

Wicklow County Council

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

Option Selection Report
Appendix C2 – Soils and geology

265455-ARP-EGT-SWI-RP-ZX-0003

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1 Soils and geology

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 Soils and geology constraints identified in **Section 13** (Soils and geology) 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 the **Volume A**.

There are three 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;
- 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 option "assessment study area" In line with Guidelines each individual corridor option has been assigned an assessment study area which has been set at 250m from the centre line of each corridor. This buffer zone may increase to consider attributes which extend beyond this zone e.g. along link roads. This area is further explained in **Section 1.2**.

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 1 assessment and summary are presented in **Section 1.4** and references are listed in **Section 1.5**.

The corridor options, their corresponding study areas and the constraints considered in the Soils and geology assessment are shown on the figures list in **Table 1.1**.

Table 1.1: List of figures for **Appendix C2** (Soils and geology) of **Volume C**.

Figure Number	Title	Sheet
Figure C2.1 – Figure C2.6	Subsoil Deposits Map	Sheet 1 to 6
Figure C2.7 – Figure C2.12	Soil Deposits Map	Sheet 1 to 6
Figure C2.13 – Figure C2.18	Geological Constraints Map	Sheet 1 to 6

The corridor options' names have been abbreviated for inclusion in a number of the tables in this assessment, as follows:

- Corridor Option 1 (North) – N1;

- Corridor Option 2 (North) – N2;
- Corridor Option 3 (North) – N3;
- Corridor Option 4 (North) – N4;
- Corridor Option 1 (South) – S1;
- Corridor Option 2 (South) – S2;
- Corridor Option 3 (South) – S3;
- Corridor Option 4 (South) – S4; and
- Corridor Option 5 (South) – S5.

1.2 Methodology

This assessment has been prepared taking cognisance of the requirements of the Transport Infrastructure Ireland (TII) guidance, formally National Roads Authority (NRA) guidance, Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology on National Road Schemes¹ (herein referred to as TII Guidelines). In line with these Guidelines, the assessment study area which is different to the scheme study area, has been set at 250m from the centre line of each corridor but has been extended on a conservative basis where appropriate. For the purposes of this assessment the corridor is considered the footprint of the works. The Environmental Protection Agency (EPA) Draft Guidelines on the Information to be Contained in Environmental Impact Assessment Reports² were also referred to when undertaking this assessment.

The TII Guidelines¹ provide useful criteria for ranking of the identified soils and geological attributes and the criteria that are presented in **Table 13.2** of **Section 13** (Soils and geology) of **Volume B**. The attributes used in this assessment are presented in **Section 1.3**. Each individual attribute was assigned an ‘Attribute Importance’ ranking based on TII Guidelines¹. These are presented in **Section 13** (Soils and geology) of **Volume B** and summarised in **Table 1.2**.

The potential impacts that may arise at each attribute have been assessed conservatively based on the information currently available. The nature and timeframe that have been considered against the criteria presented in Box 4.4 of the TII Guidelines¹, are presented in **Table 1.2** below.

An ‘Impact Level’ has been determined from **Table 1.2** based on the importance of an attribute and the potential impacts. It should be noted that these criteria only

¹ National Roads Authority Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes, NRA 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>

consider negative potential impacts, however the potential for positive impacts will also be considered.

The language used in the summary tables in **Section 1.4** to describe the significance of an impact is that used in Box 5.1, not Box 4.4, of the Guidelines as it more succinct and easier to present in a tabular format.

Table 1.2: Criteria for rating impact significance at route selection stage – Rating of Significant Environmental Impacts at Route Selection Stage (from Box 4.4 of TII Guidelines¹)

Impact Level	Attribute Importance				
	Extremely High**	Very High	High	Medium	Low
Profound	Any permanent impact on attribute	Permanent impact on significant proportion of attribute			
Significant	Temporary impact on significant proportion of attribute	Permanent impact on small proportion of attribute	Permanent impact on Significant proportion of attribute		
Moderate	Temporary impact on small proportion of attribute	Temporary impact on significant proportion of attribute	Permanent impact on small proportion of attribute	Permanent impact on significant proportion of attribute	
Slight		Temporary impact on small proportion of attribute	Temporary impact on significant proportion of attribute	Permanent impact on small proportion of attribute	Permanent impact on significant proportion of attribute
Imperceptible			Temporary impact on small proportion of attribute	Temporary impact on significant proportion of attribute	Permanent impact on small proportion of attribute

**In rating impacts on an ‘European site’ account must be taken of Article 6(3) and 6(4) of the Habitats Directive (Council Directive 92/43/EEC). Also see guidance contained within Guidelines for Assessment of Ecological Impacts of National Road Schemes (Rev 2, National Roads Authority, 2008)

Once an impact level had been determined for each attribute, the overall impact rating was assigned to that feature type. In order for the assessment to meet the requirements of the TII Project Appraisal Guidelines for National Roads (PAG)

Unit 7.0 - Multi-Criteria Analysis³ (MCA), (hereafter referred to as the TII PAG), the two scoring systems needed to be correlated.

The TII PAG³ scoring criteria is summarised below:

- 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.

Table 1.3 summarises how the two Guidelines^{1,3} have been correlated for the purpose of the corridor options assessment. It should be noted that the TII PAG Guidelines³ deal with both positive and negative impacts whereas the TII Guidelines¹ deal with only negative impacts for Soils and geology.

Table 1.3: Correlation of TII Guidelines¹ Significance Rating to an Equivalent TII PAG³ Score

Significance Rating (TII Guidelines) ¹	Equivalent PAG (Description)	Equivalent PAG (Value)
Profound	Major or highly negative	1
Significant	Major or highly negative	1
Moderate	Moderately negative	2
Slight	Minor or slightly negative	3
Imperceptible	Not significant or neutral	4

1.3 Assessment criteria

In line with TII Guidelines¹, the soils and geological attributes which have been considered during this corridor options assessment are as follows:

- Soils:
 - Subsoils
 - Soils (Agronomic soils)
- Slope stability - Landslides
- Contaminated sites – Potential areas of landfill/contamination
- Geological Heritage Areas/County Geological Sites

³Transport 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>

- Earthworks Assessment

The attributes identified in **Section 13** (Soils and geology) of **Volume B** which have not been considered in the corridor options assessment are as follows:

- Bedrock Geology
- Pits, quarries and mines
- Industrial facilities
- Crushed rock aggregate potential
- Granular aggregate potential
- Mineral resource locations

This information has been gathered to provide the wider context of the scheme and the reasons for its exclusion from the corridor options assessment is explained below. The attributes within the study area of the preferred corridor will be considered for further assessment in the EIAR where appropriate.

1.3.3 Bedrock geology

As all the corridor option study areas would intersect bedrock, which is all of low importance, the bedrock was therefore not influential on this assessment.

1.3.4 Pits, quarries and mines

There are no active pits and quarries recorded within the corridor option assessment study areas and none have been reported through consultation. The Ballycorus Lead Mine (**Figure C2.13**) a former lead mine of mining heritage interest would not be impacted by any of the corridor option assessment study areas.

1.3.5 Industrial facilities

There are no EPA licensed facilities recorded within the corridor option assessment study areas.

1.3.6 Crushed rock aggregate potential

The crushed rock aggregate potential is either high or very high for the majority of all the corridor option assessment study areas and as such any impacts are similar across the corridor options and do not have a meaningful impact on the overall MCA score.

1.3.7 Granular aggregate potential

In the Northern Section all the assessment study areas of corridor options intercept areas of either high or very high granular aggregate potential. In the Southern Section all the assessment study areas of corridor options intercept an area of very

high granular aggregate potential. Therefore, any impacts are similar across the corridor options and do not have a meaningful impact on the overall MCA score.

1.3.8 Mineral resource locations

No important mineral resource locations have been identified within the corridor option assessment study areas.

1.4 Stage 1 corridor options assessment

The following sections summarise the assessment of each type of important attribute in both the Northern and Southern Section. **Table 1.4** to **Table 1.13** provide a MCA score per important attribute type and corridor option study area which is then summarised in **Table 1.16** for the Northern Section and **Table 1.17** for the Southern Section. **Table 1.16** and **Table 1.17** also include the overall MCA score and preference for each corridor option.

1.4.3 Soils and subsoils

Where soils are deemed to be well drained on the Teagasc mapping they have been considered to be of high importance from an agronomical/fertility perspective, while poorly drained or peaty soils have been considered to be of low importance.

From a subsoils perspective, poorly drained, soft soils, peaty soils have been considered to be of medium to high importance due to the possible volume of material requiring excavation and potentially unsuitable for direct reuse as engineering fill. In turn, glacial tills and granular subsoils have been considered to be of low importance due to their potential suitability as engineering fill and due to their geotechnical properties which typically require less excavation during road construction.

Overall, this tended to balance out in the assessment but there have been notable areas such as the Fen Peat in Kilmacanoge and agricultural land within the off-line corridor option assessment study areas which resulted in some minor differences between the assessment study areas. **Table 1.4** to **Table 1.7** summarise the impacts that would result due to the northern and southern corridor options on the soils from an agronomical point of view and on the subsoils. Please note that the magnitude of the impact is qualitative for the soils and subsoils assessment as the breakdown of volumes per type of soil and subsoil has not been carried out at this stage. An overall assessment of the impact of earthworks volumes has been undertaken separately as summarised in **Table 1.14** and **Table 1.15**.

Table 1.4: Summary of soils assessment for the Northern Section

Corridor Option	Description	Importance of attribute	Significance of Impact	Magnitude of Impact	Overall MCA Score
N1	Alluvial (mineral)	Medium	Small Adverse	Slight	Moderately negative
	Deep well drained mineral (Mainly basic)	High	Small Adverse	Moderate/Slight	
	Fen peat	Low	Small Adverse	Imperceptible	
	Made ground	Low	Small Adverse	Imperceptible	
	Mineral poorly drained (Mainly acidic)	Low	Small Adverse	Imperceptible	
	Shallow well drained mineral (Mainly acidic)	High	Small Adverse	Moderate/Slight	
	Shallow well drained mineral (Mainly basic)	High	Small Adverse	Moderate/Slight	
	Deep well drained mineral (Mainly acidic)	High	Small Adverse	Moderate/Slight	
N2	Alluvial (mineral)	Medium	Small Adverse	Slight	Moderately negative
	Deep well drained mineral (Mainly basic)	High	Small Adverse	Moderate/Slight	
	Fen peat	Low	Small Adverse	Imperceptible	
	Made ground	Low	Small Adverse	Imperceptible	
	Mineral poorly drained (Mainly acidic)	Low	Small Adverse	Imperceptible	
	Shallow well drained mineral (Mainly acidic)	High	Small Adverse	Moderate/Slight	
	Shallow well drained mineral (Mainly basic)	High	Small Adverse	Moderate/Slight	
	Deep well drained mineral (Mainly acidic)	High	Small Adverse	Moderate/Slight	
N3	Alluvial (mineral)	Medium	Small Adverse	Slight	Moderately negative
	Deep well drained mineral (Mainly basic)	High	Small Adverse	Moderate/Slight	
	Made ground	Low	Small Adverse	Imperceptible	
	Mineral poorly drained (Mainly acidic)	Low	Small Adverse	Imperceptible	
	Peaty poorly drained mineral (Mainly acidic)	Low	Small Adverse	Imperceptible	

Corridor Option	Description	Importance of attribute	Significance of Impact	Magnitude of Impact	Overall MCA Score
	Shallow well drained mineral (Mainly basic)	High	Small Adverse	Moderate/Slight	
	Shallow, rocky, peaty/non-peaty mineral complexes (Mainly acidic)	Low	Small Adverse	Imperceptible	
	Deep well drained mineral (Mainly acidic)	High	Small Adverse	Moderate/Slight	
N4	Alluvial (mineral)	Medium	Small Adverse	Slight	Moderately negative
	Deep well drained mineral (Mainly basic)	High	Small Adverse	Moderate/Slight	
	Made ground	Low	Small Adverse	Imperceptible	
	Mineral poorly drained (Mainly acidic)	Low	Small Adverse	Imperceptible	
	Peaty poorly drained mineral (Mainly acidic)	Low	Small Adverse	Imperceptible	
	Shallow well drained mineral (Mainly acidic)	High	Small Adverse	Moderate/Slight	
	Shallow well drained mineral (Mainly basic)	High	Small Adverse	Moderate/Slight	
	Shallow, rocky, peaty/non-peaty mineral complexes (Mainly acidic)	Low	Small Adverse	Imperceptible	
Deep well drained mineral (Mainly acidic)	High	Small Adverse	Moderate/Slight		

Table 1.5: Summary of soils assessment for the Southern Section

Corridor Option	Description	Importance of attribute	Significance of Impact	Magnitude of Impact	Overall MCA Score
S1	Alluvial (mineral)	Medium	Small Adverse	Slight	Moderately negative
	Made ground	Low	Small Adverse	Imperceptible	
	Mineral poorly drained (Mainly acidic)	Low	Small Adverse	Imperceptible	
	Shallow well drained mineral (Mainly acidic)	High	Small Adverse	Moderate/Slight	
	Shallow well drained mineral (Mainly basic)	High	Negligible	Imperceptible	
	Deep well drained mineral (Mainly acidic)	High	Small Adverse	Moderate/Slight	
S2	Alluvial (mineral)	Medium	Small Adverse	Slight	Moderately negative

Corridor Option	Description	Importance of attribute	Significance of Impact	Magnitude of Impact	Overall MCA Score
	Made ground	Low	Small Adverse	Imperceptible	
	Mineral poorly drained (Mainly acidic)	Low	Small Adverse	Imperceptible	
	Peaty poorly drained mineral (Mainly acidic)	Low	Small Adverse	Imperceptible	
	Shallow well drained mineral (Mainly acidic)	High	Small Adverse	Moderate/Slight	
	Shallow well drained mineral (Mainly basic)	High	Small Adverse	Moderate/Slight	
	Shallow, rocky, peaty/non-peaty mineral complexes (Mainly acidic)	Low	Small Adverse	Imperceptible	
	Deep well drained mineral (Mainly acidic)	High	Small Adverse	Moderate/Slight	
S3	Alluvial (mineral)	Medium	Small Adverse	Slight	Moderately negative
	Made ground	Low	Small Adverse	Imperceptible	
	Mineral poorly drained (Mainly acidic)	Low	Small Adverse	Imperceptible	
	Peaty poorly drained mineral (Mainly acidic)	Low	Small Adverse	Imperceptible	
	Shallow well drained mineral (Mainly acidic)	High	Small Adverse	Moderate/Slight	
	Shallow well drained mineral (Mainly basic)	High	Small Adverse	Moderate/Slight	
	Deep well drained mineral (Mainly acidic)	High	Small Adverse	Moderate/Slight	
S4	Alluvial (mineral)	Medium	Small Adverse	Slight	Moderately negative
	Made ground	Low	Small Adverse	Imperceptible	
	Mineral poorly drained (Mainly acidic)	Low	Small Adverse	Imperceptible	
	Peaty poorly drained mineral (Mainly acidic)	Low	Small Adverse	Imperceptible	
	Shallow well drained mineral (Mainly acidic)	High	Small Adverse	Moderate/Slight	
	Shallow well drained mineral (Mainly basic)	High	Small Adverse	Moderate/Slight	
	Deep well drained mineral (Mainly acidic)	High	Small Adverse	Moderate/Slight	
S5	Alluvial (mineral)	Medium	Small Adverse	Slight	Moderately negative
	Made ground	Low	Small Adverse	Imperceptible	

Corridor Option	Description	Importance of attribute	Significance of Impact	Magnitude of Impact	Overall MCA Score
	Mineral poorly drained (Mainly acidic)	Low	Small Adverse	Imperceptible	
	Shallow well drained mineral (Mainly acidic)	High	Small Adverse	Moderate/Slight	
	Shallow well drained mineral (Mainly basic)	High	Small Adverse	Moderate/Slight	
	Deep well drained mineral (Mainly acidic)	High	Small Adverse	Moderate/Slight	

Table 1.6: Summary of subsoils assessment for the Northern Section

Corridor Option	Description	Importance of attribute	Significance of Impact	Magnitude of Impact	Overall MCA Score
N1	Alluvium	Medium	Small Adverse	Slight	Minor or slightly negative
	Fen Peat (includes Teagasc AminPDPT)	Medium	Small Adverse	Slight	
	Gravels derived from granite	Low	Small Adverse	Imperceptible	
	Gravels derived from Limestones	Low	Small Adverse	Imperceptible	
	Irish Sea Till derived from Limestones	Low	Small Adverse	Imperceptible	
	Urban	Medium	Small Adverse	Slight	
N2	Alluvium	Medium	Small Adverse	Slight	Minor or slightly negative
	Fen Peat (includes Teagasc AminPDPT)	Medium	Small Adverse	Slight	
	Gravels derived from Cambrian sandstones and shales	Low	Small Adverse	Imperceptible	
	Gravels derived from granite	Low	Small Adverse	Imperceptible	
	Gravels derived from Limestones	Low	Small Adverse	Imperceptible	
	Irish Sea Till derived from Limestones	Low	Small Adverse	Imperceptible	
	Urban	Medium	Small Adverse	Slight	
N3	Alluvium	Medium	Small Adverse	Slight	Minor or slightly negative
	Fen Peat (includes Teagasc AminPDPT)	Medium	Small Adverse	Slight	

Corridor Option	Description	Importance of attribute	Significance of Impact	Magnitude of Impact	Overall MCA Score
	Gravels derived from granite	Low	Small Adverse	Imperceptible	
	Gravels derived from Limestones	Low	Small Adverse	Imperceptible	
	Irish Sea Till derived from Limestones	Low	Small Adverse	Imperceptible	
	Urban	Medium	Small Adverse	Slight	
N4	Alluvium	Medium	Small Adverse	Slight	Minor or slightly negative
	Bedrock outcrop or subcrop	Low	Small Adverse	Imperceptible	
	Fen Peat (includes Teagasc AminPDPT)	Medium	Small Adverse	Slight	
	Gravels derived from granite	Low	Small Adverse	Imperceptible	
	Gravels derived from Limestones	Low	Small Adverse	Imperceptible	
	Irish Sea Till derived from Limestones	Low	Small Adverse	Imperceptible	
	Urban	Medium	Small Adverse	Slight	

Table 1.7: Summary of subsoils assessment for the Southern Section

Corridor Option	Description	Importance of attribute	Significance of Impact	Magnitude of Impact	Overall MCA Score
S1	Alluvium	Medium	Small Adverse	Slight	Minor or slightly negative
	Bedrock outcrop or subcrop	Low	Small Adverse	Imperceptible	
	Gravels derived from Limestones	Low	Small Adverse	Imperceptible	
	Gravels derived from Lower Palaeozoic sandstones and shales	Low	Small Adverse	Imperceptible	
	Irish Sea Till derived from Limestones	Low	Small Adverse	Imperceptible	
	Urban	Medium	Small Adverse	Slight	
S2	Alluvium	Medium	Small Adverse	Slight	Minor or slightly negative
	Bedrock outcrop or subcrop	Low	Small Adverse	Imperceptible	

Corridor Option	Description	Importance of attribute	Significance of Impact	Magnitude of Impact	Overall MCA Score
	Fen Peat (includes Teagasc AminPDPT)	Medium	Small Adverse	Slight	
	Gravels derived from Limestones	Low	Small Adverse	Imperceptible	
	Gravels derived from Lower Palaeozoic sandstones and shales	Low	Small Adverse	Imperceptible	
	Irish Sea Till derived from Limestones	Low	Small Adverse	Imperceptible	
	Urban	Medium	Small Adverse	Slight	
S3	Alluvium	Medium	Small Adverse	Slight	Minor or slightly negative
	Bedrock outcrop or subcrop	Low	Small Adverse	Imperceptible	
	Fen Peat (includes Teagasc AminPDPT)	Medium	Small Adverse	Slight	
	Gravels derived from Limestones	Low	Small Adverse	Imperceptible	
	Gravels derived from Lower Palaeozoic sandstones and shales	Low	Small Adverse	Imperceptible	
	Irish Sea Till derived from Limestones	Low	Small Adverse	Imperceptible	
	Urban	Medium	Small Adverse	Slight	
S4	Alluvium	Medium	Small Adverse	Slight	Minor or slightly negative
	Bedrock outcrop or subcrop	Low	Small Adverse	Imperceptible	
	Fen Peat (includes Teagasc AminPDPT)	Medium	Small Adverse	Slight	
	Gravels derived from Limestones	Low	Small Adverse	Imperceptible	
	Gravels derived from Lower Palaeozoic sandstones and shales	Low	Small Adverse	Imperceptible	
	Irish Sea Till derived from Limestones	Low	Small Adverse	Imperceptible	
	Urban	Medium	Small Adverse	Slight	
S5	Alluvium	Medium	Small Adverse	Slight	Minor or slightly negative
	Bedrock outcrop or subcrop	Low	Small Adverse	Imperceptible	
	Gravels derived from Limestones	Low	Small Adverse	Imperceptible	
	Gravels derived from Lower Palaeozoic sandstones and shales	Low	Small Adverse	Imperceptible	

Corridor Option	Description	Importance of attribute	Significance of Impact	Magnitude of Impact	Overall MCA Score
	Irish Sea Till derived from Limestones	Low	Small Adverse	Imperceptible	
	Urban	Medium	Small Adverse	Slight	

1.4.4 Slope stability – Landslides

Three landslide events have been recorded within the corridor option assessment study areas. Two were in the Northern Section (nodes A-B) of the study area which would result in an impact on all the corridor options (**Table 1.8**).

One landslide was recorded in Glen of the Downs in the Southern Section which would result in a slight impact on both Corridor Option 1 (S1) and Corridor Option 5 (S5) (**Table 1.9**).

Table 1.8: Summary of landslide assessment for the Northern Section

Corridor Option	Description	Importance of attribute	Significance of Impact	Magnitude of Impact	Overall MCA Score
N1	Landslide 1	Medium	Small Adverse	Slight	Minor or slightly negative
	Landslide 2	Medium	Small Adverse	Slight	
N2	Landslide 1	Medium	Small Adverse	Slight	Minor or slightly negative
	Landslide 2	Medium	Small Adverse	Slight	
N3	Landslide 1	Medium	Small Adverse	Slight	Minor or slightly negative
	Landslide 2	Medium	Small Adverse	Slight	
N4	Landslide 1	Medium	Small Adverse	Slight	Minor or slightly negative
	Landslide 2	Medium	Small Adverse	Slight	

Table 1.9: Summary of landslide assessment for the Southern Section

Corridor Option	Description	Importance of attribute	Significance of Impact	Magnitude of Impact	Overall MCA Score
S1	Landslides 13	Medium	Small Adverse	Slight	Minor or slightly negative
S2	N/A	N/A	N/A	N/A	Not significant or neutral
S3	N/A	N/A	N/A	N/A	Not significant or neutral
S4	N/A	N/A	N/A	N/A	Not significant or neutral
S5	Landslides 13	Medium	Small Adverse	Slight	Minor or slightly negative

1.4.5 Potential areas of landfill

A number of sites of potential areas of landfill have been identified through consultation and a desk study review as detailed in **Section 13** (Soils and geology) of **Volume B**. The history, contents and volume of these areas are not known sufficiently to provide accurate quantities.

Therefore, a worst-case scenario has been taken, considering the entire plan area identified as fill on **Figure B13.19 – Figure B13.24** of **Volume B** as hazardous waste that would require excavation and disposal. Of the areas identified in the Constraints Study only three would be impacted by the corridor options:

- Kilmurray North (**Figure B13.20**: Wicklow County Council Potential Area of Fill No. 9-12)
- Drummin Lane (**Figure B13.21**: Wicklow County Council Potential Area of Fill No. 13-16)
- Kilpedder (**Figure B13.21**: Wicklow County Council Potential Area of Fill No. 1)

In the Northern Section (**Table 1.10**), the Kilmurray North potential area of landfill is intercepted by Corridor Option 3 (N3) and Corridor Option 4 (N4) which would result in a moderate impact. Kilmurray North landfill is also within the assessment study area for Corridor Option 1 (N1) and Corridor Option 2 (N2) but the impact would be imperceptible.

In the Southern Section (**Table 1.11**), Drummin Lane potential area of landfill is intercepted by Corridor Option 1 (S1), Corridor Option 3 (S3), Corridor Option 4 (S4) and Corridor Option 5 (S5) resulting in a moderate/significant impact. Corridor Option 2 (S2) intercepts Kilpedder potential area of landfill resulting in a moderate impact.

Table 1.10: Summary of potential areas of landfill assessment for the Northern Section

Corridor Option	Description	Importance of attribute	Significance of Impact	Magnitude of Impact	Overall MCA Score
N1	Kilmurray north	Medium	Negligible	Imperceptible	Not significant or neutral
N2	Kilmurray north	Medium	Negligible	Imperceptible	Not significant or neutral
N3	Kilmurray north	Medium	Moderate Adverse	Moderate	Moderately negative
N4	Kilmurray north	Medium	Moderate Adverse	Moderate	Moderately negative

Table 1.11: Summary of potential areas of landfill assessment for the Southern Section

Corridor Option	Description	Importance of attribute	Significance of Impact	Magnitude of Impact	Overall MCA Score
S1	Drummin Lane	High	Moderate Adverse	Significant/Moderate	Major or highly negative
S2	Kilpedder	Medium	Moderate Adverse	Moderate	Moderately negative
S3	Drummin Lane	High	Moderate Adverse	Significant/Moderate	Major or highly negative
S4	Drummin Lane	High	Moderate Adverse	Significant/Moderate	Major or highly negative
S5	Drummin Lane	High	Moderate Adverse	Significant/Moderate	Major or highly negative

1.4.6 County geological sites

In the Northern Section (**Table 1.12**), the Dargle River Valley county geological site is intercepted by Corridor Option 2 (N2) and Corridor Option 3 (N3), however, the resulting impact is imperceptible. All four corridor options in the Northern Section intercept the Enniskerry Delta county geological site resulting in a moderate/slight impact.

In the Southern Section (**Table 1.13**), the Glen of the Downs county geological site is intercepted by Corridor Option 1 (S1). However, as there are no works proposed in this area the resulting impact is imperceptible. Likewise, the Glen of the Downs county geological site is within the assessment study area for Corridor Option 4 (S4) but results in an imperceptible impact. However, Corridor Option 2 (S2) and Corridor Option 5 (S5) both intercept the Glen of the Downs county geological site resulting in the removal of a small part of the county geological site resulting in a moderate/slight impact.

Table 1.12: Summary of county geological sites assessment for the Northern Section

Corridor Option	Description	Importance of attribute	Significance of Impact	Magnitude of Impact	Overall MCA Score
N1	Enniskerry Delta	High	Small Adverse	Moderate/Slight	Moderately negative
N2	Dargle River Valley	High	Negligible	Imperceptible	Moderately negative
	Enniskerry Delta	High	Small Adverse	Moderate/Slight	
N3	Dargle River Valley	High	Negligible	Imperceptible	Moderately negative
	Enniskerry Delta	High	Small Adverse	Moderate/Slight	

Corridor Option	Description	Importance of attribute	Significance of Impact	Magnitude of Impact	Overall MCA Score
				Slight	
N4	Enniskerry Delta	High	Small Adverse	Moderate/ Slight	Moderately negative

Table 1.13: Summary of county geological sites assessment for the Southern Section

Corridor Option	Description	Importance of attribute	Significance of Impact	Magnitude of Impact	Overall MCA Score
S1	Glen of the Downs	High	Negligible	Imperceptible	Not significant or neutral
S2	Glen of the Downs	High	Moderate Adverse	Significant/ Moderate	Major or highly negative
S3					Not significant or neutral
S4	Glen of the Downs	High	Negligible	Imperceptible	Not significant or neutral
S5	Glen of the Downs	High	Moderate Adverse	Significant/ Moderate	Major or highly negative

1.4.7 Earthworks assessment

This assessment also includes an earthworks assessment as per the TII PAG³. This assessment comprised a comparative earthworks assessment based on bulk cut and fill quantities derived from 3D designs of the corridor options for assessment. The assumptions that have been used for the earthworks assessment are as follows:

- Bulk earthworks volumes have been estimated based on the road geometries produced as part of the corridor options assessment;
- Cut volumes are based on a 1:2 slope;
- Fill volumes are based on a slope of 1:2;
- The bulk earthworks volume calculations for Corridor Option 5 (South) were based on different assumptions which reflect less impactful earthworks due to the option being within the Glen of the Downs SAC. The assumptions are as follows:
 - Cut volumes are based on a 70° slope;
 - Fill volumes are based on a slope of 70°;
- Volumes are a bulk estimate based on the aforementioned cut and road geometries and do not consider topsoil removal, overdigging, temporary works or construction compounds etc.;

- Where the proposed corridor is considered to remain at grade or minimal cut/fill is required for this stage of the assessment, earthworks volumes have not been assessed and a qualitative assessment has been undertaken;
- Volumes relate to bulk material volumes only and have not been classified into material types; and
- Volumes relate to in-situ volumes only, material bulking factors have not been applied.

Where there is a surplus of cut material that potentially would not be used directly on site as there is no material or fill requirement, there is a profound impact noted.

In the Northern Section (**Table 1.15**) the overall impact of the cut/fill balance for the Corridor Option 2 (N2), Corridor Option 3 (N3) and Corridor Option 4 (N4) is major. The Corridor Option 1 (N1) impact is considered to be *moderately negative*.

In the Southern Section (**Table 1.16**) the overall impact of the cut/fill balance for the Corridor Option 2 (S2), Corridor Option 3 (S3) and Corridor Option 4 (S4) is major. The Corridor Option 5 (S5) impact is slight and the Corridor Option 1 (S1) impact is considered to be *not significant or neutral* as the cut/fill balance has been assumed to be zero.

Table 1.14: Summary of the earthworks assessment for the Northern Section

Corridor Option	Description	Vol (m ³)	Importance of attribute	Significance of Impact	Magnitude of Impact	Overall MCA Score
N1	Cut (m ³)	129,000	High	Small Adverse	Moderate/Slight	Moderately negative
	Fill (m ³)	0				
	Cut/ Fill Balance (m ³)	+129,000 (Surplus)				
N2	Cut (m ³)	2,565,000	Very High	Large Adverse	Profound	Major or highly negative
	Fill (m ³)	-44,000				
	Cut/Fill Balance (m ³)	+2,521,000 (Surplus)				
N3	Cut (m ³)	2,494,000	Very High	Large Adverse	Profound	Major or highly negative
	Fill (m ³)	-95,000				
	Cut/Fill Balance (m ³)	+2,400,000 (Surplus)				
N4	Cut (m ³)	2,183,000	Very High	Large Adverse	Profound	Major or highly negative
	Fill (m ³)	25,000				
	Cut/Fill Balance (m ³)	+2,158,000 (Surplus)				

Table 1.15: Summary of the earthworks assessment for the Southern Section

Corridor Option	Description	Vol (m ³)	Importance of attribute	Significance of Impact	Magnitude of Impact	Overall MCA Score
S1	Cut (m ³)	0	Low	Negligible	Imperceptible	Not significant or neutral
	Fill (m ³)	0				
	Cut/ Fill Balance (m ³)	0				
S2	Cut (m ³)	3,058,000	Very High	Large Adverse	Profound/ Significant	Major or highly negative
	Fill (m ³)	-1,136,000				
	Cut/Fill Balance (m ³)	+1,292,000				
S3	Cut (m ³)	3,114,000	Very High	Large Adverse	Profound	Major or Highly negative
	Fill (m ³)	-1,559,000				
	Cut/Fill Balance (m ³)	+1,556,000				
S4	Cut (m ³)	7,950,000	Very High	Large Adverse	Profound	Major or highly negative
	Fill (m ³)	-2,017,000				
	Cut/Fill Balance (m ³)	+5,933,000				
S5	Cut (m ³)	67,000	Low	Moderate Adverse	Slight	Minor or slightly negative
	Fill (m ³)	-7,000				
	Cut/Fill Balance (m ³)	+60,000				

1.5 Summary

In the Northern Section, (Table 1.16), Corridor Option 1 (N1) has a *moderately negative* impact on the Soils and geology resulting in it being the preferred corridor option. Corridor Option 2 (N2), Corridor Option 3 (N3) and Corridor Option 4 (N4) have a *major or highly negative impact* on the soils and geology. Corridor Option 2 (N2) and Corridor Option 3 (N3) are of preference and Corridor Option 4 (N4) is the least preferred corridor option. The reasons are as follows:

- Corridor Option 1 (N1) is preferred over Corridor Option 2 (N2) as it has the lowest earthworks volume and does not intercept the Kilmurray North potential area of landfill like Corridor Option 3 (N3) and Corridor Option 4 (N4).
- Corridor Option 2 (N2) and Corridor Option 3 (N3) are of intermediate preference. Though Corridor Option 3 (N3) has less of an impact on the agricultural soils than Corridor Option 2 (N2), it has more of an impact on the subsoils than Corridor Option 2 (N2), thus balancing out their relative impacts. However, Corridor Option 3 (N3) intercepts the Kilmurray North potential area of landfill making it slightly less preferable than Corridor Option 2 (N2).

- Corridor Option 4 (N4) is the least preferred route as it has more of an impact on the agricultural soils than Corridor Option 3 (N3) and more of an impact on the subsoils than Corridor Option 2 (N2) and it intercepts the Kilmurray North potential area of landfill.

Table 1.16: Summary assessment table Northern Section

Assessment Criteria	Corridor Option 1 (N1)	Corridor Option 2 (N2)	Corridor Option 3 (N3)	Corridor Option 4 (N4)
Soils	Moderately negative	Moderately negative	Moderately negative	Moderately negative
Subsoils	Minor or slightly negative	Minor or slightly negative	Minor or slightly negative	Minor or slightly negative
Landslides	Minor or slightly negative	Minor or slightly negative	Minor or slightly negative	Minor or slightly negative
Potential Areas of Landfill	Not significant or neutral	Not significant or neutral	Moderately negative	Moderately negative
County Geological Sites	Moderately negative	Moderately negative	Moderately negative	Moderately negative
Earthworks Assessment	Moderately negative	Major or highly negative	Major or highly negative	Major or highly negative
Overall PAG Qualitative Assessment	Moderately negative	Major or highly negative	Major or highly negative	Major or highly negative
MCA Score	2	1	1	1
Preference	Preferred	Intermediate	Intermediate	Least preferred

In the Southern Section (**Table 1.17**), all five corridor options have a *major or highly negative* impact on the soils and geology. Corridor Option 1 (S1) is the preferred corridor option, Corridor Option 2 (S2) is of intermediate preference, and Corridor Option 3 (S3), Corridor Option 4 (S4) and Corridor Option 5 (S5) are least preferred. The reasons are as follows:

- Corridor Option 1 (S1) has the least impact on the subsoils and on the earthworks, and the second lowest impact on the agricultural soils resulting in it being the preferred corridor option despite it intercepting Drummin Lane potential area of landfill. Though it intercepts the Glen of the Downs county geological site no works are proposed in this area.

- Corridor Option 2 (S2) has the least impact on the agricultural soils and on the potential areas of landfill as the impact on the Kilpedder potential area of landfill is lower than that of the Drummin Lane potential area of landfill intercepted by the other routes, this counteracts its impact on the Glen of the Downs county geological site relative to Corridor Option 3 (S3) and Corridor Option 4 (S4).
- Corridor Option 3 (S3), Corridor Option 4 (S4) and Corridor Option 5 (S5) are least preferred as they have the higher impact on landfills (Drummin Lane) than Corridor Option 2 (S2), and earthworks than Corridor Option 1 (S1). Though Corridor Option 5 (S5) has a greater impact than Corridor Option 3 (S3) and Corridor Option 4 (S4) on the Glen of the Downs county geological site and landslides this is balanced by it having less of an impact on the agricultural soils, subsoils and earthworks.

Table 1.17: Summary assessment table Southern Section

Assessment Criteria	Corridor Option 1 (S1)	Corridor Option 2 (S2)	Corridor Option 3 (S3)	Corridor Option 4 (S4)	Corridor Option 5 (S5)
Soils	Moderately Negative	Moderately Negative	Moderately Negative	Moderately Negative	Moderately Negative
Subsoils	Minor or slightly negative	Minor or slightly negative	Minor or slightly negative	Minor or slightly negative	Minor or slightly negative
Landslides	Minor or slightly negative	Not significant or neutral	Not significant or neutral	Not significant or neutral	Minor or slightly negative
Potential Areas of Landfill	Major or highly negative	Moderately Negative	Major or highly negative	Major or highly negative	Major or highly negative
County Geological Sites	Not significant or neutral	Major or Highly Negative	Not significant or neutral	Not significant or neutral	Major or Highly Negative
Earthworks Assessment	Not significant or Neutral	Major or Highly Negative	Major or Highly Negative	Major or Highly Negative	Minor or slightly negative
Overall Qualitative Assessment	Major or highly negative	Major or highly negative	Major or highly negative	Major or highly negative	Major or highly negative
MCA Score	1	1	1	1	1
Preference	Preferred	Intermediate	Least preferred	Least preferred	Least preferred

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>

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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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