

Wicklow County Council

**N11/M11 Junction 4 to Junction 14
Improvement Scheme**

Option Selection Report
Appendix D4 - Hydrology

265455-ARP-EWE-SWI-RP-ZX-0003

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Ove Arup & Partners Ireland Ltd

Arup
50 Ringsend Road
Dublin 4
D04 T6X0
Ireland
www.arup.com

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		Name	Alison Orr/ Catherine Buckley	Clodagh O'Donovan	Aidan Cleary		
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1 Hydrology

1.1 Introduction

This report details the environmental assessment of the Stage 2 Project Appraisal Matrix for the N11/M11 Scheme with respect to the Hydrology constraints identified in **Section 14** (Hydrology) of **Volume B**.

For the corridor assessment, the overall scheme has been split into two sections, i.e. the Northern Section and the Southern Section and the corridor options assessed are those discussed in **Chapter 8** of **Volume A**.

There are three zones associated with each corridor option referred to in the corridor assessment:

- The potential road “footprint” which is the potential landtake required to construct or improve the road;
- The road “corridor” which is a 200m wide corridor centred around the alignment centre line for all off-line corridors. For the on-line Corridor Options 1 (North), 1 (South) and 5 (South), the width is variable, but is typically narrower than the width of the off-line corridors. The “footprint” sits inside the “corridor” boundary; and
- The road “assessment study area” which includes a 250m buffer zone from the road centre line and an overall width of 500m. This buffer zone may increase to consider attributes which extend beyond this zone e.g. along link roads.

A transport assessment forms part of this Stage 2 Project Appraisal Matrix. This assessment is included in **Section 1.5**. The transport scenarios that were assessed are as follows:

- Transport Scenario 5A – Parallel Links + Junction Rationalisation;
- Transport Scenario 5B – N11/M11 Additional Lane(s) + Junction Improvements; and
- Transport Scenario 4 – Bus Service Enhancements.

Section 1.2 outlines the methodology that was used to carry out the assessment, and **Section 1.3** outlines the assessment criteria which were used. The Stage 2 assessment is presented in **Section 1.4** (Corridors) and **Section 1.5** (Transport Scenarios) and references are listed in **Section 1.6**.

1.2 Methodology

This assessment was prepared taking cognisance of the requirements of the following guidance:

- Transport Infrastructure Ireland (TII) guidance, formally National Roads Authority (NRA) Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes¹ (herein referred to as the TII Guidelines).
- The Environmental Protection Agency (EPA) Draft Guidelines on the Information to be Contained in Environmental Impact Assessment Reports² (herein referred to as the EPA Guidelines).
- Transport Infrastructure Ireland (TII) guidance, formally National Roads Authority (NRA). Environmental Impact Assessment of National Road Schemes – a Practical Guide³.

In line with the TII Guidelines¹, the assessment study area for this corridor assessment has been set at 250m from the centre line of each corridor. This has been extended on a conservative basis to capture the zones of influence of attributes where appropriate.

The TII Guidelines¹ provide useful criteria for assigning importance ratings to the identified hydrological attributes which are presented in **Section 14** (Hydrology) of **Volume B**. The potential impacts that may arise at each attribute are assessed on a conservative basis based on the information currently available. The nature and timeframe are considered against the criteria presented in Box 4.4 of the TII Guidelines¹.

An Impact Level is determined from **Table 1.1** based on the importance rating of an attribute and the degree of potential impacts. It should be noted that the criteria provided in the table only considers negative potential impacts, however the potential for positive impacts is highlighted in the text of the TII Guidelines¹ and also in the EPA Guidelines². For this reason, the potential for positive impacts is also considered and incorporated where appropriate.

In order for the qualitative assessment to align with the TII Project Appraisal Guidelines for National Roads Unit 7.0 (PAG) - Multi-Criteria Analysis⁴ (hereafter referred to as the TII PAG) the two scoring systems were correlated. The TII PAG⁴ seven point scale scoring procedure is summarised below:

- 7 – Major or highly positive;
- 6 – Moderately positive;

¹Transport Infrastructure Ireland (TII) National Roads Authority Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes, 2009. Available from: <https://www.tii.ie/technical-services/environment/planning/Guidelines-on-Procedures-for-Assessment-and-Treatment-of-Geology-Hydrology-and-Hydrogeology-for-National-Road-Schemes.pdf>

² Environmental Protection Agency (EPA), Guidelines on the Information to be Contained in Environmental Impact Assessment Reports, Draft 2017. Available from: <https://www.epa.ie/pubs/advice/ea/EPA%20EIAR%20Guidelines.pdf>

³ Transport Infrastructure Ireland (TII) National Roads Authority Environmental Impact Assessment of National Road Schemes – a Practical Guide, 2008. Available from: <https://www.tii.ie/technical-services/environment/planning/Environmental-Impact-Assessment-of-National-Road-Schemes-Practical-Guide.pdf>

⁴Transport Infrastructure Ireland (TII) Project Appraisal Guidelines for National Roads Unit 7.0 - Multi-Criteria Analysis, 2016. Available from: <https://www.tiipublications.ie/library/PE-PAG-02031-01.pdf>

- 5 – Minor or slightly positive;
- 4 – Not significant or neutral;
- 3 – Minor or slightly negative;
- 2 – Moderately negative; or
- 1 – Major or highly negative.

Table 1.1 summarises how these two Guidelines^{1,4} were correlated for this Stage 2 Assessment. As outlined above, in line with the EPA Guidelines², both positive and negative potential impacts were included.

Table 1.1: Correlation of TII Guidelines¹ Impact Level Rating to an equivalent TII PAG⁴ seven point scale scoring procedure

Impact Level (TII Guidelines ¹)	Equivalent TII PAG ⁴ (Description)	Equivalent TII PAG ⁴ (Value)
Profound (Negative)	Major or highly negative	1
Significant (Negative)	Major or highly negative	1
Moderate (Negative)	Moderately negative	2
Slight (Negative)	Minor or slightly negative	3
Imperceptible	Not significant or neutral	4
Slight (Positive)	Minor or slightly positive	5
Moderate (Positive)	Moderately positive	6
Significant (Positive)	Major or highly positive	7

In order to determine the overall TII PAG score for the types of features identified (e.g. rivers), the impact level and equivalent TII PAG value was first assigned to each individual attribute identified (e.g. each individual watercourse). If multiple features were identified (e.g. multiple watercourses) these were then averaged using professional judgement, to allow an overall TII PAG score to be defined for each type of feature.

The constraints information that was included in **Section 14** (Hydrology) of **Volume B** was used to undertake this assessment.

1.3 Assessment criteria

In line with TII Guidelines¹, the hydrological attributes which should be considered during this Stage 2 Assessment are presented below:

- Watercourses crossed by each corridor and potential impacts on water quality arising from construction work or discharges during operation;

- Surface water dependent habitats;
- Surface water abstractions close to and downstream of crossings;
- Sites of amenity value traversed by the corridor; and
- Potential increase (or reduction) of flood risk to existing properties.

It should be noted that a number of other hydrological features were highlighted in **Section 14** (Hydrology) of **Volume B**. This information was gathered to provide the wider context of the Scheme (e.g. catchment information). This assessment has focused on the assessment study areas for the corridor options and on the attributes to be assessed at Stage 2 as per TII Guidelines¹ to compare the potential impacts associated with each corridor.

The TII Guidelines¹ note that with respect to hydrological features, most of the environmental impacts for watercourses occur close to the point where the proposed corridors cross the water channel. Potential exceptions to this relate to the potential to cause water quality impacts downstream and the potential to cause flooding upstream and downstream. Therefore, the assessment study areas were extended where a corridor option entered an attribute's zone of influence. The zone of influence describes the area which is hydrologically connected to the attribute and therefore activities within this area have the potential to impact on the attribute.

1.4 Stage 2 Project Appraisal Matrix – corridor assessment

The Stage 2 corridor options assessment for hydrological constraints was undertaken for the potential impacts to watercourses, ecological features, surface water abstractions, amenity sites and the potential risk of flooding.

1.4.1 Watercourses

The corridor options lie within the Ovoca-Vartry Hydrometric Area (HA 10). A number of watercourses that were identified in **Section 14** (Hydrology) of **Volume B** are presented in **Table 1.2**. The potential impacts of each corridor option on watercourses were assessed by considering the watercourses to be encountered or crossed, their attribute importance, the extent of the potential interaction (e.g. number of crossings) and determining the impact level on this basis.

It should be noted that this section of the assessment deals with the potential impacts on water quality and flows from the crossing on the watercourse – the impacts associated with the physical presence of the crossing is considered under the flooding assessment (**Section 1.4.5**) due to the interaction with the flood plain. Impacts in this assessment criterion are therefore temporary, for example, instantaneous surface water runoff impacts during a storm event.

The number of crossings of a river was considered to be a key measure of the potential impact during construction and operation.

During construction there is the potential for accidental discharges associated with the construction works at new and existing crossings.

If a river was in the corridor but did not interact with the potential road footprint, or there was only one existing crossing, there was considered to be the potential for a 'temporary impact on a small proportion of the attribute'. If a river had two or more existing crossings or one or more new crossings, the impact was considered to be greater and was ranked as a 'temporary impact on a significant proportion of the attribute'.

During the operational phase there is the potential for designed discharges (i.e. road drainage) to watercourses which may be located near river crossings. It should be noted that the existing road represents the current baseline environment. Where the corridor option is located on-line, runoff and treatment of discharges to watercourses will be improved to current standards and it is likely that during the operational phase a positive impact will arise. On a conservative basis, this has not been incorporated at this stage of the assessment. In the operational phase where there are no new crossings proposed, the impact is considered to be 'not significant or neutral' and where new crossings are proposed there is considered to be 'temporary impact on a small proportion of the attribute'.

Corridor Option 6 (South) includes a tunnel underneath the Glen of the Downs. The Three Trouts Stream flows over the footprint of the northern tunnel portal and the Woodlands 10 watercourse flows within 10m of the tunnel portal. Conservatively, it is assumed that during the operational phase of the scheme, the streams will be permanently diverted from their existing locations to allow for the tunnel portal. Dewatering potential of the tunnel segment of Corridor Option 6 (South) cannot be ruled out at this stage with the level of detail required for Phase 2. Therefore, it is assumed that dewatering of the aquifer caused by the tunnel option is likely, and this option is assessed on this basis. Walkover surveys confirmed that the watercourses are hydraulically connected to the aquifer.⁵ Thus, there is the potential for groundwater drawdown associated with the tunnel construction to temporarily reduce baseflow in the stream in the wider area during the construction phase. This dewatering is assumed to occur during the construction phase, and it is assumed that the groundwater will return to normal levels for the operational phase.

The watercourse assessments for the northern and southern corridor options are presented in **Table 1.2** and **Table 1.3**.

⁵A site walkover of hydro-ecology sites was completed by an Arup Hydrogeologist on 23/03/2021 and 24/03/2021.

Table 1.2: Watercourse assessment table Northern Section

Corridor Option	Watercourses encountered [no. of new / existing crossings]	Attribute Importance	Construction Phase			Operational Phase		
			Potential impact (from Box 4.4 of TII guidelines)	Impact level (from Box 4.4 of TII guidelines)	TII PAG Qualitative Assessment	Potential impact (from Box 4.4 of TII guidelines)	Impact level (from Box 4.4 of TII guidelines)	TII PAG Qualitative Assessment
Corridor Option 1A (North)	Rathmichael [0/1]	Very High	Small	Slight	Minor or Slightly Negative	Not significant	Imperceptible	Not significant or neutral
	County Brook [0/3]	Medium	Significant	Imperceptible		Not significant	Imperceptible	
	Dargle [0/1]	Very High	Small	Slight		Not significant	Imperceptible	
	Glencullen 10 [0/0]	High	Small	Imperceptible		Not significant	Imperceptible	
	Kilmacanoge [1/4]	High	Significant	Slight		Small	Imperceptible	
	Rocky Valley Stream [0/1]	High	Small	Imperceptible		Not significant	Imperceptible	
Corridor Option 1B (North)	Rathmichael [0/1]	Very High	Small	Slight	Minor or Slightly Negative	Not significant	Imperceptible	Not significant or neutral
	County Brook [0/3]	Medium	Significant	Imperceptible		Not significant	Imperceptible	
	Dargle [0/1]	Very High	Small	Slight		Not significant	Imperceptible	
	Glencullen 10 [0/0]	High	Small	Imperceptible		Not significant	Imperceptible	
	Kilmacanoge [0/4]	High	Significant	Slight		Not significant	Imperceptible	
	Rocky Valley Stream [0/1]	High	Small	Imperceptible		Not significant	Imperceptible	

Table 1.3: Watercourse assessment table Southern Section

Corridor Option	Watercourses encountered <i>[no. of new / existing crossings]</i>	Attribute Importance	Construction Phase			Operational Phase		
			Potential impact <i>(from Box 4.4 of TII guidelines)</i>	Impact level (from Box 4.4 of TII guidelines)	TII PAG Qualitative Assessment	Potential impact <i>(from Box 4.4 of TII guidelines)</i>	Impact level (from Box 4.4 of TII guidelines)	TII PAG Qualitative Assessment
Corridor Option 1 (South)	Kilmacanoge [0/2]	High	Significant	Slight	Minor or Slightly Negative	Not significant	Imperceptible	Not significant or neutral
	Three Trouts Stream [1/3]	Medium	Significant	Imperceptible		Small	Imperceptible	
	Woodlands 10 [0/1]	Medium	Small	Imperceptible		Not significant	Imperceptible	
	Kilcoole Stream [0/1]	High	Small	Imperceptible		Not significant	Imperceptible	
	Ballyronan Stream [0/1]	High	Small	Imperceptible		Not significant	Imperceptible	
	Newtownmountkennedy [0/1]	Very high	Small	Slight		Not significant	Imperceptible	
	Moneycarroll [0/1]	Very high	Small	Slight		Not significant	Imperceptible	
	Newcastle River [0/1]	Very high	Small	Slight		Not significant	Imperceptible	
	Volan [0/0]	Very high	Small	Slight		Not significant	Imperceptible	
	Dunran Demense Channel [0/1]	Very high	Small	Slight		Not significant	Imperceptible	
	Cullenmore Stream [0/0]	Very high	Small	Slight		Not significant	Imperceptible	
Courtfoyle Stream [0/0]	Very high	Small	Slight	Not significant	Imperceptible			
Corridor Option 2 (South)	Kilmacanoge [3/1]	High	Significant	Slight	Minor or Slightly Negative	Small	Imperceptible	Not significant or neutral
	Three Trouts Stream [1/0]	Medium	Significant	Imperceptible		Small	Imperceptible	
	Kilmurray_South [1/0]	Medium	Significant	Imperceptible		Small	Imperceptible	
	Woodlands 10 [1/0]	Medium	Significant	Imperceptible		Small	Imperceptible	
	Ballyronan Stream [0/1]	High	Small	Imperceptible		Not significant	Imperceptible	
	Newtownmountkennedy [0/1]	Very high	Small	Slight		Not significant	Imperceptible	
	Moneycarroll [0/1]	Very high	Small	Slight		Not significant	Imperceptible	
	Newcastle River [0/1]	Very high	Small	Slight		Not significant	Imperceptible	
Volan [0/0]	Very high	Small	Imperceptible	Not significant	Imperceptible			

Corridor Option	Watercourses encountered <i>[no. of new / existing crossings]</i>	Attribute Importance	Construction Phase			Operational Phase		
			Potential impact <i>(from Box 4.4 of TII guidelines)</i>	Impact level (from Box 4.4 of TII guidelines)	TII PAG Qualitative Assessment	Potential impact <i>(from Box 4.4 of TII guidelines)</i>	Impact level (from Box 4.4 of TII guidelines)	TII PAG Qualitative Assessment
	Dunran Demense Channel [0/1]	Very high	Small	Slight		Not significant	Imperceptible	
	Cullenmore Stream [0/0]	Very high	Small	Imperceptible		Not significant	Imperceptible	
	Courtfoyle Stream [0/0]	Very high	Small	Imperceptible		Not significant	Imperceptible	
Corridor Option 5 (South)	Kilmacanoge [0/2]	High	Significant	Slight	Minor or Slightly Negative	Not significant	Imperceptible	Not significant or neutral
	Three Trouts Stream [1/3]	Medium	Significant	Imperceptible		Small	Imperceptible	
	Woodlands 10 [0/1]	Medium	Small	Imperceptible		Not significant	Imperceptible	
	Kilcoole Stream [0/1]	High	Small	Imperceptible		Not significant	Imperceptible	
	Ballyronan Stream [0/1]	High	Small	Imperceptible		Not significant	Imperceptible	
	Newtownmountkennedy [0/1]	Very high	Small	Slight		Not significant	Imperceptible	
	Moneycarroll [0/1]	Very high	Small	Slight		Not significant	Imperceptible	
	Newcastle River [0/1]	Very high	Small	Slight		Not significant	Imperceptible	
	Volan [0/0]	Very high	Small	Imperceptible		Not significant	Imperceptible	
	Dunran Demense Channel [0/1]	Very high	Small	Slight		Not significant	Imperceptible	
	Cullenmore Stream [0/0]	Very high	Small	Imperceptible		Not significant	Imperceptible	
	Courtfoyle Stream [0/0]	Very high	Small	Imperceptible		Not significant	Imperceptible	
Corridor Option 6 (South)	Kilmacanoge [1/3]	High	Significant	Slight	Minor or Slightly Negative	Small	Imperceptible	Moderately negative
	Three Trouts Stream [1/1]	Medium	Significant	Imperceptible		Significant	Moderate	
	Woodlands 10 [1/0]	Medium	Significant	Imperceptible		Significant	Moderate	
	Kilcoole Stream [0/1]	High	Small	Imperceptible		Not significant	Imperceptible	
	Ballyronan Stream [0/1]	High	Small	Imperceptible		Not significant	Imperceptible	
	Newtownmountkennedy [0/1]	Very high	Small	Slight		Not significant	Imperceptible	
	Moneycarroll [0/1]	Very high	Small	Slight		Not significant	Imperceptible	
Newcastle River [0/1]	Very high	Small	Slight	Not significant	Imperceptible			

Corridor Option	Watercourses encountered [no. of <i>new</i> / <i>existing</i> crossings]	Attribute Importance	Construction Phase			Operational Phase		
			Potential impact (from Box 4.4 of TII guidelines)	Impact level (from Box 4.4 of TII guidelines)	TII PAG Qualitative Assessment	Potential impact (from Box 4.4 of TII guidelines)	Impact level (from Box 4.4 of TII guidelines)	TII PAG Qualitative Assessment
	Volan [0/0]	Very high	Small	Imperceptible		Not significant	Imperceptible	
	Dunran Demense Channel [0/1]	Very high	Small	Slight		Not significant	Imperceptible	
	Cullenmore Stream [0/0]	Very high	Small	Imperceptible		Not significant	Imperceptible	
	Courtfoyle Stream [0/0]	Very high	Small	Imperceptible		Not significant	Imperceptible	

1.4.2 Surface water dependent habitats

A conservative approach was taken regarding water dependent habitats. In advance of a detailed survey at environmental impact assessment stage, some features have been included and given an importance rating as if they are dependent on both surface water and groundwater – refer to **Appendix C4** (Hydrogeology) of **Volume C** for further details.

The ecological features that are considered to be dependent on surface water flow, level or quality to maintain their integrity are presented in **Section 14.3.6** (Hydrology) of **Volume B**. These are:

- Kilmacanoge Marsh pNHA (including the priority Annex I Habitat, Alluvial woodland [91E0*]);
- The Murrough pNHA SAC and SPA which are likely dependent on the water quality and flows from local rivers;
- Priority Annex 1 habitat Alluvial woodlands [91E0*] identified in Glen of the Downs SAC; and
- Potential site identified in Ballywaltrim Lane Ecological Site as Priority Annex 1 habitat Alluvial woodland [91E0*] (numbered EC45 in **Section 12** (Biodiversity) of **Volume B**).

Kilmacanoge Marsh pNHA has an ecological value of international importance due to the presence of the fen/fen carr invertebrate communities and Annex I woodland. Refer to **Section 12** (Biodiversity) of **Volume B** for the biodiversity assessment of this feature. This constraint is therefore assigned an attribute importance ranking of extremely high importance in this assessment.

Priority Annex I habitat Alluvial woodland [91E0*] in Glen of the Downs SAC has an ecological value of international importance and is therefore assigned an attribute importance ranking of extremely high importance in this assessment. The potential site identified at Ballywaltrim Lane (EC45) is also ranked as extremely high importance in this assessment.

An assessment of the potential for impacts to the hydrological characteristics at these attributes is presented in **Table 1.4** and **Table 1.5** and these were ranked in line with the methodology presented in **Section 1.2**. It should be noted that these did not assess the potential impacts on the attributes themselves, but only the potential changes in water quality, levels or flow at the attribute. The assessment of the impacts on the attribute as a biodiversity feature is included in **Appendix D1** (Biodiversity) of **Volume D**.

The water quality, levels or flow within the ecological features may be impacted by temporary impacts during the construction phase and both temporary and permanent impacts during the operation phase with the exception of the Murrough pNHA. The Murrough pNHA is located downstream of the proposed development and only has the potential to be impacted during the construction phase or as a result of accidents and spills during the operational phase which are temporary in nature.

In order to undertake a conservative assessment, the TII PAG qualitative assessment was assigned to each corridor option based on the highest impacts likely to be observed on any of the features. It was conservatively assumed that with standard pollution control measures and an operational drainage system designed to current standard in place, the risk of accidental spillage which could result in a change in water quality, level or flow cannot be completely ruled out.

Table 1.4: Surface water dependent habitats assessment table Northern Section

	Surface water dependent habitat	Attribute Importance	Construction Phase			Operation Phase		
			Potential impact <i>(from Box 4.4 of TII guidelines)</i>	Impact level <i>(from Box 4.4 of TII guidelines)</i>	TII PAG Qualitative Assessment	Potential impact <i>(from Box 4.4 of TII guidelines)</i>	Impact level <i>(from Box 4.4 of TII guidelines)</i>	TII PAG Qualitative Assessment
Corridor Option 1A (North)	Kilmacanoge Marsh pNHA	Extremely High	Significant (Temporary)	Significant	Major or highly negative	Not significant (Temporary)	Not significant	Major or highly negative
			n/a (Permanent)	n/a		Significant (Permanent)	Profound	
	Priority habitat in Ballywaltrim Lane	Extremely High	Significant (Temporary)	Significant		Not significant (Temporary)	Not significant	
			n/a (Permanent)	n/a		Small (Permanent)	Profound	
Corridor Option 1B (North)	Kilmacanoge Marsh pNHA	Extremely High	Significant (Temporary)	Significant	Major or highly negative	Not significant (Temporary)	Not significant	Major or highly negative
			n/a (Permanent)	n/a		Significant (Permanent)	Profound	
	Priority habitat in Ballywaltrim Lane	Extremely High	Significant (Temporary)	Significant		Not significant (Temporary)	Not significant	
			n/a (Permanent)	n/a		Small (Permanent)	Profound	

Table 1.5: Surface water dependent habitats assessment table Southern Section

	Surface water dependent habitat	Attribute Importance	Construction Phase			Operation Phase		
			Potential impact <i>(from Box 4.4 of TII guidelines)</i>	Impact level <i>(from Box 4.4 of TII guidelines)</i>	TII PAG Qualitative Assessment	Potential impact <i>(from Box 4.4 of TII guidelines)</i>	Impact level <i>(from Box 4.4 of TII guidelines)</i>	TII PAG Qualitative Assessment
Corridor Option 1 (South)	Murrough pNHA SAC & SPA	Extremely High	Small (Temporary)	Moderate	Major or highly negative	Small (Temporary)	Moderate	Major or highly negative
			n/a (Permanent)	n/a		Not significant (Permanent)	Not significant	
	Priority habitat in Glen of the Downs	Extremely High	Significant (Temporary)	Significant		Significant (Temporary)	Significant	
			n/a (Permanent)	n/a		Not significant (Permanent)	Not significant	
Corridor Option 2 (South)	Murrough pNHA SAC & SPA	Extremely High	Small (Temporary)	Moderate	Moderately negative	Small (Temporary)	Moderate	Moderately negative
			n/a (Permanent)	n/a		Not significant (Permanent)	Not significant	
	Priority habitat in Glen of the Downs	Extremely High	Small (Temporary)	Moderate		Not Significant (Temporary)	Not significant	
			n/a (Permanent)	n/a		Not significant (Permanent)	Not significant	
Corridor Option 5 (South)	Murrough pNHA SAC & SPA	Extremely High	Small (Temporary)	Moderate	Major or highly negative	Small (Temporary)	Moderate	Major or highly negative
			n/a (Permanent)	n/a		Not significant (Permanent)	Not significant	
	Priority habitat in Glen of the Downs	Extremely High	Significant (Temporary)	Significant		Significant (Temporary)	Significant	
			n/a (Permanent)	n/a		Not significant (Permanent)	Not significant	

	Surface water dependent habitat	Attribute Importance	Construction Phase			Operation Phase		
			Potential impact <i>(from Box 4.4 of TII guidelines)</i>	Impact level <i>(from Box 4.4 of TII guidelines)</i>	TII PAG Qualitative Assessment	Potential impact <i>(from Box 4.4 of TII guidelines)</i>	Impact level <i>(from Box 4.4 of TII guidelines)</i>	TII PAG Qualitative Assessment
Corridor Option 6 (South)	Murrough pNHA SAC & SPA	Extremely High	Small (Temporary)	Moderate	Major or highly negative	Small (Temporary)	Moderate	Major or highly negative
			n/a (Permanent)	n/a		Not significant (Permanent)	Not significant	
	Priority habitat in Glen of the Downs	Extremely High	Significant (Temporary)	Significant		Not Significant (Temporary)	Not significant	
			n/a (Permanent)	n/a		Significant (Permanent)	Profound	

1.4.3 Surface water abstractions

Four surface water abstractions (A1, A2, A11 and A12⁶) were identified in **Table 14.9** of **Section 14** (Hydrology) of **Volume B**. These are all upstream of the potential corridor options and will not be impacted by any of the proposed corridors. For this reason, they are not included in the assessment.

1.4.4 Amenity value

Two sites of amenity value (A2 and A13) were identified in **Table 14.9** of **Section 14** (Hydrology) of **Volume B**. These are both upstream of the corridor options and will not be impacted. For this reason, these sites will not be included in the assessment.

1.4.5 Flood risk

The potential increase (or reduction) of flood risk to existing properties is also considered as part of the assessment based on the property number bands outlined in **Table 14.1** of **Section 14** (Hydrology) of **Volume B**. The length of the mapped floodplain within the assessment study area of each corridor option and the presence of downstream flood relief schemes are the primary factors considered.

There are several areas of existing flood risk along the current alignment in the Northern Section. The on-line corridor options have the potential to alleviate some of these existing issues e.g. through upgrading the drainage system to current standards. This could potentially be considered as a positive impact, however taking a conservative approach and to ensure parity between corridor options, it will be considered as neutral.

It should be noted that there is an existing flood relief scheme downstream of the corridor options in the Northern Section on the River Dargle. The flood relief scheme protects more than 50 properties and therefore is given an attribute importance of very high. The current scheme represents the baseline environment and would have been incorporated into the design of the flood defences.

However, any additional crossings of the River Dargle or its tributaries have the potential to reduce the floodplain capacity and therefore contribute to a marginal increase in peak flood flows. The impacts of this have been incorporated into the assessment by considering the additional number of crossings that may be required that may impact the designed flood storage of the existing scheme. Additional crossings of watercourses upstream of the flood relief scheme are considered to be a permanent impact on a small proportion of the attribute, the attribute being the mapped floodplain and/or presence of the flood relief scheme. Refer to **Table 1.2** for watercourse crossings.

The assessments are presented in **Table 1.6** and **Table 1.7** for the northern and southern corridor options respectively.

⁶ Reference numbers were assigned to each attribute identified in Section 14 Hydrology of Volume B – Constraints Study and these reference numbers are used in the assessment for consistency.

Flooding impacts in this assessment are considered to be temporary as the ability for the potential for flood water to be appropriately dealt with during a storm event is assumed. The impacts are also all considered to be during the operational stage.

The length of mapped floodplain considers the total length of road with low, medium or high potential for flooding. This is a conservative approach as the assessment of flood potential is more subject to the length of embankment within these floodplains as opposed to the full length of the road through these areas.

Table 1.6: Flooding assessment table Northern Section

Assessment Criteria	Length of mapped floodplain along corridor (km)	Attribute Importance	Flood Risk Upstream Quantitative Assessment	Qualitative Assessment	Impact Level	TII PAG
Corridor Option 1A (North)	1.7	Very High	Permanent impact on small proportion of attribute	Significant negative	Significant negative	Major or highly negative
Corridor Option 1B (North)	1.7	Very High	Not significant or neutral	Neutral	Neutral	Not significant or neutral

Table 1.7: Flooding assessment table Southern Section

Assessment Criteria	Length of mapped floodplain along corridor (km)	Attribute Importance	Flood Risk Upstream Quantitative Assessment	Qualitative Assessment	Impact Level	TII PAG
Corridor Option 1 (South)	1.4	High	Not significant or neutral	Neutral	Neutral	Not significant or neutral
Corridor Option 2 (South)	0.28	High	Permanent impact on small proportion of attribute	Significant negative	Significant negative	Moderate
Corridor Option 5 (South)	1.4	High	Not significant or neutral	Neutral	Neutral	Not significant or neutral
Corridor Option 6 (South)	0.7	High	Permanent impact on small proportion of attribute	Significant negative	Significant negative	Moderate

It should be noted that further detailed studies will be undertaken to determine the potential flooding impacts.

1.4.6 Summary

The Stage 2 Project Appraisal Matrix for the northern and southern sections are summarised in **Table 1.8** and **Table 1.9**. The worst-case scenario is considered for both temporary and permanent impacts during both the construction and operational phases.

Table 1.8: Corridor assessment – Northern Section

Assessment Criteria	Corridor Option 1A (North)	Corridor Option 1B (North)
Watercourses	Minor or slightly negative	Minor or slightly negative
Surface water dependent habitats	Major or Highly negative	Major or Highly negative
Flood Risk	Major or Highly Negative	Not significant or neutral
Qualitative Assessment	Major or Highly Negative	Major or Highly negative
Score / Impact Level	1	1
Preference	Least preferred	Preferred

The preference for Corridor Option 1B (North) has been determined based on the neutral impact it will have on floodplain storage in the Northern Section. A potential additional crossing of the Kilmacanoge watercourse, a tributary of the River Dargle, may be required in Corridor Option 1A (North). This may reduce floodplain storage which is part of the River Dargle Flood Defence Scheme.

Table 1.9: Corridor assessment – Southern Section

Assessment Criteria	Corridor Option 1 (South)	Corridor Option 2 (South)	Corridor Option 5 (South)	Corridor Option 6 (South)
Watercourses	Minor or slightly negative	Minor or slightly negative	Minor or slightly negative	Moderately negative
Surface water dependent habitats	Major or Highly Negative	Moderately negative	Major or Highly Negative	Major or Highly Negative
Flood risk	Not significant or neutral	Moderately negative	Not significant or neutral	Moderately negative
Qualitative Assessment	Major or highly negative	Moderately negative	Major or Highly Negative	Major or Highly Negative
Score / Impact Level	1	2	1	1
Preference	Intermediate	Preferred	Intermediate	Least preferred

The preferred rating for Corridor Option 2 (South) is based on the least potential impact on ecological sites.

Corridor Options 1 and 5 (South) are considered as intermediate preferences as they both present a potential negative impact on the identified priority Annex I habitat in Glen of the Downs SAC.

Corridor Option 6 (South) is least preferred due to the impact on the watercourses, ecological sites and flood risk. This option has the potential to significantly impact flow in the Woodlands 10 watercourse and the Three Trouts Stream and therefore indirectly impact on the priority Annex 1 habitat in Glen of the Downs SAC, [91E0*] Alluvial Woodland. Two potential additional crossings of the Kilmacanoge watercourse, a tributary of the River Dargle, may reduce floodplain storage which is part of the River Dargle Flood Defence Scheme.

1.5 Stage 2 Project Appraisal Matrix – transport assessment

Transport Scenarios 5A and 5B have been assessed in relation to the impact on water features of importance. The transport scenarios present little difference in terms of their impact on water features as there is one additional crossing of the County Brook, Kilmacanoge and Three Trouts Stream watercourses further to the proposed corridor options and there are no additional works proposed in water dependant habitats. The additional crossings proposed as part of Transport Scenario 5A indicate that Transport Scenario 5B is the preferred option when compared to Transport Scenario 5A.

There is no discernible difference to hydrological features of importance if Transport Scenario 4 is included as a supplementary measure to Transport Scenarios 5A and 5B.

1.6 References

Environmental Protection Agency (EPA), Guidelines on the Information to be Contained in Environmental Impact Assessment Reports, Draft 2017. Available from: <https://www.epa.ie/pubs/advice/ea/EPA%20EIAR%20Guidelines.pdf>

Transport Infrastructure Ireland (TII) National Roads Authority Environmental Impact Assessment of National Road Schemes – a Practical Guide, 2008. Available from: <https://www.tii.ie/technical-services/environment/planning/Environmental-Impact-Assessment-of-National-Road-Schemes-Practical-Guide.pdf>

Transport Infrastructure Ireland (TII) National Roads Authority Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes, 2009. Available from: <https://www.tii.ie/technical-services/environment/planning/Guidelines-on-Procedures-for-Assessment-and-Treatment-of-Geology-Hydrology-and-Hydrogeology-for-National-Road-Schemes.pdf>

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