Project

Boyne Greenway

Drogheda to Mornington

Report Title

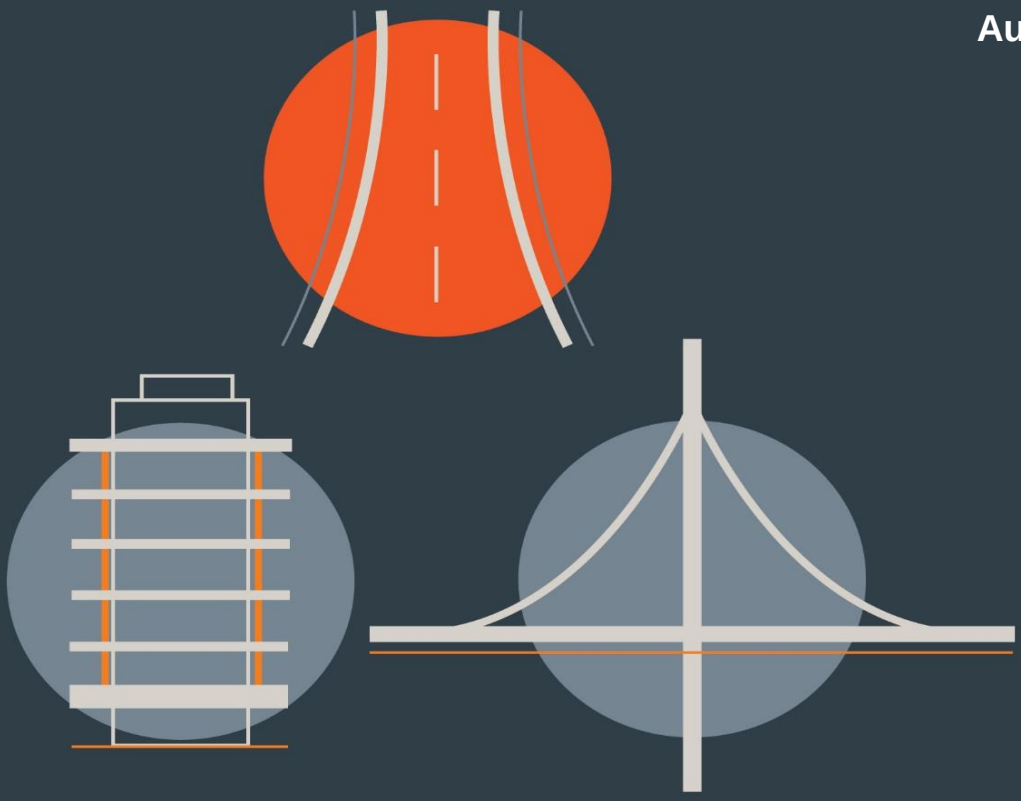
Route Options Assessment

Main Report

Date

August 2019

TRANSPORTATION



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1.0 INTRODUCTION AND BACKGROUND

1.1 Preamble

1.1.1 This report presents the findings of the route options assessment work undertaken for the Boyne Greenway- Drogheda to Mornington (hereafter referred to as the 'proposed scheme') and a recommendation on a preferred route is made.

1.1.2 This route options assessment report describes the assessment of potentially viable route options within the study area identified for the proposed scheme against established assessment criteria.

1.2 Report Structure

1.2.1 The route option assessment process and corresponding report structure are detailed below:

- Section 1 – Subsequent parts of this section provide an introduction and background to the Boyne Greenway.
- Section 2 – The proposed Study Area is described identifying key constraints and opportunities.
- Section 3 – The methodology for identifying and assessing the feasibility of the various route options is discussed in this section including:
    - the identification of study area sections where practical route options were considered;
    - the selection and determination of initial criteria for screening and assessing technically feasible route options, based on distinct, project-specific objectives; and
    - the definition of assessment criteria.
- Sections 4 to 6 – details the route option assessment for Sections 1-3 including sub-options for section 2.
- Section 5 – The preferred route for the proposed scheme is described.

1.3 Boyne Greenway – Overall scheme

1.3.1 The overall objective of the proposed Boyne Greenway is to extend the existing greenway network, Phase 1 of the Boyne Greenway/Cycleway from the Meath/Louth boundary along the Ramparts to the west of Drogheda, out to Mornington. The extended route will pass along the existing informal Ramparts Trail, pass through Drogheda town, then follow the southern edge of the River Boyne east of the town and out to Mornington (see **Figure 1.1**). The Boyne Greenway has been identified as a route which will form part of the National Cycle Network (corridor 5 & 15) linking from the East Coast Trail at Drogheda to the international cross-country EuroVelo Route 2 from Galway to Dublin southwest of Trim. Once developed the Boyne Greenway will be a world class tourist facility creating significant economic opportunities for business and communities along the length of the valley and its surrounds. The proposed route will also help to link up existing tourist attractions at Mellifont Abbey, the Bridge of Peace, the Battle Of The Boyne site at Oldcastle and Brú Na Bóinne at Newgrange.

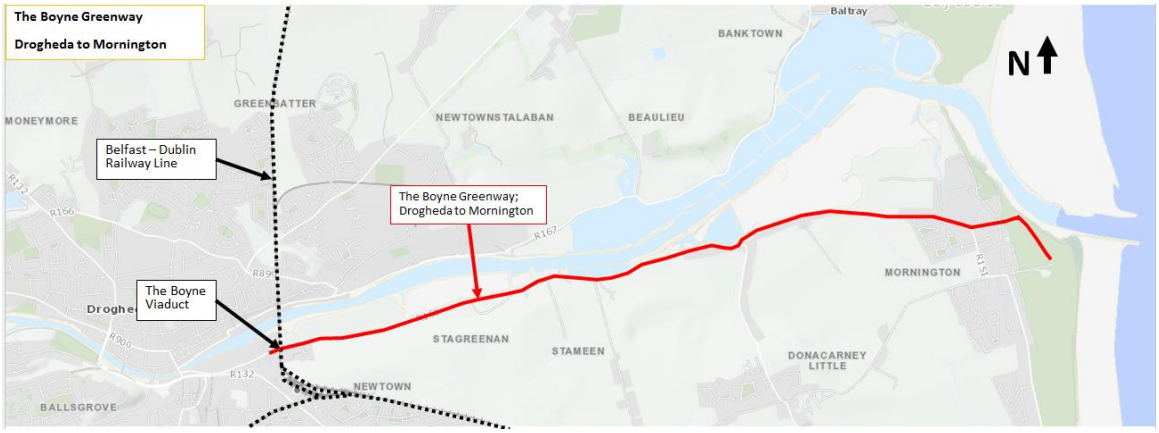

Figure 1.1: The Boyne Greenway – Drogheda to Mornington

1.4 Boyne Greenway – Drogheda to Mornington Objectives

1.4.1 One of the main objectives for the Boyne Greenway between Drogheda to Mornington is to provide a leisure route of national interest that will attract both leisure cyclists and walkers alike to visit the area thus ensuring the continued prosperity of the historical town of Drogheda and surrounding hinterland. The proposed route will also help to link up existing tourist attractions such as the Lady's Finger and Maiden Tower in Mornington as well as providing viewing opportunities for the natural fauna and flora along the Boyne Estuary.

1.4.2 Having regard to the findings of the transport context for the proposed Greenway and using the Brief provided by MCC, the following objectives have been established for the Boyne Greenway, between Drogheda and Mornington:

- Create a first class greenway and tourist attraction which can contribute to the economic development of County Meath and County Louth;
- Provide a greenway while respecting the existing environment along the route, including the designated European sites, the Boyne Coast and Estuary SAC and the Boyne Estuary SPA.
- Increase access to the locality and raise the profile of Counties Meath & Louth and the Boyne Valley by creating a facility which is recognised locally, nationally and internationally as a first-rate tourist attraction.
- Encourage use of a sustainable mode of transport, and interlink with existing public transport;
- Raise the profile of cycling and inspire people to cycle;
- Increased cyclist and pedestrian safety;
- Enhanced cyclist and pedestrian accessibility, including access to existing schools within Drogheda;
- Tackle obesity and promote activity and create a better quality of life;
- Reduce congestion and the number of motorised vehicle trips;
- Traffic calming;
- Reduced carbon emissions;

1.5 Physical Character of the Greenway

1.5.1 The proposed Boyne Greenway Project extending due east from Drogheda to the coast at Mornington will be constructed utilising three different methodologies, selected according to the sensitivities of the landscape and environment requirements encountered within the areas crossed by the route. The characteristic habitats and landscapes crossed by the route, with respective constraints, are identified with regard to:

1. Construction directly alongside, or within very close proximity of, the regional road within an area of existing road side verge.
2. Construction within the sand dunes area.
3. Construction significantly away from the roadside and/or within the intertidal zone.

1.5.2 Each of the above requirements is discussed below, providing an overview of the proposals and measures intrinsic to project design which will avoid impact on the ecological aspects of the scheme.

Greenway Construction Alongside Road

1.5.3 There is approximately 3.5km of the proposed greenway to be constructed alongside the road or very close to the road edge. Given the location, access and low maintenance requirements, robust construction forms are preferred. Therefore, bituminous construction in accordance with the recommendations of the TII Design Manual for Roads and Bridges (TII DMRB) is considered the most appropriate. With this proposed form of construction, verge vegetation would be cleared with limited additional excavation. The width of the greenway will be 4 metres and restrained on each side with a kerb. Some similar greenway examples are provided below.

Figure 1.2 Examples of Greenway Alongside Road (Holland and Ireland)

Greenway Construction in Dunes Area

1.5.4 There is approximately 0.5km of the proposed greenway within the sand dunes area at Mornington at the eastern extent of the scheme. The proposed route will follow existing informal routes where the surface has already been well compacted. A timber mat will be employed to minimise impact on this space.

Timber Mat

1.5.5 This construction comprises of timber matting which is rolled into the sand surface to provide a restrained a relatively smooth-running surface with minimal impact on existing surface. This can be created either using proprietary products or making use of recycled timber sleepers anchored into the sand. The mat is cut to size to match the existing hard surface, already compacted in place, and used regularly by walkers.

Figure 1.3 Timber Mat

1.5.6 The route will provide a more formal route and should prevent general movement throughout the dunes area reducing the impact in these areas and directing users along a formal managed route.

Greenway Construction Intertidal Zones

1.5.7 There is approximately 2.5km of proposed greenway within the intertidal zones. This part of the route also runs through the most sensitive areas of the SPA/SAC. In these areas it is proposed that the greenway be elevated onto a boardwalk structure to minimise impact on the SPA/SAC. The boardwalk will be constructed at a minimum level above the 1 in 5-year flood level for the river estuary (~3.1m AOD). This is approximately 1 metre above the current highest astronomical tide level. The width of the boardwalk will be limited to 4metres (maximum). Following a review of the options it has been agreed that the elevated boardwalk be formed using propriety recycled plastic element.

Proprietary Recycled Plastic Elements

1.5.8 A part of the Boyne Greenway has already been constructed using this form (see figure below). It involves installing recycled plastic components much like forming

a similar timber structure. They are installed to a depth to suit the underlying geology and provide the required level of load capacity.

Figure 1.4 Boyne Greenway Upstream Recycle Plastic Elements Construction

2.0 STUDY AREA

2.1 Introduction

2.1.1 The section of the Boyne Greenway route that this report will focus attention on is the section east of Drogheda from the railway viaduct (Belfast Dublin line) out to Mornington (see **Figure 2.1**) and the characteristics of this area in terms of physical features, opportunities and constraints as well as identifying potential for integration with other travel modes.

2.1.2 The study area begins east of Drogheda from the railway viaduct (Belfast Dublin line) out to Mornington via the existing R150/R151.

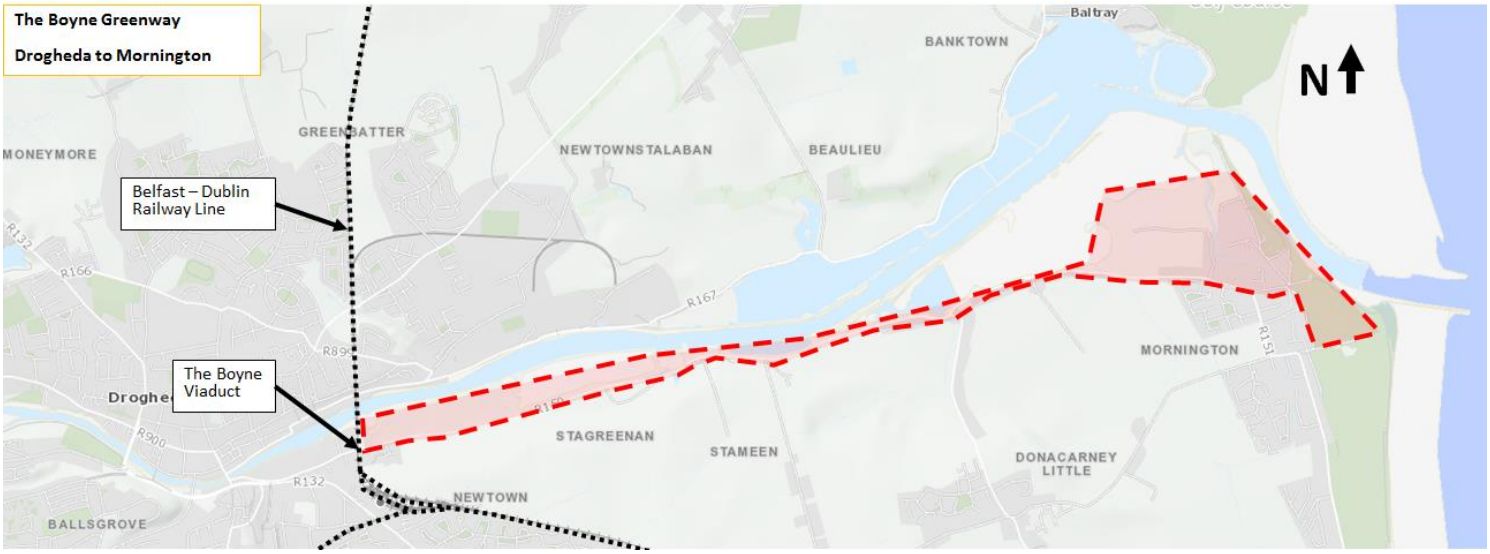

Figure 2.1: Proposed Study Area

2.2 Study Area Sections

2.2.1 The study area has been divided into three sections to simplify the assessment process as illustrated below in **Figure 2.2**: -

- Section 1 – between the Boyne Viaduct and Mornington Road/Old Golf Range access.
- Section 2 – between Mornington Road/Old Golf Range access and Tower Road/Crook Road junction.
- Section 3 – between Tower Road/Crook Road junction and the sand dunes at Drogheda East Lighthouse.

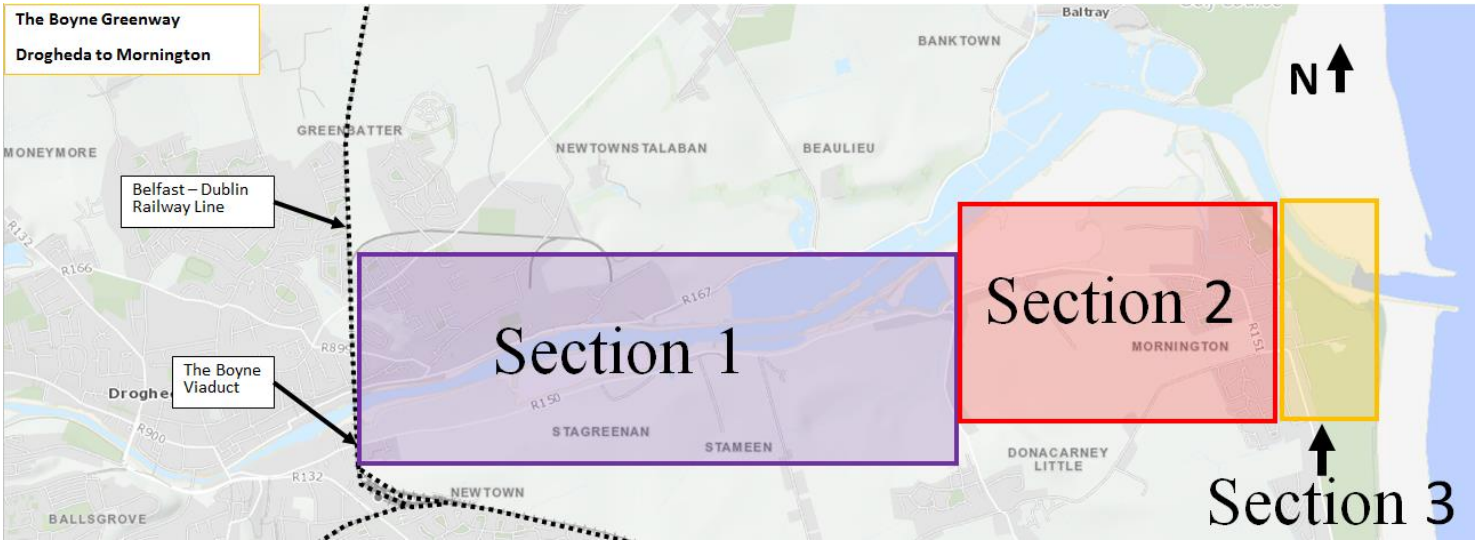

Figure 2.2: Study Area Sections

Physical Constraints and Opportunities

2.2.2 There are a number of constraints and opportunities, both natural (i.e. existing natural environment) and physical (the built environment), which constrain route options for the proposed scheme within the defined study area. These include:

- River Boyne;
- River Boyne and River Blackwater SAC, Boyne Coast and Estuary SAC and the Boyne Estuary SPA;
- Existing and committed future development along the route;
- Existing monuments and protected structures along the route such as Mornington Bridge;
- Mature Trees and other natural features along the Marsh Road (R150) and Mornington Road (R151);
- Road alignment along the Marsh Road (R150) and Mornington Road (R151);
- The need to maintain traffic flow for access to local amenities;
- Land ownership;
- Environmental impacts and engineering constraints such as steep topography, frequent watercourse crossings, and potential flooding.

3.0 ROUTE OPTION ASSESSMENT METHODOLOGY

3.1 Assessment Process

3.1.3 This section of the report presents the structure & methodology used for the assessment of route options within the study area. A detailed Multi Criteria Analysis Assessment was adopted.

3.2 Route Option Assessment Methodology

3.2.1 This route option assessment comprised a detailed qualitative and quantitative assessment, using criteria established to compare route options.

3.2.2 The 'Guidelines on a Common Appraisal Framework for Transport Projects and Programmes' published by the Department of Transport, Tourism, and Sport (DTTAS), March 2016, requires schemes to undergo a 'Multi-Criteria Analysis' (MCA) under the following criteria: -

- Economy;
- Integration;
- Physical Activity;
- Safety; and
- Environment.

3.2.3 An appreciation of constraints and opportunities within the study area as well as the defined project objectives, led to the establishment of project-specific route options assessment criteria.

3.2.4 These were tailored to have commonality to the Common Appraisal Framework guidelines where practical.

3.2.5 The physical activity criterion, added recently to the Common Appraisal Framework, relates to the health benefits derived from using different transport modes. The subject scheme options under consideration relate to the same mode of travel (cycling). As such, this criterion will not produce any relative differences between the options. Therefore, this criterion will not be applied in the multi – criteria assessment for the subject scheme.

3.2.6 The physical benefits associated with the scheme will be quantified as part of a future Cost – Benefit Analysis.

3.2.7 **Table 3.1** presents a summary of the assessment criteria and sub criteria used as part of the detailed route options assessment process.

Assessment Criteria	Assessment Sub-Criteria
1. Economy	1a. Capital Cost
2. Integration	2a. Cycling – Quality of Service
	2c. Traffic Network Integration
3. Safety	3a. Road Safety
	3b. Pedestrian Safety
4. Environment	4a. Archaeological/Architectural and Cultural Heritage
	4b. Flora & Fauna
	4c. Landscape and Visual
	4d. Risk of Flooding
	4E Soil & Hydrology
	4F. Land Use Character

Table 3.1: Assessment Criteria

3.2.8 In applying these criteria to the assessment process, it is clearly recognised that for different sections of the study area corridor, greater emphasis may need to be applied to some criterion over others in terms of their significance and influence on the route selection process. In some instances, certain criteria such as Environmental, will be identical between route options. As such, these will not be specifically assessed in such cases.

1. Economy

a. Capital Cost

3.2.9 Capital cost consists of both the indicative infrastructure cost estimate and land acquisition costs. Whilst specific estimates have not been produced at this stage, professional judgement has been used to determine the anticipated scale of cost of the different options on a relative basis.

2. Integration

a. Cycling – Quality of Service

3.2.10 The cycle route options were assessed under the following sub-criteria based on the 'needs of a cyclist' as set out in the NCM:

i. Comfort

The quality of cycle provision practically achievable on route options has been assessed. For comparison purposes, the highest level of practical cycle provision achievable on each route has been determined and compared between route options. The following were considered: Lane Width, Gradients and Surface Quality.

ii. Directness

For the purposes of comparing route options, the number of junctions, length of the route and the number of detours & gaps from the principle route has been used as a proxy for directness.

iii. Attractiveness

The cycling environment along the route should be pleasant and interesting. Monotony and lack of points of interest along the cycle route are unattractive to cyclists.

iv. Coherence

The cycle route should link all main origin and destination zones / centres for cyclists. The cycle route should be logical and continuous.

v. Segregation & Traffic Volumes

Traffic volumes on adjacent roadways have a significant effect on the quality of service provided by a cycle/pedestrian route. Heavy traffic volumes and speeds adjacent to cycle facilities can make users feel uncomfortable and discourage users from utilising the facility. Off-road facilities which provide segregation

from live traffic have substantial benefit compared to on-road facilities which place cyclists immediately adjacent to live traffic.

b. Traffic Network Integration

3.2.11 A comparative assessment of the expected traffic impact of each option has been undertaken for the routes. This assessment was undertaken based on professional judgement and an understanding of traffic conditions in the Study Area.

3.2.12 This represents a high-level assessment of the traffic impact of the route options considered in the Stage 2 Multi – Criteria Analysis (MCA). The anticipated traffic impact expected to be incurred by motorists using private vehicles as a result of the different route options will be assessed.

3. Safety

a. Road Safety

3.2.13 For the purposes of comparing route options, the number of junctions along the route has been used as a proxy for road safety. The number of junctions is effectively a measure of the number of potential conflicts on the route and therefore a measure of the potential for a collision.

3.2.14 The degree of segregation from live traffic along the greenway has also been used as a proxy for road safety.

3.2.15 The type of movement required by the cyclist at junctions on the route is also considered with routes where turning movements (either left or right) are required being assigned a lower ranking in terms of safety.

b. Pedestrian Safety

3.2.16 This criterion assesses the safety of pedestrians within the proposed scheme option. This is predominantly concerned with the presence of footpaths along the route, whether it is shared with cyclists, and the number of pedestrians crossing on the route.

4. Environmental

3.2.17 The scope and methodology for the environmental assessment was established by considering what environmental aspects are likely to be impacted and are therefore of importance in evaluating the route options. A list of the environmental topics considered is outlined in **Table 3.2** below.

Aspect	Rationale
Included in Environmental Assessment	
4.a Architectural and Cultural Heritage	The provision of the greenway has the potential to impact on the archaeological, architectural and cultural heritage environment. At this stage of the assessment process, a conservative approach has been adopted in assessing the potential for impact and this is further described below.
4.b. Flora and Fauna	The provision of the greenway has the potential to impact on flora and fauna.
4.c. Landscape and Visual	The provision of the greenway has the potential to impact the townscape/streetscape along the route.
4.d. Risk of Flooding	The proposed greenway may experience flooding depending on the route location. CFRAM Coastal and Fluvial Flood maps were used to assess the possibility of the proposed route becoming flooded and the frequency of the event (1 in 10yr etc).
4.e. Soils, Geology & Hydrology	The provision of the Greenway infrastructure has the potential to impact on soil and geology as a result of land-take and possible ground excavation (including potential to encounter ground contamination). In relation to Hydrology, the provision of the Greenway infrastructure has the potential to impact on surface water bodies as a result of land-take (with particular emphasis on floodplains and flood zones).
4.d. Land Use Character	The provision of greenway has the potential to impact on land use character through land-take, severance or reduction of viability of properties which prevents or reduces it from being used for its intended use.

Table 3.2: Environmental Aspects Considered

3.2.18 When preparing the Environmental Impact Assessment Report (EIAR) for the preferred route and scheme design for the Boyne Greenway Scheme, the environmental topics which have been scoped out (and others that are not considered relevant for the route options assessment), will be reviewed and incorporated into the EIAR as appropriate.

a. Archaeological, Architectural and Cultural Heritage

3.2.19 As mentioned previously a conservative approach has initially been adopted in undertaking the route options assessment in relation to the archaeological, architectural and cultural heritage environment. The constraints comprise Recorded Monuments and Protected Structures (RMPs) within 50m of each greenway section, extending to 250m in greenfield areas. Sites of archaeological and cultural heritage merit and sites of architectural heritage merit which are directly intersected by the greenway sections are also included within the scope of this assessment.

3.2.20 During the detailed design of the proposed scheme, the aim will be to avoid known constraints and/or minimise the number of constraints which may be directly or indirectly impacted by the proposed scheme. Appropriate mitigation for construction will be included which will seek, where practicable, to ensure preservation in situ of archaeological remains and the avoidance of impacts on archaeological and cultural heritage constraints. A similar approach has been adopted in relation to the route options assessment for architectural heritage.

3.2.21 As a result, the assessment effectively evaluates the potential for impact on architectural heritage from façade to façade which provides for a comparative and qualitative evaluation of Protected Structures along route sections.

b. Flora & Fauna

3.2.22 The provision of the greenway infrastructure has the potential to impact on flora & fauna

3.2.23 A broad assessment of the likely impacts of each of the route options on the key ecological receptors was undertaken, with an indication as to which, if any, of these were likely to be significant, and at what geographical level. The impacts were compared to allow an order of preference to be determined.

3.2.24 Features considered included the following:

- Records of rare or protected plant species;
- Records of protected fauna;

- Identified designated ecological areas and other areas of ecological importance including ecological corridors and areas of green infrastructure; and
- Watercourses and fisheries waters.

c. Landscape & Visual

3.2.25 The provision of the greenway infrastructure has the potential to impact the townscape/streetscape along the route.

3.2.26 The assessment comprised the compilation of a desktop understanding of:

- the landscape/townscape, its character and features;
- the visual environment, including the location of residential and other properties and views over the landscape;
- the landscape planning context, including landscape designations, open spaces, identified views and prospects, etc.; and
- relationship with protected structures, conservation areas, national monuments etc.

3.2.27 The impact at each geographic level was compared to allow an order of preference to be determined.

3.2.28 The provision of the greenway infrastructure has the potential to impact on land use character through land-take, severance or reduction of viability which prevents or reduces it from being used for its intended use.

d. Flooding

3.2.29 The proposed Greenway may experience flooding depending on the route location. CFRAM* Coastal and Fluvial Flood maps were used to assess the possibility of the proposed route becoming flooded and the frequency of such event (1 in 10yr, 1 in 200yr and 1 in 1000yr).

3.2.30 *The Eastern CFRAM study is the most comprehensive flood mapping undertaken in the eastern region of Ireland. It commenced in June 2011 with final flood maps issued during 2016. The study involved detailed hydraulic modelling of rivers and their tributaries.

e. Soils, Geology & Hydrology

3.2.31 The provision of the greenway infrastructure has the potential to impact on soil and geology as a result of land-take and possible ground excavation (including potential to encounter ground contamination).

3.2.32 Attributes (and impacts) assessed for each route option included the following (where relevant):

- Historic land use and potential contamination;
- Geology / Areas of Geological Significance;
- Soil quality, drainage characteristics and range of agricultural uses of soil along each route corridor; and
- Potential implications for existing quarry or mining activities and future extractable reserves.

3.2.33 The impact at each geographic level was compared to allow an order of preference to be determined. The provision of the greenway infrastructure has the potential to impact on surface water bodies as a result of land-take (with particular emphasis on floodplains and flood zones). Attributes (and impacts) assessed for each route option included the following (where relevant):

- watercourses crossed by each route corridor and potential impact on water quality arising from re-alignment works;
- discharge to receiving waters and drainage network;
- aquatic ecological sites close to and downstream of water crossings;
- surface water abstraction close to and downstream of water crossings;
- established amenity value of surface waters traversed by each route corridor, and
- potential increase (or reduction) in flood risk to existing properties.

3.2.34 The impact at each geographic level was compared to allow an order of preference to be determined.

f. Land Use Character

3.2.35 The provision of the greenway infrastructure has the potential to impact on land use character through land-take, severance or reduction of viability which prevents or reduces it from being used for its intended use.

Route Options Summary Table

3.2.36 For the study area, a route options summary table (in Project Appraisal Balance Sheet, (PABS)) format has been prepared which collates and summarises the appraisal of route options under each of the assessment criterion.

3.2.37 The route options summary table for the sub-options and primary route options are presented in **Appendix A - B**.

3.2.38 For each individual assessment criterion considered, routes have been relatively compared against each other based on a five-point scale, ranging from having significant advantages to having significant disadvantages over other route options. For illustrative purposes, this five-point scale is colour coded as presented in **Table 3.3**, with advantageous routes graded to 'dark green' and disadvantaged routes graded to 'dark red'.

Colour	Description
	Significant advantages over the other options
	Some advantages over other options
	Neutral compared to other options
	Some disadvantages over other options
	Significant disadvantages compared to other options

Table 3.3: Route Options Colour Coded Ranking Scale

3.2.39 The extent of reporting may vary between each study area section route options assessment, depending on the significance attached to specific criterion in terms of route differentiation.

3.2.40 At the end of each study area section route options assessment, an overall Multi Criterion Appraisal (MCA) table is provided, bringing together each of the individual criterion assessments.

3.2.41 This is then summarised for each study area section under the main assessment criterion as set out in **Table 3.1**.

3.2.42 A qualitative appraisal of the conclusions from the route options assessment is then provided, highlighting the key issues considered in determining recommended route options ('preferred' and in some instances, where applicable, 'next preferred'). It should be noted that a balanced approach is taken when assessing the preferred routes. All criteria are considered in undertaking the assessment and a lower ranking on one criterion, for example, will not necessarily mean that the route is not suitable.

3.2.43 The outcome from the multi-criteria assessment is considered in a holistic manner to derive a preferred 'end-to-end' route.

4.0 SECTION 1 ROUTE OPTION ASSESSMENT

4.1 Options Assessment

4.1.1 As mention previously in section 2, one of the major natural constraints upon the route options for the proposed scheme is the Boyne Coast and Estuary SAC and the Boyne Estuary SPA;

4.1.2 A comprehensive design process was instigated by Inis Environmental Consultants in respect of Biodiversity in January 2018. Following preliminary investigative works undertaken in 2017 it became clear that the previously proposed iteration of the proposed Greenway (The original Boyneside Trail Route) had to be re-visited from a design perspective – to allow for an iterative route design that was fully cognisant of the Biodiversity receptors likely to be present and subject to source-impact-effects from any likely development.

4.1.3 Therefore, to limit the encroachment into the SPA and SAC, the only feasible route option for this section, is to provide a route option that is adjacent to the R150 & R151 for the majority of the section. The route option has been designed to avoid the potential for likely significant effects on European Sites and Biodiversity receptors.

4.1.4 The proposed greenway route for section 1 is approximately 4.72km in length with approximately 3.02km directly alongside the R150/R151 Regional Road and 1.7km slightly away from the road to ensure both a safe continuation of the route and the retention of the view across the Boyne Estuary, see **Figure 4.1** below (refer to the Scheme drawings 170029-2200 on display for the non-statutory public consultation).

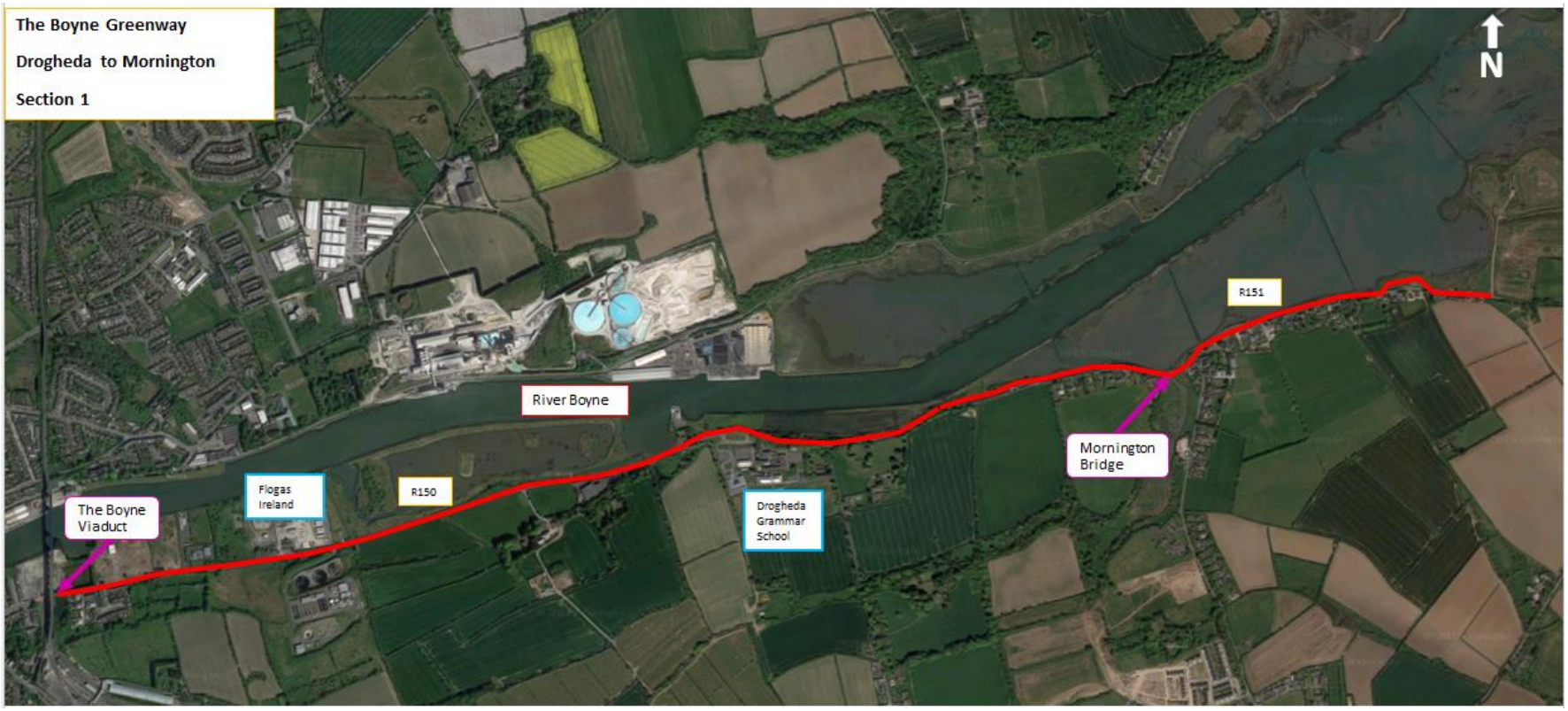

Figure 4.1: Route Option for Section 1

4.1.5 Although it would be preferable to have the greenway completely away from the road, this approach balances the avoidance of effects on the SPA/SAC with access and functionality yet still providing the outstanding views available.

4.1.6 The proposed alignment of the greenway avoids the Upper Saltmarsh within the SPA/SAC habitat (however none of the recorded habitat present was considered to be of sufficient quality to be classified as an Annex I quality).

4.1.7 The Mud Shores habitat recorded within the survey area is considered to be Annex I habitat – there is overlap between the proposed raised boardwalk and this habitat type where it runs immediately adjacent to the Regional R150/R158 road, in a small number of instances. In all cases however the raised boardwalk is to be located in rocky substrate immediately adjacent to the existing road as oppose to directly within intertidal muds.

4.1.1 The following constraints would need to be considered if this route option is progressed:

- Existing and committed future development along the route;
- Existing monuments and protected structures along the route such as Mornington Bridge;
- Mature Trees and other natural features along the Marsh Road (R150) and Mornington Road (R151);
- Road alignment along the Marsh Road (R150) and Mornington Road (R151);
- The need to maintain traffic flow for access to local amenities;
- Land ownership;

5.0 SECTION 3 ROUTE OPTION ASSESSMENT

5.1 Options Assessment

5.1.1 Similar to section 1, the route option for section 3, the dunes section from Tower Road/Crook Road junction to Drogheda East Lighthouse, is restricted due to the Annex I habitat either side of the existing trail.

5.1.2 The fixed sand dunes within the section 3 study area are considered to be Annex I habitat, however, these are heavily degraded at Mornington with damage to dune systems evident from amenity usage such as dog walking and in particular horse riding.

5.1.3 The only feasible option for the dunes section is via the existing bare track already in usage for access through the dune system and as such will not directly impact on the Annex habitat either side, see **Figure 4.2 below** (refer to scheme drawings 170029-2200 on display for the non-statutory public consultation).

5.1.4 The following constraints would need to be considered if this route option is progressed:

- Existing monuments and protected structures along the route such as Lady's Finger and Maiden Tower;
- Annex I habitat;

Figure 4.1: Route Option for Section 3

6.0 SECTION 2 ROUTE OPTION ASSESSMENT

6.1 Options Assessment

6.1.1 When assessing the route options for section 2, generally there are 4 principal routes (Option 1, Option 2, Option 3 & Option 4) between the Mornington Road/old Golf Range access road to the Tower Road/Crook Road junction as shown in **Figure 4.1** below. It should be noted that a number of additional scheme options were considered initially but were not progressed to the scheme assessment stage as they were not feasible or were less effective than the scheme options taken forward.

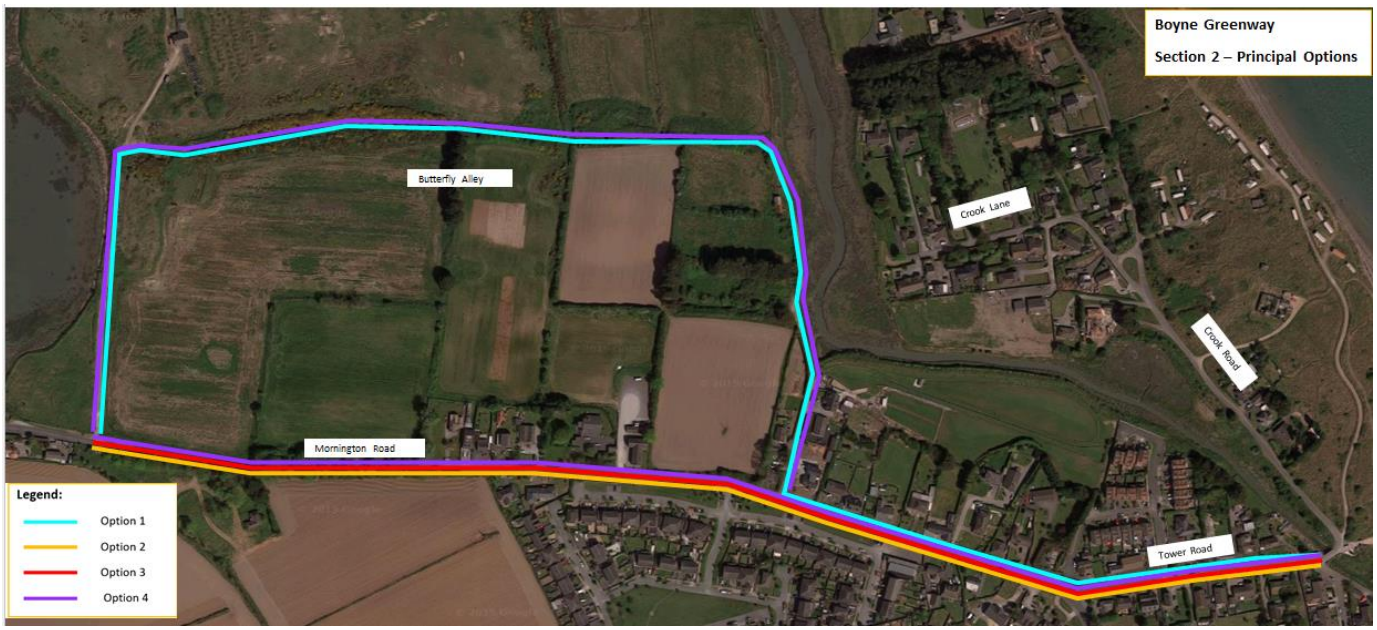

Figure 4.1: Principal routes for the Study Area.

6.1.2 The following four route options, as identified above, were taken forward:

- Option 1 via the access track from Mornington Road to the old golf range, Butterfly Alley (locally named), Mornington Road, Tower Road;
- Option 2 via Mornington Road, Tower Road (Shared/mixed street facilities); and

- Option 3 via Mornington Road, Tower Road (two-way cycle facility for a section of Mornington Road);
- Option 4 via Mornington Road, Tower Road (two-way cycle facility for a section of Mornington Road with parallel cycle pedestrian trail);

6.1.3 The assessment process has been outlined in Section 3 of this report. In this Section of the report it is proposed to set out the assessment procedure and results for the section of the study area between the access track to the old golf range access route from Mornington Road and the Tower Road/Crook Road junction.

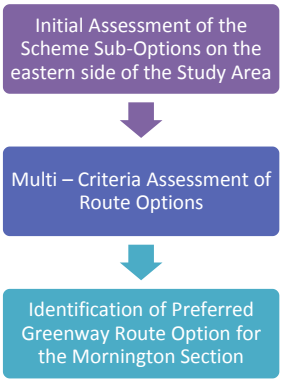

Figure 4.2: Route Option Assessment Stages

6.1.4 The assessment of the options is discussed further in Sections 6.2 & 6.3 below.

6.1.5 Within the aforementioned route options, there is a location on the eastern side of the study which includes the "The Gut" of the River Boyne Estuary which requires specific consideration. These scheme options have been brought through an initial assessment to determine the optimum layout for this area to be included in the principle route option 1 listed above. These sub-options are presented in **Figure 4.3** below:

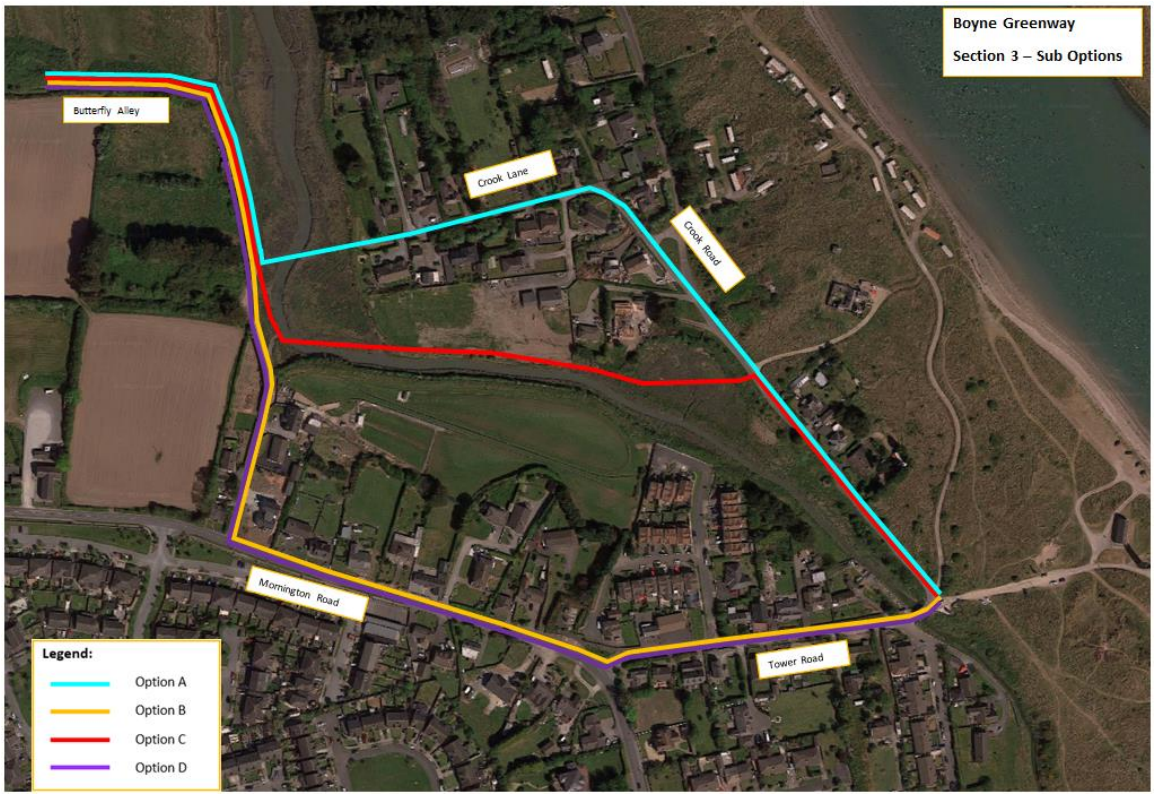

Figure 4.3: Sub-Option Locations

6.1.6 The following four route options, as identified above, were taken forward to initial assessment:

- Option A via Butterfly Alley (local name), Crook Lane and Crook Road;
- Option B via Butterfly Alley, Mornington Road and Tower Road (Shared/mixed street facilities on Mornington Road & Tower Road);
- Option C via Butterfly Alley, boardwalk to the south of Crook Lane and Shared/mixed street facilities on Crook Road;
- Option D via Mornington Road, Tower Road (two-way cycle facility for a section of Mornington Road);

6.1.7 Multi-criteria assessment will be utilised to assess these sub options to determine the optimum layout to be included in the principle route options considered for the section 2. The initial assessment of these constrained locations are outlined below.

6.2 Initial Assessment of Scheme Sub-options for 'The Gut'.

6.2.1 There are four sub-options (A-D) considered for the eastern section of the study area. It should be noted that a number of additional scheme options were considered initially but were not progressed to the scheme assessment stage as they were not feasible or were less effective than the scheme options taken forward.

Option A - via Butterfly Alley (local name), Crook Lane and Crook Road

6.2.2 This option proposed a 4m wide paved greenway which follows the locally named Butterfly Alley trail heading eastwards. These lands are in private ownership however permissive access has been discussed and verbally agreed with the landowner. It is proposed that Route Option crosses the estuary at a location known as "The Gut" to connect with Crook Road. The crossing of the estuary will require the construction of a pedestrian/cycle bridge. The Route Option will then join with Crook Lane via a Boardwalk and shared facility provided along Crook Lane and Crook Road. A boardwalk is proposed on the eastern side of the bridge due to the high risk of flooding. Crook Lane and Crook Road are residential roads with very light traffic flows and slow traffic speeds suited to shared facilities. It is likely the road would need to be resurfaced and the existing road lighting improved to adequately provide for the facility. Removing the existing cul-de-sac on Crook Lane, may cause concerns amongst residents, see **Figure 4.4**.

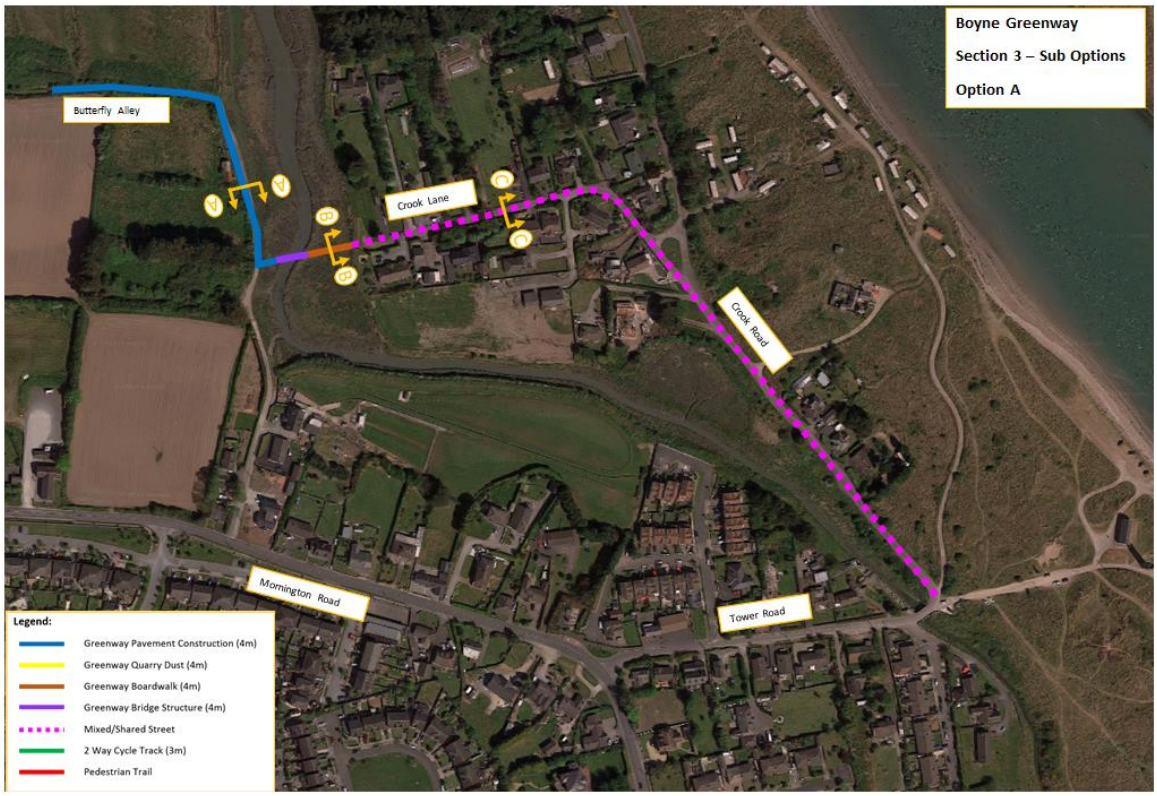

Figure 4.4: Route Option A

6.2.3 The option A sample cross sections are presented in **Figure 4.5** below.

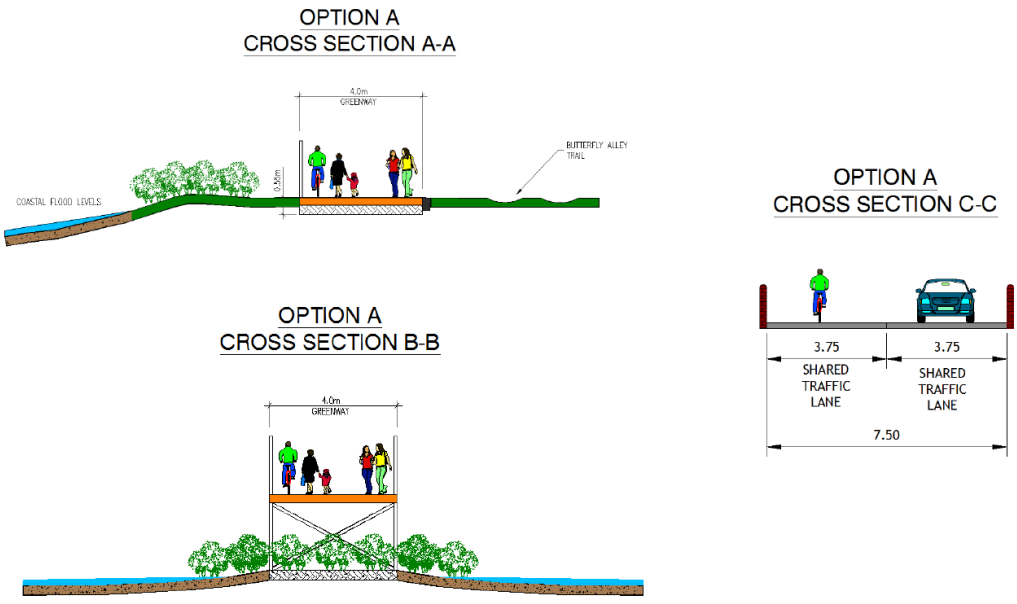

Figure 4.5: Route Option A: Proposed Cross Section.

6.2.4 The following constraints would need to be considered if this route option is progressed:

- Residents have concerns regarding the removal of the cul-de-sac on Crook Lane and the provision of a shared street facility.
- The raised boardwalk may be very challenging to construct and it may obstruct the coastal view for residents.

Option B - via Butterfly Alley, Mornington Road and Tower Road (Share/mixed street facilities on Mornington Road & Tower Road);

6.2.5 This option proposed a 4m wide paved greenway which follows the locally named Butterfly Alley trail heading eastwards. It is proposed that Route Option will travel adjacent to the Estuary at a location known as "The Gut" and continue in the south direction to the Mornington Road (R151). Due to width constraints along Mornington Road segregated cycle facilities are not achievable without widening the carriageway, removal of the verge and footpath. Therefore, shared cycle facilities are proposed for Mornington Road, see **Figure 4.6**.

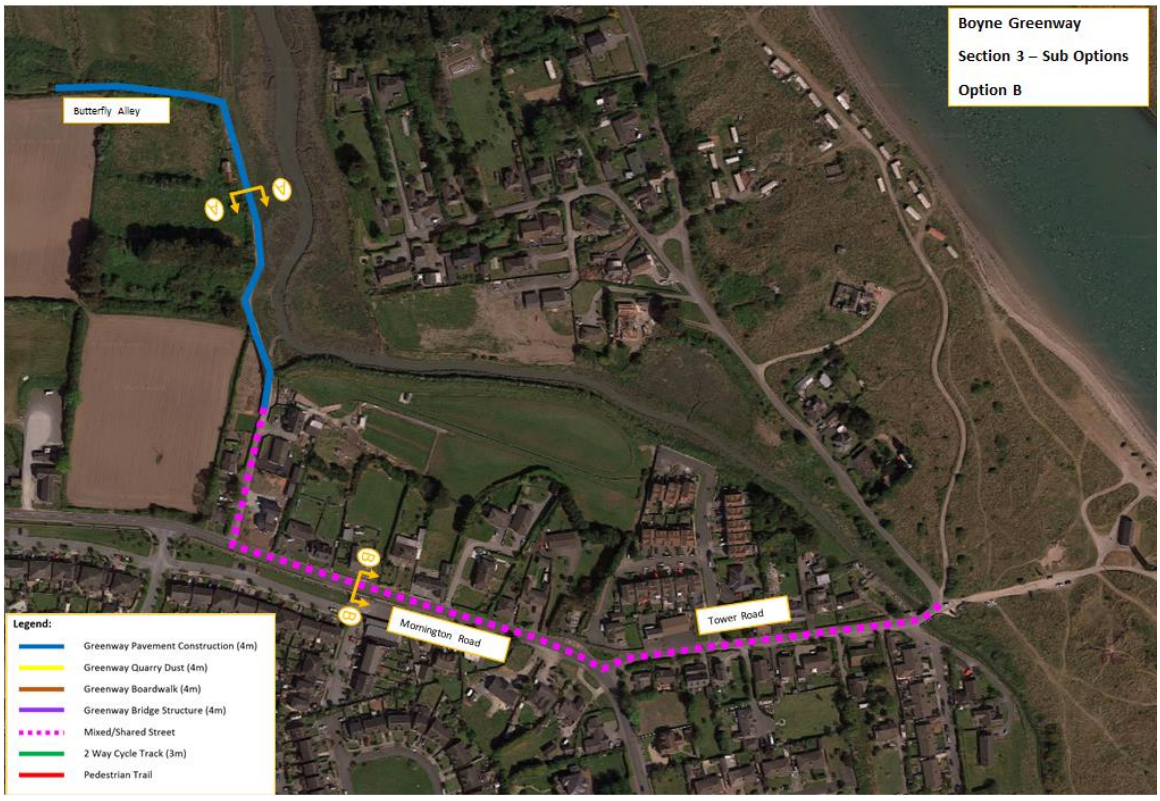

Figure 4.6: Route Option B

6.2.6 The option B sample cross sections are presented in **Figure 4.7** below.

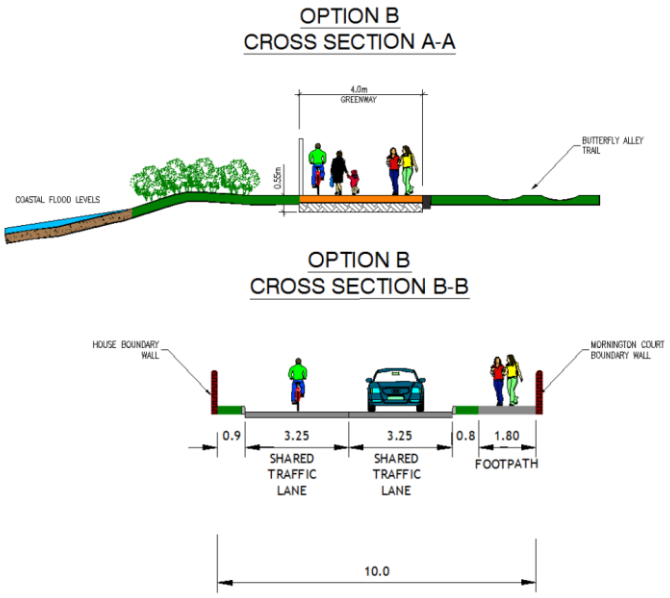

Figure 4.7: Route Option B: Proposed Cross Section

6.2.7 The following constraints would need to be considered if this route option is progressed:

- Shared street facilities provided on Mornington Road and Tower Road, no segregated cycle facilities provided on these roads.

Option C - via Butterfly Alley, boardwalk to the south of Crook Lane and Share/mixed street facilities on Crook Road;

6.2.8 This option proposed a 4m wide paved greenway which follows the locally named Butterfly Alley trail heading eastwards. It is proposed that Route Option crosses the estuary at a location known as "The Gut" and travels on the northern side of the Estuary towards Crook Road. Boardwalk facilities will need to be provided on the northern side of the estuary due to Coastal/Fluvial flooding. Crook Road is a residential road with very light traffic flows and slow traffic speeds, which are suited to a shared facility. It is likely the road would need to be resurfaced and the existing road lighting improved to adequately provide for the facility. The raised boardwalk may be very challenging to construct and it may obstruct the view of the estuary for residents, see **Figure 4.8**.

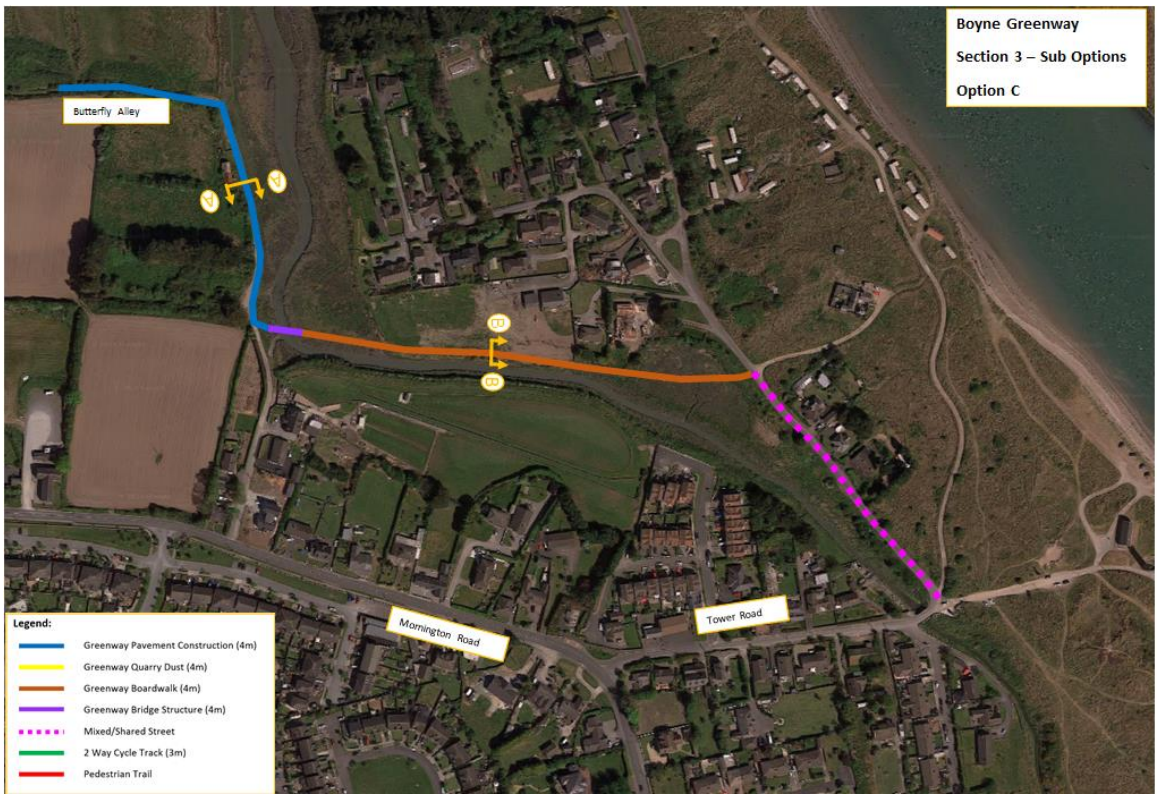

Figure 4.8: Route Option C

6.2.9 The option C sample cross sections are presented in **Figure 4.9** below.

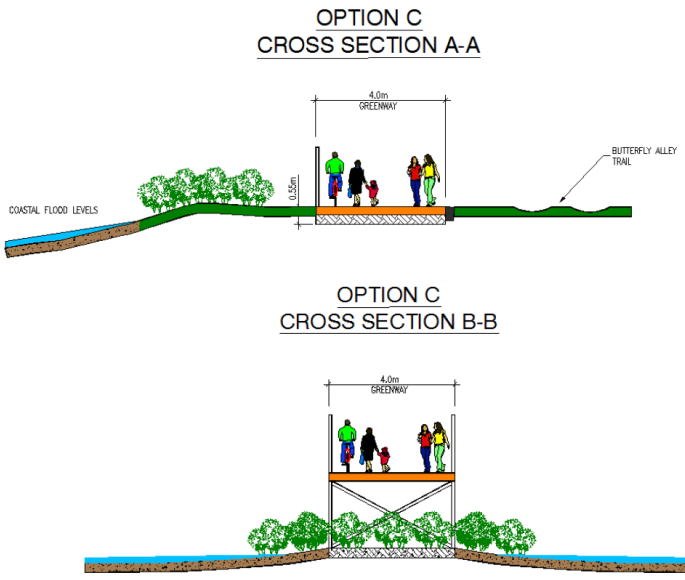

Figure 4.9: Route Option C: Proposed Cross Section.

6.2.10 The following constraints would need to be considered if this route option is progressed:

- The raised boardwalk may be technically challenging to construct and it may obstruct the view of the estuary for residents.
- A Piled boardwalk facility may disturb the marsh and grassland at the 'The Gut' of the Boyne River Estuary (50m length).

Option D - via Mornington Road, Tower Road (two-way cycle facility for a section of Mornington Road);

6.2.11 This option proposed a 4m wide paved greenway which follows the locally named Butterfly Alley trail heading eastwards. It is proposed that Route Option will travel adjacent to the Estuary at a location known as "The Gut" and continue in the south direction towards the Mornington Road (R151). This option proposes a two-way cycle track on the northern side of the Mornington Road. The provision of the two-way cycle track requires the widening of the carriageway, removal of the verge and relocation of the Mornington Court boundary wall. Due to width constraints along Tower Road (proximity of adjacent properties), mixed or shared street facilities are only feasible, see **Figure 4.10**.

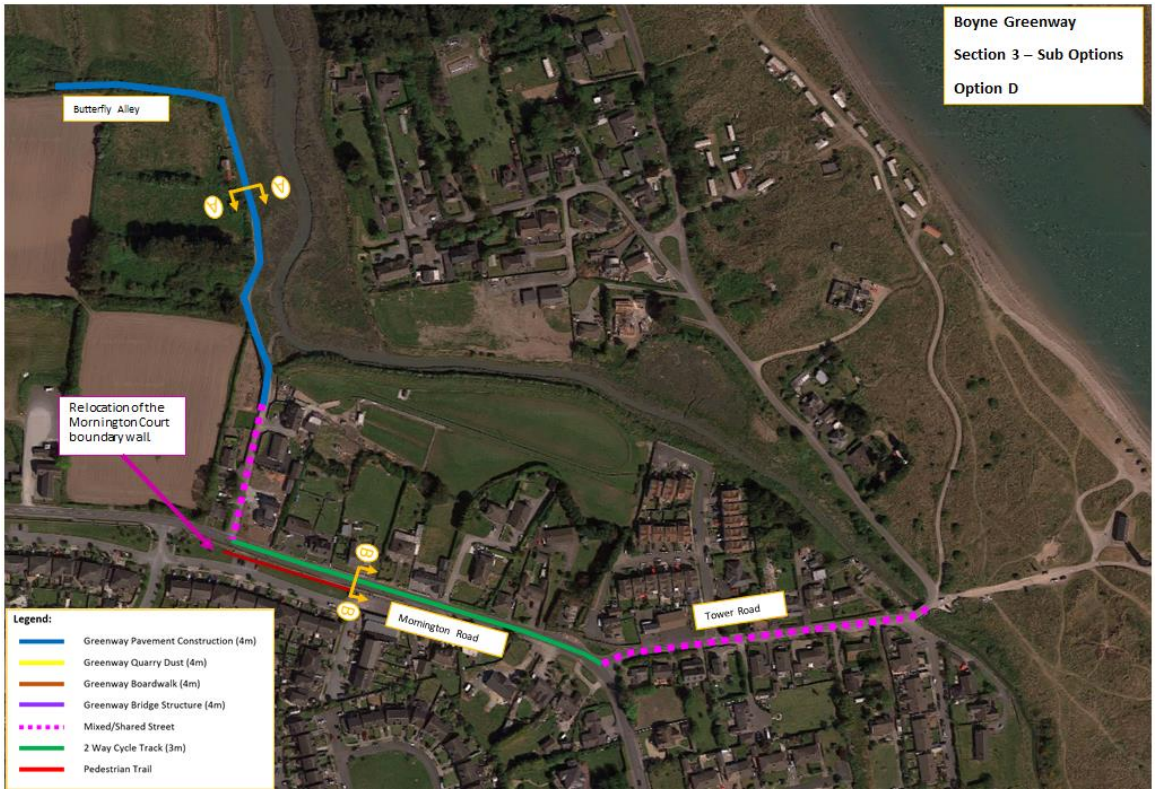

Figure 4.10: Route Option D

6.2.12 The option D sample cross sections are presented in **Figure 4.11** below.

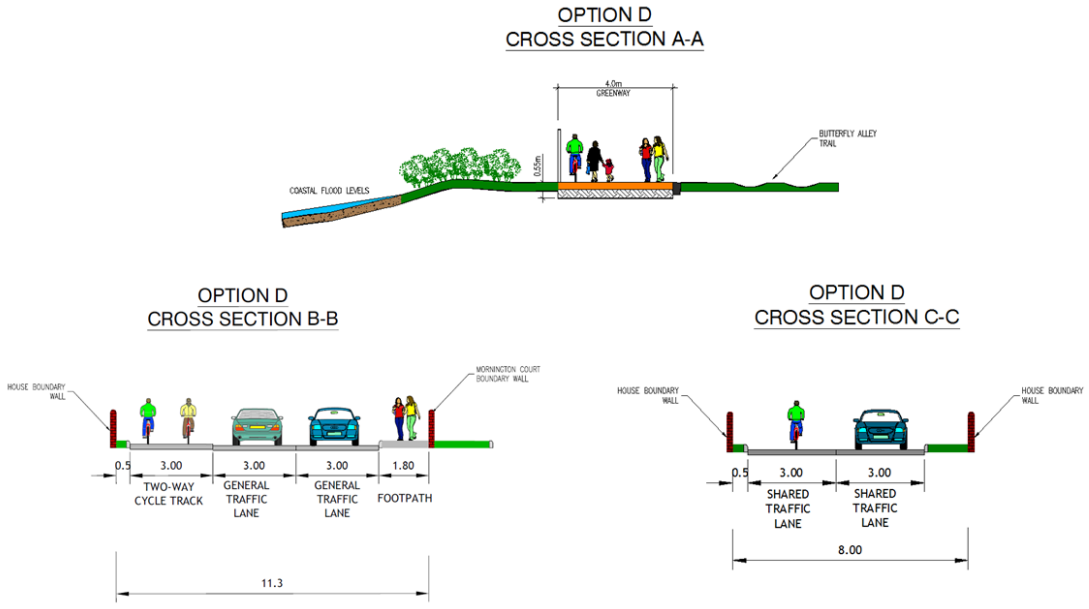

Figure 4.11: Route Option D: Proposed Cross Section

6.2.13 The following constraints would need to be considered if this route option is progressed:

- Shared street facilities provided on Tower Road, no segregated cycle facilities provided.
- Relocation of the Mornington Court boundary wall.

Route Options Multi-Criteria Analysis

6.2.14 The route options assessment summary tables for the Sub-Options for Section 3 are presented in Table 1 of Appendix A. The relative ranking of route options against the scheme assessment sub-criteria are summarised in **Table 4.1** below.

Section 2 Sub-Options					
Appraisal Criteria	**Sub-Criteria**	**Option A**	**Option B**	**Option C**	**Option D**
1 Economy	1A Capital Cost				
2 Integration	2A Transport Network Integration				
	2B Cycle Network Integration				
	2C Traffic Network Integration				
3 Safety	3A Road Safety				
	3B Pedestrians Safety				
4 Environment	4A Architectural and Cultural Heritage				
	4B Flora & Fauna				
	4C Landscape and Visual				
	4D Risk of Flooding				
	4E Soil & Hydrology				
	4F Land Use Character				

Table 4.1: Sub-Options MCA Summary (Sub-Criteria)

6.2.15 In terms of 'Economy', the primary differentiator between route options is the provision of segregated cycle facilities, boardwalk facilities and the provision of cycle/pedestrian bridges, option C proposes shared/mixed street facilities with no cycle/pedestrian bridge and therefore has the least capital costs.

6.2.16 In terms of 'Integration', options C scores highest because it includes a parallel segregated greenway facility for the majority of the route providing a high quality of service while also not impacting on the general traffic.

6.2.17 Under 'Safety', option C scores highest, it includes a parallel segregated cycle facility for the majority of the route. The only section that does not have pedestrian facilities is Crook Road (190m).

6.2.18 In terms of 'Environment', route option C is considered to be the least attractive compared to the other options due to the fact that the paved greenway along the 'The Gut' of the Boyne River Estuary may experience flooding (approx. 260m length) (1 in 10yr flood), the piled boardwalk facility may disturb the marsh and grassland at the 'The Gut' of the Boyne River Estuary (290m) and the pedestrian & cycle bridge with a section of Boardwalk (with pedestrian railings) may impact on the existing vista of the Estuary. Route options B & D scored highest due to the fact that they have do not have a boardwalk or pedestrian/cycle bridge that would impact on the existing vista of the River Boyne Estuary and disturb the marsh and grassland at the 'The Gut' of the Estuary.

6.2.19 A summary of the assessment and relative ranking of route options against the four main assessment criteria is presented in **Table 4.2** below.

Section 2 Sub-Options				
Appraisal Criteria	**Option A**	**Option B**	**Option C**	**Option D**
1 Economy				
2 Integration				
3 Safety				
4 Environment				

Table 4.2: Sub-Options MCA Summary (Main Criteria)

6.2.20 Based on the assessment undertaken, route option D appears to offer more benefits over the other options. Option D is therefore preferred route for the eastern section of the Study Area for the following reasons:

- It provides segregated cycle facilities for a large proportion of the route;
- It is one of the safest options;
- It has a low environmental impact. It has no appreciable impact on Landscape & Visual and a low impact on Flora & Fauna and Soil & Hydrology.

6.2.21 Based on the multi-criteria assessment undertaken, option D is identified as the preferred route option for the eastern section of the Study Area from the Butterfly Alley/Mornington Road to the Tower Road/Crook Road junction. Therefore, Option D will form part of the principal option.

6.3 Assessment of Principal Route Options

Introduction

6.3.1 As previously mentioned, there are four principal route options considered for the study area between the Mornington Road/old golf range access track and the Crook Road/Tower Road junction. These options are discussed below in the following paragraphs.

Principal Route Option 1: Access track from Mornington Road to the old golf range, Butterfly Alley, Mornington Road & Tower Road;

6.3.2 This option proposes a 4m wide paved greenway which follows the existing flood defence embankment travelling northwards along the old golf range access track until it meets with the Butterfly Alley heading east. These lands are in private ownership however permissive access has been discussed and verbally agreed with the landowner. It is proposed that this Route Option will travel adjacent to the Estuary at a location known as "The Gut" and continue in the south direction towards the Mornington Road (R151). This option proposes a two-way cycle track on the northern side of the Mornington Road. The provision of the two-way cycle track requires the widening of the carriageway, removal of the verge and relocation of the footpath behind the Mornington Court boundary wall. Due to width constraints along Tower Road (proximity of adjacent properties), mixed or shared street facilities are only feasible, see **Figure 4.12**.

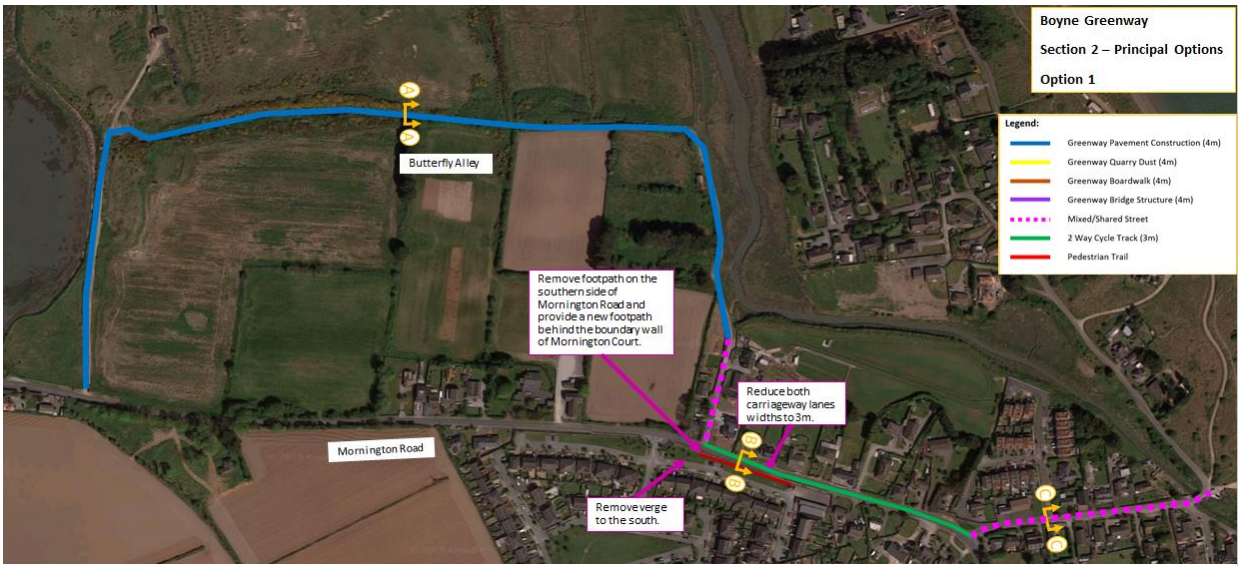

Figure 4.12: Route Option 1

6.3.3 The option 1 sample cross sections are presented in **Figure 4.13** below.

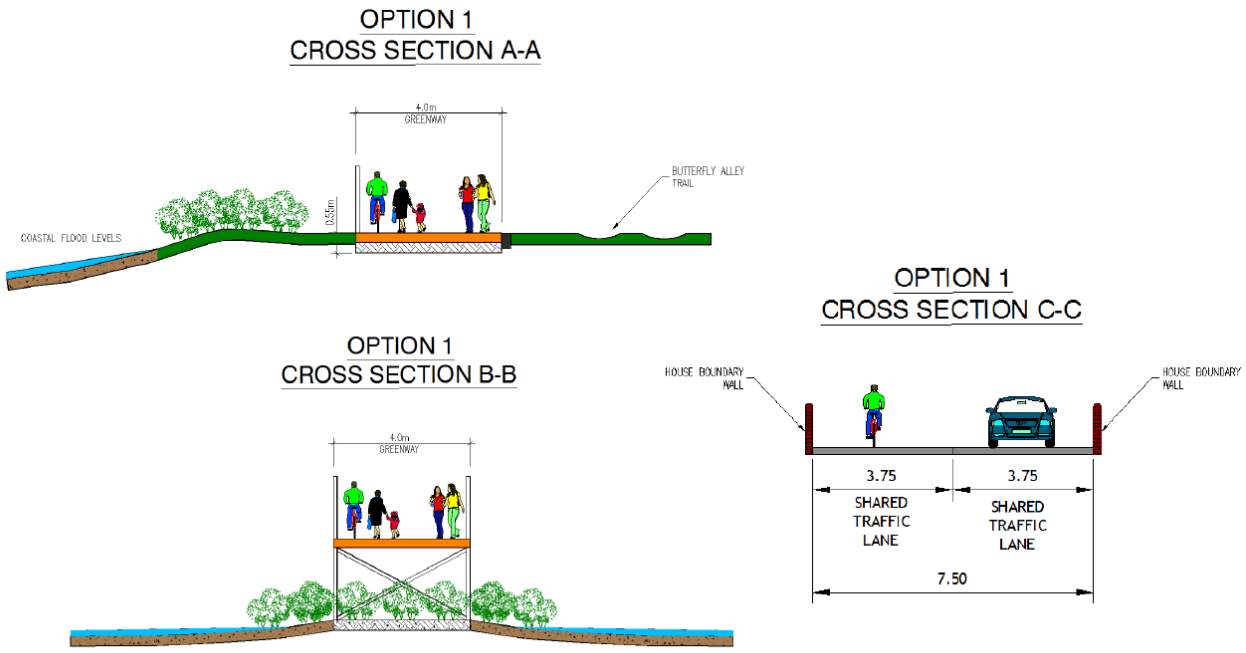

Figure 4.13 Route Option 1: Proposed Cross Section.

6.3.4 The following constraints would need to be considered if this route option is progressed:

- Shared street facilities provided along the Tower Road.

Principal Route Option 2: Mornington Road – Tower Road;

6.3.5 This option proposes mixed or shared street facilities along Mornington Road and Tower Road. Due to width constraints along Mornington Road segregated cycle facilities are not achievable without widening the carriageway resulting in a removal of a number of trees/bushes and land acquisition, see **Figure 4.14**.

Figure 4.14: Route Option 2

6.3.6 The option 2 sample cross sections are presented in **Figure 4.15** below.

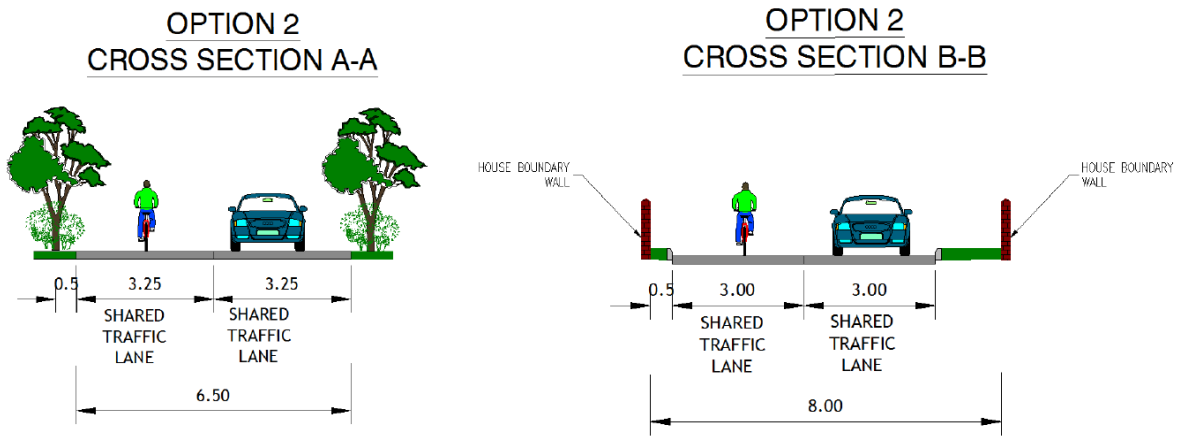

Figure 4.15: Route Option 2: Proposed Cross Section.

6.3.7 The following constraints would need to be considered if this route option is progressed:

- No segregated cycle facilities provided along the entire route.
- No pedestrian facilities for a large proportion of the route.

Principal Route Option 3: Mornington Road – Tower Road (two-way cycle facility for a section of Mornington Road);

6.3.8 This option proposes a two-way cycle track on the northern side of the Mornington Road. Due to width constraints along Mornington Road the provision of segregated cycle facilities is only achievable through widening the carriageway to the north, resulting in a removal of a number of bushes/trees and minor land acquisition. Proceeding east towards Tower Road it is proposed to relocate the boundary wall of Mornington Court to provide the two-way cycle track and footpath. Due to width constraints (proximity between adjacent properties) along Tower Road segregated cycle facilities are not achievable without widening the carriageway resulting land acquisition from residential properties, see **Figure 4.16**.

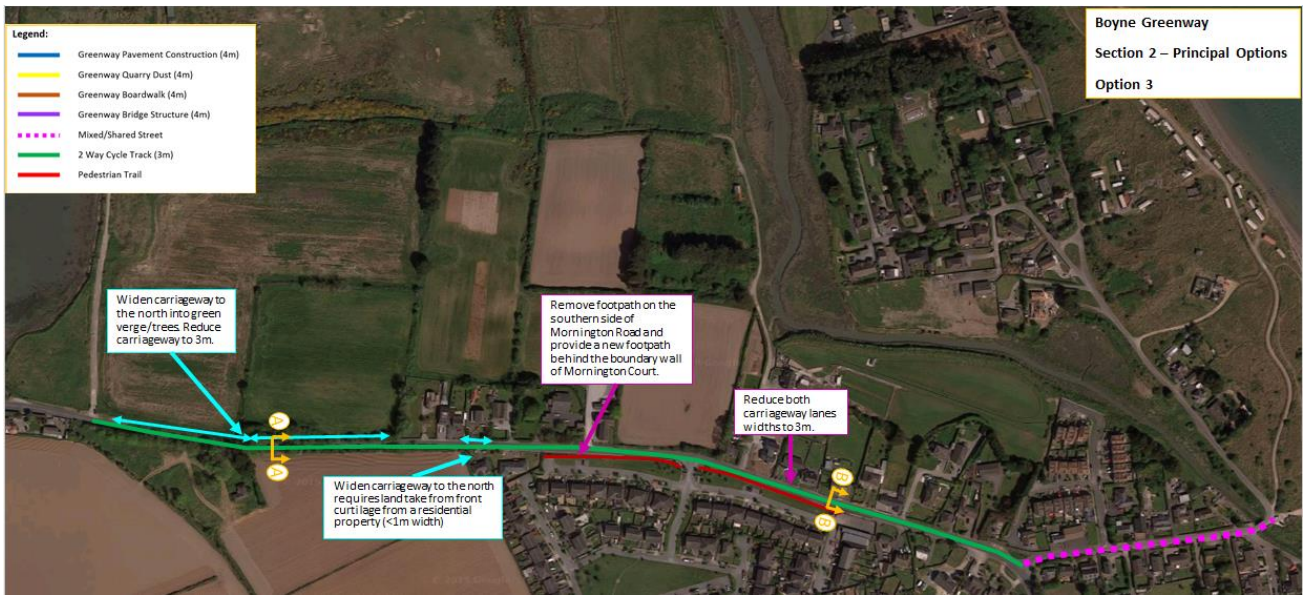

Figure 4.16: Route Option 3

6.3.9 The option A sample cross sections are presented in **Figure 4.17** below.

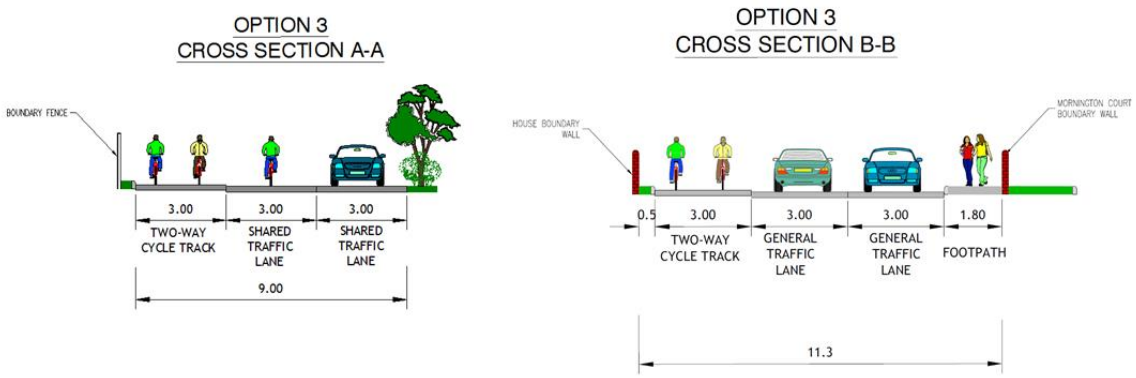

Figure 4.17: Route Option 3: Proposed Cross Section.

6.3.10 The following constraints would need to be considered if this route option is progressed:

- No segregated cycle facilities provided along the Tower Road.
- Small proportion of land acquisition required.

Principal Route Option 4: Mornington Road – Tower Road (two-way cycle facility for a section of Mornington Road with parallel cycle pedestrian trail);

6.3.11 This option proposes a two-way cycle track on the northern side of the Mornington Road. Due to width constraints along Mornington Road the provision of segregated cycle facilities is only achievable through widening the carriageway to the north, resulting in a removal of a number of bushes/trees and minor land acquisition. Proceeding east towards Tower Road it is proposed to relocate the boundary wall of Mornington Court to provide the two-way cycle track and footpath. Due to width constraints (proximity between adjacent properties) along Tower Road segregated cycle facilities are not achievable without widening the carriageway resulting land acquisition from residential properties.

6.3.12 This option also proposes a pedestrian Trail which follows the existing flood defence embankment travelling northwards along the old golf range access track until it meets with the Butterfly Alley heading eastwards. The trail will then continue south along the pier access route towards Mornington Road, see **Figure 4.18**.

6.3.13 It should be noted that a variant to this option was considered where the proposed pedestrian trail would cross the estuary at "The Gut" and travels on the northern side of the Estuary towards Crook Road. Boardwalk facilities would be required on the northern side of the estuary due to Coastal/Fluvial flooding. The trail would connect with Crook Road by the access trail to the Drogheda Port North Lighthouse. However, this option was not progressed to the scheme assessment stage as it was less feasible and had a larger environmental impact than the scheme option taken forward.

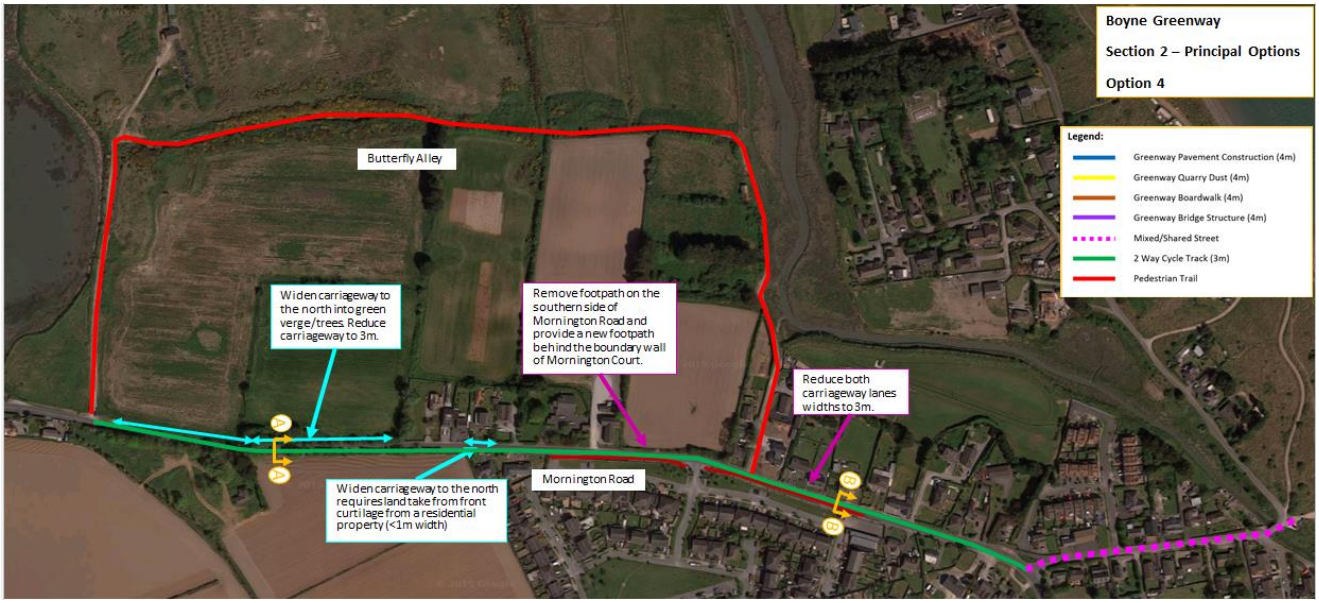

Figure 4.18: Route Option 3

6.3.14 The option A sample cross sections are presented in **Figure 4.19** below.

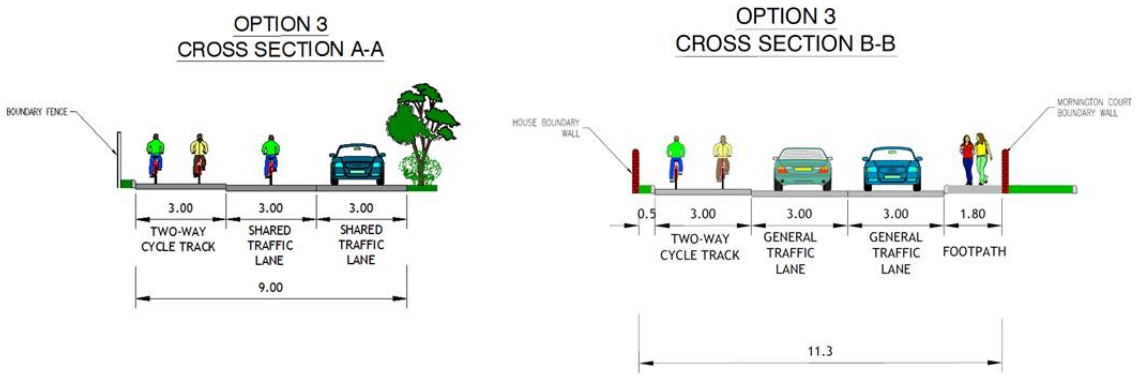

Figure 4.19: Route Option 3: Proposed Cross Section.

6.3.15 The following constraints would need to be considered if this route option is progressed:

- No segregated cycle facilities provided along the Tower Road.
- Small proportion of land acquisition required.

Stage 2 Route Options Multi-Criteria Analysis

6.3.16 The 'Stage 2' route options assessment summary tables for the greenway Options for Section 2 are presented in Table 2 of Appendix A. The relative ranking of route options against the scheme assessment sub-criteria are summarised in **Table 4.3** below.

Section 2 Principal Route Options					
Appraisal Criteria	**Sub-Criteria**	**Option 1 - Access track to the old golf range, Butterfly Alley, Mornington Road & Tower Road (Shared/mixed street facilities);**	**Option 2 – Mornington Road – Tower Road (Shared/mixed street facilities);**	**Option 3 - Mornington Road – Tower Road (two-way cycle facility for a section of Mornington Road);**	**Option 4 - Mornington Road – Tower Road (two-way cycle facility with parallel cycle pedestrian trail);**
1 Economy	**1A Capital Cost**				
2 Integration	**2A Transport Network Integration**				
	2B Cycle Network Integration				
	2C Traffic Network Integration				
3 Safety	**3A Road Safety**				
	3B Pedestrians Safety				
4 Environment	**4A Architectural and Cultural Heritage**				
	4B Flora & Fauna				
	4C Landscape and Visual				
	4D Risk of Flooding				
	4E Soil & Hydrology				
	4F Land Use Character				

Table 4.3: Principal Route Options MCA Summary (Sub-Criteria)

6.3.17 In terms of 'Economy', the primary differentiator between route options is the infrastructure costs associated with construction of the greenway facilities, option 2 proposes shared/mixed street facilities and therefore has the lowest capital costs. While option 4 proposes a cycle route and parallel pedestrian Trail via Butterfield Alley.

6.3.18 In terms of 'Integration', options 3 & 4 score highest because they provide segregated cycle facilities for the majority of the route along Mornington Road compared to aesthetically pleasing but circuitous route taken by option 1. Option 2 only provides Mixed/Shared street facilities which may also impact on the general traffic.

6.3.19 Under 'Safety', Options 1 & 4 is ranked the highest providing a parallel pedestrian facility from Mornington Road for a large proportion of the route. Both options 2 & 3 provide no pedestrian facilities along 300m of the Mornington Road.

6.3.20 In terms of 'Environment', route option 2 is considered to be the most attractive compared to the other options because only mixed/shared street facilities will be provided along the Mornington Road & Tower Road. This option has no appreciable environmental impact. Route Option 1 & 4, are considered the least attractive, as they provide a large proportion of their route along the edge of the estuary (via Butterfly Alley & 'The Gut') which will have an effect on the landscape & aesthetic vista, the paved greenway/pedestrian Trail along the 'The Gut' of the Boyne River Estuary may have an impact on the Flora and Fauna and will experience flooding (approx. 850m length) (1 in 10yr flood).

6.3.21 A summary of the assessment and relative ranking of route options against the four main assessment criteria is presented in **Table 4.4** below.

Section 2 Principal Route Options				
Appraisal Criteria	**Option 1**	**Option 2**	**Option 3**	**Option 4**
1 Economy				
2 Integration				
3 Safety				
4 Environment				

Table 4.4: Principal Route Options MCA Summary (Main Criteria)

6.3.22 Based on the assessment undertaken, route option 3 appears to offer more benefits over the other options. Option 3 is therefore preferred route option for the following reasons:

- It offers a more direct route compared to Option 1;
- It provides segregated cycle facilities for much of the route compared with Option 2;
- It generates less Environmental Impacts compared to Option 1 & 4;
- It is one of the safest options;

6.3.23 Based on the multi-criteria assessment undertaken for this section of the study area, Option 3 is identified as the preferred route option for the section 3 between the access track to the old golf range and the Tower Road/Crook Road junction.

6.3.24 The benefits of the preferred route (Option 3) can be summarised as follows:

i. Continuous segregated cycle facilities provided for the majority of the route 850m (250m shared/mixed street along Tower Road), delivering a safer, more comfortable and attractive route.

ii. The environmental impact of delivering the scheme would be minimal as the proposed two-way cycle facility will be provided adjacent to the Mornington Road.

7.0 EMERGING PREFERRED SCHEME

7.1 Introduction

7.1.1 This section of the report presents the final conclusions from the assessment process for the greenway route options considered and recommends a preferred scheme. A description of the preferred greenway route is given together with ancillary measures required and key issues to be addressed through the scheme design development.

7.2 Route Options Assessment Conclusions

7.2.1 Sections 4 to 6 of this report presented an appraisal to each of the potential route options for each of the study area sections identified. Within each study area section, where potential route options were considered to be available, they have been assessed in accordance with the methodology set out in Chapter 3 including a 'Multi-Criteria Analysis' under the headings of Economy, Integration, Safety and Environment.

7.3 Recommended Preferred Option

7.3.1 Based on the conclusions from the route options assessment process (as set out in Section 4) and the restrictions due to the SPA and SAC, the recommended preferred route for the proposed scheme is presented in **Figure 7.1** below.

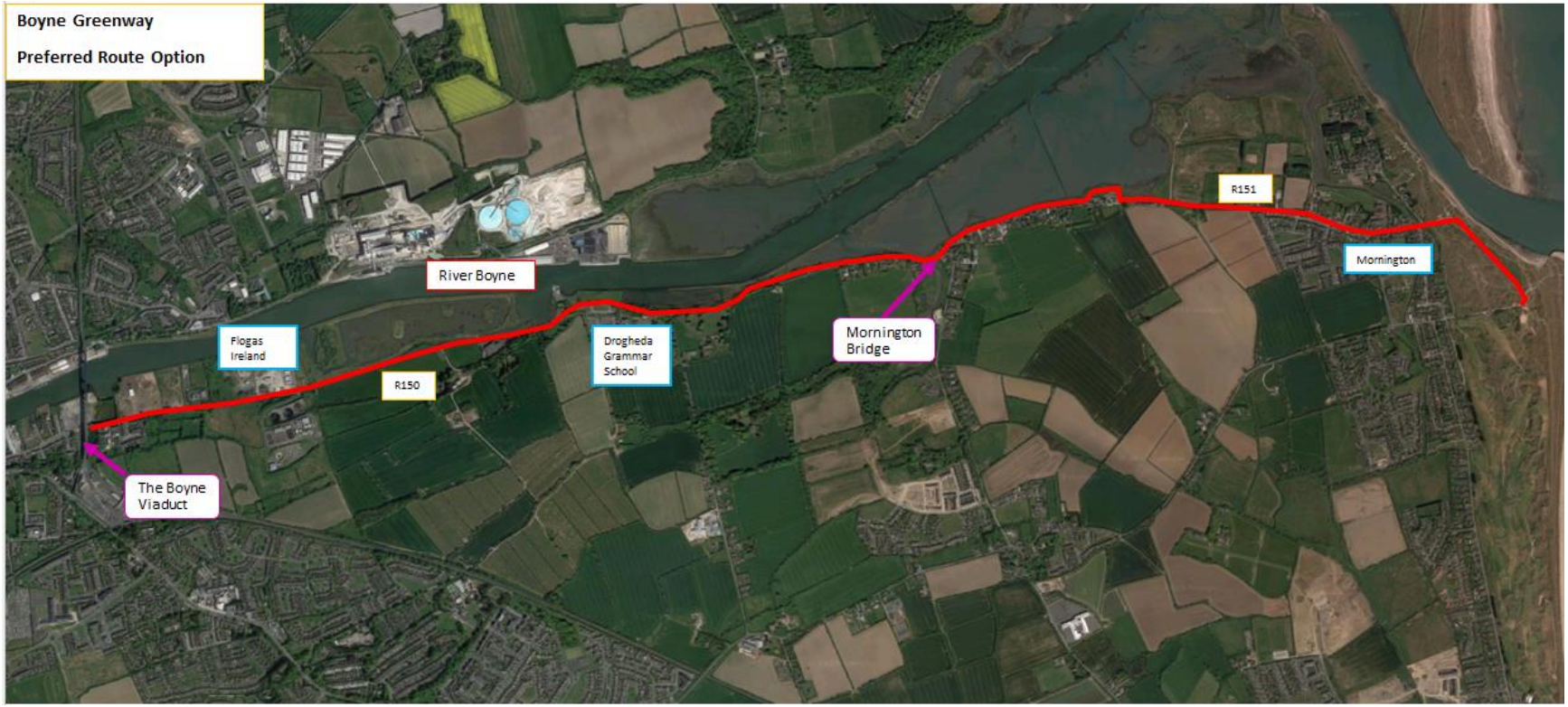

Figure 7.1: Preferred Route Option

7.3.2 The Emerging Preferred Route (EPR) has been determined following a detailed route option selection process which included an evaluation of extensive background surveys in the areas of ecology and conservation amongst other items. A range of bespoke Biodiversity sensitive aspect-based surveys were commissioned to fully inform an iterative design process. In addition, a consultation process was undertaken with NPWS throughout the design process.

7.3.3 The proposed greenway route corridor is principally aligned along existing road corridors, amenity areas and existing trackways and disturbed ground, following the southern margin of the River Boyne estuary.

7.3.4 The preferred route for route for the Boyne Greenway, between Drogheda East and Mornington, generally follows the northern side of the existing R150/R151 Regional Road (restriction due to SPA/SAC). The route moves away from the R150 road at Drogheda Grammar School providing views to the Boyne Estuary. For the majority of the route from Mornington Bridge to Tower Road the greenway will be adjacent to the R151, as either a boardwalk structure or kerbed bituminous surface. The dunes section of the preferred route, from Tower Road/Crook Road junction to the Drogheda East Lighthouse, will be via the existing bare track already in usage for access through the dune system and as such will not directly impact on the Annex habitat either side.

7.3.5 The preferred route for the Boyne Greenway is approximately 6.5 km in length with approximately 3.5 km of the route directly alongside the Regional Road, approximately 0.5km in sand dunes and 2.5km slightly away from the route of the road.

7.3.6 Although it would be preferable to have the greenway completely away from the road, this approach balances the reduced impact on the SPA/SAC with access and functionality yet still providing the outstanding views available.

7.3.7 For an illustration of the EPR, refer to the Scheme drawings 170029-2200 which are on display for the non-statutory public consultation.

8.0 APPENDIX A – Sub Options Assessment

Section 2 Sub-options					
Appraisal Criteria	**Sub-Criteria**	**Option A**	**Option B**	**Option C**	**Option D**
1 Economy	**1A Capital Cost**	*Indicative Infrastructure costs include:* • This option proposes a 4m wide paved greenway which travels along the trail locally named Butterfly alley heading east towards Bettystown Beach (210m). • It is proposed that Route Option crosses the estuary at a location known as "The Gut" to connect with Crook Road. The crossing of the estuary will require the construction of a pedestrian/cycle bridge. • The Route Option will connect with Crook Lane via a Boardwalk (50m). • Mixed/shared cycle facilities are proposed along Crook Lane and Crook Road. • It is likely the Crook Lane/Crook Road would need to be resurfaced in places and the existing road lighting improved to adequately provide for the facility.	*Indicative Infrastructure costs include:* • This option proposes a 4m wide paved greenway which will travel along the trail locally named Butterfly alley adjacent to the Estuary at a location known as "The Gut" and continue in the south direction to the Mornington Road (R151) (320m). • Due to width constraints along Mornington Road segregated cycle facilities is not achievable without widening the carriageway, removal of the verge and footpath. Therefore, shared cycle facilities are proposed for Mornington Road.	Indicative Infrastructure costs include: • This option proposes a 4m wide paved greenway which travels along the trail locally named Butterfly alley heading east towards the coast (270m). • It is proposed that Route Option crosses the estuary at a location known as "The Gut" and travels on the northern side of the Estuary towards Crook Road. Boardwalk facilities will need to be provided on the northern side of the estuary due to Coastal/Fluvial flooding (290m). • Mixed/shared cycle facilities are proposed along Crook Road. • It is likely the Crook Road would need to be resurfaced in places and the existing road lighting improved to adequately provide for the facility	Indicative Infrastructure costs include: • This option proposes a 4m wide paved greenway which will travel along the trail locally named Butterfly alley adjacent to the Estuary at a location known as "The Gut" and continue in the south direction to the Mornington Road (R151) (320m). • This option proposes a two-way cycle track on the northern side of the Mornington Road (270m). • The provision of the two-way cycle track requires the widening of the carriageway, removal of the verge and relocation of the footpath behind the Mornington Court boundary wall. • It is likely the Tower Road would need to be resurfaced in places and the existing road lighting improved to adequately provide for the facility
	Rank				
2 Integration	**2A Transport Network Integration**	No appreciable impacts	No appreciable impacts	No appreciable impacts	No appreciable impacts
	Rank				
	2B Cycling - Quality of Service	4m wide paved greenway, which will be segregated from live traffic (210m). Raised Boardwalk for 50m. Shared/mixed street facility for Crook Lane and Crook Road (500m). Greater Aesthetic views from Crook Road compared to the greenway along Mornington Road/Tower Road.	4m wide paved greenway, which will be segregated from live traffic (321m). Shared/mixed street facility provided for Mornington Road and Tower Road and Crook Road (500m).	4m wide paved greenway, which will be segregated from live traffic (270m). Raised Boardwalk for 290m. The raised boardwalk will provide a more enjoyable experience Shared/mixed street facility along Crook Road (190m). The Boardwalk structure constructed adjacent to the Boyne estuary will provide a more enjoyable experience than sections which are constructed close to the carriageway edge, however boardwalk surfacing provides a lower quality of comfort compared to smooth as asphalt which provides the best comfort of ride.	4m wide paved greenway, which will be segregated from live traffic (320m). Two-way cycle facility on Mornington Road (270m). Shared/mixed street facility along laneway to Mornington Road and Tower Road (300m). Greater Aesthetic views from Crook Road compared to the greenway along Tower Road.
	Rank				
	2C Traffic Network Integration	Shared/mixed street facility along Crook Lane and Crook Road will have a negative impact on traffic (500m). The removal of the cul-de-sac on Crook Lane will have a negative impact on traffic calming.	Shared/mixed street facility along Mornington Road and Tower Road will have a negative impact on traffic (500m).	Option C is segregated from the existing road network for the majority of its length, it therefore has the least amount of traffic impact. Shared/mixed street facility along Crook Road (190m).	Shared/mixed street facility along Tower Road will have a negative impact on traffic (300m). Traffic lane widths on Mornington Road may need to be reduced to 3m.

Section 2 Sub-options					
Appraisal Criteria	**Sub-Criteria**	**Option A**	**Option B**	**Option C**	**Option D**
	Rank				
3 Safety	**3A Road Safety**	Shared/mixed street facility along Crook Lane and Crook Road (500m).	Shared/mixed street facility along Mornington Road and Tower Road (500m).	Shared/mixed street facility along Crook Road (190m).	Shared/mixed street facility along Tower Road (300m).
	Rank				
	3B Pedestrian Safety	No pedestrian facilities are provided along Crook Lane and Crook Road (500m).	No pedestrian facilities provided in the laneway to Mornington Road and for the majority of Tower Road (300m).	No pedestrian facilities are provided along the section Crook Road (190m).	No pedestrian facilities provided in the laneway to Mornington Road and for the majority of Tower Road (300m).
	Rank				
4 Environment	**4A Architectural and Cultural Heritage**	No appreciable impacts	1 designated as protected structure Recorded Monument identified within the assessment area on the on Mornington Road. However, the structure has been recently renovated and this option does not involve land take by this structure, therefore this option will have no impact.	No appreciable impacts	1 designated as protected structure Recorded Monument identified within the assessment area on the on Mornington Road. However, the structure has been recently renovated and this option does not involve land take by this structure, therefore this option will have no impact.
	Rank				
	4B Flora and Fauna	The paved greenway and the Boardwalk facility along the 'The Gut' of the Boyne River Estuary may have an impact on the Flora and Fauna (approx. 260m length).	The paved greenway along the 'The Gut' of the Boyne River Estuary may have an impact on the Flora and Fauna (approx. 260m length).	The paved greenway along the 'The Gut' of the Boyne River Estuary will experience flooding (approx. 260m length) (1 in 10yr flood). Boardwalk facility to the north of the estuary (south of Crook Lane) an impact on the protected species including Otters and Salmon (290m length).	The paved greenway along the 'The Gut' of the Boyne River Estuary may have an impact on the Flora and Fauna (approx. 260m length)
	Rank				
	4C Landscape and Visual	Option A has a pedestrian & cycle bridge with a small section of Boardwalk (with pedestrian railings) which may impact on the existing vista of the Boyne River Estuary.	No boardwalk provided. Share/mixed street facility provided along Mornington Road and Tower Road which will have no significant impact on the existing vista of the River Boyne Estuary.	Option C has a pedestrian & cycle bridge with a section of Boardwalk (290m) (with pedestrian railings) which may impact on the existing vista of the Boyne River Estuary.	No boardwalk provided. Cycle facilities provided along the Mornington Road which will have no significant impact on the existing vista of the River Boyne Estuary.
	Rank				
	4D Risk of Flooding	The paved greenway and the Boardwalk facility along the 'The Gut' of the Boyne River Estuary will experience flooding (approx. 260m length) (1 in 10yr flood).	The paved greenway along the 'The Gut' of the Boyne River Estuary will experience flooding (approx. 260m length) (1 in 10yr flood).	The paved greenway along the 'The Gut' of the Boyne River Estuary will experience flooding (approx. 260m length) (1 in 10yr flood). Boardwalk facility to the north of the estuary (south of Crook Lane) will experience flooding (290m length).	The paved greenway along the 'The Gut' of the Boyne River Estuary will experience flooding (approx. 260m length) (1 in 10yr flood).
	Rank				

Section 2 Sub-options					
Appraisal Criteria	**Sub-Criteria**	**Option A**	**Option B**	**Option C**	**Option D**
4 Environment	**4E Soil & Hydrology**	Impacts on soil and geology as a result of possible ground excavation (including potential to encounter ground contamination) along the grassed trail approaching the 'The Gut' of the estuary to provide for a paved greenway (210m length). A Piled boardwalk facility may disturb the marsh and grassland at the 'The Gut' of the Boyne River Estuary (50m).	Impacts on soil and geology as a result of possible ground excavation (including potential to encounter ground contamination) along the grassed trail approaching the 'The Gut' of the estuary to provide for a paved greenway (320m).	Impacts on soil and geology as a result of possible ground excavation (including potential to encounter ground contamination) along the grassed trail approaching the 'The Gut' of the estuary to provide for a paved greenway (270m). A Piled boardwalk facility may disturb the marsh and grassland at the 'The Gut' of the Boyne River Estuary (290m).	Impacts on soil and geology as a result of possible ground excavation (including potential to encounter ground contamination) along the grassed trail approaching the 'The Gut' of the estuary to provide for a paved greenway (320m).
	Rank				
	4F Land Use Character	No appreciable impacts	No appreciable impacts	No appreciable impacts	No appreciable impacts
	Rank				

9.0 APPENDIX B – Principal Route Options Assessment

Section 2 Principal Route options					
Appraisal Criteria	**Sub-Criteria**	**Option 1**	**Option 2**	**Option 3**	**Option 4**
1 Economy	**1A Capital Cost**	*Indicative Infrastructure costs include:* • This option proposes a 4m wide paved greenway which follows the existing flood defence embankment travelling northwards until it meets the trail locally named Butterfly alley adjacent to the Estuary at a location known as "The Gut" and continue in the south direction to the Mornington Road (R151) (850m). • This option proposes a two-way cycle track on the northern side of the Mornington Road (270m). • The provision of the two-way cycle track requires the widening of the carriageway, removal of the verge and relocation of the footpath behind the Mornington Court boundary wall. • It is likely the Tower Road would need to be resurfaced in places and the existing road lighting improved to adequately provide for the facility. • Traffic lane widths on Mornington Road may need to be reduced to 3m.	*Indicative Infrastructure costs include:* • This option proposes mixed or shared street facilities along Mornington Road and Tower Road. Due to width constraints along Mornington Road segregated cycle facilities is not achievable without widening the carriageway resulting in a removal of a number of trees and land acquisition. • It is likely the Tower Road would need to be resurfaced in places and the existing road lighting improved to adequately provide for the facility.	*Indicative Infrastructure costs include:* • This option proposes a 3m two-way cycle track on the northern side of the Mornington Road. Due to width constraints along Mornington Road the provision of segregated cycle facilities is only achievable through widening the carriageway to the north, resulting in a removal of a number of bushes/trees and land acquisition. • Proceeding east towards Tower Road it is proposed to relocate the footpath behind the boundary wall of Mornington Court. • Due to width constraints (proximity between adjacent properties) along Tower Road segregated cycle facilities is not achievable without widening the carriageway resulting land acquisition from residential properties. • Traffic lane widths on Mornington Road may need to be reduced to 3m. • It is likely the Tower Road would need to be resurfaced in places and the existing road lighting improved to adequately provide for the facility.	*Indicative Infrastructure costs include:* • This option proposes a 3m two-way cycle track on the northern side of the Mornington Road. Due to width constraints along Mornington Road the provision of segregated cycle facilities is only achievable through widening the carriageway to the north, resulting in a removal of a number of bushes/trees and land acquisition. • Proceeding east towards Tower Road it is proposed to relocate the footpath behind the boundary wall of Mornington Court. • Due to width constraints (proximity between adjacent properties) along Tower Road segregated cycle facilities is not achievable without widening the carriageway resulting land acquisition from residential properties. • Traffic lane widths on Mornington Road may need to be reduced to 3m. • It is likely the Tower Road would need to be resurfaced in places and the existing road lighting improved to adequately provide for the facility. • This option also proposes a pedestrian tail which will travels along the trail locally named as Butterfly alley heading east towards the coast (270m) and then proceeding south towards Mornington Road via the pier access route.
	Rank				
2 Integration	**2A Transport Network Integration**	No appreciable impacts	No appreciable impacts	No appreciable impacts	No appreciable impacts
	Rank				
	2B Cycling - Quality of Service	4m wide paved greenway provided along Mornington Road which will be segregated from live traffic (850m). Greater Aesthetic views from Butterfly Alley than from Mornington Road, however it is a very circuitous route. Shared/mixed street facility along the laneway to Mornington Road and Tower Road (300m).	Shared/mixed street facility for the entire route (1 km).	Two-way cycle facility (3m wide) on Mornington Road (850m). Shared/mixed street facility along Tower Road (250m).	Two-way cycle facility (3m wide) on Mornington Road (850m). Shared/mixed street facility along Tower Road (250m).
	Rank				

Section 2 Principal Route options					
Appraisal Criteria	**Sub-Criteria**	**Option 1**	**Option 2**	**Option 3**	**Option 4**
2 Integration	2C Traffic Network Integration	Shared/mixed street facility along Tower Road will have a negative impact on traffic (250m). Traffic lane widths on Mornington Road may need to be reduced to 3m.	Shared/mixed street facility along Mornington Road and Tower Road will have a negative impact on traffic (1 km).	Shared/mixed street facility along Tower Road will have a negative impact on traffic (250m). Traffic lane widths on Mornington Road may need to be reduced to 3m.	Shared/mixed street facility along Tower Road will have a negative impact on traffic (250m). Traffic lane widths on Mornington Road may need to be reduced to 3m.
	Rank				
3 Safety	3A Road Safety	Shared/mixed street facility along Tower Road (250m).	Shared/mixed street facility along Crook Lane and Crook Road (1 km).	Shared/mixed street facility along Tower Road (250m).	Shared/mixed street facility along Tower Road (250m).
	Rank				
	3B Pedestrian Safety	Greenway provided along the Butterfly Alley Trail. No pedestrian facilities provided in the laneway to Mornington Road and for the majority of Tower Road (300m).	No pedestrian facilities provided for a section of Morngington Road (300m) and for the majority of Tower Road (300m).	No pedestrian facilities provided for a section of Morngington Road (300m) and for the majority of Tower Road (300m).	Pedestrian trail provided along the Butterfly alley and along the northern side of "The Gut". No pedestrian facilities provided for the majority of Tower Road (300m).
	Rank				
4 Environment	4A Architectural and Cultural Heritage	1 designated as protected structure Recorded Monument identified within the assessment area on the on Mornington Road. However, the structure has been recently renovated and this option does not involve land take by this structure, therefore this option will have no impact.	1 designated as protected structure Recorded Monument identified within the assessment area on the on Mornington Road. However, the structure has been recently renovated and this option does not involve land take by this structure, therefore this option will have no impact.	1 designated as protected structure Recorded Monument identified within the assessment area on the on Mornington Road. However, the structure has been recently renovated and this option does not involve land take by this structure, therefore this option will have no impact.	1 designated as protected structure Recorded Monument identified within the assessment area on the on Mornington Road. However, the structure has been recently renovated and this option does not involve land take by this structure, therefore this option will have no impact.
	Rank				
	4B Flora and Fauna	The paved greenway along Butterfly Alley and the 'The Gut' of the Boyne River Estuary may have an impact on the Flora and Fauna (approx. 850m length).	No appreciable impacts	The widening of the carriageway along the Mornington Road to provide for a two-way cycle track may have an impact on the Flora and Fauna (approx. 300m length).	The widening of the carriageway along the Mornington Road to provide for a two-way cycle track may have an impact on the Flora and Fauna (approx. 300m length). The pedestrian trail along the Butterfly Alley Estuary may have an impact on the Flora and Fauna.
	Rank				
	4C Landscape and Visual	This option is located along the Butterfly Alley and edge of the estuary by 'The Gut' which will have an effect on the landscape and Visual.	This option has one of the least impact as it is the existing Mornington Road carriageway.	This option has one of the least impact as it can be considered as an existing Mornington Road widening. Removal of Trees and Bushes required along Mornington Road.	This option is located along the Butterfly Alley and edge of the estuary by 'The Gut' which will have an effect on the landscape and Visual. Removal of Trees and Bushes required along Mornington Road.
	Rank				
	4D Risk of Flooding	The paved greenway along Butterfly Alley and along the 'The Gut' of the Boyne River Estuary will experience flooding (approx. 850m length) (1 in 10yr flood).	The Mornington Road only experiences some minor flooding.	The Mornington Road only experiences some minor flooding.	The paved greenway along Butterfly Alley and along the 'The Gut' of the Boyne River Estuary will experience flooding (approx. 850m length) (1 in 10yr flood). The Mornington Road only experiences some minor flooding.
	Rank				

Section 2 Principal Route options					
Appraisal Criteria	**Sub-Criteria**	**Option 1**	**Option 2**	**Option 3**	**Option 4**
4 Environment	**4E Soil & Hydrology**	Impacts on soil and geology as a result of possible ground excavation (including potential to encounter ground contamination) along the old access road to the Golf Driving Range and Butterfield alley approaching the 'The Gut' of the estuary to provide for a paved greenway (850m length).	No appreciable impacts	Impacts on soil and geology as a result of possible ground excavation (including potential to encounter ground contamination) along the Mornington Road due to widening of the carriageway to provide for a two-way cycle track (300m length).	Impacts on soil and geology as a result of possible ground excavation (including potential to encounter ground contamination) along the old access road to the Golf Driving Range and Butterfield alley approaching the 'The Gut' of the estuary to provide for a paved greenway (850m length).
	Rank				
	4F Land Use Character	No appreciable impacts	No appreciable impacts	The level of land take required on Mornington Road would not affect the viability of residential properties from being used for its intended use. (less than 1m width over length of 30m)	The level of land take required on Mornington Road would not affect the viability of residential properties from being used for its intended use. (less than 1m width over length of 30m)
	Rank				