N2 SLANE BYPASS & PUBLIC REALM ENHANCEMENT SCHEME

Additional Information Response Document

December 2024

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comhairle chontae na mí
meath county council

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1 INTRODUCTION

In December 2023, Meath County Council (MCC) lodged an application for development consent with An Bord Pleanála (ABP) for the N2 Slane Bypass and Public Realm Enhancement Scheme (the Proposed Scheme). As part of that application, an Environmental Impact Assessment Report (EIAR) was submitted along with a Natura Impact Statement (NIS).

In a letter dated 8 October 2024, ABP issued a request for additional information on the application in relation to the matters raised in submissions and in the ABP review of the application. This Response Document sets out the responses to the ABP requests. Each request has been addressed sequentially in the following sections with supporting information also presented in the Appendices as referenced in the responses.

2 POINT 1 – OVERLAY OF PROPOSED SCHEME ON ZONING

Point 1 of the ABP letter states:

1. "*In the interest of clarity, please provide an overlay of the proposed development works on the land use zoning map for the area.*"

Response to the Request for Additional Information:

2.1 Overlap of Proposed Scheme on CDP Zoning

The Proposed Scheme has been overlaid on the MCC County Development Plan (CDP) 2021-2027 zoning. This map is included in **Appendix A**.

2.2 Description of Relevant CDP Zoning Objectives

MCC CDP 2021-2027 includes the following descriptions for the H1 and RA objectives:

- **H1 High Amenity Objective:** "*To protect and improve areas of high amenity.*"
  - **Permitted Uses:** Cycleways / Greenways / Trail Development, Land & Water Based Recreational Activities Open Space, Cultural Activities.
  - **Open for Consideration Uses:** Kiosk, Restaurant, Tea Room, Sensitive re-use of existing structures.
- **RA Rural Areas Objective:** "*To protect and promote in a balanced way, the development of agriculture, forestry and sustainable rural-related enterprise, community facilities, biodiversity, the rural landscape, and the built and cultural heritage*."
  - **Guidance:** The primary objective is to protect and promote the value and future sustainability of rural areas. Agriculture, forestry, tourism and rural related resource enterprises will be employed for the benefit of the local and wider population. A balanced approach involving the protection and promotion of rural biodiversity, promotion of the integrity of the landscape, and enhancement of the built and cultural heritage will be adopted.
  - **Permitted Uses:** Agriculture, Agricultural Buildings, Agri-Tourism, Boarding Kennels (Where the use is ancillary to the use of the dwelling as a main residence), Burial Grounds, Extractive Industry/Quarrying, Equestrian, Farm Shop (Only where the bulk of the produce is produced on the farm), Forestry related activities, Horticulture, Caravan and Camping Park (No static mobile homes or permanent structure unless ancillary to the operation of the campsite shall be permitted), Golf Course, Open Space, Research and Development (Rural related research and development only), Residential (Subject to compliance with the Rural Settlement Strategy), Restaurant/Café (Only where ancillary to tourism uses or conversion of protected or vernacular structures), Sustainable Energy Installations, Utility Structures.
  - **Open for Consideration Uses:** Community Facility, Cultural Facility, Education, Garden Centre, Micro Businesses (Refer to the Economic Chapter), Playing Fields, Recreational Facility, Sports Club, Telecommunication Structures, Workshop (only where ancillary to an existing dwelling where it is demonstrated that the proposed activity is carried out by a resident of the dwelling, with no visiting members of the public), Veterinary Clinic.

2.3 Objective for Slane Bypass in the Meath CDP

MCC CDP 2021-2027 includes the following in relation to an objective for the Slane bypass:

'5.8.1 Slane Bypass

A bypass for Slane has been a long-standing objective of the Council and has the support of the majority of the local residents, who have campaigned for its construction for many years. The bypass is noted within the

National Development Plan 2018-2027 as key infrastructure 'investment to support the ambition for development of the border region' and is identified as a priority for delivery.

Further, the RSES (RPO 8.10 of the Strategy refers) supports the appraisal and delivery of the N2 Slane Bypass. It is an important infrastructural development that is required as a matter of urgency. Since the refusal of the scheme by An Bord Pleanála in 2012, the Council and the TII have carried out a number of studies looking at traffic management alternatives through Slane and along the N2 aimed at reducing the number of HGVs travelling through the village and across Slane bridge. These studies examined the effects of various HGV bans, tolling measures, speed limits and other traffic management options on the road network. Two public consultation meetings were held in relation to these studies in November 2012 and March 2015 and the findings were presented to the Council. The outcome of these studies concluded that traffic management options would not satisfactorily address the particular circumstances in Slane and were not shown as representing viable alternatives to a bypass.

An east-west bypass option in conjunction with the proposed north-south bypass has been considered however detailed studies indicate that there were insufficient benefits to warrant this additional bypass at this time. Work has now recommenced on the preparation of an application for consent to develop an N2 bypass for Slane village and funding and support is being provided by the TII to do so. The provision of a bypass in Slane has been prioritised in terms of funding and is identified as a priority project in Building on Recovery: Infrastructure and Capital Investment 2016- 2021.

Traffic management alternatives will continue to be examined as part of these studies. There is agreement that the potential safety risks that affect the future well-being of all road users and communities, particularly the Slane community must be addressed. There are numerous road safety problems associated with the existing N2, particularly on the section which runs across the Slane Bridge and through Slane Village. These problems include substandard vertical and horizontal alignment, including steep gradients on the approaches to Slane Bridge and the N2/N51 crossroads junction, sharp bends, one-way shuttle traffic across Slane Bridge, tight turning radii at the N2/N5 junction, particularly for Heavy Goods Vehicles (HGV's) and reduced forward visibility and junction visibility. High volumes of HGV's have led to traffic congestion, delays and nuisance for residents and visitors to the village, posing significant ongoing road safety risks for all road users. Meath County Council and Transport Infrastructure Ireland have long recognised these significant road safety issues. The installation of interim road safety measures in 2002 improved some of the safety issues but the inherent safety problems continue to exist on the substandard N2 alignment and by effect, so too does the risk of serious collisions for both road users and residents. In seeking a solution the Council recognises that a balance must be achieved between environmental, historical and archaeological considerations and the safety and other negative impacts caused by the current traffic situation in Slane village.

It is an objective of the Council:

***MOV OBJ 36** To support and facilitate the delivery of an N2 Bypass to the east of Slane Village, which is considered to comprise essential infrastructural development and to construct same subject to obtaining the relevant development consents required and to reserve and protect route option corridors from development which would interfere with the provision of the project. Development of the project will be subject to the outcome of the Appropriate Assessment process.'*

3 POINT 2 – UPDATES TO RELEVANT PLANS AND LEGISLATION

Point 2 of the ABP letter states:

2. "*It is noted that since the submission of the application, the Climate Action Plan 2024 has been published, while the application submission refers to the Climate Action Plan 2023. Please provide a statement addressing any implications of this with respect to the proposed development. Please also review any other updates to relevant policy or legislation since the submission of the application.*"

Response to the Request for Additional Information:

Section 3.1 sets out a statement addressing the implications of the updated Climate Action Plan (CAP) 2024.

Section 3.2 sets out a review of other updates to relevant policy or legislation since the submission of the application.

3.1 Climate Action Plan 2024

The Climate Action Plan 2024 (CAP24) is the third annual update to Ireland's CAP (the first of which was published in 2019 on a non-statutory basis) and the second to be prepared under the Climate Action and Low Carbon Development (Amendment) Act 2021. During the preparation of the EIAR for the proposed scheme, CAP24 was in preparation. The draft CAP24 underwent public consultation in February 2024 and was subsequently formally adopted in June 2024.

CAP24 builds on the introduction of carbon budgets and sectoral emissions ceilings which were initially included under CAP23. Limited changes were made to transport targets set in CAP23 to meet a 50% compliant pathway in the transport sector. Changes to transport related targets relevant to the Proposed Scheme are as follows in **Table 3-1**.

Table 3-1: Changes to Relevant Transport Commitments (Actions / KPI) Between CAP23 and CAP24.

CAP23 Text	CAP24 Text
KPI- "20% reduction in total vehicle kms".	**KPI-** 20% reduction in total vehicle kms relative to 2030 Business As Usual (BAU) scenario".
KPI - "20% reduction in total car kms".	Not brought forward into CAP24
KPI - "20% reduction in 'commuting' car kms".	Changed from KPI to sub-target but wording remains the same
Action - TR/23/29: "Advance roll-out of 1,000 km walking/cycling infrastructure".	Merged into one combined in CAP24.
Action - TR/23/30: "Advance roll-out of National Cycle and Greenway Networks".	**Action -** TR/24/11 (TF) "Advance roll-out of walking/cycling infrastructure in line with National Cycle Network and CycleConnects plans".
Action - EN/23/12 and **KPI** – "*Specify low carbon construction methods and low carbon cement material as far as practicable for directly procured or supported construction projects from 2023".*	Not brought forward into CAP24 as an action but kept as a KPI.

Specific consideration has been given to Chapter 19 of the EIAR which assesses climate impacts and which references a number of the CAP actions under CAP23. It specifically referenced Actions TR/23/29 and TR/23/30 which, as outlined in **Table 3-1** have been merged into TR/24/11. It also references Action EN/23/12 which was not brought forward as an action in CAP24. As CAP24 has largely built on existing policies to maintain the trajectory or the policy direction set under CAP23, the changes noted do not alter the outcome of that assessment or any related mitigations. The evaluation of consistency with policy presented in Chapter 19 of the EIAR therefore remains unchanged with regard to the most recent approved CAP24.

Furthermore the limited changes in the transport policy base between CAP23 and CAP24 since the submission of the application have been reviewed in the context of the Proposed Scheme. The updated CAP remains aligned with the policy base at the time of application. As such, the analysis of the climate impact of the Proposed Scheme relative to this policy framework as presented within Chapter 19 of the EIAR is unaltered and the Proposed Scheme remains fully consistent with CAP24. As noted in the EIAR submitted, Meath County Council have devised the Proposed Scheme to be consistent, as far as practicable, with Section 15 of the Climate Action and Low Carbon Development Act 2015, as amended and this remains the case.

3.2 Other Policies and Legislation

3.2.1 SI No. 451/2024 – European Union Habitats (River Boyne and River Blackwater Special Area of Conservation 002299) Regulations 2024

In a letter to MCC dated 9 October 2024 from the Department of Housing, Local Government and Heritage (DHLGH), the Department advised that the River Boyne and River Blackwater Special Area of Conservation (SAC) has now been designated as an SAC in accordance with Article 4 of the European Union Habitats Directive (92/43/EEC). The designation is formalised by the following regulation: SI No. 451/2024 – European Union Habitats (River Boyne and River Blackwater Special Area of Conservation 002299) Regulations 2024.

Prior to the making of the aforementioned regulations to give further effect to Council Directive 92/43/EEC, the status of the River Boyne and River Blackwater SAC was as a candidate SAC, or cSAC. Throughout each of the phases of the development of the Proposed Scheme, and the preparation of both the EIAR and the NIS, no distinction has been made between candidate (and proposed) European sites and sites fully designated as European sites which are underpinned by a Statutory Instrument. This is in accordance with the definitions for European sites included in the Birds and Natural Habitats Regulations 2011, as amended.

Furthermore the latest published Conservation Objectives document for the River Boyne and River Blackwater Special Area of Conservation, issued by NPWS (Department of Housing, Local Government and Heritage) and dated 03/12/2021 includes the same conservation objectives as those used in the assessment in the EIAR and NIS. Therefore, although the status of the River Boyne and River Blackwater SAC is no longer a ‘candidate’ site, there has been no change to the Conservation Objective document or the conservation objectives used in the EIAR and NIS and no change to the assessment presented in the EIAR or NIS in light of the published Statutory Instrument SI No. 451/2024.

3.2.2 Historic and Archaeological Heritage and Miscellaneous Provisions Act 2023

Since the publication of the EIAR, new heritage legislation has been enacted. The Historic and Archaeological Heritage and Miscellaneous Provisions Act 2023 was enacted in October 2023 and this Act is now law. The Minister for Housing, Local Government and Heritage commenced certain provisions in May 2024 (SI No. 252/2024). Until the Act is fully commenced, the National Monuments Acts remain in force. None of the changes contained in the Act (commenced or not yet commenced) invalidate the methodological approach to assessment or any of the findings relating to archaeological and cultural heritage.

3.2.3 EU Nature Restoration Law

The EU Nature Restoration Law, Regulation (EU) 2024/1991 of the European Parliament and of the Council of 24 June 2024 on nature restoration and amending Regulation (EU) 2022/869 (Text with EEA relevance),came into effect on the 18 August 2024. The European Commission has stated that the “law aims to restore ecosystems, habitats and species across the EU’s land and sea areas in order to: enable the long-term and sustained recovery of biodiverse and resilient nature: contribute to achieving the EU’s climate mitigation and climate adaptation objectives; and meet international commitments.” Specific targets are included in relation to existing legislation, pollinating insects, for ecosystems associated with forest, urban, agriculture and marine and for river connectivity.

To implement the targets, each Member State must prepare and submit a National Restoration Plan by mid-2026. Ireland is now starting that process, led by the NPWS (Department of Housing, Local Government and Heritage). The preparation of the national restoration plan is therefore at a very early stage and no detail on

the targets specific to Ireland or the measures to restore ecosystems, habitats and species is currently known.

Notwithstanding that, the EIAR and NIS for the Proposed Scheme have been prepared in the context of the existing framework of legislation, policy and guidance applicable to biodiversity generally in Ireland and the network at European and national level. It has also been informed by consultation with NPWS. The Proposed Scheme remains consistent with this existing framework.

3.2.4 Fourth Biodiversity Action Plan 2023-2030

The EIAR and NIS for the Proposed Scheme were prepared having considered the content and main objectives of both Ireland's Third National Biodiversity Action Plan (NBAP) 2017-2021 and draft Fourth National Biodiversity Action Plan 2023-2027 (which was available in draft for consultation at the end of 2023 when the Proposed Scheme was submitted for planning).

Since the submission of the EIAR in December 2023, the Fourth National Biodiversity Action Plan 2023–2030 has been finalised, and was published in January 2024. Changes to the Fourth National Biodiversity Action Plan as it progressed from draft for consultation to final adopted plan do not materially affect the assumptions made within the EIAR or NIS. As the overall aim of the Fourth National Biodiversity Action Plan 2023-2030 is to protect biodiversity and to continue and improve the transposition of the EU Habitats Directive and the EU Birds Directive, this largely aligns with the previous version.

As such the assessment in both the EIAR and NIS and the associated mitigation strategy is consistent with the objectives of the Fourth National Biodiversity Action Plan 2023-2030 as they relate to the Proposed Scheme.

3.2.5 National Energy and Climate Plan 2021-2030

The EIAR states that Ireland's first 10-year National Energy and Climate Plan 2021-2030 (NECP) was published in 2019 in accordance with Regulation (EU) 2018/1999 on the Governance of the Energy Union and Climate Action. This NECP incorporated all planned policies and measures that were identified up to the end of 2019 and which collectively deliver a 30% reduction by 2030 in non-emission trading system (non-ETS) greenhouse gas emissions (from 2005 levels) (i.e. greenhouse gas emissions not covered by the European Union Emissions Trading System). In terms of transport, the NECP report to the European Commission(EC) referenced the measures and targets that were presented in Ireland's first Climate Action Plan published in 2019 (CAP19). In accordance with the 2018 Regulation, interim draft updated NECPs were required to be prepared by Member States partway through the 2021-2030 period, and to submit a final updated NECP 2021-2030 to the EC in summer 2024.

At the time of lodgement of the application, Ireland was preparing its updated NECP which was subsequently finalised and submitted to the EC in July 2024. The NECPs are high-level 'umbrella' plans which outline the State's energy and climate policies for the period to 2030 and looks onwards to 2050. As for the first 2019 NECP, the revised NECP reiterates the measures and targets included in the latest published Climate Action Plan, CAP24, as the CAPs represents the principal instrument by which Ireland is addressing climate action. The updated NECP does not contain policies or actions that are not already outlined in the CAP24; refer to **Section 3.1** above which summaries the updates for CAP24 in the context of the Proposed Scheme.

The Proposed Scheme remains consistent with the updated NECP 2021-2030. The publication of the revised update does not invalidate the methodological approach to assessment or any of the findings relating to climate.

3.2.6 Long-Term Strategy on Greenhouse Gas Emissions Reduction to 2050

The EIAR references Ireland's first Long-term Strategy (LTS) on Greenhouse Gas Emissions Reductions 2023, which was approved by government in April 2023. The LTS sets out indicative pathways, beyond 2030, towards achieving carbon neutrality for Ireland by 2050. The Strategy builds upon the decarbonisation pathways set by the carbon budgets, sectoral emissions ceilings and Climate Action Plan 2023, to ensure coherent and effective climate policy. The LTS was updated and published in July 2024.

In the 2024 LTS, of the two measures/milestones from the 2023 LTS which were considered relevant to the Proposed Scheme, one has been updated to make reference to 'after 2035', compared to 'after 2030' in the 2023 LTS. This is a minor revision to the measure/milestone and the Proposed Scheme does not materially

affect the assessment or assumptions carried out in the EIA. The Proposed Scheme remains consistent with Section 15 of the Act with regard to the publication of the latest LTS.

3.2.7 National Adaptation Framework (2024)

In 2024 an updated National Adaptation Framework (NAF) was published based on a review of the first NAF which was published in 2018. It sets out to expand on the guiding principles that promote smarter, faster and transformative adaptation actions. The actions of the NAF foster the development and use of appropriate adaptation/ resilience indicators to create a fit-for-purpose MERL (Monitoring, Evaluation, Research and Learning) system and encourage data sharing for adaptation monitoring. Action 11 from the 2018 NAF which was cited in the EIAR as being of relevance to the Proposed Scheme at the time of lodgement (*Ensure climate proofing considerations are fully integrated into arrangements and reforms arising from the new Ireland 2040 – National Planning Framework including Guidelines, updated guidance on adaptation proofing of SEA and EIA and in revisions of building standards*) has been removed from the 2024 NAF. No new relevant actions have been included in the 2024 NAF to replace this.

This change between the 2018 NAF and the 2024 NAF does not materially affect the assessment or assumptions presented in the EIAR in respect of climate change adaptation. The Proposed Scheme remains consistent with Section 15 of the Act with regard to the publication of the latest NAF.

3.2.8 Meath County Council Climate Action Plan 2024-2029

The Meath County Council Local Authority Climate Action Plan (LA CAP) 2024-2029 was adopted in January 2024, with the overall aim to “create a low carbon and climate resilient County, by delivering and promoting best practice in climate action, at the local level”. The council are committed to lead in translating the National Climate Policy into local actions through inclusive engagement, capacity building and leadership for the people of County Meath. The requirement for MCC to produce an LA CAP is set out in Section 14(B) of the Climate Action and Low Carbon Development Amendment Act 2021, which also prescribes that a local authority climate action plan shall, as far as practicable, be consistent with the most recent approved climate action plan and national adaptation framework.

The key targets of the LA CAP include the following:

- *Green House Gas Reduction: Achieve 51% reduction in greenhouse gas emissions by 2030; Reach Net Zero by 2050*
- *Energy Efficiency: Improve energy efficiency by 50% by 2030*
- *Resilience: Make Meath a climate resilient region by reducing the impacts of future climate change-related events*
- *Awareness: Actively engaging and informing citizens, communities and businesses on climate change*

The LA CAP actions identified as being of relevance to the Proposed Scheme include the following:

- **BET 14** *New Building projects designed to Nearly Zero Energy Building (nZEB) standard including provision of Energy Efficient Design, on-site renewable energy, EV Charging Facilities, Sustainable Drainage (SuDs), and nature-based solutions*.
  - In terms of EV charging facilities, as set out in the EIAR Chapter 4 – Description of the Proposed Scheme includes for 4 no. proposed electric vehicle charging points as part of the public realm enhancement proposals. During the construction Phase, Chapter 19 – Climate sets out mitigation with regard to use of renewable energy: *For electricity generation at the construction compounds, hydrogen generators or electrified plant shall be utilised over traditional diesel generators. This shall also apply to lower powered mobile plant, as appropriate*.
  - The drainage design for the Proposed Scheme as described in Chapter 4– Description of the Proposed Scheme has included for SuDs and nature-based options over hard engineering solutions, such as the incorporation of swales and grassed surface water channels.
- **BET 16** *Increase active travel usage in town centres through improved sustainable active travel proposals and an enhanced pedestrian and public realm environment*.

  - As set out in EIAR Chapter 4– Description of the Proposed Scheme, the Proposed Scheme includes for various cycling and pedestrian facilities along both the proposed bypass, the N51 realignment works and as part of the public realm enhancements.

- **NE 6** *Identification of critical infrastructure routes on the existing network for climate related extreme weather events*.
  - As documented and assessed in Chapter 19 – Climate, the risk of adverse climate impact on the Proposed Scheme has been mitigated to reduce the likelihood of such an event having a significant adverse impact.

The Proposed Scheme is considered to be consistent with the relevant aspects of the Meath LA CAP.

3.2.9 Water Action Plan – A River Basin Management plan for Ireland

Consideration was given to the 2nd cycle River Basin Management Plan (RBMP) 2018-2021 as well as the draft 3rd cycle RBMP 2022-2027 during the preparation of Chapter 16 – Biodiversity: Aquatic Ecology and Chapter 17 – Water, of the EIAR. Since the submission of the EIAR in December 2023, the draft 3rd Cycle RBMP was finalised and published on 6th September 2024, and retitled as the Water Acton Plan 2024 –A River Basin Management Plan for Ireland.

The EU Water Framework Directive (WFD) 2000/60/EC requires achievement of environmental objectives. The implementation of the Water Action Plan 2024 seeks compliance with the environmental objectives set under the WFD and the Water Action Plan includes information on the current pressure on Ireland's water bodies, their status and the measures needed to achieve the relevant environmental objectives.

The stated aim of the Water Action Plan 2024 is to ensure that Ireland's natural waters are sustainably managed and that freshwater resources are protected to maintain and improve Ireland's water environment. It sets out the measures necessary to protect and restore water quality in Ireland and to protect water from further deterioration, in line with the Water Framework Directive (WFD).

The implementation of the Water Action Plan 2024 and achievement or maintenance of environmental objectives for water bodies will have a positive impact on water dependent habitats and species. New actions that have been incorporated into the final version of the Water Action Plan 2024 for its Programme of Measures to 2027 broadly relate to coordination and administrative actions (such as setting up technical and working groups), information sharing and liaison actions between various agencies and authorities, commitments to research/pilot studies to be undertaken, reviews and monitoring of action progress, training and upskilling etc. The changes to the final plan do not materially affect any assumptions made in the assessments or the conclusions of assessments as presented in the EIAR.

The comprehensive environmental assessment undertaken as part of the EIAR includes an evaluation of the impact of the Proposed Scheme on the overall ecological status of relevant river water bodies in terms of the objectives set out in Article 4(1) of the WFD, which found the Proposed Scheme does not cause deterioration of good status in any associated water body and does not jeopardise attainment of good status in any associated water body. The current EPA-published WFD ecological status and the risk rating for the achievement of environmental objectives remains unchanged since lodgement of the application. The Proposed Scheme remains consistent with the final published Water Action Plan 2024.

3.2.10 Draft Meath Noise Action Plan 2024-2028

The Environmental Noise Directive (END) (2002/49/EC) requires member states to prepare and publish strategic noise maps and noise management action plans every five years. The aim of the END is to provide a common framework to avoid, prevent or reduce, on a prioritised basis, the harmful effects of exposure to environmental noise.

Chapter 9 – Noise and Vibration references the Meath Noise Action Plan (NAP) 2019. Since lodgement of the application, MCC has published a draft revised NAP covering the period 2024-2028 in line with the legislative requirements to revise the plan every 5 years. Consultation on the draft plan closed in September 2024, however the final plan has not yet been made. Both the current and draft Meath NAP are underpinned by the long-term EU strategy to reduce the number of people affected by noise and provide a framework for developing existing community policy on noise reduction from major sources.

The draft NAP does refer to the "Slane Bypass" scheme, noting the removal of through-traffic on the N2, including the potential noise sensitive location at St Patrick's National School. The removal of through-traffic

from the existing N2 in Slane village, as well as the mitigation of noise impact for noise sensitive locations along the Proposed Scheme as described in the EIAR, is in keeping with the aim of reducing environmental noise on residents. There is an increase in traffic noise along the N51 due to the increase in traffic volumes as result of the Proposed Scheme, however, the Proposed Scheme will result in a positive aggregate residual impact under the END Noise Mapping. This will result in beneficial environmental and health effects on the general population in Slane village.

Having reviewed the draft NAP, the methodological approach and the findings of the noise assessment in the EIAR remain unchanged.

3.2.11 National Waste Management Plan for a Circular Economy 2024-2030

The National Waste Management Plan for a Circular Economy (NWMPCE) sets several targets relevant to the Proposed Scheme. These targets and deliverables include:

- The plan aims to curb waste generation within the construction sector through the implementation of by-product measures, end-of-waste criteria, and best practice guidelines.
- The plan has a strong focus on reusing soil and stone waste as by-products rather than treating them as waste.
- A 2% reduction per annum is proposed for total construction and demolition waste to achieve a cumulative 12% reduction by 2030.
- The plan commits to rolling out and promoting the Environmental Protection Agency (EPA) best practice guidelines for C&D projects. These guidelines are designed to enhance circular practices and reduce waste generation from construction activities.
- There is an identified need for developing facilities with larger treatment capacities and longer lifespans to manage soil and stone recovery. This includes considering old quarries and mines as potential sites for soil material recovery.
- Successful implementation of the incentivised charging regime for commercial municipal waste and the national Regulation 27 decision for greenfield soil and stone are considered primary drivers for reducing waste trends.
- An ongoing monitoring regime is required to track progress and revise projections to ensure the targets are met.

These targets and strategies aim to support sustainable waste management practices, reduce the environmental impact of construction activities, and promote the transition to a circular economy. They are crucial for ensuring that excess soil and construction demolition waste generated by road developments, such as the Proposed Scheme, are effectively managed and utilised. The Proposed Scheme is in compliance with the NWMPCE.

3.2.12 Draft Revision of the National Planning Framework

The EIAR makes reference to the National Planning Framework (NPF) 2040, which was prepared by the Department of Housing, Local Government and Heritage (DHLGH) in 2018. The NPF is the primary articulation of spatial, planning and land use policy in Ireland. The framework is intended to guide, at a high-level, strategic planning and development for the country over the next 20+ years, so that as the population grows, that growth is sustainable (in economic, social and environmental terms). The core principles of the framework include balanced regional development and compact growth and advocates for directing development to existing settlements rather than allowing the continual expansion and sprawl of cities and towns. The framework provides each region with a set of objectives and key principles from which detailed plans are to be developed. In accordance with the Planning and Development Act as amended, the NPF is required to be revised or replaced every six years. Since the publication of the EIAR, a draft revision to the NPF has been prepared by the DHLGH and was published for public consultation in July 2024 which closed in September 2024. A final version of the revised NPF has not yet been published.

The EIAR as published noted that there are clear links between several of the 2018 NPF's National Strategic Outcomes (NSOs) and the Proposed Scheme, namely: NSO 1 – Compact Growth, NSO 2 – Enhanced Regional Connectivity, NSO 3 – Strengthening Rural Economies and Communities, NSO 4 – Sustainable

Mobility, and NSO 7 – Enhanced Amenity and Heritage. The EIAR also notes that as a result of the NSOs, there is a list of ten Strategic Investment Priorities which includes the national road network.

Of the five relevant NSOs identified from the 2018 NPF, NSO 4 – Sustainable Mobility has revised wording in the 2024 draft revision to the NPF. The 2018 wording was the following: *In line with Ireland's Climate Change mitigation plan, we need to progressively electrify our mobility systems moving away from polluting and carbon intensive propulsion systems to new technologies such as electric vehicles and introduction of electric and hybrid traction systems for public transport fleets, such that by 2040 our cities and towns will enjoy a cleaner, quieter environment free of combustion engine driven transport systems*.

The 2024 wording is as follows: *In line with Ireland's Climate Action Plan and National Sustainable Mobility Policy, we need to progressively change the way we travel, by reducing dependence on cars and increasing the number of journeys taken by sustainable modes of transport, namely walking, cycling and public shared transport. As well as significantly increasing the modal share of sustainable transport, we need to ensure that where car transport is required, this travel is increasingly taken by electric vehicle. Therefore, there is a need to complement these measures by increasing the proportion of electric vehicles (EVs) in our car fleet to 30% by 2030 which will improve the efficiency of the national car fleet, and to electrify our mobility systems for public transport fleets. By doing this, our cities and towns will enjoy a cleaner, quieter environment free of engine driven transport systems by 2040*.

The wording reflects new policy and legislative developments whereby the National Mitigation Plan has been superseded by the annual Climate Action Plans (CAPs). The revised NSO 4 emphases active travel and modal shift, and supports electrification of the national car fleet.

As noted in the EIAR, sustainable mobility is identified as being central to enhancing competitiveness, sustaining economic progress and enabling mobility choices for citizens. The Proposed Scheme will facilitate greater options for the local community in Slane including enhanced pedestrian and cycling routes and space, provided by both the bypass and the public realm enhancements and links to wider facilities along the Boyne River towpath and wider regional cycling network. As also noted in the EIAR, and as reaffirmed under **Section 3.1** above, Meath County Council have devised the Proposed Scheme to be consistent, as far as practicable, with the relevant climate policy base as required by Section 15 of the Climate Action and Low Carbon Development Act 2015, as amended.

3.2.13 All-Island Strategic Rail Review

The All Island Strategic Rail Review, published in July 2024, examined how the island's railways are currently used, what role rail could play in future, and how the island's rail network could evolve to better serve the people of both jurisdictions on the Island of Ireland. It is not in itself a policy but aims to inform policy and provide a future strategic vision for delivering a railway that meets the aspirations of the people and businesses it serves and supports the development of a prosperous, equitable, and sustainable future. It presents plausible choices for policymakers and presents a set of recommendations for improvements to the rail network, both to the existing network and the provision of a number of new rail linkages.

Within the study area of the Proposed Scheme the key improvements identified under the All Island Strategic Rail Review include efficiency and capacity improvements to the Dublin-Belfast line and the Dublin-Sligo line. The review also includes for extension of the Clonsilla-M3 Parkway line to Navan together with capacity improvements.

The effects of the proposed strategy outlined in the Review include improved accessibility to the rail network generally, which together with improvements in capacity and efficiency will encourage more trips by rail rather than by car.

The effect of this on the Proposed Scheme in terms of traffic demand and impact is assessed to not be significant given the geographical location of the N2 corridor relative to the proposed rail improvements.

4 POINT 3 – ADDITIONAL INFORMATION SOUGHT

Point 3 of the ABP letter states:

3. "*Following an initial review of the Environmental Impact Assessment Report and Natura Impact Statement submitted, the following queries are raised, and further information is sought on each of the below items.*"

Sections 4.1 to 4.9 below sets out the responses to RFI Point 3, Items 3(a) to 3(i).

4.1 Item 3(a) Cofferdams and water management during construction

Item 3(a) of the Board's letter states:

a) "*There are inconsistencies in the description of potential water ingress to the cofferdams during bridge construction between the Natura Impact Statement, Chapter 5 and Chapter 18 with references to both 'constant ingress' and 'limited dewatering'. Regarding the proposed use of the attenuation ponds for water management during this phase of construction, or potential tankering, it is unclear whether the level of water ingress has been quantified and the water management system designed accordingly. The applicant shall provide calculations on the expected volume of ingress to the cofferdams during the construction phase, with cognisance of the alluvial subsoils, together with the capacity of the attenuation ponds to treat the expected volumes. If tankering is proposed, clarify the expected number of tanker trips and confirm disposal facility options.*"

Response to the Request for Additional Information:

In response to the query raised, the applicant has carried out a detailed assessment of the potential water ingress into the proposed cofferdams to be constructed during the Boyne bridge construction. The primary source of water ingress into the cofferdams is from groundwater. A minor source of potential pump-out water will be from direct rainfall (i.e. entering cofferdam areas from above) but this will be negligible in terms of the volumes of water to be managed.

Three temporary cofferdams are temporary structures and are proposed to facilitate the construction of the proposed River Boyne bridge piers and their foundations. The cofferdams are located within the flood plain of the river and are designed to provide an almost watertight working environment preventing flood waters from entering the works area. The cofferdams provide a safe environment to construct the bridge piers and also ensure there is no direct pathway to the river to avoid the risk of adverse effects on water quality.

Details of the assessment of groundwater ingress are described in **Sections 4.1.1 to 4.1.3** below.

4.1.1 Confirmation of the Descriptions and the Water Management Approach

The analysis confirms there will be a constant ingress of groundwater into the cofferdams and that the seepage rates will be low and within manageable levels. Therefore, the extent of dewatering required will be limited.

Following a review of EIAR Chapters 5, 15, 16 and 18, and the NIS, it is confirmed that there are no inconsistencies in the description of potential water ingress to the cofferdams during bridge construction, with reference to both 'constant ingress' and 'limited dewatering'. The EIAR chapters and NIS remain correct in this regard. The calculated groundwater seepage rates at each cofferdam are set out in **Table 4-1** below.

The water accumulating in the cofferdams will be pumped from a sump formed in the floor of the cofferdam to a storage bowser positioned outside of the cofferdam. As described in EIAR Chapter 16, the pump-out water is likely to be turbid and on occasion may be highly alkaline (concrete washings) and potentially contaminated with hydrocarbons (polycyclic aromatic hydrocarbons, oils). The pump-out water from cofferdam containment areas will be pH monitored.

Every bowser will be pH tested. If water in the bowser has a pH of 9.0 or less, it will be discharged to the attenuation ponds via the vortex grit separators and petrol interceptors. The daily groundwater ingress rates calculated are such that the attenuation ponds have sufficient capacity to treat this water prior to outfall.

If the pH is greater than 9.0, it will be tankered offsite to a suitable licensed treatment facility via a temporary on-site storage tank, situated on site at a location remote from the sensitive environment around the River Boyne. The treatment facilities will be a local authority or EPA licensed wastewater treatment facility.

The analysis below includes an assessment of the total volume of water ingress that could potentially be contaminated by concrete washings. This assessment concludes that the likely extent of tankering (typical capacity of 30,000 litres per tanker) required will be of the order of 23 x 2 = 46 tanker trips total to and from the site, generated over a significant overall construction period for the bridge piers and foundations, where the cofferdams will be installed and in place (expected to be 11 months).

The effect of tankering of contaminated water away from the floodplain construction areas and off the site is assessed as not significant.

4.1.2 Detailed Assessment

The detailed assessment of groundwater ingress into the cofferdams consists initially of defining a ground model at the location of each of the cofferdams. The ground model determines the expected ground and groundwater conditions at each location.

Typically, the ground consists of the following materials, namely medium dense to dense overburden or very weathered limestone, over consolidated overburden or weathered limestone on fair to good rock. These underlying materials are overlain with a layer of very soft to soft topsoil/made ground.

The groundwater level and soil permeability parameters used in the ground model are conservative to ensure that the maximum potential water ingress is quantified. The groundwater level used in the model is conservatively taken as the maximum possible being coincident with the ground surface at each location.

A typical cofferdam design was adopted for each pier based on the outline designs illustrated on the construction drawings, Drawings MDT0806-RPS-01-N2-DR-C-DG5000 to DG50005 and MDT0806-RPS-01-N2-DR-C-DG5101 to DG5105 included in the EIAR Volume 3.

The function of the cofferdams is to exclude soil and water from the excavations into the existing ground to allow the construction of the bridge pier foundations. The cofferdam design used in the analysis comprises a cofferdam of 20 m by 25 m on plan around each of the bridge piers.

The cofferdam walls are made of impermeable, interlocking steel sheet piles installed to the over consolidated overburden or weathered limestone stratum described above. The sheet piles are to be installed using a hydraulic press method, which is feasible considering ground conditions with pre-auguring as necessary, to form a continuous interlocking vertical wall. As illustrated on the drawings referenced above, the top of the sheet piles will extend to a height above the ground surface which is higher than the peak 1% AEP (plus 20%, plus freeboard) flood level of the River Boyne.

As described in Chapter 5 of the EIAR, an early warning system will be implemented to monitor rainfall and upstream river levels in real-time to provide the Contractor with advance warning of the likelihood of a flood event occurring. Once set thresholds are exceeded all materials, plant and equipment must be removed from the platform and the cofferdams, including the bowsers provided to collect groundwater ingress. When the flood water has receded, the bowsers will be remobilised and any groundwater in the cofferdams will be removed. As the likelihood of a flood event will be monitored, concrete pours will not take place during these periods, ensuring any water ingress will not be contaminated.

It is recommended that the sheet piles for the cofferdams are installed to intercept fair to good rock stratum to further limit the potential for groundwater ingress. Taking a precautionary approach, the analysis conservatively provides for the piles to be installed to a level 2 m above this stratum.

Groundwater ingress to a cofferdam will either be through the floor of the cofferdam or from the interlock between piles, though properly constructed and maintained sheet piles will allow very little water ingress at the interlock. Most water ingress will be through the floor of the cofferdam. The figures contained in **Appendix B** illustrates the model developed for each cofferdam.

The potential groundwater ingress into the cofferdams was modelled and quantified using the ground model and typical cofferdam design as given above. The groundwater ingress into the cofferdams was determined using Seep/W software. Seep/W is a finite element software routinely used for modelling groundwater flow.

4.1.3 Results

Table 4-1 provides the calculated water ingress rates at each of the cofferdams at the bridge pier locations. Typical outputs for each model are illustrated on the figures included in **Appendix B**. For a cofferdam to be functional one of the main requirements is that the amount of water entering the cofferdam must be controllable by reasonable pumping methods. Even the calculated upper end water ingress rates likely to occur are low, and are not significant from a groundwater management perspective.

Table 4-1: Outputs from Seepage Model Analyses

Cofferdam Location	Calculated Water Ingress Rate (lower end modelled rate)	Calculated Water Ingress Rate (higher end modelled rate)	Volumes of potentially contaminated water (calculated using higher end modelled rate)
Northern Pier	10.82 m^3/day (0.45 m^3/hour)	18.06 m^3/day (0.75 m^3/hour)	18.06 m^3/day x 18 days = 325 m^3
Central Pier	6.68 m^3/day (0.29 m^3/hour)	8.34 m^3/day (0.35 m^3/hour)	8.34 m^3/day x 18 days = 150 m^3
Southern Pier	9.83 m^3/day (0.41 m^3/hour)	10.40 m^3/day (0.43 m^3/hour)	10.40 m^3/day x 18 days = 187 m^3

The water entering the cofferdams will be collected in a sump system and regularly pumped out to a bowser. The cofferdams will include sump pits in the lowest parts of the cofferdam floor in which submersible sump pumps will be installed. As the water ingress rates are low, the water will be pumped into on-site bowsers to facilitate settlement of any sediments.

As described in EIAR Chapter 16, the pump-out water is likely to be turbid and on occasion may be highly alkaline (concrete washings) and potentially contaminated with hydrocarbons (polycyclic aromatic hydrocarbons (PAHs), oils). The pump-out water from cofferdam containment areas will be pH monitored.

Every bowser will be pH tested. If water in the bowser has a pH of 9.0 or less (which is the upper end of pH range set out for salmonid waters in S.I. No. 293/1988 – European Communities (Quality of Salmonid Waters Regulations), it will be transported to one of the attenuation ponds and discharged through the treatment system comprising a vortex grit separator, petrol interceptor and finally the attenuation pond to settle before being discharged to an outfall. As the volume of water ingress is low, daily discharging of bowsers will ensure the volumes treated are well within the capacity of the attenuation ponds. Refer to Table 4-23 of Chapter 4 of the EIAR for details of the retention volumes provided at each attenuation pond.

If the pH is greater than 9.0, it will be tankered offsite to a suitable licensed treatment facility. The treatment facility will be a local authority or EPA licensed wastewater treatment facility.

Contamination from concrete washings may occur during concrete works to construct the bridge piles, pilecap and piers. The risk of contamination by concrete washings is related to the initial curing phase of the concrete when it is still liquid and comes into contact with water present in the cofferdams. By the nature of the construction processes, the placing of wet concrete will occur in each cofferdam over relatively short intermittent periods. Typically, one pile will be poured with concrete in a day and similarly placing concrete for the pilecaps and each pier would also be completed in a single day. As concrete will harden to a solid within 24 hrs, the highest risk of contamination will be limited to a number of days when 'wet' concrete is being placed. Therefore, only a small proportion of the daily pump out water will potentially be contaminated with concrete washings.

To assess further the potential for the tankering of contaminated water, a total of 18 days of water ingress at each cofferdam where the water may become contaminated is calculated based on 1 day of concrete placement for each of the proposed 14 no. piles, 1 pilecap and 3 piers at each foundation location.

Taking account of the water ingress rates, the volumes of potentially contaminated water are also calculated and set out in T**able 4-1** above.

In total, the volume of contaminated water arising will be 662 m^3. This is equivalent to 23 tankers taking the typical capacity of a tanker as 30,000 litres.

The construction period for constructing the bridge foundations and piers is assessed to be approximately 14 months, as stated in Chapter 5 of the EIAR. The generation of potentially concrete-contaminated water will be spread over this considerable construction period. Therefore, the most economical solution will be for a means of temporary storage of the contaminated water to be set up on site at a location remote from the sensitive areas surrounding the River Boyne. The temporary storage tank will be intermittently emptied into tankers for off-site removal to a local authority or EPA licensed wastewater treatment facility.

As the tanker movements are intermittent over an extended period, it is assessed there will be no significant effect on the construction stage traffic impact assessed in the EIAR.

4.1.4 Conclusions and Summary

In conclusion, constant, but low rates of water ingress are expected into the cofferdams which will require removal via sumps and pumps included as part of the cofferdam design. The seepage rates calculated show that the rates of water ingress into the cofferdams are low and will therefore only require limited dewatering. The water ingress can for the most part be readily managed within the Proposed Scheme drainage system and attenuation pond water treatment systems.

Tanker movements to transport potential concrete contaminated water (i.e., elevated pH) off site are likely to be required intermittently but this is assessed to be a **not significant** effect.

It is confirmed that there are no inconsistencies in the description of potential water ingress to the cofferdams during bridge construction, with reference to both ‘constant ingress’ and ‘limited dewatering’, and no changes to the EIAR or NIS are proposed. The response above clarifies that references to ‘tankering offsite to a suitable treatment facility’ refer to a limited number of instances where the water ingress has become contaminated during concreting operations. The response confirms that the need to tanker this contaminated water offsite to a local authority or EPA licensed wastewater treatment facility will be intermittent and not significant. Most water ingress will be treated via the proposed attenuation pond water treatment system.

4.2 Item 3(b) Riverbank Exclusion Zone

Item 3(b) of the Board’s letter states:

b) “*An exception is noted to the 10m exclusion zone from the riverbank (e.g. Natura Impact Statement Section 6.2.1.1.1.) for the construction of four outfalls. The applicant shall clarify if this relates to the scour mats shown in drawing DR0004. As there is no further reference to these works in the Natura Impact Statement or Environmental Impact Assessment Report Biodiversity chapters, provide an assessment of same, and describe any mitigation measures (e.g. manual installation, timing of works) required to avoid adverse effects to qualifying interest of the European Sites, or any other habitats, flora or fauna.*”

Response to the Request for Additional Information

4.2.1 Consideration of Potential Effects

The applicant confirms that the exception related to the 10 m exclusion zone from the riverbank is for the construction of the scour mats at two proposed outfalls to the River Boyne as illustrated on Vol. 3 – Scheme Drawings, drawing MDT0806-RPS-01-N2-DR-C-DR1004.

EIAR Chapter 5 – Description of the Construction Phase, Section 5.4.8.1. Outfalls, states that: *The majority of the scheme drains towards the River Boyne valley. Outfalls are proposed to the river and also to the existing Boyne canal navigation channel. Other outfalls are located at the northern end of the scheme, where other local watercourses are present. These other local watercourses confluence with the Delvin stream, which eventually outfalls to the River Boyne. Drawing series MDT0806-RPS-01-N2-DR-C-DR1003-DR1004 illustrates the locations and plans for each of the outfalls.*

By way of clarification, the above description is amended as follows to clarify that there are five rather than four outfalls and that there are just two outfalls directly to the River Boyne (new text in blue, deleted text in strikethrough):

The majority of the scheme drains towards the River Boyne valley. ~~Outfalls are proposed to the river and also to the existing Boyne canal navigation channel.~~ There are two outfalls proposed to the River Boyne

main channel and three outfalls to the Boyne canal navigation channel. These five outfalls are near the proposed bridge crossing point, but only two of the outfalls are directly to the River Boyne main channel. These two outfalls at the north bank of the River Boyne main channel discharge surface water drainage arising from interceptor ditches east and west of the road, plus Attenuation ponds 3 and 4, respectively. These will be intermittent discharges in both the construction and operation phases as they will only respond during rainfall events. The discharges are treated through the provision of the vortex grit separators, fuel oil/hydrocarbon interceptors and attenuation ponds. The three outfalls to the disused navigation canal are 1.8 km upstream of the confluence of the navigation canal with the Boyne main channel. Within that 1.8 km distance, the canal is impounded by disused navigation locks; virtually stagnant and choked with macrophytes. In effect it forms a long linear, vegetated area between the southern bank outfalls and the Boyne main channel which intercepts discharge from the outfalls on the south bank of the canal.

*Additional ~~Other~~ outfalls are located at the northern end of the scheme in the Mattock (Mooretown) sub-catchment ~~where other local watercourses are present~~. ~~These other local watercourses~~ The Mattock (Mooretown) confluences with the ~~Delvin stream~~ Mattock River, which eventually outfalls to the River Boyne near Oldbridge, 11 km downstream of Slane. Drawing series **MDT0806-RPS-01-N2-DR-C-DR1003-DR1004** illustrates the locations and plans for each of the outfalls.*

EIAR Vol. 3 Drainage Drawing reference **MDT0806-RPS-01-N2-DR-C-DR0003** shows the outfalls associated with the proposed scheme. As illustrated, three outfalls are proposed to the River Boyne Navigation Canal from the south and two outfalls are proposed directly to the River Boyne from the north. As stated in Chapter 16, Table 16-7, the disused Boyne Navigation canal is of minor fisheries importance and even though it is within the SAC boundary, it does not support aquatic QI species of the SAC. In terms of the 10 m riverbank exclusion zone, the proposed exception therefore relates to the two proposed outfalls on the River Boyne main channel north bank.

EIAR Vol. 3 Drainage Drawing reference **MDT0806-RPS-01-N2-DR-C-DR1004** provides further detailing of these proposed outfalls, i.e. locations 3 and 4 as illustrated on this drawing. The proposed works within the exclusion zone are to provide suitable scour protection at these two outfall locations. As illustrated, no excavation works are proposed within the 10 m riverbank exclusion zone and the proposed scour protection is simply anchored into the existing ground. To achieve this effectively a particular proprietary product or similar, suitable for this type of application is referenced.

The proposed methodology includes for a geogrid scour prevention mat to be laid over the existing ground and anchored to depth within the underlying soils. See the typical illustration in **Figure 4.1** below.

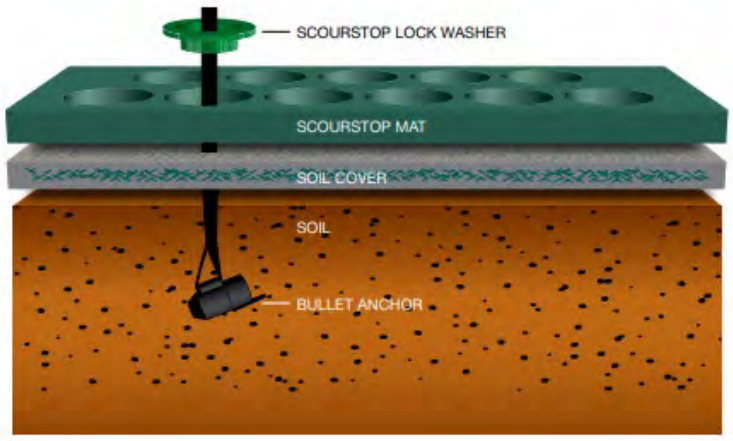


Figure 4.1: Typical Illustration of a Geogrid Scour Prevention Mat

To construct the scour protection within the 10 m riverbank exclusion zone, the scour mats are laid down on the existing ground surface by manual methods. To firmly secure the scour mats in place, anchors are manually hammered into the ground. This process firmly embeds the scour mat into the topsoil, anchored to the sub-soil and as the mats are a mesh construction, vegetation will continue to grow through the mat over time, restoring a completely natural appearance.

The work to install the mats can be undertaken within a matter of hours with no instream works required and therefore there are no seasonal restrictions as to when the works can be done.

To ensure the system achieves the desired scour protection, whilst avoiding any risk to the river, proprietary systems such as the Hanes Geo Scour Transition Mat system or similar will be utilised.

The work to construct two areas of scour protection on the northern bank of the river is the only works proposed within the 10m exclusion zone of the riverbank.

It is noted that EIAR Chapter 15 – Biodiversity: Terrestrial Ecology does not specifically mention the number of outfalls required as part of the Proposed Scheme, however, in light of the above clarification, replacement text for the NIS, Section 6.2.1.1.1.1, paragraph 4, has been provided below which clarifies the number of outfalls required and their specific locations; blue indicates new text, strikethrough indicates deleted text:

"6.2.1.1.1.1 Habitat Area and Distribution

In terms of hydrological regimes, no in-stream works ~~(other than the construction of four outfalls)~~ are proposed within the River Boyne and River Blackwater SAC but works are required to construct the proposed drainage outfalls, coffer dam and bridge crossing within the flood plain. There are two outfalls proposed to the River Boyne main channel and three outfalls to the Boyne canal navigation channel. Works include the fixing of scour mats within the 10m riverbank exclusion zone at the two outfalls direct to the river. A detailed flood risk assessment has been completed for the Proposed Scheme (refer to EIAR Volume 4, Appendix 17.2). The assessment concluded that the impact of both the temporary and permanent works for the Boyne bridge crossing will not have an adverse effect on flooding elsewhere. Therefore, no adverse effects as a result of hydrological changes are predicted to occur (see Section 6.2.1.2.1.4)."

4.2.2 Conclusion

There is no change in the outcomes of the assessments provided in Section 15.5 of the EIAR Chapter 15 – Biodiversity: Terrestrial Ecology, Section 16.5 of EIAR Chapter 16 – Biodiversity: Aquatic Ecology, or in Section 7 of the Natura Impact Statement in light of the clarification regarding the proposed drainage outfalls and the extent of the works proposed within the 10m riverbank exclusion zone. The assessment and mitigation measures laid out remain the same and, as such, there is no change in residual effects as a result of the Proposed Scheme.

4.3 Item 3(c) Potential Groundwater Dependant Habitats

Item 3(c) of the Board's letter states:

c) "*On a precautionary basis, the applicant is requested to have regard to the potential for unmapped areas of Alkaline fen habitat in the Appropriate Assessment Screening, as stated in the site-specific conservation objectives for The River Boyne and River Blackwater Special Area of Conservation and consider whether likely significant effects can be excluded. If likely effects cannot be excluded, the adequacy of the mitigation measures in the Natura Impact Statement should be considered in the context of the conservation objectives for this qualifying interest. Available information suggests that groundwater-dependant habitats may occur within Crewbane Marsh pNHA, with soil mapping showing groundwater gleys at this location, and Goodwillie (1992) Information on Areas of Scientific Interest report (available on npws.ie) referencing fen habitat at this location. A submission ( ) also references tufa springs at Crewbane. Given the location of this site in private lands, the applicant should engage with the BSBI recorder to see if they have any further data on habitats within the site. A pathway for impacts via potentially impeding groundwater flows to groundwater-dependant habitats the process of excavating the road cuttings has not been identified in the Environmental Impact Assessment Report Biodiversity assessments. The applicant is requested to confirm whether there is the potential for any groundwater flow paths to Crewbane Marsh pNHA to be altered by the proposed road cutting and any associated rock excavations. This shall be confirmed by a hydrogeologist, and any consequences for the Appropriate Assessment or Environmental Impact Assessment Report Biodiversity assessments addressed by the applicant's ecologists.*"

Response to the Request for Additional Information

The published EIAR (Vol. 2, Chapter 15 - Biodiversity: Terrestrial Ecology) assessed the potential for likely significant effects upon Crewbane Marsh pNHA (Site Code: 000553) and concluded that the Proposed Scheme would not have any significant adverse impact on the pNHA. **Figure 4.2** illustrates the location of the pNHA for context.

To provide additional scientific information in response to An Bord Pleanála's request concerning "the potential for unmapped areas of alkaline fen habitat", Dr Joanne Denyer, a national expert on Annex I priority habitat "petrifying springs with tufa formation", was commissioned to conduct a survey of the Study Area. This survey focused on the identification of previously unmapped Annex I habitats "petrifying springs with tufa formation" and "alkaline fen" (groundwater dependant habitats), within and outside of the pNHA. This involved both desktop review and site survey. Dr Denyer confirmed the presence of 2 No. locations of petrifying springs meeting the Annex I criteria within the pNHA. She also recorded one area of tufa formation (non-Annex I) in a dry stream bed, south of the River Boyne (outside the pNHA). The locations of newly mapped Annex I habitats are provided in **Appendix C**, Figure 1.15 and Section 1.2.

Previously unmapped alkaline fen has also been identified by Dr. Denyer within the Crewbane Marsh pNHA / River Boyne and River Blackwater Special Area of Conservation (SAC), at the top of the steep wooded slope (northern extent of pNHA). This location may align with the brief description of "Crewbane Complex" containing "seepage from higher ground to the north", as described by Goodwillie (1992)[1]. No other location of alkaline fen habitat was recorded within the study area either within or outside of the Crewbane Marsh pNHA.

The national conservation value of Crewbane Marsh pNHA has been further established as an ecological site containing Annex I priority habitats "petrifying springs with tufa formation" and "alkaline fen". RPS sent an information request to the Botanical Society of Britain and Ireland (BSBI) vice county recorder for Co. Meath. The response stated, "*All habitats at the site require detailed up-to-date surveys of their flora and fauna conducted by suitably qualified ecologists during appropriate seasons.",* and therefore did not provide any additional information.

Crewbane Marsh pNHA consists of a flood-plain marsh and woodland primarily on the northern bank of the River Boyne, extending for an approx. length of 2.1 km along the river at 55.1 hectares in area. The pNHA receives surface water flows from the River Boyne whose upstream catchment is relatively large at 2,490 km^2. The local groundwater contribution to the wetland and associated alkaline fen, petrifying springs, and seepages, is from a limited catchment area to the north, south, east and west of the pNHA which has been mapped in Figure 1.15 in **Appendix C**.

To assess the potential for the Proposed Scheme to impact the hydrological regime of Crewbane Marsh pNHA and its associated wetland habitats, specifically alkaline fen and petrifying springs with tufa formation (including any further unmapped habitats) contained within, and around Crewbane Marsh pNHA, a detailed hydrogeological conceptual site model (CSM) has been developed. The CSM establishes the location and size of the Zone of Contribution (ZoC) i.e. the land area that contributes water to the pNHA. Full details of the development of the hydrogeological CSM are provided in **Appendix C**. A precautionary approach has been taken in the development of this model.

Groundwater recharge to the River Boyne as baseflow occurs throughout the extensive upstream catchment of the Boyne which includes the majority of the proposed road alignment crossing the Boyne Valley, upstream of the pNHA. This becomes river flow before entering the pNHA. Any loss of recharge area by the proposed road scheme on the River Boyne baseflows will be imperceptible due to the size of the upstream catchment (2,490 km^2). Direct groundwater recharge to the pNHA occurs from a limited area immediately to the north, south, east and west of the pNHA (i.e., the ZoC) measuring 2.9km^2. Figure 1.15 in **Appendix C** presents the boundary of the ZoC in relation to the pNHA.

The land take required by the Proposed Scheme (along the N51) will lead to a reduction in the ZoC of approximately 0.0032 km^2. This equates to a loss of recharge area in the ZoC of 0.11%, with an estimated reduction in recharge volume of 0.18% (2,080 m^3 of groundwater per annum). This impact is of imperceptible significance and will not adversely affect the groundwater dependent terrestrial ecosystems (GWDTE) within and around the pNHA.

The road cutting excavations required for the Proposed Scheme have a potential to capture groundwater flow which can result in localised effects to the downstream groundwater recharge and water balance. To assess this potential effect, the Zone of Influence (ZoI), the extent to which the cuttings could affect groundwater flows along the Proposed Scheme, has been established. The ZoI is a conservative maximum extent of impact to groundwater flow paths from the road cutting. The area of deepest cutting (8.3m) within the pNHA's ZoC lies along the proposed N51 realignment east of the N2 bypass. At this location shallow groundwater flows will be affected up to a maximum of 82 m from the edge of the cut section, north and

[1] Goodwillie, R. (1992) Information on Areas of Scientific Interest in An Foras Forbartha files. A Catalogue Prepared for National Parks & Wildlife Service Office of Public Works.

south. Deeper groundwater flows below the proposed cutting will not be significantly affected. The worst-case scenario assumes full loss of the recharge area described above due to the proposed cutting and the localised ZoI. Taking account that the closest distance from the ZoI buffer to the pNHA is approximately 650m (south of the proposed N51 realignment), the assessment carried out confirms that impacts upon groundwater flow paths to the pNHA due to the Proposed Scheme are of imperceptible significance. **Appendix C**, Figure 1.5 provides a detailed cross section (Section B-B') from the N51 to the pNHA.

Crewbane Marsh pNHA has a direct hydrological connectivity with the Proposed Scheme via the River Boyne (surface water pathway). The pNHA is located approximately 750m downstream of the proposed Boyne Bridge crossing location. The pNHA floodplain receives a significant proportion of recharge from the Boyne River's baseflow. The Proposed Scheme will have no perceptible impact on the Boyne River's baseflow.

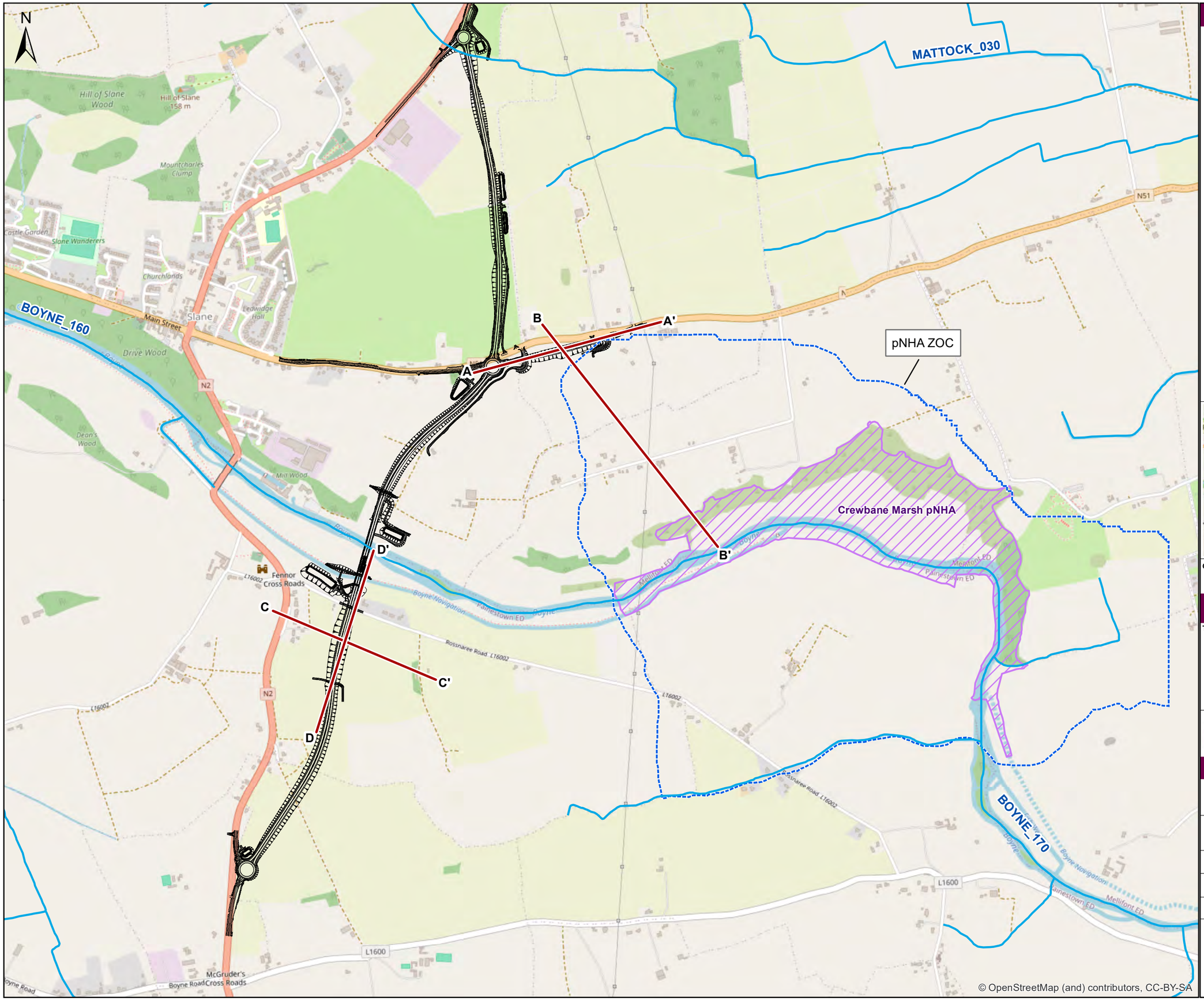
In terms of potential surface water quality effects, the EIA found that there will be no significant impacts via runoff or drainage from the Proposed Scheme. Full details of the impact assessment in this regard are provided in the EIAR Vol. 2, Chapter 4 – Description of the Proposed Scheme, Chapter 5 – Description of the Construction Phase, Chapter 16 – Biodiversity – Aquatic Ecology and Chapter 17 – Water. The Environmental Operating Plan (EOP) detailing relevant environmental mitigation and monitoring measures during the construction phase is provided in the EIAR Vol. 4B, Appendix 5.6.

The pNHA has a potential indirect hydrological connectivity with the Locally Important Bedrock Aquifer - Karstified (Lk) (groundwater pathway). Review of ground investigation (GI) data has indicated one confirmed karst feature within the ZoC of the pNHA, a swallow hole at Crewbane (approximately 350m south of the existing N51 east of Slane Village) fed by surface water run-off. A detailed review of site-specific GI data confirms that the bedrock underlying the proposed scheme is not highly karstified (i.e., low potential for conduit flow), therefore groundwater flow in the aquifer will be shallow and diffuse, occurring mainly along fractures. This conclusion provides further evidence that the Proposed Scheme will not impact the potential indirect hydrological connectivity through the aquifer and therefore will not adversely affect the groundwater dependent terrestrial ecosystems within the pNHA.

This further hydrogeological assessment of potential for groundwater flow paths to be altered by the Proposed Scheme has been undertaken by RPS Hydrogeology and Geotechnical specialists, with independent third-party review undertaken by Mr Anthony Cawley, Hydro Environmental Ltd.

RPS Ecology specialists have provided input regarding potential effects to unmapped habitats and concluded that no amendments to mitigation measures detailed in the Natura Impact Assessment are required.

In conclusion this hydrogeological assessment confirms that the Proposed Scheme will have insignificant impact on the flow regime and water quality of the groundwater dependent terrestrial ecosystems within and surrounding, Crewbane Marsh pNHA.



Legend

- Proposed Scheme
- A — A' Cross Section
- Zone of Contribution
- Proposed Natural Heritage Area
- EPA River Water Bodies

Data Source: Proposed Natural Heritage Areas (NPWS, 2015)
WFD Watercourses (EPA, 2023)

0 0.175 0.35 0.7
Kilometres

Client
Meath County Council

N2 Slane Bypass and Public Realm Enhancement Scheme

Title

Figure 4.2: Location Context for Crewbane Marsh pNHA

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Issue Details

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4.4 Item 3(d) Wintering Birds

Item 3 (d) of the Board's letter states:

d) "*The applicant shall, through the provision of updated bird use maps, confirm locations of Golden Plover and Lapwing recorded during the winter farmland bird surveys (Appendix 15.2, Table 26, 27 and 28) and during the overwintering wildfowl surveys undertaken in 2020/2021 (Appendix 15.2, Table 33). These maps should identify any core roosting and foraging areas used by these species, such as the mapped wetland at McGrunder's cross (refer to www.wetlandsurveys.ie mapping). With reference to published disturbance thresholds (e.g. Cutts et al (2013) Waterbird disturbance mitigation toolkit; Goodship & Furness (2022) Disturbance Distances Review. NatureScot Research Report 1283), the applicant should then highlight any implications for the assessment of adverse effects on the integrity of European Sites.*"

Response to the Request for Additional Information

Within the following sections, updated bird use maps, containing identification of core roosting and foraging areas for Golden Plover and Lapwing, have been provided based on the surveys completed to inform the Proposed Scheme. Published evidence on disturbance distances and buffers for both species have been reviewed, including the references referred to in the request for further information. Triggers and thresholds in the context of those references are used to define disturbance distances and buffers within which disturbance responses by those species have been shown to occur. Disturbance distances and buffers differ for both species.

For the purpose of this response, disturbance distance refers to the distance at which a bird moves away from a source of disturbance (e.g. human disturbance); and disturbance buffer (or disturbance distance (buffer)) is the distance applied around a potential source of disturbance to protect a bird.

Based on the above, the implications for the assessment of adverse effects on the integrity of European Sites have been addressed. The only European Site pertinent to the NIS for these species was the Boyne Estuary SPA.

Between 2019 and 2024, no significant numbers of lapwing or golden plover, at international, national, or SPA population level (i.e. above the 1% threshold) were found within either the footprint of the Proposed Scheme or within the identified disturbance buffer from that footprint for either Golden Plover or Lapwing. As such, the approach taken, assessment made, and conclusion reached when considering the adverse effects on the integrity of the Boyne Estuary SPA within the NIS remains unchanged since no significant numbers or regular occurring populations of either species was found within the identified disturbance buffers relevant to either Golden Plover or Lapwing.

It can therefore be reaffirmed that the Proposed Scheme will have no **adverse effects to site integrity of the Boyne Estuary SPA,** as set out in Section 6.5 of the NIS. No additional mitigations have been identified as a result of the review and analysis completed in preparing this response.

4.4.1 Lapwing (*Vanellus vanellus*)

4.4.1.1 Lapwing published disturbance distances

4.4.1.1.1 Cutts, Hemingway and Spencer (2013)

Lapwing are noted as having a moderate sensitivity and will roost within 200m of plant.

"Lapwings are thought to be only moderately sensitive to noise stimuli but there is little evidence to support this, and so a standard 'precautionary' approach should be applied, with noise of up to 72dB acceptable at the bird but with caution given for noise levels in excess of 55dB (60dB in a highly disturbed area). As Lapwing will roost to within 200m of plant, this means that a source noise threshold of 115-120dB can be applied, but with caution above 87-92dB. If birds approach closer than 200m, then appropriate mitigation should be put in place." (page 28, paragraph 3).

4.4.1.1.2 Goodship and Furness (2022)[2]

The only mention of lapwing within Goodship and Furness (2022) is that they are often in the company of golden plover (Page 162, paragraph 2).

4.4.1.1.3 Additional resource - NatureScot (2024)[3]

Lapwing are not mentioned in this NatureScot guidance page.

4.4.1.2 Lapwing disturbance buffer

Given the data gathered from the above references, the disturbance buffer used for lapwing will be any land within 200m of the Proposed Scheme's footprint, including for both the temporary and permanent land take of the Proposed Scheme.

4.4.1.3 Implications for the assessment of adverse effects on the integrity of European Sites designated for Lapwing

4.4.1.3.1 The Baseline Data

Twelve lapwing sightings were recorded across four sites: field south of McGruder's Cross (7), Slane (2), Monknewtown (2) and Higginstown (1), see **Table 4-2**, during the surveys completed in 2019, 2020, 2021 and 2023. Although the RFI specifically refers to data from the winter farmland bird surveys and overwintering wildfowl surveys undertaken in 2020/2021, additional records from the 2019/2020 winter season and the 2022/2023 survey season have been included, where relevant species data were recorded, to show a more robust baseline, with more varied peak counts, and an indication of site preference.

Table 4-2: Lapwing Records from Winter Farmland Bird Surveys and Overwintering Wildfowl Surveys

Occurrence event no	Date	Species	No.	Location	Behaviour
1	21/11/2019	Lapwing	29	Field South of McGruder's Cross	Foraging / roosting
2	16/12/2019	Lapwing	19	Field South of McGruder's Cross	Foraging / roosting
3	09/01/2020	Lapwing	38	Field South of McGruder's Cross	Foraging / roosting
4	03/12/2020	Lapwing	23	Field South of McGruder's Cross	Foraging / roosting
5	09/12/2020	Lapwing	11	Field South of McGruder's Cross	Foraging / roosting
6	15/12/2020	Lapwing	1	Slane[4]	Foraging / roosting
7	04/01/2021	Lapwing	27	Field South of McGruder's Cross	Foraging / roosting
8	04/01/2021	Lapwing	26	Monknewtown (field no.1)	Foraging / roosting
9	04/01/2021	Lapwing	40	Higginstown	Foraging / roosting
10	11/01/2021	Lapwing	25	Monknewtown (field no.2)	Foraging / roosting
11	18/02/2021	Lapwing	4	Slane[1]	Foraging / roosting
12	23/01/2023	Lapwing	176	Field South of McGruder's Cross	Foraging / roosting

Of the 12 sightings, two were within the footprint of the Proposed Scheme (Occurrence event no. 6 and no. 11 in **Table 4-2**) and none were within the 200 m disturbance buffer, see **Figure 4.3**.

[2] Goodship, N. M., and R. W. Furness (2022). "Disturbance Distances Review: An updated literature review of disturbance distances of selected bird species." A report from MacArthur Green to NatureScot. NatureScot Research Report 1283. 2022.

[3] NatureScot (2024) Disturbance Distances in selected Scottish Bird Species – NatureScot Guidance. https://www.nature.scot/doc/disturbance-distances-selected-scottish-bird-species-naturescot-guidance [Accessed 31/10/2024].

[4] Labelled as Crewbane in NIS and EIAR.

Legend

- Proposed Scheme
- Disturbance Buffer of 200 m
- Boundary of the field within which Lapwing was recorded roosting / foraging

Data Source: RPS (2024)

0 0.3 0.6 1.2
Kilometres

Client
Meath County Council

N2 Slane Bypass and Public Realm Enhancement Scheme

Title
Figure 4.3:
Lapwing records from the winter farmland bird surveys and the overwintering wildfowl surveys

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Issue Details

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Status: A1	**Rev:** C02	**Model File Identifier:**
Drawn: NR,PK		**Date:** 06/12/2024
Checked: HF		**Scale:** 1:25,000 (A3)
Approved: ML		**Projection:** ITM

4.4.1.3.2 Disturbance Buffer

As per **Table 4-2**, there were no records of significant numbers of lapwing at an international, national or even regional number, within the Proposed Scheme or within the 200m disturbance buffer of the proposed Scheme. The disturbance buffer determined was based on published references as documented above.

The estimated minimum population of lapwing for the Boyne Estuary SPA is 4,657 wintering individuals. From sightings of lapwing within the Proposed Scheme, (I.D. no. 6 – a record of one individual, and I.D. no. 11 – a record of four individuals), there was a minimum of 0.02% and a maximum of 0.24% of the SPA population present onsite and having the potential to be affected by proposed works. As per Section 6.5.1.1.1 of the NIS, "*Based on the information available, it can't be confirmed whether the populations of these two species within and adjacent to the Proposed Scheme are part of the populations from the SPA. However, as a precautionary measure it has been assumed that they could potentially be ex-situ populations of the SPA since such species are known to use both coastal/estuarine and inland areas as part of their life-cycle*."

There are no additional records, outside those mentioned above, within the disturbance buffe) for lapwing applied to the footprint of the Proposed Scheme.

There was one record, from the winter of 2022/2023, recorded on 23/01/2023, of 176 lapwing at field south of McGruder's Cross (see **Figure 4.3**). This record exceeds the 1% threshold of the Boyne Estuary SPA, with the assumption that all birds observed are part of this SPA. The birds recorded represent approximately 3.8% of the Boyne Estuary SPA population. Surveys have been ongoing since Winter 2019/2020 and this exceedance of the population threshold has happened once, showing this flock is not regularly occurring within this site.

Table 4-2: Population Threshold for Lapwing Recorded On-site

Occurrence event no.	Date	No. of lapwing recorded during sighting	Located within Proposed Scheme	Does this sighting represent 1% of the:		
				International flyway[5] population [1%=72,300][6]	National population [1%=850] [7]	Boyne Estuary SPA [1%=46.57]
1	21/11/2019	29	No	No	No	No
2	16/12/2019	19	No	No	No	No
3	09/01/2020	38	No	No	No	No
4	03/12/2020	23	No	No	No	No
5	09/12/2020	11	No	No	No	No
6	15/12/2020	1	**Yes**	No	No	No
7	04/01/2021	27	No	No	No	No
8	04/01/2021	26	No	No	No	No
9	04/01/2021	40	No	No	No	No
10	11/01/2021	25	No	No	No	No
11	18/02/2021	4	**Yes**	No	No	No
12	23/01/2023	176	No	No	No	**Yes**

[5] Flyway Definition - Waterbird Population Estimates

[6] Lewis, L. J., Burke, B., Fitzgerald, N., Tierney, T. D. & Kelly, S. (2019) Irish Wetland Bird Survey: Waterbird Status and Distribution 2009/10-2015/16. Irish Wildlife Manuals, No. 106. National Parks and Wildlife Service, Department of Culture, Heritage and the Gaeltacht, Ireland.

[7] Lewis, L. J., Burke, B., Fitzgerald, N., Tierney, T. D. & Kelly, S. (2019) Irish Wetland Bird Survey: Waterbird Status and Distribution 2009/10-2015/16. Irish Wildlife Manuals, No. 106. National Parks and Wildlife Service, Department of Culture, Heritage and the Gaeltacht, Ireland.

4.4.1.3.3 Analysis and Assessment

The Boyne Estuary SPA is classified for wintering lapwing populations (NPWS, 2020)[8].

There are two relevant records of lapwing from the four years of survey work conducted in the vicinity of the Proposed Scheme; both within the footprint of the Proposed Scheme and none within the 200m disturbance buffer of that footprint. These records do not represent a significant proportion of the international flyway populations, the national population, or the Boyne Estuary SPA population (min 0.02% and max 0.24%). As such, the displacement of these birds from site either temporarily or permanently as a result of the Proposed Scheme will not cause significant adverse effects on the overall SCI population of lapwing, for which the Boyne Estuary SPA is classified.

Where a record was recorded of lapwing exceeding the population threshold of the Boyne Estuary SPA (176 individual lapwing, representing a max of 3.8% of the Boyne Estuary SPA, assuming all birds present were in fact part of the SCI population for which this SPA was classified), they were well outside the disturbance buffer for the species with a c. 680m separation between the Proposed Scheme and the field where the species was foraging/roosting. This is over three times the disturbance distance for the species derived from published literature. In addition, this field is bound by treelines and there are at least four other hedgerows/treelines between the field and the Proposed Scheme. This, in combination with the ambient noise levels provided to the east by the existing N2 carriageway, and the precautionary principle applied, will not cause disturbance to these foraging/roosting birds.

Finally, there are ample alternative sites available along the Boyne Valley and wider area for lapwing to forage and roost and it can therefore be concluded that the Proposed Scheme will have no **adverse effects on the integrity of the Boyne Estuary SPA, as per Section 6.5 of the NIS**.

4.4.2 Golden Plover (*Pluvialis apricaria*)

4.4.2.1 Golden plover published disturbance distances

4.4.2.1.1 Cutts, Hemingway and Spencer (2013)

Golden plover are noted as having a moderate sensitivity and will roost within 300m of plant.

"Golden Plover are moderately sensitive to noise stimuli but with little direct evidence, a precautionary approach assumes tolerance of noise up to 72dB being acceptable at the bird but with caution at levels above 55 dB (60dB in a highly disturbed area). As Golden Plover will roost to within 300m of plant this means that a source noise threshold of 120-125dB may be acceptable, but with caution above 107-112dB. If birds approach closer than 300m additional mitigation should be put in place. As the species often flies between the intertidal and adjacent terrestrial habitat to roost and feed, the presence of activity behind (landward) of flood defences can also have an influence on behaviour (even when out of sight to birds using the intertidal zone), with limited data suggesting that differential site take up occurs where works are present with flocks moving to adjacent (possibly sub-optimal) areas to roost." (page 26, paragraph 3).

4.4.2.1.2 Goodship and Furness (2022)[2]

Within this paper, responses to disturbances were recorded for golden plover during both the breeding and the wintering seasons (page 162, paragraph 3). To note, the Boyne Estuary SPA is classified for wintering golden plover populations (NPWS, 2020)[8] which as such is discussed below.

.**Nonbreeding season:**

- The maximum distance recorded receiving a response to a disturbance for golden plover during the non-breeding season was 450m.

Further notes on golden plover

- ***"****In the UK, golden plover has the potential to be disturbed on breeding grounds as well as on foraging and roosting grounds during the nonbreeding season; for some individuals, tolerance of human*

[8] NPWS (2020) Natura 2000 – Standard Data Form. River Boyne and River Blackwater SPA (Site Code: 004232). https://natura2000.eea.europa.eu/Natura2000/SDF.aspx?site=IE0004232 [Accessed 31/10/2024].

disturbance may be lower during the nonbreeding season. Depending on the level of habituation to disturbance, a buffer zone of 200-500m is suggested to protect nesting golden plover as well as foraging and roosting birds during the nonbreeding season from pedestrian disturbance."

4.4.2.1.3 Additional resource - NatureScot (2024)[3]

- *"Buffer zone (m) suggestions during the breeding (BR) and nonbreeding (NBR) seasons: BR and NBR = 200-500m".*
- *"Overall likely sensitivity to disturbance: Medium".*

4.4.2.2 Golden plover disturbance buffer

Given the data gathered from the above references, the non-breeding response disturbance buffer should be applied, with the maximum response range, of 500m, to be used as the buffer area for Proposed Scheme.

4.4.2.3 Implications for the assessment of adverse effects on the integrity of European Sites designated for Golden Plover

4.4.2.3.1 The Baseline Data

Three sightings were recorded across two sites: Field south of McGruder's Cross (2) and Monknewtown (1), see **Table 4-3**. Although the RFI specifically asks for data from the winter farmland bird surveys and overwintering wildfowl surveys undertaken in 2020/2021, additional records from the 2019/2020 winter season and the 2022/2023 survey season have been included, where data were recorded, to show a more robust baseline, with more varied peak counts and an indication of site preference.

Table 4-3: Golden Plover Records from Winter Farmland Bird Surveys and Overwintering Wildfowl Surveys

Occurrence event no.	Date	Species	No.	Location	Behaviour
1	16/12/2019	Golden plover	6	Field South of McGruder's Cross	Foraging / roosting
2	29/01/2020	Golden plover	19	Field South of McGruder's Cross	Foraging / roosting
3	09/12/2020	Golden plover	12	Monknewtown (field no.3)	Foraging / roosting

Of the three sightings, none were recorded within either the footprint of the Proposed Scheme or within the 500m disturbance buffer of that footprint, see **Figure 4.4**.

Legend

- Proposed Scheme
- Disturbance Buffer of 500 m
- Boundary of the field within which Golden plover was recorded roosting / foraging

Data Source: RPS (2024)

0 0.3 0.6 1.2 Kilometres

Client

Meath County Council

N2 Slane Bypass and Public Realm Enhancement Scheme

Title

Figure 4.4:
Golden plover records from the winter farmland bird surveys and the overwintering wildfowl surveys

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Issue Details

File Identifier:
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Status:	Rev:	Model File Identifier:
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Drawn: NR,PK	**Date:** 06/12/2024
Checked: HF	**Scale:** 1:24,750 (A4)
Approved: MN	**Projection:** ITM

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4.4.2.3.2 Disturbance Buffer

As per **Table 4-4**, there were no records within the 500 m disturbance buffer of the Proposed Scheme or within the footprint of the Proposed Scheme. The disturbance buffer was determined based on published references as documented above.

The peak count of golden plover recorded within the vicinity of the Proposed Scheme is of 19 individuals, recorded at field south of McGruder's Cross, which does not represent significant numbers at an international, national or regional scale and lies outside disturbance buffer. The estimated minimum population of golden plover for the Boyne Estuary SPA is 6,070 wintering individuals (NPWS, 2020)[8]. Working under the assumption that all birds observed are part of this SPA, these birds recorded represent 0.3% of the Boyne Estuary SPA population. As per **Section 6.5.1.1.1** of the NIS, "*Based on the information available, it can't be confirmed whether the populations of these two species within and adjacent to the Proposed Scheme are part of the populations from the SPA. However, as a precautionary measure it has been assumed that they could potentially be ex-situ populations of the SPA since such species are known to use both coastal/estuarine and inland areas as part of their life-cycle*."

Table 4-4: Population Threshold for Golden Plover Recorded On-site

Occurrence event no.	Date	No. of golden plover recorded during sighting	Located within Proposed Scheme	Does this sighting represent 1% of the:		
				International flyway population [1%=9,300][9]	National population [1%=920] [10]	Boyne Estuary SPA [1%=60.70][11]
1	16/12/2019	6	No	No	No	No
2	29/01/2020	19	No	No	No	No
3	09/12/2020	12	No	No	No	No

4.4.2.3.3 Analysis and Assessment

The Boyne Estuary SPA is classified for wintering golden plover populations (NPWS, 2020)[8].

There are no records of golden plover within either the footprint of the Proposed Scheme or the 500m disturbance buffer of that footprint based on four years of survey work conducted in the vicinity of the Proposed Scheme.

There are three records of golden plover in the vicinity of the Proposed Scheme; however all are outside the 500m disturbance buffer. However, these records do not represent a significant proportion of the international flyway populations[5], the national population, or the Boyne Estuary SPA population (min 0.1% and max 0.3%) or likely to be disturbed by the proposed scheme at the locations recorded. As such, the Proposed Scheme would not have the capacity to cause significant adverse effects at these locations or on the overall SCI population of golden plover for which the Boyne Estuary SPA is classified.

Given the low numbers of golden plover recorded in the area, and the distances between the proposed scheme and the fields identified as holding roosting / foraging golden plover (in excess of 500m disturbance buffer) it can be reaffirmed that **no adverse effects to site integrity will result, as per Section 6.5 of the NIS**.

[9] Lewis, L. J., Burke, B., Fitzgerald, N., Tierney, T. D. & Kelly, S. (2019) Irish Wetland Bird Survey: Waterbird Status and Distribution 2009/10-2015/16. Irish Wildlife Manuals, No. 106. National Parks and Wildlife Service, Department of Culture, Heritage and the Gaeltacht, Ireland.

[10] Lewis, L. J., Burke, B., Fitzgerald, N., Tierney, T. D. & Kelly, S. (2019) Irish Wetland Bird Survey: Waterbird Status and Distribution 2009/10-2015/16. Irish Wildlife Manuals, No. 106. National Parks and Wildlife Service, Department of Culture, Heritage and the Gaeltacht, Ireland.

[11] NPWS (2020a) Natura 2000 – Standard Data Form. Boyne Estuary SPA (Site Code: 004080). https://natura2000.eea.europa.eu/Natura2000/SDF.aspx?site=IE0004080 [Accessed 31/10/2024].

4.5 Item 3(e) Kingfisher

Item 3(e) of the Board's letter states:

e) "*Provide a revised assessment of any potential disturbance effects to Kingfisher during construction and operation of the project, addressing current inconsistencies between the Natura Impact Statement submitted and Terrestrial Environmental Impact Assessment Report Biodiversity assessment with regard to noise/vibration impacts, and describe any mitigation measures required. The assessment should be carried out with reference to disturbance triggers and thresholds for this species, and to the recently updated site-specific conservation objectives for the River Boyne and River Blackwater Special Protection Area.*"

The response to this item is set out in **Sections 4.5.1 to 4.5.4** below.

Response to the Request for Additional Information

In response to Item 3(e), a revised assessment of any potential disturbance effects to kingfisher during construction and operation of the project has been completed.

Section 4.5.1 clarifies and corrects the identified inconsistency between Chapter 15 – Biodiversity: Terrestrial Ecology of the EIAR and NIS. The EIAR assessment was correct and amended text for the NIS assessment is set out to ensure consistency between both assessments. Upon review, the mitigation for both assessments was consistent and has not been updated.

As detailed in **Section 4.5.2**, the revised assessment has been completed with reference to published disturbance distances and an appropriate buffer identified within which disturbance responses by kingfisher were likely to be triggered. No disturbance effects to any breeding locations are confirmed and any effects relate only to potential disturbance to commuting and foraging birds; albeit these are restricted to within 100m of the Proposed Scheme.

Specific consideration is given in **Section 4.5.2** to the disturbance of typical kingfisher prey species (cyprinid fish species) from construction noise and vibration which could, indirectly, effect the pattern of kingfisher commuting and foraging activity. However, the effect on prey species is assessed as imperceptible resulting in no significant effect on kingfisher, and this is summarised in **Section 4.5.4**.

The assessment has been completed with reference to the recently updated conservation objectives for the River Boyne and River Blackwater Special Protection Area (**Section 4.5.3**) as summarised in **Table 4-4**.

In preparing the response, no additional mitigations for kingfisher have been identified for either Chapter 15 or the NIS of the Proposed Scheme.

In addition to responding to the above, further detailed survey and assessment with respect to barn owls (*Tyto alba*) has been completed since submission of the Proposed Scheme. This is set out in **Appendix D** of this response and summarised in **Section 4.5.5**, below.

4.5.1 NIS and EIAR Assessment on Kingfisher

An environmental assessment on kingfisher has been undertaken as part of the EIAR, this is detailed in Chapter 15 – Biodiversity: Terrestrial Ecology, and as part of the Appropriate Assessment documented in the Natura Impact Statement (NIS).

In Chapter 15, potential disturbance impacts (i.e. noise, vibration, lighting, and human presence) on kingfisher during the construction and operational stage of the Proposed Scheme are detailed in Section 15.4.1 and Section 15.4.2 for the River Boyne and River Blackwater SPA (Important Ecological Feature (IEF) 2). During the construction stage, potential disturbance effects were considered to be significant adverse at an International geographic scale, in the absence of mitigation. During the operational stage, potential disturbance effects were considered to be not significant. In light of significant effects identified during the construction stage, and as detailed under Chapter 15 – Biodiversity: Terrestrial Ecology, Section 15.5.3.3 (Measures to Protect European Sites), mitigation measures specifically required to ensure the protection the River Boyne and River Blackwater SPA (including kingfisher) are presented in Section 7 of the NIS. These measures include inter alia: a pre-construction kingfisher survey to assess whether new territories within or in close vicinity to the footprint of the Proposed Scheme have been established; measures to control artificial lighting (i.e. light spill); and best practice measures to control noise emissions.

In the NIS, potential disturbance effects (i.e. noise, vibration, lighting, and human presence) to kingfisher during the construction and operational stage of the Proposed Scheme are detailed in Section 6.4.1 for the River Boyne and River Blackwater SPA which assessed the following site-specific conservation objective attributes relating to:

- Population dynamics;
- Natural range; and
- Sufficiently large habitat.

During the construction stage, potential disturbance effects were not considered to result in adverse effect on the site integrity of this SPA or kingfisher. However, applying the precautionary principle, pre-construction kingfisher surveys were proposed to ensure that no new territories within or in close vicinity to the footprint of the Proposed Scheme have established. During the operational stage, potential disturbance effects were also not considered to result in adverse effect on the site integrity of this SPA or kingfisher. Additionally, Section 7.3.5 of the NIS also outlines measures specifically required to ensure the protection of SCI kingfisher, which include inter alia, measures to control artificial lighting (i.e. light spill), and best practice measures to control noise emissions.

As raised by the Board, clarification is required to align the EIAR and NIS and the assessment of potential disturbance effects on kingfisher during the construction stage of the Proposed Scheme (refer to Section 15.4.1 of the EIAR and Section 6.4.1 of the NIS). The EIAR concludes potential significant effects on kingfisher in the absence of mitigation, whilst the NIS concludes no adverse effects on the site integrity of the River Boyne and River Blackwater SPA (i.e. kingfisher). It is confirmed that the assessment provided within the EIAR is correct and the inconsistency queried, upon review, relates to the assessment set out in the NIS. However, it is confirmed that both the EIAR and NIS do provide consistent mitigation measures for kingfisher on the basis of potential effects identified during the construction stage of the Proposed Scheme (see Section 15.5.3.3 of the EIAR and Section 7 of the NIS). In light of this clarification, replacement text for the NIS has been provided below; blue indicates new text, strikethrough indicates deleted text for Section 6.4.1.1 Construction Phase, sub-Section 6.4.1.1.1 Population Dynamics; Natural Range:

Kingfisher has been screened in for assessment under "The favourable conservation status of a species is achieved when population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats" and "natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future" in order to assess whether the Proposed Scheme will result in an adverse effect on site integrity of the SPA and whether the Proposed Scheme will prevent the maintenance or restoration of the favourable conservation condition of kingfisher.

Potential impacts have been identified as a result of disturbance (noise, vibration, lighting and human presence), impacts on available commuting and foraging habitat (i.e. habitat destruction, fragmentation, and deterioration/ alteration) and barrier effects (i.e. the proposed bridge crossing). Adverse effects would be direct.

Localised disturbance to commuting and foraging kingfisher populations could occur as a result of noise/vibration emissions (i.e. construction sites, excavations, piling, human presence) and artificial lighting during (i.e. construction sites, machinery and intermittent night time working) construction. Disturbance may temporarily impact local kingfisher population dynamics by causing changes in their behaviour/movements within the immediate River Boyne corridor. Changes in the behaviour/movements of kingfisher resulting from disturbance could subsequently impact upon the natural range of this SCI, at a local level for the duration of construction. ~~No overall impact on the natural range of the SCI at the scale of the SAC is anticipated given the linear extent of the SAC. However, mindful that~~ Few sightings of the bird were made during site-specific surveys at the River Boyne (see Section 4.4), and only ~~the~~ temporary disturbance is anticipated as a result of the Proposed Scheme. However, in the absence of mitigation, the precautionary principle has been applied and ~~noise, vibration, lighting and human presence are not considered~~ adverse effects ~~on the~~ to site integrity cannot be ruled out for ~~of~~ this SPA, nor the natural range of population dynamic of kingfisher. ~~No mitigation is required~~.

…

*In the absence of mitigation, **adverse effects to site integrity cannot be ruled** out as a result of the Proposed Scheme. **Mitigation is required** in order to prevent impacts on water quality (pollution and sedimentation), and to control artificial lighting (light spill) and noise emissions in order to maintain the population dynamic and natural range of kingfisher populations of the SPA.*

Additionally, applying the precautionary principle, ***pre-construction surveys will be completed*** *to identify any further evidence of breeding, commuting and/or foraging should territories become established since the time of writing this report."*

Mindful that the relevant mitigation is already outlined in Section 7 of the NIS, no further amendments are proposed.

4.5.2 Kingfisher Disturbance Distance and Buffer

4.5.2.1 Baseline data for kingfisher

4.5.2.1.1 Desktop study data

Kingfisher is an SCI of the River Boyne and River Blackwater SPA [004232]. The all-Ireland population for kingfisher is estimated at 1,300- 2,100 pairs (NPWS, 2013)[12]. The 2010 NPWS survey (Cummins *et al*., 2010)[13] kingfisher survey of Ireland found there to be "*15-19 territories on the Boyne (densities of 0.09-0.12 territories/km*)" or up to 1.4% of the all-Ireland population. Given the area of the Proposed Scheme and its scale, if there was any effect as a result of the Proposed Scheme, it would likely be to one territory.

4.5.2.1.2 Field survey data

Dedicated kingfisher surveys were conducted from two vantage points in the vicinity of the Proposed Scheme between 2019 and 2022, prior to submission. Following submission, surveys were conducted in 2023 and 2024, to maintain the baseline data.

During ecological field surveys, it was identified that there is no optimal vertical soft-substrate nesting habitat for kingfisher within the immediate footprint of the Proposed Scheme. Some suitable nesting habitat was noted upstream, with the records of nesting kingfisher recorded within this upstream location in 2019, 2020 and 2023, see **Table 4-3** and **Figure 4.5**. Across all survey dates (**Table 4-3**) where either nesting or territory was held, kingfisher were also noted to be commuting and foraging in the area.

Table 4-3: Kingfisher Records (Breeding and Territories) in the Vicinity of the Proposed Scheme

Year of survey	Detail of kingfisher observations	Location of record in comparison to Proposed Scheme	Nature of habitat between record and Proposed Scheme
2019	A confirmed nest was recorded. Adult carrying fish flew into dense vegetation on the north embankment and emerged one minute later without food, with a different adult entering the same area 26 minutes later.	**Nest** 385m west of Proposed Scheme	Dense woodland on north embankment
2020	A confirmed nest was recorded. Activity in the area of the previously confirmed nest in 2019, such as adults carrying prey back into the north bank and the presence of a juvenile.	**Nest** 385m west of Proposed Scheme	Dense woodland
2021	No sightings of kingfisher recorded across the dedicated VP surveys, the breeding bird survey walkovers or casual observations across other ecology surveys onsite.	*N/A*	*N/A*
2022	Whilst there was no confirmation of breeding, a territory was held across the season at Slane Demesne, approximately 125 m upstream from the 2020 breeding site.	**Territory** 528m west of Proposed Scheme	Dense woodland

[12] NPWS (2013) A review of the SPA network of sites in the Republic of Ireland. Department of Arts, Heritage and the Gaeltacht. Unpublished Report.

[13] Cummins, S., Fisher, J., McKeever, R. G., McNaghten, L., & Crow, O. (2010). Assessment of the distribution and abundance of Kingfisher Alcedo atthis and other riparian birds on six SAC river systems in Ireland. A report commissioned by the National Parks and Wildlife Service and prepared by BirdWatch Ireland.

Year of survey	Detail of kingfisher observations	Location of record in comparison to Proposed Scheme	Nature of habitat between record and Proposed Scheme
2023	A confirmed nest was recorded.	**Nest** 292m southwest of Proposed Scheme	Dense woodland and the Boyne River
2024	No evidence of breeding was recorded.	*N/A*	*N/A*

4.5.2.2 Kingfisher published disturbance response distances

4.5.2.2.1 Goodship and Furness (2022)[2]

Within this study, responses to disturbances were recorded for kingfisher during both the breeding and the wintering seasons. To note, the River Boyne and River Blackwater SPA is classified for its reproducing kingfisher populations (NPWS, 2020)[8].

Breeding season: A range of recorded distances, in both rural and urban areas in Europe, shows responses from kingfishers as surveyors walked towards them during their breeding seasons, at a minimum of 9.5m and a maximum of 24.6m.

Nonbreeding season: A range of recorded distances, in both rural and urban areas in Europe, shows responses from kingfishers as surveyors walked towards them during their non-breeding seasons, at a minimum of 16.27m and a maximum of 24m.

4.5.2.2.2 NatureScot (2024)[3]

- "*Buffer zone (m) suggestions during the breeding (BR) and nonbreeding (NBR) seasons: BR and NBR = 50-100m."*
- "*Overall likely sensitivity to disturbance: Low/Medium.*"

4.5.2.2.3 Kingfisher disturbance buffer

While the River Boyne and River Blackwater SPA is classified for reproducing kingfisher populations, kingfisher are present along the Boyne during both breeding and non-breeding seasons, and as such the maximum disturbance buffer of 100m (NatureScot, 2024) has been adopted, on a conservative approach basis, and this buffer distance has been applied - see **Figure 4.5**.

Legend

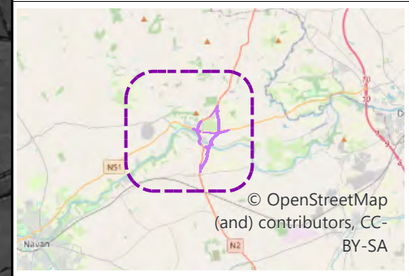
- Proposed Scheme
- Disturbance buffer of 100m

Kingfisher records

- Nest
- Territory

Data Source: RPS (2024)

0 0.25 0.5 1
Kilometres



Client

Meath County Council

N2 Slane Bypass and Public Realm Enhancement Scheme

Title

Figure 4.5
Kingfisher recorded observations in the vicinity of the proposed Scheme

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Issue Details

File Identifier: MDT0806-RPS-00-N2-DR-Z-AP-0003		
Status: A1	**Rev:** C02	**Model File Identifier:**
Drawn: NR		**Date:** 11/12/2024
Checked: AMC		**Scale:** 1:20,000 (A3)
Approved: RR		**Projection:** ITM

NOTE:

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4.5.2.3 Noise and vibration effects on Kingfisher prey species

Given all records of kingfisher nests are outside the 100 m disturbance buffer of the Proposed Scheme (see **Figure 4.5**), the potential construction and operational phase disturbance impacts are likely to only be on commuting and foraging kingfisher rather than birds on the nest. It is acknowledged that these birds may be the same birds, but the impact will affect them during different activities, i.e. not likely to flush/abandon eggs or young on the nest given the distance between the Proposed Scheme and the nests, but potential to change commutes and foraging habitat to avoid the Proposed Scheme's resulting disturbances. As such, noise effects on commuting and foraging birds are assessed, and the indirect effects on their prey species.

Minnow and stickleback are cyprinid fish that commonly constitute kingfisher prey species. These species could be present in areas of slacker flow of the River Boyne main channel near the proposed bridge crossing point (i.e., only the river margin backwaters). However, as stated in Chapter 16 – Biodiversity: Aquatic Ecology, Section 16.4.1.5 Hydroacoustic Effects – River Boyne Crossing Construction, "*Cyprinids would be more commonly found further upstream and downstream in slacker flows with a greater cover of emergent and/or submerged macrophytes*"; noting that the crossing reach has much swifter flows and is not the preferred habitat for small cyprinid fish species like stickleback and minnow. Given that these species are fairly ubiquitous in Irish freshwaters, it must be assumed that at least a few sticklebacks and minnows are present near the proposed Boyne bridge construction reach in the slack flows at river margins.

Sound exposure guidelines (Popper *et al*., 2014)[14] and evidence from Mickle and Higgs (2018), set out in EIAR Vol. 3 Appendix 16.3 – Bioacoustics Effects and Interim Sound Exposure Guidelines for Fish, suggests the following responses by cyprinids as a result of the underwater noise levels that were modelled for the construction phase, i.e., 113 dB re 1 µPa [Root Mean Square/ RMS] occurring intermittently over the course of the bridge pier, piling period:

For fish with swim bladder involvement in hearing i.e. cyprinids:

- Potential high risk of behavioural and physiological responses in any nearby individuals (Popper *et al*., 2014), possibly resulting in masking of ambient sounds and/or startle and avoidance responses.

Therefore, it is estimated that any stickleback or minnow near the proposed bridge piling construction area, a level of startle and avoidance reaction could be expected to occur, and the fish would move longitudinally upstream or downstream away from the underwater noise source (these species avoid swift currents of the mid-channel). There is alternative similar habitat available for these fish species upstream and downstream of the proposed bridge construction reach and that alternative habitat is equally available for kingfisher to hunt. Any fish that do move away locally will still be available as prey species for locally foraging kingfishers, just slightly further upstream or downstream (given that the noise/vibration will diminish with distance).

Note also from Chapter 16, Section 16.4.1.5 that the underwater sound and vibration associated with drilling auger use during the construction phase near the Boyne main channel will be semi-continuous and temporary. The critical exposure period (i.e. relating to piling of central and north piers) would potentially last for 14 days (estimated as one day needed per pile installation, times 14 piles per pier) on each side of the River Boyne main channel, resulting in a total of approximately 28 days times 8 hours. There would be a gap during this period while the drilling rig is moved from one side of the channel to the other. The sound source is therefore semi-continuous while in operation but intermittent and temporary. Furthermore, the sound source is stationary, and the channel width is 40 m, meaning there would, at all times, be a section of the channel much less affected by underwater noise associated with piling.

The effect in terms of availability of cyprinid fish prey species to kingfisher during the estimated, intermittent exposure period of 28 days is determined to be imperceptible and therefore there is no significant change to the prey species available to the kingfisher population along this section of the River Boyne as result of the construction of the Proposed Scheme. Therefore, the effect of any change in prey species populations on kingfisher as a result of construction is **not significant**. In response, no additional mitigation is required.

[14] Popper, A. N., Hawkins, A. D., Fay, R. R., Mann, D. A.,Bartol, S., Carlson, T. J., Coombs, S., Ellison, W. T., Gentry, R. L., Halvorsen, M. B., Løkkeborg, S., Rogers, P. H., Southall, B. L., Zeddies D. G., and Tavolga, W. N. (2014). Sound exposure guidelines (pp. 33-51). Springer International Publishing.

4.5.3 Updated Conservation Objectives

The above assessment has been completed with reference to the recently updated site-specific conservation objectives for the River Boyne and River Blackwater Special Protection Area. The recently updated site-specific conservation objective for kingfisher in the River Boyne and River Blackwater SPA is "*To maintain the favourable conservation condition of kingfisher in River Boyne and River Blackwater SPA*" (NPWS, 2024)[15]. Reference to "restore" has been removed from the recently updated conservation objective; superseding the previously published conservation objective (NPWS, 2022)[16]. This is considered positive and indicates that restoration of favourable conservation status has been achieved for the SPA and that there is only now a requirement to maintain that status.

An assessment against the recently updated conservation objectives is set out in **Table 4-4**, below.

[15] NPWS (2024) Conservation Objectives: River Boyne and River Blackwater SPA 004232. Version 1. National Parks and Wildlife Service, Department of Housing, Local Government and Heritage. Accessed October 2024.

[16] NPWS (2022) Conservation objectives for River Boyne and River Blackwater SPA [004232]. First Order Site Specific Conservation Objectives Version 1.0. Department of Housing, Local Government and Heritage. Accessed February 2023.

Table 4-4: Updated Assessment of Construction Based on Updated Conservation Objectives (NPWS, 2024)[15]

Attribute	Measure	Target	Unmitigated effect of proposed Scheme, i.e. noise and vibration (both on kingfisher and their prey species), lighting, and human presence, on conservation objective attributes	Effect of Proposed Scheme (mitigated) on conservation objective attributes
Population size	Number of breeding territories/pairs	No significant decline in the long term	**Potential** to reduce the population size of kingfisher in the SPA if the pair were to relocate outside the SPA as a result.	Mitigation presented in section 7 of the NIS and section 15.5 of the EIAR will mitigate both the direct and indirect effects on kingfisher.
Productivity rate	Number of fledged young per confirmed breeding pair	Sufficient productivity to maintain the population trend as stable or increasing	**Potential** to reducing the pair whose territory is within the Schemes area's productivity rates due to sub-optimal foraging conditions.	Mitigation presented in section 7 of the NIS and section 15.5 of the EIAR will mitigate both the direct and indirect effects on kingfisher.
Spatial distribution of territories	Numbers and distribution of occupied territories across site	No significant loss of distribution in the long term, other than that occurring due to natural patterns of variation	**Potential** to reducing the numbers (by one pair) and distribution of kingfisher in the SPA if the pair were to relocate outside the SPA as a result.	Mitigation presented in section 7 of the NIS and section 15.5 of the EIAR will mitigate both the direct and indirect effects on kingfisher.
Extent and quality of nesting banks and other suitable nesting features	Hectares; condition assessment	Sufficient area of high quality nesting habitat to support the population target	**No potential** effect given the nesting habitat is not within the footprint of the proposed Scheme and as such will remain unaffected.	No potential effect was concluded. Precautionary mitigation measures are laid out in section 7 of the NIS and section 15.5 of the EIAR to carry out preconstruction surveys to ensure no nests in the vicinity to the proposed works.
Forage spatial distribution, extent, abundance and availability	Location, hectares, and forage biomass	Sufficient number of locations, area of suitable forage habitat and available forage biomass to support the population target	**Potential** to reducing the forage spatial distribution, extent, abundance and availability due to sub-optimal foraging conditions created from noise and vibration effects.	Mitigation presented in section 7 of the NIS and section 15.5 of the EIAR will mitigate both the direct and indirect effects on kingfisher.
Water quality	Water quality indicators	Both biotic (i.e. Q-value) and abiotic indices reflect overall good-high quality status	**Potential** to reduce water quality during the construction phase from an accidental pollution effect.	Mitigation presented in section 7 of the NIS and section 15.5 of the EIAR will mitigate both the direct and indirect effects on kingfisher.
Barriers to connectivity	Number, location, shape and hectares	No significant increase	**Potential** to create a temporary barrier in the footprint of the proposed works during the construction phase.	Mitigation presented in section 7 of the NIS and section 15.5 of the EIAR will mitigate both the direct and indirect effects on kingfisher.

Attribute	Measure	Target	Unmitigated effect of proposed Scheme, i.e. noise and vibration (both on kingfisher and their prey species), lighting, and human presence, on conservation objective attributes	Effect of Proposed Scheme (mitigated) on conservation objective attributes
Disturbance to breeding sites	Intensity, frequency, timing and duration	Disturbance occurs at levels that do not significantly impact upon breeding kingfisher	**No potential** effect given the nesting habitat and confirmed nest sites are >100m away from the proposed Schemes footprint.	No potential effect was concluded. Precautionary mitigation measures are laid out in section 7 of the NIS and section 15.5 of the EIAR to carry out preconstruction surveys to ensure no nests in the vicinity to the proposed works.

4.5.4 Conclusion with Respect to Kingfisher

There is no change in outcome of the revised assessment on the impacts of noise and vibration on kingfisher and mitigation measures required, taking into account the clarifications described in **Section 4.5.1**, the disturbance distance and buffers for kingfisher as discussed in **Section 4.5.2**, and the updates to the Conservation Objectives described in **Section 4.5.3**. The mitigation measures set out in Section 15.5 of the EIAR Chapter 15 – Biodiversity: Terrestrial Ecology, and in Section 7 of the Natura Impact Statement, remain the same and, as such, there are no change in residual effects as a result of the Proposed Scheme.

4.5.5 Conclusion with Respect to Barn Owl

The following conclusion should be read in conjunction with **Appendix D** of this response.

Since the submission of the EIAR, field surveys and an assessment has been completed with respect to barn owl (*Tyto alba*). This work has been completed with reference to TII's published guidance[17]. Surveys were undertaken between mid-July and October 2024 which identified no nests of the species within 5km of the proposed scheme. Based on this evidence, no nests will be directly affected by the proposed scheme or indirectly affected as a result of habitat loss and/or disturbance of foraging territories as a result of the proposed scheme.

However, in order to facilitate the potential for future expansion of barn owl populations within the County and beyond, the proposed scheme through its landscape design will be consistent with the landscape measures identified within TII guidance[17], as far as reasonably practical mindful of the need for balancing this design requirement with other landscape design, safety and maintenance requirements set out in other TII guidance documents.

4.6 Item 3(f) Badger

Item 3(f) of the Board's letter states:

f) "*Confirm the number of badger setts being lost because of the scheme, as there are inconsistent references in the Terrestrial Environmental Impact Assessment Report Biodiversity assessment. Demonstrate that the opportunities for mitigating impacts to the badger population have been maximised, including the feasibility of installing mammal passes and the provision of additional artificial setts.*"

Response to the Request for Additional Information:

Confirmation of the number of badger setts being lost due to the Proposed Scheme is provided in **Section 4.6.1**.

Section 4.6.2 outlines the measures being proposed to demonstrate that the opportunities to mitigation impacts have been maximised.

In addition, **Section 4.6.3** details an updated approach to badger sett closure in relation to the Wildlife Acts, in response to a Guidance Note received from the National Parks & Wildlife Service (NPWS).

4.6.1 Number of Badger Setts Being Lost

The baseline data pertaining to the categorisation of badger setts is outlined in EIAR Chapter 15 – Biodiversity: Terrestrial Ecology, Section 15.3.4.2. Further to this, Section 15.4.1.4 of this chapter assess the likely impact of the construction phase of the Proposed Scheme on badgers.

The applicant acknowledges the inconsistency within the assessment regarding the number of setts subjected to closure (i.e. to be lost), based on the current baseline. To provide clarity within Section 15.3.4.2 (subsection IEF 24 – Badger) of the EIAR, a total of fourteen active badger setts (BS04, BS07, BS08, BS09,

[17] TII (2021). PE-ENV-07005. *Survey and Mitigation Standards for Barn Owls to inform the Planning, Construction and Operation of National Road Projects*. April 2021, prepared by BirdWatch Ireland on behalf of Transport Infrastructure Ireland (TII) Publications.

BS13, BS14, BS16, BS18, BS21, BS22, BS28, BS49, BS50, and BS51) are proposed for permanent closure (see **Table 4-5**). Of these active setts proposed for permanent closure, one (BS09) is categorised as a main sett. The remaining thirteen active setts are categorised as subsidiary, annex, outlier, or unknown[18]. One additional sett (BS48), which was considered 'not active' at point of last survey (April-May 2023), will also be permanently closed.

In addition, three active badger setts (BS10, BS12, and BS17) will be temporarily closed (excluded) during the construction phase. Two additional setts (BS02 and BS03), which were considered 'not active' at point of last survey (April-May 2023), will also be temporarily closed (excluded) during the construction phase. These setts will then be reopened and available for use when the relevant construction within their individual zone of effect is completed.

Subsidiary, annex, and outlier setts[19] tend to be used less frequently and more interchangeably than a main sett, which means that badgers will likely utilise other subsidiary, annex, and outlier setts within their territories when setts are permanently or temporarily closed as a result of the Proposed Scheme.

Table 4-5: Badger Setts Proposed for Permanent Closure

Sett Code	Sett Status	Sett Usage	Sett Type
BS04	Active	Well-used	Subsidiary BS20
BS07	Active	Partially used	Annexed to BS09
BS08	Active	Well used	Annexed to BS09
BS09	Active	Well-used	Main sett
BS13	Active	Well-used	Unknown
BS14	Active	Well-used	Subsidiary to BS37
BS16	Active	Partially used	Unknown
BS18	Active	Partially used	Outlier to BS20
BS21	Active	Well used	Outlier to BS20
BS22	Active	Partially used	Outlier to BS20
BS28	Active	Partially used	Subsidiary to BS09
BS49	Active	Well-used	Annexed to BS09
BS50	Active	Partially used	Annexed to BS09
BS51	Active	Well used	Annexed to BS09
BS48	Not active	Disused	Disused

Table 4-6: Badger Setts Proposed for Temporary Closure

Sett Code	Sett Status	Sett Usage	Sett Type
BS02	Not active	Disused	Disused
BS03	Not active	Disused	Disused
BS10	Active	Partially used	Subsidiary to BS09
BS12	Active	Well-used	Unknown
BS17	Active	Partially used	Unknown

[18] An 'unknown' category of badger sett was assigned when annexe, subsidiary, or outlier badger sett categories could not be confirmed.

[19] Sett definitions: https://www.nature.scot/doc/guidance-licensing-badgers-badger-survey-best-practice

4.6.2 Maximising Opportunities to Mitigate Impacts to Badger Population

The mitigation measures pertaining to the protection of badger are outlined in Section 15.5 of Chapter 15 – Biodiversity: Terrestrial Ecology. These measures included:

- Pre-construction badger survey;
- Sett closure (temporary and permanent) in-line with NRA guidance;
- Temporary fencing of disturbance zones for retained setts;
- Construction of 1no. artificial sett;
- Underpasses utilising appropriate culverts;
- Mammal proof fencing (at specified locations); including temporary fencing (to exclude badgers from the proposed works areas during construction) and permanent fencing (to exclude badger from the operational roadway); and
- Supervision of all relevant works pertaining to badger by a suitably qualified and experienced ECoW/Project Ecologist.

The proposed mitigation has been reviewed in preparing this response. To further demonstrate how maximising the opportunities for mitigating impacts to the badger population can be achieved, the following additional measures are now proposed (see **Table 4-7**, **Figure 4.6** and **Appendix E**):

- 6 no. additional dedicated badger/mammal pipe underpass to provide access across the mainline, N51, and tie-ins along the Proposed Scheme. This results in a total of 10 no. usable crossing locations along the Proposed Scheme;
- 1 no. additional artificial sett at an appropriate location. This results in 2 no. artificial setts to be constructed; and
- Additional mammal-proof fencing extended to entire length of the mainline, and appropriate sections of the N51 and tie-ins. This results in further decreasing the risk of badger entering the roads.

Table 4-7: Measures to Mitigate Impacts to the Badger Population

Mitigation type	Code	Description	Location	Purpose	New Mitigation
Underpass	Badger Underpass 02	Dedicated pipe culvert	South Roundabout - N2 North Link: Chainage (Ch.) 015	To allow safe passage of badger east-west across main line.	✓
Underpass	Badger Underpass 01	Dedicated pipe culvert	South Roundabout - N2 South Link: Ch. 210	To allow safe passage of badger east-west across retained N2.	✓
Underpass	*N/A*	Unobstructed riverbank area	N2 Mainline: Ch. 1,325 (under River Boyne bridge crossing, south bank)	To allow safe passage of badger east-west along the southern bank of the River Boyne.	–
Underpass	*N/A*	Unobstructed riverbank area	N2 Mainline: Ch. 1,375 (under River Boyne bridge crossing, south bank)	To allow safe passage of badger east-west along the northern bank of the River Boyne.	–
Artificial sett	*N/A*	Multi chamber, multi entrance sett.	N2 Mainline: Ch. 1,475	To provide alternative sett feature for proposed sett closures.	–
Underpass	Badger Underpass 03	Dedicated pipe culvert	N2 Mainline: Ch. 2,170	To allow safe passage of badger east-west across main line.	✓
Underpass	Badger Underpass 04	Dedicated pipe culvert	N51 East Realignment Ch. 050	To allow safe passage of badger north-south across N51.	✓

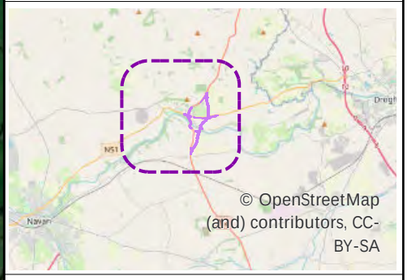
Mitigation type	Code	Description	Location	Purpose	New Mitigation
Underpass	Badger Underpass 05	Dedicated pipe culvert	N51 West Realignment Ch. 785	To allow safe passage of badger north-south across N51.	✓
Artificial sett	*N/A*	Multi chamber, multi entrance sett.	N2 Mainline: Ch. 2,650	To provide alternative sett feature for proposed sett closures.	✓
Underpass	Badger Underpass 06	Dedicated pipe culvert	N2 Mainline: Ch. 2,720	To allow safe passage of badger east-west across main line.	✓
Underpass	*N/A*	Mammal ledge within box culvert (Culvert 6B)	N2 Mainline: Ch. 3,450	To allow safe passage of badger east-west across main line.	–
Underpass	*N/A*	Mammal ledge within box culvert (Culvert 6A)	North Roundabout - N2 South Link: Ch. 105	To allow safe passage of badger north-south across retained N2.	–
Mammal resistant fencing	*N/A*	Mammal resistant fencing throughout the Proposed Scheme	Throughout the mainline, and appropriate sections of the N51 and tie-ins.	To prevent fatalities and injury to badger by restricting access to the road network.	*Length of fencing extended (to accommodate new mitigation)*

Legend

- Proposed Scheme
- Proposed Development Boundary
- Proposed Badger Underpass
- Proposed Location for Artificial Badger Sett

Data Source:

0 0.13 0.25 0.5
Kilometres



Client
Meath County Council

N2 Slane Bypass and Public Realm Enhancement Scheme

Title

Figure 4.6: Proposed Badger Underpasses and Artificial Sett Locations

West Pier
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Issue Details

File Identifier:
MDT0806-RPS-00-N2-DR-Z-AG-4024

Status:	Rev:	Model File Identifier:
A1	C01	MDT0806-RPS-01-N2-M2-C-XM1001 MDT0806-RPS-01-PR-M2-C-XR9000

Drawn: NR	**Date:** 09/12/2024
Checked: MN	**Scale:** 1:14,000 (A3)
Approved: NO'N	**Projection:** ITM

NOTE:

4.6.3 Section 23(7) of the Wildlife Act

In reference to Measures to Protect Badgers set out in Section 15.5.3.8 of the EIAR, the second bullet point states that where setts are identified to be active and are to be closed (wholly or partially), a derogation licence will be obtained from the NPWS by the Contractor's Project Ecologist. Since these measures were identified, RPS has received from NPWS in January 2024 (on a non-project specific basis) a copy of its Guidance Note with respect to working in and around badgers and their setts. A copy of this Guidance Note is included in **Appendix E**; of pertinence from that note to the EIAR is the following:

- It notes the legal protection afforded to badgers under the Wildlife Act 1976 (as amended); particularly with reference to Section 23(5)(d); and
- The Wildlife Act states that if a licence or permission has been received from another public authority whose actions are directed by a statute or statutory instrument, further permission is not required from the NPWS for works affecting badgers.

In light of the above, a separate post-consent derogation licence for badgers from the NPWS is not considered necessary. The above measures, coupled with those outlined in the EIAR, sets the mitigation necessary to be secured and adhered to with respect to badgers; refer to **Figure 4.6** above and the revised Vol. 3 Scheme Drawings (Fencing, Drainage, and Culverts 6A, 6B and 6C) included in **Appendix E**.

4.7 Item 3(g) Linear Woody Habitats and Drainage Ditches

Item 3(g) of the Board's letter states:

g) "*The description of woody habitat features is not considered sufficiently robust to inform adequate and area-specific planting/restoration proposals. The applicant shall provide a more detailed description of linear woody habitats, and highlight any features of significance e.g. banks, ditches, double-rows, mature hedgerow, with reference to Foulkes et al (2013) Hedgerow Appraisal System - Best Practise Guidance on Hedgerow Survey, Data Collation and Appraisal. Woodlands of Ireland, Dublin. (available at https://www.woodlandsofireland.com/).*"

Response to the Request for Additional Information:

4.7.1 Aims

The baseline data pertaining to the description of linear woody habitats is outlined in Section 15.3.3.1 of EIAR Vol. 2 Chapter 15 – Biodiversity: Terrestrial Ecology. This response addresses the request to provide a more detailed description of linear woody habitats.

4.7.2 Methodology

For the purposes of this response, all linear boundaries (hedgerow and treelines) within the land acquisition boundary (plus a 10 m buffer) of the Proposed Scheme were re-surveyed between 23 and 25 October 2024 supplementing the existing information detailed in Section 15.3.3.1 of the EIAR. See **Appendix F** for the location of each of these boundaries.

Each hedgerow that could be accessed was assessed according to the methodology outlined in the Hedgerow Appraisal System (HAS) (Foulkes *at al*., 2013[20]). Where possible, both sides of a linear boundary were walked in their entirety within the land acquisition boundary, however, due to access issues, this was not the case for every boundary (see **Table 4-8** for breakdown of what boundaries were fully accessed). Mindful of the timescales for responding to the RFI, it is recognised that the timing of this survey was out of season to assess the ground flora composition of linear boundaries, therefore the ground flora section of the HAS was omitted. Additionally, due to the differing lengths of each boundary (i.e. numerous boundaries were <60 m long), the tree, shrub and woody climber species lists were taken for the entirety of the boundary within the land acquisition boundary and not over two 30 m strips as outlined in the HAS. It is acknowledged

[20] Foulkes, N., Fuller, J., Little, D., McCourt, S., Murphy, P. (2013) Hedgerow Appraisal System: Best Practice Guidance on Hedgerow Surveying, Data Collation and Appraisal. The Heritage Council, Kilkenny.

that this approach can be more favourable towards longer boundaries. Boundaries that were composed entirely of non-native species such as conifer treelines, garden hedges, non-native garden treelines etc., were omitted from this survey.

4.7.3 Results

Table 4-8 outlines the length of each boundary within the land acquisition boundary, the length of each boundary within the footprint of the scheme alignment, the Hedgerow Appraisal System (HAS) Score for each hedgerow and whether each boundary was accessed on both sides. The land acquisition boundary includes all land that will be acquired to facilitate the Proposed Scheme. It is a larger area compared to the footprint of the scheme alignment. Not all hedgerows and treelines within the land acquisition boundary will be removed, however, all hedgerows and treelines within the footprint of the scheme alignment will be removed to facilitate the works. Hence these two boundaries i.e. the land acquisition boundary and the footprint of the scheme alignment have been defined as separate entities within this document. Boundaries shaded grey in **Table 4-8** are those to be removed as a result of the Proposed Scheme i.e. those with lengths that are within the footprint of the scheme alignment and are therefore, described in further detail in this document; see **Appendix F**.

In total c.3,600m of hedgerow and treeline were calculated to be within the footprint of the scheme alignment and will therefore be removed as a result of the Proposed Scheme. This differs from the length stated within the biodiversity chapter of the EIAR which states that 4,213 m shall be removed. This discrepancy can be explained by the fact that, for this exercise, any boundary that was composed entirely of non-native species (garden hedges, garden trees, conifer treelines etc.) was removed from the database as these boundaries are not considered to be semi-natural and are not assessed under the HAS. Additionally, there were a number of boundaries that consisted primarily of a stone wall with one or two native shrubs. These were also removed from the database prior to calculations being undertaken as they were not considered to fall into the hedgerow category as Foulkes *et al.* (2013) define hedgerows as semi-natural habitats. Semi-natural habitats are natural habitats that have been altered (sometimes extensively) by human activity, however, they will contain a high percentage of native botanical species e.g. heathland, calcareous grassland, *Molinia* meadows etc. Habitats that are dominated by non-native species e.g. conifer plantation, improved agricultural grasslands, conifer treelines, garden hedges composed predominantly of non-native species are not considered semi-natural. As a result, linear boundaries dominated by non-native species were therefore excluded from this assessment.

Analysis and Response

As already mentioned, not all sections of boundaries within the land acquisition boundary will be removed, however, all boundaries within the scheme alignment footprint will be removed. Therefore, a detailed description of each of the boundaries to be removed have been given here while those that will not be disturbed have not been detailed. The land acquisition boundary is represented by the “Proposed Scheme Boundary” item while the scheme alignment footprint is represented by the “Proposed Scheme” item in the drawings in **Appendix F**.

A total of 81 linear boundaries were identified across the Proposed Scheme. Fifty-two of those will be removed or partially removed as a result of the Proposed Scheme. Forty-nine of those 52 are discussed further in **Appendix F**. The remaining three, which are located within the public realm element of the Proposed Scheme (i.e. the proposed car park) were not assessed as access was not obtained on the day of the survey. The score per boundary per category within the HAS is outlined in **Appendix F**.

Of the 49 boundaries discussed in further detail in **Appendix F**, the majority of these (30 No.) obtained a HAS score of between 20 and 30, inclusive. Four obtained a score of less than 20 while 15 obtained a score greater than 30. The HAS does not provide an overall quality assessment system whereby a hedgerow that obtains a specific score can be deemed to be of a specific quality. Rather it can used to assess one hedgerow against another. The highest score (37) was obtained by boundaries 64 and 66. These boundaries are adjoining one another, are townland boundaries and are composed of a dense, wide treeline, which all contributed to the high score obtained. The lowest score (12) was obtained by boundary 67 which was gappy, had no associated features and contained a high percentage of garden species.

The majority of boundaries had relatively low woody species diversity with ≤6 woody species present. Just six out of the 49 boundaries contained >6 woody species. These were Boundary 1 with eleven woody species, Boundary 3 with nine woody species, Boundary 5 with ten woody species, Boundary 6 with seven woody species, Boundary 8 with eight woody species and Boundary 40 with nine woody species. Ash (*Fraxinus excelsior*) was a very common linear boundary component across the Proposed Scheme,

however, the vast majority of ash trees observed had signs of ash die back disease (*Hymenoscyphus fraxineus*) or as was the case with a small number of ash trees observed, were dead. Ivy (*Hedera hibernica*) was another common species observed and was often very abundant either in the tree canopy of mature trees (especially ash trees), covering the associated bank or growing up into the scrubby vegetation. The boxed component of a lot of hedgerows had ivy growing up to the height of the regularly boxed portion i.e. the ivy was completely covering the scrubby vegetation that is regularly boxed to a certain height.

As mentioned previously, the survey timing was outside the optimum time for assessing ground flora, however, what ground flora that was observed across the majority of hedgerows was primarily species poor and often composed of noxious weeds (ragwort (*Jacobaea vulgaris*), creeping thistle (*Cirsium arvense*), spear thistle (*Cirsium vulgare*), docks (*Rumex* sp.)), species indicating potential nutrient enrichment (nettles (*Urticia dioica*), cleavers (*Galium aparine*)) and/or rank grasses (false oat grass (*Arrhenatherum elatius*), cock's-foot (*Dactylis glomerata*), couch grass (*Elymus repens*)).

The majority of boundaries assessed could be categorised as being over-managed or inappropriately managed, from an ecological perspective. Thirty-four boundaries were either boxed, cut to A-shape or had their sides cut, mainly to <2.5 m height. Very few boundaries were classified as overgrown. Additionally, the basal porosity of the majority of boundaries was considered to be semi-translucent or semi-opaque with only seven of the boundaries considered to be dense at the base.

Despite the higher HAS scores obtained for some of the linear boundaries assessed, the Local Importance (higher value) categorisation for these features within the EIAR of the Proposed Scheme is appropriate as the majority of boundaries assessed were of low woody species diversity (as just six boundaries contained >6 woody species), contained an abundance of ivy and were, as a whole, over-managed. Furthermore, where ash was present, there were signs of ash die back. However, these features are important habitats providing a range of different functions (e.g. commuting corridors, roosting and nesting sites, foraging opportunities etc.) for numerous different species and taxa (birds, mammals, invertebrates, reptiles, amphibians etc.) in a local context.

Table 4-8: Linear Boundary Habitats within the Proposed Scheme and HAS Score for Each Boundary*

Boundary Feature ID	Within land acquisition boundary (m)	Within Footprint (m)	Hedgerow Appraisal System (HAS) Score	Both sides of Boundary Accessed
1	235	162	25	Yes
2	23	23	22	Yes
3	174	136	31	Yes
4	112	69	29	Yes
5	193	193	31	Yes
6	1071	49	33	Yes
7	390	0	32	No
8	86	56	28	Yes
9	221	2	28	No
10	6	0	15	No
11	106	0	16	No
12	0	0	Not assessed – no access	N/A
13	27	0	20	No
14	168	10	16	No
15	361	260	28	Yes
16	0	2	16	No
17	60	0	23	No
18	45	15	27	Yes
19	0	0	30	No
20	220	87	25	Yes
21	469	0	37	No

Boundary Feature ID	Within land acquisition boundary (m)	Within Footprint (m)	Hedgerow Appraisal System (HAS) Score	Both sides of Boundary Accessed
22	96	55	20	Yes
23	107	0	29	No
24	17	17	27	No
25	19	0	28	Yes
26	0	0	22	No
27	110	110	21	No
28	12	10	29	No
29	0	0	Not assessed – garden shrubs	N/A
30	24	24	21	Yes
31	183	129	25	Yes
32	11	6	13	Yes
33	0	0	Not assessed - circular enclosure	N/A
34	102	90	32	No
35	259	138	28	No
36	49	17	31	No
37	28	0	27	No
38	178	133	27	Yes
39	61	43	25	Yes
40	264	125	32	Yes
41	61	13	33	Yes
42	54	11	21	Yes
43	210	132	29	No
44	69	57	27	No
45	198	0	27	Yes
46	78	58	36	Yes
47	4	0	39	No
48	0	0	Not assessed - woodland	N/A
49	61	0	39	No
50	97	0	22	No
51	196	182	27	No
52	123	19	34	No
53	87	47	31	No
54	101	68	21	Yes
55	112	83	27	No
56	165	134	29	Yes
57	62	0	26	Yes
58	80	54	30	Yes
59	39	32	31	No
60	70	55	22	No
61	80	65	29	Yes
62	79	64	29	Yes
63	120	80	33	Yes

Boundary Feature ID	Within land acquisition boundary (m)	Within Footprint (m)	Hedgerow Appraisal System (HAS) Score	Both sides of Boundary Accessed
64	176	112	37	Yes
65	22	15	30	No
66	55	48	37	Yes
67	48	29	12	No
68	20	16	22	No
69	25	0	18	No
70	2	0	18	No
71	143	98	32	No
72	19.6	0	Not assessed	N/A
73	4.0	0	Not assessed	N/A
74	62.2	0	Not assessed	N/A
75	18.1	0	Not assessed	N/A
76	0	0	Not assessed	N/A
77	0	0	Not assessed	N/A
78	75.6	92.3	Not assessed – no access	N/A
79	33.7	33.7	Not assessed – no access	N/A
80	12.8	39.4	Not assessed – no access	N/A
81	0	0	Not assessed	N/A

*Boundaries shaded in grey are those with lengths within the footprint of the scheme alignment (i.e. 3rd)

4.7.4 Conclusion

The Habitat Appraisal System has been completed for relevant linear wooded habitats. The results of the HAS confirmed that the Local Importance (higher value) categorisation for these features, assigned within the EIAR of the Proposed Scheme, is considered appropriate. The assessment and mitigation measures laid out in the EIAR remain the same and, as such, there are no change in residual effects as a result of the Proposed Scheme.

4.8 Item 3(h) Woodland

Item 3(h) of the Board's letter states:

h) "*Woodland habitat descriptions are missing from the Terrestrial Environmental Impact Assessment Report Biodiversity assessment due to a missing page. In providing the missing information on wooded habitats, the applicant should include a detailed description of the vegetation composition of the wet woodland habitat adjacent to the scheme (nearest mapped area of WN5 to the Boyne crossing on north bank) and classify this habitat with regard to the Irish Vegetation Classification system (noting crossover's with Annex I habitat), the EU Interpretation Manual for Annex I habitats, and the conservation condition criteria detailed in O'Neill et al (2013) Results of monitoring survey of old sessile oak woods and alluvial forests. Irish Wildlife Manuals, No. 71. (available on npws.ie).*"

Response to the Request for Additional Information:

In response to 3(h):

- The missing page referred to is provided at **Appendix G**.

- Further detailed descriptions, based on further surveys undertaken, are provided regarding four areas of wet woodland (WN5) which has been mapped downstream of the Proposed Scheme. All four are considered to have an affinity to Annex I Alluvial Woodland 91E0.
- In light of the further survey, the assessment made within the NIS and Chapter 15 of the EIAR have been reviewed and the assessments and mitigations re-affirmed.
- In addition, with respect to mapped woodland area D (see **Figure 4.7**) and mindful it is partially within the Proposed Scheme boundary, a precautionary additional mitigation is proposed which will require that area of woodland to be protected by fencing during construction to prevent any risk of accidental incursion by construction traffic, personnel or construction materials. No such mitigation is pertinent with respect to woodland area B since it is on an island within the River Boyne and no in-river works are proposed.

The following sections expand and evidence the above response summary.

4.8.1 Addition of Missing Page

The missing page from Chapter 15 – Biodiversity: Terrestrial Ecology, page 15-24, which formed part of the EIAR assessment, is included in **Appendix G**.

4.8.2 Detailed Description of the Vegetation Composition of the Wet Woodland Habitat

Regarding a detailed description of the wet woodland habitat, sections of WN5 riparian woodland on the banks of the River Boyne up to 400m downstream of the proposed bridge crossing for the Proposed Scheme were surveyed on the 24 and 25 October 2024 for woodland labelled A to D in **Figure 4.7**. Due to safe access difficulties during the October survey, the woodland labelled D on this figure was further assessed during a site visit on the 26 November 2024. These timings are outside the optimum survey window for this habitat. Furthermore, safe access to these sections of habitat was difficult due to the boggy nature of the ground underfoot and the depth of the River Boyne. Sections of habitat that could not be directly accessed were surveyed using binoculars.

A species list was taken for the section of woodland labelled A in **Figure 4.7**. This species list is outlined in **Table 4-9**. Due to safety access issues, this list was taken from the adjacent agricultural land parcel as full access to this section of woodland was not possible. When this species list was input to ERICA software, it returned a maximum of 19.7% affinity to the *Fraxinus excelsior – Iris pseudacorus* community (WL3C) which is within the *Alnus glutinosa – Filipendula ulmaria* group. This community has affinity to the Annex I habitat 91E0 Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*). This section of WN5 is a gallery woodland with a high percentage of non-native willow (*Salix* sp.). While the dominance of non-native species within habitats generally does not indicate a habitat of high conservation priority, one exception, as per O'Neill and Barron (2013)[21], are areas of gallery woodland that contain non-native willow. It is therefore considered that this section of riparian woodland has affinity to Annex I habitat 91E0.

An individual-plot level structure and functions assessment as per Table 3 of O'Neill and Barron (2013) was also undertaken at the section of woodland labelled A in **Figure 4.7**. Due to safety access issues, a full four-plot level assessment and subsequent overall polygon level assessment could not be undertaken. Of the ten criteria assessed at the individual-plot level, eight must reach their target to reach a pass[22], however, as access was restricted, bryophyte cover could not be ascertained for this plot. Therefore, the plot was assessed using nine criteria, the results of which are outlined in **Table 4-10**. Out of these nine criteria, this plot failed on four and passed on five criteria, resulting in an overall Fail for this plot. The failures were with respect to the abundance and regeneration of negative species, primarily Himalayan balsam (*Impatiens glandulifera*), the median canopy height being <7m and that there was low coverage of native shrubs. The criteria that obtained passes included the number of positive indicator species present, total canopy cover, the percentage of target species in the canopy, field layer coverage and height, and lack of grazing pressure.

[21] O'Neill, F.H. & Barron, S.J. (2013) Results of monitoring survey of old sessile oak woods and alluvial forests. Irish Wildlife Manuals, No. 71. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin, Ireland.

[22] The pass/fail criteria is used to assess whether a section of habitat is in favourable or unfavourable condition when assessed at the 4-plot (and larger) level.

This overall Fail result highlights that this section of Annex I 91E0 habitat is underperforming in its structure and function attributes and is therefore not a pristine example of this habitat.

Table 4-9: Species List taken from the Riparian Woodland on LHB* of the River Boyne Downstream of the Proposed Bridge Crossing

Common Name	Scientific Name	DAFOR Coverage**
Crack willow	*Salix fragilis*	Abundant
Himalayan balsam	*Impatiens glandulifera*	Frequent
Flag iris	*Iris pseudacorus*	Frequent
Common club-rush	*Schoenoplectus lacustris*	Frequent
Nettle	*Urtica dioica*	Frequent
Meadowsweet	*Filipendula ulmaria*	Frequent
Branched bur-reed	*Sparganium erectum*	Occasional
Ash	*Fraxinus excelsior*	Occasional
Water mint	*Mentha aquatica*	Occasional
Sycamore	*Acer pseudoplatanus*	Rare
Water dock	*Rumex sanguineus*	Rare

*LHB – Left Hand Bank

The DAFOR scale is a measure of the abundance of a species. It is a semi-quantitative approach used to provide a quick estimate of the relative abundance of a species. The surveyor assigns one of the following categories to the abundance/coverage of a species: **Dominant, **A**bundant, **F**requent, **O**ccasional or **R**are. An approximation of the percentage cover associated with each category is D: >75%; A: 51-75%; F: 26-50%; O: 11-25%; R: 1-10%.

Table 4-10 presents assessment criterion (1st column) and target for a pass (2nd column) at the individual-plot level for 91E0 woodland as per O'Neill and Barron 2013. The third and fourth columns are the results obtained for the woodland labelled A in Figure 4.7 and whether this section of woodland passed or failed the assessment criterion, respectively.

Table 4-10: Assessment Criterion and Target for Pass at the Individual-Plot Level for 91E0 Woodland.

Assessment criterion	91E0 target for pass	Result for Area A	Pass/Fail
Positive indicator species	At least 1 target species ≥6 positive species	2 target species and 8 positive species overall.	Pass
Negative species cover	≤10% cover of plot	Himalayan balsam ≥10%	Fail
Negative species regeneration	Absent	Himalayan balsam regeneration evident	Fail
Median canopy height	≥7m	<7 – primarily *Salix* sp.	Fail
Total canopy cover	≥30% of plot	Canopy approx. 70% of plot	Pass
Proportion of target species in canopy	≥50% of canopy	Target species approx. 70% of canopy	Pass
Native shrub layer cover	10-75% of plot	No native shrub observed	Fail
Native dwarf shrub/field layer	≥20% of plot, height ≥20cm	Field layer ≥20% of plot and height approx. 50cm	Pass
Bryophyte cover	≥4%	Not assessed	N/A
Grazing pressure	All 5 indicators absent	No grazing signs observed	Pass

There is a small section of riparian woodland on the island in the centre of the River Boyne, directly downstream of the proposed River Boyne crossing (Area B in **Figure 4.7**). This section of riparian woodland consisted of approximately 5 non-native willow trees, most likely crack willow (*Salix fragilis*). Given the location of this section of woodland on the edge of the island, it most likely gets frequently inundated by the watercourse, therefore, it is considered that this small section of willows have affinity to Annex I 91E0 habitat. The remainder of this island is colonised by nettles, willowherb (*Epilobium* sp.), water dock and reed

canary grass (*Phalaris arundinacea*). There was also abundant emergent vegetation such as common club-rush around the edges of this island. Due to the inaccessible location of this woodland and the time of year that the survey was undertaken a full species list and a structure and function assessment as per O'Neill and Barron (2013) could not be undertaken for this section of woodland.

The sections of riparian woodland at Area C in **Figure 4.7**, are all located on an old weir. These sections of woodland are dominated by non-native willow, most likely crack willow. A species list could not be obtained for these areas as access could not be safely obtained. Despite the location of these sections of woodland on a man-made structure, they are likely to get frequently inundated by the waters of the River Boyne, therefore, it is considered that they have affinity to Annex I 91E0 habitat. Due to the inaccessible location of this woodland and the time of year that the survey was undertaken a full species list and a structure and function assessment as per O'Neill and Barron (2013) could not be undertaken for this section of woodland.

The sections of riparian woodland at Area D in **Figure 4.7** are dominated by shrubby willow (*Salix* sp) with occasional ash at its western extent with some hawthorn also evident. The ground upon which the woodland is located is immediately adjacent to the River Boyne and was completely saturated with open water evident through most of the woodland. Other species recorded included bramble, nettle, reed canary grass and willowherb. Given that the woodland is largely inundated and dominated by willow, on a precautionary basis and mindful of the other Areas A to B, it is considered that it has affinity to Annex I 91E0 habitat. Therefore in light of the above, the habitat map in Chapter 15 (Figure 15.5: Habitats within Proposed Scheme's Footprint, Map 2 of 5), has been updated with the revised WN5 classifications; refer to the revised map contained in **Appendix G**.

To summarise, each of the sections of WN5 woodland as outlined in **Figure 4.7**, despite not being the best quality examples are still considered to be Annex I 91E0 habitat and are of high conservation importance.

As such, the following amendments are made to EIAR Chapter 15, Section 15.3.3.1 (Habitats, Woodland, Hedgerows, Treelines and Scrub), with new text in blue and deleted text in strikethrough as follows:

WN5 Riparian woodland

Although this habitat does not occur within the footprint of the Proposed Scheme ~~it~~ a small section of it was recorded on the instream island~~s~~ directly to the ~~west~~ east of the proposed bridge crossing ~~and in a small area on the northern bank of the River Boyne.~~ This habitat was also recorded on the northern bank of the River Boyne approximately 150m downstream of the proposed bridge crossing and also on the old fish weir that spans the watercourse at this point. Additionally, a small sections of this habitat were recorded on the southern bank of the River Boyle adjacent to and directly downstream of the weir. These areas were typically dominated by Salix spp., primarily non-native Salix sp. However, despite this dominance of non-native willow species and lack of alder and ash, these areas of WN5 woodland were determined, through ERICA analysis, to ~~However, none of the aforementioned areas of woodland~~ correspond to the Annex I habitat ~~residual~~ alluvial forest [91E0] ~~Annex I Priority Habitat type on the basis that indicator species were absent (i.e. alder and ash).~~

~~However,~~ ~~downstream,~~ Additionally, c. 12.6 km east of the Proposed Scheme, Annex I alluvial forest habitat as mapped by the NPWS (2020) and designated as part of the River Boyne and River Blackwater SAC also occurs.

WL1 Hedgerows

Many of the fields within the study area are bounded by hedgerows, although field gaps, fencing or scrub could be interspersed throughout. Notwithstanding the age or condition of older hedges, owing to the linear nature of most, they were established as stockproof boundaries or townland divides rather than as naturally occurring features. Despite the nature and agricultural use of the landscape, the hedges varied in management and structure from gappy woody vegetation to more dense woody vegetation and broadleaved herbs, less than 5 m in height and species poor. In general, particularly in agricultural lands which are intensively managed - hedges were kept low and narrow through cutting. Elsewhere mature hedgerows were noted in areas with many hedgerows also exhibiting evidence of regular cutting. Occasionally, dry drainage ditches and sometimes wet ditches occurred alongside hedgerows, whilst in other areas access tracks underlain by hardcore ran alongside the hedges.

Floristic diversity is constrained mainly by management and adjacent species poor habitats as a seed source. Commonly recorded species noted included hawthorn, blackthorn, bramble, ~~and~~ gorse (Ulex europeaus) and ivy (Hedera hibernica). Rose species such as dog rose (Rosa canina) were locally abundant. In places the hedgerows had scatterings of canopy or sub-canopy forming trees species including mature ash, oak, sycamore, beech and horse chestnut with smaller willows, birch as well as holly which was

locally abundant. The understorey or herbaceous species was poorly represented and the area alongside the narrow hedge was often heavily trampled by livestock with the result that aside from bare ground or grasses, notable herbs include pioneer species such as linear features of nettles.

Other species occasionally noted in less intensively managed hedges included: ~~ivy (Hedera helix),~~ honeysuckle (Lonicera periclymenum), vetch (Vicia spp.), primrose (Primula vulgaris) and common hogweed (Heracleum sphondylium) as well as grasses and herbs from adjacent grassland. Other plants occasionally noted within hedgerows included non-native or planted species, often as garden escapes. These included cherry laurel (Prunus laurocerasus), cotoneaster (Cotoneaster spp.), fuchsia (Fuchsia; ~~L.~~ spp.), privet (Ligustrum spp.) and griselinia (Griselinia spp.).

Fruit, shrubs and trees were locally recorded in hedgelines with the majority associated with garden escapees or from vector material that originated from there. Species included commonly cultivated gooseberry (Ribes uva-crispa), blackcurrant (Ribes spp.), and raspberry (Rubus idaeus). In one long boundary hedge, a single crab apple (Malus sylvestris) was recorded among blackthorn, hawthorn, and bramble. This was the only noted record along the survey corridor.

Legend

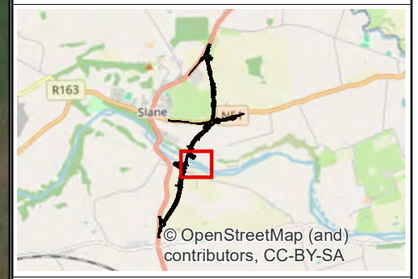
- Proposed Scheme
- Proposed Development Boundary

Habitats

- WN5

Data Source: RPS

0 0.025 0.05 0.1
Kilometres



Client
Meath County Council

N2 Slane Bypass and Public Realm Enhancement Scheme

Title

Figure 4.7: Areas of Riparian Woodland (WN5) that were surveyed in October 2024

West Pier
Business Campus,
Dun Laoghaire,
Co Dublin, Ireland.

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Issue Details

File Identifier:
MDT0806-RPS-00-N2-DR-Z-AG-4018

Status:	Rev:	Model File Identifier:
A1	C01	MDT0806-RPS-01-N2-M2-C-XM1001 MDT0806-RPS-01-PR-M2-C-XR9000

Drawn: NR	**Date:** 28/11/2024
Checked: JL	**Scale:** 1:1,800 (A3)
Approved: RR	**Projection:** ITM

NOTE:

4.8.3 Consideration of Potential Effects

An assessment of woodlands with affinity to Annex I habitat 91E0 has been detailed in Section 6.2 of the Natura Impact Statement. This assessment identified the potential for adverse effects on a number of Conservation Objective attributes for this habitat including:

- Habitat area
- Habitat distribution
- Woodland size
- Woodland structure: cover and height
- Woodland structure: community diversity and extent
- Woodland structure: natural regeneration
- Woodland structure: dead wood
- Woodland structure: veteran trees
- Woodland structure: indicators of local distinctiveness
- Vegetation composition: native tree cover
- Vegetation composition: typical species
- Hydrological regime: flooding depth/height of water table
- Vegetation composition: negative indicator species
- Vegetation composition: problematic native species

With the implementation of the mitigation measures outlined within the NIS, it was concluded that the Proposed Scheme will not result in direct, indirect or cumulative impacts which could have the potential to adversely affect this Annex I habitat. A description of the likely significant effects on WN5 riparian woodland is provided in Sections 15.4.1 and 15.4.2 of EIAR Chapter 15 – Biodiversity: Terrestrial Ecology. These effects primarily relate to a pollution event or the release of contaminants affects surface water. With the implementation of the mitigation measures stated in the EIAR, it was considered that there would be no residual impacts on this habitat as a result of the Proposed Scheme.

4.8.4 Conclusion

The assessments within the NIS and EIAR biodiversity chapter with respect to WN5 woodland and 91E0 habitat are pertinent to the sections of WN5 woodland as outlined in **Figure 4.7**. The approaches taken and conclusions reached within these assessments when considering the effects of the Proposed Scheme upon these sections of woodland are not altered when considering the sections of WN5 woodland outlined in **Figure 4.7**.

In addition to the mitigation, with respect to mapped woodland areas B and D, mindful that area D is partially within the Proposed Scheme boundary and area B is directly downstream (albeit area B is located on an in-channel island which will be unaffected by the Proposed Scheme), precautionary additional mitigation is proposed which will require that these areas of woodland be protected (i.e. clearly demarcated) during construction to prevent any risk of accidental incursion by construction traffic, personnel or construction materials.

Given the updated mapping of WN5 and mindful of the distance downstream from the proposed bridge crossing (at the closest point, areas A, B, C and D are approx. 160m, 115m, 270m and 245m, respectively, downstream), no significant shading is expected from the proposed bridge on any of these sections of Annex I habitat. Light incidence will still occur upon these habitats for the majority of the day.

4.9 Item 3(i) Boyne Greenway

Item 3(i) of the Board's letter states:

i) "*One of the stated objectives of the bypass project is to facilitate greater use of the proposed Boyne Greenway (Navan to Slane). The potential for synergistic cumulative impacts therefore potentially arises from the operational stages of both developments, and cumulative effects cannot be excluded solely on the basis that the greenway will be subject to its own Appropriate Assessment requirement. Such impacts may have potential to result in adverse disturbance effects to otter and Kingfisher associated with the River Boyne and River Blackwater Special Area of Conservation and Special Protective Area respectively. The applicant shall provide an assessment of the cumulative ecological effects of the operational stages of both developments.*"

Response to the Request for Additional Information:

In response to 3(i), further analysis and assessment has been completed with respect to the in-combination assessment of the Proposed Scheme with the proposed Boyne Greenway (Navan to Slane) in the operational phase which concludes the following based on the available information for the proposed greenway:

- The proposed Boyne Greenway is currently at Option Selection stage and an emerging preferred route has been identified, In the future, the project will be taken through the Statutory Planning Process, however this has not yet commenced.
- The principle source of *cumulative impacts from the operational stages of both developments arise from potential for increased recreational* use of the Boyne Greenway, facilitated by improved active travel facilities and access as a result of the Proposed Scheme.
- The Proposed Scheme itself does not have an objective to increase the use of the Greenway. It will however facilitate access to the Boyne Greenway should it be built, as part of wider active travel enhancements included in the scheme.
- The Proposed Scheme will potentially result in localised changes in the pattern of recreational usage in the vicinity of Slane albeit noting that the land east and west of the existing Slane Bridge are already subject to existing and frequent recreational usage. Evidence is presented below with respect to these matters.
- It is pertinent to note that any additional operational disturbance which may arise as a result of changes in recreational use due to the Proposed Scheme is balanced against a significant reduction in other existing sources of operational disturbance; particularly the reduction of vehicular traffic from the existing Slane Bridge both day and night.
- It has already been concluded in the NIS submitted that no potential adverse effects will result from likely changes in recreational use that will arise during the operational phase of the Proposed Scheme alone. As a result the potential adverse effects identified in the NIS as submitted, including those with respect to otters and kingfisher are re-affirmed (see also **Section 4.5** of this response).
- Since it is not considered that the Proposed Scheme alone will result in any adverse effects as a result of changes in recreational usage, the risk of any adverse effects in-combination with the proposed Greenway project is considered to be negligible.

4.9.1 Relevant Aspects of the Proposed Scheme

The Proposed Scheme is a multi-modal transport solution to alleviate existing transport pressures within and through Slane Village. An important aim of the Proposed Scheme is to provide enhanced active travel measures and connectivity to facilities in keeping with wider commitments under the Climate Act 2015, as amended, CAP24 and other related policy. Included in the active travel measures are the following:

1. A new pedestrian and cycle link to the existing Boyne canal towpath via the proposed Shared Use Cycle & Pedestrian Bridge adjacent to the mainline at Ch. 1220 (see Vol. 3 of the EIAR – Scheme Drawings);
2. Enhanced public realm within the Slane Village, including a new car park which is mitigating primarily the loss of on-street parking as a result of the other public realm proposals to be delivered by the

Proposed Scheme. The new car park will compensate for the loss of 24 no. on-street parking as a result of the public realm enhancements through the provision of 31 no. parking spaces, which includes for dedicated disabled parking spaces and EV charging spaces (see section 4.4.13.6 of Chapter 4 of the EIAR);

3. The new pedestrian and cycle link from the new car park in Slane Village to the existing N2; the existing N2 between Slane Village and to/over the existing Slane Bridge is likely to become more attractive for pedestrian and cycle users for recreational usage;
4. The potential for a new circular route for pedestrian and cycle users from Slane Village, across the existing Slane Bridge, eastwards along the existing Boyne canal towpath towards the new pedestrian and cycle link between the existing towpath and the proposed new bridge, northwards along the bypass and circling back into Slane Village; and
5. New off-street car-park with 31 spaces, accessed from the N51 with pedestrian/cycle link to the existing N2, largely to compensate for the loss of on-street parking through the other enhancement proposals within Slane Village.

The provision of the active travel measures, particularly the facilitation of pedestrian and cycle loops described in 4 above are expected to enhance and increase recreational activity, particularly along the existing Boyne canal towpath, which is noted to be already subject to existing and frequent local recreational usage.

4.9.2 Interaction with the Boyne Greenway

1. The Emerging Preferred Option (EPR) for the proposed greenway is illustrated in Appendix 2 and described in Section 8 of the Greenway Optioneering Report[23]; of which the eastern part of Section B (Broadboyne Bridge to Slane Bridge) and the western part of Section C (Slane Bridge to Brú na Bóinne) are considered most pertinent to this response.
2. The EPR currently overlaps with the Proposed Scheme as it travels east to west along the existing Boyne canal towpath adjacent to the River Boyne and perpendicular to the mainline of the proposed bypass which travels south to north. The key points of interaction from the Proposed Scheme to the proposed Boyne Greenway are:
    a. The Proposed Scheme will provide a car park accessed from the N51 with pedestrian/cycle link to the existing N2.
    b. The Proposed Scheme will provide a link to the existing Boyne canal towpath via the proposed Shared Use Cycle and Pedestrian Bridge adjacent to the mainline at Ch. 1220 (see Vol. 3 of the EIAR – Scheme Drawings). The canal towpath shares the EPR alignment at this location.

4.9.3 Assessment of In Combination Effects

The proposed car park off the N51 is included in the scheme, as part of the Public Realm Plan, to compensate for on-street parking which has been lost from the village in order to deliver proposed public realm enhancements. The car park will accommodate a maximum of 31 spaces and these are intended to primarily service people accessing the services in the village. It is accepted that some spaces may be used to access wider tourism offerings, including natural and built heritage however this is expected to be limited given the intended purpose of the car park and its limited size. Notwithstanding this, it is also noted that the access point from the car park is not located near any high sensitivity features of the River Boyne and River Blackwater SAC or SPA. The limited access in this area would not in-combination with the wider Greenway increase disturbance to the European site or its qualifying interests or achievement of its conservation objectives.

[23] Atkins (2023) The Boyne Greenway and Navigation Restoration. Greenway Optioneering: Executive Summary Report. December 2023. Prepared by Atkins for Meath County Council. Available online at: https://www.meath.ie/system/files/media/file-uploads/2024-07/Boyne%20Greenway%20EPR%20Summary%20Report.pdf

The second interaction is through the existing Boyne canal towpath, which is noted to be already subject to existing and frequent local recreational usage (and will form part of the EPR for the Greenway based on current information). This is evidenced through:

1. The anecdotal experience of the ecological surveyors who have visited this area over multiple years and in most seasons to inform the Proposed Scheme;
2. The physical evidence of recreational usage in the form of well-used pathways to the south of the Boyne River both east and west of the existing Slane Bridge; and
3. From monitoring completed by Meath County Council, to inform the proposed greenway, during October to November 2021 which indicated that the daily average of pedestrian users were 66, 96 and 50 and the monthly average of pedestrian users were 1,998, 2,920 and 1,515 from data collected at Slane Tow Path – West of Slane Bridge (Lat/Long: 53.705311, -6.544804), Slane Tow Path – East of Slane Bridge (Lat/Long: 53.702138, -6.540009), and Slane Tow Path - East of Slane Bridge Rossnaree/Morgans Lock (Lat/Long: 53.700738, -6.508948); respectively. It is noted that the surveys were completed during October/November and therefore it is considered reasonable to assume that the level of recreational use is likely to be higher in Spring and Summer months.

The likely changes in recreational use of the towpath that will arise during the Operational Phase of the Proposed Scheme are not expected to result in additional adverse effects, considering the existing recreational activity. The potential adverse effects on otters[24] and kingfisher[25] are as per those considered within the NIS and with reference to their published Conservation Objectives for the River Boyne and Blackwater SAC and SPA, respectively. The likely changes in recreational use as a result of the Proposed scheme are therefore not predicted to result in in-combination effects with the Boyne Greenway, if built.

In addition, any localised additional operational disturbance which may arise as a result of changes in recreational use needs to be balanced also against the significant reduction in other, existing sources of disturbance as a result of the operation of the Proposed Scheme; particularly the reduction of vehicular traffic from the existing Slane Bridge day and night. It is considered that such a balance could potentially result in positive effects to both the SAC and SPA, including with respect to otter and kingfisher.

Since it is not considered that the Proposed Scheme alone will result in any adverse effects as a result of changes in recreational usage, the risk of any adverse effects in-combination with either the proposed Greenway project is considered to be negligible.

[24] Effects on Distribution, Extent of Terrestrial Habitat, Couching Sites and Holts, Fish Biomass Available and Barriers to Connectivity considered.

[25] Effects on Population Dynamics: Natural Range and Sufficiently Large Habitat considered.

Appendix A
Map of Proposed Scheme Overlaid on MCC CDP Zoning

ADOPTED
Meath County Development Plan
2021 - 2027

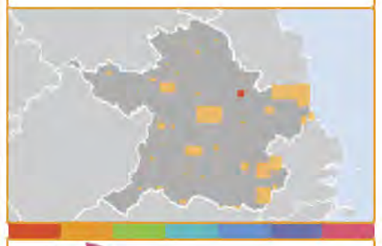
Slane

Sheet No: 34 (a) Land Use Zoning

LEGEND

Zoning Objectives

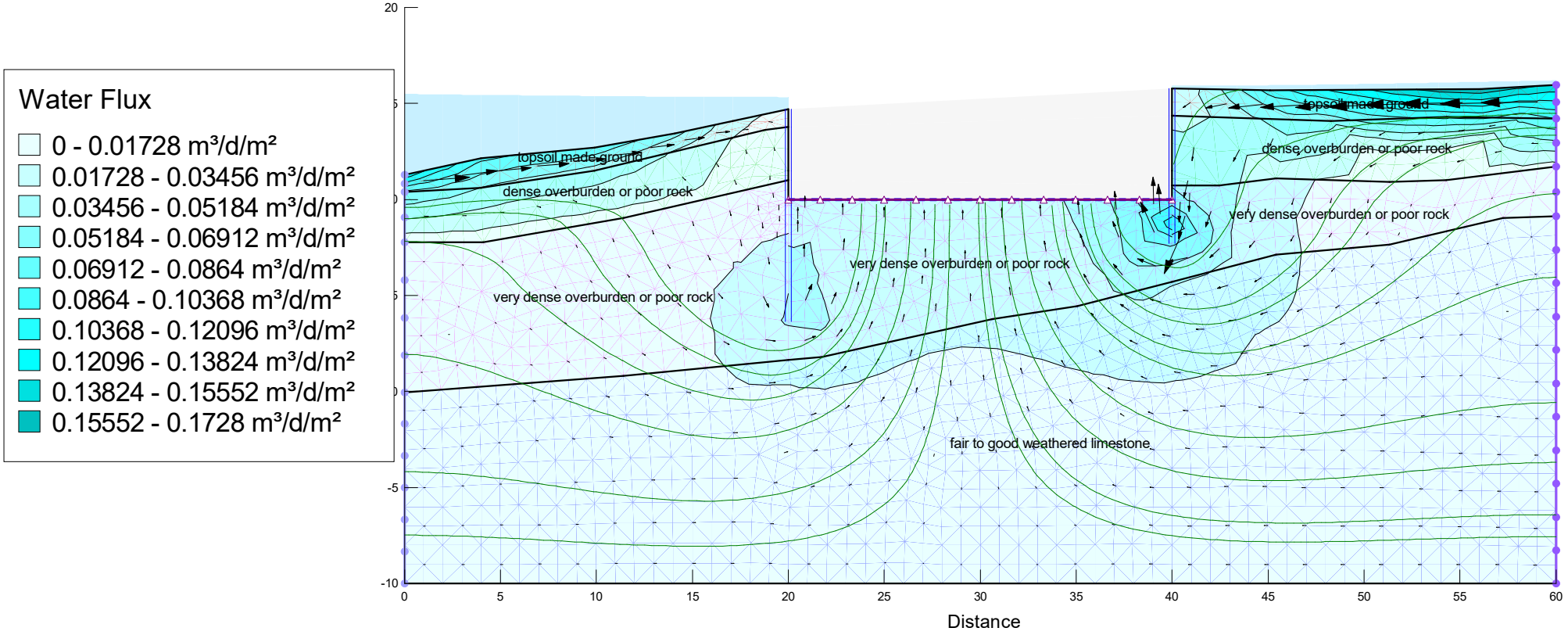
- A1 - Existing Residential
- A2 - New Residential
- B1 - Commercial Town or Village Centre
- D1 - Tourism
- E2 - General Enterprise and Employment
- F1 - Open Space
- G1 - Community Infrastructure
- H1 - High Amenity
- TU - Transport and Utilities
- RA - Rural Area
- Settlement Boundary
- Public Realm Extents
- Proposed Development Boundary



Meath County Development Plan 2021-2027

An Roinn um Pleanáil
Planning Department

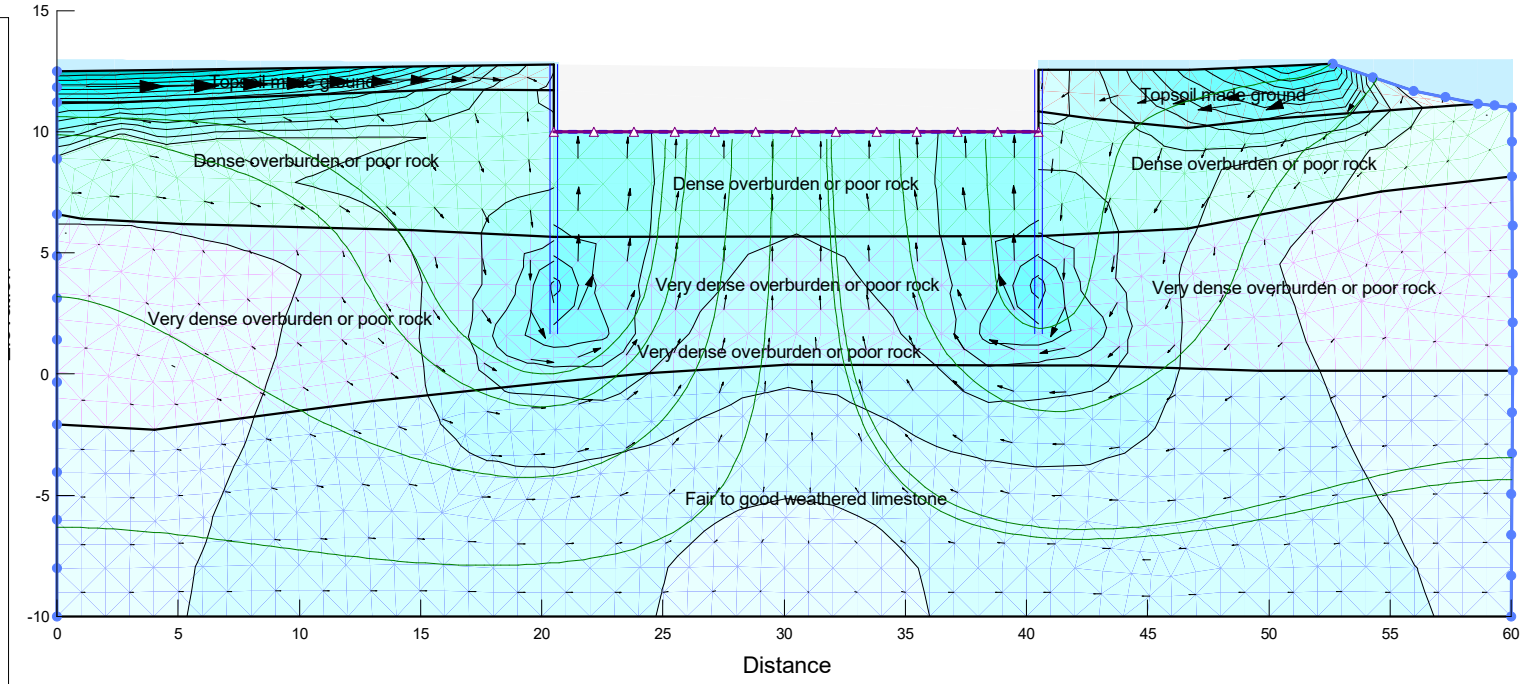
Appendix B
Cofferdam Model Outputs



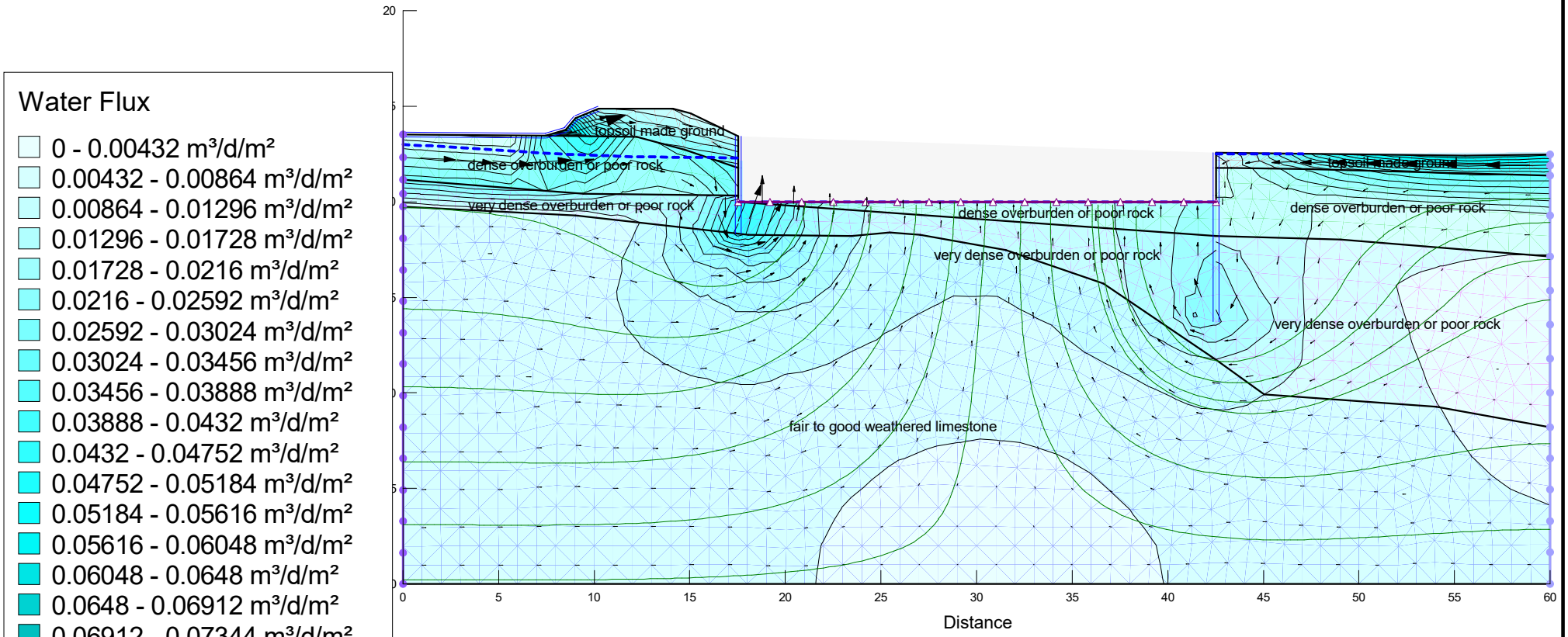
1.0Steady-State Seepage (20m C/S -2m Gap & 10mOD)
River Boyne Bridge - Northern Pier Seepage Analysis
29/11/2024 1:308

Water Flux

- 0 - 0.00432 m³/d/m²
- 0.00432 - 0.00864 m³/d/m²
- 0.00864 - 0.01296 m³/d/m²
- 0.01296 - 0.01728 m³/d/m²
- 0.01728 - 0.0216 m³/d/m²
- 0.0216 - 0.02592 m³/d/m²
- 0.02592 - 0.03024 m³/d/m²
- 0.03024 - 0.03456 m³/d/m²
- 0.03456 - 0.03888 m³/d/m²
- 0.03888 - 0.0432 m³/d/m²
- 0.0432 - 0.04752 m³/d/m²
- 0.04752 - 0.05184 m³/d/m²
- 0.05184 - 0.05616 m³/d/m²
- 0.05616 - 0.06048 m³/d/m²
- 0.06048 - 0.0648 m³/d/m²
- 0.0648 - 0.06912 m³/d/m²



1.0Steady-State Seepage (20m C/S -2m Gap & 10mOD)	
River Boyne Bridge - Central Pier Seepage Analysis	
29/11/2024	1:312



1.0Steady-State Seepage (20m C/S -2m Gap & 10mOD)
River Boyne Bridge - Southern Pier Seepage Analysis
29/11/2024 1:307

Appendix C
Groundwater Dependent Habitats Supporting Information

N2 SLANE BYPASS AND PUBLIC REALM ENHANCEMENT SCHEME

Response to Additional Information Sought - Groundwater Dependent Habitats Supporting Information

MDT0806
December 2024
MDT0806-RPS-00-N2-RP-Z-0176

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1 ITEM 3(C) POTENTIAL GROUNDWATER DEPENDANT HABITATS

Item 3(c) of the Board's letter states:

"*On a precautionary basis, the applicant is requested to have regard to the potential for unmapped areas of Alkaline fen habitat in the Appropriate Assessment Screening, as stated in the site-specific conservation objectives for The River Boyne and River Blackwater Special Area of Conservation and consider whether likely significant effects can be excluded. If likely effects cannot be excluded, the adequacy of the mitigation measures in the Natura Impact Statement should be considered in the context of the conservation objectives for this qualifying interest. Available information suggests that groundwater-dependant habitats may occur within Crewbane Marsh pNHA, with soil mapping showing groundwater gleys at this location, and Goodwillie (1992) Information on Areas of Scientific Interest report (available on npws.ie) referencing fen habitat at this location. A submission (Mr Jack Rogers) also references tufa springs at Crewbane. Given the location of this site in private lands, the applicant should engage with the BSBI recorder to see if they have any further data on habitats within the site. A pathway for impacts via potentially impeding groundwater flows to groundwater-dependant habitats the process of excavating the road cuttings has not been identified in the Environmental Impact Assessment Report Biodiversity assessments. The applicant is requested to confirm whether there is the potential for any groundwater flow paths to Crewbane Marsh pNHA to be altered by the proposed road cutting and any associated rock excavations. This shall be confirmed by a hydrogeologist, and any consequences for the Appropriate Assessment or Environmental Impact Assessment Report Biodiversity assessments addressed by the applicant's ecologists.*"

Response to the Request for Additional Information

This technical appendix provides the detailed information in support of Section 4.3 (Item 3(c) Potential groundwater dependant habitats) of the main response document.

Section 1.1 addresses the hydrogeological aspects of the request and **Section 1.2** addresses the ecological aspects of the request.

1.1 Pathway for Impacts via Potentially Impeding Groundwater Flows to Groundwater-dependant Habitats

1.1.1 Background

Item 3(c) relates to the potential for impacts to unmapped areas of groundwater dependant habitats e.g., tufa springs, particularly in the vicinity of Crewbane Marsh pNHA (Site Code: 000553).

Specifically in relation to potential for groundwater impacts to the pNHA, the Board's letter states: "*The applicant is requested to confirm whether there is the potential for any groundwater flow paths to Crewbane Marsh pNHA to be altered by the proposed road cutting and any associated rock excavations. This shall be confirmed by a hydrogeologist, and any consequences for the Appropriate Assessment or Environmental Impact Assessment Report Biodiversity assessments addressed by the applicant's ecologists.*"

Crewbane Marsh pNHA (Site Code: 000553) consists of a flood-plain marsh and woodland primarily on the northern bank of the River Boyne, but also the extents of the pNHA Marsh extend onto the southern bank of the Boyne. The pNHA extends for an approximate length of 2.1 km along the river. The Crewbane Marsh pNHA is 55.11 hectares (ha) in area. The wooded area within the pNHA is located on a steep slope, as ground elevation falls from approx. 60 metres above ordnance datum (mAOD) to 20 mAOD over a relatively short distance. A significant proportion of the pNHA is a floodplain and lies within the Office of Public Works (OPW) CFRAM mapped medium probability river flood level (i.e., within the 100-year flood level (1% Annual exceedance probability). The 100-year floodplain area within the Crewbane pNHA is approx. 30.4 hectares (ha),which is over 55% of the pNHA area. The permanent river channel area (from bank edge to bank edge) within the pNHA is approximately 9.79 ha.

The Crewbane Marsh pNHA was considered as part of the EIAR Vol. 2, Chapter 15 – Biodiversity: Terrestrial Ecology. The significance of all impacts identified including potential for direct and indirect effects to the pNHA (Ch. 15, Section 15.3.5) will not be significant with the implementation of the mitigation measures as detailed in Section 15.5 of the EIAR.

There will be no significant impacts to surface water quality (and hence the pNHA) via run-off or drainage from the Proposed Scheme. Full details of the impact assessment in this regard are provided in the EIAR Vol. 2, Chapter 4 – Description of the Proposed Scheme, Chapter 5 – Description of the Construction Phase, Chapter 17 – Water. The Environmental Operating Plan (EOP) detailing environmental mitigation and monitoring measures during the construction phase is provided in the EIAR Vol. 4B, Appendix 5.6.

The drainage area of the River Boyne discharging to the pNHA is estimated to be 2,490 square kilometres (km^2) having an annual average flow rate of 38.2 cubic metres per second (m^3/s), and a 95th percentile (95%) flow rate of 4.46m^3/s (OPW Hydrometric Station at Slane Castle, Station No. 07012[1]). The annual (2-year) flood is gauged at 274 m^3/s and the 100-year is estimated at c. 560 m^3/s. This represents a significant river with significant flows discharging through the channel and floodplain sections of the Crewbane Marsh pNHA. Refer to **Figure 1.1** for the extent of the River Boyne catchment in relation to Crewbane Marsh pNHA. All of the Proposed Scheme is located within the Boyne River catchment.

The local drainage catchment draining directly to the Crewbane Marsh pNHA is estimated from the geology and topography to be 1.42 km^2 on the north, and 0.9 km^2 on south of the River Boyne; refer to the drainage catchment mapping of **Figure 1.1**. The majority of the Proposed Scheme drains to the River Boyne upstream of the pNHA and not directly to the pNHA.

The inferred groundwater flow direction from the Proposed Scheme (based upon site-specific ground investigation data and topography) in the vicinity of the pNHA is south-southeast (north of River Boyne) and northeast (south of River Boyne). The groundwater flow direction is towards the River Boyne, and hence the pNHA both north and south of the Boyne, within the area surrounding the Proposed Scheme. The pNHA is located topographically downgradient of the Proposed Scheme, in particular the sections to the north and northeast of the River Boyne. Groundwater levels vary from approx. 65mAOD at the existing N51 east of Slane, to approx. 15mAOD at the River Boyne. The groundwater level gradient is assumed to reflect topographical gradient beyond the area covered by current GI data. A groundwater contour map is provided as **Figure 1.2**.

At the time of issue of the EIAR to ABP there were no specifically mapped groundwater dependant terrestrial ecosystems (GWDTE) within the EIAR study area (based on National databases e.g., GSI's Wells and Springs, etc.). The Geological Survey Ireland (GSI) had not mapped any groundwater springs to the east of the existing N2 Boyne Bridge, between Crewbane Marsh pNHA and the N51 to the north, or to Rossnaree Road (L16002) to the south of the River Boyne. There are 10 No. GSI listed wells in the EIAR Study area, which are detailed in Chapter 18, Section 18.3.1.4.4, (also EIAR Figure 18.6) including the Slane Public Water Supply (PWS). There are 2 No. GSI mapped karst landforms within the study area, the Slane PWS wells approx. 350 m northwest of the existing N2 Boyne Bridge, and a swallow hole located approx. 350 m south of the existing N51 east of Slane Village. No details were available for the swallow hole other than an approximate location.

During the preparation of the EIAR Meath County Council and RPS undertook further searches for potential unmapped private wells and springs in the study area but none were identified. RPS Hydrogeology and Ecology teams reviewed available information in relation to potential for springs, including Annex I priority habitat 'Petrifying springs with tufa formation' [*7220] and 'alkaline fen' [7230]. No such features were identified at that time.

In order to address, robustly, the RFI received from ABP, additional surveys have been carried out within and surrounding the pNHA. An ecological survey carried out by Dr Joanne Denyer on 5 November 2024 confirmed the presence of 2 No. locations of petrifying springs meeting the Annex I criteria within the pNHA[2] (see **Appendix C.1**). Another area of tufa formation (non-Annex I) was also recorded in a dry stream bed south of the River Boyne (outside the pNHA).

Previously unmapped alkaline fen has been identified within the Crewbane Marsh pNHA/River Boyne and River Blackwater Special Area of Conservation (SAC), at the top of the steep wooded slope (northern extent of pNHA). This location may align with the brief description of "*Crewbane Complex*" containing "*seepage*

[1] OPW, Hydrometric Monitoring Data, Station 07012, Slane Castle, www.waterlevel.ie.

[2] Denyer Ecology. 5 November 2024. River Boyne petrifying spring and alkaline fen survey.

from higher ground to the north", as described by Goodwillie (1992)[3]. No other location of alkaline fen habitat was recorded.

Due to the preferred alignment setting the scheme low in the landscape and providing for a proposed River Boyne crossing which is set at a relatively low level to reduce its impact on the receiving landscape and the World Heritage Property of Brú na Bóinne, the project is predominantly in cutting. Some fill is required, mainly at the very northern end of the scheme.

Soils within the areas of cutting are predominantly 'CLAY and SILT', with the bedrock classified as predominantly 'very weathered LIMESTONE and some interbedded MUDSTONE'.

Interbedded bedrock is identified underlying the proposed road scheme (see EIAR Chapter 18, Figure 18.4: Bedrock Geology), as mapped by the GSI, and reflected in the bedrock encountered during the ground investigations (GI) undertaken for the project, comprising primarily of limestones, limestone breccia, mudstones and sandstone. Bedrock is generally observed to be orientated aligning north-east to south-west. Within the pNHA boundary limestone breccia of the Fennor Formation is recorded dipping with an incline of 30° bedding to the south-east. Extensive structural faulting is mapped within the vicinity of the pNHA with major faults orientated aligning north-west to south-east (see EIAR Chapter 18, Figure 18.4). Faults and fractures may act as existing preferential groundwater flow pathways within the bedrock.

For the Proposed Scheme design and construction no dewatering via pumping wells or otherwise is proposed along cut sections. Herringbone drains are proposed along cut slopes as required (dependent upon seepage rates), to be buried 600mm into the cut face, and including a geotextile wrap around the filter material surrounding piping, in accordance with Transport Infrastructure Ireland (TII) standard construction details for drainage[4]. These slope drains will collect groundwater and prevent it from reaching the surface. Where herringbone drains are installed, there is limited potential for recharge of groundwater. Further details of the management of groundwater during the construction phase are provided in the EIAR, Chapter 5, Section 5.3.4.

[3] Goodwillie, R. (1992) Information on Areas of Scientific Interest in An Foras Forbartha files. A Catalogue Prepared for National Parks & Wildlife Service Office of Public Works.

[4] Transport Infrastructure Ireland (TII). 2024. Standard Construction Details, Drainage – Slope Drainage Herringbone Filter Drains, DWG No. CC-SCD-00529.

Legend

- Crewbane Marsh pNHA
- WFD Boyne Catchment
- Boyne river main channel

Data Source: Proposed Natural Heritage Areas (NPWS, 2015)
WFD Watercourses and WFD Catchments (EPA, 2023)

0 3.75 7.5 15
Kilometres

Client
Meath County Council

N2 Slane Bypass and Public Realm Enhancement Scheme

Title

Figure 1.1: Boyne Catchment Extents and Crewbane Marsh pNHA

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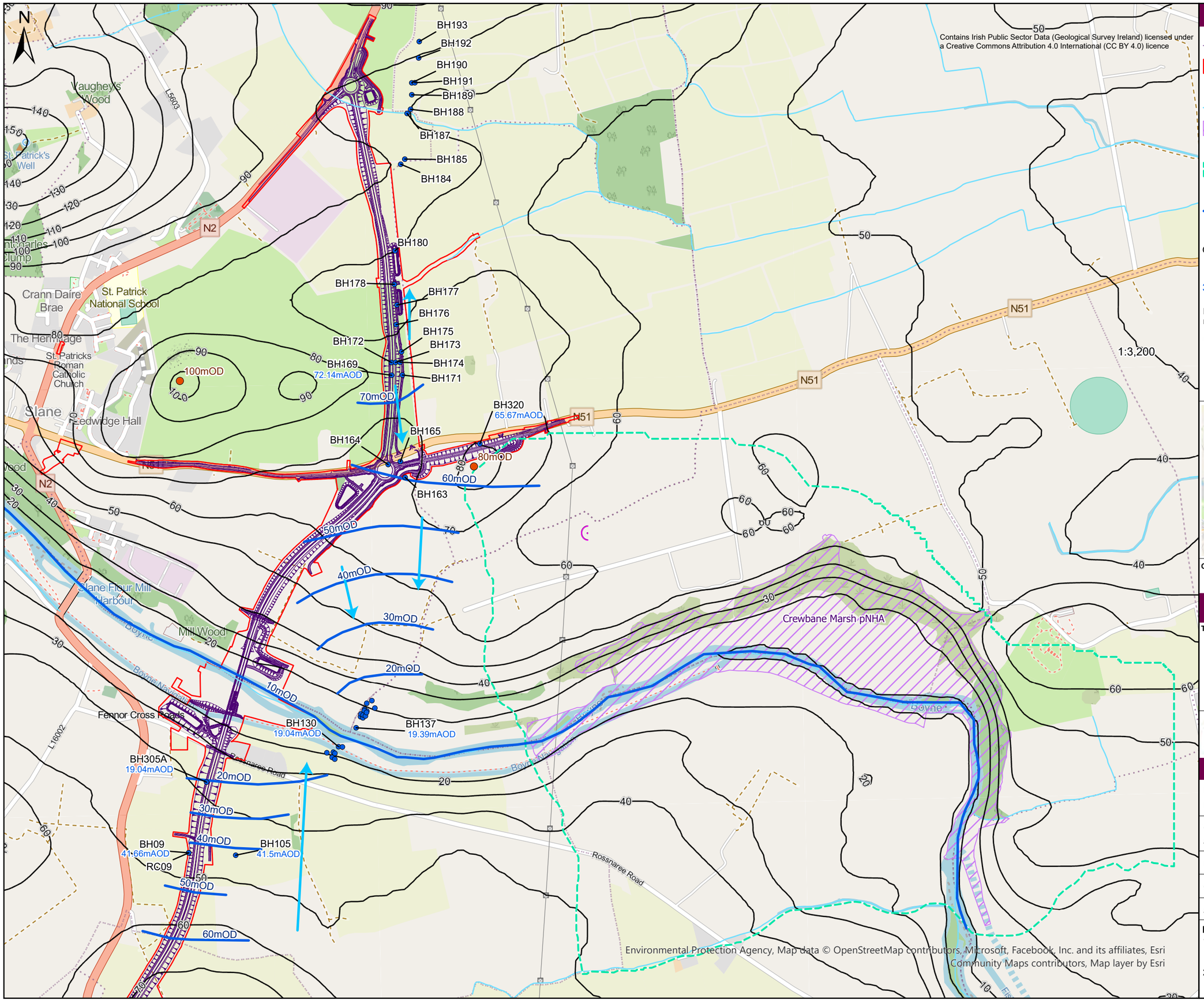

Legend

- Proposed Scheme
- Proposed Scheme Boundary
- BH locations
- River Waterbodies
- Proposed Natural Heritage Area (pNHA)
- Local Topographic Highpoint
- ZOC
- Inferred Groundwater Flow Direction
- Groundwater Elevation Contour
- Contour Line

GSI Karst Features

- Swallow Hole

34.5mAOD = water level

Note: Groundwater level data from investigations and monitoring conducted during Winter 2020/21.

Data Source: NPWS (2024), EPA (2024), GSI (2024)

Client
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Title

Figure 1.2: Groundwater Levels and Contours

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1.1.2 Further Assessment Methodology

RPS have undertaken a series of additional assessments in accordance with accepted methodologies to further assess the potential for effects of the Proposed Scheme upon the pNHA. The elements of further assessment are numbered below:

1. 4 No. Conceptual Site Model (CSM) figures were prepared to graphically present the likely effects upon groundwater flow paths. The CSM sections in plan view are provided in **Figure 1.3**. The CSM sections are provided in **Figure 1.4 to Figure 1.7**. The CSM sections are drawn to scale and include details from topographic surveys, ground investigations including geophysics, available groundwater levels, locations of karst features and locations of additional features identified via recent field surveys conducted in November 2024 (e.g., identification of tufa spring features).
2. Based on topographic survey data, LiDAR map data, and EPA catchment mapping the extent of Crewbane Marsh pNHA, the local Zone of Contribution (ZoC) was established. The pNHA recharge area north and south of the River Boyne has been taken into consideration as part of this assessment. This is due to the relatively large size of the River Boyne catchment area contributing to the pNHA (2,490km^2), hence changes to the river flow will be negligible from localised effects upon groundwater flow regime by the proposed scheme. The upgradient area of permeable ground within the local ZoC which will be lost through road construction is established. This is presented as a percentage of the overall recharge area.
3. A recharge and water balance assessment for the pNHA ZoC was carried out using two methods to give a conservative range. This provides an approximation of the extent of localised effects upon recharge of the Proposed Scheme.
    a. Use Darcian approach; $Q_{gw} = k * (\Delta h/\Delta l) * A$, *where:*
        i. Q_{gw} *= total groundwater inflow*
        ii. *k = hydraulic conductivity of aquifer*
        iii. $\Delta h/\Delta l$ *= hydraulic gradient*
        iv. *A = Saturated Aquifer Thickness * Groundwater Flow Path*
    b. Use groundwater recharge approach to quantify the total inflow of groundwater to the aquifer. Calculate the total recharge for the pNHA ZoC using available GSI data and Met Éireann rainfall data.
        i. *Total Recharge = Annual Precipitation x Recharge Coefficient x ZoC Area*
    c. The two approaches provide a range for groundwater inflow (m^3/day).
4. The potential for presence of karst features (varying degrees of weathered limestone bedrock) within the study area and beneath the proposed road alignment was reviewed in further detail. This included additional detailed review of Phase 2 and Phase 3 (GI) data, including geophysical survey and borehole logs. Additional potential karst features have been mapped (**Figure 1.8**) and a table provided with details of all locations (**Table 1-1**).
5. Depths to groundwater from available project specific GI data and any other available sources (e.g., GSI) were identified. There are currently 52 No. borehole locations from GI undertaken on this scheme with either water level (recorded via temporary piezometer) or water strike (recorded during drilling) data. The available water level data is from December 2020 to January 2021. The closest available groundwater level value to each section of cutting along the scheme was used. All groundwater level data points were mapped and inferred groundwater contours (potentiometric levels) for the scheme are presented on **Figure 1.2**.
6. The profile of cut/fill sections along the Proposed Scheme were mapped in greater detail. Within the pNHA Zone of Contribution (ZoC) the maximum depth of cut sections was divided into 100m intervals. The depth below existing ground level and depth to rockhead at each interval was calculated. Additional drawings to highlight cut/fill sections within the pNHA ZoC were produced with max depths of cut clearly identified (**Figure 1.9 to 1.13**).

7. The empirical formula from *Sichardt* was applied to determine the theoretical local zone of influence (ZoI) at the cut sections. The ZoI is the maximum extent to which localised groundwater flows and levels will be affected:

    a. *Sichardt* Equation:

$$R0 = C * (H - hw) * \sqrt{K}$$

    Where:

    R0 = Zone of Influence in m.

    C = 3000 (constant).

    K = hydraulic conductivity in metres per second (m/s). Value of hydraulic conductivity of 1.0 x 10^{-5} m/s, based on Hiscock & Bense (2014)[5], characteristics of a fractured limestone unit (e.g. Kiln Hill formation).

    H-h_w = drawdown in metres (m). This was calculated using maximum depth of cut in metres below ground level (mbgl) and highest water level value (mbgl) per cut section, to give a conservative scenario.

    H = difference in water level (head). For our calculations the closest GI locations to various scheme sections were identified and the recorded water strike or water level used.

    Assumptions and limitations of *Sichardt* equation:

    - *Sichardt* assumes radial flow paths from a well during normal pumping conditions in an unconfined aquifer with uniform hydraulic conductivity.
    - In the absence of groundwater monitoring data the maximum depth of cut at any given section is the maximum level of drawdown expected at any location.
    - As a conservative approach the water strike data is used in the absence of water level data from monitoring boreholes.
    - Bedrock is homogenous vertically and laterally, and therefore permeability value does not change.
    - No seasonal change in groundwater level accounted for.

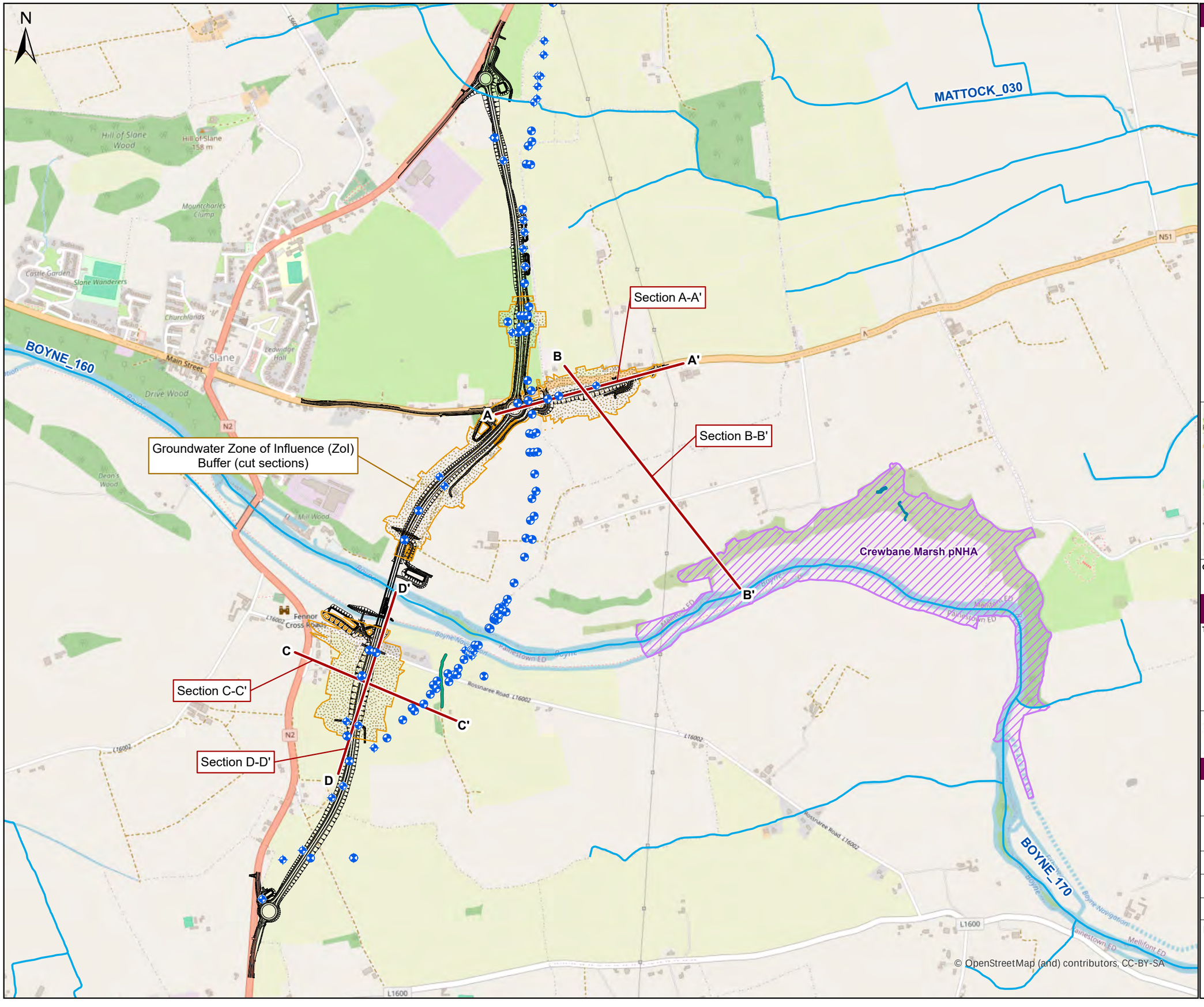
8. Map the maximum Zone of Influence (R0) values as a buffer along the entire scheme length, extending from the point of cutting on either side of the road. It is assumed that there is no drawdown effect in areas of fill. This is a conservative approach (adopting the precautionary principle) and therefore calculated drawdown effects will be significantly greater than what is likely to occur during construction and operation of the Proposed Scheme.

9. Overlay known and potential karst features with the Zone of Influence buffer to identify potential for conduit flow towards the pNHA. A table and map with all known/potential karst features is provided (**Table 1-1**). These features are also included on the relevant CSM.

    a. Typical construction detail drawings are provided showing karst mitigation measures, e.g., treatment of a spring at embankment foundation level, see **Figure 1.14**.

10. RPS Hydrogeology and Ecology Teams have undertaken an additional site survey in November 2024 (at the time of writing) within and surrounding Crewbane Marsh pNHA to confirm the nature and extent of potential unmapped GWDTE and karst landscape features. This survey has informed potential requirement for additional mitigation measures (refer to **Appendix C.1**).

[5] Hiscock, K. and Bense, V. *Hydrogeology Principles and Practice, 2nd Ed*. June 2014. Wiley-Blackwell.



Legend

- Proposed Scheme
- Groundwater ZoI Buffer
- A — A' Cross Section
- Tufa formation
- Petrifying spring
- Proposed Natural Heritage Area
- EPA River Water Bodies

GI Locations

- Cable Percussion (CP)
- CP+RC
- Rotary Core (RC)

Data Source: Proposed Natural Heritage Areas (NPWS, 2015)

0 0.17 0.35 0.7
Kilometres

Client
Meath County Council

N2 Slane Bypass and Public Realm Enhancement Scheme

Title
Figure 1.3: Groundwater Zone of Influence and CSM Section Overview

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Assumptions for section A-A'

- Max cutting depth of road is approx 5.80 meters below ground level (mbgl).
- Nearest GI points located near section A-A' were used for the CSM ground model, within an offset of <40m.
- Groundwater level of 1.55mbgl applied from BH164 and BH165.
- Depth of subsoil 2.5mbgl where not confirmed via GI data.

LEGEND

PROFILE
WITHIN GROUND INVESTIGATION LOGS

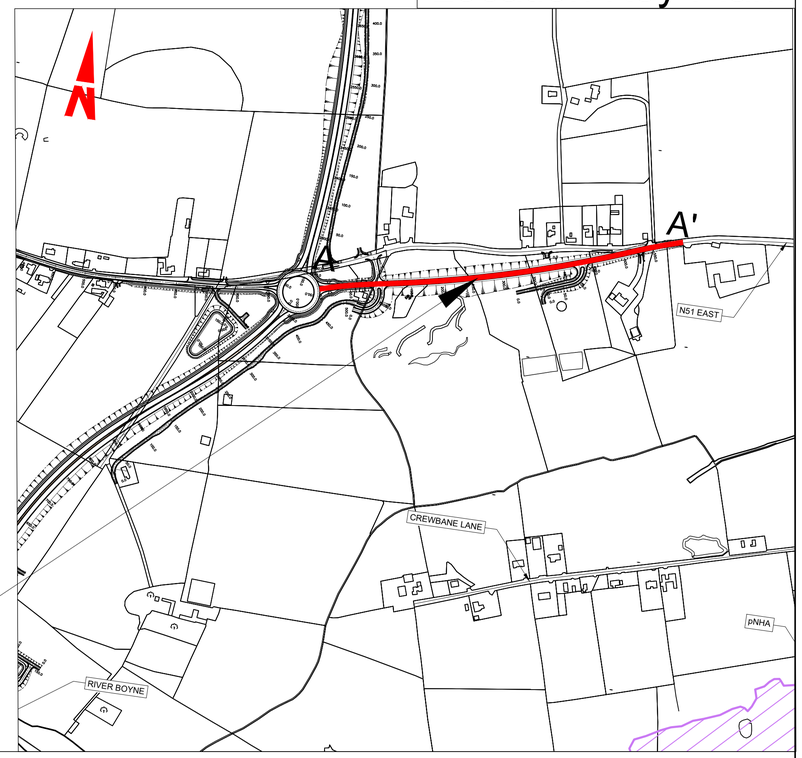
- TOPSOIL
- MADE GROUND
- CLAY
- SILT
- SAND
- COBBLES AND BOULDERS
- GRAVEL
- WEATHERED BEDROCK
- WATER STRIKE
- WATER STRIKE 20 MINUTES AFTER STRIKE

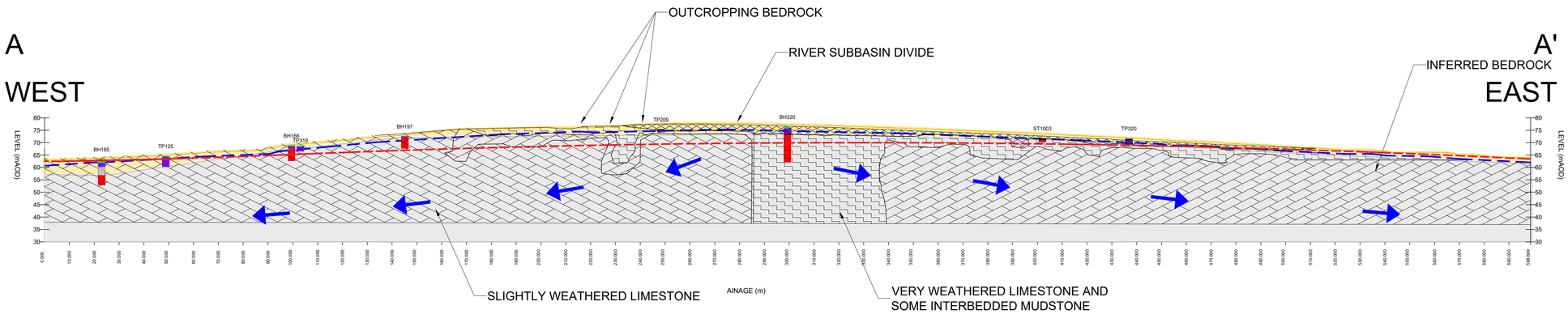
EXCLUDING LOGS

- EXISTING GROUND LEVEL
- PROPOSED ROAD LEVEL
- INFERRED GROUNDWATER LEVEL
- BEDROCK
- WEATHERED BEDROCK
- SUBSOIL
- FAULT INFERRED IN GEOPHYS. REPORT
- PREDOMINANTLY CLAY AND SILT OVERBURDEN
- CLAY-FILLED VERY WEATHERED LIMESTONE AND INTERBEDDED MUDSTONE
- VERY WEATHERED LIMESTONE AND SOME INTERBEDDED MUDSTONE
- WEATHERED LIMESTONE
- SLIGHTLY WEATHERED LIMESTONE
- PROPOSED NATURAL HERITAGE AREA (pNHA)

Cross-section location

Location Key Plan





Section A-A'

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Project: **N2 SLANE BYPASS AND PUBLIC REALM ENHANCEMENT SCHEME**

Title: Figure 1.4: CONCEPTUAL SITE MODEL SECTION A-A'

Drawing Number: GI6000

Status: A1

Rev: C01

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Assumptions for section B-B'

- Max cutting depth of road is approx 7.70m.
- Used nearest borehole locations and available geophysics data to infer ground conditions.
- The maximums one of Influence (ZOL) is 81.6m north and south of the cutting.

LEGEND

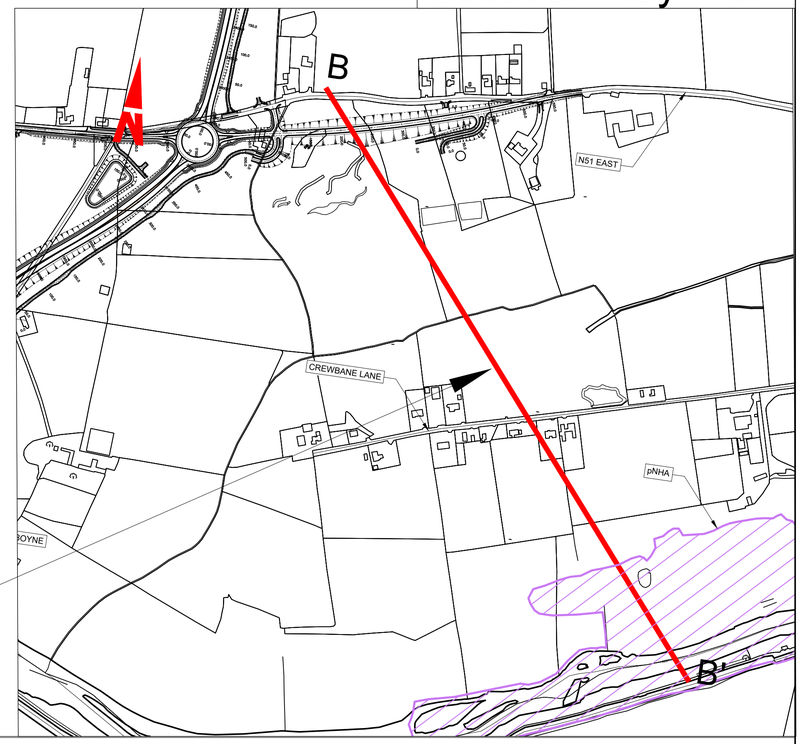
PROFILE
WITHIN GROUND INVESTIGATION LOGS

- TOPSOIL
- MADE GROUND
- CLAY
- SILT
- SAND
- COBBLES AND BOULDERS
- GRAVEL
- WEATHERED BEDROCK
- WATER STRIKE
- WATER STRIKE 20 MINUTES AFTER STRIKE

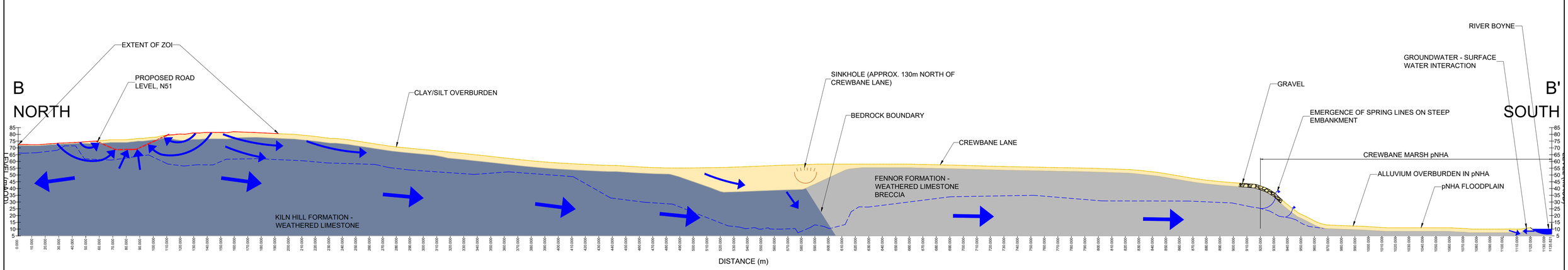
EXCLUDING LOGS

- EXISTING GROUND LEVEL
- PROPOSED ROAD LEVEL
- INFERRED GROUNDWATER LEVEL
- BEDROCK
- WEATHERED BEDROCK
- SUBSOIL
- FAULT INFERRED IN GEOPHYS. REPORT
- PREDOMINANTLY CLAY AND SILT OVERBURDEN
- CLAY-FILLED VERY WEATHERED LIMESTONE AND INTERBEDDED MUDSTONE
- VERY WEATHERED LIMESTONE AND SOME INTERBEDDED MUDSTONE
- WEATHERED LIMESTONE
- SLIGHTLY WEATHERED LIMESTONE
- PROPOSED NATURAL HERITAGE AREA (pNHA)

Location Key Plan



Cross-section location



Section B-B'

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Project **N2 SLANE BYPASS AND PUBLIC REALM ENHANCEMENT SCHEME**

Title Figure 1.5: CONCEPTUAL SITE MODEL SECTION B-B'

Drawing Number	Status	Rev
GI6000	A1	C01

Assumptions for section C-C'

- Max cutting depth of road is approx 11.60m.
- Nearest GI points located near section C-C' were used for the CSM model.
- Nearest groundwater level taken from BH305A, no other groundwater levels were taken at this time.
- Groundwater flow direction North-Northeast.

LEGEND

PROFILE
WITHIN GROUND INVESTIGATION LOGS

- TOPSOIL
- MADE GROUND
- CLAY
- SILT
- SAND
- COBBLES AND BOULDERS
- GRAVEL
- WEATHERED BEDROCK
- WATER STRIKE
- WATER STRIKE 20 MINUTES AFTER STRIKE

EXCLUDING LOGS

- EXISTING GROUND LEVEL
- PROPOSED ROAD LEVEL
- INFERRED GROUNDWATER LEVEL
- BEDROCK
- WEATHERED BEDROCK
- SUBSOIL
- FAULT INFERRED IN GEOPHYS. REPORT
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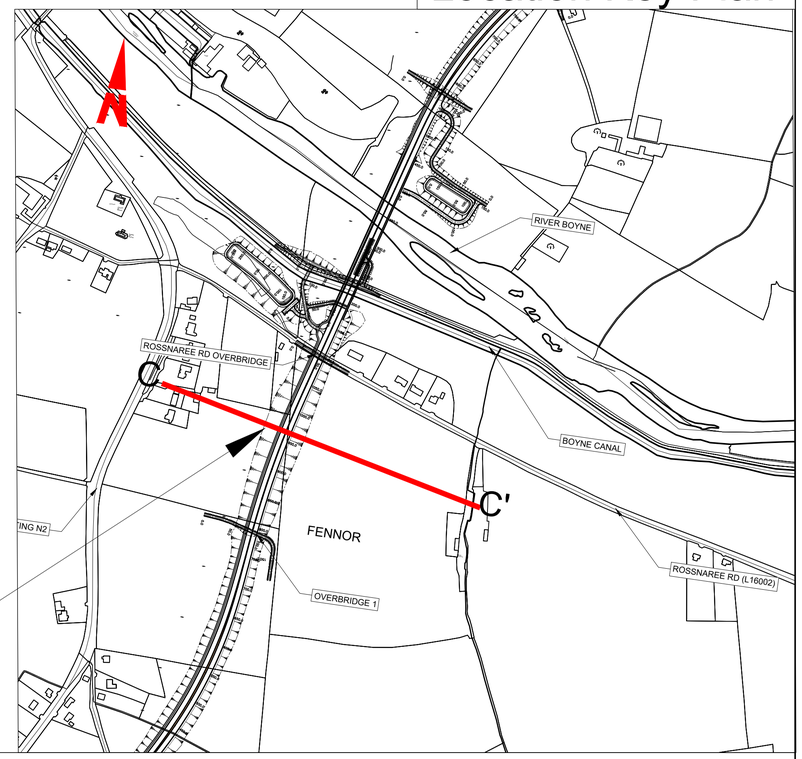
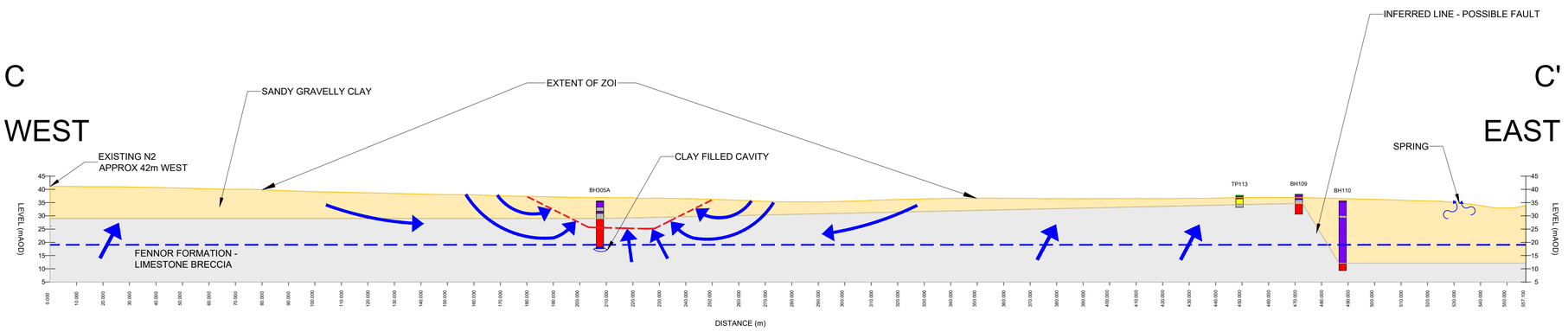
- CLAY-FILLED VERY WEATHERED LIMESTONE AND INTERBEDDED MUDSTONE
- VERY WEATHERED LIMESTONE AND SOME INTERBEDDED MUDSTONE
- WEATHERED LIMESTONE
- SLIGHTLY WEATHERED LIMESTONE
- PROPOSED NATURAL HERITAGE AREA (pNHA)

Location Key Plan



Cross-section location



Section C-C'

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Project: **N2 SLANE BYPASS AND PUBLIC REALM ENHANCEMENT SCHEME**
Title: Figure 1.6: CONCEPTUAL SITE MODEL SECTION C-C'

Drawing Number: GI6000
Status: A1
Rev: C01

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Assumptions for section D-D'

- Max cutting depth of road is approx 11.60m.
- Used nearest borehole locations and available geophysics data to develop inferred ground conditions.
- Inferred groundwater levels taken from RC/BH09, BH304, and BH305A.

LEGEND

PROFILE
WITHIN GROUND INVESTIGATION LOGS

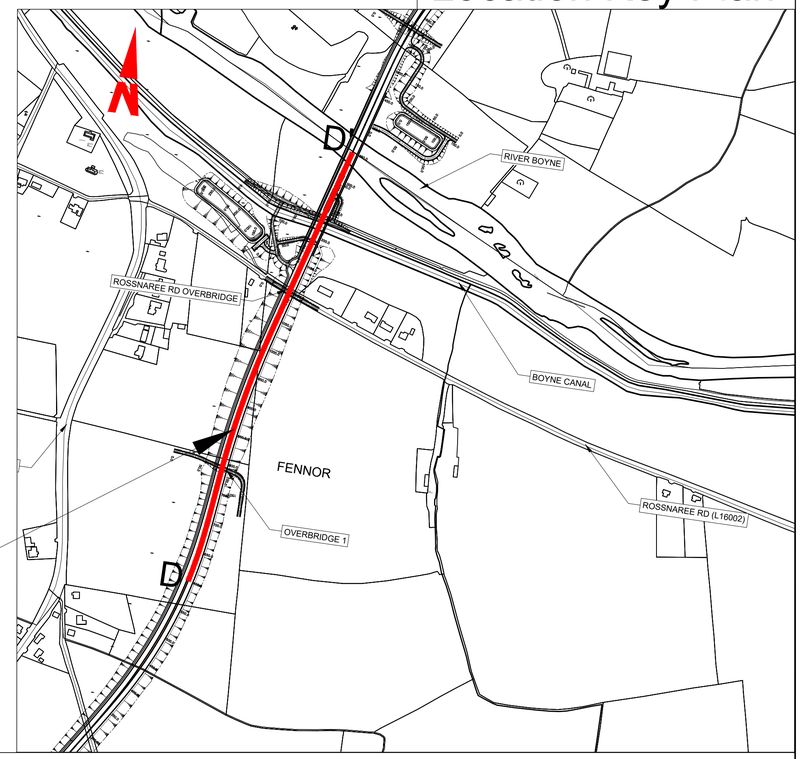
- TOPSOIL
- MADE GROUND
- CLAY
- SILT
- SAND
- COBBLES AND BOULDERS
- GRAVEL
- WEATHERED BEDROCK
- WATER STRIKE
- WATER STRIKE 20 MINUTES AFTER STRIKE

EXCLUDING LOGS

- EXISTING GROUND LEVEL
- PROPOSED ROAD LEVEL
- INFERRED GROUNDWATER LEVEL
- BEDROCK
- WEATHERED BEDROCK
- SUBSOIL
- FAULT INFERRED IN GEOPHYS. REPORT
- PREDOMINANTLY CLAY AND SILT OVERBURDEN
- CLAY-FILLED VERY WEATHERED LIMESTONE AND INTERBEDDED MUDSTONE
- VERY WEATHERED LIMESTONE AND SOME INTERBEDDED MUDSTONE
- WEATHERED LIMESTONE
- SLIGHTLY WEATHERED LIMESTONE
- PROPOSED NATURAL HERITAGE AREA (pNHA)

Cross-section location

Location Key Plan

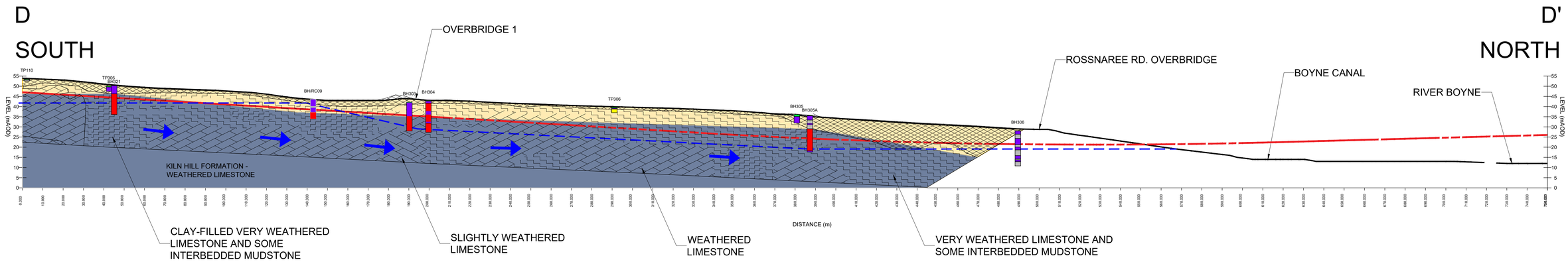


D

SOUTH

D'

NORTH



Section D-D'

Client

Bonneagar Iompair Éireann Transport Infrastructure Ireland
An Roinn Iompair Department of Transport
comhairle chontae na mí meath county council

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(v) All Levels refer to Ordnance Survey Datum, Malin Head.

Rev	Date	Drn Chk	Amendment / Issue	App
P01	26/11/24	MMCL HC	FOR REVIEW/COMMENT	EH

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File Identifier: MDT0806-RPS-01-N2-DR-C-GI6000

Scale: 1:200 @ A1, 1:400 @ A3

Created on: Nov 2024

Sheets: 04 of 04

Project: **N2 SLANE BYPASS AND PUBLIC REALM ENHANCEMENT SCHEME**

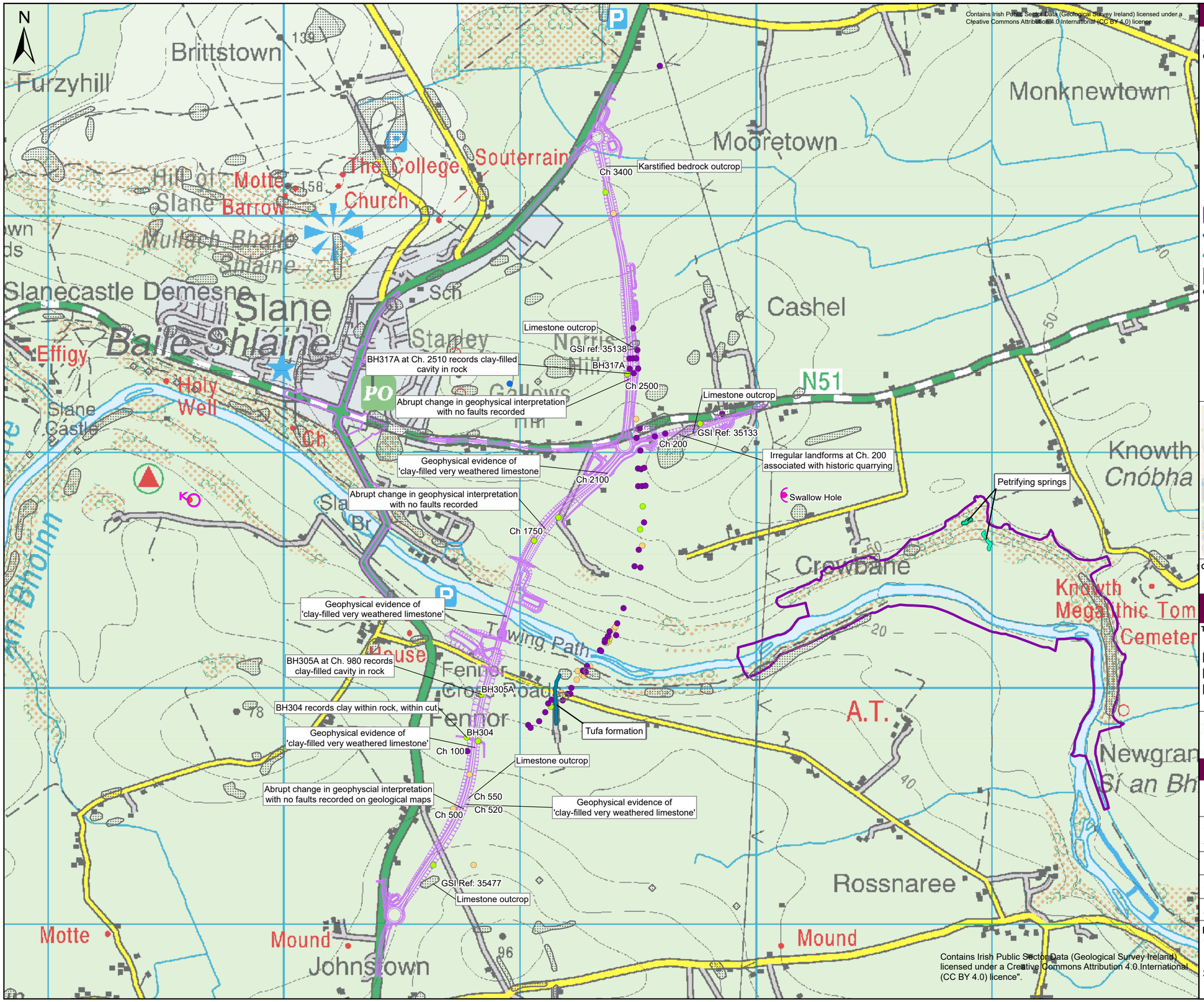
Title: Figure 1.7: CONCEPTUAL SITE MODEL SECTION D-D'

Drawing Number: GI6000

Status: A1

Rev: C01

S:\MDT0806_N2 Slane Bypass\8.0 Drawings\DGI\MDT0806-RPS-01-N2-DR-C-GI6000.dwg



Legend

- Proposed Scheme

GI Locations

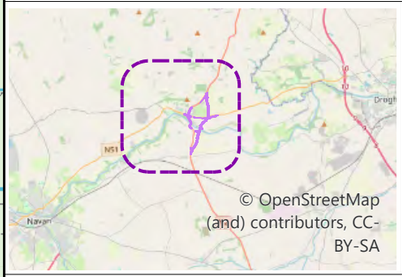
- Clay lined cavities and fractures and isolated weathering at depth
- Isolated weathering and destructed bedrock at depth
- Isolated weathering at depth
- Slight to moderate isolated weathering at depth
- Karst Borehole
- Swallow Hole
- Weathering at depth
- Crewbane Marsh pNHA
- Tufa formation
- Petrifying spring
- GSI Bedrock Outcrops

GSI Karst Features

- Borehole
- Swallow Hole

Data Source: GSI (2024)

0 0.15 0.3 0.6
Kilometres



Client
Meath County Council

N2 Slane Bypass and Public Realm Enhancement Scheme

Title

Figure 1.8: Potential and Confirmed Karst Features

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Issue Details

File Identifier:
MDT0806-RPS-00-N2-DR-Z-AG-4005

Status:	Rev:	Model File Identifier:
A1	C01	MDT0806-RPS-01-N2-M2-C-XM1001 MDT0806-RPS-01-PR-M2-C-XR9000

Drawn:	NR	**Date:**	11/12/2024
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Table 1-1: Karst Details

GI Location ID	X Coordinate (ITM)	Y Coordinate (ITM)	Ground Level Elevation (mOD)	Legend Description	Notes	Source
BH09	696707.6101	772753.3101	43.66	Slight to moderate isolated weathering at depth	--	IGSL Ltd. N2 Slane Bypass Ground Investigaiton actual Report, 2018
BH16	696434.5283	776350.0437	124.59	Slight to moderate isolated weathering at depth	--	IGSL Ltd. N2 Slane Bypass Ground Investigaiton actual Report, 2018
RC01	--	--	--	Slight to moderate isolated weathering at depth	--	IGSL Ltd. N2 Slane Bypass Ground Investigaiton actual Report, 2018
RC02	--	--	--	Slight to moderate isolated weathering at depth	--	IGSL Ltd. N2 Slane Bypass Ground Investigaiton actual Report, 2018
RC03	--	--	--	Isolated weathering at depth	--	IGSL Ltd. N2 Slane Bypass Ground Investigaiton actual Report, 2018
RC05	--	--	--	Isolated weathering at depth	--	IGSL Ltd. N2 Slane Bypass Ground Investigaiton actual Report, 2018
RC06	--	--	--	Isolated weathering at depth	--	IGSL Ltd. N2 Slane Bypass Ground Investigaiton actual Report, 2018
RC08	--	--	--	Isolated weathering at depth	--	IGSL Ltd. N2 Slane Bypass Ground Investigaiton actual Report, 2018
RC09	696707.61	772753.31	43.66	Clay lined cavities and fractures and isolated weathering at depth	--	IGSL Ltd. N2 Slane Bypass Ground Investigaiton actual Report, 2018
RC11	696935.59	773529.15	35.26	Isolated weathering at depth	--	IGSL Ltd. N2 Slane Bypass Ground Investigaiton actual Report, 2018
RC12	696734.64	772270.96	74.18	Clay lined cavities and fractures and isolated weathering at depth	--	IGSL Ltd. N2 Slane Bypass Ground Investigaiton actual Report, 2018
RC13	697250.64	772989.98	34.4	Isolated weathering at depth	--	IGSL Ltd. N2 Slane Bypass Ground Investigaiton actual Report, 2018
RC14	696887.6	774309.75	87.29	Weathering at depth	--	IGSL Ltd. N2 Slane Bypass Ground Investigaiton actual Report, 2018
RC15	--	--	--	Slight to moderate isolated weathering at depth	--	IGSL Ltd. N2 Slane Bypass Ground Investigaiton actual Report, 2018
RC16	696435.27	776.349.96	124.59	Weathering at depth	--	IGSL Ltd. N2 Slane Bypass Ground Investigaiton actual Report, 2018
2927SWK001	695530.32	773817.81		Slane PWS Well	GSI mapped feature - manmade, 2 No. wells, active abstraction, Slane PWS	GSI, Database, 2024
Swallow Hole	698050.11	773838.36		Swallow Hole	GSI mapped feature - unknown detail	GSI, Database, 2024
BH301A	696563.8	772270.2	69.35	Isolated weathering at depth	--	GII, 2021 Ground Investigation Report
BH302	696648.3001	772509.1001	59.4	Isolated weathering at depth	--	GII, 2021 Ground Investigation Report
BH303	696753.3	772795.6	42.12	Clay lined cavities and fractures and isolated weathering at depth	--	GII, 2021 Ground Investigation Report
BH304	696705.6001	772811.2001	42.94	Isolated weathering at depth	--	GII, 2021 Ground Investigation Report
BH305A	696768	772993	35.59	Clay lined cavities and fractures and isolated weathering at depth	--	GII, 2021 Ground Investigation Report
BH315	697094.1001	773742.8001	52.83	Clay lined cavities and fractures and isolated weathering at depth	--	GII, 2021 Ground Investigation Report
BH317	697363.1001	774349.9001	74.93	Isolated weathering at depth	--	GII, 2021 Ground Investigation Report
BH317A	697386.4	774350.3	73.83	Clay lined cavities and fractures and isolated weathering at depth	--	GII, 2021 Ground Investigation Report
BH318	697327.9001	775031.0001	78.64	Isolated weathering at depth	--	GII, 2021 Ground Investigation Report
BH319A	697294.1	775120.9	79.77	Isolated weathering at depth	--	GII, 2021 Ground Investigation Report
BH320	697694.8001	774140.3001	76.13	Isolated weathering at depth	--	GII, 2021 Ground Investigation Report
BH321	696717.3	772654.1	50.2	Isolated weathering at depth	--	GII, 2021 Ground Investigation Report
BH322	696991.3	773645.1	42.7	Clay lined cavities and fractures and isolated weathering at depth	--	GII, 2021 Ground Investigation Report
RC11	696935.59	773529.15	35.26	Isolated weathering at depth	--	IGSL Ltd. N2 Slane Bypass Ground Investigaiton actual Report, 2018
BH105	696866.84	772745.09	43.7	Isolated weathering at depth	--	2007

GI Location ID	X Coordinate (ITM)	Y Coordinate (ITM)	Ground Level Elevation (mOD)	Legend Description	Notes	Source
BH106	696929.4	772816.63	39.29	Isolated weathering at depth	--	
BH107	696966.2	772863.92	38.62	Slight to moderate isolated weathering at depth	--	
BH108	696976.27	772852.07	38.73	Slight to moderate isolated weathering at depth	--	
BH109	697012.49	772879.92	38.15	Slight to moderate isolated weathering at depth	--	
BH110	697038.4	772918.08	35.64	Slight to moderate isolated weathering at depth	--	
BH111	697061.88	772940.8	32.32	Isolated weathering and destructed bedrock at depth	--	
BH112	697050.75	772955.15	32.1	Slight to moderate isolated weathering at depth	--	
BH113	697112.15	772968.26	33.33	Slight to moderate isolated weathering at depth	--	
BH114	697133.51	772995.71	29.7	Slight to moderate isolated weathering at depth	--	
BH115	697064.83	772971.05	29.71	Slight to moderate isolated weathering at depth	--	
BH116	697107.7	773000.17	28.5	Clay lined cavities and fractures and isolated weathering at depth	--	
BH117	697144.64	772995.72	30.01	Slight to moderate isolated weathering at depth	--	
BH118	697149.12	773020.99	26.95	Slight to moderate isolated weathering at depth	--	
BH119	697171.83	773055.66	23.08	Clay lined cavities and fractures and isolated weathering at depth	--	
BH120	697176.04	773092.63	13.97	Clay lined cavities and fractures and isolated weathering at depth	--	
BH121	697193.88	773077.07	16.64	Clay lined cavities and fractures and isolated weathering at depth	--	
BH122	697202.78	773071.05	17.58	Clay lined cavities and fractures and isolated weathering at depth	--	
BH123	697197.82	773094.54	13.49	Slight to moderate isolated weathering at depth	--	
BH124	697203.35	773090.6	13.26	Slight to moderate isolated weathering at depth	--	
BH125	697210.65	773087.86	13.4	Slight to moderate isolated weathering at depth	--	
BH130	697215.62	773113.15	13.85	Slight to moderate isolated weathering at depth	--	
BH131	697228.73	773112.35	11.85	Clay lined cavities and fractures and isolated weathering at depth	--	
BH136	697270.45	773180.6	11.86	Slight to moderate isolated weathering at depth	--	
BH137	697275.25	773177.36	11.79	Slight to moderate isolated weathering at depth	--	
BH141	697290.2	773214.87	13	Slight to moderate isolated weathering at depth	--	
BH142	697298.22	773210.99	12.94	Clay lined cavities and fractures and isolated weathering at depth	--	
BH143	697291.67	773224.37	14.07	Slight to moderate isolated weathering at depth	--	
BH144	697299.06	773221.11	13.77	Isolated weathering and destructed bedrock at depth	--	
BH144A	697306.91	773217.36	13.74	Clay lined cavities and fractures and isolated weathering at depth	--	
BH144B	697303.94	773240.02	16.44	Slight to moderate isolated weathering at depth	--	
BH144D	697311.67	773233.7	15.97	Isolated weathering at depth	--	
BH145	697311.26	773260.33	21.6	Slight to moderate isolated weathering at depth	--	
BH146	697338.78	773244.13	19.74	Slight to moderate isolated weathering at depth	--	
BH147	697343.53	773294.54	23.61	Slight to moderate isolated weathering at depth	--	
BH148	697370.12	773358.79	31.62	Slight to moderate isolated weathering at depth	--	
BH149	697411.5	773461.21	45.43	Isolated weathering at depth	--	
BH150	697416.98	773536.19	52.5	Slight to moderate isolated weathering at depth	--	
BH151	697442.02	773531.12	52.42	Slight to moderate isolated weathering at depth	--	
BH152	697434.73	773606.24	54.3	Slight to moderate isolated weathering at depth	--	
BH153	697449.6	773623.45	54.95	Clay lined cavities and fractures and isolated weathering at depth	--	
BH154	697440.77	773692.43	58.23	Isolated weathering and destructed bedrock at depth	--	
BH155	697457.2	773722.11	60.04	Slight to moderate isolated weathering at depth	--	
BH156	697451.67	773790.04	63.01	Isolated weathering and destructed bedrock at depth	--	
BH157	697432.09	773875.55	64.85	Slight to moderate isolated weathering at depth	--	
BH158	697448.53	773875.87	65.38	Slight to moderate isolated weathering at depth	--	

GI Location ID	X Coordinate (ITM)	Y Coordinate (ITM)	Ground Level Elevation (mOD)	Legend Description	Notes	Source
BH159	697463.27	773877.51	65.95	Slight to moderate isolated weathering at depth	--	
BH160	697431.44	773950.4	64.97	Slight to moderate isolated weathering at depth	--	
BH161	697444.54	773947.62	65.98	Slight to moderate isolated weathering at depth	--	
BH162	697457.41	773953.14	67.05	Slight to moderate isolated weathering at depth	--	
BH163	697441.55	774026.53	64.79	Slight to moderate isolated weathering at depth	--	
BH164	697384	774070.29	62.22	Isolated weathering at depth	--	
BH165	697425.24	774080.54	63.28	Slight to moderate isolated weathering at depth	--	
BH166	697503.01	774086.54	68.79	Slight to moderate isolated weathering at depth	--	
BH167	697438.46	774119.64	64.96	Slight to moderate isolated weathering at depth	--	
BH168	697423.21	774160.17	66.54	Clay lined cavities and fractures and isolated weathering at depth	--	
BH169	697395.93	774373.03	74.84	Slight to moderate isolated weathering at depth	--	
BH170	697413.4	774353.98	73.12	Slight to moderate isolated weathering at depth	--	
BH171	697432.1	774373.67	73.66	Slight to moderate isolated weathering at depth	--	
BH172	697395.11	774416.22	75.74	Slight to moderate isolated weathering at depth	--	
BH173	697408.86	774416.57	75.45	Slight to moderate isolated weathering at depth	--	
BH174	697424.02	774416.7	75.3	Slight to moderate isolated weathering at depth	--	
BH175	697428.98	774452.38	73.02	Slight to moderate isolated weathering at depth	--	
BH176	697411.32	774544.78	65	Slight to moderate isolated weathering at depth	--	
BH194	697524.12	775656.01	88.2	Slight to moderate isolated weathering at depth	--	
BH195	697611.64	775980.94	90.34	Isolated weathering and destructed bedrock at depth	--	
BH197	697547.09	774098.75	72.51	Slight to moderate isolated weathering at depth	--	
BH199	697307.49	773237.07	16.28	Clay lined cavities and fractures and isolated weathering at depth	--	
BH200	697328.69	773269.44	22.43	Clay lined cavities and fractures and isolated weathering at depth	--	
BH201	697335.85	773280.12	22.88	Clay lined cavities and fractures and isolated weathering at depth	--	
BH202	697302.83	773235.39	15.68	Isolated weathering and destructed bedrock at depth	--	
BH203	697310.52	773229.26	15.11	Clay lined cavities and fractures and isolated weathering at depth	--	
BH301A	696563.8	772270.2	69.35	Isolated weathering and destructed bedrock at depth	--	GII, 2021 Ground Investigation Report
BH302	696648.3	772509.1	59.4	Clay lined cavities and fractures and isolated weathering at depth	--	GII, 2021 Ground Investigation Report
BH303	696753.3	772795.6	42.12	Isolated weathering and destructed bedrock at depth	--	GII, 2021 Ground Investigation Report
BH304	696705.6	772811.2	42.94	Isolated weathering and destructed bedrock at depth	--	GII, 2021 Ground Investigation Report
BH305A	696768	772993	35.59	Isolated weathering and destructed bedrock at depth	--	GII, 2021 Ground Investigation Report
BH315	697094.1	773742.8	52.83	Isolated weathering and destructed bedrock at depth	--	GII, 2021 Ground Investigation Report
BH317A	697386.4	774350.3	73.83	Isolated weathering and destructed bedrock at depth	--	GII, 2021 Ground Investigation Report
BH318	697327.9	775031	78.64	Clay lined cavities and fractures and isolated weathering at depth	--	GII, 2021 Ground Investigation Report
BH319A	697294.1	775120.9	79.77	Isolated weathering and destructed bedrock at depth	--	GII, 2021 Ground Investigation Report
BH320	697694.8	774140.3	76.13	Isolated weathering and destructed bedrock at depth	--	GII, 2021 Ground Investigation Report
BH321	696717.3	772654.1	50.2	Clay lined cavities and fractures and isolated weathering at depth	--	GII, 2021 Ground Investigation Report
BH322	696991.3	773645.1	42.7	Isolated weathering and destructed bedrock at depth	--	GII, 2021 Ground Investigation Report
ST1003	697788.37	774182.1	71.76	Slight to moderate isolated weathering at depth	--	GII, 2021 Ground Investigation Report
GSI Ref: 35477	696564	772190	--	Limestone outcrop	--	GSI Database, 2024
Chainage 500	696692	772509	--	Geophysical evidence of ‘clay-filled very weathered limestone	--	Minerex, 2004 Geophysical Survey
Chainage 520	696701	722527	--	Abrupt change in geophysical interpretation with no faults recorded on geological maps	--	Minerex, 2004 Geophysical Survey
Chainage 550	696711	772552	--	Limestone outcrop from Ch. 550 to Ch.750	--	GSI Database, 2024
BH304	696705.6	772811.2	--	• BH304 records clay within rock, within cut	--	GII, 2021 Ground Investigation Report

GI Location ID	X Coordinate (ITM)	Y Coordinate (ITM)	Ground Level Elevation (mOD)	Legend Description	Notes	Source
Chainage 100	696742	772768	--	Geophysical evidence of 'clay-filled very weathered limestone'	--	GII, 2021 Ground Investigation Report
BH305A	696768	772993	--	BH305A at Ch. 980 records clay-filled cavity in rock at 17.4 mbgl (6 m below toe of cut)	--	GII, 2021 Ground Investigation Report
GSI Ref: 35133	697664	774099	--	Limestone outcrop	--	GSI Database, 2024
Swallow Hole	698050.11	773838.36	--	There is a swallow hole recorded 300m south.	--	GSI Database, 2024
Chainage 200	697606	774094	--	There are irregular landforms within the earthworks footprint at Ch. 200. These may be associated with historic quarrying but will need to be investigated for possible karst.	--	Minerex, 2004 Geophysical Survey
Chainage 1750	697039	773694	--	Abrupt change in geophysical interpretation with no faults recorded on geological maps	--	Minerex, 2004 Geophysical Survey
Chainage 2100	697303	773930	--	Geophysical evidence of 'clay-filled very weathered limestone	--	GII, 2021 Ground Investigation Report
Chainage 2500	697409	774336	--	Abrupt change in geophysical interpretation with no faults recorded on geological maps	--	Minerex, 2004 Geophysical Survey
GSI ref: 35138	697407	774465	--	Limestone outcrop	--	GSI Database, 2024
BH317A	697386.4	774350.3	--	BH317A at Ch. 2510 records clay-filled cavity in rock at 11.4 mbgl to 14.2 mbgl	--	GII, 2021 Ground Investigation Report
Chainage 3400	6972977.00	775231	--	Karstified bedrock outcrop	--	GSI Database, 2024

Abbreviations Note	
GI	Ground Investigation
mOD	Metres above Ordnance Datum
mbGL	Metres below ground level
ID	Identification
ITM	Irish Transverse Mercator Coordinates
--	Indicates that no data was recorded

Sources
IGSL Ltd. N2 Slane Bypass Ground Investigation Factual Report, 2018
GII, 2021 Ground Investigation Report
GSI database https://www.gsi.ie/ accessed in 2024

N2

SOUTH OF BOYNE BRIDGE

PROPOSED N2 ALIGNMENT, SOUTH OF BOYNE BRIDGE CROSSING

LEGEND
PLAN - CUTTING DEPTHS

- 0-2m
- 2-4m
- 4-6m
- 6-8m
- 8-10m
- 10-12m

0.00m 40m 80m 120m 160m 200m
Scale Bar

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An Roinn Iompair Department of Transport
comhairle chontae na mi meath county council

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File Identifier: MDT0806- Cutting Depths Plan.dwg

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Created on: 27/11/24
Sheets: 01 of 05

Project: **N2 SLANE BYPASS AND PUBLIC REALM ENHANCEMENT SCHEME**

Title: FIGURE 1.9: CUTTING DEPTHS
N2 SOUTH, CH: 0m - 730m
SHEET 1 OF 5

Drawing Number: GI3001
Status: S1
Rev: P01

PROPOSED N2
SOUTH OF BOYNE BRIDGE

PROPOSED N2
SOUTH OF BOYNE
BRIDGE

RIVER BOYNE

PROPOSED RIVER
BOYNE BRIDGE

LEGEND
PLAN - CUTTING DEPTHS

- 0-2m
- 2-4m
- 4-6m
- 6-8m
- 8-10m
- 10-12m

0.00m 40m 80m 120m 160m 200m
Scale Bar

S:\MDT0806_N2 Slane Bypass\11.0 Submission to ABP\10. RFI Response\RFI Response Document\Item 3(c)_GWDTE\Crewbane Marsh pNHA\working docs\other\MDT0806- Cutting Depths Plan.dwg

Client

Bonneagar Iompair Éireann
Transport Infrastructure Ireland

An Roinn Iompair
Department of Transport

comhairle chontae na mi
meath county council

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27/11/24

Sheets
02 of 05

File Identifier
MDT0806- Cutting Depths Plan.dwg

Project
N2 SLANE BYPASS AND PUBLIC REALM ENHANCEMENT SCHEME

Title
FIGURE 1-10: CUTTING DEPTHS
N2 SOUTH, CH: 740m - 1470m
SHEET 2 OF 5

Drawing Number
GI3002

Status
S1

Rev
P01

PROPOSED N2

SOUTH TO BOYNE BRIDGE

PROPOSED N2 ALIGNMENT, NORTH OF BOYNE BRIDGE CROSSING

N51

TO SLANE

LEGEND
PLAN - CUTTING DEPTHS

- 0-2m
- 2-4m
- 4-6m
- 6-8m
- 8-10m
- 10-12m

0.00m 40m 80m 120m 160m 200m
Scale Bar

S:\MDT0806_N2 Slane Bypass\11.0 Submission to ABP\10. RFI Response\RFI Response DocumentItem 3(c)_GWDTE\Crewbane Marsh pNHA\working docs\other\MDT0806- Cutting Depths Plan.dwg

Client

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Sheets 03 of 05

Project **N2 SLANE BYPASS AND PUBLIC REALM ENHANCEMENT SCHEME**

Title FIGURE 1.11: CUTTING DEPTHS
N2 NORTH, CH: 1480m - 2200m
SHEET 3 OF 5

File Identifier MDT0806- Cutting Depths Plan.dwg

Drawing Number GI3003

Status S1

Rev P01

N51 ROUNDABOUT

PROPOSED N2 ALIGNMENT, NORTH OF BOYNE BRIDGE CROSSING

AREA OF FILL

LEGEND
PLAN - CUTTING DEPTHS

- 0-2m
- 2-4m
- 4-6m
- 6-8m
- 8-10m
- 10-12m

0.00m 40m 80m 120m 160m 200m
Scale Bar

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Sheets 04 of 05

Project **N2 SLANE BYPASS AND PUBLIC REALM ENHANCEMENT SCHEME**

Title FIGURE 1.12: CUTTING DEPTHS
N2 NORTH, CH: 2240m - 2840m
SHEET 4 OF 5

File Identifier MDT0806- Cutting Depths Plan.dwg

Drawing Number GI3004

Status S1

Rev P01

N51

TO SLANE

N51

TO M1/DROGHEDA

LEGEND
PLAN - CUTTING DEPTHS

- 0-2m
- 2-4m
- 4-6m
- 6-8m
- 8-10m
- 10-12m

0.00m 40m 80m 120m 160m 200m
Scale Bar

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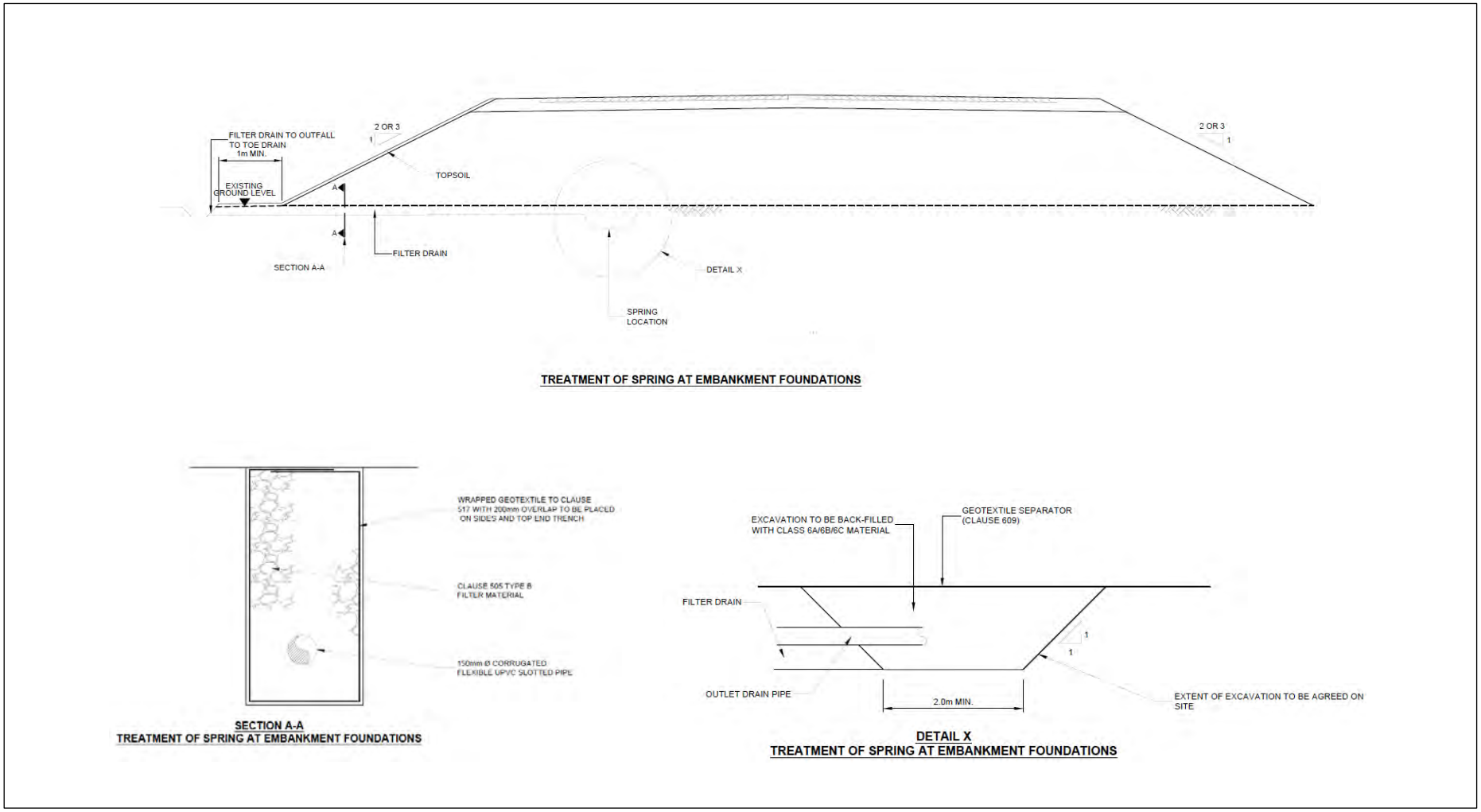
Sheets: 05 of 05

Project: **N2 SLANE BYPASS AND PUBLIC REALM ENHANCEMENT SCHEME**

Title: FIGURE 1.13: CUTTING DEPTHS N51 EAST, CH: 0m - 550m SHEET 5 OF 5

Drawing Number: GI3007
Status: S1
Rev: P01

Figure 1.14: Typical detail for Treatment of Spring at Embankment Foundations



1.1.3 Results of Further Assessment

1.1.3.1 CSM and CSM Sections

Based upon the desk study completed previously for the EIAR Chapter 18, and incorporating additional site-specific information as described in **Section 1.1** and physical characteristics of the pNHA Study Area, an understanding of the hydrogeological setting is set out in **Table 1-2**.

Table 1-2: Summary of Baseline Environment within the pNHA Study Area

Aspect	Description	Source
Topography	The general topography of the land falls towards the River Boyne, on both the northern and southern sides of the river. The lowest elevation of the Proposed Scheme is approximately 15mAOD at the River Boyne, this rises to approximately 70mAOD to the south of the Proposed Scheme and 80mAOD to the north of the Proposed Scheme. The topographic gradient is greatest approaching the River Boyne and becomes shallower with distance from the River Boyne.	GSI Topographic Viewer, Project LiDAR Mapping
Topsoil	Slane village is underlain by built land (Made Ground) and the River Boyne is underlain by alluvial mineral soils (AlluvMIN). The area South of the River Boyne is underlain by shallow well-drained (mainly acidic) mineral soil (AminSW), shallow well-drained (mainly basic) mineral soil (BminSW, with isolated regions of shallow poorly drained mineral soil – AminSP) and deep well-drained (mainly acidic) mineral soil (AminDW). Approximately 1 km south of the River Boyne are regions of deep well-drained (mainly basic) mineral soils (BminDW) and shallow well-drained (mainly basic) mineral soil (BminSW) in the rendzinas/lithosols soil group. North of the River Boyne there are more regions underlain by Made Ground. The soils underlying the area north-west of the River Boyne include AminDW with smaller areas of AminSW and BminSW. The soils underlying the area north-east of the River Boyne include BminDW with smaller areas of BminSW.	Teagasc Soils Map
Subsoil	The River Boyne is typically underlain by alluvium subsoils. To the south of the River Boyne there is an area sub-parallel to the River Boyne underlain by gravels derived from Lower Palaeozoic sandstones and shales (GLPSsS) and a larger area to the south comprised of till derived from Lower Palaeozoic sandstones and shales (TLPSsS). South of the TLPSsS are areas of till derived from limestone subsoil (TLs) and regions where bedrock outcrop or subcrop is at or close to the surface. There are also tills derived from Namurian sandstones and shales subsoils (TNSSs) south of the River Boyne. North of the River Boyne there are tills derived from TLPSsS and gravels derived from limestone subsoils (GLs) adjacent to the river. Further north of the river are tills derived from TLs and TLPSsS subsoils.	GSI Quaternary Mapping
Groundwater Vulnerability	The Proposed Scheme overlies regions of Moderate to Extreme groundwater vulnerability. Regions of High and Extreme groundwater vulnerability are common adjacent to the River Boyne. The existing N2 route through Slane village traverses across large regions of High and Extreme groundwater vulnerability. The proposed bypass route traverses across areas of Moderate, High and Extreme groundwater vulnerability, with the Moderate classification being in the northern-most and central parts of the scheme, and in small parts of the southern section of the route. The site investigation found topsoil and made ground underlain by alluvium, glaciofluvial terrace gravel, glacial till and coarse soil deposits between 0.4 m and 25 m prior to encountering rock. Groundwater was measured at the site between 1.6 m below ground level (bgl) and 17 mbgl, demonstrating a varied groundwater vulnerability across the site.	GSI Groundwater Vulnerability Map
Bedrock Geology	The site of the Proposed Scheme is underlain by interbedded bedrock which includes: • Boyne Formation – dark limestone and shale (Calp). • Mooretown Formation – Crinoidal wackestone-packstone beds.	GSI Bedrock Geology 100k Map

Aspect	Description	Source
	• Glaspistol Formation – black mudstone and quartzose greywacke. • Slane Castle Formation – Argillaceous bioclastic limestone and interbedded shales. • White Island Bridge Formation – Interbedded lapilli tuff, crystal tuffs, volcanic breccia, basic lavas, turbidite sandstones and graptolitic siltstones. • Hill of Slane Formation – Massive to bedded lapilli tuffs. • Navan Beds – dark limestone, mudstone, sandstone.Donore Formation – interbedded shale and subordinate basinal limestone. • Fennor Formation – Limestone breccias and pale grey, thickly bedded, coarse grained turbidites. • Loughshinny Formation – Dark micritic & calcarenite, shale. • Mattock Member – Intermittent slumps and boulder conglomerate beds among turbiditic calcerenites. • Kiln Hill Formation – Thickly bedded, shelf derived, pale grey, peloidal and crinoidal turbidites, with occasional micrites and interbedded shales. • Waulsortian Limestones – Dominantly pale grey, crudely bedded or massive limestone. • Knockerk Formation – This formation was originally separated into four members: a sandstone member consisting of tuffaceous sandstones with minor shales. The sandstones are locally fossiliferous, early Caradoc brachiopods. • Donore Formation – shale, sandstone, limestone.	
Groundwater Body	• Wilkinstown (IE_EA_G_010) • Trim (IE_EA_G_002) • Donore (IE_EA_G_021)	GSI Carrowmore East GWB Description
Recharge Coefficient	• The recharge coefficient ranges from 15-85% across the scheme. • North of the River Boyne: Weighted average of 30%. • South of the River Boyne: 75% (larger area of sands and gravels). • Weighted average of 52.5%.	GSI Groundwater Recharge Map
Aquifer	• Poor Aquifer -Bedrock which is Generally Unproductive except for Local Zones (Ll) • Locally Important Aquifer – Bedrock which is Moderately Productive only in Local Zones (Ll) • Locally Important Aquifer – Karstified (Lk) • Locally Important Aquifer – Bedrock which is Generally Moderately Productive (Lm)	GSI Aquifer Map

Recharge will penetrate the higher ground along the N51 where there is outcropping bedrock and where subsoils are thinnest and move to the area of lower elevation along the River Boyne.

Recharge will also penetrate the higher permeability gravels adjacent to the River Boyne. Such recharge will discharge to the River Boyne as baseflow and interflow. The GSI mapping classifies this overburden as high in terms of permeability with a recharge coefficient of 60-85%, corresponding to a vulnerability classification of Extreme (<3m of overburden cover).

Further north, between the River Boyne and the N51, the GI logs describe the limestone tills as slightly sandy, slightly gravelly clay or silty, indicating a less permeable subsoil which align with GSI mapping as a low permeability subsoil with a recharge coefficient of 15-25%, corresponding to a vulnerability classification of Moderate (5-10m of overburden cover restricting recharge where these deposits occur).

The soils overlying the limestone tills are a mixture of deep and well-draining podzolics and poorly draining surface and groundwater gleys. The surface water gleys overlying the limestone gravels are also shallow and poorly draining. For the purpose of this assessment a conservative high value of 52.5% has been selected which is based on a weighted average across the ZoC as a whole. Refer to EIAR Chapter 18, Figures 18.2 and 18.3 for mapping of soil and subsoil types.

While the bedrock of the Moorestown Formation and Fennor Formation are mapped as being a Locally Important Aquifers – karstified, bedrock underlying the proposed scheme is not shown to be highly karstified

and groundwater flow in the aquifer will be shallower and diffuse overall with groundwater flow occurring mainly along fractures. Refer to EIAR Chapter 18, Figure 18.4 for bedrock geology mapping.

According to the GI reports bedrock encountered in the Study Area included 53 No. locations of slight to moderate localised weathering, which was recorded as fractures infilled with clay. Instances of clay-filled cavities were recorded at 24 No. locations. Rarer instances of more extensive weathering and destructed bedrock were recorded at 15 No. GI locations.

In an unconfined aquifer the regional water table will generally reflect topography with groundwater generally flowing from areas of higher elevation to lower. Groundwater flow directions in karst can be unpredictable, however groundwater is expected to reflect topography and flow from areas of higher ground along the N51 to areas of lower lying ground and towards the River Boyne. This assumption is supported by contouring of groundwater strikes recorded during GI.

The groundwater elevations in the vicinity of the proposed road scheme were produced using water strike data recorded from GI locations. The water strike data shows that groundwater generally follows topography. Groundwater strikes were encountered between 10mOD and 80mOD at GI locations. Based on the recorded groundwater strikes groundwater flow across the northern and eastern portion of the scheme has been inferred to flow from the proposed scheme towards the south and the River Boyne. Groundwater flow in the southern portion of the scheme has been inferred to flow north towards and the River Boyne (see **Figure 1.2**).

As per the 4 No. conceptual site model (CSM) sections generated (2 No. north of the Proposed Scheme, 2 No. south of the Proposed Scheme) there is a significant distance from the extent of the ZoI at locations of maximum cutting (e.g. BH320) and the pNHA boundary. The ZoI is the maximum extent to which localised groundwater flows and levels will be affected. For example, in Section B-B' this distance is approx. 750 m. Both the identified location of the swallow hole (karst feature with greater potential for conduit flow) and the recently mapped tufa springs (within the pNHA) are also beyond the ZoI of the proposed realignment of the N51, north of the pNHA. The swallow hole feature receives local surface water runoff from a short ditch and will not be affected by the proposed road alignment and its cuttings. Based on the distance from the ZoI of the Proposed Scheme to the mapped tufa springs there will not be significant effects to the GWDTE either within or outside the pNHA.

1.1.3.2 pNHA Zone of Contribution

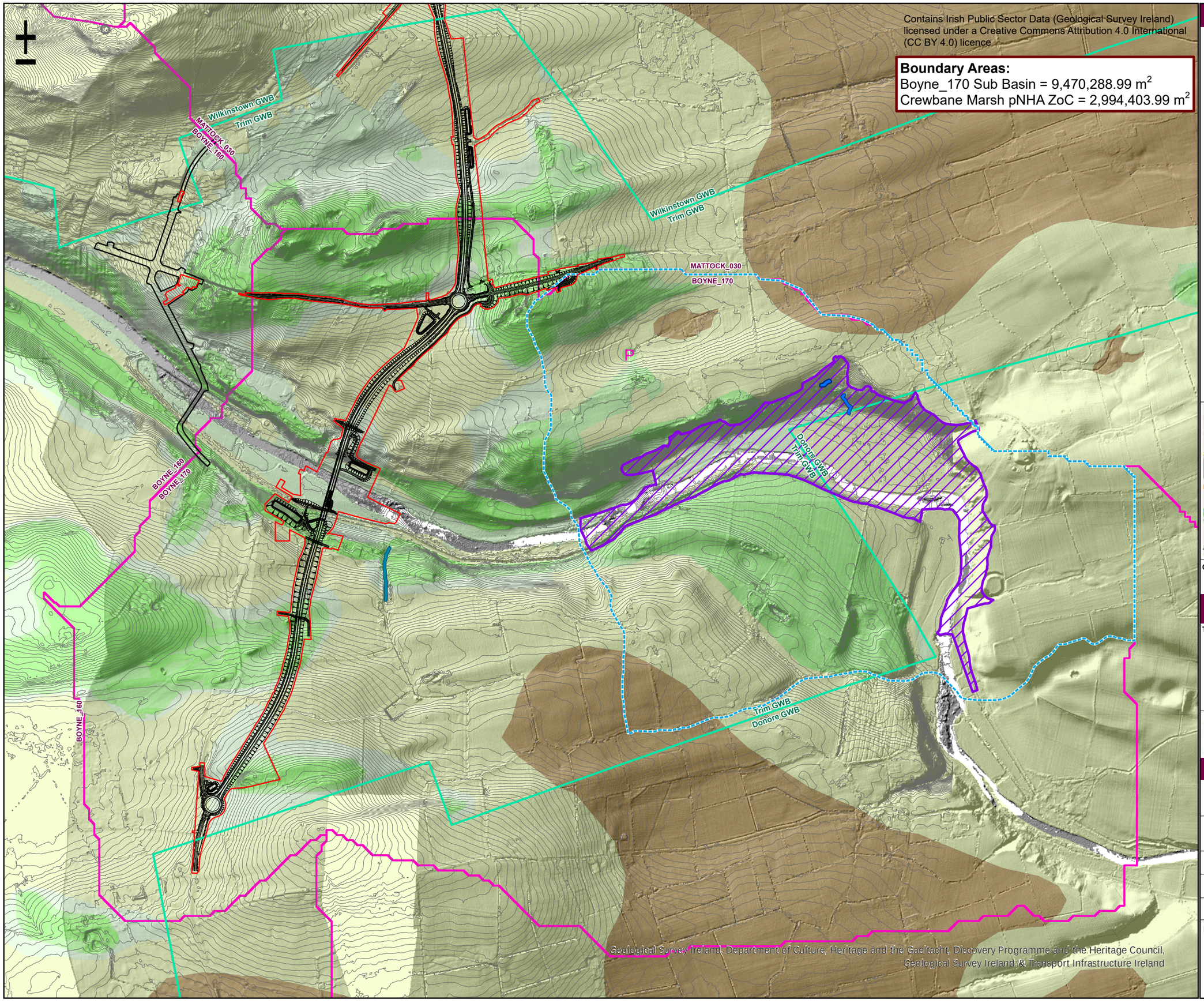
The Zone of Contribution (ZoC) is the catchment area required to support the groundwater needs of Crewbane Marsh pNHA. The size and shape of the ZoC is controlled by discharge, groundwater flow direction and gradient, subsoil and rock permeability and recharge to the area. With clear hydrogeological divides it is possible to define a ZoC using LiDAR mapping combined with data from the ground investigations (GI) undertaken (i.e., groundwater levels).

The northern boundary of the Boyne River Sub Basin represents the upgradient boundary (north of the pNHA). The southern boundary is defined by the groundwater divide mapped via water level and topographic contours (from LiDAR imagery). The eastern boundary of the Boyne River Sub Basin defines the eastern boundary of the ZoC. The western boundary of the ZoC is defined by mapping of groundwater contours and topography (via LiDAR imagery). The Boyne Catchment area upstream of the pNHA is 2,490 km^2 (see **Figure 1.1**).

From this assessment, the area of the ZoC for the pNHA is calculated as approx. 2.99 km^2 (2,994,404 m^2), as illustrated in **Figure 1.15**. This area represents the maximum potential ZoC approach and is the largest possible extent of upstream and downstream groundwater catchment that feeds towards the pNHA.

The total area of the Proposed Development boundary intersecting the ZoC (i.e., reduction in permeable area) is 3,241 m^2, corresponding to the proposed realignment area south of the N51. The total loss of permeable area for recharge within the ZoC is 0.11% of the existing area. This loss of recharge area due to the Proposed Scheme is not considered to affect the GWDTE within the pNHA. The ZoC for the floodplain section of the pNHA is relatively extensive in area at 2,490 km^2.

The ZoC north of the River Boyne is approx. 1.8 km^2 (1,834,138 m^2), and the ZoC south of the River Boyne is approx. 1.1 km^2 (1,160,266 m^2). In total, the pNHA ZoC represents the largest possible extent of groundwater recharge to the pNHA.



Legend

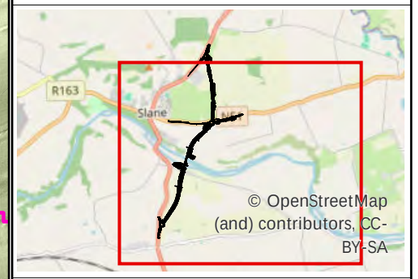
- Proposed Scheme
- Proposed Development Boundary
- ZOC
- Tufa formation
- Petrifying Spring
- Crewbane Marsh pNHA
- P — GSI Karst Feature (Swallow hole)
- WFD Groundwater Bodies
- WFD River Sub Basins

Average Recharge Range (mm/yr)

- 351-400
- 301-350
- 251-300
- 201-250
- 151-200
- 101-150
- 51-100
- 1-50

Data Source: Proposed Natural Heritage Areas (NPWS, 2015), GSI LiDAR (2017), GSI/TII LiDAR (2011), GSI GW Recharge (2024)

0 0.17 0.35 0.7 Kilometres



Client
Meath County Council

N2 Slane Bypass and Public Realm Enhancement Scheme

Title

Figure 1.15: pNHA Zone of Contribution

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Issue Details

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Status: A1	**Rev:** C01	**Model File Identifier:** MDT0806-RPS-01-N2-M2-C-XM1001 MDT0806-RPS-01-PR-M2-C-XR9000
Drawn: NR		**Date:** 03/12/2024
Checked: ND		**Scale:** 1:14,000 (A3)
Approved: NO'N		**Projection:** ITM

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1.1.3.3 Recharge and Water Balance Assessment

Aquifer Parameters

Published transmissivity values for a Lk aquifer from the Irish Aquifer Properties Manual are considered to be equivalent to the conduit karst sub-type (RKc). RKc aquifers which have a mean bulk transmissivity of 500m³/day. In theory, hydraulic conductivity (K) can be derived from transmissivity (i.e., transmissivity divided by the aquifer thickness) but in practice permeability can vary greatly with depth depending on the extent of fracturing with depth.

In the absence of site-specific permeability test data and as the bedrock is not thought to be highly karstified with groundwater flow in the aquifer dominated by fracture flow rather than conduit flow, a hydraulic conductivity in metres per second (m/s) of 1.0 x 10-5m/s (0.864 m/d) was selected based on K values for fractured limestone rock.

The GSI's Irish Aquifer Properties Reference Guide[6] was consulted as a sense check which gives a value of 5.5 x 10^{-6} m/s (0.48 m/d) for an Lk aquifer. The more conservative value (higher permeability) of 1.0 x 10^{-5} m/s was selected.

The hydraulic gradient to the north of the River Boyne is calculated from the recorded water strikes in BH320 along the N51 alignment and BH148 adjacent to the River Boyne, and groundwater level contouring. The groundwater flow path distance between these two boreholes is approximately 860m.

The hydraulic gradient to the south of the River Boyne is calculated from the recorded water strikes in BH121 and BH301A adjacent to the River Boyne, and groundwater level contouring. The groundwater flow path distance between these two boreholes is approximately 900m.

Saturated aquifer thickness is estimated from depth to bedrock and water strikes as being approximately 30m.

The hydrogeological characteristics of the underlying bedrock aquifer north and south of the River Boyne within the Study Area are summarised in **Table 1-3.**

Table 1-3: Aquifer Parameters

Area	Hydraulic Conductivity (m/d)	Change in Head Δh (m)	Groundwater Flow Path Δl (m)	Hydraulic Gradient Δh/Δl	Saturated Aquifer Thickness (m)
North of River Boyne	0.864	25.67	860	0.05	30
South of River Boyne	0.864	56.76	900	0.06	30

Climatic Data

Long term average rainfall (LTA) and potential evapotranspiration (PE) data was sourced from Met Éireann.

The closest rainfall and synoptic station to Slane is located at Dunsany, Co. Meath (approx. 19.0km to the southwest).

Assumed Actual Evapotranspiration (AE) = 0.95*PE, Effective Rainfall (ER) is calculated as ER = LTA-AE. The climatic data for the area is summarised in **Table 1-4**.

The recharge coefficient is a weighted average for the ZOC as a whole = 52.5%.

[6] Geological Survey Ireland (GSI). *Irish Aquifer Properties – A Reference Manual and Guide*. March 2015. Dublin.

Table 1-4: Regional Climatic Data

Parameter	Value (mm/year)	Source
Annual Rainfall	1260.1	Met Éireann. LTA covering the period of 1981-2010 at Dunsany.
Potential Evapotranspiration	530	Met Éireann. Average PE at Dunsany for the period 2021-2024.
Annual Actual Evapotranspiration	503.5	Assuming AE = 0.95*PE
Annual Effective Rainfall	756.6	LTA-AE
Annual Effective Recharge	397	Annual Effective Rainfall * Recharge Coefficient

Darcian Approach

To calculate the total inflow of groundwater (Q_{gw}) to the pNHA ZoC using Darcy's equation requires an estimate of the cross-sectional area of the aquifer (A), the hydraulic conductivity of the aquifer unit (k) and the hydraulic gradient, i (Δh/Δl). Q_{gw} has been calculated based on available water level data from the GI, for both sections of the pNHA ZoC north and south of the River Boyne (**Table 1-5**).

$$Qgw = k \times i \times A$$

where *A = saturated aquifer thickness x groundwater flowpath*.

ZoC North of River Boyne

A = 30m x 860m = 25,800m^2

Q_{gw} = 1,115m^3/day

ZoC South of River Boyne

A = 30m x 900m = 27,000m^2

Q_{gw} = 1,400m^3/day

Table 1-5: Groundwater Inflow – Darcian Approach

Location	Cross-Sectional Area [A] (m^2)	Saturated Aquifer thickness [b] (m)	Hydraulic Conductivity [k] (m/day)	Hydraulic Gradient [i]	Groundwater Inflow [Q_{gw}] (m^3/d)	Margin of Error (%)
ZoC - North of River Boyne	25,800	30	0.864	0.05	1,115	+/-10
ZoC -South of River Boyne	27,00	30	0.864	0.06	1,400	+/-10

Groundwater Recharge Approach

In order to validate the groundwater inflow to the pNHA estimate from the groundwater balance, a groundwater recharge model has been created using the approach set out by the Environmental Protection Agency (EPA) (2008)[7] and use of the simplified water balance equation as follows:

Total Recharge = Annual Precipitation x Recharge Coefficient x Catchment Area

The groundwater recharge rate has been calculated by estimating the percentage of total annual effective rainfall which contributes to groundwater flow. The higher recharge coefficient value for the ZoC south of the

[7] Environmental Protection Agency (EPA). 2008. STRIVE Report Series No. 6, Water Framework Directive – Recharge and Groundwater Vulnerability. EPA, Wexford.

River Boyne is due to a larger area of sands and gravels south of the river. This is based upon regional climatic data and the the GSI's groundwater recharge map (refer to **Table 1-4** above). The total groundwater recharge rate to the pNHA ZoC is approx. 3,256m³/d (**Table 1-6**).

Table 1-6: Groundwater Inflow – Groundwater Recharge Approach – Baseline

Location	Annual Effective Recharge (m/yr)	Recharge Factor	Maximum ZoC (m^2)	Total Recharge (m^3/d)	Margin of Error (%)
ZoC - North of River Boyne	0.227	0.3	1,834,138	1,140	+/-10
ZoC - South of River Boyne	0.567	0.75	1,160,265	1,802	+/-10
ZoC - Total	0.397	0.525	2,994,404	3,256	+/-10

It can be concluded that based on the delineated ZoC and cross-sectional area of the aquifer, the total groundwater recharge is approx. 3,256 m³/day for the pNHA ZoC (north and south of the River Boyne).

The groundwater recharge approach can be re-applied, as below in **Table 1-7**, based on a reduced ZoC / reduced recharge area as a result of loss of permeable ground, following construction of the Proposed Scheme. The area of permeable ground that will be lost in total, north of the Boyne Bridge, is approx. 274,906m^2. The area of permeable ground that will be lost in total, north and south of the Boyne Bridge, is approx. 439,298m^2.

The area of permeable ground lost within the pNHA ZoC is 3,241m^2. This area of land is north of the River Boyne, adjacent to the proposed N51 realignment, east of Slane. The recharge coefficient at this section of the N51 is 85% (0.85), therefore this value will be used to calculate AER for this portion of the ZoC.

Table 1-7: Groundwater Inflow – Groundwater Recharge Approach

Location	Annual Precipitation (m/yr)	Recharge Factor	Annual Effective Recharge (m/yr)	Loss of Permeable Ground* (m^2)	Loss of Recharge (m^3/d)	Margin of Error (%)
Total ZoC North & South of Boyne Bridge	0.756	0.525	0.397	439,298	478	+/-10
Total Area North of Boyne Bridge	0.756	0.30	0.227	274,906	171	+/-10
Total Area South of Boyne Bridge	0.756	0.75	0.567	164,392	255	+/-10
Area Within pNHA ZoC	**0.756**	**0.85**	**0.642**	**3,241**	**5.7**	**+/-10**

*Defined by Proposed Scheme Boundary

The water balance equation estimates a reduction in groundwater recharge of 5.7m³/d as a result of the loss of permeable ground within the delineated ZoC. This represents a negligible reduction in the overall groundwater recharge to the pNHA ZoC, a decrease of approximately 0.18%. The calculation is set out below:

$$Loss\ of\ Recharge = \frac{Recharge\ lost\ within\ pNHA\ ZoC}{Total\ recharge\ to\ pNHA\ ZoC} = \frac{5.7\ m3/d}{3{,}256\ m3/d} = 0.18\%$$

1.1.3.4 Presence of Karst Features

Additional identified karst landscape features (e.g., springs) and potential karst features (e.g., clay-filled voids) have been mapped by RPS as part of this further assessment (see **Figure 1.8**) and a table provided with details of all locations (**Table 1-1**).

Karstification within the Trim GWB is highly variable[8]. Within the ZoC the Kiln Hill Member (bedrock) is an impure limestone which occupies the ground along the N51, while the pure limestone of the Fennor Formation (bedrock) comprises the ground between Crewbane Lane and the pNHA. The mapped swallow hole is located at the boundary between these two formations. Karstification at the boundary of two rock types is often found due to percolation of mildly acidic water from the pure limestone giving rise to dissolution of the more impure limestones.

Based upon all available information, major subsurface karst formations and hence the presence of conduit flow is not considered significant within the pNHA ZoC. Apart from the mapped swallow hole and clay filled cavities, the ground investigation (GI) did not encounter large scale dissolution of the bedrock or conduits, indicating that karstification is less developed, and groundwater pathways are via shallow diffuse flow.

Where karst features are encountered during construction, there are a standard set of solutions to remediate the karst including skin friction piling and rock socketed piling. If significant karst features are encountered in cuttings then the designer will design remediation measures based on the specific type and geometry of the feature. **Figure 1.14** sets out a typical approach for a karst engineering solution of a spring at embankment foundation level, comprising provision of a geotextile wrap and filter drain connected to an outlet drainpipe.

1.1.3.5 Groundwater Flows and Contours

Groundwater conditions within the study area for this further assessment of potential for effects upon the pNHA are detailed in **Table 1-2**. Based upon GI data review and GSI reports groundwater flow in the Locally Important Aquifer – Karstified (Lk) is dominated by flows along fractures and fault lines.

North of the River Boyne, recharge will penetrate the local topographic high point just south of the existing N51 road where there is outcropping bedrock and where subsoils are thinnest. Groundwater will then follow topography and flow generally south-southeast towards the River Boyne. This is supported by recorded groundwater monitoring data, groundwater strike data, and groundwater contouring.

Full details of groundwater levels recorded during the previous ground investigations are provided in **Table 1-8**. Groundwater flow directions and levels are provided on **Figure 1.2**. Localised changes to groundwater flow paths resulting from construction of the Proposed Scheme are indicated on each of the 4 No. conceptual site models (CSMs) provided (**Figure 1.4 to Figure 1.7**).

GSI recharge mapping supports the assumption that recharge will also penetrate the higher permeability gravels adjacent to the steeply sloping wooded hillside within the pNHA, north of River Boyne. Previous studies in similar settings indicate that it is this shallow groundwater flow that gives rise to the occurrence of petrifying springs, rather than the deeper bedrock aquifer flow regime[9].

[8] Geological Survey Ireland (GSI). Trim Groundwater Body: Summary of Initial Characterisation.

[9] Denyer, J., Eakin, M., & Gill, M. (2023). Guidelines for the Assessment of Annex I Priority Petrifying Springs in Ireland. Irish Wildlife Manuals, No. 142, National Parks and Wildlife Service, Dept. of Housing, Local Government and Heritage, Ireland.

Table 1-8: Historic Groundwater Level Data

GI ID	Drilling Date	X Coordinate (ITM)	Y Coordinate (ITM)	Ground Level Elevation (mOD)	Water strike (mbGL)	Water strike (mOD)	Water strike (mbGL)2	Water strike (mOD)3	Install Details	Water Level (GII) 04/12/2020 mbGL	Water Level elevation (mOD) 1	Water Level (GII) 21/01/2021 mbGL	Water Level elevation (mOD)2	Data Source
BH09	15/02/2018-16/02/2018	696707.61	772753.31	43.66	2.00	41.66	6.40	37.26	None	--	--	--	--	IGSL Ltd. N2 Slane Bypass Ground Investigaiton actual Report, 2018
RC09	15/02/2018-16/02/2018	696707.61	772753.31	43.66	7.00	36.66	--	--	None	--	--	--	--	IGSL Ltd. N2 Slane Bypass Ground Investigaiton actual Report, 2018
BH301A	26/11/2020-26/12/202	696563.80	772270.20	69.35	2.25	67.10	--	--	None	3.37	65.98	2.25	67.1	GII, 2021 Ground Investigation Report
BH304	10/09/2020-01/12/2020	696705.60	772811.20	42.94	--	--	--	--	None	14	28.94			GII, 2021 Ground Investigation Report
BH305A	28/10/2020-30/10/2020	696768.00	772993.00	35.59	--	--	--	--	Temporary piezometer	--	--	16.55	19.04	GII, 2021 Ground Investigation Report
BH315	09/09/2020	697094.10	773742.80	52.83	--	--	--	--	Temporary piezometer	9.14	43.69	1.61	51.22	GII, 2021 Ground Investigation Report
BH317A	19/10/2020-22/10/2020	697386.40	774350.30	73.83	--	--	--	--	Temporary piezometer	11.42	62.41	7.92	65.91	GII, 2021 Ground Investigation Report
BH319A	15/10/2020-16/10/2020	697294.10	775120.90	79.77	--	--	--	--	Temporary piezometer	12.87	66.9	11.63	68.14	GII, 2021 Ground Investigation Report
BH105	30/01/2007-13/03/2007	696866.84	772745.09	43.7	2.20	41.50	--	--	None	--	--	--	--	
BH120	04/04/2007	697176.04	773092.63	13.97	6.70	7.27	--	--	None	--	--	--	--	
BH121	03/04/2007-04/04/2007	697193.88	773077.07	16.64	6.30	10.34	--	--	None	--	--	--	--	
BH122	10/04/2007-11/04/2007	697202.78	773071.05	17.58	1.20	16.38	--	--	None	--	--	--	--	
BH123	23/03/2007-27/03/2007	697197.82	773094.54	13.49	0.35	13.14	--	--	None	--	--	--	--	
BH124	27/03/2007-28/03/2007	697203.35	773090.60	13.26	1.20	12.06	--	--	None	--	--	--	--	
BH130	26/02/2007-12/03/2007	697215.62	773113.15	13.85	2.60	11.25	--	--	None	--	--	--	--	
BH131	27/02/2007-14/03/2007	697228.73	773112.35	11.85	0.60	11.25	--	--	None	--	--	--	--	
BH137	26/01/2007-14/03/2007	697275.25	773177.36	11.79	1.40	10.39	--	--	None	--	--	--	--	
BH141	25/01/2007-08/03/2007	697290.20	773214.87	13	2.60	10.40	--	--	None	--	--	--	--	
BH142	29/01/2007-05/03/2007	697298.22	773210.99	12.94	2.90	10.04	--	--	None	--	--	--	--	
BH143	31/01/2007-22/02/2007	697291.67	773224.37	14.07	4.20	9.87	--	--	None	--	--	--	--	
BH144	31/01/2007-27/02/2007	697299.06	773221.11	13.77	3.70	10.07	--	--	None	--	--	--	--	
BH144A	30/01/2007-01/03/2007	697306.91	773217.36	13.74	4.20	9.54	--	--	None	--	--	--	--	
BH144B	25/01/2007-21/03/2007	697303.94	773240.02	16.44	5.30	11.14	--	--	None	--	--	--	--	
BH144D	30/01/2007-15/02/2007	697311.67	773233.70	15.97	5.00	10.97	--	--	None	--	--	--	--	

GI ID	Drilling Date	X Coordinate (ITM)	Y Coordinate (ITM)	Ground Level Elevation (mOD)	Water strike (mbGL)	Water strike (mOD)	Water strike (mbGL)2	Water strike (mOD)3	Install Details	Water Level (GII) 04/12/2020 mbGL	Water Level elevation (mOD) 1	Water Level (GII) 21/01/2021 mbGL	Water Level elevation (mOD)2	Data Source
BH145	25/01/2007-17/02/2007	697311.26	773260.33	21.6	10.20	11.40	--	--	None	--	--	--	--	
BH146	25/01/2007-20/02/2007	697338.78	773244.13	19.74	9.80	9.94	--	--	None	--	--	--	--	
BH163	23/01/2007-01/03/2007	697441.55	774026.53	64.79	4.00	60.79	--	--	None	--	--	--	--	
BH164	22/01/2007-05/03/2007	697384.00	774070.29	62.22	2.70	59.52	--	--	None	--	--	--	--	
BH165	23/01/2007-01/03/2007	697425.24	774080.54	63.28	1.20	62.08	--	--	None	--	--	--	--	
BH169	09/01/2007-23/01/2007	697395.93	774373.03	74.84	2.70	72.14	--	--	None	--	--	--	--	
BH171	09/01/2007-29/01/2007	697432.10	774373.67	73.66	9.00	64.66	--	--	None	--	--	--	--	
BH172	10/01/2007-03/02/2007	697395.11	774416.22	75.74	3.30	72.44	--	--	None	--	--	--	--	
BH173	10/01/2007-01/02/2007	697408.86	774416.57	75.45	1.70	73.75	--	--	None	--	--	--	--	
BH174	10/01/2007-30/01/2007	697424.02	774416.70	75.3	10.50	64.80	--	--	None	--	--	--	--	
BH175	11/01/2007-02/02/2007	697428.98	774452.38	73.02	3.70	69.32	--	--	None	--	--	--	--	
BH176	11/01/2007-05/02/2007	697411.32	774544.78	65	2.60	62.40	--	--	None	--	--	--	--	
BH177	12/01/2007	697413.64	774611.41	64.18	3.00	61.18	--	--	None	--	--	--	--	
BH178	15/01/2007-16/01/2007	697405.14	774681.32	64.26	3.40	60.86	--	--	None	--	--	--	--	
BH180	17/01/2007-18/01/2007	697407.22	774794.86	66.9	5.00	61.90	--	--	None	--	--	--	--	
BH184	03/02/2007-04/04/2007	697426.42	775088.57	76.95	4.80	72.15	--	--	None	--	--	--	--	
BH185	24/01/2007-30/03/2007	697440.35	775105.91	76.19	3.90	72.29	--	--	None	--	--	--	--	
BH187	17/01/2007-18/01/2007	697448.25	775260.86	68.24	1.90	66.34	--	--	None	--	--	--	--	
BH188	12/02/2007	697460.00	775275.14	67.75	1.40	66.35	--	--	None	--	--	--	--	
BH189	07/02/2007-08/02/2007	697464.00	775324.29	68.8	3.00	65.80	--	--	None	--	--	--	--	
BH190	06/02/2007-07/02/2007	697463.95	775364.67	70.84	8.00	62.84	--	--	None	--	--	--	--	
BH191	06/02/2007	697474.36	775365.02	70.58	4.40	66.18	--	--	None	--	--	--	--	
BH192	13/02/2007	697487.33	775449.00	76.76	6.30	70.46	--	--	None	--	--	--	--	
BH193	01/02/2007	697489.33	775504.67	80.47	7.60	72.87	--	--	None	--	--	--	--	
BH200	11/04/2007-12/04/2007	697328.69	773269.44	22.43	12.20	10.23	--	--	None	--	--	--	--	
BH202	13/04/2007-16/04/2007	697302.83	773235.39	15.68	5.70	9.98	--	--	None	--	--	--	--	
BH203	18/04/2007-25/04/2007	697310.52	773229.26	15.11	5.50	9.61	--	--	None	--	--	--	--	
BH320	10/09/2020-24/09/2020	697694.80	774140.30	76.13	14.00	62.13	--	--	None	--	--	--	--	GII, 2021 Ground Investigation Report

Abbreviations Note	
GI	Ground Investigation
mOD	Metres above Ordnance Datum
mbGL	Metres below ground level
ID	Identification
ITM	Irish Transverse Mercator Coordinates
--	Indicates that no data was recorded

Sources
IGSL Ltd. N2 Slane Bypass Ground Investigation Factual Report, 2018
GII, 2021 Ground Investigation Report
GSI database https://www.gsi.ie/ accessed in 2024

1.1.3.6 Delineation of Zone of Influence of the Proposed Scheme

Based upon the methodology detailed in **Section 1.1.2** (*Sichardt*) for the cut sections, the maximum Zone of Influence (ZoI) for the Proposed Scheme is 100.6m at BH304. (The ZoI is the maximum extent to which localised groundwater flows and levels will be affected.) BH304 is located at Chainage (Ch.) 890-1040, on the south side of the Proposed Boyne Bridge crossing location (**Figure 1.16** below). The water strike at BH304 was recorded as 1.4mbgl, and the max cut depth is 12.0 m (i.e., head difference of 10.6m).

Figure 1.16: BH304 Location

The maximum ZoI for the proposed N51 realignment is 81.6m at BH320, located approximately 1.5km east of Slane Village (**Figure 1.17** below). The water strike at BH320 was recorded as 1.4mbgl, and the maximum cut depth is 8.3m (i.e., head difference of 6.9m).

Figure 1.17: BH320 Location

Table 1-9: ZoI Calculation for BH320 and BH304

Parameter	BH320	BH304	Units
C	3,000	3,000	n/a - constant
Hw	10	12	m
H	1.4	1.4	m
H-Hw	-8.6	-10.6	m
K	1.00E-05	1.00E-05	m/s
√K	3.16E-03	3.16E-03	m
R0	-81.59	-100.56	m

Figure 1.3 provides an overview of the ZoI applied as a buffer along the full length of the Proposed Scheme, varying in accordance with cut depths.

Based on the ZoI assessment the effects upon groundwater flow paths to Crewbane Marsh pNHA are considered negligible. The closest distance from the ZoI buffer to the pNHA is approximately 650m (south of the proposed N51 realignment). The distance from the maximum ZoI (100.6 m) at BH304 (south of the proposed Boyne Bridge crossing) to the pNHA is approx. 900 m.

The Proposed Scheme will not impact upon recharge to the mapped swallow hole (karst feature), as it is located approx. 270 m from the ZoI buffer. The swallow hole primarily receives surface water runoff via drainage from the surrounding fields to the north and east. There remains potential for connectivity between this swallow hole and the pNHA.

1.1.3.7 Additional Field Surveys

A site survey was carried out by RPS and Denyer Ecology on 5 November 2024 to assess whether there were any examples of the Annex I priority habitat "petrifying springs with tufa formation" or "alkaline fen" present within the pNHA and downgradient of the Proposed Scheme. The survey identified two (2 No.) areas of petrifying tufa springs within the pNHA. It concluded that these petrifying springs were examples of Annex I priority habitats; "petrifying springs with tufa formation" which "are in poor condition due to vegetation succession on the slope and animal trampling in the open area at the top of the slope". Locations of the confirmed petrifying springs are detailed in **Figure 1.18** and also in the attached Denyer Ecology report[10].

1.2 Regard to Unmapped Areas of Alkaline Fen Habitat in the Appropriate Assessment Screening

The receiving environment of the Proposed Scheme is outlined in Vol. 5 Appropriate Assessment, Section 4 of the Report to Inform Screening for Appropriate Assessment, and in Section 4 of the Natura Impact Statement. In response to this request for additional information an additional ecological site assessment, outside the described biodiversity zone of influence of the Proposed Scheme, was completed on 5 November 2024, led by botanical specialist Dr Joanne Denyer. The focus of this additional site assessment was groundwater dependant habitats within the River Boyne and River Blackwater SAC, from the existing N2 Slane bridge/Mill House to the western extent of the Crewbane Marsh pNHA. The upper floodplain and targeted sloped areas of the Crewbane Marsh pNHA were also assessed. Where land access was not permitted, reviewed desk study information was supplemented with visual searches, using binoculars, while on site.

1.2.1 Unmapped Fen

The report to Inform Screening for Appropriate Assessment identified alkaline fens [7230], upstream of the Proposed Scheme, in the vicinity of Lough Shesk, Freehan Lough and Newtown Lough in the upper reaches of the Stonyford River, near Delvin, Co. Westmeath.

During the additional ecological site assessment, previously unmapped alkaline fen was noted at the top of the slope, outside of the zone of influence of the Proposed Scheme (see **Figure 1.18**), within the Crewbane Marsh pNHA/River Boyne and River Blackwater SAC. This location may align with the brief description of "*Crewbane Complex*" containing "*seepage from higher ground to the north*", as described by Goodwillie (1992). No other location of alkaline fen habitat was noted from the additional ecological site assessment.

1.2.2 Confirmation of Tufa Springs in pNHA

Tufa springs were confirmed to be present within the Crewbane Marsh pNHA. These features are described as follows:

- In Crewbane Marsh pNHA there is an area of petrifying spring vegetation at the top of the slope (**Figure 1.18**). This has multiple springheads with paludal tufa. However, it is highly poached and trampled by animals. Below this, to the south-east, there is a petrifying spring/stream with strong cascade tufa

[10] Denyer Ecology. 5 November 2024. River Boyne petrifying spring and alkaline fen survey.

formation and good flow. The pH in the stream was 7.79 (within described range, as per Denyer *et al*., 2023). The stream discharges into the floodplain below. The spring is very overgrown, but positive indicator species are present in open areas as listed below.

- At least six positive indicator species for Annex I priority petrifying spring habitat (Denyer *et al*., 2023) were present in the petrifying spring areas in the survey area: common stonewort (*Chara vulgaris*), long-stalked yellow-sedge (*Carex lepidocarpa*), carnation sedge (*Carex panicea*), red fescue (*Festuca rubra*), curled hook-moss (*Palustriella commutate*), butterwort (*Pinguicula vulgaris*).
- Both petrifying spring areas are examples of the Annex I priority habitat "*petrifying springs with tufa formation*" but are in poor condition due to vegetation succession to a grass dominated sward on the slope and animal trampling in the open area at the top of the slope.

Figure 1.18: Ecology Survey Area in Crewbane Marsh pNHA

In addition, a dry stream bed with tufa formation was noted c. 250 m west of the proposed crossing of the River Boyne (see **Figure 1.19**). This feature is described as follows:

- A is a dry stream bed where there is cascade tufa formation on rocks within the stream bed. The presence of bare soil and the aquatic moss, long-beaked water feather-moss (*Rhynchostegium riparioides*), suggests that there is occasional flow in this stream. However, most of the vascular plant and bryophyte species recorded in the stream bed were non-wetland (terrestrial) species.
- Only one positive indicator species for Annex I priority petrifying spring habitat (Denyer *et al*., 2023) was recorded: olive beard-moss (*Didymodon tophaceus*).
- The stream was followed upstream where there is a culvert under the road. This was also dry and had old cascade tufa formation present. To the south of the road, the stream channel remained dry until c. 115 m upstream from the road culvert. Here a pond has been created to the east of the track into which most of the stream flow is diverted. Above the diversion the stream has good flow and a pH of 7.9 (within described range, as per Denyer *et al*., 2023), suggesting a strong groundwater influence. Tufa was present in the channel in this location and the petrifying spring positive indicator species endive Pellia (*Pellia endiviifolia*) was present in small amounts.
- This stream is not considered to be an example of the Annex I priority habitat "*petrifying springs with tufa formation*" as there is only seasonal flow, and wetland and petrifying spring positive indicator species are rarely present. The stream flow has been heavily modified, but it is not known whether petrifying spring vegetation was present prior to the modification. This stream channel is located approx.

145m beyond the eastern extent of the ZoI. There will therefore be no significant effect upon stream flow from the Proposed Road construction.

Figure 1.19: Tufa formation Outside of Crewbane Marsh pNHA

1.2.3 Engagement with BSBI Recorder

An information request was sent to the Botanical Society of Britain & Ireland (BSBI) vice county recorder for Co. Meath. The response received was the following:

"*This site represents one of the last remaining floodplain marshes on the banks of the River Boyne. The slope above the marsh is covered by one of the best examples of deciduous woodland in the Boyne valley. Such slopes have the potential for water flushes to occur. All habitats at the site require detailed up-to-date surveys of their flora and fauna conducted by suitably qualified ecologists during appropriate seasons. Flora surveys need to be conducted during both early and late summer when the vascular plants are evident and not during the winter months when such plants are not evident.*"

The description and information provided by the BSBI vice county recorder corresponds to the information obtained during the additional ecological site assessment and desk study. It was noted during the site assessment that the majority of the habitats present within lower levels of Crewbane Marsh pNHA were mainly influenced by the function of the floodplain (see **Section 1.1.1)**.

1.3 Conclusion Regarding Screening for AA and Natura Impact Assessment

Annex I quality alkaline fen habitat and tufa springs were identified within the Crewbane Marsh pNHA. An area of non-Annex I tufa formation was identified outside the pNHA to the south of the River Boyne. No other Annex I quality alkaline fen or tufa springs were noted elsewhere within the additional ecological site assessment area. There is no potential for the groundwater flow paths or recharge to Crewbane Marsh pNHA, or the tufa formation outside the pNHA, to be altered as a result of the Proposed Scheme. This has been confirmed through hydrogeological assessment (see **Section 1.1**). As such, the approach taken, assessment made, and conclusion reached when considering the likely significant effects within the report to inform AA screening are not altered. The likelihood of a significant effect to occur with regard to both alkaline

fen and tufa spring can be excluded. Therefore, no amendments to mitigation measures, outlined within the Natura Impact Assessment, are required.

Appendix C1 Denyer Ecology Survey Report

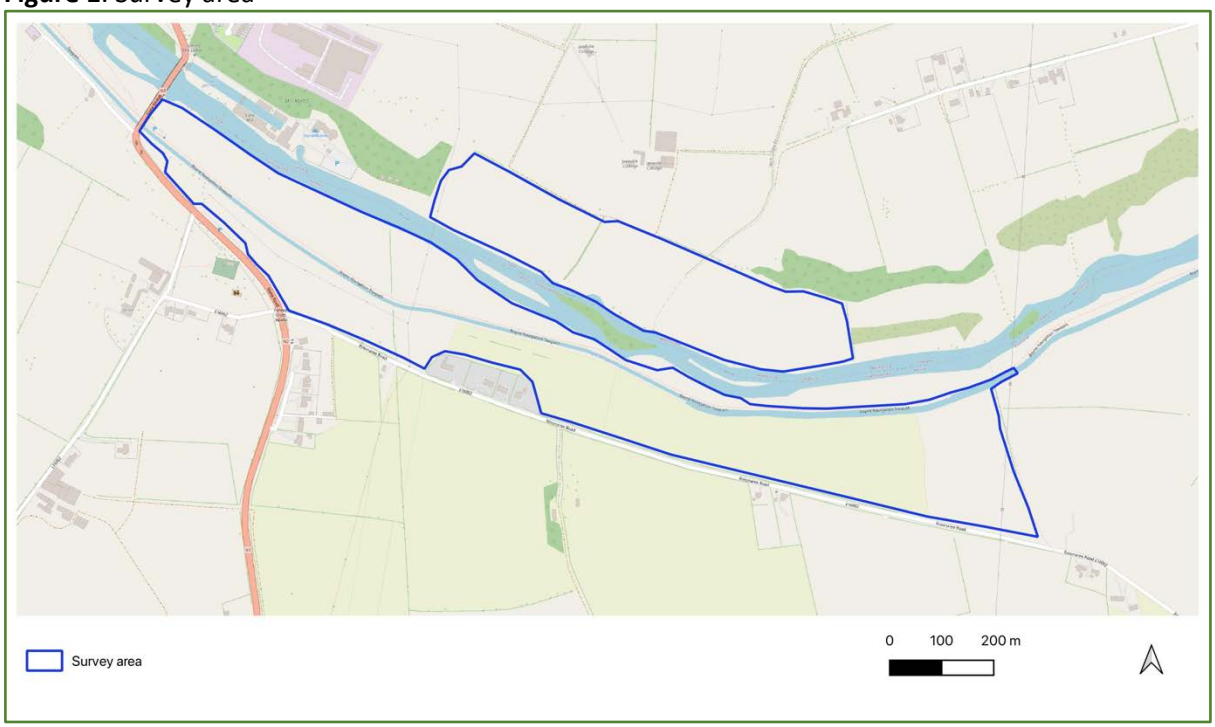
To: Miles Newman (RPS)
From: Dr Joanne Denyer (Denyer Ecology)
Date: 06/11/24
Subject: River Boyne petrifying spring and alkaline fen survey 2024

Survey

This site was visited in early November 2024 to assess whether there were any examples of the Annex I priority habitat 'Petrifying springs with tufa formation' [*7220], or 'alkaline fen' [7230] present. The main survey area is shown in Figure 1. In addition, Crewbane Marsh pNHA (site code 000553) was surveyed in an area where there was a potential spring (Figure 2).

Within the survey area, land was directly accessed and walked over where possible. Where access was not possible (e.g. no landowner permission, cattle in field, flooded land), the area was viewed from a close vantage point. This was only suitable where there was good visibility of the land (e.g. open short grassland). Only areas where it was considered possible to assess for the presence of alkaline fen or petrifying spring are included in the mapped survey areas in Figures 1 and 2.

Figure 1. Survey area



Maps © Thunderforest, Data © OpenStreetMap contributors

Figure 2. Crewbane Marsh pNHA survey area

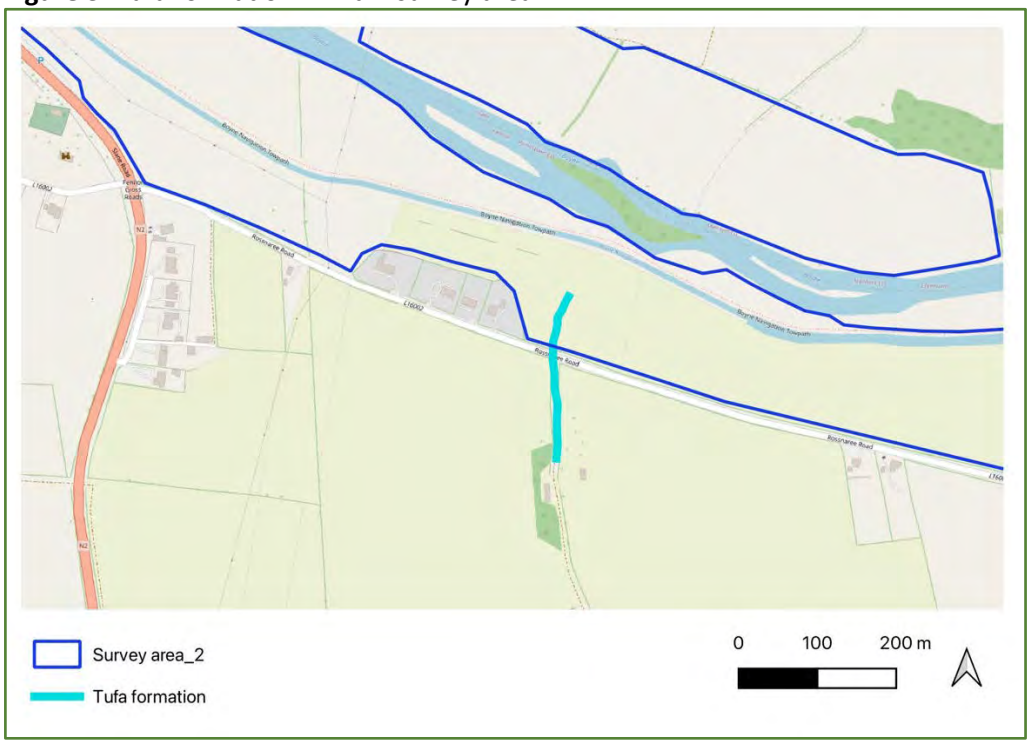
Maps © Thunderforest, Data © OpenStreetMap contributors

Main survey area

Within the main survey area, tufa was recorded in one location (Figure 3). This is a dry stream bed where there is cascade tufa formation on rocks within the stream bed (Photographs 1 and 2). The presence of bare soil and the aquatic moss *Rhynchostegium riparioides* suggests that there is occasional flow in this stream. However, most of the vascular plant and bryophyte species recorded in the stream bed were non-wetland (terrestrial) species. Only one positive indicator species for Annex I priority petrifying spring habitat (Denyer et al., 2023) was recorded (*Didymodon tophaceus*). The stream was followed upstream where there is a culvert under the road (Photograph 3). This was also dry and had old cascade tufa formation present. To the south of the road, the stream channel remained dry until *c.* 115m upstream from the road culvert. Here a pond has been created to the east of the track into which most of the stream flow is diverted. Above the diversion the stream has good flow and a pH of 7.9, suggesting a strong groundwater influence. Tufa was present in the channel in this location and the petrifying spring positive indicator species *Pellia endiviifolia* was present in small amounts.

This stream is **not considered** to be an example of the **Annex I priority habitat 'petrifying springs with tufa formation**' as there is only seasonal flow, and wetland and petrifying spring positive indicator species are rare. The stream flow has been heavily modified, but it is not known whether petrifying spring vegetation was present prior to the modification.

Figure 3. Tufa formation in main survey area



Maps © Thunderforest, Data © OpenStreetMap contributors

Photograph 1. Old cascade tufa in dry stream channel, largely vegetated with non-wetland species (view to south, upstream)

Photograph 2. Tufa within dry stream channel

Photograph 3. Culvert under road with old cascade tufa formation (view to south)

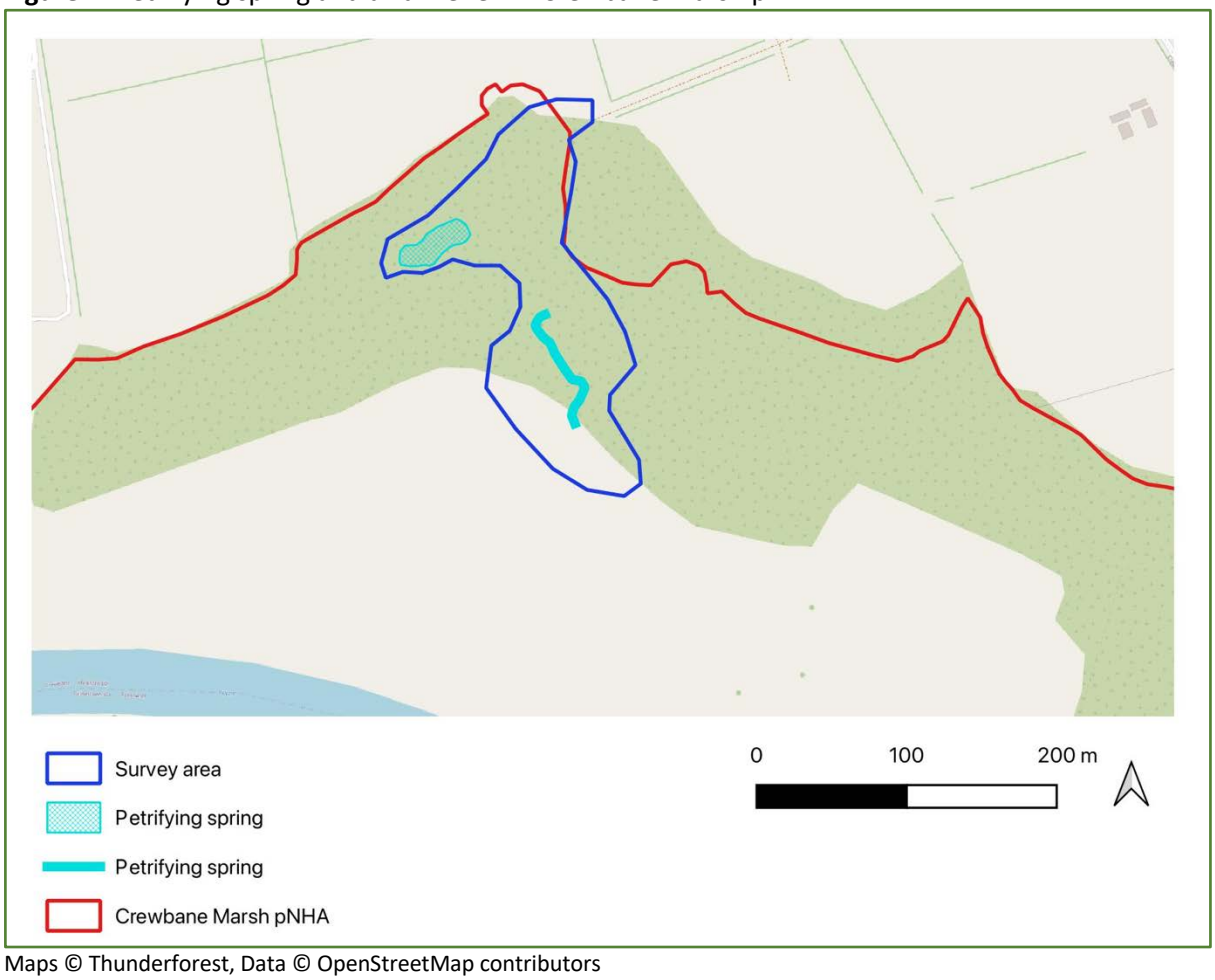
Crewbane Marsh pNHA

In Crewbane Marsh pNHA there is an area of petrifying spring vegetation at the top of the slope (Figure 4). This has multiple springheads with paludal tufa (e.g. Photograph 4). However, it is highly poached and trampled by animals. Below this, to the south-east, there is a petrifying spring/ stream with strong cascade tufa formation (e.g. Photograph 5) and good flow. The pH in the stream was 7.79. The stream discharges into the floodplain below. The is very overgrown, but positive indicator species are present in open areas.

At least six positive indicator species for Annex I priority petrifying spring habitat (Denyer et al., 2023) were present in the petrifying spring areas in the survey area: *Chara vulgaris, Carex lepidocarpa, Carex panicea, Festuca rubra, Palustriella commutata, Pinguicula vulgaris*.

Both petrifying spring areas **are** examples of the **Annex I priority habitat 'petrifying springs with tufa formation**', but are in poor condition due to vegetation succession on the slope and animal trampling in the open area at the top of the slope.

Figure 4. Petrifying spring and alkaline fen in Crewbane Marsh pNHA



Maps © Thunderforest, Data © OpenStreetMap contributors

Photograph 4. Petrifying spring with charophytes and paludal tufa in Crewbane Marsh pNHA

Photograph 5. Cascade tufa in petrifying spring/ stream in Crewbane Marsh pNHA

Relevant expertise

Dr Joanne Denyer is a highly experienced botanist and bryologist with over 20 years' experience of ecological survey and research. She specialises in botanical, wetland and bryological survey in the Republic of Ireland. She is a national expert on Annex I priority habitat petrifying springs and has worked on a wide range of projects and sites in relation to this habitat. This includes detailed site survey, assessment and monitoring, habitat management, Ecological Impact Assessment, pre and post construction monitoring, acting as an expert witness on calcareous springs at Oral Hearing and providing advice to county councils and NPWS. In 2018 (Denyer et al, 2018) and 2024 she assisted National Parks and Wildlife Service (NPWS) in the latest Article 17 reporting on Petrifying springs to the European Commission. The 2024 assessment included a national survey of petrifying spring sites across Ireland. She is the lead author of new guidance on petrifying spring assessment and monitoring (Denyer et al., 2023).

References

Denyer, J., Eakin, M., & Gill, M. (2023). Guidelines for the Assessment of Annex I Priority Petrifying Springs in Ireland. *Irish Wildlife Manuals*, No. 142. National Parks and Wildlife Service, Department of Housing, Local Government and Heritage, Ireland.

Appendix D
Barn Owl Survey (2024) Results

N2 SLANE BYPASS AND PUBLIC REALM ENHANCEMENT SCHEME

Barn Owl Survey 2024 Report

MDT0806
December 2024
MDT0806-RPS-00-N2-RP-Z-0177

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1 INTRODUCTION

Meath County Council (MCC), under the auspices of Transport Infrastructure Ireland (TII), are developing a bypass of Slane Village to address a sub-standard section of the existing N2 National Primary Route. The Proposed Scheme also encompasses public realm enhancements and traffic management measures within Slane Village, together with works on the N51 between the proposed bypass and the centre of the village. The collective elements together make up the N2 Slane Bypass and Public Realm Enhancement Scheme, hereinafter referred to as the 'Proposed Scheme'.

Since the submission of the EIAR, RPS was commissioned by MCC to undertake barn owl surveys within a 5 km buffer of the Proposed Scheme with reference to TII guidelines[1]; as detailed in **Section 2** of this report. This report outlines the methodology and results of the barn owl surveys undertaken.

Barn owl are protected under the EU Birds Directive (79/409/EEC), as transposed into Irish Law through the Wildlife Acts 1976-2018, the EC (Birds and Natural Habitats) (Restrictions on use of Poison Bait Regulations) 2010 and the EC (Birds and Natural Habitats) Regulations 2011-2015. This legislative framework provides for the protection of all wild birds and their nests, eggs and young including barn owl, which are red listed under the Birds of Conservation Concern in Ireland (Gilbert, Stanbury and Lewis, 2021) and are noted within TII's publication (2021) as having "*suffered serious population declines in recent decades*".

[1] Transport Infrastructure Ireland (April 2021) *Survey and Mitigation Standards for Barn Owls to inform the Planning, Construction and Operation of National Roads Projects*. RE-ENV-07005

2 METHODOLOGY

2.1 Survey Methodology

The surveys were conducted with reference to the TII's published *Survey and Mitigation Standards for Barn Owls to inform the Planning, Construction and Operation of National Road Projects* (TII, 2021). The surveys were also cognisant of the findings of the Meath County-wide survey for Barn Owls completed during 2023[2].

The surveys were conducted by suitably qualified and experienced members of the RPS ecology team, always under the supervision of a team member who holds the relevant licence to examine, inspect or take the nests or eggs of protected wild birds for educational, scientific or other purposes (License No. 002/2024). The relevant survey phases are outlined in detail under the below headings.

2.1.1 Desk Study

As per reference to the TII guidance, a 5 km buffer of the Proposed Scheme was selected as the study area, see **Figure 2.1**. Published sources, including NBDC and the 2023 Meath County Barn Owl Survey Report, were analysed, while there was also consultation with MCC, BirdWatch Ireland (BWI) and the NPWS.

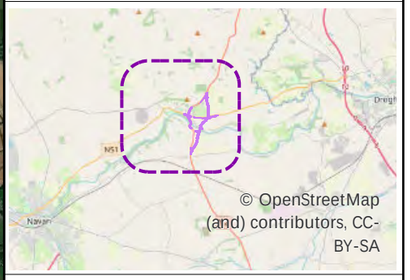
[2] Bird Watch Ireland (November 2023). *Barn Owl Population Status and Trends in County Meath*. Report prepared on behalf of Meath County Council.

Legend

- Proposed Scheme
- 5km Buffer

Data Source:

0 0.5 1 2
Kilometres



Client
Meath County Council

N2 Slane Bypass and Public Realm Enhancement Scheme

Title

Figure 2.1: Study area of barn owl survey

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Issue Details

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2.1.2 Phase One – Building and Structure External Appraisal

The entirety of the Proposed Scheme and the 5 km buffer were driven with a surveyor in the passenger seat to keep notes, with all buildings being assessed visually and externally from the roadside or other public vantage points to determine their suitability for breeding barn owls.

TII's guidance notes: "*Buildings shall be classed as 'unsuitable' if there are no nesting opportunities for Barn Owls. Most modern and occupied dwellings will be unsuitable for Barn Owls and can be quickly ruled out on inspection to ensure that there are no artificial nesting sites associated with the building, blocked chimneys or access to the roof space or other suitable cavities. Buildings shall be considered 'potentially suitable' if they provide nesting opportunities for Barn Owls which include any cavities or other dry, dark and secluded spaces with a floor space greater than 30cm x 30cm (Taylor 1994) and access point of approximately 7cm x 7cm or greater (Barn Owl Trust 2012), which can include blocked chimneys, roof spaces, wall cavities, chutes and any other cavities which meet these specifications*."

From this Phase One survey, buildings/structures noted from the roadside inspection as having *potential suitability* were identified as requiring Phase 2 internal surveys. Those which were marked as unsuitable did not require any further action.

2.1.3 Phase Two – Building and Structure Internal Assessment

For buildings (where landowner access was granted) considered to be *potentially suitable* for breeding barn owls, a thorough day-time inspection was carried out between August and September to record the presence of signs indicating barn owl occupancy, including pellets, white-wash, and moulted feathers. All areas of the interior and exterior of the building which were safe to access were checked, with particular attention to the ground under suitable cavities, chimneys and perches both inside and outside the building, and the entrance to potential nesting or roosting sites. Areas where there was a build-up of white-wash were to be inspected for additional signs to inform species identification.

While onsite with landowners, surveyors asked if there were any artificial barn owl boxes onsite and if the landowner had ever seen a barn owl onsite. Barn owl boxes, where present, were inspected for signs indicating the presence of barn owls.

Where all areas of a site were accessed and a thorough inspection yielded no signs indicating the presence of barn owls, the site was classed as *unoccupied* and excluded from further survey effort.

Where it was not possible to access all areas of the site and/or signs which could be attributed to barn owl (feathers, pellets and/or white-wash) were identified, these sites were identified as requiring nocturnal surveys.

2.1.4 Phase Three – Nocturnal Surveys

Nocturnal surveys involved observing a *potentially suitable*, *suitable* or *active* barn owl site from a selected vantage point during nocturnal hours, when the birds are active, in order to establish occupancy and breeding status based on observations, vocalisations and/or behaviour of birds associated with the site. Nocturnal surveys were carried out in September from a discrete vantage point to avoid disturbance to birds.

Infrared cameras (Canon XA60) and thermal scopes (Pulsar Thermal Imaging scope Axion 2 XG35) were used to aid in the detection of barn owl, with cameras pointed at the structure in question and multiple cameras used if multiple entry/exit points were noted onsite. The use of this thermal equipment is included for in the licence from NPWS (License No. 002/2024).

Nocturnal surveys were conducted in calm and dry conditions, for three hours, commencing 30 minutes prior to sunset.

Where evidence of breeding is confirmed, the site was recorded as a *breeding site* and there is no requirement for further visits unless necessary to obtain information on breeding success. Where nocturnal surveys produce no evidence of barn owls, then the site was considered as *unoccupied*.

3 RESULTS

3.1 Desk Study

NBDC records held one sighting of barn owl within the study area for the last ten years. The record was from Balrenny, in December 2019, *c.* 2.5 km north of the Proposed Scheme.

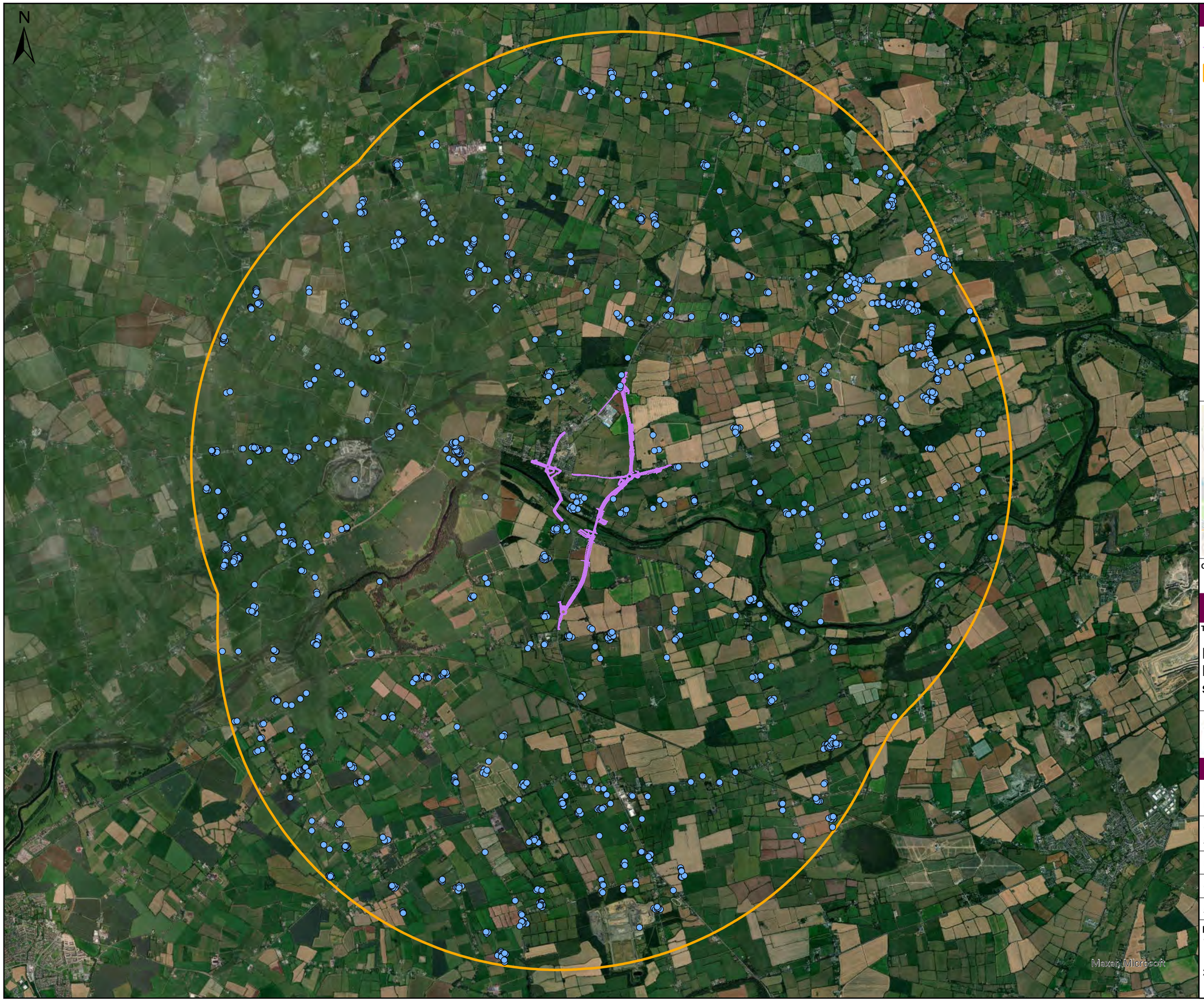
NPWS responded to the consultation to say they "*do not hold any data on breeding Barn owl centrally in NPWS*" but referred to the Meath County Barn Owl Survey Report.

MCC shared confidential results from their 2023 Meath County Barn Owl Survey Report, which showed the closest barn owl sighting was *c.* 6.5 km from the Proposed Scheme and therefore outside the 5 km buffer used by RPS surveys as per TII guidance. Given this data is confidential, the exact location is not disclosed in this report.

BirdWatch Ireland did not respond to a consultation request, with attempts made in August and October 2024.

3.2 Phase One – Building and Structure External Appraisal

Of the 3,584 buildings/structures identified within the 5 km buffer of the Proposed Scheme, 1,343 were flagged as having potential for suitability and requiring internal inspections. The majority of these were sheds which could not be viewed fully from the roadside. 2,241 were noted as not suitable and no further action was required for these; see **Figure 3.1**.



Legend

- Proposed Scheme
- 5km Buffer
- Barn Owl Potentially Suitable Sites

Data Source:

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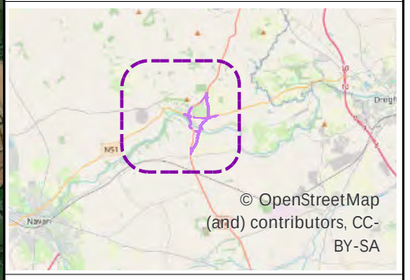
Kilometres



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N2 Slane Bypass and Public Realm Enhancement Scheme

Title

Figure 3.1: Phase One potentially suitable structures

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3.3 Phase Two

3.3.1 Building and Structure Internal Assessment

Of the 1,343 structures flagged as having potential for suitability during the Phase One survey:

- 544 structures were on lands where at least two attempts were made by surveyors to gain access. This involved two site visits and leaving a letter for landowners to explain the survey and requesting they contact MCC to organise access to allow for the survey. These landowners did not respond to MCC to organise access for survey, and as such, land was not surveyed due to lack of access. All reasonable efforts to gain access were made.
- Surveyors were denied access to 16 of the structures noted as potentially suitable from Phase One.
- 757 structures were found not to be suitable for barn owl upon internal inspection i.e. there were no suitable nesting opportunities within the surveyed structure.
- 26 were found to be *potential suitable* (where full access was not available e.g. unstable roof etc) or *suitable* i.e. there were suitable nesting opportunities identified within the surveyed structure; see **Figure 3.2**.

N

Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

Legend

- Proposed Scheme
- 5km Buffer
- Barn Owl Potentially Suitable Sites

Data Source:

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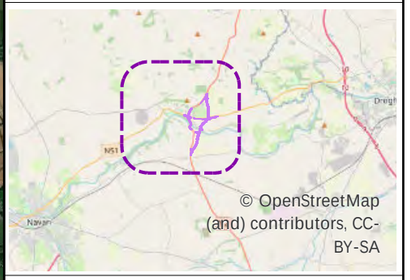
Kilometres



Client
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N2 Slane Bypass and Public Realm Enhancement Scheme

Title

Figure 3.2: Phase Two potentially suitable structures

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Issue Details

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3.3.2 Anecdotal Evidence

Resulting from the surveyors' interactions with landowners during the Phase Two surveys, anecdotal evidence of barn owl sighting were recorded. While pieces of anecdotal evidence for barn owl from landowners were recorded, the majority of landowners surveyors talked to stated they had not seen owls in the area for 10-20 years. Of those that have more recent "sightings", upon further questioning, most seem to be hearing pigeons in wooded areas or seeing long-eared owls (brown owls vs white owls). Where a few individuals said they saw white owl chicks, from describing sound, or in a few rare occasions where they had videos, they turned out to be long-eared owl chicks. **Table 3-1** contains pieces of more recent "evidence" from landowners who were considered by the surveyors to know what barns owls look/sound like upon further questioning:

Table 3-1: Summary of viable anecdotal evidence for barn owl to date

General location description	Distance to Proposed Scheme	Anecdotal evidence
West of Slane Bridge but just south of River Boyne	1 km to existing bridge. 1.5 km to the proposed bridge.	When landowners moved to site, they found a dead barn owl chick and feathers in their hayshed. Hayshed was repurposed, but to mitigate this two barn owl boxes were erected. No owls were ever noted using the boxes and as such were moved to the copse of trees north of the buildings. Surveyors only could see one box onsite during the Phase Two surveys and no signs were noted of owl presence. In 2013 landowner saw a barn owl flying down the road from the property from the reception and reported it to BWI. There is a derelict cottage under an old horse chestnut tree onsite. No suitable nesting opportunities for barn owl were observed during the Phase Two surveys.
Farmlands east of Proposed Scheme and north of River Boyne	3.7 km to existing bridge. 3.1 km to the proposed bridge. 2.7 km to closest point of the redline boundary.	Landowner of farm informed surveyors, last year he had barn owl chicks sat on a fence on his farm calling out to adults begging for food. Landowner believed owls were nesting in trees to the southwest of farm, on a property along the River Boyne. Landowners at this property were not home any of the three times we visited. From the car, surveyors observed large trees with diameters suitable for owls but no cavities were noted, nor were any barn owl nest boxes.
Farmland west of Proposed Scheme and south of River Boyne	2.8 km to existing bridge. 2.2 km to the proposed bridge. 2 km to closest point of the redline boundary.	Landowner's daughter claimed to have seen barn owls following harvesters last autumn in a field northwest of the house by her own property. Note, this is <1 km from the above Farm where barn owl chicks were said to be spotted last year by the landowner.

As such, none of these anecdotal pieces of evidence appear to be within 500 m of the Proposed Scheme and therefore, the mitigation specific to barn owl nesting within the vicinity of the Proposed Scheme are not deemed to be required; see **Figure 3.3**.

N

Maxar, Microsoft

Legend

- Proposed Scheme
- 5km Buffer
- Anecdotal Evidence

Data Source:

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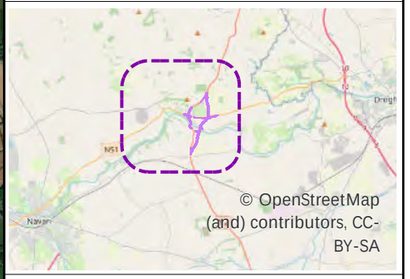
Kilometres



Client
Meath County Council

N2 Slane Bypass and Public Realm Enhancement Scheme

Title

Figure 3.3: Anecdotal evidence within 5km of proposed works

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3.4 Phase Three – Nocturnal Surveys

Of the 26 structures found to be *potential suitable* (where full access was not available, e.g. unstable roof etc) or *suitable* i.e. there were suitable nesting opportunities identified within the surveyed structure:

- 12 contained no signs (white-wash, pellets, feathers) of nesting/roosting barn owl and were classified as *unoccupied*.
- 13 were not fully accessible and therefore required nocturnal surveys.
  - Of these 13, seven nocturnal surveys went ahead and did not record any barn owl and were therefore classified as *unoccupied*;
  - two belonged to OPW who did not respond to letters or follow up emails requesting nighttime access; and
  - four belonged to three landowners who were visited by surveyors three times to request access, with letters dropped requesting they contact MCC to allow surveys to be scheduled. Landowners did not reply to these letters and these four structures were not surveyed as a result.
  - One house was noted as having "signs" outside their barn owl box onsite. During the Phase 2 inspection, surveyors found white feathers (note by surveyors as not likely to be barn owl given colouring) and a pellet on a fence outside the box (again, noted by surveyors as not likely to be barn owl given colour, shape and contents (it looked heavy in grains); see **Figure 3.4**). These were sent for DNA testing. The feather came back to be woodpigeon *Columba palumbus.* Common pipistrelle *Pipistrellus pipistrellus* remains were identified in the pellet. While barn owls are known to eat bats, given the shape, size and consistency of the pellet (see **Figure 3.4** below), it is not considered to be attributable to barn owl. Despite this, surveyors tried to organise a nocturnal VP onsite. However, the property was visited three times in an attempt to organise this and the landowner did not respond to any of the letters dropped onsite requesting they contact MCC to organise access.

Figure 3.4: Image of pellet found on 12/08/2024 outside a barn owl box near Slane

3.5 Survey Limitations

It is noted that these surveys were carried out outside of the survey period of mid-March to mid-July as per TII's publication (2021). These surveys were carried out from mid-July to the end of September. While this lies outside of this TII defined survey season, it is noted within TII's publication (2021) that barn owl "*can have an extended breeding season and may have second broods, so the timing of breeding can vary*". The Barn Owl Trust[3] and BirdWatch Ireland[4] note the barn owl breeding season as "March to August", with reports, such as the BBC's report[5] on a late brood in Co. Down fledging in December of 2023. In addition, it is considered that given that the surveys were completed just outside the defined survey period, evidence of roosting and/or breeding would still have been clear and evident at the time the surveys were completed.

While the surveys were carried out from mid-July to the end of September, there is still validity to them given the possibility of late broods, second broods and the extensive area covered in this survey would have resulted in signs such as nests, roosts, white-wash, pellets and/or feathers given the nests would have been in dark, sheltered, secluded spaces.

[3] https://www.barnowltrust.org.uk/barn-owl-facts/barn-owl-nesting/#:~:text=Eggs%20in%20March%20are%20now,than%20older%2C%20more%20experienced%20birds. Accessed October 2024.

[4] https://birdwatchireland.ie/app/uploads/2021/01/Barn-Owl-information-and-conservation-advice-booklet-_For-Web.pdf Accessed October 2024.

[5] https://www.bbc.com/news/uk-northern-ireland-67916306 Accessed October 2024.

4 CONCLUSION

There were no signs of barn owl during the 2024 survey period.

There were no sightings of barn owl, no nests or roosts found within the structures searched in the Study Area, and no signs of barn owl such as feathers, pellets or while-wash. Using the anecdotal evidence of breeding and foraging barn owl to the east of the Proposed Scheme, this puts the closest records of barn owls at c. 2 km away from the closest point of the redline boundary.

There are no known nests being directly affected by the development and none which could be affected indirectly through habitat loss or disturbance foraging territories.

If the unverified anecdotal evidence (refer to **Section 3.3.2**) is to be treated as fact and therefore a precautionary approach adopted, it would trigger the requirement for mitigation as laid out in Section 3 of TII's (2021) publication. This would involve implementing mitigation to reduce barn owl mortality on roads. Section 3.2 *Barn Owl Mitigation Measures in the Landscape Treatment* outlines how "*A natural barrier of dense shrub and tree line should be provided in the wider verge adjacent to the immediate roadside verge to serve as buffer to: (i) focus the foraging activities of birds further from the road, (ii) reduce the wake effect of HGVs, and (iii) deflect the flight path of Barn Owls which are crossing the road above the height of vehicles".* Upon review of the landscape plan designed for the Proposed Scheme, the proposed landscape plan is consistent, as far as reasonably practical, with TII's mitigation for barn owls, balanced with other landscape design, safety and maintenance considerations set out by TII, and no further action is deemed required.

5 REFERENCES

Barn Owl Trust (2012) *Barn Owl Conservation Handbook*, Pelagic Publishing, Exeter.

Forman, R.T.T., Sperling, D., Bissonette, J.A., Clevenger, A.P., Cutshall, C.D., Dale, V.H., Fahrig, l., France, R., Goldman, C.R., Heanue, K., Jones, J.A., Swanson, F.J., Turrentine, T., Winter, T.C. (2003). *Road Ecology: Science and Solutions*. Island Press, Washington, D.C.

Gilbert, G., Stanbury, A. and Lewis, L., 2021. *Birds of conservation concern in Ireland 4: 2020–2026*. Irish Birds, 43, pp.1-22.

Lusby, J., O'Clery, M., McGuinness, S., Tosh, D., & Crowe, O. (2021). RE-ENV-07004 *The interactions between Barn Owls and major roads: informing management and mitigation*.

Shawyer, C.R. & Dixon, N. (1999). *Impact of roads on Barn Owl Tyto alba populations*. Unpublished report to the Highways Agency, London.

Shawyer, C.R. (1987). *The Barn Owl in the British Isles: Its Past, Present and Future*. The Hawk Trust, London.

Taylor, I.R. (1994) *Barn Owls: Predator–Prey Relationships and Their Conservation*. Cambridge University Press, Cambridge.

TII (2021). PE-ENV-07005. *Survey and Mitigation Standards for Barn Owls to inform the Planning, Construction and Operation of National Road Projects*. April 2021, prepared by BirdWatch Ireland on behalf of Transport Infrastructure Ireland (TII) Publications.

Appendix E
Badger Supporting Information

E.1 NPWS Guidance Note January 2024

From:
Sent: Tuesday 2 January 2024 15:51
To: Housing wildlifelicence
Cc:
Subject: Badger Derogation Licensing

Dear Sir/Madam,

We are working on a project which received consent in 2016 and which is only now being implemented. The badger baseline has changed and this has been updated through survey. The works will involve disturbing works within 30m of active sett (considered to be a main sett). On previous projects under similar circumstances we submitted a derogation licence to NPWS to which NPWS issued a "letter of non-opposition". Is this still the case since there does not seem to be any guidance on NPWS's website regarding to badger derogation licensing?

I assume that if the baseline had not changed that the mitigation measures set out in the ecological impact assessment completed for the original application, now consented, would suffice and negate the need for separate derogation licence on the basis that under Section 23(7)(c) of the Wildlife Act the work would be consented works (or "*…other permission granted…which is lawfully done*")?

Also, on a separate query, at a recent Legal Update Seminar held by CIEEM/Phillip Lee, NPWS mentioned that it would be publishing an advisory note/guidance following the recent Hellfire case – is it still the intention for this to be issued?

Thanks in advance for your response.

Best Wishes

Dear Sir/Madam

Thank you for contacting the NPWS with your query relating to what your options are for working in and around badgers and their setts. There are a number of key points to be aware of and these are listed below:

- Badgers are protected under the Wildlife Act 1976-21. Section 23(5)(d) which states that it is an offence to wilfully interfere with or destroy the breeding place of any protected wild animal.

- If the project affecting badgers and their habitat involves road building, Section 23(7)(c) of the Wildlife Act may apply. This act states that, *it shall not be an offence for a person—while constructing a road or while carrying on any archaeological operation, building operation or work of engineering construction, or while constructing or carrying on such other operation or work as may be prescribed,* ***unintentionally*** *to kill or injure such an animal or* ***unintentionally*** *to destroy or injure the breeding place of such an animal.* If it can be reasonably foreseen that the work would lead to killing or injuring a badger, or damaging or destroying the sett, then it is not possible to state that the act was "unintentional".

- For works involving the building or maintenance of roads, the NRA's Guidelines for the Treatment of Badgers prior to the Construction of a National Road Scheme document should be consulted and a copy of this document can be found here.

- Section 23(7)(e)(iv) of the Wildlife Act outlines that '*nothing in this section shall make unlawful,……(iv) anything which is duly done pursuant to a licence or other permission granted or issued pursuant to the Wildlife Acts, 1976 and 2000, or which is duly done pursuant to any other statute or statutory instrument, which is permitted to be done under such a statute or instrument or which is done pursuant to and in accordance with a licence or other permission granted or issued pursuant to such a statute or instrument or anything caused by or which results from, or is consequent upon or the effect of any other act or thing which is lawfully done*." If a licence or permission has been received from another public authority whose actions are directed by a statute or statutory instrument, further permission is not required from the NPWS for works affecting badgers. Furthermore, it is the responsibility of the authority granting the permission or licence to ensure that proper consideration is afforded to badgers in the course of works and that all recommendations or mitigation is adhered to by the applicant.

- In certain circumstances and where certain criteria are met, a licence under Section 42 of the Wildlife Acts may be issued in relation to badgers. This section deals with circumstances where serious damage is being caused by protected wild birds or by protected wild animals to food, livestock, poultry or agricultural crops, pen-reared wild birds, other fauna, flora, woodland or forest plantation, a fishery, buildings and other structures and their contents or aquaculture installations.. More information on this licence can be found here.

- If your query relates to the TB vaccination programme run by the Department of Agriculture, Food and the Marine, please see following link for details as well as contact details for questions you may have.

There is no specific licence or permission that the NPWS can issue to allow exceptions to Section 23(5)(d) of the Wildlife Acts and any works not permitted under that Act that result in the wilful interference or destruction of breeding places of a badger may result in a prosecution.

The onus is on the person carrying out works to ensure their activities are legally permitted

Kind regards

Wildlife Licensing Unit

E.2 Updated EIAR Vol. 3 Fencing Drawings

SLANE VILLAGE PUBLIC REALM IMPROVEMENTS REFER TO GA9000 SERIES

SLANE VILLAGE

RIVER BOYNE

RIVER BOYNE

N2 TO DERRY

N51 TO DROGHEDA

N51 TO NAVAN

TO DUBLIN N2

FE0007

FE0006

FE0004

FE0005

FE0003

FE0002

FE0001

N

0.00km 0.4km 0.8km 1.2km 1.6km 2.0km
Scale Bar

R:\MDT0806_N2 Slane Bypass\8.0 Drawings\DG\FE\MDT0806-RPS-01-N2-DR-C-FE0000-FE0007 Fencing, Boundary Treatment and Environmental Barriers.dwg

Client

Bonneagar Iompair Éireann Transport Infrastructure Ireland

An Roinn Iompair Department of Transport

comhairle chontae na mi meath county council

General Notes

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Rev	Date	Dm Chk	Amendment / Issue	App
C02	28/11/24	TD MN	RESPONSE TO RFI	MN
P05	18/11/24	TD MN	FOR REVIEW AND COMMENT	MN
C01	14/06/23	TS TD	FINAL ISSUE	MN

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1:20,000 @ A3

Created on 03/06/2021

Sheets 00 of 07

Project **N2 SLANE BYPASS AND PUBLIC REALM ENHANCEMENT SCHEME**

Title FENCING, BOUNDARY TREATMENT AND ENVIRONMENTAL BARRIERS INDEX PLAN OF SHEETS

File Identifier MDT0806-RPS-01-N2-DR-C-FE0000-FE0007

Drawing Number FE0000

Status A1

Rev C02

JOHNSTOWN

MAMMAL UNDERPASS

MAMMAL UNDERPASS

MATCHLINE

MATCHLINE

NOTES:

1. Fencing and Boundary Treatment proposals to be confirmed at detailed design stage.
2. Any requirements for mammal resistant fencing subject to ecological assessments.
3. Drawings show indicative permanent Fencing and Boundary Treatment proposals only and do not indicate any temporary fencing that may be required for the construction of the Scheme.
4. Any requirements for visual screening or noise mitigation measures subject to relevant environmental assessments.
5. Where timber post and rail fence (CC-SCD-00301) is proposed, mesh is to be omitted between bottom rail and ground level to provide minimum 200mm gap for passage of mammals.

LEGEND:

- TIMBER POST AND TENSION MESH FENCE (CC-SCD-00321)
- TIMBER POST AND RAIL FENCE (CC-SCD-00301 - Refer to Note 5)
- MAMMAL RESISTANT FENCING (CC-SCD-00324)
- BOUNDARY WALL (SIMILAR TO EXISTING)
- STEEL SINGLE FIELD GATE (CC-SCD-00309)
- STEEL SINGLE FIELD GATE (CC-SCD-00309) WITH MAMMAL RESISTANT MEASURES
- STEEL DOUBLE FIELD GATE (CC-SCD-00310) WITH MAMMAL RESISTANT MEASURES
- DOMESTIC ACCESS GATE (SIMILAR TO EXISTING)
- NOISE MITIGATION MEASURES

0.00km 0.4km 0.8km 1.2km 1.6km 2.0km
Scale Bar

R:\MDT0806_N2 Slane Bypass\8.0 Drawings\DGN\FE\MDT0806-RPS-01-N2-DR-C-FE0000-FE0007 Fencing, Boundary Treatment and Environmental Barriers.dwg

Client

Transport Infrastructure Ireland
An Roinn Iompair
Department of Transport
comhairle chontae na mi
meath county council

General Notes

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C02	28/11/24	TD MN	RESPONSE TO RFI	MN
P05	18/11/24	TD MN	FOR REVIEW AND COMMENT	MN
C01	14/06/23	TS TO	FINAL ISSUE	MN

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Created on 03/06/2021

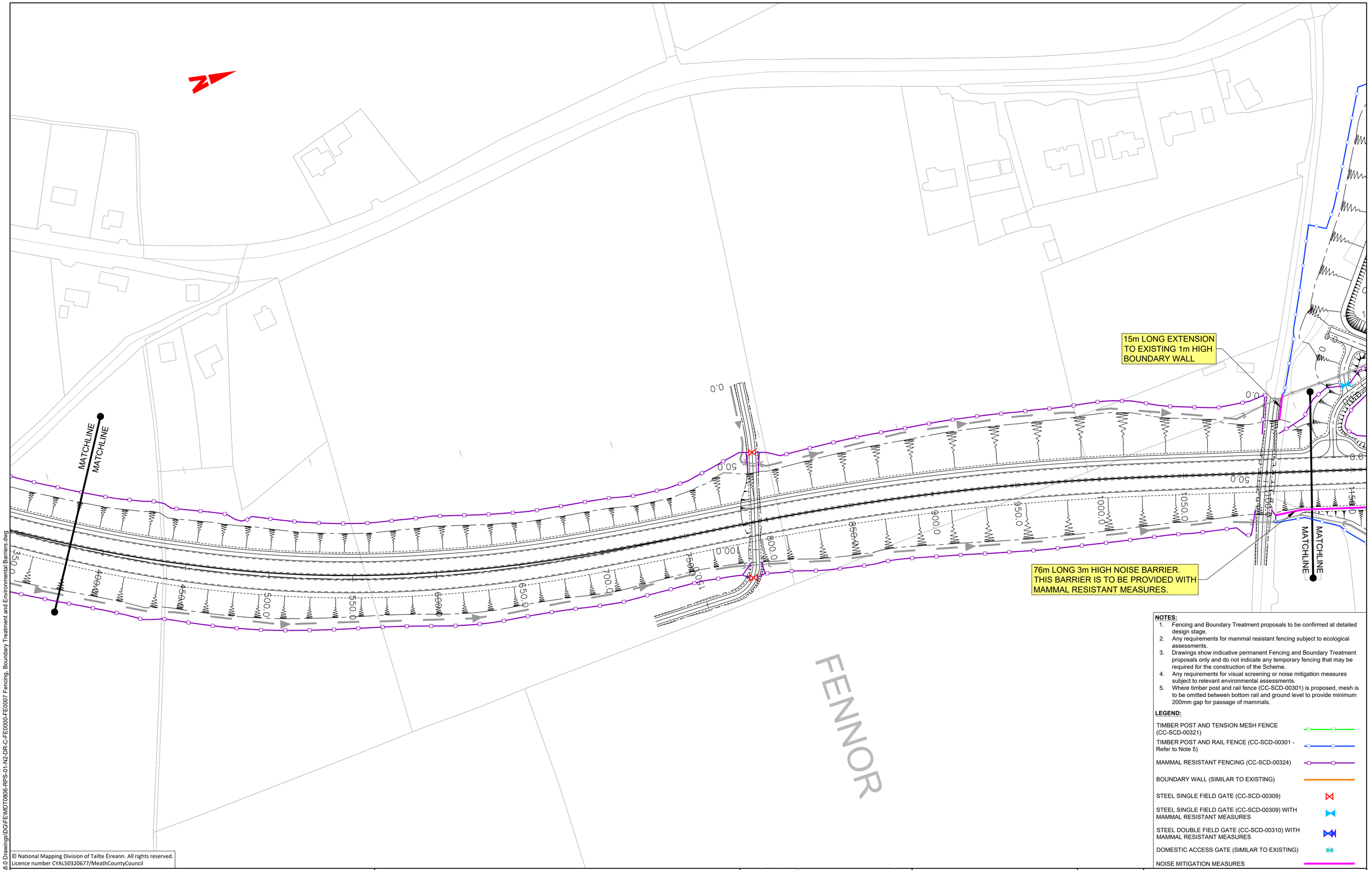
Sheets 01 of 07

File Identifier MDT0806-RPS-01-N2-DR-C-FE0000-FE0007

Project **N2 SLANE BYPASS AND PUBLIC REALM ENHANCEMENT SCHEME**

Title FENCING, BOUNDARY TREATMENT AND ENVIRONMENTAL BARRIIERS SHEET 1 OF 7

Drawing Number	Status	Rev
FE0001	A1	C02



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3. Drawings show indicative permanent Fencing and Boundary Treatment proposals only and do not indicate any temporary fencing that may be required for the construction of the Scheme.
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LEGEND:

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- TIMBER POST AND RAIL FENCE (CC-SCD-00301 - Refer to Note 5)
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- DOMESTIC ACCESS GATE (SIMILAR TO EXISTING)
- NOISE MITIGATION MEASURES

R:\MDT0806_N2 Slane Bypass\8.0 Drawings\DG\FE\MDT0806-RPS-01-N2-DR-C-FE0000-FE0007 Fencing, Boundary Treatment and Environmental Barriers.dwg

Client

Bonneagar Iompair Éireann Transport Infrastructure Ireland
An Roinn Iompair Department of Transport
comhairle chontae na mí meath county council

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C02	28/11/24	TD / MN	RESPONSE TO RFI	MN
P05	18/11/24	TD / MN	FOR REVIEW AND COMMENT	MN
C01	14/06/23	TS / TD	FINAL ISSUE	MN

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File Identifier: MDT0806-RPS-01-N2-DR-C-FE0000-FE0007

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Created on: 03/06/2021

Sheets: 02 of 07

Project: **N2 SLANE BYPASS AND PUBLIC REALM ENHANCEMENT SCHEME**

Title: FENCING, BOUNDARY TREATMENT AND ENVIRONMENTAL BARRIERS SHEET 2 OF 7

Drawing Number: FE0002

Status: A1

Rev: C02

NOTES:

1. Fencing and Boundary Treatment proposals to be confirmed at detailed design stage.
2. Any requirements for mammal resistant fencing subject to ecological assessments.
3. Drawings show indicative permanent Fencing and Boundary Treatment proposals only and do not indicate any temporary fencing that may be required for the construction of the Scheme.
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5. Where timber post and rail fence (CC-SCD-00301) is proposed, mesh is to be omitted between bottom rail and ground level to provide minimum 200mm gap for passage of mammals.

LEGEND:

- TIMBER POST AND TENSION MESH FENCE (CC-SCD-00321)
- TIMBER POST AND RAIL FENCE (CC-SCD-00301 - Refer to Note 5)
- MAMMAL RESISTANT FENCING (CC-SCD-00324)
- BOUNDARY WALL (SIMILAR TO EXISTING)
- STEEL SINGLE FIELD GATE (CC-SCD-00309)
- STEEL SINGLE FIELD GATE (CC-SCD-00309) WITH MAMMAL RESISTANT MEASURES
- STEEL DOUBLE FIELD GATE (CC-SCD-00310) WITH MAMMAL RESISTANT MEASURES
- DOMESTIC ACCESS GATE (SIMILAR TO EXISTING)
- NOISE MITIGATION MEASURES

MATCHLINE

MATCHLINE

MATCHLINE

MATCHLINE

76m LONG 3m HIGH NOISE BARRIER. THIS BARRIER IS TO BE PROVIDED WITH MAMMAL RESISTANT MEASURES.

R:\MDT0806_N2 Slane Bypass\8.0 Drawings\DG\FE\MDT0806-RPS-01-N2-DR-C-FE0000-FE0007 Fencing, Boundary Treatment and Environmental Barriers.dwg

Client

Bonneagar Iompair Éireann Transport Infrastructure Ireland

An Roinn Iompair Department of Transport

comhairle chontae na mí meath county council

General Notes

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C02	28/11/24	TD	MN	RESPONSE TO RFI	MN
P05	18/11/24	TD	MN	FOR REVIEW AND COMMENT	MN
C01	14/06/23	TS	TD	FINAL ISSUE	MN

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Created on: 03/06/2021

Sheets: 03 of 07

Project: **N2 SLANE BYPASS AND PUBLIC REALM ENHANCEMENT SCHEME**

Title: FENCING, BOUNDARY TREATMENT AND ENVIRONMENTAL BARRIERS SHEET 3 OF 7

Drawing Number: FE0003

Status: A1

Rev: C02

NOTES:

1. Fencing and Boundary Treatment proposals to be confirmed at detailed design stage.
2. Any requirements for mammal resistant fencing subject to ecological assessments.
3. Drawings show indicative permanent Fencing and Boundary Treatment proposals only and do not indicate any temporary fencing that may be required for the construction of the Scheme.
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5. Where timber post and rail fence (CC-SCD-00301) is proposed, mesh is to be omitted between bottom rail and ground level to provide minimum 200mm gap for passage of mammals.

LEGEND:

- TIMBER POST AND TENSION MESH FENCE (CC-SCD-00321)
- TIMBER POST AND RAIL FENCE (CC-SCD-00301 - Refer to Note 5)
- MAMMAL RESISTANT FENCING (CC-SCD-00324)
- BOUNDARY WALL (SIMILAR TO EXISTING)
- STEEL SINGLE FIELD GATE (CC-SCD-00309)
- STEEL SINGLE FIELD GATE (CC-SCD-00309) WITH MAMMAL RESISTANT MEASURES
- STEEL DOUBLE FIELD GATE (CC-SCD-00310) WITH MAMMAL RESISTANT MEASURES
- DOMESTIC ACCESS GATE (SIMILAR TO EXISTING)

Client

Bonneagar Iompair Éireann
Transport Infrastructure Ireland

An Roinn Iompair
Department of Transport

comhairle chontae na mí
meath county council

General Notes

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Project: N2 SLANE BYPASS AND PUBLIC REALM ENHANCEMENT SCHEME

Title: FENCING, BOUNDARY TREATMENT AND ENVIRONMENTAL BARRIIERS SHEET 4 OF 7

File Identifier: MDT0806-RPS-01-N2-DR-C-FE0000-FE0007

Drawing Number: FE0004

Status: A1

Rev: C02

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295m LONG 2.5m HIGH COMBINED NOISE BARRIER ON EARTHWORKS BUND. THIS BARRIER IS TO BE PROVIDED WITH MAMMAL RESISTANT MEASURES.

21.5m LONG 2m HIGH NOISE BARRIER

MAMMAL UNDERPASS

MAMMAL UNDERPASS

MAMMAL UNDERPASS

MATCHLINE

MATCHLINE

MATCHLINE

MATCHLINE

MATCHLINE

MATCHLINE

NOTES:

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LEGEND:

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- TIMBER POST AND RAIL FENCE (CC-SCD-00301 - Refer to Note 5)
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- STEEL DOUBLE FIELD GATE (CC-SCD-00310) WITH MAMMAL RESISTANT MEASURES
- DOMESTIC ACCESS GATE (SIMILAR TO EXISTING)
- NOISE MITIGATION MEASURES

Client: Transport Infrastructure Ireland; An Roinn Iompair Department of Transport; comhairle chontae na mi meath county council

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Created on: 03/06/2021

Sheets: 05 of 07

File Identifier: MDT0806-RPS-01-N2-DR-C-FE0000-FE0007

Project: **N2 SLANE BYPASS AND PUBLIC REALM ENHANCEMENT SCHEME**

Title: FENCING, BOUNDARY TREATMENT AND ENVIRONMENTAL BARRIERS SHEET 5 OF 7

Drawing Number: FE0005

Status: A1

Rev: C02

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LEGEND:

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- TIMBER POST AND RAIL FENCE (CC-SCD-00301 - Refer to Note 5)
- MAMMAL RESISTANT FENCING (CC-SCD-00324)
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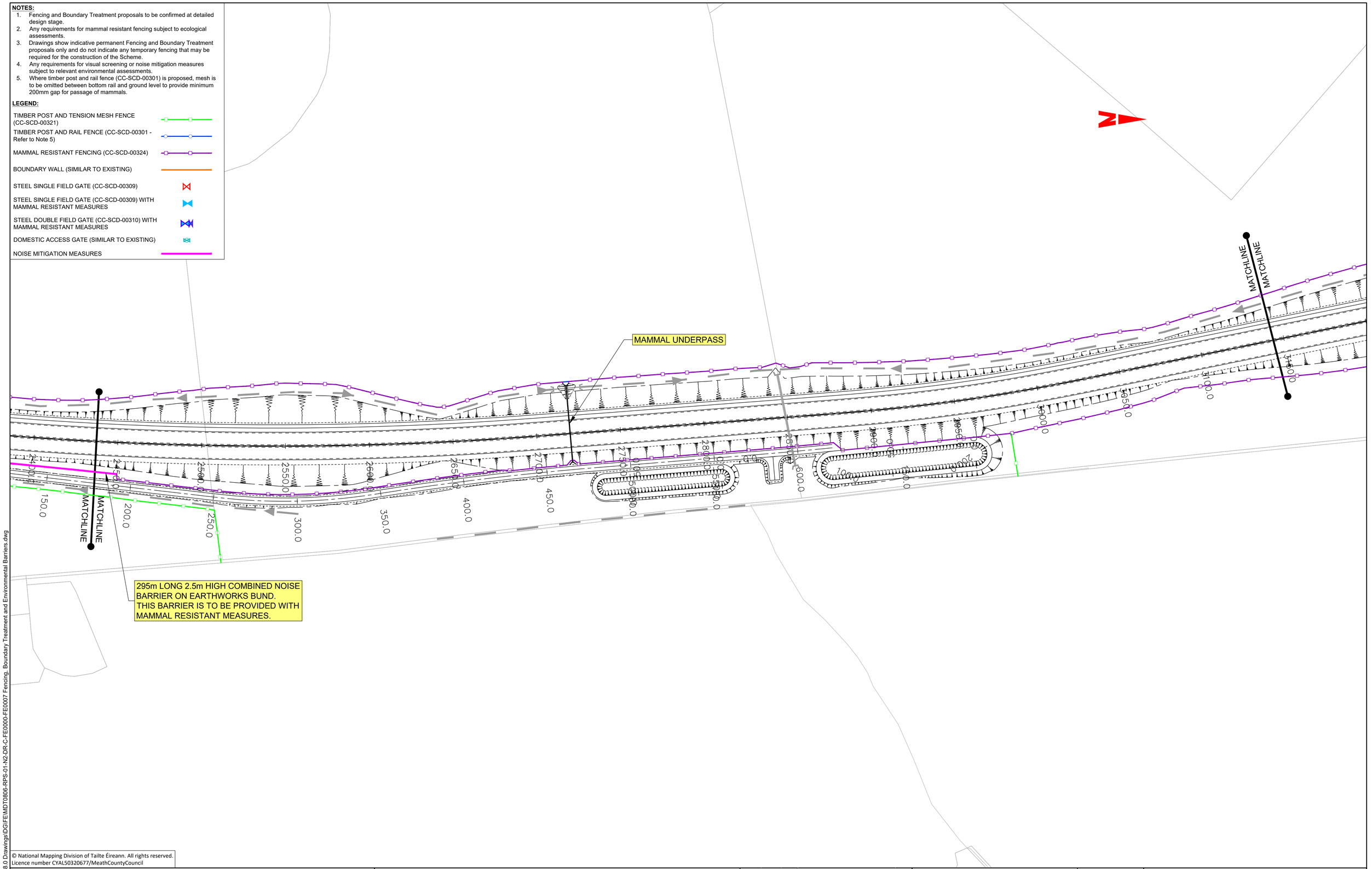
- DOMESTIC ACCESS GATE (SIMILAR TO EXISTING)
- NOISE MITIGATION MEASURES



Client

Bonneagar Iompair Éireann Transport Infrastructure Ireland
An Roinn Iompair Department of Transport
comhairle chontae na mí meath county council

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P05	18/11/24	TD / MN	FOR REVIEW AND COMMENT	MN
C01	14/06/23	TS / TD	FINAL ISSUE	MN

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File Identifier: MDT0806-RPS-01-N2-DR-C-FE0000-FE0007

Scale: 1:1,000 @ A1, 1:2,000 @ A3

Created on: 03/06/2021

Sheets: 06 of 07

Project: **N2 SLANE BYPASS AND PUBLIC REALM ENHANCEMENT SCHEME**

Title: FENCING, BOUNDARY TREATMENT AND ENVIRONMENTAL BARRIERS SHEET 6 OF 7

Drawing Number: FE0006

Status: A1

Rev: C02

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BOX CULVERTS TO BE PROVIDED WITH LEDGES FOR PASSAGE OF MAMMALS. RAMPS TO BE PROVIDED BETWEEN THESE LEDGES AND GROUND LEVEL AT EITHER END OF EACH CULVERT.

MATCHLINE

MATCHLINE

NOTES:

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- STEEL DOUBLE FIELD GATE (CC-SCD-00310) WITH MAMMAL RESISTANT MEASURES
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- NOISE MITIGATION MEASURES

Client

Bonneagar Iompair Éireann Transport Infrastructure Ireland

An Roinn Iompair Department of Transport

comhairle chontae na mi meath county council

General Notes

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(v) All Levels refer to Ordnance Survey Datum, Malin Head.

Rev	Date	Dim	Chk	Amendment / Issue	App
C02	28/11/24	TD	MN	RESPONSE TO RFI	MN
P05	18/11/24	TD	MN	FOR REVIEW AND COMMENT	MN
C01	14/06/23	TS	TD	FINAL ISSUE	MN

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Created on 03/06/2021

Sheets 07 of 07

File Identifier MDT0806-RPS-01-N2-DR-C-FE0000-FE0007

Project **N2 SLANE BYPASS AND PUBLIC REALM ENHANCEMENT SCHEME**

Title FENCING, BOUNDARY TREATMENT AND ENVIRONMENTAL BARRIERS SHEET 7 OF 7

Drawing Number FE0007 | Status A1 | Rev C02

R:\MDT0806_N2 Slane Bypass\8.0 Drawings\DG\FE\MDT0806-RPS-01-N2-DR-C-FE0000-FE0007 Fencing, Boundary Treatment and Environmental Barriers.dwg

E.3 Updated EIAR Vol. 3 Drainage Drawings

SLANE VILLAGE PUBLIC REALM IMPROVEMENTS REFER TO GA9000 SERIES

SLANE VILLAGE

RIVER BOYNE

RIVER BOYNE

N2 TO DERRY

N51 TO DROGHEDA

N51 TO NAVAN

TO DUBLIN N2

DR0001

DR0002

DR0003

DR0004

DR0005

DR0006

DR0007

DR0008

N

0.00km 0.4km 0.8km 1.2km 1.6km 2.0km

Scale Bar

R:\MDT0806_N2 Slane Bypass\8.0 Drawings\DG\DR\MDT0806-RPS-01-N2-DR-C-DR0000-DR0008 Drainage.dwg

Client

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Created on 06/11/2020

Sheets 00 of 08

Project **N2 SLANE BYPASS AND PUBLIC REALM ENHANCEMENT SCHEME**

Title PROPOSED DRAINAGE LAYOUT INDEX PLAN OF SHEETS

File Identifier MDT0806-RPS-01-N2-DR-C-DR0000-DR0008

Drawing Number DR0000

Status A1

Rev C02

JOHNSTOWN

EXISTING DITCH

EXISTING CULVERT

EXISTING ROAD CROSSING TO BE REPLACED WITH AN OPEN CHANNEL

MAMMAL UNDERPASS

PROPOSED CULVERT 1B

EXISTING DITCH TO BE INTERCEPTED AND DIVERTED

MAMMAL UNDERPASS

PROPOSED FILTER DRAIN

EXISTING FILTER DRAIN

CULVERT 1A - PROPOSED 600mm Ø PIPED CULVERT VIA BACKDROP MANHOLE TO MAINTAIN EXISTING FLOW REGIME

KERB AND GULLY DRAINAGE ON ROUNDABOUT AND ON FIRST 50m OF APPROACH TO ROUNDABOUT

EXISTING DITCH TO BE INTERCEPTED AND DIVERTED TO MAINTAIN CURRENT FLOW REGIME

EXISTING DITCH TO BE INTERCEPTED AND DIVERTED TO MAINTAIN CURRENT FLOW REGIME

EXISTING DITCH

VORTEX GRIT SEPARATOR

CLASS 1 BYPASS MINIMUM NSBE015 FUEL OIL/HYDROCARBON INTERCEPTOR

ATTENUATION POND 1
ATTENUATION STORAGE = 290m³
RETENTION STORAGE = 99.7m³

OUTFALL TO BE FITTED WITH A VORTEX FLOW CONTROL DEVICE LIMITING DISCHARGE TO Q100 RATE OF 6.7l/s. OUTFALL DRAINING TO PROPOSED SURFACE WATER NETWORK

OVERFLOW TO PROPOSED SURFACE WATER NETWORK AFTER FLOW CONTROL

EXISTING DITCH TO BE INTERCEPTED AND DIVERTED INTO INTERCEPTOR DITCH

PROPOSED INTERCEPTOR DITCH

PROPOSED GRASSED OPEN CHANNEL DRAIN TO COLLECT CUTTING SLOPE RUNOFF

PROPOSED GROUNDWATER FILTER DRAIN

PROPOSED GRASSED OPEN CHANNEL DRAINS WITH CARRIER PIPE BELOW

PROPOSED GROUNDWATER FILTER DRAIN

EXISTING DITCH TO BE INTERCEPTED AND DIVERTED

EXISTING DITCH TO BE INTERCEPTED

EXISTING DITCH

MATCH LINE

MATCH LINE

NOTES:

1. ALL STORMWATER DRAINAGE TO BE IN ACCORDANCE WITH TII STANDARDS AND SPECIFICATIONS.
2. FLOW CONTROL MANHOLES TO BE DESIGNED IN ACCORDANCE WITH MANUFACTURERS SPECIFICATIONS.
3. CLASS 1 BYPASS FUEL OIL/HYDROCARBON INTERCEPTORS TO BE FITTED AT EACH DISCHARGE LOCATION.
4. CULVERTS ON WATERCOURSES SUBJECT TO SECTION 50 APPROVAL.
5. GROUNDWATER DRAINAGE REQUIREMENTS TO BE CONFIRMED AT DETAILED DESIGN STAGE.
6. CHAMBER LOCATIONS SHOWN INDICATIVELY ONLY.
7. REFER TO DRAWING MDT0806-RPS-01-N2-DR-C-DR1001 FOR TYPICAL MAINLINE DRAINAGE CROSS-SECTION.
8. REFER TO DRAWING MDT0806-RPS-01-N2-DR-C-DR1002 FOR TYPICAL DETAILS OF ATTENUATION PONDS.
9. REFER TO DRAWINGS MDT0806-RPS-01-N2-DR-C-DR1003 TO MDT0806-RPS-01-N2-DR-C-DR1004 FOR TYPICAL OUTFALL DETAILS.
10. REFER TO DRAWINGS MDT0806-RPS-01-N2-DR-C-DR2001 TO MDT0806-RPS-01-N2-DR-C-DR2003 FOR DETAILS OF CULVERTS 6A, 6B AND 6C.

LEGEND

- PROPOSED STORM CARRIER PIPE
- PROPOSED GRASSED OPEN CHANNEL
- PROPOSED GRASSED OPEN CHANNEL & PIPE
- PROPOSED CONCRETE OPEN CHANNEL DRAIN
- PROPOSED FILTER DRAIN
- PROPOSED GROUNDWATER FILTER DRAIN
- PROPOSED KERB DRAIN - BRIDGE DECK
- PROPOSED INTERCEPTOR DITCH
- PROPOSED PETROL INTERCEPTOR
- PROPOSED WATERCOURSE/DITCH DIVERSION
- PROPOSED CULVERT
- PROPOSED POND OVERFLOW
- PROPOSED INVERTED SIPHON
- PROPOSED INFILTRATION TRENCH
- EXISTING FILTER DRAIN
- EXISTING FALL OF GROUND
- EXISTING WATERCOURSE/DITCH

R:\MDT0806_N2 Slane Bypass\8.0 Drawings\DGI\DR\MDT0806-RPS-01-N2-DR-C-DR0000-DR0008 Drainage.dwg

Client

Bonneagar Iompair Éireann Transport Infrastructure Ireland

An Roinn Iompair Department of Transport

comhairle chontae na mí meath county council

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Scale 1:1,000 @ A1 HALF @ A3

Created on 06/11/2020

Sheets 01 of 08

File Identifier MDT0806-RPS-01-N2-DR-C-DR0000-DR0008

Project **N2 SLANE BYPASS AND PUBLIC REALM ENHANCEMENT SCHEME**

Title PROPOSED DRAINAGE LAYOUT SHEET 1 OF 8

Drawing Number DR0001 | Status A1 | Rev C02

NOTES:

1. ALL STORMWATER DRAINAGE TO BE IN ACCORDANCE WITH TII STANDARDS AND SPECIFICATIONS.
2. FLOW CONTROL MANHOLES TO BE DESIGNED IN ACCORDANCE WITH MANUFACTURERS SPECIFICATIONS.
3. CLASS 1 BYPASS FUEL OIL/HYDROCARBON INTERCEPTORS TO BE FITTED AT EACH DISCHARGE LOCATION.
4. CULVERTS ON WATERCOURSES SUBJECT TO SECTION 50 APPROVAL.
5. GROUNDWATER DRAINAGE REQUIREMENTS TO BE CONFIRMED AT DETAILED DESIGN STAGE.
6. CHAMBER LOCATIONS SHOWN INDICATIVELY ONLY.
7. REFER TO DRAWING MDT0806-RPS-01-N2-DR-C-DR1001 FOR TYPICAL MAINLINE DRAINAGE CROSS-SECTION.
8. REFER TO DRAWING MDT0806-RPS-01-N2-DR-C-DR1002 FOR TYPICAL DETAILS OF ATTENUATION PONDS.
9. REFER TO DRAWINGS MDT0806-RPS-01-N2-DR-C-DR1003 TO MDT0806-RPS-01-N2-DR-C-DR1004 FOR TYPICAL OUTFALL DETAILS.
10. REFER TO DRAWINGS MDT0806-RPS-01-N2-DR-C-DR2001 TO MDT0806-RPS-01-N2-DR-C-DR2003 FOR DETAILS OF CULVERTS 6A, 6B AND 6C.

LEGEND

- PROPOSED STORM CARRIER PIPE
- PROPOSED GRASSED OPEN CHANNEL
- PROPOSED GRASSED OPEN CHANNEL & PIPE
- PROPOSED CONCRETE OPEN CHANNEL DRAIN
- PROPOSED FILTER DRAIN
- PROPOSED GROUNDWATER FILTER DRAIN
- PROPOSED KERB DRAIN - BRIDGE DECK
- PROPOSED INTERCEPTOR DITCH
- PROPOSED PETROL INTERCEPTOR
- PROPOSED WATERCOURSE/DITCH DIVERSION
- PROPOSED CULVERT
- PROPOSED POND OVERFLOW
- PROPOSED INVERTED SIPHON
- PROPOSED INFILTRATION TRENCH
- EXISTING FILTER DRAIN
- EXISTING FALL OF GROUND
- EXISTING WATERCOURSE/DITCH

EXISTING DITCH
EXISTING DITCH TO BE INTERCEPTED
EXISTING DITCH TO BE INTERCEPTED
PROPOSED INTERCEPTOR DITCH
PROPOSED GROUNDWATER FILTER DRAIN
VORTEX GRIT SEPARATOR
GROUNDWATER FILTER DRAIN OUTFALLING TO PROPOSED CULVERT
CULVERT 2D - PROPOSED PIPED CULVERT UNDER ROSSNAREE ROAD
PROPOSED CULVERT 2B
PROPOSED GRASSED OPEN CHANNEL DRAIN TO COLLECT CUTTING SLOPE RUNOFF
PROPOSED GROUNDWATER FILTER DRAIN
MATCHLINE
MATCHLINE
MATCHLINE
MATCHLINE
PROPOSED GROUNDWATER FILTER DRAIN
EXISTING DITCH TO BE INTERCEPTED
PROPOSED CULVERT 2A
SLURRY TRAP TO BE PROVIDED AT END OF KERBED SECTION OF ACCESS TRACK ON LOW SIDE OF OVERBRIDGE
PROPOSED GRASSED OPEN CHANNEL DRAINS WITH CARRIER PIPE BELOW
PROPOSED GROUNDWATER FILTER DRAIN
PROPOSED INTERCEPTOR DITCH
EXISTING DITCH TO BE INTERCEPTED
EXISTING DITCH
FENNOR

R:\MDT0806_N2 Slane Bypass\8.0 Drawings\DG\DR\MDT0806-RPS-01-N2-DR-C-DR0000-DR0008 Drainage.dwg

Client: Bonneagar Iompair Éireann Transport Infrastructure Ireland; An Roinn Iompair Department of Transport; comhairle chontae na mí meath county council

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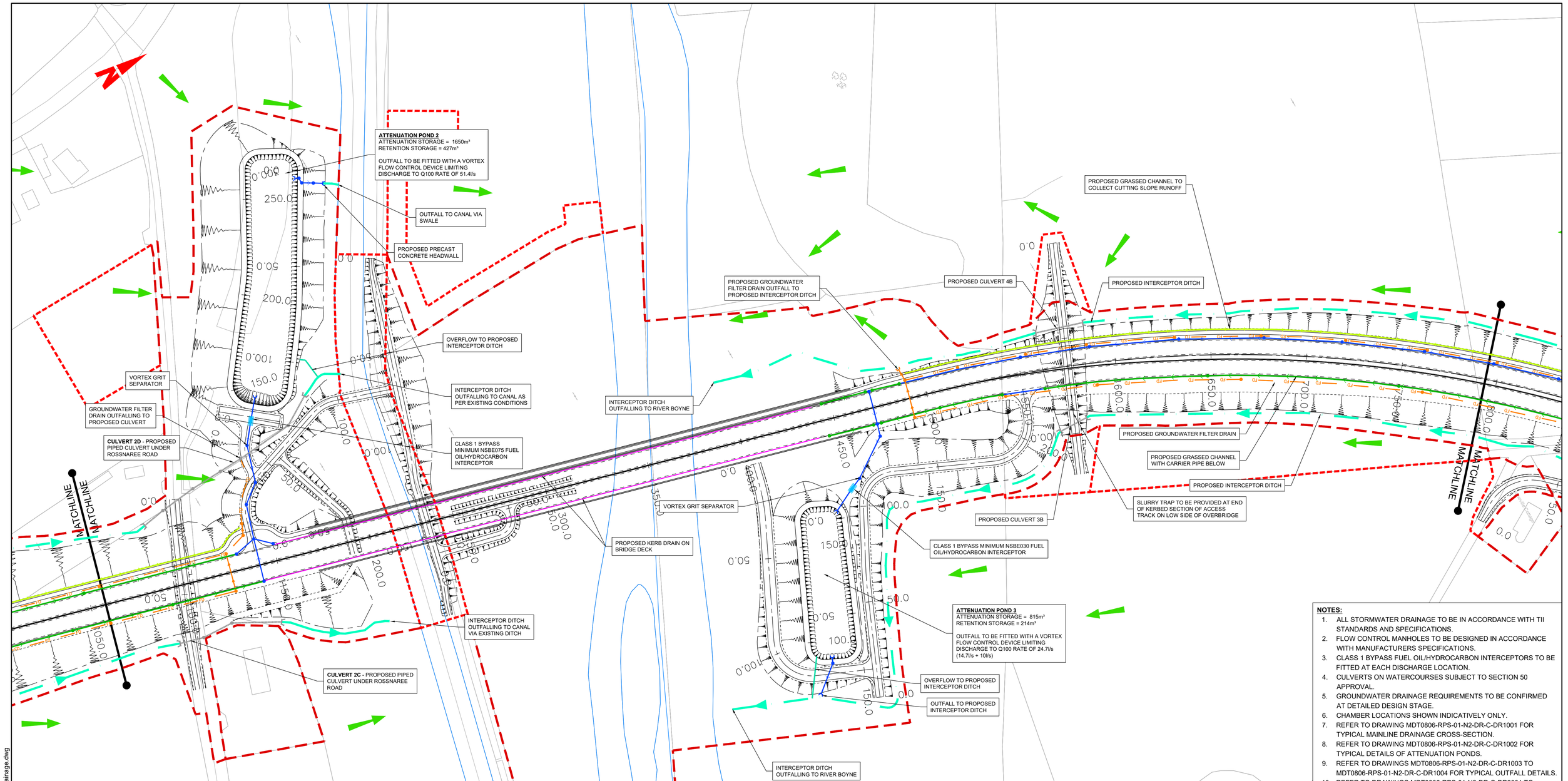
File Identifier: MDT0806-RPS-01-N2-DR-C-DR0000-DR0008

Scale: 1:1,000 @ A1, HALF @ A3
Created on: 06/11/2020
Sheets: 02 of 08

Project: **N2 SLANE BYPASS AND PUBLIC REALM ENHANCEMENT SCHEME**
Title: PROPOSED DRAINAGE LAYOUT SHEET 2 OF 8
Drawing Number: DR0002
Status: A1
Rev: C02



NOTES:

1. ALL STORMWATER DRAINAGE TO BE IN ACCORDANCE WITH TII STANDARDS AND SPECIFICATIONS.
2. FLOW CONTROL MANHOLES TO BE DESIGNED IN ACCORDANCE WITH MANUFACTURERS SPECIFICATIONS.
3. CLASS 1 BYPASS FUEL OIL/HYDROCARBON INTERCEPTORS TO BE FITTED AT EACH DISCHARGE LOCATION.
4. CULVERTS ON WATERCOURSES SUBJECT TO SECTION 50 APPROVAL.
5. GROUNDWATER DRAINAGE REQUIREMENTS TO BE CONFIRMED AT DETAILED DESIGN STAGE.
6. CHAMBER LOCATIONS SHOWN INDICATIVELY ONLY.
7. REFER TO DRAWING MDT0806-RPS-01-N2-DR-C-DR1001 FOR TYPICAL MAINLINE DRAINAGE CROSS-SECTION.
8. REFER TO DRAWING MDT0806-RPS-01-N2-DR-C-DR1002 FOR TYPICAL DETAILS OF ATTENUATION PONDS.
9. REFER TO DRAWINGS MDT0806-RPS-01-N2-DR-C-DR1003 TO MDT0806-RPS-01-N2-DR-C-DR1004 FOR TYPICAL OUTFALL DETAILS.
10. REFER TO DRAWINGS MDT0806-RPS-01-N2-DR-C-DR2001 TO MDT0806-RPS-01-N2-DR-C-DR2003 FOR DETAILS OF CULVERTS 6A, 6B AND 6C.

LEGEND

- PROPOSED STORM CARRIER PIPE
- PROPOSED GRASSED OPEN CHANNEL
- PROPOSED GRASSED OPEN CHANNEL & PIPE
- PROPOSED CONCRETE OPEN CHANNEL DRAIN
- PROPOSED FILTER DRAIN
- PROPOSED GROUNDWATER FILTER DRAIN
- PROPOSED KERB DRAIN - BRIDGE DECK
- PROPOSED INTERCEPTOR DITCH
- PROPOSED PETROL INTERCEPTOR
- PROPOSED WATERCOURSE/DITCH DIVERSION
- PROPOSED CULVERT
- PROPOSED POND OVERFLOW
- PROPOSED INVERTED SIPHON
- PROPOSED INFILTRATION TRENCH
- EXISTING FILTER DRAIN
- EXISTING FALL OF GROUND
- EXISTING WATERCOURSE/DITCH

R:\MDT0806_N2 Slane Bypass\8.0 Drawings\DG\DR\MDT0806-RPS-01-N2-DR-C-DR0000-DR0008 Drainage.dwg

Client

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An Roinn Iompair Department of Transport
comhairle chontae na mi meath county council

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Sheets 03 of 08

Project **N2 SLANE BYPASS AND PUBLIC REALM ENHANCEMENT SCHEME**

Title PROPOSED DRAINAGE LAYOUT SHEET 3 OF 8

File Identifier MDT0806-RPS-01-N2-DR-C-DR0000-DR0008

Drawing Number DR0003 | Status A1 | Rev C02

NOTES:

1. ALL STORMWATER DRAINAGE TO BE IN ACCORDANCE WITH TII STANDARDS AND SPECIFICATIONS.
2. FLOW CONTROL MANHOLES TO BE DESIGNED IN ACCORDANCE WITH MANUFACTURERS SPECIFICATIONS.
3. CLASS 1 BYPASS FUEL OIL/HYDROCARBON INTERCEPTORS TO BE FITTED AT EACH DISCHARGE LOCATION.
4. CULVERTS ON WATERCOURSES SUBJECT TO SECTION 50 APPROVAL.
5. GROUNDWATER DRAINAGE REQUIREMENTS TO BE CONFIRMED AT DETAILED DESIGN STAGE.
6. CHAMBER LOCATIONS SHOWN INDICATIVELY ONLY.
7. REFER TO DRAWING MDT0806-RPS-01-N2-DR-C-DR1001 FOR TYPICAL MAINLINE DRAINAGE CROSS-SECTION.
8. REFER TO DRAWING MDT0806-RPS-01-N2-DR-C-DR1002 FOR TYPICAL DETAILS OF ATTENUATION PONDS.
9. REFER TO DRAWINGS MDT0806-RPS-01-N2-DR-C-DR1003 TO MDT0806-RPS-01-N2-DR-C-DR1004 FOR TYPICAL OUTFALL DETAILS.
10. REFER TO DRAWINGS MDT0806-RPS-01-N2-DR-C-DR2001 TO MDT0806-RPS-01-N2-DR-C-DR2003 FOR DETAILS OF CULVERTS 6A, 6B AND 6C.

LEGEND

- PROPOSED STORM CARRIER PIPE
- PROPOSED GRASSED OPEN CHANNEL
- PROPOSED GRASSED OPEN CHANNEL & PIPE
- PROPOSED CONCRETE OPEN CHANNEL DRAIN
- PROPOSED FILTER DRAIN
- PROPOSED GROUNDWATER FILTER DRAIN
- PROPOSED KERB DRAIN - BRIDGE DECK
- PROPOSED INTERCEPTOR DITCH
- PROPOSED PETROL INTERCEPTOR
- PROPOSED WATERCOURSE/DITCH DIVERSION
- PROPOSED CULVERT
- PROPOSED POND OVERFLOW
- PROPOSED INVERTED SIPHON
- PROPOSED INFILTRATION TRENCH
- EXISTING FILTER DRAIN
- EXISTING FALL OF GROUND
- EXISTING WATERCOURSE/DITCH

ATTENUATION POND 4
ATTENUATION STORAGE = 1500m³
RETENTION STORAGE = 292.5m³

OUTFALL TO BE FITTED WITH A VORTEX FLOW CONTROL DEVICE LIMITING DISCHARGE TO 10.0l/s (Q100 EQUALS 21.8l/s).

OUTFALL DISCHARGES TO PROPOSED SURFACE WATER NETWORK

PROPOSED KERB AND GULLY DRAINAGE ALONG SOUTHERN SIDE OF N51

PROPOSED GROUNDWATER FILTER DRAIN

OVERFLOW TO PROPOSED INTERCEPTOR DITCH

CLASS 1 BYPASS MINIMUM NSBE040 FUEL OIL/HYDROCARBON INTERCEPTOR

PROPOSED KERB AND GULLY DRAINAGE AT PROPOSED FOOTPATH

PROPOSED FILTER DRAIN TO COLLECT FIELD RUNOFF

MAMMAL UNDERPASS

VORTEX GRIT SEPARATOR

PROPOSED PIPE TO DRAIN LOW POINT OF MAMMAL CROSSING

PROPOSED GROUNDWATER FILTER DRAIN

PROPOSED CULVERT 4A

PROPOSED INTERCEPTOR DITCH

PROPOSED GROUNDWATER FILTER DRAIN

PROPOSED CULVERT 3A

PROPOSED INTERCEPTOR DITCH

PROPOSED PIPE TO DRAIN LOW POINT OF MAMMAL CROSSING

MAMMAL UNDERPASS

PROPOSED CULVERT 3C

KERB AND GULLY DRAINAGE ON ROUNDABOUT

PROPOSED GROUNDWATER FILTER DRAIN OUTFALL TO PROPOSED INTERCEPTOR DITCH

PROPOSED INTERCEPTOR DITCH

PROPOSED INTERCEPTOR DITCH

PROPOSED GRASSED CHANNEL WITH CARRIER PIPE BELOW

PROPOSED INTERCEPTOR DITCH

PROPOSED CULVERT 4A

MATCHLINE

MATCHLINE

MATCHLINE

MATCHLINE

Client

Bonneagar Iompair Éireann Transport Infrastructure Ireland

An Roinn Iompair Department of Transport

comhairle chontae na mí meath county council

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Scale 1:1,000 @ A1 HALF @ A3

Created on 06/11/2020

Sheets 04 of 08

File Identifier MDT0806-RPS-01-N2-DR-C-DR0000-DR0008

Project **N2 SLANE BYPASS AND PUBLIC REALM ENHANCEMENT SCHEME**

Title PROPOSED DRAINAGE LAYOUT SHEET 4 OF 8

Drawing Number DR0004 | Status A1 | Rev C02

R:\MDT0806_N2 Slane Bypass\8.0 Drawings\DG\DR\MDT0806-RPS-01-N2-DR-C-DR0000-DR0008 Drainage.dwg

EXISTING WATERCOURSE/DITCH

EXISTING STORM DRAIN TO BE INTERCEPTED AND DISCHARGE INTO PROPOSED INTERCEPTOR DITCH

PROPOSED INTERCEPTOR DITCH

CULVERT 5 - PROPOSED PIPED CULVERT

PROPOSED CONCRETE CHANNEL DRAIN WITH CARRIER PIPE BELOW

VORTEX GRIT SEPARATOR

PROPOSED CULVERT 7

PROPOSED INTERCEPTOR DITCH

PROPOSED GRASSED CHANNEL DRAIN

MATCHLINE

MATCHLINE

EXISTING WATERCOURSE/DITCH

CLASS 1 BYPASS MINIMUM NSBE020 FUEL OIL/HYDROCARBON INTERCEPTOR

VORTEX GRIT SEPARATOR

OVERFLOW TO STREAM

OUTFALL TO EXISTING WATERCOURSE

OVERFLOW TO DITCH

ATTENUATION POND 5B
ATTENUATION STORAGE = 520m³
RETENTION STORAGE = 153.6m³

OUTFALL TO BE FITTED WITH A VORTEX FLOW CONTROL DEVICE LIMITING DISCHARGE TO Q100 RATE OF 8.5l/s

EXISTING CULVERT UNDER FIELD ACCESS TO BE CLEARED OF ANY BLOCKAGES PRIOR TO ROAD DRAINAGE DISCHARGING.

MAMMAL UNDERPASS

PROPOSED INTERCEPTOR DITCH

CLASS 1 BYPASS MINIMUM NSBE015 FUEL OIL/HYDROCARBON INTERCEPTOR

PROPOSED INTERCEPTOR DITCH

ATTENUATION POND 5A
ATTENUATION STORAGE = 260m³
RETENTION STORAGE = 85m³

OUTFALL TO BE FITTED WITH A VORTEX FLOW CONTROL DEVICE LIMITING DISCHARGE TO Q100 RATE OF 3.82l/s

EXISTING WATERCOURSE

DITCH TO BE CLEARED OF ANY BLOCKAGES PRIOR TO ROAD DRAINAGE DISCHARGING.

NOTES:

1. ALL STORMWATER DRAINAGE TO BE IN ACCORDANCE WITH TII STANDARDS AND SPECIFICATIONS.
2. FLOW CONTROL MANHOLES TO BE DESIGNED IN ACCORDANCE WITH MANUFACTURERS SPECIFICATIONS.
3. CLASS 1 BYPASS FUEL OIL/HYDROCARBON INTERCEPTORS TO BE FITTED AT EACH DISCHARGE LOCATION.
4. CULVERTS ON WATERCOURSES SUBJECT TO SECTION 50 APPROVAL.
5. GROUNDWATER DRAINAGE REQUIREMENTS TO BE CONFIRMED AT DETAILED DESIGN STAGE.
6. CHAMBER LOCATIONS SHOWN INDICATIVELY ONLY.
7. REFER TO DRAWING MDT0806-RPS-01-N2-DR-C-DR1001 FOR TYPICAL MAINLINE DRAINAGE CROSS-SECTION.
8. REFER TO DRAWING MDT0806-RPS-01-N2-DR-C-DR1002 FOR TYPICAL DETAILS OF ATTENUATION PONDS.
9. REFER TO DRAWINGS MDT0806-RPS-01-N2-DR-C-DR1003 TO MDT0806-RPS-01-N2-DR-C-DR1004 FOR TYPICAL OUTFALL DETAILS.
10. REFER TO DRAWINGS MDT0806-RPS-01-N2-DR-C-DR2001 TO MDT0806-RPS-01-N2-DR-C-DR2003 FOR DETAILS OF CULVERTS 6A, 6B AND 6C.

LEGEND

PROPOSED STORM CARRIER PIPE
PROPOSED GRASSED OPEN CHANNEL
PROPOSED GRASSED OPEN CHANNEL & PIPE
PROPOSED CONCRETE OPEN CHANNEL DRAIN
PROPOSED FILTER DRAIN
PROPOSED GROUNDWATER FILTER DRAIN
PROPOSED KERB DRAIN - BRIDGE DECK
PROPOSED INTERCEPTOR DITCH
PROPOSED PETROL INTERCEPTOR
PROPOSED WATERCOURSE/DITCH DIVERSION
PROPOSED CULVERT
PROPOSED POND OVERFLOW
PROPOSED INVERTED SIPHON
PROPOSED INFILTRATION TRENCH
EXISTING FILTER DRAIN
EXISTING FALL OF GROUND
EXISTING WATERCOURSE/DITCH

R:\MDT0806_N2 Slane Bypass\8.0 Drawings\DG\DR\MDT0806-RPS-01-N2-DR-C-DR0000-DR0008 Drainage.dwg

Client

Bonneagar Iompair Éireann Transport Infrastructure Ireland
An Roinn Iompair Department of Transport
comhairle chontae na mi meath county council

General Notes

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(v) All Levels refer to Ordnance Survey Datum, Malin Head.

Rev	Date	Drn / Chk	Amendment / Issue	App
C02	28/11/24	TD / MN	RESPONSE TO RFI	MN
P08	18/11/24	TD / MN	FOR REVIEW AND COMMENT	MN
C01	14/06/23	KC / TD	FINAL ISSUE	MN

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Scale 1:1,000 @ A1, HALF @ A3
Created on 06/11/2020
Sheets 05 of 08

File Identifier MDT0806-RPS-01-N2-DR-C-DR0000-DR0008

Project **N2 SLANE BYPASS AND PUBLIC REALM ENHANCEMENT SCHEME**

Title PROPOSED DRAINAGE LAYOUT SHEET 5 OF 8

Drawing Number DR0005 | Status A1 | Rev C02

KERB AND GULLY DRAINAGE ON SOUTHBOUND LANE

CULVERT 6A:
2.4m WIDE X 2.4M HIGH BOX CULVERT.

LEDGE TO BE PROVIDED IN BOX CULVERT TO ALLOW PASSAGE OF MAMMALS. RAMPS TO BE PROVIDED BETWEEN THIS LEDGE AND GROUND LEVEL AT EITHER END OF CULVERT.

EXISTING MOORETOWN STREAM

EXISTING CULVERT UNDER N2 TO BE REMOVED

KERB AND GULLY DRAINAGE ON ROUNDABOUT

PROPOSED FILTER DRAIN

CULVERT 6B:
1.8m WIDE X 1.6M HIGH BOX CULVERT.

LEDGE TO BE PROVIDED IN BOX CULVERT TO ALLOW PASSAGE OF MAMMALS. RAMPS TO BE PROVIDED BETWEEN THIS LEDGE AND GROUND LEVEL AT EITHER END OF CULVERT.

VORTEX GRIT SEPARATOR

CLASS 1 BYPASS MINIMUM NSBE015 FUEL OIL/HYDROCARBON INTERCEPTOR

ATTENUATION POND 6
ATTENUATION STORAGE = 430m³
RETENTION STORAGE = 142m³

OUTFALL TO BE FITTED WITH A VORTEX FLOW CONTROL DEVICE LIMITING DISCHARGE TO Q100 RATE OF 6.8l/s

PROPOSED INTERCEPTOR DITCH

PROPOSED GRASSED CHANNEL DRAIN TO COLLECT CUTTING SLOPE RUNOFF

OUTFALL TO EXISTING WATERCOURSE

OVERFLOW TO STREAM

PROPOSED CONCRETE CHANNEL DRAIN ON BOTH SIDES OF ROAD WITH CARRIER PIPE BELOW

CULVERT 6C:
1.8m WIDE X 1.5M HIGH BOX CULVERT

EXISTING WATERCOURSE/DITCH

EXISTING CULVERT

MATCHLINE

MATCHLINE

NOTES:

1. ALL STORMWATER DRAINAGE TO BE IN ACCORDANCE WITH TII STANDARDS AND SPECIFICATIONS.
2. FLOW CONTROL MANHOLES TO BE DESIGNED IN ACCORDANCE WITH MANUFACTURERS SPECIFICATIONS.
3. CLASS 1 BYPASS FUEL OIL/HYDROCARBON INTERCEPTORS TO BE FITTED AT EACH DISCHARGE LOCATION.
4. CULVERTS ON WATERCOURSES SUBJECT TO SECTION 50 APPROVAL.
5. GROUNDWATER DRAINAGE REQUIREMENTS TO BE CONFIRMED AT DETAILED DESIGN STAGE.
6. CHAMBER LOCATIONS SHOWN INDICATIVELY ONLY.
7. REFER TO DRAWING MDT0806-RPS-01-N2-DR-C-DR1001 FOR TYPICAL MAINLINE DRAINAGE CROSS-SECTION.
8. REFER TO DRAWING MDT0806-RPS-01-N2-DR-C-DR1002 FOR TYPICAL DETAILS OF ATTENUATION PONDS.
9. REFER TO DRAWINGS MDT0806-RPS-01-N2-DR-C-DR1003 TO MDT0806-RPS-01-N2-DR-C-DR1004 FOR TYPICAL OUTFALL DETAILS.
10. REFER TO DRAWINGS MDT0806-RPS-01-N2-DR-C-DR2001 TO MDT0806-RPS-01-N2-DR-C-DR2003 FOR DETAILS OF CULVERTS 6A, 6B AND 6C.

LEGEND

- PROPOSED STORM CARRIER PIPE
- PROPOSED GRASSED OPEN CHANNEL
- PROPOSED GRASSED OPEN CHANNEL & PIPE
- PROPOSED CONCRETE OPEN CHANNEL DRAIN
- PROPOSED FILTER DRAIN
- PROPOSED GROUNDWATER FILTER DRAIN
- PROPOSED KERB DRAIN - BRIDGE DECK
- PROPOSED INTERCEPTOR DITCH
- PROPOSED PETROL INTERCEPTOR
- PROPOSED WATERCOURSE/DITCH DIVERSION
- PROPOSED CULVERT
- PROPOSED POND OVERFLOW
- PROPOSED INVERTED SIPHON
- PROPOSED INFILTRATION TRENCH
- EXISTING FILTER DRAIN
- EXISTING FALL OF GROUND
- EXISTING WATERCOURSE/DITCH

R:\MDT0806_N2 Slane Bypass\8.0 Drawings\DG\DR\MDT0806-RPS-01-N2-DR-C-DR0000-DR0008 Drainage.dwg

Client

Bonneagar Iompair Éireann
Transport Infrastructure Ireland

An Roinn Iompair
Department of Transport

comhairle chontae na mi
meath county council

General Notes

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Rev	Date	Dim	Chk	Amendment / Issue	App
C02	28/11/24	TD	MN	RESPONSE TO RFI	MN
P08	18/11/24	TD	MN	FOR REVIEW AND COMMENT	MN
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Scale 1:1,000 @ A1
HALF @ A3

Created on 06/11/2020

Sheets 06 of 08

Project **N2 SLANE BYPASS AND PUBLIC REALM ENHANCEMENT SCHEME**

Title PROPOSED DRAINAGE LAYOUT SHEET 6 OF 8

File Identifier MDT0806-RPS-01-N2-DR-C-DR0000-DR0008

Drawing Number DR0006

Status A1

Rev C02

NOTES:

1. ALL STORMWATER DRAINAGE TO BE IN ACCORDANCE WITH TII STANDARDS AND SPECIFICATIONS.
2. FLOW CONTROL MANHOLES TO BE DESIGNED IN ACCORDANCE WITH MANUFACTURERS SPECIFICATIONS.
3. CLASS 1 BYPASS FUEL OIL/HYDROCARBON INTERCEPTORS TO BE FITTED AT EACH DISCHARGE LOCATION.
4. CULVERTS ON WATERCOURSES SUBJECT TO SECTION 50 APPROVAL.
5. GROUNDWATER DRAINAGE REQUIREMENTS TO BE CONFIRMED AT DETAILED DESIGN STAGE.
6. CHAMBER LOCATIONS SHOWN INDICATIVELY ONLY.
7. REFER TO DRAWING MDT0806-RPS-01-N2-DR-C-DR1001 FOR TYPICAL MAINLINE DRAINAGE CROSS-SECTION.
8. REFER TO DRAWING MDT0806-RPS-01-N2-DR-C-DR1002 FOR TYPICAL DETAILS OF ATTENUATION PONDS.
9. REFER TO DRAWINGS MDT0806-RPS-01-N2-DR-C-DR1003 TO MDT0806-RPS-01-N2-DR-C-DR1004 FOR TYPICAL OUTFALL DETAILS.
10. REFER TO DRAWINGS MDT0806-RPS-01-N2-DR-C-DR2001 TO MDT0806-RPS-01-N2-DR-C-DR2003 FOR DETAILS OF CULVERTS 6A, 6B AND 6C.

LEGEND

- PROPOSED STORM CARRIER PIPE
- PROPOSED GRASSED OPEN CHANNEL
- PROPOSED GRASSED OPEN CHANNEL & PIPE
- PROPOSED CONCRETE OPEN CHANNEL DRAIN
- PROPOSED FILTER DRAIN
- PROPOSED GROUNDWATER FILTER DRAIN
- PROPOSED KERB DRAIN - BRIDGE DECK
- PROPOSED INTERCEPTOR DITCH
- PROPOSED PETROL INTERCEPTOR
- PROPOSED WATERCOURSE/DITCH DIVERSION
- PROPOSED CULVERT
- PROPOSED POND OVERFLOW
- PROPOSED INVERTED SIPHON
- PROPOSED INFILTRATION TRENCH
- EXISTING FILTER DRAIN
- EXISTING FALL OF GROUND
- EXISTING WATERCOURSE/DITCH

PROPOSED INFILTRATION TRENCH TO COLLECT FIELD RUNOFF. TO BE SIZED BASED ON CALCULATED INFILTRATION RATE IN ACCORDANCE WITH THE REQUIREMENTS OF BRE 365

PROPOSED FILTER DRAIN ALONG NORTHERN SIDE OF N51

KERB AND GULLY DRAINAGE ALONG SOUTHERN SIDE OF N51

PROPOSED INFILTRATION TRENCH TO COLLECT FIELD RUNOFF. OVERFLOW TO PROPOSED FILTER DRAIN IN THE EVENT OF THE DESIGN FLOW BEING EXCEEDED.

PROPOSED FILTER DRAIN ALONG NORTHERN SIDE OF N51

KERB AND GULLY DRAINAGE ALONG SOUTHERN SIDE OF N51

MATCHLINE

MATCHLINE

Quarry

Quarry (Disused)

Slane

Baile

Shláine

0.0 50.0 100.0 150.0 200.0 250.0 300.0 350.0 400.0 450.0 500.0 550.0 600.0

R:\MDT0806_N2 Slane Bypass\8.0 Drawings\DG\DR\MDT0806-RPS-01-N2-DR-C-DR0000-DR0008 Drainage.dwg

Client

Bonneagar Iompair Éireann Transport Infrastructure Ireland

An Roinn Iompair Department of Transport

comhairle chontae na mí meath county council

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C02	28/11/24	TD / MN	RESPONSE TO RFI	MN
P08	18/11/24	TD / MN	FOR REVIEW AND COMMENT	MN
C01	14/06/23	KC / TD	FINAL ISSUE	MN

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File Identifier: MDT0806-RPS-01-N2-DR-C-DR0000-DR0008

Scale: 1:1,000 @ A1, HALF @ A3

Created on: 06/11/2020

Sheets: 07 of 08

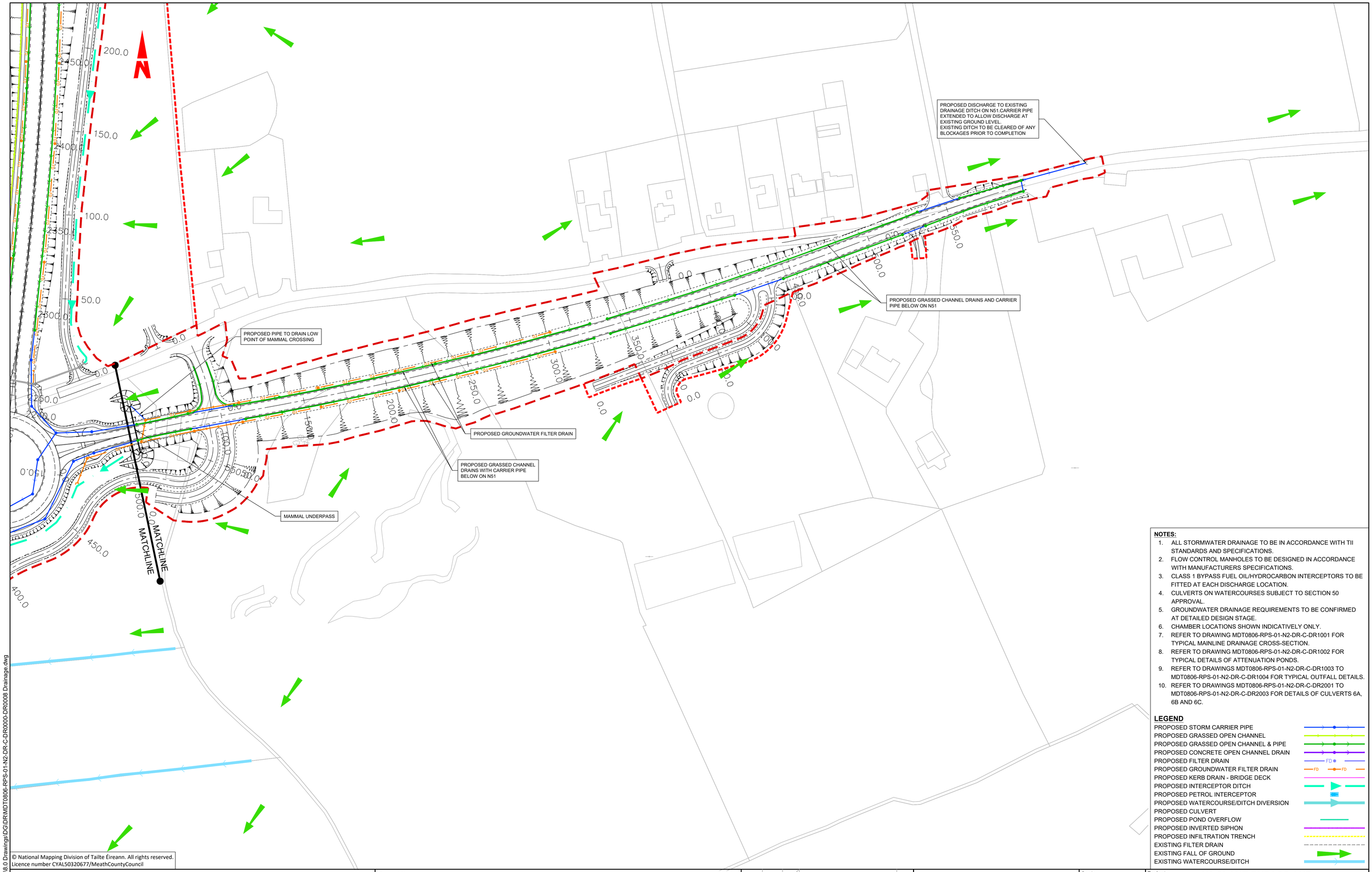
Project: **N2 SLANE BYPASS AND PUBLIC REALM ENHANCEMENT SCHEME**

Title: PROPOSED DRAINAGE LAYOUT SHEET 7 OF 8

Drawing Number: DR0007

Status: A1

Rev: C02



NOTES:

1. ALL STORMWATER DRAINAGE TO BE IN ACCORDANCE WITH TII STANDARDS AND SPECIFICATIONS.
2. FLOW CONTROL MANHOLES TO BE DESIGNED IN ACCORDANCE WITH MANUFACTURERS SPECIFICATIONS.
3. CLASS 1 BYPASS FUEL OIL/HYDROCARBON INTERCEPTORS TO BE FITTED AT EACH DISCHARGE LOCATION.
4. CULVERTS ON WATERCOURSES SUBJECT TO SECTION 50 APPROVAL.
5. GROUNDWATER DRAINAGE REQUIREMENTS TO BE CONFIRMED AT DETAILED DESIGN STAGE.
6. CHAMBER LOCATIONS SHOWN INDICATIVELY ONLY.
7. REFER TO DRAWING MDT0806-RPS-01-N2-DR-C-DR1001 FOR TYPICAL MAINLINE DRAINAGE CROSS-SECTION.
8. REFER TO DRAWING MDT0806-RPS-01-N2-DR-C-DR1002 FOR TYPICAL DETAILS OF ATTENUATION PONDS.
9. REFER TO DRAWINGS MDT0806-RPS-01-N2-DR-C-DR1003 TO MDT0806-RPS-01-N2-DR-C-DR1004 FOR TYPICAL OUTFALL DETAILS.
10. REFER TO DRAWINGS MDT0806-RPS-01-N2-DR-C-DR2001 TO MDT0806-RPS-01-N2-DR-C-DR2003 FOR DETAILS OF CULVERTS 6A, 6B AND 6C.

LEGEND

- PROPOSED STORM CARRIER PIPE
- PROPOSED GRASSED OPEN CHANNEL
- PROPOSED GRASSED OPEN CHANNEL & PIPE
- PROPOSED CONCRETE OPEN CHANNEL DRAIN
- PROPOSED FILTER DRAIN
- PROPOSED GROUNDWATER FILTER DRAIN
- PROPOSED KERB DRAIN - BRIDGE DECK
- PROPOSED INTERCEPTOR DITCH
- PROPOSED PETROL INTERCEPTOR
- PROPOSED WATERCOURSE/DITCH DIVERSION
- PROPOSED CULVERT
- PROPOSED POND OVERFLOW
- PROPOSED INVERTED SIPHON
- PROPOSED INFILTRATION TRENCH
- EXISTING FILTER DRAIN
- EXISTING FALL OF GROUND
- EXISTING WATERCOURSE/DITCH

R:\MDT0806_N2 Slane Bypass\8.0 Drawings\DG\DR\MDT0806-RPS-01-N2-DR-C-DR0000-DR0008 Drainage.dwg

Client

Bonneagar Iompair Éireann
Transport Infrastructure Ireland

An Roinn Iompair
Department of Transport

comhairle chontae na mi
meath county council

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File Identifier: MDT0806-RPS-01-N2-DR-C-DR0000-DR0008

Scale: 1:1,000 @ A1, HALF @ A3

Created on: 06/11/2020

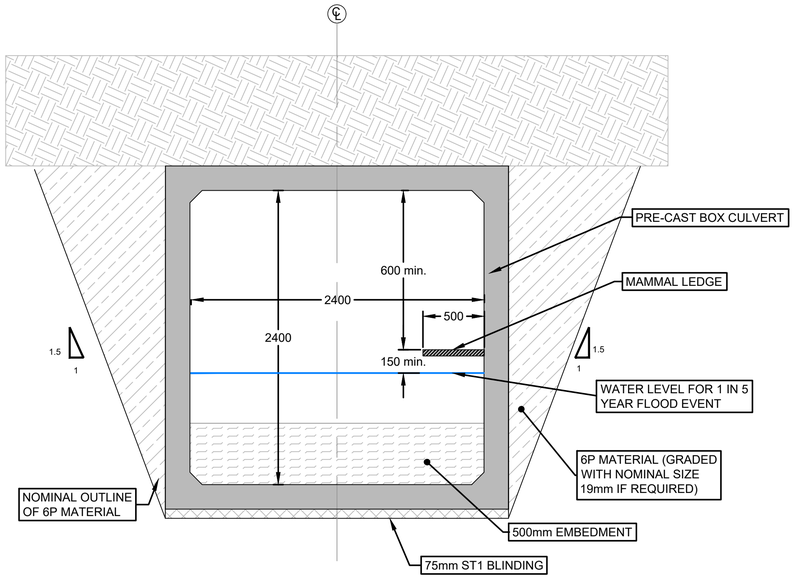
Sheets: 08 of 08

Project: **N2 SLANE BYPASS AND PUBLIC REALM ENHANCEMENT SCHEME**

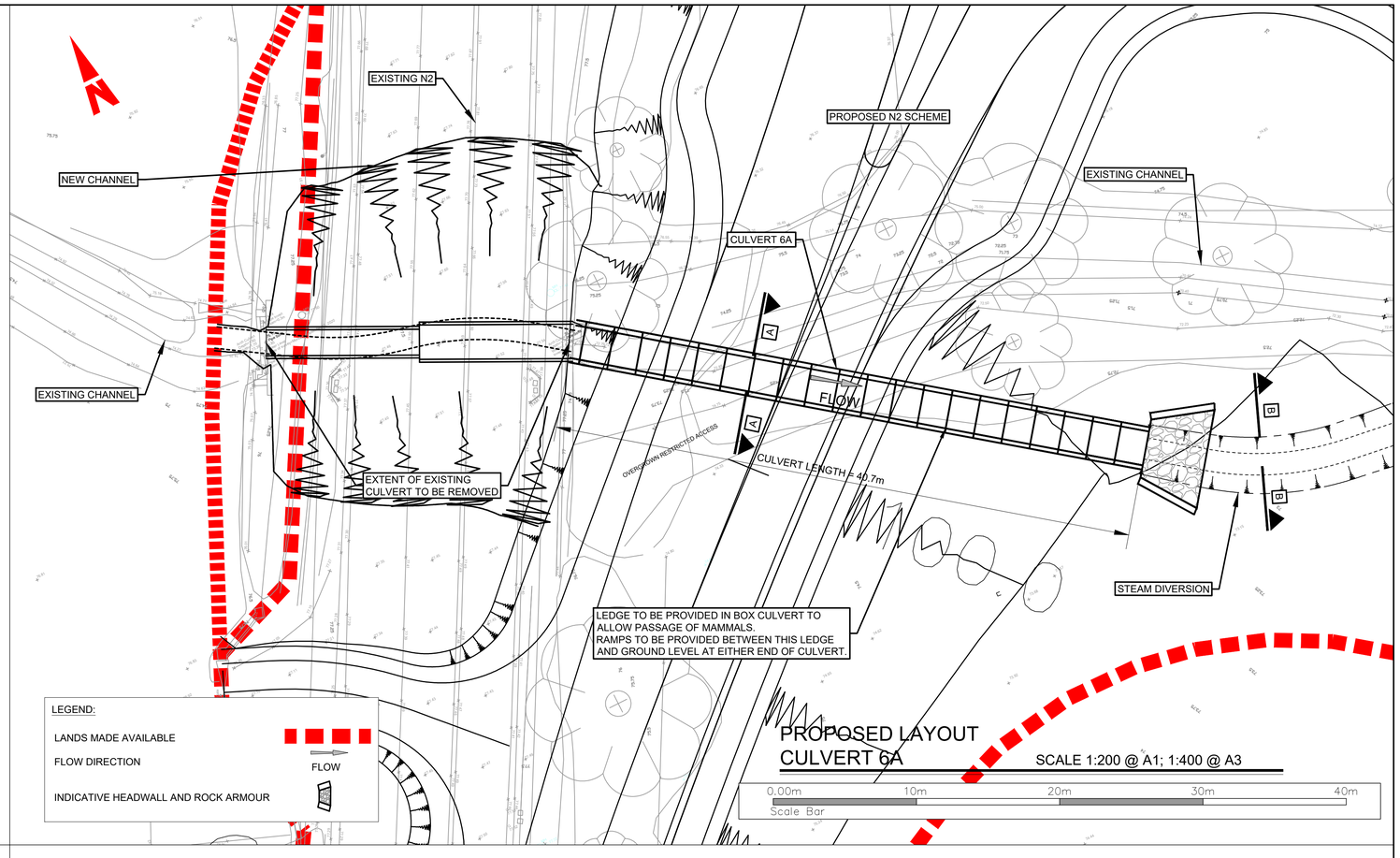
Title: PROPOSED DRAINAGE LAYOUT SHEET 8 OF 8

Drawing Number	Status	Rev
DR0008	A1	C02

E.4 Updated EIAR Vol. 3 Culvert Drawings (6A, 6B, 6C)

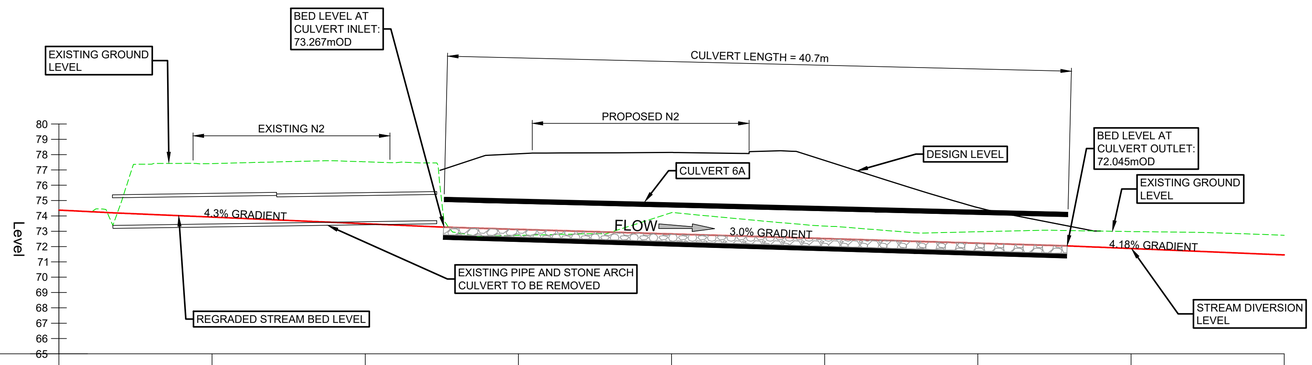


CULVERT 6A
CROSS SECTION A - A SCALE 1:20 @A1 ; 1:40 @A3



PROPOSED LAYOUT
CULVERT 6A SCALE 1:200 @ A1; 1:400 @ A3

STREAM DIVERSION
CROSS SECTION B - B SCALE 1:50 @A1 ; 1:100 @A3



CHAINAGE	00.000	10.000	20.000	30.000	40.000	50.000	60.000	70.000	80.000
PROPOSED LEVELS	74.379	73.922	73.489	73.120	72.820	72.520	72.220	71.871	71.454
EXISTING LEVELS	74.379	77.416	77.531	72.730	74.213	73.335	72.966	72.978	72.739

LONGITUDINAL SECTION
CULVERT 6A SCALE 1:200 @A1 ; 1:400 @A3

Client
Bonneagar Iompair Éireann Transport Infrastructure Ireland
An Roinn Iompair Department of Transport
comhairle chontae na mí meath county council

General Notes
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Rev	Date	Drn	Chk	Amendment / Issue	App
C02	28/11/24	MR	PM	RESPONSE TO RFI	BV
P03	21/11/24	MR	PM	FOR REVIEW AND COMMENT	BV
C01	14/06/23	MR	PM	FINAL ISSUE	BV

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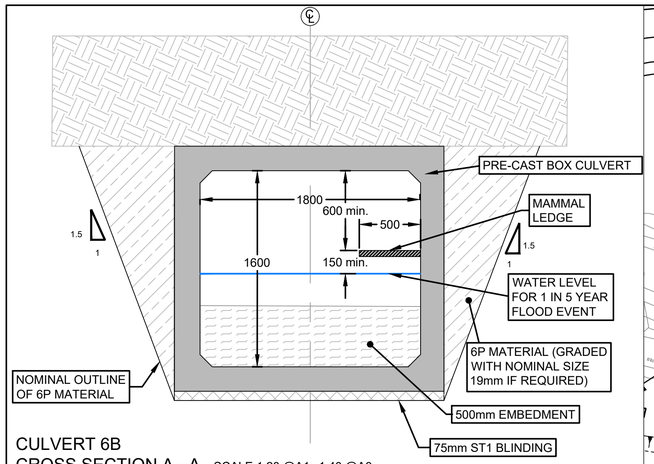
Scale: AS SHOWN @ A1, AS SHOWN @ A3
Created on: 13/05/2022
Sheets: 01 of 03

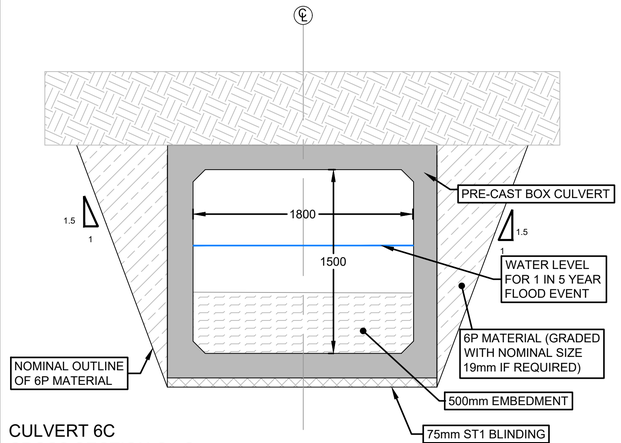
Project: N2 SLANE BYPASS AND PUBLIC REALM ENHANCEMENT SCHEME
Title: CULVERTS 6A, 6B AND 6C LAYOUT PLAN

File Identifier: MDT0806-RPS-01-N2-DR-C-DR2001-DR2004
Drawing Number: DR2001
Status: A1
Rev: C02

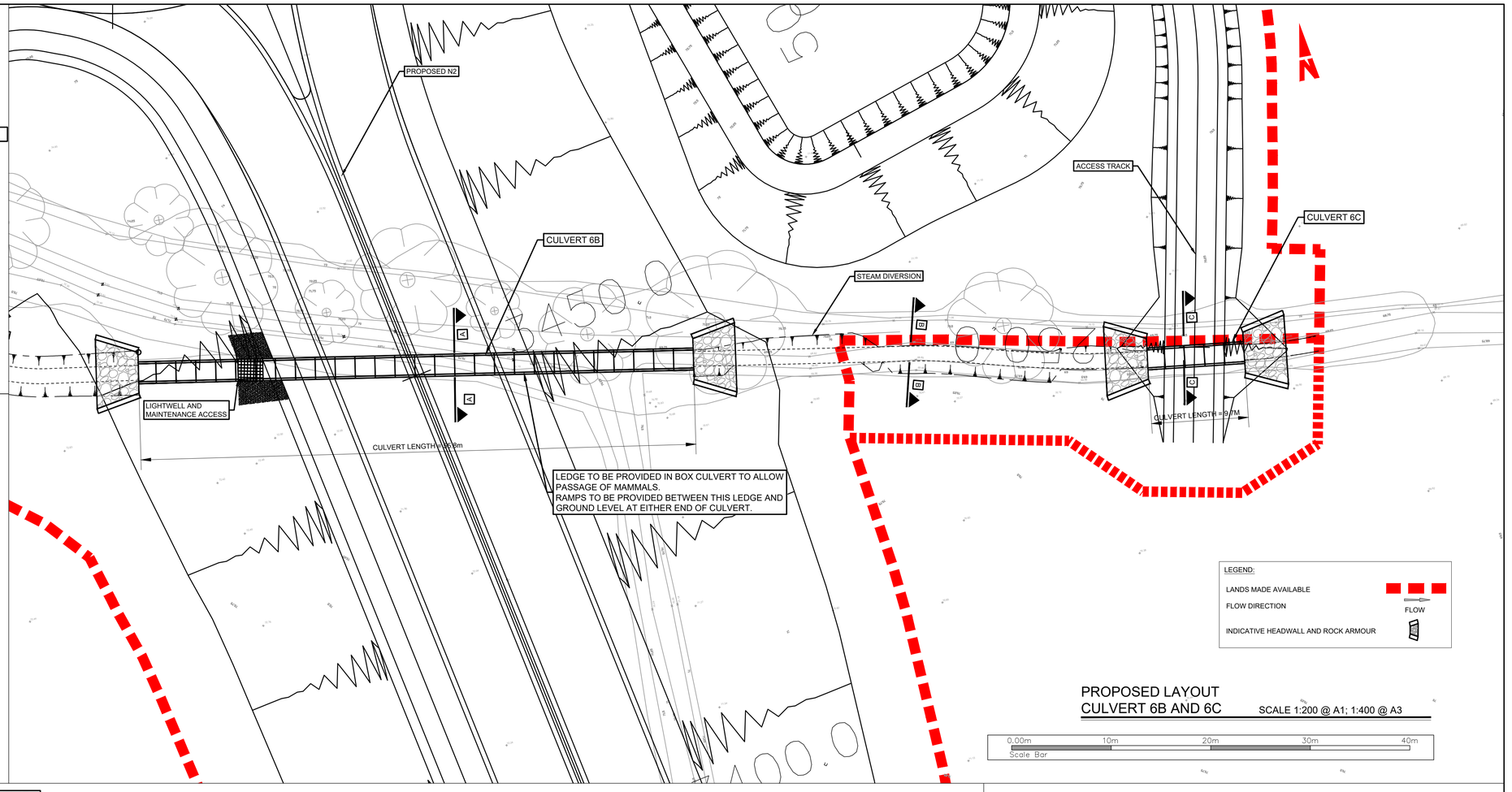
\\dubl-wp-f01\Work_Transport\MDT0806_N2 Slane Bypass\8.0 Drawings\DG\DR\MDT0806-RPS-01-N2-DR-C-DR2001-DR2004 - Culverts 6A, 6B & 6C.dwg



CULVERT 6B
CROSS SECTION A - A SCALE 1:20 @A1 ; 1:40 @A3

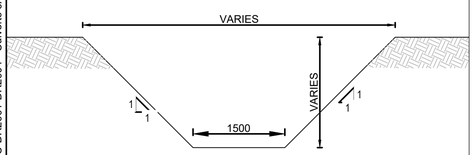


CULVERT 6C
CROSS SECTION C - C SCALE 1:20 @A1 ; 1:40 @A3

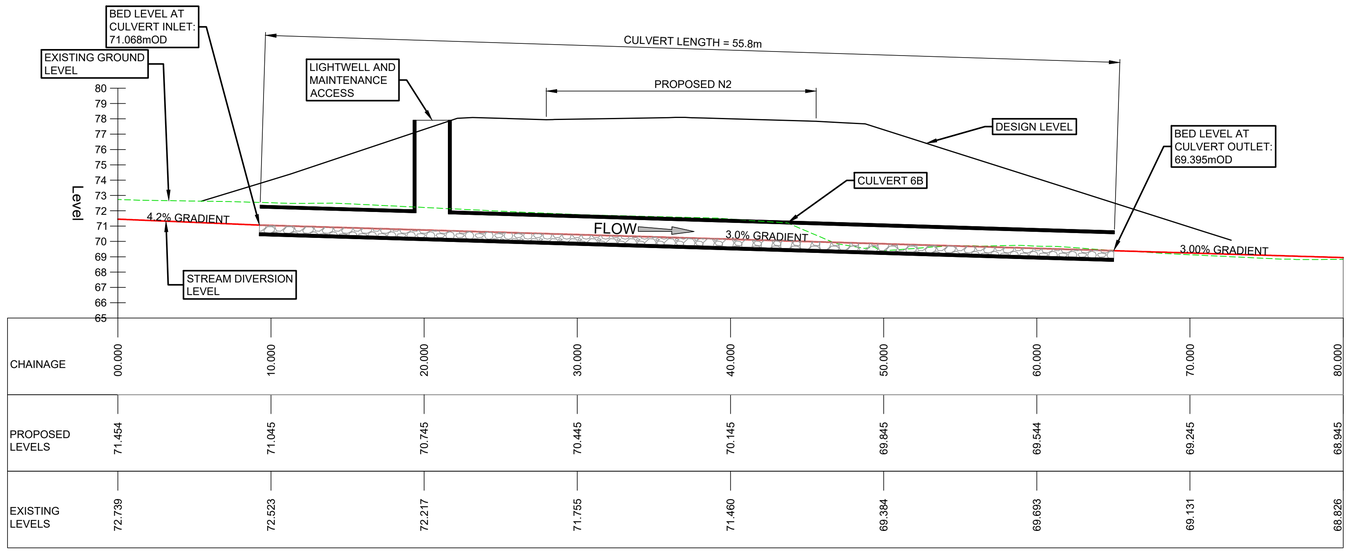


PROPOSED LAYOUT
CULVERT 6B AND 6C SCALE 1:200 @ A1; 1:400 @ A3

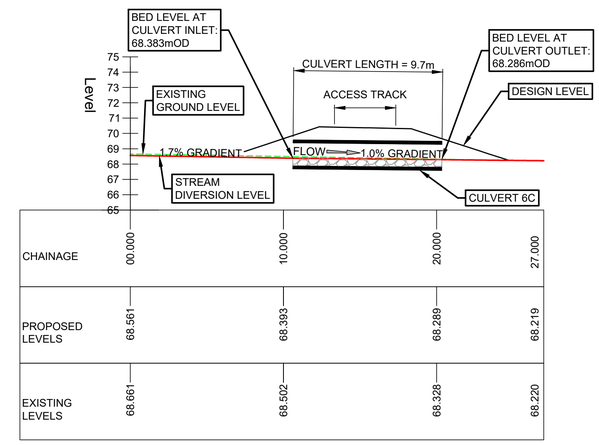
0.00m 10m 20m 30m 40m
Scale Bar



STREAM DIVERSION
CROSS SECTION B - B SCALE 1:50 @A1 ; 1:100 @A3



LONGITUDINAL SECTION
CULVERT 6B SCALE 1:200 @A1 ; 1:400 @A3



LONGITUDINAL SECTION
CULVERT 6C SCALE 1:200 @A1 ; 1:400 @A3

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Appendix F
Linear Woody Habitats

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F.1 Linear Boundaries within the Footprint of the Scheme Alignment

The following descriptions should be read in conjunction with the five maps, **Figures 1.1 to 1.5**, contained in **Section F.2** (Maps illustrating the locations of the hedgerows and treelines) at the end of this Appendix.

A total of 81 linear boundaries were identified across the Proposed Scheme. Fifty-two of those will be removed or partially removed as a result of the Proposed Scheme. Forty-nine of those 52 are discussed below. The remaining three, which are located within the public realm element of the Proposed Scheme (i.e. the proposed car park) were not assessed as access was not obtained on the day of the survey.

F.1.1 Boundary 1

Boundary 1 was a hedgerow boxed to approximately 2m high and 1.5-2m wide. It was a roadside hedgerow which is also present on the 1st edition Ordnance Survey Ireland (OSI) maps. It was relatively species rich containing eleven favourable tree, shrub and woody climber species listed in Appendix D of the Hedgerow Appraisal System (HAS) booklet (Foulkes at al., 2013). These species consisted of frequent hawthorn (*Crataegus monogyna*), rose (Rosa sp.), crab apple (*Malus sylvestris*) and ivy (*Hedera hibernica*) in conjunction with occasional damson (*Prunus domestica subsp. insititia*) and ash (*Fraxinus excelsior*) and rare holly (*Ilex aquifolium*), spindle (*Euonymus europaeus*), honeysuckle (*Lonicera periclymenum*), wild privet (*Ligustrum vulgare*) and wych elm (*Ulmus glabra*). Frequent brambles (*Rubus fruticosus* agg.) were present also. Ground flora included nettles (*Urticia dioica*), creeping buttercup (*Ranunculus repens*), hogweed (*Heracleum sphondylium*), herb-robert (*Geranium robertianum*), bush vetch (*Vicia sepium*) and cow parsley (*Anthriscus sylvestris*). There was a dry drain on the agricultural field side of this hedgerow of approximately 75cm depth. There is a slope up to the road of approximately 1m high at the hedgerow as the road has likely been raised adjacent to this boundary. This slope seemed to incorporate the bank that the hedge was initially created upon. This hedgerow has poor connectivity to the landscape as it was only linked to a single other semi-natural habitat. It was semi-opaque with <5% gaps with no one gap >5m in length. The was minor degradation of the bank visible in addition to frequent ivy on this bank. Furthermore, there was occasional sycamore (*Acer pseudoplatanus*) and field maple (*Acer campestre*) and rare snowberry (*Symphoricarpos albus*) (unfavourable tree and shrub species listed in Appendix D of the HAS booklet) dispersed throughout the hedgerow.

This hedgerow scored 25 when assessed using the HAS.

The total length of this boundary within the land acquisition boundary is 235.3m. 162.5m of this length lies within the scheme alignment/works boundary.

Plate 1 Boundary 1

F.1.2 Boundary 2

Boundary 2 was a hedgerow that had no signs of management on the day of the survey as it had an overgrown, dense habit. It was approximately 2.5-3m tall with a couple of taller elder trees and it was 3-4m wide. It was a continuous boundary with no gaps. It was also a roadside boundary and the road has been raised adjacent to it. It is not present on 1st edition OSI maps. This boundary contained six favourable tree, shrub and woody climber species listed in Appendix D of the HAS booklet. These species consisted of abundant blackthorn (*Prunus spinosa*) along with frequent wild privet, ivy and elder (*Sambucus nigra*). Frequent brambles were present also. Ground flora included herb-robert, nettles and nipplewort (*Lapsana communis*). There was no feature such as a bank or drain associated with this hedgerow, however it had multiple links with other semi-natural habitats including linear boundaries and a watercourse. This hedgerow had frequent ivy growing on the other vegetation.

This hedgerow scored 22 when assessed using the HAS.

The total length of this boundary within the land acquisition boundary is 23m. The entirety of this length lies within the scheme alignment/works boundary.

Plate 2 Boundary 2

F.1.3 Boundary 3

Boundary 3 consisted of a treeline and stream. This boundary was composed of a line of trees with scrubby vegetation between the trees on the northern side of the stream while it was primarily composed of a 1.5m wide buffer of brambles and herbaceous vegetation on the southern side of the stream. The northern section of this boundary (i.e. the left-hand bank of the stream) was approximately 1-1.5m higher than the southern section (i.e. the right-hand bank of the stream). This boundary contained nine favourable tree, shrub and woody climber species listed in Appendix D of the HAS booklet. These species consisted of abundant ash and ivy with frequent rose, occasional hawthorn, gorse (*Ulex europeaus*) and elder and rare blackthorn, holly and damson. Abundant brambles were present also. The ground flora was dominated by nutrient rich and rank species such as cleavers (*Galium aparine*), nettles (*Urtica dioica*), docks (*Rumex* sp.), couch grass (Elymus repens) and false oat grass (*Arrhenatherum elatius*) which, in conjunction with brambles and ivy were often nearly completely covering over the stream. Other ground flora species observed included cow parsley, false brome (*Brachypodium sylvaticum*), creeping buttercup, soft shield fern (*Polystichum setiferum*), bush vetch and hart's tongue fern (Asplenium scolopendrium). There were no obvious signs of management on either side of this treeline, however, the northern section has potentially had its sides cut previously. As this is a treeline, it was over 4m tall and the boundary was also >4m wide. It was losing basal structure with basal porosity deemed to be semi-translucent. Overall, boundary 3 was 5-10% gappy with no one gap >5m in length. There was abundant ash (*Fraxinus excelsior*) in this treeline, the majority of which had signs of ash die back (*Hymenoscyphus fraxineus*) or were dead. This treeline also contained abundant ivy both on the floor of the treeline and growing up into the scrubby vegetation and trees. Minor bank degradation was observed across the treeline.

This treeline scored 31 when assessed using the HAS.

The total length of this boundary within the land acquisition boundary is 174.7m. 136.2m of this length lies within the scheme alignment/works boundary.

Plate 3 Boundary 3

F.1.4 Boundary 4

Boundary 4 was a roadside treeline that was also present on 1st edition OSI maps. It contained six favourable tree, shrub and woody climber species listed in Appendix D of the HAS booklet. These species consisted of abundant ash and ivy with frequent rose and crab apple and occasional elder and hawthorn. Frequent brambles were also present. Ground flora included bush vetch, nettles, herb-robert, dock, nipplewort, hogweed, creeping buttercup, hart's tongue fern, soft-shield fern, cow parsley, false brome, wood avens (*Geum urbanum*) and willowherb (*Epilobium* sp.). This boundary contained a bank of approximately 1m high and similar to boundary 1, the verge on the roadside of this boundary has been raised during road improvements pushing material up against this bank. There was also a shallow (approx. 0.5m deep) dry, vegetated drain on the field side of this treeline. As this is a treeline, it was over 4m tall and the boundary was also >4m wide. There was no obvious recent management of this boundary on the day of the survey, however, it has had its sides cut previously. There was abundant ash in this treeline, the majority of which had signs of ash die back. This treeline also contained abundant ivy both on the floor of the treeline and growing up into the scrubby vegetation and trees.

This boundary scored 29 when assessed using the HAS.

The total length of this boundary within the land acquisition boundary is 111.9m. 69.1m of this length lies within the scheme alignment/works boundary.

Plate 4 Boundary 4

F.1.5 Boundary 5

Boundary 5 was classified as a hedgerow. It was an internal farm boundary and was also present on 1st edition OSI maps. It was relatively species rich containing 10 favourable tree, shrub and woody climber species listed in Appendix D of the HAS booklet. These species consisted of abundant ivy with frequent rose, occasional blackthorn, ash, gorse, elder, holly, guelder-rose (*Viburnum opulus*) and hawthorn and rare goat willow (*Salix caprea*). Abundant brambles were also present. Ground flora included creeping bent (*Agrostis stolonifera*), Yorkshire fog (*Holcus lanatus*), nettles, herb-robert, couch grass, bush vetch, creeping buttercup, horsetail (*Equisetum* sp.) and greater bird's-foot trefoil (*Lotus pedunculatus*). This hedgerow was built upon a bank of approximately 0.5m high with an adjacent dry drain of up to approximately 2m deep in parts. This hedgerow has been cut A-shape to approximately 2m high previously and was approximately 5m wide. The basal porosity of this hedgerow was dense with the exception of a small section towards the southern extent. It was also a continuous hedgerow with no gaps. There was abundant ivy visible on the bank/floor of the hedgerow and the margins contained frequent couch grass and occasional nettles.

This boundary scored 31 when assessed using the HAS.

The total length of this boundary within land acquisition boundary is 193.3m. The entirety of this length lies within the scheme alignment/works boundary.

Plate 5 Boundary 5

F.1.6 Boundary 6

Boundary 6 was classified as a hedgerow with occasional mature ash trees which had signs of ash die back. It was an internal farm boundary and was also present on 1st edition OSI maps. It contained 7 favourable tree, shrub and woody climber species listed in Appendix D of the HAS booklet. These species consisted of abundant ivy and gorse with frequent rose, occasional ash and hawthorn and rare holly and elder. Frequent brambles were also present. Ground flora included false brome, creeping thistle (*Cirsium arvense*), meadow vetchling (*Lathyrus pratensis*), Yorkshire fog, herb-robert and soft shield fern. This hedgerow was built upon a bank of approximately 1m high and 4m wide which did not seem to be degraded apart from the occasional den (fox) or burrow (rabbit). There was also a dry drain present on the northern side of the hedgerow of approximately 2m deep. The scrubby vegetation within this boundary had been previously cut to an A-shape of approximately 3m high and 4-5m wide. The basal porosity of this hedgerow was classified as dense and it was also a continuous hedgerow with no gaps. Ivy was occasional across the entire boundary but was observed in the canopy of each ash tree. Sheep wire was also visible within the hedgerow.

This boundary scored 33 when assessed using the HAS.

The total length of this boundary within the land acquisition boundary is 107.1m. 48.5m of this length lies within the scheme alignment/works boundary.

Plate 6 Boundary 6

F.1.7 Boundary 8

Boundary 8 was classified as a treeline. It was a farm boundary and was also present on 1st edition OSI maps. It contained 7 favourable tree, shrub and woody climber species listed in Appendix D of the HAS booklet. These species consisted of abundant ivy and blackthorn with occasional ash, rose and hawthorn and rare elder and cherry (*Prunus* sp.). Abundant brambles were also present. The ground flora was dominated by rank grasses, noxious weeds and nutrient rich species such as couch grass, docks, spear thistle (*Cirsium vulgare*) and nettles. Species such as creeping buttercup, cow parsley, soft shield fern, Yorkshire fog and herb-robert were also present. This treeline was located on a bank of less than 0.5m high and there was also a wet drain on the southern side of this treeline which was approximately 2m wide and 1.5m deep. There was abundant duckweed (*Lemna* sp.) in this drain on the day of the survey. There was also small areas of woody vegetation on the southern bank of this drain, however, the vast majority of the woody vegetation associated with boundary 8 was on the northern side of this drain. Minor bank degradation was observed. Additionally, some stones were visible on the bank in various locations, however, it was not possible to determine whether this bank was once fully stone-faced due to the sparsity of stones visible. The scrubby vegetation was approximately 3-4m high within this treeline. There was no obvious recent management of this boundary on the day of the survey, however, it has had its sides cut previously. There were less than 5% gaps throughout this treeline with no one gap being greater than 5m wide. The basal porosity was assessed to be semi-translucent as it was quite open towards the eastern extent with increasing density towards the centre of the field. Ash trees were occasional throughout this treeline with the majority showing signs of ash die back. Ivy was also abundant growing up the woody vegetation.

This boundary scored 28 when assessed using the HAS.

The total length of this boundary within the land acquisition boundary is 85.9m. 56.1m of this length lies within the scheme alignment/works boundary.

Plate 7 Boundary 8

F.1.8 Boundary 9

Boundary 9 was classified as a hedgerow. It was a roadside boundary and was also present on 1st edition OSI maps. It contained 5 favourable tree, shrub and woody climber species listed in Appendix D of the HAS booklet. These species consisted of abundant ivy and hawthorn with occasional ash, blackthorn and rose. Ground flora included cleavers, false oat grass, fescue (*Festuca* sp.), creeping buttercup, cow parsley, dandelion (*Taraxacum offinalis* agg.), hogweed and yarrow (*Achillea millefolium*). This hedgerow was located on a bank of approximately 3m height. The hedgerow was boxed to approximately 2m high before and approximately 3m wide. The sides had been recently cut on the day of the survey. The basal porosity of this hedgerow was classified as dense. It was also a continuous hedgerow with no gaps and there was no bank degradation visible. Ash was occasional throughout the hedgerow with signs of ash die back. Abundant ivy was visible throughout the hedgerow.

This boundary scored 28 when assessed using the HAS.

The total length of this boundary within the land acquisition boundary is 220.9m. 1.8m of this length lies within the scheme alignment/works boundary.

Plate 8 Boundary 9

F.1.9 Boundary 14

Boundary 14 was classified as a hedgerow. It was a roadside boundary that seems to have been relatively recently established (i.e. less than 25 years ago), most likely after road upgrades. There were no features (i.e. bank, drain etc.) associated with this hedgerow. It was dominated by hawthorn and contained 4 favourable tree, shrub and woody climber species listed in Appendix D of the HAS booklet. The other three species consisting of rare ivy, ash and rose. Occasional brambles were also present. Ground flora included false oat grass, nettles, hogweed and cow parsley. This hedgerow has been boxed to approximately 2m high and 1.5-2m wide. The basal porosity of this hedgerow was classified as semi-opaque as there were a few small gaps at the base. It was also a continuous hedgerow with no gaps and there was no bank degradation visible.

This boundary scored 16 when assessed using the HAS.

The total length of this boundary within the land acquisition boundary is 168.4m. 10.2m of this length lies within the scheme alignment/works boundary.

Plate 9 Boundary 14

F.1.10 Boundary 15

Boundary 15 was classified as a hedgerow. It was a roadside boundary and was also present on 1st edition OSI maps. It contained 6 favourable tree, shrub and woody climber species listed in Appendix D of the HAS booklet. These species consisted of abundant ivy, hawthorn and blackthorn with occasional elder and rare rose and damson. Abundant brambles were also present. Ground flora included nettles, creeping thistle, creeping buttercup and bush vetch. This hedgerow was located on a bank of approximately 1m high. Due to the topography of the landscape the adjacent road was approximately 2m downslope of this hedgerow. From the vantage of the field, this boundary was boxed to approximately 1.5m high and 1.5m wide, however, from the roadside it was approximately 3m tall. The basal porosity of this hedgerow was classified as semi-opaque as there were a few small gaps at the base. It was also a continuous hedgerow with no gaps and there was no bank degradation visible. Four strands of barbwire were observed internally in this hedgerow. The ground flora was dominated by nutrient rich species and noxious weeds i.e. frequent nettles with occasional creeping thistle. There was also abundant ivy present on the bank of this boundary.

This boundary scored 28 when assessed using the HAS.

The total length of this boundary within the land acquisition boundary is 360.8m. 259.7m of this length lies within the scheme alignment/works boundary.

Plate 10 Boundary 15

F.1.11 Boundary 16

Boundary 16 was classified as a treeline with occasional ash and hawthorn trees. The ash had signs of ash die back. It was a farm boundary and was also present on 1st edition OSI maps. It contained two favourable tree, shrub and woody climber species listed in Appendix D of the HAS booklet. These species were occasional hawthorn and ash. Occasional brambles were also present. Ground flora included cow parsley, dandelion, nettles, creeping buttercup, spear thistle and dock. The southern 5-6m of this boundary was a timber and chain-link fence i.e. not a treeline. This treeline was located on a heavily degraded stone-faced bank of approximately 1.25m high. This degradation had occurred because sheep have access to the bank. There was sheep-wire and barbwire located on top of the bank. As a treeline, this boundary was >4m high and it was 1-2m wide. Due to the lack of scrubby vegetation between the trees, this boundary was classified as derelict and open. It was also considered to be >10% gappy with at least one individual gap >5m wide. Ivy was abundant in the canopy of this treeline.

This boundary scored 16 when assessed using the HAS.

The total length of this boundary within the land acquisition boundary is 8.5m. 2.5m of this length lies within the scheme alignment/works boundary.

Plate 11 Boundary 16

F.1.12 Boundary 18

Boundary 18 was assessed to be a hedgerow. It was a roadside boundary and was also present on 1st edition OSI maps. It contained 4 favourable tree, shrub and woody climber species listed in Appendix D of the HAS booklet. These species consisted of abundant blackthorn and ivy with occasional hawthorn and elder. Ground flora included nettles, bush vetch, creeping thistle and creeping buttercup. This hedgerow was located on a bank of approximately 1m high. This hedgerow has been boxed to approximately 1.5m high and 1.5m wide. The basal porosity of this hedgerow was classified as semi-opaque as there were a few small gaps at the base. It was also a continuous hedgerow with no gaps and there was no bank degradation visible. The ground flora was dominated by nutrient rich species and noxious weeds i.e. frequent nettles with occasional creeping thistle. There was also abundant ivy present on the bank of this boundary.

This boundary scored 27 when assessed using the HAS.

The total length of this boundary within the land acquisition boundary is 44.6m. 15m of this length lies within the scheme alignment/works boundary.

Plate 12 Boundary 18

F.1.13 Boundary 20

Boundary 20 was classified as a hedgerow. It was a roadside boundary and was also present on 1st edition OSI maps. It contained 5 favourable tree, shrub and woody climber species listed in Appendix D of the HAS booklet. This hedgerow was dominated by hawthorn with abundant ivy, with occasional elder, and rare ash and rose. Abundant brambles were also present. Ground flora included wood avens, bush vetch, false oat grass, creeping thistle, soft shield fern, cow parsley, nettles, meadow vetchling, creeping buttercup, germander speedwell (*Veronica chamaedrys*), cleavers, hart's tongue fern and hogweed. This hedgerow was located on a bank of approximately 0.5-1m high and 1.5m wide. This bank was stone-faced on both sides to give the appearance of a wall from both the field and roadside and had minor signs of degradation. The scrubby vegetation was placed in a double-line on top of this bank, one line at each edge. The hedgerow was boxed to approximately 2m high and 2m wide. The basal porosity was considered to be semi-opaque as there were a few small gaps at the base. It was also a continuous hedgerow with no gaps. Sheep-wire was attached to the boundary along the roadside while barbwire was visible along the field side.

This boundary scored 25 when assessed using the HAS.

The total length of this boundary within the land acquisition boundary is 220.2m. 86.6m of this length lies within the scheme alignment/works boundary.

Plate 13 Boundary 20

F.1.14 Boundary 22

Boundary 22 was classified as a hedgerow. It was an internal farm boundary, was present on 1st edition OSI maps and is also a townland boundary. It contained 2 favourable tree, shrub and woody climber species listed in Appendix D of the HAS booklet. These species were rare hawthorn and elder. This hedgerow was dominated by brambles. Ground flora included fescue, nettles and creeping thistle. The remains of an old wall or stone-faced bank can be seen in numerous areas throughout the hedgerow of approximately 0.5m high. The hedgerow was A-shape and approximately 2m high and 3m wide. It was >50% gaps with at least one gap >5m long. Basal porosity (where vegetation was located) was considered to be dense.

This boundary scored 20 when assessed using the HAS.

The total length of this boundary within the land acquisition boundary is 96m. 54.8.6m of this length lies within the scheme alignment/works boundary. However, at least 50% of this length is a gap.

Plate 14 Boundary 22

F.1.15 Boundary 24

Boundary 24 was classified as a treeline. It was a roadside boundary and was also present on 1st edition OSI maps. It contained 5 favourable tree, shrub and woody climber species listed in Appendix D of the HAS booklet. These species consisted of abundant ivy with occasional ash, elder, blackthorn and hawthorn. Ash die back was evident within the ash trees. Rarely, beech (*Fagus sylvatica*) (an unfavourable tree species listed in Appendix D of the HAS booklet) was also present. Ground flora included dandelion, cleavers and creeping buttercup. This treeline was located on a bank of approximately 1m high. The treeline was straight sided, >4m high and approximately 2m wide. Basal porosity was assessed to be semi-opaque. It was also a continuous hedgerow with no gaps. The bank had minor signs of degradation.

This boundary scored 27 when assessed using the HAS.

The total length of this boundary within the land acquisition boundary 17.3m. The entirety of this length lies within the scheme alignment/works boundary.

Plate 15 Boundary 24

F.1.16 Boundary 27

Boundary 27 was classified as a hedgerow. It was a roadside boundary and was also present on 1st edition OSI maps. It contained 4 favourable tree, shrub and woody climber species listed in Appendix D of the HAS booklet. These species were dominated by elder with abundant ivy, occasional hawthorn and rare ash. Frequent brambles were also present. Ground flora included cleavers, nipplewort, cow parsley, creeping buttercup, dandelion and dock. This hedgerow was located on a low bank of <5m height. There was also a bank approximately 0.75m high and 2m wide located between the hedgerow and the road. This hedgerow has been previously boxed (cut on all sides) to approximately 1.25m height and 2.25m wide but on the day of the survey had elder shoots growing up. Basal porosity was assessed to be semi-translucent. It was also a continuous hedgerow with no gaps. The bank had minor signs of degradation.

This boundary scored 21 when assessed using the HAS.

The total length of this boundary within the land acquisition boundary is 109.7m. The entirety of this length lies within the scheme alignment/works boundary.

Plate 16 Boundary 27

F.1.17 Boundary 28

Boundary 28 was classified as a treeline. It was a farm boundary and was also present on 1st edition OSI maps. Full access was not obtained to this boundary; therefore, it was assessed using binoculars and from access from the eastern side of the boundary where possible. It contained at least 4 favourable tree, shrub and woody climber species listed in Appendix D of the HAS booklet. These species were abundant ivy (especially in the canopy) with frequent hawthorn, occasional elder and rare ash. The ash had signs of ash die back. This hedgerow was located on a bank of approximately 0.5-1m height. A dry drain was also present on the field side of this boundary. This treeline was undercut and basal porosity was assess to be semi-opaque. It was also a continuous hedgerow with no gaps.

This boundary scored 29 when assessed using the HAS.

The total length of this boundary within the land acquisition boundary is 11.9m. 9.9m of this length lies within the scheme alignment/works boundary.

Plate 17 Boundary 28

F.1.18 Boundary 30

Boundary 30 was classified as a treeline. It was a roadside boundary and was not present on 1st edition OSI maps. It contained 4 favourable tree, shrub and woody climber species listed in Appendix D of the HAS booklet. These species were abundant ivy with occasional ash and hawthorn and rare elder. The ash trees have signs of ash die back. Occasional sycamore (an unfavourable tree species listed in Appendix D of the HAS booklet) and brambles were also present. Ground flora included nettles and cow parsley. This treeline consisted of 4 trees with lower, scrubby vegetation boxed to approximately 1.5m high and 1m wide. The treeline is located on a low (<0.5m) bank and there was also a degraded old stone wall in part in addition to a more modern concrete wall present in part. Basal porosity was assessed to be semi-translucent. It was also a continuous treeline with no gaps. The bank had minor signs of degradation.

This boundary scored 21 when assessed using the HAS.

The total length of this boundary within the land acquisition boundary is 24.3m. The entirety of this length lies within the scheme alignment/works boundary.

Plate 18 Boundary 30

F.1.19 Boundary 31

Boundary 31 was classified as a hedgerow. It was a roadside boundary and was also present on 1st edition OSI maps. It contained 4 favourable tree, shrub and woody climber species listed in Appendix D of the HAS booklet. These species were abundant ivy with frequent elder, ash and hawthorn. Frequent brambles were also present. Ground flora included cleavers, nettles, docks, ragwort (*Jacobaea vulgaris*), colt's-foot (*Tussilago farfara*), cow parsley, creeping buttercup and hart's tongue fern. This hedgerow was located on what was potentially a stone-faced bank as there were stones visible in sections. This bank was approximately 1m high. The road has been raised adjacent to the hedgerow and the roadside verge is now pushed back into the base of the hedgerow. The hedgerow has been boxed to approximately 1.5-1.75m high and 2m wide. Towards the eastern extent the hedgerow increases to approximately 2-2.5m high. A dry, shallow (<0.5m) drain was also present adjacent to the hedgerow for approximately 50m on the field side. Another dry, shallow drain was also present adjacent to the hedgerow on the roadside towards the eastern extent. Basal porosity was assessed to be semi-opaque. This treeline was continuous with no gaps. The bank had minor signs of degradation. Barbwire has been attached to the hedgerow.

This boundary scored 25 when assessed using the HAS.

The total length of this boundary within the land acquisition boundary is 182.7m. 128.8m of this length lies within the scheme alignment/works boundary.

Plate 19 Boundary 31

F.1.20 Boundary 32

Boundary 32 was classified as a treeline. It was an internal field boundary and was not present on 1st edition OSI maps. It contained 3 favourable tree, shrub and woody climber species listed in Appendix D of the HAS booklet. These species were occasional ivy, ash and hawthorn. Occasional brambles were also present. Ground flora included cock's-foot (*Dactylis glomerata*), nettles, wood avens and cow parsley. This treeline was located on a bank of approximately 1-1.25m height and 3m width. This bank was heavily degraded. As a treeline, this boundary was >4m high and it was 1-2m wide. Due to the lack of scrubby vegetation between the trees, this boundary was classified as derelict and open. It was also considered to be 5-10% gappy with no individual gap >5m wide.

This boundary scored 13 when assessed using the HAS.

The total length of this boundary within the land acquisition boundary is 11.3m. 6.1m of this length lies within the scheme alignment/works boundary.

Plate 20 Boundary 32

F.1.21 Boundary 34

Boundary 34 was classified as a hedgerow. It was a farm boundary, which was also present on 1st edition OSI maps and is also a townland boundary. Additionally, it was a non-linear boundary. It contained 5 favourable tree, shrub and woody climber species listed in Appendix D of the HAS booklet. These species consisted of abundant ivy with occasional elder, ash and hawthorn and rare rose. Occasional sycamore and rare beech, both unfavourable tree species listed in Appendix D of the HAS booklet, were also observed in addition to frequent brambles. Ground flora was dominated by nutrient rich species such as cleavers and nettles with noxious weeds such as docks and creeping thistle. Other herbaceous species included cow parsley, creeping buttercup, bush vetch, cock's-foot and hogweed.

This hedgerow was located on a bank of <0.5m height. There was also a slope down from the hedgerow to the adjacent residential property. The hedgerow has been boxed to approximately 2m high and 1.5m wide. There is a single mature ash tree towards the southern extent of the hedgerow. This hedgerow was continuous with no gaps, however, the northern quarter to a third of the hedgerow is primarily composed of dominant nettles with brambles and ivy. The basal porosity was considered to be semi-opaque for the majority of the hedgerow. The bank had minor signs of degradation. Sheep-wire has been attached to the hedgerow.

This boundary scored 34 when assessed using the HAS.

The total length of this boundary within the land acquisition boundary is 101.7m. 90.3m of this length lies within the scheme alignment/works boundary.

Plate 21 Boundary 34

F.1.22 Boundary 35

Boundary 35 was classified as a hedgerow. It was a roadside boundary which was also present on 1st edition OSI maps. It contained 5 favourable tree, shrub and woody climber species listed in Appendix D of the HAS booklet. These species consisted of abundant ivy and hawthorn with occasional elder and damson with rare hazel (*Corylus avellana*). Occasional sycamore and rare fuchsia (*Fuchsia magellanica*), and garden privet (*Ligustrum ovalifolium*), each of which are unfavourable tree or shrub species listed in Appendix D of the HAS booklet were also observed within the hedgerow in addition to frequent brambles. Ground flora was dominated by nutrient rich and rank species such as cleavers and false oat grass.

This hedgerow was located on a bank of approximately 1.25m height. The hedgerow has been boxed to approximately 3m high and 2.5m wide. There was immature garden trees on the southern side of the hedgerow. A gap of approximately 7m was observed within the taller scrubby hedgerow vegetation which had been planted with fuchsia, hazel and garden privet slips. Overall, the basal porosity was considered to be dense for the majority of the hedgerow. The bank had minor signs of degradation.

This boundary scored 28 when assessed using the HAS.

The total length of this boundary within the land acquisition boundary is 258.2m. 138.1m of this length lies within the scheme alignment/works boundary.

Plate 22 Boundary 35

F.1.23 Boundary 36

Boundary 36 was classified as a hedgerow. It was a roadside boundary which was also present on 1st edition OSI maps. It contained 4 favourable tree, shrub and woody climber species listed in Appendix D of the HAS booklet. These species consisted of abundant ivy with frequent hawthorn and occasional elder and blackthorn. Frequent brambles were also present. This hedgerow was located on a stone-faced bank or stonewall of approximately 1.5m height. A dry, shallow (approx. 0.5m deep) drain was also present on the roadside of this hedgerow. The hedgerow has been boxed to approximately 2.5-3m high and 2.5-3m wide. This hedgerow was continuous with no gaps and the basal porosity was considered to be dense. There were no signs of degradation of the bank/wall.

This boundary scored 31 when assessed using the HAS.

The total length of this boundary within the land acquisition boundary is 48.6m. 17.3m of this length lies within the scheme alignment/works boundary.

Plate 23 Boundary 36

F.1.24 Boundary 38

Boundary 38 was classified as a hedgerow. It was an internal farm boundary which was also present on 1st edition OSI maps. It contained 5 favourable tree, shrub and woody climber species listed in Appendix D of the HAS booklet. These species consisted of frequent ivy and hawthorn with occasional ash, elder and rose. The ash trees had signs of ash die back and abundant ivy in their canopies. Frequent brambles were also present. The ground flora consisted of a high percentage of nutrient rich species (nettles) with noxious weeds (ragwort and spear thistle). Other species present included cow parsley, creeping buttercup, germander speedwell, bush vetch, false brome, herb-robert and wood avens.

This hedgerow was located on a bank of approximately 1m high and 2.5m wide. The hedgerow is boxed to approximately 2m high and 1.5m wide with occasional mature trees. A dry drain was observed towards the southern extent of the hedgerow. This drain was approximately 1.5m deep and 1.5m wide. This hedgerow was continuous with no gaps and the basal porosity was considered to be semi-opaque. There were minor signs of degradation of the bank.

This boundary scored 27 when assessed using the HAS.

The total length of this boundary within the land acquisition boundary is 177.6m. 133.1m of this length lies within the scheme alignment/works boundary.

Plate 24 Boundary 38

F.1.25 Boundary 39

Boundary 39 was classified as a hedgerow. It was an internal farm boundary which was also present on 1st edition OSI maps. It contained 4 favourable tree, shrub and woody climber species listed in Appendix D of the HAS booklet. These species consisted of abundant ivy with frequent hawthorn and rare rose and holly. Occasional beech, an unfavourable tree species listed in Appendix D of the HAS booklet and frequent brambles were also present. The ground flora consisted of a high percentage of nutrient rich species (nettles and cleavers) with noxious weeds (ragwort). Other species present included cow parsley, cock's-foot, dandelion, soft shield fern, false brome, wood avens, hogweed and germander speedwell. This hedgerow was located on a bank of approximately 1m high. The hedgerow is boxed to approximately 2m high and 1.5m wide with occasional mature trees. This hedgerow was continuous with no gaps and the basal porosity was considered to be semi-opaque. There were minor signs of degradation of the bank.

This boundary scored 25 when assessed using the HAS.

The total length of this boundary within the land acquisition boundary is 61.3m. 42.7m of this length lies within the scheme alignment/works boundary.

Plate 25 Boundary 39

F.1.26 Boundary 40

Boundary 40 was classified as a hedgerow. It was an internal farm boundary which was also present on 1st edition OSI maps. It contained 9 favourable tree, shrub and woody climber species listed in Appendix D of the HAS booklet. These species consisted of abundant ivy and hawthorn with occasional blackthorn, rose and elder with rare holly, wych elm, crab apple and ash. Occasional sycamore and rare conifers were also present, both species that are unfavourable tree species listed in Appendix D of the HAS booklet. Frequent brambles were also observed. Ground flora included abundant nutrient rich species such as nettles and cleavers in conjunction to noxious weeds such as spear thistle, creeping thistle and ragwort. Other ground flora species present included lord's and ladies (*Arum maculatum*), soft shield fern, dandelion, hogweed, knapweed (*Centaurea nigra*), cow parsley, herb-robert, hart's tongue fern and meadow vetchling. This hedgerow was located on a bank of approximately 1-1.5m high. There was also a shallow (<0.5m deep and 0.75m wide), dry, vegetated drain present on the field side of this boundary. The hedgerow is boxed to approximately 1.5m high and 3-4m wide with rare mature trees. This hedgerow was continuous with no gaps and the basal porosity was considered to be semi-opaque. There were minor signs of degradation of the bank.

This boundary scored 32 when assessed using the HAS.

The total length of this boundary within the land acquisition boundary is 264.4m. 125.6m of this length lies within the scheme alignment/works boundary.

Plate 26 Boundary 40

F.1.27 Boundary 41

Boundary 41 was classified as a treeline. It was an internal farm boundary which was also present on 1st edition OSI maps. It contained 6 favourable tree, shrub and woody climber species listed in Appendix D of the HAS booklet. These species consisted of abundant ivy with frequent hawthorn and occasional rose and elder with rare holly and ash. The ash had signs of ash die back. Occasional Wilson's honeysuckle (*Lonicera nitida*) and rare field maple and sycamore were also present, all species that are unfavourable tree species listed in Appendix D of the HAS booklet. Frequent brambles were also observed. Ground flora included abundant nutrient rich species such as nettles and cleavers in conjunction to noxious weeds such as docks. Other ground flora species present included herb-robert, wood avens, bush vetch, dandelion, cow parsley, creeping buttercup, false oat grass, hedge woundwort (*Stachys sylvatica*), nipplewort and false brome. This treeline was located on a bank of approximately 1-1.25m high and was undercut. This treeline was continuous with no gaps and the basal porosity was considered to be semi-opaque. There were minor signs of degradation of the bank.

This boundary scored 33 when assessed using the HAS.

The total length of this boundary within the land acquisition boundary is 61.2m. 12.7m of this length lies within the scheme alignment/works boundary.

Plate 27 Boundary 41

F.1.28 Boundary 42

Boundary 42 was classified as a treeline. It was an internal farm boundary which was also present on 1st edition OSI maps. It contained 4 favourable tree, shrub and woody climber species listed in Appendix D of the HAS booklet. These species consisted of abundant ivy with occasional elder and rare ash and hawthorn. Frequent Wilson's honeysuckle, occasional conifers and rare sycamore were also present, all species that are unfavourable tree species listed in Appendix D of the HAS booklet. Occasional brambles were also observed. Ground flora included abundant nutrient rich species such as nettles in conjunction to noxious weeds such as docks. Other species included nipplewort, wood avens, false oat grass, hedge woundwort, false brome, cow parsley, hogweed and creeping buttercup. This treeline was located on a bank less than 0.5m high. There was no management of the trees, however, the lower scrubby vegetation had been previously boxed to approximately 1.5m high. This treeline was >3m wide and was 5-10% gappy. No individual gap was >5m wide. The basal porosity was considered to be semi-translucent. There were minor signs of degradation of the bank.

This boundary scored 21 when assessed using the HAS.

The total length of this boundary within the land acquisition boundary is 54.5m. 10.9m of this length lies within the scheme alignment/works boundary.

Plate 28 Boundary 42

F.1.29 Boundary 43

Boundary 43 was classified as a hedgerow. It was a farm boundary which was also present on 1st edition OSI maps. It contained 5 favourable tree, shrub and woody climber species listed in Appendix D of the HAS booklet. These species consisted of abundant ivy with frequent ash, hawthorn and elder and occasional rose. Rare conifer, species that are unfavourable tree species listed in Appendix D of the HAS booklet were also observed in addition to frequent brambles. Ground flora included cock's-foot, rosebay willowherb (*Chamaenerion angustifolium*), false oat grass, cow parsley, meadow vetchling, knapweed, nettles, creeping buttercup, hogweed, broadleaved plantain (*Plantago major*), bush vetch, ribwort plantain (*Plantago lanceolata*), dandelion, nipplewort and wood avens. This hedgerow was located on a bank of approximately 1.25m high and 3-4m wide. The woody vegetation had been boxed to approximately 1.5m high with a number of mature trees. Overall width was >3m. This treeline was continuous with no gaps. The basal porosity was considered to be semi-opaque. There were signs of minor degradation of the bank.

This boundary scored 28 when assessed using the HAS.

The total length of this boundary within the land acquisition boundary is 209.7m. 131.9m of this length lies within the scheme alignment/works boundary.

Plate 29 Boundary 43

F.1.30 Boundary 44

Boundary 44 was classified as a hedgerow. It was an internal farm boundary which was also present on 1st edition OSI maps. It contained 5 favourable tree, shrub and woody climber species listed in Appendix D of the HAS booklet. These species consisted of abundant ivy with frequent blackthorn and elder, occasional hawthorn and rare rose. Frequent brambles were also present. Ground flora included nutrient rich species such as cleavers and nettles in conjunction with noxious weeds such as spear thistle and ragwort. Other species observed included upright hedge parsley (*Torilis japonica*), creeping buttercup, false brome, bush vetch, cow parsley, cock's-foot, herb-robert, dandelion and nipplewort. This hedgerow was located on a bank of approximately 1m high. The woody vegetation had been boxed to approximately 2-2.5m high and 3m wide. This hedgerow was continuous with no gaps and the basal porosity was considered to be dense. There were signs of minor degradation of the bank.

This boundary scored 27 when assessed using the HAS.

The total length of this boundary within the land acquisition boundary is 68.6m. 57.4m of this length lies within the scheme alignment/works boundary.

Plate 30 Boundary 44

F.1.31 Boundary 46

Boundary 46 was classified as a hedgerow. It was an internal farm boundary, it was present on 1st edition OSI maps and also linked to woodland on 1st edition OSI maps. It contained 5 favourable tree, shrub and woody climber species listed in Appendix D of the HAS booklet. These species consisted of abundant ivy with frequent elder and occasional ash, rose and hawthorn. Frequent brambles were also present. Ground flora included abundant nutrient rich species such as cleavers and nettles in conjunction with noxious weeds such as ragwort. Other species observed included creeping buttercup, bush vetch and cow parsley. This hedgerow was located on a bank of approximately 0.5m high. There is also a drop on the southern side of the hedgerow. There was no obvious recent management of the hedgerow, however, it seems like the sides were cut previously. The hedgerow was approximately 3m tall and 2m wide. This hedgerow was continuous with no gaps and the basal porosity was considered to be semi-translucent. Less than 20% of the bank was degraded.

This boundary scored 36 when assessed using the HAS.

The total length of this boundary within the land acquisition boundary is 78.5m. 57.5m of this length lies within the scheme alignment/works boundary.

Plate 31 Boundary 46

F.1.32 Boundary 51

Boundary 51 was classified as a treeline. It was a canal boundary and also present on 1st edition OSI maps. It contained 5 favourable tree, shrub and woody climber species listed in Appendix D of the HAS booklet. These species consisted of abundant ivy with frequent hawthorn and occasional elder, ash and grey willow. The ash trees had signs of dieback. Occasional crack willow (*Salix fragilis*) and sycamore and rare snowberry, all species that are listed as unfavourable in Appendix D of the HAS booklet were also observed in addition to abundant brambles. Ground flora included nutrient rich species such as cleavers and nettles in conjunction with cock's-foot, ribwort plantain, knapweed, flag iris (*Iris pseudacorus*), creeping buttercup, meadowsweet (*Filipendula ulmaria*), horsetail, dandelion, soft shield fern, bush vetch, cow parsley and rosebay willowherb. This hedgerow was located on a bank of low bank of <0.5m high. This hedgerow was located on the northern side of the canal towpath. A wet drain of approximately 1.5m wide was located to the north of this hedgerow. There was a slope of approximately 3m down to this drain from the hedgerow. Another drain was located on the southern side of the towpath. There was no obvious recent management of the hedgerow, however, it seems like the sides were cut previously. The hedgerow was approximately 3m tall and 2.5m wide. The western section of this hedgerow primarily consisted of a few trees with brambles and nettles on the bank while the eastern section contained more scrubby species and was more dense. This hedgerow contained >10% gaps and the basal porosity was considered to be semi-translucent. Minor bank degradation was observed along with sheep-wire and barbwire attached to the hedgerow.

This boundary scored 27 when assessed using the HAS.

The total length of this boundary within the land acquisition boundary is 195.6m. 182.6m of this length lies within the scheme alignment/works boundary.

Plate 32 Boundary 51

F.1.33 Boundary 52

Boundary 52 was classified as a treeline. It was a farm boundary and also present on 1st edition OSI maps. This treeline was only surveyed up close from the eastern side on the day of survey due to access issues. The western side was surveyed using binoculars. This western side of this hedgerow seems to be a more standard treeline located on a bank with numerous different species. These species could not be fully ascertained using binoculars. There was standing water on the eastern side of this treeline that had been colonised by non-native willow species for a width of at least 25m. Due to the access issues, only 1 favourable tree, shrub and woody climber species listed in Appendix D of the HAS booklet was identified within this treeline. This species was occasional hawthorn. Non-native willow, potentially crack willow, a species listed as unfavourable in Appendix D of the HAS booklet was the dominant species colonising the wetter eastern side of this treeline. Ground flora on the eastern side of the treeline included abundant nutrient rich species such as nettles in conjunction with species that prefer wetter habitats such as brooklime (*Veronica beccabunga*), meadow-sweet, water figwort (*Scrophularia auriculata*), reed canary grass (*Phalaris arundinacea*), silverweed (*Potentilla anserina*), creeping buttercup and flag iris. This treeline was assessed to be >4m high, >3m wide, overgrown and dense. It was also continuous with no gaps.

This boundary scored 34 when assessed using the HAS.

The total length of this boundary within the land acquisition boundary is 122.9m. 19.1m of this length lies within the scheme alignment/works boundary.

Plate 33 Boundary 52

F.1.34 Boundary 53

Boundary 53 was classified as a treeline. It was a farm boundary and also present on 1st edition OSI maps. It contained 5 favourable tree, shrub and woody climber species listed in Appendix D of the HAS booklet. These species consisted of frequent ivy and hawthorn with occasional ash, elder and rare rose. The ash trees had signs of dieback. Abundant brambles were also present. Ground flora included abundant nettles, a nutrient rich species. Other ground flora species observed included cock's-foot, chickweed (*Stellaria media*), bush vetch, hedge woundwort, red clover (*Trifolium pratense*), herb-robert, cow parsley, creeping buttercup, common sorrel (*Rumex acetosa*), wood avens, dandelion, ribwort plantain, yarrow, nipplewort and crested dog's tail (*Cynosurus cristatus*). This treeline is located between two fields. There is a drop of approximately 1.5m between western and eastern fields with the eastern field lower than the western field. This treeline is located in the western field. The drop between fields has stone placed up against the bank. There were no obvious signs of management of the treeline on the day of the survey and it varied in width from 1m to 6-7m throughout its length. This hedgerow contained 5-10% gaps with no one gap being >5m long. Basal porosity was considered to be semi-opaque. Less than 20% of the stone-faced bank had signs of degradation. Barbwire was observed attached to the hedgerow.

This boundary scored 31 when assessed using the HAS.

The total length of this boundary within the land acquisition boundary is 87m. 46.9m of this length lies within the scheme alignment/works boundary.

Plate 34 Boundary 53

F.1.35 Boundary 54

Boundary 54 was classified as a hedgerow. It was a roadside boundary and also present on 1st edition OSI maps. It contained 3 favourable tree, shrub and woody climber species listed in Appendix D of the HAS booklet. These species consisted of abundant, frequent hawthorn and occasional elder. Rare conifers, species that are listed as unfavourable in Appendix D of the HAS booklet were also observed in addition to frequent brambles. Ground flora included frequent nettles and cleaver, both nutrient rich species, in addition to rank grass such as couch grass, false oat grass, cock's-foot. Other ground flora species present included cow parsley and creeping buttercup. This hedgerow was located on a bank less than 0.5m high. The hedgerow itself was boxed to approximately 2m wide and 1.25m high. It was continuous with no gaps and basal porosity was considered to be semi-opaque. There were signs of minor degradation of the bank.

This boundary scored 21 when assessed using the HAS.

The total length of this boundary within the land acquisition boundary is 101.7m. 67.9m of this length lies within the scheme alignment/works boundary.

Plate 35 Boundary 54

F.1.36 Boundary 55

Boundary 55 was classified as a hedgerow. It was a farm boundary and also present on 1st edition OSI maps. It contained 6 favourable tree, shrub and woody climber species listed in Appendix D of the HAS booklet. These species consisted of abundant ivy, frequent hawthorn and damson, occasional elder and rare rose and holly. Frequent brambles were also present. Ground flora was very nutrient rich and included species such as nettles and cleaver, in addition to rank grass such as false oat grass and noxious weeds such as dock. Other ground flora species present included creeping buttercup and hogweed. This hedgerow was located on a bank of approximately 1.25m high. The hedgerow had sides cut and was approximately 4.5m high. This hedgerow had <5% gaps with at least one gap >5m long. Basal porosity was considered to be dense. There were signs of minor degradation of the bank.

This boundary scored 27 when assessed using the HAS.

The total length of this boundary within the land acquisition boundary is 111.8m. 82.7m of this length lies within the scheme alignment/works boundary.

Plate 36 Boundary 55

F.1.37 Boundary 56

Boundary 56 was classified as a hedgerow. It was a farm boundary and also present on 1st edition OSI maps. It contained 6 favourable tree, shrub and woody climber species listed in Appendix D of the HAS booklet. These species consisted of abundant ivy with frequent elder, occasional hawthorn, rose and ash and rare crab apple. The ash had signs of ash die back and abundant ivy in their canopy. Frequent brambles were also present. Ground flora was very nutrient rich and included species such as nettles and cleavers, in addition to rank grass such as false oat grass and couch grass. Noxious weeds such as dock were also present. Other ground flora species present included burdock (*Arctium minus)*, hedge woundwort, hogweed and red dead nettle (*Lamium purpureum*). This hedgerow was located on a bank of approximately 1m high. The hedgerow had sides cut with a couple of trees. The height of the lower scrubby vegetation varied between 4-5m high (elder, hawthorn) and approximately 2m high (brambles, rose). It was approximately 1.5-2m wide. The hedgerow was continuous with no gaps. Basal porosity was considered to be semi-translucent. There were signs of minor degradation of the bank.

This boundary scored 29 when assessed using the HAS.

The total length of this boundary within the land acquisition boundary is 165m. 134.1m of this length lies within the scheme alignment/works boundary.

Plate 37 Boundary 56

F.1.38 Boundary 58

Boundary 58 was classified as a hedgerow. It was a farm boundary and also present on 1st edition OSI maps. It contained 4 favourable tree, shrub and woody climber species listed in Appendix D of the HAS booklet. These species consisted of abundant ivy with frequent hawthorn and occasional ash and elder. The ash had signs of ash die back and abundant ivy in their canopy. Frequent brambles were also present. Ground flora was very nutrient rich and included species such as nettles and cleavers, in addition to rank grass such as false oat grass while noxious weeds such as dock and ragwort were also present. Other ground flora species present included hogweed, prickly sow thistle (*Sonchus asper*), germander speedwell, creeping buttercup and nipplewort. This hedgerow was located on a bank of approximately 1m high. A dry, shallow (approx. 0.75m deep) and 1.5m wide drain was present on the southern side. The hedgerow had its sides cut on the northern side while it was undercut on the southern side. It was approximately 3-4m high and 1-2m wide on the day of the survey. The hedgerow was continuous with no gaps. Basal porosity was considered to be semi-opaque. There were signs of minor degradation of the bank.

This boundary scored 30 when assessed using the HAS.

The total length of this boundary within the land acquisition boundary is 80.1m. 54.4m of this length lies within the scheme alignment/works boundary.

Plate 38 Boundary 58

F.1.39 Boundary 59

Boundary 59 was classified as a hedgerow. It was a farm boundary and also present on 1st edition OSI maps. It contained 4 favourable tree, shrub and woody climber species listed in Appendix D of the HAS booklet. These species consisted of abundant ivy with frequent hawthorn and occasional damson and elder. Occasional brambles were also present. Ground flora was nutrient rich and included abundant nettles in addition to rank grass such as false oat grass and cock's-foot. Noxious weeds such as dock and creeping thistle were also present. Other ground flora species present included fool's parsley (*Aethusa cynapium*), wood avens, hedge woundwort, burdock, red dead nettle, bush vetch and nipplewort. This hedgerow was located on a bank of approximately 1-1.25m high. A dry, shallow (approx. 0.5m deep) drain was also present adjacent to this hedgerow. This hedgerow had sides cut to a height of approximately 3m and it was approximately 5-6m wide. The hedgerow was continuous with no gaps. Basal porosity was considered to be semi-translucent. There were signs of minor degradation of the bank.

This boundary scored 31 when assessed using the HAS.

The total length of this boundary within the land acquisition boundary is 39.2m. 32.2m of this length lies within the scheme alignment/works boundary.

Plate 39 Boundary 59

F.1.40 Boundary 60

Boundary 60 was classified as a hedgerow. It was an internal farm boundary, was also present on 1st edition OSI maps and it is a townland boundary. It contained 4 favourable tree, shrub and woody climber species listed in Appendix D of the HAS booklet. These species consisted of frequent hawthorn and elder with occasional ivy and rare gorse. Frequent brambles were also present. Ground flora had signs of nutrient enrichment as occasional nettles were observed. Other ground flora species included cow parsley and false oat grass. This hedgerow was located on a slope of approximately 1.5m high with the field to the north on a lower level than the hedgerow. The hedgerow had been recently boxed (with rare hawthorn trees) to approximately 1.25m high and 1m wide. It had between 5-10% gaps and no one gap >5m long. Basal porosity was considered to be semi-translucent. There were signs of minor degradation of the bank/slope.

This boundary scored 22 when assessed using the HAS.

The total length of this boundary within the land acquisition boundary is 69.1m. 55.4m of this length lies within the scheme alignment/works boundary.

Plate 40 Boundary 60

F.1.41 Boundary 61

Boundary 61 was classified as a hedgerow. It was a road boundary and also present on 1st edition OSI maps. This boundary had been recently cut making identification of woody and herbaceous species difficult, however, it contained at least 4 favourable tree, shrub and woody climber species listed in Appendix D of the HAS booklet. These species consisted of frequent ivy, ash and hawthorn with occasional rose. Ash trees had signs of ash die back and abundant ivy in their canopy. Frequent brambles were also present. Ground flora included nutrient rich species such as cleavers in addition to rank grasses such as false oat grass and noxious weeds such as dock. Other ground flora species observed included bush vetch, creeping buttercup, soft shield fern, wood avens, cow parsley, hogweed, and hart's-tongue fern. This hedgerow was located on and old roadway that currently seems to be used solely for farmland access. There was a bank of approximately 1-1.25m high present in addition to a dry drain of approximately 1.5m deep and 2m wide. The laneway was lower than the adjacent fields, meaning that the hedgerow is higher on the side of the laneway compared to the field side. From the vantage of the field, the hedgerow was approximately 1.5m high and 1.5m wide with the occasional mature tree. From the laneway it was approximately 2-2.5m high. The hedgerow was continuous with no gaps. Basal porosity was considered to be semi-opaque. There were signs of minor degradation of the bank.

This boundary scored 29 when assessed using the HAS.

The total length of this boundary within the land acquisition boundary is 80.1m. 64.9m of this length lies within the scheme alignment/works boundary.

Plate 41 Boundary 61

F.1.42 Boundary 62

Boundary 62 was classified as a hedgerow. It was a roadside boundary and also present on 1st edition OSI maps. This boundary had been recently cut making identification of woody and herbaceous species difficult, however, it contained at least 6 favourable tree, shrub and woody climber species listed in Appendix D of the HAS booklet. These species consisted of abundant ivy with frequent hawthorn, rose, ash and elder with occasional gorse. The ash had signs of ash die back and abundant ivy in their canopy. Abundant brambles were also present. Ground flora included creeping buttercup, Yorkshire fog, soft shield fern, hart's tongue fern, cock's-foot, bush vetch, perennial rye grass (*Lolium perenne*), cow parsley, fescue and herb-robert. This hedgerow was located on and old roadway that currently seems to be used solely for farmland access. There was a bank of approximately 1-1.25m high and 1.5m wide present in addition to a shallow, dry drain of approximately 0.5m deep. There was a 0.5m step up to this bank on the field side. The laneway was lower than the adjacent fields, meaning that the hedgerow is higher on the side of the laneway compared to the field side. From the vantage of the field, the hedgerow was approximately 1m high and 2m wide with the occasional mature tree. From the laneway it was approximately 2-2.5m high. The hedgerow was continuous with no gaps. Basal porosity was considered to be semi-opaque. There were signs of minor degradation of the bank.

This boundary scored 29 when assessed using the HAS.

The total length of this boundary within the land acquisition boundary is 79.2m. 64.1m of this length lies within the scheme alignment/works boundary.

Plate 42 Boundary 62

F.1.43 Boundary 63

Boundary 63 was classified as a hedgerow. It was a farm boundary and also present on 1st edition OSI maps. It contained 6 favourable tree, shrub and woody climber species listed in Appendix D of the HAS booklet. These species consisted of frequent ivy and elder with occasional rose, hawthorn, holly and ash. The ash had signs of ash die back and abundant ivy in their canopy. Abundant brambles were also present. Ground flora included frequent nutrient rich species such as nettles and cleavers, in addition to rank grass such as false oat grass, cock's-foot and couch grass. Noxious weeds such as dock were also present. Other ground flora species present included colt's-foot, creeping buttercup, hogweed, Yorkshire fog, rosebay willowherb and dandelion. This hedgerow was located on a bank of approximately 0.5-1m high. Dry vegetated drains were present on both sides of this hedgerow, at least in parts. These drains were approximately 1m deep and up to 2.5m wide. The hedgerow seemed to be largely unmanaged, however, the western approximate third of this hedgerow on the northern side had recently had its sides cut. The boundary was >4m high and >3m wide. It was overgrown and basal porosity was assessed to be dense. It contained <5% gaps with no one gap being >5m long. Less than 20% of the length of the bank had signs of degradation.

This boundary scored 33 when assessed using the HAS.

The total length of this boundary within the land acquisition boundary is 120.8m. 80m of this length lies within the scheme alignment/works boundary.

Plate 43 Boundary 63

F.1.44 Boundary 64

Boundary 64 was classified as a treeline. It was a roadside boundary, which was present on 1st edition OSI maps and it is also a townland boundary. It contained 5 favourable tree, shrub and woody climber species listed in Appendix D of the HAS booklet. These species consisted of abundant ivy with frequent elder and hawthorn with occasional ash and Scots pine (*Pinus sylvestris*). The ash had signs of ash die back and there was abundant ivy climbing up the majority of trees and scrub. Abundant brambles were also present. Occasional conifers and sycamore, species that are listed as unfavourable in Appendix D of the HAS booklet were also observed scattered throughout the treeline. Ground flora was nutrient rich and included abundant nettles and cleavers, in addition to rank grass such as false oat grass. Noxious weeds such as dock and creeping thistle were also present. Other ground flora species present included creeping buttercup, hart's-tongue fern, soft shield fern, wood avens, hogweed, cow parsley and herb-robert. This treeline was >4m high and >4m wide and was more akin to woodland than a treeline. There was a dry drain approximately 1.5-2m deep and 2-3m wide internally with woody vegetation present on both banks. There was no obvious management of this treeline on the field side, however sides had been previously cut on the roadside. It was continuous with no gaps. Basal porosity was considered to be dense. There were signs of minor degradation of the bank.

This boundary scored 37 when assessed using the HAS.

The total length of this boundary within the land acquisition boundary is 176.5m. 112m of this length lies within the scheme alignment/works boundary.

Plate 44 Boundary 64

F.1.45 Boundary 65

Boundary 65 was classified as a hedgerow. It was a farm boundary, was present on 1st edition OSI maps and is also a townland boundary. It contained 3 favourable tree, shrub and woody climber species listed in Appendix D of the HAS booklet. These species consisted of abundant ivy with occasional elder and hawthorn. Frequent brambles were also present. Rare conifers, species that are listed as unfavourable in Appendix D of the HAS booklet were also observed within this hedgerow. Ground flora was very nutrient rich and included species such as nettles and cleavers, in addition to rank grass such as false oat grass. Other ground flora species present included herb-robert, false brome and creeping buttercup. This hedgerow was located on a low bank <0.5m high. There was no recent management of this hedgerow however, the lower vegetation had been previously cut A-shape to approximately 2.5m high and >3m wide. There was abundant ivy throughout the hedgerow. The hedgerow was continuous with no gaps. Basal porosity was considered to be semi-translucent. There were signs of minor degradation of the bank.

This boundary scored 30 when assessed using the HAS.

The total length of this boundary within the land acquisition boundary is 21.8m. 14.6m of this length lies within the scheme alignment/works boundary.

Plate 45 Boundary 65

F.1.46 Boundary 66

Boundary 66 was classified as a treeline. It was a roadside boundary, which was present on 1st edition OSI maps and it is also a townland boundary. It contained 6 favourable tree, shrub and woody climber species listed in Appendix D of the HAS booklet. These species consisted of abundant ivy with frequent ash and hawthorn with occasional damson and rare elm (*Ulmus procera*). The ash had signs of ash die back and there was abundant ivy climbing up the majority of trees and scrub. Frequent brambles were also present. Ground flora included ribwort plantain, cow parsley and hedge woundwort. This treeline was >4m high and >4m wide and was more akin to woodland than a treeline. There was a low bank of <0.5m on the eastern side of this boundary which slopes down towards the road for approximately 2-2.5m high. There was a dry drain approximately 1.5-2m deep and 4-5m wide internally with woody vegetation present on both banks. The sides of this treeline had been recently cut on the eastern side and sides had been previously cut on the roadside. It was continuous with no gaps. Basal porosity was considered to be dense. There were signs of minor degradation of the bank.

This boundary scored 37 when assessed using the HAS.

The total length of this boundary within the land acquisition boundary is 55.3m. 48.2m of this length lies within the scheme alignment/works boundary.

Plate 46 Boundary 66

F.1.47 Boundary 67

Boundary 67 was classified as a treeline. It was a roadside boundary and also present on 1st edition OSI maps. It contained 4 favourable tree, shrub and woody climber species listed in Appendix D of the HAS booklet. These species consisted of frequent ivy with occasional ash, hawthorn and rare elm. The ash had signs of ash die back or were dead. Occasional brambles and non-native garden shrubby species were also present. Ground flora included nettles, creeping buttercup and false oat grass. This treeline was approximately 1-2m wide and >4m high. It contained >10% gaps with at least one gap >5m wide. Basal porosity was considered to be semi-translucent. There were signs of minor degradation of the bank.

This boundary scored 12 when assessed using the HAS.

The total length of this boundary within the land acquisition boundary is 47.8m. 29m of this length lies within the scheme alignment/works boundary.

Plate 47 Boundary 67

F.1.48 Boundary 68

Boundary 68 was classified as a treeline. It was a roadside boundary and also present on 1st edition OSI maps. It contained 3 favourable tree, shrub and woody climber species listed in Appendix D of the HAS booklet. These species consisted of frequent ivy with occasional ash and elder. The ash had signs of ash die back. Abundant brambles were also present. Rare sycamore, a species that is listed as unfavourable in Appendix D of the HAS booklet were also observed within this treeline. Ground flora included cow parsley, bush vetch and cleavers. This hedgerow was located around a timber fence and there is a slope of approximately 2m height down from the roadside to the adjacent field. This treeline has had its sides cut previously. It contained between 5 and 10% gaps with no individual gap >5m in length. Basal porosity was considered to be semi-translucent. There were signs of minor degradation of the slope.

This boundary scored 22 when assessed using the HAS.

The total length of this boundary within the land acquisition boundary is 19.6m. 15.7m of this length lies within the scheme alignment/works boundary.

Plate 48 Boundary 68

F.1.49 Boundary 71

Boundary 71 was classified as a treeline. It was a roadside boundary and also present on 1st edition OSI maps. It contained 6 favourable tree, shrub and woody climber species listed in Appendix D of the HAS booklet. These species consisted of abundant ivy with frequent elm, hawthorn and blackthorn with occasional rose and ash. The ash had signs of ash die or were dead. Frequent brambles were also present. Occasional sycamore, a species that is listed as unfavourable in Appendix D of the HAS booklet were also observed within this treeline. Ground flora included cow parsley, ribwort plantain, hart's-tongue fern, soft shield fern, bush vetch, black medic (*Medicago lupulina*), germander speedwell and false brome. This treeline was located on a bank of approximately 1m high. The lower vegetation within this treeline was boxed to approximately 3m high and 2-3m wide. A drain was observed on the eastern side of the hedgerow which was approximately 1.5m wide and 1.5m deep. The hedgerow was continuous with no gaps. Basal porosity was considered to be dense. There were signs of minor degradation of the bank.

This boundary scored 32 when assessed using the HAS.

The total length of this boundary within the land acquisition boundary is 143.4m. 97.8m of this length lies within the scheme alignment/works boundary.

Plate 49 Boundary 71

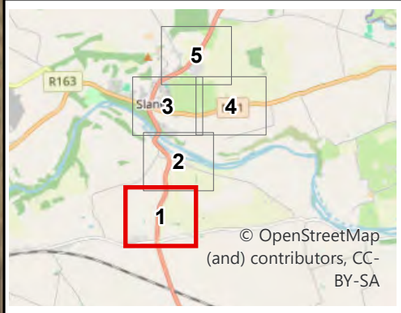
F.2 Maps illustrating the locations of the hedgerows and treelines

Legend

- Proposed Scheme
- Proposed Scheme Boundary
- Linear Woody Boundaries

Data Source: OSi Orthophotography tiles 2019

0 0.05 0.1 0.2
Kilometres



Client

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N2 Slane Bypass and Public Realm Enhancement Scheme

Title

Figure 1.1
Linear Woody Boundaries within the Proposed Scheme's Footprint
Map 1 of 5

West Pier
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Issue Details

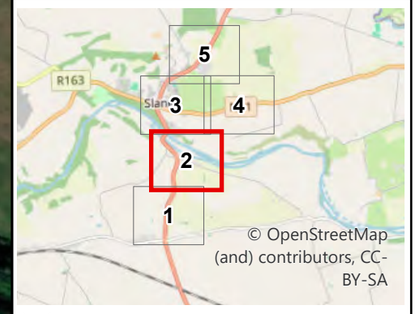
File Identifier: MDT0806-RPS-00-N2-DR-Z-AG-4015		
Status: A1	**Rev:** C01	**Model File Identifier:** MDT0806-RPS-01-N2-M2-C-XM1001 MDT0806-RPS-01-PR-M2-C-XR9000
Drawn: NR		**Date:** 12/12/2024
Checked: JL		**Scale:** 1:4,000 (A3)
Approved: MN		**Projection:** ITM

Legend

- Proposed Scheme
- Proposed Scheme Boundary
- Linear Woody Boundaries

Data Source: OSi Orthophotography tiles 2019

0 0.05 0.1 0.2
Kilometres



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Title

Figure 1.2
Linear Woody Boundaries within the Proposed Scheme's Footprint
Map 2 of 5

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File Identifier:
MDT0806-RPS-00-N2-DR-Z-AG-4015

Status:	Rev:	Model File Identifier:
A1	C01	MDT0806-RPS-01-N2-M2-C-XM1001 MDT0806-RPS-01-PR-M2-C-XR9000

Drawn: NR	**Date:** 12/12/2024
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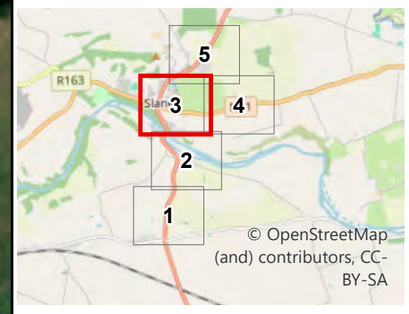
Legend

- Proposed Scheme
- Proposed Scheme Boundary
- Linear Woody Boundaries

Data Source: OSi Orthophotography tiles 2019

0 0.05 0.1 0.2
Kilometres



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Title

Figure 1.3
Linear Woody Boundaries within the Proposed Scheme's Footprint
Map 3 of 5

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Status:	Rev:	Model File Identifier:
A1	C01	MDT0806-RPS-01-N2-M2-C-XM1001 MDT0806-RPS-01-PR-M2-C-XR9000

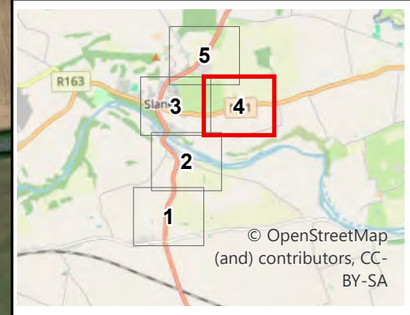
Drawn: NR	**Date:** 12/12/2024
Checked: JL	**Scale:** 1:4,000 (A3)
Approved: MN	**Projection:** ITM

Legend

- Proposed Scheme
- Proposed Scheme Boundary
- Linear Woody Boundaries

Data Source: OSi Orthophotography tiles 2019

0 0.05 0.1 0.2
Kilometres



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Title

Figure 1.4
Linear Woody Boundaries within the Proposed Scheme's Footprint
Map 4 of 5

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Status:	Rev:	Model File Identifier:
A1	C01	MDT0806-RPS-01-N2-M2-C-XM1001 MDT0806-RPS-01-PR-M2-C-XR9000

Drawn: NR	**Date:** 12/12/2024
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Approved: MN	**Projection:** ITM

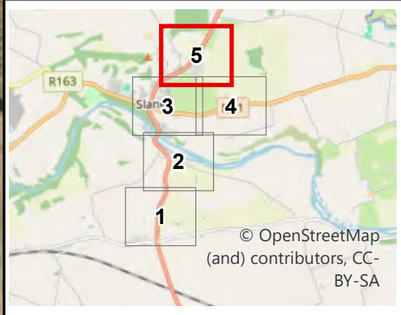
NOTE:

Legend

- Proposed Scheme
- Proposed Scheme Boundary
- Linear Woody Boundaries

Data Source: OSi Orthophotography tiles 2019

0 0.05 0.1 0.2
Kilometres



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Title

Figure 1.5
Linear Woody Boundaries within the Proposed Scheme's Footprint
Map 5 of 5

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Issue Details

File Identifier:
MDT0806-RPS-00-N2-DR-Z-AG-4015

Status:	Rev:	Model File Identifier:
A1	C01	MDT0806-RPS-01-N2-M2-C-XM1001 MDT0806-RPS-01-PR-M2-C-XR9000

Drawn: NR	**Date:** 12/12/2024
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Approved: MN	**Projection:** ITM

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F.3 Habitat Appraisal System Scoring Breakdown Linear boundaries with the footprint of the scheme alignment

Boundary ID	Historical	Species diversity	Structure, construction and associated features	Habitat connectivity	Landscape	Structural variables	Continuity	Negative Indicators	Total
1	2 - roadside 3 - 1st edition OSI	4 – 11 species	2 – dry drain 2 – bank 0.75m	1 – single link with SNH		1 – 1.5-2.5m high 1 – 1-2m wide 2 – boxed 2 – semi-opaque	2 - <5% gaps 1 - <5m individual gap	2 – minor bank degradation	
Total	**5**	**4**	**4**	**1**	**0**	**6**	**3**	**2**	**25**
2	2 - roadside boundary	2 – 6 species	N/A	2 – multiple links		2 – 2.5-4m high 3 - >3m wide 3 – overgrown 3 - dense	3 – continuous 3 – no gaps	>25% Ivy	
Total	**2**	**2**	**0**	**2**	**0**	**11**	**6**	**0**	**22**
3	2 – farm 3 – 1st edition OSI	3 – 9 species	3 – bank >1m 4 – stream	2 – multiple links	2 – mature trees	3 - >4m high 3 - >3m wide 1 – losing basal structure 1 – semi-translucent	1 – 5—10% gaps 1 - <5m gaps	2 – minor bank degradation >25% Ivy >20% ruderal	
Total	**5**	**3**	**7**	**2**	**2**	**8**	**2**	**2**	**31**
4	2 - roadside 3 - 1st edition OSI	2 – 6 species	2 - Bank – 0.5-1m 2 – dry ditch	2 – multiple links	2 – mature trees	3 - >4m high 3 - >3m wide 2 – straight sided 1 – semi-translucent	2 - <5% gaps 1 - <5m gap	2 – minor bank degradation >25% ivy >20% NR species	
Total	**5**	**2**	**4**	**2**	**2**	**9**	**3**	**2**	**29**
5	1 – internal 3 – 1st ed OSI	4 – 10 species	1 – bank <0.5m 2 – dry drain	2 – multiple links		2 – 2.5-4m high 3 - >3m wide 2 – A shaped 2 – semi opaque	3 – continuous 3 – no gaps	3 – no bank degradation >20% NR species	

Boundary ID	Historical	Species diversity	Structure, construction and associated features	Habitat connectivity	Landscape	Structural variables	Continuity	Negative Indicators	Total
Total	**4**	**4**	**3**	**2**	**0**	**9**	**6**	**3**	**31**
6	1 – internal 3 – 1st ed OSI	2 – 7 species	2 – bank 1m 2 – dry drain	2 – multiple links	2 – mature trees	2 – 2.5-4m high 3 - >3m wide 2 – A-shape 3 - dense	3 – continuous 3 – no gaps	3 – no bank degradation >25% ivy	
Total	**4**	**2**	**4**	**2**	**2**	**10**	**6**	**3**	**33**
7	2 – farm 3 – 1st ed OSI 4 - Townland	2 – 6 species	1 – bank <0.5m 2 – dry drain	2 – multiple links	2 – mature trees	3 - >4m high 1 – 1-2m wide 1 – losing basal structure 1 – semi-translucent	3 – continuous 3 – no gaps	2 – minor bank degradation >25% ivy	
Total	**9**	**2**	**3**	**2**	**2**	**6**	**6**	**2**	**32**
8	2 – farm 3 – 1st ed OSI	3 – 8 species	1 – bank <5m high 3 – wet ditch	2 – multiple links	2 – mature trees	3 - >4m high 1 – 1-2m wide 2 – straight sided 1 – semi-translucent	2 - <5% gaps 1 - <5m gap	2 – minor bank degradation >25% ivy >20% NR	
Total	**5**	**3**	**4**	**2**	**2**	**7**	**3**	**2**	**28**
9	2 – roadside 3 – 1st ed OSI	1 – 5 species	3 – bank >1m	2 – multiple links		1 – 1.5-2.5m high 2 – 2-3m wide 2 – boxed 3 – dense	3 – continuous 3 – no gaps	3 – no degradation	
Total	**5**	**1**	**3**	**2**	**0**	**8**	**6**	**3**	**28**
10	2 – roadside	0 – 1 species	0 – no features	2 – multiple links		1 – 1.5-2.5m high 2 – 2-3m wide 2 – A shaped	3 – continuous 3 – no gaps	0 – no bank Just brambles on fence	
Total	**2**	**0**	**0**	**2**	**0**	**5**	**6**	**0**	**15**
11	0 – recently established 2 – roadside	1 – 4 species	0 – no features	1 – single link		1 – 1.5-2.5m high 1 – 1-2m wide 2 – boxed 2 – semi-opaque	3 – continuous 3 – no gaps	0 – no bank	

Boundary ID	Historical	Species diversity	Structure, construction and associated features	Habitat connectivity	Landscape	Structural variables	Continuity	Negative Indicators	Total
Total	**2**	**1**	**0**	**1**	**0**	**6**	**6**		**16**
12	Didn't go into field								
13	2 – roadside 3 – 1sr ed OSI	0 – 3 species	3 – bank >1m	2 – multiple links	2 – mature trees	3 - >4m high 1 – 1-2m wide 2 – straight sided 0 – open	0 - >10% gaps 0 – gap >5m	2 – minor degradation >25% ivy	
Total	**5**	**0**	**3**	**2**	**2**	**6**	**0**	**2**	**20**
14	0 – recently established 2 – roadside	1 – 4 species	0 – no features	1 – single link		1 – 1.5-2.5m high 1 – 1-2m wide 2 – boxed 2 – semi-opaque	3 – continuous 3 – no gaps	0 – no bank	
Total	**2**	**1**	**0**	**1**	**0**	**6**	**6**	**0**	**16**
15	2 – roadside 3 – 1st ed OSI	2 – 6 species	3 – bank >1m	2 – multiple links		2 – 2.5-4m high 1 – 1-2m wide 2 – boxed 2 – semi-opaque	3 – continuous 3 – no gaps	3 – no degradation	
Total	**5**	**2**	**3**	**2**	**0**	**7**	**6**	**3**	**28**
16	2 - farm 3 – 1st ed OSI	0 – 1-3 species	3 - >1m bank	2 – multiple links	2 – mature trees	3 - >4m high 1 – 1-2m wide 0 – remnant 0 - open	0 - >10% gaps 0 – gap >5m	0 - >20% bank degraded >25% ivy	
Total	**5**	**0**	**3**	**2**	**2**	**4**	**0**	**0**	**16**
17	2 – roadside 3 – 1st ed OSI	1 – 5 species	3 – bank >1m	1 – single link SNH	2 – mature trees	3 - >4m high 1 – 1-2m wide 1 – losing basal structure 1 – semi translucent	2 - <5% gappy 1 - <5m gap	2 – minor degradation 0 - >25% ivy	
Total	**5**	**1**	**3**	**1**	**2**	**6**	**3**	**2**	**23**
18	2 – roadside 3 – 1st ed OSI	1 – 4 species	2 – bank 0.5-1m	2 – multiple links		2 – 2.5-4m high 2 – 2-3m wide	3 – continuous 3 – no gaps	3 – no degradation	

Boundary ID	Historical	Species diversity	Structure, construction and associated features	Habitat connectivity	Landscape	Structural variables	Continuity	Negative Indicators	Total
						2 – boxed 2 – semi-opaque			
Total	**5**	**1**	**2**	**2**	**0**	**8**	**6**	**3**	**27**
19	1 – internal 3 – 1st ed OSi 4 - Connects to woodland	1 – 4 species	3 – wall >1m	2 – multiple links	2 – mature trees	3 - >4m high 2 – 2-3m wide 3 – undercut 1 – semi-translucent	3 – continuous 3 – no gaps	0 - >20% of wall degraded 0 - >25% ivy	
Total	**8**	**1**	**3**	**2**	**2**	**9**	**6**	**0**	**30**
20	3 – 1st ed OIS 2 – road	1 – 5 species	2 – wall 0.5-1m high	2 – multiple links		1 – 1.5-2.5m high 2 – 2-3m wide 2 – boxed 2 – semi opaque	3 – continuous 3 – no gaps	2 – minor wall degradation	
Total	**5**	**1**	**2**	**2**	**0**	**7**	**6**	**2**	**25**
21	2 – farm 3 – 1st ed OSI 4 - townland	2 – 7 species	1 – bank <5m 3 – wet drain	2 – multiple links	2 – mature trees	3 - >4m high 2 – 2-3m wide 3 – undercut 2 – semi-opaque	3 – continuous 3 – no gaps	2 – minor wall degradation	
Total	**9**	**2**	**4**	**2**	**2**	**10**	**6**	**2**	**37**
22	1 – internal 3 – 1st ed OSI 4 – woodland	0 – 2 species	2 – wall 0.5-1	2 – multiple links		1 – 1.5-2.5m high 2 – 2-3m wide 2 – A-shape 3 – dense	0 - >10% gaps 0 – gap >5m	0 - >20% wall degraded	
Total	**8**	**0**	**2**	**2**	**0**	**8**	**0**	**0**	**20**
23	2 – road 3 – 1st ed OSI	1 – 5 species	2 – bank 0.5-1m 2 – dry drain	1 – single link	2 – mature trees	2 – 2-3m high 2 – 2-3m wide 2 – boxed 2 – semi-opaque	3 – continuous 3 – no gaps	2 – minor degradation 0 - >25% ivy	
Total	**5**	**1**	**4**	**1**	**2**	**8**	**6**	**2**	**29**
24	2 – road 3 – 1st ed OIS	1 – 5 species	2 – bank 0.5-1m	0 – no links	2 – mature trees	3 – >m high 2 – 2-3m wide	3 – continuous 3 – no gaps	2 – minor degradation 0 - >25% ivy	

Boundary ID	Historical	Species diversity	Structure, construction and associated features	Habitat connectivity	Landscape	Structural variables	Continuity	Negative Indicators	Total
						2 – straight sided 2 – semi-opaque			
Total	**5**	**1**	**2**	**0**	**2**	**9**	**6**	**2**	**27**
25	2 – road 3 – 1sr ed OSI	1 – 4 species	3 - Bank >1m	1 – single link		1 – 1.5-2.5m high 3 - >4m wide 2 – boxed 3 - dense	3 – continuous 3 – no gaps	3 – no degradation 0 - >10% of unfavourable species (dogwood, wilson's h/s) 0 - >20% N/R	
Total	**5**	**1**	**3**	**1**	**0**	**9**	**6**	**3**	**28**
26	1 – internal	0 – 3 species	2 – bank 0.5-1m 2 – dry drain	1 – single link		1 – 1.5-2.5m high 1 – 1-2m wide 2 – boxed 3 – dense	3- continuous 3 – no gaps	3 – no degradation	
Total	**1**	**0**	**4**	**1**	**0**	**7**	**6**	**3**	**22**
27	2 – road 3 – 1st ed OIS	1 – 4 species	1 – bank <05.m	1 – single link		0 - <1.5m high 2 – 2-3m wide 2 – boxed 1 – semi-translucent	3 – continuous 3 – no gaps	2 – minor degradation	
Total	**5**	**1**	**1**	**1**	**0**	**5**	**6**	**2**	**21**
28	2 – farm 3 – 1st ed OSI	1 – 4 species	1 – bank <05.m 2 – dry drain	2 – multiple links	2 – mature trees	2 – 2.5-4m high 3 - >3m wide 3 – undercut 2 – semi-opaque	3 – continuous 3 – no gaps	0 - >25% ivy	
Total	**5**	**1**	**3**	**2**	**2**	**10**	**6**	**0**	**29**
29	N/A – not a boundary								
30	2 - roadside	1 – 4 species	1 – bank <0.5m	2 – multiple links	2 – mature trees	1 – 1.5-2.5m high 1 - 1-2m wide 2 – boxed 1 – semi- translucent	3 – continuous 3 – no gaps	2 – minor degradation 0 - >25% ivy	
Total	**2**	**1**	**1**	**2**	**2**	**5**	**6**	**2**	**21**

Boundary ID	Historical	Species diversity	Structure, construction and associated features	Habitat connectivity	Landscape	Structural variables	Continuity	Negative Indicators	Total
31	2 – roadside 3 – 1st ed OSI	1 – 4 species	2 – bank 0.5-1m 2 – dry drain	1 – single link		1 – 1.5-2.5m high 1 – 1-2m wide 2 – boxed 2 – semi-opaque	3 – continuous 3 – no gaps	2 – minor bank degradation	
Total	**5**	**1**	**4**	**1**	**0**	**6**	**6**	**2**	**25**
32	1 - internal	0 – 3 species	3 - Bank >1m high	1 – single link	2 – mature trees	3 - >4m high 1 – 1-2m wide 0 – remnant/derelict 0 - open	1 – 5-10% gaps 1 - <5m gap	0 - >20% bank degradation	
Total	**1**	**0**	**3**	**1**	**2**	**4**	**2**	**0**	**13**
33	Enclosure – not down as a hedgerow								
34	2 – farm 3 – 1st ed OSI 3 – non-linear 4 - townland	1 – 5 species	1 - Bank <0.5m	2 – multiple links	2 – mature trees	1 – 1.5-2.5m high 1 – 1-2m wide 2 – boxed 2 – semi-opaque	3 – continuous 3 – no gaps	2 – minor degradation	
Total	**12**	**1**	**1**	**2**	**2**	**6**	**6**	**2**	**32**
35	2 – roadside 3 – 1st ed OSI	1 – 5 species	3 – bank >1m high	2 – multiple links		2 – 2.5-4m high 2 – 2-3m wide 2 – boxed 3 - dense	3 – continupis 3 – no gaps	2 – minor degradation	
Total	**5**	**1**	**3**	**2**	**0**	**9**	**6**	**2**	**28**
36	2 – roadside 3 – 1st ed OSI	1 – 4 species	3 – wall >1m 2 – dry drain	2 – multiple links		2 – 2.5-4m high 2 – 2-3m wide 2 – boxed 3 – dense	3 – continuous 3 – no gaps	3 – no wall degradation	
Total	**5**	**1**	**5**	**2**	**0**	**9**	**6**	**3**	**31**
37	2 – roadside 3 – 1st ed OSI	0 - <3 species	3 – bank >1m	0 – no links		3 - >4m high 3 - >3m wide 2 – straight sided 2 – semi-opaque	3 – continuous 3 – no gaps	3 – no degradation	

Boundary ID	Historical	Species diversity	Structure, construction and associated features	Habitat connectivity	Landscape	Structural variables	Continuity	Negative Indicators	Total
Total	**5**	**0**	**3**	**0**	**0**	**10**	**6**	**3**	**27**
38	1 – internal 3 – 1st ed OSI	1 – 5 species	2 – bank 0.5-1m 2 – dry drain	2 – multiple links	2 – mature trees	1 – 1.5-2.5m high 1 – 1-2m wide 2 – boxed 2 – semi-opaque	3 – continuous 3 – no gaps	2 – minor degradation 0 - >25% ivy	
Total	**4**	**1**	**4**	**2**	**2**	**6**	**6**	**2**	**27**
39	1 – internal 3 – 1st ed OSI	1 – 4 species	2 – bank 0.5-1m	2 – multiple links	2 – mature trees	1 – 1.5-2.5m high 1 – 1-2m wide 2 – boxed 2 – semi-opaque	3 – continuous 3 – no gaps	2 – minor degradation 0 - >25% ivy	
Total	**4**	**1**	**2**	**2**	**2**	**6**	**6**	**2**	**25**
40	1 – internal 3 – 1st ed OSI	3 – 9 species	3 – bank >1m 2 – dry drain	2 – multiple links	2 – mature trees	1 – 1.5-2.5m high 3 - >3m wide 2 – boxed 2 – semi-opaque	3 – continuous 3 – no gaps	2 – minor degradation 0 - >25% ivy	
Total	**4**	**3**	**5**	**2**	**2**	**8**	**6**	**2**	**32**
41	1 – internal 3 – 1st ed OSI	2 – 6 species	3 – bank >1m	2 – multiple links	2 – mature trees	3 - >4m high 3 - >3m wide 3 – undercut 3 – dense	3 – continuous 3 – no gaps	2 – minor degradation 0 - >25% ivy	
Total	**4**	**2**	**3**	**2**	**2**	**12**	**6**	**2**	**33**
42	1 – internal 3 – 1st ed OSI	1 – 4 species	1 – bank <0.5m	2 – multiple links	2 – mature trees	3 – >4m high 3 - >3m wide 2 – boxed 1 – semi-translucent	1 – 5-10% gappy 1 – <5m gaps	0 >20%degraded >25% ivy >10% non-native	
Total	**4**	**1**	**1**	**2**	**2**	**9**	**2**	**0**	**21**
43	2 – farm 3 – 1st ed OSI	1 – 5 species	3 – bank >1m	2 – multiple links	2 – mature trees	1 – 1.5-2.5m 3 - >3m wide 2 – boxed 2 – semi- opaque	3 – continuous 3 – no gaps	2 – minor degradation	

Boundary ID	Historical	Species diversity	Structure, construction and associated features	Habitat connectivity	Landscape	Structural variables	Continuity	Negative Indicators	Total
Total	**5**	**1**	**3**	**2**	**2**	**8**	**6**	**2**	**29**
44	2 – farm 3 – 1st ed OSI	1 – 5 species	2 – bank 0.5-1m	2 – multiple links		1 – 1.5-2.5m 3 - >3m wide 2 – boxed 3 - dense	3- continuous 3 – no gaps	2 – minor degradation	
Total	**5**	**1**	**2**	**2**	**0**	**9**	**6**	**2**	**27**
45	1 – internal 3 – 1st ed OSI	1 – 4 species	2 – bank 0.5-1m 2 – dry drain	2 – multiple links		1 – 1.5-2.5m high 2 – 2-3m wide 2 – boxed 3 – dense	3 – continuous 3 – no gaps	2 – minor degradation	
Total	**4**	**1**	**4**	**2**	**0**	**8**	**6**	**2**	**27**
46	1 – internal 3 – 1st ed OSI 4 – woodland	1 – 5 species	2 – bank 0.5-1m	2 – multiple links 3 – woodland 4 – designated area	2 – mature trees	2 – 2.5-4m high 2 – 2-3m wide 2 – straight sided 1 – semi-translucent	3 – continuous 3 – no gaps	1 - <20% bank degraded.	
Total	**8**	**1**	**2**	**9**	**2**	**7**	**6**	**1**	**36**
47	2 – farm 3 – 1st ed OSI 4 - woodland	1 – 5 species	2 – bank 0.5-1m 2 – dry drain	2 – multiple links 3 – woodland 4 – designated area	2 – mature trees	2 – 2.5-4m high 2 – 2-3m high 2 – straight sided 1 – semi-translucent	3 – continuous 3 – no gaps	1 - <20% bank degraded	
Total	**9**	**1**	**4**	**9**	**2**	**7**	**6**	**1**	**39**
48	Slope with woodland – not a hedgerow								
49	2 – farm 3 – 1st ed OSI 4 - woodland 3 – non-linear	1 – 5 species	3 – wall >1m	2 – multiple links 3 – woodland 4 – designated area	2 – mature trees	3 - >4m high 2 – 2-3m wide 2 – straight sided 1 – semi-translucent	1 – 5-10% gaps 1 - <5m gap	2 – minor degradation	
Total	**12**	**1**	**3**	**9**	**2**	**8**	**2**	**2**	**39**
50	2 – road 3 – 1st ed OSI	0 – 2 species	2 – bank 0.5-1m	1 – single link		0 - <1.5m high 2 – 2-3m wide	3 – continuous 3 – no gaps	2 – minor bank degradation >10% non-native	

Boundary ID	Historical	Species diversity	Structure, construction and associated features	Habitat connectivity	Landscape	Structural variables	Continuity	Negative Indicators	Total
						2 – boxed 2 – semi-opaque		>25% ivy	
Total	**5**	**0**	**2**	**1**	**0**	**6**	**6**	**2**	**22**
51	2 – canal 3 – 1st ed OSI	1 – 5 species	1 – bank <0.5m 3 – wet drain	2 – multiple links 4 – designated area	2 – mature trees	2 – 2.5-4m high 2 – 2-3m wide 2 – sides straight 1 – semi-translucent	0 - >10% gappy 0 – gap >5m	2 – minor degradation >25% ivy	
Total	**5**	**1**	**4**	**6**	**2**	**7**	**0**	**2**	**27**
52	3 – 1st ed OSI 2 – farm	0 – 1 species	1 – bank <0.5m	2 – multiple links 4 – designated area	2 – mature trees	3 - >4m high 3 - >3m wide 3 – overgrown 3 - dense	3 – continuous 3 – no gaps	2 – minor degradation	
Total	**5**	**0**	**1**	**6**	**2**	**12**	**6**	**2**	**34**
53	3 – 1st ed OSI 2 – farm	1 – 5 species	3 - Bank >1m	2 – multiple links 4 – designated area	2 – mature trees	3 - >4m high 3 - >3m wide 3 – overgrown 2 – semi opaque	1 >5-10% gaps 1 - <5m gap	1 - <20% degraded	
Total	**5**	**1**	**3**	**6**	**2**	**11**	**2**	**1**	**31**
54	2 – road 3 – 1st ed OSI	0 – 3 species	1 – bank <0.5m	2 – multiple links		0 - <1.5m high 1 – 1-2m wide 2 - boxed 2 – semi opaque	3 – continuous 3 – no gaps	2 – minor degradation	
Total	**5**	**0**	**1**	**2**	**0**	**5**	**6**	**2**	**21**
55	3 – 1st ed OSI 2 – farm	2 – 6 species	3 – bank >1m	2 – multiple links		3 - >4m high 3 - >3m wide 2 – straight sided 3 - dense	2 - <5% gaps 0 – gap >5m	2 – minor degradation	
Total	**5**	**2**	**3**	**2**	**0**	**11**	**2**	**2**	**27**
56	3 – 1st ed OSI 2 – farm	2 – 6 species	3 – bank >1m	2 – multiple links	2 – mature trees	3- > 4m high 1 – 1.5-2m wide	3 – continuous 3 – no gaps	2 – minor degradation	

Boundary ID	Historical	Species diversity	Structure, construction and associated features	Habitat connectivity	Landscape	Structural variables	Continuity	Negative Indicators	Total
						2 – straight sided 1 – semi translucent			
Total	**5**	**2**	**3**	**2**	**2**	**7**	**6**	**2**	**29**
57	3 – 1st ed OSI 2 – farm	2 – 6 species	1 – bank <0.5	2 – multiple links	2 – mature trees	1 – 1.5-2.5m high 2 – 2-3m wide 2 – boxed 1 – semi translucent	3 – continuous 3 – no gaps	2 – minor degradation	
Total	**5**	**2**	**1**	**2**	**2**	**6**	**6**	**2**	**26**
58	3 – 1st ed OSI 2 – farm	1 – 4 species	2 – bank 0.5-1m tall 2 – dry drain	2 – multiple links	2 – mature trees	2 – 2.5-4m high 1 – 1-2m wide 3 – overhang 2 – semi-opaque	3 – continuous 3 – no gaps	2 – minor degradation	
Total	**5**	**1**	**4**	**2**	**2**	**8**	**6**	**2**	**30**
59	3 – 1st ed OSI 2 – farm	1 – 4 species	3 – bank >1m 2 - Dry drain	2 – multiple links		2 – 2.5-4m high 3 - >3m high 2 – sides cut 3 - dense	3 – continuous 3 – no gaps	2 – minor degradation	
Total	**5**	**1**	**5**	**2**	**0**	**10**	**6**	**2**	**31**
60	1 – internal 3 – 1st ed OSI 4 - townland	1 – 4 species	3 – bank >1m high	2 – multiple links		0 - <1.5m high 1 – 1-2m wide 2 – boxed 1 – semi-translucent	1 – 5-10% gaps 1 – gap <5m	2 – minor degradation	
Total	**8**	**1**	**3**	**2**	**0**	**4**	**2**	**2**	**22**
61	2 – roadside 3 – 1st ed OSI	1 – 4 species	3 - Bank >1m high 2 – dry drain	2 – multiple links	2 – mature trees	1 – 1.5-2.5m high 1 – 1-2m wide 2 – boxed 2 – semi-opaque	3 – no gaps 3 – continuous	2 – minor degradation	
Total	**5**	**1**	**5**	**2**	**2**	**6**	**6**	**2**	**29**
62	2 – roadside 3 – 1st ed OSI	2 – 6 species	3 – bank >1m high 2 – dry drain	2 – multiple links	2 – mature trees	0 - <1.5m high 1 – 1-2m wide	3- continuous 3 – no gaps	2 – minor degradation	

Boundary ID	Historical	Species diversity	Structure, construction and associated features	Habitat connectivity	Landscape	Structural variables	Continuity	Negative Indicators	Total
						2 – boxed 2 – semi-opaque			
Total	**5**	**2**	**5**	**2**	**2**	**5**	**6**	**2**	**29**
63	3 – 1st ed OSI 2 – farm	2 – 6 species	2 – bank 0.5-1m 4 – double drain	2 – multiple links	2 – mature trees	3 - >4m high 3 - >3m wide 3 – overgrown 3 – dense	2 - <5% gaps 1 - <5m gap	1 - <20% bank degraded	
Total	**5**	**2**	**6**	**2**	**2**	**12**	**3**	**1**	**33**
64	2 – roadside 3 – 1st ed OSI 4 – townland	1 – 5 species	1 – bank <0.5m 2 – dry drain	2 – multiple links	2 – mature trees	3 - >4m high 3 - >3m wide 3 – overgrown 3 – dense	3 – continuous 3 – no gaps	2 – minor degradation >25% ivy	
Total	**9**	**1**	**3**	**2**	**2**	**12**	**6**	**2**	**37**
65	2 – farm 3 – 1st ed OSI 4 – townland	0 – 3 species	1 – bank <0.5	2 – multiple links	2 – mature trees	2 – 2.5-4m high 3 - >3m wide 2 – boxed 1 – semi-translucent	3 – continuous 3 – no gaps	2 – minor degradation	
Total	**9**	**0**	**1**	**2**	**2**	**8**	**6**	**2**	**30**
66	2 – roadside 3 – 1st ed OSI 4 – townland	2 – 6 species	1 – bank <0.5m 2 – dry drain	2 – multiple links	2 – mature trees	3 - >4m high 3 - >3m high 2 – sides cut 3 – dense	3 – continuous 3 – no gaps	2 – minor degradation	
Total	**9**	**2**	**3**	**2**	**2**	**11**	**6**	**2**	**37**
67	2 – roadside 3 – 1st ed OSI	1 – 4 species		1 – single link	2 – mature trees	1 – 1.5 -2.5m high 1 – 1-2m wide 0 – remnant 1 – semi-translucent	0 - >10% gaps 0 - >5m gap		
Total	**5**	**1**	**0**	**1**	**2**	**3**	**0**	**0**	**12**
68	2 – roadside 3 – 1st ed OSI	0 – 3 species	3 - Slope >1m	2 – multiple links	2 – mature trees	3 - >4m high 1 – 1-2m wide	1 – 5-10% gaps 1 – gap <5m	2 – minor degradation	

Boundary ID	Historical	Species diversity	Structure, construction and associated features	Habitat connectivity	Landscape	Structural variables	Continuity	Negative Indicators	Total
						1 – loosing basal structure 1 – semi-translucent			
Total	**5**	**0**	**3**	**2**	**2**	**6**	**2**	**2**	**22**
69	2 – roadside 3 – 1st ed OSI	0 – 1 species	1 – slope <1m	2 – multiple links	2 – mature trees	0 - <1.5m high 1 – 1-2m wide 2 – boxed 1 – semi-translucent	1 – 5-10% gaps 1 - <5m gap	2 – minor degradation	
Total	**5**	**0**	**1**	**2**	**2**	**4**	**2**	**2**	**18**
70	2 – roadside 3 – 1st ed OSI	0 – 0 species		1 – single link		0 - <1.5m high 2 – 2-3m wide 2 – A-shape 2 – semi-opaque	3 – continuous 3 – no gaps		
Total	**5**	**0**	**0**	**1**	**0**	**6**	**6**	**0**	**18**
71	2 – roadside 3 – 1st ed OSI	2 – 6 species	2 – bank 0.5-1m high 2 – dry drain	2 – multiple links	2 – mature trees	2 – 2.5-4m high 2 – 2-3m wide 2 – boxed 3 - dense	3 – continuous 3 – no gaps	2 – minor degradation	
Total	**5**	**2**	**4**	**2**	**2**	**9**	**6**	**2**	**32**

Appendix G
EIAR Chapter 15 – Biodiversity: Terrestrial Ecology Missing Page & Updated Habitat Map

G.1 Missing Page 15-24 from EIAR Chapter 15 – Biodiversity: Terrestrial Ecology

species included creeping bent (*Agrostis stolonifera*), common rush (*Juncus effusus*), silverweed (*Potentilla anserina*) along with dock and marsh thistle (*Cirsium palustre*).

GS3 Dry-humid grassland

Dry-humid grassland was recorded in mosaic with GA1 improved agricultural grassland in a field to the adjacent north of the existing N51, north of the proposed N51/N2 roundabout. This area was noted as being species poor as a result of sheep grazing. Commonly recorded species included: common bent grass (*Agrotis capillaris*), crested dog's tail (*Cynosarus cristatus*), sweet vernal grass (*Anthoxanthum odoratum*) and mat grass (*Nardus stricta*).

GM1 Marsh

The presence of marsh habitat within the study area was limited in extent owing to the nature and management of the surrounding agricultural lands. Elements of marsh were typically found alongside each bank of the River Boyne, particularly along its southern bank, where it occurred in mosaic with rank wet grassland. The river edge grades into marsh with ground conditions reflecting the poorly draining soils or waterlogged conditions coupled with the artesian nature of the groundwater. The ground is poached in places (typically by horses). Unlike wet grassland, where waterlogging is often ephemeral, the marsh flora is indicative of longer-term waterlogged conditions, often found in topographical hollows and ditches. This habitat was also present along the Boyne Navigation Canal where it occurred in a mosaic with FS1 large reed and sedge swamp. Commonly recorded species include tall fescue (*Festuca arundinacaea*), creeping bent, yellow flag (*Iris pseudacorus*), silverweed, meadowsweet (*Filipendula ulmaria*), creeping buttercup and marsh bedstraw (*Galium palustre*)

BC1 Arable crops and BC3 Tilled land

Another habitat related to agriculture but not specific to supporting livestock is BC1 arable crop and BC3 tilled land. Across the wider study area and in the northern end of the scheme lands are given over to cereal production (wheat, oats etc.) or other crops (e.g. beans). Some fields were fallow during the summer 2020 survey although based on previous visits, the timing of crop and its rotation was specific to landowners and no large areas of land were left uncultivated for long periods. Floristically, the intensity and frequency of the management regime influences this floristically poor habitat, although species commonly encountered around the field perimeters included chickweed (*Stellaria* spp.), fumitory (*Fumaria* spp.) and speedwell (*Veronica persica*).

Woodland, Hedgerows, Treelines and Scrub

Despite the expansive agricultural patchwork of fields that characterise the Proposed Scheme, there remain areas of woodland, often as linear landscape elements, but elsewhere, such as the northern side of the River Boyne, as discrete woodland units. Across the landscape, semi-mature and mature trees, largely deciduous, are common throughout, reflecting in places the heritage of larger demesnes and estates.

WD1 (Mixed) Broadleaved woodland

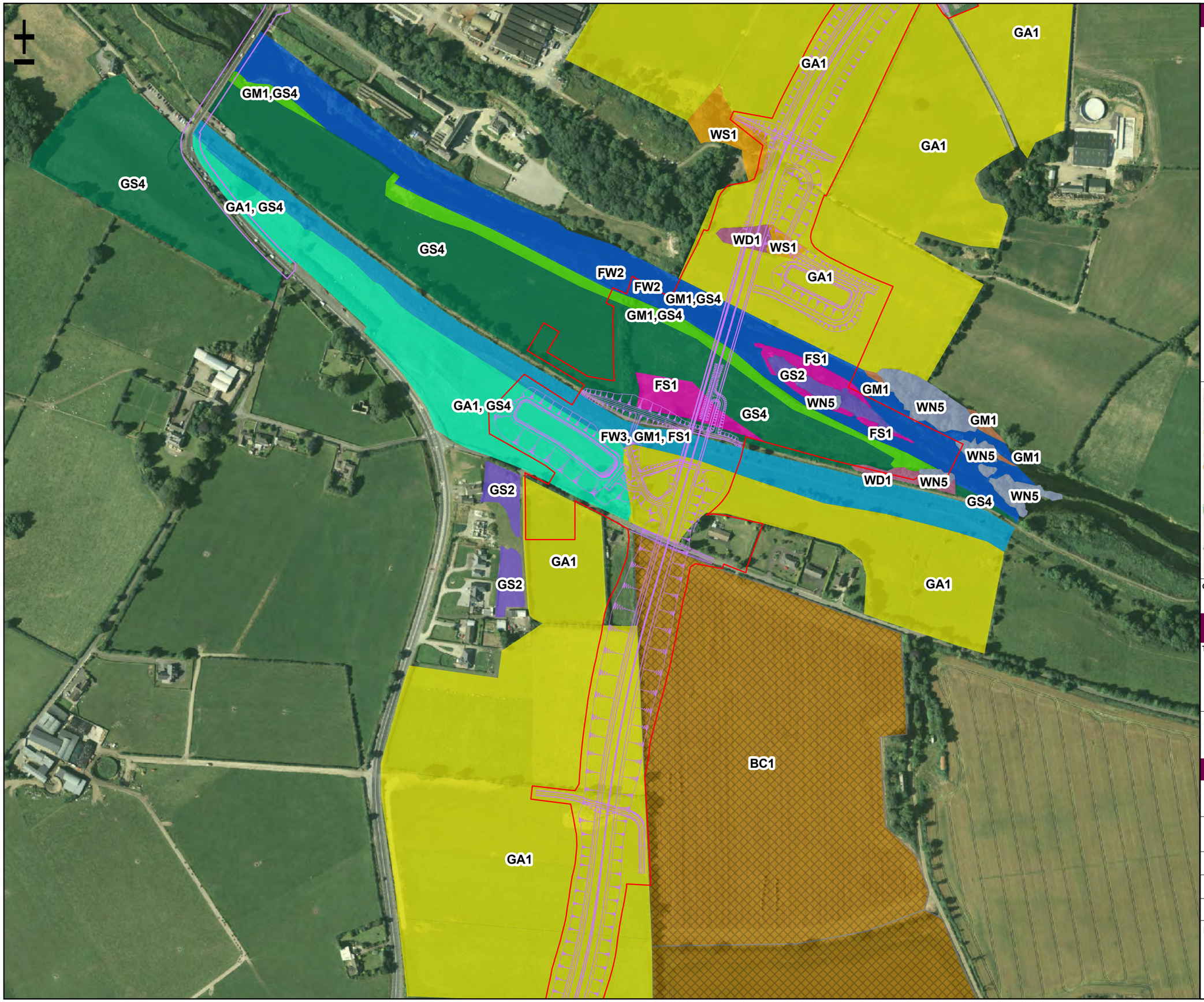
A range of native woodland species are located in the surrounding landscape of Slane village. Many of the species observed during site visits included; oak (*Quercus* spp.), ash, sycamore (*Acer pseudoplatanus*), beech (*Fagus sylvaticus*), horse chestnut (*Aesculus hippocastanum*), hawthorn (*Crataegus monogyna*), blackthorn (*Prunus spinosa*), holly (*Ilex aquifolium*), willows (*Salix* spp.), hazel (*Corylus avellana*), elder (*Sambucus nigra*), and bramble (*Rubus fruticosus* agg.).

WD2 Mixed Broadleaved/Conifer woodland

Along the existing N2 Road there is an area of planted broadleaved/conifer woodland associated with the Boyne Woods pNHA/Slane Castle & Distillery which is bound by a stone wall. Tree species included: birch (*Betula* spp.), hazel, Scots pine (*Pinus sylvestris*), oak, elm (*Ulmus procera*), alder and ash.

Three small, isolated patches of mixed broadleaved/conifer are also present towards the eastern end of the Proposed Scheme, adjacent south to the existing N51/Drogheda road.

G.2 Updated Habitat Map for EIAR Chapter 15 – Biodiversity: Terrestrial Ecology



Legend

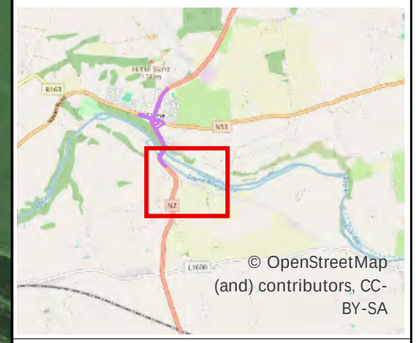
- Proposed Scheme
- Proposed Development Boundary

Habitat

- BC1
- FS1
- FW2
- FW3, GM1, FS1
- GA1
- GA1, GS4
- GA2, BC3, WL1, WS1
- GM1
- GM1,GS4
- GS2
- GS4
- WD1
- WN5
- WS1

Data Source: OSi Orthophotography tiles 2019

0 0.05 0.1 0.2
Kilometres



Client
Meath County Council

N2 Slane Bypass and Public Realm Enhancement Scheme

Title
Figure 15.5: Habitats within Proposed Scheme's Footprint: Map 2 of 5

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Issue Details

File Identifier: MDT0806-RPS-00-N2-DR-Z-AG-4027		
Status: A1	**Rev:** C02	**Model File Identifier:** MDT0806-RPS-01-N2-M2-C-XM1001 MDT0806-RPS-01-PR-M2-C-XR9000
Drawn: NR		**Date:** 28/11/2024
Checked: RR		**Scale:** 1:4,000 (A3)
Approved: NO'N		**Projection:** ITM

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