KWF Grid Connection EIA 2023 Report

Volume C2: EIAR 2023 Main Report

Chapter 12: Material Assets

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Glossary of Terms

Term	Definition
KWF Grid Connection (the subject development)	Underground cabling, additional plant and apparatus in the existing Woodhouse Substation, the construction a new link road, the widening of an existing forestry road and the use of the existing entrance and windfarm road network at Woodhouse Windfarm.
Authorised Knocknamona Windfarm	Not Constructed - Knocknamona Windfarm authorised in 2016 (ABP-PL 93.244006); Amendments to Knocknamona Windfarm to provide for larger turbines authorised in September 2022 (ABP-309412-21) and Junction & Bend Widening Works to facilitate turbine component access through the windfarm site entrance at Knocknaglogh Lower authorised in December 2022 (ABP-314219-22)
Whole Project	KWF Grid Connection with Authorised Knocknamona Windfarm

12 Environmental Factor: Material Assets

12.1 Introduction to the Material Assets Chapter

12.1.1 What is Material Assets?

In this EIAR, Material Assets relate to the local, regional and national roads which are part of the Public Road network, and the built services (pipes, overhead lines, underground cables and wireless signals) which supply drinking water[1], electricity[2] and communication[3] services to houses, businesses and community facilities in the area. Road users (pedestrians, cyclists, and drivers of motor vehicles) and the end users of built services are also included for evaluation.

12.1.2 Overview of Material Assets in the Local Environment

The existing roads environment in the immediate vicinity of KWF Grid Connection consists for the most part of lightly trafficked local roads. These local roads are generally single lane roads with narrow verges, bounded by low level earthen embankments or hedgerows along either side. The road pavements consist of traditional surface-dressed flexible pavement ('tar and chippings'), with road surface water drained to open drains, generally running along each of the roadsides.

Further away from the proposed KWF Grid Connection development, the Regional Road R671 links the national roads N72 (Dungarvan – Cappoquin - Killarney Road) to the north, with the N25 (Dungarvan – Youghal - Cork road) to the south. The villages of Aglish and Clashmore are located along the R671. There are 2 No. bridges, 3 No. culverts (including a cattle underpass) and 2 No. drainage pipes along the section of the R671 road between the N72 junction and the L6074 junction at Clogh Crossroads going east to Woodhouse Windfarm Site Entrance. There is 1 No. culvert on the L6074.

The Built Services in the area are mainly made up of overhead high voltage transmission lines in the vicinity of Woodhouse Substation, along with local services made up of lower voltage overhead electricity lines which are generally located in fields close to the local roads and overhead telephone lines which are along roadside boundaries. The local electricity lines and local telephone lines are connected to local residences and also service Woodhouse Substation. As the area around KWF Grid Connection is sparsely populated, the number of houses and other properties connected to built services is very low. No other built services (such as underground water pipes, telephone lines or gas supply lines) occur in close proximity to the KWF Grid Connection development.

[1] Water supply relates to the network of water mains and pipes which are part of the public Irish Water network. Pipes and mains related to private water supply (in the form of group schemes) are also considered, however the sources of private water supply (i.e. wells, springs etc.) are evaluated in Chapter 9: Water.

[2] Electricity supply relates to both the local Low Voltage (LV), Medium Voltage (MV) such as the 20kV networks which supply local houses and businesses; and high voltage 38kV, 110kV and 220kV lines all of which form part of the electricity system.

[3] Communications supply relates to the overhead lines and underground telecommunication cables, which form part of the Eir network. Communications supply also relates to privately owned telecommunication masts and associated wireless signals.

Relevant Figure (at the end of this chapter)

Figure 12.1: Location of KWF Grid Connection in relation to Material Assets
Figure 12.2: Public Road - Construction Materials Haul Route
Figure 12.3: Public Roads – Turbine Component and Electrical Apparatus Haul Route

12.1.3 SENSITIVE ASPECTS of Material Assets

Any receptor in the local environment which could be affected by a development is a Sensitive Aspect.

12.1.3.1 Sensitive Aspects included for detailed evaluation in this Topic Chapter

The following Sensitive Aspect is **included for detailed evaluation in this topic chapter** as it is likely or there is potential, for this Sensitive Aspect to be affected by the KWF Grid Connection:

Sensitive Aspect No. 1	**Public Roads**	Section 12.2

The above listed Sensitive Aspect is evaluated in Section 12.2 of this Chapter.

12.1.3.2 Sensitive Aspects excluded from further evaluation

The following Sensitive Aspects are **excluded from further evaluation in this topic chapter** because there is no potential for effects, no likely effects, or any effects caused by the KWF Grid Connection will be Neutral.

The following Sensitive Aspects **are excluded from this topic chapter**:

Public Roads and Road Users along construction materials (concrete/ stone) haul routes as far as Clogh Crossroads (R671 with L6074)	Evaluated as excluded, due to **Neutral impacts**: Neutral impacts to road pavements, road boundaries or buried structures, and Neutral impacts to road users along the Local Roads, National Road N72 and Regional Road R671 where they occur along delivery routes for concrete (from Cappagh Quarry L2018 and L2019) and aggregate (Keereen Quarry R671) due to: the very low volumes of traffic associated with the development (39 loads of stone and 4 loads of concrete in total, with up to 3 loads per day); the absence of works along any of these roads; the absence of specific weight restrictions on any of these roads; all loads being within allowable axle weights; the suitable condition of the bridges and buried structures (culverts) along the route; the established use of the L2019 and L2018 as the access to the Cappagh Quarry; and the level of spare traffic capacity on the N72 and R671. No potential for cumulative impacts with Authorised Knocknamona Windfarm on the N72 or R671, as the KWF Grid Connection uses a different haul route and site access points to the haul route/access points which will be used by the Authorised Knocknamona Windfarm. Figure 12.1: Location of KWF Grid Connection in relation to Material Assets Figure 12.2: Public Road - Construction Materials Haul Route Figure 12.4: Public roads – Whole Project Haul Routes
Public Roads and Road Users along the turbine component and electrical apparatus haul	Evaluated as excluded, due to **Neutral impacts:** Neutral impacts to road pavements, road boundaries or buried structures, and Neutral impacts to road users along the N29, N25, N72, R671, L6074 and

routes as far as the Woodhouse Windfarm Main Entrance on the L60741	L60741 as far as the Woodhouse Windfarm main entrance, where they occur along the haul route for the main transformer for Woodhouse Substation and the haulage of turbine components for Knocknamona Windfarm from port (most likely Belview, County Kilkenny) due to: • very low number of abnormal loads, which is expected to range from 8 to 10 per day on a total of 10 days; • no requirements for works along any of these roads; • while some street furniture (signs, fencing etc.) may need to be briefly removed during transportations this activity will not have any effect on the structure or use of the roads; • all abnormal loads will be within allowable axle weights; • abnormal loads will be delivered during off peak traffic times, with the turbine components expected to take place during the early hours of the morning when other road users are few or none. • the good condition and inherent strength of the road pavements, bridges and buried structures; and • the lightly trafficked nature and extent of spare capacity available on these roads. No potential for cumulative impacts with Authorised Knocknamona Windfarm as the KWF Grid Connection turbine component load haul route uses a different haul route and site access points (Woodhouse Windfarm entrance) to the construction haul routes and access points for construction materials and turbine components which will be used by the Authorised Knocknamona Windfarm. Figure 12.1: Location of KWF Grid Connection in relation to Material Assets Figure 12.3: Public Roads – Turbine Components and Electrical Apparatus Haul Route Figure 12.4: Public roads – Whole Project Haul Routes
Public Roads or road users along delivery routes for other materials or along transport routes for construction/operational stage personnel as far as Clogh Crossroads (R671 with L6074)	Evaluated as excluded, due to **Neutral impacts** due to**:** • the negligible levels of traffic associated with these deliveries/personnel, which will range from 1 to 3 per day over a 4-month period. Figure 12.2: Public Road - Construction Materials Haul Route Figure 12.3: Public Roads – Turbine Components and Electrical Apparatus Haul Route
Local Road Users on the L6074 and L60741 (pedestrians, cyclists, and drivers of motor vehicles)	Evaluated as excluded, due to **Neutral Impacts:** **Negligible increase in journey times** to road users (drivers) and **negligible levels of disruption or disturbance of cyclists or walkers** (particularly on the section of the St. Declan's Way walk which crosses the L6074 near the junction of the L60741) which will be no greater than Imperceptible significance due to the extremely lightly trafficked nature of the local roads L6074 and L60741, and the very short duration of construction stage (4 months), and very low volume of deliveries required (3 to 6 loads per day), in the context of use of these roads on a daily basis by large farm machinery and diversions around the works will be facilitated. **No interrupted or disrupted access to property** due to no public roadworks.

	No increased risk of accidents due to increased HGV traffic on the local roads due to the very low volumes of HGVs, over a very short duration, and in the context of the current use of these roads by large tractors and farm machinery. Figure 12.2: Public Road Construction Materials Haul Route Figure 12.3: Public Roads - Turbine Components and Electrical Apparatus Haul Route Figure 12.4: Public roads – Whole Project Haul Routes
Electricity Transmission System	**Evaluated as excluded,** due to **Neutral Impact:** During the commissioning of the new plant and apparatus for KWF Grid Connection in the existing Woodhouse Substation, the Woodhouse Substation will be disconnected from the 110kV overhead line network. This will allow the new plant and apparatus commissioning works to be completed and once completed the Woodhouse Substation will be reconnected to the 110kV overhead line network again. This 110kV overhead line network connects a station at Knockraha, Cork with a substation at Dungarvan, Waterford, with Woodhouse Substation being a connection point along that line. The line will be switched out for the duration of commissioning but the operation of the Electricity Transmission System will not be affected as other radial networks will be used to feed both Knockraha station and Dungarvan substations.
Local Electricity Network	**Evaluated as excluded, due to No Likely Impacts:** There are no overhead lines serving the locality within 7m (the reach of an excavator) to KWF Grid Connection construction works, and therefore there is no potential for excavators to accidently damage the overhead network. There is one underground cable under an existing Woodhouse Windfarm road which services two residences in Keereen Upper. There is no likely impact on the underground cable due to its separation distance from the works. The 3rd party cable is 45m from the proposed KWF Grid Connection underground cabling and outside the construction works area.
Local Eir Network	**Evaluated as excluded, due to No Likely/No Potential for impacts:** There is one telephone pole adjacent to the crossing point of the local road of the underground cabling but the attached overhead line does not cross over the works, and is not likely to be affected. There are no other overhead telephone lines or underground Eir cables in close proximity to KWF Grid Connection, and furthermore there will be no requirement for works along the public road network in order to gain access to KWF Grid Connection and no requirement for works to public roads, to facilitate the delivery of abnormal loads (including turbine components), therefore it is evaluated that there is no potential for excavators to accidently damage the overhead or underground Eir network, either in the vicinity of the KWF Grid Connection or in the wider area.
Public Water Supply & Private Group Schemes	**Evaluated as excluded, due to No Potential for Impacts** because of the absence of any Irish Water underground services or local Group Water Schemes within close proximity of construction works.
Airborne Communication Signals	**Evaluated as excluded, due to No Potential for impacts:**

and Television Reception	The additional plant and apparatus associated with KWF Grid Connection will not block any communication signal paths or block or interfere with any television reception in the area because: the only above ground structures relate to the additional plant and apparatus in Woodhouse Substation, which will be located in an existing compound and will be similar in dimension to the apparatus already existing, furthermore the existing substation compound is situated lower down than the local topography to the south and east.

12.1.4 The Authors of this Material Assets Chapter and Appendices

This **Material Assets chapter and Appendix 12.3** - Structural Inspection of Bridges Along the KWF Grid Connection Haulage Route has been written by Ruairí Geary and David Tarrant, Chartered Engineers with TLI Group. Ruairi Geary is a design team leader within TLI Group. Ruairí has over 10 years' experience in a wide range of Electrical/Mechanical engineering projects, specialising in the area of distribution and transmission network design, and in particular working on the ESB system. David Tarrant has over 12 years' experience in the Irish construction sector is currently a lead civil design engineer with TLI Group. TLI Group is a utility infrastructure consultancy and construction company, operating extensively within the utilities sector both in Ireland and internationally. Designing and building overhead power lines and underground cables with associated structures are the company's core expertise. Appendix 12.3 - Structural Inspection of Bridges Along the KWF Grid Connection Haulage Route can be found after the figures at the end of this chapter.

Appendix 12.2 - Traffic & Transport Assessment Report was prepared by Eoin Reynolds, Director of NRB Consulting Engineers Ltd. Eoin is experienced in a wide variety of traffic, transport, traffic impact, roads design & Civil Engineering projects. NRB are specialist in the area of Traffic/Roads and Transportation, and in particular in the assessment of the impact of traffic associated with commercial development. Appendix 12.2 - Traffic & Transport Assessment Report can be found after the figures at the end of this chapter.

Appendix 12.4 – Pavement Condition Survey was carried out by PMS Pavement Management Services Ltd. PMS is a civil engineering consultancy firm specialising in testing, evaluation and management of roads, airports and ports. Appendix 12.4 - Pavement Condition Survey can be found after the figures at the end of this chapter.

12.1.5 Sources of EIAR Information

The following sources of information were used to gather information on the baseline environment and evaluate impacts, including cumulative impacts.

Table 12-1: Sources of EIAR 2023 Information

Type	Information Source
Consultation	TII were consulted in February 2022 comprising general guidance with respect to EIAR scoping. Uisce Eireann were consulted in February 2022. Feedback of a general nature. See Appendix 3.2. Jack Brett meeting with Josephine MacGrath, Roads Department of Waterford County Council about the content of this chapter (pdf page 16 - 19 of Appendix 3.1)

Type	Information Source
Guidelines	• TII Traffic and Transport Assessment Guidelines (2014) • TII Design Manual for Roads and Bridges (2013, as amended) • Department for Transport Traffic Signs Manual (November 2021)
Desktop	• POWSCAR 2016, CSO Database • RSA Road Collision Annual Reports • Waterford County Development Plan 2022 - 2028 • Review of Irish Water Services Mapping • Review of Eir Mapping • Review of ESBN Existing Asset Database • Review of Eirgrid 110kV Functional Specifications • Review of ESB Networks Functional Specifications • Review of Gas Networks Ireland Mapping <u>Review of Authorised Knocknamona Windfarm Planning Docs</u> • Knocknamona Windfarm Revised EIS 2015 • Amendment to Knocknamona Windfarm – Larger Turbines Revised EIAR 2021 • Junction & Bend Widening Works Screening for EIA 2022 Available in Volume F: Reference Documents
Fieldwork	Site Visits • Site Visits • Buried Structures (i.e. bridges and culverts) Survey • Passing Traffic Volume Data collection and assessment (ATC Tube Counts) • GPS survey of all existing underground or overhead services (e.g. Irish Water/Eir/ESBN) within 20m of works areas

12.1.6 Methodology used to Describe the Baseline Environment and to Evaluate Impacts

There are no specific guidelines on the evaluation of effects to Material Assets for an EIA Report.

A Traffic & Transport Assessment Report can be found in Appendix 12.2. This assessment is prepared in accordance with Transport Infrastructure Ireland guidelines and examines all traffic movements associated with the proposed and authorised development works and details the sequencing of works to avoid overlap in traffic routes with the Whole Project traffic movements.

A Structural Inspection of Buried Structures can be found in Appendix 12.3. This survey includes a pre-condition survey of the bridge and culvert crossings (buried structures) on the Local and Regional Roads involved in the construction haulage. The L2018: L2019; L6074; L6074-1 and R671 were inspected and the structures were assessed as to their current condition and an engineer's comment (Tli) was prepared on the suitability of the bridges/culverts for increased haulage traffic during the construction of the KWF Grid Connection and the delivery of abnormal loads for the Knocknamona Windfarm.

It was considered that a Road Safety Audit for the haul routes associated with the proposed development (both construction and extraordinary loads) does not need to be carried out because no public road

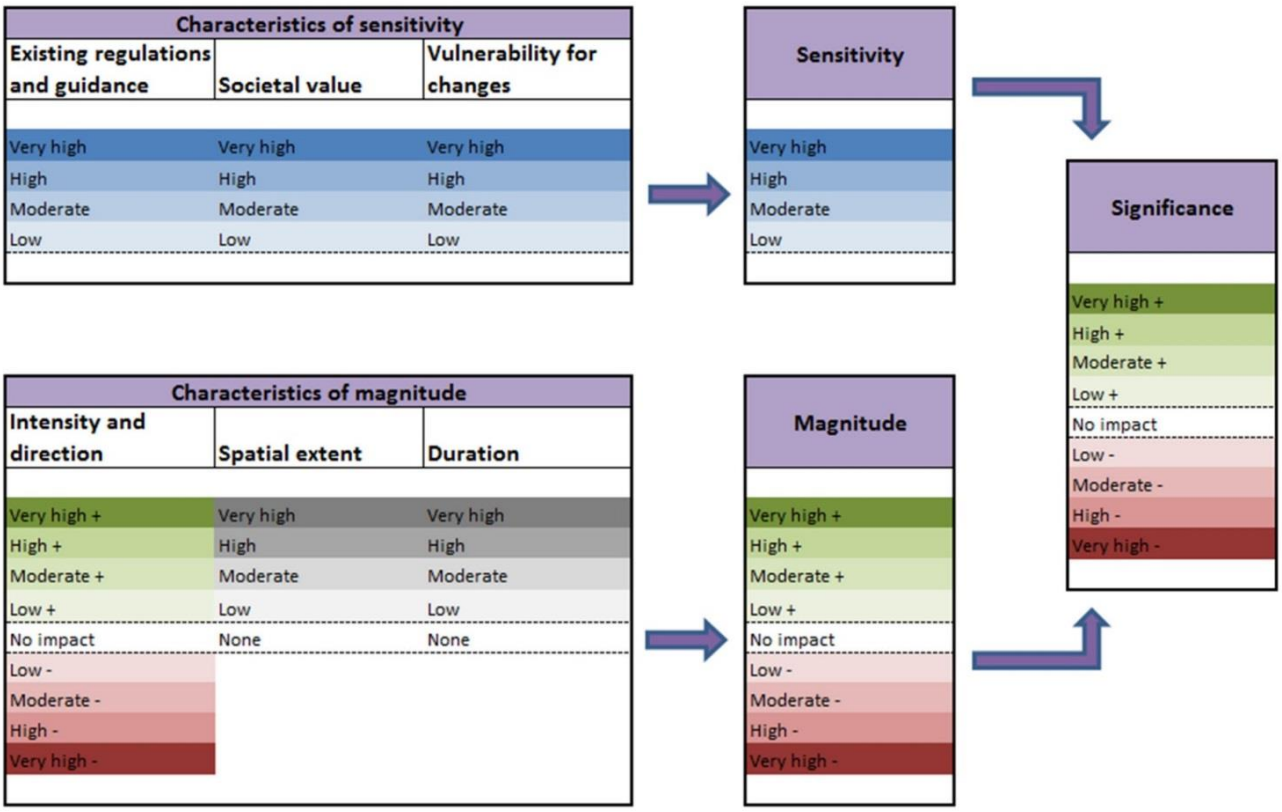
modifications are required for either the deliveries for the proposed development or for the wind turbine component deliveries for Knocknamona Windfarm.

The results of the Pavement Condition Survey can be found in Appendix 12.4. The pavement condition survey comprised of a video survey and pavement condition index (vPCI) survey for the network. The data collection survey of the road network in the field is carried out using a specialised video survey vehicle equipped with a high-definition video camera, distance measurement instrument (DMI), and GPS receiver. The video survey is typically carried out at normal traffic speeds, depending on road condition and road geometrics. Due to the long development period for windfarm and grid connection works, a more up to date pavement condition survey will be carried out prior to commencement of development, so that real time information is available to the developer and the Roads Section of Waterford City & County Council. This pre-commencement pavement condition survey will likely be subject to planning condition.

In this chapter, the methodology for evaluating impacts to the Material Asset – public roads, uses a standard EIAR methodology – the IMPERIA methodology. The IMPERIA methodology is described in Section 12.1.6.1 below.

12.1.6.1 Overview of the IMPERIA Methodology

In the framework developed under the EC LIFE project - IMPERIA, the evaluation of impact significance uses a replicable, multi-criteria decision analysis, where the sensitivity of the receptor (i.e. the sensitivity of a Sensitive Aspect of the environment) and the magnitude of the change caused by a project are rated using sub-criteria or scales, and then the overall significance is evaluated using a matrix.



The criteria for determining the overall sensitivity of a receptor and magnitude of the change (impact) to the receptor, is provided in the tables below. The matrix for determining the significance of the impact to the receptor is provided after these tables.

12.1.6.1.1 Criteria for Evaluating the Sensitivity of a Receptor

Sensitivity of the receptor is a description of the characteristics of the receptor or aspect of the environment which will be affected by the development. It is a measure of 1) existing regulations and guidance, 2) societal value and 3) vulnerability for the change. The sensitivity of a receptor is estimated in its current state prior to any change implied by the project.

Existing regulations and guidance describes whether there are any such objects in the impact area, which have some level of protection by law or other regulations (e.g. prohibition against polluting groundwater and Natura areas), or whose conservation value is increased by programs or recommendations (e.g. landscapes designated as nationally valuable).

Societal value describes the value of the receptor to the society and depending on the type of impact may be related to economic values (e.g. water supply), social values (e.g. landscape or recreation) or environmental values (e.g. natural habitat). Societal value measures general appreciation from the point of view of the society. When relevant, the number of people impacted is taken into account.

Vulnerability for the change describes how liable the receptor is to be influenced or harmed by changes to its environment.

Sensitivity	Criteria Existing regulations/guidance	Criteria Societal value	Criteria Vulnerability to change
Low	Few or no recommendations which add to the conservation value of the impact area, and no regulations restricting use of the area (e.g. zoning plans).	The receptor is of small value or uniqueness. The number of people impacted is small.	Even a large external change would not have substantial impact on the status of the receptor. There are only few or none vulnerable receptors in the area.
Moderate	Regulation sets recommendations or reference values for an object in the impact area, or the project may impact an area conserved by a national or an international program.	The receptor is valuable and locally significant but not very unique. The number of people impacted is moderate.	At least moderate changes are needed to substantially change the status of the receptor. There are some vulnerable receptors in the area.
High	The impact area includes an object that is protected by national law or an EU directive (e.g. Natura 2000 areas).	The receptor is unique and valuable to society. It may be deemed nationally significant and valuable. The number of people impacted is large.	Even a small external change could substantially change the status of the receptor. There are many vulnerable receptors in the area.
Very High	The impact area includes an object that is protected by national law or an EU directive (e.g. Natura 2000 areas).	The receptor is highly unique, very valuable to society and possibly irreplaceable. It may be deemed internationally significant and valuable. The number of people affected is very large.	Even a very small external change could substantially change the status of the receptor. There are very many vulnerable receptors in the area.

The **overall sensitivity of a receptor** is assessed by the competent expert on the basis on his/her assessment of the components of sensitivity. A general guide for deriving the overall sensitivity is to pick the maximum of existing regulations and guidance and societal value and then adjust that value depending on the level of vulnerability.

Determining the Overall Sensitivity of a Receptor

Low	The receptor has minor social value, low vulnerability for the change and no existing regulations and guidance. Even a receptor which has major or moderate social value may have low sensitivity if it's not liable to be influenced by the development.
Moderate	The receptor has moderate value to society, its vulnerability for the change is moderate, regulation may set reference values or recommendations, and it may be in a conservation program. Even a receptor which has major social value may have moderate sensitivity if it has low vulnerability, and vice versa.
High	Legislation strictly conserves the receptor, or it is very valuable to society, or very liable to be harmed by the development.
Very High	Legislation strictly conserves the receptor, or it is irreplaceable to society, or extremely liable to be harmed by the development. Even minor influence by the proposed development is likely to make the development unfeasible.

12.1.6.1.2 Criteria for Evaluating the Magnitude of an Impact

Magnitude of the impact describes the characteristics of changes the planned project is likely to cause. Magnitude is a combination of 1) intensity and direction, 2) spatial extent, and 3) duration. Assessment of magnitude evaluates the likely changes affecting the receptor *without* taking into account the receptors sensitivity to those changes.

Intensity describes the physical dimension of a development. The direction of the impact/change is either positive (green) or negative (red).

Magnitude	Criteria – Intensity & Direction
Very High	The proposal has an extremely beneficial effect on nature or environmental load. A social change benefits substantially people's daily lives
High	The proposal has a large beneficial effect on nature or environmental load. A social change clearly benefits people's daily lives.
Moderate	The proposal has a clearly observable positive effect on nature or environmental load. A social change has an observable effect on people's daily lives
Low	An effect is **positive** and observable, but the change to environmental conditions or on people is small
No impact	An effect so small that it has no practical implication. Any benefit or harm is negligible.
Low	An effect is **negative** and observable, but the change to environmental conditions or on people is small
Moderate	The proposal has a clearly observable negative effect on nature or environmental load. A social change has an observable effect on people's daily lives and may impact daily routines
High	The proposal has a large detrimental effect on nature or environmental load. A social change clearly hinders people's daily lives.
Very High	The proposal has an extremely harmful effect on nature or environmental load. A social change substantially hinders people's daily lives

Spatial extent describes the geographical reach of an impact area, or the range within which an effect is observable.

Duration describes the length of time during which an impact is observable and it also takes other related issues such as timing and periodicity into account. These are relevant for impacts which aren't observable all the time such as periodic impacts.

Magnitude	Criteria Spatial Extent	Criteria Duration

Low	Impact extends only to the immediate vicinity of a source. Typical range is < 1 km.	An impact whose duration is at most one year, for instance during construction and not operation. A moderate-term impact may fall into this category if it's not constant and occurs only at periods causing the least possible disturbance
Moderate	Impact extends over one municipality. Typical range is 1-10 km	An impact lasts from one to a number of years. A long-term impact may fall into this category if it's not constant and occurs only at periods causing the least possible disturbance
High	Impact extends over one region. Typical range is 10-100 km	An impact lasts several years. The impact area will recover after the project is decommissioned.
Very High	Impact extends over several regions and may cross national borders. Typical range is > 100 km.	An impact is permanent. The impact area won't recover even after the project is decommissioned.

Deriving the overall magnitude of the change from components of magnitude

Magnitude of the change is a comprehensive synthesis of its component factors. In a case, where intensity, spatial case and duration all get the same value, the magnitude would also be given this value. In other cases, intensity should be taken as a starting point, and the assessment should be adjusted based on spatial extent and duration to obtain an overall estimate. The aim is that the overall assessment should capture the characteristics of an effect. The table below describes some example descriptions of different categories for the magnitude of the change.

Determining the Overall Magnitude of the Change/Effect	
Very High	The proposal has beneficial effects of very high intensity and the extent and the duration of the effects are at least high.
High	The proposal has beneficial effects of high intensity and the extent and the duration of the effects are high.
Moderate	The proposal has clearly observable positive effects on nature or people's daily lives, and the extent and the duration of the effects are moderate.
Low	An effect is positive and observable, but the change to environmental conditions or on people is small
No impact	No change is noticeable in practice. Any benefit or harm is negligible.
Low	An effect is negative and observable, but the change to environmental conditions or on people is small.
Moderate	The proposal has clearly observable negative effects on nature or people's daily lives, and the extent and the duration of the effects are moderate.
High	The proposal has harmful effects of high intensity and the extent and the duration of the effects are high
Very High	The proposal has harmful effects of very high intensity and the extent and the duration of the effects are at least high.

12.1.6.2 Assessing the significance of an impact

The **assessment of the overall significance uses the matrix below,** where positive impacts are in green and negative in red. The matrix is based on the **magnitude of the change** affecting a receptor and on the **sensitivity of the receptor** to those changes.

The values obtained from the table are indicative because the most relevant dimensions for characterising an impact are dependent on the type of impact. Thus, some discretion from the expert is required, in

particular in cases, where the one component is low and the other one high or very high.

Determining the Overall Significance of an Impact

Impact Significance		Magnitude of change								
		Very High	**High**	**Moderate**	**Low**	**No Change**	**Low**	**Moderate**	**High**	**Very High**
Receptor Sensitivity	**Low**	Significant*	Moderate*	Slight	Imperceptible	No Impact	Imperceptible	Slight	Moderate*	Significant*
	Moderate	Significant	Significant	Moderate	Slight	No Impact	Slight	Moderate	Significant	Significant
	High	Profound	Significant	Significant	Moderate*	No Impact	Moderate*	Significant	Significant	Profound
	Very High	Profound	Profound	Significant	Significant*	No Impact	Significant*	Significant	Profound	Profound

* Especially in these cases, significance might get a lower estimate, if sensitivity or magnitude is near the lower bound of the classification

Note on Terms used in 'Determining the Overall Significance of an Impact' Table: *The Significance rating ascribed in the Table above have been refined from the ARVI tool, to provide a more nuanced understanding of the significance and also to be compatible with the terms used throughout this EIA Report, which have been informed by the EPA Guidelines on Information to be contained in EIAR (2017) for description of effects.*

In the above Table - Low has been refined as Slight or Imperceptible depending on context; High has been renamed as Significant; Very High has been renamed as Profound and No Impact is understood to also mean Neutral effect, which is defined in the EPA Guidelines as 'no effects or effects that are imperceptible, within normal bounds of variation or within the margin of forecasting error'

12.1.7 Certainty and Sufficiency of Public Roads information and evaluation

The information which informed the baseline descriptions and impact evaluations was collated from site visits and surveys of the local road network and local built services, carried out in February 2023, and through consultation with local landowners, with the operators of Woodhouse Windfarm and Woodhouse Substation, and with the Roads Department of Waterford County Council (in 2019). The Waterford County Council planning database and the Authorised Knocknamona Windfarm planning documents also informed the cumulative evaluations.

In respect of Public Roads, no significant limitations or difficulties were encountered.

12.2 Sensitive Aspect No.1: Public Roads

This Section 12.2 provides a description of the baseline environment and an evaluation of the likely impacts of KWF Grid Connection, both alone and cumulatively, on **Public Roads**.

12.2.1 Description of the BASELINE ENVIRONMENT for Public Roads

This Section 12.2.1 comprises the identification of the Study Area for direct or indirect effects and for cumulative effects, and a description of the context, character, importance and sensitivity of the Public Roads in the area. Trends or changes in the baseline environment and the expected receiving environment are also identified.

12.2.1.1 STUDY AREA for Public Roads

Study areas relate to areas which could be affected by impacts from KWF Grid Connection, whether direct impacts from the KWF Grid Connection on its own or cumulative impacts from KWF Grid Connection and other projects or activities. The study areas are described in the table below and on relevant figures.

Relevant Figure (at the end of this chapter)

Figure 12.1: Location of KWF Grid Connection in relation to Material Assets
Figure 12.2: Public Road Construction Materials Haul Route
Figure 12.3: Public Roads - Turbine Components and Electrical Apparatus Haul Route
Figure 12.4: Public Roads – Whole Project Haul Routes

Table 12-2: Study Area for Public Roads

KWF Grid Connection Study Area (direct or indirect effects)	Cumulative Study Area
Study Area Extent: The route of concentrated construction traffic from Clogh Crossroads (on the R671) onto the Local Road L6074 and Local Road L60741 to the existing Woodhouse Windfarm main entrance in Woodhouse or Tinakilly townland and continuing on the Woodhouse Windfarm private access roads and also a crossing of the L6074 at Woodhouse Substation entrance. Bridges & Culverts (Buried Structures) under the L6074 and along the haul route on the R671.	Study Area Extent: The route of concentrated construction traffic from Clogh Crossroads (on the R671) onto the Local Road L6074 and Local Road L60741 to the existing Woodhouse Windfarm main entrance in Woodhouse or Tinakilly townland and continuing on the Woodhouse Windfarm private access roads and also a crossing of the L6074 at Woodhouse Substation entrance. The Local Roads L2018 & L2019 at Cappagh Quarry which will be used by KWF Grid Connection construction materials traffic (turning west onto the N72) and Knocknamona Windfarm construction materials traffic (turning east onto the N72).
Justification for Study Area Extent: Local Roads and bridges & culverts along routes of concentrated construction traffic or site access points may be affected by construction traffic	Justification for Study Area Extent: the potential for cumulative impacts only relates to those roads which can be affected by KWF Grid Connection and

movements. National and Regional Roads connected to these Local Roads are not likely to be affected due to the habitual use of these roads for HGVs and the very little traffic associated with KWF Grid Connection in the first place. The turbine component deliveries will take place in the late at night/very early morning and will be escorted and carried out by arrangement with the Local Authority and the Gardaí.	Knocknamona Windfarm in the first instance i.e. L2018 & L2019.
Relevant development stage Construction Justification: The delivery of construction materials and turbine components will predominantly occur during the construction period. There may be an occasional delivery of a turbine component replacement part during the operational period, but the impact of such a seldom occurrence would be negligible.	Relevant development stage Construction Justification: The potential for cumulative effects is limited to the construction stage of the KWF Grid Connection development during which impacts can occur.

12.2.1.2 Description of the BASELINE CONTEXT and CHARACTER of Public Roads

The baseline context includes a description of the KWF Grid Connection Study Area and also the wider area which includes the Cumulative Study Area; Knocknamona Windfarm project area; Woodhouse Substation and Woodhouse Windfarm project areas.

12.2.1.2.1 Baseline for KWF Grid Connection Study Area (Public Roads)

Road Pavements: The local roads L6074 and L60741 are single lane roads with narrow verges. The road pavements consist of traditional surface-dressed flexible pavement ('tar and chippings'). A Pavement Condition Survey prepared by Pavement Management Services Ltd (PMS) was carried out in September 2019 following consultation with Josephine McGrath (County Roads Engineer). The pavement condition of the following roads were surveyed - L2018; L2019; L6074; L6074-1. The Roads Department only required a survey of the Local Roads involved. The table below showing baseline conditions - PCI Section Results is extracted from Appendix 12.4: Pavement Condition Survey (Table 4).

Road No.	Location	Lane/Dir	vPCI	Rating	Standard Deviation	% Structure	% Surface
L2018 & L2019	Knocknamona	NB	81	Good	15	36	50
L2018 & L2019	Knocknamona	SB	79	Good	13	28	59
L-6074	Clogh	EB	87	Very Good	3	17	73
L-60741	Woodhouse	SB	81	Good	10	45	42
L-6074	Keereen Upper	EB	46	Poor	0	79	21

Appendix 12.4 Table 4: PCI Section Results

Buried Structures: While one buried structure, in the form of a culvert, does occur under the L6074 public road, no weight restrictions are in place and there will be no requirement to carry out works at this structure. Furthermore all deliveries will be within the allowed axle limits. There are seven structures along the R671

from the N72 junction with the R671 and the turnoff at Clogh Crossroads onto the L6074. These comprise 2 No. bridges; 1 No. concrete cattle underpass and 4 No. concrete/masonry or plastic culverts. These were inspected by a structural engineer and found to be in 'fair to good' condition. There is no evidence at road level of any settlement or failure of the road surface. These structures are purpose built to accommodate traffic loading and therefore suitable for construction materials traffic associated with KWF Grid Connection and turbine component deliveries for Knocknamona Windfarm. Buried Structures are scoped out from further examination as no impacts are expected to occur. The full report on these structures, including photos comprises Appendix 12.3: Structural Inspection of Buried Structures (TLI).

Road Boundaries: consist of a mix of hedgerows and simple mounded embankments, which are aligned beyond drainage channels that occur in many roadside verges. No works are required to road boundaries for either installation of underground cabling, or site access, or delivery of materials or abnormal loads. Therefore, road boundaries are scoped out from further examination as no impacts are expected to occur.

Traffic Volumes: Observation based on site visits, and a review of the traffic survey information, confirms that the L6074 and L60741 are very lightly trafficked, and have on average 99.8% spare capacity during peak traffic periods, further information on traffic volumes is included in Appendix 12.2: Traffic & Transportation Assessment Report (NRB).

Public road cable crossing will be carried out by directional drilling beneath the road structure at one location under the L6074 in Keereen Upper townland.

Concentrated construction material deliveries will occur along the local road L6074 from its junction with the Regional Road R671 at Clogh Crossroads as far as the turnoff onto the L60741 and as far as the site access point for Woodhouse Windfarm (Site Entrance No. 2). Deliveries for Woodhouse Substation will be required to cross the L6074 at Woodhouse Substation (Site Entrance No. 1). Cumulative deliveries of construction materials for both KWF Grid Connection and Authorised Knocknamona Windfarm will only occur along the L2018 and L2019 at Cappagh Quarry.

Turbine Components and the electrical equipment and apparatus for KWF Grid Connection will be transported along the national road network, N29, N25 and N72 and regional road R671 as far as Clogh Crossroad on the R671, then along the local roads L6074 and L60741 to the Woodhouse Windfarm Main Entrance (Site Entrance No. 2). The turbine component loads will then be transported on the existing (private) Woodhouse Windfarm access roads to access the new Link Road (private) and widened forestry road (private) for delivery to Knocknamona Windfarm. Delivery of the electrical equipment to Woodhouse Substation (Site Entrance No. 1) will also use the Woodhouse Windfarm private roads from Site Entrance No. 2 and cross the L6074 beside Woodhouse Substation Entrance Gate (Site Entrance No. 1)

Relevant Figure (at the end of this chapter)

Figure 12.1: Location of KWF Grid Connection in relation to Material Assets
Figure 12.2: Public Road Construction Materials Haul Route
Figure 12.3.: Public Roads - Turbine Components and Electrical Apparatus Haul Route

Relevant Appendix (at the end of this chapter)

Appendix 12.2: Traffic & Transportation Assessment Report (NRB).
Appendix 12.3: Structural Inspection of Buried Structures (Tli)
Appendix 12.4: Pavement Condition Survey (PMS)

12.2.1.2.2 Baseline for the Cumulative Study Area (Public Roads)

Authorised (but not constructed) Knocknamona Windfarm: Deliveries and other construction related traffic for Knocknamona Windfarm will use different haul routes to the KWF Grid Connection traffic. Concentrated construction traffic (stone, concrete) and turbine components will be delivered to the windfarm site along the L2024, L2022 and L6077 local roads, all of which approach the windfarm from the east and do not overlap the KWF Grid Connection haul routes on local roads or regional roads except for the L2018 and L2019 at Cappagh Quarry.

See Figure 12.4: Public Roads – Whole Project Haul Routes

Operational Woodhouse Windfarm and Woodhouse Substation: Access to Woodhouse Windfarm is along the R671, then along the L6074 and the L60741 to the existing windfarm entrances at Woodhouse or Tinakilly townland. Access through Woodhouse Substation Entrance is from the L6074 at Keereen Upper townland. These Regional and Local Roads overlap with KWF Grid Connection haul routes.

12.2.1.2.3 Consideration of the Passage of time

The Revised Knocknamona Windfarm EIS 2015 was reviewed in the context of the current baseline conditions. The passage of time was considered during this review. Material Assets in the area were surveyed again in February 2023 and the following changes have occurred since 2015;

- Public Road Network: Some public road widening works (provision of laybys) and road drainage works were carried out by the Local Authority, on the Local Road L2024 which is located near the Knocknamona Windfarm site entrance and part of the Haul Route for Authorised Knocknamona Windfarm and within the cumulative study area. However it is considered that the works to the roads environment (carried out by the Local Authority) are not material;
- Electricity Network: Woodhouse Windfarm and Woodhouse Substation are now operational, and the Woodhouse Substation forms part of the national electricity network;
- Airborne Telecommunication Signals: The operators of airborne communication signals on the RTE Dungarvan Mast at Ballintaylor Upper and at Kilnafarna Mast #1 remain largely the same, although some equipment has been updated in recent years. Since the 2015 evaluation, 0_2 is now part of the Three Ireland network. SaorSAT, a subscription-free satellite TV service has also been launched in the intervening years, and is now available as mitigation for television interference in the locality. There are also additional operators on Kilnafarna Masts #2 and #3, however none of these operators have antennae orientated in the direction of the windfarm, and as they have not potential for impacts, these signals are not considered further herein.
- No changes have occurred to local overhead telephone lines; No new water services have been installed in close proximity to the Knocknamona Windfarm or the KWF Grid Connection.

12.2.1.3 IMPORTANCE of Public Roads

The local roads generally serve as access to local residential traffic and are used for farming and rural operations and activities.

12.2.1.4 SENSITIVITY of Public Roads

Public Roads in the study area are considered to have a **Low sensitivity**, as per the IMPERIA methodology outlined in Section 12.1.6, due the extremely low usage of these roads, primarily serving as access to 10 houses and circa. 16 farm landholdings.

12.2.1.5 TRENDS for Public Roads in the Baseline Environment

While the current good condition of the public road pavements on the L6074 and L60741 is likely to continue, these roads will very slowly dis-improve over time with wear and tear. Traffic volumes on the local roads are

not expected to change by the time of construction, as no major changes to farm practices are expected, and there are no new planning permissions for significant developments along either the L6074 or L60741.

12.2.1.6 The 'Do Nothing Scenario' (the Environment if the Development is not carried out)

If the KWF Grid Connection does not proceed, the effects on the environment will not occur and the baseline environment will only change in line with the trends identified above.

12.2.1.7 Description of the RECEIVING ENVIRONMENT for Public Roads

The receiving environment is the likely state of the baseline environment at the time of construction/operation/decommissioning as relevant i.e. baseline + trends.

The condition of road pavements and traffic volumes are assumed to be the same as the current condition by the start of the construction stage with no material changes envisaged.

12.2.2 EVALUATION OF IMPACTS to Public Roads

In this Section, the direct or indirect impacts and the cumulative impacts of KWF Grid Connection on Public Roads are described.

12.2.2.1 Potential Impacts Evaluated for Public Roads

A conceptual site model exercise was carried out to identify potential impacts through the examination of the specific pathways between the project (source) and the sensitive aspect (receptor).

The potential for impacts was **examined in the absence of mitigation measures**, and **based on the description of development, standard construction methodologies, construction activities and operational activities as described in Chapter 5**: **Description of the Development**.

The potential impacts which were evaluated are listed in the 1st column of the table below. As summarised in the table below, **no significant effects are likely to occur**.

Table 12-3: Conclusion of the Evaluation of Potential Impacts to Public Roads

Potential Impacts which were evaluated	Relevant Stage of KWF Grid Connection	Direct Impact of KWF Grid Connection	Cumulative Impact with the Authorised Knocknamona Windfarm	Impact with Woodhouse Windfarm and Woodhouse Substation	Cumulative Whole Knocknamona Windfarm Project Impact
Damage to Local Road pavements, boundaries, buried structures	Construction	**Neutral**	No potential for cumulative impact	Neutral	**Neutral**

In order to keep this EIA Report concise and focused on potential significant impacts, where the evaluation of potential impacts found no significant impacts from the development, the evaluation tables are presented in the appendix to the chapter.

Because no significant impacts to Public Roads are likely to occur, the Impact Evaluation Table for the potential impact listed in the table above, is in Appendix 12.1 at the end of this chapter.

Relevant Appendix (at the end of this chapter)

Appendix 12.1 Evaluation of Potential Impacts to Material Assets

12.2.2.2 Summary of the Significance of the Potential Impacts to Public Roads

As outlined in the table above, **damage to Local Road pavements, boundaries and buried structures on Public Roads as a direct result of KWF Grid Connection will be Neutral.** This is due to low sensitivity of the local roads, extremely low volumes of daily traffic, low magnitude of any effects to local road pavements, there will be no widening of boundaries, no new access points and no works to buried structures/bridges.

Cumulative impacts of KWF Grid Connection with Knocknamona Windfarm: there is no potential for cumulative impacts, this is due to KWF Grid Connection using different local roads to those used by Knocknamona Windfarm except for an overlap on the L2018 & L2019 for access and egress to and from Cappagh Quarry. **Overall the 'whole project' effect of KWF Grid Connection and the Authorised Knocknamona Windfarm to Public Roads will not be significant.**

When Woodhouse Windfarm and Woodhouse Substation are also taken into account, the additional cumulative impact will be Neutral, this is generally due to Woodhouse Windfarm and Woodhouse Substation already been constructed, with no further construction works and associated traffic required; operational traffic associated with both of these projects is negligible; no turbine component deliveries for Woodhouse Windfarm are planned nor expected to occur during the construction period associated with the whole project.

12.3 Summary of the Material Assets Chapter

The Material Assets chapter examines the effects of the KWF Grid Connection on the local, regional and national roads which are part of the Public Road network, and the built services (pipes, overhead lines, underground cables and wireless signals) which supply drinking water, electricity and communication services to houses, businesses and community facilities in the area. Road users (pedestrians, cyclists, and drivers of motor vehicles) and the end users of built services are also included for evaluation.

The following aspects of Material Assets were considered during scoping for this topic chapter: road pavements, buried structures, road boundaries, traffic volumes, public road cable crossing works, construction materials delivery route and turbine component and electrical apparatus delivery routes.

Public Roads (Damage to Local Road pavements, boundaries, buried structures) was scoped in for detailed examination.

The other aspects were scoped out because the **effects would be Neutral** on Public Roads and Road Users along national and regional roads as far as Clogh Crossroads (junction of the R671 with L6074); Public Roads and Road Users along the electrical apparatus and turbine component haul routes as far as the Woodhouse Windfarm Main Site Entrance on the L60741; Public Roads or Road Users along delivery routes for other materials or along transport routes for construction/operational stage personnel as far as Clogh Crossroads; Local Road Users on the L6074 and L60741 (pedestrians, cyclists, and drivers of motor vehicles); and the Electricity Transmission System. There is **No Potential or Likely Impacts** on the Local Electricity Network, Local EIR Network, Public Water Supply & Private Group Schemes, Airborne Communication Signals & Television Reception. (Rationale for scoping out Section 12.1.3.2)

In relation to the sensitive aspects which were scoped in for evaluation, the impacts were evaluated as follows:

- **Damage to Local Road pavements, boundaries, buried structures**: potential impacts were evaluated as **Neutral**. (Section 12.2.2)

Related Documents

Non-Technical Summary of this chapter can be found in Volume C1: Non-Technical Summary: Section 12

Figures for Material Assets chapter

Figure 12.1: Location of KWF Grid Connection in relation to Material Assets
Figure 12.2: Public Road Construction Materials Haul Route
Figure 12.3: Public Roads - Public Roads - Turbine Components and Electrical Apparatus Haul Route
Figure 12.4: Public Roads – Whole Project Haul Routes

Appendices for Material Assets chapter

Appendix 12.1 Evaluation of Potential Impacts to Material Assets
Appendix 12.2: Traffic & Transport Assessment Report (TLi) - pdf page 31 - 111
Appendix 12.3: Structural Inspection of Bridge Structures (Tli) - pdf page 112 to 134
Appendix 12.4: Pavement Condition Survey (PMS) - pdf page 135 to 149

12.4 Reference List

Census 2016 Small Area Population Statistics. https://data.cso.ie/#

Road Safety Authority, Road Casualties and Collisions in Ireland 2019 Tables – Provisional (June 2022 https://www.rsa.ie/docs/default-source/road-safety/r2---statistics/road-collision-annual-reports/road-casualties-and-collisions-in-ireland-2019.pdf?Status=Master&sfvrsn=a6dcadd8_3

Location of Eircom services. Click Before You Dig - https://cbyd.enet.ie/

Location of Gas Networks services – email location to dig@gasnetworks.ie

Location of ESB Networks services – email location to dig@esb.ie

Location of all Utilities https://www.beforeudig.ie/

Figure 12.1 - Location of the KWF Grid Connection in relation to Material Assets

Legend:

KWF Grid Connection:

- KWF Grid Connection Construction Works Area
- Access Road through Woodhouse Windfarm Entrance
- Aglish Village — Town/Village

KWF Grid Connection

Aglish Village

Dungarvan Town

DUNGARVAN
Dún Garbhán

SLIEVE GRIAN

N

Figure 12.2 - Public Road - Construction Materials Haul Route

Legend:

KWF Grid Connection:

- KWF Grid Connection Construction Works Area
- Access Road through Woodhouse Windfarm Entrance

Haul Route:

- KWF Grid Connection Construction Materials Haul Route

Whole Project:

- Authorised Knocknamona Windfarm and amendments

Other Projects:

- Existing Woodhouse Substation
- Existing Woodhouse Windfarm

Map Features:

- BS — Buried Structure along the Local Road
- L6074 — Road Identification Number
- Quarry Location

BS1
BS2
BS3
BS4
BS5
BS6
BS7
BS8
R671
N72
L2019
L2018
L6074
L60741
Roadstone Cappagh Quarry
Kereen Quarry
Existing Woodhouse Substation
Site Entrance 1 at Woodhouse Substation
Site Entrance 2 at Woodhouse Windfarm Main Entrance
Existing Woodhouse Windfarm
KWF Grid Connection Construction Works Area
Authorised Knocknamona Windfarm and amendments
Clogh Croassroads
Aglish Village
Springfield
Quarter
Bewley
Bullaun Stone
Knockalahara
Clashnadarriv
Curraghmoreen
Kilmolash
Drumroe
Kildoher
Rockfield
Ballynahemery
Ballynamintra Lower
Farrantbullen
Bridgequarter
Whitechurch
Ballygambon Lower
Knocknaskagh Lower
Ballynameelagh
Clonkerdin
Scart
Ballykennedy
Ballynamintra Middle
Ballynamintra Upper
Cappagh
Dismantled Railway
Knocknacrooha
Coolnana
Canty
Kilgreany
Woodstock
Knocknaskagh Upper
Cool
Ross
Fulachtai Fia
Ballygambon Upper
Keereen Lower
Ballymulalla West
Coolatoor
Lauragh
Parkeenagarra
Knockmaon
Mountodell
Carrigroe
Cloghbog
Kilmagibboge
Clogh
Woodhouse Cr. Rds.
Augharnorrick
Ballymulalla East
Knocknamona
Ballintaylor Lower
Barranastook
Kilnafarna Lower
Ballyguiry West
Ballyguiry East
Ballynaparka
Collin's Br.
Holy Well
Killatoor
River Brickey
An Bhroice
Finisk
Magaha
An Fhinse
Kildoher Br.
Finisk Br.
Whitechurch Br.
Bewley Br.
Kilmolash Br.
Curraghroche Cr. Rds.
Knocknaskagh Cr. Rds.
Keereen Cr. Rds.
Lauragh Br.
Lauragh Cr. Rds.
Canty Br.
Knockmaon Br.
Aughanorrick Br.
Ballynicole Br.
Ballyguiry Br.
Ballynaparka Br.
Church
Ch
Sch
Holy Well
N

Figure 12.3 - Public Roads - Turbine Components and Electrical Apparatus Haul Route

Legend:

KWF Grid Connection:

- KWF Grid Connection Construction Works Area
- Access Road through Woodhouse Windfarm Entrance

Haul Route:

- Turbine Component Haul Route through Woodhouse Windfarm Main Entrance

Whole Project:

- Authorised Knocknamona Windfarm and amendments

Other Projects:

- Existing Woodhouse Substation
- Existing Woodhouse Windfarm

Map Features:

- L6074 Road Identification Number

Kilcloher Junction

N72

R671

Turbine Components and Electrical Apparatus Haul Route

N72

R671

R671

Existing Woodhouse Windfarm

Existing Woodhouse Substation

Clogh Croassroads

L6074

L60741

KWF Grid Connection Construction Works Area

Authorised Knocknamona Windfarm and amendments

Site Entrance 2 at Woodhouse Windfarm Main Entrance

Authorised Knocknamona Windfarm Main Entrance at Knocknaglogh Lower

Dungarvan Town

N

Kilcloher Junction

N72

R671

Turbine Components and Electrical Apparatus Haul Route

Roadstone Cappagh Quarry

R671

Kereen Quarry

Clogh Croassroads

L6074

L60741

Existing Woodhouse Windfarm

Existing Woodhouse Substation

KWF Grid Connection Construction Works Area

Authorised Knocknamona Windfarm and amendments

Site Entrance 2 at Woodhouse Windfarm Main Entrance

Authorised Knocknamona Windfarm Main Entrance at Knocknaglogh Lower

Authorised Junction & Bend widening works

N72

R672

Dungarvan Town

Figure 12.4 - Public Roads - Whole Project Haul Routes

Legend:

KWF Grid Connection:

- KWF Grid Connection Construction Works Area
- Access Road through Woodhouse Windfarm Entrance

Haul Routes:

- KWF Grid Connection Construction Materials Haul Route
- Turbine Component Haul Route through Woodhouse Windfarm Main Entrance
- Authorised Knocknamona Windfarm Construction Materials Haul Route
- Authorised Turbine Component Haul Route through Knocknamona Windfarm Main Entrance at Knocknaglogh Lower

Whole Project:

- Authorised Knocknamona Windfarm and amendments
- Authorised Junction & Bend widening works

Other Projects:

- Existing Woodhouse Substation
- Existing Woodhouse Windfarm

Map Features:

- L6074 Road Identification Number

N

Appendix 12.1: Evaluation of Potential Impacts to Material Assets

This Appendix contains Impact Evaluation Table for the following Sensitive Aspect:

Sensitive Aspect Details as per Main EIA Report		Relevant Section of Main EIA Report:
Sensitive Aspect No. 1	Public Roads	Section 12.2 of the Main EIA Report

Evaluation of Potential Impacts to PUBLIC ROADS

In relation to **Public Roads**, the following potential impacts were evaluated:

Potential Impacts which were evaluated	Relevant Stage of KWF Grid Connection	Evaluated in this Appendix in Table:
Damage to Local Road pavements, boundaries, buried structures	Construction Stage	A12.1, Table 1

A12.1 Table 1 Public Roads - Damage to Local Road pavements, boundaries, buried structures

Impact Source	Trenching works, site access, construction traffic
Impact Pathway (between Source and Sensitive Aspect)	Road carriageway/corridor
Brief Impact Description	Road pavements can be affected by additional construction traffic along local roads (L6074 & L60741) which can lead to deterioration of the road edges at site access points and along haulage routes. Additional traffic volumes can also affect the integrity of road pavements. Roadside boundaries can be affected by widening works, or new access points to adjacent lands – there are no widening works, or new access points required for KWF Grid Connection. Roadside boundaries are important for road safety. Buried structures such as culverts or stone arches can be affected if works are required to the structure, or in close proximity to the structure, or potentially by the delivery of exceptionally heavy loads – there are no works required to buried structures and all deliveries will be within allowable axle weights.
Project Stage:	Construction
A: Direct/Indirect Impacts of KWF Grid Connection	The impact will have **Neutral** significance because: • The low sensitivity of the local road on which the works occur, due to the extremely low volumes of daily traffic required for KWF Grid Connection works (up to 3 loads per day.) • the low magnitude of any effects to local road pavements due to the small scale of delivery traffic, any impacts (including deterioration of the surface of the road along haul routes) will be reversible with reinstatement; • No impact on roadside boundaries – no widening of boundaries or new access points will be required for KWF Grid Connection which will use the already existing entrances at Keereen Upper. • No impact on roadside boundaries for the delivery of turbine component loads - the same haul route as that used (and already widened) for Woodhouse Windfarm will be used for KWF Grid Connection including the delivery of turbine components to Knocknamona Windfarm. KWF Grid Connection will use the already existing Woodhouse Windfarm entrance at Woodhouse or Tinakilly on the L60741 and the existing Woodhouse Substation entrance at Keereen Upper on the L6074. • No impact on the one buried structure along the L6074. No works to buried structures will be required for KWF Grid Connection. • All deliveries will be within the allowable axle weights, in the context of the absence of weight restrictions on the Local roads; and the prior use of these roads for construction traffic and turbine component and electrical apparatus deliveries.
B: Cumulative Impact of the Whole Project - KWF Grid Connection with the authorised	**No Potential for Cumulative Impact** because: • KWF Grid Connection will use different local roads to those used by Authorised Knocknamona Windfarm save for the L2018 and L2019 for access and egress at Cappagh Quarry, therefore there is negligible potential for cumulative impacts to local roads. • Impacts to Public Roads as a result of Authorised Knocknamona Windfarm were

Knocknamona Windfarm i.e. the windfarm; amendments to the windfarm to provide for larger turbines and Junction & Bend Widening Works to facilitate turbine component access through the windfarm site entrance at Knocknaglogh Lower	previously assessed by An Bord Pleanála as not significant in 2016 and 2022. The additional Neutral impact associated with KWF Grid Connection and the use predominately of separate local road networks means the combined whole project effect remains not significant. • In relation to Junction & Bend Widening Works to facilitate turbine component deliveries to the Knocknamona Windfarm Entrance at Knocknaglogh Lower – road widening and resurfacing will improve the condition of on the L2024, L6077 and L2022 roads and road boundaries will be reinstated/replaced, along the original alignment following the works.
C: Cumulative Impact of KWF Grid Connection with Knocknamona Windfarm, Woodhouse Substation and Woodhouse Windfarm	The cumulative impact will be **Neutral** because: • Woodhouse Windfarm and Woodhouse Substation are already constructed, with no further construction works and associated traffic and road cable crossing works required. Operational stage traffic associated with these two projects is negligible, and no deliveries of turbine component for Woodhouse Windfarm or abnormal loads for Woodhouse Substation are planned or expected to occur during the construction period associated with KWF Grid Connection. Therefore, the operation of Woodhouse Windfarm and Woodhouse Substation will not contribute to cumulative impacts during the construction of the whole project.

Appendix 12.2: Traffic & Transport Assessment Report

The data and descriptions in this appendix have informed Chapter 12: Material Assets of the EIA Report

consulting engineers

NRB

Traffic/Transport Assessment

for

KWF Grid Connection Works

at

Drumhills,
Co. Waterford.

SUBMISSION ISSUE

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Registered in Ireland No. 491679

CONTENTS:

APPENDICES:

1.0 NON-TECHNICAL SUMMARY

This report has been prepared in accordance with Transport Infrastructure Ireland's Traffic & Transportation Assessment Guidelines and addresses the worst-case vehicular traffic impact of the proposed KWF Grid Connection works and the cumulative works, which in this instance are the construction phases of the Knocknamona Windfarm and the KWF Grid Connection works along cumulative transport routes.

The adequacy of the road network to safely and appropriately accommodate the worst- case transportation demands of the proposed KWF Grid Connection development and the cumulative traffic impacts with the construction of the consented Knocknamona Windfarm is addressed.

A comprehensive classified traffic survey ('traffic counts') of the road network in the vicinity of the site was undertaken in Feb/March 2023. This information, together with observation of the performance of the road network, forms the basis for this assessment. Traffic Data was collected using temporary Automatic Traffic Counters known as 'ATC tube counters', and these allowed full vehicle classification to be measured and recorded.

It is intended that construction materials deliveries and construction operatives will use the established road network during the construction stage. The suitability of this haul route in terms of Traffic Capacity and Traffic Safety has been assessed. For the proposed KWF Grid Connection, this same route and network is already established as adequate, as it facilitated the construction of the operational Woodhouse Windfarm and the wind turbine component deliveries, with the required geometric widening and road strengthening already in place.

In terms of the assessment of the Traffic Impact of the proposed KWF Grid Connection and cumulatively with the consented Knocknamona Windfarm, the construction programme and plans prepared for the works elements allow the associated daily traffic volumes to be calculated. The worst-case daily traffic associated with each element of the works (consented Knocknamona Windfarm and the proposed KWF Grid Connection) was assigned to the roads in accordance with industry guidelines for an assumed commencement/construction year of 2025. The impact of the traffic has been assessed and quantified.

Based on our studies, we believe that there are no adverse traffic/transportation capacity or road safety issues associated with the construction or operation of the proposed KWF Grid Connection and cumulatively with the construction of the consented Knocknamona Windfarm.

2.0 EXISTING CONDITIONS/RECEIVING ENVIRONMENT

2.1 This Transportation Assessment (TA) has been prepared by NRB Consulting Engineers Ltd. NRB is a fully Irish-owned, Irish-based independent business. The principals in the firm together have over 50 years' experience in a wide variety of traffic, transport, traffic impact, roads design & Civil Engineering projects. Though we have excellent experience in other broad-engineering fields, NRB are specialist in the area of Traffic/Roads and Transportation, and in particular in the assessment of the impact of traffic associated with commercial development. Further details of NRB's expertise is available on our website (www.nrb.ie).

2.2 This Report addresses the Traffic/Transportation and Construction/Operational Access issues arising from the construction and operation of the proposed KWF Grid Connection Project and the cumulative traffic impacts with the construction of the consented Knocknamona Windfarm. The location for the works is as per ***Figure 2.1*** below;

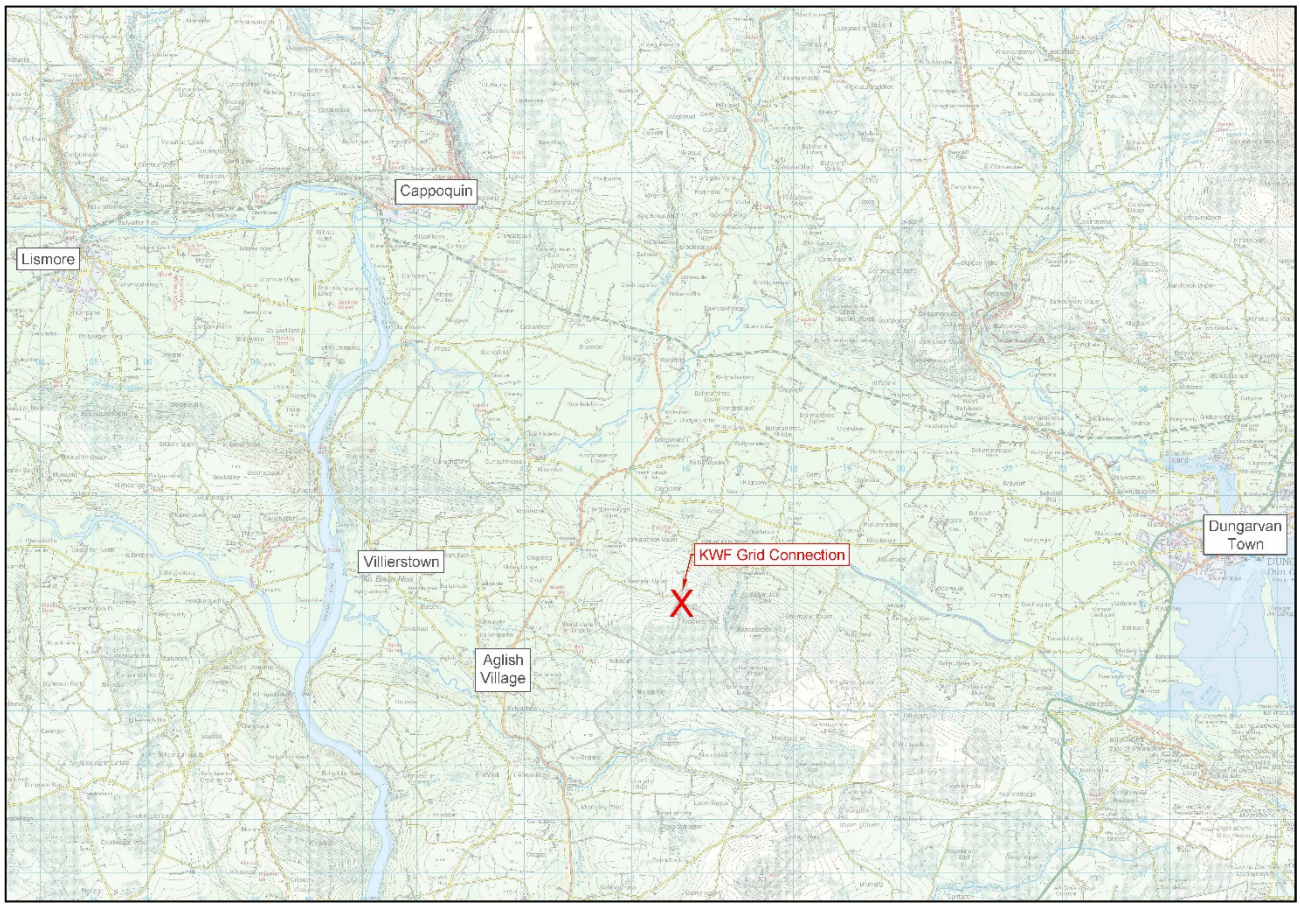


Figure 2.1 - Works Location

2.3 The Knocknamona Windfarm delivery route for construction and operational traffic will fully follow the routes as-consented under the planning permission (Planning Reference 14/600109), from the N25 at Pulla Crossroads along the L2024, L2022 and L6077 to the consented Knocknamona Windfarm site entrance. For concrete and crushed stone deliveries, construction traffic will follow the L2018 and L2019 from Cappagh Quarry to the N72. This is as illustrated in ***Figure 2.2*** below.

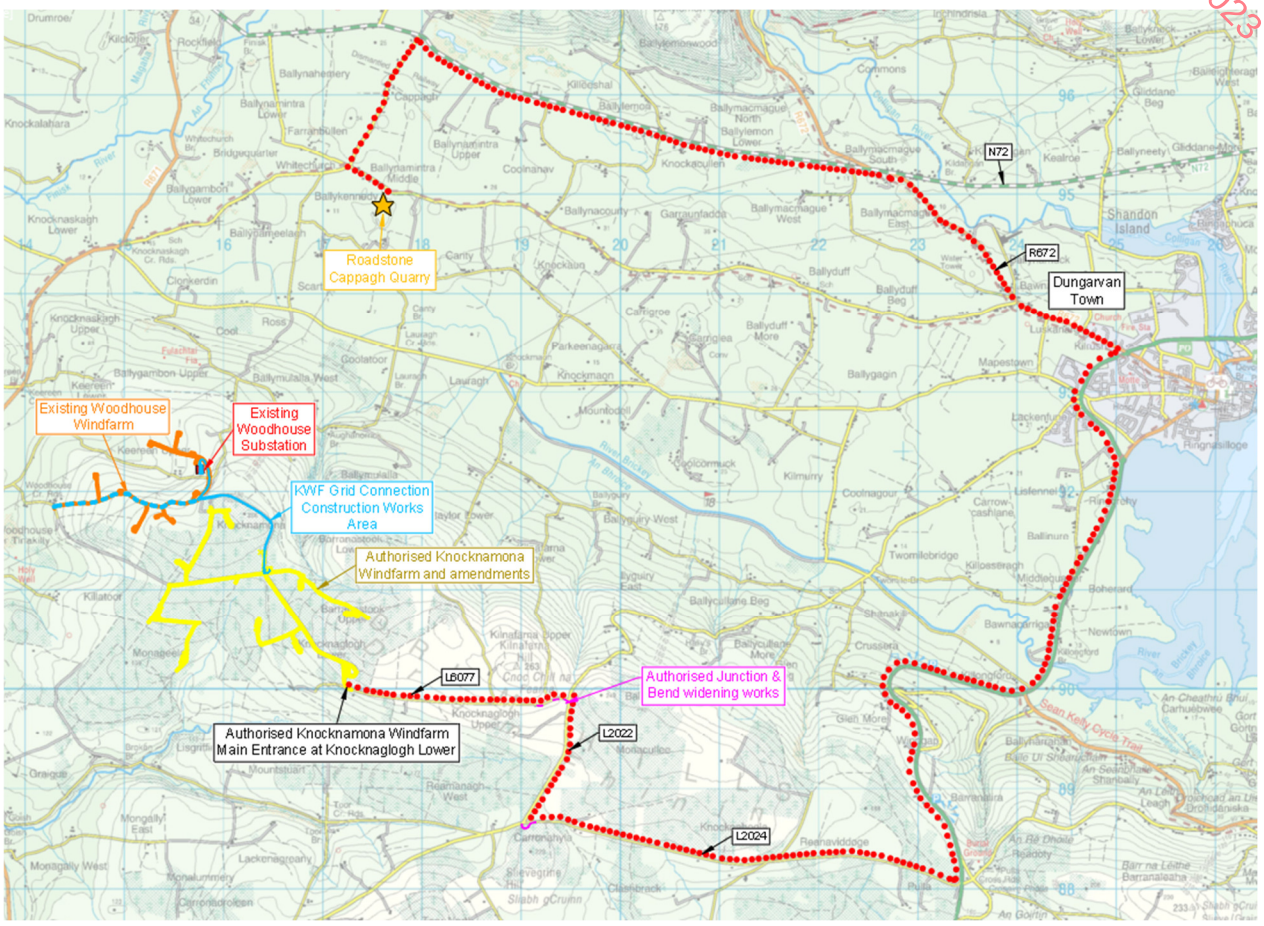


Figure 2.2 - Wind Farm Haul Route - as Authorisedd

2.4 Save for some turbine component deliveries, the construction vehicles for Knocknamona Windfarm will follow the route consented under planning reference 14/600109 (Knocknamona Windfarm) as illustrated above in Figure 2.2. However, it is now proposed to deliver some turbine components for Knocknamona Windfarm along the haul route proposed in the subject application (KWF Grid Connection), with the proposed route for these components as well as for the construction materials and staff for the subject application as per Figure 2.3 below.

2.5 The KWF Grid Connection delivery route for construction traffic will fully follow the established route used for the construction of the existing Woodhouse Windfarm and associated wind turbine component deliveries. All construction operatives, staff and materials (stone, concrete, building materials, electrical apparatus and construction personnel) and the abnormal load haulage (new substation transformer for Woodhouse

Windfarm and turbine components for the consented Knocknamona Windfarm) will originate along the National Road N72. They will then travel via the Regional Road R671, to Clogh Crossroads, then along the Local Road L6074 and then along the Local Road L60741 to the Woodhouse Windfarm Main Entrance in Woodhouse or Tinakilly townland (KWF Grid Connection Site Entrance No.2). This is as illustrated in ***Figure 2.3*** and ***Figure 2.4*** below.

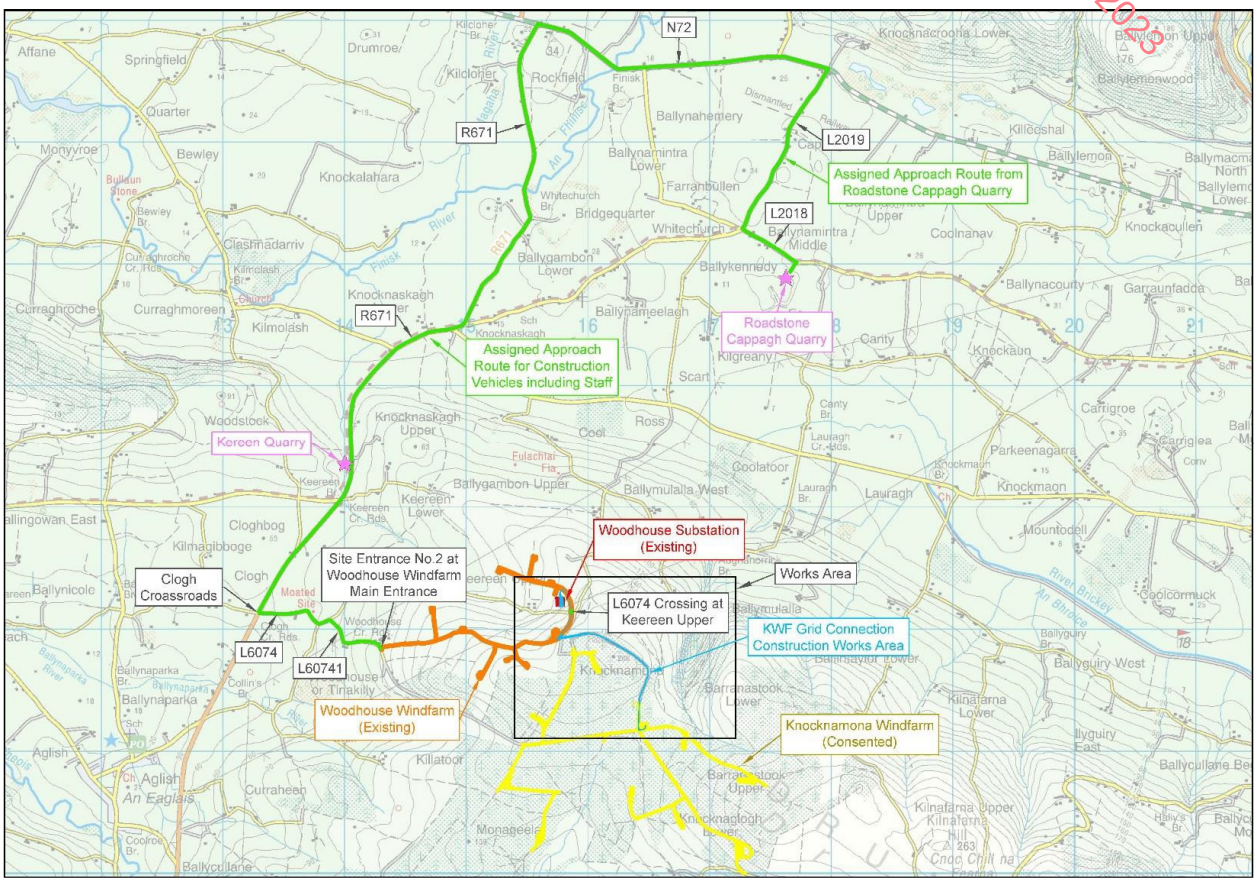


Figure 2.3 - Construction Traffic Route (including Local Quarry/Materials Source) for KWF Grid Connection and Turbine Delivery (including Local Quarry/Material Source)

2.6 The KWF Grid Connection materials and apparatus construction traffic will travel along the Woodhouse Windfarm roads as far as the Woodhouse Windfarm entrance on the L6074, and travel north for less than 100m on the L6074 for a short distance to Woodhouse Substation entrance. The turbine components will be delivered along the Woodhouse Windfarm access roads, then join the proposed new link road (part of the KWF Grid Connection application) and then travel onto the Knocknamona Windfarm turbine sites using the Knocknamona Windfarm access roads. No public road crossing is required for this part of the turbine component deliveries, only windfarm lands are involved. See close-up in ***Figure 2.4*** below.

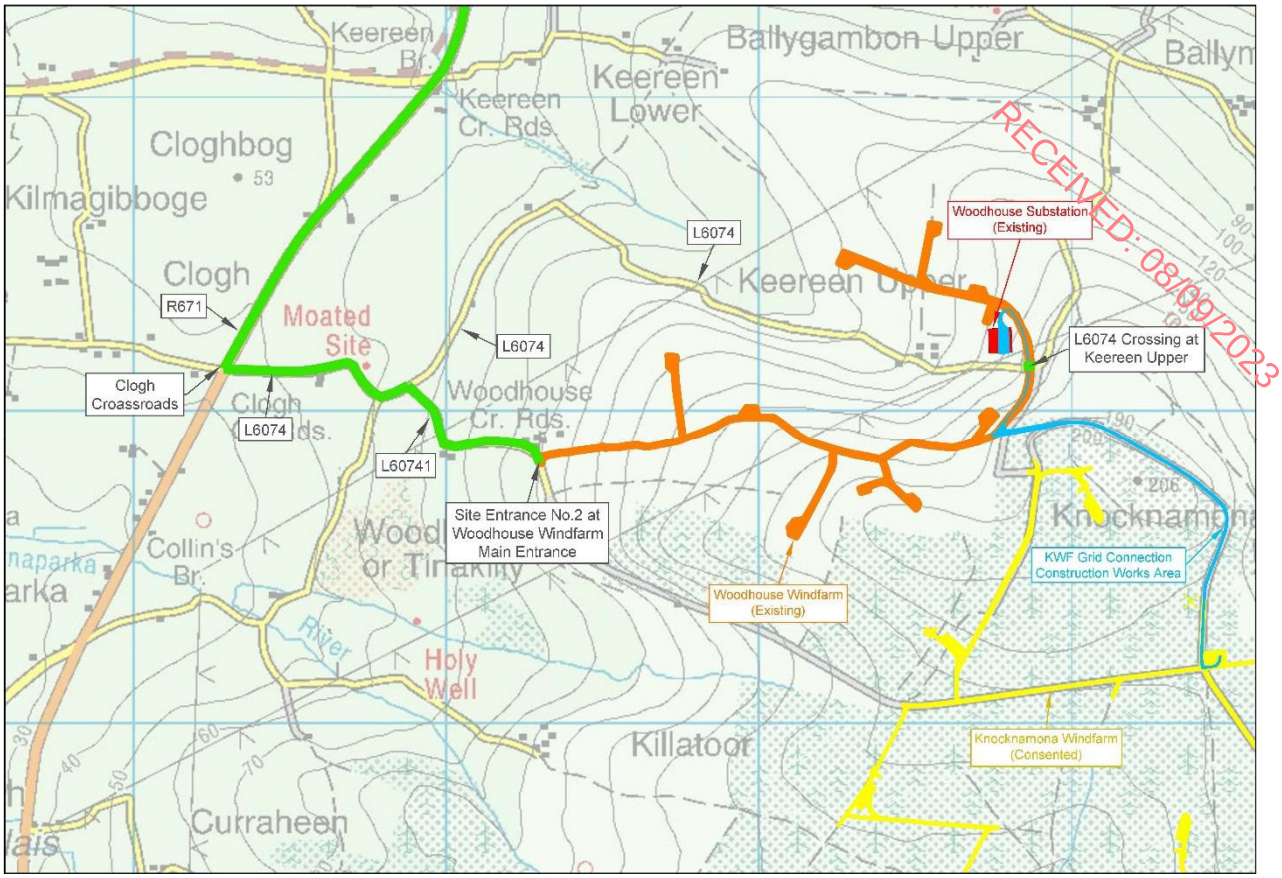


Figure 2.4 – Close up of L6074 and L60741

2.7 Both the proposed KWF Grid Connection and consented Knocknamona Windfarm will source concrete and crushed stone from Cappagh Quarry. Both projects will use the L2018 and L2019 from Cappagh Quarry to the N72, at this point the proposed KWF Grid Connection traffic will turn west and the consented Knocknamona Windfarm traffic will turn east. This is as illustrated in ***Figure 2.5*** below. There are no other local or regional roads that will carry both the proposed KWF Grid Connection traffic and the consented Knocknamona Windfarm traffic. This report examines the cumulative impact of traffic along the L2018 and L2019.

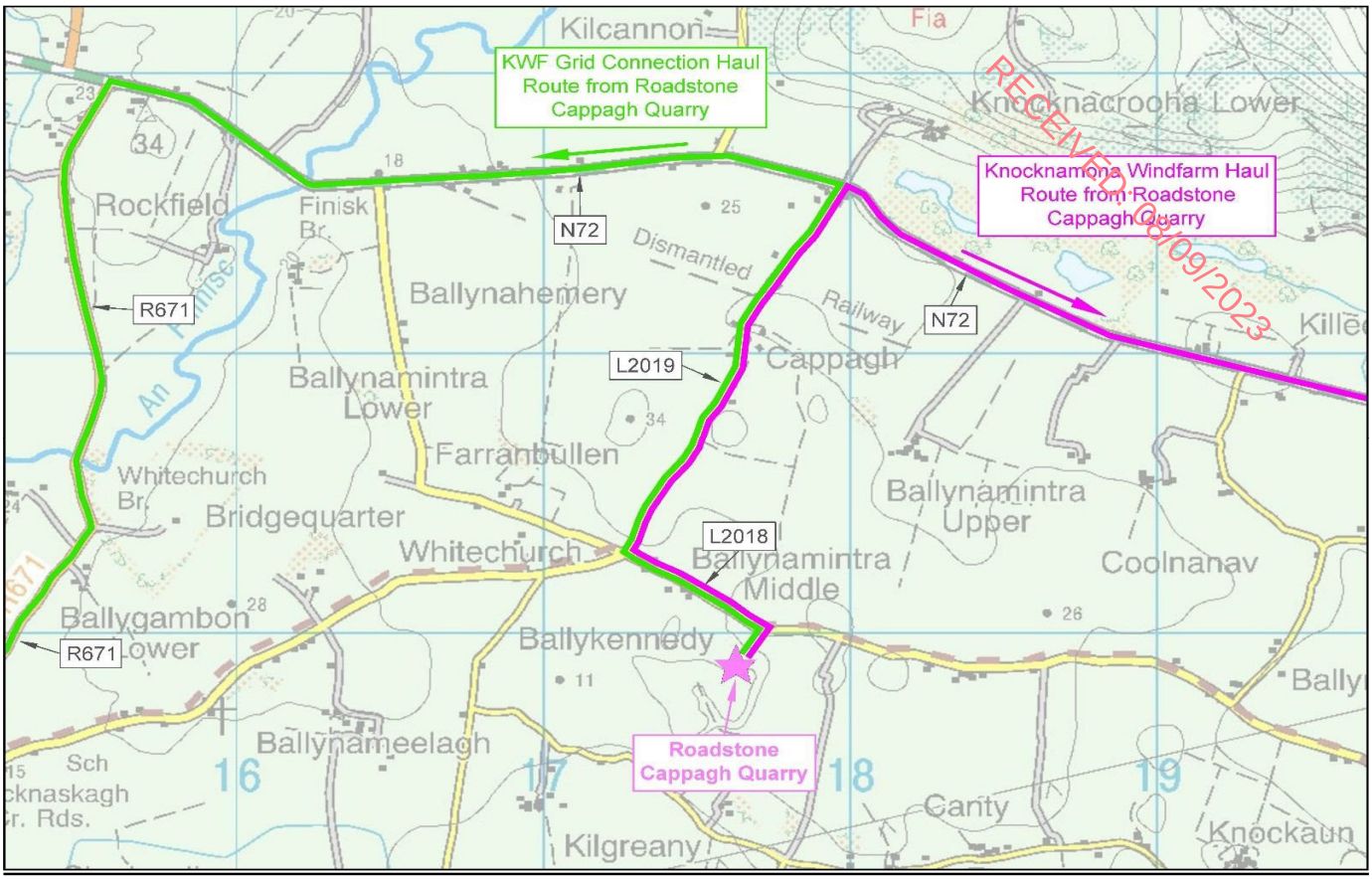


Figure 2.5 – Cumulative Haul Route for KWF Grid Connection and Knocknamona Windfarm from Cappagh Quarry

2.8 In order to establish background traffic conditions on the roads around the site, a comprehensive 24-Hour Automated Traffic Counter (ATC) ('Tube Counter') survey of the local roads was undertaken at 6 specific locations, the Surveys were undertaken over 14 days during Feb/Mar 2023 using ATC Tube Counters and included the following locations & roads, which covered the proposed KWF Grid Connection Route and the consented Knocknamona Windfarm Construction Route; -

- The Local Road L2018 at 'Cappagh' Quarry,
- The Local Road L2019 on the approach to the quarry from the N72,
- The National Secondary road N72;
- The Regional Road R671 leading to the KWF Grid Connection site (as far as Clogh Crossroads),
- The Local Road L6074 leading to the junction with the L6074,
- The Local Road L60741 leading to the Woodhouse Windfarm Main Entrance,
- The Local Road L6074 at the KWF Grid Connection construction traffic crossing at Keereen Upper.

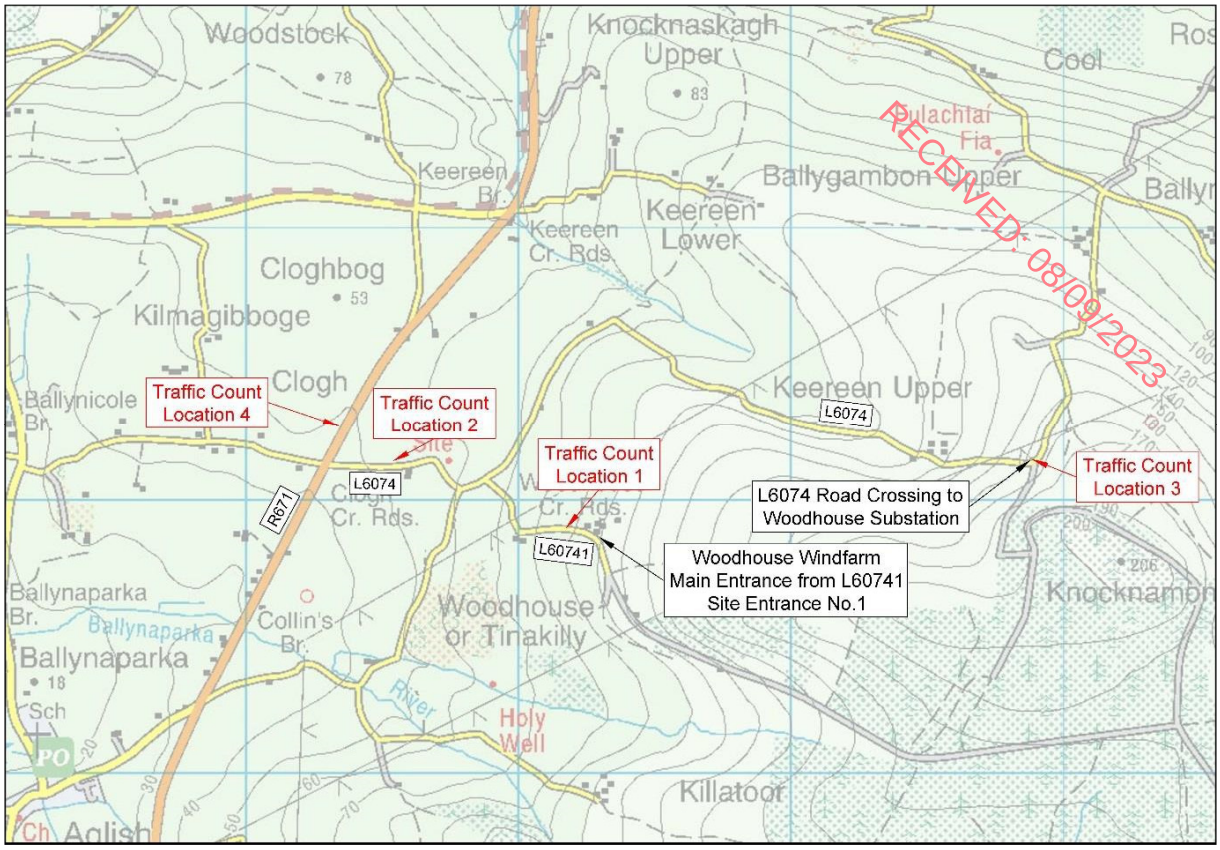


Figure 2.6 – Traffic count locations 1 – 4 along the KWF Grid Connection delivery routes

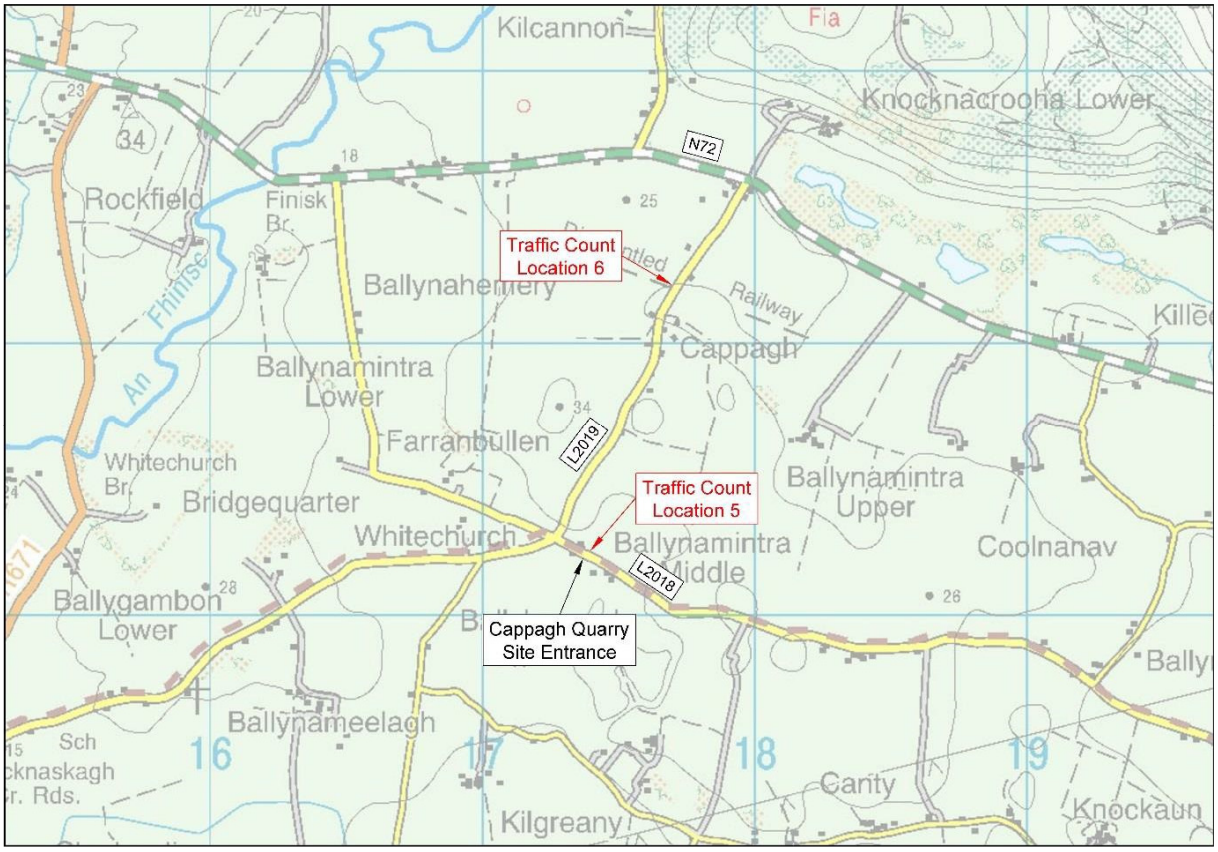


Figure 2.7 – Traffic count locations 5 - 6 along the delivery routes from Cappagh Quarry

2.9 The summary results of the ATC Surveys at each location are represented by Traffic Flow Diagrams included herein as ***Appendix B*** (Results illustrated for AM Peak Hour, PM Peak Hour and 24 Hour Annual Average Daily Traffic). The results clearly show that all of the locally affected roads carry low-moderate levels of traffic.

2.10 The main road, the N72, is classified as a National Secondary Road. It consists of a single carriageway road running generally in an East-West orientation, linking Dungarvan to the east with Lismore and Fermoy to the west. Though there are some local speed restrictions in place, the N72 is generally subject to a 100kph speed limit. Based on the TII Traffic Counter database (Source: TII Counter location at N72 Dungarvan/Cappoquin), it carries a 2-Way 24 Hour AADT of 4,963 Passenger Car Units (PCUs, or car- equivalents). The existing 2-way traffic flow is 482 PCUs during the weekday 8-9am traditional commuter peak hour and 502 PCUs during the 5-6pm commuter peak hour.

2.11 To set these traffic flows in context, a road of the nature of the N72 has a traffic capacity of more than 1,200 PCUs per-direction per hour (in excess of 2,400 PCUs 2-way per hour). This demonstrates and confirms the low to moderate levels of traffic flow currently experienced on the N72, with the existing 24-Hour traffic volume being only 4,963 PCUs.

2.12 The junction of the N72 with the Regional Road R671, was relatively recently upgraded in terms of traffic capacity and traffic safety - it now consists of a high capacity Priority Controlled T Junction, with the provision of a dedicated right turn 'ghost island' or shelter on the N72. An image showing the current facilities at the junction is included below as ***Figure 2.8***; -

Figure 2.8 - Existing N72/R671 Junction

2.13 The Regional Road R671 consists of a single carriageway road. It runs generally in a North-South orientation and links the N72 with Youghal to the south. Being a Regional Road, it is subject to an 80kph speed limit along its length. The R671 carries a 2-Way 24 Hour AADT of 1,774 Passenger Car Units (PCUs, or car-equivalents) adjacent the L6074 Local Road Junction. The existing 2-way traffic flow was measured as 148 PCUs during the weekday 8-9am traditional commuter peak hour and 164 PCUs during the 5 - 6pm commuter peak. In these terms the Regional Road is considered lightly trafficked.

2.14 The junction of the Regional Road R671 with the Local Road L6074 consists of a Simple Priority Controlled T-Junction, with single lane approaches and with adequate sightlines and forward stopping distances available. The Local Road L6074 was previously subject to geometric improvements and widening to facilitate the safe passage of existing Woodhouse Windfarm turbine and substation components, and these improvements will again be utilised for the KWF Grid Connection abnormal load haulage (new substation transformer for additional apparatus at Woodhouse Windfarm and turbine components for the consented Knocknamona Windfarm). The layout and configuration of the junction is illustrated below as ***Figure 2.9***

Figure 2.9 - Existing R671/L6074 Junction

2.15 The Local Road L6074 is a single carriageway rural road, albeit it was recently widened and strengthened as far as the junction with the Local Road L60741 to facilitate the safe passage of construction materials and turbine components associated with the existing Woodhouse Wind Farm. After the Junction with the L60741, the Local Road L6074 is a narrow single carriageway rural road. At Clogh Crossroads, the L6074 carries a 2-Way 24 Hour AADT of 87 Passenger Car Units (PCUs, or car-equivalents) adjacent the R671 Junction. The existing 2-way traffic flow was measured as 6 PCUs during the weekday 8-9am traditional commuter peak hour and 6 PCUs during the 5-6pm commuter peak. In these terms the Road is considered very lightly trafficked indeed (understandably given that it serves as access solely to a few agricultural farms and a few local residents).

2.16 Along the L60741, on approach to the Woodhouse Windfarm main site entrance at Woodhouse or Tinakilly, the Traffic Survey revealed that in this location the road carries a weekday AM Peak Hour 2-way flow of 4 PCUs, a weekday PM Peak Hour 2-way of 5 PCU, and a 24 Hr AADT of 43 PCUs. This constitutes a very lightly trafficked road indeed.

2.17 At the L6074 crossing point at Keereen Upper (to access the Woodhouse Sub-Station), which is along the narrow single carriageway section of the L6074 local road after the Junction with the L60741, the L6074 remains a narrow single carriageway rural road. The Traffic Survey revealed that in this location the road carries a weekday AM Peak Hour 2-way flow of 1 PCUs, a weekday PM Peak Hour 2-way flow of 0 PCUs, and a 24 Hr AADT of 8 PCUs. This constitutes a very lightly trafficked road indeed. The L6074 carries on from Keereen Upper townland as far as the T Junction at Ballymulalla West. The roads in this area are all classified as "Local" (ie L-designated) and are rural in nature.

2.18 In terms of Crushed Rock, stone and Sub-base material, aggregate and concrete deliveries for the proposed KWF Grid Connection, it is proposed that these will again be

locally sourced from Keereen Quarry on the R671 and also Roadstone Cappagh Quarry. The location of and proximity to Roadstone Cappagh Quarry is illustrated above as ***Figure 2.3*** The Quarry is accessed from the N72 onto the local road L2019 and local road L2018 which leads directly to the facility.

2.19 The junction of the L2019 with the N72 consists of a simple priority junction provided with adequate sightlines and forward stopping distances for approaching traffic. The L2019 consists of single carriageway rural local road. The L2019 carries a 2-Way 24 Hour AADT of 335 Passenger Car Units (PCUs, or car-equivalents) on the approach to the N72. The existing 2-way traffic flow was measured as 27 PCUs during the weekday 8 - 9am traditional commuter peak hour and 26 PCUs during the 5-6pm commuter peak. In these terms the Road is also considered very lightly trafficked indeed.

2.20 The L2019 in turn leads to the Local Road L2018 which provides access to Cappagh Quarry. The L2018 consists of a single carriageway rural local road. The Traffic Survey revealed that the L2018 carries 24 Hour AADT of 148 Passenger Car Units (PCUs, or car-equivalents) and a weekday 2-way traffic flow of 12 PCUs during the weekday 8 - 9am traditional commuter peak hour and 11 PCUs during the 5-6pm commuter peak - again this is considered to be very lightly trafficked

Road Safety

2.21 In terms of Historic Road Safety– along the KWF Grid Connection route, whilst the database is now no longer available, a previous review of the Road Safety Authority (RSA) online collision database indicates that there was no record of any significant relevant collision proximate to the site on the rural local roads and at the National Road/Regional Road junctions where the majority of traffic movements occur, between 2005-2016 inclusive (save for some mostly single vehicle accidents which are classified as 'minor' on the database). The original Data from the RSA on-line tool is reproduced below as ***Figure 2.10*** and ***Figure 2.11*** below.

2.22 Save for those on the National Road, all accidents illustrated are classified as 'minor' in nature and these low severity and frequency of accidents provides assurance in terms of the historic trends and safety of the local roads.

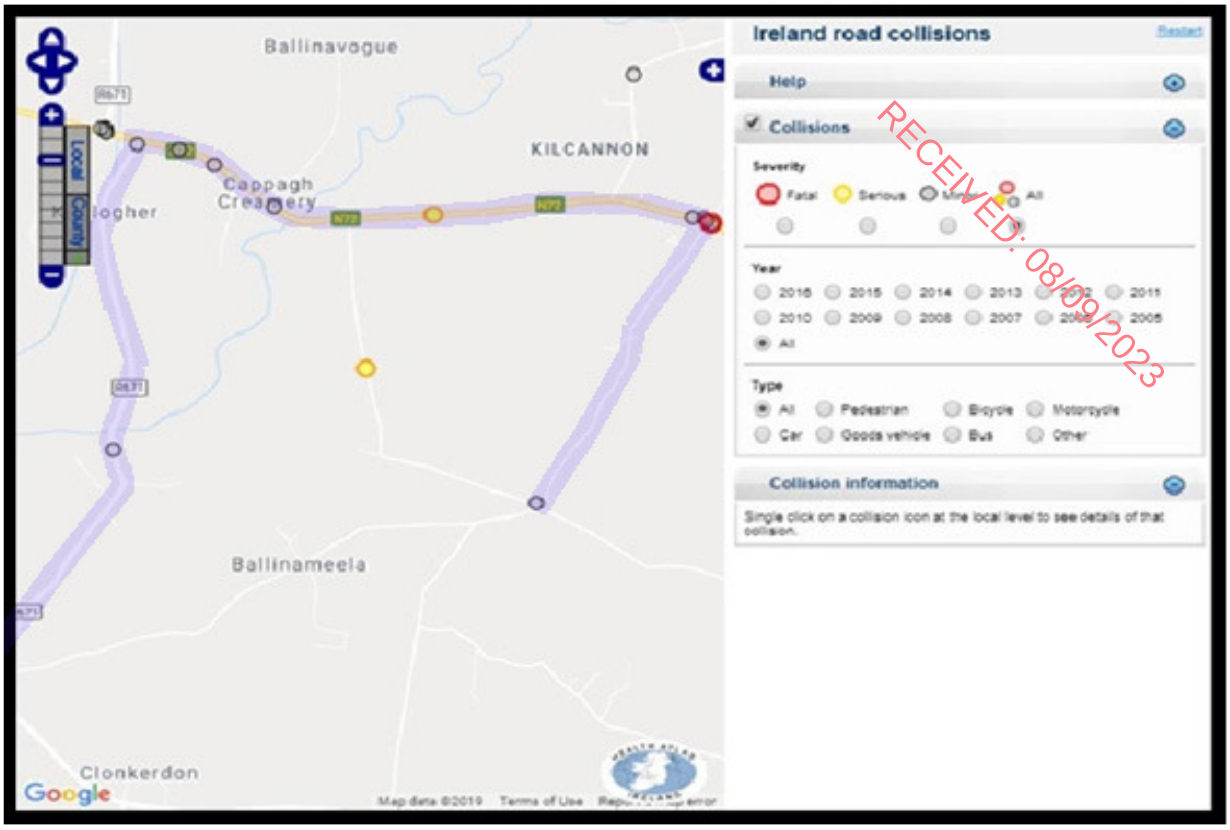


Figure 2.10 - Extract #1 from RSA Database

(KWF Grid Connection haul route from Cappagh Quarry along purple route)

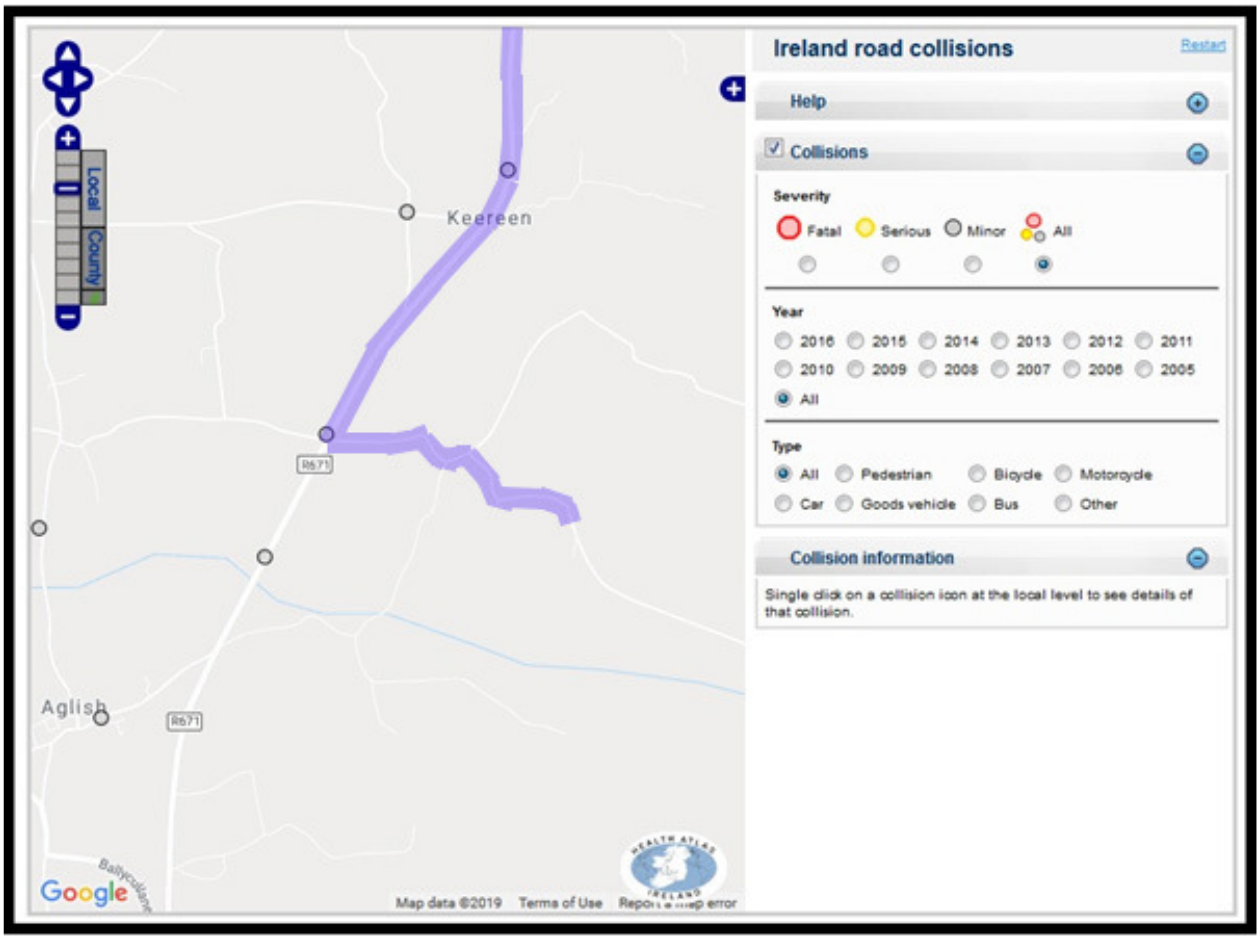


Figure 2.11- Extract #2 from RSA Database

(KWF Grid Connection haul route along purple route)

2.23 It should be remembered that there is an existing established windfarm adjacent to the site, Woodhouse Windfarm, and the construction of the existing windfarm used the same roads and routes that is now intended as the primary haul route for the KWF Grid Connection development.

Road Condition

2.24 In describing the Receiving Environment and the Proposed Future Environment this report addresses the following aspects of the proposed KWF Grid Connection development and cumulatively with the consented Knocknamona Windfarm:

- The Construction Works and Transportation Impact,
- The Safety and Capacity of Construction and Operational Access Points,
- The capacity of the road network and in particular junction capacity to accommodate the worst case predicted traffic volumes associated with the combined works,
- Our observation of existing roads operation and condition.

2.25 Recommendations contained within this Transportation Assessment are based upon site visits, observations of operational performance of the existing road network, a comprehensive classified traffic survey of all of the affected roads, and our experience in assessing and designing for developments of this nature.

2.26 The Report has been prepared broadly in accordance with the following information and industry accepted practices:

- The TII Traffic and Transportation Assessment Guidelines (2014),
- TII Design Manual for Roads and Bridges (2013, as amended),
- The Department for Transport Traffic Signs Manual (November 2021)TII Requirements for the Reinstatement of Openings in National Roads (May 2019).

2.27 It should be noted that to our knowledge the entire road network affected by the work does not have any special vehicle weight restriction in place that would in any way affect the ability to transport the proposed construction materials and abnormal load deliveries. This provides a useful guide to the acceptability of the roads and buried structures and their adequacy to facilitate the movement of the anticipated vehicle types, subject to the normal legally allowable axle loading on Irish Roads.

2.28 In addition, the proposed delivery route for KWF Grid Connection follows exactly the established route for the construction of the existing Woodhouse Windfarm on the site. The geometric improvements strengthening and widening that were used for these works

will again be used for the construction on the now-proposed KWF Grid Connection works and the delivery of turbine components for the consented Knocknamona Windfarm. In our view there is no requirement for further widening or strengthening along the route of the KWF Grid Connection traffic.

2.29 The Applicant will work closely with the Roads Department of Waterford City & County Council to ensure that the roads and road boundaries are maintained and returned to Waterford City & County Council in same or better condition as they are at commencement of haulage of materials and abnormal load deliveries. In this regard, it is proposed that a joint road and boundary condition survey will be carried out in agreement with the Roads Department of Waterford City & County Council.

3.0 PROPOSED DEVELOPMENT & CONSTRUCTION WORKS

3.1 This Report contains an assessment of the worst-case maximum Construction Traffic associated with the KWF Gird Connection works, and abnormal load deliveries, based on an anticipated works programme and schedule.

3.2 We have assigned the worst-case traffic to the roads for the weekday AM and weekday PM Peak Commuter peak periods and assessed the impact in terms of Junction and Link Capacity. We have also provided an assessment in terms of Weekday 24 Hour AADT impact within ***Appendix B***.

3.3 It should be noted that the consented Knocknamona Windfarm will use the consented haulage routes for materials and turbine component deliveries and for staff traffic, from the N25 along the L2024, L2022 and L6077. These haulage roads do not overlap whatsoever with the KWF Grid Connection haulage routes, with the exception of concrete and aggregate deliveries on the L2018 and L2019 from Cappagh quarry.

4.0 TRIP GENERATION, ASSIGNMENT & DISTRIBUTION

4.1 Ordinarily for developments it is possible to use databases such as the Trip Rate Information Computer System (TRICS), to enable the traffic generated by the operational development to be quantified and assigned to the road network. In this case, the reality is that an operational windfarm has naturally very little if any traffic generated associated with its day-to-day final use, i.e. the generation and supply of electricity (perhaps at worst 1 or 2 PCU trips per day, when operational).

4.2 In the case of the subject works, the construction works will have a more significant impact on the local roads than the operation of the windfarm itself. In this regard, we have based the calculation of daily and commuter peak hour traffic movements from the construction phase for the KWF Grid Connection works on the following sources of information; -

- The Construction Details,
- The Construction Programme,
- Anticipated and Planned Construction Staff Numbers,
- Operational requirements.

4.3 In terms of operational activities for the KWF Grid Connection development, it requires minimal maintenance, generally involving;

- Annual walk-over inspection of the cables route,
- Maintenance - As the cables will be factory tested to a high standard, sourced from ESBN approved suppliers and constructed in accordance with ESBN specifications, it is not expected that they will require repair or replacement. However, if a cable needs replacing, new cable can be pulled through the ducts.
- Regular visual inspection of site access roads and site drainage system by the Knocknamona Windfarm asset manager.
- The additional plant and apparatus in Woodhouse Substation will require approximately 4 days of maintenance per annum. Maintenance will involve testing of equipment, apparatus and systems, and may also involve the replacement of electrical parts within the substation compound or control building.
- On-going post construction operational requirements for the cabling elements - the lengths of cabling between jointing will be subject to a single annual inspection to confirm the continued integrity and conductivity of the cable.
- The underground cabling and the Woodhouse Substation will have very infrequent but necessary maintenance requirements. However, this serves to underline the low levels of traffic generated during the operational stages of the works and

reinforces the fact that construction stage traffic is much more significant in terms of potential impact. In these terms, this Transportation Assessment Report focuses on the Construction Stage.

4.4 The location of the proposed Haul Route, construction and operational access locations are illustrated on the plans enclosed within ***Appendix A***.

4.5 Based on the construction programme, the planned construction works, the levels of staff and materials deliveries, we quantified the levels of traffic 'generated' by the KWF Grid Connection works and abnormal load deliveries, and cumulatively with the consented Knocknamona Windfarm deliveries. We then assigned this traffic to the relevant section of road to quantify the impact. This was undertaken for a typical 24 Hour Annual Average Daily Traffic Volume, and for the traditional weekday AM and weekday PM Peak hours.

4.6 The breakdown and assignment of construction traffic for the combined works is expressed as Traffic Flow Diagrams included within ***Appendix B***. Traffic surveys of each of the existing affected roads and junctions were undertaken in order to establish background traffic conditions, in terms of traffic volume. Details of the results of the classified surveys 'ATC Tube Counts' are included here in summary form also in ***Appendix B*** (and also in the Existing Conditions Section, described above).

4.7 In Traffic Engineering, all vehicles are expressed in terms of “Passenger Car Units” (PCUs), sometimes referred to as “Car Equivalents”. This is the methodology which has been employed here (with for example specific industry standard conversion factors to convert HGVs, Rigid Trucks, Skip Lorries, Cars/Trailers and other Lorries to "PCUs"). The conversion factors used are in accordance with industry-standard recommendations.

4.8 We have assigned the traffic to the road network based on the reasonable and industry standard assumption that the trip patterns associated with the works will naturally gravitate to and from the National Roads. We have selected a year of opening of 2025 for the purposes of this assessment, however it should be noted that minor changes of 1-2 years in the selected or actual year of opening will have no impact whatsoever on the conclusions of the study. Ordinarily, a Transportation Assessment for development would require assessment of Design Years which can be 5, 10 or 15years following opening. However, as we have clearly stated the Construction Works will generate traffic levels that, whilst in themselves are considered to be low in volume, they will nonetheless be several multiples on the volume of operational traffic. In these terms the assessment of Design Years of the operational KWF Grid Connection and operational Knocknamona Windfarm which generate extremely low levels of traffic is considered unnecessary and would be of no assessment value, based on our experience

4.9 Traffic growth factors for construction year 2025 were calculated from data obtained in the TII PE-PAG-02017 Project Appraisal Guidelines for National Roads Unit 5.3 (Travel Demand Projections October 2021, Table 5.3.2: Link-Based Growth Rates: Annual Growth Factors) which provides the recommended method of predicting future year traffic growth on public roads. Calculations of the relevant growth factor are included in ***Table 4.1.*** (It should be noted that any requirement to use different or higher growth factors will have no implications for the conclusions of the study).

Table 4.1 - Traffic Growth Rates, TII Project Appraisal Guidelines

Year	to Year	Table 5.3.2:
2023	2025	1.034

TRAFFIC GENERATION CALCULATIONS

4.10 In order to provide Waterford City & County Council with the worst-case assessment of traffic conditions we have calculated the worst-case traffic associated with the 2 separate but related works. This is specifically to address the proposed route for the KWF Grid Connection, the subject works planning application, and any overlap with the Knocknamona Windfarm deliveries in the wider area.

KWF Grid Connection

4.11 The volume of traffic approaching the site along the R671 will be associated with the KWF Grid Connection construction works and abnormal load deliveries. This construction traffic will include deliveries of materials, construction personnel and abnormal load deliveries (turbine components & electrical equipment). Keereen/Aglish Quarry, which can supply crushed stone for the KWF Grid Connection works, is located off the R671. Loads from Keereen/Aglish are accounted for in this assessment.

4.12 As the Local Roads accessing Cappagh Quarry - the L2018 and L2019, includes transporting materials that will be used to construct both the consented Knocknamona Windfarm and proposed KWF Grid Connection, we have undertaken a specific cumulative impact assessment on this route to include crushed stone and concrete deliveries for both these developments. This is included in order to provide reassurance in terms of junction capacity at the L2019/N72 Junction to accommodate the cumulative traffic effects. The L2018 and L2019 leading to Cappagh Quarry, and the Junction with the N72, are the only affected roads that facilitate both KWF Grid Connection and Knocknamona Windfarm construction traffic.

4.13 It is expected that there will be 3 HGV deliveries and c.12 construction personnel or staff arriving to site each day associated with the KWF Grid Connection works. Assuming a normal sharing of staff vehicles, and also assuming that some will arrive prior to 8am, this equates to 8 Staff Vehicles arriving between 8 and 9am (8 Cars or 8 PCUs) and departing between 5 and 6pm. For the purposes of this assessment and in order to provide a Robust and Onerous test of the impact, we have assumed that **all** 3 HGV Site Deliveries Occur (4.5 PCUs) in the AM Peak and PM Peak Hours. KWF Grid Connection material deliveries and construction personnel combined therefore give 12.5 PCUs 2- way assigned to the local roads.

4.14 The construction traffic for the KWF Grid Connection along the L2018 and L2019, is the delivery of 2 HGVs (3 PCUs) of crushed stone or concrete every second day for the 2-month construction period. For the purposes of this assessment and in order to provide a Robust and Onerous test of the impact, we have assumed that **all** 2 HGV Site Deliveries Occur (3 PCUs) in the AM Peak and PM Peak Hours. The L2018 and L2019 from Cappagh Quarry is the overlapping traffic routes for both the proposed KWF Grid Connection and the consented Knocknamona Windfarm.

KWF Grid Connection - Wind Farm Turbine Components

4.15 It is now proposed that wind turbine components for the consented Knocknamona windfarm will be delivered along the proposed KWF Grid Connection haul route (N72/R671/L6074/L60741) to the site. Turbine component will be delivered to the Knocknamona Windfarm site, via the adjacent existing Woodhouse Windfarm site access roads. There will be a maximum of one complete wind turbine abnormal delivery on any one day, which comprises c.9 traditional individual HGV loads in total for each turbine (equating to c13.5 PCUs).

4.16 These 9 HGVs will clearly not arrive together in the peak hour but occur in the early morning hours. During peak traffic times on these days there could, worst-case, be 2 HGV deliveries of wind turbine components (equating to 3 PCUs), and this will be combined with a worst-case of all of the construction personnel travelling to site at the same time (8 PCUs). This results in a robust worst-case total of 11 PCUs travelling to/from the site during the weekday AM and PM peak commuter traffic Hours during turbine component delivery and construction periods.

Consented Knocknamona Windfarm

4.17 In terms of the consented Knocknamona Windfarm, it is intended to use the designated consented routes, as illustrated under ***Figure 2.2*** above (and as enclosed as ***Appendix A***), the capacity of the N25, the L2024, the L2022 and the L6077 were assessed as part of the revised EIS 2015, Appendix 10.5, submitted to An Bord Pleanala for the consented

Knocknamona Windfarm development (***WCCC Planning Ref 14/600109, ABP Ref 93.244006***). In consideration of this application the above roads (N25, L2024, L2022 and L6077) will be wholly unaffected by the subject KWF Grid Connection works.

4.18 In terms of the impact upon the consented Knocknamona Windfarm route via the N25/L2024/L2022/L6077 route to site, the consented route for the Knocknamona Windfarm will still facilitate the deliveries of materials (general, electrical, crushed stone and concrete etc.) and turbine blades for the construction of that windfarm (Planning granted in 2022 for Junction & Bend Widening Works in the vicinity of Knocknamona Windfarm Site Entrance at Knocknaglogh Lower).

4.19 There is only an overlap of construction traffic between the proposed KWF Grid Connection and the consented Knocknamona Windfarm along the route of the crushed stone and concrete deliveries from Cappagh Quarry along the L2018 and the L2019. All other material deliveries and construction personnel will use separate transport routes. Further to this, the KWF Grid Connection works will not take deliveries of crushed stone or concrete during the turbine foundation pours days at Knocknamona Windfarm, therefore not overlapping with the most onerous traffic days at Knocknamona Windfarm. Although Keereen/Aglish quarry (off the R7671) may also be used as a source of stone for KWF Grid Connection, for the purposes of this cumulative assessment, it is assumed that all crushed stone deliveries for KWF Grid Connection will be sourced from Cappagh Quarry in order to provide a robust worst-case cumulative traffic volume for this assessment. Imported crushed stone will only be sourced from Cappagh Quarry for the construction of Knocknamona Windfarm. The overlap of traffic volumes along the L2018 and L2019 will be regular delivery days of 5 HGVs (7.5 PCUs) to the consented Knocknamona Windfarm daily and 2 HGVs (3 PCUs) every second day to the KWF Grid Connection. The overlap period will be no greater than the construction period of the KWF Grid Connection, which is 2 months.

4.20 In this case, the only consented Knocknamona Windfarm traffic that cumulatively affects the proposed subject route is the transport of crushed stone and concrete from Cappagh Quarry along the L2018 and L2019 to the junction with the N72. The cumulative HGV Traffic associated with these elements has been assessed as consisting of 6 PCUs during both the weekday AM and PM Peak Hour Periods, of 10.5 PCUs on a 24Hr AADT basis – See ***Table 4.2*** over.

4.21 For the purposes of this assessment it has been confirmed that there will be no other significant deliveries to KWF Grid Connection during the 8-turbine foundation concrete pour days to Knocknamona Windfarm.

4.22 We have set out below as ***Table 4.2*** for illustrative purposes the net expected impact on each of the commuter peak hour periods and on the 24 Hr AADTs for each of the roads included within the Area of Influence of the proposed KWF Grid Connection construction traffic. Knocknamona Windfarm construction traffic volumes are provided along the overlapping roads with the KWF Grid Connection, L2018 and L2019. It should be noted, as a comparative example, that the Regional Road R671 has a Link Traffic Carrying Capacity of c.1,200 PCUs per-direction per-hour, and the very low traffic volumes as illustrated below should be considered in this context.

Table 4.2 - Volume of Construction Traffic on Roads within Area of Influence

	Total Works Traffic (KWF Grid Connection)			Total Works Traffic (Knocknamona Windfarm)			Total Works Traffic (Whole Project)		
Traffic Count Locations and road numbers	24Hr 2-Way AADT PCUs	AM Peak Hr 2-Way Flow PCUS	PM Peak Hr 2-Way Flow PCUS	24Hr 2-Way AADT PCUs	AM Peak Hr 2-Way Flow PCUS	PM Peak Hr 2-Way Flow PCUS	24Hr 2-Way AADT PCUs	AM Peak Hr 2-Way Flow PCUS	PM Peak Hr 2-Way Flow PCUS
1-L60741	26	12.5	12.5				26	12.5	12.5
2 – L6074	26	12.5	12.5				26	12.5	12.5
3 – L6074							0	0	0
4 –R671	26	12.5	12.5				26	12.5	12.5
5-L2018	3	3	3	7.5	3	3	10.5	6	6
6 - L2019	3	3	3	7.5	3	3	10.5	6	6

5.0 TRAFFIC IMPACT & TRAFFIC SAFETY RECOMMENDATIONS

5.1 In accordance with our methodology, we have followed TII's Traffic and Transportation Assessment Guidelines, in the assessment of the traffic impact resulting from the proposed development. TII's Traffic and Transportation Assessment Guidelines recommends that a threshold assessment & analysis is undertaken to determine the increases in traffic associated with any particular development, and whether this might be considered as significant.

5.2 For developments to be located in areas with roads that are considered as 'congested', the Guidance recommends the use of ***Threshold-levels of traffic increase of 5%***, which if exceeded require further assessment to be undertaken. The Threshold level is set at **10% for uncongested conditions**. In the case of the subject development, the 10% threshold is clearly breeched for the Local Roads (designated "L") which are currently very lightly trafficked and where any increase in traffic whatsoever will result in the TII Thresholds being breeched. We believe that in these circumstances it is inappropriate to apply Thresholds, particularly when the traffic volumes generated are also considered to be low as evidenced from ***Table 4.2*** in the foregoing.

5.3 The construction of the subject application (i.e. KWF Grid Connection) in isolation is considered to be negligible in terms of Traffic/Roads impact, as the levels of traffic associated with these works are relatively small in the context of the area and in terms of the number of operatives and materials requirements. In these terms, in our opinion, the KWF Grid Connection works are likely to go entirely unnoticed and will be unnoticeable on the local roads.

5.4 Wind Turbine Component deliveries for the Authorised Knocknamona Windfarm will follow the route of the proposed construction traffic route of the KWF Grid Connection works. There will be a maximum of one complete wind turbine abnormal delivery on any one day, which comprises c.9 traditional individual HGV loads in total for each turbine. These 9 (13.5 PCUs) HGVs will most likely be delivered outside daytime hours. During peak traffic times on these days there could, worst-case, be 2 HGV deliveries of wind turbine components (equating to 3 PCUs), and this will be combined with a worst-case of all of the construction personnel travelling to site at the same time (8 PCUs). This results in a robust worst-case total of 11 PCUs travelling to/from the site during the weekday AM and PM peak commuter traffic Hours during turbine component delivery and construction periods. A total addition of 11 PCUs, or car-equivalents on roads of this nature is considered to be totally insignificant and will we believe go unnoticed on the local road network.

5.5 This assessment has included the effect of the cumulative Construction Traffic associated with both the KWF Grid Connection and the already Authorised Knocknamona Windfarm works. In terms of over lapping construction traffic routes, only the L2018 and L2019 local roads from Cappagh Quarry to the N72 will be used by both the proposed KWF Grid Connection and the Authorised Knocknamona Windfarm. The overlapping route of crushed stone and concrete along the L2018 and L2019 local roads which are expected to run concurrently with the KWF Grid Connection works over a 2-month period. In terms of impact, the resulting traffic increase of 6 PCUs maximum in any one hour on the L2018 and L2019, and onwards to the junction of the N72 being equivalent to one additional car every 6 minutes is not considered to be significant in Traffic Capacity or Safety terms.

5.6 The route of construction and component traffic for the Authorised Knocknamona Windfarm, along the N25, L2024, L2022 and the L6077 was assessed by Malachy Walsh and Partners Engineers as part of the planning application revised EIS 2015, Appendix 10.5, submitted to An Bord Pleanála for the Authorised Knocknamona Windfarm development (WCCC Planning Ref 14/600109, ABP Ref 93.244006). That assessment concluded that the proposed Knocknamona Wind Farm local road network would have sufficient capacity for the peak construction and operational phase traffic volumes generated by Knocknamona Windfarm. The additional heavy vehicle traffic, during peak construction, will have no significant effect on the capacity of the road network in the long term. Traffic disruption on the local road network will be minimised by ensuring all heavy vehicles follow the designated haulage routes. During operation of the Windfarm the predicted increase in traffic will not generate any significant impacts on traffic in the vicinity of the site given the very low volumes observed locally.

5.7 Furthermore, the proposed development of the Authorised Knocknamona Windfarm and the subject KWF Grid Connection results in short duration peak traffic during the construction works - for the most part the Traffic Impact and effects will go unnoticed. In order to provide Waterford City & County Council with assurance that the road network is adequate we have undertaken and enclosed detailed Modelling and Capacity assessment for the weekday 8-9am and weekday 5-6pm commuter peak hours for the following key junctions; -

- The N72/L2019 Priority T Junction leading to Cappagh Quarry – Appendix C,
- The N72/R671 T Junction – Appendix D, and
- The L6074/R671 T Junction – Appendix E.

Junction Capacity Modelling

5.8 We have used the TII-approved software package 'Junctions 9' PICADY' (Priority Intersection Capacity and Delay) software package (as part of the TRL Package Junction 9') to assess the capacity of the existing and improved road junctions to accommodate the development construction Traffic Volumes. PiCADY produces results based on a ratio of flow to capacity (RFC) and queue length. An RFC greater than 1.00 indicates that a junction is operating at or above capacity, with 0.85 considered to be the optimum RFC Value.

5.9 We have appended the detailed computer simulation model results (PiCADY Outputs) of the junction modelling for each of the above junctions as ***Appendix C, Appendix D and Appendix E.***

5.10 A summary of the results is reproduced below as ***Table 5.1, Table 5.2 and Table 5.3.***

Table 5.1 - PiCADY Results N72/L2019 Priority Junction (Leading to Cappagh Quarry)

Modelled Scenario	Period Mean Max Q (PCUs)	Period Max RFC
Opening Year 2025 AM Peak Hr	<1	0.08
Opening Year 2025 PM Peak Hr	<1	0.06

Table 5.2 - PiCADY Results N72/R671 Priority Junction

Modelled Scenario	Period Mean Max Q (PCUs)	Period Max RFC
Opening Year 2025 AM Peak Hr	<1	0.25
Opening Year 2025 PM Peak Hr	<1	0.25

Table 5.3 - PiCADY Results L6074/R671 Priority Junction

Modelled Scenario	Period Mean Max Q (PCUs)	Period Max RFC
Opening Year 2025 AM Peak Hr	<1	0.04
Opening Year 2025 PM Peak Hr	<1	0.04

5.11 The results of the modelling clearly show that each of the junctions will have WAY more than adequate capacity to accommodate the worst-case construction traffic associated with the development. All of the RFCs are **way** below the theoretical capacity of 0.85 and no unacceptable queuing is anticipated as clearly illustrated in the modelling. The above analysis is unsurprising in light of the observed and anticipated traffic flows, based on our experience in these matters. The results are so favourable that we are confident that the junctions could accommodate significantly higher traffic volumes without any noticeable increased capacity related problems arising (in effect several multiples of the modelled flows).

6.0 TRAFFIC SAFETY ASSESSMENT OF THE L6074 CROSSING AT KEEREEN UPPER

6.1 It is submitted that a Road Safety Audit is not appropriate as there are no modifications required to the public road network for either the material deliveries or wind turbine component deliveries.

6.2 This Section is a traffic assessment of the L6074 crossing at Keereen Upper (near Woodhouse Substation entrance).

6.3 The L6074 after the Junction with the R671 is 5m wide and was widened for the construction of the existing Woodhouse Windfarm. The application will use the L6074, then travel along the also widened section of the L60741 to the main Woodhouse Windfarm site entrance. The applicant will then use the existing Woodhouse Windfarm access roads to access the existing Woodhouse Substation.

6.4 KWF Grid Connection traffic will use the Woodhouse Windfarm access roads, exit on to the L6074 from the Woodhouse Windfarm gates on the L6074 and travel north on the L6074 for c.100m to access the Woodhouse Substation gate, just north of the substation itself. From there construction traffic for the Woodhouse Substation and cabling in the vicinity will enter the Woodhouse Substation using an existing road on private lands behind the Substation.

Safety Review/Assessment of L6074 Crossing Point

6.5 Following a site visit, and conscious of the extremely low anticipated traffic volumes on the L6074 as evidenced from the Traffic Surveys, NRB have prepared a Traffic Management and Signage drawing for the proposed L6074 crossing at Keereen Upper. This clearly defines which road has priority at the crossing, and it accommodates the construction traffic intersection in a safe and appropriate manner. This is in part reproduced below as **Figure 6.1.** We believe that this arrangement will safely and appropriately accommodate the expected traffic at the intersection of the local road.

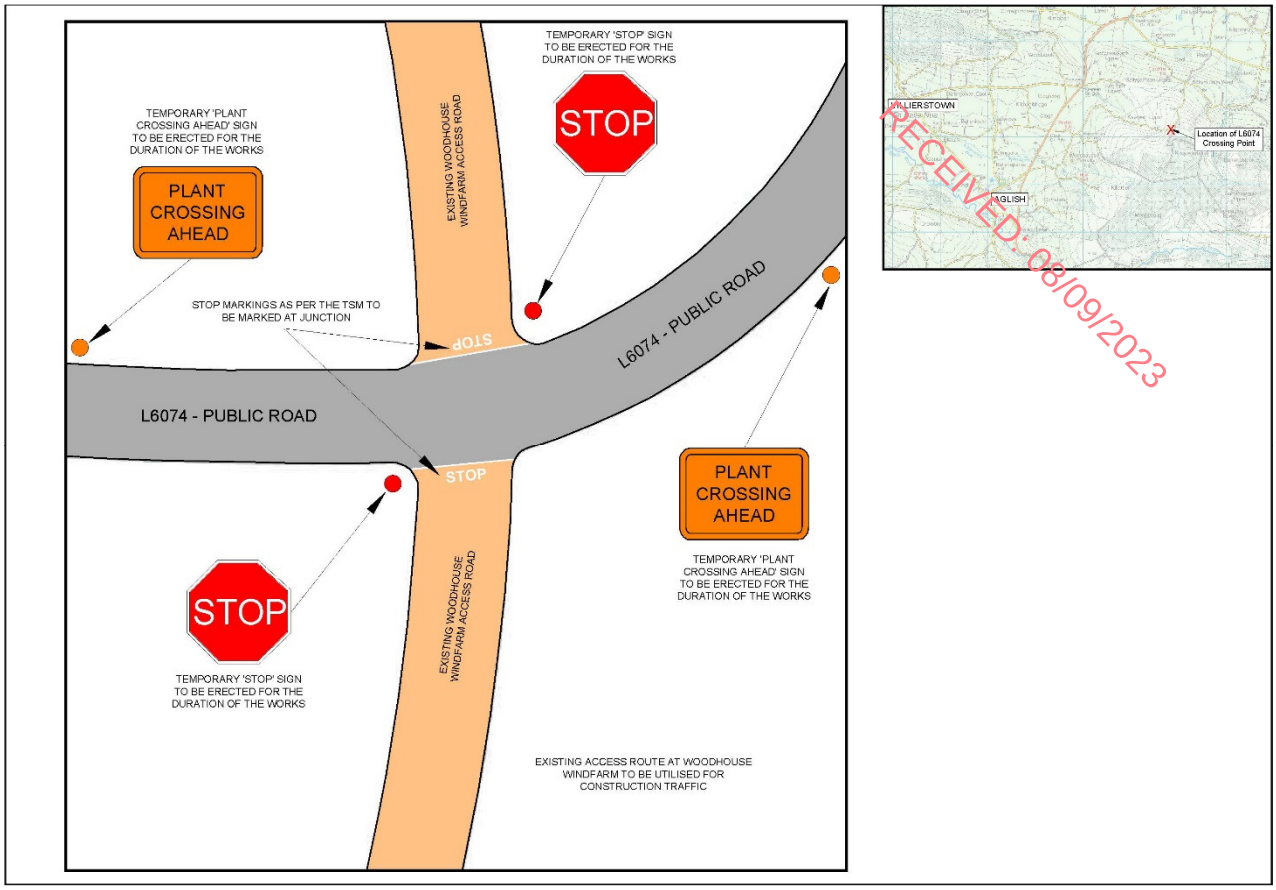


Figure 6.1 - Extract from NRB Drawing NRB-SK-001 Enclosed in Appendix A

7.0 CONCLUSIONS

7.1 This Traffic and Transportation Assessment Report deals with the traffic/transport issues associated with the proposed KWF Grid Connection works and the cumulative traffic/transport issues associated with the proposed KWF Grid Connection works and the consented Knocknamona Windfarm works. The Report follows the TII Traffic and Transport Assessment Guidelines.

7.2 Construction traffic has been added to existing traffic volumes to examine the impact, based on recent comprehensive traffic survey data.

7.3 This Report addresses the adequacy of the existing and proposed road network to safely and appropriately accommodate the worst case demands and clearly demonstrates that there will be negligible impact upon the operation of the road network.

7.4 We have reviewed the existing roads and junctions in terms of existing and projected traffic volumes, and we have assessed the capacity of locally affected junctions using TII Approved Junction Modelling Software. The assessment confirms that the roads and junctions are more than adequate to accommodate the worst-case construction traffic volumes associated with the works.

7.5 We believe that a road pavement and road boundary condition survey should be agreed between the applicant and Roads Department Officials of Waterford City & County Council prior to commencing the works.

7.6 Through discussion with Roads Department Officials of Waterford City & County Council, an existing road crossing/intersection within the site crossing the L6074 was identified as important. We have prepared a Temporary Signage/Traffic Management Drawings for this public road intersection.

7.7 We conclude that the proposed KWF Grid Connection works are not expected to have any adverse impact in terms of traffic capacity or road safety on the surrounding road network or in the wider area in combination with the consented Knocknamona Windfarm works. We therefore would support a grant of planning for the development from Waterford City & County Council.

APPENDICES - CONTENT

APPENDIX A

Proposed Development
Construction Haul Route & Junction Improvement Drawings

Kilcloher Junction

N72

R671

Turbine Components and Electrical Apparatus Haul Route

Roadstone Cappagh Quarry

R671

Kereen Quarry

Clogh Croassroads

L6074

L60741

Existing Woodhouse Windfarm

Existing Woodhouse Substation

KWF Grid Connection Construction Works Area

Authorised Knocknamona Windfarm and amendments

Site Entrance 2 at Woodhouse Windfarm Main Entrance

Authorised Knocknamona Windfarm Main Entrance at Knocknaglogh Lower

Authorised Junction & Bend widening works

N72

R672

Dungarvan Town

Figure 12.4 - Public Roads - Whole Project Haul Routes

Legend:

KWF Grid Connection:

- KWF Grid Connection Construction Works Area
- Access Road through Woodhouse Windfarm Entrance

Haul Routes:

- KWF Grid Connection Construction Materials Haul Route
- Turbine Component Haul Route through Woodhouse Windfarm Main Entrance
- Authorised Knocknamona Windfarm Construction Materials Haul Route
- Authorised Turbine Component Haul Route through Knocknamona Windfarm Main Entrance at Knocknaglogh Lower

Whole Project:

- Authorised Knocknamona Windfarm and amendments
- Authorised Junction & Bend widening works

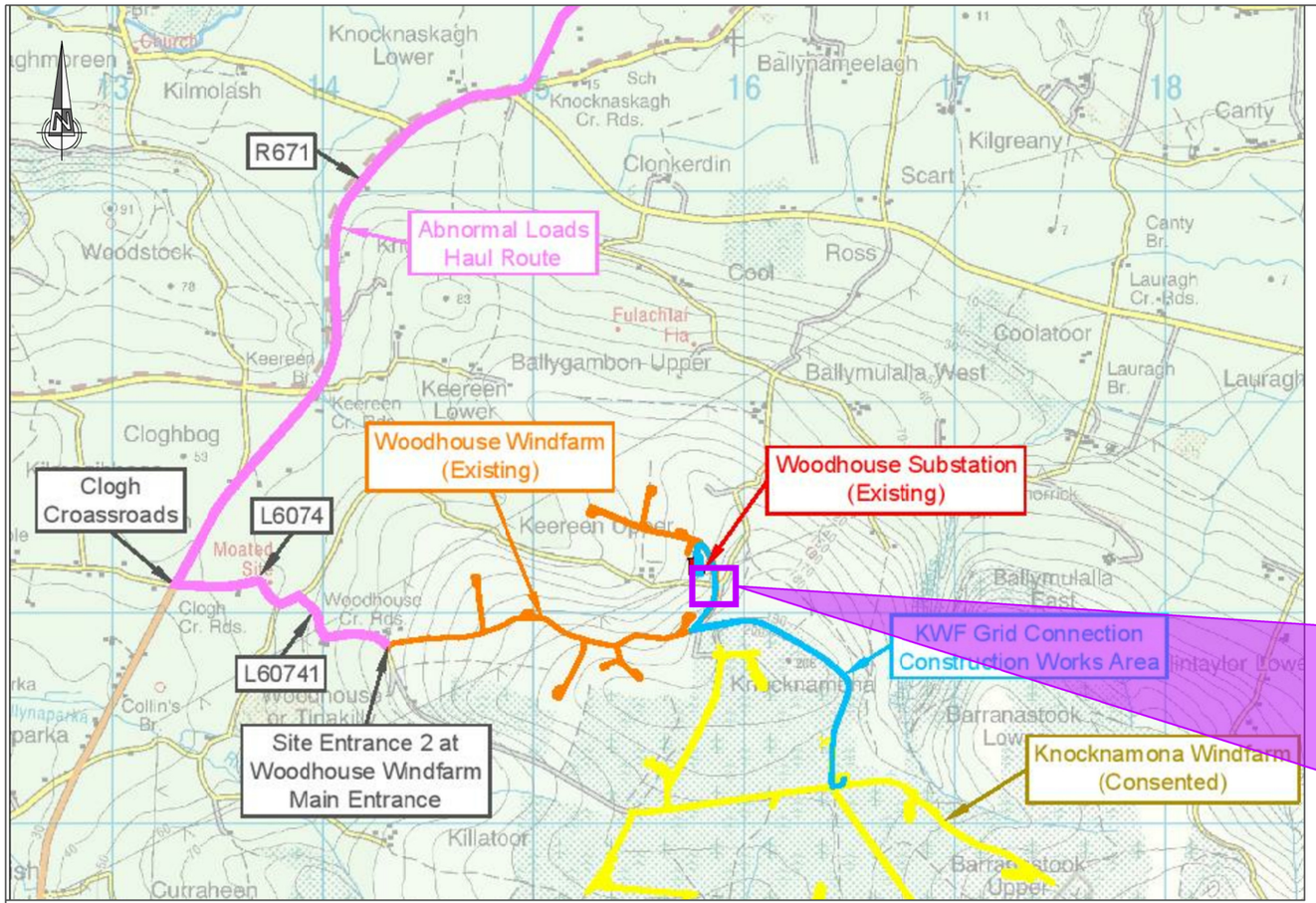
Other Projects:

- Existing Woodhouse Substation
- Existing Woodhouse Windfarm

Map Features:

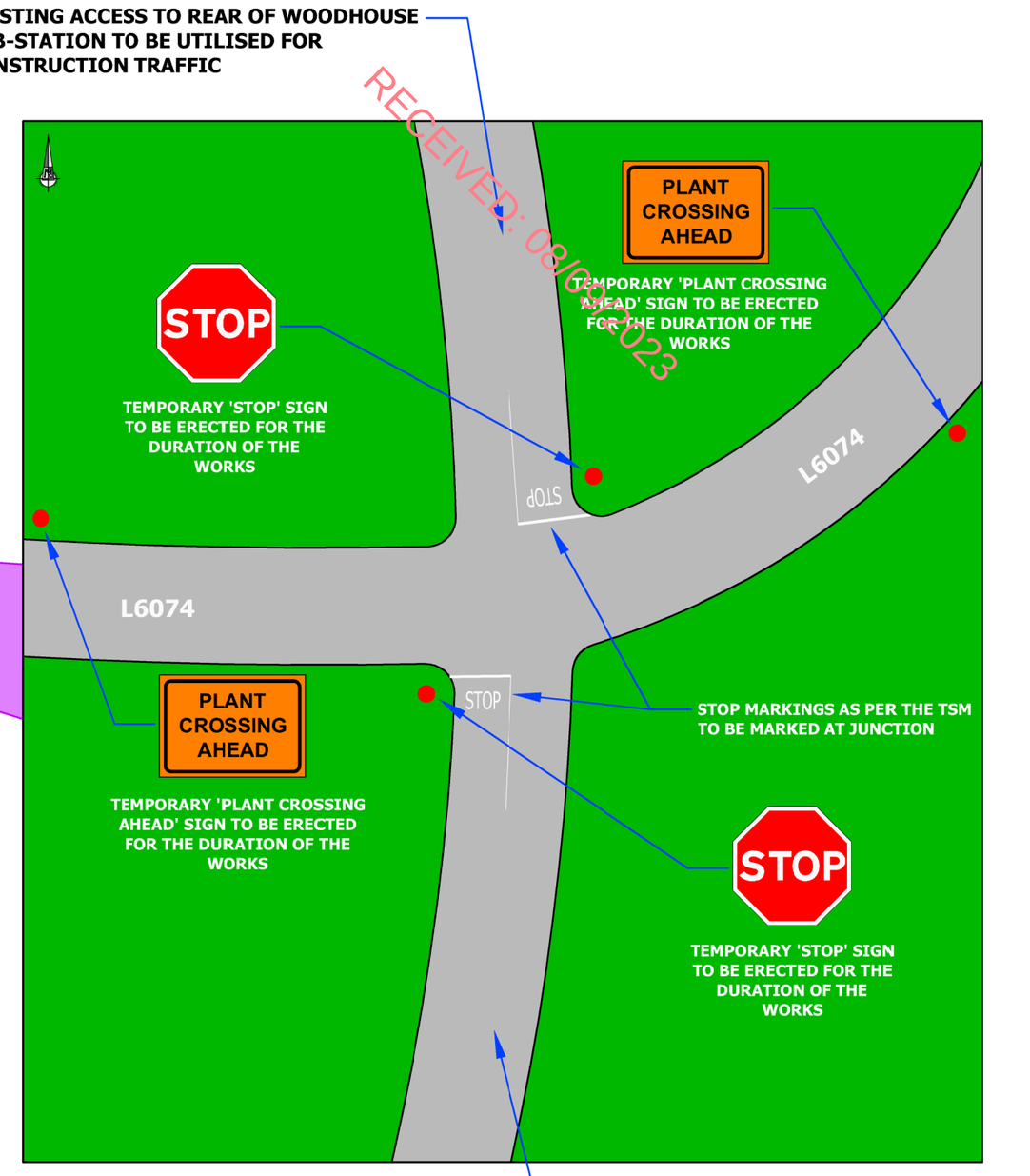
- L6074 Road Identification Number

N



NOTES:

1. **STOP SIGNS RUS 027 TO BE ERECTED ON EXISTING GRANTED HAUL ROUTE ROAD AS INDICATED OPPOSITE FOR THE DURATION OF THE WORKS.**
2. **PLANT CROSSING AHEAD SIGNS TO BE ERECTED FOR THE DURATION OF THE WORKS ON THE L6074 HEADING EAST AND WEST TO WARN PUBLIC ROAD USERS OF HAUL ROUTE CROSSING.**
3. **EXISTING HEDGING TO BE TRIMMED BACK WHERE POSSIBLE TO IMPROVE CONSPICUITY OF MACHINERY CROSSING AT JUNCTION.**



NRB Consulting Engineers Ltd recommend that Road and land ownership boundaries are verified through Legal & Land searches by the Client.

This drawing is based upon Google Mapping and Site Visit. NRB Consulting Engineers Ltd shall not be liable for any inaccuracies or deficiencies.

REV	DATE	AMENDMENTS	DRAWN	CHK	APP

NRB Consulting Engineers Ltd
8 Leopardstown Business Centre
Ballyogan Avenue
Leopardstown
Dublin 18

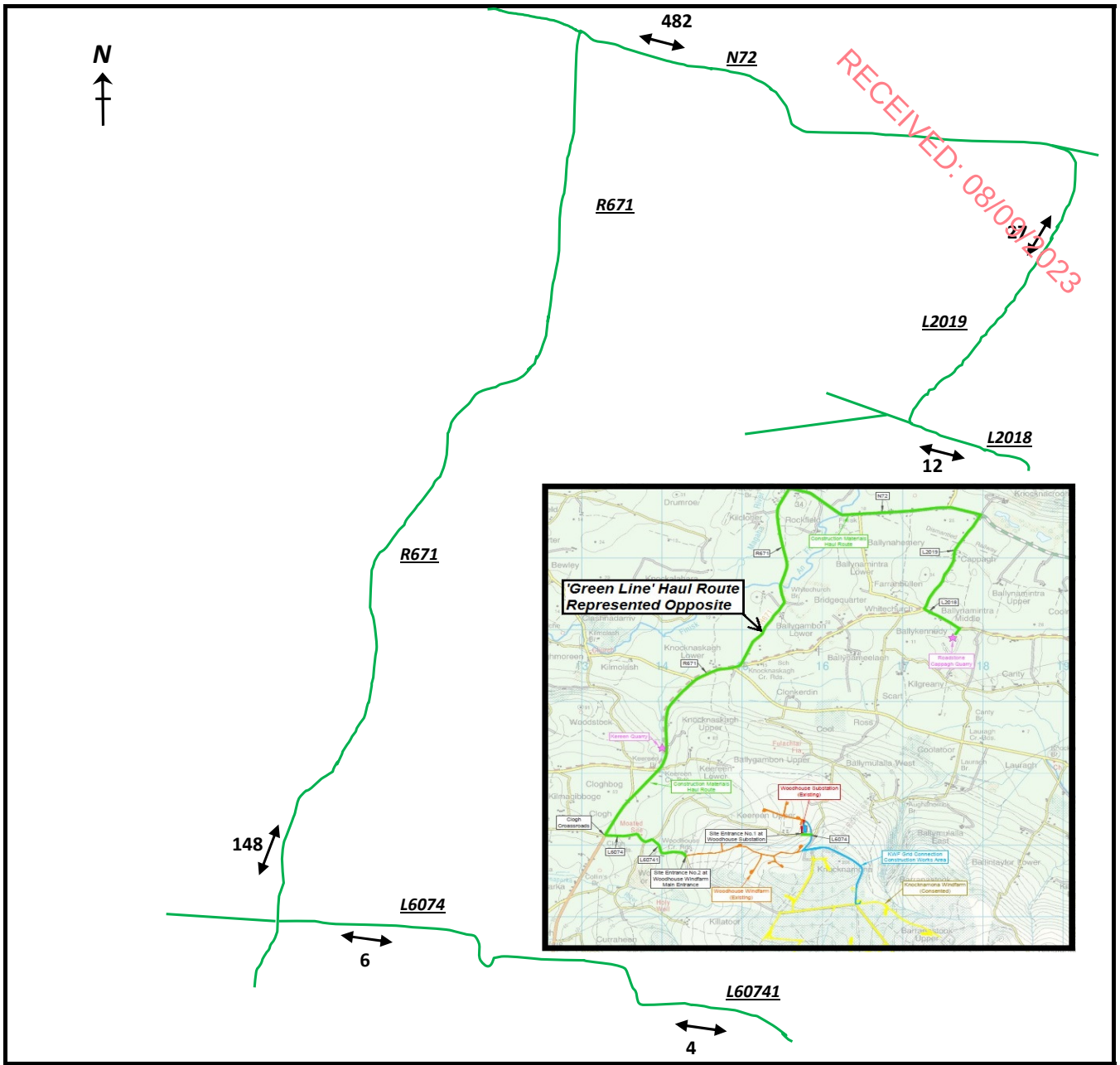
Phone/Fax: +353 1 292 1941
Email: info@nrb.ie
Web: www.nrb.ie
Registered in Ireland No. 491679

Client		Project No. 19-085	Drawing No. NRB-SK-001
Project	Ecopower Knocknamona	Drawn PB / Checked / Approved	
Title	Temporary Signage for Duration Of Works at L6074	Date 18-Sep-19	Scale @ A3 n.t.s. / Rev -

Purpose of Issue: ☐ Draft ☐ Information ☐ Approval ☐ As Built ☐ Tender ☐ Construction

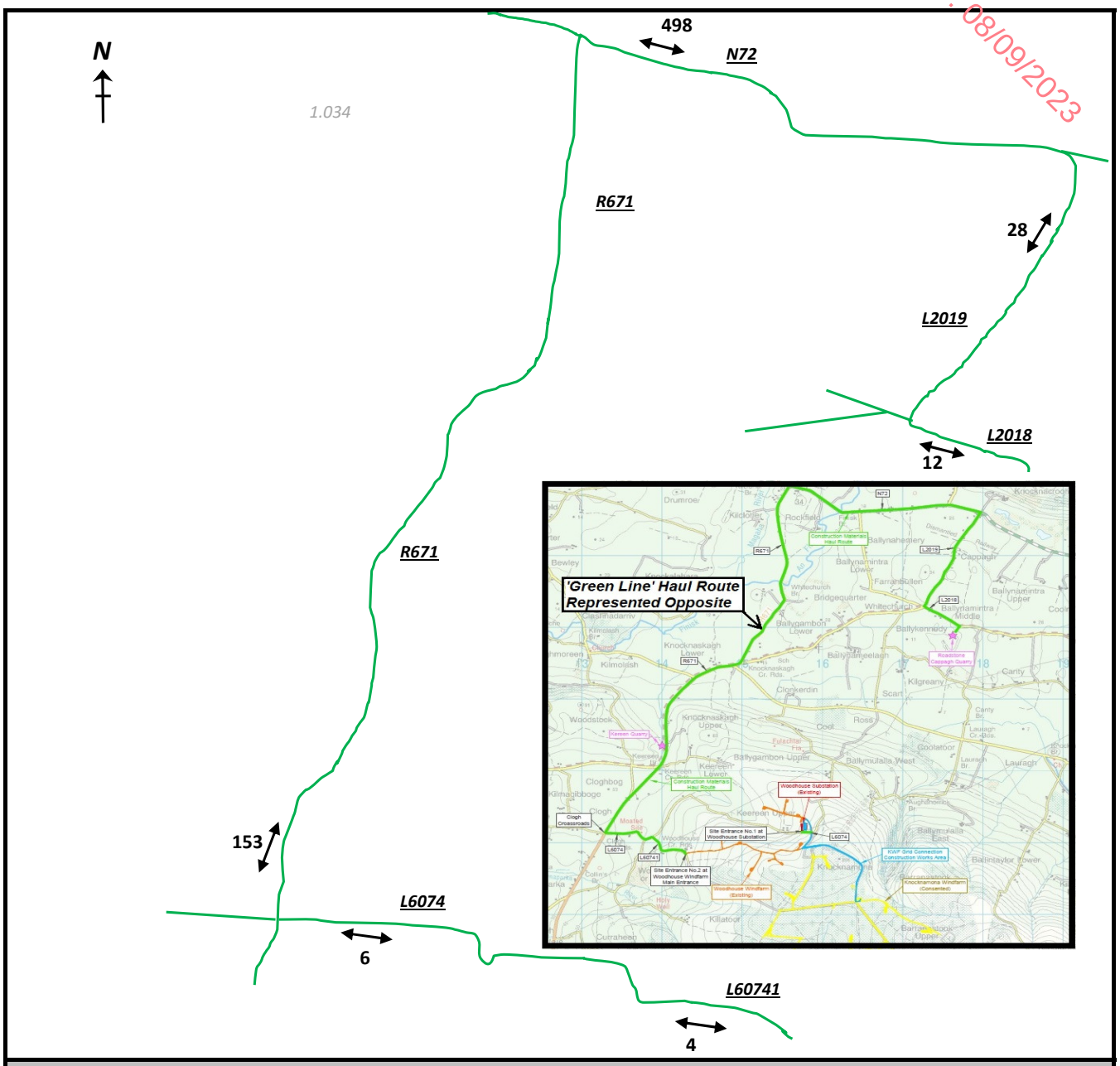
APPENDIX B

Traffic Calculations, Trip Distribution, Network Traffic Flow Diagrams & Projections Based on Traffic Surveys

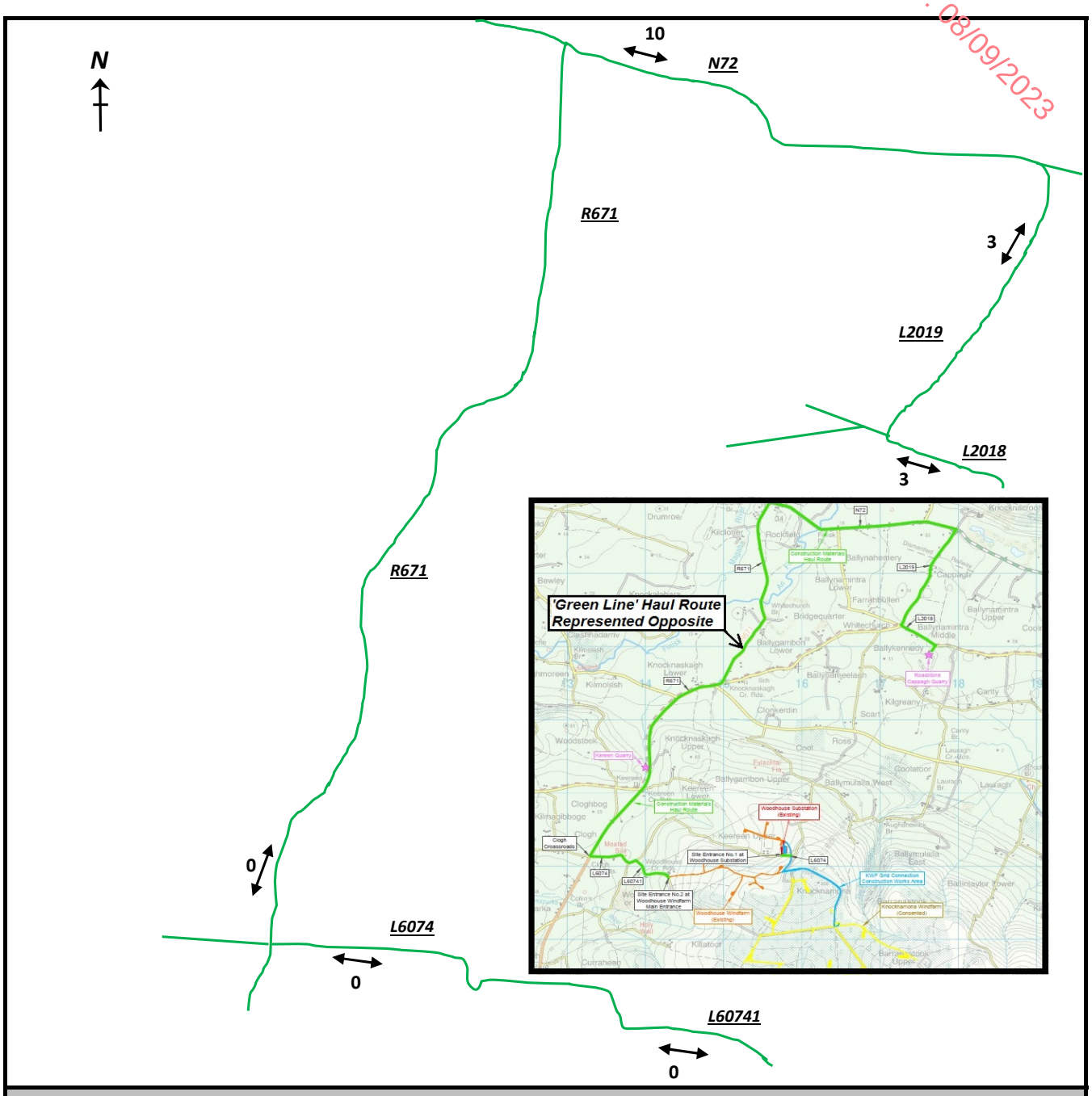


Existing Traffic Flow, Local Network
AM Peak Hour 8-9am, 2023
Without Development (PCUs)

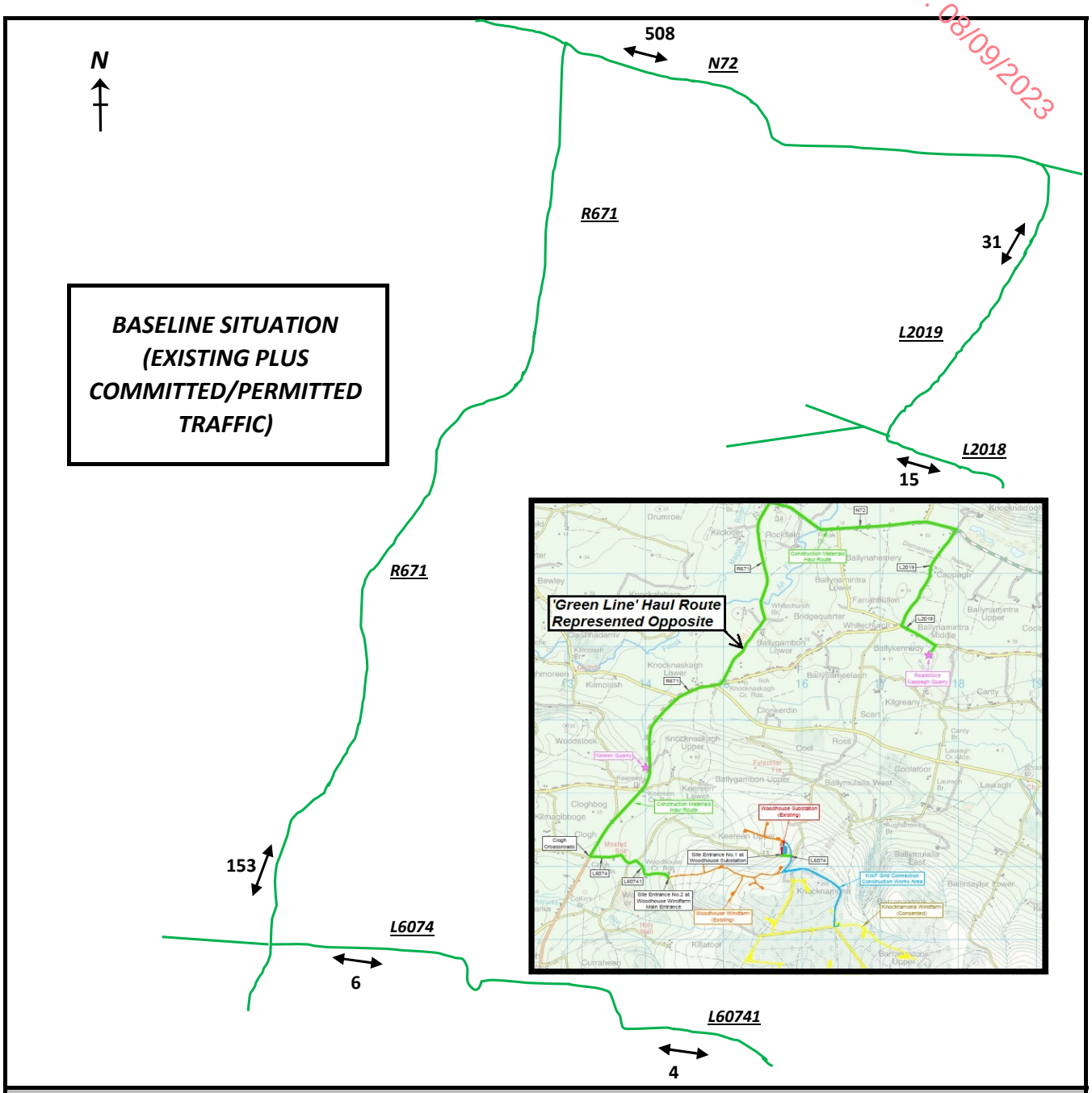
Tii Project Appraisal Guidelines Unit 5.3, (Travel Demand Projections Oct 2021, Table 5.3.2) Yr2023 to Yr2025 factor is 1.034



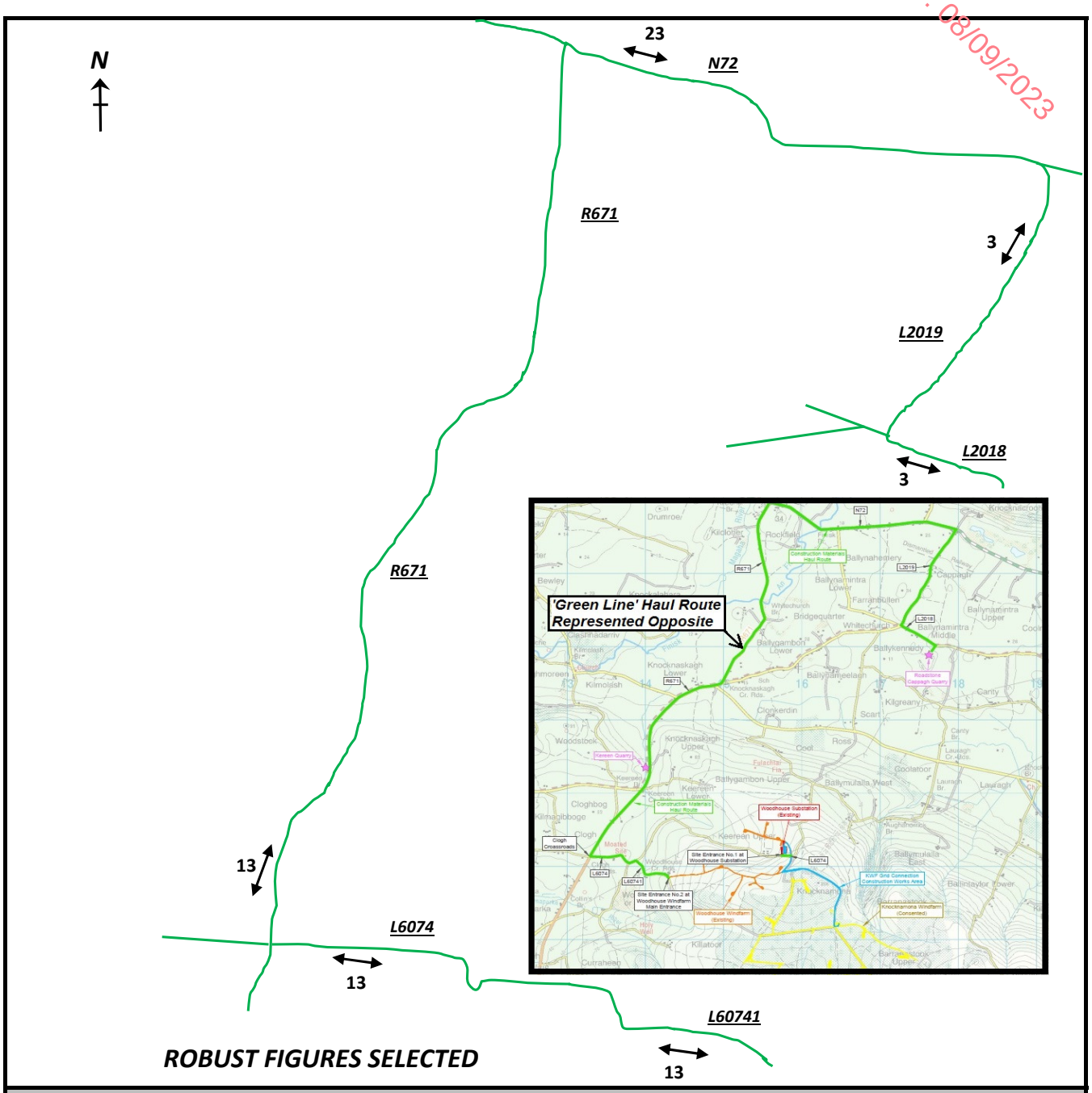
Projected Traffic Flow, Local Network
AM Peak Hour 8-9am, 2025 (PCUs)
Commencement/Construction Year <u>Without ANY Development</u>



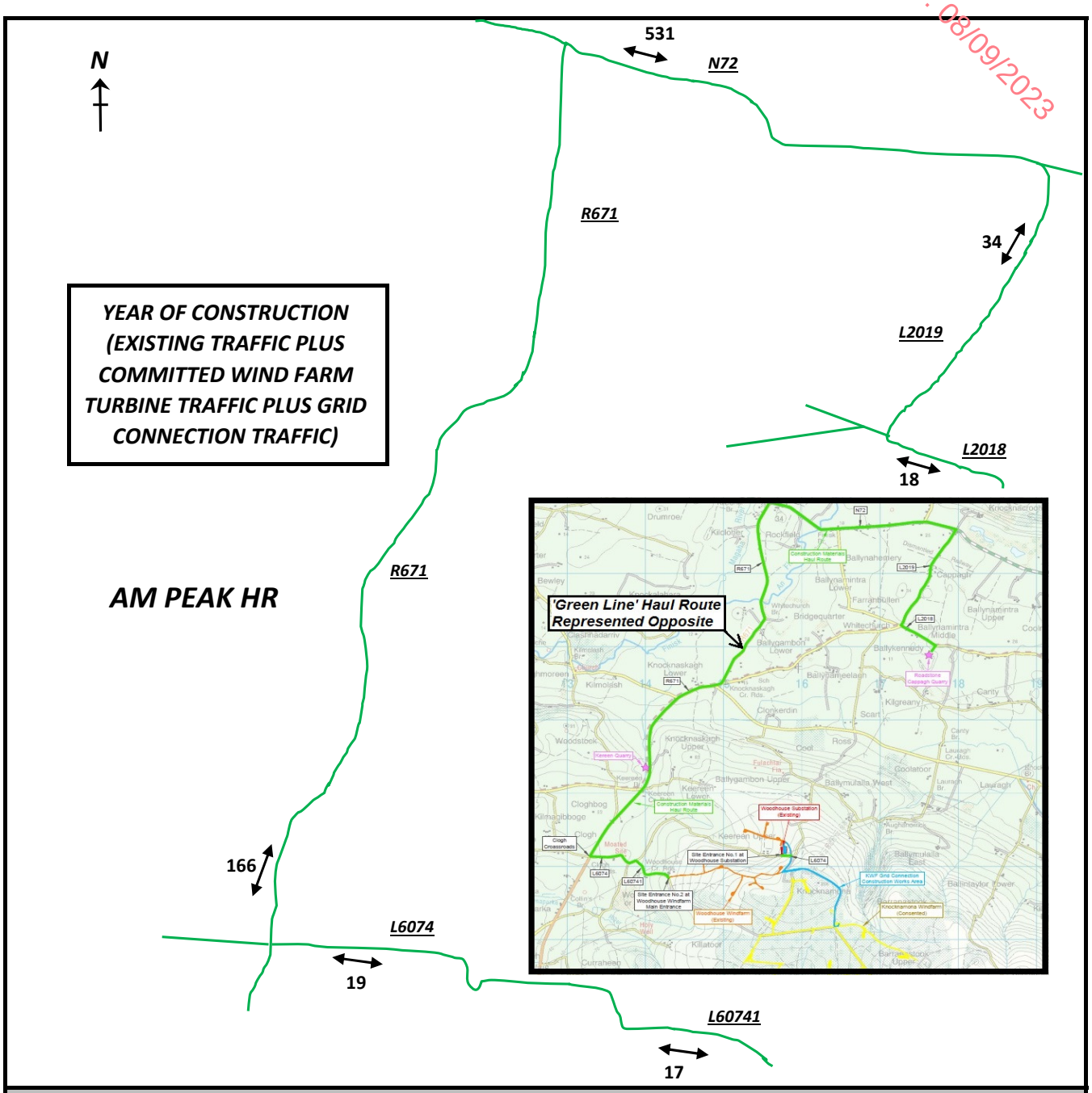
Assignment of Committed Traffic Associated with PERMITTED Wind Farm/Turbines
AM Peak Hour 8-9am (PCUs)



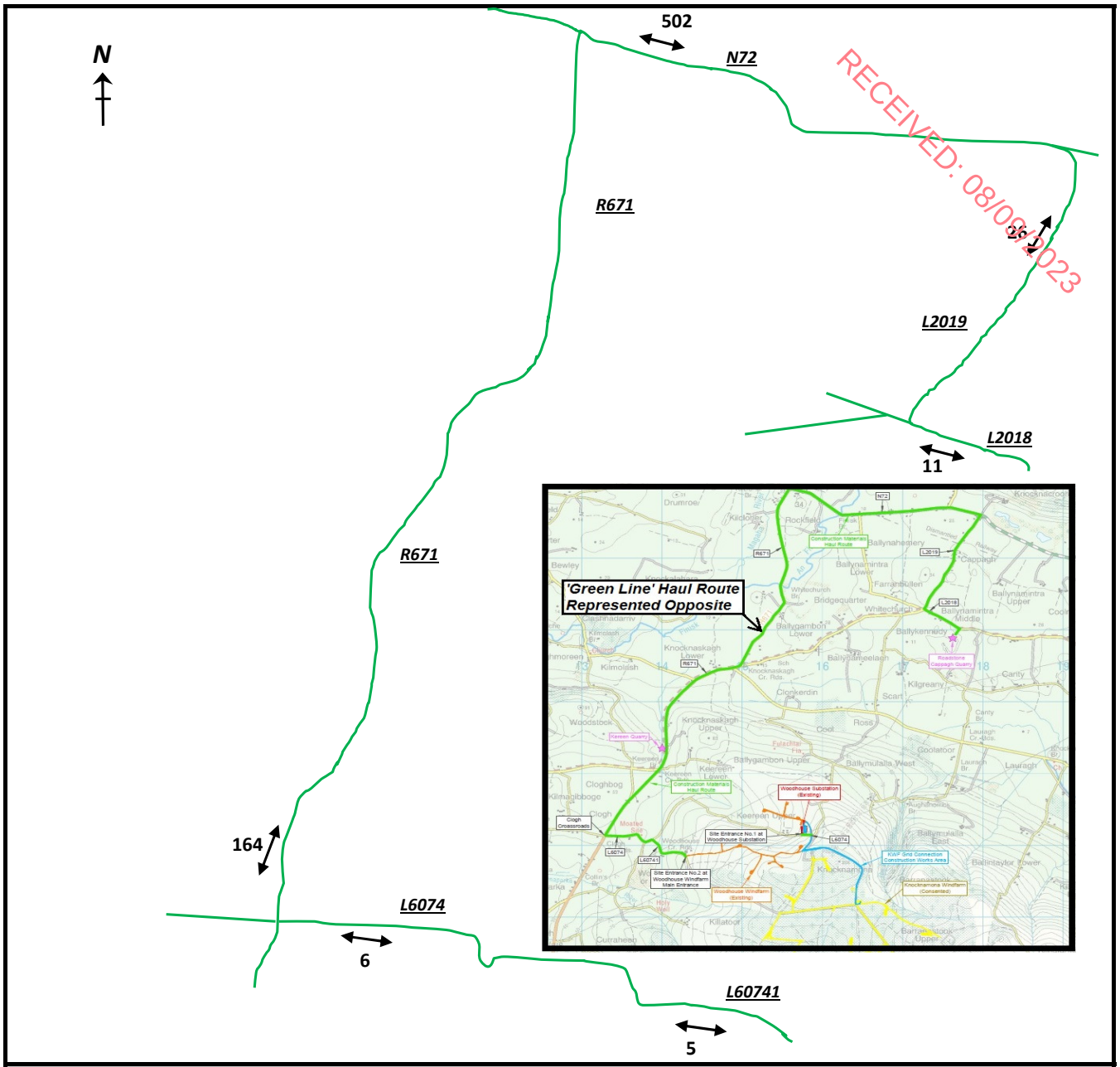
Projected Traffic Flow, Local Network
AM Peak Hour 8-9am, Construction Year 2025
With Committed Wind Farm Turbines Traffic Included (PCUs)



Assignment of Worst Case Construction Traffic
Associated with Subject Application for Grid Connection
AM Peak Hour 8-9am (PCUs)

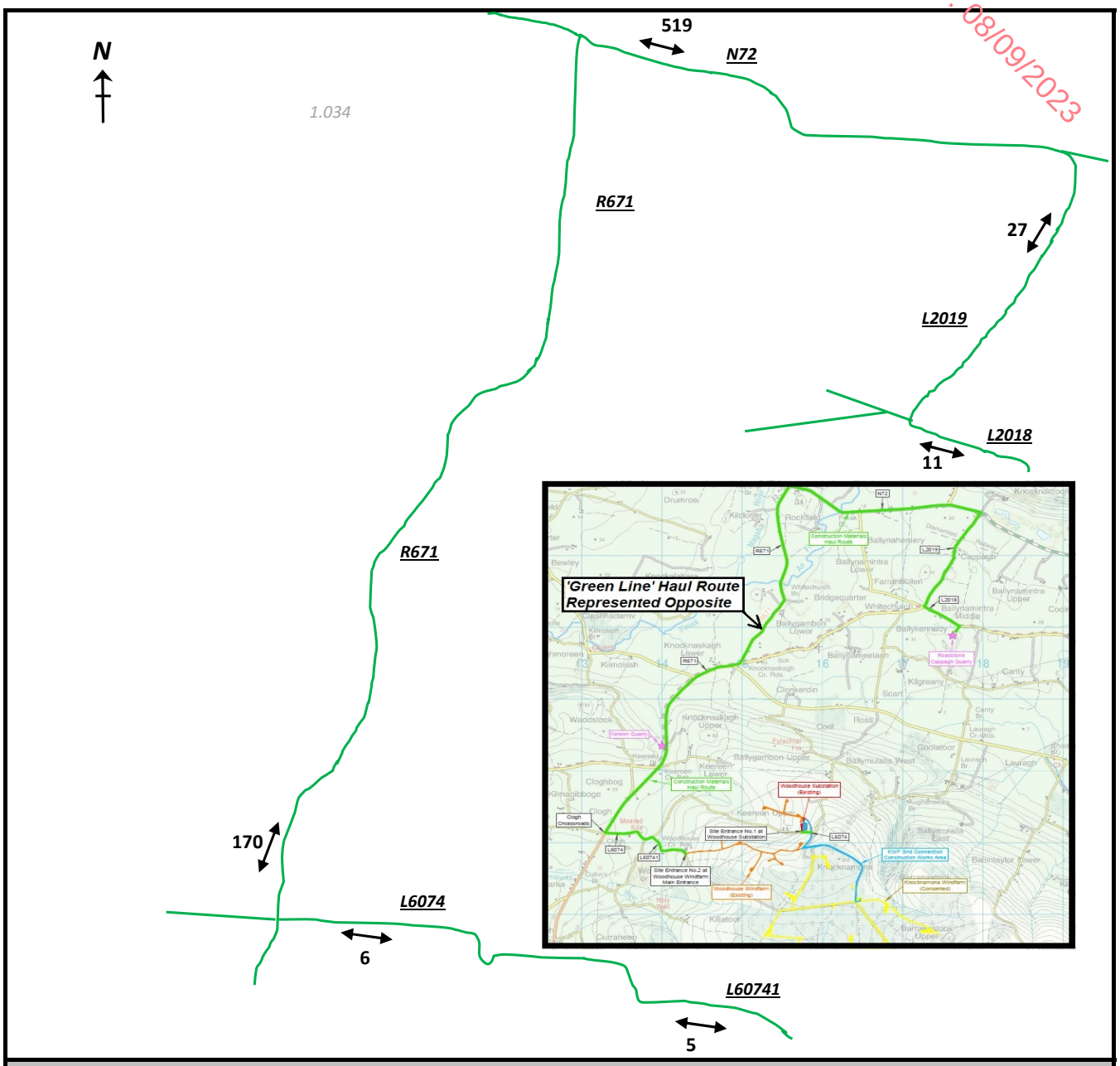


Projected Traffic Flow, Local Network
AM Peak Hour 8-9am, Construction Year 2025 - ALL TRAFFIC
With Committed Wind Farm Turbine Traffic Included (PCUs)

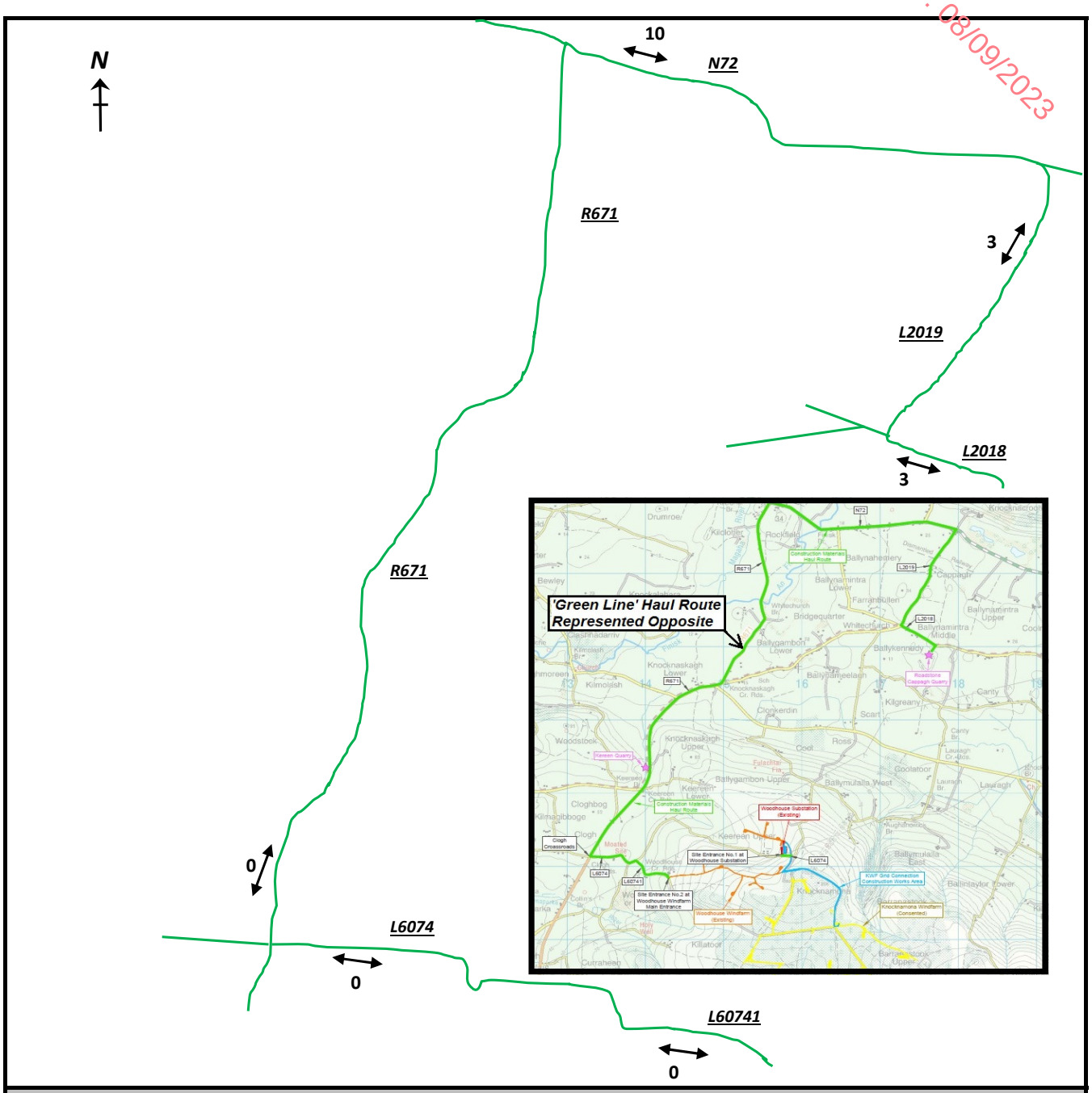


Existing Traffic Flow, Local Network
PM Peak Hour 5-6pm, 2023
Without Development (PCUs)

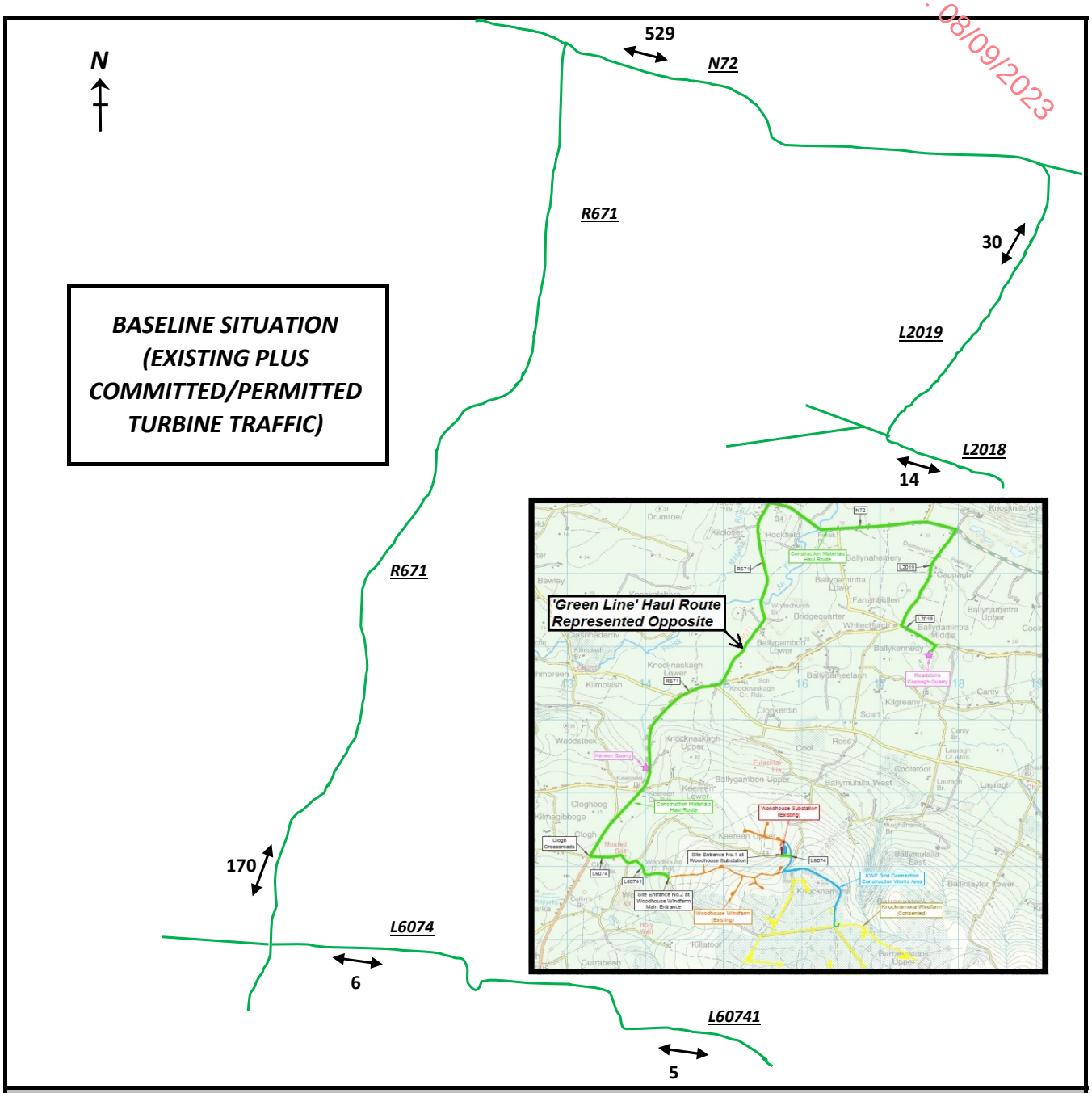
Tii Project Appraisal Guidelines Unit 5.3, (Travel Demand Projections Oct 2021, Table 5.3.2) Yr2023 to Yr2025 factor is 1.034



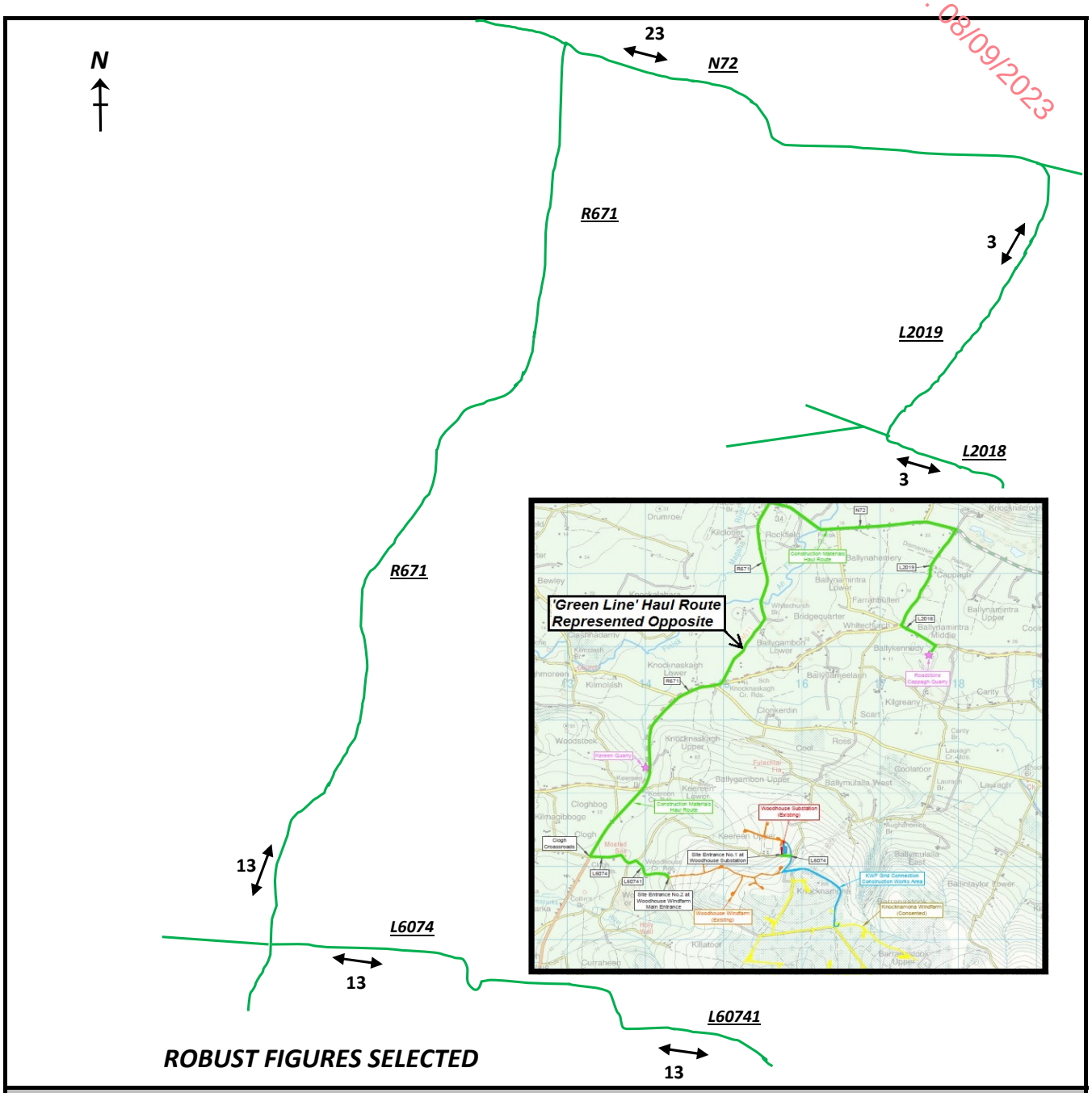
Projected Traffic Flow, Local Network
PM Peak Hour 5-6pm, 2025 (PCUs)
Commencement/Construction Year <u>Without ANY Development</u>



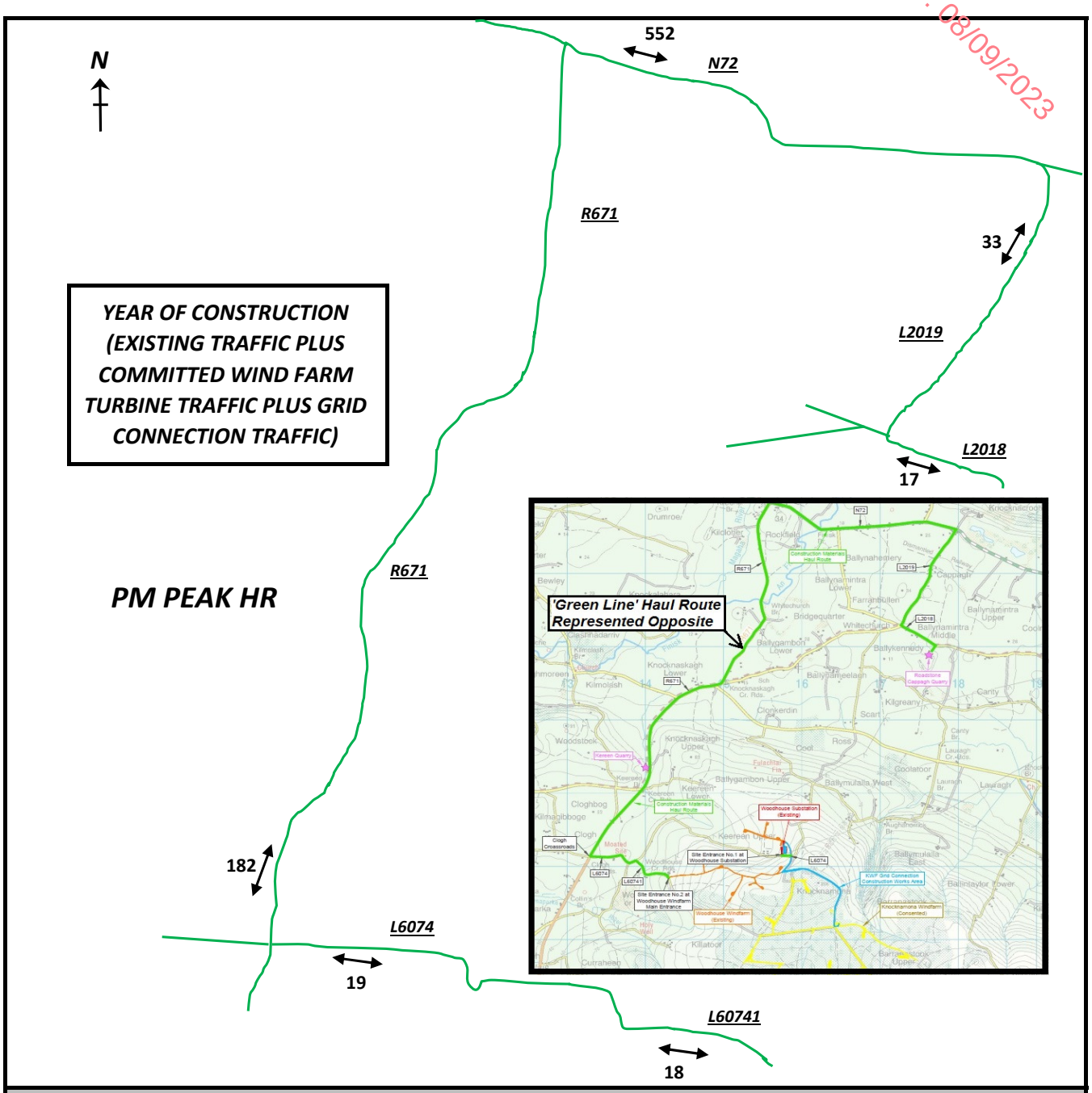
Assignment of Committed Traffic Associated with PERMITTED Wind Farm/Turbines
PM Peak Hour 5-6pm (PCUs)



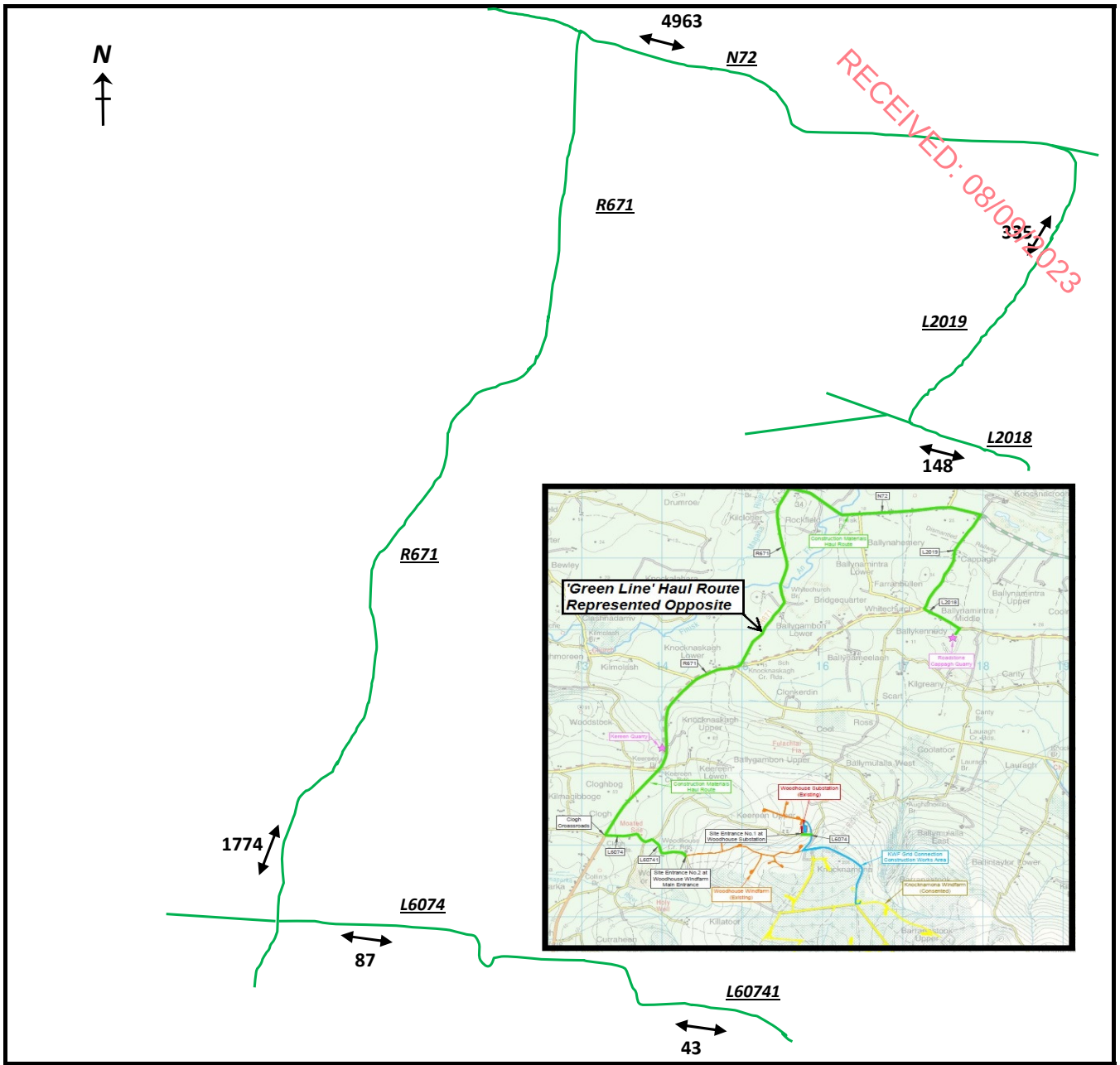
Projected Traffic Flow, Local Network
PM Peak Hour 5-6pm, Construction Year 2025
With Committed Wind Farm TurbineTraffic Included (PCUs)



Assignment of Worst Case Construction Traffic
Associated with Subject Application for Grid Connection
PM Peak Hour 5-6pm (PCUs)

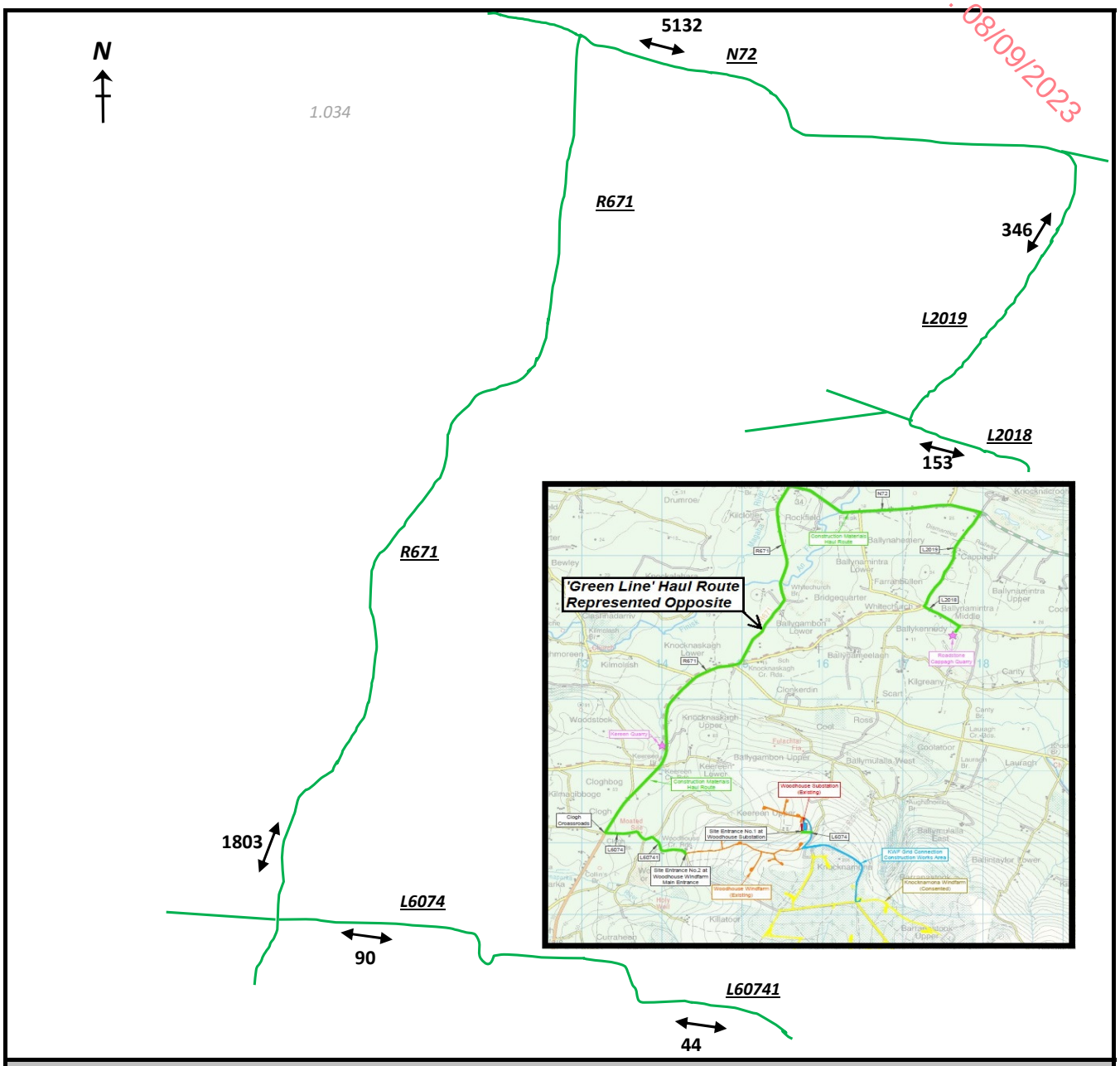


Projected Traffic Flow, Local Network
PM Peak Hour 5-6pm, Construction Year 2025 - ALL TRAFFIC
With Committed Wind Farm Turbine Traffic Included (PCUs)

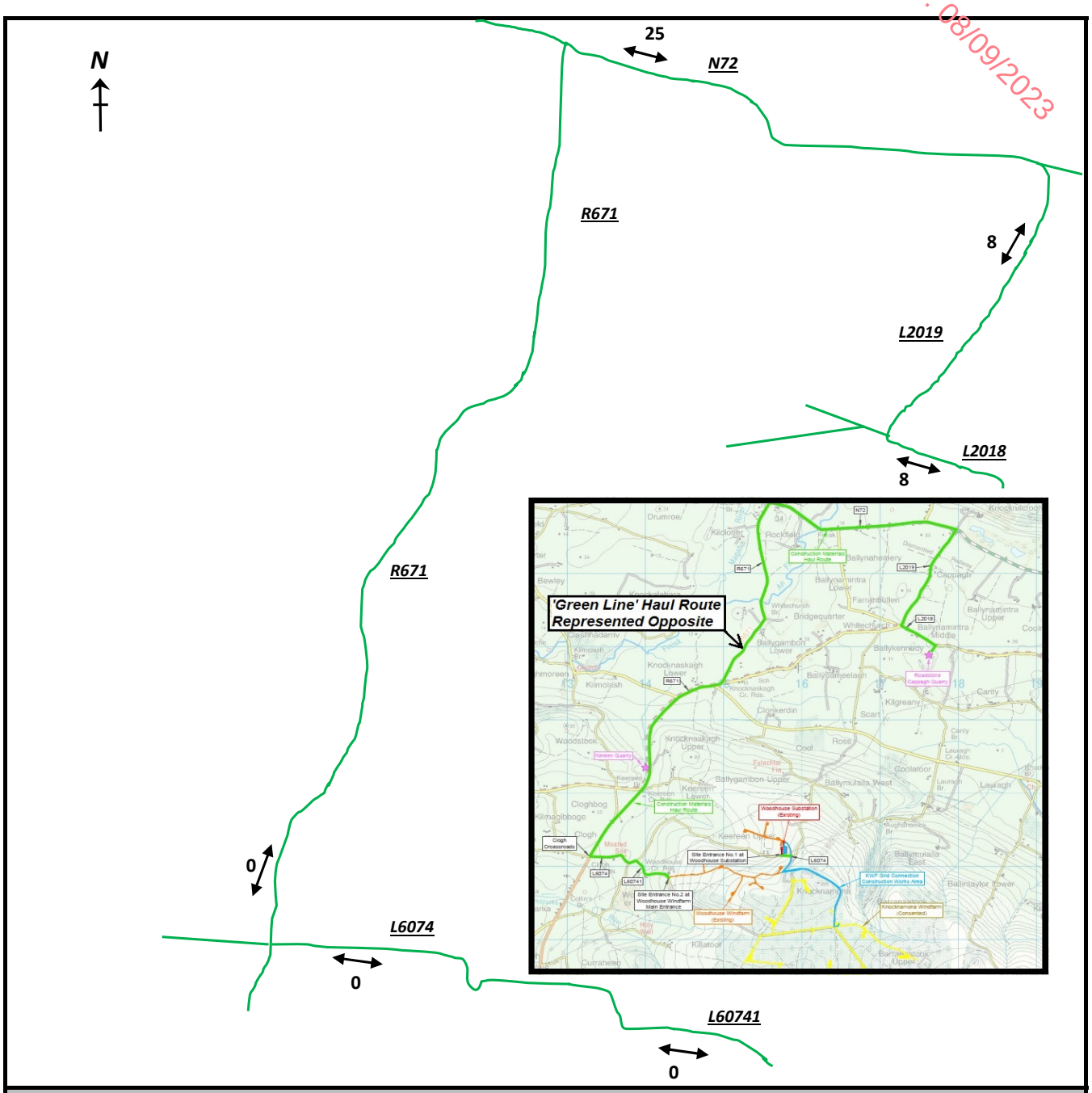


Existing Traffic Flow, Local Network
24 Hour AADT, 2023
Without Development (PCUs)

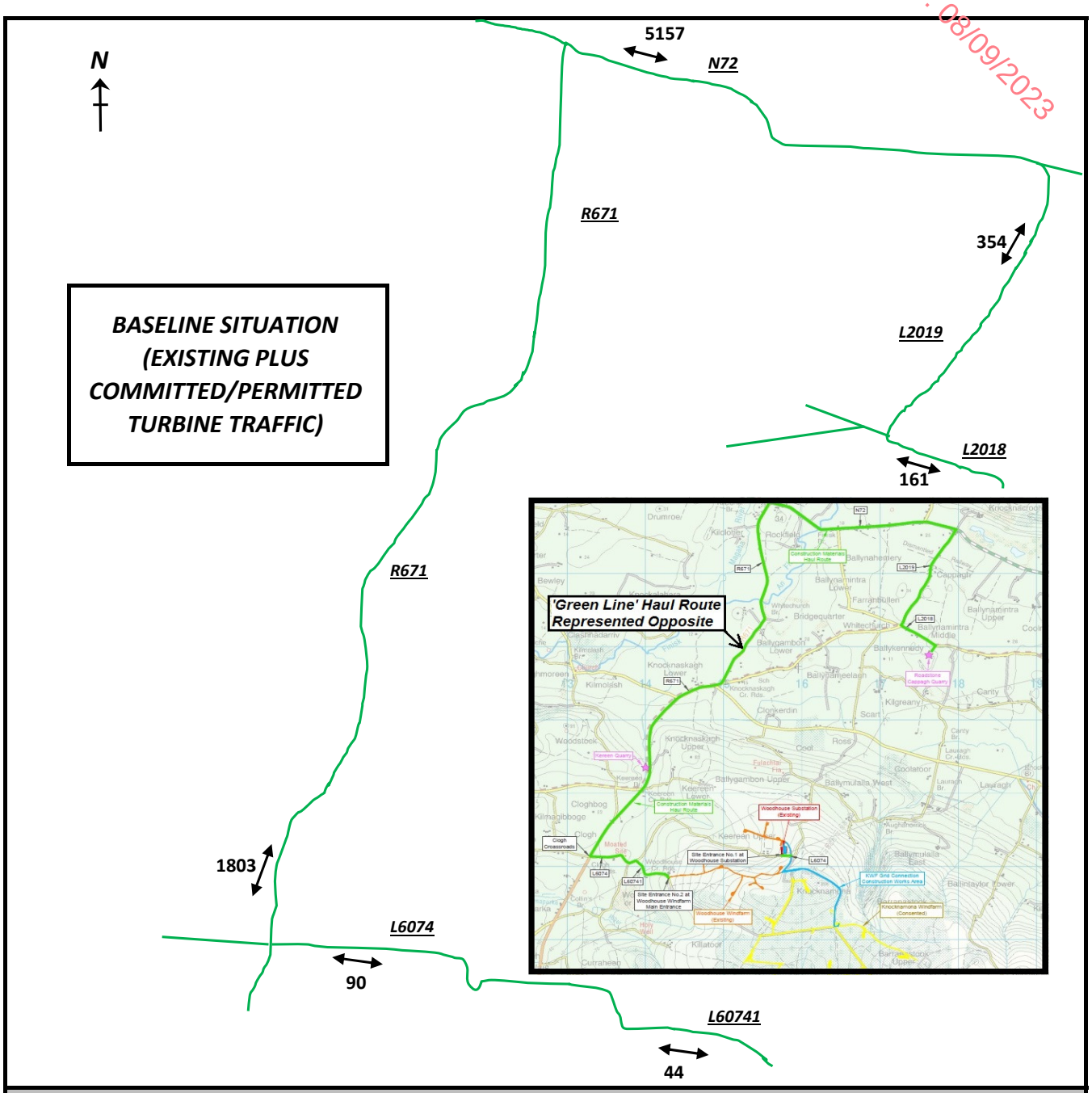
Tii Project Appraisal Guidelines Unit 5.3, (Travel Demand Projections Oct 2021, Table 5.3.2) Yr2023 to Yr2025 factor is 1.034



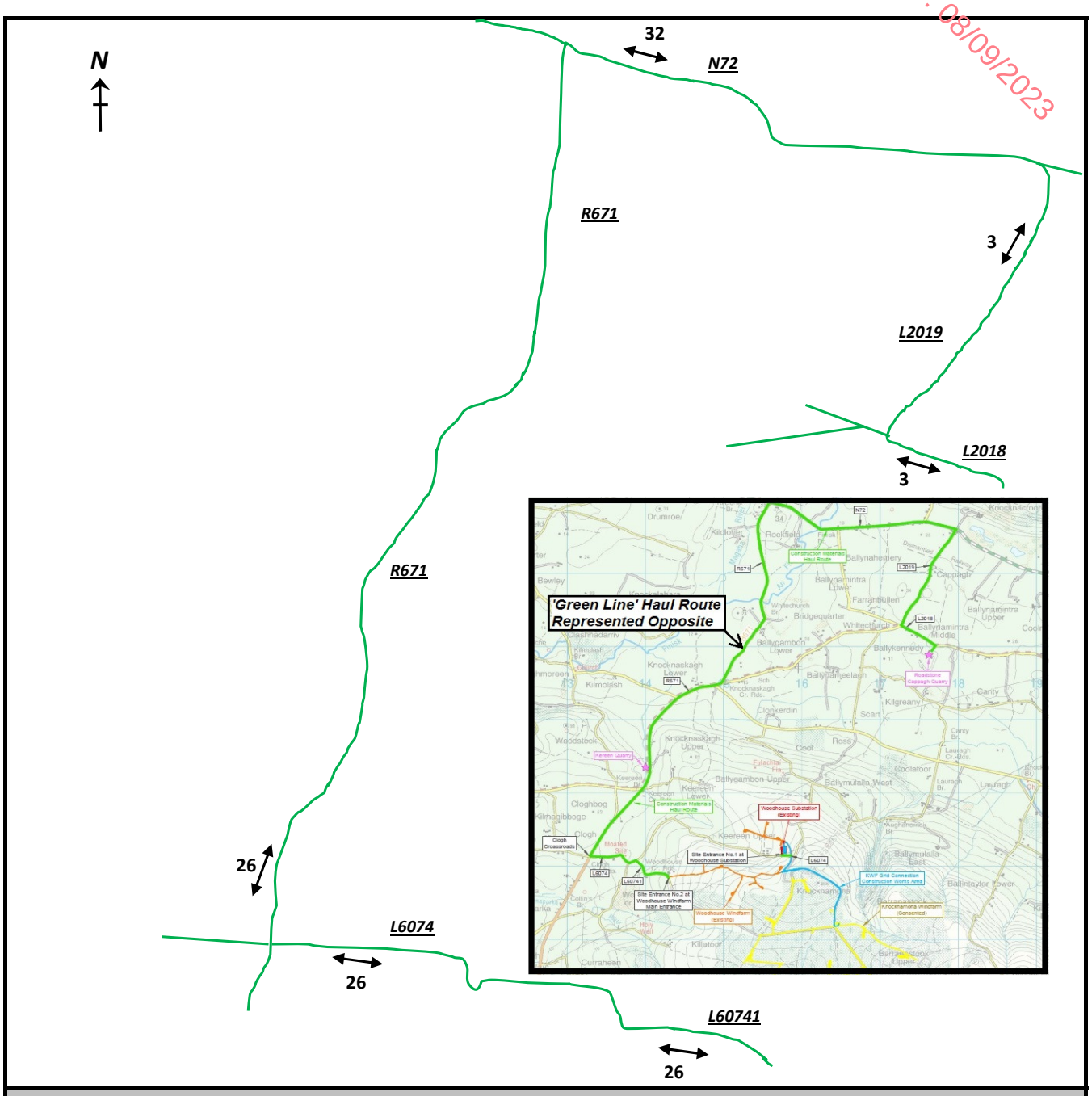
Projected Traffic Flow, Local Network
24 Hr AADT, 2025 (PCUs)
Commencement/Construction Year Without ANY Development



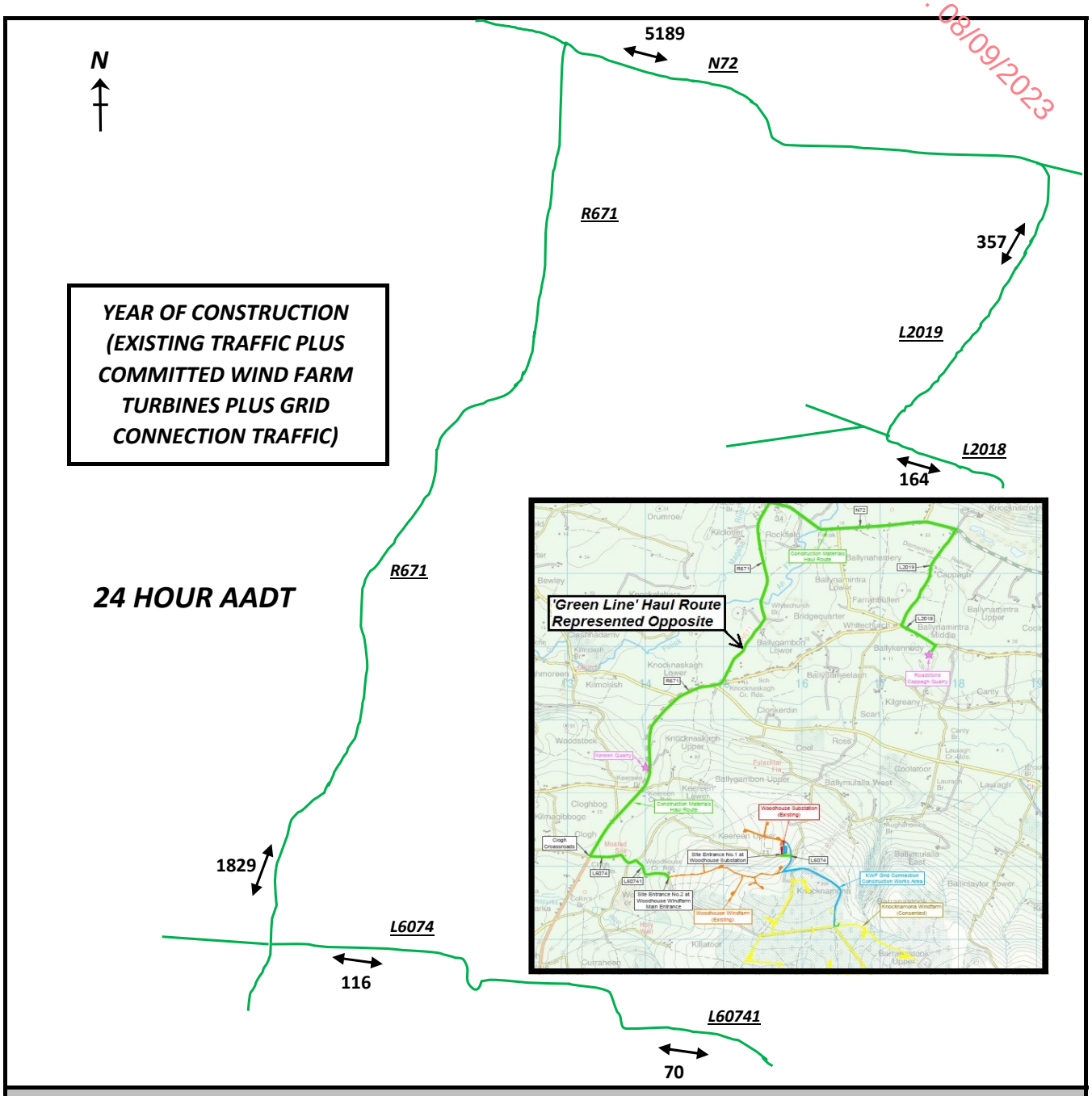
Assignment of Committed Traffic Associated with PERMITTED Wind Farm/Turbines
24 Hour AADT (PCUs)



Projected Traffic Flow, Local Network
24 Hour AADT, Construction Year 2025
With Committed Wind Farm Turbine Traffic Included (PCUs)



Assignment of Worst Case Construction Traffic
Associated with Subject Application for Grid Connection
24 Hour AADT (PCUs)



Projected Traffic Flow, Local Network
24 Hour AADT, Construction Year 2025 - ALL TRAFFIC
With Committed Wind Farm Turbine Traffic Included (PCUs)

APPENDIX C

PiCADY Capacity Model Output
L2019/N72 T-Junction

Capacity Assessment With ALL Development Construction Traffic
Summary 'Junctions-9' PiCADY Results, Robust & Worst Case

Modelled Scenario	Period Mean Max Q (PCUs)	Period Max RFC
Opening Year 2025 AM Peak Hr	<1	0.08
Opening Year 2025 PM Peak Hr	<1	0.06

RESULTS CONFIRM ALL WORST CASE RFCs < AVAILABLE CAPACITY

(In PiCADY, Junctions are considered nearing capacity when RFC reaches 0.85)

The Assessment Clearly Demonstrates that No problems whatsover are expected at the Junction as all RFCs are WAY BELOW capacity. This is unsurprising in Light of Low Traffic Volumes and in Light of On-Site Capacity Observations.

Junctions 9

PICADY 9 - Priority Intersection Module

Version: 9.0.1.4646 []

Filename: 2025 AM PM.j9
Path: C:\Users\Eoin\NRB Consulting Engineers Ltd\NRB Server - Documents\2023\23-063 KWF Grid Connection 2023 \Calculations\L2019 N72 Picadys
Report generation date: 15/06/2023 13:48:13

Summary of junction performance

	AM				PM			
	Q (PCU)	Delay (s)	RFC	LOS	Q (PCU)	Delay (s)	RFC	LOS
	2025							
Stream B-AC	0.1	8.15	0.08	A	0.1	8.64	0.06	A
Stream C-AB	0.0	7.21	0.04	A	0.0	7.34	0.04	A

Values shown are the highest values encountered over all time segments. Delay is the maximum value of Av. delay per arriving vehicle.

File summary

File Description

Title	(untitled)
Location	
Site number	
Date	17/09/2019
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	
Enumerator	NRB-004\Eoin
Description	

Units

Distance units	Speed units	Traffic units input	Traffic units results	Flow units	Av. delay units	Total delay units	Rate of delay units
m	kph	PCU	PCU	perHour	s	-Min	perMin

Analysis Options

Calculate Q Percentiles	Calculate residual capacity	RFC Threshold	Av. Delay threshold (s)	Q threshold (PCU)
		0.85	36.00	20.00

Demand Set Summary

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D1	2025	AM	ONE HOUR	07:45	09:15	15
D2	2025	PM	ONE HOUR	16:45	18:15	15

Analysis Set Details

ID	Network flow scaling factor (%)
A1	100.000

2025, AM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction Type	Major road direction	Junction Delay (s)	Junction LOS
1	N72 L2019 T Junction at Cappagh	T-Junction	Two-way	0.82	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Arms

Arms

Arm	Name	Description	Arm type
A	N72 East		Major
B	L2019 to Quarry		Minor
C	N72 West		Major

Major Arm Geometry

Arm	Width of carriageway (m)	Has kerbed central reserve	Has right turn bay	Visibility for right turn (m)	Blocks?	Blocking queue (PCU)
C	6.70			90.0	✓	1.00

Geometries for Arm C are measured opposite Arm B. Geometries for Arm A (if relevant) are measured opposite Arm D.

Minor Arm Geometry

Arm	Minor arm type	Lane width (m)	Visibility to left (m)	Visibility to right (m)
B	One lane	3.50	90	90

Slope / Intercept / Capacity

Priority Intersection Slopes and Intercepts

Junction	Stream	Intercept (PCU/hr)	Slope for A-B	Slope for A-C	Slope for C-A	Slope for C-B
1	B-A	580	0.102	0.259	0.163	0.370
1	B-C	715	0.106	0.268	-	-
1	C-B	626	0.235	0.235	-	-

The slopes and intercepts shown above do NOT include any corrections or adjustments.

Streams may be combined, in which case capacity will be adjusted.

Values are shown for the first time segment only; they may differ for subsequent time segments.

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D1	2025	AM	ONE HOUR	07:45	09:15	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Av. Demand (PCU/hr)	Scaling Factor (%)
A		✓	270	100.000
B		✓	40	100.000
C		✓	270	100.000

Origin-Destination Data

Demand (PCU/hr)

		To		
		A	B	C
From	A	0	20	250
	B	20	0	20
	C	250	20	0

Vehicle Mix

HV %s

		To		
		A	B	C
From	A	0	10	2
	B	10	0	10
	C	2	10	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max delay (s)	Max Q (PCU)	Max LOS
B-AC	0.08	8.15	0.1	A
C-AB	0.04	7.21	0.0	A
C-A				
A-B				
A-C				

Main Results for each time segment

07:45 - 08:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	LOS
B-AC	30	566	0.053	30	0.1	7.388	A
C-AB	15	585	0.026	15	0.0	6.939	A
C-A	188			188			
A-B	15			15			
A-C	188			188			

08:00 - 08:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	LOS
B-AC	36	551	0.065	36	0.1	7.690	A
C-AB	18	579	0.032	18	0.0	7.055	A
C-A	224			224			
A-B	18			18			
A-C	225			225			

08:15 - 08:30

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	LOS
B-AC	44	530	0.083	44	0.1	8.144	A
C-AB	23	571	0.040	23	0.0	7.208	A
C-A	275			275			
A-B	22			22			
A-C	275			275			

08:30 - 08:45

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	LOS
B-AC	44	530	0.083	44	0.1	8.145	A
C-AB	23	571	0.040	23	0.0	7.211	A
C-A	275			275			
A-B	22			22			
A-C	275			275			

08:45 - 09:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	LOS
B-AC	36	551	0.065	36	0.1	7.694	A
C-AB	18	578	0.032	18	0.0	7.059	A
C-A	224			224			
A-B	18			18			
A-C	225			225			

09:00 - 09:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	LOS
B-AC	30	566	0.053	30	0.1	7.396	A
C-AB	15	585	0.026	15	0.0	6.942	A
C-A	188			188			
A-B	15			15			
A-C	188			188			

2025, PM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction Type	Major road direction	Junction Delay (s)	Junction LOS
1	N72 L2019 T Junction at Cappagh	T-Junction	Two-way	0.61	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D2	2025	PM	ONE HOUR	16:45	18:15	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Av. Demand (PCU/hr)	Scaling Factor (%)
A		✓	320	100.000
B		✓	30	100.000
C		✓	320	100.000

Origin-Destination Data

Demand (PCU/hr)

		To		
		A	B	C
From	A	0	20	300
	B	15	0	15
	C	300	20	0

Vehicle Mix

HV %s

		To		
		A	B	C
From	A	0	10	2
	B	19	0	10
	C	2	10	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max delay (s)	Max Q (PCU)	Max LOS
B-AC	0.06	8.64	0.1	A
C-AB	0.04	7.34	0.0	A
C-A				
A-B				
A-C				

Main Results for each time segment

16:45 - 17:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	LOS
B-AC	23	551	0.041	22	0.0	7.777	A
C-AB	15	578	0.026	15	0.0	7.029	A
C-A	226			226			
A-B	15			15			
A-C	226			226			

17:00 - 17:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	LOS
B-AC	27	534	0.051	27	0.1	8.120	A
C-AB	18	570	0.032	18	0.0	7.162	A
C-A	269			269			
A-B	18			18			
A-C	270			270			

17:15 - 17:30

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	LOS
B-AC	33	509	0.065	33	0.1	8.642	A
C-AB	23	561	0.041	23	0.0	7.335	A
C-A	330			330			
A-B	22			22			
A-C	330			330			

17:30 - 17:45

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	LOS
B-AC	33	509	0.065	33	0.1	8.644	A
C-AB	23	561	0.041	23	0.0	7.338	A
C-A	330			330			
A-B	22			22			
A-C	330			330			

17:45 - 18:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	LOS
B-AC	27	534	0.051	27	0.1	8.124	A
C-AB	18	570	0.032	18	0.0	7.166	A
C-A	269			269			
A-B	18			18			
A-C	270			270			

18:00 - 18:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	LOS
B-AC	23	551	0.041	23	0.0	7.785	A
C-AB	15	578	0.026	15	0.0	7.032	A
C-A	226			226			
A-B	15			15			
A-C	226			226			

APPENDIX D

PiCADY Capacity Model Output
N72/R671 T-Junction

Capacity Assessment With ALL Development Construction Traffic
Summary 'Junctions-9' PiCADY Results, Robust & Worst Case

Modelled Scenario	Period Mean Max Q (PCUs)	Period Max RFC
Opening Year 2025 AM Peak Hr	<1	0.25
Opening Year 2025 PM Peak Hr	<1	0.4

RESULTS CONFIRM ALL WORST CASE RFCs < AVAILABLE CAPACITY

(In PiCADY, Junctions are considered nearing capacity when RFC reaches 0.85)

The Assessment Clearly Demonstrates that No problems whatsover are expected at the Junction as all RFCs are WAY BELOW capacity. This is unsurprising in Light of Low Traffic Volumes and in Light of On-Site Capacity Observations.

Junctions 9

PICADY 9 - Priority Intersection Module

Filename: 2025 AM PM.j9
Path: C:\Users\Eoin\NRB Consulting Engineers Ltd\NRB Server - Documents\2023\23-063 KWF Grid Connection 2023\Calculations\N72 R761 Picadys
Report generation date: 15/06/2023 13:52:36

Summary of junction performance

	AM				PM			
	Q (PCU)	Delay (s)	RFC	LOS	Q (PCU)	Delay (s)	RFC	LOS
	2025							
Stream B-AC	0.4	9.64	0.25	A	0.3	9.51	0.25	A
Stream C-B	0.1	6.64	0.08	A	0.1	6.60	0.08	A

Values shown are the highest values encountered over all time segments. Delay is the maximum value of Av. delay per arriving vehicle.

File summary

File Description

Title	(untitled)
Location	
Site number	
Date	17/09/2019
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	
Enumerator	NRB-004\Eoin
Description	

Units

Distance units	Speed units	Traffic units input	Traffic units results	Flow units	Av. delay units	Total delay units	Rate of delay units
m	kph	PCU	PCU	perHour	s	-Min	perMin

Analysis Options

Calculate Q Percentiles	Calculate residual capacity	RFC Threshold	Av. Delay threshold (s)	Q threshold (PCU)
		0.85	36.00	20.00

Demand Set Summary

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D1	2025	AM	ONE HOUR	07:45	09:15	15
D2	2025	PM	ONE HOUR	16:45	18:15	15

Analysis Set Details

ID	Network flow scaling factor (%)
A1	100.000

2025, AM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction Type	Major road direction	Junction Delay (s)	Junction LOS
1	N72 R671 T Junction	T-Junction	Two-way	1.97	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Arms

Arms

Arm	Name	Description	Arm type
A	N72 East		Major
B	R671 Reg Road		Minor
C	N72 West		Major

Major Arm Geometry

Arm	Width of carriageway (m)	Has kerbed central reserve	Has right turn bay	Width for right turn (m)	Visibility for right turn (m)	Blocks?	Blocking queue (PCU)
C	9.00		✓	3.00	90.0		-

Geometries for Arm C are measured opposite Arm B. Geometries for Arm A (if relevant) are measured opposite Arm D.

Minor Arm Geometry

Arm	Minor arm type	Lane width (m)	Visibility to left (m)	Visibility to right (m)
B	One lane	3.50	90	90

Slope / Intercept / Capacity

Priority Intersection Slopes and Intercepts

Junction	Stream	Intercept (PCU/hr)	Slope for A-B	Slope for A-C	Slope for C-A	Slope for C-B
1	B-A	580	0.092	0.232	0.146	0.332
1	B-C	715	0.095	0.241	-	-
1	C-B	681	0.229	0.229	-	-

The slopes and intercepts shown above do NOT include any corrections or adjustments.

Streams may be combined, in which case capacity will be adjusted.

Values are shown for the first time segment only; they may differ for subsequent time segments.

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D1	2025	AM	ONE HOUR	07:45	09:15	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Av. Demand (PCU/hr)	Scaling Factor (%)
A		✓	310	100.000
B		✓	120	100.000
C		✓	310	100.000

Origin-Destination Data

Demand (PCU/hr)

		To		
		A	B	C
From	A	0	45	265
	B	60	0	60
	C	265	45	0

Vehicle Mix

HV %s

		To		
		A	B	C
From	A	0	10	2
	B	10	0	2
	C	2	2	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max delay (s)	Max Q (PCU)	Max LOS
B-AC	0.25	9.64	0.4	A
C-A				
C-B	0.08	6.64	0.1	A
A-B				
A-C				

Main Results for each time segment

07:45 - 08:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	LOS
B-AC	90	564	0.160	90	0.2	8.023	A
C-A	200			200			
C-B	34	627	0.054	34	0.1	6.188	A
A-B	34			34			
A-C	200			200			

08:00 - 08:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	LOS
B-AC	108	548	0.197	108	0.3	8.640	A
C-A	238			238			
C-B	40	617	0.066	40	0.1	6.371	A
A-B	40			40			
A-C	238			238			

08:15 - 08:30

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	LOS
B-AC	132	527	0.251	132	0.3	9.626	A
C-A	292			292			
C-B	50	602	0.082	49	0.1	6.641	A
A-B	50			50			
A-C	292			292			

08:30 - 08:45

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	LOS
B-AC	132	527	0.251	132	0.4	9.643	A
C-A	292			292			
C-B	50	602	0.082	50	0.1	6.641	A
A-B	50			50			
A-C	292			292			

08:45 - 09:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	LOS
B-AC	108	548	0.197	108	0.3	8.663	A
C-A	238			238			
C-B	40	617	0.066	41	0.1	6.375	A
A-B	40			40			
A-C	238			238			

09:00 - 09:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	LOS
B-AC	90	564	0.160	91	0.2	8.060	A
C-A	200			200			
C-B	34	627	0.054	34	0.1	6.190	A
A-B	34			34			
A-C	200			200			

2025, PM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction Type	Major road direction	Junction Delay (s)	Junction LOS
1	N72 R671 T Junction	T-Junction	Two-way	2.02	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D2	2025	PM	ONE HOUR	16:45	18:15	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Av. Demand (PCU/hr)	Scaling Factor (%)
A		✓	295	100.000
B		✓	120	100.000
C		✓	295	100.000

Origin-Destination Data

Demand (PCU/hr)

		To		
		A	B	C
From	A	0	45	250
	B	60	0	60
	C	250	45	0

Vehicle Mix

HV %s

		To		
		A	B	C
From	A	0	10	2
	B	10	0	2
	C	2	2	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max delay (s)	Max Q (PCU)	Max LOS
B-AC	0.25	9.51	0.3	A
C-A				
C-B	0.08	6.60	0.1	A
A-B				
A-C				

Main Results for each time segment

16:45 - 17:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	LOS
B-AC	90	567	0.159	90	0.2	7.960	A
C-A	188			188			
C-B	34	630	0.054	34	0.1	6.161	A
A-B	34			34			
A-C	188			188			

17:00 - 17:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	LOS
B-AC	108	553	0.195	108	0.3	8.551	A
C-A	225			225			
C-B	40	620	0.065	40	0.1	6.337	A
A-B	40			40			
A-C	225			225			

17:15 - 17:30

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	LOS
B-AC	132	533	0.248	132	0.3	9.490	A
C-A	275			275			
C-B	50	606	0.082	49	0.1	6.596	A
A-B	50			50			
A-C	275			275			

17:30 - 17:45

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	LOS
B-AC	132	533	0.248	132	0.3	9.507	A
C-A	275			275			
C-B	50	606	0.082	50	0.1	6.596	A
A-B	50			50			
A-C	275			275			

17:45 - 18:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	LOS
B-AC	108	553	0.195	108	0.3	8.575	A
C-A	225			225			
C-B	40	620	0.065	41	0.1	6.341	A
A-B	40			40			
A-C	225			225			

18:00 - 18:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	LOS
B-AC	90	567	0.159	91	0.2	7.994	A
C-A	188			188			
C-B	34	630	0.054	34	0.1	6.163	A
A-B	34			34			
A-C	188			188			

APPENDIX E

PiCADY Capacity Model Output
R671/L6074 T-Junction

Capacity Assessment With ALL Development Construction Traffic
Summary 'Junctions-9' PiCADY Results, Robust & Worst Case

Modelled Scenario	Period Mean Max Q (PCUs)	Period Max RFC
Opening Year 2025 AM Peak Hr	<1	0.04
Opening Year 2025 PM Peak Hr	<1	0.05

RESULTS CONFIRM ALL WORST CASE RFCs < AVAILABLE CAPACITY
(In PiCADY, Junctions are considered nearing capacity when RFC reaches 0.85)

The Assessment Clearly Demonstrates that No problems whatsover are expected at the Junction as all RFCs are WAY BELOW capacity. This is unsurprising in Light of Low Traffic Volumes and in Light of On-Site Capacity Observations.

Junctions 9

PICADY 9 - Priority Intersection Module

Filename: 2025 AM PM.j9
Path: C:\Users\Eoin\NRB Consulting Engineers Ltd\NRB Server - Documents\2023\23-063 KWF Grid Connection 2023\Calculations\L6074 R671 Picadys
Report generation date: 15/06/2023 13:57:45

Summary of junction performance

	AM				PM			
	Q (PCU)	Delay (s)	RFC	LOS	Q (PCU)	Delay (s)	RFC	LOS
	2025							
Stream B-AC	0.1	7.93	0.04	A	0.1	7.85	0.05	A
Stream C-AB	0.0	6.26	0.04	A	0.0	6.27	0.02	A

Values shown are the highest values encountered over all time segments. Delay is the maximum value of Av. delay per arriving vehicle.

File summary

File Description

Title	(untitled)
Location	
Site number	
Date	17/09/2019
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	
Enumerator	NRB-004\Eoin
Description	

Units

Distance units	Speed units	Traffic units input	Traffic units results	Flow units	Av. delay units	Total delay units	Rate of delay units
m	kph	PCU	PCU	perHour	s	-Min	perMin

Analysis Options

Calculate Q Percentiles	Calculate residual capacity	RFC Threshold	Av. Delay threshold (s)	Q threshold (PCU)
		0.85	36.00	20.00

Demand Set Summary

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D1	2025	AM	ONE HOUR	07:45	09:15	15
D2	2025	PM	ONE HOUR	16:45	18:15	15

Analysis Set Details

ID	Network flow scaling factor (%)
A1	100.000

2025, AM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction Type	Major road direction	Junction Delay (s)	Junction LOS
1	T Junction at L6074 R671	T-Junction	Two-way	1.71	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Arms

Arms

Arm	Name	Description	Arm type
A	R671 N		Major
B	L60745 to Site		Minor
C	R671 S		Major

Major Arm Geometry

Arm	Width of carriageway (m)	Has kerbed central reserve	Has right turn bay	Visibility for right turn (m)	Blocks?	Blocking queue (PCU)
C	6.00			90.0	✓	1.00

Geometries for Arm C are measured opposite Arm B. Geometries for Arm A (if relevant) are measured opposite Arm D.

Minor Arm Geometry

Arm	Minor arm type	Lane width (m)	Visibility to left (m)	Visibility to right (m)
B	One lane	3.00	90	90

Slope / Intercept / Capacity

Priority Intersection Slopes and Intercepts

Junction	Stream	Intercept (PCU/hr)	Slope for A-B	Slope for A-C	Slope for C-A	Slope for C-B
1	B-A	552	0.101	0.254	0.160	0.363
1	B-C	681	0.104	0.264	-	-
1	C-B	626	0.243	0.243	-	-

The slopes and intercepts shown above do NOT include any corrections or adjustments.

Streams may be combined, in which case capacity will be adjusted.

Values are shown for the first time segment only; they may differ for subsequent time segments.

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D1	2025	AM	ONE HOUR	07:45	09:15	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Av. Demand (PCU/hr)	Scaling Factor (%)
A		✓	75	100.000
B		✓	21	100.000
C		✓	75	100.000

Origin-Destination Data

Demand (PCU/hr)

		To		
		A	B	C
From	A	0	20	55
	B	20	0	1
	C	55	20	0

Vehicle Mix

HV %s

		To		
		A	B	C
From	A	0	10	2
	B	10	0	10
	C	2	2	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max delay (s)	Max Q (PCU)	Max LOS
B-AC	0.04	7.93	0.1	A
C-AB	0.04	6.26	0.0	A
C-A				
A-B				
A-C				

Main Results for each time segment

07:45 - 08:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	LOS
B-AC	16	533	0.030	16	0.0	7.647	A
C-AB	15	613	0.025	15	0.0	6.135	A
C-A	41			41			
A-B	15			15			
A-C	41			41			

08:00 - 08:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	LOS
B-AC	19	529	0.036	19	0.0	7.767	A
C-AB	18	611	0.029	18	0.0	6.188	A
C-A	49			49			
A-B	18			18			
A-C	49			49			

08:15 - 08:30

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	LOS
B-AC	23	522	0.044	23	0.1	7.932	A
C-AB	22	608	0.036	22	0.0	6.262	A
C-A	60			60			
A-B	22			22			
A-C	61			61			

08:30 - 08:45

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	LOS
B-AC	23	522	0.044	23	0.1	7.932	A
C-AB	22	608	0.036	22	0.0	6.262	A
C-A	60			60			
A-B	22			22			
A-C	61			61			

08:45 - 09:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	LOS
B-AC	19	529	0.036	19	0.0	7.768	A
C-AB	18	611	0.029	18	0.0	6.191	A
C-A	49			49			
A-B	18			18			
A-C	49			49			

09:00 - 09:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	LOS
B-AC	16	533	0.030	16	0.0	7.651	A
C-AB	15	613	0.025	15	0.0	6.136	A
C-A	41			41			
A-B	15			15			
A-C	41			41			

2025, PM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction Type	Major road direction	Junction Delay (s)	Junction LOS
1	T Junction at L6074 R671	T-Junction	Two-way	1.02	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D2	2025	PM	ONE HOUR	16:45	18:15	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Av. Demand (PCU/hr)	Scaling Factor (%)
A		✓	120	100.000
B		✓	25	100.000
C		✓	110	100.000

Origin-Destination Data

Demand (PCU/hr)

		To		
		A	B	C
From	A	0	20	100
	B	20	0	5
	C	100	10	0

Vehicle Mix

HV %s

		To		
		A	B	C
From	A	0	10	2
	B	10	0	2
	C	2	2	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max delay (s)	Max Q (PCU)	Max LOS
B-AC	0.05	7.85	0.1	A
C-AB	0.02	6.27	0.0	A
C-A				
A-B				
A-C				

Main Results for each time segment

16:45 - 17:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	LOS
B-AC	19	540	0.035	19	0.0	7.475	A
C-AB	8	605	0.012	7	0.0	6.143	A
C-A	75			75			
A-B	15			15			
A-C	75			75			

17:00 - 17:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	LOS
B-AC	22	534	0.042	22	0.0	7.628	A
C-AB	9	601	0.015	9	0.0	6.198	A
C-A	90			90			
A-B	18			18			
A-C	90			90			

17:15 - 17:30

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	LOS
B-AC	28	524	0.052	27	0.1	7.844	A
C-AB	11	596	0.019	11	0.0	6.274	A
C-A	110			110			
A-B	22			22			
A-C	110			110			

17:30 - 17:45

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	LOS
B-AC	28	524	0.052	28	0.1	7.846	A
C-AB	11	596	0.019	11	0.0	6.274	A
C-A	110			110			
A-B	22			22			
A-C	110			110			

17:45 - 18:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	LOS
B-AC	22	533	0.042	23	0.0	7.629	A
C-AB	9	601	0.015	9	0.0	6.200	A
C-A	90			90			
A-B	18			18			
A-C	90			90			

18:00 - 18:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	LOS
B-AC	19	540	0.035	19	0.0	7.482	A
C-AB	8	605	0.012	8	0.0	6.143	A
C-A	75			75			
A-B	15			15			
A-C	75			75			

17:45 - 18:00

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	LOS
B-AC	22	533	0.042	23	0.0	7.629	A
C-AB	9	601	0.015	9	0.0	6.200	A
C-A	90			90			
A-B	18			18			
A-C	90			90			

18:00 - 18:15

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	LOS
B-AC	19	540	0.035	19	0.0	7.482	A
C-AB	8	605	0.012	8	0.0	6.143	A
C-A	75			75			
A-B	15			15			
A-C	75			75			

Appendix 12.3 - Structural Inspection of Buried Structures

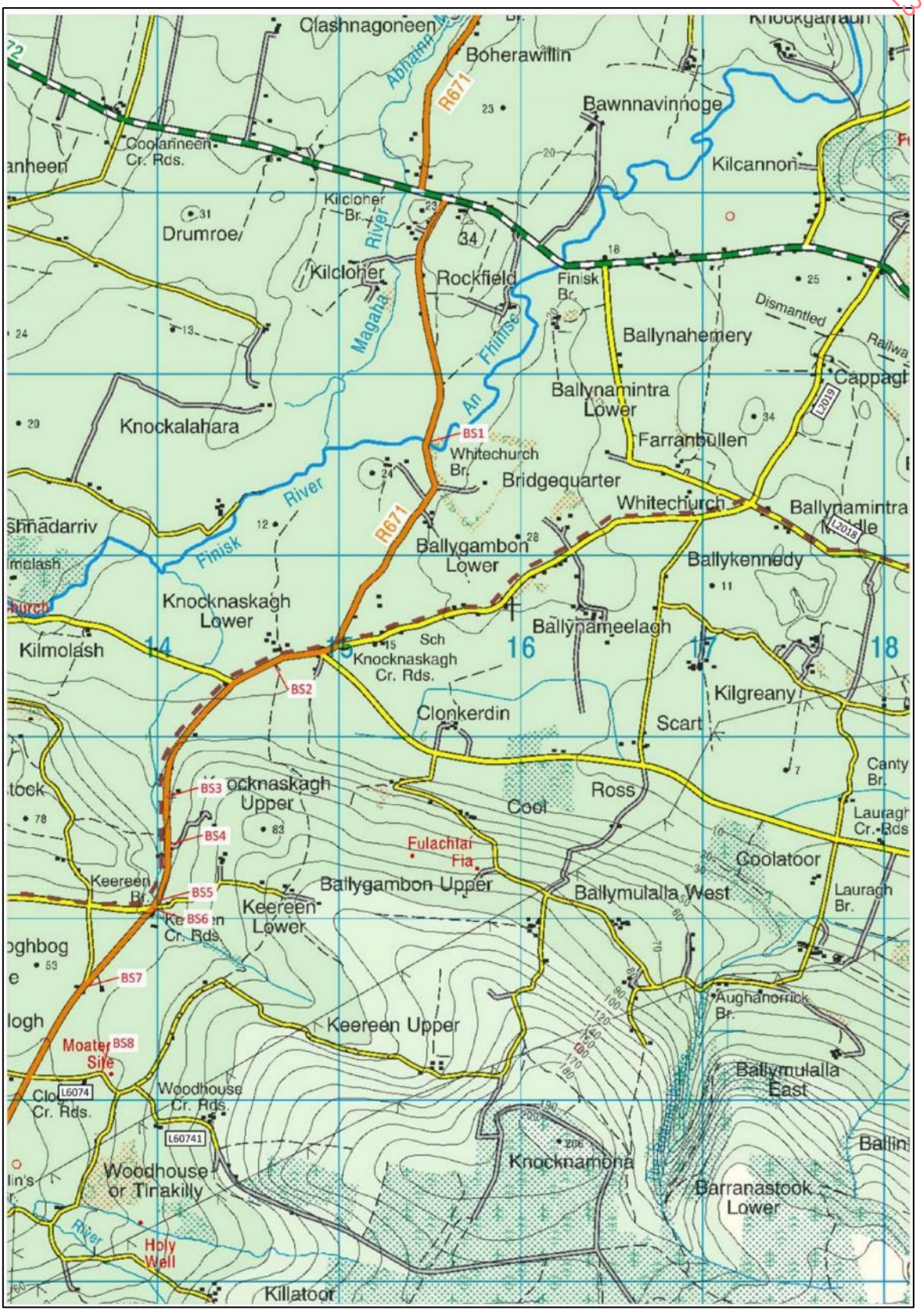
The data and descriptions in this appendix have informed Chapter 12: Material Assets

Overview:

TLI Group were employed by Knocknamona Windfarm Limited to undertake a structural survey of bridge and culverts crossings (buried structures) along the proposed haulage route for the KWF Grid Connection. A visual survey was carried out by Ruairi Geary, Chartered Engineer and David Tarrant, Chartered Engineer on the 2nd February 2023. The weather at time of inspection was dry and sunny with no heavy rainfall within a week of inspection. The bridges/culverts were accessed as far as practicable. No intrusive or uncovering works were carried out as part of the survey.

The purpose of the inspection was to assess the current condition of bridges/culverts and comment on the suitability of the bridges/culverts for increased haulage traffic during the construction of the KWF Grid Connection and the delivery of abnormal loads for the Knocknamona Windfarm. Once the maximum transportation loading to the windfarm is confirmed, TLI Group would recommend that a detailed structural analysis of the bridges/culverts is carried out immediately prior to abnormal load deliveries.

Location of Buried Structures on Discovery Map



Buried Structure 1 - BS1

Ref: Whitechurch Bridge
Location: Whitechurch Bridge – R671.015 - ITM Co-ordinates: 614557, 594466
Crossing Type: Bridge

Description:
Bridge is a 3 arch masonry bridge with masonry parapet walls.

Condition:
The bridge is in good condition. There are no visual indicators of failure or movement of the masonry. The bridge was maintained by modern construction methods in the past 20 years. The masonry on the bridge faces and piers have been pointed using cement mortar. The spaces between the barrel masonry have been filled with gunite (sprayed concrete). The barrel in Arch 1 does require the apex of the barrel to be re-spayed. The re-spraying of barrel is required for standard maintenance of the bridge.
The road surface over the bridge showed no signs of settlement / failure.

Conclusion:
Bridge is in good condition and recently maintained. Bridge is considered to be suitable for construction traffic associated with KWF Grid Connection and abnormal load deliveries for Knocknamona Windfarm.

Image 1: Whitechurch Bridge.

Image 2: Pier/ Cutwater Between Arch 1 & 2

Image 3: Pier/ Cutwater Between Arch 2 & 3

Image 4: Cavities at apex of barrel of Arch 1.

Image 5: Cavities at apex of barrel of Arch 2.

Image 6: Arch 3.

Image 7: Cavities at apex of barrel of Arch 3.

Buried Structure 2- BS2

Location: R671, west of Knocknaskagh Cross Roads - ITM Co-ordinates: 614585, 594470
Buried Structure Type: Cattle Pass

Description:
Road crossing over precast concrete cattle pass.

Condition:
The cattle pass is in good condition. There are no visual indicators of failure of the precast units. The road surface over the bridge showed no signs of settlement / failure.

Conclusion:
The cattle pass is in good condition. The cattle pass is purpose built to accommodate traffic loads and therefore is suitable for construction traffic associated with KWF Grid Connection and abnormal load deliveries for Knocknamona Windfarm.

Image 8: Precast Concrete Cattle Pass

Image 9: Precast Concrete Cattle Pass

Buried Structure 3 – BS3

Location: R671, Knocknaskagh Upper - ITM Co-ordinates: 613990, 593729
Buried Structure Type: Concrete Culvert

Description:
Road crossing over precast concrete pipe (300mm Diameter).

Condition:
The concrete pipe is in g condition. There are no visual indicators of failure of the precast units.
The road surface over the culvert showed no signs of settlement / failure.

Conclusion:
The precast concrete culvert is in fair condition. The precast concrete pipe is purpose built to accommodate traffic loads and therefore is suitable for construction traffic associated with KWF Grid Connection and abnormal load deliveries for Knocknamona Windfarm.

Image 10: Precast Concrete Pipe.

Buried Structure 4 – BS4

Location: R671, near Keereen Quarry - ITM Co-ordinates: 614012, 593467
Buried Structure Type: Masonry Box Culvert

Description:
Road crossing over masonry box culvert.

Condition:
From a visual inspection of the outlet of the masonry box culvert, it looks to be in fair condition. Due to the size of the culvert (0.6m x 0.3m) it was not possible to fully inspect the condition of the culvert. The road surface over the culvert showed no signs of settlement / failure.

Conclusion:
The masonry culvert is in fair condition. Due to the size of the culvert and the depth of the culvert below road level (1.2m from road to top of culvert) the culvert is considered suitable for construction traffic associated with KWF Grid Connection and abnormal load deliveries for Knocknamona Windfarm.

Image 11: Masonry Box Culvert.

Buried Structure 5 – BS5

Location: R671, north of Keereen Cross Roads - ITM Co-ordinates: 613941, 593156
Buried Structure Type: Twin Wall Drainage Pipe

Description:
Road crossing over 600mm diameter twin wall drainage pipe.

Condition:
From a visual inspection of the pipe, it looks to be in good condition.
The road surface over the drainage pipe showed no signs of settlement / failure.

Conclusion:
The pipe is in good condition and located 2.5m below road level. There is no evidence at road level of any settlement or failure of the road surface. The pipe is considered suitable for construction traffic associated with KWF Grid Connection and abnormal load deliveries for Knocknamona Windfarm.

Image 12: Twin Wall type drainage pipe.

Buried Structure 6 – BS6

Location: Keereen Cross
ITM Co-ordinates: R671, Bridge at Keereen Cross Roads - 613937, 593139
Buried Structure Type: Bridge

Description:
Road crossing over single arch masonry bridge.

Condition:
From a visual inspection of the bridge, it looks to be in fair to good condition. The bridge barrel has been repaired by spraying concrete (gunite) into the gaps in the masonry. Some sections of the walls under the bridge require re-spraying as part of standard maintenance. The external masonry (where visible) is in good condition. No evidence of failure of the masonry.
The road surface over the bridge showed no signs of settlement / failure.

Conclusion:
The bridge is in fair to good condition. The bridge does require some re-spraying of masonry joints as part of standard maintenance of the bridge. There is no evidence at road level of any settlement or failure of the road surface. The bridge is considered suitable for construction traffic associated with KWF Grid Connection and abnormal load deliveries for Knocknamona Windfarm.

Image 13: Barrel under bridge.

Image14: Some joints in masonry require filling.

Buried Structure 7 – BS7

Location: R671, north of Clogh Cross Roads - ITM Co-ordinates: 613551,592684

Buried Structure Type: Concrete Drainage Pipe

Description:
Road crossing over precast concrete pipe (300mm Diameter).

Condition:
The concrete pipe is in fair condition. There are no visual indicators of failure of the precast units. The road surface over the drainage pipe showed no signs of settlement / failure.

Conclusion:
The precast concrete pipe is in fair condition. The precast concrete pipe is purpose built to accommodate traffic loads and therefore is considered suitable for construction traffic associated with KWF Grid Connection and abnormal load deliveries for Knocknamona Windfarm.

Image 15: Precast concrete drainage pipe.

Buried Structure 8 – BS8

Location: Local Road L6074 at Clogh - ITM Co-ordinates: 613639 , 592203
Buried Structure Type: Twin wall drainage pipe in masonry box culvert

Description:
Road crossing over 500mm diameter twin wall drainage pipe which has been installed in a masonry box culvert.

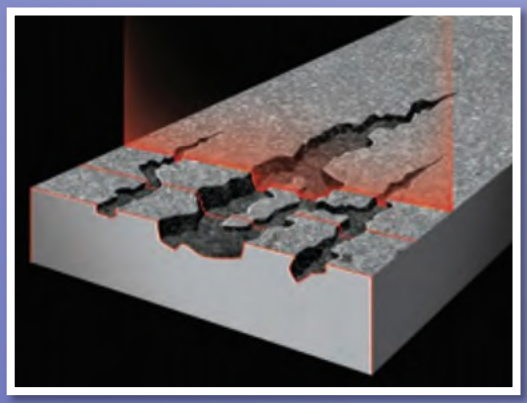
Condition:
From a visual inspection of the pipe and culvert, it looks to be in good condition.
The road surface over the drainage pipe and culvert showed no signs of settlement / failure.

Conclusion:
The pipe and culvert is in good condition and located 0.6m below road level. There is no evidence at road level of any settlement or failure of the road surface. The structure is purpose built to accommodate traffic loading and is considered suitable for construction traffic associated with KWF Grid Connection and abnormal load deliveries for Knocknamona Windfarm..

Image 16: Twin wall drainage pipe installed in a masonry box culvert.

Appendix 12.4: Pavement Condition Survey

The data and descriptions in this appendix have informed Chapter 12: Material Assets of the EIA Report



Pavement Condition Survey of the KWF Grid Connection, Dungarvan Co. Waterford

On behalf of:

Knocknamona Windfarm Ltd.

Video Pavement Condition Index (vPCI) Survey Report

Pavement Management Services Ltd.

September 2019

DOCUMENT CONTROL SHEET

Client	Knocknamona Windfarm Ltd.					
Project Title	Pavement Condition Survey of the KWF Grid Connection, Dungarvan, Co. Waterford					
Document Title	Video Pavement Condition Index (vPCI) Survey Report					
Document No.	1.2					
This Document Comprises	**DCS**	**TOC**	**Text**	**Tables**	**Figures**	**No. of Appendices**
	1	1	8	7	0	2

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Contents

1. Introduction

A pavement condition survey of the KWF Grid Connection, Dungarvan, Co. Waterford was carried out by PMS Pavement Management Services Ltd. on behalf of Knocknamona Windfarm Ltd. in September 2019. The pavement condition survey comprised of a video survey and pavement condition index (vPCI) survey for the network. The video data collection survey in the field was carried out on the 11th of September 2019. This report presents the results of the vPCI survey carried out on this date.

Table 1 gives a description of the road network surveyed including the section, lane or survey direction and measured length for each section. GPS co-ordinates at the beginning and end of each section are also indicated in Table 1.

Road No.	Location	Lane/Dir	Length (m)	GPS WGS-84 From		GPS WGS-84 To	
				Latitude	Longitude	Latitude	Longitude
L2018 & L2019	Knocknamona	NB	1605	52.109258	-7.747485	52.121373	-7.738431
L2018 & L2019	Knocknamona	SB	1605	52.121413	-7.738225	52.109306	-7.747535
L-6074	Clogh	EB	630	52.081453	-7.806599	52.081489	-7.770939
L-60741	Woodhouse	SB	535	52.080910	-7.798375	52.078929	-7.792301
L-6074	Keereen Upper	EB	20	52.081501	-7.771093	52.081483	-7.770881

Table 1: Network Description

2. Data Collection

The data collection survey of the road network in the field is carried out using a specialised video survey vehicle equipped with a high-definition video camera, distance measurement instrument (DMI), and GPS receiver. The video survey is typically carried out at normal traffic speeds, depending on road condition and road geometrics. The survey vehicle captures forward viewing video of the road surface using a high-definition video camera. The video data is recorded using both chainage and GPS referenced coordinate systems by an on-board computer. The condition of the roads surveyed can be assessed by a visual condition survey from the video recorded. Each video frame is stamped with road segment ID, date, time and chainage, and the frames are compressed to retain maximum definition at minimum storage space. The video frames and associated information are then written to a high-speed hard disk.

Once the data is collected in the field, all of the remaining post-processing can be carried out indoors. The visual assessment of the road sections was carried out in the office by viewing the video recording for each road and identifying the type, severity and quantity of the distresses present using the PCI methodology described below.

3. Pavement Condition Index (PCI)

The Pavement Condition Index (PCI) procedure was developed by the U.S. Army Corps of Engineers in the early 1970's. It is one of the most comprehensive visual pavement inspection systems and has been extensively refined and improved over the past 40 years. The detailed PCI rating procedures are outlined in U.S. Army Technical Manual 5-623 *"Pavement Maintenance Management"* and U.S. Army Construction Engineering Research Laboratory (CERL) Technical Report M-294 *"Pavement Maintenance Management for Roads and Parking Lots".*

The PCI inspection system is based on a defined index of between 0 and 100 that all pavements must lie between. A new pavement (theoretically distress-free) has a PCI of 100. For each distress measured, a "deduct value" is calculated depending upon the nature of the distress, its severity and quantity. The deduct values are summed, adjusted to take into account the total number of distresses identified, and then subtracted from 100 to give the PCI index for the pavement.

A breakdown of pavement classification by PCI is given in Table 2.

PCI Range	Pavement Condition Rating
85 to 100	Very Good
65 to 85	Good
50 to 65	Fair
40 to 50	Poor
20 to 40	Very Poor
< 20	Fail

Table 2: Pavement Classification based on PCI

A modified version of the U.S. Army Corps of Engineers PCI methodology based on a windshield survey from a slow-moving vehicle was developed in Ireland in the 1990's.

Modifications to the windshield survey were then developed to provide a video PCI (vPCI) methodology. There were 19 original distresses specified under the U.S. PCI methodology and 10 distresses were retained for the Irish method. The distresses can be grouped into four categories as shown in Table 3.

Surface Defects	Openings in Surface	Cracking	Pavement Deformation
Bleeding	Potholes	Alligator Cracking	Rutting
Ravelling	Road Disintegration	Edge Break-up	Depressions
Patching		Cracking - Other	

Table 3: Irish Distresses Grouped by Category

The Non-National Roads Pavement Condition Study; *"Windshield Distress Catalogue Descriptions and Rating Procedures"* pavement inspection manual has been produced specifically for Irish road conditions. It describes each distress type, how to distinguish between severity levels and displays photographs for every distress type/severity combination. Depending upon the distress type there is one, two or three severity levels defined. Bleeding, for example, has only one severity level defined, while Potholes and Patching have three severity levels.

The vPCI survey is carried out on every 100-metre sample unit of the road network survey from the video recorded in the field. The type, severity and quantity of pavement distress for each 100-metre length of pavement is identified and stored. The vPCI rating, structural index and surface index is calculated from the distress data collected.

The vPCI value provides an overall measure of the pavement condition based on the PCI scale, and provides information on the types and quantities of the pavement defects. The Structural Index reflects the percentage contribution of load-related distresses (potholes, rutting, alligator cracking, edge cracking, and road disintegration) to the overall vPCI value. The Surface Index reflects the percentage contribution of surface-related distresses (bleeding, ravelling) to the overall vPCI value. The remainder of the deduct is primarily attributable to patching, which is not classified as load or surface related in the present definitions.

4. Survey Results

Table 4 presents the overall average vPCI section results. The standard deviation of the vPCI values is shown to quantify the variability of vPCI values over the section. The Structural Index and Surface Index results for each section are also given in Table 4.

A breakdown of the distress data based on distress type is given in Tables 5, 6 & 7. Table 5 displays the distress types sorted by number of occurrences. Table 6 shows the distress type sorted by average quantity of distress per occurrence, expressed as a percentage of the total area of the sample unit. Table 7 shows the distress type sorted by average deduct value for each distress per occurrence.

Appendix A details the vPCI, Structural Index and Surface Index results for each 100-metre sample unit. The sample unit number increases in the direction of traffic on all sections. Detailed results of all distresses including type, severity and quantity for each 100-metre sample unit are also available, if a more detailed subsequent examination is required.

Appendix B contains a site map showing the location and extent of the section.

Road No.	Location	Lane/Dir	vPCI	Rating	Standard Deviation	% Structure	% Surface
L2018 & L2019	Knocknamona	NB	81	Good	15	36	50
L2018 & L2019	Knocknamona	SB	79	Good	13	28	59
L-6074	Clogh	EB	87	Very Good	3	17	73
L-60741	Woodhouse	SB	81	Good	10	45	42
L-6074	Keereen Upper	EB	46	Poor	0	79	21

Table 4: PCI Section Results

Name	No. Of Occurrences
Ravelling	32
Bleeding	29
Rutting	18
Depression	7
Patching	6
EdgeBreakup	3
Potholes	2
Alligator	0
Disintegration	0
OtherCracking	0

Table 5: Distresses Sorted by Number of Occurrences

Name	Average Quantity
Bleeding	12
Ravelling	7
Rutting	4
Patching	3
Potholes	2
Depression	2
EdgeBreakup	1
Alligator	0
Disintegration	0
OtherCracking	0

Table 6: Distresses Sorted by Average Quantity per Occurrence

Name	Average Deduct
Rutting	21
EdgeBreakup	14
Patching	12
Depression	12
Bleeding	12
Potholes	11
Ravelling	9
Alligator	0
Disintegration	0
OtherCracking	0

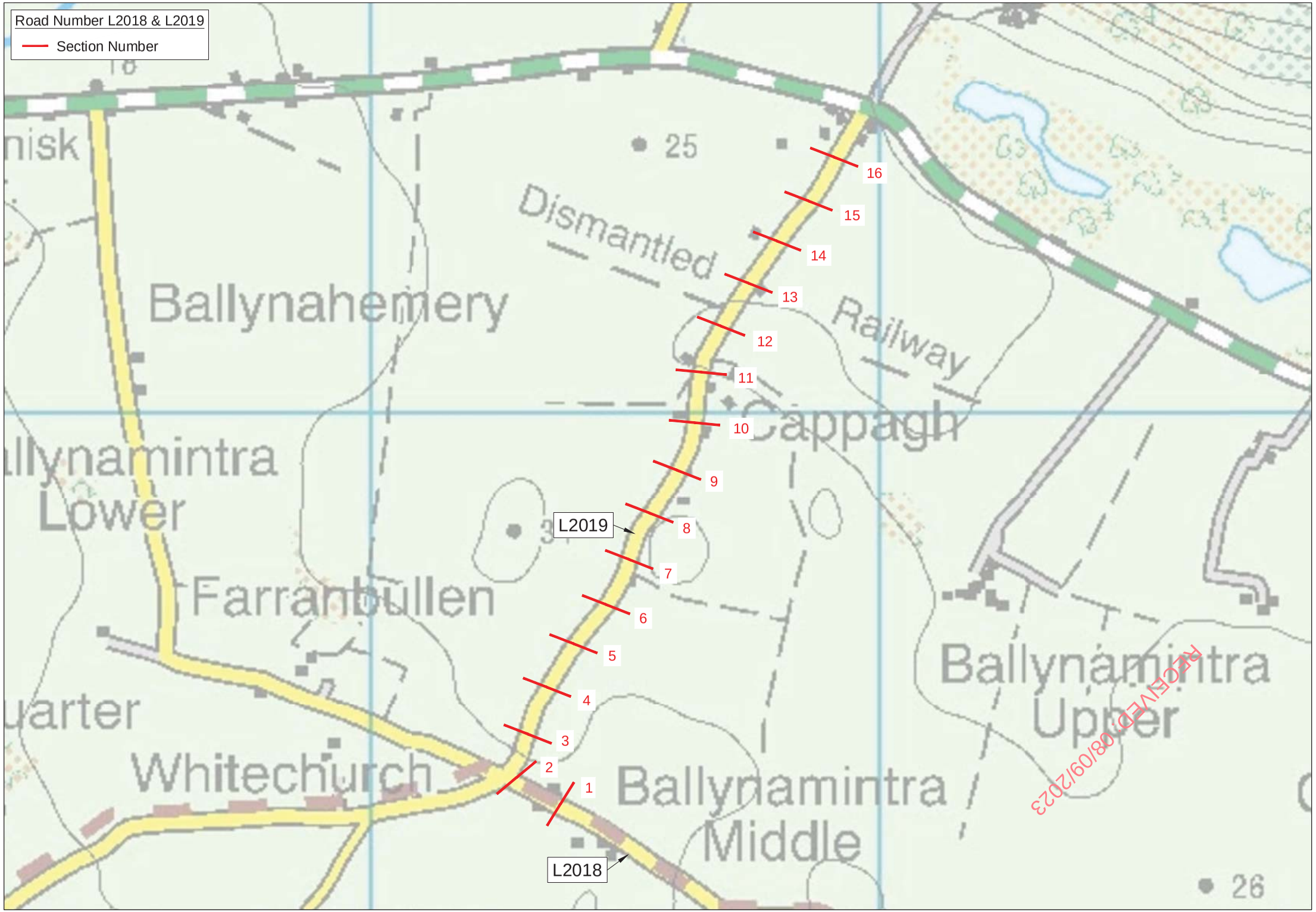
Table 7: Distresses Sorted by Average Deduct per Occurrence

Appendix A – vPCI Results

100m Sample Units

Road No.	Location	Lane/Dir	Section number	Chainage (m)		PCI	% Structure	% Surface
				From	To			
L2018 & L2019	Cappagh	NB	1	0	100	95	0	100
L2018 & L2019	Cappagh	NB	2	100	200	42	54	24
L2018 & L2019	Cappagh	NB	3	200	300	49	48	27
L2018 & L2019	Cappagh	NB	4	300	400	83	0	71
L2018 & L2019	Cappagh	NB	5	400	500	84	36	64
L2018 & L2019	Cappagh	NB	6	500	600	67	66	34
L2018 & L2019	Cappagh	NB	7	600	700	92	0	100
L2018 & L2019	Cappagh	NB	8	700	800	86	32	34
L2018 & L2019	Cappagh	NB	9	800	900	91	0	100
L2018 & L2019	Cappagh	NB	10	900	1000	91	0	100
L2018 & L2019	Cappagh	NB	11	1000	1100	81	33	67
L2018 & L2019	Cappagh	NB	12	1100	1200	85	0	68
L2018 & L2019	Cappagh	NB	13	1200	1300	91	0	100
L2018 & L2019	Cappagh	NB	14	1300	1400	91	0	100
L2018 & L2019	Cappagh	NB	15	1400	1500	84	36	64
L2018 & L2019	Cappagh	NB	16	1500	1600	90	0	100
L2018 & L2019	Cappagh	SB	16	0	100	91	0	100
L2018 & L2019	Cappagh	SB	15	100	200	87	0	100
L2018 & L2019	Cappagh	SB	14	200	300	82	0	100
L2018 & L2019	Cappagh	SB	13	300	400	87	0	100
L2018 & L2019	Cappagh	SB	12	400	500	87	0	100
L2018 & L2019	Cappagh	SB	11	500	600	59	60	40
L2018 & L2019	Cappagh	SB	10	600	700	50	48	52
L2018 & L2019	Cappagh	SB	9	700	800	74	25	75
L2018 & L2019	Cappagh	SB	8	800	900	74	7	93
L2018 & L2019	Cappagh	SB	7	900	1000	92	0	100
L2018 & L2019	Cappagh	SB	6	1000	1100	85	0	100
L2018 & L2019	Cappagh	SB	5	1100	1200	84	45	55
L2018 & L2019	Cappagh	SB	4	1200	1300	76	0	23
L2018 & L2019	Cappagh	SB	3	1300	1400	85	11	49
L2018 & L2019	Cappagh	SB	2	1400	1500	58	45	27
L2018 & L2019	Cappagh	SB	1	1500	1600	100	0	0
L-6074	Clogh	EB	1	0	100	89	0	100
L-6074	Clogh	EB	2	100	200	87	0	64
L-6074	Clogh	EB	3	200	300	81	33	35
L-6074	Clogh	EB	4	300	400	87	0	94
L-6074	Clogh	EB	5	400	500	92	0	100
L-6074	Clogh	EB	6	500	630	88	26	74
L-60741	Woodhouse	SB	5	0	100	82	58	42
L-60741	Woodhouse	SB	4	100	200	61	55	18
L-60741	Woodhouse	SB	3	200	300	89	0	100
L-60741	Woodhouse	SB	2	300	400	85	49	51
L-60741	Woodhouse	SB	1	400	535	89	0	100
L-6074	Keereen Upper	EB	1	0	20	46	79	21

Appendix B – Site Map


Road Number L2018 & L2019
Section Number
Dismantled
Railway
Ballynahemery
Cappagh
Lower
Farrantullen
Whitechurch
Ballynamintra
Middle
Ballynamintra
Upper
L2019
L2018
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
25
26
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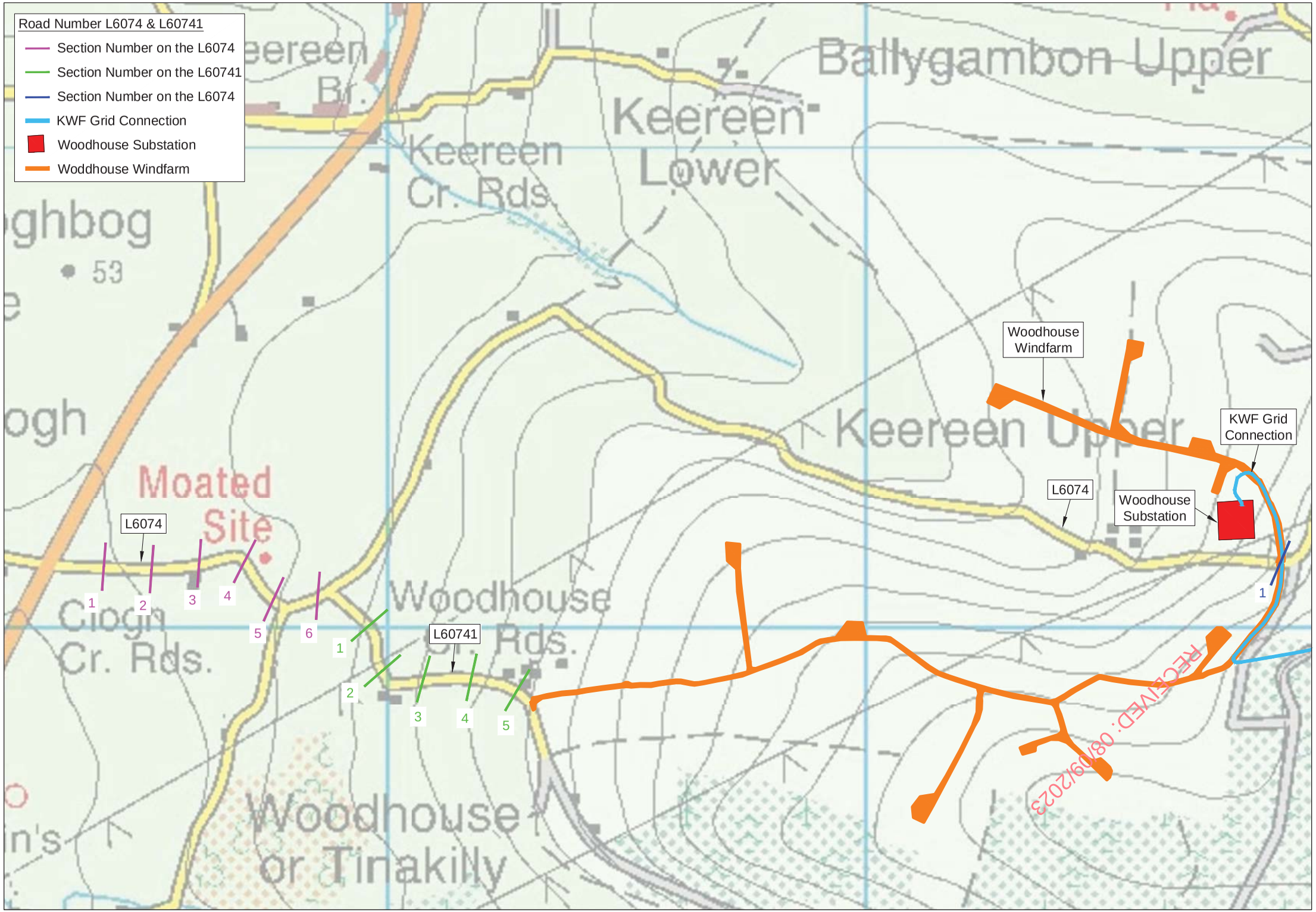
Road Number L6074 & L60741
Section Number on the L6074
Section Number on the L60741
Section Number on the L6074
KWF Grid Connection
Woodhouse Substation
Woddhouse Windfarm
Ballygambon Upper
Keereen Br.
Keereen Lower
Keereen Cr. Rds
Keereen Upper
Moated Site
L6074
L60741
Woodhouse Cr. Rds.
Ciogn Cr. Rds.
Woodhouse or Tinakilly
Woodhouse Windfarm
KWF Grid Connection
L6074
Woodhouse Substation
1
2
3
4
5
6
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