a complete upgrade of existing defences. However, it would also involve a significant volume of stone and concrete armour units to be brought to site and transport of same. It requires significantly more concrete than other options.		This Option would have some advantages to other options as it would align with the Transport Climate Change Sectoral Adaptation Plan by protecting the existing rail infrastructure through a complete upgrade of existing defences. However, similar to Option 3 it would also involve a significant volume of materials and transport of same but it has no or significantly less concrete.
	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 the coastline throughout CCA1 from Merrion Gates to Dún Laoghaire. Providing the revetment is implemented with consideration of 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 the coastline throughout CCA1 from Merrion Gates to Dún Laoghaire. Providing the revetment is implemented with consideration of the East Coast Trail, this option will support the Transport Strategy.
	Biodiversity		This Option has disadvantages over other options due to the larger footprint of the revetment. Night time working is likely to be required due to the tides which would cause some disturbances. There is one Ramsar site (Sandymount Strand/Tolka Estuary), one SAC (South Dublin Bay SAC) and several SPA (South Dublin and River Tolka Estuary SPA being the closest) one pNHA (Booterstown Marsh) and one pNHA (South Dublin Bay) that could be negatively affected. This Option would have direct negative impact on QI habitats of the South Dublin Bay SAC including loss of mud/sand flats which is widespread and is foraging habitat for South Dublin and River Tolka Estuary SPA QI bird species. Loss of fine sand Augulus tenuis community must be conserved in a natural condition as stated in the Conservation Objectives for the SAC. A significant amount of rock armour would be needed for the underlayers which would need to be transported by barge.		This Option has disadvantages over other options due to the larger footprint of the revetment. Night time working is likely to be required due to the tides which would cause some disturbances. There is one Ramsar site (Sandymount Strand/Tolka Estuary), one SAC (South Dublin Bay SAC) and several SPA (South Dublin and River Tolka Estuary SPA being the closest), one pNHA (Booterstown Marsh) and one pNHA (South Dublin Bay) that could be negatively affected. This Option would have a direct negative impact on QI habitats of the South Dublin Bay SAC including loss of mud/sand flats which is widespread and is foraging habitat for South Dublin and River Tolka Estuary SPA QI bird species. Loss of fine sand Augulus tenuis community must be conserved in a natural condition, as stated in the Conservation Objectives for the SAC. A significant amount of rock armour would be needed for this option which would be transported by barge. Operational extension of the revetment to 9.2m would result in no direct loss of eel grass bed or reef QI habitat although would be closer than Option 3 which has a slightly reduced footprint. Loss of muds may occur but would be minimal in the context of the area of this habitat type. Indirect impacts through changes in hydrology could occur.

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Core Criteria	Sub Criteria	Option 3	Option 3 Narrative (Concrete Armour unit revetments)	Option 4	Option 4 Narrative (Rock Revetment (with raised wall where needed))
Environment	Landscape, Visual and Seascape		Concrete armour unit revetements have a heavily engineered form that is incongruous with this frontage. Whilst there is potential to mitigate this through the use of concrete products with a more natural character, as this stretch of coastline is experienced at close proximity, the scale and form of uniform concrete armour units would contrast the characteristics of the area and generate significant adverse landscape/seascape and visual effects.		This Option has disadvantages compared to other options as rock revetments would have a scale and form with the potential to generate significant adverse landscape/seascape and visual effects, given that they would occur along a stretch of coastline that is experienced at close proximity. The use of natural material however would offer advantages over Option 3, and have a more natural character that could be integrated sympathetically with existing walling and features along the coastal edge. The integration of protection at the coastal edge is considered to generate less impact than features out at sea.
	Archaeology, Architectural and Cultural Heritage		This Option is similar to other options as no potential direct impacts on Recorded Monuments or SMR Sites have been identified, however, 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 two SMR sites (DU023-009; Ritual Site - Holy Well and DU023-010; Martello Tower). There is the potential for indirect setting and visual impacts to occur on 115 RPS Sites		This Option is similar to other options as no potential direct impacts on Recorded Monuments or SMR Sites have been identified, however, 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 two SMR sites (DU023-009; Ritual Site - Holy Well and DU023-010; Martello Tower). There is the potential for indirect setting and visual impacts to occur on 115 RPS Sites
	Marine Archaeology		There are two recorded wrecks (ID WO1960 and WO1961). This Option does not involve any works offshore and therefore 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 two recorded wrecks (ID WO1960 and WO1961). This Option does not involve any works offshore and therefore 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		This Option is similar to other options with some advantages due to the absence of any major intrusive works. All impacts are temporary to short-term. No long term operational noise or vibration impacts. Noise impact will be from mobile plant when working in proximity to Noise Sensitive Locations. Specific instances of elevated noise will be localised and temporary. There may be periods of night-time works required. No significant vibration impacts from this proposal.		This Option is similar to other options with some advantages due to the absence of any major intrusive works. All impacts are temporary to short-term. No long term operational noise or vibration impacts. Noise impact will be from mobile plant when working in proximity to Noise Sensitive Locations. Specific instances of elevated noise will be localised and temporary. There may be periods of night-time works required. No significant vibration impacts from this proposal.
	Air Quality		This Option has advantages over other options as there will be some construction phase impacts associated with potentially dusty activities and construction vehicle emissions but these would be short term and dust mitigation can be put in place. It is assumed that all concrete units would be precast to reduce impacts from onsite batching. There would be minimal operational phase impacts, with the assumption that maintenance requirement is low. This Option would facilitate operational phase reliance on public transport and reduce reliance on private vehicles for the long term.		This Option has advantages over other options as there will be some construction phase impacts associated with potentially dusty activities and construction vehicle emissions but these would be short term and dust mitigation can be put in place. It is assumed that rock will be delivered by marine plant. There would be minimal operational phase impacts, with the assumption that maintenance requirement is low. This Option would facilitate operational phase reliance on public transport and reduce reliance on private vehicles for the long term.
	Carbon Management		Whole Life Carbon (tonnes CO2e) was 184% of average across 9 options, therefore it is 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.		Whole Life Carbon (tonnes CO2e) was 14% 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.

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Core Criteria	Sub Criteria	Option 3	Option 3 Narrative (Concrete Armour unit revetments)	Option 4	Option 4 Narrative (Rock Revetment (with raised wall where needed))
	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		Concrete armour unit revetment will cause moderate disturbance to geological resources and areas of potential contamination during the construction phase of the Scheme. More significant impacts are expected in the vicinity of the County Geological Heritage Site located at Blackrock.		Rock revetment will cause minimal/moderate disturbance to geological resources during the construction phase of the Scheme. However, more significant impacts are expected in the vicinity of the County Geological Heritage Site located at Blackrock.
	Material and Circular Economy		This Option would provide some advantages over other options due to its comparatively low materials consumption score (330,580t). 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 be 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 (221,927t).
	Waste		This Option would provide some disadvantages over other options as it is likely to be associated with comparatively high wastage (5,886t). 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. Minimal waste would be generated from the removal of existing structures (new revetments will be constructed over the existing structures). Some removal of existing concrete walkways in sub cell D and E may be required to enable construction of the revetments. These walkways are in a relatively poor state already and beyond the end of their design life.		This Option would provide some advantages over other options is likely to be associated with comparatively low wastage (0.8t). Minimal waste would be generated from the removal of existing structures (new revetments will be constructed over the existing structures). Some removal of existing concrete walkways in sub cell D and E may be required to enable construction of the revetments. These walkways are in a relatively poor state already and beyond the end of their design life.
	Traffic and Transport		This Option is similar to other options as minimal operational impact is 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.		This Option is similar to other options as minimal operational impact is 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 over other options as it would be challenging to construct. Production, handling and placing of concrete armour units would need to be facilitated from land, increasing onshore footprint of the project. Placing of concrete armour units can be challenging depending on the size/weight of the units and will require specialist plant and experience in placing. Interlocking of units is required and replacement of broken units is difficult, especially at or near the toe.		This Option has significant advantages because, although it requires significant volumes of rock armour, construction is relatively simple but would be slow due to the scale of the works. Several work fronts could be opened up to improve construction duration. As existing infrastructure is being added to rather than removed and the cross section is relatively constant throughout the length of CCA1 this option would be simpler to construct. It is assumed that rock armour will be delivered by marine plant.
	Rail Service Impact		Minimal impact on operation of railway line as works are adding to existing infrastructure so no excavation is needed. Irish Rail will require to be notified of works as adjacent to the railway line but this is expected to be low risk. Some potential impact during the wall raisings.		Minimal impact on operation of railway line as works are adding to existing infrastructure so no excavation is needed. Irish Rail will require to be notified of works as adjacent to the railway line but this is expected to be low risk. Some potential impact during the wall raisings.

CCA1 Emerging Preferred Option Multi Criteria Analysis

Core Criteria	Sub Criteria	Option 3	Option 3 Narrative (Concrete Armour unit revetments)	Option 4	Option 4 Narrative (Rock Revetment (with raised wall where needed))
Engineering/ Technical	Reliance on Maintenance Maintenance burden		This Option has advantages over other options as the revetments only require routine and post storm monitoring but 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. If maintenance of the revetment is required this would be more complex than for a rock revetment. The repairs would also be more critical as a concrete armour unit revetment only has one layer of units over the underlayer/core material and therefore any damage or loss of units would more quickly lead to failure, compared to rock armour revetments which have two layers of rock over the underlying material.		This Option has significant advantages over other options as it would only require routine and post storm monitoring but 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. Maintenance of a rock revetment is less complex than that of a concrete armour unit revetment (Option 3).
	Adaptation		This Option is less adaptable than Option 4 due to the nature of concrete armour unit revetments. The interlocking nature of the units makes it very challenging to increases the height or size of the structures following construction.		This Option has advantages over Option 3 as the rock revetment would be less challenging to adapt compared to a concrete armour unit revetment.
	Residual Risk		This Option is similar to other options as failure of a concrete armour unit revetment is very unlikely to be sudden, failure would be progressive in the form of some loss of units 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 is similar to other options 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.
Planning Risk	Consenting Risk		This Option would have some disadvantages over other options. 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. Significant volumes of imported material, loss of views/prospects from the railway line and some loss of amenity area on the beach due to the rock toe could pose significant risks to achieving consent.		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. A full upgrade of existing defences would protect the area for a longer time in line with planning policy. Rock revetment is likely to be more acceptable than a concrete revetment.

CCA1 Emerging Preferred Option Multi Criteria Analysis

Core Criteria	Sub Criteria	Option 5	Option 5 Narrative (Concrete seawall fronted by rock toe)	Option 6	Option 6 Narrative (Detached breakwater with nourishment and raised seawall (Beach and dune stabilisation where possible)
Economy	Land Use and Third Party Assets		No direct impact on private third party lands with this option. Potential impact on Dun Laoghaire Rathdown County Council land at Salthill and Monkstown Station.		No direct impact on private third party lands with this option. Potential impact on Dun Laoghaire Rathdown County Council land at Salthill and Monkstown Station.
	Capital Expenditure		Along the majority of CCA1 this option would require the removal of existing defences which would have significant cost implications. This Option would also require excavation close to the railway in places which increases the complexity and temporary works requirements. The use of cofferdams at certain locations may be required. Transporting insitu concrete to the work area would be challenging. The temporary works costs on this option alone would be significant and would likely require closure of the railway line during construction.		This Option would be complex and costly to construct. Material for the breakwaters could be brought in by barges and bottom dumped close to final location, profiled by marine plant and/or discharged into marine stockpiles which requires double handling. Significant marine plant would be required and the number of breakwaters required for this option would result in significant costs for the plant alone, and the duration for which it would be required. The beach nourishment will require a dredger to obtain the beach material and then pump it ashore before land based plant is used to move the material into place.
	Maintenance Expenditure		This Option has significant advantages over other options as it would only require a routine and post storm monitoring plan but should require minimal maintenance during the design life. Maintenance of the concrete seawall is likely to be patch repairs. Minimal maintenance of the beach should be required.		This Option has disadvantages over other options due to the need for ongoing monitoring and maintenance to maintain the beach to the design levels. The detached breakwaters should require minimal maintenance but routine inspections and post storm inspections should be undertaken which would require marine plant.
Safety	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. Furthermore the interface risk with Irish Rail would be increased due to the close proximity of the excavation to the railway. Irish Rail would need to approve any temporary works design which may prolong the programme. This Option would also include removal of the existing structures in numerous locations which would add additional Health and Safety risks		This Option has disadvantages over options 3, 7and 8 because the detached breakwaters can be challenging to construct in open water and would require the exclusive use of marine equipment to construct and carry increased safety risks. The beach no nourishment is a relatively straightforward process and the Health and Safety aspects would be managed by the specialist contractor undertaking the works. Interface with the public would need to be managed and appropriate segregation installed to ensure no public access during the works.
	Health and Safety (Design Life)		This Option has disadvantages over other options due to increased potential for falls from height and reduced visibility of the sea for people on the landward side of the seawalls. The rock toe protection may become exposed if/when beach levels lower which could cause some trip hazards and potential for people to become trapped if they climb on the rocks. The height of the seawall is likely to be higher than for other options and this could lead to an increased risk to people landward of the seawall who do not have a clear view of the sea and would have no warning of overtopping waves. If the concrete seawalls are not maintained and repaired this would lead to safety issues such as loss of concrete and exposed rebar. There is also a risk of falling from height should people access the top of the seawall. Warning signs should be installed to deter people from climbing on the wall. This Option has a smaller footprint than the existing revetment and therefore there should be no changes to the access to/from the beach		This Option has a significant number of breakwaters at a number of public access points. During low tide conditions the detached breakwaters will be fully emergent (particularly in the mid/northern areas) and members of the public may attempt to access and climb on the breakwaters which could lead to people becoming trapped in the voids between the armour. To the north of this area, the mudflats are extensive and breakwaters may result in more variable bed levels and composition, which will increase the risk of the public being drawn towards these structures at low tide. At higher tide conditions members of the public might attempt to swim out to the breakwaters, or access them from kayaks/boats etc. 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. The renourished beaches may require reprofiling or renourishing during the design life which will require plant on the beach that would need to be managed to mitigate Health and Safety risks with the public.

CCA1 Emerging Preferred Option Multi Criteria Analysis

Core Criteria	Sub Criteria	Option 5	Option 5 Narrative (Concrete seawall fronted by rock toe)	Option 6	Option 6 Narrative (Detached breakwater with nourishment and raised seawall (Beach and dune stabilisation where possible)
Accessibility and Social Inclusion	Community		This Option is considered to have some disadvantages 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 significant advantages over other options as the placement of detached breakwaters, groynes, concrete sea walls and undertaking of beach nourishment will provide enhanced beach amenity areas all along the coastline of this CCA. This would contribute positively to the amenity value of the area as well as the general perception of the area. The breakwaters proposed under this option may have some disadvantages to the recreational use of the beach amenity area however (see social and recreational facilities below).
	Access		This Option is considered to have some disadvantages over other options as the imposition of concrete seawall with rock toe protection along the majority of the coastline within this CCA will result in the removal/curtailing of some formal and informal access points to the beach amenity that currently exist and are used by members of the public (for example the pedestrian access to the beach amenity area at Booterstown train station). Reflection from the sea walls may also curtail long-shore access.		This Option is considered to have some advantages over other options as beach nourishment along the entire coastline of this CCA is likely to improve long-shore access, albeit groynes may limit access at the northern extent. The proposed raising of seawalls will not impact any informal or formal accesses that currently exist (for example the pedestrian access to the beach amenity area at Booterstown train station).
	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 have some advantages over other options as it provides additional beach amenity areas all along the coastline of this CCA. However, the placement of breakwaters just off shore will likely make the undertaking of water based activities unsafe and dangerous.
	Compatibility with Development Plans		This Option is similar to other options as it aligns with high level coastal protection and coastal area management objectives within the development plans. This Option has a smaller footprint compared to other options and therefore has reduced impacts on SAC/SPA/PNHA. The disadvantages relating to this option are: No enhancement of the areas - utilising naturally occurring green infrastructure, impacting natural habitats, providing coastal recreation amenities or incorporating pedestrian/cycling infrastructure. Raising of wall may impact map based objectives such as protected views.		This Option would have significant disadvantages over other options as it could impact on Marine Policy /Map based objectives. Potential for impact on Marine sites such as Inter Alia Wind Farm Site Investigation Works, marine mammals range, Fish Species grounds Marine Spatial Plan Map Viewer Activities/Policy. Large amounts of marine works, Breakwaters located within UNESCO site.

CCA1 Emerging Preferred Option Multi Criteria Analysis

Core Criteria	Sub Criteria	Option 5	Option 5 Narrative (Concrete seawall fronted by rock toe)	Option 6	Option 6 Narrative (Detached breakwater with nourishment and raised seawall (Beach and dune stabilisation where possible)
Integration	Compatibility with Climate Adaptation Plans		This Option would have some disadvantages to other options. It would align with the Transport Climate Change Sectoral Adaptation Plan in terms of protecting the coastline and transport assets. This Option would involve a significant amount of concrete.		This Option would have some disadvantages over other options, it generally aligns with Transport Climate Change Sectoral Adaptation Plan in terms of protecting the coastline and transport assets. However this option would have negative marine based impacts as it requires a significant volumes of rock to be transported offshore for the 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 the coastline throughout CCA1 from Merrion Gates to Dún Laoghaire. Providing the seawall is implemented with consideration of 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 the coastline throughout CCA1 from Merrion Gates to Dún Laoghaire. Providing the seawall is implemented with consideration of the East Coast Trail, this option will support the Transport Strategy.
	Biodiversity		This Option has advantages over other options due to it's reduced footprint. There is one Ramsar site (Sandymount Strand/Tolka Estuary), one SAC (South Dublin Bay SAC) and several SPA (South Dublin and River Tolka Estuary SPA being the closest), one pNHA (Booterstown Marsh) and one pNHA (South Dublin Bay) that could be negatively affected. The removal of the existing wall and the potential for in and around the tracks to be polluted with oils and other pollutants could result in a risk that these pollutants could be released. Demolition and replacement of the wall will likely not be able to be carried out within the existing footprint and a cofferdam may be required. Although there would be disturbance and temporary impacts to habitats, this would be a short-term effect. Although there would be direct loss of habitat (mud flats and fine sand for example) this habitat is widely available for foraging QI bird species. Fine sand Conservation Object does state that this QI must be conserved in a natural condition. Indirect impacts through changes in hydrology could occur to QI habitat of the South Dublin Bay SAC so modelling needed to confirm no reduction but would be expected to be lower risk than other options.		This Option has significant disadvantages compared to other option as the detached breakwaters and beach nourishment could lead to significant loss of habitat. There is one Ramsar site (Sandymount Strand/Tolka Estuary), one SAC (South Dublin Bay SAC) and several SPA (South Dublin and River Tolka Estuary SPA being the closest), one pNHA (Booterstown Marsh) pNHA (Booterstown Marsh) and one pNHA (South Dublin Bay) that could be negatively affected. The breakwaters would interrupt natural processes of beach movement. Nourishment may smother reefs and may interrupt increased expansion of the spit. Replenishment of sand in future may be needed causing disturbance in the long term. A small area of pioneer saltmarsh now occurs in the lee of an embryonic sand dune just north of Booterstown Station. This early stage of saltmarsh development is here characterised by the presence of pioneer stands of glassworts (Salicornia spp.) occurring below an area of drift line vegetation. The above area could be severely impacted by nourishment and changes in hydrology from breakwaters. Presence of Annex I species (annual vegetation drift lines) known to be present would be destroyed. In a sand/shingle community the niches between substrates are quite important and 'wave deposited sediment' (or human deposited sediment in this case) can reduce seed germination, change the arrangement of wave sorted sediments and lead to burial of seeds. Replenishment of sand in future may be needed causing disturbance in the long term. General construction at sea and on-shore would disturb QI bird species. Impacts could occur from International to National level with this option.

CCA1 Emerging Preferred Option Multi Criteria Analysis

Core Criteria	Sub Criteria	Option 5	Option 5 Narrative (Concrete seawall fronted by rock toe)	Option 6	Option 6 Narrative (Detached breakwater with nourishment and raised seawall (Beach and dune stabilisation where possible)
Environment	Landscape, Visual and Seascape		This Option has significant advantages over other options due to the opportunity to holistically upgrade and regularise the coastal edge frontage whilst retaining the characteristics and views of the foreshore and coastal waters for those at its edge and within elevated hinterland areas. Wall and rock toe protection is a visually simple treatment that is consistent with the existing features present, and offers significant potential to be adapted and integrated sympathetically with features along the coastal edge such as to deliver positive placemaking outcomes.		Regularisation of sea wall and beach nourishment have potential to enhance the character and amenity of the coastal edge. However, detached breakwaters applied consistently within the near shore coastal waters, some of which are above the low water mark, would generate significant adverse landscape/seascape and visual effects.
	Archaeology, Architectural and Cultural Heritage		This Option is similar to other options as no potential direct impacts on Recorded Monuments or SMR Sites have been identified, however, 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 two SMR sites (DU023-009; Ritual Site - Holy Well and DU023-010; Martello Tower). There is the potential for indirect setting and visual impacts to occur on 115 RPS Sites.		This Option is similar to other options as no potential direct impacts on Recorded Monuments or SMR Sites have been identified, however, 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 two SMR sites (DU023-009; Ritual Site - Holy Well and DU023-010; Martello Tower). There is the potential for indirect setting and visual impacts to occur on 115 RPS Sites.
	Marine Archaeology		There are two recorded wrecks (ID WO1960 and WO1961). This Option does not involve any works offshore and therefore 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 two recorded wrecks (ID WO1960 and WO1961). 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. This is only relevant to section E at the southern end of the beach.
	Noise and Vibration		This Option has disadvantages compared to other options due to more intrusive construction works with potential for elevated noise and vibration when works occurring in vicinity of Noise Sensitive Locations. Will require railway possession to conduct works and likely require some night-time works. May require use of a cofferdam. Whilst higher noise impacts will likely be experienced with this option, these will be localised and temporary (i.e. during piling and excavation works). Short-term impacts overall. No long-term significant noise or vibration impacts.		This Option would have some disadvantages over other options due to the impacts to both airborne sensitive receptors during concrete wall construction (excavation works) and short term underwater noise during construction of breakwaters over full extent of CCA1. Airborne noise impacts will be temporary to short-term. There will be requirement for railway possession and likely require some night-time works. Impacts to marine life may have longer term impacts if displaced.
	Air Quality		This Option has disadvantages over other options due to the demolition of the existing wall and requirement for long closure of railway during construction phase which is a disadvantage compared to other Do Minimum options. The new wall would require piling which would require heavy Machinery. It is assumed that all units would be precast to reduce impacts. There would be minimal operational phase impacts, with the assumption that maintenance requirement is low. 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 due to the need for ongoing monitoring and maintenance requirements to maintain the beach to the design levels which has the potential for dust emissions. This Option also has the potential for higher construction phase impacts associated with beach nourishment which would require heavy Machinery and therefore have higher potential for dust impact on sensitive receptors in proximity to the works being carried. It is assumed that rock would be delivered by marine plant. Construction phase impacts would be likely considered short term and dust mitigation can be put in place. This Option would facilitate operational phase reliance on public transport and reduce reliance on private vehicles for the long term.
	Carbon Management		Whole Life Carbon (tonnes CO2e) was 466% 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 74% of average across 9 options, preferable to some options. This Option would facilitate operational phase reliance on public transport and reduce reliance on private vehicles for the long term.

CCA1 Emerging Preferred Option Multi Criteria Analysis

Core Criteria	Sub Criteria	Option 5	Option 5 Narrative (Concrete seawall fronted by rock toe)	Option 6	Option 6 Narrative (Detached breakwater with nourishment and raised seawall (Beach and dune stabilisation where possible)
	Water Resources		Below ground structure in the form of a concrete wall could impact groundwater levels, flows and quality.		Minimal impacts to groundwater as minimal below ground construction required.
	Geology and Soils		The construction of the concrete seawall and rock toe is likely to involve bulk excavation, cofferdams, and piling works which will significantly disturb geological resources across the cell. Furthermore, the intrusive nature of the works may release contamination into the wider environment.		The raised seawall will cause moderate disturbance to geological resources and potential areas of contamination across the cell. More significant impacts are expected for the County Geological Heritage Site located at Blackrock. The addition of beach nourishment and detached breakwater elements are expected to cause moderate disturbance to geological resources.
	Material and Circular Economy		This Option would provide some advantages over other options due to its comparatively low materials consumption score (448,726t).		This Option would provide significant disadvantages over other options due to its comparatively high materials consumption score (2,347,233t).
	Waste		This Option would provide significant disadvantages over other options as it has a high wastage (982t) due to significant waste that would be generated from the removal of existing structures (existing masonry revetments along the majority of the frontage would be removed).		This Option would provide significant advantages over other options as it has a comparatively low wastage (0.8t). No waste would be generated from the removal of existing structures.
	Traffic and Transport		This Option is similar to other options as minimal operational impact is 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.		This Option is similar to other options as minimal operational impact is 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 over other options as deep excavations near the rail line will be challenging, time consuming, high risk and costly. Interface risk with Irish Rail to seek approval to implement temporary works adjacent to the live rail line. Works will require dewatering or working in dry environment to construct the wall. This Option would carry high risk, high cost and long construction programme.		This Option has some disadvantages as it would be 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. Material may need to be stockpiled on land or marine which results in double handling increasing cost and reducing efficiency.
	Rail Service Impact		Will require deep excavations adjacent to railway. Approval from Irish rail would be required detailing all temporary works requirements, mitigation measures and may result in numerous closures of the line resulting in programme extension overall.		No impact on railway during construction of the detached breakwaters. Minimal impact during beach nourishment. Some potential impact during the wall raisings.

CCA1 Emerging Preferred Option Multi Criteria Analysis

Core Criteria	Sub Criteria	Option 5	Option 5 Narrative (Concrete seawall fronted by rock toe)	Option 6	Option 6 Narrative (Detached breakwater with nourishment and raised seawall (Beach and dune stabilisation where possible)
Engineering/ Technical	Reliance on Maintenance Maintenance burden		This Option has advantages over other options as regular routine monitoring of the concrete seawalls would be required with minor maintenance such as patch repairs throughout the design life, with increased maintenance expected towards the end of the design life.		This Option has disadvantages over other options due to the need for monitoring and maintenance(recycling or nourishment) of the beaches during the design life. A monitoring programme should be prepared to ensure the regular monitoring is undertaken so that maintenance works can be planned. The detached breakwaters should require minimal maintenance but routine inspections and post storm inspections should be undertaken which would be more complex and expensive than for the revetments due to the need for marine plant.
	Adaptation		This Option has significant advantages over other options as future raising of the concrete seawall could be possible without significant construction challenges.		This Option does allow for some future adaptation of the beach levels through additional beach nourishment. However, this would be limited by the height of the seawalls (beach levels could not be higher than the wall levels). Adaptation of the detached breakwaters is not practical.
	Residual Risk		This Option has disadvantages over other options as failure of concrete walls (e.g. due to undermining) can be sudden		This Option is similar to other options as breakwaters and the beach 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 would have some advantages over other options as it would have less impact on the amenity space of the beach compared to other options. 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 sites which may invoke IROPI, however this option has no additional permanent footprint in the Natura 2000 sites.		This Option would have significant disadvantages over other options as significant volumes of materials would be required for breakwaters and beach nourishment. The breakwaters proposed in a sensitive environment that will have potential to be visible widely from viewpoints across Dublin Bay. Potential to contravene Development Plan objective for marine based activities. 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.

CCA1 Emerging Preferred Option Multi Criteria Analysis

Core Criteria	Sub Criteria	Option 7	Option 7 Narrative (Rock revetment (A-D); attached breakwaters and amenity beach (E); local raising of defences where required	Option 8	Option 8 Rock revetment (A-C); stepped revetment with rock toe protection in amenity frontages (D-E)
Economy	Land Use and Third Party Assets		No direct impact on private third party lands with this option. Potential impact on Dun Laoghaire Rathdown County Council land at Salthill and Monkstown Station.		No direct impact on private third party lands with this option. Potential impact on Dun Laoghaire Rathdown County Council land at Salthill and Monkstown Station.
	Capital Expenditure		This Option would be similar to Option 4 but with the additional cost of the beach nourishment at Seapoint Beach. The attached breakwaters would follow a similar construction methodology as the rock revetments.		This Option would be similar to Option 4 but with increased costs at Blackrock and Seapoint to provide replacement amenity areas and access.
	Maintenance Expenditure		This Option is similar to Option 4, the maintenance requirements of the attached breakwaters would be similar to that of the revetment, but the beach at CCA1-E would require regular monitoring and maintenance. However, the bays are relatively small and self-contained so maintenance (beach recycling and beach nourishment) should be relatively in-frequent.		This Option is similar to Option 4 with the addition of the stepped revetments which would require occasional maintenance and repairs during its deign life (e.g. concrete patch repairs).
Safety	Health and Safety (Construction)		This Option is similar to Option 4 but with the addition of the attached breakwaters, but these would carry a similar Health and Safety construction risk due to the revetment because they are shore attached meaning they can be constructed via land. The beach no nourishment is a relatively straightforward process and the Health and Safety aspects would be managed by the specialist contractor undertaking the works. Interface with the public would need to be managed and appropriate segregation installed to ensure no public access during the works.		This Option is similar to Option 4 but with the stepped revetment at CCA1-D and CCA1-E. The stepped revetments and raised footways and new access locations will require extensive work on the existing revetments and raising works immediately adjacent to the railway, bringing increased risks compared to Option 4
	Health and Safety (Design Life)		This Option is similar to Option 4 but has significant advantages by not having a revetment at Blackrock and Seapoint Beach. The new amenity areas at these locations improve the Health and Safety for the public as it would be built to modern standards.		This Option is similar to Options 3 and 4 but has significant advantages by not having a revetment at Seapoint Beach. The renourished beaches will improve the bathing conditions by creating larger more sheltered areas. Warning signs should be placed on the attached breakwaters to deter people from climbing on them but the renourished beaches, and the breakwaters being attached will mitigate the risk of people becoming cut off by the tide. The renourished beaches at Seapoint should require minimal maintenance. The stepped revetment at Blackrock will improve access in this location

CCA1 Emerging Preferred Option Multi Criteria Analysis

Core Criteria	Sub Criteria	Option 7	Option 7 Narrative (Rock revetment (A-D); attached breakwaters and amenity beach (E); local raising of defences where required	Option 8	Option 8 Rock revetment (A-C); stepped revetment with rock toe protection in amenity frontages (D-E)
Accessibility and Social Inclusion	Community		This Option is considered to have some advantages over other options. While the placement of rock revetment along the majority of the coastline of this CCA is not considered to be positive in regard to improving the amenity value or public perception of the area. The provision of minor breakwaters and beach nourishment at Seapoint would provide enhanced beach amenity areas at this location, and thereby contribute positively to public perception and amenity value locally.		This Option is considered to have some advantages over other options. While the placement of rock revetment along the majority of the coastline of this CCA is not considered to be positive in regard to improving the amenity value or public perception of the area, the provision of stepped revetment at Blackrock and Seapoint would provide enhanced amenity areas at this location, and thereby contribute positively to public perception and amenity value locally.
	Access		This Option is considered to have some advantages over other options as access to and along the beach at Seapoint is likely be improved under this option.		This Option is considered to have significant advantages over other options as access to and along the beach at Blackrock and Seapoint will be maintained and improved under this option.
	Social and Recreation Facilities		This Option is considered to have some advantages over other options as it provides for enhanced beach amenity areas at Seapoint Beach (Salthill Beach)		This Option is considered to have some advantages over other options as it provides for enhanced amenity areas at Blackrock and Seapoint. However, the placement of rock revetment along the remaining length of coastline within this CCA will likely restrict the public's ability to use it for social and recreational activities.
	Compatibility with Development Plans		This Option is similar to Option 4 but has some advantages over other options as it would include enhancement of the area with beach amenity and coastal recreation amenity and elements of green infrastructure.		This Option is similar to Option 4 but has some advantages over other options as it would include enhancement of the area with beach amenity and coastal recreation amenity and elements of green infrastructure.

CCA1 Emerging Preferred Option Multi Criteria Analysis

Core Criteria	Sub Criteria	Option 7	Option 7 Narrative (Rock revetment (A-D); attached breakwaters and amenity beach (E); local raising of defences where required	Option 8	Option 8 Rock revetment (A-C); stepped revetment with rock toe protection in amenity frontages (D-E)
Integration	Compatibility with Climate Adaptation Plans		This Option has some advantages over other options. It generally aligns with Transport Climate Change Sectoral Adaptation Plan in terms of protecting the coastline and transport assets. In comparison with Option 6 it requires less sand for beach nourishment and significantly lower volume of rock for breakwaters. It has no or significantly less concrete than other options.		This Option would have some advantages over other options, it generally aligns with Transport Climate Change Sectoral Adaptation Plan in terms of protecting the coastline and transport assets. In comparison with Option 4 it requires less rock but more concrete.
	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 the coastline throughout CCA1 from Merrion Gates to Dún Laoghaire. Providing the revetment is implemented with consideration of 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 the coastline throughout CCA1 from Merrion Gates to Dún Laoghaire. Providing the revetment is implemented with consideration of the East Coast Trail, this option will support the Transport Strategy.
	Biodiversity		This Option is similar to Option 4 but with disadvantages due to the loss of habitat under the breakwaters and beach nourishment at locations where reef habitat is known to occur.		This Option is similar to Option 4 as the stepped revetments at CCA1-D and E have similar footprint to the rock revetments.

CCA1 Emerging Preferred Option Multi Criteria Analysis

Core Criteria	Sub Criteria	Option 7	Option 7 Narrative (Rock revetment (A-D); attached breakwaters and amenity beach (E); local raising of defences where required	Option 8	Option 8 Rock revetment (A-C); stepped revetment with rock toe protection in amenity frontages (D-E)
Environment	Landscape, Visual and Seascape		Whilst features associated with breakwaters have the potential to generate adverse effects, attached breakwaters are comparatively more sympathetic with the rocky nature of the foreshore and coastal edge, and together with beach nourishment and improved sea walls, offers the potential to contribute positively and enhance the character and amenity of Seapoint Beach.		This Option has the potential to retain the existing landscape, visual and seascape at Blackrock and Seapoint as this option replaces current provision on a like for like basis, but everything is raised in elevation. The new works will be more aesthetically coherent and pleasing. However, this option requires increased wall heights, particularly along the railway line, which will have a higher visual impact on rail users.
	Archaeology, Architectural and Cultural Heritage		This Option is similar to other options as no potential direct impacts on Recorded Monuments or SMR Sites have been identified, however, 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 two SMR sites (DU023-009; Ritual Site - Holy Well and DU023-010; Martello Tower). There is the potential for indirect setting and visual impacts to occur on 115 RPS Sites.		This Option is similar to other options as no potential direct impacts on Recorded Monuments or SMR Sites have been identified, however, 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 two SMR sites (DU023-009; Ritual Site - Holy Well and DU023-010; Martello Tower). There is the potential for indirect setting and visual impacts to occur on 115 RPS Sites.
	Marine Archaeology		There are two recorded wrecks (ID WO1960 and WO1961)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. This is only relevant to section E at the southern end of the beach.		There are two recorded wrecks (ID WO1960 and WO1961). This Option does not involve any works offshore and therefore 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		This Option is similar to other options with some advantages due to the absence of any major intrusive works. All impacts are temporary to short-term. No long term operational noise or vibration impacts. Noise impact will be from mobile plant when working in proximity to Noise Sensitive Locations. Specific instances of elevated noise will be localised and temporary. There may be periods of night-time works required. No significant vibration impacts from this proposal.		This Option is similar to other options with some advantages due to the absence of any major intrusive works. All impacts are temporary to short-term. No long term operational noise or vibration impacts. Noise impact will be from mobile plant when working in proximity to Noise Sensitive Locations. Specific instances of elevated noise will be localised and temporary. There may be periods of night-time works required. No significant vibration impacts from this proposal.
	Air Quality		This Option has advantages over other options as there will be some construction phase impacts associated with potentially dusty activities and construction vehicle emissions but these would be short term and dust mitigation can be put in place. It is assumed that rock will be delivered by marine plant. There would be minimal operational phase impacts, with the assumption that maintenance requirement is low. This Option would facilitate operational phase reliance on public transport and reduce reliance on private vehicles for the long term.		This Option has advantages over other options as there will be some construction phase impacts associated with potentially dusty activities and construction vehicle emissions but these would be short term and dust mitigation can be put in place. It is assumed that rock will be delivered by marine plant. There would be minimal operational phase impacts, with the assumption that maintenance requirement is low. This Option would facilitate operational phase reliance on public transport and reduce reliance on private vehicles for the long term.
	Carbon Management		Whole Life Carbon (tonnes CO2e) was 23% of average across 9 options, preferable to some options. This Option would facilitate operational phase reliance on public transport and reduce reliance on private vehicles for the long term.		This Option is similar to Option 4 in terms of Whole Life Carbon (tonnes CO2e). This Option would facilitate operational phase reliance on public transport and reduce reliance on private vehicles for the long term.

CCA1 Emerging Preferred Option Multi Criteria Analysis

Core Criteria	Sub Criteria	Option 7	Option 7 Narrative (Rock revetment (A-D); attached breakwaters and amenity beach (E); local raising of defences where required	Option 8	Option 8 Rock revetment (A-C); stepped revetment with rock toe protection in amenity frontages (D-E)
	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		Rock revetment will cause minimal/moderate disturbance to geological resources and areas of potential contamination during the construction phase of the Scheme, from CCA1-A to CCA-D. More significant impacts are expected for the County Geological Heritage Site located at Blackrock. The addition of beach nourishment and attached breakwater elements at CCA1-E is expected to cause moderate disturbance to geological resources.		Rock revetment will cause minimal/moderate disturbance to geological resources and areas of potential contamination during the construction at CCA-A to CCA-D. Less disturbance at Blackrock and Seapoint anticipated as the proposed works involve building over the existing defence with minimum impact on the existing ground.
	Material and Circular Economy		This Option would provide some disadvantages over other options due to its comparatively high materials consumption score (605,926t).		This Option is similar to Option 4 in terms of materials consumption score.
	Waste		This Option would provide some advantages over other options as it has a comparatively low wastage (0.8t). Minimal waste would be generated from the removal of existing structures (new revetments will be constructed over the existing structures). Some removal of existing concrete walkways in sub cell D and E may be required to enable construction of the revetments. These walkways are in a relatively poor state already and beyond the end of their design life.		This Option would provide some advantages over other options as it has a comparatively low wastage (66t). Minimal waste would be generated from the removal of existing structures (new revetments will be constructed over the existing structures). Some removal of existing concrete walkways in sub cell D and E may be required to enable construction of the revetments. These walkways are in a relatively poor state already and beyond the end of their design life.
	Traffic and Transport		This Option is similar to other options as minimal operational impact is 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.		This Option is similar to other options as minimal operational impact is 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 is similar to Option 4 but with added complexity of attached breakwaters at CCA1-E, although these could be constructed landside reducing reliance on marine works. Breakwaters are small in comparison to detached breakwater in Option 6. Beach nourishment would be relatively simple to construct using appropriate marine equipment.		Similar to Option 4, but extensive concrete works at Seapoint will result in more interfaces to manage through construction. Limited space for constructing the raised rear seawall and raised footpath.
	Rail Service Impact		No impact on railway during construction of the attached breakwaters. Minimal impact during beach nourishment. Some potential impact during the wall raisings.		Possible impact on railway during the construction of the back wall at Seapoint. Some potential impact during the wall raisings and stepped revetment.

CCA1 Emerging Preferred Option Multi Criteria Analysis

Core Criteria	Sub Criteria	Option 7	Option 7 Narrative (Rock revetment (A-D); attached breakwaters and amenity beach (E); local raising of defences where required	Option 8	Option 8 Rock revetment (A-C); stepped revetment with rock toe protection in amenity frontages (D-E)
Engineering/ Technical	Reliance on Maintenance Maintenance burden		This Option is similar to Option 4 but with additional maintenance and monitoring required at the amenity beach. However, the bays are relatively small and self-contained so maintenance (beach recycling and beach nourishment) should be relatively in-frequent.		This Option is similar to Option 4 but with additional maintenance required for the stepped revetments which would require minor maintenance such as patch repairs throughout the design life, with increased maintenance expected towards the end of the design life.
	Adaptation		This Option is similar to Option 4. Future adaptation of the amenity beach at CCA1-E could be undertaken through additional beach nourishment but this would be limited by the size of the breakwaters which would be required to hold the beach material in place and adaptation of these would be similar to that of the rock revetment.		This Option is similar to Option 4. Future adaptation of the stepped revetments in CCA1-D and E could be undertaken through raising the wave walls but this would be limited.
	Residual Risk		This Option is similar to other options as its comprises a combination of Option 4 and Option 6		This Option would use new hard engineering to manage risk, with less reliance on a beach (which could be stripped out quickly in a significant event). If the new defence was compromised, failure could be rapid.
Planning Risk	Consenting Risk		This Option has some advantages compared to Option 6 as the volume of materials will be reduced but disadvantages compared to Option 8 as it will impact on the amenity use at CCA1-E. Still has potential to impact upon Development Plan objective for marine based activities but less than Option 6. 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.		This Option has advantages over Option 4 as the stepped revetment at CCA1-E will have less impact on amenity use in this area.

CCA1 Emerging Preferred Option Multi Criteria Analysis

Core Criteria	Sub Criteria	Option 9	Option 9 Rock revetment (A-C); stepped revetment with rock toe protection in amenity frontage of D; detached breakwaters and amenity beach (E); local raising of defences where required
Economy	Land Use and Third Party Assets		No direct impact on private third party lands with this option. Potential impact on Dun Laoghaire Rathdown County Council land at Salthill and Monkstown Station.
	Capital Expenditure		This Option has significant disadvantages over other options due to the additional cost of the two detached breakwaters at Seapoint which would require larger quantities of rock which would increase the costs.
	Maintenance Expenditure		This Option is similar to Options 7 and 8, with the addition of the detached breakwaters which would require marine based plant for maintenance but this should be very infrequent. This Option has advantages over Option 6 because there are a lot less breakwaters and a smaller beach area requiring maintenance.
Safety	Health and Safety (Construction)		This Option has disadvantages compared to other options due to the detached breakwaters which will need to be constructed by marine plant increasing overall construction risk, although they are smaller in size to Option 6's detached breakwaters.
	Health and Safety (Design Life)		This Option is similar to Options 3 and 4 but has disadvantages of detached breakwaters at Seapoint Beach. During low tide conditions the detached breakwaters will be fully emergent and members of the public may attempt to access and climb on the breakwaters which could lead to people becoming trapped in the voids between the armour. At higher tide conditions members of the public might attempt to swim out to the breakwaters, or access them from kayaks/boats etc. 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. The beaches at Seapoint should require minimal maintenance.

CCA1 Emerging Preferred Option Multi Criteria Analysis

Core Criteria	Sub Criteria	Option 9	Option 9 Rock revetment (A-C); stepped revetment with rock toe protection in amenity frontage of D; detached breakwaters and amenity beach (E); local raising of defences where required
Accessibility and Social Inclusion	Community		This Option is considered to have some advantages over other options. While the placement of rock revetment along the majority of the coastline of this CCA is not considered to be positive in regard to improving the amenity value or public perception of the area, the provision of minor breakwaters and beach nourishment at Seapoint would provide enhanced beach amenity areas at this location, and thereby contribute positively to public perception and amenity value locally. The breakwaters proposed under this option may have some disadvantages to the recreational use of the beach amenity area however (see social and recreational facilities below).
	Access		This Option is considered to have some advantages over other options as access to and along the beach at Seapoint is likely be improved under this option.
	Social and Recreation Facilities		This Option is considered to have some advantages over other options as it provides for enhanced beach amenity areas at Seapoint Beach in Monkstown by way of providing beach nourishment. However, the placement of breakwaters just offshore is likely to make water-based activities unsafe and dangerous. Furthermore, rock revetment along the remaining length of coastline within this CCA will likely restrict the public's ability to use it for social and recreational activities.
	Compatibility with Development Plans		This Option is similar to Option 4 but has some advantages over other options as it would include enhancement of the area with beach amenity and coastal recreation amenity and elements of green infrastructure.

CCA1 Emerging Preferred Option Multi Criteria Analysis

Core Criteria	Sub Criteria	Option 9	Option 9 Rock revetment (A-C); stepped revetment with rock toe protection in amenity frontage of D; detached breakwaters and amenity beach (E); local raising of defences where required
Integration	Compatibility with Climate Adaptation Plans		This Option has some advantages over other options, it generally aligns with Transport Climate Change Sectoral Adaptation Plan in terms of protecting the coastline and transport assets. It requires less sand imported for nourishment, however it does have rock/toe protection which will require more material to be imported to site.
	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 the coastline throughout CCA1 from Merrion Gates to Dún Laoghaire. Providing the revetment is implemented with consideration of the East Coast Trail, this option will support the Transport Strategy.
	Biodiversity		This Option has disadvantages compared to other options due to the loss of habitat under two breakwaters and beach nourishment at two discrete locations near where reef habitat is known to occur. There is one Ramsar site (Sandymount Strand/Tolka Estuary), one SAC (South Dublin Bay SAC) and several SPA (South Dublin and River Tolka Estuary SPA being the closest), one pNHA (Booterstown Marsh) pNHA (Booterstown Marsh) and one pNHA (South Dublin Bay) that could be negatively affected. Impact and potential loss of reef QI habitat through hydrological changes from breakwaters and risk of beach nourishment smothering reefs. Replenishment of sand in future may be needed causing disturbance in the long term. This Option would have a direct negative impact on QI habitats of the South Dublin Bay SAC including loss of mud/sand flats which is widespread and is foraging habitat for South Dublin and River Tolka Estuary SPA QI bird species. Loss of fine sand Augulus tenuis community must be conserved in a natural condition as stated in the Conservation Objectives for the SAC. Rock revetments if they require a high tide to take rock to the beach are likely to require night working. Lights/ noise of Machinery, would disturb QI bird species in the short term and operationally increase current disturbance levels due to new/extended beach levels and due to stepped revetement at Blackrock wall being used increasing by public. Potential for release of pollutants.

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Core Criteria	Sub Criteria	Option 9	Option 9 Rock revetment (A-C); stepped revetment with rock toe protection in amenity frontage of D; detached breakwaters and amenity beach (E); local raising of defences where required
Environment	Landscape, Visual and Seascape		Beach nourishment has potential to enhance the character and amenity value at Seapoint beach. However, detached breakwaters have the potential to generate significant adverse landscape/seascape and visual effects, interrupting views out over the coastal waters.
	Archaeology, Architectural and Cultural Heritage		This Option is similar to other options as no potential direct impacts on Recorded Monuments or SMR Sites have been identified, however, 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 two SMR sites (DU023-009; Ritual Site - Holy Well and DU023-010; Martello Tower). There is the potential for indirect setting and visual impacts to occur on 115 RPS Sites
	Marine Archaeology		There are two recorded wrecks (ID WO1960 and WO1961). 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. This is only relevant to section E at the southern end of the beach.
	Noise and Vibration		This Option is similar to other options with some advantages due to the absence of any major intrusive works. All impacts are temporary to short-term. No long term operational noise or vibration impacts. Noise impact will be from mobile plant when working in proximity to Noise Sensitive Locations. Specific instances of elevated noise will be localised and temporary. There may be periods of night-time works required. No significant vibration impacts from this proposal.
	Air Quality		This Option has advantages over other options as there will be some construction phase impacts associated with potentially dusty activities and construction vehicle emissions but these would be short term and dust mitigation can be put in place. It is assumed that rock will be delivered by marine plant. There would be minimal operational phase impacts, with the assumption that maintenance requirement is low. This Option would facilitate operational phase reliance on public transport and reduce reliance on private vehicles for the long term.
	Carbon Management		Whole Life Carbon (tonnes CO2e) was 33% of average across 9 options, preferable to some options. This Option would facilitate operational phase reliance on public transport and reduce reliance on private vehicles for the long term.

CCA1 Emerging Preferred Option Multi Criteria Analysis

Core Criteria	Sub Criteria	Option 9	Option 9 Rock revetment (A-C); stepped revetment with rock toe protection in amenity frontage of D; detached breakwaters and amenity beach (E); local raising of defences where required
	Water Resources		Minimal impacts to groundwater as minimal below ground construction required.
	Geology and Soils		Rock revetment will cause minimal/moderate disturbance to geological resources and areas of potential contamination during the construction at CCA-A to CCA-D. More significant impacts are expected in the vicinity of the County Geological Heritage Site located at Blackrock where stepped revetment with rock toe protection at CCA1-D is planned. Moderate disturbance is expected at CCA-E with the adoption of beach nourishment and detached breakwater elements.
	Material and Circular Economy		This Option would provide some disadvantages over other options due to its comparatively high materials consumption score (721,711t).
	Waste		This Option would provide some advantages over other options as it has a comparatively low wastage (0.6t). Minimal waste would be generated from the removal of existing structures (new revetments will be constructed over the existing structures). Some removal of existing concrete walkways in sub cell D and E may be required to enable construction of the revetments. These walkways are in a relatively poor state already and beyond the end of their design life.
	Traffic and Transport		This Option is similar to other options as minimal operational impact is 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 disadvantages compared to Options 7 and 8 due to the detached breakwaters at Seapoint that may prove difficult due to shallow waters.
	Rail Service Impact		No impact on railway during construction of the detached breakwaters. Minimal impact during beach nourishment. Some potential impact during the wall raisings and stepped revetment.

CCA1 Emerging Preferred Option Multi Criteria Analysis

Core Criteria	Sub Criteria	Option 9	Option 9 Rock revetment (A-C); stepped revetment with rock toe protection in amenity frontage of D; detached breakwaters and amenity beach (E); local raising of defences where required
Engineering/ Technical	Reliance on Maintenance Maintenance burden		This Option is similar to Option 4 but with additional maintenance of the stepped revetments and amenity beach.
	Adaptation		This Option is similar to Option 4. Future adaptation of the amenity beach at CCA1-E could be undertaken through additional beach nourishment but this would be limited by the size of the breakwaters which would be required to hold the beach material in place and adaptation of these would be challenging.
	Residual Risk		This Option is similar to other options as its comprises a combination of Option 4 and Option 6.
Planning Risk	Consenting Risk		This Option would have some disadvantages compared to other options due to the proposed breakwaters at Seapoint.