

Limerick to Scarriff Greenway Feasibility and Constraints Report

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DATE: April 2022
Client: Waterways Ireland
Project: Limerick to Scarriff
Greenway



Comhairle Cathrach
& Contae Luimnigh
Limerick City
& County Council



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1 INTRODUCTION

Waterways Ireland, together with Limerick City and County Council, Clare County Council and ESB, are working in partnership and have established a working group to explore the potential to develop a Limerick to Scarriff Greenway. A steering group comprising Waterways Ireland, Limerick City and County Council and Clare County Council has also been formed. The proposed greenway has been identified as a signature project in the Shannon Tourism Masterplan as it would provide a gateway to and from the heart of Limerick City to Lough Derg and the Shannon.

Subject to the selection of the preferred route, the proposed greenway would link Limerick City to Scarriff Town. The proposed greenway may provide connections to nearby villages and towns such as Clonlara, Obriensbridge, Killaloe, Ogonolloe and Tuamgraney and may be developed to improve connection to University of Limerick, its Sports Campus and associated attractions and/or the Ardnacrusa power plant, where the development of a visitor attraction is being considered. The greenway will also traverse and travel along a rich and varied landscape, potentially following a number of waterway routes which may include the Park Canal, the Shannon River, Errinagh Canal and the lands associated with the Shannon Head Race between Parteen Weir and Ardnacrusa and Lough Derg.

Further key project objectives are as follows:

- Create connectivity to existing routes and trails and future greenway routes and trails including Limerick City and County Council's proposed greenway from Limerick to Castleconnel.
- Link and improve accessibility to a number of significant tourist attractions and features of interest including those in Limerick City, the Ard na Crusha Power Station, Parteen Weir, Killaloe Cathedral, Brian Boru Fort, St Cronan's Church and Visitor Centre Tuamgraney and the Scarriff Workhouse.
- The route should aim to be along existing water bodies and infrastructure, where possible.
- Stimulate and grow economic activity in the urban fringes of Limerick City and Villages and Towns along and adjacent to the proposed greenway.
- Increase the adventure and recreational potential of the area through increased sustainable tourist and amenity use of the countryside.

In keeping with the Department of Transport, Tourism and Sport's '*Strategy for the Development of National and Regional Greenways*', the greenway should be developed to be sustainable, strategic, substantially segregated and shared use, scenic and offer lots to see and do.

Waterways Ireland have appointed Clandillon Civil Consulting (CCC) to carry out a constraints and feasibility study in respect of the proposed greenway. Transport Infrastructure Ireland (TII) define a greenway as follows:

*"A cycleway that caters for people walking, wheeling and cycling in a mainly recreational environment."*¹

This report will set out the planning context for the scheme, determine an appropriate study area and identify engineering and environmental constraints which may prevent, impede or otherwise influence the development of the greenway. These constraints will be discussed in the chapters below

¹ PE-PMG-02045-01 National Roads Active Travel Planning – Section 1.4 (g)

and are illustrated in the Appendix B Constraints drawings. Thereafter, the report will reach conclusions on whether it will be feasible to develop the greenway to meet the project objectives.

2 PLANNING CONTEXT

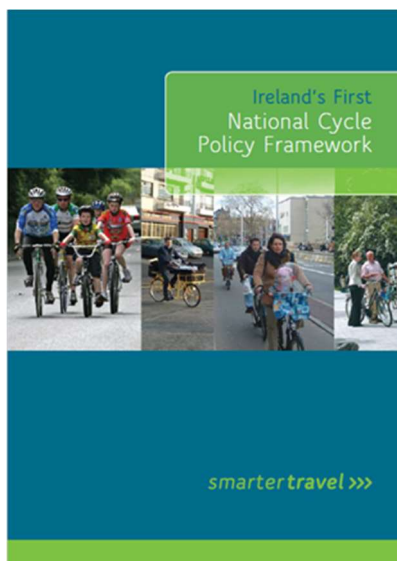
This chapter explores the national, regional and local planning policies in existence to determine if they support the development of the proposed greenway.

2.1 National Policy

On a national level, the development of greenway projects is identified as a policy objective within the Department of Transport, Tourism and Sport, “Strategy for the Future Development of National and Regional Greenways” published in 2018 and referred to in The National Development Plan 2021-2030. The development of greenways is also supported within the National Planning Framework (Project Ireland 2040), the National Cycle Policy Framework (2009), Rural Development Policy 2021-2025 (Our Rural Future), the National Physical Activity Plan² for Ireland (Get Ireland Active) and the Climate Action Plan (2021). The following extracts from each policy refer:

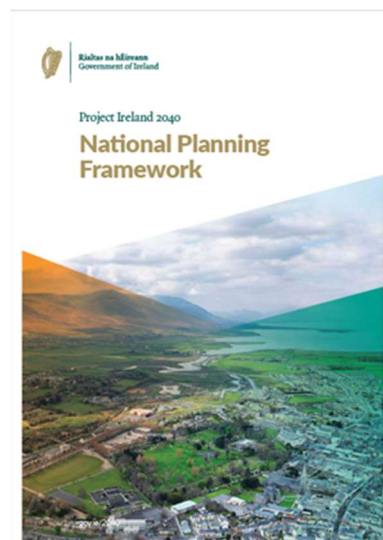
National Planning Framework Objective 21: Facilitate tourism development and in particular a National Greenways, Blueways and Peatways Strategy, which prioritises projects on the basis of achieving maximum impact and connectivity at national and regional level.

National Planning Framework Objective 27: Ensure the integration of safe and convenient alternatives to the car into the design of our communities, by prioritising walking and cycling accessibility to both existing and proposed developments and integrating physical activity facilities for all ages.



National Planning Framework Objective 64: Improve air quality and help prevent people being exposed to unacceptable levels of pollution in our urban and rural areas through integrated land use and spatial planning that supports public transport, walking and cycling as more favourable modes of transport to the private car, the promotion of energy efficient buildings and homes, heating systems with zero local emissions, green infrastructure planning and innovative design solutions.

National Cycle Policy Framework (2009) Objective 3: Provide designated rural cycle networks especially for visitors and recreational cycling.



² Note that objective 1.10 of ‘Healthy Ireland Strategic Action Plan 2021–2025’ involves overseeing the implementation of the National Physical Activity Plan.

National Cycle Policy Framework (2009) Objective 3.2: We will carry out further research and surveying work in order to expand the network to include rural recreational routes around urban areas and to connect to major urban areas. We will pay special attention to the opportunities of using both the extensive disused rail network and canal/river tow-path networks as cycling walking routes.

Rural Development Policy 2021-2025 Policy Measure 36: Invest in greenways, blueways, walking trails and other outdoor recreation infrastructure to support the growth in outdoor recreational tourism.

Rural Development Policy 2021-2025 Policy Measure 64: Invest in infrastructure, including water and wastewater infrastructure, to support the development of rural towns and villages.

Rural Development Policy 2021-2025 Policy Measure 102: Invest in high-quality walking and cycling infrastructure specifically targeted at towns and villages across the country.

National Physical Activity Plan for Ireland Objective 36: Prioritise the planning and development of walking and cycling and general recreational /physical activity infrastructure.

National Physical Activity Plan for Ireland Objective 37: Explore opportunities to maximise physical activity and recreation amenities in the natural environment.

Climate Action Plan Action Number 225: Continue the improvement and expansion of the Active Travel and Greenway Network.

Climate Action Plan Action Number 227: Construct an additional 1,000km of cycling and walking infrastructure.

Climate Action Plan Action Number 227: Encourage an increased level of modal shift towards Active Travel (walking and cycling) and away from private car use.

2.2 Regional Policy

In respect of the regional policy, the Shannon Tourism Masterplan, 'The Shannon - Mighty River of Ireland' was published in 2021, with a view to considering, "the tourism and visitor development opportunities for the entire length of the Shannon," within the wider context of Ireland's Hidden Heartlands. The masterplan, which is also referred to in the Climate Action Plan 2021, contains several strategic initiatives which relate to, enhancing the on-water visitor experience, enhancing the waterside visitor experience, improving connectivity and building enterprise, all of which are supportive of the development of the proposed greenway. The proposed greenway is also specifically identified on an indicative list of priority Shannon Trails for development within Appendix 3 of the documents and sits alongside 12 other schemes which, once developed, would constitute a network of greenways which traverse the full length of the Shannon and connect to other strategically important national greenways. The development of a feasibility study for the proposed greenway was identified as a recommended priority project in respect of the Lower Shannon Discovery Zone. Figure 1 is an extract from that policy that further identifies specific objectives in respect of the scheme.

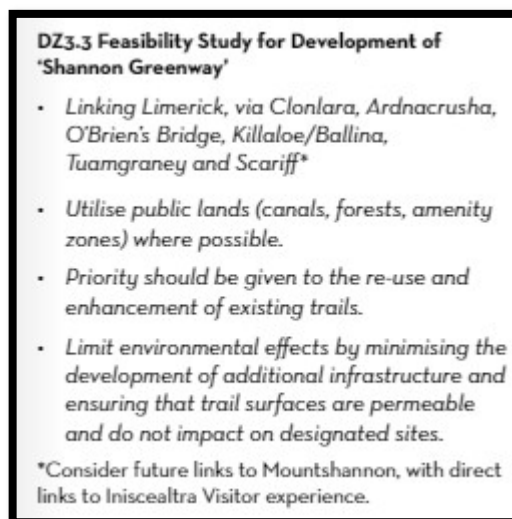


Figure 1: Extract from Shannon Tourism Masterplan

2.3 Local Policy

The proposed greenway will primarily be located within Co. Clare with a shorter section in Co. Limerick. The Clare County Development Plan is therefore of relevance, as is the Limerick County Development Plan, the Limerick Shannon Metropolitan Area Transport Strategy (LSMATS) and the Limerick 2030 Vision documents.

Clare County Development Plan

Section 5.4.2.1 of the Clare County Development Plan 2017-2023 is dedicated to Off Road Walking and Cycling Route and objective CDP5.12.A identified support for the *“maintenance of existing off-road walking and cycling trails and support the development of new trails in County Clare”* as a specific objective. The plan also contains objectives that relate to how these routes should be developed and interact with the natural and built environment. Figure 2 below refers.

CDP5.12

**Development Plan Objective:
Off-Road Walking and Cycling**

It is an objective of the Development Plan:

- A** To support the maintenance of existing off-road walking and cycling trails and support the development of new trails in County Clare;
- B** To support and facilitate the development of the West Clare Railway Greenway and necessary supporting infrastructure;
- C** To promote the development of regional-scale, off-road cycling trails and associated facilities in the Cratloe Woods area;
- D** To ensure any proposed development for off-road walking and cycling takes into consideration the safe and adequate provision of access, set-down and parking areas;
- E** To complete heritage audits and improve heritage interpretation along walking and cycling routes in the County;
- F** To encourage and support the development of ancillary businesses and facilities such as bike hire and repair, outdoor clothing sales, drying rooms for walkers, surfers etc. and businesses offering walking and cycling tours subject to normal planning considerations;
- G** To ensure that the development of any off-road walking and cycling routes does not negatively impact on any European or nationally protected sites;
- H** To ensure all cycle routes adhere to the principles contained within the national policy document 'Smarter Travel A Sustainable Transport Future 2009-2020', and 'The National Cycle Policy Framework' or any updated/ amended guidance document.

Figure 2: Extract from Clare County Development Plan

Transport Strategy makes specific reference to a greenway from Limerick City to University of Limerick, which extends to Castleconnell. While the LSMATS documents do not specifically refer to the proposed Limerick to Scarriff greenway, its development would be consistent with objective CC1, "Develop an Inter-Urban [cycling] network connecting Limerick City and Metropolitan town centres;"

Limerick 2030

Limerick 2030 is an economic and Spatial Plan for Limerick. It contains "four supporting themes of 'Enterprise and Knowledge', 'Attractive and Historic', 'Green and Sustainable', and 'Creative and Vibrant' will inform all messaging about Limerick." The plans sets out an objective to "Create the conditions where Limerick City gains a reputation as a safe and easy place for pedestrians to use and

As illustrated in Figure 3, objective CDP5.12-G sets out that it is an objective of the Development Plan "to ensure that the development of any off-road walking and cycling routes does not negatively impact on any European site or nationally protected sites."

LSMATS

Objective WK4 of the LSMATS sets out the objective to "Upgrade walking facilities linking green spaces, the River Shannon and other recreational areas to create green-blue corridors to promote positive physical and mental well-being." Further objectives are outlined in Figure 3 below extracted from the report.

OBJECTIVE CC1

Develop a Comprehensive Strategic Cycling Network

It is the intention of the NTA and the local authorities to:

- Build upon the existing Limerick Metropolitan Cycle Network Study and Shannon and Environs Local Area Plan to deliver a comprehensive cycle network for the LSMA, in a manner consistent with the National Cycle Manual;
- To deliver an integrated, fully connected high-quality cycle network linking all major origins and destinations within the LSMA;
- Develop an Inter-Urban network connecting Limerick City and Metropolitan town centres;
- Identify local opportunities for permeability and feeder routes to improve links to the primary, secondary and greenway network and enhance the attractiveness of cycling for short trips
- Maintain and enhance existing infrastructure to a high standard.

Figure 3: Objective CC1 from LSMATS

Figure 5-1 of the Transport Options Report associated with the Limerick Shannon Metropolitan Area

as a green transport City;” The plan also sets out that “Green Infrastructure measures shall be incorporated into any public realm strategy.”

2.4 Tourism Policies

Relevant tourism policies which relate to the proposed greenway include the Tourism Action Plan 2019-2021, the Gateway to the Wild Atlantic Way policy document and the Lough Derg Visitor Experience proposals. References from each document which are relevant to the development of the proposed greenway are set out below.

Tourism Action Plan

Policy Action 7 – *“Building on existing partnerships, and within the framework of Project Ireland 2040, Fáilte Ireland will continue to develop enhanced tourism experiences with a view to optimising key assets for the benefit of tourism and economic development through increasing regional spread, season extension and promoting sustainable growth management. This will initially involve the examination of new tourism experiences and/or an optimisation of existing tourism experiences or clusters.”*

Policy Action 21 - *“Fáilte Ireland will continue to work with other state agencies such as the OPW and NPWS, through strategic partnership agreements, to optimise their assets for the benefit of tourists and maximise the potential contribution of their respective work programmes to the development of the tourism sector.”*

Lough Derg Visitor Experience

The Lough Derg Visitor Experience document sets out the importance of Lough Derg as a tourist attraction, making specific reference to greenways which will connect Lough Derg to the whole Shannon region:

“The Lower Shannon, incorporating Lough Derg, is one of three “Discovery Zones” in the new Shannon Tourism Masterplan. The Lough Derg region also includes the long distance Beara Breifne Way which is one of Ireland’s Hidden Heartlands’ “transformational signature products of scale”. This strongly positions Lough Derg within a context of emerging national strategies and significant long distance trails and greenways connecting Lough Derg to the whole Shannon region.

Further reference to the proposed greenway is made in describing the twin towns of Killaloe and Ballina located directly south of Lough Derg.

“This is a place where the mighty Shannon river rushes through the iconic 13 arched bridge connecting the destination twin towns of Killaloe and Ballina. There are unique views and perspectives from the town streets, and the legacy of Brian Ború is widely visible in the town and experienced through the mythology of the surrounding landscape..... Work under way will free up the twin towns from heavy traffic and reinforce the historic character of the iconic river crossing point. New projects are planned to connect the towns to Limerick via a greenway passing by the industrial marvel of Ardnacrusha.”

This plan also directly references the proposed greenway, as illustrated in **Error! Reference source not found.** below extracted from the plan

Limerick – Wild Atlantic Way Gateway City Strategy

The Limerick Wild Atlantic Way Gateway City Strategy sets out its goals as follows

“Over the five years of the Limerick Wild Atlantic Way Gateway City Strategy, the approach is to enhance the existing core visitor proposition to the longer term development of worldclass visitor experiences. It will support the ambition to become a world leading destination harnessing the city’s unique stories, status as a gateway tourism hub and base for the Wild Atlantic Way. It will support the telling of the Limerick story through world-class immersive and fascinating experiences for visitors.”

Key plan objectives which are considered to be well aligned with a national greenway project of this type are as follows:

“Establish Limerick as a key destination in the leisure tourism market for domestic and international visitors.

Assess the opportunities for Limerick to create a major international tourism catalyst/hero project for the city that will become a major attractor aligned with the city and third level partners’ association with the science, tech and engineering sectors.

Maximise the potential of existing hero attractions, assessing and developing their capacity to grow visitor numbers and improve the overall visitor experience. e.g. King John’s Castle, St. Mary’s Cathedral, The Hunt Museum and Limerick Museum.

-Develop the range and quality of the Limerick Festivals and Events portfolio to attract new domestic and international audiences to Limerick.

Enhance and market existing saleable experiences and create new tourism experiences to attract visitors to Limerick and increase dwell time while supporting the destination development themes

Enhance visitor flow and orientation into the city and throughout its city quarters.

Work with all stakeholders to improve the aesthetic appearance of the city, fostering community and stakeholder ownership, improving the presentation of Limerick City for visitors.”

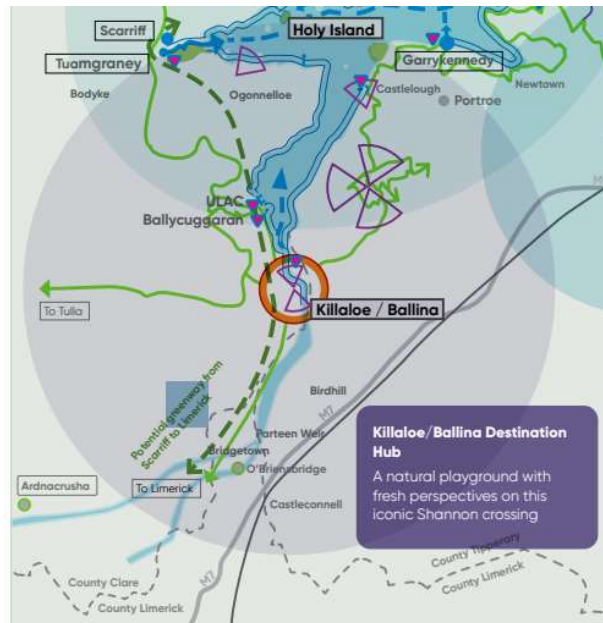


Figure 4: Extract from Lough Derg Visitor Experience Document Illustrating Proposed Limerick to Scarriff Greenway

2.5 Planning Context Conclusion

Based on the above review, it is evident that the development of the proposed greenway would be well aligned with local, regional and national planning and policy objectives and associated tourism policies, subject to the greenway being progressed in line with the specific objectives referred to. Specific planning objectives which may have a significant bearing on the development of the study area, determination of constraints, route selection and design are as follows:

- The National Cycle Policy Commitment to *“pay special attention to the opportunities of using both the extensive disused rail network and canal/river two-path networks as cycling walking routes.”*
- The Shannon Masterplan advises the public lands should be used in respect of this greenway, where possible, that priority should be given to the re-use and enhancement of existing trails and that environmental impacts should be minimised by limiting the need for additional infrastructure.
- The Clare County Council development plan sets out a policy objective that the development of greenways does not negatively impact on any European or nationally protected sites.

In respect of this last point, it is considered that the wording of the Clare County Development Plan is such that the development of a greenway within any European or nationally protected sites or their associated zones of influence may be precluded under the current development plan. As the zones of influence can be extensive, particularly where developments are along water bodies, this provision could act as a significant constraint to the development of the proposed greenway. This constraint has been discussed with Clare County Council, as part of the ongoing consultations relating to the proposed scheme. Clare County Council have advised that the draft County Development Plan 2023 - 2029 has been published and that the content of this plan differs from the published Clare County Development Plan 2017-2023, in respect of this criteria. The draft plan contains the following relevant wording in respect of the interface between recreational routes and designated European sites.

“g) To ensure that the development of any off-road walking and cycling routes, blueways and peatways is informed by an appropriate level of environmental assessment, including all necessary reports to assess the potential impact on designated European sites and any impacts that may arise from increased visitor pressures;”

Should the above wording ultimately be adopted, this would facilitate the consideration of route options which are within designated European sites or their zones of influence, subject to the appropriate level of environmental assessments being undertaken.

In respect of greenway proposals within planning documents, it is noted that the Shannon Masterplan and the Lough Derg Visitor Experience documents both refer to a Limerick to Scarriff Greenway that incorporates Ardnacrusha. The Limerick Shannon Metropolitan Area Transport Strategy refers to a greenway between Limerick and University of Limerick that extends to Castleconnell. It is not considered that these two objectives are mutually exclusive and it is not considered that the intent of either plan was to override the need for a formal options selections process.

3 STUDY AREA

In order to commence the consideration of engineering and environmental constraints, it is first necessary to determine a study area to investigate. The extent of the study area was determined through the development of several preliminary route options which span between Limerick and Scarriff. The options developed took cognisance of the project objectives outlined in the introduction to this report and significant constraints such as large water bodies, topographical constraints, roads and buildings which were readily evident from a review of ordinance survey mapping and aerial photography.

At least two route options have been developed for each section of the route in order to ensure there is a reasonable level of choice between options. Where more significant constraints were immediately evident, further options have been developed. The preliminary route options developed are described in the sections below. It should be noted that the route options described are preliminary only and are to be used to determine engineering and environmental constraints which may be present along these routes. Where significant constraints are found, further route options may be required, or these preliminary route options may be refined. Other route options may also be added as part of the formal route selection phase of the project, which will involve public consultation.

Preliminary route options and the associated study area are illustrated in Appendix A.

3.1 Limerick to Cloonlara

Between Limerick and Cloonlara, two primary preliminary route options have been developed:

Green Route - The Green Route starts at King John's Castle on the east bank of the Shannon and crosses to the west bank of the Shannon across Thomond Bridge. The route proceeds adjacent to Brown's quay and New Road before entering the forest walkways located between the New Road/R464 and the western bank of the Shannon. The route crosses under a railway crossing north of King John's Island and continues north to where the Shannon head race re-joins the Shannon River. From this point, the route continues north broadly along the western bank of the head race to where it intersects with the R464 crossing of the head race. The route continues across the R464 and north along an existing woodland walk towards Ardnacrusha. From Ardnacrusha the route continues east along the banks of the head race to Cloonlara.

Red Route – The red route commences at King John's castle and proceeds south-east past Limerick City civic offices and along Merchant's Quay and George's Quay until it meets the Park Canal. The route proceeds along existing footpaths on the south bank of the Park Canal to meet the Shannon adjacent the Kevin Hannon footbridge. From this point, the route follows the southern bank of the Shannon along existing paths past the University of Limerick Boat House to the Black Bridge, located west of the University of Limerick. The route crosses the Black Bridge and proceeds north along the former tow-paths of the Errina Canal, which is currently dis-used. It follows the Errina canal for approximately 5.5km, crossing the



Figure 5: Illustration of Greenway Crossing the Black Bridge

L7050 at Garraun and the L7048 at Cappavilla North before meeting the R471 directly west of

Cloonlara. Figure 5 provides an illustration of how the proposed route may look as it passes over the Black Bridge.

In addition to these two primary preliminary routes, a route options has been developed from an offshoot of the red route. Rather than crossing the Black Bridge, which is currently closed, this route follows the banks of the Shannon further east along existing paths to the existing pedestrian crossing of the Shannon within the University of Limerick campus.

3.2 Cloonlara to Parteen Weir

Between Cloonlara to Parteen Weir three preliminary route options have been developed:

Green Option - The green route crosses the R471 west of Cloonlara bridge and continues north along the banks of the head race, diverted slightly west of the banks only in heavily forested areas. It crosses over the R466 where this road crosses the head race, west of Obriensbridge, and continues along the lands associated with the west bank of the head race to the Parteen Weir.

Red Option – The red route crosses the R471 east of Cloonlara and continues along the Errina Canal to where it meets the River Shannon at Drummeen. It then follows existing paths north along the western bank of the Shannon to O’Briensbridge. The route will cross the R466 in O’Briensbridge and continue along existing paths on the western back of the River Shannon as far as the Parteen Weir. At this point it would be necessary to cross the Parteen Weir, either through the existing facilities or a dedicated structure.

Orange Option – The orange option is a spur off the red option, or, with a slight amendment, off the Green Option. It follows the R471 into Cloonlara, before crossing the road onto the east bank of the Head Race. This option then follows the lands associated with the eastern bank of the head race north to Obriensbridge. The route would cross the R466 directly west of Obriensbridge and continue along the lands associated with the eastern bank of the Head Race as far as the Parteen Weir. At this point, it would be necessary to cross the Parteen Weir either through the existing facilities or a dedicated structure.

3.3 Parteen Weir to Killaloe

North of the Parteen Weir, the R463 regional road runs parallel to the Head Race. The road and the head race serve as natural barriers in considering route options. Three preliminary route options have been developed:

Green Route – The green route continues north from the Parteen Weir along the banks of the Parteen Basin. The man-made embankments associated with the Parteen Basin extend for a kilometre north of the weir, beyond which the green route would effectively follow the banks of the natural basin. The proposed route would subsequently follow field boundaries in Cloonfadda, thereby bypassing a headland that juts into the basin, before re-joining the bank of the basin. The proposed route would follow further field boundaries in the townland of Moys, West of Clarisford Park, before connecting with the pedestrian facilitates that will be provided as part of the Killaloe Bypass Scheme. The tie-in point with this scheme would be just north of the roundabout that will be provided on the R463 in Moys.

Red Route - The red route continues north from the Parteen Weir along the banks of the Parteen Basin for 600m, before turning west to follow private road until it meets the R463 regional road. The red route then follows the R463 north for 3.5km to the townland of Killestry, south of Killaloe.

Orange Route – Starting from the Parteen Weir, the orange route initially follows a stream and field boundaries to cross the R463 in Ardclony. From this crossing point, it then follows stream and field boundaries north towards Killaloe, running broadly parallel to the R463, but offset from it by between

150-450m. It subsequently intersects the L3080 and follows the alignment of this road until it merges with the red route in the townland of Creeveroe, west of Killaloe.

3.4 Killaloe (South) to Brian Boru's Fort

Two preliminary route options have been developed that bypass Killaloe. While no option has been developed that goes through Killaloe itself, it is envisaged that whichever option was preferred would be connected to the centre of Killaloe through one or a number of links from the town centre to the greenway.

Green Route – The green route follows the line of the proposed Killaloe Bypass which will be provided with pedestrian and cyclist facilities in the verge. The location of the bypass and the green route is shown on drawings in Appendix A. Having 'picked up' the R463 south of Killaloe in the townland of Moys, the proposed road bypasses Killaloe to the west before reconnecting with the R463 just south of Brian Boru's Fort in Ballyvally.

Red Route – At Killestry, the red route turns west at Killestry bridge and follows the Ballyteige River west, crossing the L3076 at Ballyteige Bridge. It continues north along the Ballyteige River to the intersection with the L7080 (Hill Road) at Gortmagee. From that road crossing, it follows field boundaries north to Ballyvally. A stub could potentially be provided to connect the red route to Brian Boru's Fort.

3.5 Brian Boru's Fort to Annacarriga

The shores of Lough Derg and the Hills to the west of the R463 are two very prominent features located between Brian Boru's Fort and Annacarriga which influence the choice of route options. Two preliminary route options have been developed.

Green Route – From Brian Boru's Fort, the green route follows the R463 north to Annacarriga, passing the amenity area on the shores of Lough Derg that houses the University of Limerick Adventure Centre and a number of other amenities.

Red Route – The red route continues from Ballyvally north along field boundaries over steep terrain to intercept existing paths located in the woods in Craglea. It exits the woods at Ballycuggaran and crosses a field, before crossing a private road. From here it follows field boundaries, where possible, travelling north until it intercepts the L4128.

3.6 Annacarriga to Scarriff

Between Annacarriga and Scarriff, three preliminary route options have been developed.

Green Route – From Annacarriga, the green route follows the R463 north to Ogonnelloe. From Ogonnelloe, the green route follows the R463 west to Tuamgraney and then north once more to Scarriff.

Red Route – From the intersection of the L8198 and the L4128, the red route follows the line of the L4128 past Piper's Inn and 'cross-country' to where it intersects the R463 near the Raheen Bridge in the townland of Hazelbrook. The red route crosses the R463 and travels north along the L4130 past the Raheen Community Hospital and into a Coillte woodland. The red route then turns west and follows existing trails within the forest that travel west and meet the Scarriff River at Reddan's Quay, east of Tuamgraney. From Reddan's Quay, the red route travels north along the banks of the Scarriff River towards Scarriff Harbour and on towards Scarriff town. Figure 6 below illustrates how the greenway may look where it travels along the L4020, overlooking Lough Derg.



Figure 6: Visualisation of Proposed Greenway if it followed L4020 overlooking Lough Derg.

Orange Route – From Piper’s Inn, the orange route follows a local road and then filed boundaries north-east until it intersects the R463 at Rahenna Beg, adjacent the local church. The orange route crosses the R463 and proceeds along private road towards Islandcosgry. It departs private road and then follows field boundaries to the intersection with another private road. It follows the private road north towards Tullabeg where it enters the Aughinish Woods on the shore of Lough Derg. The orange route traverses through the woods and comes out to meet a private access road at Bunglasha Lodge. It follows the private access and then private road along the shores of Lough Derg. It subsequently follows the shore of Lough Derg, occasionally crossing fields to bypass headlands. It departs the shoreline once it enters Bealkelly Wood and proceeds west through the woods. It subsequently follows filed boundaries west into Raheen Woods where it joins the red route.

4 ENGINEERING AND ENVIRONMENTAL CONSTRAINTS

This section of the report is interested in determining the engineering and environmental characteristics and constraints within the study area that may influence the development of the greenway.

4.1 Geometry, Road Interfaces and Connectivity

Standards that are available to Designers that provide advice on the design of segregated greenways are published by Transport Infrastructure Ireland (TII). The Design Manual for Urban Roads (DMURs) provides guidance on the design of facilitates for non-motorised users in urban settings.

Cross-Section

TII guidance advises that a 3.0m width is desirable for Low Volume (< 1500 users/day) routes, but that relaxations can be provided to allow the width to be reduced to an absolute minimum of 1.75m over

short lengths where physical obstructions limit the width that may be provided.³ TII guidance also advises of lateral clearances which need to be achieved adjacent vertical features, which can have a bearing on the overall cross-section. Typically, a lateral clearance of 1m is deemed to be desirable, which can be reduced to an absolute minimum of 0.25m where necessary.⁴

Where the greenway is located adjacent to a road, it is typically necessary to maintain a distance of 2m between the edge of the trafficked lane and the edge of the greenway in accordance with TII Publication DN-GEO-03036 Cross Sections and Headroom;

'4.17.3 Carriageway Separation Distances When cycle/pedestrian facilities follow the route of a road, a separation distance is to be provided between the road and the cycle track through the provision of a grassed verge. The carriageway separation distance includes any hard strips. Table 4.6 presents the minimum separation distances between the road carriageway and the cycle track. The minimum grassed verge width to be provided shall be 1m. The cycle facility should however be located as far from the edge of the carriageway as possible and share the maintenance strip if practical, as described earlier in this section.

Passively safe reflective vertical features shall be positioned within the grassed verge width where the cycle track runs adjacent to the road. Any values below those outlined in Table 4.6 require a Departure from Standard.

Table 4.6 Carriageway Separation Distances

Road Type	Desirable Min (m)	One Step Below Desirable Min (m)
Type 2 and Type 3 Single Carriageway	2.0	1.5
Type 2 and Type 3 Dual Carriageway	6.0	3.0

³ Section 4.1 and Table 4.1 of DN-GEO-03047.

⁴ Section 4.2 and Table 4.2 of DN-GEO-03047

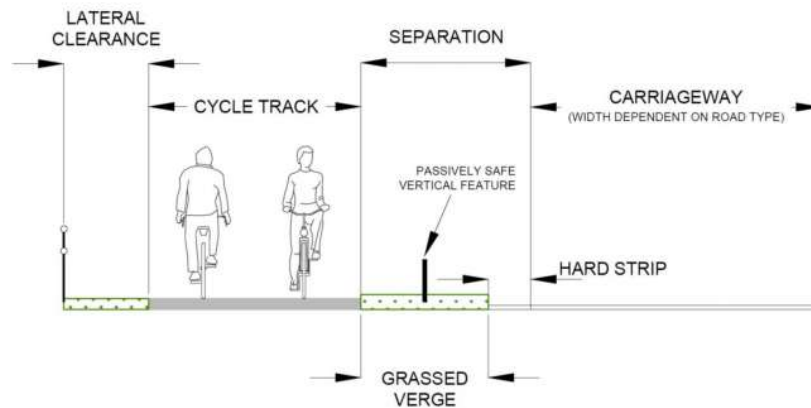


Figure 4.2 Off-Road Two-Way Cycle Track

In Instances where the greenway will cross a direct access onto the road, the offset, can be reduced to 0.5m in certain circumstances. Figure 7 below extracted from TII Publication DN-GEO-03060 refers:

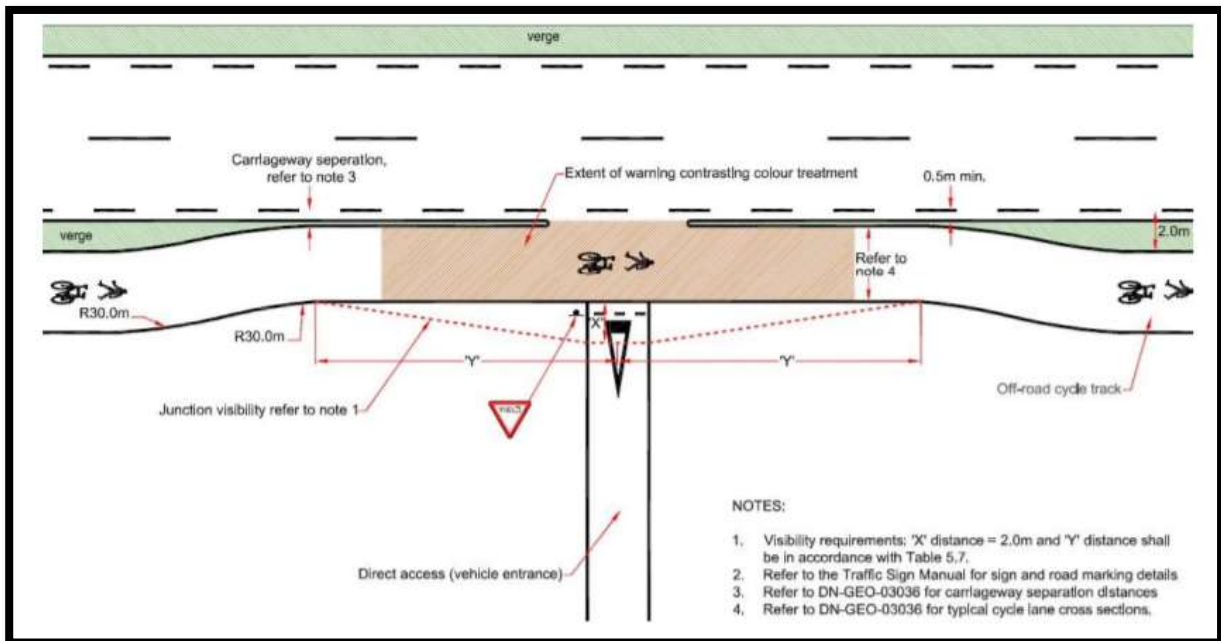


Figure 7: Direct Access Bend-In Crossing from DN-GEO-03060

Where the proposed greenway passes through urban areas, the provision of a 6m corridor that provided for minimum greenway width, lateral clearance and carriageway separation would be challenging and, in these areas, it is considered that the Design Manual for Urban Roads (DMURS) would apply. Alternatively, it may be appropriate to consider that the greenway terminates where it ties-into existing pedestrian facilities at the fringe of urban areas. Outside of urban areas, there are a number of locations where cross-sectional constraints exist as outlined below:

Green Route

Within the confines of Limerick city, the cross-section of the proposed greenway would be confined by the existing street cross-section, most notably over Thomond Bridge, which is illustrated in Figure 8 below.



Figure 8: Existing Pedestrian Facilitate on Thomond Bridge adjacent King John's Castle

Outside of Limerick City, the green route typically follows the Shannon, the Head Race and field boundaries to Killaloe

where it is considered there are relatively few man-made obstacles that would constrain the development of the desirable minimum cross-section.

The green route follows the proposed Killaloe Bypass, which is due to commence construction in 2022. The proposed cross-section for the Killaloe Bypass is illustrated in Figure 9. While this cross-section would ensure a desirable minimum width of 3m is provided, the clearance from the carriageway of 0.5m is lower than the desirable minimum of 2.0m.

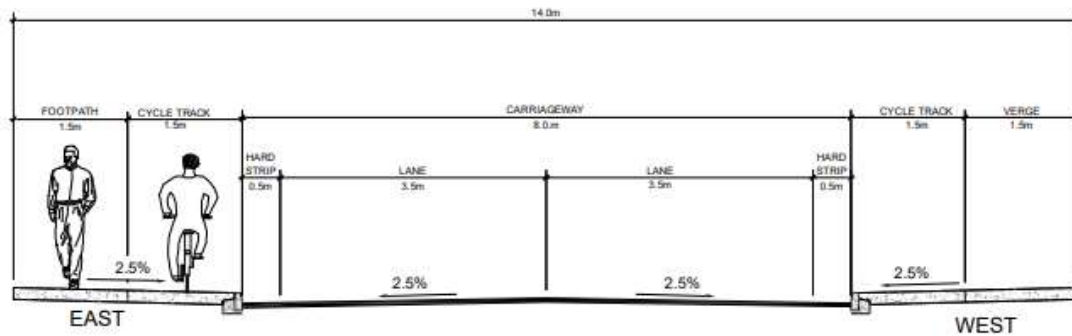


Figure 9: Killaloe Bypass Typical Section

North of Killaloe, the green route follows the R463. Although there are some pedestrian facilities currently provided along the R463, the separation of those facilities from the carriageway, their width and their clearance from obstacles is typically below standard. In a number of instances, there are obstacles adjacent to the existing facilities that would make it difficult to provide a greenway that meets desirable minimum standards without impacting on existing buildings. In other instances, it is likely that the widening of the R463 verge to accommodate the greenway would necessitate the construction of retaining walls. This is particularly the case where the R463 runs at the top of steep banks that overlook domestic properties.

Figure 10 and Figure 11 below provide examples of locations where existing buildings would be impacted by the provision of a greenway on the eastern side of the R463.

In addition to the above, there are also instances where there may physically be enough room to provide a greenway between the carriageway and a domestic property, but, such is the proximity of the property to the road, doing so would have a significant impact on the character of the property.

There are dozens of locations where property boundaries would be impacted, where the impact of the main building within the property would be less significant.

Through the townland of Ballyheafy, there is also a location where the R463 is quite close to Lough Derg, where the provision of a greenway would require construction within or directly adjacent to the lake.



Figure 10: Property Adjacent R463 in in Ballyvalley



Figure 11: Property Adjacent R463 in in Raheen

Red Route

Within the confines of Limerick city, the cross-section of the proposed greenway would be confined by the existing street cross-section, most notably along Mary St. and Charlotte's Quay. From Charlotte's Quay, the red route follows the Park Canal as far as the Shannon where a high-quality corridor is already in place. From the Kevin Hannon bridge, where the Park Canal meets the Shannon, the red route follows the southern back of the Shannon along existing paths to the University of Limerick campus. The width of these paths is not typically to greenway standard and widening would be required to achieve desirable minimum standard. It is envisaged that the paths could be widened to the south, where a back-drain could be partially infilled. There are also a



Figure 12: Existing Path Under O'Brien's Bridge

number of culverts along these existing paths, which would also need to be widened to bring these paths up to greenway standard.

Where the red route follows the Errina canal north, it is not considered that there are particular physical obstacles that would limit the ability to provide a greenway, except at Obriensbridge where the tow-path underneath the main Shannon crossing is narrow, as illustrated in Figure 12. In this location, it may be possible to ask cyclists to dismount or for an alternative route to be used locally.

North of the Obriensbridge, the red route crosses the Parteen Weir. In order to make this crossing it would be necessary to agree access to existing facilities with ESB or provide a new bridge to accommodate greenway users, which is an option that would also need to be explored with ESB.

North of the Parteen Weir, the red route follows the R463 for 3.5km. There are three domestic properties located to the east of the R463 along this stretch of road. The provision of a greenway along the eastern verge of the R463 in this area would potentially impact an existing shed in Cloofadda and would otherwise impact on the boundaries of the other properties in the area. The shed in Cloonfadda and an associated wall is illustrated in Figure 13 below.



Figure 13: Shed and Wall along R463 in Cloonfadda

The red route follows the L4128 between Ballyheefy and Piper's Inn. The provision of a greenway with desirable minimum cross-section adjacent to the road may impact on a number of properties and property boundaries, specifically those illustrated in Figure 14 below, where the provision of properties on both sides of the road acts as a particular constraint.



Figure 14: Properties Adjacent Local Road at Carrownakilly

Between Piper's Inn and Hazelbrook, the red route follows the L4128. Although there is ribbon development along this route, there are not typically houses located directly opposite one another on the road. On the assumption that it is accepted that there may be numerous crossings on this lightly trafficked local road, it should be possible to provide a segregated greenway without impacting on domestic property boundaries.



Orange Route

The orange route branches off the red route in Cloonlara.

Figure 15: Bridge Parapets and Domestic Properties along LXXX in Carrowbaun

Where the Errina Canal intersects with the R471, the existing bridge over the canal is not sufficiently wide to accommodate a greenway and the road. There are also existing boundary walls and properties directly west of the canal bridge, which would constrain the development of a greenway with a desirable minimum cross-section.



Figure 16: Road Cross-Section West of R471 crossing of Errina Canal

Figure 16 below refers.

Beyond this point, there are existing pedestrian facilities, but these facilities do not currently meet desirable minimum greenway standards. There does appear to be space to improve the standard and it may be that the DMURs standards is most appropriate through the urban area.

North of the Obriensbridge, the orange route crosses the Parteen Weir. In order to make this crossing it would be necessary to agree access to existing facilities with ESB or provide a new bridge to accommodate greenway users, which is an option that would also need to be explored with ESB.

The orange route follows the L3080 for 700m in the townland of Killestry. Although there is ribbon development along this route, there are no houses located directly opposite one another on the road and there is only one domestic property on the northern side of the L3080 through this stretch. On the assumption that it is accepted that there may be numerous crossings on this lightly trafficked local road, it should be possible to provide a segregated greenway without impacting on domestic property boundaries.

The orange route follows the L8198 for 1.5km in the townland of Ballyheefy. Similar to the situation described above in respect of private road, although there are a number of domestic properties located along this route, there are no houses located directly opposite one another on the road. On the assumption that it is accepted that there may be numerous crossings on this lightly trafficked local road, it should be possible to provide a segregated greenway without impacting on domestic property or associated boundaries. The same is true of the local roads which the orange route follows north of Annacarriga.

In the townland of Ballynagleragh, the orange route follows a local road towards a cul-de-sac. In this location, the provision of a greenway with desirable minimum cross-section would impact on the property boundaries illustrated in Figure 17 below.



Figure 17: Properties in Ballynagleragh on the Shore of Lough Derg

Black Route

A number of black routes are shown on the drawings in Appendix A. These are routes that can be used to join one section of the green, red or orange route to one of the other routes. One of these routes crosses the bridge in Cloonlara which crosses the Shannon Head Race. Another crosses the bridge in Obriensbridge which crosses the Shannon Head Race. Both bridges date from the 1920s and neither currently have sufficient width to cater for 2-way vehicular traffic over the bridge. Each bridge has existing pedestrian facilities on one side, however these facilities are less than 1m wide. Figure 18 below shows the bridge and pedestrian facilities in Cloonlara



Figure 18: Existing Bridge over Shannon Head Race in Cloonlara

Horizontal Geometry and Visibility

The horizontal alignment requirements associated with cycling facilities are discussed in DN-GEO-03047. Principle among the requirements is the need to provide minimum horizontal radii of 25m in locations where the design speed is 30 km/h. Minimum horizontal radii of 4m and 94m apply where the design speed is 10 km/h and 50 km/h respectively.

Given the generous horizontal geometry associated with the Shannon, the Shannon Head Race and associated canals, where the route follows the prominent water bodies, it is likely that it will be possible to provide minimum horizontal radii.

Where it is not possible to follow the route of the prominent water bodies, the greenway may follow existing field boundaries, local roads and smaller watercourses. In these instances, it will be necessary to develop the geometry design associated with each route option in order to ensure minimum standards can be met and to determine associated land requirements. This is particularly the case, where:

- The land boundary or local being followed turns through sharp angles.
- The watercourse the greenway is aligned to is meandering.

In developing the horizontal geometry, it will also be necessary to consider the visibility associated with the design. As per Table 5.2 of DN-GEO-0304, the dynamic stopping sight distance (DSSD) associated with a 30kph design speed is 65m.⁵ Where small horizontal curves are used, the visibility splay can often extend well beyond the greenway footprint. This can be problematic if the visibility splay crosses hedgerows or other boundaries or crosses privately-owned lands that contain or are likely to contain vegetation, crops or structures which will impede visibility. The lands required for the development of the greenway are therefore likely to include the extent of the greenway footprint and the associated visibility splays.

Vertical Geometry

The vertical alignment requirements associated with cycling facilities are discussed in DN-GEO-03047. The principle requirement is to ensure appropriate vertical gradients are used along the route. DN-GEO-03047 sets out that the desirable maximum gradient for cycling facilities is 3%.⁶ Gradients of up to 10% are allowable as a two-step relaxation, however DN-GEO-03047 advises that: *“the provision of gradients greater than 5% should be confined to short sections of the cycle route and should be preferably less than 100 metres in length.”*

The likely gradients along the preliminary route options within the study area have been investigated in Google Earth. Locations where steep gradients may be encountered are illustrated in the constraint drawings in Appendix B.1⁷ and are summarised below:

- Green Route - There are two locations along the green route where gradients exceed 5%.
 - South of Ogonnello, the maximum gradient is 5.7%. The length over which the gradient exceeds 5% is 120m.
 - Southwest of Tuamgraney, the maximum gradient is 6.4%. The length over which the gradient exceeds 5% is 150m.
- Red Route - The locations along the red route where gradients exceed 5% are outlined below:
 - In Killestry, close to where the red route crosses the L3076, the maximum gradient is 5.2%. The length over which the gradient exceeds 5% is 80m.
 - West of Killaloe, where the red route follows field boundaries, there is a section where the local gradient along the red route reaches a maximum of 13.6%. The length over which the gradient is above 5% is approximately 170m.

⁵ For 50 kph and 10 kph design speeds the DSSD is 100 kph and 10 kph respectively.

⁶ Table 6.2 of DN-GEO-03047.

⁷ It is noted that the above analysis is not based on dedicated survey information and should be treated with some caution.

- In Craglea, where the red route passes through hilly terrain there are extensive lengths where the natural gradient of the ground is higher than desirable minimum standards. Through one section which is 1.2 km long, gradients are up to 12.5%.
- Where the red route passes through Ballycuggaran, gradients are between 9.8% and 14.1% over a distance of almost 500m. There is another location in Ballycuggaran where gradients are up to 10.8% over a distance of 185m.
- Where the red route follows the L4128, there are four locations where the gradient exceeds 5%. The maximum gradient along the local road in this area is 8.9%. The length of road where the gradients exceed 5% is approximately 1.6km
- Orange Route - The locations along the green route where gradients exceed 5% are outlined below:
 - Along the west bank of the Shannon Head Race south of Obriensbridge the natural topography has gradients of up to 8.8%. It is considered that this is likely an anomaly and a relatively flat route could be perused along the head race.
 - West of the Parteen Weir, where the route follows field boundaries, local gradients are up to 9.2% over a distance of 300m.
 - Where the orange route follows the L3080, west of Killaloe, the local road gradient is 6.0% over a distance of 100m.
 - Between Aughinish and Tullabeg, where the orange route follows a local track, the gradient is up to 8.6% over of 275m and then up to 6.8% over a distance of 350m.
 - In Bealkelly, where the orange route departs the banks of Lough Derg, the gradient is up to 5.3% over a distance of 300m.

From a review of the profiles generated through google earth, it is evident that there are few, if any, significant vertical geometry constraints associated with the sections of route options which lie to the south of Killaloe. North of Killaloe, there are particular vertical geometry constraints associated with the red route where it traverses steep wooded areas west of Twomilegate and where it follows the L4128.

Where gradients are above desirable minimum standards, mitigation options might include:

- Carrying out earthworks to amend the natural gradient through localised high points/low points.
- Introducing 'S-curves' to reduce the severity of gradients.
- Investigating the use of local diversions from the route corridor to reduce gradients.
- Applying for departures from standard

The need to undertake such measures should be considered as part of the route selection and subsequent design processes, as it may have a bearing on cost, environmental impacts or engineering parameters.

Road Interfaces

The road interfaces associated with each preliminary route option are described in the sections below and are illustrated on the constraints drawings in Appendix B.1.

Green Option

Road Interfaces associated with Green route are described in Table 1 below. Road interfaces within Limerick city have not been included in this table.

Table 1: Road Interfaces Associated with Preliminary Route Option A

RI No.	Road No.	Interface Type	Length (km)
A1	R464	Regional Road Crossing at Parteen Bridge	N/A
A2	Private	Interface with ESB track network within Ardnacrusha. Exact details to be confirmed.	TBC
A3	R463	Regional Road Crossing at Rosmadda West	N/A
A4	R471	Regional Road Crossing at Cloonlara	N/A
A5	R466	Regional Road Crossing at Obriensbridge	N/A
A6	Private	Crossing of Access to Parteen Weir	N/A
A7	R463	Regional Road Crossing at Moys	N/A
A8	Killaloe Bypass	Segregated Greenway Adjacent to Road	2.2 km
A9	L3076	Local Road Crossing at Shantraud where L3076 forms junction with Killaloe Bypass	N/A
A10	L3078	Crossing of Hill Road where L3078 forms junction with Killaloe Bypass	N/A
A11	R463	Regional Road Crossing at Ballyally	
A12	R463	Segregated Greenway Adjacent to Road ⁸	16.5km

In the section south of Killaloe, it is evident that the green route has relatively few road interfaces. However, from the point at which it intersects the Killaloe bypass the green route runs almost exclusively parallel to a road.

Red Route Option

Road Interfaces associated with the red route option are described in Table 2 below. Road interfaces within Limerick city have not been included in this table.

Table 2: Road Interfaces Associated with Preliminary Route Option B

RI No.	Road Number	Interface Type	Length
B1	TBC	Local Road Crossing at Rosmadda West	N/A
B2	L7050	Local Road Crossing at Garraun	N/A
B3	L7048	Local Road Crossing at Springfield	N/A
B4	R471	Regional Road Crossing at Cloonlara	N/A
B5	L3072	Local Road crossing at Coollisteige	N/A
B6	R466	Regional Road Crossing within Obriensbridge	N/A
B7	Private	Crossing of Access to Parteen Weir	N/A

⁸ In addition to this interface there are a large number of access and local road crossings along this road where local roads and domestic or field entrances meet the regional road. IT may also be necessary to cross the R463 occasionally to avoid cross-section constraints on the eastern verge.

RI No.	Road Number	Interface Type	Length
B8	Private	Segregated Greenway Adjacent to Road at Ardclony	0.4 km
B9	R463	Segregated Greenway Adjacent to Road at Ardclony	3.5 km
B10	R463	Regional Road Crossing at Moys	N/A
B11	L3076	Local Road Crossing near Ballyteige Bridge	N/A
B12	L7080	Local Road Crossing at Creeveroe Bridge	N/A
B13	L3078	Local Road Crossing at Knockyclovaun	N/A
B14	Private	Local Road Crossing at Ballycuggaran	N/A
B15	L4128	Segregated Greenway Adjacent to Local Road ⁹	5.5 km
B16	R463	Regional Road Crossing at Bealkelly	N/A
B17	L4130	Segregated Greenway adjacent to Local Road in Raheen	0.9 km
B18	L4020	Segregated Greenway adjacent to Local Road in Riverview	0.3 km

Preliminary Route Option C

Road Interfaces associated with Preliminary Route Option C are described in Table 3 below.

Table 3: Road Interfaces Associated with Preliminary Route Option C

RI No.	Road Number	Interface Type	Length
C1	Private	Segregated Greenway Adjacent to Road through UL	0.2 km
C2	R471	Segregated Greenway Adjacent to Road in Cloonlara	0.4 km
C3	R471	Regional Road Crossing in Cloonlara	N/A
C4	R466	Regional Road Crossing at Obriensbridge	N/A
C5	R463	Regional Road Crossing at Ardclony	N/A
C6	L7106	Local Road Crossing at Ross	N/A
C7	L30801	Local Road Crossing at Ross	N/A
C8	L3080	Segregated Greenway Adjacent to Road in Killestry	0.6 km
C9	L3080	Local Road Crossing at Killestry	N/A
C10	L8198	Segregated Greenway Adjacent to Road in Ballyheefy ¹⁰	1.6 km
C11	Private	Local Road Crossing at Ballheefy	N/A

⁹ In addition to this interface there are up to 11 local road crossings along this road where other local meet this local road. There are also a large number of domestic and field entrance crossings. It may also be necessary to cross the L4128 occasionally to avoid cross-section constraints.

¹⁰ In addition to this interface there are a number of domestic and field entrance crossings

RI No.	Road Number	Interface Type	Length
C12	L8194	Local Road Crossing at Rahena Beg	N/A
C13	R463	Regional Road Crossing at Rahena Beg	N/A
C14	Private	Segregated Greenway Adjacent to Road in Carrowgar/Aughinish	1.2km
C15	Private	Segregated Greenway Adjacent to Private Access in Aughinish/Tullabeg	1 km
C16	Private	Segregated Greenway Adjacent to Private Access and Road in Ballynagleragh	1 km

4.2 Connectivity

Connections to Towns and Places of Interest

The study area developed for this scheme extends from the urban area of Limerick and to Scarriff. In addition to Limerick and Scarriff, each of the preliminary route options pass through or close to Clonlara, Obriensbridge/Mountpullier, Killloe/Ballina, Annacarriga and Tuamgraney. The population of each of these towns is outlined in Table 4 below.

Table 4: Town Populations

Town	County	Population (as per 2016 census)
Clonlara	Clare	713
O'briensbridge/ Montpelier	Clare	396
Killaloe	Clare	1484
Ballina	Tipperary	2632
Scariff-Tuamgraney	Clare	770
Limerick City	Limerick	94192

Tourism is regarded as one of Ireland's most important economic sectors and key to dispersing wealth into the rural economy and smaller towns. Within County Clare, the tourism industry contributed €244.5 million to the economy in 2018 and supported approx 6,600 tourism jobs.¹¹ Tourist attractions and places of interest which are connected to each route option include St John's Castle, Limerick and the towns referred to above, the Shannon River (to a greater or lesser extent depending on the option selected), the Shannon Head Race (to a greater or lesser extent depending on the option selected), the Parteen Weir and Parteen Basin, Brian Boru's Fort, St. Cronan's Church and the Scarriff Union Workhouse.

In a number of instances, connectivity to a particular town or feature of interest is unique to one of the route options as follows:

¹¹ Extract from County Clare Tourism Strategy 2030

- Green Route – Unique connections to the villages of Ardnacrusha and Ogonnelloe, as well as the Ardnacrusha Power Plant. The green route also runs closer to features such as Killaloe, Brian Boru’s fort, Tuamgraney and the Parteen Basin
- Red Route – Unique in providing connectivity to University of Limerick, the Park Canal, the Errina Canal and all associated locks, the East Clare Way, Raheen Woods and the Scarriff River.
- Orange Route – Unique in its proximity to Lough Derg and associated features of interest including Auginish Woods, Caher Island and Castlebawn Island.

While it is evident from the above, that no one route provides access to each of the features and towns of interest within the Study Area, it is equally as evident that each of the proposals would provide opportunities to connect to a large number of populated areas and features of interest along the approximately 40 km route. The locations of these features of interest are shown on the constraints drawings in Appendix B of this report.

Links to Public Transport

Public transport links within the area include train and bus links. Limerick city is directly connected to Dublin, Galway, Cork and Waterford by train and by bus which will mean the start of the greenway is accessible by public transport from each of the other major cities in Ireland and all the associated towns along those train lines. On the Limerick to Dublin line, there is stop at Birdhill which is located 5km from Obriensbridge. The proximity of the proposed greenway to this station may serve to increase the catchment area for this station or allow train passengers to cycle to the train station rather than taking the car. Travellers coming from Dublin may also chose to get off at Birdhill and join the greenway at Obriensbridge or to cycle from Limerick to Obriensbridge and get the train back to Limerick as part of a recreational journey.¹²

In addition to national bus and train lines, bus route 345 runs between Tuamgraney and Limerick and runs up to five times per day, connecting Tuamgraney, Ogonolloe Killaloe, Obriensbridge, Cloonlara, Ardnacrusha and Limerick.

Connections to Other Recreational Routes

The proposed greenway would be likely to connect to existing trails and walkways and existing and proposed national greenways.

Existing Walks and Trails

Information on existing trails in Co. Clare has been obtained through the Clare Recreational Officer. There are a number of prominent walkways within the Study Area as follows:

- Lough Derg Way – Starting in Limerick City, the Lough Derg Way follows the Park Canal and River Shannon to UL, before following a local road to intersect the Shannon Head Race north of Ardnacrusha. The Lough Derg Way follows the eastern bank of the Shannon Head Race to Obriensbridge where it crosses the head race canal and then follows the west bank of the head race past the Parteen Weir and along the Parteen Basin. The Lough Derg Way follows the Ardclony River, from its outlet to the Pareen Basin, upstream to where it intersects the L30801. IT then following the L3080 to Killaloe and Ballina.
- East Clare Way – The East Clare Way starts in Killaloe, effectively continuing from the Lough Derg Way and travels out the L3078. It continues north across country west of Lough Derg following local roads or rivers. It ultimately meets the R398 south of Tuamgraney and follows this road to Scarrif and beyond.

¹² Note that there are no cyclist or pedestrian facilities currently provided between Birdhill and Obriensbridge

Further walks and trails within the study include the Obriensbridge Loop Walk, the Obriensbridge Old Barge Loop walk, the Errinagh Bridge Loop and the Obriensbridge to Parteen Weir Loop Walk and the Ballycuggaran Crag Wood Walk. It is noticeable that there are a particularly high concentration of existing walks between Cloonlara and Obriensbridge/Parteen Weir.

Existing trails within the Study Area are illustrated on the drawings in Appendix B.1.

Connection and Potential Connection to National Greenway Network

AS set out in the Shannon Master Plan, it is intended to develop a recreational route along the full length of the Shannon. There are a number of sections of the Shannon Greenway complete and there are further sections currently being progressed through the planning process. In addition to the establishment of a greenway along the Shannon, the completion of these greenways would ultimately connect the proposed Limerick to Scarriff greenway and the proposed Dublin to Galway Greenway, which would facilitate users to cycle between Galway, Dublin and Limerick in the medium term. Further connections as far as Sligo and Belfast are possible in the longer terms if other planned greenways were progressed. To the south of Limerick City, as set out in LSMATS, there is the potential for the proposed Limerick City Centre to Patrickswell Greenway to be connected to the Great Southern Greenway. The proposed greenway has the potential to become an important strategic link within the national greenway network.

4.3 Hydrology and Hydrogeology

The study area has been reviewed to determine if there are any drainage related constraints which would impede the development of the proposed greenway. Such constraints may include:

- Rivers and stream which may have to be crossed;
- Areas of historical flooding which may have to be avoided or catered for; and
- Areas where the topography and alignment are such that draining the walkway would be difficult.
- Areas with hydrogeological sensitivities

Rivers and Stream Crossings

The most prominent hydrological features in the study area is Lough Derg and the River Shannon which, flowing through the south, receives water from a significant number of tributaries. Figure 6 shows an overview of the watercourses in the study area as well as the subcatchment extents associated with the prominent watercourses.

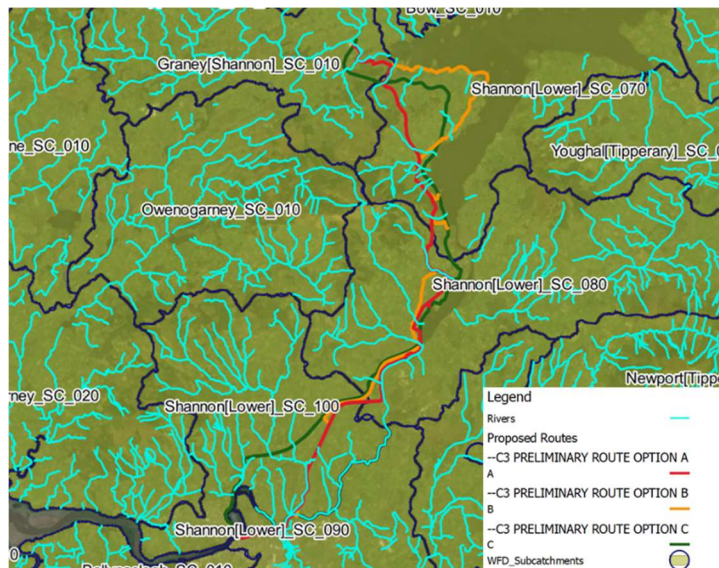


Figure 19: Hydrological Feature within Study Area

Watercourse crossings which are associated with each preliminary route option are illustrated in Appendix B.1 drawings. The number of crossings associated with each route options are summarised in Table 5 below

Table 5: Stream/river Crossings Associated with Each Route

Route Options within Study Area	River/Minor Streams
Red Route	19
Orange Route	10
Green Route	19

Where new stream crossings are required, Section 50 consent from the OPW will typically be required. In such instances, appropriately sized box or pipe culverts or clear span pedestrian crossings could be provided.

Flooding

The OPW Flood Hazard Mapping websites (www.floodmaps.ie and www.floodinfo.ie) were consulted to determine whether there was any evidence of flooding within the study area. There are three sections of the proposed routes which are located within Shannon Flood zones, and these are illustrated in the images below from north to south. Figure 20 illustrates how segments of the orange and red routes are within the flood zones associated with Lough Derg and the Scarriff River.

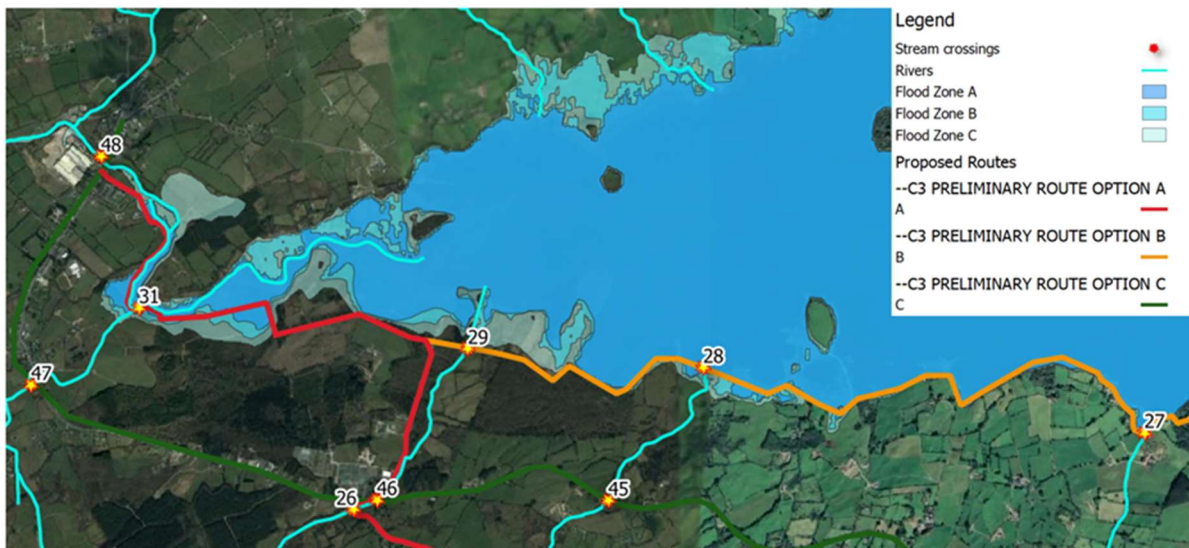


Figure 20: Excerpt from www.floodinfo.ie showing northern section of the proposed routes within the Lough Derg flood plains

Figure 20 illustrates how segments of the red route are within the flood zones associated with the River Shannon south of the Parteen Weir. Figure 22 illustrates how segments of the red route and green route are within the flood zones associated with the River Shannon south of the Parteen Weir.

The high frequency flood extents, where they are shown on OPW maps, are illustrated on Appendix B.1 drawings. Although it is unlikely that the provision of an at-grade greenway, which is considered to be a ‘water compatible’ development¹³ would impact on the flood extents, the likely frequency of the greenway flooding and the impact that would have on the availability of the greenway to users and on maintenance requirements is something that would need to be considered as part of the route selection and design process.

Hydrogeology

The Environmental Sensitivity Mapping (ESM) tool was consulted for available hydrogeological information relating to the study area. The following aquifer types were identified within the study area:

Locally Important Aquifer (Lm) – Bedrock which is generally moderately productive. This aquifer is located between Thomond Village and Springfield.

Regionally Important Aquifer, Karstified (Rkd) – This aquifer is present between Ardnacrusha and Clonlara.

Poor Aquifer (PI) – Generally unproductive except in localised areas. This aquifer is located North of Killaloe to Scarriff.

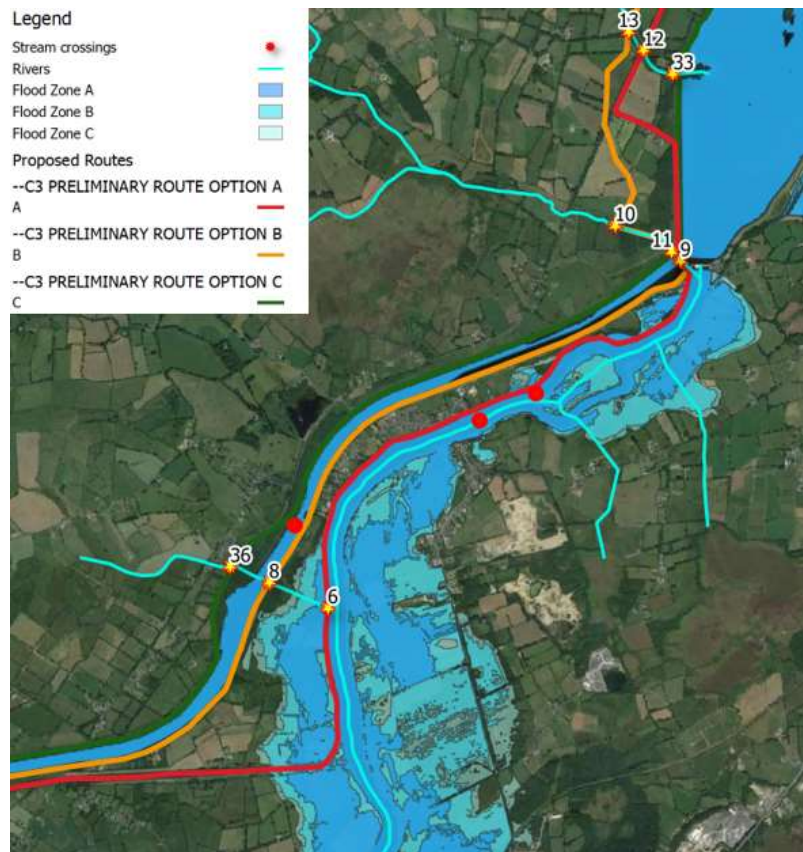


Figure 21: Excerpt from www.floodinfo.ie showing locations of reported flooding near Parteen Weir

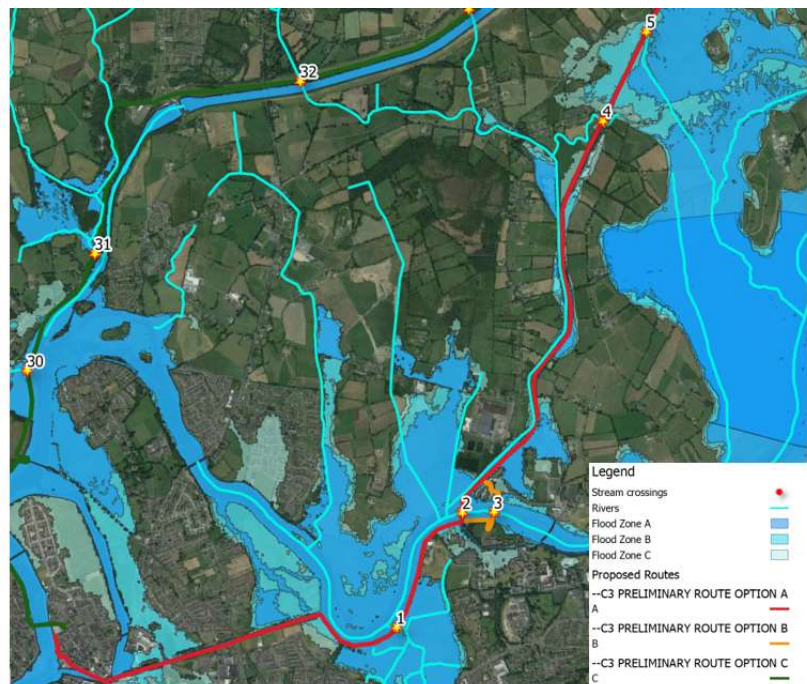


Figure 22: Excerpt from www.floodinfo.ie showing locations of reported flooding in Limerick

¹³ Planning System and Food Risk Management Guidelines (2009) – Table 3.1

Groundwater Vulnerability

Groundwater vulnerability describes the possibility of contamination of groundwater by human activity. The groundwater vulnerability classification through the study area ranges from 'moderate', between Derryduff and Clonlara, and 'extreme' within the Slieve Bernagh mountains where bedrock very close to surface. There are also two public water supply extraction points within the study area: Killaloe and Ardataggle in O'briensbridge.

The presence of aquifers and areas of groundwater vulnerability may need to be taken into consideration during design phases if significant ground works were planned that could impact on groundwater. The presence of these features may also require consideration during construction.

4.4 Soils and Geology

In considering potential geotechnical constraints that may influence the development of the proposed route, this report has considered the following data sets:

- OSI mapping - historical to present day; and
- Geological Survey Ireland mapping relating to topography, quaternary sediments, bedrock and aquifer classification.

Site-specific geotechnical investigations have not been carried out to date and so the potential constraints identified in this report are based only on publicly available information and the observations made during the walkover survey.

Bedrock Geology

The GSI shows the bedrock geology beneath the study area is predominantly limestone, sandstone and shale. Outcrops of volcanistic rock and visean limestone are evident along the Killaloe Canal at Garraun. Limestone shale is recorded North of Clonlara, and Old Red Sandstone at O'Briensbridge. Greywacke underlies the town of Killaloe and forms the Slieve Bernagh mountains to the NW of Killaloe. Old Red sandstone conglomerates between Ogonnelloe and Tuamgraney. Tuamgraney and Scarriff are underlain by dark muddy limestone and shale.

As noted in Section 4.3, there is a Regionally Important Aquifer, Karstified (Rkd) present between Ardnacrusha and Cloonlara. There is a sinkhole located at GR: 561825, 662088 100m west of red route option at Springfield. The ESB have also advised that sinkholes have developed directly adjacent the headrace canal near Cloonlara.

Drift Geology

Quaternary sediments viewer shows drift geology comprises of estuarine silts and clays beneath the proposed route between Thomond Village and Garraun. A floating road construction may be required in this location. A gravel track is present between Garraun and Clonlara. Till is present to the West of Cloonlara then silt and clay beneath the footpath where the Errinagh canal turns East to meet the Shannon, again, geotextiles may be required here to prevent settlement of track and minimise the stone required. The quaternary sediments viewer recorded peat at Springfield. The site walkover revealed a gravel track present in this location which appeared to be in good condition.

Quarries in Study Area

There are no active quarries within the study area. Eight mineral locations were recorded within the study area, on the Environmental Sensitivity Mapping (ESM) tool, however none of these sites appeared to be currently active. There were also two mineral locations recorded within 1km of the study area: an active sand and gravel pit in Montpellier and a former galena mining site in Ballycuggaran. Given the location of the active pit at Montpellier is the opposite side of the River Shannon to any of the routes proposed, this is not considered to be a constraint.

Risk of Landslide

The ESM map viewer revealed no landslide events have occurred within the study area. The closest is west of Annacarriga, 1km outside of the study area in woodland on the Slieve Bernagh mountains. The landslide susceptibility in the area of the preliminary orange route option west of Twomilegate is classified as 'high' as seen in Figure 23.

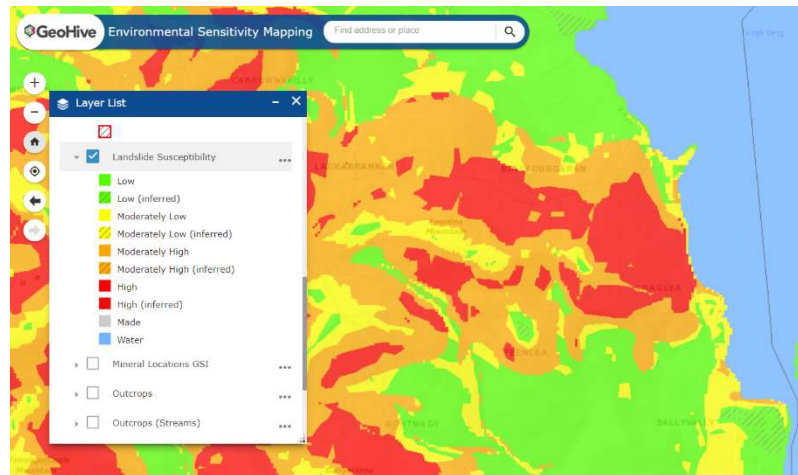


Figure 23: Landslide susceptibility at Twomilegate

Based on the above review, possible geotechnical constraints in the study area are as follows:

- Areas of soft ground – Peat/alluvium. Likely to result in difficult underfoot conditions which may necessitate use of geotextiles in these locations. Compressible and low strength alluvial deposits will need to be considered when designing structural foundations.
- Shallow rock outcrops – Potential physical obstructions, may require breaking or a minor diversion of the route.
- 'High' landslide susceptibility in Twomilegate – Specific geotechnical solutions may be required to improve ground stability adjacent the proposed greenway.

The location of soft ground, potential rock outcropping, the locations are shown on the constraints drawings in Appendix B.1.

4.5 Structures

Where existing paths and walks are developed to meet greenway standards, existing structures may need to be amended or new structures developed. Where 'greenfield' greenways are developed, structures are typically required to take users over obstacles such as roads or watercourses. In some instances, it is necessary to consider the condition of existing structures and their ability to carry greenway traffic. The locations of existing and proposed structures associated with each of the preliminary route options in the Study Area are shown in Appendix B.1. Photos of each of the existing structures is contained within Appendix D. For the purposes of this report, it has been assumed that at-grade crossings will be provided where the greenway crosses regional and local roads.

Existing and Proposed Structures – General

The below section of this report provides a list of the existing structures along each preliminary route option along with information on any new structures that would be required to facilitate that route option.

- **Green Route** – The following prominent structures feature on the green route:

- **Thomond Bridge (Ref ST110)** – Existing bridge currently open to traffic would be used to take greenway users over the River Shannon. The bridge has existing non-motorised user facilities on either side of the road.
- **Rail Bridge (Ref ST111)** – An existing rail bridge crosses the River Shannon north of King John’s Island. Subject to considerations associated with flooding in this area, the greenway would pass under the existing bridge close to the banks of the Shannon.
- **Quinnspool bridge (Ref ST112)** – This structure consists of 2no. bridges adjacent to each other. 1 bridge carries live traffic at present. The second bridge is overgrown and unused. This structure should be cleared so a full inspection can be carried out of the second structure crossing. The measurement from inside of parapet to inside of parapet is 7m
- **Arcloony River** – The green route crosses the Arcloony River where it enters the Parteen Basin. A new river crossing may be required at this location.
- **Ballyteige River** – The green route crosses the Ballyteige River where it enters the Parteen Basin. A new river crossing may be required at this location.
- **R463 Culverts** – Where the green route follows the R463 between Killaloe and Scarriff, there are 12 river of stream crossings and 1 no. farmer’s underpass. It is likely that each of these structures would need to be widened to accommodate the greenway.
- **Red Route** – The following prominent structures feature on the red route:
 - **Mary St. (Ref ST 101)** - Bridge over River Abbey with existing (narrow) pedestrian facilities on either side of the road.
 - **Pa Healy Rd. (Ref ST 102)** – Road Bridge which spans the Park Canal and the associated existing non-motorised user facilities on the banks of the canal.
 - **Rail Bridge (Ref ST 104)** – An existing rail bridge which spans over the Park Canal and the associated existing non-motorised user facilities on the banks of the canal.
 - **3 No. NMU bridges on Shannon Banks (Ref ST 105 – ST 107)** – Recently installed bridges which cross stream and lie adjacent to more historic structures which are still open to the public.
 - **Black bridge (Ref ST 108)** – An existing bridge over the Shannon near the University of Limerick, the Black Bridge Structure was a pedestrian bridge which was closed after the Plassey Floods of 2009 where the water level in the Shannon rose and almost overtopped the structure deck. Debris was caught against the bridge. Fears that structural integrity was compromised lead to the closure of the bridge. The bridge is currently overgrown with vegetation. The structure should be cleared of any debris and a full inspection is required of the deck, supports and foundation which may involve the use of a boat during low water levels in the Shannon. Any reports leading to the closure of the structure should also be requested and reviewed prior to any inspection to assess risk.
 - **Errina Canal Bridges** – There is a possibility that new bridges would be required over the Errina canal at certain locations to minimise impacts on landowners. Existing bridges on the local road network may also be used for the same purpose in certain instances, subject to cross-section considerations.
 - **Obriensbridge** – The existing bridge spans the Shannon in the town of Obriensbridge. There is an existing narrow footway on the banks which is spanned by the bridge.

- **Obriensbridge to Parteen Weir** – There are a number of structures, ST209, ST210, ST211, along an existing walking trail from Obriensbridge to Parteen Weir. These structures may need to be widened to accommodate greenway traffic.
- **R463 Crossing of Ardclony River (Ref ST301)** – An existing structure across the Ardclony River would need to be widened or a new structure provided.
- **Killestry/Ballyteige/Raheen Bridge (Ref ST302, ST303, ST304)** – Potential requirement to use existing structures or new structures to cross the Ballyteige River.
- **L4128 Culverts** – Where the red route follows the L4128 between Killaloe and Scarriff, there are 9 river or stream crossings. It is likely that each of these structures would need to be widened to accommodate the greenway or new structures provided.
- **Croaghurum River** - An existing structure across the Croaghurum River would need to be widened or a new structure provided.

Figure 24 below shows the R463 crossing of the Ardclony River, where a new structure would be required, or the existing structure would need to be widened.



Figure 24: R463 Crossing of the Ardclony River

- **Orange Route** – The following prominent structures feature on the orange route:
 - **UL Bridge (Ref ST109)** - This structure has an existing segregated pedestrian crossing over the structure. No works are proposed for inclusion in the route.
 - **R471 crossing of Errina Canal** - The existing crossing does not have sufficient width to provide a segregated cycleway crossing. This route can be utilised as a shared route, a new bridge can be constructed adjacent to the road, or the bridge may be widened to accommodate the greenway.
 - **Ardclony River** – The orange route crosses the Ardclony River west of where it crosses the R463. A new river crossing may be required at this location.
 - **Ballyteige River** – The orange route crosses the Ballyteige River west of Ballyteige Bridge. A new river crossing would be required at this location.

ESB Owned and Operated Structures

Based on the preliminary route options developed to date, the proposed development has the potential to interface with a number of prominent ESB owned and operated structures.

Head Race Bridges at Cloonlara and Obriensbridge

In addition to the structures associated with the green, red and orange routes it may be necessary to use or develop new structures over the Shannon Head Race at Cloonlara and/or at Obriensbridge. This would be necessary if a preferred segment of one route which is to the west of the Shannon Head Race to be connected to a subsequent segment which is selected as the preferred option, but is on the east side of the Shannon Head Race or vice versa.

There are currently existing structures over the Shannon Head Race at Cloonlara and Obriensbridge. The existing structures date from the 1920s and carry road traffic and pedestrians across the Shannon Head Race. The visibility across the structure is poor and the width of the pedestrian facilities is less than that which would be required to allow two bicycles to pass one another on the structure. It is noted that the carriageway width is insufficient to allow two vehicles to pass one another. Figure 25 below shows the existing structure at Cloonlara.



Figure 25: Existing Bridge over Shannon Head Race in Cloonlara

In consultations with the ESB and Clare County Council, it is noted that, given that there is not currently room for two vehicles to pass one another at this location, it is likely that traffic lights will be installed to facilitate the safe operation of the bridge. Such a solution may also facilitate the use of the roadway as a shared surface that could accommodate pedestrian and cyclists.

Shannon Head Race, Tail Race and Parteen Basin Dams

The Shannon Head Race is located between the Ardnacrusha Power Station and the Parteen Weir. The Tail Race extends from the Ardnacrusha Power Station south towards the intersection of the Tail Race and the Shannon. The embankments associated with the Parteen Basin extend from the Parteen weir to the location where the Ardcloony River enters the Parteen Basin. The Head Race and Tail Race are man-made canals which span approximately 30m and were constructed in the 1920s. While in some instances, the canal was cut into the existing ground, it is more typically formed from constructed embankments. Through consultation with the ESB, it is understood that these

embankments were not built to modern standards or with modern machinery and construction practices and that their make-up may not be entirely homogeneous. The embankments are subject to ongoing maintenance and inspection and are categorised as Class A dams, which is a category of dam that denotes that a failure could result in loss of life. During consultations, the ESB have expressed the following concerns in respect of the development of the greenway along or adjacent to the canal embankments:

- Structural Integrity – ESB personnel have expressed concerns that the construction and operation of a greenway on the canal embankment or adjacent to them could impact on the structural integrity of those embankments and have highlighted the potentially serious consequences on any embankment failure.
- User Safety – ESB personnel have highlighted that there are steep side slopes that fall towards the canal at the top of the embankments and that there are not currently any natural access or egress points from the canal to assist in facilitating a recovery or a rescue effort. Flows within the canals fluctuate from 0 m³/s to 400 m³/s depending on operations. Swimming is prohibited, however there are often instances as such and the ESB have reported that there have been casualties as a result of the public entering the water. The ESB have expressed its view that promoting people to areas adjacent the dam increases the risk to loss of life. The ESB have also noted that the tailrace canals was blasted out of rock and has particular steep sides and is subject to more significant flow velocities than the headrace canal
- Impact on Operation and Maintenance – ESB personnel raised a number of concerns in respect of how the proposed greenway might impact on operation and maintenance of the embankments associated with the Shannon Head Race, Tail Race and Parteen Weir Embankments as follows:
 - Regular embankment maintenance and grass cutting is performed by a combination of machinery and grazing by a controlled flock of sheep. ESB personnel highlighted that the machinery used could damage the greenway surface and that the use of farm animals, necessary for the maintenance of the embankments, may not be conducive to the provision of a greenway in this location.
 - There are an intricate network of piezometers located at the base of the embankments, which are used to take readings which relate to the stability of the embankments. The ESB is concerned about how the proposed greenway may impact or interfere with these instruments and the monitoring of readings and has advised that any activity that would increase the risk of these devices being damaged would be unacceptable to them.
 - There are relief pools located adjacent Parteen Weir which relieve uplift pressure directly adjacent the dam. The ESB has expressed its view that the development of a greenway in the vicinity of these pools, which would likely increase public access to them, would introduce a safety or maintenance risk which is unacceptable to the ESB.
 - The operation and availability of ESB access points to the Head Race is considered to be a key element of ESB's maintenance operations. The ESB has expressed a concern that the development of a greenway along or adjacent to the head race may result in accesses becoming blocked. This would compromise ESB's ability to react to a dam safety or other incident and is considered unacceptable to the ESB.
 - There are a number of structures built to convey water beneath Parteen Weir and the Headrace Canal. The inlet, outlet and structures themselves are closely monitored. Blockage or change of flow to these syphons and culverts cannot be risked as blockage of same (as occurred over the life of the scheme) could have a detrimental effect on

the dam's operation. In addition, a change of flow to the structures could reduce the ESB's ability to detect leakage and Seepage flow from the Dam which is an unacceptable Dam Safety risk

- Due to sensitive nature of the grounds adjacent the embankments and the impact a change to them could have on the structure, ESB has advised it could not risk inadvertent damage to the structure by maintenance of the greenway by others.
- Ongoing essential maintenance of specific sections of the embankments would likely lead to periods where the greenway would be unavailable to users.

Parteen Weir/Shannon Head Race (Ref ST212)

There are existing structures that span the Shannon Head Race at the Parteen Weir. To use this crossing, it would be necessary to use the existing footways or to develop a new structure at this location. ESB have noted that such an option may not be feasible due to concerns in respect of its impact on ESB's ability to perform its operational and maintenance functions and due to safety concerns.

4.6 Ecology

An ecological constraints study has been conducted and is included as Appendix F of this report. The ecological constraints exercise was informed by a desktop study and a walkover survey of the study area. It provides an assessment of the existing ecological resources within the study area, designated conservation areas, the main habitats of conservation value and the associated conservation objectives with a view to providing a comprehensive understanding of ecological constraints.

The desktop survey determined that preliminary route options developed to date often run through or border Lough Derg SPA and the Lower River Shannon SAC. The route also runs in close proximity to the River Shannon and Fergus estuary SPA. The interface between preliminary route options and protected/designated sites are illustrated in the ecological constraints drawings included in Appendix B.2.

Following the desktop study, field surveys were carried out by a team of ecologists from Flynn Furney Environmental Consultants in October and November 2021. The primary aims of the field surveys were to:

- Identify habitat types within the study area at a high-level (Fossitt level II to level III)
- Assess for the presence of protected species
- Identify ecological and environmental constraints
- Identify ecological sensitivities around and within the study area

On the basis of these studies, a series of tables that set out the habitats and ecologically sensitive area associated with each preliminary route option has been developed. These tables provide recommendations on the viability of each preliminary route option. These recommendations are summarised as follows:

Limerick to Cloonlara:

- The development of the red route is not considered to be compatible with current conservation objectives in its current form. Consideration should be given to clarifying the route through Springfield bog and tie-into existing facilities at UL rather than developing these facilities through the SAC.

- The development of the green route is not considered to be compatible with current conservation objectives where it borders the River Shannon. This route should be amended significantly to avoid ecologically sensitive areas, inclusive of associated buffer zones.

Cloonlara to Ardcloney:

- The green route option may continue to be considered as part of the Options Selection phase of the development.
- The orange route option may continue to be considered as part of the Options Selection phase of the development.
- The red route is not considered to be compatible with current conservation objectives. This route should be removed from consideration or amended significantly to avoid ecologically sensitive areas, inclusive of associated buffer zones.

Ardcloney to Craglea:

- The green route is not considered to be compatible with current conservation objectives where it borders the Parteen Basin. This route should be removed from consideration or amended significantly to avoid ecologically sensitive areas referred, inclusive of associated buffer zones.
- The orange route option may continue to be considered as part of the Options Selection phase of the development.
- The red route option may continue to be considered as part of the Options Selection phase of the development subject to a buffer distance from the Ballyteige river being defined to ensure an adequate distance is given to protect this high fishery value river.

Craglea to Ballyheefy:

- The green route option may continue to be considered as part of the Options Selection phase of the development.
- The orange route option may continue to be considered as part of the Options Selection phase of the development.
- The red route option may continue to be considered as part of the Options Selection phase of the development.

Ballyheefy to Raheen Moor

- The green route option may continue to be considered as part of the Options Selection phase of the development.
- The red route option may continue to be considered as part of the Options Selection phase of the development.
- The orange route is not considered to be compatible with current conservation objectives. This route should be removed from consideration or amended significantly to avoid ecologically sensitive areas referred, inclusive of associated buffer zones.

Raheen Moor to Scarriff

- The green route option may continue to be considered as part of the Options Selection phase of the development.
- The red route option should be amended where possible to minimise impact on identified features of interest as part of Options Selection phase.

- The orange route is not considered to be compatible with current conservation objectives. This route should be removed from consideration or amended significantly to avoid ecologically sensitive areas referred, inclusive of associated buffer zones.

While noting that the study area passes through areas of rich ecological value, on the basis that there are viable route options within each section of the study area, it is considered that, a feasible route may exist. It is also noted that a greater number of options can be brought forwards for assessment if amendments to preliminary route options referred to above are made. Consideration should be given to the appropriate start/termination point of the red route between Limerick City and University of Limerick is this option is ultimately preferred over the green route. Consideration should be given to moving the green route away from the banks of the Shannon between Limerick City and the start of the Shannon Tail Race as part of the options selection process.

4.7 Archaeological, Architectural and Cultural Heritage

The assessment of cultural heritage constraint for this project involved a desktop survey of archaeological, historical and cartographic sources within the identified study area. The following sources were examined to establish the archaeological, architectural, and cultural heritage potential of the proposed development:

- Record of Monuments and Places (“RMP”)/ for County Limerick and County Clare;
- Limerick City Development Plan 2010-2016
- Limerick City and County Development Plan 2022-2028 (Draft), Volume 3: ACA’s and RPS;
- Clare County Development Plan 2017-2023, Volume 4: Record of Protected Structures (RPS);
- Urban Archaeological Survey (Limerick City);
- National Inventory of Architectural Heritage (NIAH);
- Cartographic sources, including first edition 6” OS maps;
- Aerial photography;
- Excavation bulletins;
- Clare Bridge Survey
- Clare Canal Locks & Bridges
- Clare Shannon Navigation Architectural Survey

The desktop assessment of the route options for the proposed greenway development identified 52 recorded archaeological sites from the Record of Monuments and Places located within the study area, as well as 43 sites of architectural heritage significance included in the NIAH and Records of Protected Structures in the Development Plans for Counties Limerick and Clare. Eighteen further sites of potential cultural heritage significance were also identified from cartographic sources or local authority surveys.

Ten recorded archaeological sites were identified in close proximity to the Red Route Option, of which three are historic bridges or features associated with bridges. One enclosure recorded at O’Briensbridge (CL054-008) was removed by the construction works of the head race for Ardnacrusha in 1925. Six enclosures and a mound with standing stone are located within 20m of the proposed route.

Fourteen recorded archaeological sites were identified in close proximity to the Green Route Option. Of these, six are associated with St.Cronan’s Church and Graveyard in Tuamgraney. It is not expected that the development of the route will impact directly on any part of this site, given its significance. The Bastioned Fort (LI005-017147) west of Thomond Bridge in Limerick City is located within the Zone of Archaeological Potential. However, it is not anticipated that there will a requirement for

groundworks at this location, as the route will follow existing road surfaces. The remaining five sites are a roadway or track of unknown date at Ardnataggle, an ecclesiastical enclosure with souterrain and two bullaun stones (CL029-023001-04) and two ringforts (CL029-021001 and CL029-021002), all located directly along the roadside at Ogonelloe. Any development works in these areas are likely to require consultation with the National Monuments Service.

Any development works within the Architectural Conservation Areas of Limerick City, O'Briensbridge, Tuamgraney and Scarriff will require special consideration and impacts on existing streetscapes, street furniture, views and any features associated with protected structures should be avoided.

In total, 43 structures of Architectural Heritage Significance were identified within the study area. As the Red Route Option follows the Errina Canal, nine of the sites directly impacted by this route option are associated with canal architecture. Due to the nature of the development, it is expected that impacts on these features can be mitigated through route design.

Other potential impacts on Architectural Heritage sites were identified at the location of Ballyvally House, just north of Killaloe and at Tineran House, further along the R463. The Green Route Option passes the demesne walls, gates and gate lodge for Ballyvalley House (NIAH 20404510, RPS 440) located along the eastern side of the R463, close to the access lane for Brian Boru's Fort. It is recommended that any route design at this location must mitigate against impacts on these structures. The proposed Orange Route Option passes through the 19th century entrance gates adjacent to the gate lodge associated with Tinerana House at Islandcosgry/ Rahena Beg (NIAH 20403702), located along the western side of the R463. The Orange Route then continues through the estate lands and past the 18th walled garden located within the grounds of Tinerana House. The house and lands are in private ownership. The Green Route option also passes Tinerana Gate Lodge on the public road (R463). Between Tinerana and Scarriff, the Orange Route Option follows the southern shore of Lough Derg, where it will pass close to Castlebawn Tower House at Carrowena (A30/ AH 25: RPS 646 / RMP CL029-019). Due to changes in water levels, the tower house is now situated on a peninsula in the lake, but there may be previously unrecorded, below-ground features associated with the tower house at this location.

Other Architectural Heritage sites in close proximity of the route options are in the main located along existing roads in towns and villages and any impacts on these sites by the proposed scheme is deemed to be low due to the nature of the development.

The thirteen further sites of potential cultural heritage significance identified from cartographic sources and a number of previously undertaken local authority surveys represent three additional locks and bridges associated with the Errina Canal, two sites associated with the construction of the Ardnacrusa scheme, the sites of two Flour Mills at O'Briensbridge and Bealkelly (Raheen) and number of 19th century dwellings. The flour mills have now disappeared, but in the event of groundworks in these areas, there is high potential for features associated with these structures to be uncovered. The structures of the potential Estate Cottages at Rahena More and the site of the Constabulary Barracks at Rahena Beg may require further investigation.

The general impact of the proposed development on the cultural heritage of the study area is deemed to be low. It is expected that impacts on any features or sites outlined above can be mitigated through design of the route and avoidance of structures. Further detailed recording of features identified from cartographic sources should be undertaken during further stages of the project.

It is also noted that the proposed development, depending on the route selected, could provide improved access to canal architecture, to historic villages such as O'Briensbridge and Cloonlara, heritage sites at Killaloe, Tuamgraney and Scarriff and enhance the amenity value of the area.

As there is strong evidence that study area has been inhabited for several thousand years, there is high potential to uncover further unrecorded sites of archaeological significance in any sections where the greenway development will require the construction of new surface, especially through agricultural land. It is recommended that works shall be designed to minimise ground disturbance.

Further detail of the Archaeological, Architectural and Cultural Heritage assessments carried out are included in Appendix E of this report. The location of features identified in the report are illustrated on the constraints drawings in Appendix B.1.

4.8 Land Use and Planning

A number of preliminary route options have been developed as part of this constraints report in order to better understand the feasibility and potential impacts that may be associated with the scheme. The route options developed to date typically sought to use existing footpaths adjacent to prominent waterways. Where this is not possible, the routes sought to follow existing boundaries including road and field boundaries. In this manner, it is envisaged that any impact on landowners and agricultural operations could be minimised. It is recommended that further consideration should be given to the impact on farming operations as part of the route selection process. Consultation should be undertaken with the public and potentially impacted landowners as part of this process.

One of the waterways which is followed by preliminary route options which have been developed is the Shannon Tail Race and the Shannon Head Race, which are owned and operated by the ESB. The Head Race and Tail Race consist of very significant manmade structures which form canals which run from the Parteen Basin to Parteen village outside of Limerick City. The canals are associated with the operation of the Parteen Weir and the Ardnacrusha Power plant both of which play a significant role in the management of the lower Shannon catchment. Consultations have been undertaken with the ESB who have expressed concerns in respect of the feasibility of developing and operating a greenway within the curtilage associated with the Shannon Tail Race and Head Race. The concerns raised, in summary, relate to the structural integrity of their embankments, operation and maintenance of those embankments and user safety.¹⁴

It is noted that there are a number of domestic dwellings located within the study area and adjacent to the preliminary route options developed. Consideration should be given to how these dwellings are impacted and what mitigation measures can be provided to mitigate the impact, particularly where the proposals involve overlooking dwellings or part of dwellings such that the privacy previously afforded to them is impacted.

4.9 Land Ownership

Unlike many infrastructural projects, greenway projects and the applicable design standards can allow more flexibility for discussions with landowners to identify options that reduce impact or facilitate landowner operations. It is recommended that local landowners are approached at an early stage to determine whether acceptable route options can be identified that can meet all of the design criteria. Notwithstanding this, it is likely that not all landowners along a route of this magnitude would agree to a project, and it is important that due process, including formal public consultations and

¹⁴ Constraints associated with the Head/Tail Race embankments are also referred to in Section 4.5 - Structures

appropriate surveys and investigations are undertaken to support the design process and any future statutory approvals required.

Discussions are taking place at national level to agree the best approach to land acquisition for greenway projects, as landowner representative groups do not support the use of compulsory purchase orders for Greenway land acquisition. The Department of Transport published a Code of Best Practice for National Greenways in December 2021, which should be referred to during the subsequent phases of this project.

A further consideration in respect of land ownership is that, while compulsory purchase order powers may typically apply to lands within the study area, ESB lands associated with the Shannon Tail Race, the Shannon Head Race, Ardnacrusha Power Plant and the Parteen Weir are either practically or legally exempt and cannot or would not form part of a compulsory purchase order. Following extensive consultation, the ESB has advised that, on the basis of the structural, safety, operation and maintenance constraints referred to in section 4.5 of this report, it would be unwilling to provide its consent to the development of the greenway within the lands that are adjacent to the Shannon Head Race, Tail Race or Ardnacrusha. In the absence of the ESB's consent to allow the development on its lands and on the basis that the lands cannot be subject to a CPO, it is considered that routes within ESB lands should be considered to be unfeasible.

4.10 Material Assets – Agriculture

The preliminary route options developed to date typically sought to use existing footpaths adjacent to prominent waterways. Where this is not possible, the routes sought to follow existing boundaries including road and field boundaries. In this manner, it is envisaged that any impact on landowners and agricultural operations could be minimised, however, the exact impact on each operation would need to be assessed on case-by-case basis, based on an understanding of the type of farm impacted and the manner in which that farm is operated. It is recommended that further consideration should be given to the impact on farming operations as part of the route selection and preliminary design processes. Consultation should be undertaken with the public and potentially impacted landowners as part of this process.

4.11 Material Assets – Non-Agriculture

A construction project may affect material assets if it involves acquisition of land, demolition of private property or revaluation of or change in the development potential of adjoining lands / properties. Based on the preliminary route options developed to date, there is potential for a number of properties to be impacted by the proposed greenway. This is particularly the case where the green route option follows the R463 north of Killaloe and, to a lesser extent, where there are options that follow regional roads in other areas and local roads.

Along the R463, the development of a greenway that uses desirable minimum standards may require boundary walls to be moved back up to 4m. This is a constraint in areas such as Ogonnelloe, where buildings appear to be within 5 metres of the edge of carriageway. Figure 26 below provides an example of one such property.



Figure 26: Example of Material Asset which would be Impacted by Greenway

There are also instances where there may physically be enough room to provide a greenway between the carriageway and a domestic property, but, such is the proximity of the property to the road, doing so would have a significant impact on the property. Examples of properties that have the potential to be impacted by the greenway along the R463 and elsewhere are shown in Appendix C. Locations where adjacent domestic properties pose a constraint on the development of a compliant greenway are also shown on the Appendix B.1 constraint drawings.

4.12 Landscape and Visual

Greenways are typically developed 'at-grade', i.e. without the need for large embankments or cuttings. For that reason, their impact on the landscape is typically limited to the impact of introducing formal pathways where none previously existed. In the case of this project, the proximity of some routes to residential properties has the potential to impact the landscape and visual impacts of those properties. This is discussed further under the heading of material assets.

The Clare County Council Development plan 2017-2023 proposes that future planning policies for rural areas in County Clare be integrated by categorising the landscape in to three main types: settled, working and heritage with definitions provided in Figure 28 below.

- i **Settled landscapes** – areas where people live and work;
- ii **Working Landscapes** – intensively settled and developed areas within Settled Landscapes or areas with a unique natural resource;
- iii **Heritage Landscapes** – areas where natural and cultural heritage are given priority and where development is not precluded but happens more slowly and carefully.

Figure 28: Development Plan Extract – Landscape Categories

The Landscape designation map included in Chapter 13 of the development plan defines the areas between the Shannon in Limerick City and Clonlara as ‘working landscape’. The area between Clonlara and Garranroe is designated as ‘settled landscape’, while the area between Garranroe and Scarriff is designated as heritage landscape. Figure 27 below refers. The ‘heritage landscape’ classification between Clonlara and Scarriff could be a constraint given developments, although not precluded, are considered more carefully in these locations.

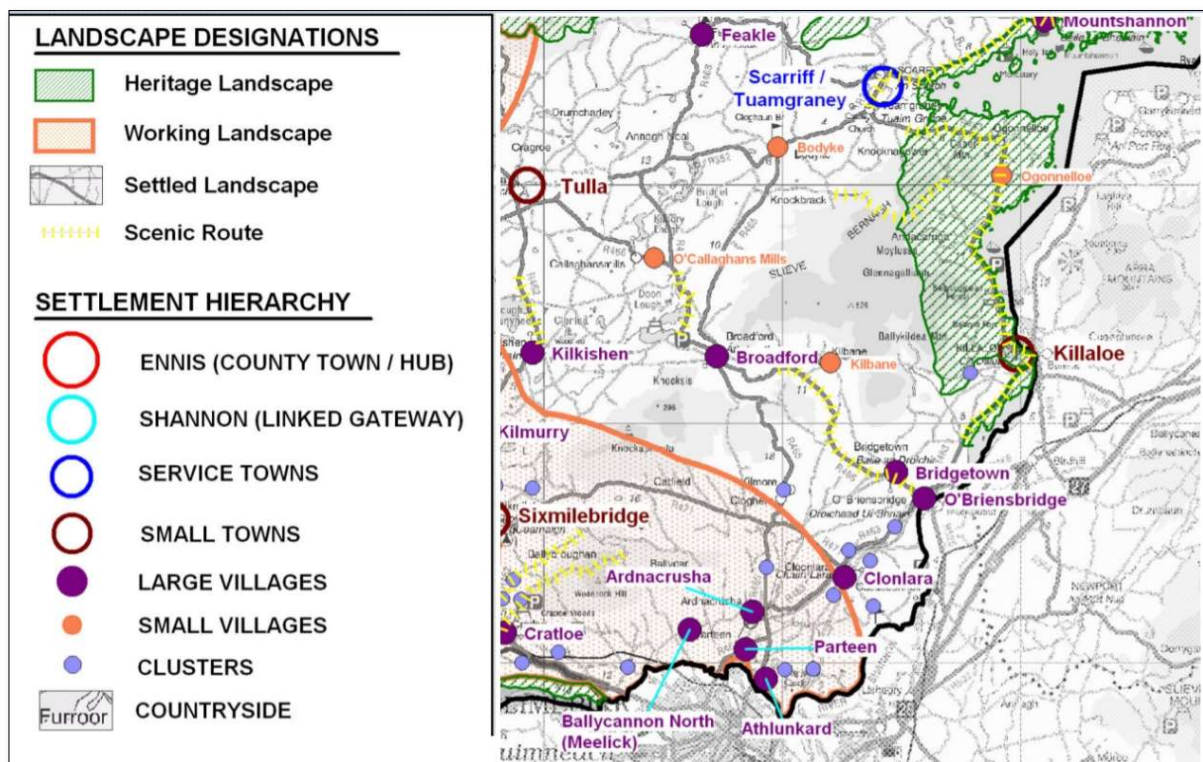


Figure 27: Landscape Designation with Study Area

4.13 Air Quality and Climate

The EPA air quality website provides air quality data for two locations within Limerick City: Henry St and People’s Park. The Limerick city stations monitor particulate matter (2.5 and 10), O₃ and NO₂. The current air quality index rating (October 2021) for both stations is 2 which corresponds to a ‘good’ classification.

It is not anticipated that the development would result in any likely significant impacts to air quality. The use of plant in the construction phase would have potential to cause environmental effects, however these effects can be reduced by adhering to best practice guidelines.

Carbon ceilings may be enforced on the transport and construction sectors, as part of the Carbon Budgets developed by the Climate Change Advisory Group. This may be a possible constraint at

construction stage and the means by which the carbon footprint of the scheme can be minimised should be considered at each stage of the project.

4.14 Noise and Vibration

Both the construction and the operation of the greenway are unlikely to have significant negative impacts in respect of noise and vibration where the greenway passes through rural area. There are not considered to be any constraints that will impact on route selection in respect of noise and vibration in such areas. Should the construction of the greenway require significant engineering works in urbanised areas or adjacent to dwellings, there is potential for noise and vibration disruption to occur during construction works. Areas where domestic properties or associated property boundaries may be impacted would be the areas most likely to be impacted and these areas are highlighted on the constraints drawings in Appendix B.1.

4.15 Human Beings and Human Health

The impact of the proposed greenway on human beings and human health has been considered insofar as it may act as a constraint on the development which will need to be considered as part of the route selection process. The constraints relating to human beings and human health are considered to be the consequential impacts of the potential impacts on materials assets described in section 4.10 above.

5 PHASING OF PROJECT

As part of this constraints study, Waterways Ireland requested that CCC consider if there are constraints that would restrict the construction of the greenway in phases. This report considers the design, procurement and construction of the project to determine if splitting the project into distinct phases is feasible.

- Design and Planning – Subsequent phases of this project will involve route selection, preliminary design and environmental evaluation and statutory consent. For the purposes of the environmental evaluation, it is important that the project is considered together to determine the full impacts of the proposed project on the environment. There will also be a number of advantages to progressing the route selection, design and consent process simultaneously including relative programme improvements, costs reductions, consistency of approach and reduction in project complexity due to a reduced number of interface points. The risk associated with progressing the project in its entirety through the planning process is that planning for the full project could be refused due to discrete issues in one area or section of the project.
- Procurement – Construction costs consist primarily of labour and material costs, along with the cost of preliminaries which, include site management, supervision and offices. It is considered that best value for money would be achieved if the project was procured under a single contract. This approach would typically result in lower preliminary costs, relative to the procurement of two separate contracts, and the greater economies of scale associated with one larger project may lead to lower rates for project materials. Procurement and contract administration costs are also likely to be lower on one larger project than on two smaller projects procured separately.
- Construction – Unlike large highways schemes, which may be concerned with an earthworks balance over a full scheme, greenways do not typically require significant earthworks. Cost considerations aside, there are not thought to be any significant restrictions that would prevent the proposed greenway being split into two or more phases. Nonetheless, progressing the project in its entirety is likely to be somewhat beneficial as it would allow completion at an earlier date and may improve consistency of the finished product.

6 CONCLUSIONS

Clandillon Civil Consulting has been appointed by Waterways Ireland to carry out a study in relation to the proposed Limerick to Scarriff Greenway to determine if the development of a greenway is feasible and to determine existing constraints, which would influence the development. CCC have assessed the viability of proposed greenway, the ability of the greenway to meet project objectives and key constraints, which should be considered in subsequent phases of the development.

6.1 Viability of Proposed Greenway

A constraints and feasibility study has been carried out that considered the planning context for the proposed scheme and engineering and environmental constraints within the adopted study area. Based on the investigations undertaken, it is considered that it is likely that a viable route option or a number of viable route options for a greenway between Limerick and Scarriff could be developed within the Study Area, except between Cloonlara and the Parteen Weir, and subject to the following caveats:

- Amendments should be made to the route in Limerick to avoid Special Areas of Conservation or an alternative start point should be chosen in order to ensure such areas are avoided;
- The proposed wording within the draft Clare County Development Plan, which relates to the development of greenways in areas of environmental sensitivity, is incorporated into the final plan.

Between Cloonlara and the Parteen Weir, the Study Area initially developed facilitated the development of three route options, all of which would require the consent of the ESB and one of which is also deemed to be incompatible with conservation objectives associated with the Lower Shannon SAC. As the ESB has advised that, on the basis of the structural, safety, operation and maintenance constraints referred to in section 4.5 of this report, it would be unwilling to provide its consent to the development of the greenway within its lands, it is considered that no viable route option existing within the original study Area developed. It is therefore recommended that the Study Area between Cloonlara and the Parteen Weir be expanded to facilitate the consideration of other options.

6.2 Meeting Project Objectives

The study area and associated preliminary route options were developed with the project objectives in mind. **Table 6** below provides a summary of project specific objectives and a comment on the likelihood of achieving those objectives.

Table 6: Project Specific Objectives

Objective	Comment
Provide connections to nearby villages and towns such as Clonlara, Obriensbridge, Killaloe, Ogonolloe and Tuamgraney	Each route options passes through or near referred towns. Spurs should be provided from preferred rout options to existing facilities on the urban fringe, where required.
Improve connection to University of Limerick, its Sports Campus and associated attractions and/or the proposed Ardnacrusha Visitor attraction.	The proposed greenway is likely to meet the objective of improving connectivity to the University of Limerick. As the constraints study has considered routes to Ardnacrusha to be unfeasible, the objective to link to the proposed visitor attraction will not be achieved.
Follow a number of waterway routes which may include the Park Canal, the Shannon River,	The proposed greenway is likely to achive the objective of following prominent waterways.

Objective	Comment
Errinagh Canal, the Shannon Head Race between Parteen Weir and Ardnacrusha and Lough Derg.	The extent to which the greenway interfaces with the Shannon head Race may ultimately be limited due to the conclusion that routes which follow the Head Race will be unfeasible.
Stimulate and grow economic activity in the urban fringes of Limerick City and Villages and Towns along and adjacent to the proposed greenway.	This will be considered further in developing the Preliminary Business Case for the scheme.
Increase the adventure and recreational potential of the area through increased sustainable tourist and amenity use of the countryside.	The proposed greenway will provide a new amenity through an area of natural beauty where there is currently limited segregated cycle facilities.
Create connectivity to existing routes and trails and future greenway routes and trails including Limerick County Council’s proposed greenway form Limerick to Castleconnel.	The proposed greenway would for part of the greater Shannon Greenway that may ultimately link to the Dublin to Galway Greenway and Royal Canal Greenway. It would ultimately be connected to the existing Limerick Greenway if the proposed Limerick to Rathkeele Greenway was to proceed and would also connect to proposed Limerick to Castleconnel and Ballina to Dromineer Greenways, were those schemes to be progressed. As such it would form a key link within a national greenway network.
Link and improve accessibility to a number of significant tourist attractions and features of interest including those in Limerick City, the Ard na Crusha Power Station, Parteen Weir, Killaloe Cathedral, Brian Boru Fort, St Cronan’s Church and Visitor Centre Tuamgraney and the Scarriff Workhouse.	The proposed greenway will be capable of improving accessibility to the tourist attractions. As the constraints study has considered routes to Ardnacrusha and along the Shannon Head Race to be unfeasible, the objective to link to the proposed visitor attraction at this location will not be achieved. The opportunity to interact with the Parteen Weir may also be limited

In addition to the project specific objectives, the Department of Transport, Tourism and Sport’s ‘Strategy for the Development of National and Regional Greenways’, states that national and regional greenways should be developed to be sustainable, strategic, substantially segregated and shared use, scenic and offer lots to see and do. The proposed greenway has been reviewed against these objectives as set out below:

- Sustainable – There is potential for this project to be developed to follow the alignment of existing tow-paths or trails along approximately 50% of its length. Where it is not possible to follow the tow-paths, there are typically options to follow field boundaries, rivers or local roads, which will assist in ensuring the greenway does not have significant impacts on the local environment.
- Strategic – As set out in Table 6 above, the proposed greenway will form part of the broader Shannon Greenway and be an important link between national greenways including the Dublin to Galway Greenway and the Limerick Greenway.

- Substantially Segregated & Shared Use – Preliminary route options have been developed which demonstrate the potential exists for the proposed greenway to be substantially segregated. The route would be developed in accordance with design standards to ensure it is of sufficient width to facilitate all non-motorised users.
- Scenic - The proposed greenway is likely to include sections along prominent water bodies, views of Lough Derg, the Shannon, the Shannon Head Race, Parteen Weir and has the potential to be of high scenic value.
- Lots to See and Do – Greenway users would benefit from existing attractions along or near the route including Limerick City, University of Limerick and associated facilities, Killaloe Cathedral, Brian Boru Fort, St Cronan’s Church and Visitor Centre Tuamgraney and the Scarriff Workhouse, ensuring that there are plenty of associated amenities along the route.

6.3 Key Constraints

During the course of the studies undertaken, some key constraints have emerged. These constraints fall into two categories:

- Constraints which rule out an identified preliminary route option; and
- Constraints which will need to be taken into consideration when developing formal route options.

Within the first category, ecological constraints are prominent and certain sections of preliminary route options have been ruled out of consideration in their current form. Proposals for these routes would need to be amended if they were to be brought forward for assessment as part of subsequent phases of the proposed development. Sections which need to be amended or discounted, include:

- The green route between Limerick City and the Shannon Tail Race, where it lies along the River Shannon;
- The red route within Co. Limerick where it borders the River Shannon or is otherwise with the Lower Shannon SAC;
- The red route between Cloonlara and Parteen Weir where it is within the Lower Shannon SAC;
- The green route along the Parteen Basin;
- The orange route where it lies along the shores of Lough Derg;

The ESB have advised that, on the basis of the structural, safety, operation and maintenance constraints referred to in section 4.5 of this report, it would be unwilling to provide its consent to the development of a greenway within the lands that are adjacent to the Shannon Head Race, Tail Race or Ardnacrusha. On the basis that the ESB’s consent would be required to develop a greenway that used its land, the route options which follow these water bodies have been deemed to be unfeasible.

A summary of prominent constraints which will require further consideration as part of subsequent design phases is as follows:

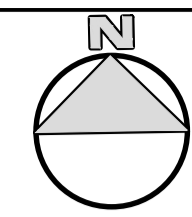
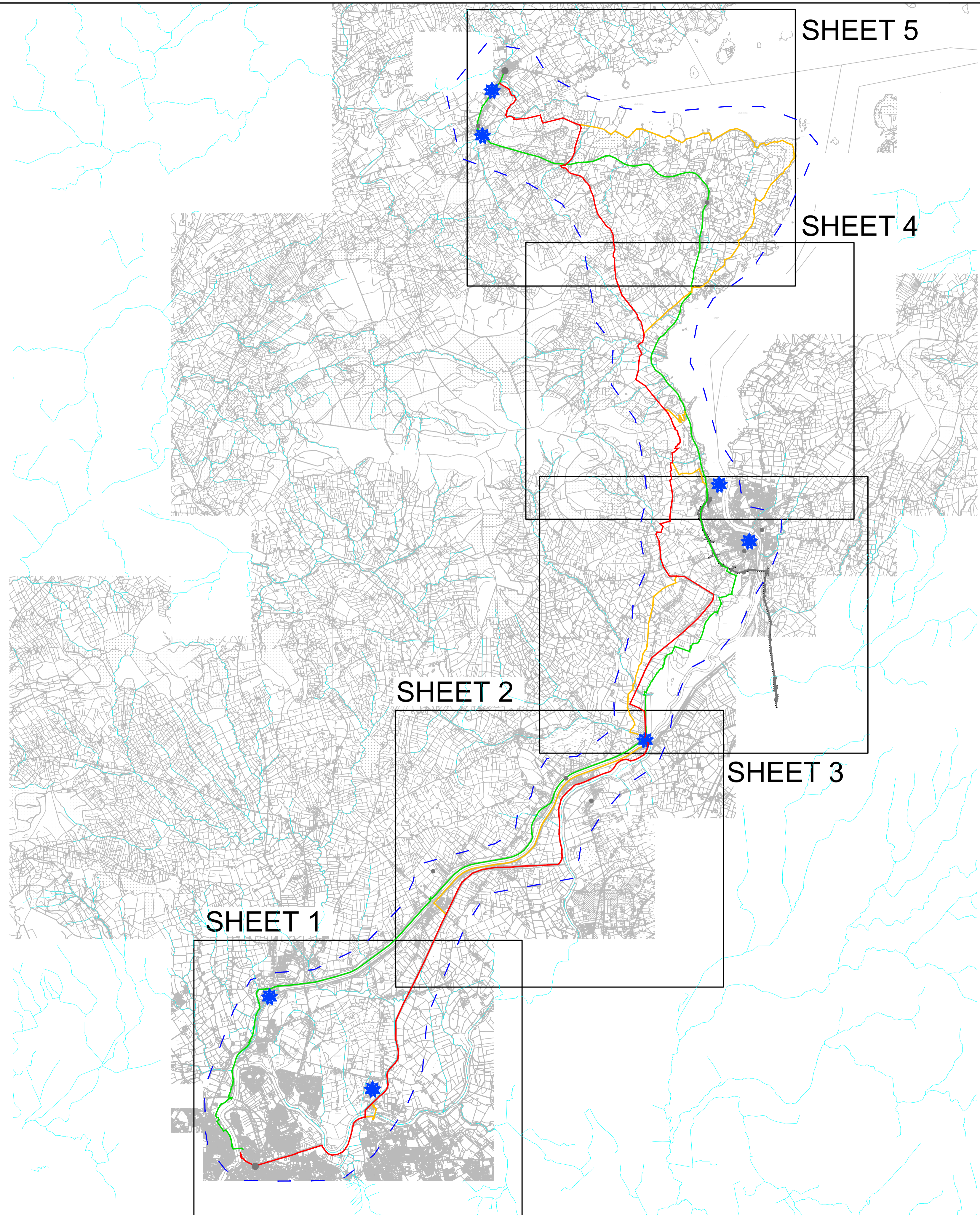
- Prominent cross-section constraints exist within the Study Area, particularly along the exiting R398 regional road and on existing bridges that cross the Shannon Head Race. The proposed cross-section of the Killaloe Bypass, which is below current national standards for active travel is a further cross-section constraint.
- Topography and its impact on vertical geometry is a particular issue along the red route between Killaloe and Tuamgraney.

-
- The extent of flooding along the Shannon is a constraint, albeit this is likely to be less prominent if routes are amended to move them out of SACs/SPAs.
 - Notwithstanding the proposals to develop route options which lie predominantly outside of SACs, SPAs and associated buffer zones, significant ecological constraints exist throughout the study area which will require further consideration should the scheme progress to Options Selection.
 - Land ownership, particularly in the northern half of the scheme, where the availability of publicly owned lands is limited is a key constraint.

It is further recommended that in the development of formal route options, connections are made between the route option proposed and prominent town, tourist attractions and features of interest to ensure they are accessible to greenway users.

APPENDIX A – STUDY AREA

FOR INFORMATION



NOTES

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2. Route options illustrated are preliminary only and have been developed in order to define a study area. Preliminary route options may be amended following the investigations of constraints during the route selection process.

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- STUDY AREA
- PRELIMINARY ROUTE - OPTION A
- PRELIMINARY ROUTE - OPTION B
- PRELIMINARY ROUTE - OPTION C
- FEATURE OF INTEREST
- WATERCOURSES
- KILLALOE BYPASS

KEY PLAN



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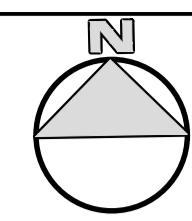
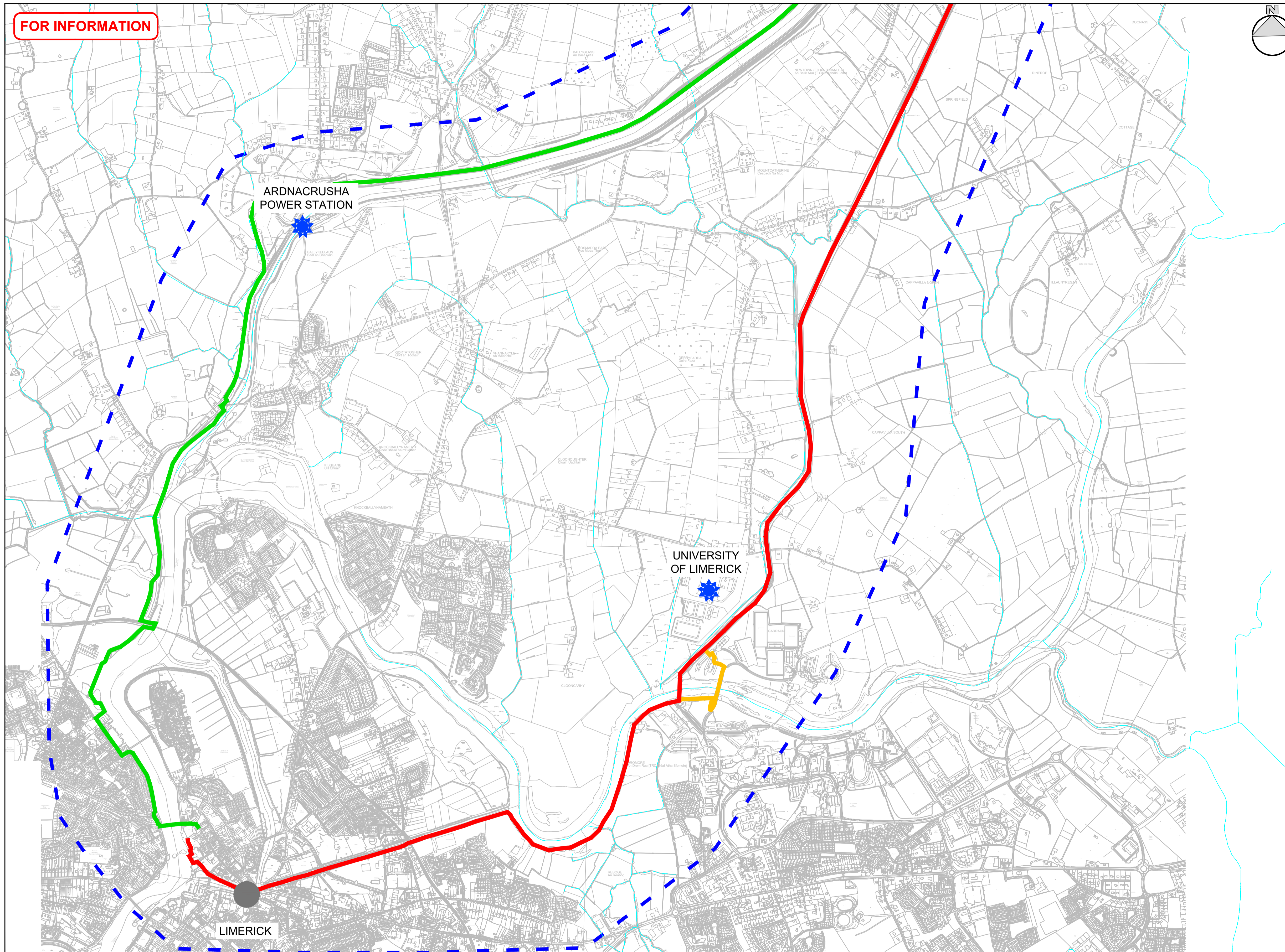
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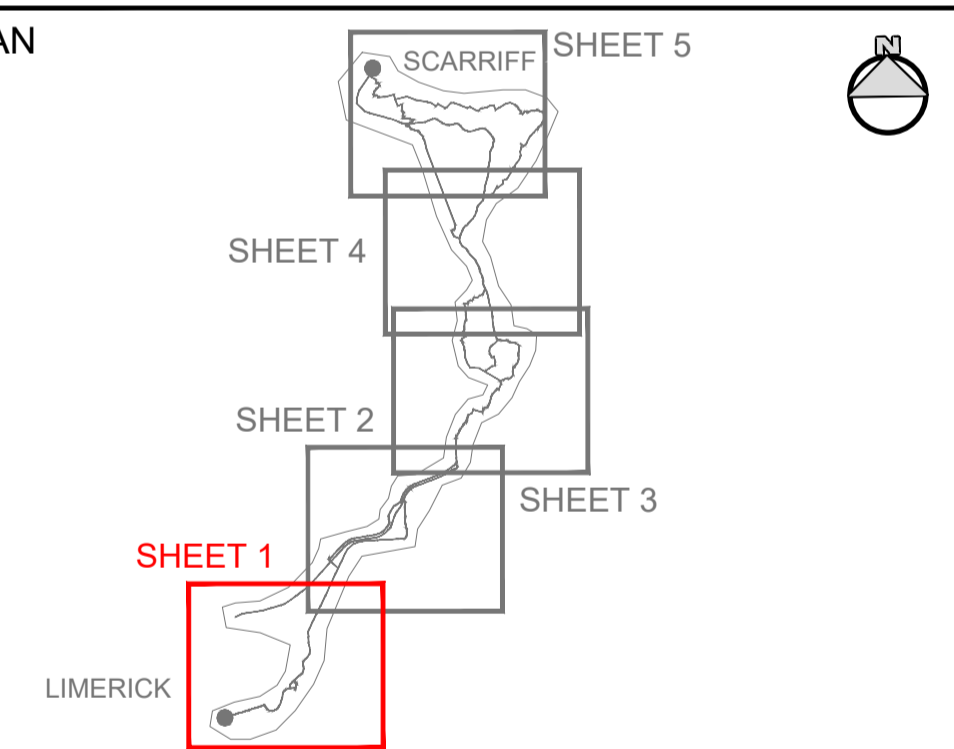
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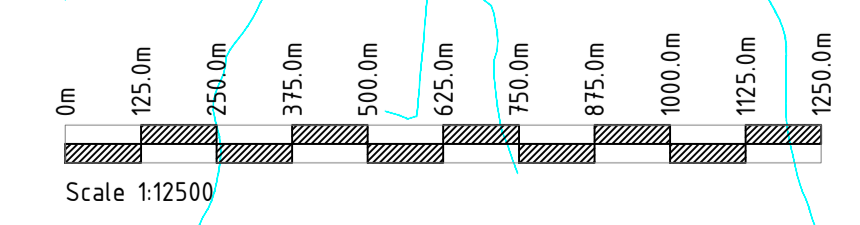
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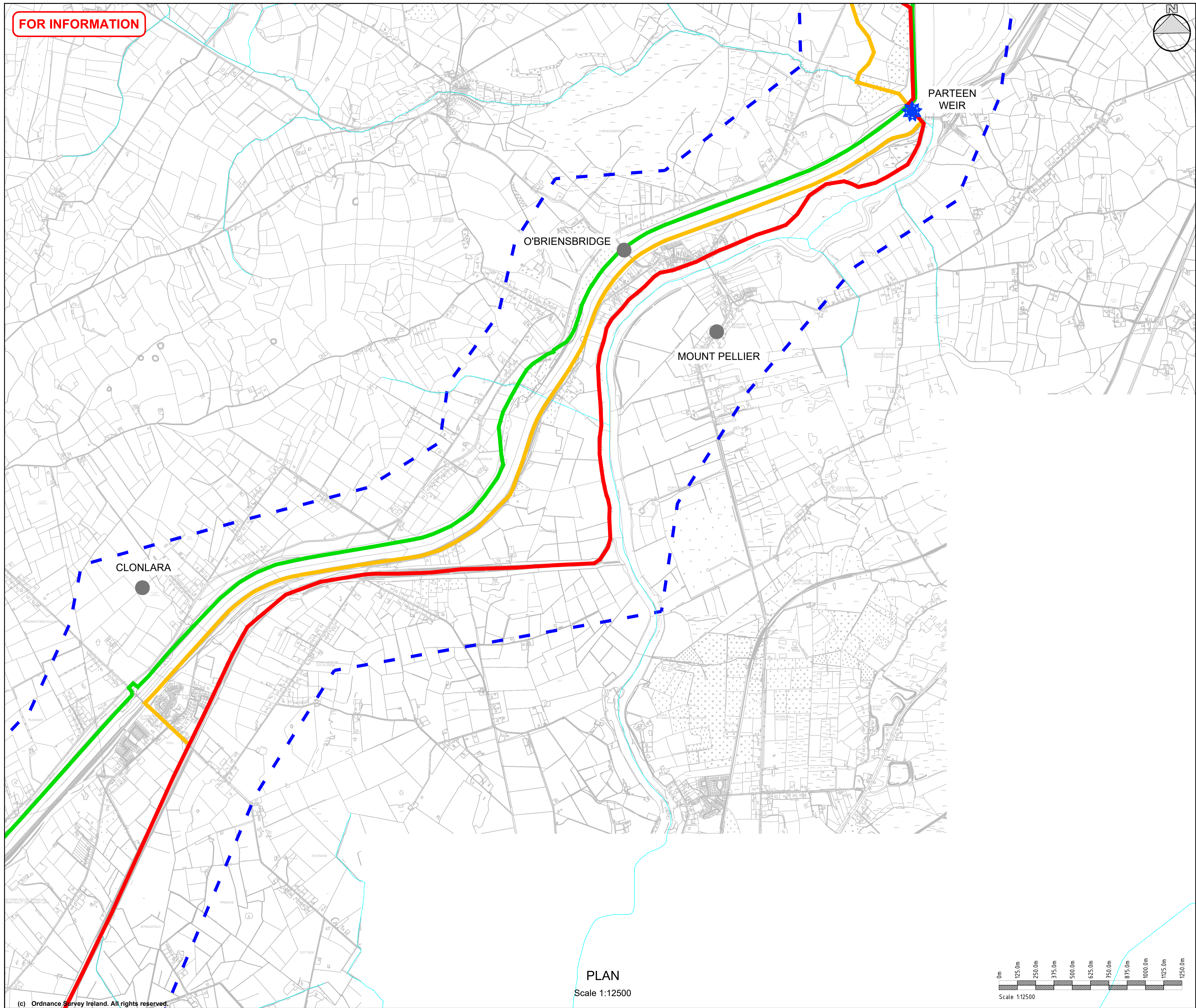
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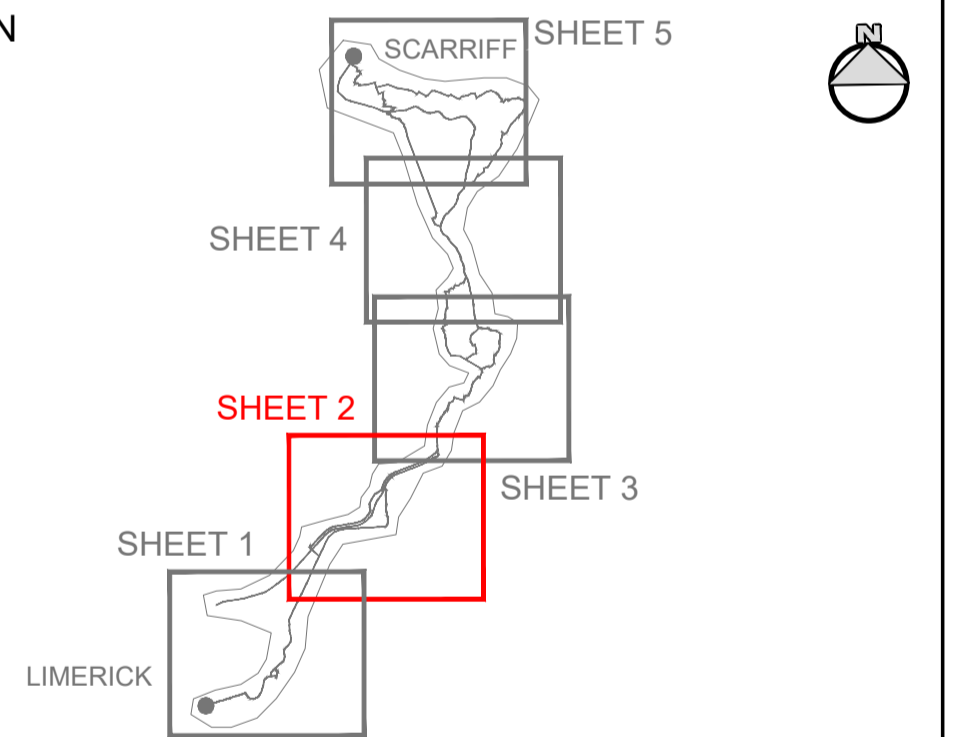
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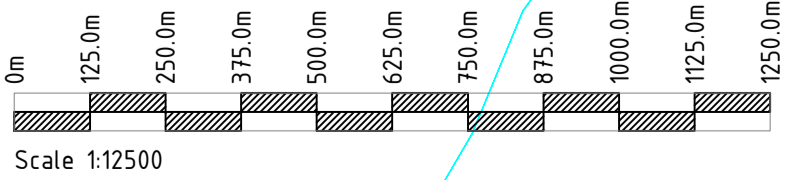
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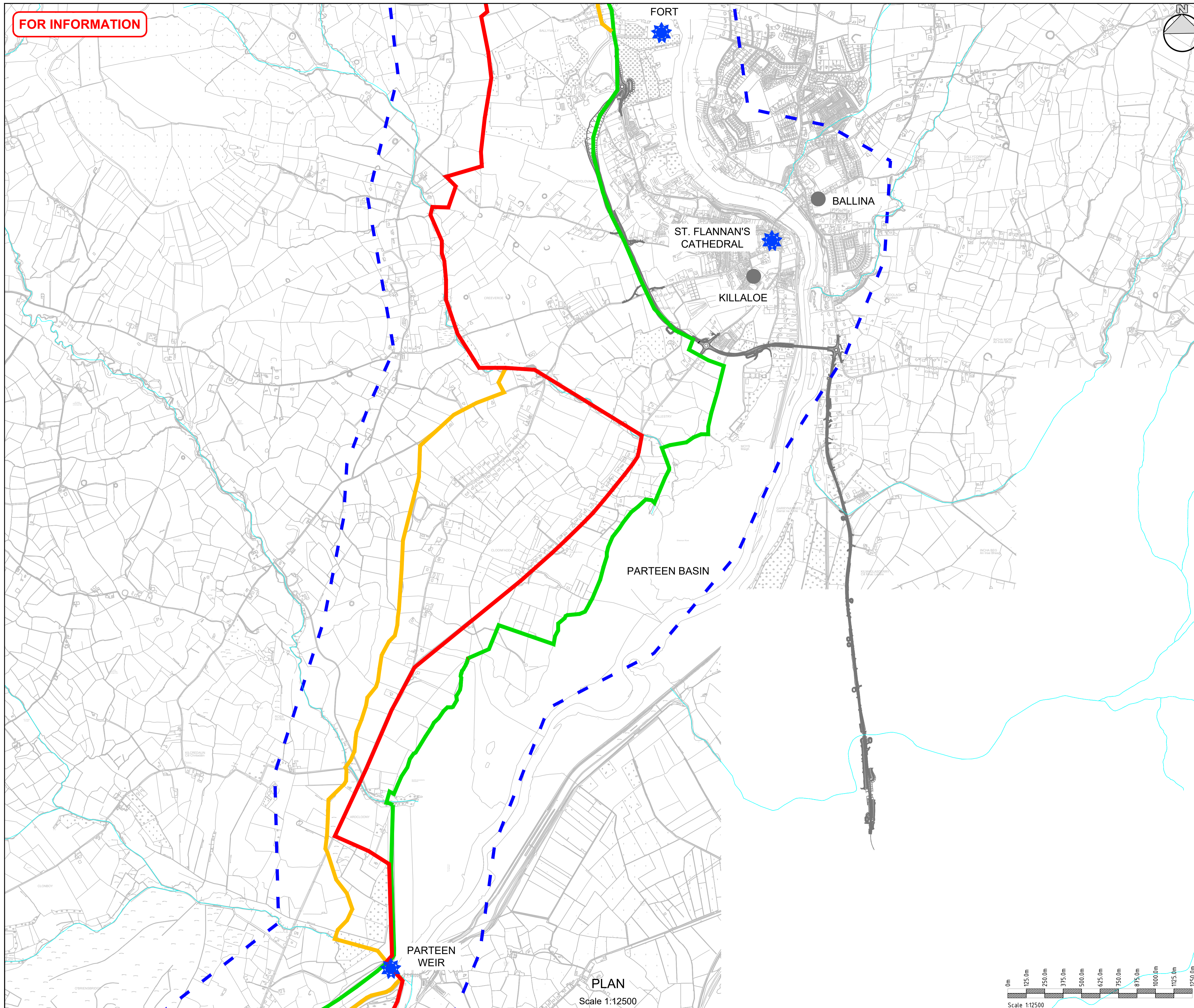
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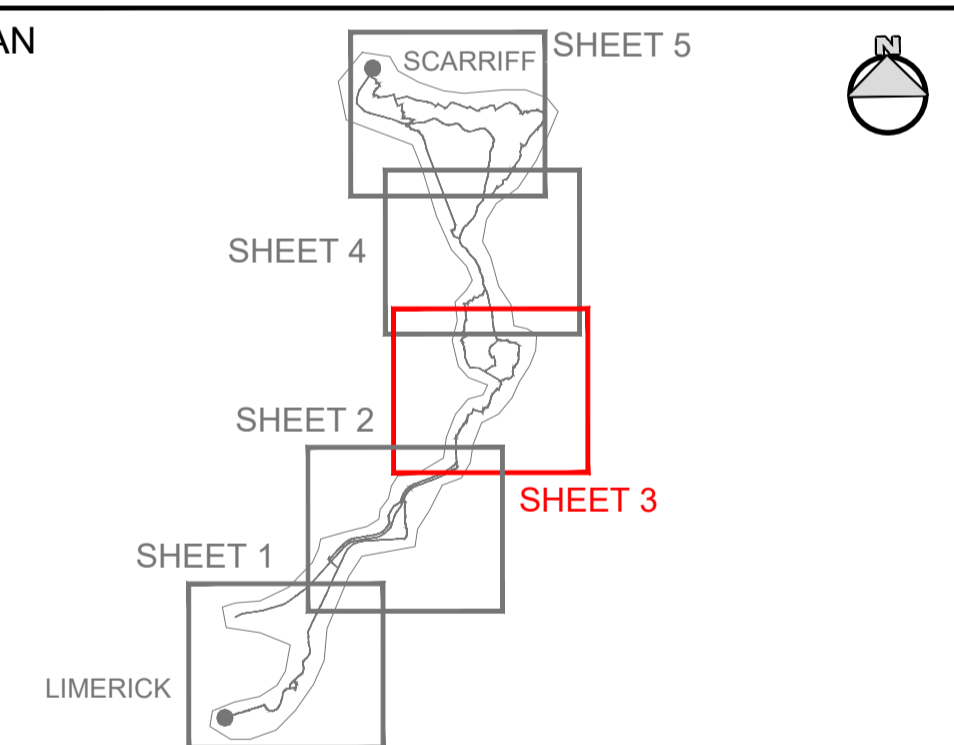
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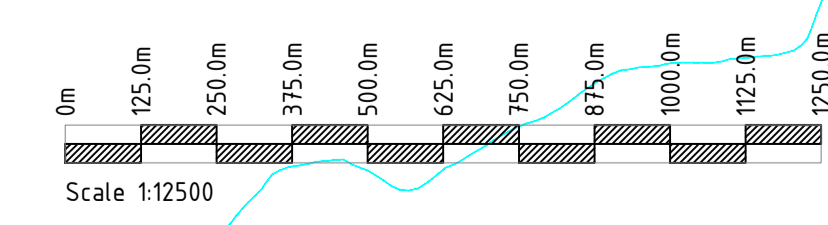
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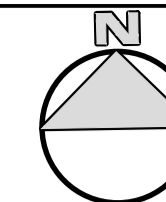
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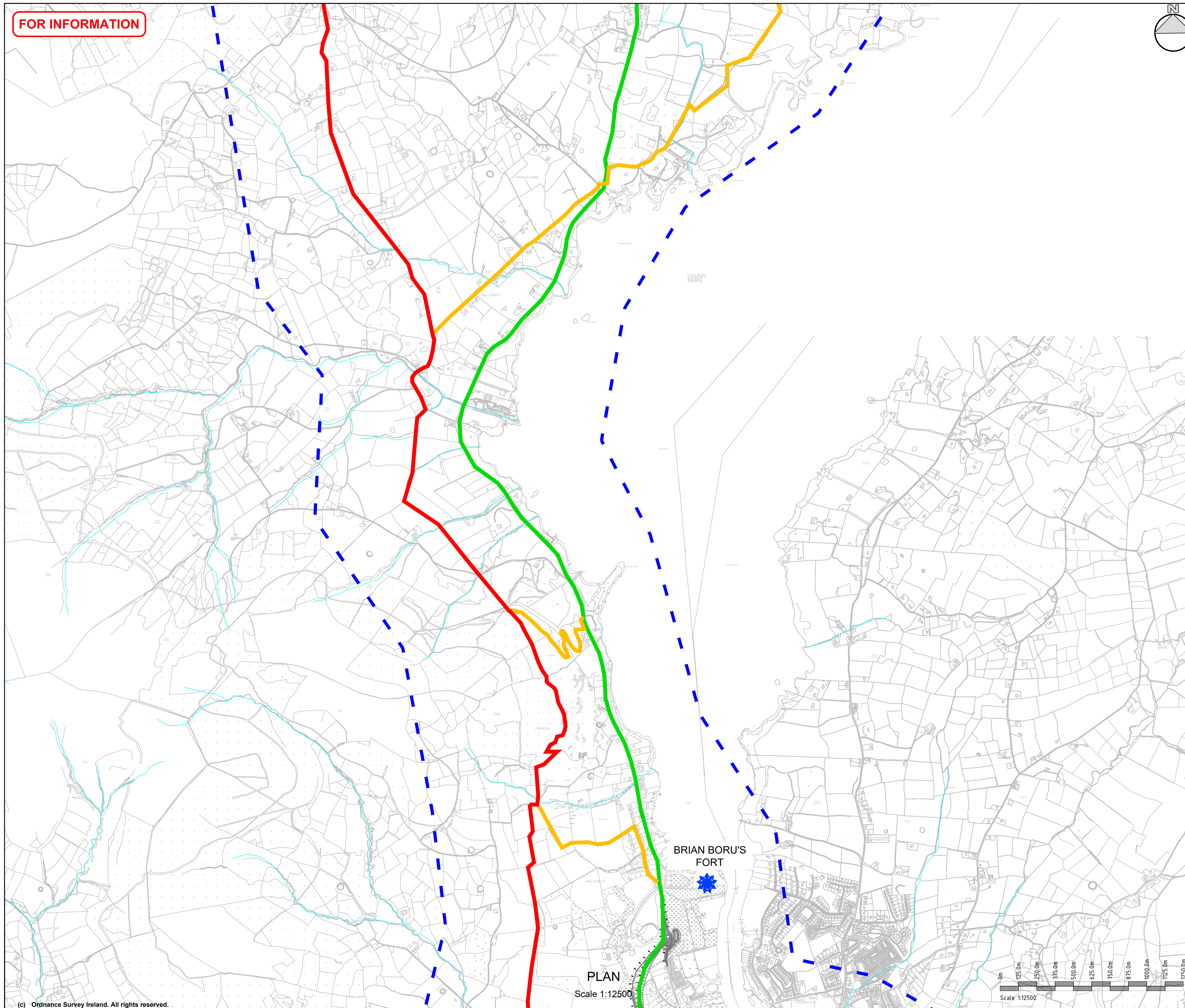


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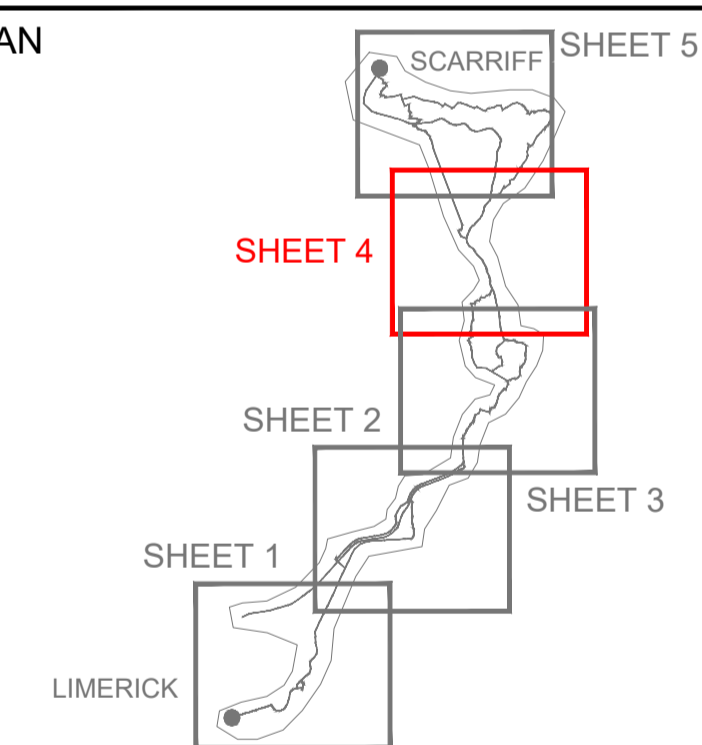
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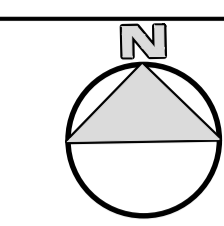
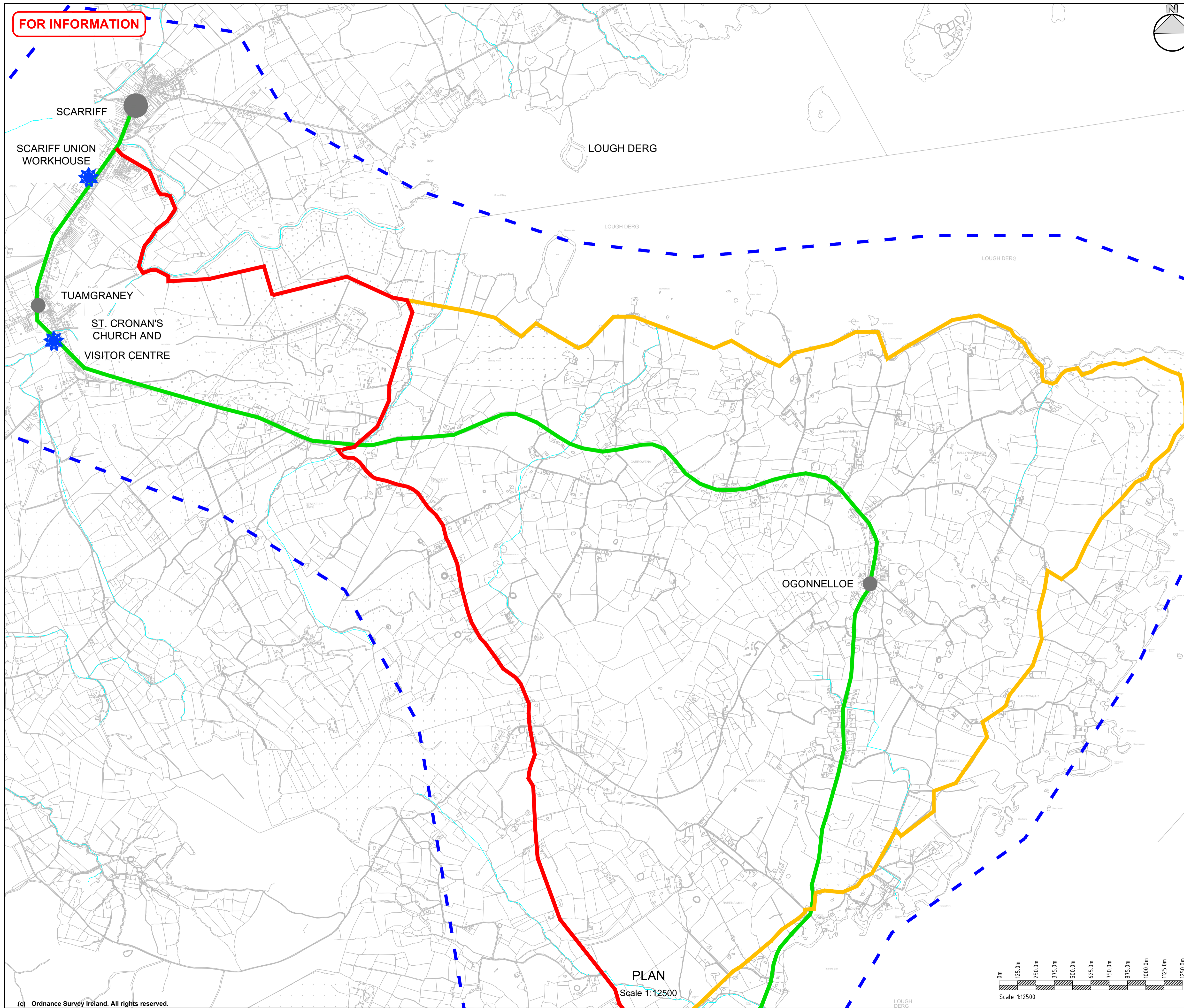
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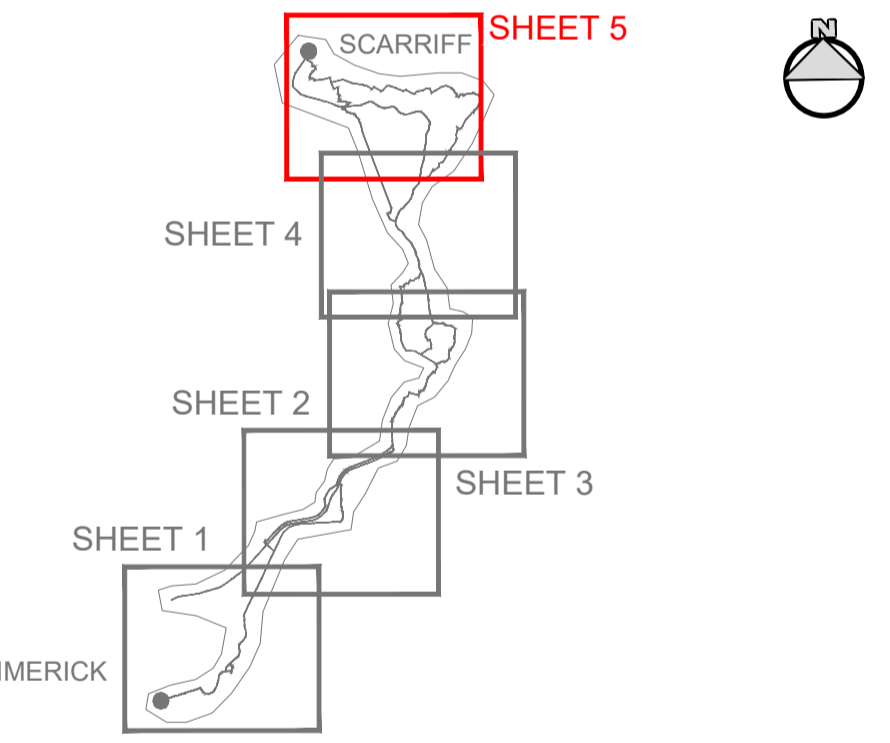
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I00	22/09/2021	FOR INFORMATION	KK	SF	SC

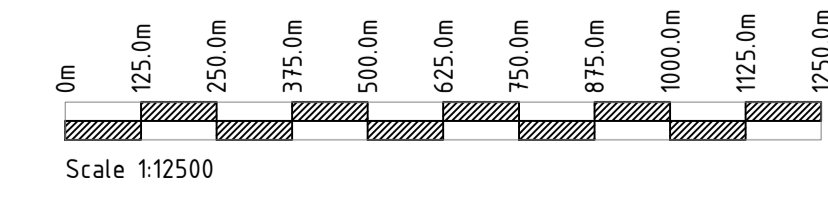
CLIENT
 Waterways Ireland
 Uiscebhéal Fáilteam Waterways Ailteam

DESIGNER
 CLANDILLON CIVIL CONSULTING

PROJECT
LIMERICK TO SCARRIFF GREENWAY PROJECT

DRAWING TITLE
STUDY AREA GENERAL ARRANGEMENTS SHEET 5 OF 5

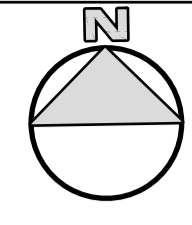
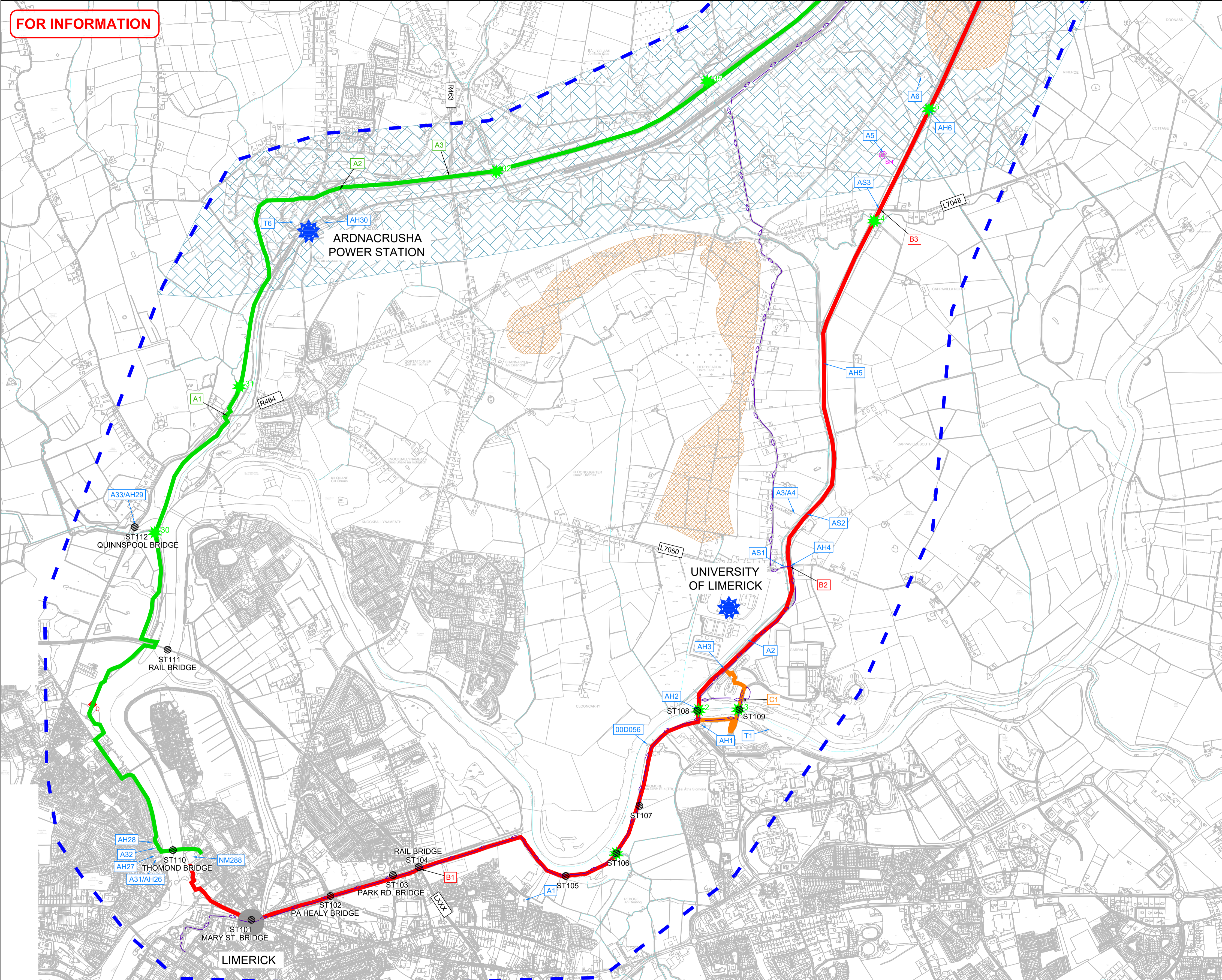
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DATE 12/08/2021	SCALE 1:12,500	SHEET SIZE A1
DRAWING NUMBER L2S-DR-GA-0005	REVISION I01	



APPENDIX B – CONSTRAINT DRAWINGS

APPENDIX B.1 – CONSTRAINT DRAWINGS

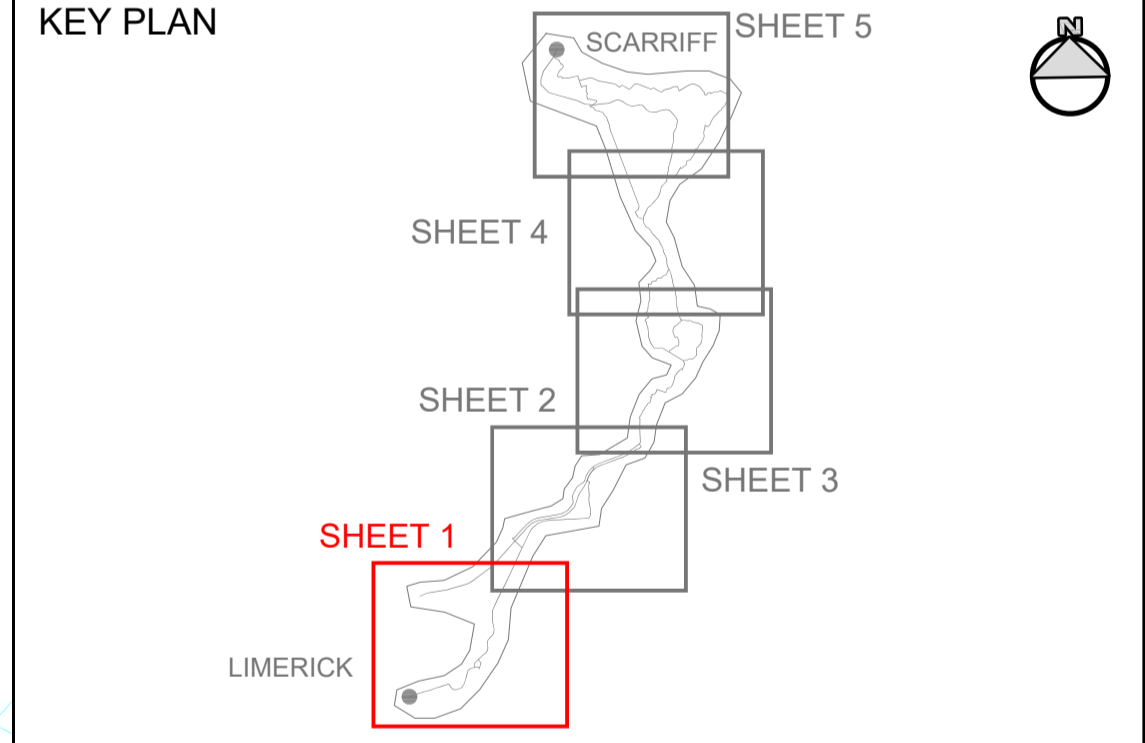
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- LEGEND**
- STUDY AREA
 - PRELIMINARY ROUTE OPTION - GREEN OPTION
 - PRELIMINARY ROUTE OPTION - RED OPTION
 - PRELIMINARY ROUTE OPTION - ORANGE OPTION
 - FEATURE OF INTEREST
 - WATERCOURSES
 - ROAD INTERFACES
 - VERTICAL GEOMETRY CONSTRAINTS
 - STREAM CROSSING
 - EXISTING STRUCTURE
 - POTENTIAL REQUIREMENT FOR NEW STRUCTURE
 - EXISTING DESIGNATED WALKS IN EAST CLARE:
 - LOUGH DERG WAY
 - O'BRIANSBRIDGE LOOP
 - O'BRIANSBRIDGE OLD BARGE LOOP
 - ERRINAGH BRIDGE LOOP
 - O'BRIENSBRIDGE - PARTEEN WEIR
 - EAST CLARE WAY

- GEOTECHNICAL CONSTRAINTS:**
- PEAT
 - ESTUARINE SILTS AND CLAYS
 - AREA OF HIGH LANDSLIDE SUSCEPTIBILITY
 - ALLUVIUM
 - EXTENTS OF KARST AQUIFER AREA
 - SINKHOLE
 - DUMP SITE
- ENVIRONMENTAL CONSTRAINTS:**
- DWELLING BOUNDARY
 - HERITAGE SITES
 - ARCHITECTURAL CONSERVATION AREAS



REV	DATE	DESCRIPTION	BY	CHK	APD
101	17/01/2022	FOR INFORMATION - ROAD NUMBERS ADDED	KK	SF	SC
100	16/11/2021	FOR INFORMATION	KK	SF	SC

CLIENT

DESIGNER

PROJECT

LIMERICK TO SCARRIFF GREENWAY PROJECT

DRAWING TITLE

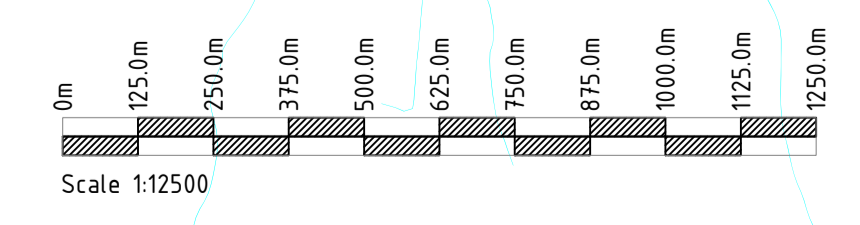
ENGINEERING & ENVIRONMENTAL CONSTRAINTS SHEET 1 OF 5

DESIGNED	DATE	DRAWN	SCALE	CHECKED/APPROVED	SHEET SIZE
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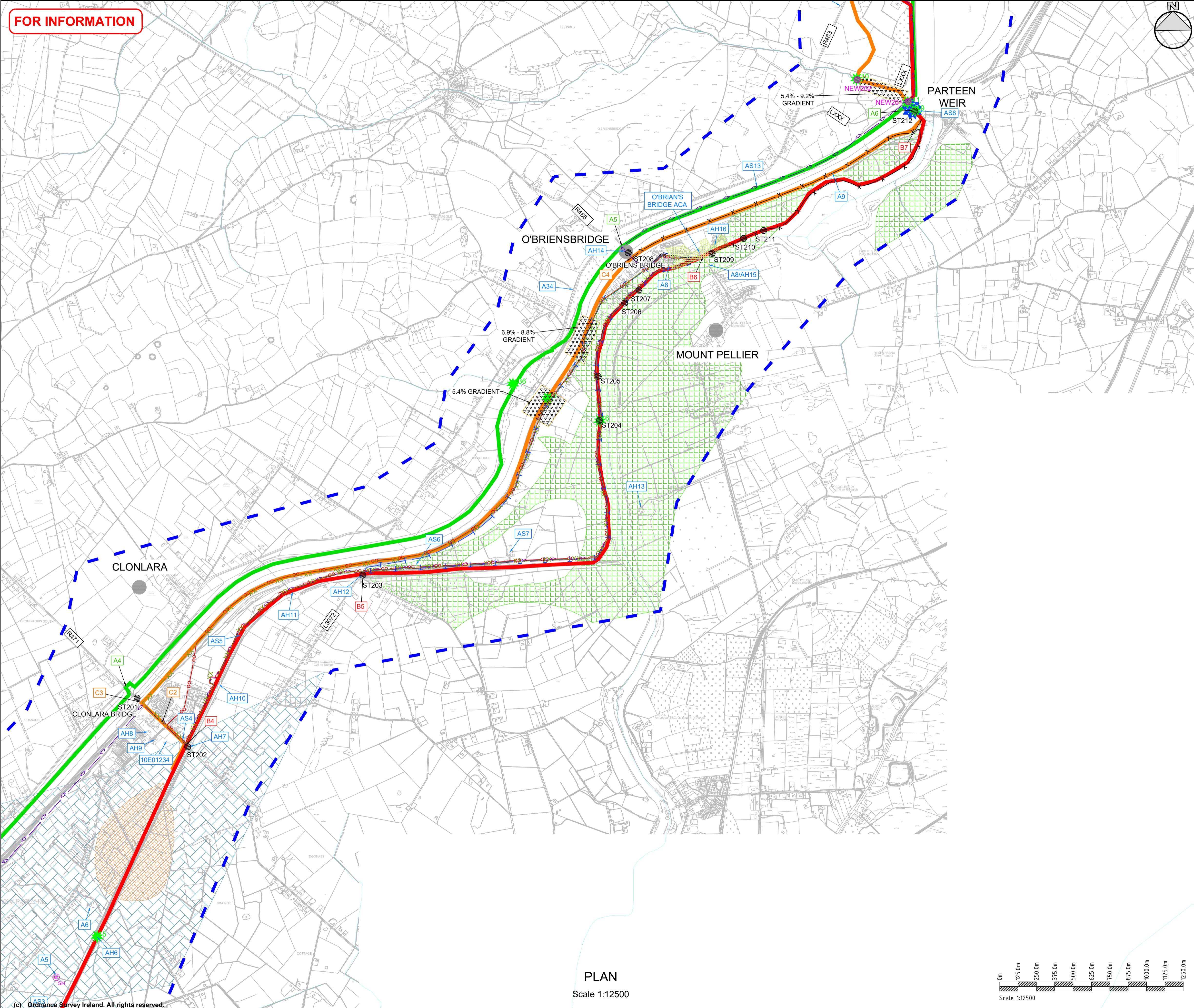
REVISION: 101

PLAN
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LEGEND

- STUDY AREA
- PRELIMINARY ROUTE OPTION - GREEN OPTION
- PRELIMINARY ROUTE OPTION - RED OPTION
- PRELIMINARY ROUTE OPTION - ORANGE OPTION
- FEATURE OF INTEREST
- WATERCOURSES
- ROAD INTERFACES
- VERTICAL GEOMETRY CONSTRAINTS
- STREAM CROSSING
- EXISTING STRUCTURE
- POTENTIAL REQUIREMENT FOR NEW STRUCTURE

EXISTING DESIGNATED WALKS IN EAST CLARE:

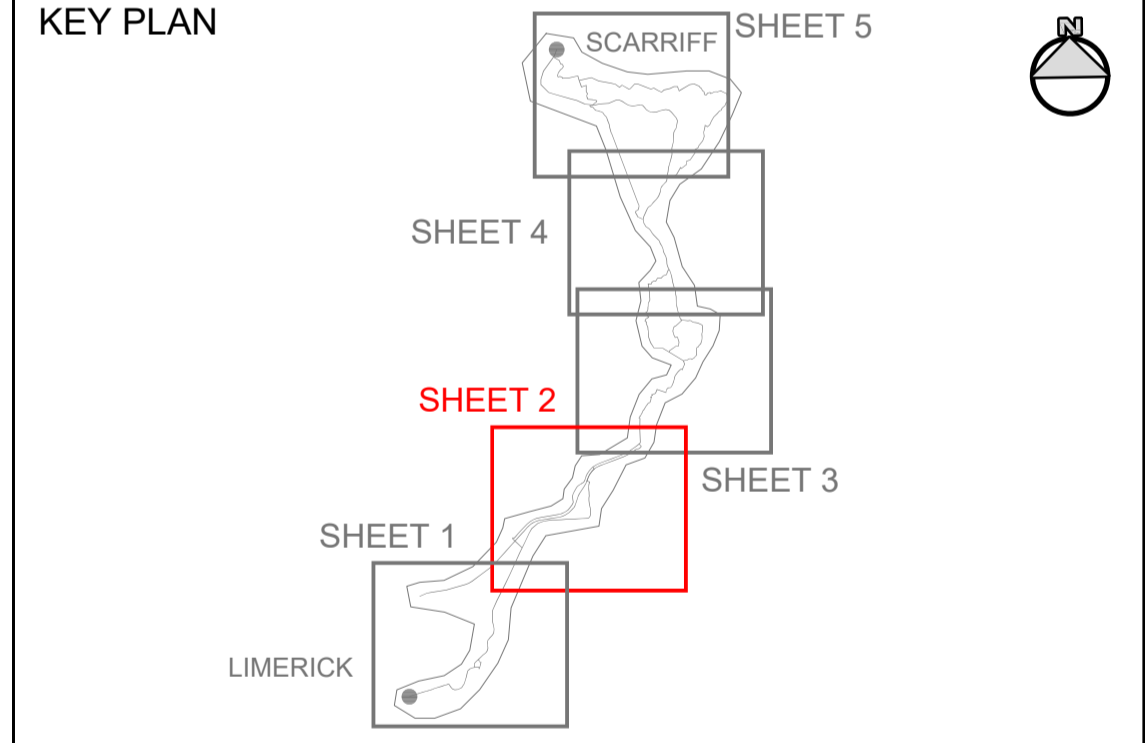
- LOUGH DERG WAY
- O'BRIENSBRIDGE LOOP
- O'BRIENSBRIDGE OLD BARGE LOOP
- ERRINAGH BRIDGE LOOP
- O'BRIENSBRIDGE - PARTEEN WEIR
- EAST CLARE WAY

GEOTECHNICAL CONSTRAINTS:

- PEAT
- ESTUARINE SILTS AND CLAYS
- AREA OF HIGH LANDSLIDE SUSCEPTIBILITY
- ALLUVIUM
- EXTENTS OF KARST AQUIFER AREA
- SINKHOLE
- DUMP SITE

ENVIRONMENTAL CONSTRAINTS:

- DWELLING BOUNDARY
- HERITAGE SITES
- ARCHITECTURAL CONSERVATION AREAS



REV	DATE	DESCRIPTION	BY	CHK	APD
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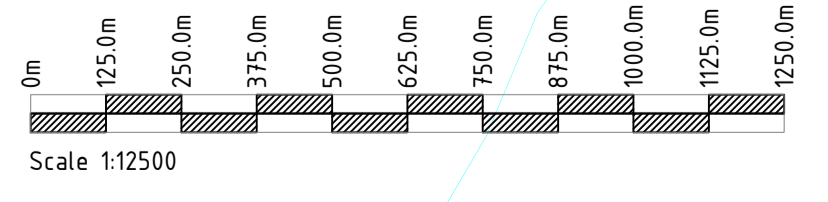
CLIENT

DESIGNER

PROJECT
LIMERICK TO SCARRIFF GREENWAY PROJECT

DRAWING TITLE
ENGINEERING & ENVIRONMENTAL CONSTRAINTS
SHEET 2 OF 5

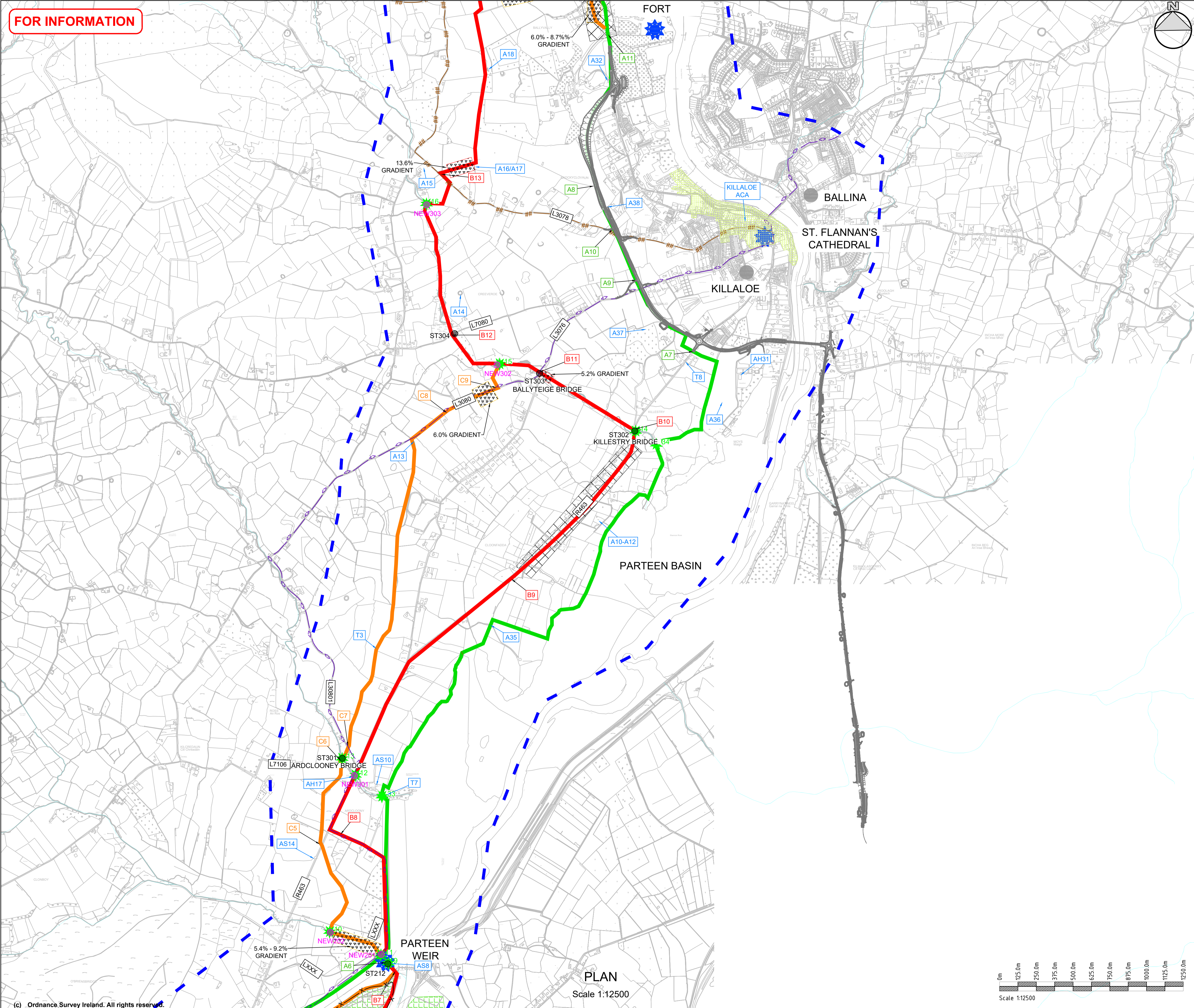
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SF	ZM	SC
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19/10/2021	1:12,500	A1
DRAWING NUMBER	REVISION	
L2S-DR-EN-0002	101	



PLAN
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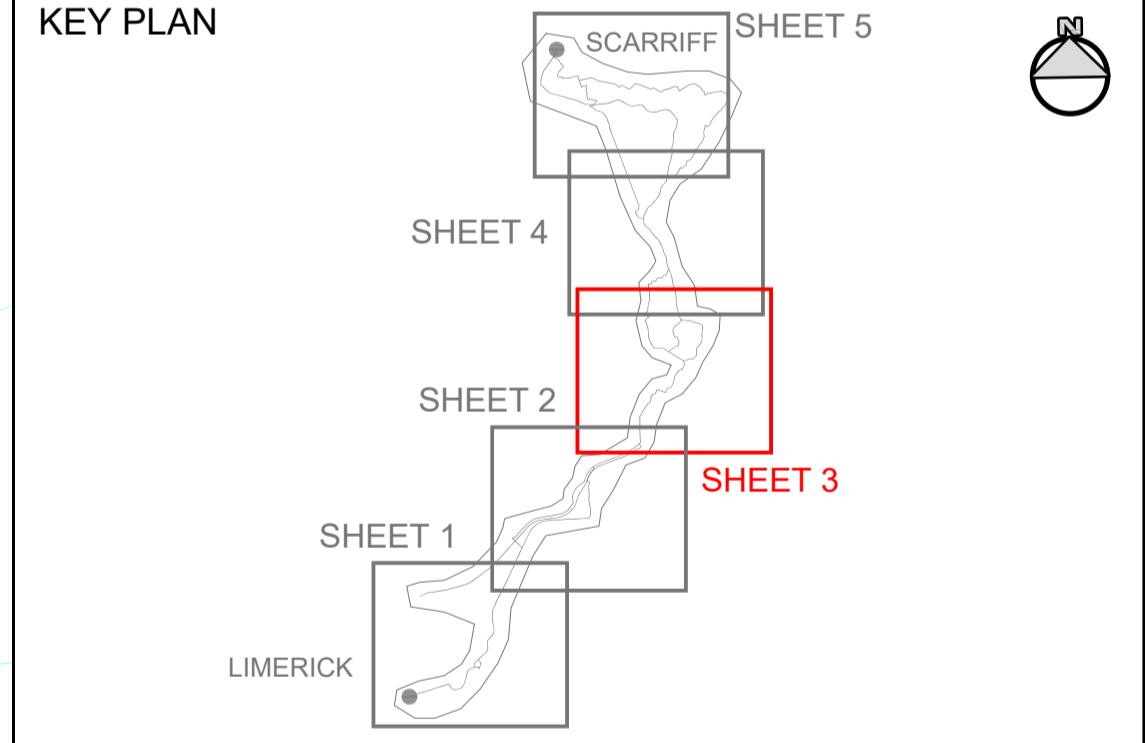
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- LEGEND**
- STUDY AREA
 - PRELIMINARY ROUTE OPTION - GREEN OPTION
 - PRELIMINARY ROUTE OPTION - RED OPTION
 - PRELIMINARY ROUTE OPTION - ORANGE OPTION
 - FEATURE OF INTEREST
 - WATERCOURSES
 - ROAD INTERFACES
 - VERTICAL GEOMETRY CONSTRAINTS
 - STREAM CROSSING
 - EXISTING STRUCTURE
 - POTENTIAL REQUIREMENT FOR NEW STRUCTURE
- EXISTING DESIGNATED WALKS IN EAST CLARE:**
- LOUGH DERG WAY
 - O'BRIANSBRIDGE LOOP
 - O'BRIANSBRIDGE OLD BARGE LOOP
 - ERRINAGH BRIDGE LOOP
 - O'BRIANSBRIDGE - PARTEEN WEIR
 - EAST CLARE WAY

- GEOTECHNICAL CONSTRAINTS:**
- PEAT
 - ESTUARINE SILTS AND CLAYS
 - AREA OF HIGH LANDSLIDE SUSCEPTIBILITY
 - ALLUVIUM
 - EXTENTS OF KARST AQUIFER AREA
 - SINKHOLE
 - DUMP SITE
- ENVIRONMENTAL CONSTRAINTS:**
- DWELLING BOUNDARY
 - HERITAGE SITES
 - ARCHITECTURAL CONSERVATION AREAS



101	17/01/2022	FOR INFORMATION - ROAD NUMBERS ADDED	KK	SF	SC
100	16/11/2021	FOR INFORMATION	KK	SF	SC
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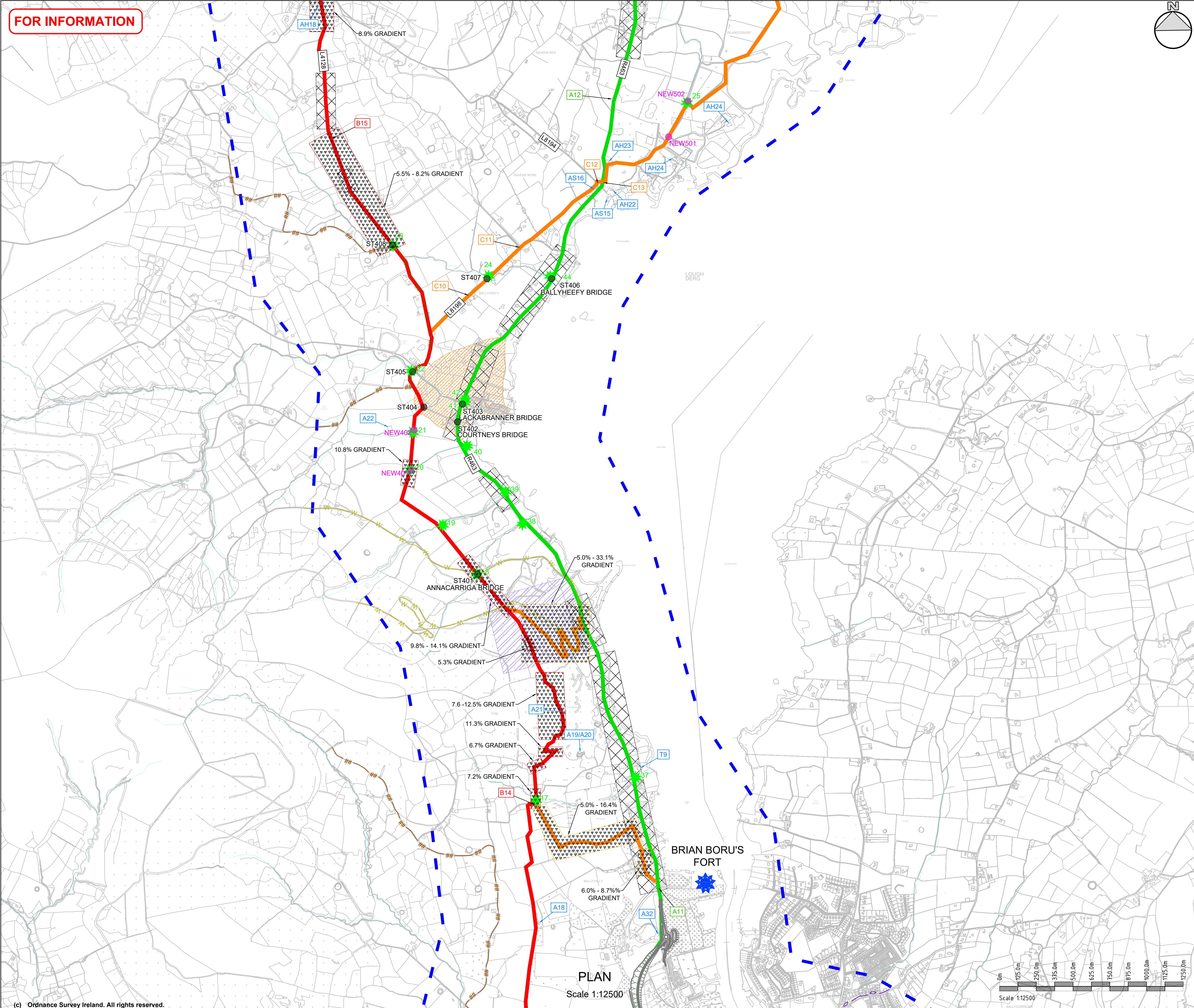


PROJECT
LIMERICK TO SCARRIFF GREENWAY PROJECT

DRAWING TITLE
ENGINEERING & ENVIRONMENTAL CONSTRAINTS SHEET 3 OF 5

DESIGNED SF	DRAWN ZM	CHECKED/APPROVED SC
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DRAWING NUMBER L2S-DR-EN-0003		REVISION 101

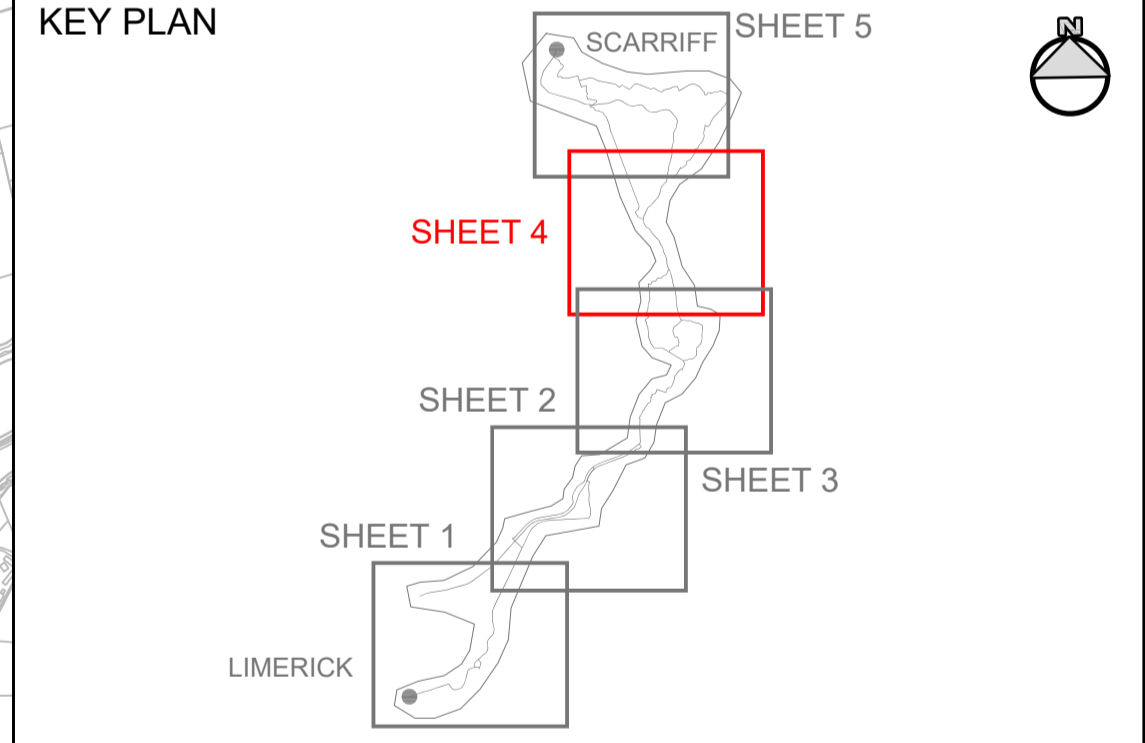
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- LEGEND**
- STUDY AREA
 - PRELIMINARY ROUTE OPTION - GREEN OPTION
 - PRELIMINARY ROUTE OPTION - RED OPTION
 - PRELIMINARY ROUTE OPTION - ORANGE OPTION
 - FEATURE OF INTEREST
 - WATERCOURSES
 - ROAD INTERFACES
 - VERTICAL GEOMETRY CONSTRAINTS
 - STREAM CROSSING
 - EXISTING STRUCTURE
 - POTENTIAL REQUIREMENT FOR NEW STRUCTURE
- EXISTING DESIGNATED WALKS IN EAST CLARE:**
- LOUGH DERG WAY
 - O'BRIANSBRIDGE LOOP
 - O'BRIANSBRIDGE OLD BARGE LOOP
 - ERRINAGH BRIDGE LOOP
 - O'BRIANSBRIDGE - PARTEEN WEIR
 - EAST CLARE WAY

- GEOTECHNICAL CONSTRAINTS:**
- PEAT
 - ESTUARINE SILTS AND CLAYS
 - AREA OF HIGH LANDSLIDE SUSCEPTIBILITY
 - ALLUVIUM
 - EXTENTS OF KARST AQUIFER AREA
 - SINKHOLE
 - DUMP SITE
- ENVIRONMENTAL CONSTRAINTS:**
- DWELLING BOUNDARY
 - HERITAGE SITES
 - ARCHITECTURAL CONSERVATION AREAS



REV	DATE	DESCRIPTION	BY	CHK	APD
101	17/01/2022	FOR INFORMATION - ROAD NUMBERS ADDED	KK	SF	SC
100	16/11/2021	FOR INFORMATION	KK	SF	SC

CLIENT

DESIGNER

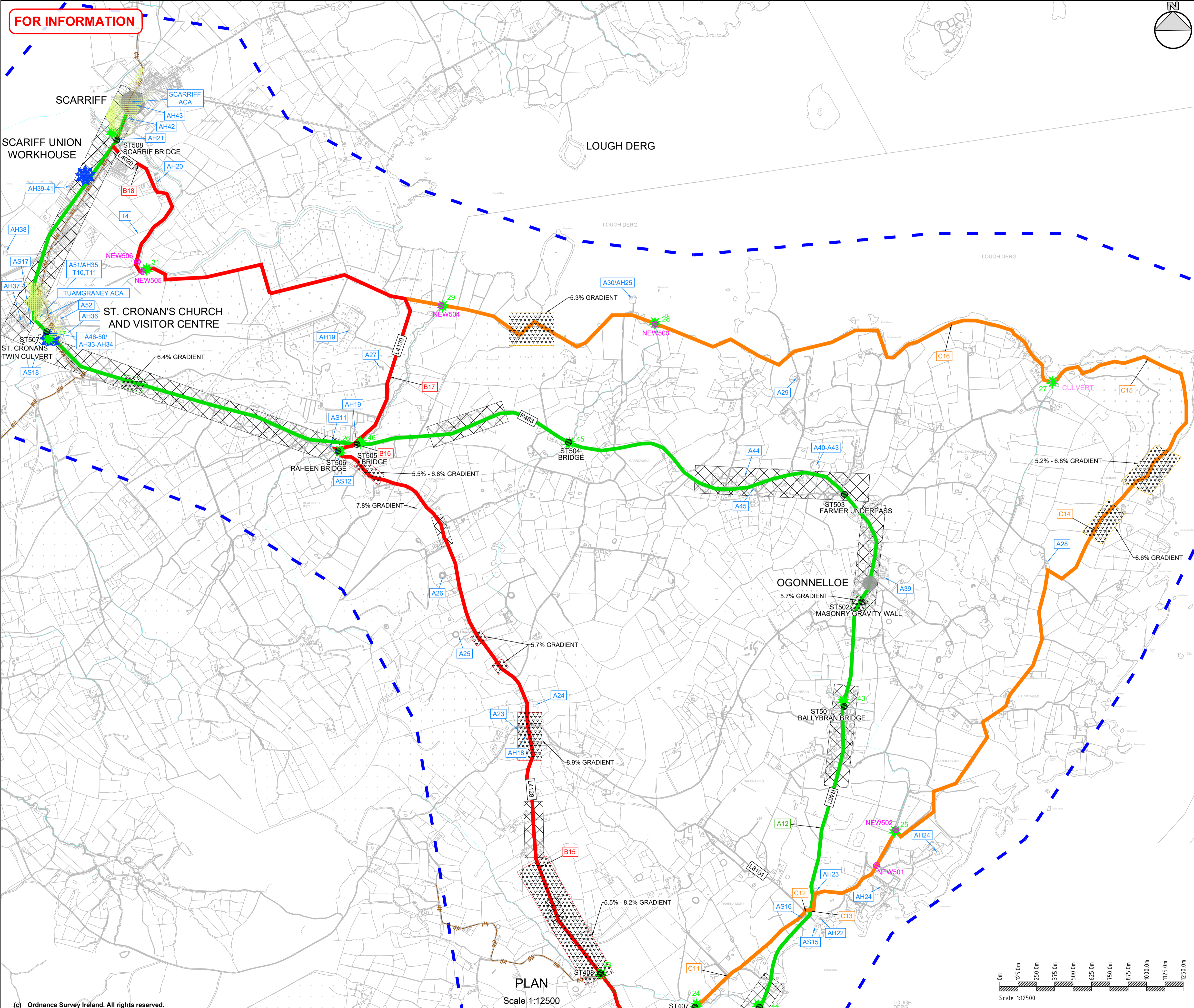
PROJECT
LIMERICK TO SCARRIFF
GREENWAY PROJECT

DRAWING TITLE
ENGINEERING & ENVIRONMENTAL
CONSTRAINTS
SHEET 4 OF 5

DESIGNED	DATE	DRAWN	SCALE	CHECKED/APPROVED	SHEET SIZE
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DRAWING NUMBER L2S-DR-EN-0004

REVISION 101

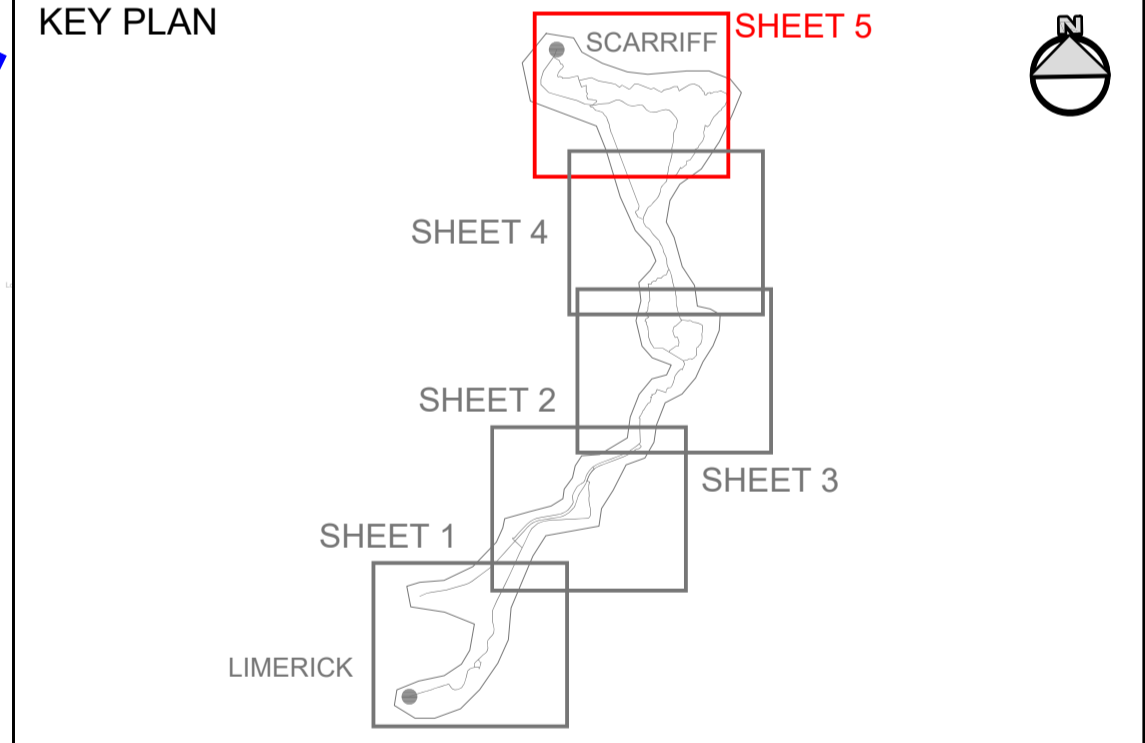


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- LEGEND**
- STUDY AREA
 - PRELIMINARY ROUTE OPTION - GREEN OPTION
 - PRELIMINARY ROUTE OPTION - RED OPTION
 - PRELIMINARY ROUTE OPTION - ORANGE OPTION
 - FEATURE OF INTEREST
 - WATERCOURSES
 - ROAD INTERFACES
 - VERTICAL GEOMETRY CONSTRAINTS
 - STREAM CROSSING
 - EXISTING STRUCTURE
 - POTENTIAL REQUIREMENT FOR NEW STRUCTURE
- EXISTING DESIGNATED WALKS IN EAST CLARE:**
- LOUGH DERG WAY
 - O'BRIANSBRIDGE OLD BARGE LOOP
 - O'BRIANSBRIDGE - PARTEEN WEIR
 - EAST CLARE WAY
 - BALLYCUGGARAN CRAG WOOD WALK

- GEOTECHNICAL CONSTRAINTS:**
- PEAT
 - ESTUARINE SILTS AND CLAYS
 - AREA OF HIGH LANDSLIDE SUSCEPTIBILITY
 - ALLUVIUM
 - EXTENTS OF KARST AQUIFER AREA
 - SINKHOLE
 - DUMP SITE
- ENVIRONMENTAL CONSTRAINTS:**
- DWELLING BOUNDARY
 - HERITAGE SITES
 - ARCHITECTURAL CONSERVATION AREAS



REV	DATE	DESCRIPTION	BY	CHK	APD
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100	16/11/2021	FOR INFORMATION	KK	SF	SC

CLIENT

DESIGNER

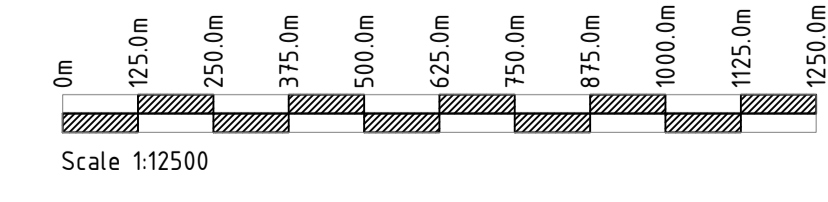
PROJECT
LIMERICK TO SCARRIFF
GREENWAY PROJECT

DRAWING TITLE
ENGINEERING & ENVIRONMENTAL
CONSTRAINTS
SHEET 5 OF 5

DESIGNED	DATE	SCALE	CHECKED/APPROVED	SHEET SIZE	REVISION
SF	19/10/2021	1:12,500	SC	A1	

DRAWING NUMBER
L2S-DR-EN-0005

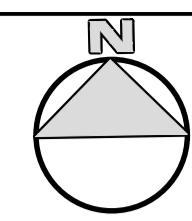
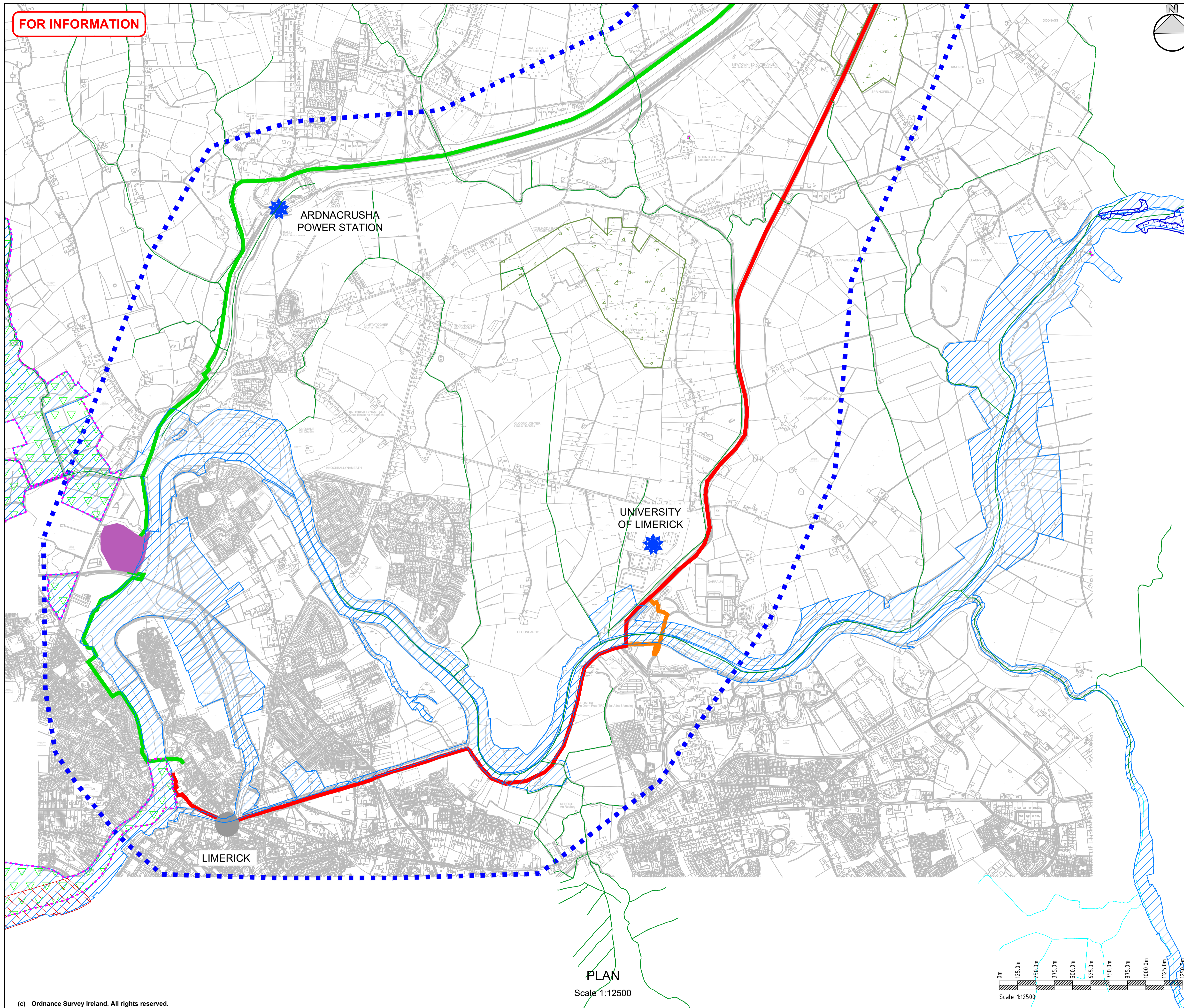
REVISION
101



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APPENDIX B.2 – ECOLOGICAL CONSTRAINT DRAWINGS

FOR INFORMATION



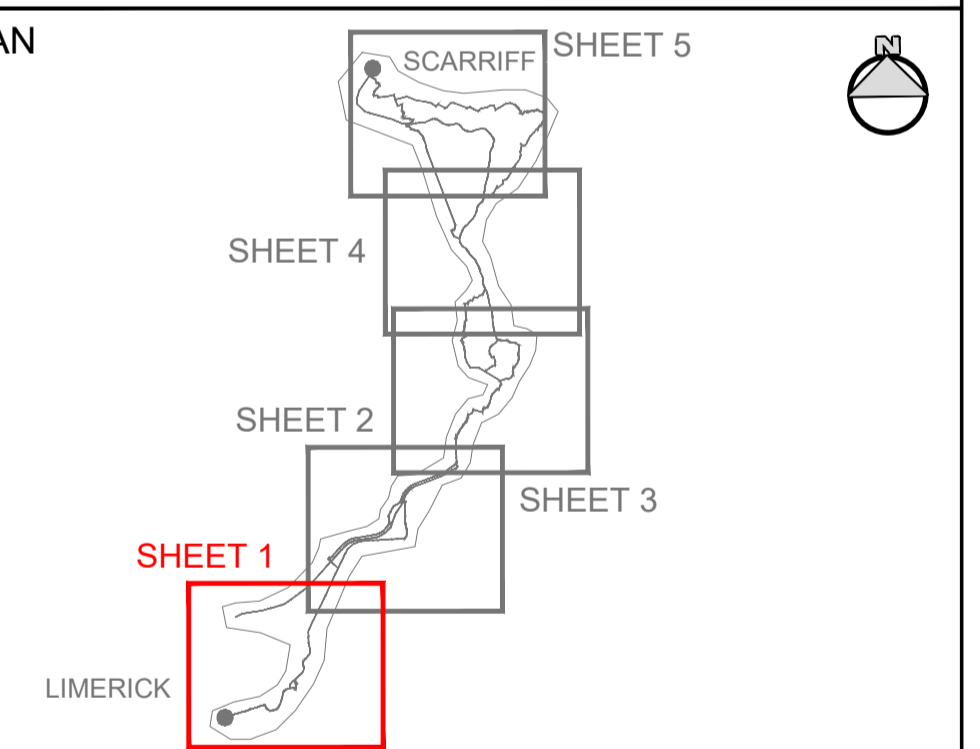
NOTES

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LEGEND

- - - - - STUDY AREA
- PRELIMINARY ROUTE OPTION - GREEN OPTION
- PRELIMINARY ROUTE OPTION - RED OPTION
- PRELIMINARY ROUTE OPTION - ORANGE OPTION
- FEATURE OF INTEREST
- WATERCOURSES
- SAC
- SPA
- pNHA 1
- pNHA 2
- ANNEX 1: BOG WOODLAND (AS PER REPORT)
- NSW WOODLAND (NATIVE WOODLAND SURVEY)
- COUNTY WETLANDS (ALL IRELAND WETLAND SURVEY)
- SPECIES-RICH WET WOODLAND & REED SWAMP (HIGH DIVERSITY)
- LONG-PAVEMENT LANDFILL (MENTIONED IN THE REPORT)
- RIVERS & STREAMS WHICH FLOW INTO PROTECTED SITES (ECOLOGICALLY SENSITIVE)

KEY PLAN



100	23/03/2022	FOR INFORMATION	ZM	SF	SC
REV	DATE	DESCRIPTION	BY	CHK	APD

CLIENT
 Waterways Ireland
 Uiscebhéal Fáilinn Waterways Ailann

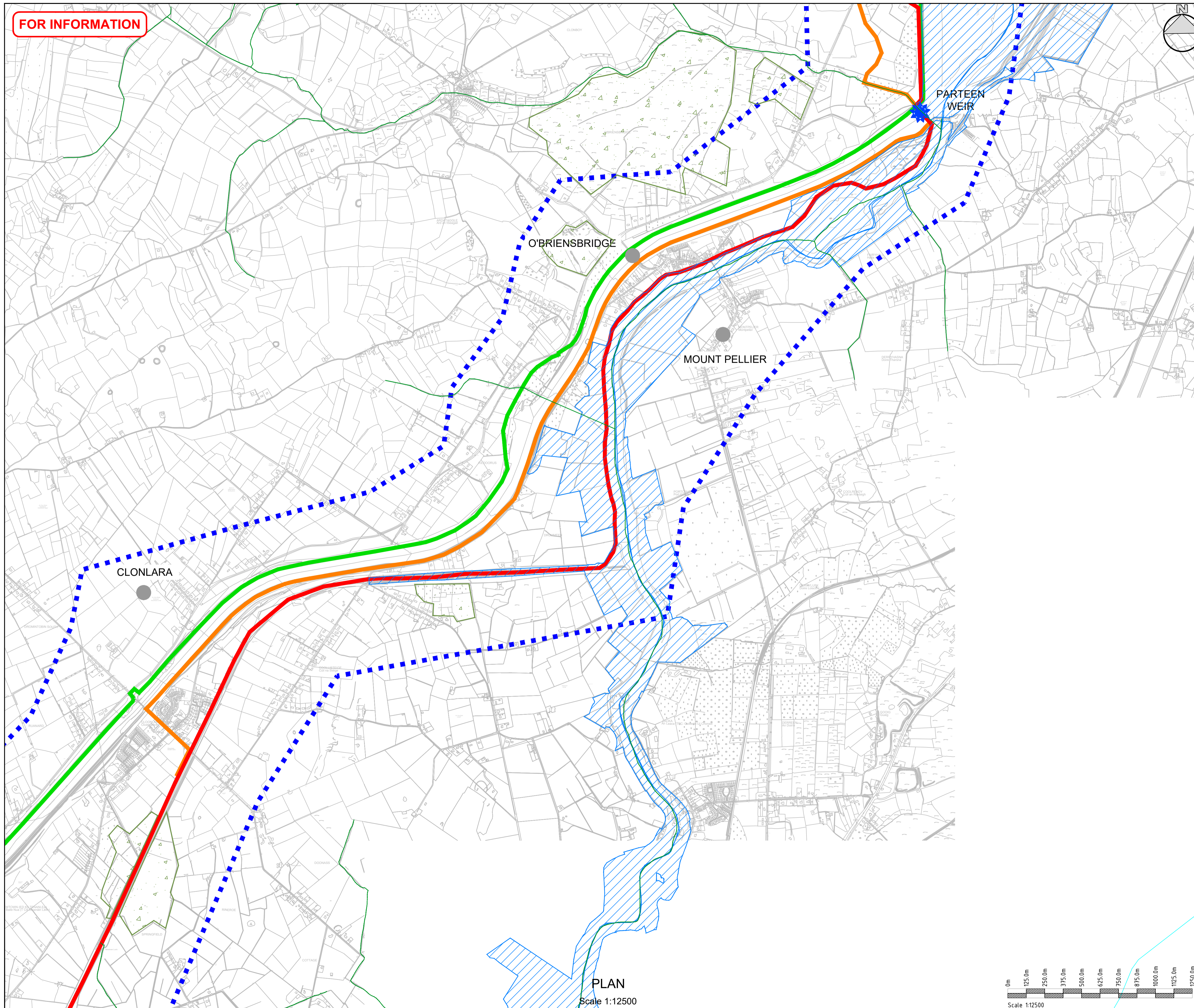
DESIGNER
 CLANDILLON
 CIVIL CONSULTING

PROJECT
**LIMERICK TO SCARRIFF
 GREENWAY PROJECT**

DRAWING TITLE
**ECOLOGICAL CONSTRAINTS
 SHEET 1 OF 5**

DESIGNED SF	DRAWN ZM	CHECKED/APPROVED SC
DATE 23/03/2022	SCALE 1:12,500	SHEET SIZE A1
DRAWING NUMBER L2S-DR-EN-0101	REVISION 100	

FOR INFORMATION



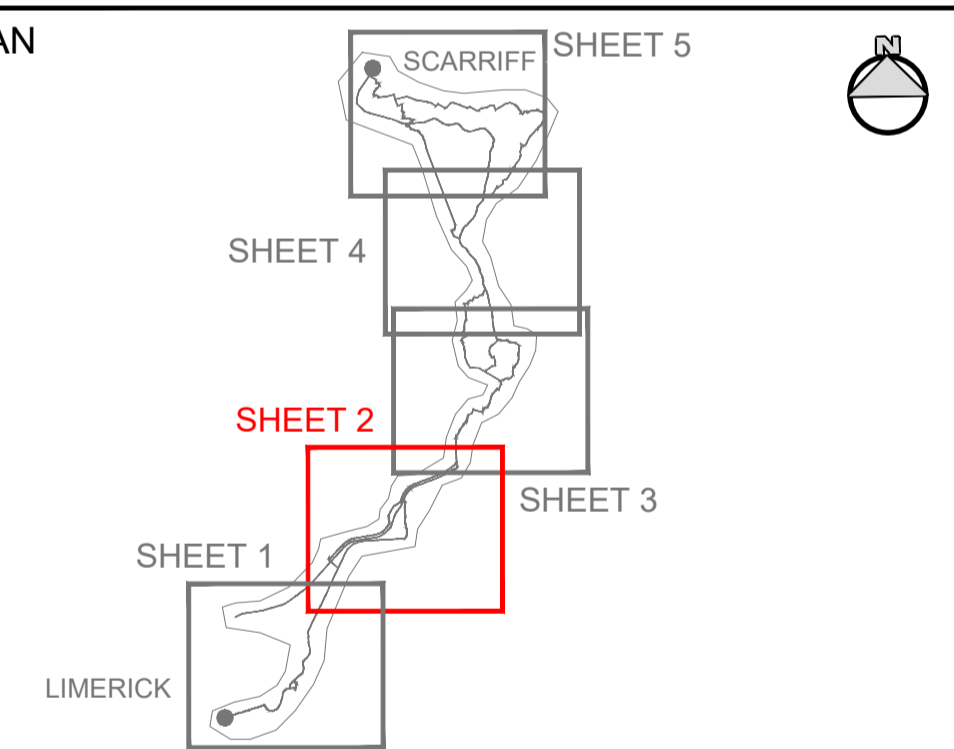
NOTES

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LEGEND

- - - - - STUDY AREA
- PRELIMINARY ROUTE OPTION - GREEN OPTION
- PRELIMINARY ROUTE OPTION - RED OPTION
- PRELIMINARY ROUTE OPTION - ORANGE OPTION
- FEATURE OF INTEREST
- WATERCOURSES
- SAC
- SPA
- pNHA 1
- pNHA 2
- ANNEX 1: BOG WOODLAND (AS PER REPORT)
- NSNW WOODLAND (NATIVE WOODLAND SURVEY)
- COUNTY WETLANDS (ALL IRELAND WETLAND SURVEY)
- SPECIES-RICH WET WOODLAND & REED SWAMP (HIGH DIVERSITY)
- LONG-PAVEMENT LANDFILL (MENTIONED IN THE REPORT)
- RIVERS & STREAMS WHICH FLOW INTO PROTECTED SITES (ECOLOGICALLY SENSITIVE)

KEY PLAN



REV	DATE	DESCRIPTION	BY	CHK	APD
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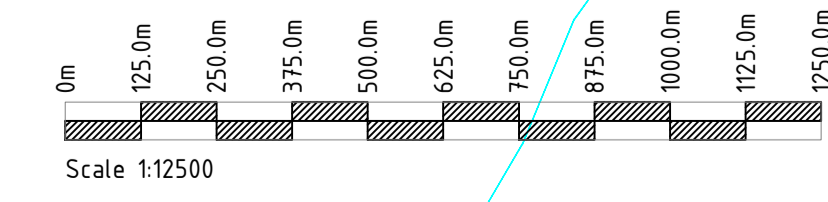
CLIENT
 Waterways Ireland
 Uiscebhéal Fáilte Waterways Ailte

DESIGNER
 CLANDILLON
 CIVIL CONSULTING

PROJECT
**LIMERICK TO SCARRIFF
 GREENWAY PROJECT**

DRAWING TITLE
**ECOLOGICAL CONSTRAINTS
 SHEET 2 OF 5**

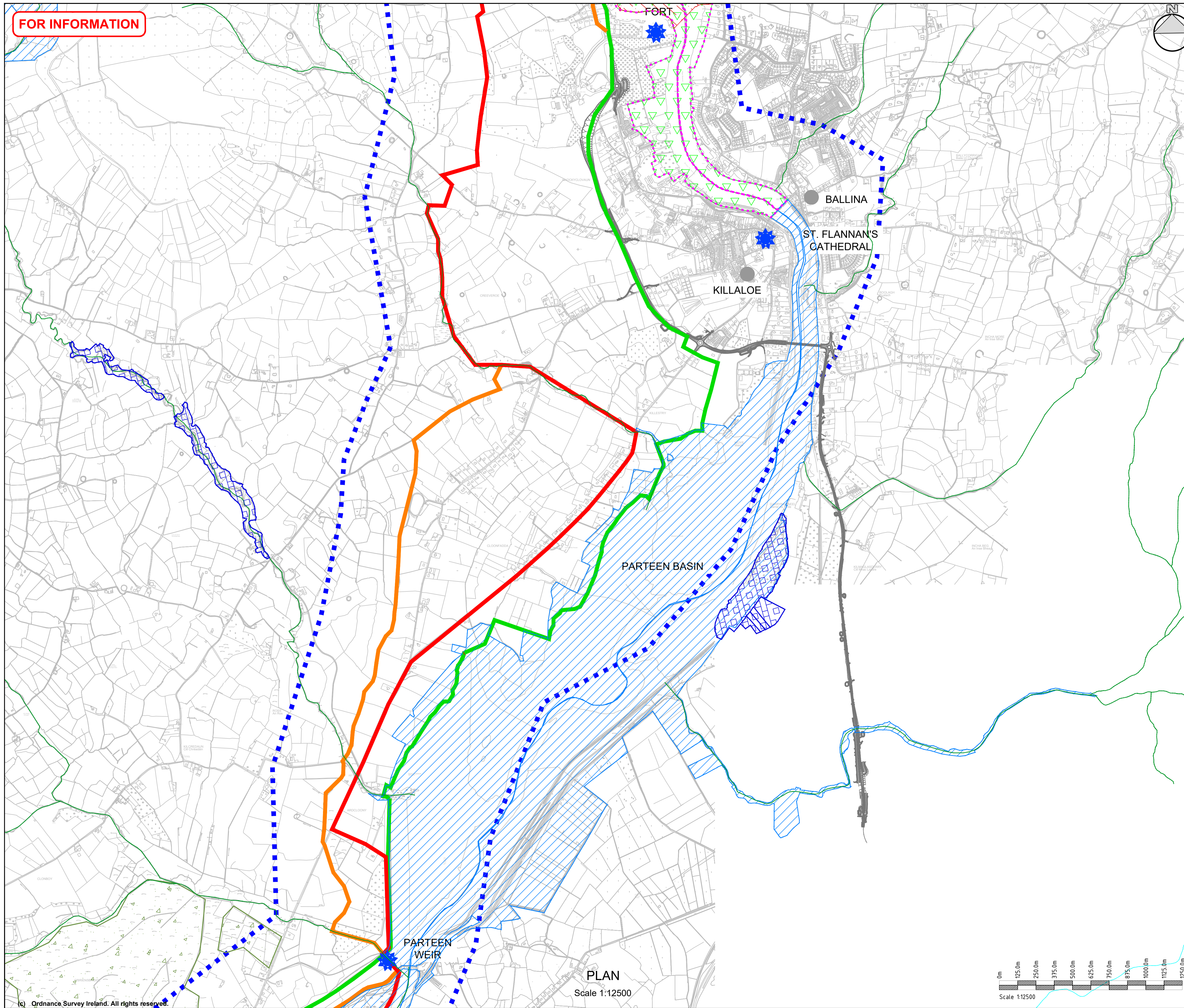
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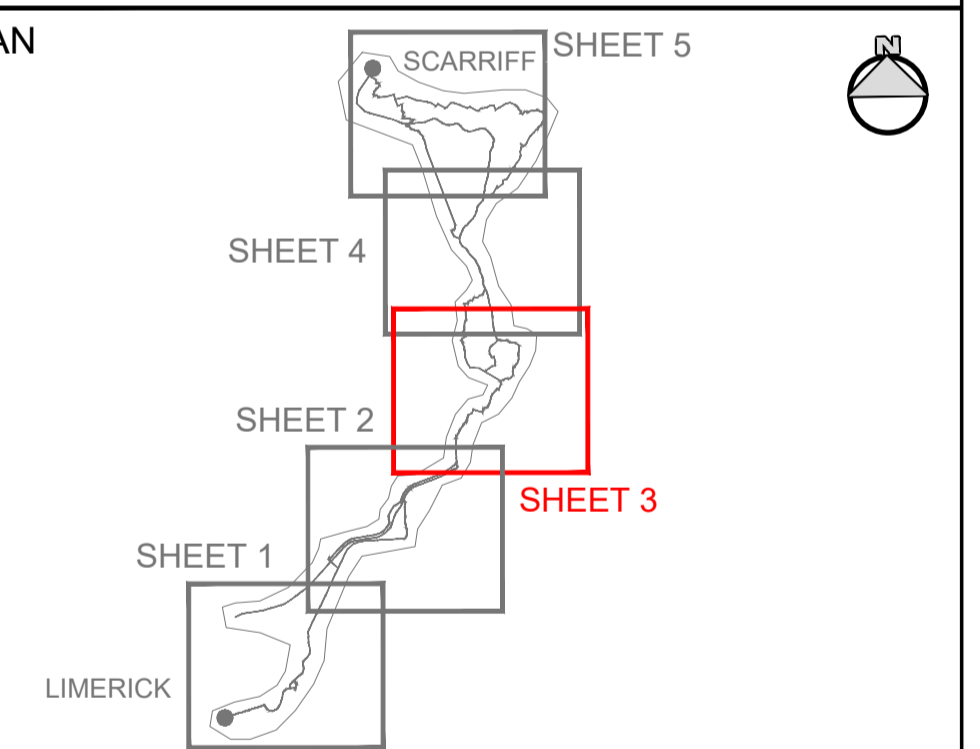
NOTES

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LEGEND

- - - - - STUDY AREA
- PRELIMINARY ROUTE OPTION - GREEN OPTION
- PRELIMINARY ROUTE OPTION - RED OPTION
- PRELIMINARY ROUTE OPTION - ORANGE OPTION
- FEATURE OF INTEREST
- WATERCOURSES
- SAC
- SPA
- pNHA 1
- pNHA 2
- ANNEX 1: BOG WOODLAND (AS PER REPORT)
- NSNW WOODLAND (NATIVE WOODLAND SURVEY)
- COUNTY WETLANDS (ALL IRELAND WETLAND SURVEY)
- SPECIES-RICH WET WOODLAND & REED SWAMP (HIGH DIVERSITY)
- LONG-PAVEMENT LANDFILL (MENTIONED IN THE REPORT)
- RIVERS & STREAMS WHICH FLOW INTO PROTECTED SITES (ECOLOGICALLY SENSITIVE)

KEY PLAN



100	23/03/2022	FOR INFORMATION	ZM	SF	SC
REV	DATE	DESCRIPTION	BY	CHK	APD

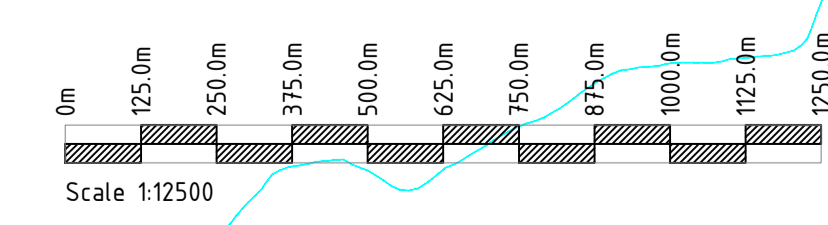
CLIENT

DESIGNER

PROJECT **LIMERICK TO SCARRIFF GREENWAY PROJECT**

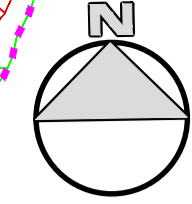
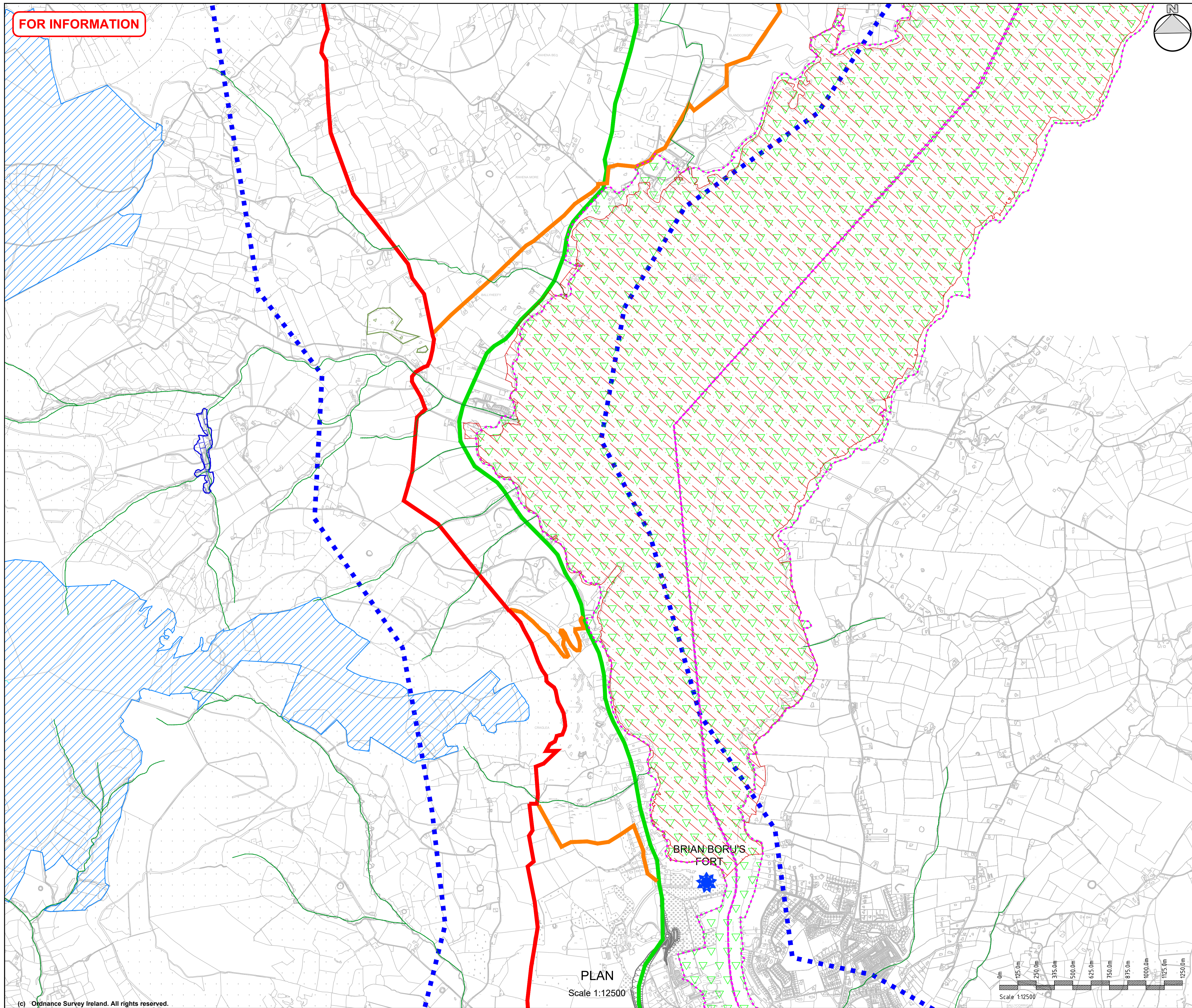
DRAWING TITLE **ENVIRONMENTAL CONSTRAINTS SHEET 3 OF 5**

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DRAWING NUMBER L2S-DR-EN-0103		REVISION 100



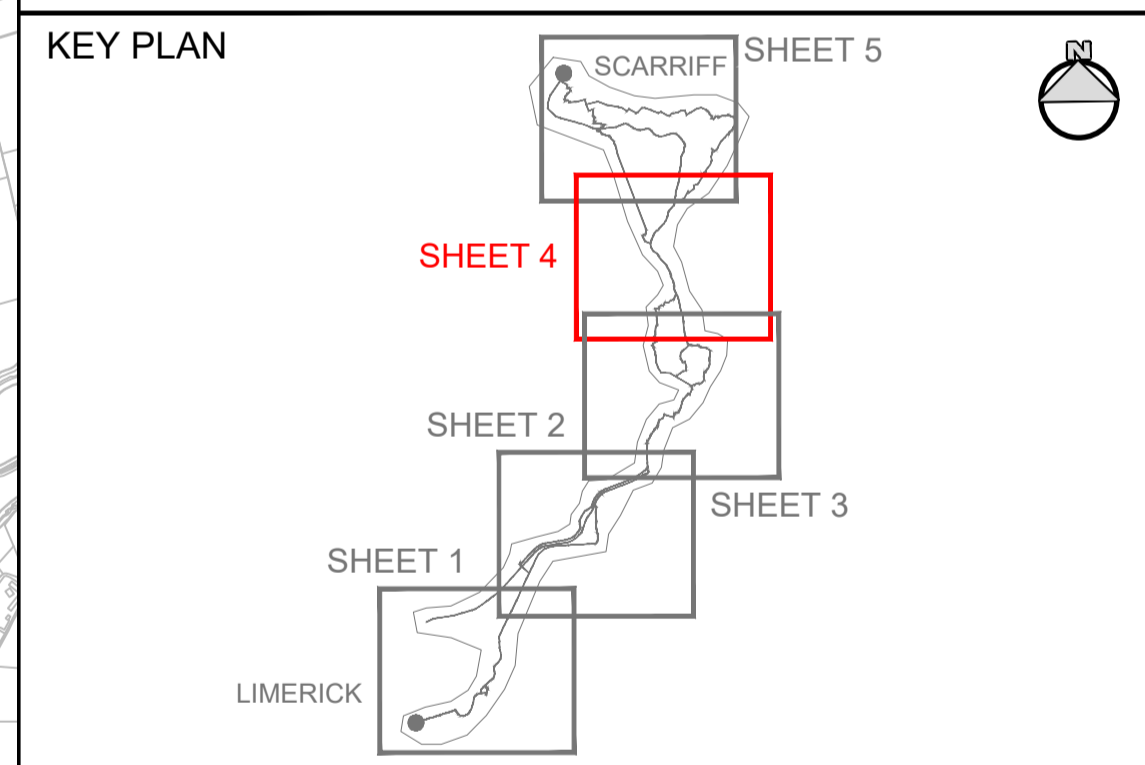
PLAN
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 3. These drawings do not provide an exhaustive list of constraints and should be read in conjunction with the feasibility and constraints report L2S-RP-AL-0002.

- LEGEND**
- STUDY AREA
 - PRELIMINARY ROUTE OPTION - GREEN OPTION
 - PRELIMINARY ROUTE OPTION - RED OPTION
 - PRELIMINARY ROUTE OPTION - ORANGE OPTION
 - ★ FEATURE OF INTEREST
 - WATERCOURSES
 - ▨ SAC
 - ▨ SPA
 - ▽ pNHA 1
 - ⋯ pNHA 2
 - ANNEX 1: BOG WOODLAND (AS PER REPORT)
 - ▨ NSNW WOODLAND (NATIVE WOODLAND SURVEY)
 - ▨ COUNTY WETLANDS (ALL IRELAND WETLAND SURVEY)
 - SPECIES-RICH WET WOODLAND & REED SWAMP (HIGH DIVERSITY)
 - LONG-PAVEMENT LANDFILL (MENTIONED IN THE REPORT)
 - RIVERS & STREAMS WHICH FLOW INTO PROTECTED SITES (ECOLOGICALLY SENSITIVE)



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CLIENT

 Uiscebhéal Fáilinn Waterways Ailann

DESIGNER

 CLANDILLON CIVIL CONSULTING

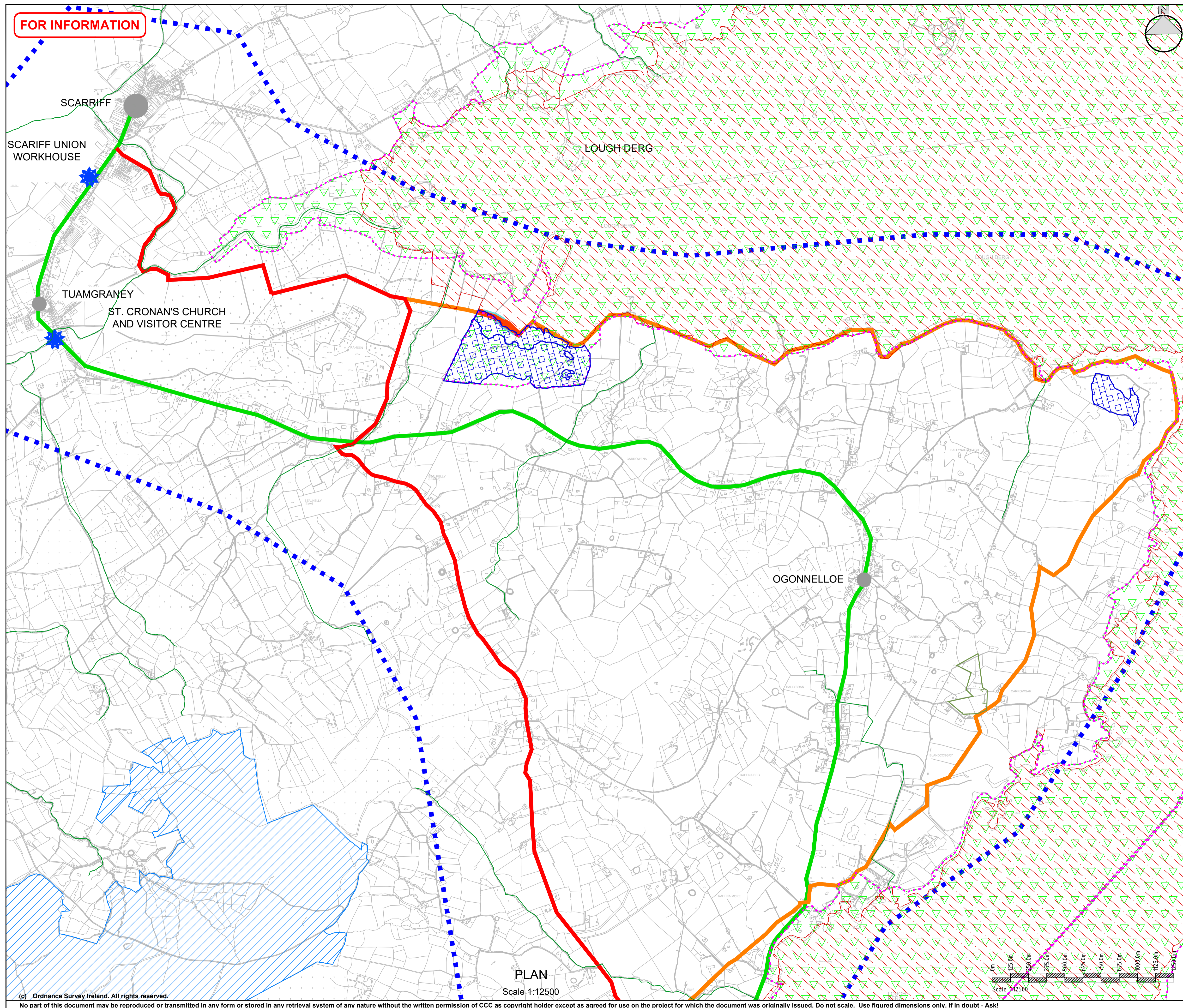
PROJECT
LIMERICK TO SCARRIFF GREENWAY PROJECT

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ECOLOGICAL CONSTRAINTS SHEET 4 OF 5

DESIGNED	DRAWN	CHECKED/APPROVED
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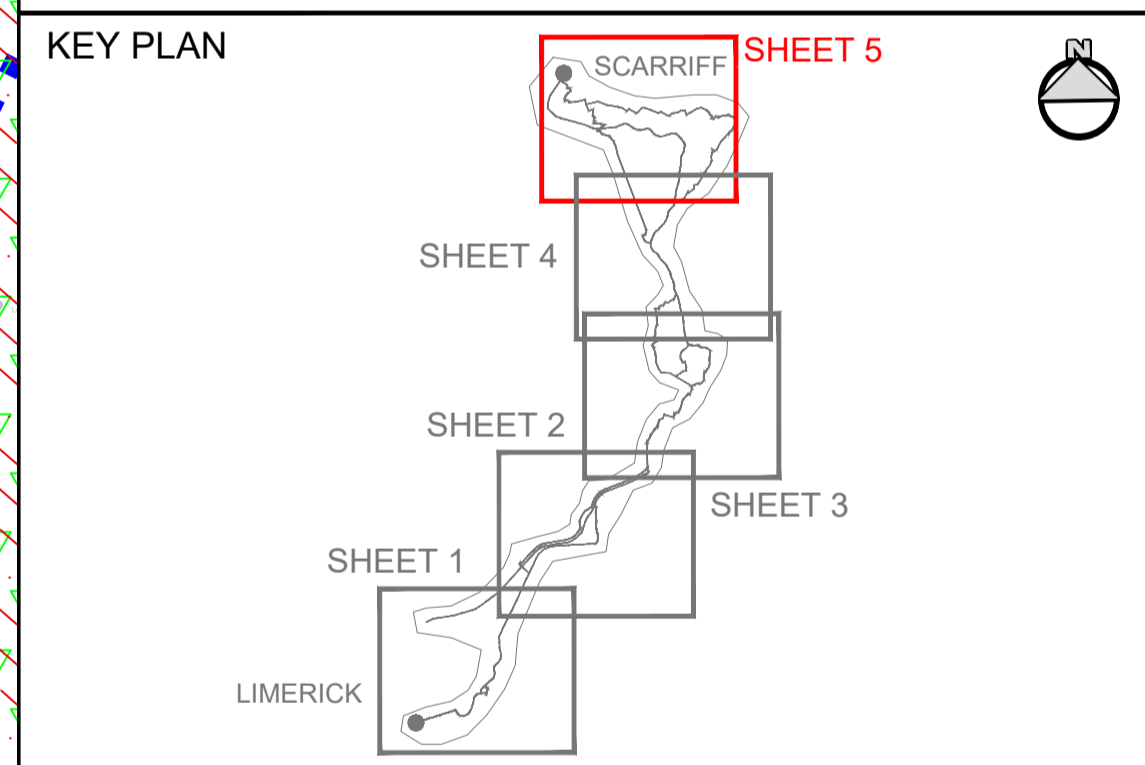
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- LEGEND**
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CLIENT

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DESIGNER

 CLANDILLON CIVIL CONSULTING

PROJECT
LIMERICK TO SCARRIFF GREENWAY PROJECT

DRAWING TITLE
ECOLOGICAL CONSTRAINTS SHEET 5 OF 5

DESIGNED	DRAWN	CHECKED/APPROVED
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DATE	SCALE	SHEET SIZE
23/03/2022	1:12,500	A1
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APPENDIX C – R463 CONSTRAINTS











APPENDIX D – EXISTING STRUCTURES

APPENDIX E - ARCHAEOLOGICAL, ARCHITECTURAL AND CULTURAL HERITAGE ASSESSMENTS

1. INTRODUCTION

The Cultural Heritage Assessment was carried in October 2021 by Kerstin Bartels-Shortt MIAI of Clandillon Civil Consulting as part of the Feasibility and Constraints Study Report for the Limerick to Scarriff Blueway/Greenway Project for Waterways Ireland. The report aims to identify heritage constraints within the study area between Limerick City and Scarriff in Co. Clare.

The report assesses the archaeological and cultural heritage potential of the receiving environment and forms the basis for the examination of potential constraints posed by the proposed development on the archaeology, architectural heritage, industrial heritage and other cultural heritage elements.

2. THE STUDY AREA

The proposed scheme aims to provide connectivity to existing and future greenway routes and trails in the area and to stimulate local, regional, national and international economic and tourism potential. The study area of the proposed development extends from Limerick City centre near the 13th century St. John's Castle to the market town in Scarriff, Co. Clare, covering a distance of over 40 km. A number of route options have been developed, with the aim to provide connectivity to the amenities of the River Shannon and Lough Derg, as well as small towns, villages and visitor attractions along the route. The greenway development will connect to the existing 69 km Lough Derg Way walking route as well as the East Clare Way, a 180 km circular walking route, which starts and ends at Killaloe. The proposed Limerick to Scarriff Greenway will also complement and form part of the wider Lough Derg Blueway.

Between Limerick City and Killaloe, the Red Route Option runs mainly along the tow path of the disused 'Errina Plassey Canal', which formed part of the Shannon Navigation, the Parteen Basin and the eastern bank of the Shannon. The Green Route Option starts at King John's Castle and crosses the Shannon across Thomond Bridge and proceeds in northern direction along the Shannon and Shannon head race towards Ardnacrusha and onwards towards Parteen Weir (see Appendix A).

All the route options continue around the eastern outskirts of Killaloe, while aiming to connect the town and its visitor attractions, such as St. Flannan's Cathedral and Brian Boru's Fort, with the proposed greenway development.

To the north of Killaloe, the Red Route Option runs along higher ground to the east of Lough Derg. It connects to Ballycuggaran Forest Walk (6km) to the north of Brian Boru's Fort, affording views over Lough Derg. The Green Route Option follows the route of the R463 to Tuamgraney and Scarriff, while the Orange Route Option provides connections between the Red and Green Options and from Tinerara to Tuamgraney runs through farmland and woodland along the eastern shore of Lough Derg before merging with the Red Route at Raheen and continuing on to Scarriff.

For a more detailed description of the route options see Constraints Report, Section 3: Study Area and Appendix A for a map of route options.

2.1 The Receiving Environment

Limerick City and Towns in the Study Area

In Limerick City the route starts on King's Island, near the 13th century Anglo-Norman St. John's Castle, a national monument in the guardianship of the state. The area to the east and south of the castle is

one of the oldest parts of the city and was enclosed within the medieval walls of Limerick. It features an abundance of archaeological sites, historic monuments and protected structures, including Thomond Bridge, Limerick's medieval town defences, a toll house, churches and historic graveyards can be found in this area. The area between Lock Quay and Thomond Bridge was designated as Zone 1: Medieval Quarter of the Limerick City Development Plan 2010-2016. It is part of a proposed Architectural Conservation Area (ACA7) in the Limerick City and County Development Plan 2022-2028 (Draft) and located within the Zone of Archaeological Potential (see Figure 3 below). From the later Seventeenth Century, the city gradually developed from the docks on the River Shannon. From the mid-18th century, mills, warehouses, distilleries, breweries and other industrial buildings were developed in the area of Lock Quay, bearing witness to the economic expansion of the 18th and 19th Centuries in Ireland. These buildings are of significant technological, architectural and social interest. Communication to and from the city was facilitated by the construction of the canals in the mid-18th century as part of the Limerick to Killaloe Navigation and the development of the associated docks. Plassey Mill, located on the banks of the Shannon to the north of the city, is one of the important structures associated with the city's industrial past.

The heritage town of Killaloe is located on the eastern bank of the River Shannon, just to the south of Lough Derg. The first bridge connecting Killaloe with Ballina across the Shannon was recorded in the early 11th century. In the 10th century, the fort of Kincora was the residence of the High King Brian Boru and just north of the town, a large ringfort known as Brian Boru's Fort is also said to have been a place where he lived. St. Flannan's Cathedral also dates back to the medieval period, having first been built in late 12th century. The 11th century St. Molua's Oratory with Sheela-na-gig in the churchyard was relocated here from a Shannon island when the construction of the Ardnacrusha scheme raised water levels of the Shannon in 1925. The Shannon was an important means of transportation since prehistoric times, which is evidenced by the large amounts of finds recovered from the river near Killaloe, dating from the Neolithic to the Middle Ages. In the 18th century, the new stone-arched bridge was constructed, along with canal architecture to bypass dangerous rapids. St. Flannan's Catholic Church in the town features a Harry Clarke stained glass window.

The small town of Tuamgraney also has medieval roots. The medieval church of St. Cronan's, now the East Clare Heritage Centre, and a tower house are located here. O'Briensbridge is dominated by the long stone-arch bridge over the River Shannon, guarded by the castle at the Montpelier side. O'Briensbridge and the village of Cloonlara feature good examples of 19th century streetscapes with traditional shopfronts and vernacular architecture.

Archaeological Sites

The route passes through an area of rich and diverse cultural heritage with a large number of archaeological sites dating from a variety of time periods from the Stone Ages to the Middle Ages. A concentration of sites can be observed on the higher ground to the east of the Shannon and Lough Derg, with large numbers of ringforts and enclosures located between Killaloe and Tuamgraney in particular. Ringforts are thought to have been constructed mainly in the Early Medieval Period, but some may date back to the Iron Age, indicating that parts of the study area were quite densely inhabited since this time period. At Gortmagy northwest of Killaloe a Megalithic Structure (CL045-015) can be dated to the Neolithic Period and recorded finds of polished stone axeheads in a number of locations within the study area, also indicate that there was a human presence here from the time of the earliest Irish settlers.

To the east and south of Killaloe, a number of Standing Stones have been recorded. Standing stones vary in date from about the late Bronze Age period to the Early Iron Age period and may have remained in use during the early Christian period, when they sometimes feature Ogham inscriptions.

The Middle Ages are represented by a large number of ringforts or raths, especially on the high ground near Killaloe and Tuamgraney. In the area around Ogonelloe two early medieval ecclesiastical sites have also been recorded (CL029-023001-04 and CL029-039001-02). The large 10th century ringfort known as Brian Ború's Fort north of Killaloe underlines the significance of the medieval settlement of the area. The site of Brian Boru's Fort was later reused and altered by Anglo-Norman settlers.



Image 1: Northeastern side of Brian Boru's Fort

There are 15th and 16th century towerhouses at Reboge, Newtown, Montpelier, Castlebaun and Tuamgraney. The village of Montpelier across the Shannon from O'Briensbridge is named for a monastic establishment by French monks on the Shannon island of Inishlosky. Between Tinerana and Scarriff, the Orange Route Option will follow the southern shore of Lough Derg, where it will pass close to Castlebawn Tower House at Carrowena. Due to changes in water levels, the tower house is now situated on a peninsula in the lake.



Image 2: Castlebawn Towerhouse

Canal Architecture and Industrial Heritage

In the second half of the 18th century, the Shannon's importance as a route for trading was enhanced by the construction of a system of canals and locks between Killaloe and Limerick City. The canals were part of the Shannon Navigation System constructed in 1770 and designed to bypass dangerous falls at Castleconnell and Doonass. The Errina Canal was constructed over a distance of c. 9 km from Plassy north of Limerick City to north of Cloonlara in County Clare at this time.

3 ASSESSMENT METHODOLOGY

The assessment of cultural heritage constraint for this project involved a desktop survey of archaeological, historical and cartographic sources within the identified study area (see Appendix A for route location maps). Recorded sites of archaeological or architectural heritage significance, as well as other potential sites of cultural heritage significance within 100m of the proposed route options are listed in the relevant sections below. Due to the relatively low impact nature of greenway developments, sites outside the 100m corridor were not considered as part of the assessment.

Sites are listed roughly from south to north, starting in Limerick City and ending in Scarriff. In locations with a number of route options, tables of sites have been divided by route options for ease of reference.

At the start point of the Red and Green Route Options in the centre of Limerick City a large number of archaeological sites and protected structures have been identified, particularly in the area between Lock Quay to the south and Castle Street to the north (see Figure xx below). These include prominent structures such as St. John's Castle and Thomond Bridge. Sites in this area have not listed separately, as the route in the city centre will follow existing roads and paths.

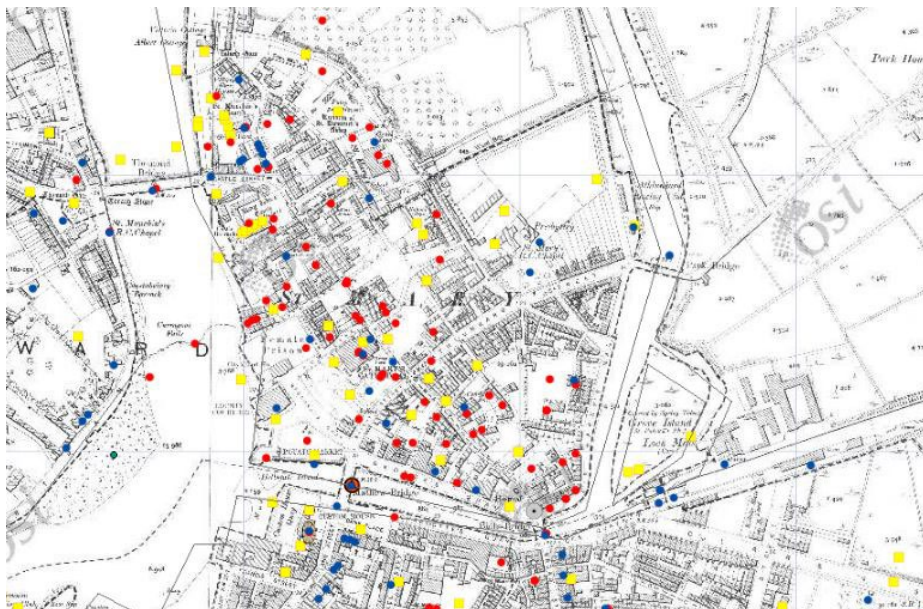


Figure 1:
Limerick City centre:
Protected Structures: yellow,
NIAH sites: blue,
Recorded archaeological sites: red,
(on late 19th century 25" Ordnance Survey background)



Figure 2:
Limerick Medieval City Walls (LCC Development Plan 2010-2016)



Figure 3:
Zone of Archaeological Potential (LCC Development Plan 2010-2016)

The following sources were examined to establish the archaeological, architectural and cultural heritage potential of the proposed development:

- Record of Monuments and Places (“RMP”)/ for Counties Limerick and Clare;
- Limerick City Development Plan 2010-2016
- Limerick City and County Development Plan 2022-2028 (Draft), Volume 3: ACA’s and RPS;
- Clare County Development Plan 2017-2023, Volume 4: Record of Protected Structures (RPS);
- Urban Archaeological Survey (Limerick City)
- National Inventory of Architectural Heritage (NIAH);

- Cartographic sources, including first edition 6" OS maps;
- Aerial photography;
- Excavation bulletins;
- Clare Bridge Survey
- Clare Canal Locks & Bridges
- Clare Shannon Navigation Architectural Survey
- Cathal O'Neill Architects: Shannon Heritage Survey 2009 (SH)

4. REGISTER OF SITES

4.1 ARCHAEOLOGY

Sites/National Monuments in the Guardianship or Ownership of the State

One site or National Monument in guardianship or ownership of the State located within the study area:

National Monument No./ RMP	Townland	Monument	Location	Distance
NM 288/ RMP LI005-017014	Limerick City	King John's Castle (Anglo-Norman masonry castle) Monument in Guardianship of the State	557689/ 657804	0m

4.1.1 RMP Sites

Outside of the Limerick city centre, 52 recorded archaeological sites listed in the Record of Monuments and Places were identified within 100m of the route options, see tables below. Recorded sites in Limerick City are not listed separately in this table, as the route will follow pre-existing roads or tracks at this location.

Abbreviations: Red Option= RO, Green Option = GO, Orange Option = OO

Table 1: Recorded Archaeological Sites along the Red Route and Orange Route:

Ref	RMP No.	Townland	Monument	Location	Distance
A1	LI005-024	Reboge	Castle - unclassified	599705/ 657624	180m RO
A2	CL063-015	Gilloge	Enclosure	561078/ 659190	30m RO
A3	CL063-024001	Derryfadda	Enclosure	561304/ 659856	140m RO

A4	CL063-024002	Derryfadda	Enclosure	561328/ 659869	100m RO
A5	CL053-048	Mountcatherine, Newtown	Earthwork	561896/ 662068	125m RO
A6	CL053-043001	Newtown	Newtown Castle, Castle - unclassified	562114/ 662565	110m RO
A7	CL053-038	Cloonlara	Sheela-na-gig (set into canal bridge at Cloonlara but said to be from Newtown Castle, Ref. A6)	562799/ 663635	0m RO
A8	CL054-004	O'Briensbridge	Bridge (River Bridge), see also AH15	566338/ 666912	0m RO
A9	CL054-008	O'Briensbridge	Enclosure, removed by earthworks constructions associated with Ardnacrusha	567208/ 667601	25m OO
A10	CL045-048001	Cloonfadda	Standing stone	569042/ 670994	5m RO
A11	CL045-048002	Cloonfadda	Standing stone	569159/ 670994	90m RO
A12	CL045-048003	Cloonfadda	Standing stone	569201/ 671067	70m RO
A13	CL045-046	Cloonfadda	Enclosure (marked on 1 st ed 6'' OS/ 25'' OS 'Lislattin')	567919/ 671525	0m OO
A14	CL045-017	Creeveroe	Enclosure	568231 672518	100m RO
A15	CL045-015	Gortmagy	Megalithic Structure	568000/ 673394	100m RO
A16	CL045-019001	Knockyclovaun	Standing Stone	568352/ 673418	0-20m RO
A17	CL045-019002	Knockyclovaun	Mound	568352/ 673418	0-20m RO
A18	CL045-056--	Ballyvally	Enclosure	568433/ 674042	20m RO
A19	CL037-020001	Craglea	Earthwork	568717/ 675210	50-100m RO
A20	CL037-020002	Craglea	Enclosure	568753/ 675210	75-120m RO
A21	CL037-019	Craglea	Ritual Site – Holy Well	568777/ 675407	0m RO
A22	CL037-016	Carrownakilly	Burial Ground	567413/ 677399	100m RO
A23	CL037-003	Ballylaghnan	Enclosure	566881/ 680305	30m RO
A24	CL037-004	Ballylaghnan	Children's Burial Ground	566965/ 680490	10m RO
A25	CL029-014	Bealkelly	Ringfort - Rath	566439/ 680959	100m RO
A26	CL029-013	Bealkelly	Ringfort - Rath	566348/ 681357	75m RO
A27	CL029-056	Raheen	Fulacht Fiadh	565916/ 682782	90m RO
Ref	Orange Route Option sites from Tinerara to Scarriff):				

A28	CL029-039001-02	Aughinish	Site of Church and burial ground, medieval	570390/ 681532	100-125m
A29	CL029-022001-02	Caher	Bawn and Tower House	568770/ 682702	100-125 m
A30	CL029-019	Carrowena	Tower House	567645/ 683239	100-125 m

Table 2: Green Route Option (from west end of Thomond Bridge):

Ref	RMP No.	Townland	Monument	Location	Distance
A31	LI005-017119- (NIAH 21507007/ RPS 003)	Limerick City (Clancy's Strand)	Treaty Stone (not in original position) See also Ref AH26	557519/ 657793	40m S of GO
A32	LI005-017147-	Limerick City (Deaneryland)	Bastioned Fort (location of post-medieval fortification)	557478/ 657856	0m GO
A33	CL063-007- (RPS 649)	Quinspool South	Bridge / Location of pre-17 th century bridge, see also Ref AH29	557338/ 659816	100 m GO
A34	CL054-003	Ardataggle	Road/trackway	565328/ 666802	20-50m GO
A35	CL045-047	Cloonfadda	Fulacht Fiadh	568430/ 670251	0m GO
A10	CL045-048002	Cloonfadda	Standing stone	569159/ 670994	100m GO (see also RO)
A36	CL045-060	Moys	Standing stone	570010/ 671763	100m GO
A37	CL045-059	Creeveroe	Standing stone	569433/ 672312	100m GO
A38	CL045-057	Knockyclovaun	Enclosure	569246 / 673125	0-10m GO (on route of Killaloe Bypass)

Table 3: Green Route Options from Tinerara to Scarriff:

Ref	RMP No.	Townland	Monument	Location	Distance
A39	CL029-053	Carrowcore	Mass Rock	569307/ 681284	40m GO
A40	CL029-023001	Ballyhurly	Ecclesiastical Enclosure	568887/ 682104	5-75m GO
A41	CL029-023002	Ballyhurly	Souterrain	568869/ 682109	45m GO
A42	CL029-023003	Ballyhurly	Bullaun Stone	568888/ 682120	55m GO
A43	CL029-023004	Ballyhurly	Bullaun Stone	568909/ 682066	10m GO

A44	CL029-021001	Caher	Ringfort - Rath	568432/ 681970	0m GO
A45	CL029-021002	Caher	Ringfort - Rath	568471/ 681921	3m GO
A46	CL028-058001	Tomgraney	Church	563699/ 683004	15m GO
A47	CL028-058002	Tomgraney	Graveyard	563700/ 682985	0-5m GO
A48	CL028-058007	Tomgraney	Burial	563758/ 682938	0-5m GO
A49	CL028-058008	Tomgraney	Cross-slab (originally from graveyard, now lost)	563700/ 682997	10m GO
A50	CL028-058004	Tomgraney	Cross-slab (originally from graveyard, now lost)	563700/ 682997	10m GO
A51	CL028-058003	Tomgraney	Tower House (see also AH35)	563675/ 683043	5-10m GO
A52	CL028-058006	Ballyquin	Burnt Spread	563756/ 683088	65m GO

4.1.2 Excavations Database (www.excavations.ie)

Of the sites identified within the study area from the excavations database, only one is deemed to have archaeological significance.

Table 4: Sites identified from the Excavations Database

Licence No.	Townland	Monument Type	Location	Distance
00D056	River Shannon at Plassey	Ship's timber 1.9m long	E 560599/ N 658558	10m RO

4.1.3 Topographical Files

The topographical files of the National Museum of Ireland provide a record of individual finds, which are recorded per townland. A number of finds were identified from the Heritage Council's Environment Viewer. Topographical Files will be examined in the more detailed stages for the environmental assessment of the proposed development.

Table 5: Archaeological finds along Red route/ Orange Route options:

Ref	NM Ref No.	Townland	Monument Type	Location	Distance
T1	LI 17	Sreelane	Two Roman coins	E 561110/ N 658585	10m RO
T2	CL 04	Cloonlara	Sheela-na-gig (see also Ref A7 and AH7))	562787 663657	0m RO
T3	NM 1986:52	Ardcloony/ Ballycorney	Axehead - Polished Stone	567560/ 669787	0m OO
T4	NM 1988:14	Dewsborough	Stone Axehead	564238/ 683659	

Table 6: Archaeological Finds along Green Route Option:

Ref	Ref No.	Townland	Monument Type	Location	Distance
T6	NM IA/L/1978:1	Ballykeelaune	Polished Stone Axe	558476/ 661823	75m GO
T7	NM IA/106/1983	Ardcloony	Axehead-Polished Stone	567664/ 669158	0m GO
T8	NM 1986:23	Killestry	Polished Stone Axehead	569731/ 672044	100m GO
T9	NM 1934:407	Craglea	Stone Axehead	569155/ 675101	80m GO
T10	NM N/A	Tomgraney	Wooden trough (associated with Ref A51/ AH25)	563693/ 683062	20m GO
T11	NM N/A	Tomgraney	Iron slag / furnace bottom (associated with Ref A51/ AH25)	563687/ 683031	20m GO

4.2 ARCHITECTURAL HERITAGE

In 1990, the National Inventory of Architectural Heritage (“NIAH”) was established to fulfil Ireland’s obligations under the Granada Convention, through the establishment and maintenance of a central record, documenting and evaluating the architectural heritage of Ireland.

The National Inventory of Architectural Heritage (“NIAH”) records all built heritage structures within specific counties in Ireland and the record is used to advise Local Authorities on the updating of the Record of Protected Structures (“RPS”) as required by the Planning and Development Act, 2000. The Act of 2000 requires Local Authorities to establish a Record of Protected Structures to be included in the County Development Plan (“CDP”). Structures which have been attributed a rating value of international, national or regional importance in the NIAH inventory are recommended by the Minister of Culture, Heritage and the Gaeltacht (CHG) to the relevant planning authority for inclusion on the RPS. Buildings recorded in the RPS can include Recorded Monuments, structures listed in the NIAH or buildings deemed to of architectural, archaeological or artistic importance by the Minister. Once listed in the RPS the sites/areas receive statutory protection from injury or demolition under the 2000 Act. Damage to or demolition of a site registered in the RPS is an offence.

Records examined for the purpose of this assessment included:

- National Inventory of Architectural Heritage: County Limerick and County Clare;
- Record of Protected Structures in Development Plans for Counties Limerick and Clare
- Ordnance Survey of Ireland 1st edition 6” maps (ca. 1839-40)
- Ordnance Survey of Ireland 25” maps (ca. 1880-1900)
- Clare Bridge Survey
- Clare Canal Locks & Bridges
- Clare Shannon Navigation Architectural Survey
- Clare Stone Roofs
- Cathal O’Neill Architects: Shannon Heritage Survey 2009 (SH)

4.2.1 Architectural Conservation Areas (ACAs)

An Architectural Conservation Area (ACA) is a place, area, group of structures or townscape that is of special architectural, historical, archaeological, technical, social, cultural, or scientific interest, or that contributes to the appreciation of a Protected Structure. The Planning and Development Act 2000 (amended) provides the legislative basis for the protection of ACA's. Planning applications within ACA's are to be assessed in accordance with the provisions of the Architectural Protection Guidelines for Planning Authorities (2011), therefore any development proposals and works, which may affect structures both protected and non-protected in these areas, require special consideration.

There are a number of Architectural Conservation Areas located within the study area. Limerick City has a number of designated ACAs. ACA 7 is located to the east of Thomond Bridge and encompasses parts of Thomondgate, Castle Street, Verdant Place, Nicholas Street from King John's Castle to the junction with Crosbie Row and St. Francis Street, High Street, Church Street, the Parade and part of Merchant's Quay. The architecture in this ACA varies from the 13th century Norman architecture of St. John's Castle, to Victorian terraced housing and the vernacular townscape of ground floor retail units with residential overhead. This ACA is part of the historic town designated by the National Monuments Service and there is an abundance of National Monuments in the area comprising a bridge, town defences, toll house, castle, historic well, churches, historic graveyards and almshouses. The NIAH recognises the regional significance and special interest of 14 structures in this ACA.

A further ACA (ACA 9 Castletroy – Dromore) is located the north of Limerick City Centre, centred around the classical Georgian Plassey House on the University of Limerick Campus. It is located just to the east of the study area.

Four further ACAs are located at O'Briensbridge, Killaloe, Tuamgraney and Scarriff. The Red Route Option runs along the southern side of the ACA at O'Briensbridge. O'Briensbridge is dominated by the twelve arch stone road bridge crossing the River Shannon to Montpelier. According to Lewis (1837), four arches at the north end of the bridge were taken down and replaced with cast-iron arches of 60 feet span in the 129th century. The river crossing was protected on the Montpelier side by a castle built in the early 16th century (LI001-005).

None of the route options are located in close proximity of the ACA for Killaloe. The Green Route Option follows the Killaloe Bypass, currently under construction. This allows for easy access to Killaloe town centre and its heritage sites, such as St. Flannan's Cathedral.

The ACA for Tuamgraney contains a number of sites deemed of National rating in the NIAH, such as a medieval church and tower house. A school, courthouse and constabulary barrack just to the North of the tower house, and a disused Roman Catholic Chapel to the east of St. Joseph's Roman Catholic Church can also be identified at this location on the late 19th century 25" OS map.

See images below:



Image 3: O'Briensbridge ACA, Co. Clare



Image 4: Killaloe ACA, Co. Clare



Image 5: Tuamgraney ACA



Image 6: Scarriff ACA

4.2.2 NIAH Sites / Record of Protected Structures (RPS)

In total, 43 structures of architectural heritage significance included in the NIAH and/ or the Record of Protected Structures for Counties Limerick and Clare were identified within the study area, see tables 7 to 9 below. Some of these, such as the gatelodge of Tinerana House (AH25) are in close proximity to more than one route option. Architectural Heritage Sites within Limerick City Centre (King's Island, Lock quay area) are not listed separately in the tables below. As the Red Route Option follows the Errina Canal, nine of the sites below will be directly impacted by this route option. Due to the nature of the development, it is expected that impacts on these features will be mitigated through design of the route.

Abbreviations:

Red Option = RO , Green Option = GO, Blue Option = BO, Orange Option = OO

NIAH terms: Architectural = Arch, Artistic = Art, Archaeological = Archae, Historical = Hist, Scientific = Sc, Social = Soc, Technical = Tech

Table 7: NIAH / RPS sites along Red Route/ Orange Route Options:

Ref	NIAH/RPS	Townland	Description	Comments	Location	Date	Distance
AH1	NIAH 21900504 RPS 1600 (LCC)	Sreelane	Plassey Mills (water mill); industrial complex with millstream, locks and sluices	NIAH Regional	562534/ 663737	1820-1830	25m RO,
AH2	NIAH 21900503 RPS 1599 (LCC)	Sreelane/ Garraun	Plassey Bridge (Black Bridge); cast-iron and concrete bridge erected by Shannon Commissioners	NIAH Regional	562534/ 663737	1830-1850	0m RO, 0m OO
AH3	RPS 647	Gilloge/ Garraun	Plassey or Annaghbeg Lock,	Most southerly	560834 658844	1770	0-5m RO

			including metal bridge and lock keeper's house	lock, Ref 3100/3101, Shannon Heritage Survey 2009			
AH4	RPS 648	Gilloge/Garraun	Gilloge Bridge (canal bridge)	Access to East Clare Walk	561333/659574	1760-1770	0-5m RO
AH5	RPS 521	Coollisteige	Plassey-Errina Canal				0m RO
AH6	RPS 522	Newtown	Newtown Lock	Only lock dated 1792	562155/662332	1792	0-5m RO
AH7	RPS 523	Cloonlara	Cloonlara Bridge (with Sheela-na-Gig, see also A7)	Repaired/replaced 1975	562799/663632	1770-1780	0m RO, 0m OO
AH8	NIAH 20405302 RPS 119	Cloonlara	Church of Ireland	NIAH Regional Arch, Art, Soc	562534/663737	1815	100m OO
AH9	NIAH 20405303 RPS 079	Cloonlara	Glebe House	NIAH Regional Arch, Art, Soc	562581/663682	1810	100m OO
AH 10	RPS 524	Knockbrack Lower/Coolisteige	Cloonlara Lock and lockhouse (modern replacement)	Single chamber lock	562996/664061	1770	0m RO
AH 11	RPS 685	Monaskeha/Coolisteige/Aughboy	Errina Lock, lock bridge and lock keeper's house	Triple chamber, altered to double, disused	563497/664689	1770	0m RO
AH 12	RPS 525	Aughboy/Coolisteige	Errina Bridge	single-arch canal bridge	563971/664796	1770	0m RO, 20m GO
AH 13	NIAH 21900103	Portcrusha	Mona Lodge (Country house)	NIAH Regional	565832/665259	1830	100m RO (E of Shannon)
AH 14	NIAH 20405401	O'Briens-bridge	Bridge over Canal	NIAH Regional, Arch, Tech	565792/666986	1925	0m RO, OO
AH 15	NIAH 20405402 RPS 215	O'Briens-bridge	Bridge (see also A8)	NIAH Regional, Arch, Tech	566366/666991	1695	0m RO
AH 16	NIAH 20405403 RPS 644	O'Briens-bridge	House (Police Barracks /Old Stonebridge House)	NIAH Regional, Arch, Tech	566307/667061	1810-1840	50m RO
AH 17	RPS 588	Ardcloony	Ardcloony Bridge	Double arched river bridge	567507/669252	c. 1800	0m RO, 75m OO
AH 18	NIAH 20403701 RPS 161	Ballylagnan	St. Mary's RC Church	NIAH Regional R; Arch, Art, Soc	566881/680305	1840	0m RO

AH 19	NIAH 20402903 RPS 355	Raheen	Raheen Estate demesne wall, gates, railings, gate lodge	NIAH Regional; Arch, Art, Soc	565768/ 682289	c. 1820, extended 1895	0m RO (also 15m GO)
AH 20	NIAH 20402805 RPS 227	Dewsborough	Scarriff Dock including crane	NIAH Regional; Arch, Tech	564399/ 684037	1850	0-5m RO
AH 21	NIAH 20402818 RPS 220	Ballyminoge	Scarriff Bridge, in Scarriff ACA	NIAH Regional; Arch, Tech	564134/ 684317	1860	0m GO

Table 8: NIAH/ RPS Sites along Orange Route Option from Tinerana:

	Ref No.	Townland	Description	Comments	Location	Date	Distance
AH 22	NIAH 20403705 RPS 101	Islandcosgry, Rahena Beg	Church / Chapel and graveyard (now private dwelling)	NIAH Regional; Arch, Art, Soc	569239/ 673955	1860	0m GO (see also OO, 10m)
AH 23	RPS 645	Islandcosgry / Rahena Beg	Gate Lodge of Tinarana House (see also AH24), walls, gates, Victorian Postbox	NIAH Regional; Arch, Art, Hist, So, Tech	569239/ 673955	1860- 1880	0m GO, 0m OO
AH 24	NIAH 20403702 RPS 095	Islandcosgry / Rahena Beg	Tinarana House and walled garden (walled garden associated with older house)	NIAH Regional; Arch, Art, Hist, Soc, Tech	568240/ 681900	1750- 1900	0m OO
AH 25	RPS 646	Carrowena	Tower House 'Castlebawn' (see also A30)		567645/ 683239		0-100m

Table 9: NIAH/ RPS Sites along Green Route Option:

	Ref No.	Townland	Description	Comments	Location	Date	Distance
AH 26	NIAH 21507007 RPS 003	Limerick City (Clancy's Strand)	Treaty Stone monument (stone not in original position)	Moved in 1990	557519/ 657793	1865	40m S of GO
AH 27	RPS 409/ NIAH 21507003	Limerick Municipal Borough (Thomond-gate)	Saint Munchin's Roman Catholic Church	Corner of Clancy's Strand and High Road opposite Thomond Bridge	556789/ 657793	1922	10m GO

AH 28	NIAH 21507001	Limerick Municipal Borough (Thomond gate)	JJ Bowles Public House		557487/ 657881	1790-1810	0m GO
AH 29	RPS 649	Quinspool South	Quinspool Bridge, Plaque with Latin inscription	Previous bridge pre 17 th century	557338/ 659816	Dated 1635	100m GO
AH 30	NIAH 20405308 RPS 311	Ardnacrusha Ballykeelaun	Ardnacrusha Power Station / Shannon Power Station	Hydro-electric complex	558569/ 661777	1925-1930	0m GO
AH 14	NIAH 20405401	O'Briens-bridge	Bridge over Canal	NIAH Regional, Arch, Tech	565792/ 666986	1925	0m GO
AH 31	NIAH 20404514 RPS 441	Moys	Clarisford Palace (Bishop's Palace)	NIAH Regional; Arch, Art, Soc	570251/ 671990	1771-1779	300m house, 150m walled garden, 0m 19 th century demesne
AH 32	NIAH 20404510 RPS 440	Ballyvally	Demesne walls/ gates / railings / gate lodge for Ballyvalley House	NIAH Regional; Art, Tech	569239/ 673955	1780-1820	0m GO
AH 22	NIAH 20403705 RPS 101	Islandcosgry, Rahena Beg	Church / Chapel and graveyard (now private dwelling)	NIAH Regional; Arch, Art, Soc	569239/ 673955	1860	0m GO (see also 10m OO)
AH 23	RPS 645	Islandcosgry / Rahena Beg	Gate Lodge of Tinarana House (see AH 24), walls, gates, Victorian Postbox	NIAH Regional; Arch, Art, Hist, So, Tech	569239/ 673955	1860-1880	0m GO, (see also 0m OO)
AH 19	NIAH 20402812 RPS 327	Ballyquin	Gate Lodge (Raheen House)	NIAH Regional; Arch	563732/ 683029	1820	5m GO
AH 33	NIAH 20402809 RPS 122	Tomgraney	Church/ Chapel, St. Cronan's (now East Clare Heritage Centre)	NIAH National; Arch, Art, Hist, Soc, Sc, Tech	563701/ 683001	10 th c. with 19 th c. extension	10m GO
AH 34	RPS 254	Tomgraney	Cross-slabs	See RMP CL028-058 (004/008)	563701/ 683001		unknown
AH 35	NIAH 20402810 RPS 293	Tomgraney	Castle/ fortified House (O'Grady's Towerhouse)	NIAH National; Archae, Arch	563668/ 683044	Mid 16 th c.	10m GO

AH 36	RPS 651	Ballyquin	Limekiln	Clare Lim & Corn Kilns Survey	563771/ 682942	18 th / 19 th c.	50m GO
AH 37	NIAH 20402807 RPS 159	Tomgraney	St. Joseph's Church/ Chapel (RC)	NIAH Regional; Arch, Art, Hist, Soc, Tech	563701/ 683001	1870	20m GO
AH 38	RPS 091	Drews-borough	Drewborough House, On grounds of 18 th c. house	Gate on roadside, site of gate lodge	563654/ 683539	c. 1930	5m GO
AH 39	NIAH 20402818 RPS 466	Drews-borough	Scarriff Union Workhouse Complex (lodges and boundary wall with letter box)	NIAH Regional; Arch, Hist, Soc	563928/ 683968	Built 1845	0m GO
AH 40	NIAH 20402818 RPS 500	Drews-borough	Scarriff Union Workhouse Complex 'The Store' (lodge)	NIAH Regional; Arch, Hist, Soc	563928/ 683968	Built 1845	0m GO
AH 41	NIAH 20402818 RPS 501	Drews-borough	Scarriff Union Workhouse Complex 'The coffin house' (mortuary)	NIAH Regional; Arch, Hist, Soc	563928/ 683968	Built 1845	0m GO
AH 21	NIAH 20402818 RPS 220	Ballyminoge	Scarriff Bridge, in Scarriff ACA	NIAH Regional; Arch, Tech	564134/ 684317	1860	0m GO
AH 42	NIAH 20402803 RPS 467	Scarriff Town, Main St	W. Bolton Public House/ Harbour Bar, in Scarriff ACA	NIAH Regional; Arch, Art	564197/ 684502	1870	0m GO
AH 43	NIAH 20402801 RPS 465	Scarriff Town, Main St	Market Weigh House with weighbridge, in Scarriff ACA	NIAH Regional; Arch, Hist, Soc, Tech	564226/ 684565	1855	0m GO

4.2.3 Additional Sites of Cultural Heritage Potential

Eighteen further sites of potential cultural heritage significance were identified from cartographic sources and a number of previously undertaken local authority surveys, such as the Clare Bridge Survey (CBS), Clare Canal Locks & Bridges (CCLB) and Clare Shannon Navigation Architectural Survey (CSNAS). Three of these are additional locks and bridges associated with the Errina Canal. Some of these sites, such as the Flour Mills at O'Briensbridge and Bealkelly (Raheen) have disappeared, but in the event of groundworks in these areas, there is high potential for features associated with these structures to be uncovered. The structures of the potential Estate Cottages at Rahena More and the site of the Constabulary Barracks at Rahena Beg may require further investigation.

Table 10: Sites identified from Surveys and Cartographic Sources along Red Route Option:

Ref	Source	Town-land	Description	Comments	Location	Date	Distance
AS1	1 st ed OS 6''/ SH19A	Gilloge	Bridge (over Blackwater River)	Adjacent to Errina canal	561295/ 659572	18 th -/ 19 th c	10m RO

AS2	1 st ed OS 6"/ SH	Garraun	Canal Lock (Gillogie Lock) and lock keeper's house (modernised)	not in RPS	561409/ 659853	1770	5-10m RO
AS3	CCLB/ CSNAS	Springfield	Wooden Bridge	Originally 1770, replaced 1975	561864/ 661735	1770	0-5m RO
AS4	1 st ed OS 6"	Cloonlara	Cloonlara Police Barracks (now private dwelling)		562758/ 663656	early 19 th c.	10m RO, 0m OO
AS5	25" OS / SH	Monaskeha/ Coolisteige	Monaskeha Lock and lockhouse	Single chamber lock	563162/ 664401	1770	0m RO
AS6	SH	Kildoorus	Errina Milestone	Canal mile-stone	564856/ 664884	1770	0m RO
AS7	1 st ed 6" OS/ 25" OS	Drummeen	Farm complex and disused limekiln		564962/ 664902	Pre 1840	20m RO
AS8	1 st ed 6" OS/ 25" OS	O'Briens- bridge	Site of Flour Mill	Disused by late 1900	566072/ 666931	Pre 1840	0m RO
AS9	Aerial photo- graphy	Parteen	Parteen Weir	not listed as part of any surveys	567746/ 667951	1925	0m RO/ 0m OO
AS10	1 st ed 6" OS/ 25" OS	Ardcloony	Ardcloony House	House and farmyard	567664/ 669158		100m RO
AS11	1 st ed 6" OS/ 25" OS	Bealkelly	Site of Raheen Mills Complex (Corn&Tuck Mill, millrace)	'In ruins' on 25" OS	565570/ 682219		0m RO (see also GO)
AS12	1 st ed 6" OS/ 25" OS	Bealkelly	Raheen Bridge		565619/ 682214		0m RO (see also GO)

Table 11: Sites identified from Surveys and Cartographic Sources along Orange Route Option:

Ref	Source	Town-land	Description	Comments	Location	Date	Distance
AS13	CCLB	Parteen	Earthen banks for Shannon Hydro-Electric Scheme	Between Killaloe and Parteen	-	1925	0m OO
AS14	1 st ed 6" OS/ 25" OS	Ross	Site of Gate Lodge associated 18th c. Ross House (NIAH 20404517/ RPS 094)	Removed, gates across road extant	567271/ 668690		70m OO
AS15	25" OS, Site visit	Rahena More	Semi-detached Estate Cottages	Derelict, possibly for Tinarana House	568835/ 679035	Late 19 th c.	0m OO (also 0m GO)

AS16	25" OS	Rahena Beg	Constabulary Barracks	Derelict, possibly for Tinarana House	568843/ 679073	Late 19 th c.	0m OO (also 20m GO)
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Table 12: Sites identified from Surveys and Cartographic Sources along Green Route Option:

Ref	Source	Town-land	Description	Comments	Location	Date	Distance
AS11	1 st ed 6" OS/ 25" OS	Bealkelly	Site of Raheen Mills Complex (Corn&Tuck Mill, millrace)	'In ruins' on 25" OS	565570/ 682219		15-30m GO (see also RO)
AS12	1 st ed 6" OS/ 25" OS	Bealkelly	Raheen Bridge		565619/ 682214		25m GO (see also RO)
AS17	1 st ed 6" OS/ 25" OS	Tom-graney	Roman Catholic Chapel (disused)	To east of St. Joseph's RC church	563540/ 683132		0m GO
AS18	1 st ed 6" OS/ 25" OS	Tom-graney	Quarry (disused)	To west of tower house	563615/ 683057		0m GO

5. CONCLUSION

The desktop assessment of the route options for the proposed greenway development has identified 52 recorded archaeological sites from the Record of Monuments and Places located within the study area, as well as 43 sites of architectural heritage significance included in the NIAH and Records of Protected Structures in the Development Plans for Counties Limerick and Clare. Eighteen further sites of cultural heritage significance were also identified from cartographic sources or local authority surveys.

Ten of the recorded archaeological sites are located in close proximity to the Red Route Option, of which three are bridges or features associated with bridges. An enclosure recorded at O'Briensbridge (CL054-008) was removed by the construction works of the head race for Ardnacrusa in 1925. A number of enclosures and a mound with standing stone are located within 20m of the proposed route.

Fourteen recorded archaeological sites are located in close proximity to the Green Route Option. Of these, six are associated with St.Cronan's Church and Graveyard in Tuamgraney. It is not expected that the development of the route will impact directly on any part of this site, given its significance. The Bastioned Fort (LI005-017147) west of Thomond Bridge in Limerick City is located within the Zone of Archaeological Potential. However, it is not anticipated that there will a requirement for groundworks at this location, as the route will follow existing road surfaces. The remaining five sites are a roadway or track of unknown date at Ardnataggle, an ecclesiastical enclosure with souterrain and two bullaun stones (CL029-023001-04) and two ringforts (CL029-021001 and CL029-021002), all located directly along the roadside at Ogonelloe. Any works in these areas would required consultation with the National Monuments Service. Between Tinerana and Scarriff, the Orange Route Option follows the southern shore of Lough Derg, where it will pass close to Castlebawn Tower House at Carrowena (A30/AH 25: RPS 646 / RMP CL029-019). Due to changes in water levels, the tower house is now situated on a peninsula in the lake, but there may be previously unrecorded, below-ground features associated with the tower house at this location.

Any development works within the Architectural Conservation Areas of Limerick City, O'Briensbridge, Tuamgraney and Scarriff will require special consideration and impacts on existing streetscapes, street furniture, views and any features associated with protected structures should be avoided.

43 structures of Architectural Heritage Significance were identified within the study area. As the Red Route Option follows the Errina Canal, nine of the sites directly impacted by this route option are associated with canal architecture. Due to the nature of the development, it is expected that impacts on these features can be mitigated through route design. Potential impacts on Architectural Heritage sites were identified at the location of Tinerana House (RPS 095). The proposed Orange Route Option passes through the 19th century entrance gates adjacent to the gate lodge at Islandcosgry / Rahena Beg (NIAH 20403702) and past the 18th walled garden located within the grounds of Tinerana House. The house and lands are in private ownership. The Green Route option passes the Gate Lodge on the public road (R463).

At Ballyvally north of Killaloe, the Green Route Option passes the demesne walls, gates and gate lodge for Ballyvalley House (NIAH 20404510, RPS 440) located along the eastern side of the R463, close to the access lane for Brian Boru's Fort. It is recommended that any route design at this location must mitigate against impacts on these structures.

Other Architectural Heritage sites in close proximity of the route options are in the main located along existing roads in towns and villages and any impacts on these sites by the proposed scheme is deemed to be low due to the nature of the development.

Of the eighteen further sites of potential cultural heritage significance identified from cartographic sources and a number of previously undertaken local authority surveys, six represent additional features such as locks and bridges associated with the Errina Canal and the construction of the Ardnacrusha scheme. Two are sites of late 18th century or early 19th century Flour Mills at O'Briensbridge and Beakelly (Raheen) and the rest are 19th century dwellings. The flour mills have now disappeared, but in the event of groundworks in these areas, there is high potential for features associated with these structures to be uncovered.

The general impact of the proposed development on the cultural heritage of the study area is deemed to be low. It is expected that impacts on any features or sites outlined above can be mitigated through design of the route, such as avoidance of sites or structures. More detailed recording of features identified from cartographic sources should be undertaken during further stages of the project.

As there is strong evidence that study area has been inhabited for several thousand years, there is high potential to uncover further unrecorded sites of archaeological significance in any sections where the greenway development will require the construction of new surfaces, especially through agricultural land. It is recommended that works shall be designed to minimise ground disturbance.

However, the proposed development will also provide improved access to canal architecture, to historic villages such as O'Briensbridge and Cloonlara, heritage sites at Killaloe, Tuamgraney and Scarriff and enhance the amenity value of the area.

APPENDIX F – ECOLOGICAL CONSTRAINTS STUDY



Limerick to Scarriff Greenway: Ecological Constraints Report



By: Flynn Furney Environmental Consultants

For: Waterways Ireland

Date: March 2022



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1. Introduction

Waterways Ireland, together with Limerick City and County Council, Clare County Council and ESB, are working in partnership and have established a working group to explore the potential to develop a Limerick to Scarriff Greenway. A steering group comprising Waterways Ireland, Limerick City and County Council and Clare County Council has also been formed. The proposed greenway has been identified as a signature project in the Shannon Tourism Masterplan as it would provide a gateway to and from the heart of Limerick City to Lough Derg and the Shannon.

Clandillon Civil Consulting (CCC) have been appointed to provide consultancy services in respect of the Concept and Feasibility and Options Selection phases of the project. CCC have engaged Flynn Furney to undertake the required ecological assessments. In order to commence the consideration of engineering and environmental constraints, CCC have developed a Study Area. The extent of the study area was determined through the development of several preliminary route options which span between Limerick and Scarriff. The preliminary route options developed took cognisance of the project objectives and significant constraints such as large water bodies, topographical constraints, roads and buildings, which were readily evident from a review of ordinance survey mapping and aerial photography. Study Area drawings are included in Appendix A of the Constraints Report.

This report will provide an assessment of the existing ecological resources within the study area, designated conservation areas, the main habitats of conservation value, the associated conservation objectives and the relevant water or drainage features, with a view to providing a comprehensive understanding of ecological constraints. This understanding will inform the feasibility of the project and should be considered during the formal options selection phase of this project in developing formal route options.

1.1. Study Area Description

Working north to south within the Study Area, the first section of the greenway study area runs from Scarriff to Killaloe. Three preliminary route options have been identified. The landscape and habitat types of these three routes vary significantly and a number of ecological constraints were noted.

After the route has passed Killaloe town, the Study Area extends toward the Parteen Weir. Preliminary route options developed run through agricultural landscapes and through the Lower River Shannon SAC. The Study Area then extends from the Parteen Weir to O'Briensbridge following the River Shannon and the Headrace Canal.

After the village of O'Briensbridge the Study Area widens once more. One preliminary route option follows the Errinagh Plassey Canal until it reaches the River Blackwater. The route then continues beside the River Blackwater until it reaches the University of Limerick campus, entering the Lower Shannon SAC and crossing the River Shannon over one of two existing structures. Once on the southern side of the River Shannon, the preliminary route option follows the banks of the Shannon along established cycle facilities to its intersection with the Park Canal. This route options follows the Park Canal to where the route finishes in Limerick city.

A second preliminary route option follows the Shannon Head Race Canal from Obriensbridge past Cloonlara and on to the Ardnacrusha Dam. It follows the Shannon Tail Race to where it meets with the Shannon River and it follow the banks of the River Shannon to King John's Castle in Limerick city, often inside the boundaries of the Lower River Shannon SAC.

1.2. Zone of Influence

Following the guidance set out by the (NRA, 2009b), the proposed development has been evaluated based on an identified zone of influence (Zoi) with regard to the potential impact pathways to ecological feature (habitats, flora and fauna). The Zoi for terrestrial habitats is limited to around 30 metres either side from footprint of the proposed routes for this initial field assessment. Desk research often considered sites within 15km of the proposed works. Hydrological linkages between the proposed development and aquatic habitats/species can occur over significant distances; however, the significance of the impact will be site specific depending on the receiving water environment and nature of the potential impact. Adopting a precautionary approach, the distance over which surface water discharges could have a significant impact on receiving watercourses is considered to extend downstream of the proposed development route to the Lough Derg SPA, the Lower River Shannon SAC and the River Shannon and River Fergus Estuary SPA. The Zoi for significant impacts to breeding birds is considered to extend no more than 100m from the proposed route to take account of disturbance during construction or the potential to impact on large swaths of linear vegetation from the river banks. The Zoi for mammals such as bats, badgers and otters may extend over larger distances due to the fact that they can commute and forage several kilometres from their breeding or resting sites. An extensive mammal survey was not completed as part of this assessment however all evidence of protected mammal species noted has been recorded.

2. Legislation & Methodologies

2.1 Legislation, Planning & Policy

Consideration has been given to the key legislative, planning and policy requirements with potential to influence the proposed Limerick to Scarriff Greenway. These are outlined below:

Legislation, Plan or Policy	Relevance to Proposed Greenway Project
European Legislation	
EIA Directive (85/337/EEC) as amended	Directive ensures that projects likely to have significant environmental effects are subject to comprehensive assessment of environmental effects.
Habitats Directive (92/43/EEC)	Works during the construction and operation of the scheme must aim to maintain/conserv habitats and species of community interest. The project must be screened for Appropriate Assessment.
Birds Directive (2009/147/EC)	Works during the construction and operation of the scheme must aim to maintain/conserv wild birds.
Water Framework Directive (2000/60/EC)	Relevant to all works related to construction of the scheme as well as the operation of the Greenway.
National Legislation	
European Communities (Planning and Development Regulations 2001 (SI 600 of 2001), as amended	It must be determined whether the scheme requires to undergo Environmental Impact Assessment.
European Communities (Birds and Natural Habitats) Regulations 2011, SI 477/2011	The project must undergo screening for Appropriate Assessment in accordance with Articles 6(3) and 6(4) of the Habitats Directive.
Wildlife Act 1976 (SI 39/76) as amended and the Wildlife (Amendment) Act 2000 (SI 38/2000 as amended [The Wildlife Acts]	These are the primary domestic statutes for wildlife protection in Ireland. These acts provide protection to species not listed on the EU Habitats Directive. The 2000 act makes provision for the designation and protection of a national network of Natural Heritage Areas (NHAs).
The Inland Fisheries Act 2010. EU (Quality of Salmonid Waters) Regulations 1988.	Works during the construction and operation of the scheme must aim to maintain/conserv fish and other species of fauna and flora, biodiversity of inland fisheries and ecosystems and protect spawning salmon and trout.
Regional Policy	
Regional Planning Guidelines for the West	The project should comply with Policy IP23: <i>“Pedestrian and cycling routes must be</i>

Region 2010 - 2022	<i>designed to minimise impact on habitats and species and should not adversely impact on the conservation objectives or site integrity of SAC, SPA or other ecologically sensitive sites".</i>
Clare County Development Plan 2017-2023 (as varied)	The project is to comply with relevant policies with regard to development of Greenways and other amenities as well as all relevant policies with regard to environmental protection.
Draft Limerick Development Plan 2022-2028	The project is to comply with relevant policies with regard to development of Greenways and other amenities as well as all relevant policies with regard to environmental protection.

2.2 Methodologies

The methods employed in this study adhered to best practice guidelines in order to inform the baseline ecological conditions of the receiving environment. These are summarised below:

Assessment Stage/Criterion	Best Practice Guidance Employed
Greenway Constraints Assessment	<i>Code of Best Practice- National and Regional Greenways</i> (TII, 2021)
Habitat Classification	The Heritage Council classification system (Fossitt, 2000)
Ecological Survey Methodology	Ecological surveying techniques for protected flora and fauna during the planning of national road schemes (NRA, 2009), and: <i>The Heritage Council's Best Practice Guidance for Habitat Survey and Mapping</i> (Smith et al, 2011).
Ecological Impact Assessment	<i>Guidelines for Ecological Impact Assessment in the UK and Ireland.</i> (Chartered Institute of Ecology and Environmental Management, 2018, as updated 2019). <i>Guidelines for Assessment of Ecological Impacts of National Road Schemes</i> (NRA, 2009a)
Annex I Habitat Classification	(old sessile oak woods and alluvial forests) Irish Wildlife Manuals No. 71 National Parks and Wildlife Service (O'Neill & Barron, 2013).
Impact Assessment	The EPA's Advice Notes on Preparing Environmental Impact Statements Draft. EPA (2015a). The EPA's Draft Revised Guidelines on Information to be Contained in Environmental Impact Statements. EPA (2015b).
Bat Habitat Assessment	Bat Surveys for Professional Ecologists. Bat Conservation Trust (UK). Collins, J. ed. (2016)

3. Stakeholder Consultation

During the fieldwork assessment for this Constraints Report, the authors undertook measures to consult with a number of bodies and known authorities as well as non-governmental and voluntary organisations. The results of this consultation process are provided below.

Table 3: Stakeholder Consultation

Stakeholder Consulted	Stakeholder Comment
National Parks and Wildlife Service (NPWS)	No comment received at time of writing
Bat Conservation Ireland	No capacity to comment due to limited resources.
Irish Wildlife Trust	No comment received at time of writing
Inland Fisheries Ireland	No comment received at time of writing
Birdwatch Ireland	No comment received at time of writing
Vincent Wildlife Trust	No comment received at time of writing

4. Desktop study

Prior to the main fieldwork contributing to this assessment, a desktop survey of the available sources of information was carried out. Sources included:

- The National Biodiversity Data Centre Online Database (NBDC)
- The Environmental Protection Agency (EPA) map viewer & database
- The National Parks and Wildlife Services (NPWS) Protected Species Database and Online mapping
- The EPA Water Quality in Ireland Report
- The OSI Geohive Database
- The All-Ireland Wetlands Survey maps
- The Department of Housing, Local Government and Heritage datasets
- National Survey of Native Woodlands (2003-2008)
- Ancient and Long-established Woodland Inventory Survey 2010
- Botanical Society of Britain and Ireland maps

4.1 Protected/designated sites

The ZoI (Zone of Influence) constitutes a 15km Buffer from the proposed development site. There are four internationally protected sites located within the ZoI of the proposed development, two Special Areas of Conservation and two Special Areas of Protection.

4.1.1. European Sites

SACs are sites of international importance due to the presence of Annex I habitats and/or Annex II species listed under the EU Habitats Directive (92/43/EEC). SPAs are designated for the protection of bird species listed on Annex I of the Bird Directive (2009/147/EC), regularly occurring populations of migratory species and areas of international importance for migratory birds.. All sites designated for the conservation of nature within 15km of the proposed works are detailed in Table 4.1.1.

Designated Natura 2000 sites were identified using both the NPWS database and shapefiles and also, the EPA map viewer online tool. Natura 2000 is a network which legally protects areas of special conservation value. It accounts for both protected species and habitats. It comprises Special Areas of Conservation (Habitats Directive) and Special Protection Areas (Birds directive). Species records from the relevant areas were taken from the NBDC online database. Other datasets examined were the Irish Semi-Natural Grasslands (ISGS), the National Survey of Native Woodland (NSNW) and the Ancient Woodland Inventory.

Table 4.1.1. European sites within the Zone of Influence

Natura sites and site code	Special Interest
Slieve Aughties Mountain SPA 004168	[A082] Hen Harrier <i>Circus cyaneus</i> [A098] Merlin <i>Falco columbarius</i>
Lough Atorick South Bog SAC 000308	[7130] Blanket Bogs (Active)*
Slieve Bernagh Bog SAC 002312	[4010] Wet Heath [4030] Dry Heath [7130] Blanket Bogs (Active)*
Lough Derg SPA 004058	[A017] Cormorant <i>Phalacrocorax carbo</i> [A061] Tufted Duck <i>Aythya fuligula</i> [A067] Goldeneye <i>Bucephala clangula</i> [A193] Common Tern <i>Sterna hirundo</i>
Silvermines Mountains West SAC 002258	[4010] Wet Heath [4030] Dry Heath [6130] Calaminarian Grassland
Clare Glens SAC 000930	[91A0] Old Oak Woodlands [1421] Killarney Fern (<i>Trichomanes speciosum</i>)
Slievefelim to Silvermines Mountains SPA 004165	[A082] Hen Harrier <i>Circus cyaneus</i>
Lower River Shannon SAC 002165	Sandbanks which are slightly covered by sea water all the time [1110] Estuaries [1130] Mudflats and sandflats not covered by seawater at low tide [1140] Coastal lagoons [1150] Large shallow inlets and bays [1160]

Natura sites and site code	Special Interest
	<p>Reefs [1170] Perennial vegetation of stony banks [1220] Vegetated sea cliffs of the Atlantic and Baltic coasts [1230] Salicornia and other annuals colonising mud and sand [1310] Atlantic salt meadows (<i>Glauco-Puccinellietalia maritimae</i>) [1330] Mediterranean salt meadows (<i>Juncetalia maritimi</i>) [1410] Water courses of plain to montane levels with the <i>Ranunculion fluitantis</i> and <i>Callitricho-Batrachion</i> vegetation [3260] Molinia meadows on calcareous, peaty or clayey-silt-laden soils (<i>Molinion caeruleae</i>) [6410] Alluvial forests with <i>Alnus glutinosa</i> and <i>Fraxinus excelsior</i> (<i>Alno-Padion</i>, <i>Alnion incanae</i>, <i>Salicion albae</i>) [91E0] <i>Margaritifera margaritifera</i> (Freshwater Pearl Mussel) [1029] <i>Petromyzon marinus</i> (Sea Lamprey) [1095] <i>Lampetra planeri</i> (Brook Lamprey) [1096] <i>Lampetra fluviatilis</i> (River Lamprey) [1099] <i>Salmo salar</i> (Salmon) [1106] <i>Tursiops truncatus</i> (Common Bottlenose Dolphin) [1349] <i>Lutra lutra</i> (Otter) [1355]</p>
Glenomara Wood SAC 001013	[91A0] Old Oak Woodlands
River Shannon and Fergus estuaries SPA 004077	<p>Cormorant (<i>Phalacrocorax carbo</i>) [A017] Whooper Swan (<i>Cygnus cygnus</i>) [A038] Light-bellied Brent Goose (<i>Branta bernicla hrota</i>) [A046] Shelduck (<i>Tadorna tadorna</i>) [A048] Wigeon (<i>Anas penelope</i>) [A050] Teal (<i>Anas crecca</i>) [A052] Pintail (<i>Anas acuta</i>) [A054] Shoveler (<i>Anas clypeata</i>) [A056] Scaup (<i>Aythya marila</i>) [A062] Ringed Plover (<i>Charadrius hiaticula</i>) [A137] Golden Plover (<i>Pluvialis apricaria</i>) [A140] Grey Plover (<i>Pluvialis squatarola</i>) [A141] Lapwing (<i>Vanellus vanellus</i>) [A142] Knot (<i>Calidris canutus</i>) [A143] Dunlin (<i>Calidris alpina</i>) [A149] Black-tailed Godwit (<i>Limosa limosa</i>) [A156] Bar-tailed Godwit (<i>Limosa lapponica</i>) [A157] Curlew (<i>Numenius arquata</i>) [A160] Redshank (<i>Tringa totanus</i>) [A162] Greenshank (<i>Tringa nebularia</i>) [A164] Black-headed Gull (<i>Chroicocephalus ridibundus</i>) [A179] Wetland and Waterbirds [A999]</p>

As illustrated in the drawings in Annex A of this report, preliminary route options developed to date often run through or border Lough Derg SPA and the Lower River Shannon SAC. The route also runs in close proximity to the River Shannon and Fergus estuary SPA. These sites are assessed in more detail below.

The River Shannon and Fergus SPA

The site has vast expanses of intertidal flats which contain a diverse macroinvertebrate community, e.g. *Macoma-Scrobicularia-Nereis*, which provides a rich food resource for the wintering birds. Salt marsh vegetation frequently fringes the mudflats and this provides important high tide roost areas for the wintering birds. Elsewhere in the site the shoreline comprises stony or shingle beaches. The site is a Special Protection Area (SPA) under the E.U. Birds Directive, of special conservation interest for the following species: Cormorant, Whooper Swan, Lightbellied Brent Goose, Shelduck, Wigeon, Teal, Pintail, Shoveler, Scaup, Ringed Plover, Golden Plover, Grey Plover, Lapwing, Knot, Dunlin, Black-tailed Godwit, Bar-tailed Godwit, Curlew, Redshank, Greenshank and Black-headed Gull. It is also of special conservation interest for holding an assemblage of over 20,000 wintering waterbirds. The E.U. Birds Directive pays particular attention to wetlands and, as these form part of this SPA, the site and its associated waterbirds are of special conservation interest for Wetland & Waterbirds.

The conservation objectives are to maintain favourable status of the birds which are listed as special interests of the site, and to maintain favourable condition of the wetlands inside the SPA.

This SPA borders the green route near King John's castle. Macroinvertebrate community structures are influenced by changes in water quality. Removal of riparian vegetation upstream reduces the buffering capacity to filter polluted runoff. This can result in a reduction in water quality affecting macroinvertebrate populations, and subsequently wintering bird populations. Minimal impact on the riparian woodland, marsh and wet grassland in Quinspool South would prevent removal of part of an important pollution buffer.

Anthropogenic suspended silt is also known to have a significant negative impact on aquatic macroinvertebrate diversity and density. Impacts may be expected during construction. However these would be temporary and impacts could be mitigated.

Lough Derg SPA

The lake is a nationally and internationally important site for breeding waterfowl and wintering birds. The Qualifying Interests for the site are Common Tern, Cormorant, Tufted Duck, Goldeneye and Wetland and Waterbirds. The nationally important Hen Harrier is also known to roost in reedbeds along the lakeshore. It should be noted that parts of the Lough Derg SPA are classed as wildfowl sanctuaries.

The conservation objective of this SPA is to maintain or restore the favourable conservation condition of the wetland habitat at Lough Derg (Shannon) SPA as a resource for the regularly occurring migratory waterbirds that utilise it.

Preliminary route options used to develop the Study Area pass through this SPA. While an AA screening has not been completed in respect of these routes, it is evident that the construction and maintenance of a greenway and the introduction of significant numbers of cyclists and pedestrians to this area would be likely to have a negative impact on the conservation objectives of the SPA.

On that basis, it is recommended that the SPA should be avoided when developing formal route options unless there is a clear justification for entering it and it can be demonstrated that the construction and operation of the greenway is unlikely to have significant adverse impacts on the area in question. An example of an instance where it may be acceptable for the greenway to enter the SPA, subject to appropriate screening and assessment, is where a section of the SPA is already urbanised, such as in the townland of Bunglasha. Where route options are developed within the vicinity of the SPA, a buffer zone equal to the zone of influence associated with the protected species should be maintained.

The Lower Shannon SAC

This is a large, designated site that extends from the other side of the Killaloe bridge down to Loop head in southwest Clare along the River Shannon. It is approximately 120km in length. The Study Area for the greenway interfaces directly with this SAC between:

- Killaloe and the Parteen Weir, where the green route option shown on drawing L2S-DR-EN-0103 in Annex A runs through the SAC and where the red route options runs along the border of the SAC over a short distance.
- Parteen Weir and Cloonlara, where the red route option shown on drawing L2S-DR-EN-0102 in Annex A runs through the SAC and where the orange route option runs along the border of the SAC over a short distance.

- In Co. Limerick, where the green route shown on drawing L2S-DR-EN-0103 in Annex A runs through or along the SAC, where it is adjacent the River Shannon, and where the red route option runs through or along the SAC, where it is adjacent the River Shannon and the Park Canal.

A summary of some of the conservation objectives associated with the SAC is as follows:

1. To restore the favourable conservation condition of Freshwater Pearl Mussel in the Lower River Shannon SAC. Specifically, the population in the Cloon River, Co. Clare. The Cloon population is confined to the main channel and is distributed from Croany Bridge to approx. 1.5km upstream of Clonderalaw Bridge.
2. To maintain favourable condition of Sea Lamprey, Brook Lamprey and River Lamprey in the Lower River Shannon SAC. Artificial barriers can block or cause difficulties to lampreys' upstream migration, Lampreys spawn in clean gravel and there should be no decline in the extent of spawning beds.
3. To restore the favourable conservation condition of Salmon in the Lower River Shannon SAC. Including a target of at least Q4 at all sites sampled by EPA.
4. To restore the favourable conservation condition of Otter in the Lower River Shannon SAC. Including no significant decline. Area mapped and calculated as 596.8ha above high-water mark (HWM); 958.9ha along river banks/ around ponds. Otters need lying up areas throughout their territory where they are secure from disturbance (Kruuk, 2006; Kruuk and Moorhouse, 1991). No significant decline in couching areas and holts. (See Figure 4.1.1.1).
5. To maintain the favourable conservation condition of water courses of plain to montane levels with the *Ranunculus fluitans* and *Callitriche-Batrachion* vegetation in the Lower River Shannon SAC. Decline in habitat must be avoided, and the area of riparian woodland at and upstream of the bryophyte-rich sub-type should be maintained (see Figure 4.1.1.2).
6. To maintain the favourable conservation condition of *Molinia* meadows on calcareous, peaty or clayey-silt laden soils (*Molinia caerulea*) in the Lower River Shannon SAC. This habitat has been recorded on the eastern bank of the Shannon, just north of Castleconnell, Co. Limerick (NPWS internal files). Full distribution of this habitat in this site is currently unknown and it almost certainly occurs elsewhere.
7. To restore the favourable conservation condition of Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*) in the Lower River Shannon SAC. Area stable or increasing. Where topographically possible, "large" woods at least 25ha in size and "small" woods at least 3ha in size. No decline in mature and veteran trees. (See Figure 4.1.1.3.)

Potential impacts on the water quality of the site may be likely due to the type of work expected along the riverbanks. Naturally, sediment would be likely to enter the watercourse with works bankside without mitigation. However, relatively small amounts of sediment may not be a cause of huge concern due to the dilution rate in this large river. The site has five Annex II protected fish species, these are Sea Lamprey, Brook Lamprey & River Lamprey, Twaite Shad and Atlantic Salmon. These are known to spawn in the Lower Shannon and its tributaries. In terms of terrestrial impacts, one of the protected habitats within this SAC is Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, *Alnion incanae*, *Salicion albae*) (91E0) which if the route follows the banks of the River Shannon, it's likely there could be impacts. It is stated in the site synopsis that the woodland present on the banks of Shannon can be up to 50m in width. Further specialised surveys are needed to determine the exact location of other areas of alluvial woodland which may be directly impacted by the route as no indicator species were identified on initial surveys. However, the red route from Thomand village (University of Limerick) to Kings castle should remain outside of the SAC boundaries to avoid any impact. Any widening of the existing path should be designed in such a way as to mitigate impacts. Further surveying of the area for the presence of annex 1 alluvial woodlands is needed.

Ranunculus fluitantis and *Callitriche-Batrachion* vegetation is indicated as present to the North-West of Kings Island (See figure 4.1.1.3). The SAC conservation objectives state that areas of riparian woodland at and upstream of the bryophyte-rich sub-type should be maintained. The area of riparian woodland (inside the SAC boundaries) where the canal meets the River Shannon (north of Kings Island) would be impacted if the green route were to be constructed. This area must be avoided as impacts would be in direct violation of the SAC conservation objectives. This area is also indicated as providing otter habitat. One of the SAC conservation objectives previously mentioned is to prevent any future decline in otter habitat.

Other internationally protected sites were not considered at this stage either due to their distance from the proposed works or lack of hydrological connectivity.

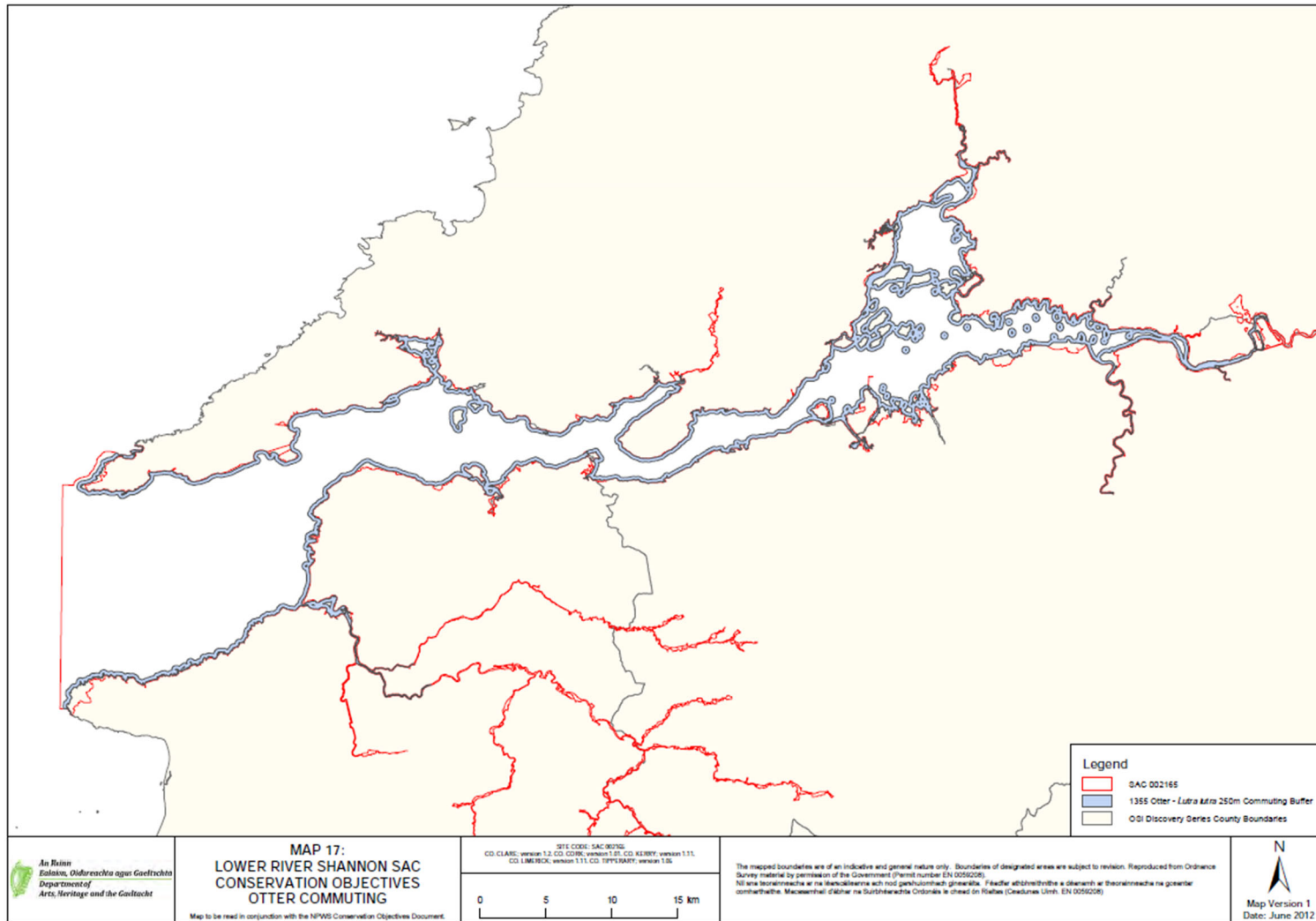


Figure 4.1.1.1.: Map from Lower River Shannon Conservation objectives: Otter Commuting (NPWS, 2022)

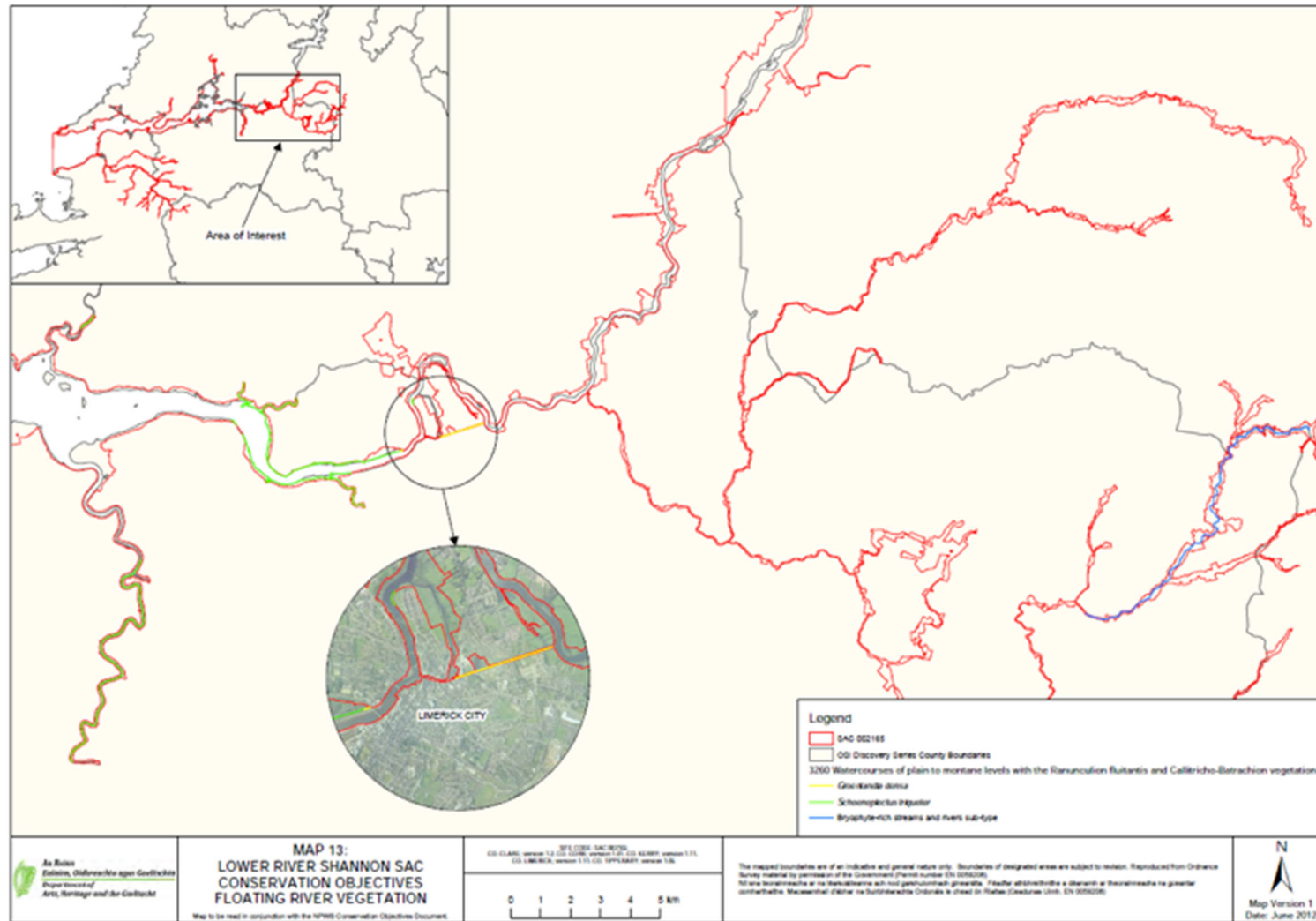


Figure 4.1.1.3.: Map from Lower River Shannon Conservation objectives: Floating River Vegetation (NPWS, 2022).

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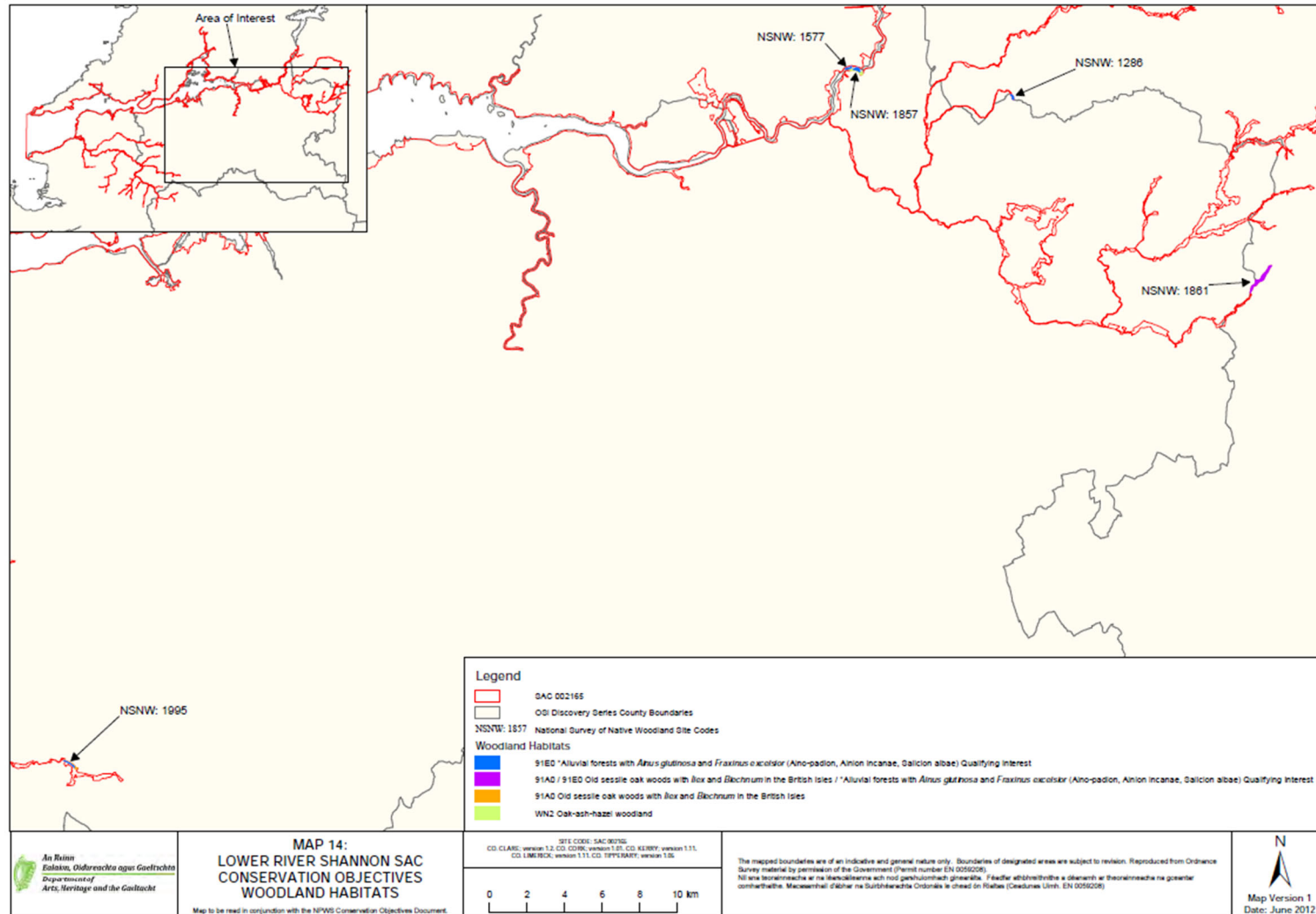


Figure 1:Figure 4.1.1.1.: Map from Lower River Shannon Conservation objectives: Woodland Habitats. (NPWS, 2022)

4.1.2. Nationally designated sites

Natural Heritage Areas (NHAs) are sites deemed to be of national ecological importance and are afforded protection under the Wildlife (Amendment) Act 2000. Many NHA boundaries overlap with European sites. The proposed NHAs (pNHAs) have not been statutorily proposed or designated under the Wildlife Act (as amended). However, they are afforded some protection under planning legislation and objectives are included in the current County Development Plan specifically aimed at protecting pNHAs or providing complimentary protective measures that enhance the network of pNHAs. All NHA's and pNHA's within the 15km of the proposed routes are described below in table 4.1.2.

Table 1: 4.1.2. Nationally designated sites within 15km of the study area.

Woodcock Hill and Bog 002402
Woodcock Hill Bog NHA is a site of considerable conservation significance comprising upland blanket bog and wet heath. Blanket bog habitat is a globally scarce resource. It is largely confined to coastal regions at temperate latitudes with cool, wet, oceanic climates. North-west Europe contains some of the best - developed areas of blanket bog in the world. The most extensive areas are found in Ireland, Britain and Iceland. Upland blanket bogs, due to their exposure to severe climatic conditions at high elevations, are particularly vulnerable to erosion by human activities and extensive areas are currently undergoing active erosion due mainly to overgrazing. The current area of intact upland blanket bog in Ireland represents only a fraction of the original resource, due to the combined impacts of afforestation and overgrazing, and intact examples are therefore extremely valuable for nature conservation. Their long-term survival requires sensitive management.
Gortacullin Bog NHA 002401
Gortacullin Bog NHA is a site of considerable conservation significance containing upland blanket bog and wet heath. The site supports a good diversity of blanket bog microhabitats, including hummock/hollow complexes, flushes and regenerating cutover with willow and birch scrub. Blanket bog habitat is a globally scarce resource. It is largely confined to coastal regions at temperate latitudes with cool, wet, oceanic climates. North-west Europe contains some of the best-developed areas of blanket bog in the world. The most extensive areas are found in Ireland, Britain and Iceland. Upland blanket bogs, due to their exposure to severe climatic conditions at high elevations, are particularly vulnerable to erosion by human activities and extensive areas are currently undergoing active erosion due mainly to overgrazing. The current area of intact upland blanket bog in Ireland represents only a fraction of the original resource, due to the combined impacts of afforestation and overgrazing, and intact examples are therefore extremely valuable for nature conservation. Their long-term survival requires sensitive management
Lough Derg pNHA 00011
No synopsis available but Lough Derg is also an SPA due to its high ornithological importance. Supports nationally important breeding populations of Cormorant and Common Tern. In winter, it has nationally important populations of Tufted Duck and Goldeneye, as well as a range of other species including Whooper Swan. The presence of Whooper Swan, Greenland White-fronted

Goose, Hen Harrier and Common Tern is of particular note as these are listed on Annex I of the E.U. Birds Directive. Parts of Lough Derg (Shannon) SPA are a Wildfowl Sanctuary
Cloonlara house pNHA 00028
This bat site is located in a three-story domestic dwelling house and contains over 100 Leisler's Bats (<i>Nyctalus leisleri</i>) during the summer months. The Leisler's Bat is the largest bat to occur in Ireland. Although the number of bats at this site has declined in recent years, it is still one of the biggest nursery sites in Ireland and in Europe. It is a site of international importance.
Castleconnel Dwelling 000433
No site synopsis available
Inner Shannon Estuary 000435
No synopsis is available however the site is known to have vast expanses of intertidal mudflats and populations of Black-tailed godwits <i>Limosa limosa</i> (amber-listed).
Glenomra Woods 001013
No synopsis available although the Glenomra Woods SAC is known for its Old Oak Woodlands.
Lough O'Grady 001019
Lough O'Grady is a medium sized lake situated about 3km south-west of Scarriff in Co. Clare. Keel Lough, a small lake north-west of O'Grady, is part of the site. The River Graney flows into the lake at the west end, while the River Scarriff flows out at the eastern side. The lake is an important wildfowl site with regionally significant populations of Wigeon, Teal, Mallard and Lapwing. Greenland White-fronted Geese regularly visit the site and use Island O'Grady as a roost. The main interest of this site is as a waterfowl site, especially for Greenland Whitefronted Geese. However, there is also a good diversity of habitats ranging from open water to wet grassland/marsh and wet woodland and scrub. There has been relatively little damage to the site.
Knockailsheen Marsh 002001
No synopsis available. This area drains to the River Shannon, to its east and is a Special Area of Conservation (SAC) for its wetland habitats.
Fergus Estuary and Shannon North Shore 002048
No site synopsis available. However, the area is also a SPA. The site has vast expanses of intertidal flats which contain a diverse macroinvertebrate community, e.g. <i>Macoma-Scrobicularia-Nereis</i> , which provides a rich food resource for the wintering birds. The site is a Special Protection Area (SPA) under the E.U. Birds Directive, of special conservation interest for the following species: Cormorant, Whooper Swan, Lightbellied Brent Goose, Shelduck, Wigeon, Teal, Pintail, Shoveler, Scaup, Ringed Plover, Golden Plover, Grey Plover, Lapwing, Knot, Dunlin, Black-tailed Godwit, Bar-tailed Godwit, Curlew, Redshank, Greenshank and Black-headed Gull. It is also of special conservation interest for holding an assemblage of over 20,000 wintering waterbirds. The E.U. Birds Directive pays particular attention to wetlands and, as these form part of this SPA, the site and its associated waterbirds are of special conservation interest for Wetland & Waterbirds.

Lough Derg pNHA would be expected to suffer impacts if the Orange route between Scariff and Killaloe were to be developed. The site is of high ornithological importance and any reduction in lakeside bird habitat should be avoided. As such, route options currently inside the pNHA and SPA boundaries

should be reconsidered to allow for a sufficient buffering zone at the lake edge and avoid impacting important lakeside habitats. Other routes which cross rivers flowing into Lough Derg may also be expected to have indirect and temporary impacts on water quality during construction. A reduction in water quality could result in reduction in the amount of prey available causing birds to avoid the site. However, given the scale of the project impacts on water quality would most likely be negligible and any predicted impacts could be prevented with the correct procedures in place.

The Fergus estuary and Shannon North Shore pNHA borders the green route near King John's castle. The site is known for its diverse macroinvertebrate community which provide a food source for wintering birds. Macroinvertebrate community structures are influenced by changes in water quality. Removal of riparian vegetation upstream reduces its buffering capacity to filter polluted runoff. This could result in a reduction in water quality affecting macroinvertebrate populations and subsequently wintering bird populations. Anthropogenic suspended silt is also known to have a significant negative impact on aquatic macroinvertebrate diversity and density. Impacts may be expected during construction if the correct procedures are not ensured. However, these impacts can be prevented with sufficient mitigation measures.

The green route runs close to Knockailsheen Marsh near Parteen, however impacts would not be expected. Impacts on other pNHA's mentioned are not predicted due to a sufficient buffering distance or lack of hydrological connectivity.

4.2 All Ireland Wetlands Survey

Wetland is a collective term for ecosystems (habitats and their associated species) whose formation has been dominated by water, and whose processes and characteristics are largely controlled by water. A wetland is a place that has been wet enough for a long enough time to develop specially adapted vegetation and other organisms (Maltby 1986). They occur where the water table is at or near the surface of the land, or where the land is covered by a layer of shallow water, either throughout the entire year or seasonally.

In conjunction with Foss Environmental Consulting, Wetland Surveys have developed an online map of all known wetlands in the Republic of Ireland. This map was investigated to identify any wetlands which may be affected by the development of a particular greenway route. The ZoI (Zone of Influence) was considered and established at 500 metres from the preliminary greenway route options developed.

Table 2: A list of all wetlands identified on the All Ireland Wetland Survey maps which may be affected by the development of any of the proposed routes

Site Name	Code	Site Evaluation	Main Wetland Type	Description	Data Source
Scarriff River Mouth (Lough Derg SPA and pNHA)	WMI_CL0282	A Rating: Internationally Important	Data Pending, RIVER, REED SWAMP, SCRUB, LAKE	Description pending	Clare County Council
CARROWCORE CARROWGAR WETLAND	WMI_CL0838	D Rating: Local conservation value (moderate value)	MARSH, WET GRASSLAND, SCRUB, TALL HERB SWAMP	Mosaic of wetland habitats	Clare Habitat Survey East Clare 2008
BALLYBROGHAN WETLAND	WMI_CL0836	D Rating: Local conservation value (moderate value)	LAKE, WET WOODLAND (OAK ASH OR WILLOW ALDER), SCRUB, DYSTROPHIC LAKE, REED SWAMP	Large wet woodland dominated by grey willow and downy birch. Very wet beneath, including species such as iris and water horsetail.	Clare Habitat Survey East Clare 2008
ARDCLOONEY RIVER WET WOODLAND	WMI_CL0871	C+ Rating: County Conservation value	RIVER, RIPARIAN WOODLAND	Eroding Upland River in a deep ravine. Very rapid flow. Woodland on either side of the river composed mainly of Willows with occasional Ash and Alder.	Survey and Mapping of Habitats of Mid East Clare 2011
LOWER RIVER SHANNON SAC	WMI_TI15	A Rating: Internationally Important	REED SWAMP, TALL HERB SWAMP, WET WOODLAND (OAK ASH OR WILLOW ALDER), RIPARIAN WOODLAND, SCRUB, LAKE, RESERVOIR, RIVER, CUTOVER BOG, WET GRASSLAND, WET HEATH, POOR FEN	This very large site stretches along the Shannon valley from Killaloe to Loop Head/ Kerry Head, a distance of some 120 km. Lower River Shannon in Tipperary includes section of river/reservoir between Killaloe and Parteen, and a section of river running from Newport to Keeper Hill.	National Parks and Wildlife Service

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Site Name	Code	Site Evaluation	Main Wetland Type	Description	Data Source
O'BRIENSBRIDGE WET WOODLAND	WMI_CL0869	C Rating: Local conservation value (high value)	RIVER, RIPARIAN WOODLAND	Riparian woodland dominated by Willows. The water table is very high here with some pooling, probably fed by a small stream flowing through the woodland.	Survey and Mapping of Habitats of Mid East Clare 2011
RED BOG - OBRIENSBRIDGE cNHA	WMI_CL0271	C+ Rating: County Conservation value	RAISED BOG, CUTOVER BOG, SCRUB, WET GRASSLAND, WET HEATH, TALL HERB SWAMP, RIVER	Description pending	Clare County Council
ARDATAGGLE OBRIENSBRIDGE POND	WMI_CL0626	C Rating: Local conservation value (high value)	SCRUB, RIPARIAN WOODLAND, MESOTROPHIC LAKE, WET WOODLAND (OAK ASH OR WILLOW ALDER)	Mesotrophic Lake with Riparian woodland. The surrounding shoreline is host to a wide variety of wetland species and mature woodland surrounds the entire lake.	Wetland Surveys Ireland
ERRINA	WMI_CL0831	D Rating: Local conservation value (moderate value)	WET GRASSLAND, SCRUB	This site is located south of the Errina Canal and Ardnacrusha headrace canal. This site is a good example of Acid grassland.	Survey & Mapping of Habitats from Cratloe to Parteen, South East Clare
SPRINGFIELD BOG	WMI_CL0629	C+ Rating: County Conservation value	REED SWAMP, CANAL, WET GRASSLAND, CUTOVER BOG, SCRUB, MARSH, WET WOODLAND (OAK ASH OR WILLOW ALDER)	Located between the Errina Canal and the headrace canal of Ardnacrusha power station. This habitat comprises a species-diverse Marsh which gradually grades into Wet Willow-Alder-Ash woodland.	Wetland Surveys Ireland
GARRAUN POND NORTH	WMI_CL0606	F Rating: Unknown value - survey required	Data Pending, ARTIFICIAL POND, REED SWAMP, RIVER, SCRUB	Description pending	Wetlands Surveys Ireland

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Site Name	Code	Site Evaluation	Main Wetland Type	Description	Data Source
PARTEEN	WMI_CL0254	F Rating: Unknown value - survey required	TIDAL RIVER	Description pending	Clare County Council
KNOCKALISHEEN MARSH pNHA - LOWER RIVER SHANNON SAC	WMI_CL0157	A Rating: Internationally Important	WET GRASSLAND, FEN, REED SWAMP, SCRUB	This site is situated mostly within Co. Clare but just to the north of Limerick City. It consists of grassland that slopes gradually to a wetland area, which then drains into the River Shannon.	Clare County Council

The greenway route runs through Springfield bog. This cutover bog habitat comprises a species-diverse Marsh which gradually grades into Wet Willow-Alder-Ash woodland. The Errina canal and associated towpaths intersect this wetland. The vegetated towpaths, around 3-4 meters wide, are raised above the canal and wetlands. Therefore, development of this route would be expected to have minimal impacts on this wetland with the correct procedures in place as the route will follow the existing towpaths.

Parteen tidal river and its associated wetlands, such as the riparian woodlands near Quinspool South, have the possibility to be affected by route selection in this area. These areas should be avoided where possible.

The route runs near to other wetlands such as Knockalisheen Marsh and Errina acid grassland but no substantial impact is predicted.

4.4. Watercourses

A review of available data on the catchments and sub-catchments was carried out. This used data from the Environmental Protection Agency and other sources such as www.catchments.ie. The recorded Q-values of river waterbodies were examined. A Q-value is assigned under the WFD through the analysis of macroinvertebrate populations and is an indication of water quality status. Under the requirements of the Water Framework Directive all watercourses must achieve good status within the required time frame. The Water Framework Directive (WFD) was transposed into Irish law by the European Communities (Water Policy). It represents a legal requirement to carry out water protection and water management measures that are integrated, targeted, and which ultimately must be effective in achieving the objective of at least 'good status' for Irish waters by 2027.

The preliminary route options developed cross or come into close contact with approximately 24 recognised EPA watercourses and is within Lower Shannon catchment (Catchment ID- 25C & 25D). These watercourse range in sizes and characteristics. The stream orders vary between order 1-7. Majority of them have not been assigned a quality status under the Water Framework Directive (2013-18). However, others such as Ardclony and Black (O'Brien's Bridge) streams have generally satisfactory water quality (Q5) (Q4).

The information in the data table below has originated from the EPA map viewer under WFD 2013-18 and river flow databases.

Table 4.4.1. Water courses which may be impacted by the proposed routes.

European code	EPA Name	WFD Name	WFD Status	Order
IE_SH_25G040400	Graney [Shannon]	Graney [Shannon]	Moderate	5
IE_SH_25G040400	Tuamgraney	Graney (Shannon)_050	Moderate	2
IE_SH_25A050100	Hospital Raheen	Shannon (Lower)_040	Unassigned	1
IE_SH_25A050100	Picnic Carrowena	Shannon (Lower)_040	Unassigned	1
IE_SH_25A050100	Aughinish	Shannon (Lower)_040	Unassigned	1
IE_SH_25A050100	Ballybran	Shannon (Lower)_040	Unassigned	1
IE_SH_25A050100	Ballyheefy Stream	Shannon (Lower)_040	Unassigned	1
IE_SH_25A050100	Annacarriga 25	Shannon (Lower)_040	Unassigned	3
IE_SH_25A050100	Un-named	Shannon (Lower)_040	Unassigned	1
IE_SH_25A050100	Rinnaman Point	Shannon (Lower)_040	Unassigned	1
IE_SH_25A050100	FEENLEA 25	Shannon (Lower)_040	Unassigned	1
IE_SH_25A050100	FEENLEA 25	Shannon (Lower)_040	Unassigned	1
IE_SH_25S012500	Ballyteige 25	Shannon (Lower)_050	Moderate	2
IE_SH_25A030100	Ardcloony	Ardcloony_010	High	2
IE_SH25B230100	Black [O'Briensbridge]	Bridgetown (Clare)_010	Good	3
IE_SH_25S012500	Montpelier	Shannon (Lower)_050	Moderate	1
IE_SH_25S012600	Blackwater [Clare]	Shannon (Lower)_060	Unassigned [upstream "Good"]	4
IE_SH_25S012600	Shannon [Lower]	Shannon (Lower)_060	Unassigned [upstream "Moderate"]	7
IE_SH_25S012600	Groody	Shannon (LOWER)_060	Poor	4
IE_SH_25N170970	North Ballycannan	North Ballycannan_010	Unassigned	3
IE_SH_25N170970	South Ballycar	North Ballycannan_010	Unassigned	3
IE_SH_25B060250	Blackwater [Clare]	Blackwater (Clare)_020	Good	4
IE_SH_25B060250	Oakfield 25	BLACKWATER (CLARE)_020	Unassigned	1

Only one watercourse, the Groody, is considered to be of poor water quality status. Four streams/ivers are designated as having moderate water quality. The Blackwater, Black (O'Briensbridge) and Ardcloney are found to be either in good or high quality. Care should be taken to avoid any actions which would result in the reduction in water quality in any of these waterbodies, especially where it would lead to a waterbody failing to achieve good quality status, which is a legal requirement under the Water Framework Directive. These water courses are also connected to Special

Areas of Conservation and Special Areas of Protection previously mentioned and reduction in water quality could also result in impacts upon these sites.

4.5. Protected species

The National Biodiversity Data Centre

The National Biodiversity Data Centre maps were used to draw rough polygons around the route sections to determine the protected species which have been recorded within approximately 4-5km of each section. The route is split into 5 sections and a full list of the recorded protected species is found in Appendix 1. Additionally, the Irish Wetland Bird Survey (I-WeBS) was contacted for information regarding wetland birds recorded.

Pine Marten (*Martes martes*), Eurasian red squirrel (*Sciurus vulgaris*) and West European Hedgehog (*Erinaceus europaeus*) were recorded in more sections than not. Eurasian Badger (*Meles meles*) has been recorded in all sections bar one. Five species of bat were recorded in section one. While the Soprano pipistrelle (*Pipistrellus pygmaeus*) was recorded in every section bar the green route in section 5. The European otter (*Lutra lutra*) was also recorded in three sections, two of which incorporated the Lower River Shannon SAC within which it is a special interest.

Irish Wetland Bird Survey

I-WeBs Surveys between Killaloe and O'Brien bridge show the area is important for a number of wetland birds including multiple recordings of red-listed species such as the Purple sandpiper *Calidris maritima*, Curlew *Numenius arquata*, Snipe *Gallinago gallinago* and Lapwing *Vanellus vanellus*. A number of amber-listed species have also been recorded here.

Amber-listed species such as Teal *Anas crecca*, Pochard *Aythya farina*, Tufted Duck *Aythya fuligula*, Black-headed Gull *Chroicocephalus ridibundus* were recorded at Westfield wetland in Limerick.

The Botanical Society of Britain and Ireland

The BSBI atlas search was used to determine the location of species which are a designated special interest of the Lower River Shannon SAC. Two species with flora protection orders and listed under the conservation objectives were present in areas of the proposed routes. Triangular club-rush (*Scirpus triquetrus*) and Opposite-leaved pondweed (*Groenlandia densa*) have been recorded since 2000 in the area of Moyross. Opposite-leaved pondweed is also present in the vicinity of King John's Castle. These species were not found on route during surveying but further surveying of the wider area will allow any impacts to these species (from machinery etc. during construction) to be avoided.

5. Field Surveys

Field surveys were carried out by a team of ecologists from Flynn Furney Environmental Consultants in October and November 2021. The primary aims of the field surveys were to:

- Identify habitat types within the study area at a high-level (Fossitt level II to level III)
- Assess for the presence of protected species
- Identify ecological and environmental constraints
- Identify ecological sensitivities around and within the study area

These were initial high-level surveys carried out outside the optimal season for flora and provide only the baseline information for the initial constraints assessment. Further surveys will be required, during optimal seasons. Methods for surveying are as follows:

- Habitat survey and mapping were carried out as per the guidelines given by Smith et al (2011).
- Habitats were classified according to Fossitt's Guide to Habitats in Ireland, sometimes only possible to level II given the seasonal constraint (Fossitt, 2000).
- Evidence of mammals was recorded however not extensive.
- Birds observed during surveying were recorded and wintering bird habitat.
- Fisheries potential of rivers and streams was noted

5.1. Habitats

A number of habitats were recorded on route as part of an initial walkover survey. Habitats that will be directly impacted or removed are outlined in section 6. These habitats were recorded outside the optimal season for the identification of flora, repeat surveys are needed to confirm the habitats present. Thus, protected flora and protected habitats may not be sufficiently surveyed in the context of the wider study area, and may require to be identified in follow-up surveys. Of the habitats recorded, two Annex 1 habitat types were found. Some significant habitats are described below.

Bog woodlands are Coniferous and broad-leaved forests on a humid to wet peaty substrate, with the water level permanently high and even higher than the surrounding water table. The water is always very poor in nutrients. These communities are generally dominated by *Betula pubescens*, *Frangula alnus*, *Pinus sylvestris*, *Pinus rotundata* and *Picea abies*, with species-specific to bogland or, more generally, to oligotrophic environments. This habitat was identified near Bealkelly woods where the

soil type is cutover peat with a carpet of Sphagnum moss, corresponding to Sphagnum birch woods (91D0), an Annex 1 habitat.

Alluvial woodlands occur along the Shannon, in the valley bottoms of the tributaries and on seepage zones on valley sides. The first type of alluvial forest is alder *Alnus glutinosa* and ash *Fraxinus excelsior* (91EO), this is a special interest of the Lower Shannon SAC. Some surveyed woodlands also conform to a second habitat listed in Annex I of the Habitats Directive, Old sessile oak woods with *Ilex* and *Blechnum* (91A0).

Alluvial forests belong to the most species-rich and essential habitats in Europe. They are placed under the strict protection of the EU Habitats directive. Further surveying is needed to determine the presence of indicator species of annex 1 type alluvial woodlands on route.

Reed swamps were often present at the water's edge in Lough Derg, and areas of the Shannon. This habitat is commonly found around lakes, on slow-flowing riverbanks, and estuaries. They are usually species-poor stands of vegetation that are dominated by Reeds and other large grasses or large, tussock-forming Sedges. Most reed and large sedge swamps are overwhelmingly dominated by one or a small number of species, as in the case of reed beds. Stands of vegetation range from very dense to open. Unlike tall-herb swamps, in reed and large sedge swamp, the broad-leaved herb component is a minor element in the vegetation. Swamps support a number of EU-protected species including Otter, Sedge Warbler, Water Rail, Moorhen and other waterfowl. The principal threats to this habitat include nutrient enrichment and damage arising from agricultural practices, human developments around lakes and utilization of lakes for increased sport and leisure activities.

Tall herb swamps were sometimes present ranging from species-poor to more moderately-rich, they must be resurveyed during the optimal months to determine the presence of Annex 1 habitat (6430) under the EU Habitats Directive. Tall-herb swamps are comparatively species-rich stands of vegetation dominated by herbs that occur in wet areas where the water table is above the ground surface for most of the year, or where water levels fluctuate regularly as in the case of tidal sections of rivers. Tall herb swamps are not dominated by reeds.

Marsh is found on level ground near slow-flowing riverbanks, lakeshores, and in other places where mineral or shallow peaty soils are waterlogged, and where the water table is close to ground level for most of the year.

Unlike swamps, standing water is not a characteristic feature except, perhaps, during very wet periods or in winter months. Marshes tend to be comparatively species-rich, especially with herbs. Marshes

can be an ideal breeding ground for waders such as Snipe. This habitat type should be resurveyed during optimal seasons to determine if Annex 1 habitat (6430) is present.

There are a number of Woodland habitats in the study area. The most common being either **Conifer forestry (WD4)** or **Mixed conifer woodland (WD2)** also of forestry interest. These habitats are beneficial for birds such as the Redwing *Turdus iliacus* and Goldcrest *Regulus regulus*. However, the temporary nature of these forestry woodlands means there is only minor impact in the removal of small sections.

Oak-Ash-Hazel woodland (WN2) was common throughout the study area. This type of woodland is typically dominated by Pedunculate Oak (*Quercus robur*), Ash (*Fraxinus excelsior*) or Hazel (*Corylus avellana*), or by various mixtures of some or all of these trees. Oak Woods once covered almost 75% of the country but the tree-cover today stands at about 10% and very little of this is native woodland. Although this woodland category is not an annexed habitat, it is very limited in extent in Ireland and should be regarded as being of conservation importance.

Oak-Birch-Holly woodland (WN1) are Native, semi-natural broadleaved woodland that occurs on acid or base-poor soils that may be either dry or humid, but not waterlogged. Stands are usually dominated by Sessile Oak (*Quercus petraea*), or mixed stands of Sessile and Pedunculate Oak (*Q. petraea* and *Q. robur*) or their hybrids. Other common trees include Downy Birch (*Betula pubescens*), Holly (*Ilex aquifolium*) and Rowan (*Sorbus aucuparia*). This habitat type can be found in Raheen Woods. Possible links with Annex 1 'old sessile oak woods with *Ilex* and *Blechnum* in the British Isles (91A0)'.

Wet Pedunculate Ash-Oak woodlands (WN4) are found in the study area in Bealkelly woods and near Thomond village, University Limerick. Often abundant with Ash and Sycamore. On alluvial sites, this type of woodland corresponds to the priority habitat, '*alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-padion, Alnion incanae, Salicion albae) (91E0)'.

Mixed Broadleaf woodland (WD1) This general category includes woodland areas with 75-100% cover of broadleaved trees, and 0-25% cover of conifers. It is found on occasion throughout the study area.

Wet grasslands (GS4) occur on wet or waterlogged mineral or organic soils that are poorly-drained or, subject to seasonal or periodic flooding. Wet grassland often contains abundant rushes (*Juncus*

effusus, *J. acutiflorus*, *J. articulatus*, *J. inflexus*) and/or small sedges (*Carex flacca*, *C. hirta*, *C. ovalis*). Wet grassland frequently grades into **marsh - GM1** and there are many similarities in the range of species present in both habitats. *Links with Annex 1:* Wet grassland may contain examples of the annexed habitat, ‘*Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae) (6410)’. This Annex 1 habitat was not determined but grasslands should be resurveyed during the optimal season for floristic surveys.

Dry calcareous and neutral grasslands (GS1) are unimproved or semi-improved dry grassland that may be either calcareous or neutral, but not acid. It is associated with low-intensity agriculture and typically occurs on free-draining mineral soils of various depths. Neutral grasslands were more common occurring on a few occasions. Calcareous grasslands with either high numbers or diversity of orchids correspond to the priority habitat, ‘semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometea) (*important orchid sites) (6210)’. Grasslands appeared to be of the neutral type in most cases but also require resurveying during optimal months.

The routes often parallel **Old stone walls and other stonework (BL1)**. Due to the wealth of archaeological heritage in County Clare there is a considerable quantity of old buildings and stone walls in the county. Buildings and stone walls provide important habitats for many plant and animal species. Cracks and crevices in walls are important for lichens, mosses and ferns, and many bird and bat species use them for breeding or hibernating.

***Molinia* meadows** are known to occur in several parts of the Lower River Shannon SAC and the examples at Worldsend on the River Shannon are especially noteworthy. *Molinia* meadows are herb-rich and blossomy hay meadows. They occur on wet-dry to wet, nutrient-low soils. Unstable soil moisture is a requirement for the occurrence of this type of meadow and can be led back to temporary waterlogging and regular desiccating of the clayey soils. The nutrient poverty is crucial as well. The *Molinia* spec. is eponymous and characteristic. Furthermore, plants which only blossom in mid and high summer are defining. No *Molinia* meadows were found to be directly impacted during surveying but this habitat type is best determined during optimal surveying season for flora. This habitat has been recorded on the eastern bank of the Shannon, just north of Castleconnell, Co. Limerick (NPWS internal files). Full distribution of this habitat in this site is currently unknown and it almost certainly occurs elsewhere.

Other habitats also occurred inside the study area and the habitats found and where they occurred are outlined under the ecological constraints section. This is part of an initial habitat assessment. These habitats have been surveyed outside of the optimal surveying season for flora and are subject to change and expansion in subsequent reporting.

5.2. Birds

A standalone bird survey following a set methodology was not carried out as part of this initial assessment. However, birds were recorded when encountered during surveying. Protected species are listed below.

Name	Latin	Description	Protection BoCCI	Location
Kingfisher	<i>Alcedo atthis</i>	perched for hunting, flushed	Amber-listed	52.90512, -8.52763
Whooper swan	<i>Cygnus cygnus</i>	Flyover x6	Amber-listed	52.9041, -8.52752
Meadow pipit	<i>Anthus pratensis</i>	Flushed	Red-listed	52.89638, -8.47117
Meadow pipit	<i>Anthus pratensis</i>	Flushed	Red-listed	52.89539, -8.4653
Coot	<i>Fulica atra</i>	On the lake	Amber-listed	52.89621, -8.46418
Curlew	<i>Numenius arquata</i>	Around 20 feeding and flushed	Red-listed	52.89616, -8.46158
Kestrel	<i>Falco tinnunculus</i>	Male hunting.	Red-listed	52.89197, -8.45653
Great crested grebe	<i>Podiceps cristatus</i>	On the lake	Amber-listed	52.89688, -8.46192
Mute swans	<i>Cygnus olor</i>	On the lake	Amber-listed	52.89709, -8.45996
Teal	<i>Anas crecca</i>	On the lake	Amber-listed	52.89688, -8.45504
Wigeon	<i>Amber-listed</i>	On the lake	Amber-listed	52.89655, -8.45417
Great crested grebe	<i>Podiceps cristatus</i>	On the lake	Amber-listed	52.89664, -8.44013
Cormorant	<i>Phalacrocorax carbo</i>	On the lake	Amber-listed	52.88681, -8.42472
Cormorant	<i>Phalacrocorax carbo</i>	Multiple drying their wings and roosting	Amber-listed	52.86463, -8.44399
Mute swan	<i>Cygnus olor</i>	Multiple on lake	Amber-listed	52.86442, -8.44443

Name	Latin	Description	Protection BoCCI	Location
Kingfisher	<i>Alcedo atthis</i>	Hunting in drains	Amber-listed	52.86435, -8.45601
Starlings	<i>Sturnus vulgaris</i>	Large flock perched in large birch singing	Amber-listed	52.86377, -8.45799
Greylag goose	<i>Anser anser</i>	Flyover	Amber-listed	52.78272, -8.46085
Whooper swan	<i>Cygnus cygnus</i>	Seven flying overhead	Amber-listed	52.77933, -8.46992
Dunlin	<i>Calidris alpina</i>	Singular seen feeding on lake shores	Red-listed	52.77746, -8.47201
Mute swans	<i>Cygnus olor</i>	On the edge of the river	Amber-listed	52.7727, -8.47676
Mute swans	<i>Cygnus olor</i>	Large number on the river	Amber-listed	52.76996, -8.47642
Tufted Duck	<i>Aythya fuligula</i>	Hundreds on the river	Amber-listed	52.7689, -8.47446
Cormorant	<i>Phalacrocorax carbo</i>	Sitting on buoy in river	Amber-listed	52.75985, -8.47715
Black-headed gull	<i>Chroicocephalus ridibundus</i>	Perched on the northern bank.		52.735748, -8.522916
Snipe	<i>Gallinago gallinago</i>	Feeding	Amber-listed	52.75502, -8.48665
Cormorant	<i>Phalacrocorax carbo</i>	Flying low over the river	Amber-listed	52.74921, -8.50686
Mute swans	<i>Cygnus olor</i>	feeding	Amber-listed	52.74802, -8.50889
Cormorant	<i>Phalacrocorax carbo</i>	Terrestrial roosting	Amber-listed	52.74447, -8.50811
Mallard	<i>Anas platyrhynchos</i>	Travelling on water.	Amber-listed	52.74275, -8.51639
Redwings	<i>Turdus iliacus</i>	initially feeding then disturbed and flushed	Red-listed	52.7342, -8.51164
Meadow pipits	<i>Anthus pratensis</i>	Flushed from long grass	Red-listed	52.73343, -8.53782
Meadow pipits	<i>Anthus pratensis</i>	Flushed from long grass	Red-listed	52.73152, -8.54598
Meadow pipits	<i>Anthus pratensis</i>	Flushed from long grass	Red-listed	52.72861, -8.55056
Black-headed gulls	<i>Chroicocephalus ridibundus</i>	Sitting on the water	Amber-listed	52.72847, -8.55177
Lapwing	<i>Vanellus vanellus</i>	Flock flying overhead	Red-listed	52.72618, -8.55503
Starlings	<i>Sturnus vulgaris</i>	Perched signing	Amber-listed	52.72302, -8.55128

Name	Latin	Description	Protection BoCCI	Location
Mallard	<i>Anas platyrhynchos</i>	Large group in the canal.	Amber-listed	52.724078, -8.549477
Lapwing	<i>Vanellus vanellus</i>	Flyover	Red-listed	52.71885, -8.55376
Kestrel	<i>Falco tinnunculus</i>	Perched on fence	Red-listed	52.84049, -8.47845
Snipe	<i>Gallinago gallinago</i>	Flying overhead	Red-listed	52.7138, -8.55735
Black headed gull	<i>Larus ridibundus</i>	Group on old foodbridge. Possible breeding site.	Amber-listed	52.67813, -8.58
Cormorant	<i>Phalacrocorax carbo</i>	Large group meeting at confluence of canal and river	Amber-listed	52.689364, -8.626940
Black headed gull	<i>Larus ridibundus</i>	Group on electric power line	Amber-listed	52.689364, -8.626940
Grey wagtail	<i>Motacilla cinerea</i>	Feeding on far side of river	Red-listed	52.689364, -8.626940
Grey wagtail	<i>Motacilla cinerea</i>	Flying low at far side of the canal	Red-listed	52.736833, -8.522840

5.3. Mammals

An extensive mammal survey was not carried out as part of this initial constraints survey. However, any evidence of mammals was recorded. This information has been discussed in the constraints section in relation to the route where evidence was identified. Evidence of the presence of Otter was frequent throughout the Lower River Shannon SAC, especially on the river banks near Parteen and Quinspool South. Development too close to the river banks in this area has the potential to negatively impact upon this species.

5.4. Fish

Five species of fish listed on Annex II of the E.U. Habitats Directive are known to occur within the area under survey. These are Sea Lamprey (*Petromyzon marinus*), Brook Lamprey (*Lampetra planeri*), River Lamprey (*Lampetra fluviatilis*), Twaite Shad (*Allosa fallax fallax*) and Salmon (*Salmo*

salar). The three lampreys and Salmon have all been observed spawning in the lower Shannon or its tributaries.

Streams and rivers which were noted to have high fisheries potential during surveying area as follows:

- **Graney (Scarriff)** - 52.908293, -8.532830 – High fisheries
- **Tuamgraney** - 52.900296, -8.530868 – No notes. As impounded from Scarriff River it is most likely moderate potential for salmonids as adults may be present. Eel and other coarse fish most likely present.
- **Hospital – Raheen** - 52.889696, -8.510736 – High fisheries potential for salmonids. Eel may be present also.
- **Ballyheefy Stream** - 52.857646, -8.483495 – Moderate to high fisheries potential for salmonids from my memory of seeing it. Eel likely to be present.
- **Annacarriga River** - 52.850069, -8.481505 – High fisheries potential for salmonids. Eel likely to be present. May be lamprey present.
- **Blackwater (Clare) River** - 52.707701, -8.598923 – High fisheries potential for salmonids. Fish pass present at weir. Eel may also be present.
- **Abbey River** - 52.666559, -8.622052 – High fisheries potential.
- **City Canal** - 52.669742, -8.602569 – High fisheries potential for multiple species of fish due to direct connectivity to the Shannon and Abbey Rivers.
- **Groody River** - 52.670120, -8.587284 – High fisheries potential for multiple species of fish.
- **Shannon River** - 52.678112, -8.576472 – High fisheries potential.
- **Ballyteige River** - 52.809490, -8.475926 – High fisheries potential for salmonids. Eel and lamprey may be present.
- **Ardclooney River** - 52.774184, -8.482746 – High fisheries potential for salmonids. Eel and lamprey may be present.

5.5. Other

Any other evidence of significant species' habitat or evidence of other protected species such as amphibian or invertebrate was recorded and is discussed in the constraints section.

6. Constraints

In this section the main ecological constraints will be discussed. The ‘ecological value’ of an area and the predicted ‘Significance of effect’ are used to put these constraints into context. Both valuations are discussed below.

The ‘ecological value’ of an area or feature is therefore defined with reference to geographical context. That is, whether it is of value locally, regionally, nationally or internationally. This is assessed by ecologists on reviewing survey outcomes. Key criteria are the presence of designated sites, the site or feature containing protected species or areas of high biodiversity. The criteria for ecological value are given in Table 5.1.

Table 5.1: Ecological Value Criteria

Ecological Value	Criteria
International	<p>‘European Sites’ including Special Areas of Conservation (SAC) & Special Protection Areas (SPA).</p> <p>Sites that satisfy the criteria for designation as a ‘European Site’ (see Annex III of the Habitats Directive, as amended).</p> <p>Features essential to maintaining the coherence of the Natura 2000 Network.</p> <p>Sites containing ‘best examples’ of the habitat types listed in Annex I of the Habitats Directive.</p> <p>Resident or regularly occurring populations (assessed to be important at the national level) of the following:</p> <p>Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive; and/or</p> <p>Species of animal and plants listed in Annex II and/or IV of the Habitats Directive.</p> <p>Ramsar Sites</p> <p>World Heritage Sites (Convention for the Protection of World Cultural & Natural Heritage, 1972).</p> <p>Sites hosting significant species populations under the Bonn Convention</p> <p>Sites hosting significant populations under the Berne Convention</p>
National	<p>Areas of Special Scientific Interest (ASSI) or Natural Heritage Area (NHA).</p> <p>National Nature Reserves (NNR).</p> <p>Marine Nature Reserves (MNR).</p> <p>Area of Outstanding Natural Beauty (AONB).</p> <p>Refuge for species protected under the Wildlife (Northern Ireland) Order 1985 (as amended).</p> <p>Undesignated sites fulfilling the criteria for designation as an ASSI; NNR; MNR; and/or refuge for species protected under the Wildlife (Northern Ireland) Order 1985 (as amended).</p> <p>Resident or regularly occurring populations (important at the national level) of the following:</p> <p>Species protected under Wildlife (Northern Ireland) Order 1985 or Wildlife Act 1976, as amended); and/or</p> <p>Species listed on the relevant Red Data list.</p> <p>Sites containing ‘viable areas’ of the habitat types listed in Annex I of the Habitats Directive.</p>
Regional	<p>Sites of Local Nature Conservation Importance (SLNCI).</p>

Ecological Value	Criteria
	<p>Areas subject to a Tree Preservation Order.</p> <p>Resident or regularly occurring populations (assessed to be important at the Regional level) of the following:</p> <p>Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive;</p> <p>Species of animal and plants listed in Annex II and/or IV of the Habitats Directive;</p> <p>Species protected under the Wildlife (Northern Ireland) Order 1985 (as amended); and/or</p> <p>Species listed on the relevant Red Data list.</p> <p>Sites containing areas of the habitat types listed in Annex I of the Habitats Directive that do not satisfy the criteria for valuation as of International or National importance.</p> <p>Regionally important populations of species or viable areas of semi-natural habitats or natural heritage features identified in the National or Local Biodiversity Action Plan (BAP), if this have been prepared.</p> <p>Sites containing semi-natural habitat types with high biodiversity in a regional context and a high degree of naturalness, or populations of species that are uncommon within the region.</p> <p>Sites containing habitats and species that are rare or are undergoing a decline in quality or extent at a national level.</p>
<p>Local</p>	<p>Locally important populations of priority species or habitats or features of natural heritage importance identified in the Local BAP, if this has been prepared;</p> <p>Resident or regularly occurring populations (assessed to be important at the Local level) of the following:</p> <p>Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive;</p> <p>Species of animal and plants listed in Annex II and/or IV of the Habitats Directive;</p> <p>Species protected under the Wildlife (Northern Ireland) Order 1985 (as amended); and/or</p> <p>Species listed on the relevant Red Data list.</p> <p>Sites containing semi-natural habitat types with high biodiversity in a local context and a high degree of naturalness, or populations of species that are uncommon in the locality;</p> <p>Sites or features containing common or lower value habitats, including naturalised species that are nevertheless essential in maintaining links and ecological corridors between features of higher ecological value</p> <p>Sites containing small areas of semi-natural habitat that are of some local importance for wildlife;</p> <p>Sites or features containing non-native species that are of some importance in maintaining habitat links.</p>

Table 3.2. : Criteria for Assessing Significance of Effects

Impact Significance		Criteria
Significant Negative Effect	Major Adverse	Loss of, permanent damage to or adverse impact on any part of a site of international or national importance; Loss of a substantial part or key feature of a site of regional importance; Loss of favourable conservation status (FCS) of a legally protected species; Loss of or moderate damage to a population of nationally rare or scarce species.
	Moderate Adverse	Temporary disturbance to a site of international or national importance, but no permanent damage; Loss of or permanent damage to any part of a site of regional importance; Loss of a key feature of local importance; A substantial reduction in the numbers of legally protected species such that there is no loss of FCS but the population is significantly more vulnerable; Reduction in the amount of habitat available for a nationally rare or scarce species, or species that are notable at a regional or county level.
No Significant Effect	Minor Adverse	Temporary disturbance to a site of regional value, but no permanent damage; Loss of, or permanent damage to, a feature with some ecological value in a local context but that has no nature conservation designation; A minor impact on legally protected species but no significant habitat loss or reduction in FCS; A minor impact on populations of nationally rare or scarce species or species that are notable at a regional or county level.
	Negligible	No impacts on sites of international, national or county importance; Temporary disturbance or damage to a small part of a feature of local importance; Loss of or damage to land of negligible nature conservation value; No reduction in the population of legally protected, nationally rare, nationally scarce or notable (regional level) species on the site or its immediate vicinity. Beneficial and adverse impacts balance such that resulting impact has no overall affect upon feature.

Impact Significance		Criteria
	Minor Beneficial	A small but clear and measurable gain in general wildlife interest, e.g. small-scale new habitats of wildlife value created where none existed before or where the new habitats exceeds in area that habitats lost.
Significant Positive Effect	Moderate Beneficial	Larger new scale habitats (e.g. net gains over 1 ha in area) created leading to significant measurable gains in relation to the objectives of biodiversity action plans.
	Major Beneficial	Major gains in new habitats (net gains of at least 10 ha) of high significance for biodiversity being those habitats, or habitats supporting viable species populations, of national or international importance cited in Annexes I and II of the habitats Directive or Annex I of the Birds Directive.

6.1. Section 1 Constraints

Townlands: Drewsborough, Ballyquinn, Raheen, Bealkelly, Carrowena, Caher

Within Section 1, there is potential for a *Moderate Adverse* impact if the **red route** option was developed as currently drawn. This is due to constraints such as the route running adjacent to the Graney Shannon/Scarriff River, construction of the route has the possibility to temporarily disturb sites of national and international importance due to the input of sediment, silt and other pollutants into the Graney Shannon/Scarriff causing a temporary decrease in water quality. Construction of the route may also affect foraging populations of protected bird species. A kingfisher *Alcedo atthis* (amber-listed and Annex I) was noted perched for hunting on route and six Whooper Swans *Cygnus cygnus* (amber-listed and Annex I) flew overhead. The establishment of a route on this trail would result in loss and permanent damage to the native Sessile Oak woodlands in Raheen woods which would be considered to be of regional importance. Mature trees in this woodland are currently providing habitats to bats and there are a number of specimen Oaks present. Most notable of these is the Brian Boru Oak. The tree stands in one of the last surviving sections of Ireland's ancient wild oak forests – the forest of Suidain of the Sliabh Aughty Mountains.

Within Section 1, there is potential for a *Major Adverse* impact if the **orange route** were developed. This route would result in permanent damage to part of a site of international and national importance, namely Annex 1 Bog Woodland and ancient and long-established woodland. Bealkeally woods is an ancient and long-established woodland (NSNW:1497) of Wet pendunculate Oak-Ash woodland (WN4), associated with areas that are flooded in winter but which dry out in summer, and Oak-Birch-Holly woodland (WN1) which is a native semi-natural broadleaf woodland. Given the route's proximity to the shoreline, it has the potential to impact reed swamps and wet grasslands on the lake banks, with effects to the feeding ground of a number of bird species protected under the Lough Derg SPA, given the width of the proposed path. This impact could result in protected species avoiding these areas, reducing their habitat. Hen Harrier (Annex I of the E.U. Birds Directive) are also known to roost in the reedbeds of Lough Derg SPA during the winter and have the potential to be disturbed pre- and post-construction.

Within Section 1, there is potential for a *Minor Adverse Impact* if the **green route** in this section was developed. This is due to the route following a pre-existing amenity path that runs from Scarriff to Killaloe. However, this path would need to be widened as has the possibility of affecting some locally important habitats.

Table 6.1. Section 1 constraints.

<i>Townlands: Drewsborough, Ballyquinn, Raheen, Bealkelly, Carrowena, Caher</i>			
Route	Habitats affected	Ecologically sensitive areas	Recommendation
<i>Red</i>	Wet grassland (GS4) Conifer plantation (WD2/WD4) Scrub (WS1) Treeline (WL2) Hedgerow (WL1) Improved grassland (GA1) Old stone wall (BL1) Reed swamp (FS1) Bog woodland (WN7) Oak-Birch-Holly woodland (WN1) Wet Willow-Alder-Ash (WN6) Ponds (FL8)	<ul style="list-style-type: none"> • Reed swamps as a habitat for wintering birds • Wet grassland as a habitat for wintering birds • River Graney Shannon_050 (Graney) – hydrologically connected to Lough Derg SPA. • Specimen Oaks in Raheen woods • Mature and Veteran trees • Old stonework with bat roosting habitat • Native Oak-Birch-Holly woodland and ancient Oaks in Raheen woods. 	Amend preliminary route option developed, where possible, to minimise impact on identified features of interest as part of Options Selection phase.
<i>Green</i>	Artificial and Built surfaces Improved grassland Amenity grassland Conifer plantation		Consider further at Options Selection phase.
<i>Orange</i>	Wet grassland (GS4) Conifer plantation (WD4) Scrub (WS1) Treeline (WL2) Hedgerow (WL1) Old stone wall (BL1) Reed swamp (FS1) Bog woodland (WN7) Oak-Birch-Holly woodland (WN1) Oak-Ash-Hazel woodland (WN2) Wet pedunculate Oak Ash Woodland (WN4)- Links with Annex 1 Marsh (GM1)- Links with Annex 1 FL (Freshwater ponds)	<ul style="list-style-type: none"> • Old Sessile Oak woodland (Annex 1:91A0)- Raheen Ancient woods (PAW) • Reed swamps as a habitat for wintering birds • Wet Pedunculate Oak- Ash woodland (alluvial forest) (links with annex 1: 91E0) • Bog woodland (Annex 1:91D0) • Old trees with bat roosting habitat • Wet grassland as a habitat for wintering birds (Special interest of the SPA) • River Shannon (lower_040)- hospital Raheen and Picnic Carrowena. -hydrologically connected to the SPA. • Lough Derg pNHA (000011) • Lough Derg Shannon SPA 	The orange route is not considered to be compatible with current conservation objectives. This route should be removed from consideration or amended significantly to avoid ecologically sensitive areas referred, inclusive of associated buffer zones.

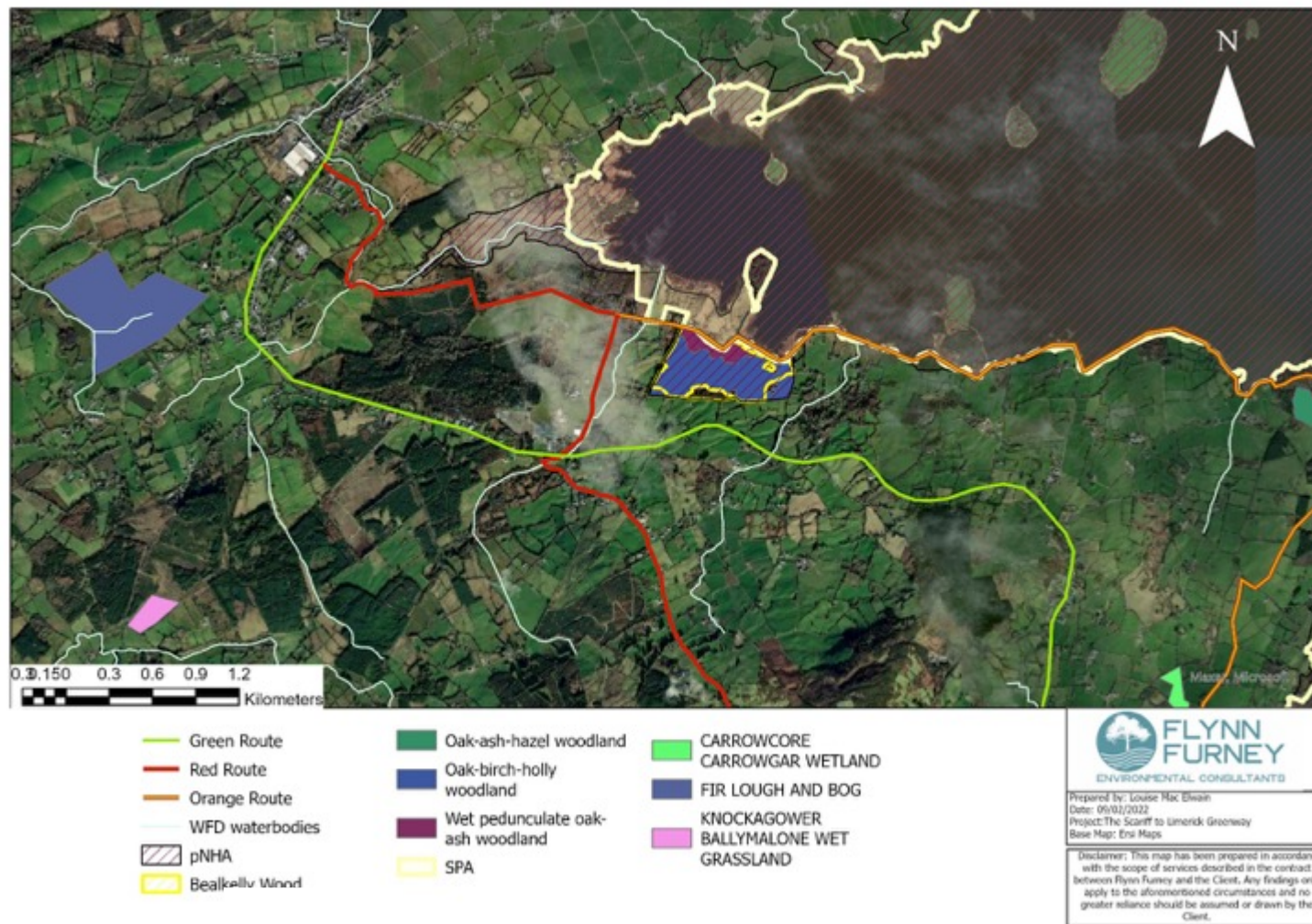


Figure 6.1. Section 1 maps.

5.2. Section 2 Constraints

Townlands: Ballyhurley, Ballynagleragh, Aughinish, Islandcosgry, Carrowgar, Ballyloughnane, Raheenbeg, Raheen Moor

Within Section 2, there is potential for a Major Adverse if the **orange route** is developed. This is due to a disturbance in the feeding and breeding ground of protected species and a reduction of wetland habitat protected under the Lough Derg SPA. Around 20 Curlew *Numenius arquata* (red-listed) were found foraging in the wet grassland habitat on route and flushed on arrival. Curlew and other waders are now among our most threatened breeding birds and it is crucial that the Environmental Requirements incorporate consideration of Curlew habitat requirements in order to ensure that this species is not lost. Meadow pipits *Anthus pratensis* (red-listed) were seen and flushed on two occasions. Other Amber-listed species noted on the lake in this area were Coots *Fulica atra*, Mute Swans *Cygnus olar*, Teal *Anas crecca*, Wigeon *Anas enelope* and a Great Crested Grebe *Podiceps cristatus*. Although no birds designated as Special Conservation Interests to Lough Derg SPA were noted, construction and removal of lakeshore habitat may negatively impact the SPA conservation objectives which are to 'To maintain or restore the favourable conservation condition of the wetland habitat at Lough Derg' Additionally, amphibian habitat was abundant and would be affected.

The route joins a forestry trail (around 5m wide) near Bunglasha lodge and continues on a road until Tirana house. The impact of the development of the orange route south of Bunglasha lodge would likely be significantly less than the potential impact of the greenway to the west of the lodge, however, widening of the path on the lakeside and through Aughinish Wood may result in removal of mature trees and disturbance to protected fauna. There appears to have been woodland at Aughinish for some time as it is marked as wooded on the 1st edition Ordnance Survey map of the site (1842). The wood is known to hold most of the common woodland birds, Tits, Treecreeper *Certhia familiaris*, Jay *Garrulus glandarius*, and Sparrowhawk *Accipiter nisus*. Red Squirrel *Sciurus vulgaris*, Badger *Meles meles*, Pine Marten *Martes martes*, and the Fallow Deer *Dana dana* are known locally to inhabit the woodland and could therefore be affected. The widening on the road after Aughinish Wood could also result in the removal of some heritage hedgerows and treelines (high local importance) and disturbance to agricultural and amenity grassland (low local importance). The route also crosses River Ballybran and Aughinish, Ballyheefy and Annacarriga streams which are hydrologically connected to Lough Derg SPA and could have temporary impacts on water quality during construction.

A *Minor Adverse Impact* may be expected from the construction of the **green route** in this section. This is due to the route following a pre-existing amenity path that runs from Scarriff to Killaloe.

Widening of this path in sections may result in disturbance to treelines and hedgerows of local importance.

A *Minor Adverse Impact* is possible if the **red route** is chosen. This route runs parallel to a road but would result in widening of the path with potential adverse impacts to hedgerows and treelines. Annacarriga 25, a tributary of Lough Derg, has the possibility of being impacted.

Table 5.2. Constraints section2.

<i>Townlands: Ballyhurley, Ballynagleragh, Aughinish, Islandcosgry, Carrowgar, Ballyloughnane, Raheenbeg, Raheen Moor</i>			
Route	Habitats directly affected	Ecologically sensitive areas	Recommendation
<i>Orange</i>	Reed swamp (FS1) Wet grassland (GS4) Scrub (WS1) Treelines (WL2) Hedgerow (WL1) Conifer woodland (WD4) Mixed broadleaf woodland (WD1) Meadows and grassy verge (GS2) Oak-Ash-Hazel Woodland (WN2)	<ul style="list-style-type: none"> • Reed swamps and wet grassland adjacent to and within Lough Derg SPA and pNHA. Disturbance to protected bird species. • Disturbance or habitat loss to legally protected species such as the Curlew. • River Ballybran and Aughinish and Ballyheefy streams – hydrologically connected to SPA. • Mixed broadleaf woodland with a high percentage of Wild Cherry (<i>Prunus avium</i>) • Aughinish wood • Carrowgar wetland (could be impacted) 	The orange route is not considered to be compatible with current conservation objectives. This route should be removed from consideration or amended significantly to avoid ecologically sensitive areas referred, inclusive of associated buffer zones.
<i>Green</i>	Built land and artificial surfaces (BL3) Improved grassland (GA1) Amenity grassland (GA2) Conifer plantation (WD4)		Consider further at Options Selection phase.
<i>Red</i>	Built land and artificial surfaces (BL3) Hedgerows (WL1)		Consider further at Options Selection phase.

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	Treelines (WL2) Amenity grassland (GA2) Improved grassland (GA1)		
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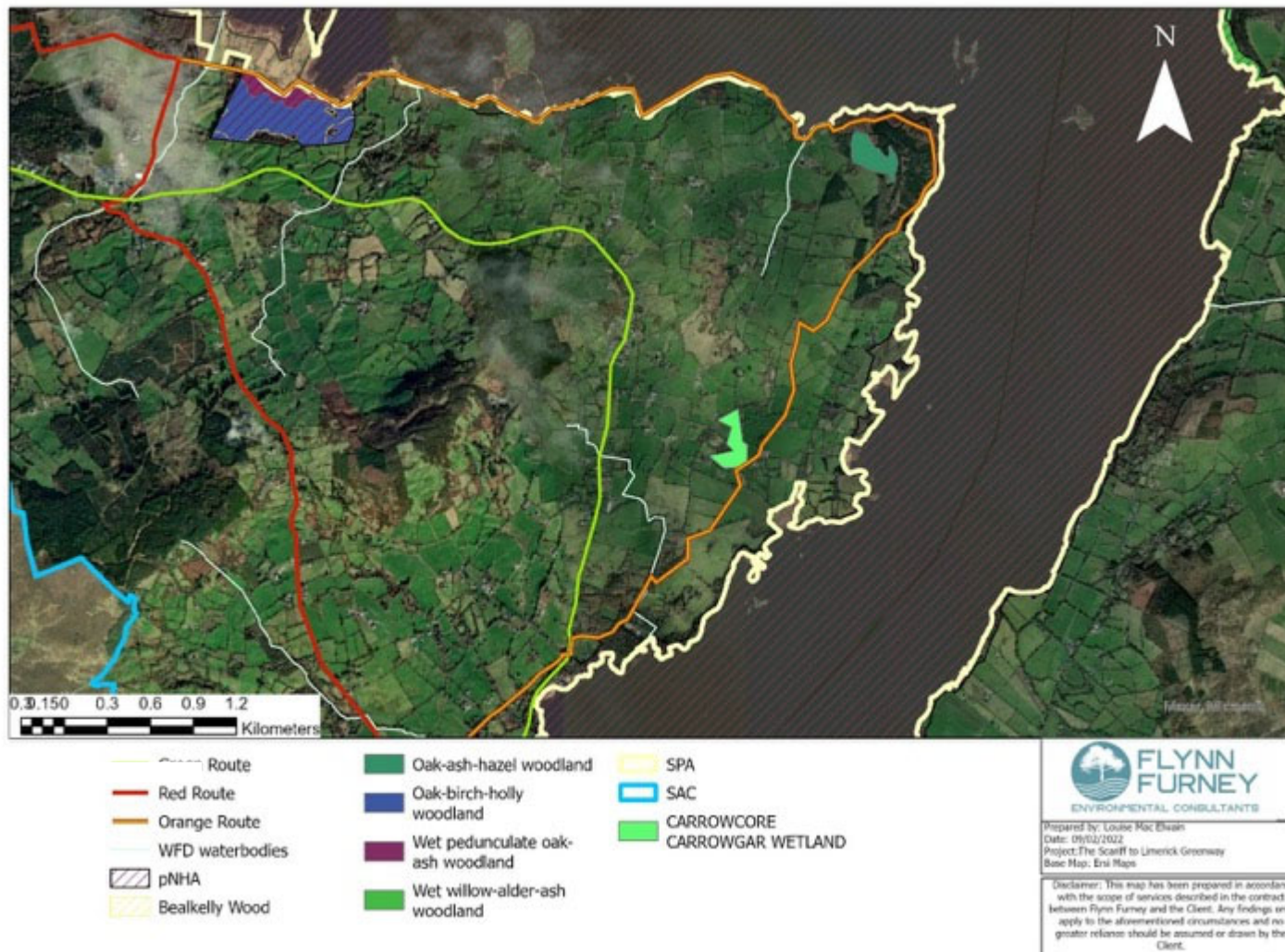


Figure 5.2. Section 2 maps.

5.3. Section 3 Constraints

Ecological constraints Townlands: Ballyheefy, Carrowbaun, Lackbranner, Ballycuggaran, Craglea

Within Section 3, impacts are likely to be *Negligible if the* yellow route was developed due to the presence of a forestry trail through Ballycuggaran forest and a habitat of conifer woodland. The greenway could result in replacing Sitka Spruce with linear strips of vegetation, with benefits for wildlife.

The green route could result in the removal of locally important hedgerows and treelines resulting in *Minor Adverse Impact*. However, the existing path provides some of the infrastructure. The route crosses a number of streams connected to Lough Derg but they have already been bridged and culverted for the R463, which the route runs adjacent to.

Development of the red route may result in *Moderate Adverse Impact* due to the crossing of two streams leading to Lough Derg. As there is currently no crossing, a potential temporary decrease in water quality may be considered. Crossing Rinnamin Point stream is also in a valley of Oak-Ash-Hazel woodland, although these woodland categories are not an annexed habitat, they are limited in extent in Ireland and should be regarded as being of high conservation importance. The second stream on route braids through an Oak-Ash-Hazel woodland. The braiding nature of this stream means disturbance would be expected with permanent damage to a feature of ecological importance. Both of these streams are hydrologically connected to Lough Derg pNHA and SPA (under 1km). Construction could result in silt and other pollutants entering watercourses with negative impacts for protected species.

Table 5.4: Constraints section3.

<i>Townlands: Ballyheefy, Carrowbaun, Lackbranner, Ballycuggaran, Craglea</i>			
Route	Habitats directly affected	Ecologically sensitive areas	Recommendation
<i>Green</i>	Hedgerows (WL1) Treelines (WL2)		Consider further at Options Selection phase.
<i>Yellow</i>	Exposed sand and gravel (ED1) Conifer plantation (WD4)		Consider further at Options Selection phase.
<i>Red</i>	Built land and artificial surfaces (BL3) Improved agricultural grassland (GA1) Treelines (WL2) Hedgerows (WL1)	<ul style="list-style-type: none"> Rinnamin Point stream and associated Oak-Ash-Hazel woodland (hydrologically connected to Lough Derg SPA). Deep V shaped valley with native woodland. 	Consider further at Options Selection phase.

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	Semi-natural neutral grassland (GS1) Oak-Ash-Hazel woodland (WN2) Eroding upland river (FW1)	<ul style="list-style-type: none">• A braided stream where the route crosses FEENLEA stream. (hydrologically connected to Lough Derg SPA)	
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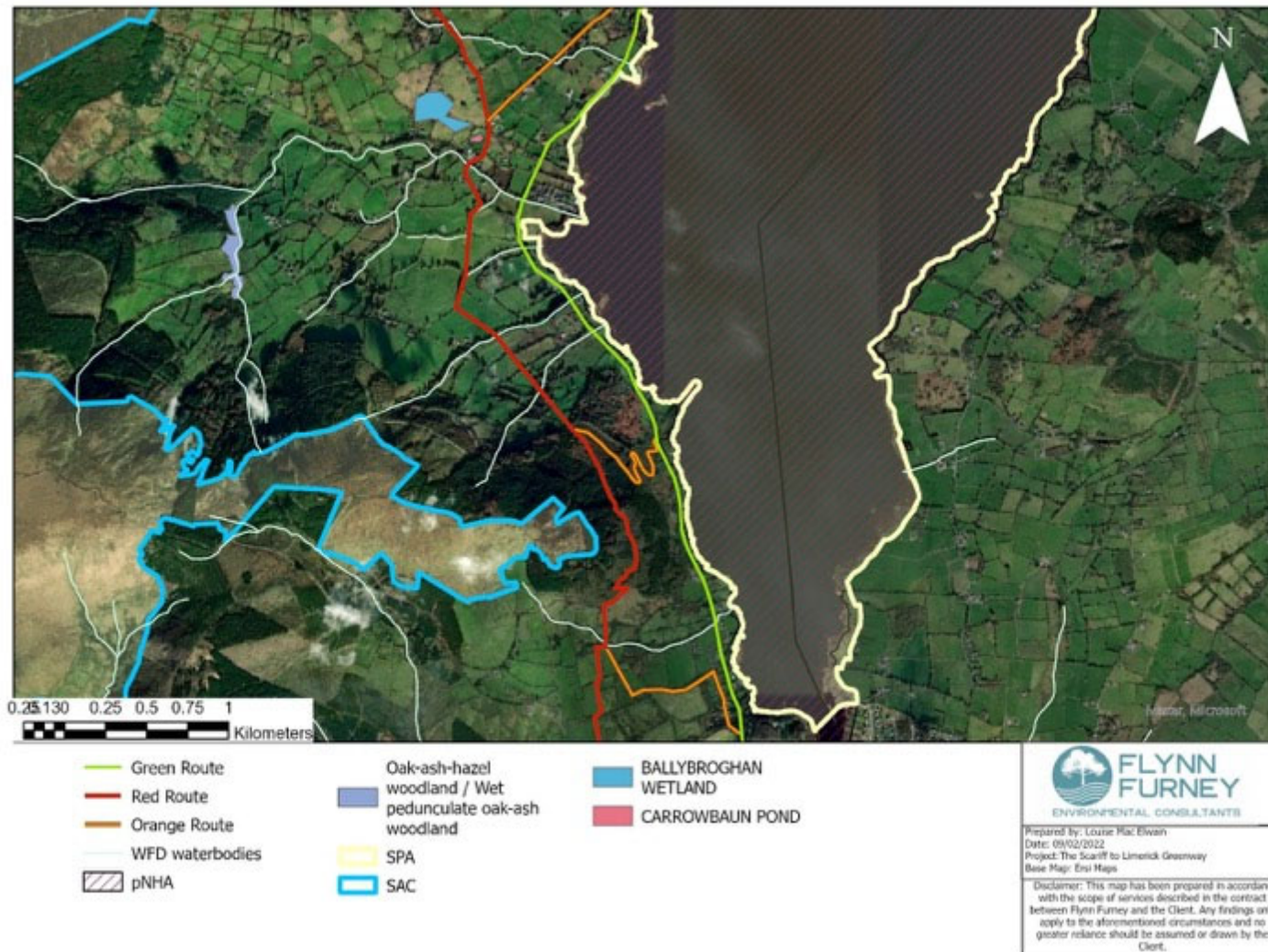


Figure 5.3. Section 3 Maps.

5.4. Section 4 Constraints

Ecological Constraints Townlands: *Craglea, Ballyvally, Knockyclovaun, Gortmagy, Shauntraud, Creeveroe, Garraunboy, Cloonfada, Killestry, Ardclooney*

In Section 4, the development of the **green route** may result in *Major Adverse Impacts* causing adverse impacts on part of a site of international importance. The initial section follows the route of the Killaloe bypass, where no additional impacts are anticipated beyond those that will be associated with the independent development of the Killaloe Bypass. However, the route then runs through the Lower River Shannon SAC which could impact Otter (*Lutra lutra*) habitat. Otter is an Annex II species and a qualifying interest of the Lower River Shannon SAC and Otter spraint was noted on surveying. Potential removal of mature treelines on the banks of the Ballyteige River (inside the SAC boundaries) would result in both a major temporary and minor permanent disturbance. Additionally, where the route runs along the River Shannon banks, wetland habitats such as reed swamp, wet grassland and marsh would be disturbed. Snipe *Gallinago gallinago* (Red-listed) were flushed from the marshy habitat on surveying. A Dunlin *Calidris alpina* (Red-listed and Annex I) was seen feeding on the shores of the lake. This area also contained a hundreds of Tufted Ducks *Aythya fuligula* which are a special interest of the Lough Derg SPA. This area is outside the SPA boundaries but could still be instrumental in their protection.

The development of the **orange route** in Craglea may result in *Minor Adverse Impacts*. It would result in the loss of features of local ecological value but these features have no conservation designation. The development of the orange route from Clonfadda on would also result in a *Minor Adverse Impact*. Works crossing rivers connected to the Lower River Shannon SAC could result in a temporary disturbance to the site but would cause no permanent damage. Inputs of pollutants into rivers during construction has the potential to impact spawning and nursery habitat temporarily. Other habitats of local ecological value may be permanently removed or disturbed.

An establishment of a greenway path at the beginning of the **red route** would have *Minor Negative Impacts*. However, more ecologically sensitive areas occur after the Route joins the Ballyteige River. Numerous spawning beds and excellent salmonid nursery habitats were noted. Riparian woodlands of Alder, Willow, and Ash are found along the banks. Features of local importance such as these may be impacted. Therefore, these impacts are predicted as *Moderate Adverse* with the possibility of increasing to *Major Adverse* on further surveying of alluvial type woodland habitat. At least a 15-20 metre buffer distance must be kept between the route and the river with no disturbance to the

streamside zone (see Inland Fisheries PLANNING FOR WATERCOURSES IN THE URBAN ENVIRONMENT).

Table 5.4. Ecological constraints on section 4.

<i>Townlands: Craglea, Ballyvally, Knockyclovaun, Gortmagy, Shauntraud, Creeveroe, Garraunboy, Cloonfada, Killestry, Ardcloney</i>			
Route	Habitats directly affected	Ecologically sensitive areas	Recommendation
<i>Green</i>	Improved grassland (GA1) Conifer woodland (WD4) Mixed Deciduous woodland (WD1) Reed swamps (FS1) Treeline (WL2) Hedgerow (WL1) Scrub (WS1) Upland eroding river (FW1) Stonewall (BL1) Dry calcareous and neutral grassland (GS1) Willow scrub (WS1) Marsh (GM1) Wet woodland (WN6) Tall herb swamp (FS2)	<ul style="list-style-type: none"> • The Lower River Shannon SAC (002165) • The Ballyteige River (part of the lower river Shannon SAC) • Otter habitat • Mature treelines on the Ballyteige River • Wet grassland and marsh as a habitat for amber-listed birds, such as the Tufted duck. And red-listed birds such as the Dunlin. • Disturbance of Alluvial woodland 	The green route is not considered to be compatible with current conservation objectives where it borders the Parteen Basin. This route should be removed from consideration or amended significantly to avoid ecologically sensitive areas referred, inclusive of associated buffer zones.
<i>Yellow (Craglea)</i>	Amenity grassland (GA2) Wet grassland/ Scrub (GS4/WS1) Treelines (WL2) Hedgerow (WL1) Dense Bracken (HD1)	<ul style="list-style-type: none"> • Features of local conservation value 	Consider further at Options Selection phase.
<i>Yellow (Cloonfada on)</i>	Riparian woodland (WN5) Upland eroding river (FW2) Built land and artificial surfaces (BL3) Wet grassland (GS4) Hedgerows (WL1) Treelines (WL2) Wet grassland (GS4) Dry calcareous and neutral grassland (GS1)	<ul style="list-style-type: none"> • Crossing point for Ardcloney river (high fisheries potential). • Removal of some mature trees • Disturbance to Montpellier stream possible 	Consider further at Options Selection phase.
<i>Red</i>	Improved grassland (GA1) Scrub (WS1) Dry calcareous and neutral grassland (GS1) Wet grassland (GS4) Dense bracken (HD1) Conifer woodland (WD4) Mixed Conifer woodland (WD3)	<ul style="list-style-type: none"> • The Ballyteige river and spawning a nursery habitat. (High fisheries potential). • Longer-term disturbance due to the removal of riparian vegetation. • Disturbance to Riparian and wet woodlands. 	Further define buffer distance of the route from the Ballyteige river to ensure an adequate distance is given to protect this high fishery value river. Consider further at

<i>Townlands: Craglea, Ballyvally, Knockyclovaun, Gortmagy, Shauntraud, Creeveroe, Garraunboy, Cloonfada, Killestry. Ardclooney</i>			
Route	Habitats directly affected	Ecologically sensitive areas	Recommendation
	Mixed broadleaved woodland (WD1) Oak-Ash-Hazel woodland (WN2) Riparian woodland (WN5) Wet woodland (WN6)		Options Selection phase.

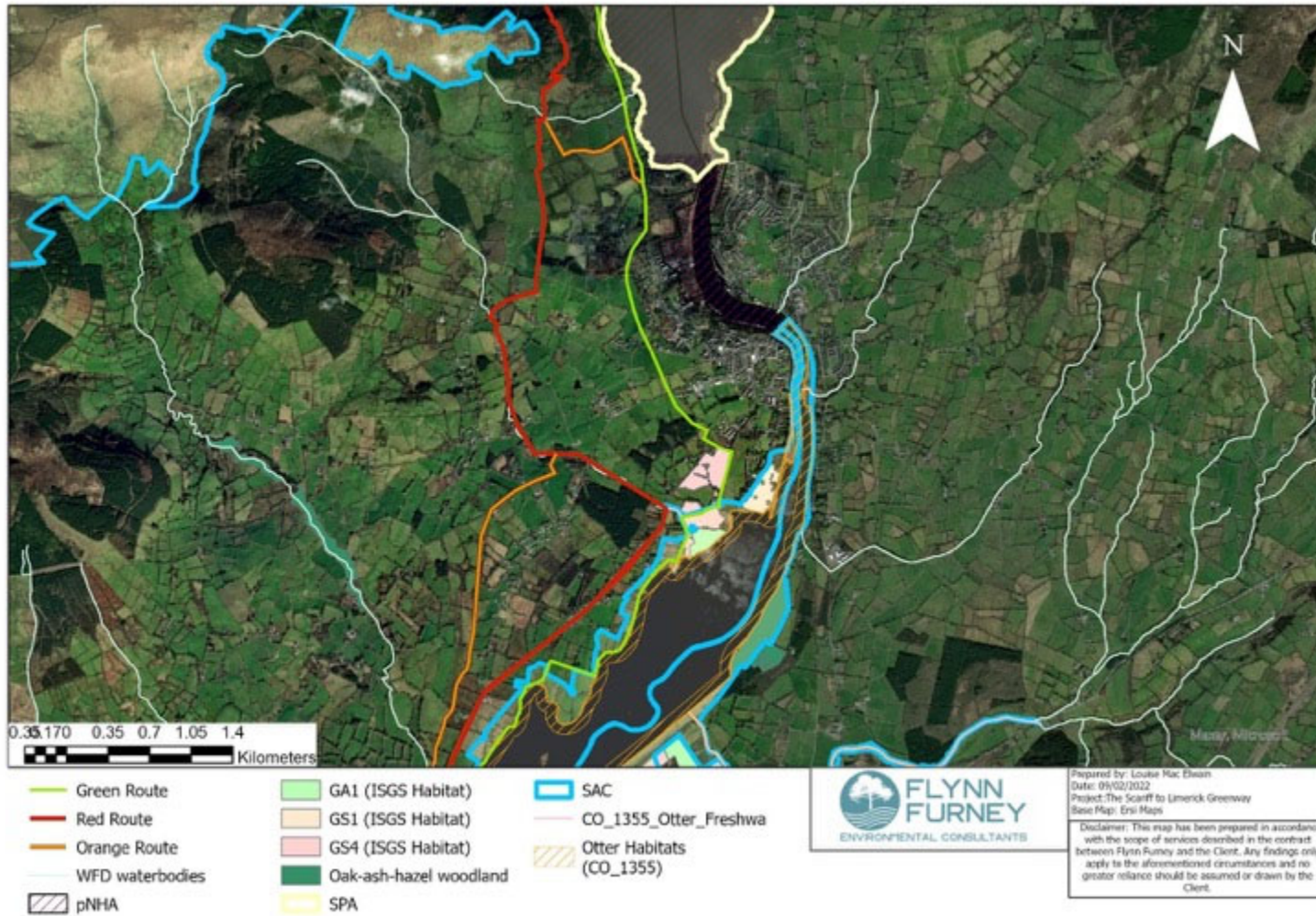


Figure 5.4. Section 4 map.

5.5. Section 5 Constraints

Townlands: Ardclooney, O'Briensbridge, Arddaggle, Kildoorus, Drummeen, Aughboy, Monaskeha, Knockbrack Lower, Cloonlara

The development of the **green route** may have a *Minor Adverse Impact*. This is due to the loss of some features of local importance and a possible minor impact on rare species that frequent the Ardnacrusa canal during construction. The most significant ecological constraint is an area of dense scrub which could not be surveyed but is likely providing habitats for a range of species including bird nesting habitat.

The development of the **orange route** may result in a *Minor Adverse Impact*. This is due to the permanent removal of areas of improved grassland and neutral grassland. Meadow Pipits *Anthus prathensis* (Red-listed) were flushed twice from the long grass at the side of the canal. A temporary disturbance to this protected species may be expected but no significant loss of habitat.

The development of the **red route** would have the most significant effect with potential for *Major Adverse Impacts*. High-diversity heritage hedgerows are of high local importance. Disturbance to a site of international importance is predicted due to the necessity to remove large linear strips of treeline and hedgerow inside the Lower River Shannon SAC boundaries in order to facilitate the widening of the current path. Large drainage ditches containing large sedge swamps would likely be impacted, or riverside vegetation may be removed with negative impacts to otter habitat. The Errina canal is said to be a "haven for wildlife" which is "likely to act as a significant wildlife corridor". The canal is largely overgrown and with the steep banks supporting dense broad-leafed woodland. Redwings *Turdus iliacus* (Red-listed) were feeding and flushed on the Errina Canal trail. Removal of vegetation on this path would impact this species and many others. A number of old stone bridges and stonework would be impacted by the development of this route with a disturbance to bat roosting habitat. After Errina bridge the pathway is less restricted and impacts would be considered as minor if the current pathway is extended away from the canal, with consideration for the canal vegetation and riparian woodlands within.

Table 5.5. Constraints on section 5.

<i>Townlands: Ardclooney, O'Briensbridge, Ardtaggle, Kildoorus, Drummeen, Aughboy, Monaskeha, Knockbrack Lower, Cloonlara</i>			
Route	Habitats directly affected	Ecologically sensitive areas	Recommendation
<i>Green</i>	Improved grassland (GA1) Dry calcareous and neutral grassland (GS1) Dense Bracken (HD1) Conifer woodland (WD4) Scrub (WS1) Riparian woodland (WN5) Semi-natural grassland (GS1) Mixed broadleaf/conifer woodland (WD2)	<ul style="list-style-type: none"> Dense area of scrub which could not be surveyed possibly providing a range of habitats. 	Consider further at Options Selection phase.
<i>Orange</i>	Improved grassland (GA1) Dry calcareous and neutral grassland (GS1)	<ul style="list-style-type: none"> Habitats are of low local importance 	Consider further at Options Selection phase.
<i>Red</i>	Mixed broadleaf woodland (WD1) Hedgerow (WL1) Treeline (WL2) Scrub (WS1) Large drainage ditch (FW4) Tall herb swamp (FS2) Eroding/ upland river (FW1) Built land and artificial surfaces (BL3) Stone walls and other stonework (BL1) Dry meadows and grassy verges (GS2) Dry humic acid grassland (GS3) Canal (FW3) Riparian woodland (WN5) – Links with Annex 1 91E0	<ul style="list-style-type: none"> Heritage Hedgerows inside the River Shannon Disturbance to Otter habitat during and post-construction Diverse hedgerows containing species considered rare in the wild (Purging Buckthorn <i>Rhamnus cathartica</i>) Old stonework with bat roosting potential including Errina Canal bridge. Removal of large linear sections of Mixed broadleaf woodland with diverse ground flora. 	The red route is not considered to be compatible with current conservation objectives. This route should be removed from consideration or amended significantly to avoid ecologically sensitive areas referred, inclusive of associated buffer zones.

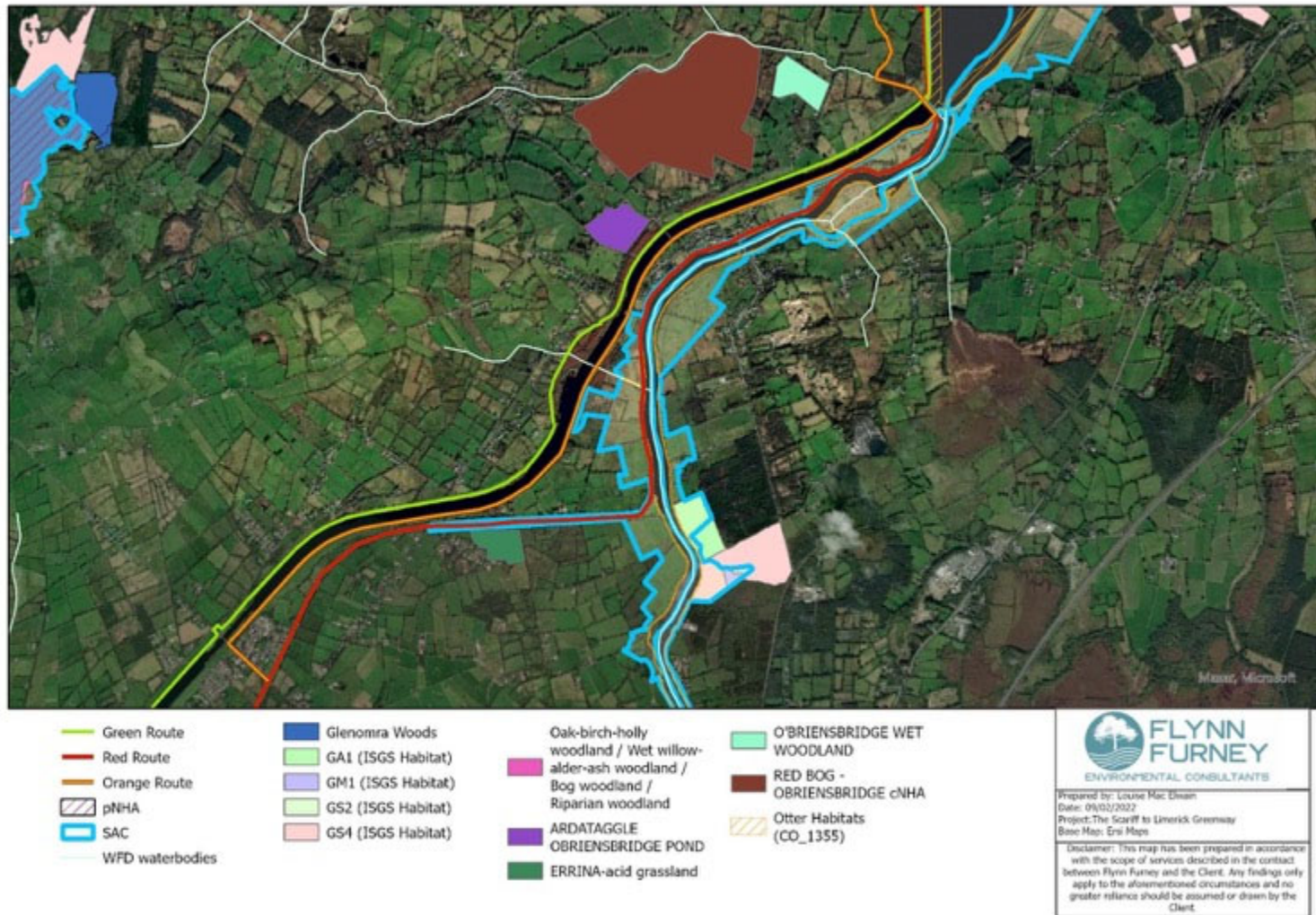


Figure 5.5. Map of section 5.

5.6. Section 6 Constraints

Townlands: Clonlara to Kings Island

The construction of the **red route** may result in *Major Adverse Impacts* as the route runs through the Lower Shannon SAC for at least 4km. Given the proposed route width, this would result in loss of, permanent damage to, or adverse impact upon part of a site of international and national importance. A number of ecologically sensitive areas are present on route. Although a number of walking paths and trails already exist on this route, they are often narrow and widening these could have significant impacts on surrounding habitats. The first such habitat is at Springfield Bog where a diversity of wetland habitats are present. Construction of the greenway has the potential to have impacts here but as the route would follow existing towpaths minimal impacts may be predicted. The River Blackwater runs parallel to the route at a stretch and may be impacted, along with associated riparian woodland, from the widening of the path. Alluvial woodland of Pendunculate Oak-Ash near where the Blackwater meets the Shannon signifies a *Moderate Adverse Impact* due to its designation as an Annex 1 habitat and as a special conservation interest of the SAC. Impacts may be avoided but temporary disturbance is possible. The wet grassland/ marsh on the River Shannon at the northeast tip of Redboge townland (inside the River Shannon SAC) will be impacted if the current path is widened here. This is ecologically valuable to its species diversity but also as a habitat to Eurasian Otters, likely resulting in the reduction of Otter habitat (the maintenance of the same is a conservation objective of the Lower River Shannon SAC). Watercourses of plain to montane levels with the Ranunculion fluitantis and Callitriche-Batrachion vegetation- *Groenlandia densa* at City Canal in Limerick (Annex 1: 3260) may not be affected if the correct mitigation is put in place and given that a wide path already exists along this canal.

The development of the **green route** has the potential to have *Major Adverse Impacts* if the route is not altered near Parteen and Quinspool South. The route in this section runs through the Lower River Shannon SAC and would impact alluvial type woodland, floodplains with rich and diverse wetlands and Otter habitat. A number of Otter couches and slides were noted on the riverbank and two were observed in this area during surveying, indicating high activity levels in the area. Otters need lying up areas throughout their territory where they are secure from disturbance. As the green route runs along the river banks a significant part of this Otter habitat could be affected, which would conflict with one of the SAC's conservation objectives. This may be avoided by increasing the distance from the banks of the River. The preservation of sections of riparian woodland are also essential to ensure

the protection of *Ranunculus fluitantis* and *Callitriche-Batrachion* vegetation, as the conservation objectives state the area of active floodplain at and upstream of the habitat should be maintained.

The **yellow route** runs near areas of alluvial woodland. However, it is possible to avoid and protect these areas given the trajectory of the proposed route and the current infrastructure. Therefore, effects have been designated as *Minor Adverse*.

Table 5.6. Summary of constraints for section 6

<i>Townlands: Cloonlara to Kings Island</i>			
Route	Habitats directly affected	Ecologically sensitive areas	Red Route
<i>Red</i>	Dry calcareous and neutral grassland (GS1) Wet willow woodland (WN6) Scrub (WS1) Canal (FW3) Lowland/ depositing river (FW2) Riparian woodland (WN5) Wet grassland (GS4) Marsh (GM1) Treeline (WL2) Other lakes and artificial ponds (FL8) Riparian woodland (WN5)- Annex 1 alluvial woodland Wet pedunculate Ash-Oak (WN4) – links with Annex 1 alluvial woodland Oak-Ash-Hazel (WN2)	<ul style="list-style-type: none"> Species-diverse Marsh and wet grassland which gradually grades into Wet Willow-Alder-Ash woodland at Springfield bog. The River Blackwater Alluvial woodland where the blackwater meets the River Shannon banks and otter habitat. Wet grassland/Marsh and otter habitat on the River Shannon near Pdraig Neem GAA grounds. The River Groody and its otter habitat. Water courses of plain to montane levels with the <i>Ranunculus fluitantis</i> and <i>Callitriche-Batrachion</i> vegetation-<i>Groenlandia densa</i> at City Canal in Limerick. (Annex 1: 3260) 	The red route is not considered to be compatible with current conservation objectives in its current form. Consideration should be given to clarifying the route through Springfield bog and tie-into existing facilities at UL rather than developing these facilities through the SAC.
<i>Green</i>	Improved grassland (GA1) Dry neutral and semi-natural grassland (GS2) Conifer plantation (WD4) Scrub (WS1) Mixed broadleaf woodland (WD1) Riparian woodland (WN5)	<ul style="list-style-type: none"> Wetland habitats at Parteen and Quinspool south inside the Lower River Shannon SAC. Riparian woodland upstream of the <i>Ranunculus fluitantis</i> and <i>Callitriche-Batrachion</i> vegetation to be maintained as an SAC conservation objective. 	The green route is not considered to be compatible with current conservation objectives where it borders the River Shannon. This route should be amended significantly to avoid ecologically sensitive areas referred,

	<p>Depositing lowland river (FW2) Riparian woodland (WN5)- Links with Annex 1 alluvial woodland Marsh (GM1) Reed and large sedge swamp (FS1) Wet grassland (GS4) Eutrophic lake (FL5)</p>	<ul style="list-style-type: none"> • Otter habitat on the River Shannon • Disturbance to protected bird species at the River Shannon Confluence • North Ballycannan River otter habitat and as a tributary of the Lower River Shannon SAC. • Riparian woodland and alluvial woodland on the banks of the Lower River Shannon SAC. 	<p>inclusive of associated buffer zones.</p>
<p><i>Orange route</i></p>	<p>Amenity grassland (GA2) Riparian woodland (WN5) / Alluvial woodland -Links with Annex 1. Drainage ditch (FW4)</p>	<ul style="list-style-type: none"> • Alluvial woodland (Annex 1 links) on the banks of the Shannon SAC. 	<p>Consider further at Options Selection phase.</p>

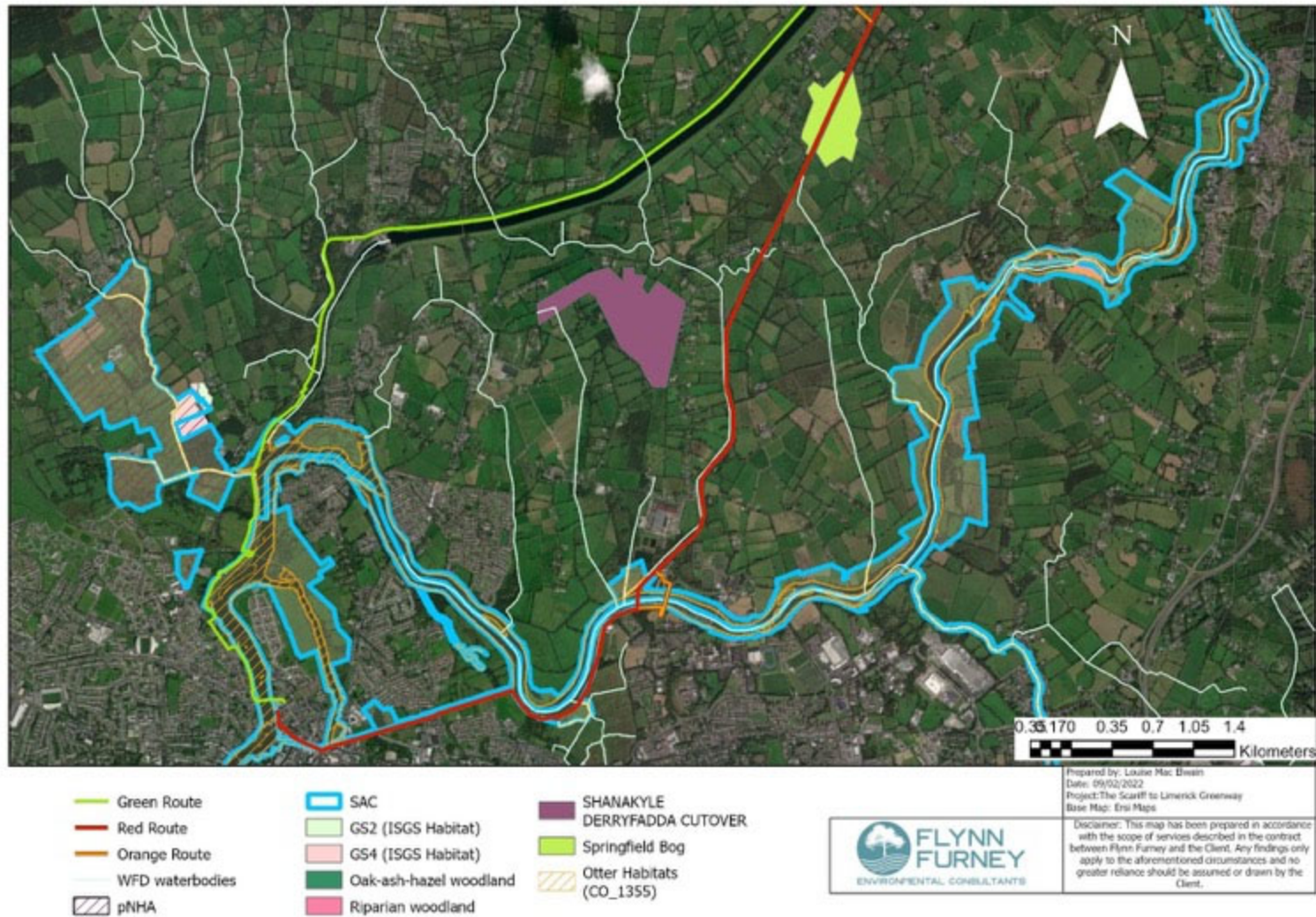


Figure 5.6. Section 6 map

6. Conclusion

The Limerick to Scarriff Greenway route corridor is proposed in a high value nature area. Several internationally protected and nationally protected sites exist within the Study Area, which has been selected based on the development of preliminary route options. These preliminary route options often interact with internationally protected sites on the river and lake shores. The Regional Planning Guidelines for the West Region 2010-2022 state that the project should comply with policy IP23 and should be *'designed to minimise impact on habitats and species and should not adversely impact on the conservation objectives or site integrity of SAC, SPA or other ecologically sensitive sites.'* With this in mind a number of ecologically sensitive sites have been outlined in this report to be avoided during the final route design.

Due to the long and linear nature of the greenway, and given its width, routes may impact upon large areas of freshwater bank vegetation with potential negative impacts to protected species. In a number of areas, the route may conflict with the Conservation Objectives of Natura sites. In these instances, the routes have been designated as having a major adverse effect. This effect is also attributed when an extensive or ecologically sensitive area may be affected. In such instances, it is recommended that the preliminary route option developed be discounted or amended to avoid areas of greatest sensitivity.

The development of some of the preliminary route options, such as the orange route near Scarriff, the green route past Killaloe, and the red route after the Parteen Weir may have significant negative ecological impacts. The Orange route near Scarriff overlaps with Annex I bog woodland and possible Annex I alluvial woodland. It would result in the removal of mature and veteran trees from the ancient Oak woodland of Bealkelly. The proximity to the water's edge would impact reed swamps, marsh and wet grassland habitat which is vital for the wetland birds protected within the SPA, and would be in conflict with the site's conservation objectives.

The green route just past Scarriff has its own set of ecological constraints once the route meets the Ballyteige River. The narrow trail currently present would require widening with impacts to the treeline and watercourse likely. This is within the SAC and is designated as Otter habitat. Evidence of Otter was also noted in this area, and interference here would result in an adverse impact to a site of international importance. Additionally, the number of Tufted Ducks utilising the habitat on route indicates a disturbance to this species is possible. A Dunlin which is an Annex I species was feeding on the reed beds, habitat which would be impacted by the Greenway.

The red route between the Parteen Weir and Clonlara would have a predicted *Major Adverse Impact*. Disturbance to a site of international importance is predicted due to the necessity to remove large linear strips of treeline and hedgerow inside the Lower River Shannon SAC boundaries in order to facilitate the widening of the current path. Large drainage ditches containing large sedge swamps would likely be impacted, or riverside vegetation may be removed with negative impacts to Otter habitat. Redwings *Turdus iliacus* (Red-listed) were feeding and flushed on the Errina Canal trail. Removal of vegetation on the Errina Canal would impact this species among others. The canal is known to host a wealth of biodiversity. A number of old stone bridges and stonework would be impacted by the development of this route with a possible disturbance to bat roosting habitat.

Nearer to Limerick, the green and red routes are predicted to have potential for major impacts. If areas such as the alluvial woodlands near U the Otter habitat on the banks of the Shannon in Redboge, and the riparian woodland and Otter habitat in Parteen and Quinspool South are avoided, these impacts can be would also be eliminated. Preliminary route options in these sections should be reconsidered in light of these ecological constraints. Further surveying is needed to adequately determine the location of annex 1 type alluvial woodlands in Limerick.

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Appendix 1

Table 5: Section 1, protected species from the NBDC database.

Species name	Species group
Common Frog (<i>Rana temporaria</i>)	Amphibian
Common Coot (<i>Fulica atra</i>)	Bird
Common Kingfisher (<i>Alcedo atthis</i>)	Bird
Common Wood Pigeon (<i>Columba palumbus</i>)	Bird
Little Egret (<i>Egretta garzetta</i>)	Bird
Little Grebe (<i>Tachybaptus ruficollis</i>)	Bird
Whooper Swan (<i>Cygnus cygnus</i>)	Bird
Brown Long-eared Bat (<i>Plecotus auritus</i>)	Terrestrial Mammal
Daubenton's Bat (<i>Myotis daubentonii</i>)	Terrestrial Mammal
Eurasian Badger (<i>Meles meles</i>)	Terrestrial Mammal
Eurasian Red Squirrel (<i>Sciurus vulgaris</i>)	Terrestrial Mammal
European Otter (<i>Lutra lutra</i>)	Terrestrial Mammal
Lesser Noctule (<i>Nyctalus leisleri</i>)	Terrestrial Mammal
Pine Marten (<i>Martes martes</i>)	Terrestrial Mammal
Pipistrelle (<i>Pipistrellus pipistrellus sensu lato</i>)	Terrestrial Mammal
Soprano Pipistrelle (<i>Pipistrellus pygmaeus</i>)	Terrestrial Mammal
West European Hedgehog (<i>Erinaceus europaeus</i>)	Terrestrial Mammal

Table 2: Section 2, protected species from the NBDC database.

Species name	Species group
Common Frog (<i>Rana temporaria</i>)	Amphibian
Smooth Newt (<i>Lissotriton vulgaris</i>)	Amphibian
Barn Swallow (<i>Hirundo rustica</i>)	Bird
Common Linnet (<i>Carduelis cannabina</i>)	Bird
Common Starling (<i>Sturnus vulgaris</i>)	Bird
Common Wood Pigeon (<i>Columba palumbus</i>)	Bird
House Martin (<i>Delichon urbicum</i>)	Bird
Brown Long-eared Bat (<i>Plecotus auritus</i>)	Terrestrial Mammal
Eurasian Badger (<i>Meles meles</i>)	Terrestrial Mammal
Eurasian Red Squirrel (<i>Sciurus vulgaris</i>)	Terrestrial Mammal
European Otter (<i>Lutra lutra</i>)	Terrestrial Mammal
Pine Marten (<i>Martes martes</i>)	Terrestrial Mammal
Pipistrelle (<i>Pipistrellus pipistrellus sensu lato</i>)	Terrestrial Mammal
Red Deer (<i>Cervus elaphus</i>)	Terrestrial Mammal
Soprano Pipistrelle (<i>Pipistrellus pygmaeus</i>)	Terrestrial Mammal

Table 3: Section 3, protected species from the NBDC database.

Species name	Species group
Pine Marten (<i>Martes martes</i>)	Terrestrial Mammal
Soprano Pipistrelle (<i>Pipistrellus pygmaeus</i>)	Terrestrial Mammal
West European Hedgehog (<i>Erinaceus europaeus</i>)	Terrestrial Mammal

Table 4: Section 4, protected species from the NBDC database.

Species name	Species group
Common Frog (<i>Rana temporaria</i>)	Amphibian
Common Kingfisher (<i>Alcedo atthis</i>)	Bird
Brown Long-eared Bat (<i>Plecotus auritus</i>)	Terrestrial Mammal
Daubenton's Bat (<i>Myotis daubentonii</i>)	Terrestrial Mammal
Eurasian Badger (<i>Meles meles</i>)	Terrestrial Mammal
Eurasian Pygmy Shrew (<i>Sorex minutus</i>)	Terrestrial Mammal
Eurasian Red Squirrel (<i>Sciurus vulgaris</i>)	Terrestrial Mammal
European Otter (<i>Lutra lutra</i>)	Terrestrial Mammal
Lesser Noctule (<i>Nyctalus leisleri</i>)	Terrestrial Mammal
Natterer's Bat (<i>Myotis nattereri</i>)	Terrestrial Mammal
Pine Marten (<i>Martes martes</i>)	Terrestrial Mammal
Pipistrelle (<i>Pipistrellus pipistrellus sensu lato</i>)	Terrestrial Mammal
Soprano Pipistrelle (<i>Pipistrellus pygmaeus</i>)	Terrestrial Mammal
West European Hedgehog (<i>Erinaceus europaeus</i>)	Terrestrial Mammal

Table 5a: Section 5, protected species from the NBDC database.

Species name	Species group
Great Cormorant (<i>Phalacrocorax carbo</i>)	Bird
Mute Swan (<i>Cygnus olor</i>)	Bird
Daubenton's Bat (<i>Myotis daubentonii</i>)	Terrestrial Mammal
Eurasian Badger (<i>Meles meles</i>)	Terrestrial Mammal
Eurasian Pygmy Shrew (<i>Sorex minutus</i>)	Terrestrial Mammal
Greater White-toothed Shrew (<i>Crocidura russula</i>)	Terrestrial Mammal
Lesser Noctule (<i>Nyctalus leisleri</i>)	Terrestrial Mammal
Pipistrelle (<i>Pipistrellus pipistrellus sensu lato</i>)	Terrestrial Mammal
Soprano Pipistrelle (<i>Pipistrellus pygmaeus</i>)	Terrestrial Mammal
West European Hedgehog (<i>Erinaceus europaeus</i>)	Terrestrial Mammal

Table 6: Section 6a (yellow and red route), protected species from the NBDC database.

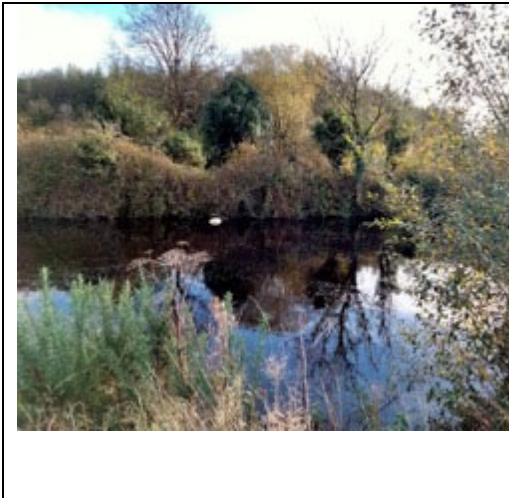
Species name	Species group
Barn Swallow (<i>Hirundo rustica</i>)	Bird
Common Kestrel (<i>Falco tinnunculus</i>)	Bird
Black-headed Gull (<i>Larus ridibundus</i>)	Bird
Common Kingfisher (<i>Alcedo atthis</i>)	Bird
Common Snipe (<i>Gallinago gallinago</i>)	Bird
Common Swift (<i>Apus apus</i>)	Bird
Common Wood Pigeon (<i>Columba palumbus</i>)	Bird
Great Black-backed Gull (<i>Larus marinus</i>)	Bird
Great Cormorant (<i>Phalacrocorax carbo</i>)	Bird
Greylag Goose (<i>Anser anser</i>)	Bird

Lesser Black-backed Gull (<i>Larus fuscus</i>)	Bird
Little Grebe (<i>Tachybaptus ruficollis</i>)	Bird
Mallard (<i>Anas platyrhynchos</i>)	Bird
Mew Gull (<i>Larus canus</i>)	Bird
Mute Swan (<i>Cygnus olor</i>)	Bird
Northern Lapwing (<i>Vanellus vanellus</i>)	Bird
Tufted Duck (<i>Aythya fuligula</i>)	Bird
Eurasian Badger (<i>Meles meles</i>)	Terrestrial Mammal
Eurasian Pygmy Shrew (<i>Sorex minutus</i>)	Terrestrial Mammal
Eurasian Red Squirrel (<i>Sciurus vulgaris</i>)	Terrestrial Mammal
European Otter (<i>Lutra lutra</i>)	Terrestrial Mammal
Greater White-toothed Shrew (<i>Crocidura russula</i>)	Terrestrial Mammal
Lesser Noctule (<i>Nyctalus leisleri</i>)	Terrestrial Mammal
Pine Marten (<i>Martes martes</i>)	Terrestrial Mammal
Pipistrelle (<i>Pipistrellus pipistrellus sensu lato</i>)	Terrestrial Mammal
Soprano Pipistrelle (<i>Pipistrellus pygmaeus</i>)	Terrestrial Mammal
West European Hedgehog (<i>Erinaceus europaeus</i>)	Terrestrial Mammal

Table7: Section 6b (green route), protected species from the NBDC database

Species name	Species group
Black-headed Gull (<i>Larus ridibundus</i>)	Bird
Common Starling (<i>Sturnus vulgaris</i>)	Bird
Great Cormorant (<i>Phalacrocorax carbo</i>)	Bird
Lesser Black-backed Gull (<i>Larus fuscus</i>)	Bird
Eurasian Badger (<i>Meles meles</i>)	Terrestrial Mammal
Eurasian Red Squirrel (<i>Sciurus vulgaris</i>)	Terrestrial Mammal
West European Hedgehog (<i>Erinaceus europaeus</i>)	Terrestrial Mammal

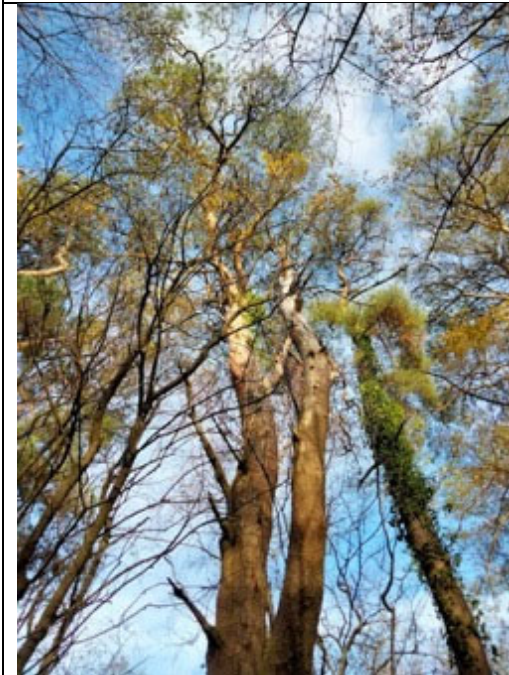
Appendix 2: Photographs



The River Graney on the red route



Wintering bird habitat near the river Graney



Raheen woods



Raheen woods wet woodland



Wet pendunculate Oak-Ash woodland (links with Annex I alluvial woodland)



Wetland bird habitat inside the Lough Derg SPA (yellow route)



Bog woodland (Annex I) at Bealkelly woods



Reed beds on the yellow route near Bealkelly Ancient woodland



Trail near Aughinish woods



Reed beds near Bealkelly



Wet grassland along the margins of Lough Derg, south of Killaloe



A stream (FEENLEA) braiding through the Oak-Ash-Hazel woodland on the red route. The stream is hydrologically connected to Lough Derg SPA.

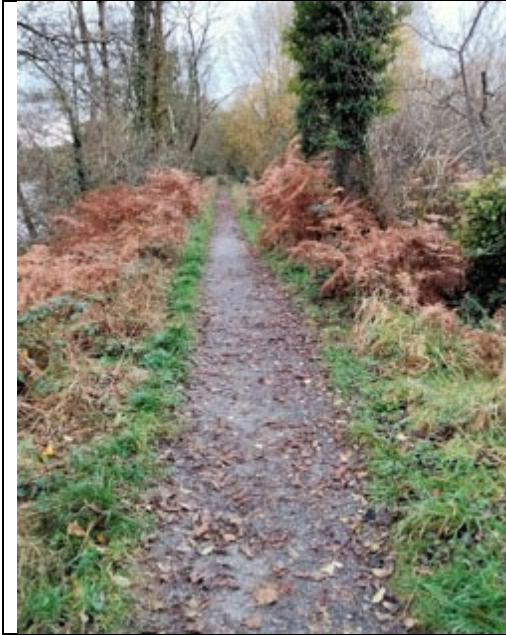


The Ballyteige River (red route)



The green route on the Ballyteige River (inside the Lower Shannin SAC)

Cormorant on the River Shannon (red route near the Parteen Weir)



Current path on the red route from the Parteen Weir to O' Briensbridge



Old stone bridge between O'Briensbridge and Cloonlara with bat roosting potential (red route)



Narrow pathway on the Errina Canal trail



Purging buckthorn on the Errina Canal trail.



Wetland habitat on where the River Shannon meets the Canal on the green route (inside the Lower River Shannon SAC).



An Elm on the riparian woodland where the canal meets the Shannon (green route).



Existing pathway between UL and St. Johns Castle.