CHAPTER 13 TRAFFIC AND TRANSPORTATION

Figures (Volume 3)

Technical Appendices (Volume 4)

13. Traffic and Transportation

13.1 Executive Summary

13.1.1 An assessment of traffic and transport effects on the public road network associated with Achany Extension Wind Farm (the Proposed Development) has been undertaken. The preferred access strategy proposes that all turbine abnormal loads would originate from either Nigg or Invergordon and access the site via the A9 to Loch Fleet then the A839 passing through Lairg before entering the Site entrance from the east.

13.1.2 The assessment considers the impacts during the construction phase of the Proposed Development, when volumes of traffic generation are anticipated to be at their greatest due to the delivery of equipment and construction materials. In line with IEMA guidelines (Institute of Environmental Assessment, 1993), severance, driver delay, pedestrian delay, pedestrian amenity, fear and intimidation as well as accidents and safety have been evaluated in isolation for the Proposed Development. Following the implementation of a Construction Traffic Management Plan (CTMP), proposed mitigation measures and discussion with stakeholders, the environmental effect is considered to be **not significant**.

13.1.3 Traffic volumes, as a result of construction activities, are likely to increase on the public roads approaching the Site. Heavy Goods Vehicles (HGV) traffic volumes are anticipated to temporarily increase by more than 30% on the A836 and A949 with total traffic volumes likely to increase by more than 30% on the A839. The environmental effect is considered to be **not significant** following the implementation of the proposed mitigation measures, such as a comprehensive CTMP.

13.1.4 For the purposes of the cumulative assessment, it has been assumed that all construction programmes for committed developments; Lairg 2, Creag Riabhach and Braemore Wind Farms coincide with the Proposed Development. Although, this is highly unlikely due to supply chain constraints associated with the transport of construction materials including wind turbines, the cumulative assessment has considered the worst-case scenario.

13.1.5 In this worst-case scenario, HGV traffic volumes for the Proposed Development in combination with other committed developments are anticipated to increase by over 30% on the A836, A949 and A839 with total traffic volumes also likely to increase by over 30% on the A836 and A839. In this scenario, and prior to mitigation measures, it is considered that significant cumulative effects in relation to pedestrian amenity, fear and intimidation could arise for users of the A839 west of Lairg. Significant cumulative effects in relation to pedestrian amenity could also arise for users of A836, A949 and within Bonar Bridge.

13.1.6 When considering theoretical worst case overlap of the peak periods associated with the construction programmes of other developments within the cumulative assessment, the effects are considered to be **significant** although temporary and over a short time period.

13.1.7 However, in the unlikely event of peak construction activities overlapping, further mitigation measures would be introduced through the CTMP to minimise conflict between construction traffic and road users within Bonar Bridge and on the A839. Following the implementation of suitable mitigation measures, **no significant residual cumulative effects** are anticipated.

13.2 Introduction

13.2.1 This Chapter considers the potential traffic and transport effects associated with Achany Extension Wind Farm (the Proposed Development).

13.2.2 The assessment focusses on the construction phase of the Proposed Development as the worst-case scenario for traffic generation.

13.2.3 The specific objectives of the Chapter are to:

- Describe the traffic and transportation baseline;
- Describe the assessment methodology and significance criteria used in completing the impact assessment;
- Describe the potential effects, including direct, indirect and cumulative effects; and
- Assess the residual effects remaining following the implementation of mitigation.

13.2.4 This Chapter is supported by the following technical appendices:

- Technical Appendix 13.1: Transport Assessment; and
- Technical Appendix 13.2: Route Survey Report.

13.2.5 Technical Appendix 13.1 includes an Outline Construction Traffic Management Plan (CTMP) with Technical Appendix 13.2 detailing traffic management measures specific to the movement of abnormal loads.

13.2.6 The assessment has been carried out by Tetra Tech Environment Planning Transport Limited, part of the Tetra Tech Europe Group in accordance with the Institute of Environmental Assessment (now Institute of Environmental Management and Assessment (IEMA)) Guidelines for the Environmental Assessment of Road Traffic (Institute of Environmental Assessment, 1993). All staff contributing to this Chapter have undergraduate and/or postgraduate degrees in relevant subjects, have professional transport assessment experience, and hold professional membership of the Chartered Institute of Logistics and Transport.

13.3 Scope of Assessment

Study Area

13.3.1 The study area includes sections of the public road network which would be used to access the Proposed Development (also referred to as 'the Site') by construction and operational traffic, as agreed with the relevant Road authorities i.e. Transport Scotland (TS) and The Highland Council (THC). The study area has been identified through a review of the likely routes used for abnormal loads, by suppliers of equipment and materials, to and from the Site. It is considered that it should include:

- A839 between Loch Fleet and Proposed Development;
- A836 between Tarlogie and Lairg;
- A494 between Clashmore and Bonar Bridge; and
- A9 between Invergordon and Loch Fleet.

13.3.2 The preferred abnormal load access strategy is the same delivery route utilised for the operational Achany Wind Farm. The component parts of the proposed turbines, in particular the blade components, are larger than those previously transported along the proposed delivery route. Subject to detailed design review and trial runs, additional modifications would be required to the road network such as vegetation clipping or

clearance and street furniture removal. Details of the abnormal load access strategy and associated road network modifications are detailed in Technical Appendix 13.2 Route Survey Report.

Consultation Responses

13.3.3 The 2019 and 2020 Scoping exercises for the Proposed Development have identified key issues to be considered within the assessment. Issues of relevance to Traffic and Transport are outlined in Table 13.1 below.

Table 13.1: Scoping and Consultation Responses relevant to Traffic and Transport

Consultee	Consultation Response	Comment / Action Taken
Transport Scotland (TS)	Transport Scotland would request that potential trunk road related environmental impacts such as driver delay, pedestrian amenity, severance, safety etc be considered and assessed where appropriate (i.e. where Institute of Environmental Management and Assessment Guidelines for further assessment are breached).	Impacts on the trunk road network have been assessed relative to IEMA guidelines (Section 13.5).
	A full Abnormal Loads Assessment report should be provided with the Environmental Impact Assessment Report (EIAR) that identifies key pinch points on the trunk road network. Swept path analysis should be undertaken and details provided with regard to any required changes to street furniture or structures along the route.	A full abnormal loads route assessment is provided in Technical Appendix 13.2.
Transport Scotland (TS)	As there are no predicted changes to the Traffic and Transport elements of the project, Transport Scotland is satisfied that the comments provided in their previous scoping response (11 September 2019) remain valid.	Noted
The Highland Council (THC)	A Transport Assessment (TA), or section on traffic and transportation, within the EIA Report for the project will be required. The TA should identify all roads likely to be affected by the various stages of the development and consider in detail the impact of development traffic, including abnormal load movements, on these roads.	In addtion to the assement of transport impact contained within Section 13.7, a Transport Assessment is provided in Technical Appendix 13.1.

13.4 Legislation, Policy and Guidance

13.4.1 A review of relevant traffic and transport planning policies has been undertaken and summarised below. The review provides the basis for the wider development context of energy proposals.

National Policy and Guidance

National Planning Framework 3

13.4.2 The Scottish National Planning Framework 3 (NPF3) sets the context for development planning in Scotland and provides a framework for the spatial development of Scotland as a whole. It sets out the Government's development priorities over the next 20 to 30 years and identifies national developments which support the development strategy. Scotland's NPF 3 was laid in the Scottish Parliament on 23 June 2014.

Scottish Planning Policy

13.4.3 In relation to transport and access matters, Scottish Planning Policy (SPP) notes:

- "*Where a new development or a change of use is likely to generate a significant increase in the number of trips, a transport assessment should be carried out. This should identify any potential cumulative effects which need to be addressed;"* and,
- *"Development proposals that have the potential to affect the performance or safety of the strategic transport network need to be fully assessed to determine their impact. Where existing infrastructure has the capacity to accommodate a development without adverse impacts on safety or unacceptable impacts on operational performance, further investment in the network is not likely to be required. Where such investment is required, the cost of the mitigation measures required to ensure the continued safe and effective operation of the network will have to be met by the developer."*

Planning Advice Notice (PAN) 75

13.4.4 PAN75: Planning for Transport provides advice on the requirements for Transport Assessments as follows:

- *"Requires a transport assessment to be produced for significant travel generating developments. Transport Assessment is a tool that enables delivery of policy aiming to integrate transport and land use planning."*
- *"All planning applications that involve the generation of person trips should provide information which covers the transport implications of the development. The level of detail will be proportionate to the complexity and scale of the impact of the proposal. For smaller developments the information on transport implications will enable local authorities to monitor potential cumulative impact and for larger developments it will form part of a scoping exercise for a full transport assessment. Development applications will therefore be assessed by relevant parties at levels of detail corresponding to their potential impact."*

Onshore Wind Turbines: Online Renewables Planning Advice (May 2014)

13.4.5 The Scottish Government introduced online renewables planning advice in February 2011 which has been updated since then. The most recent specific advice note regarding onshore wind turbines was published in May 2014. The advice note identifies the typical planning considerations in determining applications for onshore wind turbines including landscape impact, impacts on wildlife and ecology, shadow flicker, noise, ice throw, aviation, road traffic impacts, cumulative impacts and decommissioning.

13.4.6 In terms of road traffic impacts, the guidance notes that in siting wind turbines close to major roads, pre-application discussions are advisable. This is particularly important for

the movement of large components (abnormal load routing) during the construction period, periodic maintenance and for decommissioning.

Transport Assessment Guidance 2012

13.4.7 The main objective of this Transport Scotland guidance document is to assist in the preparation of Transport Assessments for development proposals in Scotland. The planning and transport policy context is set out in SPP which provides an outline of the framework for delivering integration of transport and land use planning, including the requirement for a Transport Assessment, for developments involving significant travel generating uses.

13.4.8 Transport Assessment Guidance sets out requirements according to the scale of development being proposed.

Guidelines for the Environmental Assessment of Road Traffic, IEMA, 1993

13.4.9 The document includes guidance on how the sensitivity of receptors should be assessed, contains rules to help determine which links in the study area should be considered for detailed assessment and identifies the key impacts that are most important when assessing the magnitude of traffic effects from an individual development.

Local Policy

The Highland Council Local Transport Strategy 2010

13.4.10 The Local Transport Strategy (LTS) sets out the Council's transport policies within the study area. It refers to the road network across rural areas being characterised by 'winding single carriageway roads with passing places'. Reference is also made to the additional pressure that can be placed on sub-standard roads. The LTS also mentions the many bridges which are subject to weight restrictions in the Local Authority area. The LTS states that "*where possible, the Council, through its Lifeline Bridges programme will invest in the bridges to maintain access either by removing weight restrictions or reducing the weight restriction effect of HGV vehicles*." The aim of the Lifeline Bridges programme is to assist the economy of the area by allowing the efficient transport of essential goods and services and providing for industries that are heavily dependent on large vehicle transport.

13.5 Methodology

Method of Baseline Characterisation

13.5.1 The methodology adopted in this assessment has involved the following key stages:

- Determine baseline conditions;
- Review the Proposed Development to identify potential effects including any cumulative effects;
- Evaluate significance;
- Identify mitigation; and
- Assess residual effects.

Desk Study

13.5.2 The baseline review focuses on the nature of the surrounding road infrastructure and the level of traffic that uses it. It has been informed by the following:

- Review of the 2019 Scoping Opinion and 2020 Scoping Refresh responses;
- Collection of traffic flow data;
- Review of roads hierarchy;
- Identification of sensitive junction locations;
- Identification of constraints to the roads network, with or without height/width/weight restrictions;
- Identification of areas of road safety concerns;
- Identification of other traffic sensitive receptors in the area (routes, communities, buildings etc.);
- Review of Ordnance Survey (OS) plans to derive a local roads network; and
- Consideration of potential supply locations for construction materials to inform the extent of roads network to be considered in the assessment.

Field Study

13.5.3 Site visits were undertaken as part of the Abnormal Indivisible Load (AIL) route assessment which considered potential constraints to the movement of AILs in terms of height, width and weight restrictions.

Methodology for the Assessment of Effects from Construction

Criteria for Assessing the Sensitivity of Receptors

13.5.4 In terms of transport and access impacts, the receptors are the users of the roads within the study area and the locations through which those roads pass.

13.5.5 The IEMA Guidelines document includes guidance on how the sensitivity of receptors should be assessed. Using that as a base, professional judgement was used to develop a classification of sensitivity for users based on the characteristics of roads and locations. This receptor sensitivity classification is summarised in Table 13.2.

Table 13.2: Classification of Receptor Sensitivity

Receptor value/sensitivity	Receptor Type	
	Users of Roads	**Users of Locations**
High	Where the road is a minor rural road, not constructed to accommodate frequent use by Heavy Goods Vehicles (HGV's). Includes roads with traffic control signals, waiting and loading restrictions, traffic calming measures.	Where a location is a large rural settlement containing a high number of community and public services and facilities.
Medium	Where the road is a local A or B class road, capable of regular use by HGV traffic.	Where a location is an intermediate sized rural settlement, containing some

Receptor value/sensitivity	Receptor Type	
	Users of Roads	**Users of Locations**
	Includes roads where there is some traffic calming or traffic management measures.	community or public facilities and services.
Low	Where the road is Trunk or A-class, constructed to accommodate general and HGV traffic moving between primary destinations. Includes roads with little or no traffic calming or traffic management measures.	Where a location is a small rural settlement, few community or public facilities or services.
Negligible	Where roads have no adjacent settlements. Includes new strategic trunk roads that would be little affected by additional traffic and suitable for Abnormal Indivisible Load (AILs) and new strategic trunk road junctions capable of accommodating AILs.	Where a location includes individual dwellings or scattered settlements with no facilities.

13.5.6 Where a road passes through a location, users are considered subject to the highest level of sensitivity defined by either the road or location characteristics.

Criteria for Assessing the Magnitude of Change

13.5.7 The following rules, also taken from the IEMA Guidelines were used to determine which links within the traffic and transport study area should be considered:

- Rule 1 – include highway links where traffic flows are predicted to increase by more than 30% (or where the number of HGVs is predicted to increase by more than 30%).
- Rule 2 – include any other specifically sensitive areas (such as schools, hospitals, congested junctions etc.) where traffic flows are predicted to increase by 10% or more.

13.5.8 The IEMA Guidelines identify the key impacts that are most important when assessing the magnitude of traffic impacts from an individual development: the impacts and levels of magnitude are discussed below:

- **Severance** – the IEMA Guidance states that, "*severance is the perceived division that can occur within a community when it becomes separated by a major traffic artery*." Further, "*Changes in traffic of 30%, 60% and 90% are regarded as producing 'slight', 'moderate' and 'substantial' [or minor, moderate and major] changes in severance respectively*". However, the Guidelines acknowledge that "*the measurement and prediction of severance is extremely difficult*" (Para 4.28).

- **Driver delay** – the IEMA Guidelines note that these delays are only likely to be "*significant [or major] when the traffic on the network surrounding the development is already at, or close to, the capacity of the system*" (Para 4.32).
- **Pedestrian Delay** – the delay to pedestrians, as with driver delay, is likely only to be major when the traffic on the network surrounding the development is already at, or close to, the capacity of the system. An increase in total traffic of approximately 30 % can double the delay experienced by pedestrians attempting to cross the road and would be considered 'major'.
- **Pedestrian Amenity** – the IEMA Guidelines broadly define pedestrian amenity as the "*relative pleasantness of a journey*". It is affected by traffic flow, traffic composition, footway width and separation from traffic. The IEMA Guidelines suggest that a tentative threshold for judging the significance of changes in pedestrian amenity is where the traffic flow (or its lorry component) is halved or doubled (Para 4.39). It is therefore considered that a change in the traffic flow of -50 % or +100 % would produce a 'major' change in pedestrian amenity.
- **Fear and intimidation** – there are no commonly agreed thresholds for estimating levels of fear and intimidation from known traffic and physical conditions. However, as the impact is considered to be sensitive to traffic flow, changes in traffic flow of 30 %, 60 % and 90 % are regarded as producing 'minor', 'moderate' and 'major' changes in fear and intimidation respectively.
- **Accidents and safety** – professional judgement would be used to assess the implications of local circumstances, or factors which may elevate or lessen risks of accidents.

Criteria for Assessing Cumulative Effects

13.5.9 Traffic associated with operational wind farms and other development currently using the road network, and therefore flows, are captured in baseline traffic surveys or extracted from the online Department for Transport (DfT) database of count sites (https://roadtraffic.dft.gov.uk/).

13.5.10 Cumulative developments identified as having an impact on the road network within the study area during their respective construction periods have been considered in a cumulative assessment. This assessment considers developments which are either committed or subject to valid planning applications and is carried out on the assumption that the peak period of construction for these developments would coincide with that of the Proposed Development. Traffic flow information for relevant developments is extracted from documentation submitted with the relevant consent applications.

Criteria for Assessing Significance of Effect

13.5.11 To determine the overall significance of the effects, the results from the receptor sensitivity and magnitude assessment are correlated and classified using a scale set out in Table 2.4 of Volume 11, Section 2, Part 5 of Design Manual for Roads and Bridges (DMRB) and summarised in Table 13.3.

Table 13.3: Significance of Effect

Receptor Sensitivity	Magnitude of Impact			
	Major	**Moderate**	**Minor**	**Negligible**
High	**Major**	**Major**	**Moderate**	Negligible
Medium	**Major**	**Moderate**	Minor	Negligible
Low	**Moderate**	Minor	Minor	Negligible
Negligible	Negligible	Negligible	Negligible	Negligible

13.5.12 In terms of the Environmental Impact Assessment (EIA) Regulations, effects are considered significant where they are assessed to be major or moderate (shown as bold in Table 13.3.).

Assumptions and Limitations

13.5.13 The UK coronavirus lockdown commenced on the 23 March 2020 with various restrictions on movement in place for the majority of 2020 with an associated impact on traffic flows within the Study Area. To enable a robust assessment of the likely impacts during the construction phase, 2019 Annual Average Daily Traffic Flow data was extracted from the online DfT database of count sites located within the Study Area.

13.5.14 The area of the Proposed Development has not seen any significant growth in recent years therefore the DfT count sites are believed to provide an accurate representation of existing road usage without the risk of commissioning surveys that may result in misrepresentative traffic flows compared to usual conditions, because of the current global pandemic.

13.5.15 Six years of National Road Traffic Forecast (NRTF) high growth was applied to the surveyed traffic movements. The NRTF high growth factor for 2019 to 2025 is 8.08%. This factor was applied to the 2019 DfT data to estimate the 2025 traffic flows. High growth is substantially higher than the levels of growth generally experienced in the area and is considered to adequately cover for any committed developments not individually accounted for within the cumulative assessment.

13.5.16 Construction traffic flows associated with committed and planned developments were included within the cumulative assessment, assuming that the peak period of construction for all developments would occur simultaneously. This is considered a very conservative assumption in order to consider the worst-case cumulative scenario.

13.5.17 For the purposes of this assessment, it is assumed that all staff and construction traffic will be generated from outside the traffic and transport Study Area. This is a conservative assumption as it is likely that some staff and construction materials will originate within the traffic and transport Study Area and their movements will not therefore impact on all roads under consideration within the Study Area. This could include staff based in Tain, Bonar Bridge or Lairg or construction materials sourced from quarries including Breedon, Ardchronie Quarry and Pat Munro, Dornoch Bridge Quarry.

13.5.18 Based on the location of population centres outwith the study area, 85 % of staff trips were assumed to originate from towns accessed via the A9 south of the Dornoch Firth,

such as Inverness and Dingwall with 15% via the A9 north of the Dornoch Firth, including Dornoch and Golspie.

13.6 Baseline

Current Baseline

Extent of Study Area

13.6.1 The study area for the traffic and transport assessment was identified through a review of the likely routes between suppliers of equipment and materials and the Proposed Development, including the preferred abnormal delivery route. The study area is defined as the public roads which would be used during the construction phase to access the Proposed Development, as shown in Figure 13.1 and includes:

- A839 between Loch Fleet and the Proposed Development;
- A836 between Tarlogie and Lairg;
- A949 between Clashmore and Bonar Bridge; and
- A9 between Invergordon and Loch Fleet.

13.6.2 To reduce the impact of construction traffic on the rural single track road network, it has been assumed that no construction traffic will approach the Proposed Development from the west on the A839.

13.6.3 The A9 is a strategic trunk road managed by Transport Scotland and its managing agent Bear Scotland. The A839, A836 and A949 are local roads managed by THC.

13.6.4 The A839 is a two-way rural single carriageway road subject to the national speed limit except where it passes through settlements including Lairg and Pittentrail, where the speed limit reduces to 30 miles per hour (mph). The road provides access to small hamlets and dwellings in the study area and provides access to Lairg from both the east and west. West of Lairg between the junction with the B864 and the Proposed Development, the A839 is of varying width including sections of single track with passing places.

13.6.5 The A836 is a two-way rural single carriageway road subject to the national speed limit except where it passes through settlements including Ardgay, Bonar Bridge and Lairg where the speed limit reduces to 30mph. The road provides access to small hamlets and dwellings in the study area and provides access to Lairg from both the north and south.

13.6.6 The A949 is a two-way rural single carriageway road subject to the national speed limit except where it passes through settlements including Bonar Bridge where the speed limit reduces to 30mph. The road provides access to small hamlets and dwellings in the study area and provides an alternative access to Bonar Bridge along the northern edge of the Dornoch Firth.

Existing Traffic Movements

13.6.7 To determine the existing road usage, 2019 Annual Average Daily Traffic Flow (AADT) data for eight sites was extracted from the online DfT database of count sites. The locations of the traffic count sites are illustrated on Figure 13.1 and are as follows:

- A9 between Invergordon and Tain; (DfT 20724);
- A9 between Tain and Dornoch Bridge; (DfT 30723);
- A836 between Dornoch Firth Bridge (south side) and Bonar Bridge; (DfT 80004);

- A9 between Dornoch Firth Bridge (south side) and The Mound; (DfT 30722);
- A839 between The Mound and Lairg; (DfT 20935);
- A836 between Bonar Bridge and Lairg; (DfT 20934);
- A839 between Lairg and the Proposed Development Junction; (DfT 50934); and
- A949 between Clashmore and Bonar Bridge; (DfT 20935).

13.6.8 The existing weekday traffic flows at each count site are summarised into cars, Light Goods Vehicles (LGV) and HGVs in Table 13.4.

Table 13.4: Existing Traffic Conditions (Weekday Average Two Way Flows)

Survey Location	Cars & LGV's	HGV's	Total
A9 between Invergordon and Tain (DfT 20724)	10012	732	10744
A9 between Tain and Dornoch Bridge (DfT 30723)	7275	589	7864
A836 between Dornoch Firth Bridge and Bonar Bridge (DfT 80004)	548	164	712
A9 between Dornoch Firth Bridge and The Mound (DfT 30722)	4004	335	4339
A839 between The Mound and Lairg (DfT 20935)	831	40	871
A836 between Bonar Bridge and Lairg (DfT 20934)	986	87	1073
A839 between Lairg and Site Access Junction (DfT 50934	265	98	363
A949 between Clashmore and Bonar Bridge (DfT 20935)	830	40	870

Accident Data

13.6.9 Road traffic accident data obtained from the web resource http://www.crashmap.co.uk for the study area roads covering the five years to the end of 2019. A detailed summary of the personal injury accidents recorded within the study area road network is presented in Technical Appendix 13.1: Transport Assessment, for the five-year period which indicate that:

- Over the 260km network reviewed, out of a total of 68 accidents, an average of 13 accidents occurred every year;
- 82% of the accidents are classified as slight;
- 13% of accidents are classified as serious;
- 5% of accidents are classified as fatal;
- The A9 / B9174 Junction presents an area where 18 accidents were recorded accounting for 26% of the total, these accidents were all classified as 'slight'; and
- All other accidents were spread evenly across the network with no common locations or causes identified.

Footway and Cycleway Network

13.6.10 A review of foot and cycle paths that may be affected by the movement of construction traffic was undertaken.

13.6.11 THC's Interactive Core Paths Map (The Highland Council, 2021) indicates the following Core Paths in close proximity to the Proposed Development:

- Sika Trail Cycle Route SU21.02 – off-road cycle route following the Rosehall Wind Farm access track north of the B839 around 1.5km west of the Site access;
- Braemore – Achany SU16.08 – unsurfaced track linking Achany to the A839 approximately 1.5km east of the Achany Wind Farm access junction; and
- Gruids Wood Track SU16.09 – unsurfaced track linking the A839 and B864 approximately 3km east of the Achany Wind Farm access junction.

13.6.12 There are no core paths or other formal footpaths within the site or in proximity that would be affected by traffic movements associated with the Proposed Development as none of these paths cross roads which would be utilised by construction traffic.

13.6.13 The A836 east of Ardgay and A839 within Lairg also form part of National Cycle Route 1 (NCR1).

Future Baseline

Traffic Flows

13.6.14 It is anticipated that construction of the Proposed Development could potentially take place during 2025 (subject to consents and approvals being granted). For the purpose of this assessment, an 18-month construction period was assumed. Any lengthening in the programme will reduce the peak period trip generation.

13.6.15 Base year traffic flows were determined by applying a National Road Traffic Forecast (NRTF) factor to the surveyed traffic flows.

13.6.16 The NRTF high growth factor for 2019 to 2025 is 1.0808. This factor was applied to the 2019 Dft data and to estimate the 2025 traffic flows. The estimated future year baseline traffic movements are shown in Table 13.5.

Table 13.5: Future Year Baseline Traffic Conditions (Weekday Average Two Way Flows)

Survey Location	Cars & LGV's	HGV's	Total
A9 between Invergordon and Tain (DfT 20724)	10821	791	11612
A9 between Tain and Dornoch Bridge (DfT 30723)	7863	637	8499
A836 between Dornoch Firth Bridge and Bonar Bridge (DfT 80004)	592	177	770
A9 between Dornoch Firth Bridge and The Mound (DfT 30722)	4328	362	4690
A839 between The Mound and Lairg (DfT 20935)	898	43	941
A836 between Bonar Bridge and Lairg (DfT 20934)	1066	94	1160
A839 between Lairg and Site Access Junction (DfT 50934	286	106	392
A949 between Clashmore and Bonar Bridge (DfT 20935)	897	43	940

Summary of Sensitive Receptors

13.6.17 Table 13.6 provides a summary of the receptors identified as being sensitive to the Proposed Development and which have been 'scoped-in' to the assessment, together with a justification for their inclusion.

Table 13.6: Summary of Receptor Sensitivity

Receptor (Users of Road or Location)	Sensitivity	Justification
A9	Low	Trunk or A-class road constructed to accomodate general and HGV traffic between primary destinations.
A836	Low	Trunk or A-class road constructed to accomodate general and HGV traffic between primary destinations.
A839 (East of Lairg)	Low	Trunk or A-class road constructed to accomodate general and HGV traffic between primary destinations.
A949	Low	Trunk or A-class road constructed to accomodate general and HGV traffic between primary destinations.
A839 (West of Lairg)	Medium	Local A or B class road, capable of regular use by HGV traffic.
Bonar Bridge	Medium	Intermediate sized rural settlement with several facilities and services.
Lairg	Medium	Intermediate sized rural settlement with several facilities and services.
Edderton	Low	Small rural settlement with limited services.
Ardgay	Low	Small rural settlement with limited services.
Pittentrail	Low	Small rural settlement with limited services.

13.7 Potential Effects

Potential Construction Impacts

Construction Traffic Generation

13.7.1 During the assumed 18-month construction programme, it is anticipated the following vehicle types would require regular access to the Proposed Development from the public road:

- staff transport, cars, vans and staff minibuses (cars and LGV);
- construction equipment and materials, deliveries of machinery and supplies such as imported stone (if required) and concrete raw materials (HGV);
- AILs consisting of the wind turbine components, transformer components and heavy lift crane(s); and
- escort vehicles for AIL deliveries, cars and LGV.

13.7.2 Except for the turbine components, most traffic would be normal construction plant and would include grading tractors, excavators, high capacity cranes, forklifts and dumper trucks. Most would arrive at the site on HGVs.

13.7.3 The turbines would be delivered to the Proposed Development in component sections and assembled on-site. The nacelle, hub, drive train, blade sections and tower sections are classified as AILs due to their weight and/or length, width and height when loaded.

13.7.4 The turbine components can be delivered on a variety of transport platforms with typical examples illustrated in Technical Appendix 13.2.

13.7.5 In addition to the turbine deliveries, two or more high capacity erection cranes will be needed to offload some components and erect the turbines. The cranes are likely to be mobile cranes with a capacity up to 1,000 tonnes that would be escorted by boom and ballast trucks to allow full mobilisation on-site. Smaller erector cranes would also be present to allow the assembly of the main cranes and to facilitate overall erection of the turbines.

Construction Traffic Movements

13.7.6 The assessment is based upon information provided by the Applicant and developed from experience of other wind farms of a similar scale which is detailed in Section 6 of Technical Appendix 13.1.

13.7.7 The candidate turbine used in the route assessment, represents the most onerous component dimensions likely to be transported to the Proposed Development.

13.7.8 The greatest number of vehicle movements are associated with the import of materials associated with the on-site production of concrete for turbine foundations.

13.7.9 Technical Appendix 11.1: Borrow Pit Appraisal identifies 5 suitable borrow pits (BP) noting that subject further investigations that BP1 and BP2 have the potential to provide sufficient rock material to provide the full stone requirement for the site. Based on the information available from an initial assessment of available stone combined with experience from the previous construction of Achany Wind Farm, it is therefore been assumed that the majority of stone material (80% of the total volume) will be delivered from the on-site borrow pits. An exception has been made for higher quality aggregate materials required to construct the wearing course of access tracks, crane hardstandings

(20% of the total volume) which will be sourced from off-site quarries. It is considered that this provides a robust methodology should it not be possible to source all the required stone material from on-site borrow pits.

13.7.10 To enable comparison of the estimated future year baseline traffic movements with total volumes including predicted construction traffic, average daily two-way movements for each month assuming a 22-day working month for deliveries were determined. Traffic movements were also split by vehicle type, in line with the baseline data and the peak period determined for construction traffic. The final daily construction profile by activity is set out in Annex B of Technical Appendix 13.1 and summarised in Table 13.7.

Table 13.7: Daily Construction Traffic Movements (Weekday Average Two way Flows)

Vehicle Type	**Month**								
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Car/LGV	24	48	48	48	48	50	52	52	52
HGV	7	10	61	60	70	90	93	92	84
Total	31	58	109	108	118	140	145	145	136
Vehicle Type	**Month**								
	10	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**
Car/LGV	43	43	26	14	14	14	14	14	14
HGV	73	16	4	1	1	1	1	1	1
Total	116	59	31	16	16	16	16	21	21

13.7.11 The maximum traffic movements associated with construction of the Proposed Development are predicted to occur during months 7 to 8 of the programme. During these months, an average of 93 HGV movements is predicted per day and it is estimated that there would be a further 52 car and minibus / LGV movements per day to transport construction workers to and from the Proposed Development.

Construction Traffic Routing/Distribution

13.7.12 The origin of vehicle traffic would depend on the location of staff accommodation and the source of materials being imported. It is likely that staff would be accommodated across a wide area. The highest volume of traffic would be generated by the requirement for concrete source materials and stone associated with the access track construction, elements of which would be imported. There are several potential sources of suitable materials near the Proposed Development including Breedon, Ardchronie Quarry and Pat Munro, Dornoch Bridge Quarry. Full details of the assumed distribution are set out in Section 6 of Technical Appendix 13.1.

13.7.13 HGV traffic is assumed to use the A836 and A949 from their respective junctions with the A9 then access the Proposed Development from the east via the A839 making a right turn. All HGV traffic would only use the A839 to the east of the site access and would be forced to turn left when exiting the Proposed Development, due to the low standards of the road network to the west. The choice of HGV route was based on identifying the most suitable route between the access to the Proposed Development and the primary Trunk or A-Class road network. It is considered unlikely that HGV traffic would utilise the A839 to the east of Lairg as the majority of construction materials could be sourced from the A9 to the south.

13.7.14 Due to the similar journey times and distances on the A836 and A949 routes between the A9 and Bonar Bridge, it has been assumed that 100% of the assumed HGV distribution would approach from the south on the A9 and has then been applied to each route in order to provide a robust assessment. It should be noted that the closest sources of materials, Ardchronie Quarry and Dornoch Bridge Quarry are located within the study area and that the selection of materials supplier prior to construction will impact on the final traffic distribution.

13.7.15 All turbine blade loads would originate from Invergordon or Nigg and access the site via the A9 to Loch Fleet then the A839 to Lairg before following the same route as HGV traffic.

Predicted Construction Impacts

13.7.16 To estimate the total trips on the road network within the study area during the construction phase, daily construction traffic flows were combined with the future year baseline traffic data. The resulting figures were compared with the weekday future year baseline traffic.

13.7.17 Table 13.8 summarises the daily peak construction traffic (Months 7 to 8) at the various locations within the study area and Table 13.9 summarises the future year baseline plus peak construction traffic (total) flows.

Table 13.8: Weekday Peak Construction Traffic (Daily Average Two Way Flows)

Survey Location	Cars & LGV's	HGV's	Total
A9 between Invergordon and Tain (DfT 20724)	45	93	138
A9 between Tain and Dornoch Bridge (DfT 30723)	45	93	138
A836 between Dornoch Firth Bridge and Bonar Bridge (DfT 80004)	45	93	138
A9 between Dornoch Firth Bridge and The Mound (DfT 30722)	4	4	8
A839 between The Mound and Lairg (DfT 20935)	12	4	16
A836 between Bonar Bridge and Lairg (DfT 20934)	45	93	138
A839 between Lairg and Site Access Junction (DfT 50934	52	93	145
A949 between Clashmore and Bonar Bridge (DfT 20935)	45	92	137

Table 13.9: Total Weekday Traffic (Daily Average Two Way Flows)

Survey Location	Cars & LGV's	HGV's	Total
A9 between Invergordon and Tain (DfT 20724)	10866	884	11750
A9 between Tain and Dornoch Bridge (DfT 30723)	7908	730	8637
A836 between Dornoch Firth Bridge and Bonar Bridge (DfT 80004)	637	270	908
A9 between Dornoch Firth Bridge and The Mound (DfT 30722)	4332	366	4698

Survey Location	Cars & LGV's	HGV's	Total
A839 between The Mound and Lairg (DfT 20935)	910	47	957
A836 between Bonar Bridge and Lairg (DfT 20934)	1111	187	1298
A839 between Lairg and Site Access Junction (DfT 50934)	338	199	537
A949 between Clashmore and Bonar Bridge (DfT 20935)	942	135	1077

13.7.18 Table 13.10 shows the percentage increase in total traffic over future year baseline traffic.

Table 13.10: Percentage Increase in Total Traffic Generation v Future Year Baseline (Daily Average Two Way Flows)

Survey Location	Cars & LGV's	HGV's	Total
A9 between Invergordon and Tain (DfT 20724)	0.42%	11.76%	1.19%
A9 between Tain and Dornoch Bridge (DfT 30723)	0.57%	14.61%	1.62%
A836 between Dornoch Firth Bridge and Bonar Bridge (DfT 80004)	7.60%	52.47%	17.93%
A9 between Dornoch Firth Bridge and The Mound (DfT 30722)	0.09%	1.10%	0.17%
A839 between The Mound and Lairg (DfT 20935)	1.34%	9.25%	1.70%
A836 between Bonar Bridge and Lairg (DfT 20934)	4.22%	98.91%	11.90%
A839 between Lairg and Site Access Junction (DfT 50934)	18.16%	87.80%	36.96%
A949 between Clashmore and Bonar Bridge (DfT 20935)	5.02%	212.81%	14.57%

13.7.19 The results in Table 13.10 indicate that during construction of the Proposed Development, neither total nor HGV traffic flows are predicted to increase by more than 30% on the A9 or A839 east of Lairg. Users of the A9 and A839 are considered receptors of low sensitivity. With reference to rule 1 of the IEMA Guidelines, no further assessment of these receptors is required.

13.7.20 During construction of the Proposed Development, total traffic movements may increase by more than 30% on the A839 between Lairg and the Proposed Development with HGV movements increasing by more than 50% on the A836 between Dornoch Firth Bridge and Lairg and A949 between Clashmore and Bonar Bridge. While the effects would be temporary and short-term in duration, these links along with the settlements of Bonar Bridge and Lairg have been taken forward to an assessment of effect significance.

Tables 13.11, 13.12 and 13.13 summarise the potential effects (as identified in the IEMA Guidelines) and predicted magnitude of the impact from increases in traffic movements on the A836/A949, A839 and the settlements of Bonar Bridge and Lairg, with no mitigation in place.

Table 13.11: Assessment of Construction Effects (A836/A949)

Receptor	Potential Impact	Magnitude of Impact	Significance of Effect
Users of / residents adjacent to A836/A949	Severance	Negligible	The change in total traffic does not exceed 30% on either route and is therefore assessed as **negligible** and **not significant**.
	Driver Delay	Minor	Some delay to drivers may occur during the movement of construction vehicles. While the road is a public road, traffic flows are low, and the road is not close to capacity. The significance is assessed as **minor** and **not significant**.
	Pedestrian Delay	Minor	Pedestrians could experience delay if their movements conflict with those of construction traffic. While total volumes may increase by over 10%, the road is not close to capacity, pedestrian movements are not observed to be high; the significance is assessed as **minor** and **not significant**.
	Pedestrian Amenity	Minor	Pedestrians could experience delay if their movements conflict with those of construction traffic. While total volumes may increase by over 10%, the road is not close to capacity, pedestrian movements are not observed to be high; the significance is assessed as **minor** and **not significant**.
	Fear and Initimidation	Negligible	The change in total traffic is not anticipated to exceed 30% and is therefore assessed as minor. As general traffic and pedestrian flows are also low, the significance is considered **negligible** and **not significant**.
	Accidents and Safety	Minor	There is potential for impact on safety due to potential conflict between HGVs and other traffic and pedestrians. As general traffic and pedestrian flows are low, the significance is considered **minor** and **not significant**.

Table 13.12: Assessment of Construction Effects (A839 West of Lairg)

Receptor	Potential Impact	Magnitude of Impact	Significance of Effect
Users of / residents adjacent to A839	Severance	Minor	The change in total traffic is anticipated to exceed 30% and is therefore assessed as **minor** and **not significant**.
	Driver Delay	Minor	Some delay to drivers may occur during the movement of construction vehicles. While the road is a public road, traffic flows are low, and the road is not close to capacity. The significance is assessed as **minor** and **not significant**.
	Pedestrian Delay	Minor	Pedestrians could experience delay if their movements conflict with those of construction traffic. While total volumes may increase by

Receptor	Potential Impact	Magnitude of Impact	Significance of Effect
			over 30%, traffic volumes are considered to remain low, the road is not close to capacity, pedestrian movements are not observed to be high; the significance is assessed as **minor** and **not significant**.
	Pedestrian Amenity	Moderate	Pedestrians could experience reduced amenity if their movements conflict with those of construction traffic. While HGV volumes may increase by over 50%, the road is not close to capacity, the impact would be temporary and pedestrian movements are not observed to be high with pedestrian infrstruture limited to the northern extent of the link; the significance is assessed as **moderate** and **significant**.
	Fear and Initimidation	Minor	The change in total traffic is anticipated to exceed 30% and is therefore assessed as minor. As general traffic and pedestrian flows are also low, the significance is considered **minor** and **not significant**.
	Accidents and Safety	Minor	There is potential for impact on safety due to potential conflict between HGVs and other traffic and pedestrians. As general traffic and pedestrian flows are low, the significance is considered **minor** and **not significant**.

Table 13.13: Assessment of Construction Effects (Bonar Bridge)

Receptor	Potential Impact	Magnitude of Impact	Significance of Effect
Bonar Bridge	Severance	Negligible	The change in total traffic exceeds 11% and is therefore assessed as **negligible** and **not significant**.
	Driver Delay	Minor	Some delay to drivers may occur during the movement of construction vehicles. While the road is a public road, traffic flows are low, and the road is not close to capacity. The significance is assessed as **minor** and **not significant**.
	Pedestrian Delay	Minor	Pedestrians could experience delay if their movements conflict with those of construction traffic. While total volumes may increase by over 30%, traffic volumes are considered to remain low, the road is not close to capacity, pedestrian movements are not observed to be high; the significance is assessed as **minor** and **not significant**.
	Pedestrian Amenity	Moderate	Pedestrians could experience reduced amenity if their movements conflict with those of construction traffic. While HGV volumes may increase by over 50%, the road is not close to capacity and increses in total traffic are limited

Receptor	Potential Impact	Magnitude of Impact	Significance of Effect
			and temporary, pedestrian movements are not observed to be high; the significance is assessed as **moderate** and **significant**.
	Fear and Initimidation	Minor	The change in total traffic is anticipated to exceed 11% and is therefore assessed as minor. As general traffic and pedestrian flows are also low, the significance is considered **minor** and **not significant**.
	Accidents and Safety	Minor	There is potential for impact on safety due to potential conflict between HGVs and other traffic and pedestrians. As general traffic and pedestrian flows are low, the significance is considered **minor** and **not significant**.

13.7.21 Before the introduction of mitigation, significant effects relating to pedestrian amenity would arise for users of the A839 and within Bonar Bridge, as a result of the predicted increase in HGV traffic levels.

13.7.22 The following points should be taken into account when considering the significance of effect:

- The increases in HGV traffic predicted are temporary and over a short duration; and
- The high percentage increase in HGV traffic are as a result of the existing low numbers of HGV movements.

Potential Operational Impacts

13.7.23 It is predicted that during the operation of the Proposed Development there would be on average up to two vehicle movements per week for maintenance purposes. Also, there could be occasional abnormal load movements to deliver replacement components in the event of a major component failure.

13.7.24 In terms of the IEMA Guidelines, such a small number of traffic movements and the associated percentage uplift over baseline traffic movements are **not significant.**

Potential Decommissioning Effects

13.7.25 Prior to decommissioning of the site, a traffic assessment would be undertaken in line with the best practice guidance and relevant legislation at the time, and appropriate traffic management procedures would be followed.

13.7.26 The decommissioning phase is anticipated to result in fewer trips on the road network than the construction phase, as it is likely that elements of infrastructure such as access tracks and electrical cables would be left in place and components could be broken up on-site to allow transport by reduced numbers of standard HGVs.

13.7.27 As decommissioning would result in fewer vehicle trips on the road network than the construction phase, assuming the baseline has not substantially changed, the significance of any effects would not be greater than those identified for the construction phase. It can therefore be assumed that the assessment of the construction phase covers the

worst-case scenario for the decommissioning phase. Potential decommissioning effects have therefore been scoped out of further assessment.

13.8 Mitigation

Mitigation During Construction

General Construction Traffic

13.8.1 During the construction period, a community liaison group would be set up by the Applicant's Stakeholder Engagement Manager to disseminate information and listen to feedback. The Applicant would maintain the project website that could be regularly updated to provide the latest information relating to traffic movements associated with vehicles accessing the Site. This would be agreed with THC.

13.8.2 The following measures would be implemented during the construction phase through the CTMP (see Technical Appendix 13.1):

- All materials on delivery lorries (dry materials) would be sheeted to reduce dust and stop spillage on public roads;
- The CEMP will require contractors to employ appropriate mitigation measures to prevent mud or deleterious material entering the carriageway;
- Working hours will be limited to between 0700 and 1900 Monday to Friday, and 0700 to 1400 on Saturday except for AIL component delivery which could take place outside these hours;
- Avoidance of transit through the rural communities identified during arrival and departure times of schools;
- Police escorts would be utilised for the movement of AIL with the aim of having several vehicles in convoy to minimise the disruption caused to road users;
- Abnormal load escorts would also warn oncoming vehicles of approaching loads and will pull vehicles over to allow the convoy to pass. They would also pull the convoy over at predetermined locations allowing vehicles to pass reducing the risk of any large build-up of traffic;
- Appropriate traffic management measures would be put in place along the A839 to avoid conflict with general traffic, subject to the agreement of THC;
- Appropriate traffic management measures would be put in place at the site access junction. Typical measures would include speed limit, HGV turning and crossing signs and/ or banksmen at the site access and warning signs; and
- Provision of construction updates on the project website and a newsletter to be distributed to residents within an agreed distance of the Site.

13.8.3 All drivers would be required to attend an induction to include:

- A safety briefing;
- The need for appropriate care and speed control;
- A briefing on driver speed reduction agreements (to slow site traffic at sensitive locations);
- Identification of specific sensitive areas including the section of the A839 within Lairg and A836 through Bonar Bridge;
- Identification of the specified route; and

- The requirement not to deviate from the specified route.

13.8.4 Video footage of the pre-construction phase condition of the AIL access route and the construction vehicles route would be recorded to provide a baseline of the state of the road prior to any construction work commencing. This baseline will allow identification of any change in the road condition during the construction stage of the Proposed Development. Any necessary repairs would be co-ordinated with TS and THC and any damage caused by traffic associated with the Proposed Development during the construction period that would be hazardous to public traffic would be repaired as soon as possible.

13.8.5 Damage to road infrastructure caused directly by construction traffic will be made good and street furniture that is removed on a temporary basis would be fully reinstated.

13.8.6 There will be a daily road edge review and debris and mud would be removed from the carriageway using an on-site road sweeper to keep the road clean and safe.

Mitigation during Operation

13.8.7 Although an assessment of the operational phase of the Proposed Development has been scoped out due to the low levels of traffic that are forecast, the Site entrance roads would be well maintained and monitored throughout the operational phase of the Proposed Development.

Mitigation During Decommissioning

13.8.8 Although an assessment of the decommissioning phase of the Proposed Development has been scoped out due to effects being no greater than those identified for the construction phase, like the construction phase, a CTMP would be prepared for the decommissioning phase of the Proposed Development.

13.9 Residual Effects

13.9.1 This section considers the assessment of traffic effects following the incorporation of the mitigation measures identified above.

Residual Construction Effects

13.9.2 An evaluation of the potential effects of the increase in traffic on the local roads to be used as part of the route for construction traffic has been undertaken. This considered the traffic effects on different environmental receptors identified in the IEMA Guidelines with no mitigation in place (see Tables 13.11, 13.12 and 13.13). As noted in Paragraph 13.7.21, before the introduction of mitigation, significant effects relating to pedestrian amenity would arise for users of the A839 and within Bonar Bridge during the construction phase, as a result of the predicted increase in HGV traffic levels.

13.9.3 Following the introduction of mitigation measures outlined in Paragraphs 13.8.1 – 13.8.6, including the implementation of the CTMP (see Technical Appendix 13.1), no significant effects to pedestrian amenity for users of the A839 and within Bonar Bridge resulting from the construction phase are anticipated with the residual magnitude of impact considered to be Minor and not significant. As such, **no significant residual effects** are anticipated during the construction phase of the Proposed Development.

13.10 Cumulative Effects

13.10.1 Consideration was given to the cumulative impact of the Proposed Development in combination with other developments that are both committed and subject of valid planning applications which would impact on the study area. It was considered that committed developments (developments with S36 or planning approval), comprising Lairg 2, Creag Riabhach and Braemore Wind Farms should be included in the assessment.

13.10.2 It is considered highly unlikely that the construction programmes for the Proposed Development and the identified wind farms would coincide due to supply chain constraints associated with the supply of materials and in particular the shipping and storage of turbine components and associated availability of police escorts for the transport of turbine components. However, for the purposes of this assessment it was assumed that the peak periods of the construction programmes would overlap and as such, the cumulative assessment has considered the worst-case scenario.

13.10.3 Peak period traffic flows for these other developments were extracted where available from planning documentation and added to the future year flows where they impact on the study area.

13.10.4 Table 13.14 illustrates the weekday traffic flows associated with the three cumulative developments, Table 13.15 the Total Cumulative Traffic Flows (baseline traffic plus Proposed Development and cumulative developments) and Table 13.16 the percentage increase in cumulative traffic over baseline traffic.

Table 13.14: Cumulative Development Peak Construction Traffic (Weekday Average Two-Way Flows)

Survey Location	Cars & LGV's	HGV's	Total
A9 between Invergordon and Tain (DfT 20724)	93	114	207
A9 between Tain and Dornoch Bridge (DfT 30723)	93	114	207
A836 between Dornoch Firth Bridge and Bonar Bridge (DfT 80004)	60	92	152
A9 between Dornoch Firth Bridge and The Mound (DfT 30722)	66	26	91
A839 between The Mound and Lairg (DfT 20935)	71	26	97
A836 between Bonar Bridge and Lairg (DfT 20934)	60	92	152
A839 between Lairg and Site Access Junction (DfT 50934)	35	65	100
A949 between Clashmore and Bonar Bridge (DfT 20935)	60	67	128

Table 13.15: Total Cumulative Traffic Flows (Weekday Average Two-Way Flows)

Survey Location	Cars & LGV's	HGV's	Total
A9 between Invergordon and Tain (DfT 20724)	10959	998	11957
A9 between Tain and Dornoch Bridge (DfT 30723)	8001	844	8845

Survey Location	Cars & LGV's	HGV's	Total
A836 between Dornoch Firth Bridge and Bonar Bridge (DfT 80004)	698	362	1060
A9 between Dornoch Firth Bridge and The Mound (DfT 30722)	4397	392	4789
A839 between The Mound and Lairg (DfT 20935)	981	73	1054
A836 between Bonar Bridge and Lairg (DfT 20934)	1171	279	1450
A839 between Lairg and Site Access Junction (DfT 50934)	373	264	637
A949 between Clashmore and Bonar Bridge (DfT 20935)	1002	203	1205

Table 13.16: Total Cumulative Traffic Flows (Weekday Average Two-Way Flows)

Survey Location	Cars & LGV's	HGV's	Total
A9 between Invergordon and Tain (DfT 20724)	1.28%	26.16%	2.97%
A9 between Tain and Dornoch Bridge (DfT 30723)	1.76%	32.52%	4.06%
A836 between Dornoch Firth Bridge and Bonar Bridge (DfT 80004)	17.78%	104.37%	37.72%
A9 between Dornoch Firth Bridge and The Mound (DfT 30722)	1.61%	8.23%	2.12%
A839 between The Mound and Lairg (DfT 20935)	9.25%	68.92%	11.99%
A836 between Bonar Bridge and Lairg (DfT 20934)	9.88%	196.75%	25.03%
A839 between Lairg and Site Access Junction (DfT 50934)	30.38%	149.17%	62.45%
A949 between Clashmore and Bonar Bridge (DfT 20935)	11.74%	368.48%	28.14%

13.10.5 When considering the cumulative construction phases, both the total traffic and HGV flows assessment results indicate an increase on all links within the study area, including large increases on the links previously taken forward for assessment of effect significance namely, the A836, A949 and A839.

13.10.6 Before the introduction of mitigation, it is considered that significant effects considered to be major, in relation to pedestrian amenity and moderate, in relation to fear and intimidation would arise for users of A839 west of Lairg, resulting from the cumulative impact of HGV construction traffic movements from the Proposed Development and Braemore Wind Farm which share an access route. Significant effects considered to be major in relation to pedestrian amenity would also arise for users of A836, A949 and within Bonar Bridge resulting from the cumulative impact of HGV construction traffic movements from the Proposed Development and cumulative developments of Lairg 2, Creag Riabhach and Braemore Wind Farms.

13.10.7 It is considered that any cumulative effects would be temporary and short lived during the construction phase as the road is not close to capacity and pedestrian movements

are not observed to be high, with limited pedestrian infrastructure. Should cumulative construction phases occur concurrently, enhanced CTMP mitigation measures would be developed and introduced following liaison with stakeholders including the THC roads officers, developer representatives and the emergency services within Bonar Bridge and Lairg, in order to manage the impact of increased HGV movements.

13.10.8 In relation to the A839, a receptor of medium sensitivity, while it is considered unlikely that the peak months of construction would clash across both developments, there could be combined HGV traffic from both developments using this road during their construction programmes, should these coincide. Without consideration of prior improvement work, this road may be unable to be able to safely accommodate the anticipated combined peak two-way movement of HGV traffic due to its constrained nature with a number of sections of single track. This can be mitigated through the implementation of CTMPs associated with each individual development and a further assessment of the suitability of existing passing place locations and layouts on the A839 prior to construction.

13.10.9 Following the implementation of suitable mitigation measures, to minimise conflict between construction traffic and all road users, **no significant residual cumulative effects** are anticipated.

13.11 Conclusion

13.11.1 The Proposed Development would lead to temporary increased traffic volumes on sections of the A9, A836, A949 and the A839, subject to the movements of construction traffic during the peak construction period.

13.11.2 No significant construction effects were identified for the A9 as neither total nor HGV traffic flows are anticipated to increase by more than the relevant threshold of 30%.

13.11.3 During construction of the Proposed Development, HGV traffic movements could increase by more than 30% on the A836 and A949, receptors of low sensitivity. However, upon further assessment, no significant construction effects were identified. Total traffic could increase by more than 30% on the A839, a receptor of Medium sensitivity. Significant effects were identified in relation to pedestrian amenity on both the A839 and Bonar Bridge, a location of medium sensitivity, being an intermediate sized rural settlement, with several facilities and services. Following the implementation of proposed mitigation measures, to minimise conflict between construction traffic and all road users, **no significant residual effects** are anticipated.

13.11.4 Consideration was given to the cumulative impact of the Proposed Development plus other wind farm developments that are the subject of valid planning applications or approved and which would impact on the study area. It was considered that Lairg 2, Creag Riabhach and Braemore Wind Farms should be included in the cumulative assessment.

13.11.5 It is considered highly unlikely that the construction programmes for the Proposed Development and the identified wind farms would coincide due to supply chain constraints associated with the supply of materials and in particular the shipping and storage of turbine components and associated availability of police escorts for the transport of turbine components.

13.11.6 Before the introduction of mitigation measures, it is considered that significant cumulative effects would be major, in relation to pedestrian amenity and moderate, in relation to fear and intimidation for users of A839 west of Lairg. Significant cumulative

effects considered to be major in relation to pedestrian amenity for users of A836, A949 and within Bonar Bridge.

13.11.7 Should cumulative construction phases occur concurrently, enhanced CTMP mitigation measures would be developed through liaison with stakeholders including the THC roads officers, developer representatives and the emergency services are introduced within Bonar Bridge and Lairg, in order to manage the impact of increased cumulative HGV movements. Following the implementation of suitable mitigation measures, to minimise conflict between construction traffic and all road users, **no significant residual cumulative effects** are anticipated.

13.11.8 No significant operational or decommissioning effects were identified.

13.12 References

The Highland Council (2021): *Interactive Core Paths Map*, available online at: https://www.highland.gov.uk/info/1225/countryside_farming_and_wildlife/161/outdoor_access/4.

Institute of Environmental Assessment (1993): *Guidelines for the Environmental Assessment of Road Traffic.*