

TRANSPORTATION

Project

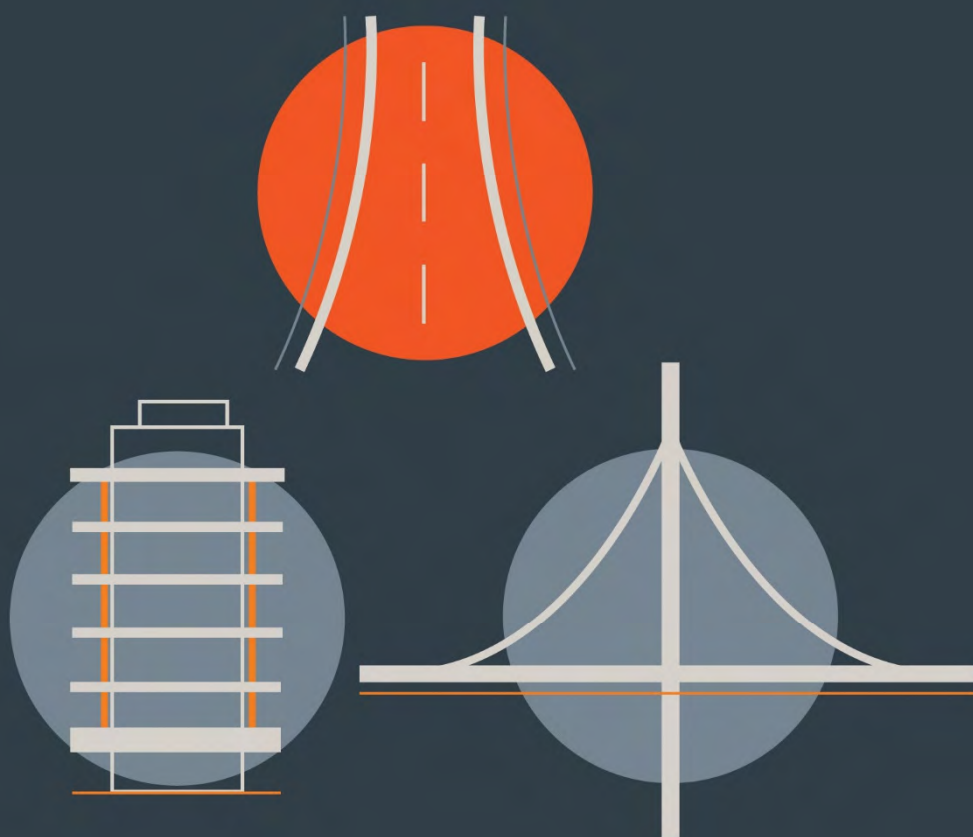
**Boyne Greenway
(Drogheda to Mornington)**

Report Title

Outline Construction Methodology

Client

Meath County Council



DBFL CONSULTING ENGINEERS

TABLE OF CONTENTS

1.0 INTRODUCTION1

1.1 Overview.....1

1.2 Greenway Route Drogheda to Mornington1

1.3 Physical Constraints and Opportunities2

2.0 PROPOSED WORKS & MITIGATION3

2.1 Overview.....3

2.2 Greenway Construction Alongside Road3

2.3 Greenway Construction Intertidal Zones/SPA/SAC5

2.4 Greenway Construction Bridge Sections.....7

3.0 RESILIENT CONSTRUCTION FORMS9

3.1 Overview.....9

3.2 Bituminous Pavement (Greenway Construction Alongside Road).....9

3.3 Recycle Plastic Boardwalk (Greenway Construction Intertidal Zones/SPA/SAC) 10

4.0 TRAFFIC MANAGEMENT & ACCESS DURING CONSTRUCTION & OPERATION12

4.1 General Storage Compounds & Parking 12

4.2 Temporary Impact on Schools and Surrounding Business 12

4.3 Temporary Traffic Management for Greenway Construction ‘Alongside Road’ 12

4.4 Temporary Traffic Management for Greenway Construction ‘Away from the Road’ 13

4.5 Temporary Traffic Management for Greenway Construction ‘Bridge Structures’ 14

4.6 Traffic Management of the Greenway in Operation 17

5.0 SUMMARY18

5.1 Review 18

5.2 Monitoring Commitment 18

APPENDIX A ROUTE DESCRIPTION SUMMARY

APPENDIX B NATIONAL CYCLE NETWORK – EAST MEATH

1.0 INTRODUCTION

1.1 Overview

DBFL Consulting Engineers were appointed by Meath County Council (MCC) to prepare a preliminary design for a section of the Boyne Greenway commencing at Ship Street in Drogheda and terminating in Mornington at the Tower Road / Crook Road junction in advance of the beach (dunes area).

As part of the preliminary design for the proposed Boyne Greenway, between Drogheda and Mornington, DBFL have prepared this report to outline the proposed construction strategies for same. The aim of the report is to provide an overview of the proposed construction methodologies as well as presenting early options aimed at lessening the potential impacts of the proposed cycle and pedestrian infrastructure on the existing Boyne Estuary Special Protection Area and the Boyne Coast and Estuary Special Area of Conservation, both during construction and long term during the operational stage. The effectiveness of the intrinsic design measures will be monitored during construction and post construction for 3 years.

Monitoring during construction will be undertaken both by a suitably qualified resident engineer to monitor the engineering quality of the works and by a suitably qualified Ecological Clerk of Works, (ECow) with a 'Stop Works' authority. This Ecologist will have previous experience and extensive knowledge of working on construction programmes within SAC and SPA areas with significant bird populations.

1.2 Greenway Route Drogheda to Mornington

As noted above, this construction methodology report will focus attention on the section of Boyne Greenway to the east of Drogheda, starting at Ship Street and terminating in Mornington at the Tower Road / Crook Road junction (see **Figure 1**). We would also note that this section of the proposed greenway will serve as a direct route for pedestrian and cyclists between Mornington/East Meath and the population employment centre in Drogheda. It will also provide local access points at key locations along the route.

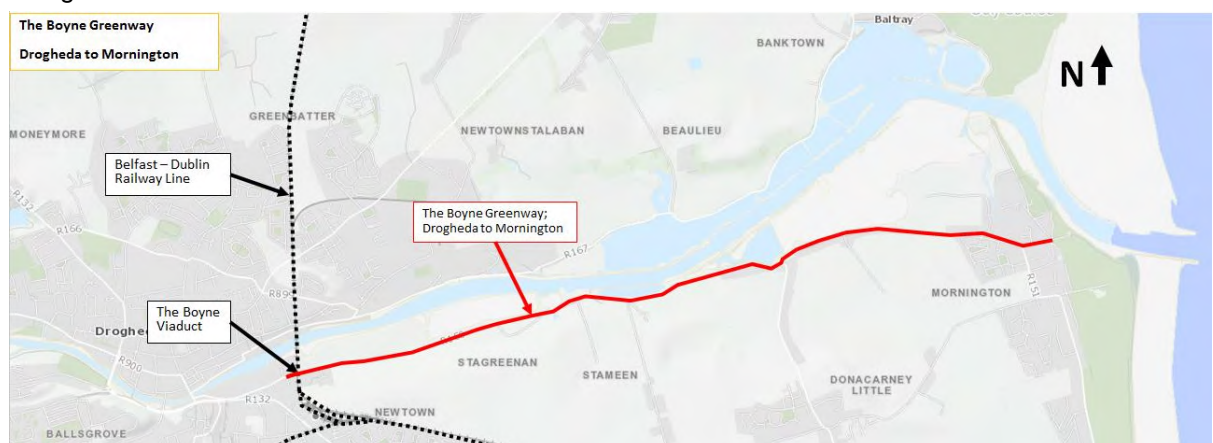


Figure 1-1 Proposed Greenway Route Drogheda East to Mornington

The identified route for the Boyne Greenway, between Drogheda and Mornington, generally follows the existing R150/R151 Regional Road, moving away from the road due to levels, lack of space, or to ensure that open views to the Boyne Estuary are retained where possible and maximising the benefits of the greenway. As highlighted earlier a portion of the route falls within the boundary of the Boyne Estuary Special Protection Area and Special Area of Conservation.

The route for this section of the Boyne Greenway is approximately 5.9 km in length with approximately 4.1 km of the route directly alongside the Regional Road, and 1.8km away from the route of the road to ensure both a safe continuation of the route and the retention of the views across the Boyne Estuary.

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.

1.3 Physical Constraints and Opportunities

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.
- Boyne Estuary SPA and the Boyne Coast and Estuary SAC.
- 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.

2.0 Proposed Works & Mitigation

2.1 Overview

As outlined above the proposed section of the Boyne Greenway running from Drogheda East out to Mornington is to be made up of two different construction forms depending on location:

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

Each of the above constructed elements 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. The report goes on to look at the safe delivery of the works from a traffic management perspective and the robustness of the design in the context of a low impact low maintenance solution.

During construction, the works will be supervised by an appropriately qualified resident engineer who will oversee the works and record all aspects of the works ensuring that they are in accordance with the detail design drawings and specification. The resident engineer will be supported by the ecological clerk of works who will provide direction on any additional measures that may be necessary to ensure minimal impact on the surrounding fauna and flora. Additional detail on ecological mitigation measures is provided under the different construction types below.

2.2 Greenway Construction Alongside Road

There is approximately 4.1km of the proposed greenway to be constructed alongside the road, or very close to the road edge. There will be vertical segregation provided in the form of a vertical kerb between pedestrian/cyclist and vehicular traffic.

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 pavement will be formed by placing imported granular subbase material on a geotextile separator and finished with approximately 100mm of bituminous surfacing in accordance with the TII DMRB. The width of the greenway will be limited to 4metres and restrained on each side with a kerb.

A typical construction section is provided as part of the drawing package and included in section 3 of this document. Some similar greenway examples are provided below for illustration.



Figure 2-1 Examples of Bituminous Greenways Alongside Road (Holland and Ireland)

As part of the proposed construction methodology, a number of proposed measures will be employed to ensure minimal impact during construction of the greenway:

- a. Works will be restricted to outside the period of October to March at all sensitive sites where disturbance is an issue i.e within the SAC/SPA or immediately adjacent. The timing restriction will not apply to public road sections.
- b. Construction works will be limited to daylight hours to avoid effects on bats, birds and otters. The use of construction lighting will be limited to absolute minimums. Where it is necessary, all lighting will be cowled away from sensitive habitats, with no light spillage, in line with best practice for bats.
- c. The timing of the works and the measures intrinsic to the design, outlined above, will be sufficient to avoid significant effects. Nevertheless, if on the advice of the onsite ecologist further protection is required, then a suitable camouflage barrier netting will be utilised. Camouflage netting will be utilised on all roadside works outside the period March to September, to minimise noise transfer, as a matter of course.
- d. Regular monitoring of the works will be provided by a suitably qualified ECoW with authority to 'Stop the Works'. The representative will have knowledge of working on construction programmes within SAC and SPA areas where significant bird populations exist.

In operation, the roadside greenway should have a negligible impact on the fauna and flora in the long term as it is generally alongside the road which would have a similar impact to that of the greenway. Nonetheless, further direction will be taken from the ecological consultant and NPWS. The following measures are proposed to limit the impact of the greenway in operation:

1. No engineered barriers are proposed. This will minimise any visual impact both from the road or estuary side. Nonetheless, natural mid-level barrier planting will be provided particularly where similar items have been removed to allow for the greenway. Native species of hedging, locally sourced, will be utilised for biodiversity enhancement. This would offer protection to birds and act as general biodiversity enhancement.
2. Operational lighting, where necessary for security and safety (at pedestrian crossings, bicycle parking areas, etc) will be LED based (to avoid emission of UV light) and will be cowled away from estuarine habitats with no light spillage in line with best practice for bats and birds. Low energy

LED luminaires incorporating a solar power source and motion detectors will be used only. Furthermore, to minimise the requirement for lighting all access features, such as bollards and gates, shall have reflectorised strips in line with best practice guidance. No lighting will be provided where birds forage within 50 metres of the cycle path to avoid any potential disturbance.

2.3 Greenway Construction Intertidal Zones/SPA/SAC

There is approximately 2.4km of the proposed greenway within the SPA/SAC areas with approximately 610 metres of this within the intertidal zone. In these areas it is proposed that the greenway be elevated onto a boardwalk structure to minimise impact as agreed with the ecological consultant. The boardwalk will be constructed at a minimum level defined within the Flood Risk Assessment report (3.54m Above Ordnance Datum). This is approximately 1.5 metre above the present day highest astronomical tide level and will mitigate the risk of coastal flood throughout the design life of the boardwalk section of greenway. This is discussed further in section 3 of the report as well as in the Flood Risk Assessment report. The width of the boardwalk will be limited to 4metres (maximum). Following a review of the options, and in consultation with the ecological consultant, it has been agreed that the elevated boardwalk be formed using propriety recycled plastic elements.

Proprietary Recycled Plastic Elements

A section of Phase 1 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. Long column type elements are installed into the underlying ground at regular intervals acting as mini piles. They are installed to a depth to suit the underlying geology and provide the required level of load capacity. The running surface is then created by bolting transverse and longitudinal beams together. Running boards are then fixed to the beams to provide the surface. As the boardwalk is elevated a barrier will be necessary. This is fixed to the elevated structure and uses similar recycled plastic components.

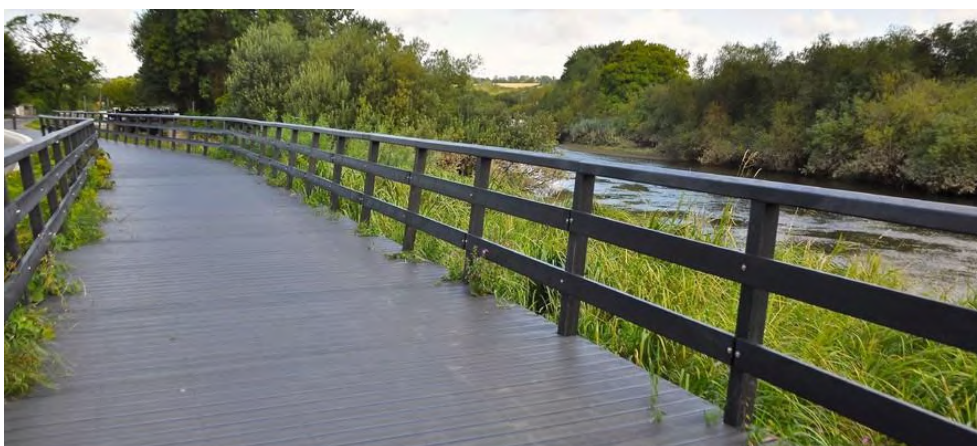


Figure 2-2 Boyne Greenway Upstream Recycle Plastic Elements Construction

As the intertidal, SPA and SAC areas are typically away from the road, and are most ecologically sensitive, the following measures will be employed to ensure minimal impact during construction of the greenway:

-
- a. The works in these areas will be scheduled to avoid the winter months between October and March when most of the species likely to be affected will be present. Therefore, all works will be undertaken between March and September.
 - b. The timing of the works in these areas and the measures intrinsic to the design, outlined above, will be sufficient to avoid significant effects. Nevertheless, if on the advice of the onsite ecologist further protection is required, then a suitable camouflage barrier netting will be utilised.
 - c. Construction works in these areas will be limited to daylight hours to avoid effects on bats, birds and otters. The use of construction lighting will be limited to absolute minimums. Where it is necessary, all lighting will be cowled away from sensitive habitats, with no light spillage, in line with best practice for bats.
 - d. The mini piling for the proposed boardwalk will be installed using reduced noise equipment in accordance with industry best practice. The preferred option at this stage, subject to detail ground investigation, is bottom driven mini piling. This option offers a low impact solution with small diameter piles and requires small plant items to install. The option also works well where access is restricted.
 - e. Regular monitoring of the works will be provided by a suitably qualified ECoW with authority to 'Stop the Works'. The representative will have knowledge of working on construction programmes within SAC and SPA areas where significant bird populations exist.

In operation the boardwalk section of greenway should have a negligible impact on the fauna and flora in the long term as it will generally merge into the surroundings. To limit impact, the following measures are proposed initially:

1. To counteract impact on the fauna and flora in these areas, from dogs particularly, and avoid noise transfer to birds and other species which may occur, the boardwalk barrier will be screened by fixing boardwalk running boards to the fence posts. Half-height (c.600mm) screening will be used between chainage 1810 and 2000, to supplement proposed hedgerow planting that would be situated to the north of the boardwalk, between it and the intertidal habitats. Full-height (c.1400mm) screening will be used between chainage 2000 and 2104 as well as between chainage 2270 and 4735, where landscape screening from tree and hedgerow planting is not proposed. Further details on the need and extent of screening are provided in the NIS report.
2. No lighting is proposed on the overall boardwalk section. Access features, such as bollards and gates, shall have reflectorised strips in line with best practice guidance. Operational lighting will be used for security and safety on approaches to pedestrian crossings and at bicycle parking areas only. The lighting will be alongside the public road, LED based (to avoid emission of UV light) and will be cowled away from estuarine habitats with no light spillage in line with best practice for bats and birds. The proposed locations for lighting are at chainage 40, 2215, 2610 and between 3730-3760 (Church Road/R151 junction).

2.4 Greenway Construction Bridge Sections

Bridge sections will be required at two locations along the route of the greenway to provide 20 metre clear spans. The first between chainage 3705 and 3725 and the second between chainage 4720 and 4740. The bridging sections are over a stream and surface water outfall respectively.

The proposed bridge at chainage 3705 to 3725 will be a prefabricated steel arch bridge placed on precast concrete cross beams on precast concrete piles. This construction form was agreed through discussions with the architectural heritage department of Meath County Council to limit impact on the existing stone arch bridge structure and not detract from the bridge visually.



Figure 2-3 Typical Prefabricated Steel Arch Bridges

The proposed bridge at chainage 4720 to 4740 will be a simpler construction form such as a prestressed precast concrete beam resting on a precast concrete ground beam on precast concrete piles. The deck will be partially precast with in-situ finished surface.



Figure 2-4 Typical Precast Concrete Bridges

3.0 Resilient Construction Forms

3.1 Overview

As noted earlier in this construction methodology, sections of the greenway will be constructed in areas that are prone to flooding and are in relatively harsh environments alongside the sea as well as regional road. Therefore, the proposed construction forms must be robust and resilient to the environment in which they are placed and that can easily be maintained throughout the anticipated design life. As noted above there are two core forms used on the greenway, when alongside the road (at grade) or away from the road and elevated onto a boardwalk structure. Each of these is discussed in turn.

3.2 Bituminous Pavement (Greenway Construction Alongside Road)

Where the proposed greenway is directly alongside the road, at a similar level, and in an area that may be impacted repeatedly by flooding as a result of existing infrastructure levels, this will require a robust and resilient construction form that is easily maintained using systems and procedures familiar to the local roads authority. Therefore, the greenway in these areas will be constructed using a bituminous (flexible) pavement construction in accordance with the recommendations of the TII Design Manual for Roads and Bridges (TII DMRB).

The bituminous pavement will be formed by removal of the existing topsoil to formation (approximately 250-300mm below existing ground level), with ground improvement using 6F2 capping material on a geotextile separator as required based on the findings of the site investigation. A 150mm layer of imported stone (granular subbase material) to clause 804/808 of the specification will then be placed and compacted. The upper pavement surface will be made up of a 75mm base layer of dense asphalt concrete (AC20) overlain by a 25mm surface layer of dense asphalt concrete (AC6), both meeting the requirements of the TII Specification for Road Works and EN 13108-1. Concrete kerb restraints will be provided on either side of the pavement construction to provide a neat maintainable solution.

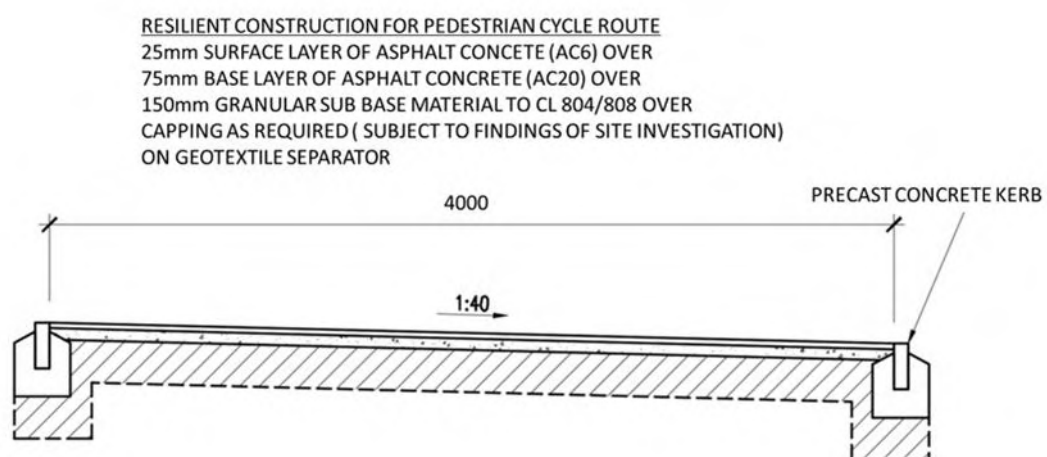


Figure 3-1 Resilient Construction Form Bituminous Pavement



The construction form is similar to the roadway alongside and can easily be maintained using similar equipment. Road sweepers will be allowed access to these sections of greenway and will be afforded same by way of raised tables and removable bollards at agreed locations. The robust pavement construction will easily accommodate vehicles of this size on a regular basis without damage.

In the event of a flood, the greenway will be cleared using similar procedures to the road alongside. Larger items of debris resulting from a flood event will be moved to collection locations, as required, using small items of plant. The road sweeper will clear any smaller residual detritus.

3.3 Recycle Plastic Boardwalk (Greenway Construction Intertidal Zones/SPA/SAC)

Where the proposed greenway moves away from the road and is elevated above the appropriate flood zone level (refer to Flood Risk Assessment), this will require a robust and resilient construction form that requires little or no maintenance. Therefore, the greenway in these areas will be constructed using recycled mixed plastic members. The members are similar in form to timber but are fabricated from recycled mixed plastic. The members are very durable, require no maintenance, will never rot, are vandal resistant and most of all offer a sustainable construction solution.

Mini piles will be bottom driven into the underlying geology to provide the required vertical support with minimal noise or vibrational impact. They will be closed-end steel and filled with concrete. The spacing of the piles will be dependent on the spacing of the superstructure, the loading requirements, the availability of recycled plastic members and the underlying ground conditions. Beam members tend to come in similar lengths to timber, and this is likely to be the main geometrical constraint.

As the boardwalk will be elevated above all but the extreme flood events, the maintenance requirements again will be minimal. In the event of an impacting excess flood, any resulting debris on the boardwalk would be relatively small and could simply be collected or brushed up manually, then the running surface could be jet-washed to provide a surface ready for re-use immediately following an extreme event.

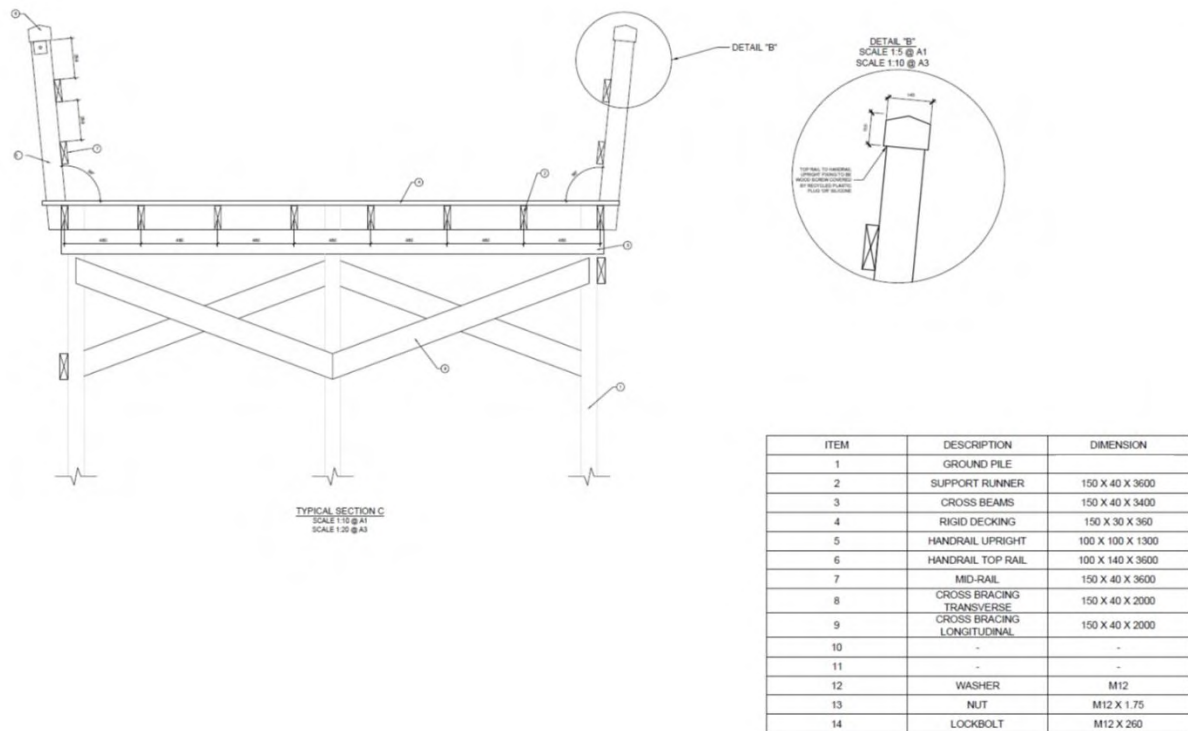


Figure 3-2 Typical Construction of Recycled Plastic Boardwalk (Away from Road)

4.0 Traffic Management & Access During Construction & Operation

4.1 General Storage Compounds & Parking

Potential compound locations have not been identified definitively as part of this planning application. Existing Local Authority (Meath County Council) controlled material storage yards in the locality, currently used for the storage of inert materials, will be utilised during the construction phase to store similarly inert materials for incorporation in the proposed scheme. Materials will be brought to site on a periodic basis as required.

Where additional space is required, this will be sought by Meath County Council as part of the detail design process and where planning is required, this will be sought separately. Notwithstanding the location of the main compound areas, these will be made available to the successful works contractor for the purposeful delivery of the works. All bulk material and construction plant will be stored at main compound locations and taken to works areas as required on a periodic basis.

Parking for operatives will be at the main compound only. Operatives will be transported from the compound to the works area. No parking will be allowed within the temporary works area.

4.2 Temporary Impact on Schools and Surrounding Business

To minimise impact on school traffic, works in the vicinity of the schools will be undertaken during summer months (June to September), and as far as reasonably practicable when schools are closed. Should works be necessary when schools are open, restrictions will be imposed on the contractor in respect of Temporary Traffic Management (TTM) to ensure impact on traffic during school drop off and pick up times is minimised.

There will be a minor impact on residents and businesses during the course of the works. However, the traffic volumes on the Marsh Road are not excessive and could easily be managed by way of proper TTM and advance information signs informing local traffic of the works and giving them the opportunity to use alternative routes between Drogheda and Mornington. The TTM will be designed and installed in accordance with Chapter 8 of the Traffic Signs Manual and Guidance for the Control and Management of Traffic at Road Works.

4.3 Temporary Traffic Management for Greenway Construction '*Alongside Road*'

From a construction methodology perspective, this section of the works is the most straightforward. Details of the proposed works in these areas, and the mitigation measures in respect of ecological impact, have been outlined in section 2 above. This section of the report outlines how the construction will be delivered in a safe and efficient manner from a temporary traffic management perspective.

Temporary Traffic Management (TTM) will be established alongside the existing road to allow for the creation of safe working areas offering space to progressively construct the new pedestrian cycle route alongside the road. The TTM will be established by trained and competent contractors in accordance with ***Guidance for the Control & Management of Traffic at Road Works (example layout below)***.

All works will generally be constructed within this safely managed area. The works area will be accessed directly from the public road. The maximum length of the works area will be agreed in advance with the local roads authority and will be dependent on proposed traffic control measures and levels of visibility. Materials will be brought to the works area daily and used within the working day. No excess materials will be retained in the works area. The final surfacing will be undertaken in long sections during off peak hours to ensure minimal impact on traffic.

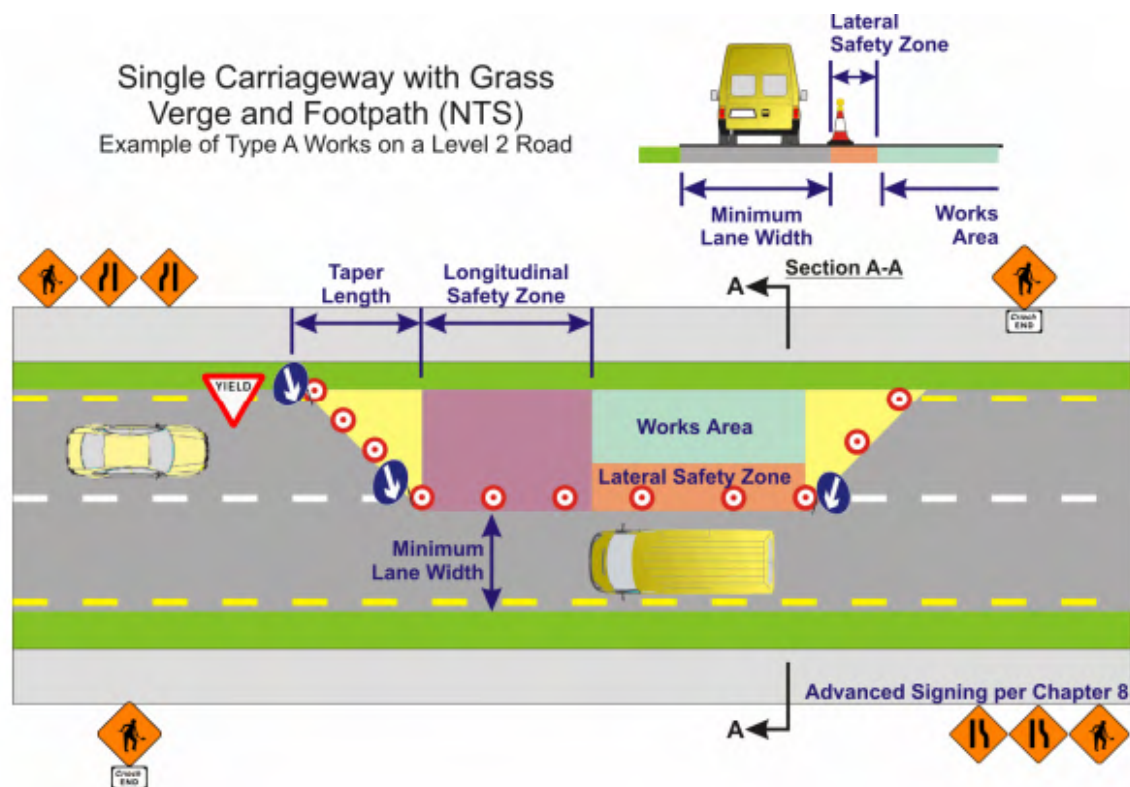


Figure 4-1 Example Shuttle Temporary Traffic Management Area Works Alongside Road

4.4 Temporary Traffic Management for Greenway Construction 'Away from the Road'

Details of the proposed works in these areas, and the mitigation measures in respect of ecological impact, have been outlined in section 2 above. This section of the report outlines how the construction will be delivered in a safe and efficient manner from a temporary traffic management perspective.

Temporary Traffic Management (TTM) will be established alongside the existing road to allow for the creation of safe access points at agreed locations along the route for the safe delivery of plant, materials, and labour. (It should be noted that the proposed form of construction, namely recycled plastic boardwalk, will only require small plant items to construct). The selected access points from the public road, as identified below, will also have space for the short-term holding of materials (maximum 1 week) and provide space for plant drop off as well as the linear movement of plant, materials and labour along the route and transition from the road. The access will be controlled in a

similar fashion to that for the works alongside the road. The works area indicated would generally be used for the short-term holding of materials and access, as opposed to physical works.

The works area will be away from the road and will move progressively from the access points along the route of the greenway. Small plant items will be delivered to the entry locations, and these will progress along the route. Excavator mounted pile drivers will be used to install the support posts/piles. Other small plant items will be used to move the recycled plastic structural elements from the entry drop off location to the installation location. The structure will then be bolted together using small power tools and hand tools.

Although construction stage access points will be formally agreed with the works contractor, preliminary access points, for works away from the road, are anticipated initially at chainage 2200, 2900, 3650/3750, 4250 and 4700. Specific traffic management arrangements will be made at each of these locations but are likely to involve partial closure of the nearside lane too allow for safe and controlled access similar to the progressive works alongside the road.

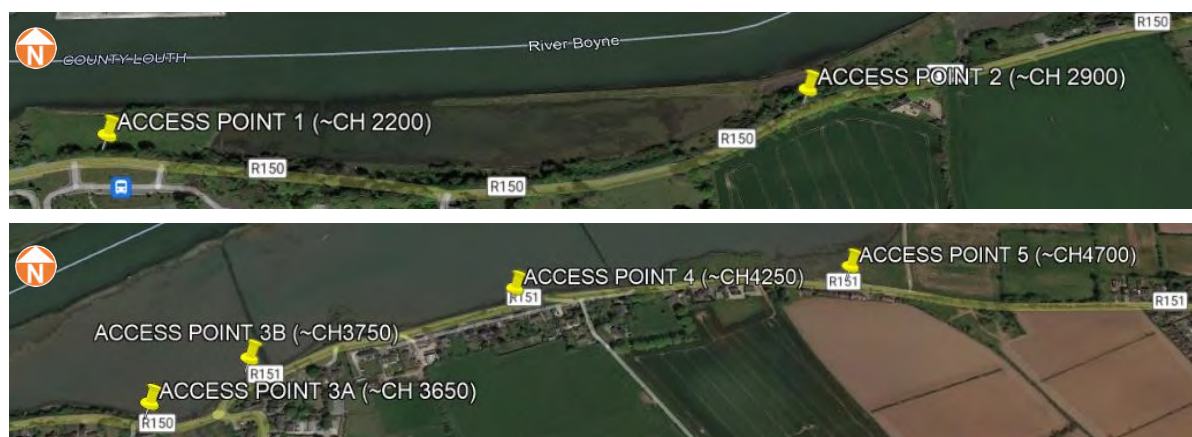


Figure 4-2 Locations of Access Points for Works Away from Road

4.5 Temporary Traffic Management for Greenway Construction ‘*Bridge Structures*’

The construction of the bridge structures will require specific temporary traffic management arrangements for each aspect of the work. These will be developed in agreement with the local roads’ authority.

The works associated with the construction of the bridges will also be scheduled to avoid the winter months and will be undertaken between April and September to minimise impact on wintering birds.

There are three main elements associated with the construction of the bridge structures, the support foundation (likely to be piles), ground beam/abutment and the superstructure.

The piles will be installed in-situ. The type and form will be dependent on the underlying geology. A site investigation will be carried out during detail design phase to ascertain precise requirements. Irrespective of the piling option employed, restrictions will be put in place, as outlined previously, to avoid impact on the surrounding ecology. A temporary and removable piling mat will be constructed

alongside the road to provide a level running surface for the piling rig. Traffic may need to be temporarily diverted to allow access and egress of the piling rig from the road to the working area.

Given the sloped nature of the embankment at the location of the proposed bridge at chainage 3705, large stone filled bags will be used to create a level and retained surface onto which a timber piling mat will be placed. Following installation of the piles, the mat will be removed together with the stone filled bags. The stone will be used elsewhere in the project to prevent waste.



Figure 4-3 Typical Geotextile Filled Bags and Timber Piling Mat (Temporary)

The ground-beams and abutments will be constructed insitu. These elements will be insitu reinforced concrete elements. The traffic management for these elements would be similar to works away from the road. Dedicated works area would be created at chainage 3650, 3750, 4700 and 4750 to allow for construction of the ground works. Specific traffic management measures would be put in place through these areas. One bridge would be undertaken at a time to avoid unnecessary temporary traffic management being put in place at the same time. The temporary traffic management would be used to provide access and a location for the temporary storage of materials similar to works away from the road. No road closures would be necessary for these works.

The steel superstructure for the larger bridge at chainage 3705 will be fabricated off site and brought to site on a special vehicle and then craned into position. Use will be made of lands to the south, subject to approval, as a temporary set-down area for the structure. During the crane operations the road would temporarily be closed to traffic and diversions put in place. Advance notifications would be directed to the local press and all diversion signage erected. The process will be undertaken during off peak times to minimise impact. Protective mats will also be placed on the road to avoid damage to the exiting road from the crane. Stone filled bags will also be placed around the existing protected arch bridge to prevent impact during the crane in operations.



Figure 4-4 Layout for Delivery and Installation of Large Bridge



Figure 4-5 Typical Bridge Lifting Operations (One Lift)

The superstructure for the bridge at chainage 4720 is far simpler and will be made up of precast concrete beams that will be installed using excavators and small plant items. GRP permanent formwork would then be installed by hand before installing the in situ concrete deck.

The construction of the superstructure will be undertaken within the works area making use of the nearside lane and the existing space available.



Figure 4-6 Layout for Delivery and Installation of Small Bridge

4.6 Traffic Management of the Greenway in Operation

There will be limited need for permanent traffic management of the R150 or greenway, as the road will remain generally as it is currently, and the greenway will be off road. Controlled and uncontrolled crossing locations will be provided at strategic locations along the route to service schools, etc. These are at chainage 40 (Footpath link at start of Greenway), 2215 (Link with Drogheda Grammar), 2610 (Link with Mill Road) and between 3730-3760 (Church Road/R151 junction) and are presented on the planning drawings.

As noted from the Flood Risk Assessment Report, a significant portion of the greenway falls within Flood Zone A, because of being directly alongside the existing low lying road infrastructure. Although flooding of the greenway route will be a rare event and will only occur where flooding has taken place on the road alongside, a management procedure will be necessary.

Current procedures for the management of flooding on the Marsh Road are relatively ad hoc and reactive, with advance warning signs being placed where tidal swells are anticipated. To provide a more formal warning system, it is the intention of Meath County Council that permanent warning signage be put in place notifying both road and greenway users of the flood levels and directing them to an alternative route. The sign information will be switched by way of automatic level monitoring within Drogheda Port which will in turn send a telemetry signal to control stations.

Further detail on maintenance of the route, post flood was presented in section 3.

5.0 Summary

5.1 Review

This outline Construction Methodology has provided initial proposals for the delivery of the Boyne Greenway between Ship Street in Drogheda and the Tower Road / Crook Road junction in Mornington. The report has presented the proposed construction forms and strategies for delivery and operation of the greenway. The report is seen as a live document for discussion with the ecological consultant and NPWS. All proposals have been discussed and agreed to date. A summary of the route, in terms of position in relation to road, flood level, intertidal zone, interaction with SPA/SAC and construction form is provided in Appendix A for clarity along with drawings illustrating the route.

Impact on the ecological environment has been considered, in the context of existing infrastructure in the area, and has outlined measures to avoid any risks associated with the proposed construction works.

5.2 Monitoring Commitment

The effectiveness of the intrinsic design measures will be monitored during construction and post construction for 3 years. Monitoring during construction will be undertaken by a suitably qualified Ecological Clerk of Works, (ECoW) with a 'Stop Works' authority. This ecologist will have previous experience and extensive knowledge of working on construction programmes within SAC and SPA areas with significant bird populations.

The importance of the annex species listed for the SPA requires that on-going monitoring of the greenway corridor is required during construction and for a number of years post construction to prove that birds are not displaced such that the integrity of the Natura Sites is affected negatively.

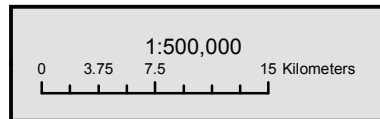
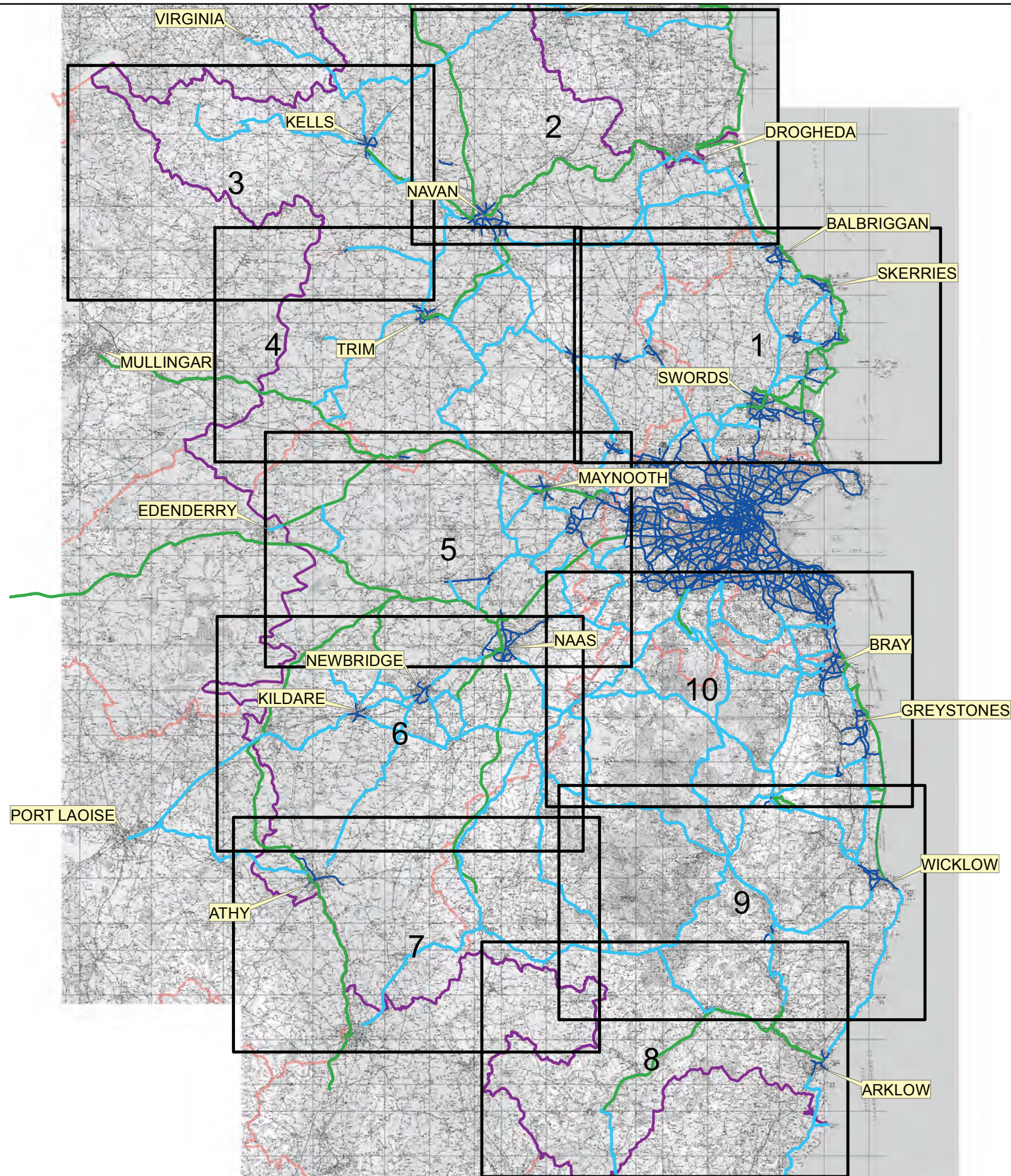
The monitoring shall test the effectiveness of the proposed design measures for the new greenway using actual bird survey counts and behaviour analysis. A report of each inspection shall be prepared and reviewed at the start and finish of each season the greenway is active. The ecologist/ornithologist shall, where necessary, recommend adaptive measures to be implemented by the greenway management team and provide advice during the implementation of measures and further monitor the effectiveness of any adaptive measures once deployed. The performance of the particular measures of importance shall be observed, such as the durability of the fencing erected, the effectiveness of any screening and feeding habits of birds adjacent to the screens.

Appendix A
Route Description Summary

CHAINAGE		INTERTIDAL ZONE	FLOOD ZONE A	SAC	SPA	ROUTE POSITION	CONSTRUCTION TYPE
START	END						
0	90	NO	YES	NO	NO	ALONGSIDE ROAD	BITUMINOUS
90	340	NO	NO	NO	NO	ALONGSIDE ROAD	BITUMINOUS
340	1470	NO	YES	NO	NO	ALONGSIDE ROAD	BITUMINOUS
1470	2000	NO	NO	NO	NO	ALONGSIDE ROAD	BITUMINOUS
2000	2100	YES	YES	YES	YES	ALONGSIDE ROAD	BOARDWALK
2100	2160	NO	YES	NO	NO	ALONGSIDE ROAD	BOARDWALK
2160	2260	NO	NO	NO	NO	ALONGSIDE ROAD	BITUMINOUS
2260	2360	NO	NO	YES	YES	ALONGSIDE ROAD	BITUMINOUS
2360	2380	NO	NO	YES	YES	AWAY FROM ROAD	BOARDWALK
2380	2550	YES	NO	YES	YES	AWAY FROM ROAD	BOARDWALK
2550	2900	NO	NO	YES	YES	AWAY FROM ROAD	BOARDWALK
2900	3030	NO	NO	NO	YES	AWAY FROM ROAD	BITUMINOUS
3030	3110	NO	NO	YES	YES	AWAY FROM ROAD	BITUMINOUS
3110	3280	NO	NO	YES	YES	AWAY FROM ROAD	BOARDWALK
3280	3320	NO	NO	NO	NO	AWAY FROM ROAD	BOARDWALK
3320	3700	NO	NO	YES	YES	AWAY FROM ROAD	BOARDWALK
3700	3720	NO	NO	YES	YES	ALONGSIDE ROAD	BRIDGE
3720	3730	YES	NO	YES	YES	ALONGSIDE ROAD	BRIDGE
3730	3750	YES	NO	YES	YES	ALONGSIDE ROAD	BOARDWALK
3750	3830	NO	YES	YES	YES	ALONGSIDE ROAD	BOARDWALK
3830	3880	YES	YES	YES	YES	ALONGSIDE ROAD	BOARDWALK
3880	4090	NO	YES	YES	YES	ALONGSIDE ROAD	BOARDWALK
4090	4330	YES	YES	YES	YES	ALONGSIDE ROAD	BOARDWALK
4330	4350	NO	YES	YES	YES	ALONGSIDE ROAD	BOARDWALK
4350	4430	NO	NO	YES	YES	ALONGSIDE ROAD	BOARDWALK
4430	4620	NO	NO	NO	NO	AWAY FROM ROAD	BITUMINOUS
4620	4640	NO	NO	YES	YES	AWAY FROM ROAD	BITUMINOUS
4640	4720	NO	YES	YES	YES	AWAY FROM ROAD	BITUMINOUS
4720	4730	NO	YES	YES	YES	AWAY FROM ROAD	BRIDGE
4730	4740	YES	YES	YES	YES	AWAY FROM ROAD	BRIDGE
4740	4750	NO	YES	YES	YES	AWAY FROM ROAD	BRIDGE
4750	4860	NO	YES	NO	NO	ALONGSIDE ROAD	BITUMINOUS
4860	5500	NO	NO	NO	NO	ALONGSIDE ROAD	BITUMINOUS
5500	5660	NO	YES	NO	NO	ALONGSIDE ROAD	BITUMINOUS
5660	5840	NO	YES	NO	NO	ALONGSIDE ROAD	EXISTING

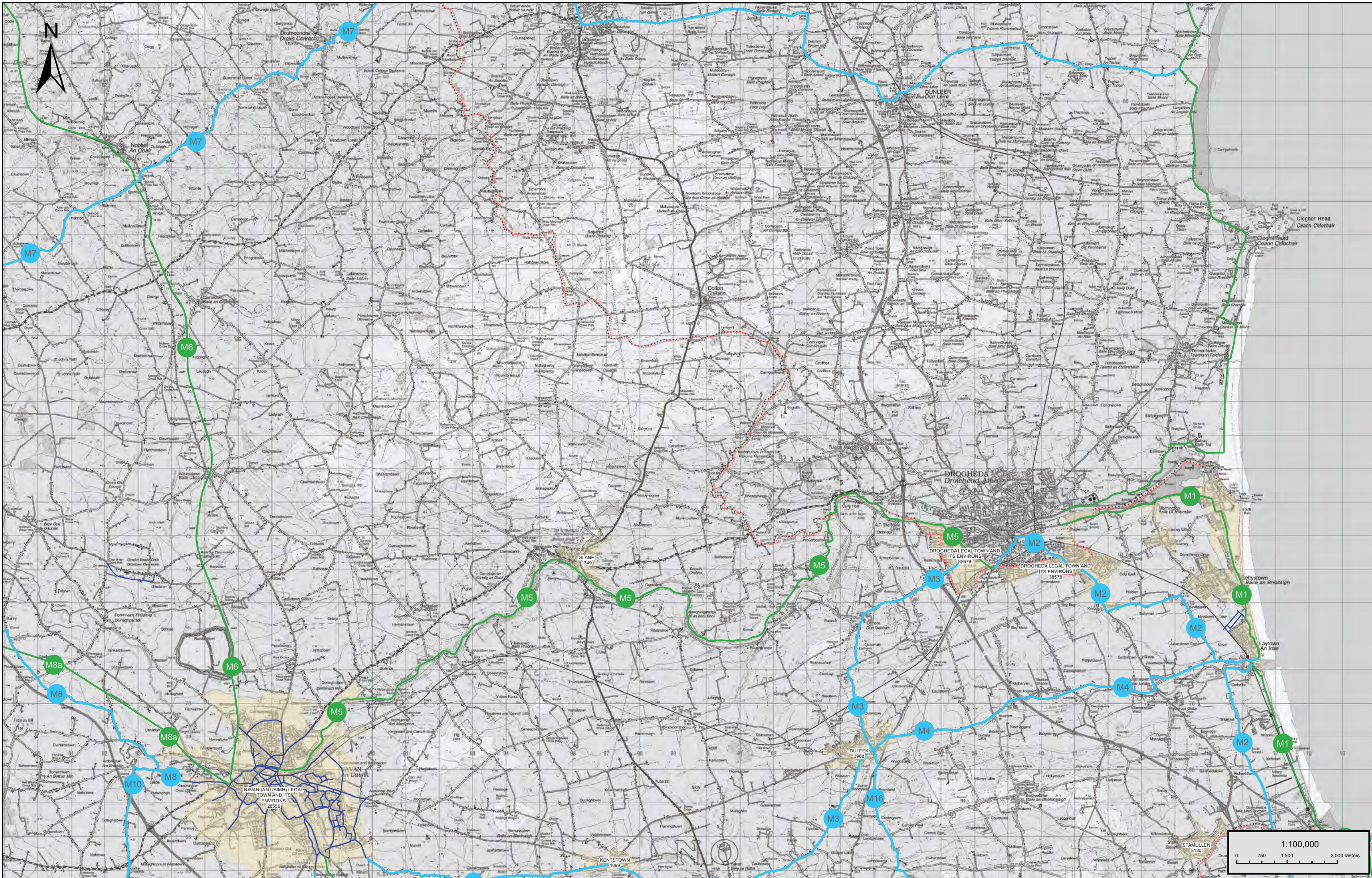
1. The start and end chainage refers to the point at which there are changes in the existing environment (intertidal zone, flood zone, SAC, SPA), location (alongside or away from public road) or proposed construction type (bituminous, boardwalk, bridge or existing).
2. The intertidal zone refers to a level of the existing ground that is below 2.1 metres above ordnance datum (highest astronomical tide) where the proposed greenway route passes through.
3. The flood zone refers to a level of 3.54 metres above ordnance datum (above Flood Zone A) for coastal flooding (representing the acceptable risk level for the greenway) where the proposed greenway route passes through.
4. The SAC and SPA are the Special Area of Conservation and Special Protection Area respectively where the proposed greenway route passes through. (It is worth noting that some sections of the existing public road are within the mapped Special Protection Area)
5. The route position refers to the location of the proposed greenway in relation to the existing public road. It is either alongside or away from the public road.
6. The construction type is as defined in the main section of this report.

Appendix B
National Cycle Network – East Meath



Legend

- Inter-Urban Routes
- Greenway
- Possible Greenway
- Urban/Town Network
- Study Area
- County Council Boundaries



Project:
CYCLE NETWORK PLAN FOR
THE GREATER DUBLIN AREA

Title:
INTER-URBAN CYCLE ROUTES
EAST MEATH
SHEET RN2

		Grand Canal House, Upper Grand Canal Street, Dublin 4		Date: July 2013
		Tel: +353 (0)1 238 3100		Drg No: RN2
		Fax: +353 (0)1 238 3199		Created: DB Approved: JS
		www.aecom.com		Checked: SMG