

Wicklow County Council

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

Option Selection Report
Appendix C1 - Biodiversity

265455-ARP-EBD-SWI-RP-LB-0002-P01

C01 | 6 December 2021

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It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

Job number 265455

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Document Verification

Job title		N11/M11 Junction 4 to Junction 14 Improvement Scheme		Job number		265455	
Document title		Option Selection Report Appendix C1 - Biodiversity		File reference			
Document ref		265455-ARP-EBD-SWI-RP-LB-0002-P01					
Revision	Date	Filename	265455-ARP-EBD-SWI-RP-LB-0002-P02 Biodiversity.docx				
C01	6 Dec 2021	Description	Final Issue.				
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		Signature					
		Filename					
		Description					
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		Name					
		Signature					
		Filename					
		Description					
			Prepared by	Checked by	Approved by		
		Name					
		Signature					
Issue Document Verification with Document <input checked="" type="checkbox"/>							

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1 Biodiversity

1.1 Introduction

This report details the environmental assessment of the Stage 1 Preliminary Options Assessment for the N11/M11 Scheme with respect to the Biodiversity constraints identified in **Section 12** (Biodiversity) 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 **Section 6.1** of **Volume A**.

There are two zones associated with each corridor option referred to in this assessment:

- The potential road “footprint” which is the potential landtake required to construct or improve the road; and
- The road “corridor” which in most cases is a 200m wide corridor centred around an alignment centre line. The “footprint” sits inside the corridor (the exception being the existing road, Corridor Options 1 (North), 1 (South) and 5 (South), where the corridor area matches the footprint).

Section 1.2 outlines the methodology that was used to carry out the study, and **Section 1.3** outlines the assessment criteria which were used. The Stage 1 assessment and summary are presented in **Section 1.4** and references are listed in **Section 1.5**.

The principal objectives of the options assessment are to:

- Evaluate all corridor options contained within each section, based on ecological criteria, as per the Transport Infrastructure Ireland (TII), formerly National Road Authority (NRA) Guidelines for Assessment of Ecological Impacts of National Road Schemes (NRA, 2009)¹ (herein referred to as the TII Guidelines) and Chartered Institute for Ecology and Environmental Management (CIEEM) Guidelines for Ecological Impact Assessment in the UK and Ireland; Terrestrial, Freshwater, Coastal and Marine (2019)²;
- Assess the significance of the likely impacts of the proposed scheme on each of the biodiversity receptors potentially impacted by each corridor option.

¹ National Roads Authority (2009) Guidelines for Assessment of Ecological Impacts of National Road Schemes. Available from: <https://www.tii.ie/technical-services/environment/planning/Guidelines-for-Assessment-of-Ecological-Impacts-of-National-Road-Schemes.pdf>

² Chartered Institute for Ecology and Environmental Management (CIEEM) (2019) Guidelines for Ecological Impact Assessment in the UK and Ireland; Terrestrial, Freshwater, Coastal and Marine. Available from: <https://cieem.net/wp-content/uploads/2018/08/ECIA-Guidelines-2018-Terrestrial-Freshwater-Coastal-and-Marine-V1.1.pdf>

As per the TII Guidelines¹, this step discounted biodiversity receptors or ecological sites where the risk of significant impacts is unlikely considering where the application of standard mitigation and best practice during construction is unambiguous and success is highly likely; and

- To assess each option in accordance with TII Project Appraisal Guidelines for National Roads Unit 7.0 - Multi Criteria Analysis (TII, 2016)³(herein referred to as the TII PAG).

In fulfilling these objectives, an assessment of the likely or potential impacts of each corridor option on ecological receptors is carried out so that an informed comparison of the corridor options contained in both sections can be made with the knowledge of the potential ecological consequences.

1.2 Methodology

The process by which the corridor options were assessed was as follows:

- The key ecological receptors within the scheme study area were identified based on a combination of desktop data, consultation and field survey;
- The key ecological receptors were attributed an ecological valuation based on a geographic frame of reference ranging from international to local importance;
- The likely impacts of each of the corridor options on the key ecological receptors were identified and assessed, indicating which, if any, of these are likely to be significant, and at what geographical level;
- The impacts of each of the corridor options on the key ecological receptors were scored based on a seven-point scale ranging from ‘major or highly negative’ to ‘major or highly positive’;
- The overall cumulative impact of each corridor option across all the key ecological receptors affected was also scored on the same seven-point scale; and
- The scores attributed to each of the corridor options were assessed comparatively and assigned a preference ranking score.

1.2.1 Key ecological receptors

Key ecological receptors are those biodiversity receptors confirmed, or likely to occur, within the overall scheme study area with an ecological value of local importance (higher value) or greater and, therefore, likely to affect the scoring and ranking of the corridor options, including:

- Designated sites for nature conservation (e.g. SACs, SPAs, NHAs, pNHAs and Nature Reserves);

³ Transport Infrastructure Ireland (2016) Project Appraisal Guidelines for National Roads Unit 7.0 - Multi Criteria Analysis Available from: <https://www.tiipublications.ie/library/PE-PAG-02031-01.pdf>

- Sensitive habitats (e.g. non-designated areas of Annex I habitat⁴, non-Annex I semi-natural woodland habitats and watercourses⁵); and,
- Ecological sites

The key ecological receptors were initially identified in **Section 12** (Biodiversity) of **Volume B** based on collation of available existing information, from the desk study and consultations with relevant bodies/organisations and focussed on the known/potential ecological value for the habitats/species present. In the case of the ecological sites, the boundaries were initially defined based on interpretation of orthophotography and collation of available existing habitat information.

This was supplemented at the corridor options stage by field surveys. The aim of the field surveys was a ground truthing exercise to verify the orthophotography interpretation and selection of ecological sites, refine site boundaries and to capture additional ecological sites not identified during the desk study. Walkover surveys, of ecological sites which were located in close proximity to, or overlapped with, one of the corridor options, were undertaken in June 2020. One other ecological site- Ballywaltrim (EC45), which had not been accessible in June 2020, was briefly surveyed in August 2020.

In some cases, ecological sites were viewed from a distance or could not be viewed at a distance due to the local topography or limited access. However, assumptions have been made on the value of those ecological sites based on local information gathered during the field surveys and desk study.

Where possible, during the site walkover surveys, habitat types were classified using the Guide to Habitats in Ireland (Fossitt, 2000)⁶ and the likelihood/potential for Annex I habitat types was inferred where possible based on the professional judgement of the surveyor, with reference to the Interpretation manual of European Union Habitats EUR 28 (CEC, 2013)⁷. A precautionary approach was adopted with regards to the identification of the potential presence of Annex I habitats within an ecological site.

⁴ The short-hand names of Annex I habitats is used in this assessment, as per NPWS (2019). The Status of European Habitats and Species in Ireland. Volume 2: Habitat Assessments. Available from: https://www.npws.ie/sites/default/files/publications/pdf/NPWS_2019_Vol2_Habitats_Article17.pdf

⁵ Watercourses are referred to as per the names presented on the EPA's online Map Viewer. Available from: <https://gis.epa.ie/EPAMaps/> [Accessed 03 April 2020]

⁶ Fossitt, J.A. (2000) A Guide to Habitats in Ireland. Heritage Council, Kilkenny. Available from: <https://www.npws.ie/sites/default/files/publications/pdf/A%20Guide%20to%20Habitats%20in%20Ireland%20-%20Fossitt.pdf>

⁷ CEC. (Commission of the European Communities) (2013) Interpretation manual of European Union Habitats EUR28. European Commission, DG Environment. Available from: https://ec.europa.eu/environment/nature/legislation/habitatsdirective/docs/Int_Manual_EU28.pdf

Multidisciplinary surveys were carried out within 250m of the existing N11/ M11 road so the Design Team could be fully informed of the environmental constraints adjacent to the existing, heavily constrained road. Precision of existing constraints on the N11/M11 road is required to inform this assessment as there is limited space to manoeuvre along the existing road corridor. Dedicated habitat surveys have been undertaken at certain highly-sensitive ecological sites (Glen of the Downs SAC, Kilmacanoge Marsh pNHA, Druids Glen Woodland Ecological Site (EC24) and Ballyvolan Upper – Coynes Cross Ecological Site (EC29)) and this information has informed the Option Selection process.

In addition, the multidisciplinary surveys identified habitats along the existing N11/ M11 road of varying ecological value, ranging from local ecological value to international value. The results of these surveys have been used to refine and inform the ecological sites identified during the desktop study.

1.2.2 Ecological valuation

The key ecological receptors identified have been valued with regard to ecological valuation guidance set out in TII Guidelines¹ and Guidelines for Ecological Impact Assessment in the UK and Ireland; Terrestrial, Freshwater, Coastal and Marine (CIEEM, 2019)².

The following geographic frame of reference is used when valuing the key ecological receptors:

- International importance;
- National importance;
- County importance; or
- Local importance (higher value).

All Annex I habitats that lie outside of European sites, are valued as being of national importance, given that these habitats are of high conservation concern. However, priority Annex I habitat types are valued as being of international importance given that they are of the highest conservation concern at a European level (i.e. natural habitat types in danger of disappearance⁸).

For individual sites (e.g. designated sites, watercourses or ecological sites identified during the Constraints Study), the overall ecological valuation for each of the key ecological receptors was based upon the highest value receptor known to be present, or potentially present, within the ecological site.

1.3 Assessment criteria

The assessment of each corridor option included both a quantitative and qualitative assessment.

⁸ From the definition of “*priority natural habitat types*” in Article 1(d) of the Habitats Directive.

Each potential impact on sensitive receptors was scored, based on the seven-point scale below from the TII PAG³ and an integer was assigned according to the impact significance:

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

To interpret the above impact scoring key to assess the likely ecological impacts of each corridor option on individual key ecological receptors, the following criteria are applied, with the use of professional judgement as to the likelihood of significant effects occurring:

- Potential impacts on an ecological receptor of national/ international importance were assigned a score of 1 – Major or highly negative;
- Potential impacts on an ecological receptor of county importance were assigned a score of 2 – Moderately negative; and;
- Potential impacts on a receptor of local importance (higher value) were assigned a score of 3 – Minor or slightly negative.

Although a given corridor option may impact upon a particular key ecological receptor, the direct impact(s) on the site may not necessarily directly impact on the highest value receptor(s). This is taken into account in the assessment in so far as is possible based on the level of ecological information available.

To interpret the above impact scoring key to assess the likely cumulative overall ecological impacts for each corridor option, the following criteria are applied, with the use of professional judgement as to the likelihood of significant effects occurring:

- If a corridor option impacts directly on one or more ecological site valued as international or national importance, the corridor is scored as major or highly negative;
- If a corridor option impacts directly on one or more ecological site valued as county importance, or numerous ecological sites valued as local higher importance, the corridor is scored as moderately negative; and,
- If a corridor option impacts directly on a small number of ecological sites valued as local higher importance, the corridor is scored as minor or slightly negative.

As all corridor options will have some level of impact on biodiversity, neutral or positive impacts do not apply in this context.

Each of the corridor options in the Northern Section, and separately each of the corridor options in the Southern Section, were comparatively assessed in terms of the overall impact significance to give a preference ranking for each of the two sections.

The preference ranking was as follows: ‘Preferred’, ‘Intermediate’ and ‘Least Preferred’. These terms are used to comparatively assess corridor options in either the Northern or Southern Section and should not be interpreted to compare the significance of impacts between those sections. For clarity, where the preference ranking for two or more corridor options was the same numerical ranking is given in brackets (e.g. if 4 options exist numerical ranking is given as 4,3,2,1 and where 5 options exist numerical ranking is given as 5,4,3,2,1 in ascending order of preference).

In accordance with the TII Guidelines¹, key ecological receptors within the scheme study area were not assessed against the corridor options where the risk of significant impacts is unlikely, considering where the delivery of standard mitigation and best practice during construction is unequivocal and success is highly likely. For example, with the application of standard pollution control measures during construction and an operation drainage and pollution control system designed to current standards, sensitive biodiversity receptors downstream of corridor options are not likely to be affected. However, it should be noted that potential watercourse crossings were considered in this assessment as it cannot be assumed that clear-span crossings will be possible at each crossing point. In addition, potential watercourse crossings will undoubtedly result in habitat loss, with regards riparian habitat, and other indirect impacts on the watercourse in question (e.g. additional shading). In addition, to ensure consistency with the hydrogeology assessment (refer to **Appendix C3 (Hydrogeology) of Volume C**), potential indirect impacts on hydrogeological dependent habitats were assessed based on potential for impacts on the preliminary zone of contribution (PZOC) for each groundwater dependent habitat, as identified in the Hydrogeology assessment.

1.4 Stage 1 corridor options assessment

This section details the Stage 1 assessment of the corridor options for both the northern and southern sections of the N11/M11 Scheme. **Table 1.3** summarises the potential impacts associated with each of the four corridor options proposed in the Northern Section of the scheme and presents the scores allocated to each corridor option. Likewise, **Table 1.4** summarises the potential impacts associated with each of the five corridor options proposed in the Southern Section of the scheme and presents the scores awarded to each corridor option. Key ecological receptors which are located within, or partially within, a corridor option for the proposed scheme, and on which the corridor options were assessed, are presented in **Table 1.1**. In addition, **Table 1.2** outlines which ecological receptors are impacted by each of the corridor options.

Table 1.1: Key ecological receptors located within, or partially within, a corridor option of the proposed scheme.

Site Name	Description	Ecological Value
Rathmichael Stream	River known to support Brown Trout (<i>Salmo trutta</i>)	County Importance
County Brook Stream	River known to support Brown Trout (<i>Salmo trutta</i>)	County Importance
River Dargle	Designated salmonid river under S.I No. 293/1988. River known to support Brown/ Sea Trout (<i>Salmo trutta</i>), Salmon (<i>Salmo salar</i>), Eel (<i>Anguilla anguilla</i>) and Lamprey species (<i>Lampetra</i> spp.)	National Importance
Dargle Woodland Ecological Site (EC07)	Mixed broadleaved woodland along the valley of the River Dargle	Local Importance (Higher Value)
Glencullen Woodland Ecological Site (EC08)	Mixed broadleaved woodland along the valley of the Glencullen River	Local Importance (Higher Value)
Dargle River Valley pNHA [001754]	Designated site (pNHA). Wooded valley along the River Dargle. Dominated by mature oak woodland. Yellow Archangel (Red Data Book species) occurs here.	National Importance
Kilmacanoge River	River known to support Brown Trout (<i>Salmo trutta</i>)	County Importance
Hollybrook- Brennanstown Riding School Ecological Site (EC10)	Large area of broadleaf woodland, much of which is dominated by Beech, including the banks along the Kilmacanoge River.	Local Importance (Higher Value)
Barnacoille- Little Sugarloaf Ecological Site (EC16)	Mosaic of dense bracken and gorse scrub with areas of dry meadows and grassy verges also present. Upland heath habitats (Annex I) also occur on the higher slopes.	National Importance
Rocky Valley Stream	River known to support Brown Trout (<i>Salmo trutta</i>)	County Importance
Kilmacanoge Marsh pNHA [000724]	Designated site (pNHA). Mosaic of wet woodland, wet grassland and fen. Wet willow alder ash woodland present here. Of international importance due to the fen/ fen carr invertebrate communities which are present here and presence of Annex I woodland.	International Importance
Glen of the Downs SAC, pNHA & Nature Reserve [000719]	Designated site (SAC, pNHA, Nature Reserve). Annex I “Old Oak woodland [91A0]”. Other non-Annex woodland habitats including various semi-natural and modified woodland types. Non-QI Annex I “Alluvial woodland [91E0]” also present. Rare mosses also found here. Also known to contain the priority Annex I habitat Petrifying springs ¹ [7220*]	International Importance
Bellevue Demesne Ecological Site (EC18)	Woodland including areas of mixed conifer/ broadleaved woodland and non-native conifer woodland.	Local Importance (Higher Value)
Three Trouts Stream	River known to support Brown/ Sea Trout (<i>Salmo trutta</i>)	County Importance
Kilmurray South River	Watercourse	Local Importance (Higher Value)
Woodlands [10] River	Watercourse	Local Importance (Higher Value)
Ballinashinnagh – Kilmurray Ecological Site (EC20)	Mainly composed of conifer plantations, with areas of dense bracken, gorse scrub and dry meadows and grassy verges also present. Annex I heath habitat located towards the top of the slope.	National Importance
Kilcoole Stream	River known to support Brown/ Sea Trout (<i>Salmo trutta</i>)	County Importance
Newtown Demesne Ecological Site (EC37)	Modified mixed woodland habitats, agricultural lands and scrub	Local Importance (Higher Value)

Site Name	Description	Ecological Value
Ballyronan Ecological Site (EC23)	Most of the site has been cleared of vegetation recently and is now composed of mounds of excavated soil. Broadleaved woodland occurs in the area north of Ballyronan Stream and the canopy here consists of Ash, Alder, Sycamore and Birch.	Local Importance (Higher Value)
Ballyronan Stream	River known to support Brown Trout (<i>Salmo trutta</i>)	County Importance
Druids Glen Woodland Ecological Site (EC24)	Woodland mosaic including areas of wet willow woodland and the priority Annex I habitat "Petrifying springs" [7220]".	International Importance
Newtownmountkennedy River	River known to support Brown/ Sea Trout (<i>Salmo trutta</i>) and Eel (<i>Anguilla anguilla</i>)	County Importance
Moneycarrol River	River known to support Brown/ Sea Trout (<i>Salmo trutta</i>)	County Importance
Newcastle River	River known to support Brown/ Sea Trout (<i>Salmo trutta</i>)	County Importance
Newcastle Upper Ecological Site (EC27)	The area immediately adjacent to the existing N11 is composed of motorway/ roadside planting and dense gorse scrub. To the west exists an area of broadleaf woodland along the banks of the Newcastle River.	Local Importance (Higher Value)
Ballyvolan Upper- Coynes Cross Ecological Site (EC29)	Woodland habitat including Annex I Old oak woodland [91A0] and modified, semi-natural and non-native woodland types.	National Importance
Dunran Demesne River	River known to support Brown/ Sea Trout (<i>Salmo trutta</i>)	County Importance
Cullenmore Stream	Watercourse which could potentially support Brown Trout (<i>Salmo trutta</i>)	County Importance
Kilmartin Ecological Site (EC35)	The majority of the site is composed of conifer plantation along the banks of the Cullenmore Stream. Some scrub and broadleaved woodland further west in the site.	Local Importance (Higher Value)
Rathmore Ecological Site (EC36)	Woodland habitat along the banks of the Courtfoyle River. Semi-natural woodland, consisting of wet willow-alder-ash woodland is present in the eastern half of the site. On the western side, woodland consists of modified broadleaved woodland with conifer species occurring occasionally on a steep slope. Motorway/ roadside planting occurs immediately adjacent to the existing N11 along with gorse scrub and exposed rock surfaces.	Local Importance (Higher Value)
Courtfoyle River	Watercourse which could potentially support Brown Trout (<i>Salmo trutta</i>)	County Importance
Tinnapark Ecological Site (EC38)	Woodland and potentially FPO species present	National Importance
Delgany Golf Club Ecological Site (EC39)	Mixed broadleaved woodland with occasional conifers.	Local Importance (Higher Value)
Delgany Ecological Site (EC40)	Mixed broadleaved woodland and scrub.	Local Importance (Higher Value)
Woodlands Ecological Site (EC41)	Broadleaved woodland, including native wet willow-alder-ash woodland, along with pockets of wet grassland and bramble/gorse scrub.	Local Importance (Higher Value)
Kilmurray South Ecological Site (EC42)	Broadleaved woodland, hedgerows, gorse scrub and dry meadows and grassy verges.	Local Importance (Higher Value)
Dublin Oak Academy Ecological Site (EC43)	Woodland	Local Importance (Higher Value)
Old Connaught Ecological Site (EC44)	Broadleaved woodland and scrub, with motorway/roadside planting immediately adjacent to the existing N11/ M11.	Local Importance (Higher Value)
Ballywaltrim (EC45)	Area of broadleaved woodland between the R767 and the R768, which potentially contains pockets of the priority Annex I habitat Alluvial woodland [91E0*] and residential gardens on	International Importance

Site Name	Description	Ecological Value
	Ballywaltrim Lane along the Kilmacanoge River corridor, which are known to contain the priority Annex I habitat Petrifying springs ⁱ [7220*].	
<p>Note:</p> <p>i. As part of the hydrogeological assessment of these springs, a preliminary zone of contribution (PZOC), which is the area that contributes water to the spring, has been delineated. These are explained in further detail in Section 15.3.5, Eco-hydrology.</p>		

Table 1.2: Breakdown of the key ecological receptors which are impacted by the proposed corridor options.

Northern Section Corridor Options				
	Receptors of International Importance Impacted	Receptors of National Importance Impacted	Receptors of County Importance Impacted	Receptors of Local Importance (Higher Value) Impacted
Corridor Option 1 North	<ol style="list-style-type: none"> 1. Kilmacanoge Marsh pNHA [000724] 2. Ballywaltrim Ecological Site (EC45) 	<ol style="list-style-type: none"> 1. River Dargle 	<ol style="list-style-type: none"> 1. Rathmichael Stream 2. County Brook Stream 3. Kilmacanoge River 4. Rocky Valley Stream 	<ol style="list-style-type: none"> 1. Dargle Woodland Ecological Site (EC07) 2. Glencullen Woodland Ecological Site (EC08) 3. Hollybrook- Brennanstown Riding School Ecological Site (EC10) 4. Dublin Oak Academy Ecological Site (EC43) 5. Old Connaught Ecological Site (EC44)
Corridor Option 2 North	<ol style="list-style-type: none"> 1. Kilmacanoge Marsh pNHA [000724] 	<ol style="list-style-type: none"> 1. River Dargle 2. Dargle River Valley pNHA [001754] 	<ol style="list-style-type: none"> 1. Rathmichael Stream 2. County Brook Stream 3. Kilmacanoge River 4. Rocky Valley Stream 	<ol style="list-style-type: none"> 1. Dargle Woodland Ecological Site (EC07) 2. Glencullen Woodland Ecological Site (EC08) 3. Old Connaught Ecological Site (EC44)
Corridor Option 3 North		<ol style="list-style-type: none"> 1. River Dargle 2. Dargle River Valley pNHA [001754] 	<ol style="list-style-type: none"> 1. Rathmichael Stream 2. County Brook Stream 3. Kilmacanoge River 	<ol style="list-style-type: none"> 1. Dargle Woodland Ecological Site (EC07) 2. Glencullen Woodland Ecological Site (EC08) 3. Hollybrook- Brennanstown Riding School Ecological Site (EC10) 4. Dublin Oak Academy Ecological Site (EC43) 5. Old Connaught Ecological Site (EC44) 6. Barnacoille- Little Sugarloaf Ecological Site (EC16)
Corridor Option 4 North	<ol style="list-style-type: none"> 1. Ballywaltrim Ecological Site (EC45) 	<ol style="list-style-type: none"> 1. River Dargle 	<ol style="list-style-type: none"> 1. Rathmichael Stream 2. County Brook Stream 	<ol style="list-style-type: none"> 1. Dargle Woodland Ecological Site (EC07)

Northern Section Corridor Options				
			3. Kilmacanoge River	2. Glencullen Woodland Ecological Site (EC08) 3. Hollybrook- Brennanstown Riding School Ecological Site (EC10) 4. Dublin Oak Academy Ecological Site (EC43) 5. Old Connaught Ecological Site (EC44) 6. Barnacoille- Little Sugarloaf Ecological Site (EC16)
Southern Section Corridor Options				
	Receptors of International Importance Impacted	Receptors of National Importance Impacted	Receptors of County Importance Impacted	Receptors of Local Importance (Higher Value) Impacted
Corridor Option 1 South	1. Glen of the Downs SAC, pNHA & Nature Reserve [000719] 2. Druids Glen Woodland Ecological Site (EC24)	1. Ballyvolan Upper- Coynes Cross Ecological Site (EC29) 2. Tinnapark Ecological Site (EC38) ⁹	1. Kilmacanoge River 2. Three Trouts Stream 3. Kilcoole Stream 4. Ballyronan Stream 5. Newtownmountkennedy River 6. Moneycarrol River 7. Newcastle River 8. Dunran Demesne River 9. Cullenmore Stream 10. Courtfoyle River	1. Newcastle Upper Ecological Site (EC27) 2. Kilmartin Ecological Site (EC35) 3. Rathmore Ecological Site (EC36) 4. Newtown Demesne Ecological Site (EC37) 5. Delgany Golf Club Ecological Site (EC39)
Corridor Option 2 South	1. Glen of the Downs SAC, pNHA & Nature Reserve [000719] 2. Druids Glen Woodland Ecological Site (EC24)	1. Ballyvolan Upper- Coynes Cross Ecological Site (EC29) 2. Ballinashinnagh – Kilmurray Ecological Site (EC20) 3. Tinnapark Ecological Site (EC38)	1. Kilmacanoge River 2. Three Trouts Stream 3. Ballyronan Stream 4. Newtownmountkennedy River 5. Moneycarrol River 6. Newcastle River 7. Dunran Demesne River	1. Kilmurray South River 2. Woodlands [10] River 3. Newtown Demesne Ecological Site (EC37) 4. Ballyronan Ecological Site (EC23) 5. Newcastle Upper Ecological Site (EC27)

⁹Impacts on Tinnapark ecological site (EC38) are reduced to being significant at a local level only, considering the habitats involved.

Northern Section Corridor Options				
			<ul style="list-style-type: none"> 8. Cullenmore Stream 9. Courtfoyle River 	<ul style="list-style-type: none"> 6. Kilmartin Ecological Site (EC35) 7. Rathmore Ecological Site (EC36) 8. Woodlands Ecological Site (EC41) 9. Kilmurray South Ecological Site (EC42)
Corridor Option 3 South	<ul style="list-style-type: none"> 1. Druids Glen Woodland Ecological Site (EC24) 	<ul style="list-style-type: none"> 1. Ballyvolan Upper- Coynes Cross Ecological Site (EC29) 	<ul style="list-style-type: none"> 1. Kilmacanoge River 2. Three Trouts Stream 3. Kilcoole Stream 4. Ballyronan Stream 5. Newtownmountkennedy River 6. Moneycarrol River 7. Newcastle River 8. Dunran Demesne River 9. Cullenmore Stream 10. Courtfoyle River 	<ul style="list-style-type: none"> 1. Bellevue Demesne Ecological Site (EC18) 2. Newtown Demesne Ecological Site (EC37) 3. Newcastle Upper Ecological Site (EC27) 4. Kilmartin Ecological Site (EC35) 5. Rathmore Ecological Site (EC36) 6. Tinnapark Ecological Site (EC38) 7. Delgany Golf Club Ecological Site (EC39) 8. Delgany Ecological Site (EC40)
Corridor Option 4 South	<ul style="list-style-type: none"> 1. Druids Glen Woodland Ecological Site (EC24) 2. Glen of the Downs SAC, pNHA & Nature Reserve [000719] 	<ul style="list-style-type: none"> 1. Ballyvolan Upper- Coynes Cross Ecological Site (EC29) 2. Tinnapark Ecological Site (EC38)⁹ 	<ul style="list-style-type: none"> 1. Kilmacanoge River 2. Three Trouts Stream 3. Kilcoole Stream 4. Ballyronan Stream 5. Newtownmountkennedy River 6. Moneycarrol River 7. Newcastle River 8. Dunran Demesne River 9. Cullenmore Stream 10. Courtfoyle River 	<ul style="list-style-type: none"> 1. Bellevue Demesne Ecological Site (EC18) 2. Newtown Demesne Ecological Site (EC37) 3. Newcastle Upper Ecological Site (EC27) 4. Kilmartin Ecological Site (EC35) 5. Rathmore Ecological Site (EC36) 6. Delgany Golf Club Ecological Site (EC39)

Northern Section Corridor Options				
				7. Delgany Ecological Site (EC40)
Corridor Option 5 South	<ol style="list-style-type: none"> Glen of the Downs SAC, pNHA & Nature Reserve [000719] Druids Glen Woodland Ecological Site (EC24) 	<ol style="list-style-type: none"> Ballyvolan Upper- Coynes Cross Ecological Site (EC29) 	<ol style="list-style-type: none"> Kilmacanoge River Three Trouts Stream Kilcoole Stream Ballyronan Stream Newtownmountkennedy River Moneycarrol River Newcastle River Dunran Demesne River Cullenmore Stream Courtfoyle River 	<ol style="list-style-type: none"> Woodlands [10] River Newtown Demesne Ecological Site (EC37) Newcastle Upper Ecological Site (EC27) Kilmartin Ecological Site (EC35) Rathmore Ecological Site (EC36) Tinnapark Ecological Site (EC38) Delgany Ecological Site (EC40)

1.4.1 Northern Section

Corridor Option 1 (North)

This is an on-line corridor option focused on the existing N11/M11 road. It crosses a number of watercourses of county importance, including the Rathmichael Stream (nodes A-B), County Brook Stream (nodes A-B), Kilmacanoge River (crossed three times (between nodes B-D; nodes D-E; and nodes E-G)) and Rocky Valley Stream (nodes E-G), all of which are known to support populations of Brown Trout *Salmo trutta*. To the north of Junction 6 (Bray/Fassaroe), between nodes A and B, the on-line corridor clips the eastern boundary of the Old Connaught ecological site (EC 44). This ecological site is composed of woodland which lines the banks of the County Brook Stream and is of local importance (higher value). At Junction 6a (Enniskerry), between nodes B and D, this corridor option crosses the River Dargle, a designated salmonid river, of national ecological importance, which is known to support Brown/Sea Trout, Salmon *Salmo salar*, Eel *Anguilla anguilla* and Lamprey species *Lampetra* spp.

At the same junction (between nodes B-D), this corridor option would potentially result in habitat loss from both the Dargle Woodland ecological site (EC07) and the Glencullen Woodland ecological site (EC08). These sites are of local importance (higher value) due to the presence of mixed deciduous woodland along the valley sides of the Dargle and Glencullen rivers. Just to the south, again between nodes B and D, the corridor clips the western boundary of the Dublin Oak Academy ecological site (EC43), an area comprising woodland and grassland habitats of local importance (higher value). East of the existing road at Junction 7 (Bray South), between nodes D and E, habitat loss would also potentially occur at Brennanstown Riding School ecological site (EC10), which consists of Beech woodland along the banks of the Kilmacanoge River. The proposed corridor clips the northern end of the woodland here. In the same area (between nodes D-E), habitat loss may also occur at the Ballywaltrim ecological site (EC45), an area composed of woodland, scrub, semi-natural grassland habitats and the priority Annex I habitat Petrifying springs [7220*]. This ecological site is of international ecological importance due to the presence of these petrifying springs, a priority Annex I habitat, and also due to the potential presence of an additional priority Annex I habitat – Alluvial woodland [91E0*], which may be present in the woodland area located between the R767 and R768. Indirect impacts on the Petrifying springs [7220*] (priority Annex I habitat), which are known to occur in residential gardens on Ballywaltrim Lane (contained within the same Ballywaltrim ecological site (EC45)), and which could also potentially result in indirect impacts to areas of the priority Annex I habitat Alluvial woodland [91E0*], if present, are also likely to occur as a result of potential impacts to the PZOCs, on which these habitats depend. These springs, and alluvial woodland, if present, are of international importance owing to their priority Annex I habitat status.

Finally, to the south of Junction 8 (Kilmacanoge / Roundwood), between nodes E and G, this corridor option impacts considerably on Kilmacanoge Marsh pNHA, ecologically important at an international level.

This pNHA site is composed of a mosaic of habitats including wet woodland, wet grassland and fen. Wet willow-alder-ash woodland, which has affinities with the priority Annex I habitat type Alluvial woodland [91E0*], is present here, along with riparian woodland. The proposed corridor option here would result in significant habitat loss, including considerable areas of wet willow-alder-ash woodland and riparian woodland (some of which corresponds to the priority Annex I Alluvial woodland [91E0*] habitat type, wet grassland and scrub. Impacts on the Kilmacanoge River, which runs along the western boundary of the existing N11 road, would also be likely if road widening or alterations to the existing junction occurred here.

This is the least preferred (LP (4)) corridor option from a biodiversity point of view due to the fact that it would result in significant impacts on Kilmacanoge Marsh pNHA, a site of international importance, and could also potentially result in indirect impacts on several Petrifying springs and, potentially, Alluvial woodland, if present, (also of international importance) which occur in Ballywaltrim ecological site (EC45). It would also impact on the Dargle River, a designated salmonid river of national importance, four watercourses of county importance and six ecological sites of local importance (higher value).

Corridor Option 2 (North)

The majority of this corridor option consists of an on-line section (Red Corridor), with an off-line section between Junctions 6a (Enniskerry) and Junction 8 (Kilmacanoge / Roundwood) (nodes B-D). To the north of Junction 6 (Bray / Fassaroe), between nodes A and B, the on-line corridor clips the eastern boundary of the Old Connaught ecological site (EC 44). This ecological site is composed of woodland which lines the banks of the County Brook Stream and is of local importance (higher value). This corridor option again crosses a number of watercourses of county importance including the Rathmichael Stream (nodes A-B), County Brook Stream (nodes A-B), Kilmacanoge River (crossed twice at nodes B-C; and nodes E-G) and Rocky Valley Stream (nodes E-G), as well as the River Dargle (nodes B-C and; C-E), which is considered to be of national importance given that it is a designated salmonid river.

Direct impacts on the Dargle Woodland ecological site (EC07) (local importance (higher value)) will be more profound, and with a slightly greater area of habitat loss, with the off-line portion of this corridor option (Yellow corridor) at Junction 6a (nodes B-C and C-E) than the on-line option (Corridor Option 1 North). Between nodes B and C, the off-line portion of this corridor option also clips the south eastern corner of the Glencullen Woodland ecological site (EC08) (local importance (higher value)). The Dargle River Valley pNHA, which is valued as national ecological importance given its status as a pNHA, will also be directly impacted by the off-line section (nodes C-E).

The off-line section of this corridor option avoids impacts on Brennanstown Riding School ecological site (EC10) (local importance (higher value)) and Ballywaltrim ecological site (EC45) (international importance).

This corridor option returns on-line to the north of Junction 8 (Kilmacanoge / Roundwood) such that the impacts on Kilmacanoge Marsh pNHA (international importance), between nodes E and G, are as significant as described above under Corridor Option 1 (North).

This is the second least preferred (LP (3)) corridor option with respect to biodiversity. This is because this corridor option would result in significant impacts on Kilmacanoge Marsh pNHA, a site of international importance, as well as two sites of national importance – the River Dargle and the Dargle Valley pNHA. Four watercourses of county importance also occur within this corridor option and impacts on three ecological sites of local importance (higher value) would also occur. Despite the fact that both Corridor Option 1 (North) and Corridor Option 2 (North) would result in significant impacts on Kilmacanoge Marsh pNHA (international importance), Corridor Option 2 (North) is deemed to be more favourable than Corridor Option 1 (North) due to the fact that it would result in impacts on only one ecological receptor of international importance, rather than two, as is the case for Corridor Option 1 (North) which also could result in potential indirect impacts on Petrifying springs, and potentially direct impacts on Alluvial woodland, if present, at Ballywaltrim ecological site (EC45). Corridor Option 2 North will also result in impacts on two receptors of national importance (River Dargle and Dargle Valley pNHA) compared with Corridor Option 1 (North) which would result in impacts to only one ecological site of national importance (River Dargle).

Corridor Option 3 (North)

This corridor option consists of an on-line section between Junction 4 (City Centre/Dún Laoghaire) and Junction 6a (Enniskerry) (nodes A-B), and an off-line section (Blue Corridor) from Junction 6a (Enniskerry) to the north of Junction 9 (Glenview) (nodes B-H). Again, to the north of Junction 6 (Bray / Fassaroe) the on-line corridor clips the eastern boundary of the Old Connaught ecological site (EC 44) (local importance (higher value) between nodes A and B). This corridor option crosses a number of watercourses of county importance including the Rathmichael Stream (nodes A-B), County Brook Stream (nodes A-B) and Kilmacanoge River (crossed three times at nodes B-C; nodes C-F; and nodes F-H), as well as the River Dargle (crossed twice at nodes B-C; and nodes C-F), which is considered to be of national importance given that it is a designated salmonid river.

Direct impacts on the Dargle Woodland ecological site (EC07) (local importance (higher value)) will occur, and the off-line section here, between nodes B and F, (Blue corridor) will result in a greater area of habitat loss than the on-line option (Corridor Option 1 (North)). The off-line portion of this corridor option also clips the south eastern corner of the Glencullen Woodland ecological site (EC08) (local importance (higher value)), between nodes B and C, and the south eastern corner of the Dargle Valley pNHA, between nodes C and F. It should be noted however, that if the corridor here was reduced/refined by as little as 10- 30m, direct impacts on both the pNHA and the Glencullen Woodland (EC08) could be avoided.

South of the River Dargle pNHA, between nodes C and F, the off-line portion of this corridor option passes through several school campuses with associated grassland and woodland habitat, including the Dublin Oak Academy ecological site (EC43), as well as agricultural and residential lands. Habitat loss at the Dublin Oak Academy ecological site (EC43) would comprise the loss of woodland habitat (local importance (higher value)). To the south of Junction 7 (Bray South), between nodes C and F, the off-line portion moves to the east of the existing N11 road. Here it passes through agricultural lands and directly impacts on Brennanstown Riding School ecological site (EC10) (local importance (higher value)), where it crosses the Kilmacanoge River again, and the Little Sugarloaf ecological site (EC16) which is deemed to be of national importance due to the presence of non-designated Annex I heath habitat. However, it should be noted that the habitats within this ecological site, which are present within this corridor option, and which would be directly affected as a result of this option, consist of gorse scrub, dense bracken and dry meadows and grassy verges, all of which are considered to be of local importance (higher value). Therefore, the impact on this ecological site is reduced to that of local significance. It is important to note that this corridor option would fragment the beech woodland located at Brennanstown Riding School (EC10), such that the remaining portion on the western side of this proposed corridor option would become an isolated stand of woodland.

Further south, between nodes F and H, this corridor option passes through agricultural lands before returning on-line to the north of Junction 9 (Glenview). Importantly, this corridor option avoids direct impacts on Kilmacanoge Marsh pNHA (international importance).

This is the preferred corridor option, from a biodiversity perspective. It would not result in any impacts to Kilmacanoge Marsh pNHA (international importance), but it would result in impacts of potentially national significance at the River Dargle and the Dargle River Valley pNHA. Impacts at the Little Sugarloaf ecological site (EC16) would only be significant at the local scale, as the habitats which would be lost there are of local importance (higher value) only. It would also result in potential impacts on three watercourses of county importance and six impacts, significant at the local scale.

Corridor Option 4 (North)

This corridor option consists of an on-line section between nodes A and D, until Junction 7 (Bray South), where the corridor goes off-line between nodes D and H, until north of Junction 9 (Glenview) via the Green and Blue off-line corridor sections. The on-line portion of this corridor option (nodes A-D) crosses a number of watercourses of county importance including the Rathmichael Stream (nodes A-B), County Brook Stream (nodes A-B) and Kilmacanoge River (crossed three times between nodes B-D; nodes D-F; and nodes F-H), as well as one crossing of the River Dargle (nodes B-D) which is considered to be of national importance given that it is a designated salmonid river.

Again, the on-line corridor here clips the eastern boundary of the Old Connaught ecological site (EC44) at Junction 6 (Bray / Fassaroe) between nodes A and B, as well as the eastern boundary of the Dublin Oak Academy ecological site (EC43) to the south of Junction 6a (Enniskerry), between nodes B and D. Both of these ecological sites are of local importance (higher value).

Direct impacts on the Dargle Woodland ecological site (EC07) (local importance (higher value)) will occur as a result of the on-line section of this corridor option, between nodes B and D. This section also clips the south eastern corner of the Glencullen Woodland ecological site (EC08) between nodes B and D, although refinement of the corridor in this area, if possible, could avoid such an impact. Where this corridor option moves off-line (Green corridor) at Junction 7 (Bray South) (node D), it crosses the Kilmacanoge River. Also, at Junction 7 (Bray South) the corridor clips the western boundary of the Ballywaltrim ecological site (EC45) between nodes D and F, although corridor refinement by as little as 5m would avoid this direct impact. Indirect impacts on the petrifying spring which has been recorded between the R767 and R768 may also occur.

To the south of Junction 7 (Bray South) (node D) the off-line corridor (Green corridor) passes through the centre of Brennanstown Riding School ecological site (EC10) (local importance (higher value)), essentially bisecting the area of beech woodland, resulting in significant habitat loss and fragmentation. As the off-line section continues further south (where the Green corridor merges with the Blue corridor – node F), the corridor clips the western edge of the Little Sugarloaf ecological site (EC16) (national importance). Habitats which would be impacted here consist of gorse scrub, dense bracken and dry meadows and grassy verges, all of which are valued as being of local importance (higher value). Therefore, whilst this corridor option would result in impacts on an ecological site of national importance, the impact would only be significant at the local scale. The corridor then passes through agricultural lands between nodes F and H, before returning on-line to the north of Junction 9 (Glenview). Importantly, the off-line section of this corridor option avoids direct impacts on Kilmacanoge Marsh pNHA (international importance).

This corridor option was assessed as being of *Intermediate* preference, from a biodiversity perspective. It would avoid impacts on Kilmacanoge Marsh pNHA (international importance) and would potentially result in impacts on a site of national importance - the River Dargle. Impacts on Ballywaltrim ecological site (EC45), which is currently valued as being of international importance due to the potential presence of Alluvial woodland [91E0*] could be avoided with refinement of the corridor by as little as 5m. Indirect impacts on the petrifying spring identified here may be unavoidable. Impacts on the Little Sugarloaf ecological site (EC16) would only be significant at the local scale, as the habitats which would be lost there are of local importance (higher value) only. Three watercourses of county importance could potentially be impacted upon. Six impacts, significant at the local level will also occur.

This corridor option is currently less preferential to Corridor Option 3 (North) in that while it avoids impacts on the Dargle River Valley pNHA, the width of the corridor as it currently stands would potentially result in impacts to a site of international importance (Ballywaltrim ecological site (EC45)), as its current configuration clips the corner of this site and indirect impacts on Petrifying springs may also occur.

Table 1.3: Corridor option assessment - Northern Section

	Corridor Option 1 (North)	Corridor Option 2 (North)	Corridor Option 3 (North)	Corridor Option 4 (North)
Assessment Criteria	Quantitative Assessment: Number of Ecological Receptors of Varying Importance Impacted by the Proposed Corridor Options			
Significant impact on sites of International Importance (major or highly negative)	2	1	0	1
Significant impact on sites of National Importance (major or highly negative)	1	2	2	1
Significant impact on sites of County Importance (moderately negative)	4	4	3	3
Significant impact on sites of Local Importance (Higher Value) (minor or slightly negative)	5	3	6	6
Qualitative Assessment				
	Impacts on Kilmacanoge Marsh pNHA, springs, and potentially, Alluvial woodland and Petrifying springs in Ballywaltrim ecological site (EC45), the	Impacts on Kilmacanoge Marsh pNHA, the Dargle River, the Dargle River Valley pNHA, four watercourses of county importance	Impacts on the Dargle River and Dargle River Valley pNHA which are both of national importance. Also impacts on three watercourses	Impacts indirectly on the petrifying spring which is located between R767 and R768. Impacts on the Dargle River which is of national importance.

	Corridor Option 1 (North)	Corridor Option 2 (North)	Corridor Option 3 (North)	Corridor Option 4 (North)
	Dargle River (a designated salmonid river of national importance), four watercourses of county importance and five ecological sites of local importance (higher value).	and three ecological sites of local importance (higher value).	of county importance and results in impacts significant at the local level in six places (including Little Sugarloaf ecological site (EC16). Importantly it avoids impacts on Kilmacanoge Marsh pNHA (international importance).	Also impacts on three watercourses of county importance and results in impacts which are significant at the local level in six places (including Little Sugarloaf ecological site (EC16). Avoids impacts on Kilmacanoge Marsh pNHA and Dargle River Valley pNHA.
Score / Impact Level	1 - Major or Highly Negative	1 - Major or Highly Negative	1 - Major or Highly Negative	1 - Major or Highly Negative
Preference[†]	Least Preferred (4)	Least Preferred (3)	Preferred (1)	Intermediate (2)

† Numerical preference rankings were provided when the assessment indicated that two or more corridor options were Least Preferred.

1.4.2 Southern Section

Corridor Option 1 (South)

This is an on-line corridor option focused on the existing N11/M11 road, running from approximately Junction 9 (Glenview) (node G) to Junction 14 (Coynes Cross) (node K). It crosses ten watercourses of county importance including the Kilmacanoge River (crossed twice between nodes G-H; and nodes H-I), the Three Trouts Stream (nodes H-I), Kilcoole Stream (H-I), Ballyronan Stream (nodes I-J), Newtownmountkennedy River (nodes J-K), Moneycarrol River (nodes J-K), Newcastle River (nodes J-K), Dunran Demesne River (nodes J-K), Cullenmore Stream (nodes J-K) and Courtfoyle River (nodes J-K). These watercourses are all regarded to be of county importance due to their known fisheries potential (capable of supporting populations of Brown/Sea Trout and Eel).

Moving southwards from Junction 9 (Glenview) this corridor option crosses the Kilmacanoge River and Three Trouts Stream (nodes H-I) before passing through the Glen of the Downs (between nodes H and I), a designated SAC, pNHA and Nature Reserve. The Glen of the Downs is regarded as being of international importance, given its status as a SAC. This corridor option would result in direct impacts on the SAC, particularly on the qualifying interest habitat, Old oak woodland [91A0] in the north-west corner of the site and along the existing road footprint on either side of the glen. Other non-qualifying interest habitats within the site which would be directly impacted would include areas of Annex I Alluvial woodland [91E0*], oak-ash-hazel woodland, areas of mixed broadleaved woodland and areas of mixed broadleaved/ conifer woodland.

At Junction 10 (Delgany / Drummin), between nodes H and I, this corridor option clips the western boundary of the Delgany ecological site (EC40), an area of mixed broadleaved woodland and scrub. This area is of local importance (higher value).

At Junction 11 (Greystones/ Kilpedder/ Kilcoole), between nodes I and J, this corridor option crosses the Kilcoole Stream. To the south of Junction 11 (Greystones / Kilpedder / Kilcoole), on the northbound section of the existing N11 road, the proposed corridor will result in habitat loss from the Tinnapark ecological site (EC38) (National importance) and Newtown Demesne ecological site (EC37), between nodes I and J. Tinnapark ecological site (EC38) is composed of woodland and a number of species protected under the Flora Protection Order, 2015, are reported to exist here. The portion which would be lost to the proposed corridor consists of a treelined avenue and is of local importance (higher value) only. Newtown Demesne ecological site (EC37) is an area comprising agricultural lands and woodland which is deemed to be of local importance (higher value).

Moving south, at Junction 12 (Newtownmountkennedy / Roundwood) (nodes I-J) this corridor option clips the western edge of Ballyronan ecological site (EC23), a site composed of recently cleared land and broadleaved woodland, which is of local importance (higher value). Roadside/ motorway planting, consisting of narrow strips of immature woodland, occur along the western boundary of this ecological site, and this corridor option would likely result in the loss of this habitat type. This habitat type is regarded to be of local importance (lower value) and is therefore not regarded as a key ecological receptor. Therefore, this is not deemed to be a significant impact. In the same area, it crosses the Ballyronan Stream. Further south, at node J, the corridor passes through the Druids Glen Woodland ecological site (EC24), which comprises a mosaic of habitats including wet willow-alder-ash woodland and calcareous springs. The Newtownmountkennedy River is also crossed by this corridor option here as it runs through this ecological site. This site is regarded as being of international importance due to the presence of calcareous springs which align with the priority Annex I habitat Petrifying springs [7220*]. Here, the proposed corridor option would result in direct impacts on at least one of the priority Annex I Petrifying springs identified here, as well as wet willow-alder-ash woodland and mixed broadleaved/ conifer woodland.

In addition to the direct impacts on one of the Annex I Petrifying springs, this corridor option will also result in indirect impacts to three additional Annex I Petrifying springs located within this ecological site, as the corridor intersects with the PZOC for these groundwater dependent habitats. Both the direct, and indirect, impacts on these springs would be regarded as being significant to these springs, which are of international ecological importance.

At Junction 13 (Newtownmountkennedy / Newcastle), the corridor crosses the Moneycarrol River. To the south of the same junction, between nodes J-K, this corridor option passes through the western section of Newcastle Upper ecological site (EC27) and crosses the associated Newcastle River. This site comprises an area of broadleaf woodland along the banks of the Newcastle River and is deemed to be of local importance (higher value). Direct impacts here would comprise habitat loss, although most of the habitat loss would involve the removal of roadside/ motorway planting (immature woodland) and dense gorse scrub, both of which are regarded as being of low ecological value. A small portion of broadleaved woodland would also be lost from the sites western side. At the same junction, on the north bound side of the existing N11 road, this corridor option clips the eastern boundary of the Ballyvolan Upper – Coynes Cross ecological site (EC29). This site comprises a mosaic of woodland habitats including areas of the Annex I habitat type Old oak woodland [91A0]. This ecological site is deemed to be of national importance due to the presence of this Annex I woodland. Where this corridor option clips the eastern side of the ecological site, in the southern half of the site, habitat loss here would comprise the loss of gorse scrub habitat and exposed rocky slopes, which is not regarded to be ecologically significant. In the northern half of the site, to the east of Kiltimon House, this corridor option appears to closely follow the boundary of this ecological site. There are a few places where the corridor clips the boundary, which would result in direct impacts on the Annex I Old Oak woodland habitat, which occurs here. It should be noted that if this corridor was refined by as little as 5m, such that impacts on Oak trees could be avoided, impacts on this woodland habitat could be avoided, as well as other non-Annex woodland in this location. Just to the south of this area this corridor crosses the Dunran Demesne River.

At Junction 14 (Coyne's Cross), to the north of node K, this corridor option would result in direct impact to both the Kilmartin ecological site (EC35) and the Rathmore ecological site (EC36). The Kilmartin ecological site (EC35) is mainly composed of conifer plantation along the banks of the Cullenmore Stream (also crossed by the proposed corridor here), which would be clipped along its western boundary by the proposed corridor. The Rathmore ecological site (EC36) comprises woodland, including areas of wet willow alder ash woodland and mixed broadleaved woodland, along the banks of the Courtfoyle River (also crossed by the proposed corridor here). Habitat loss here would comprise loss of a small amount of wet willow-alder-ash woodland as well as gorse scrub, roadside/ motorway planting and exposed rocky surfaces. Both the Kilmartin ecological site (EC35) and the Rathmore ecological site (EC36) are of local importance (higher value).

This is the joint second least preferred (4) corridor option, from a biodiversity perspective, due to the fact that it would result in direct impacts on the Glen of the Downs SAC, including the loss of some of the qualifying interest Old oak woodland [91A0] habitat from this SAC.

This corridor option would result in impacts on two receptors of international importance, one ecological site of national importance, ten watercourses of county importance and six ecological sites of local importance (higher value). Corridor Option 5 South is less preferential to this corridor option, due to the fact that the wider corridor through the Glen of the Downs SAC, present in Corridor Option 5, would increase the extent of direct habitat loss which would occur in the SAC. Direct impacts on the non-designated priority Annex I Petrifying springs habitat [7220*] at the Druids Glen Woodland ecological site (EC24) will occur across all Corridor Options in the Southern Section of the scheme, as will direct impacts on the non-designated Old oak woodland [91A0] habitat at Ballyvolan- Coyne's Cross ecological site (EC29).

Corridor Option 2 (South)

The majority of this corridor option follows the on-line corridor option as described under the Red Corridor (Corridor Option 1 (South)) above. However, an off-line corridor section (Cyan corridor) is proposed from Junction 9 (Glenview) to Junction 12 (Newtownmountkennedy / Roundwood) (nodes G-J), which runs to the west of the existing N11 road. The Kilmacanoge River is crossed once by the on-line corridor option to the south of Junction 9 (Glenview) (nodes G-H), and then once again by the off-line portion (nodes H-J) of this corridor option. The off-line portion then crosses the Three Trouts Stream, Kilmurray South River and Woodlands [10] River. The Kilmacanoge River and Three Trouts Stream are regarded as being of county importance due to their fisheries potential (both known to support Brown/ Sea Trout). The Kilmurray South River and Woodlands [10] River are both of local importance (higher value). At the same point (south of node H) the corridor passes through the Kilmurray South ecological site (EC42) and Woodlands ecological site (EC41) (both of local importance (higher value)). These sites are composed of woodland and scrub habitat along the banks of the Kilmurray South River and Woodlands [10] River. Kilmurray South ecological site (EC42) is composed of broadleaved woodland, hedgerows, gorse scrub and dry meadows and grassy verges. Woodlands ecological site (EC41) is composed of broadleaved woodland habitats, including native wet willow-alder-ash woodland, along with pockets of wet grassland and bramble/ gorse scrub. The proposed corridor will result in direct loss and habitat fragmentation at these ecological sites.

The off-line section (nodes H-J) of the proposed corridor also clips the north-western corner of the Glen of the Downs SAC, pNHA and Nature Reserve, which would result in a direct impact to the QI habitat Old oak woodland [91A0] here. Further south, to the west of Junction 10 (Delgany / Drummin), the off-line corridor passes through Ballinashinnagh – Kilmurray ecological site (EC20). This site comprises woodland and heath habitats, including non-designated Annex I heath habitat. This site is regarded as being of national importance due to the presence of non-designated Annex I heath habitat.

However, the portion of the site, through which this corridor option would run, is mainly composed of conifer plantation, with areas of dense bracken, gorse scrub and dry meadows and grassy verges also present. Annex I heath habitat occurs further up the slope.

The proposed off-line corridor option here would result in direct habitat loss and habitat fragmentation at this ecological site but given the value of the habitats which would be lost as a result, the level of impact significance here is reduced to local level.

To the north of Junction 12 (Newtownmountkennedy / Roundwood) the off-line corridor segment passes through Tinnapark ecological site (EC38) (National importance) and Newtown Demesne ecological site (EC37). Tinnapark ecological site (EC38) is composed of woodland and a number of species protected under the Flora Protection Order, 2015, are reported to exist here. A precautionary approach has been adopted with regard to impact significance here, given that the exact locations of Flora Protection Order species within the ecological site is as of yet unknown, and impacts here, as a result of the proposed corridor option, are regarded to be significant at the National level. Newtown Demesne ecological site (EC37) is an area comprising agricultural lands and woodland. This area is of local importance (higher value). The off-line corridor merges with the on-line (Red) corridor at Junction 12 (Newtownmountkennedy) (node J) and remains on-line for the rest of the scheme (nodes J-K). Impacts on key ecological receptors from Junction 12 (Newtownmountkennedy) (node J) to Junction 14 (Coyne's Cross) (node K) are described above under Corridor Option 1 (South).

This corridor option was assessed as being the joint second least preferred option (4), from a biodiversity perspective. For the most part it minimises impacts on the Glen of the Downs SAC due to the fact that it has an off-line section to the west of the SAC, save for the north-western corner of the SAC which is clipped by the off-line corridor. Other direct impacts on sites of international importance comprise impacts on the non-designated priority Annex I Petrifying springs habitat [7220*] at the Druids Glen Woodland ecological site (EC24), which will also be subject to indirect impacts. Unlike other corridor options, this corridor would also directly impact on the Ballinashinnagh - Kilmurray ecological site (EC20), which is deemed to be of national importance due to the presence of non-designated Annex I heath habitat there. However, given the limited ecological value of the habitats which would be impacted here, the overall impact significance for this site is reduced to local level only. It also impacts on Ballyvolan Upper- Coyne's Cross ecological site (EC29), also of national importance, as well as nine watercourses of county importance. The corridor option will also result in eleven impacts, significant at the local level.

Corridor Option 3 (South)

The majority of this corridor option follows the on-line corridor option as described under the Red Corridor (Corridor Option 1 (South)) above. However, an off-line corridor section (Orange corridor) is proposed from Junction 9 (Glenview) (node G) to Junction 11 (Greystones / Kilpedder / Kilcoole) (node D), which runs to the east of the existing N11 road.

The Kilmacanoge River is crossed once before this corridor option goes off-line, to the south of Junction 9 (Glenview) (node G). This river is regarded to be of county importance due to its fisheries potential.

The off-line corridor section (nodes G-I) also passes through the eastern extents of Bellevue Demesne ecological site (EC18). This site comprises areas of woodland including mixed woodland and non-native conifer woodland habitats. It is deemed to be of local importance (higher value). The off-line corridor option here would result in direct habitat loss to this ecological site, comprising loss of non-native and mixed woodland habitat. This off-line corridor avoids impacts to the Glen of the Downs SAC, pNHA and Nature Reserve.

Moving south from Bellevue Demesne ecological site (EC18), the off-line corridor passes through the Delgany Golf Course ecological site (EC39) and Delgany ecological site (EC40), both of local importance (higher value). Delgany Golf Course ecological site (EC39) comprises mixed woodland, the vast majority of which would be lost to the proposed corridor. Delgany ecological site (EC40) is composed of mixed broadleaved woodland and scrub, a large area of which would be removed for this corridor option. This corridor option would effectively fragment this ecological site, as it passes through the centre of the site. The Three Trouts stream, a watercourse of county importance, would also be crossed at this location.

The off-line section of this corridor crosses the Kilcoole Stream just before it returns on-line at Junction 11 (Greystones / Kilpedder / Kilcoole) (node I). The Kilcoole Stream is deemed to be of county importance due to the fact that it is known to support Brown/ Sea Trout. Impacts on key ecological receptors from Junction 11 (node I) to Junction 14 (Coyne's Cross) (node K) are described above under Corridor Option 1 (South).

This is the preferred corridor option, from a biodiversity perspective. Direct impacts to sites of international importance are limited to impacts on priority Annex I Petrifying springs habitat [7220*] at Druids Glen Woodland ecological site (EC24) because the off-line sections at Glen of the Downs avoid direct impacts on the Glen of the Downs SAC. Indirect impacts on the priority Annex I Petrifying springs habitat [7220*] at Druids Glen Woodland (EC24) will also occur. Direct impacts on sites of national importance are limited to impacts on non-designated Annex I Old oak woodland habitat [91A0] at Ballyvolan- Coyne's Cross ecological site (EC29). Ten ecological receptors of county importance could potentially be impacted by this corridor option. This corridor option will also result in eight impacts, significant at the local level.

Corridor Option 4 (South)

The majority of this corridor option follows the on-line corridor option as described under the Red Corridor (Corridor Option 1 (South)) above. However, an off-line corridor section (Pink corridor) is proposed from Junction 9 (Glenview) (node G) to Junction 11 (Greystones) (node I), which runs to the east of the existing N11 road. In contrast to the Orange - Red Corridor (Corridor Option 3 (South)), the off-line section of Corridor Option 4 (South) (nodes G-I) (i.e. the Pink corridor), is located closer to the Glen of the Downs SAC than the off-line section of Corridor Option 3 (South) (i.e. the Orange Corridor).

The off-line section of this corridor option (nodes G-I) (Pink corridor) commences at Junction 9 (Glenview) and crosses the Kilmacanoge River (county importance) before turning eastwards, crossing over agricultural lands before it passes through Bellevue Demesne ecological site (EC18) (local importance (higher value)). The off-line corridor cuts through the centre of Bellevue Demesne, effectively removing the eastern section of the site. Direct habitat loss here, which, with regards to woodland habitat at Bellevue Demesne, is of a greater area than that of Corridor Option 3 (South), would comprise non-native and mixed woodland habitats. Small sections of woodland which would remain to the east of the off-line corridor would be isolated stands and fragmented from the rest of the Demesnes woodland.

It should be noted that the off-line section of this corridor overlaps with the preliminary zone of contribution (PZOC) associated with the non-designated priority Annex I Petrifying springs [7220*] habitat which occurs in the north-eastern portion of the Glen of the Downs. This effectively means that it is likely that this corridor option would result in indirect effects on this groundwater dependent habitat, through impacts to the underlying aquifer with regards water quality or quantity. Despite the fact that this indirect impact will not result in impacts to the SAC's QI habitat, and therefore will not result in impacts on the integrity of the SAC site, this would, nevertheless, still be regarded as an impact of international significance, because Petrifying springs [7220*] are a priority Annex I habitat.

To the east of Junction 10 (Delgany / Drummin) the off-line corridor crosses the Three Trouts Stream (county importance). In a similar fashion to Corridor Option 3 (South), the off-line corridor here also passes through Delgany Golf Course ecological site (EC39) and Delgany ecological site (EC40). Direct impacts to these two ecological sites, which are of local importance (higher value), would include habitat loss and habitat fragmentation. Before the off-line corridor merges with the on-line corridor at Junction 11 (Greystones / Kilpedder / Kilcoole) (node I) it crosses the Kilcoole Stream (county importance). Impacts on key ecological receptors from Junction 11 (node I) to Junction 14 (Coyne's Cross) (node K) are described above under Corridor Option 1 (South).

This is the *Intermediate* preference corridor option, due to the fact that whilst it avoids direct impacts on the Glen of the Downs SAC, it would result in indirect impacts on the priority Annex I Petrifying springs [7220*] habitat which is present within the SAC. It will also result in direct, and indirect, impacts on the priority Annex I Petrifying springs habitat [7220*] at Druids Glen Woodland ecological site (EC24). Direct impacts on sites of national importance are limited to impacts on non-designated Annex I Old oak woodland habitat [91A0] at Ballyvolan Upper- Coyne's Cross ecological site (EC29). Ten watercourses of county importance could potentially be impacted by this corridor option. This corridor option will also result in eight impacts, significant at the local level.

Corridor Option 5 (South)

This is an on-line option with the same alignment as Corridor Option 1 (South) (Red Corridor) except that the section of the corridor option which passes through the Glen of the Downs SAC (nodes H-I) (Corridor Red (A)) is wider than that assessed under Corridor Option 1 (South). This corridor option crosses the Kilmacanoge River (county importance) at node H before it enters the Glen of the Downs SAC. At the SAC, the corridor crosses the Three Trouts Stream (county importance) and then cuts through the SAC, following the path of the existing N11 road resulting in direct habitat loss to the SAC on either side of the existing road. Habitat loss here would include areas of the SAC's qualifying interest Annex I Old oak woodland habitat type [91A0]. Due to the fact that Corridor Red (A) is wider through the Glen than that section in Corridor Option 1 South, the extent of habitat loss in the SAC, including qualifying interest habitat and non-qualifying interest habitat types, would be greater for Corridor Red (A).

In addition to the loss of qualifying interest Old oak woodland [91A0] habitat, Corridor Red (A) would also result in habitat loss of the complete extent of the non-qualifying interest Annex I habitat type Alluvial woodland [91E0*] in the south-west of the glen.

The corridor returns to match that of Corridor Option 1 (South) using the Red corridor to the south of Glen of the Downs (node I) and remains on-line for the remainder of the scheme (up to node K). Impacts on key ecological receptors from Junction 10 (Delgany / Drumming) (node I) to Junction 14 (Coynes Cross) (node K) are described above under Corridor Option 1 (South).

This is the least preferred corridor option (5), from a biodiversity perspective, on account of this corridor option having the greatest loss of qualifying interest Old oak woodland [91A0] habitat from the Glen of the Downs SAC, along with the loss of an area of non-qualifying interest Alluvial woodland [91E0*] habitat from the SAC. This would result in a significant impact on a site of international importance

Table 1.4: Summary assessment table Southern Section

	Corridor Option 1 (South)	Corridor Option 2 (South)	Corridor Option 3 (South)	Corridor Option 4 (South)	Corridor Option 5 (South)
Assessment Criteria	Quantitative Assessment: Number of Ecological Receptors of Varying Importance Impacted by the Proposed Corridor Options				
Significant impact on sites of International Importance (major or highly negative)	2	2	1	2	2
Significant impact on sites of National Importance (major or highly negative)	1	1	1	1	1
Significant impact on sites	10	9	10	10	10

	Corridor Option 1 (South)	Corridor Option 2 (South)	Corridor Option 3 (South)	Corridor Option 4 (South)	Corridor Option 5 (South)
of County Importance (moderately negative)					
Significant impact on sites of Local Importance (Higher Value) (minor or slightly negative)	6	11	8	8	7
Qualitative Assessment					
	Impacts on Glen of the Downs SAC (removing 91A0 habitat) and Druids Glen Woodland ecological site (EC24) (international importance). Also impacts on Ballyvolan Upper-Coynes Cross ecological site (EC29) (national importance) and ten ecological receptors of	Impacts on Glen of the Downs SAC (potentially removing 91A0 habitat) and Druids Glen Woodland ecological site (EC24) (international importance). Also impacts on Ballyvolan Upper-Coynes Cross ecological site (EC29) (of national importance) and nine ecological receptors of	Avoids impacts on Glen of the Downs SAC. Impacts on Druids Glen Woodland ecological site (EC24) (international importance) and Ballyvolan Upper-Coynes Cross ecological site (EC29) (national importance). Impacts ten ecological receptors of	Avoids direct impacts on Glen of the Downs SAC, although indirect impacts on the petrifying spring here [7220*] (international importance) are likely. Impacts on Druids Glen Woodland ecological site (EC24) (international importance) and Ballyvolan Upper-Coynes Cross	Impacts on Glen of the Downs SAC (removing substantial areas of 91A0 habitat) and Druids Glen Woodland ecological site (EC24) (international importance). Also impacts on Ballyvolan Upper-Coynes Cross ecological site (EC29) (national importance) and ten

	Corridor Option 1 (South)	Corridor Option 2 (South)	Corridor Option 3 (South)	Corridor Option 4 (South)	Corridor Option 5 (South)
	county importance. This corridor option will also result in six impacts, significant at the local level.	county importance. This corridor option will also result in eleven impacts, significant at the local level.	county importance and eight impacts, significant at the local level.	ecological site (EC29) (national importance). Impacts ten ecological receptors of county importance and eight impacts, significant at the local level.	ecological receptors of county importance. This corridor option will also result in seven impacts, significant at the local level.
Score / Impact Level	1 - Major or Highly Negative	1 - Major or Highly Negative	1 - Major or Highly Negative	1 - Major or Highly Negative	1 - Major or Highly Negative
Preference[†]	Least Preferred (4)	Least Preferred (4)	Preferred (1)	Intermediate (2)	Least Preferred (5)

† Numerical preference rankings were provided when the assessment indicated that two or more corridor options were Least Preferred.

1.5 References

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