Chapter 12: Access, Traffic and Transport

Figures

Appendices

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12 Access, Traffic and Transport

12.1 Executive Summary

12.1.1 This Chapter assesses the main traffic and transport effects associated with the Development. The assessment is focussed on the construction phase, where the majority of traffic would be generated.

12.1.2 The assessment has been undertaken in accordance with the Guidelines for Environmental Effect Assessment' produced by the Institute of Environmental Management and Assessment (IEMA, 2004), complemented by professional judgement and the experience of the assessors. These guidelines were used as a screening process to define the geographical boundaries of the assessment. The assessment included a review of the roads hierarchy, a review of traffic count data, and a site visit to visually assess the general nature and condition of the routes around the site.

12.1.3 The potential effects of the development traffic were drawn from the Guidelines for the Environmental Assessment of Road Traffic (IEA, 1993) including severance, driver delay, pedestrian delay, pedestrian amenity, fear and intimidation and accidents and safety.

12.1.4 A significant amount of material will be sourced from borrow pits on site and concrete will be batched on site, which will significantly reduce transport requirements. A number of mitigation measures are also proposed to reduce the adverse effects of the construction traffic, including traffic management measures and communications protocols.

12.1.5 Based on existing traffic data and the estimated construction vehicle movements, the assessment concludes that no significant detrimental effects are predicted as a result of construction traffic associated with the Development. A cumulative assessment has also been undertaken which concludes that no significant cumulative effects are predicted on the local roads network.

12.2 Introduction

12.2.1 The purpose of this Chapter is to provide information about the proposed transport arrangements associated with the construction, operational and decommissioning phases of the Development.

12.2.2 The main traffic and transport effects relating to the Development would be associated with the traffic movements during the construction period. During construction, vehicles would access the site transporting construction staff, construction materials (aggregates, cement, steel bar etc.), plant items and turbine components.

12.2.3 Once operational, it is envisaged that the amount of traffic associated with the Development would be minimal, although regular visits would be made for maintenance checks.

12.2.4 The decommissioning phase would involve fewer trips on the public road network than the construction phase as elements of infrastructure such as access tracks and electrical connections are often left in place (in agreement with The Local Planning Authority and the landowner), adding to local infrastructure.

12.2.5 This Chapter is supported by Appendix 12.1: Abnormal Load Route Survey Report and Appendix 12.2: Abnormal Load Route Survey Supplementary Report.

12.2.6 The assessment has been carried out by CH2M.

12.3 Scope of Assessment

Study Area

12.3.1 The study area was agreed with The Highland Council (THC) and Transport Scotland (TS) in October/November 2014 (see Table 12.1), and comprises the parts of the public road network that could be used by construction and operational traffic accessing the site.

12.3.2 The likely routes to site by abnormal loads and construction traffic given consideration within this assessment are:

- A9 Trunk Road;
- Clynelish Distillery Road; and
- C6 Strath Brora Road.

12.3.3 These routes utilise the same delivery routes used for the operational Gordonbush Wind Farm. The route was upgraded as part of the operational wind farm construction, and substantial works were undertaken on the public road network to accommodate the associated abnormal loads, such as:

- Opening the junction of the A9 / Clynelish Distillery at Old School House;
- Localised strengthening, reinforcement and widening of the Clynelish and Moss roads;
- Straightening the approach to Gordonbush Bridge;
- Widening of the approach to Oldtown Bridge; and
- Constructing a high standard track from Ascoile leading to the wind farm site, sufficient for delivery of turbine components and materials.

Scoping and Consultation

12.3.4 CH2M consulted with organisations that have a direct involvement or responsibility for roads and structures in the study area. In particular, CH2M invited general comments regarding the scope of the intended assessment related to roads and traffic matters. Full consultation responses are included in Appendix 12.1 and are summarised in Table 12.1.

Table 12.1: Consultation Responses

Consultee	Summary Response	Comment/Action Taken
The Highland Council – Transport Planning	Confirmed the requirement to undertake a Transport Assessment to consider the transport effects of the Development, and the need to identify all Council maintained roads. It was noted that road capacity is unlikely to be an issue. The submission of a scoping note for the consideration of each road authority was requested by THC. Pre-application Guidance was supplied as a guide to THC prospective methodology for a Transport Statement/Assessment associated with Renewable Energy proposals.	Subsequently, a Scoping Note was submitted to THC outlining: the study area; the assessment methodology; and what would be scoped out of the assessment. Agreement was also reached on the location of supplementary traffic counts on Clynelish Distillery Road and the C6 Strath Brora Road.
The Highland Council – Structures	THC Structures team noted that, based on the assumption that transport would use the same route(s) as the earlier and original Gordonbush Wind Farm development, there would not appear to be any structural problems to contend with. It was confirmed that once the route is defined and abnormal load details confirmed, further advice can be given.	The traffic and transport assessments undertaken confirm that the transport routes will be consistent with the original Gordonbush Wind Farm development.
Police Scotland	Police Scotland confirmed the preferred route from the Port of Entry (POE). It was confirmed that Police Scotland would have no issues with the use of the unclassified road from Clynelish but it's suitability for the proposed loads weights and configurations should be ensured. It was also confirmed that, in the interests of road safety and to minimise traffic disruption, all abnormal load movements will require a police escort and this would be reflected on the comments in the VR1 (application form to move abnormal loads).	The traffic and transport assessments undertaken confirm that the transport routes will be consistent with the original Gordonbush Wind Farm development, which conforms to that described by Police Scotland.
Transport Scotland – via JMP (term consultants for TS)	THC requested that a Scoping letter was issued to each road authority. In response to this letter, Transport Scotland outlined that the Route Survey Report approach was acceptable i.e. the abnormal load assessment, with information provided on the preferred approach regarding the assessment of the construction traffic effects. Additional guidance was proffered regarding the potential air quality and noise and vibration effects of traffic.	The approach regarding the assessment of traffic effects has been applied in this chapter. The air quality and noise and vibration effects are considered in other Chapters of this ES.

Scope Out of Assessment

12.3.5 Based on previous experience, the assessment will exclude operational and decommissioning effects. Significant effects related to traffic movements during the operational phase are unlikely to arise i.e. the traffic generated once the Development is operational would be associated mainly with service and maintenance trips. Vehicle types would mainly be 4x4s with potentially occasional Heavy Goods Vehicles (HGV) movements to access the site for heavier maintenance and repairs, and would not, therefore, result in significant effects.

12.3.6 With regard to the decommissioning phase, the expected operational life of the Development is 25 years from the date of commissioning. At the end of this period, a decision would be made as to whether to refurbish, remove, or replace the turbines. Relevant planning applications would be sought and additional assessment undertaken as necessary. However, the baseline data used for the purposes of this assessment may not be relevant so far in the future and, therefore, a quantitative assessment of traffic effects during decommissioning cannot be undertaken at this stage. Due to the uncertainties associated with estimating traffic movements so far in the future and the likely effects associated with the decommissioning phase (i.e. less than those estimated in the assessment of the effect of the construction traffic), decommissioning will be scoped out of the assessment.

12.4 Policy, Legislation & Guidance

National Legislation and Policy

12.4.1 'Scotland's Transport Future', published by the Scottish Government (formerly the Scottish Executive) in June 2004, outlines the Scottish Government's vision for transport at national and regional levels across Scotland and states that its overall aim is "to promote economic growth, social inclusion, health and protection of our environment through a safe, integrated, effective and efficient transport system." The publication observes that "the vast bulk of freight traffic will continue to be carried by road".

12.4.2 Scottish Planning Policy (SPP) is a statement of Scottish Government policy on land use planning. SPP states that a Transport Assessment should be carried out where a new development is likely to result in a significant increase in the number of trips as well as identifying potential cumulative effects of development. Providing for the safe and efficient movement of traffic on the strategic road network requires the implications of development proposals on traffic and road safety to be taken into account. SPP refers specifically to wind farm developments, with reference made to the potential constraint of site access. SPP also refers to the haulage of minerals. It states that "where there are significant transport effects on local communities, routes which avoid settlements as far as possible should be identified."

Regional Policy

12.4.3 The Highlands and Islands Transport Partnership (HITRANS) Regional Transport Strategy (RTS), published in 2008, states how "continued investment in the region's infrastructure and services will allow the region to make a full and effective contribution to national economic life." In particular, this continued investment is expected to "support the development of key and emerging sectors" such as renewable energy. The RTS also

confirms that road transport is the dominant mode for freight transport in the region. However, it also acknowledges that existing road traffic flows are such that present levels of HGV volumes on the region's roads do not have significant negative environmental effects. The RTS states that the relatively high level of freight movement has the potential to damage infrastructure.

Local Policy

12.4.4 The Highland Council (THC) Local Transport Strategy (LTS), published in 2010, 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 notes that in terms of timber transport, there are initiatives such as tyre pressure moderation which are reducing the damaging effect of forestry lorries on rural 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 also providing for industries that are heavily dependent on large vehicle transport.

12.5 Methodology

Desk Study

12.5.1 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 desktop studies and consultation (see Appendix 12.1), comprising the following:

- Review of responses to the Scoping Report;
- Review of responses to additional consultation undertaken by CH2M specifically on traffic issues;
- Collection of traffic flow data;
- Review of any roads hierarchy promoted in relevant Local Transport Strategies;
- 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.); and
- Review of Ordnance Survey (OS) plans to derive a local area roads network.

Field Survey

12.5.2 Field surveys have also been undertaken to further enhance the understanding of the road network in the study area, and to identify potential constraints on the network. This included:

- Visual inspection of all roads identified in the study area network;
- Photographic/video record of any constraints; and
- Traffic counts to determine existing traffic flows on the surrounding road network.

Method of Assessment

12.5.3 The assessment has been undertaken in accordance with the Guidelines for Environmental Effect Assessment' produced by the Institute of Environmental Management and Assessment (IEMA, 2004). These guidelines express that the separate Guidelines for the Environmental Assessment of Road Traffic, produced by its predecessor the IEA in 1993, should be used to characterise the environmental traffic and transport effects (off-site effects) and the assessment of significance of major new developments. The guidelines intend to complement professional judgement and the experience of trained assessors.

12.5.4 The perception of changes in traffic is dependent upon a wide range of factors including its volume, speed, function and its composition (e.g. percentage of heavy goods vehicles). Therefore, the assessment of the environmental effects of traffic requires a number of stages, namely:

- Determination of existing and forecast traffic levels and characteristics;
- Determining the time period suitable for assessment;
- Determining the year of assessment; and
- Identifying the geographical boundaries of assessment.

12.5.5 The following rules, taken from the IEA 1993 guidelines, have been used as a screening process to define the geographical boundaries of this assessment:

- Rule 1 – include highway links where traffic flows are predicted to increase by more than 30% (or where the number of heavy goods vehicles is predicted to increase by more than 30%); and
- Rule 2 – include any other specifically sensitive areas where traffic flows are predicted to increase by 10% or more (IEA Guidelines: Sensitive areas include 'accident blackspots, conservation areas, hospitals, and links with pedestrian flows').

12.5.6 The assessment will present the potential effects of construction traffic, and identifies those which are likely to be significant.

Identification of Effects to be Assessed

12.5.7 The effects recommended to be potentially important in the IEA guidelines, when assessing the traffic effects from an individual development, listed below, have been considered.

- Severance – severance is the perceived division that can occur within a community when it becomes separated by a major traffic artery resulting from the difficulty of crossing a heavily trafficked road or a physical barrier created by the road itself;
- Driver delay – these delays are only likely to be significant when the traffic on the network surrounding the development is already at, or close to, the capacity of the system;

- Pedestrian delay – the delay to pedestrians, as with driver delay, is likely only to be significant when the traffic on the network surrounding the development is already at, or close to, the capacity of the system;
- Pedestrian amenity – the Guidelines for the Environmental Assessment of Road Traffic suggests that a tentative threshold for judging the significance of changes in pedestrian amenity would be where the traffic flow (or its lorry component) is halved or doubled;
- Fear and intimidation – there are no commonly agreed thresholds for estimating levels of danger, or fear and intimidation, from known traffic and physical conditions; and
- Accidents and safety – professional judgement will be used to assess the implications of local circumstances, or factors which may elevate or lessen risks of accidents.

Severance, Fear and Intimidation

12.5.8 Within Design Manual for Road and Bridges (DMRB) Volume 11, Section 3, Part 8, Chapter 6, it is stated that new severance should be described using a three point scale:

- Slight – In general the current journey pattern is likely to be maintained, but there will probably be some hindrance to movement;
- Moderate – Some residents, particularly children and elderly people, are likely to be dissuaded from making trips. Other trips will be made longer or less attractive; and
- Severe – People are likely to be deterred from making trips to an extent sufficient to induce a reorganisation of their habits leading to a change in the location of centres of activity or in some cases to a permanent loss to a particular community.

12.5.9 The above severance scale was also used to inform consideration of fear and intimidation.

12.5.10 The Guidelines for the Environmental Assessment of Road Traffic also refers to a range of indicators for determining the significance of the relief from severance: changes in traffic flow of 30%, 60% and 90% are regarded as producing 'slight', 'moderate' and 'substantial' changes in severance respectively. This advice is repeated in DMRB Volume 11, Section 3, Part 8, Chapter 7. In the absence of predicative formulae for determining simple relationships between traffic factors and levels of severance, these changes in traffic flow relating to relief from severance are considered as a guide subject to professional judgement in determining the significance of new severance i.e. traffic flow changes.

Driver and Pedestrian Delay

12.5.11 To inform the assessment of driver and pedestrian delay, the theoretical capacity of the roads has been considered by calculating the average link capacities for the various links within the study area from the DMRB Volume 15 Part 5: Traffic Modelling in NESA (Network Evaluation from Surveys and Assignment), Chapter 3.

Pedestrian Amenity

12.5.12 The magnitude of the effect on pedestrian amenity has been considered in terms of the threshold described in the Guidelines for the Environmental Assessment of Road Traffic which suggests that a meaningful change in amenity would be where traffic flow (or its lorry component) is halved or doubled.

Accidents and Safety

12.5.13 As there is no threshold assessment to determine the significance of the effects of the construction related traffic on accidents and safety, consideration has been given to the temporary nature of the increase in traffic volumes associated with the Development, as well as mitigation measures employed during the period that the increased traffic will be appreciable. A qualitative assessment has therefore been undertaken informed by this information.

Assessment of Effects

12.5.14 Having identified the environmental effects to be considered and the road network to be included within the analysis, the next stage of the assessment is to quantify the magnitude of the environmental effects and, critically, to identify the level of significance that such a change may have, taking into account an evaluation of the sensitivity and value of the receptors.

Sensitivity/Importance

12.5.15 The receptors that may be affected by the traffic effects arising from the construction of the Development are likely to be settlements along the turbine delivery route and the construction traffic route(s). These settlements are classified by size, function, presence of school and community facilities, traffic calming or traffic management measures, vehicle speed limits and position on the roads hierarchy, using the criteria identified in Table 12.2. This classification is based upon subjective judgement and relative sensitivity to the potential traffic effects of the Development.

Table 12.2: Receptor Sensitivity

Sensitivity	Comment/Action Taken
High	Typically receptors with high importance and rarity on an international and national scale and with limited potential for substitution. To include large rural settlements containing a high number of community and public services and facilities, areas with traffic control signals, waiting and loading restrictions, traffic calming measures and minor rural roads, not constructed to accommodate frequent use by HGV.
Medium	Typically receptors with high or medium importance and rarity on a regional scale and with limited potential for substitution. To include intermediate sized rural settlements containing some community or public facilities and services, areas with some traffic calming or traffic management measures and local A or B class roads, capable of regular use by HGV traffic.
Low	Typically receptors with low or medium importance and rarity on a local scale (on-site or neighbouring the site). To include small rural settlements with few community or public facilities or services, areas with little or no traffic calming or traffic management measures and trunk or A-class roads, constructed to accommodate significant HGV composition.
Negligible	Typically receptors with little importance and rarity. To include roads with no adjacent settlements including new strategic trunk roads or motorways that would be little effected by additional traffic and suitable for abnormal loads.

Magnitude of Effect

12.5.16 The magnitude of the effect of increased traffic volumes is based, initially, on the Rule 1 and Rule 2 criteria introduced previously (see Section 12.5.5). As referenced in the IEA 1993 guidelines, a range of indicators for determining the significance of the relief from severance advises that changes in traffic flow of 30%, 60% and 90% are regarded as producing 'slight', 'moderate' and 'substantial' changes in severance respectively. Additionally, it is generally accepted that traffic flow increases of less than 10% on uncongested roads are generally considered to be 'not significant', given that daily variations in background traffic flow may vary by this amount. Based on these rules and perceptions, the magnitude of the effects is classified using the criteria identified in Table 12.3.

Table 12.3: Effects Magnitude

High	Medium	Low	Negligible
>90% increase in traffic	60% - 90% increase in traffic	30% - 60% increase in traffic	0% - 30% increase in traffic

Significance of Effect

12.5.17 To determine the overall significance of the effects, the results from the receptor sensitivity and effect magnitude classifications are correlated and classified using the scale summarised in Table 12.4.

Table 12.4: Sensitivity/Magnitude

Consultee	High	Medium	Low	Negligible
High	Major Significance	Major Significance	Moderate Significance	Minor Significance
Medium	Major Significance	Moderate Significance	Minor Significance	No Significance
Low	Moderate Significance	Minor Significance	No Significance	No Significance
Negligible	Minor Significance	No Significance	No Significance	No Significance

12.5.18 For the purposes of assessing significant effects under the EIA Regulations, this matrix provides a guide subject to professional judgement. For example, the introduction of a low number of additional HGV movements on a route that does not currently have a large number of HGV trips are recorded as being highly statistically significant, even though the numbers of additional trips could be as low as up to five to ten additional vehicles. Despite the fact that additional traffic may be exceptionally low in actual volumes, it may be statistically high i.e. may constitute a high degree of change in relation to current traffic volumes. However, it is not necessarily significant in terms of the EIA Regulations. Effects are considered to be significant for the purposes of the EIA Regulations where the effect is classified as being of equal to or greater than moderate significance.

Limitations to the Assessment

12.5.19 The main limitation of this assessment is that in line with standard procurement practice, a contractor and supply-chain for materials would not be selected prior to the Development receiving consent. Consequently, the information presented in this Chapter is necessarily indicative and the proposed routes, vehicles and other arrangements provided are examples based on CH2M's and the Applicant's experience of construction and operation of wind farms in Scotland.

12.5.20 Until contractors have been appointed and materials sources have been identified, it is not possible to determine exactly how many vehicles would reach the site using the recommended routes. Hence, the assessment has assumed that 100% of the generated construction traffic would affect all routes. This presents a worst-case scenario as, in reality, once contractors have been appointed and materials sourced, it is expected that generated construction traffic will arrive at site using the various routes and would disperse prior to reaching the sensitive receptors.

12.6 Baseline Conditions

Context

12.6.1 The Development is located north-west of Brora, a village situated in the east of Sutherland in the Highlands (see Figure 4.1: Site Context and Figures 12.1 – 12.3). The main A-class road on the surrounding network is the A9 Trunk Road. The A9 links the south of Scotland with the far north and, from Inverness, runs across the Moray Firth, through the Black Isle, across the Cromarty Firth, near Invergordon and Tain, across the Dornoch Firth and Loch Fleet, near Golspie and beyond via Brora ending at Thurso. From the A9 close to Brora there is a network of local roads linking communities and settlements to the west. Access to the Development is from one of these local roads, the C6 Strath Brora Road.

12.6.2 As highlighted in Section 12.3.3, parts of the local road network were upgraded as part of the operational Gordonbush Wind Farm construction in order to accommodate associated construction and abnormal loads traffic.

Desk Study

Review of Roads Hierarchy

12.6.3 The HITRANS RTS summarises the region's agreed transport network hierarchy into the categories strategic, regional and locally significant, in order of decreasing importance. The A9 is designated as part of the strategic road network while the Clynelish Distillery Road and the C6 Strath Brora Road are not designated as being significant. In addition, the THC LTS sets out a roads hierarchy which designates the A9 as Trunk Road (strategic) and, again, the Clynelish Distillery Road and the C6 Strath Brora Road have no designation in its roads hierarchy. The network hierarchy is illustrated on Figure 12.1.

Review of Traffic Count Data

12.6.4 A desktop review of traffic count data has been undertaken. The data used consisted of 2013 Automatic Traffic Counts (ATC) data, obtained from Transport Scotland, which were supplemented with targeted ATC counts commissioned for this Development in November 2014 (as agreed with The Highland Council). The review has focussed on weekday 2-way Annual Average Daily Flow (AADF) and the weekday average daily flow (ADF) from the supplementary counts (undertaken over 2 weeks in November 2014) and, where available, the average weekday percentage of HGVs. The data have been summarised in Table 12.5 and the count site locations are illustrated on Figure 12.2.

Table 12.5: Traffic Count Data

Site Ref.	Transport Scotland Site Ref.	Location Description	Weekday AADF	Weekday %HGV	Weekday AM Peak[1]	Weekday PM Peak[1]
1	104890	A9 Berriedale	1837	15%	161	166
2	ATC01026	A9 Brora to Helmsdale	2613	-	225	231
3	ATC01025	A9 Golspie to Brora	3878	-	324	345
4	ATC01334	A9 Poles to The Mound (B9174 to A839)	4562	-	360	408
5	ATC01023	A9 Dornoch Bypass (A949 to B9168)	4045	-	310	357
6	JTC08225	A9 Dornoch	6260	12%	492	564
7	ATC01020	A9 Dornoch Bridge	6347	-	485	574
8	ATC01021	A9 Tain North (B9174) to Dornoch Bridge	7471	-	567	668
9	ATCNW007	A9 Garrick Bridge to Logie Easter	7089	-	507	663
10	ATC01333	A9 Kildary (B817) to Nigg Junction (B9165)	9370	-	697	852
11	ATC01018	A9 Tomich Junction to Kildary (B817)	8672	-	645	776
12	ATC01017	A9 Obsdale Junction to Tomich Junction	11065	-	845	996
13	-	Clynelish Distillery Road	289	6%		
14	-	C6 Strath Brora Road	84	5%		

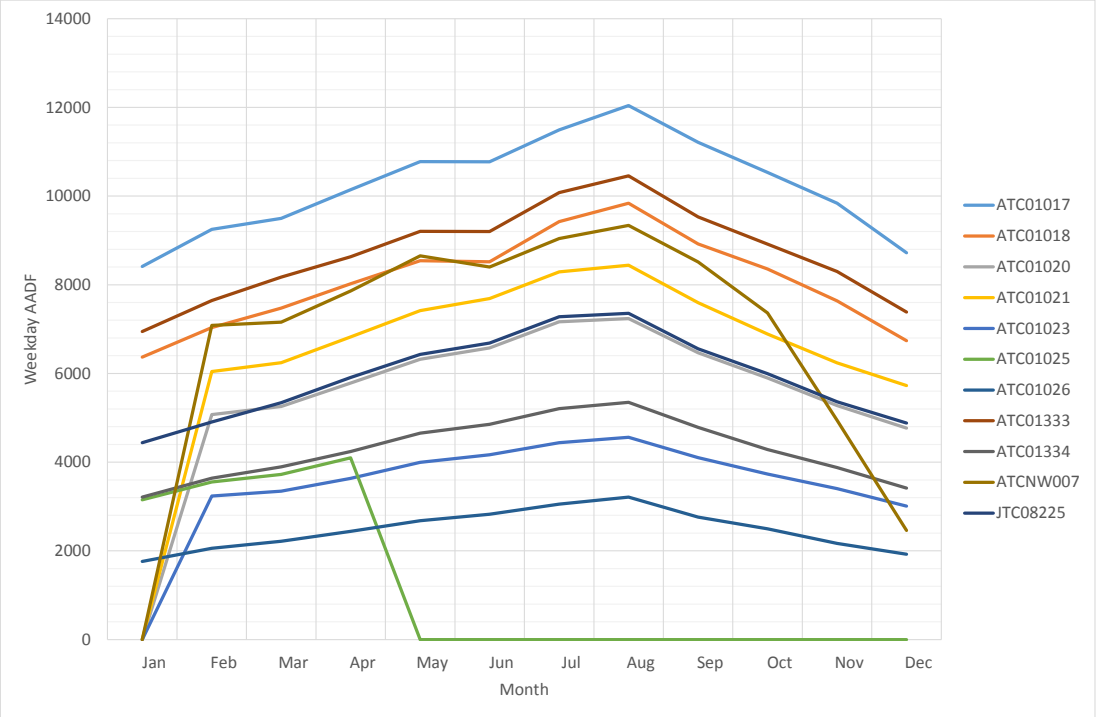
12.6.5 The traffic data illustrates that the two-way weekday AADF are modest with a maximum of approximately 10,000 – 11,000 vehicles on the A9 near Invergordon with generally decreasing flows on the A9 as it continues north, with flows of approximately 4,000 at Brora. The 2013 data, obtained from Transport Scotland, indicates an HGV percentage of

[1] 2013 Annual Average

12% – 15% on the A9, while the HGV percentages on the Clynelish Distillery Road and the C6 Strath Brora Road, surveyed in November 2014, were recorded as approximately 6%.

12.6.6 The traffic in the area under consideration peaks in the summer months, particularly August, as illustrated in Chart 12.1. In order to present a robust assessment, the application of a factor to represent the peak month traffic volumes has not been undertaken.

Chart 12.1: 2013 ATC Summary



Field Studies

Vehicle Routes

12.6.7 A site visit was undertaken to visually assess the potential routes to the site to inform this Chapter and the Abnormal Loads Assessment reported in ES Appendix 12.1 and Appendix 12.2. It has been determined that all construction vehicles will originate from the A9, north and south of Brora and travel between Brora and the site entrance via Clynelish Distillery Road and the C6 Strath Brora Road. The trunk road network in the vicinity of the Development site has reasonably good horizontal and vertical alignment suitable for accommodating general HGV construction traffic. As introduced previously, the proposed POE for the delivery of wind farm components is Invergordon. The routes are illustrated on Figure 12.3.

Abnormal Load Route

12.6.8 Considering that the proposed POE for abnormal loads is Invergordon and that the Development is an extension to an existing site, the proposed route for abnormal loads is to travel northbound on the A9 via Evelix; Golspie; and Brora, before continuing westbound on the Clynelish Distillery Road and the C6 Strath Brora Road to the

Development site access (the same access used for the operational Gordonbush Wind Farm).

Summary of Routes

12.6.9 A summary of the potential routes to the Development site access, and the sensitive locations affected, for construction traffic, excluding abnormal loads, is shown in Table 12.6 and illustrated in Figure 12.3: Route Options and Sensitive Receptors.

Table 12.6: Route Option Summary

Reference	Sensitive Locations	Route Options Affected	Comments
i	Helmsdale	A9 from North	Helmsdale is classified as a Local Centre in Sutherland with community facilities including: a Primary School; a Community Centre; local shops; Health Centre/Medical Practice etc.
ii	Brora	A9 from North and A9 from South	The settlement of Brora is a Local Centre in Sutherland with community facilities including: a Primary School; a Community Learning Centre; Police Station; local shops; Health Centre/Medical Practice etc.
iii	Invergordon	A9 from South	Invergordon is classified as a Local Centre in Ross and Cromarty East with established business and industries and associated community facilities including: a school; a Community Centre; local shops; Health Centre/Medical Practice etc.
iv	Evelix	A9 from South	Small group of residential properties close to the A9.
v	Golspie	A9 from South	Golspie is the largest settlement within Sutherland playing an important role as a Local Centre providing service and a variety and mix of retail uses to a large part of Sutherland. Golspie has community facilities including: a Primary School; a Secondary School; a Community Centre; Fire Station; local shops; Health Centre/Medical Practice etc.
vi	Adjacent to the Clynelish Distillery Road and the C6 Strath Brora Road (Killin; Oldtown; Kilcalmkill; Gordonbush)	A9 from North and A9 from South	Residential properties (single or in small groups) adjacent to the Clynelish Distillery Road and the C6 Strath Brora Road. No facilities/services.

12.7 Potential Effects

12.7.1 The IEA 1993 guidelines recommend that the following environmental effects are considered to be potentially important when assessing the traffic effects from an individual development. Many of these effects are considered elsewhere within the ES due to the specialist skills required in assessing these. The effects highlighted in bold, are considered in this Chapter:

- Noise (Chapter 13 of this ES);
- Vibration (Chapter 13 of this ES);
- Visual Effects (Chapter 7 of this ES);
- **Severance** – in this context, the perceived division occurring within a community, i.e. the difficulty of crossing the road, which may result from the temporary increase in traffic during the construction period;
- **Driver Delay** – traffic delays to non-development traffic can occur at several points on the network surrounding the site including at the site entrance, on the highways passing the site, at other key intersections and at side roads (where the ability to find gaps in the traffic may be reduced, thereby lengthening delays);
- **Pedestrian Delay** – changes in the volume, composition or speed of traffic may affect the ability of people to cross roads and, in general, increasing traffic levels are likely to lead to greater increases in delay depending upon the general level of pedestrian activity, visibility and general physical conditions of the site;
- **Pedestrian Amenity** – broadly defined as the relative pleasantness of a journey, and is considered to be affected by traffic flow, traffic composition and pavement width/ separation from traffic;
- **Fear and Intimidation** – this is dependent on the volume of traffic, its HGV composition, its proximity to people or the lack of protection caused by such factors as narrow pavement widths;
- **Accidents and Safety** – the determination of effects which may elevate or lessen the risks of accidents, e.g., junction conflicts;
- Hazardous Loads – not considered as no hazardous loads expected during construction i.e. nuclear waste or similar;
- Air Pollution (Chapter 15: Other Issues);
- Dust and Dirt (Appendix 4.1: Draft CEMP);
- Ecological Effects (Chapter 8 of this ES); and
- Heritage and Conservation (Chapter 11 of this ES).

12.8 Mitigation

Mitigation during Construction

Route Selection

12.8.1 The primary mitigation measure to help minimise the effects of the construction traffic is the careful consideration of the roads network to identify a preferred route to and from the Development access junction. This has considered physical characteristics of the roads network and the number and location of potentially sensitive receptors along the various routes.

General Modifications Required for Turbine Components

12.8.2 A separate Route Survey Report has identified any modifications required for the transportation of the turbine equipment (see Appendix 12.1 and Appendix 12.2). As highlighted previously in Section 12.3.3, parts of the local road network were upgraded as part of the Gordonbush Wind Farm construction in order to accommodate associated abnormal loads traffic, and this has been reflected in the assessments provided.

On-site Sourcing of Material

12.8.3 It is intended that a significant amount of material for the construction of access tracks and areas of hardstanding (at turbine bases and site compounds) will be sourced on site from borrow pits. This significantly reduces potential effects on the road network by reducing the material import requirements and hence the vehicle movements.

Concrete Batching

12.8.4 It is anticipated that concrete would be batched on-site to help minimise the effect on the surrounding road network.

Road Maintenance

12.8.5 As stated in the consultation response from THC (see Annex A of Appendix 12.1), it will be necessary to establish the current condition of the roads, including road surface condition and profile prior to commencing construction of the Development to establish a baseline for any subsequent repairs required during the construction period.

Traffic Management Measures

12.8.6 In addition to the specification of preferred access routes and the detailed phasing of construction traffic, additional measures and initiatives would be introduced to minimise the intrusive effects of construction related traffic. Measures proposed include:

- Police escort for movement of abnormal loads with the preference to have a convoy of several vehicles to minimise the disruption to other road users;
- Abnormal loads escorting vehicles to warn oncoming vehicles of the approaching loads, pulling the vehicles in where necessary, and pulling the convoy over at predetermined locations to allow any build-up of following traffic to pass;
- Regulated site working hours;
- Where appropriate, additional warning and speed control signs could be installed, temporarily or otherwise, with the agreement of the Roads Authority;
- A construction liaison committee would be established to ensure the smooth management of the project/public interface. It is proposed that representatives of the Applicant, the construction contractors, the local community, and, if appropriate, the Police, form the committee. This committee would form a means of communicating, and updating on forthcoming activities and dealing with any issues arising; and
- A driver's 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; identification of the specified route; and the requirement not to deviate from the specified route.

12.8.7 A Traffic Management Plan will be developed, should the Development be consented, detailing ways to reduce the effect considering:

- Avoiding transit through communities at peak times, including school arrival and departure times;
- A communications protocol to avoid delays with emergency vehicle traffic; and
- Communication of proposed delivery movements to liaise with the communities to avoid key dates such as fetes etc.

12.9 Monitoring

12.9.1 The transportation effects of the construction traffic are temporary only. Mud and debris on the surrounding road network in the vicinity of the Development site would be monitored and inspections of the mitigation work would be undertaken on a regular basis to confirm these measures are proving effective at reducing effects. Where necessary, mitigation measures would be reviewed and amended.

12.10 Residual Effects

Introduction

12.10.1 This section considers the level of sensitivity to the increase in vehicle movements associated with the construction phase.

Derivation of Development Traffic

12.10.2 It is anticipated that construction of the Development will take approximately 13 months. The construction programme and predicted traffic movements forming the basis of the effect assessment provided to CH2M are summarised in Table 12.7 and Table 12.8 respectively. In predicting the traffic movements, the following assumptions have been made:

- The extension will consist of 16 turbines;
- No forestry felling is required;
- Concrete batching anticipated on-site;
- Stone for the construction of access tracks and hardstandings is assumed to be sourced from on-site borrow pits, however an allowance has been made for importing the capping stone for the access tracks and crane hardstandings from offsite quarries (without intrusive GI in the borrow pit extension areas to indicate if suitable rock for capping is available, it is deemed prudent to include these journeys should no suitable capping material be sourced on site);
- Due to the nature of materials and plant required on site, the majority of vehicles utilised would be HGV;
- Items of plant for Civil, Electrical and Wind Turbine Supplier based on recent project plant numbers;

- The concrete pump is not permanently on site but is brought in for each wind turbine base pour individually and any other pours as required;
- Turbine delivery movements are based on the delivery of: three blades per turbine (one vehicle per blade); three tower components per turbine (base, mid and top); one nacelle per turbine; one blade hub per turbine; one can per turbine; and 5 storage cabins allowed for use by wind turbine supplier;
- Two escort vehicles (LGV) have been assumed per abnormal load convoy of three loads for the wind turbine components and main erection crane;
- Sand and aggregates for concrete are to be imported using 20T capacity HGVs – figures for these deliveries plus an allowance for additional concrete pours (operations building foundations, met mast foundation, transformer plinths, access stair plinths etc.) and any increase that results in the final base volumes;
- Cement for concrete is to be imported using a $32m^3$ capacity HGV – an additional number of journeys has been added to this figure as per the sand and aggregates;
- Reinforcement is to be delivered on 20T capacity HGVs – assumed 55T of reinforcement per base plus an allowance for additional reinforcement requirements has been allowed e.g. operations building foundation, met mast foundation, transformer plinths, access stair plinths etc., and any increase that results in the final base tonnages);
- Assumed that piles are delivered on a 20T capacity HGV with 14 piles delivered per vehicle;
- Geotextiles are delivered on a 20T capacity HGV – vehicle numbers based on delivery of 340 rolls at 80 rolls per vehicle;
- Electrical ducts, assumption made to cover ducting into bases, buildings and cable crossings under access tracks/watercourses;
- Deliveries for Operations Building based on project experience;
- Sand for cable surround delivered by 20T capacity HGV, cable surround volume based on a trench 1.6m wide by 0.6m deep;
- Electrical cable comes in 500m drums and is delivered 6 drums per vehicle. The length of cable used to predict the associated traffic movements is the length of the access track multiplied by 3, to allow for triplex installation;
- Earth cable comes in 500m drums and is delivered 10 drums per vehicle. The length of cable used to predict the associated traffic movements is the length of the access track plus an allowance for earthing bases, operations buildings etc.; and
- Fibre optic cable comes in 2000m drums and the length of cable used to predict the associated traffic movements is the length of the access track plus an allowance for entering the operations building and substation building etc.

12.10.3 The workforce on-site will depend on the activities being undertaken but is based on the following assumptions (provided to CH2M):

- Developer Staff – assumed 1 Project Manager, 1 Site Manager, 1 Ecological Clerk of Works, 1 Archaeological Clerk of Works on site permanently, 10 additional staff on part time at 2 visits per week;

- Contractor Office Staff – Assumed 1 Site Agent, 2 Engineers, 2 Foremen, 1 Health & Safety Advisor, 1 Environmental Advisor, 1 Admin Assistant on site permanently;
- Contractor Site Staff – equal to items of plant + 8 general operatives, 2 steel fixing squads of 4 operatives, 1 concrete squad of 5 operatives;
- Wind Turbine Supplier Staff – 1 Project Manager, 1 Site Manager, 1 Health & Safety Advisor, 10 Operatives sharing 5 vehicles; and
- Electrical Contractor Staff – 1 Site Supervisor, 5 Operatives and Plant Operators equal to number of items of plant.

Table 12.7: Predicted Construction Programme

	Months												
	1	2	3	4	5	6	7	8	9	10	11	12	13
Mobilisation													
Borrow Pits													
Access Track Construction													
Hardstanding Construction													
Wind Turbine & Met Mast Foundations													
Operations Building													
Wind Turbine & Met Mast Erection													
Reinstatement													
Demobilise													

Table 12.8: Predicted Traffic Movements (Journeys confirmed by SSER as round trips i.e. one round trip equals one arrival movement and one departure movement)

	Months												
	1	2	3	4	5	6	7	8	9	10	11	12	13
Site Setup													
Offices	3												3
Contractor Offices	5		5										10
Contractor Storage	10												10
Wind Turbine Supplier Offices									2				2
Wind Turbine Supplier Storage									5				5
Miscellaneous Compound (cones, barriers, fencing, signage, tanks, skips etc.)	11								4				15
Contractor Plant Deliveries (incl. 7 Excavators, 1 Crane, 7 Dump Trucks, 5 Batching Plant Items, 2 Rollers, 6 Concrete Trucks, 2 Tractors, 1 Telehandler, 1 Mini excavator, 2 Graders, 1 Bulldozer + Misc. Allowance)	23	2	11	4				35					5
Concrete Pump			2	4	4	4	4	2					
Electrical Contractor Plant Deliveries (incl. 3 Excavators, 1 Telehandler, 2 Cable Trailers, 2 Tractors + Misc. Allowance)			10									10	
Compound Waste (Sewage/Waste, 8 per month)	8	8	8	8	8	8	8	8	8	8	8	8	8
Fuel Deliveries (8 per month)	8	8	8	8	8	8	8	8	8	8	8	8	8

	Months												
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**
Construction Materials													
Concrete Sand			67	67	67	67	67	68					
Concrete Cement			13	13	13	13	14	14					
Concrete Aggregate			80	80	80	80	80	80					
Capping Material				900	900	900							
Reinforcement Steel			10	10	10	10	10	10					
Culverts		10											
Building Steel Frame			5										
Building Cladding, Doors, Windows, External Finishes			10										
Building Roof				6									
Miscellaneous Items (Cattle Grids, Snow Poles, Gates, Office Furniture etc.)		4	4	4	4	4							
Geotextiles		4											
Piles (assumed 8 bases require piles, 40 No 339mm dia. CHS)				23									
Electrical Equipment													
Electrical Cable			6	3	3	3	3	3					
Earth Cable			2	2	1								
Fibre Cable			1										
Electrical Equipment (Switchgear, transformers, cable markers etc.)						4	4		4	4	4	4	
Cable Surround Sand			279	279	279	279	279	279					
Ducts		5	5	5	5								
Wind Turbine Deliveries and Erection													
Blades									12	12	12	12	
Nacelles									4	4	4	4	
Tower Sections									12	12	12	12	
Cans									16				
Blade Hub									4	4	4	4	
Erection Crane									3			3	
Assist Crane									3			3	
Telehandlers									2			2	
Escort Vehicles (2 No.)									23	21	21	23	

	Months												
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**
Staff													
Staff	172	172	172	172	172	172	172	172	172	172	172	172	172
Contractor Office Staff	184	184	184	184	184	184	184	184	184	184	184	184	184
Contractor Site Staff	713	759	1311	1403	1403	1403	1403	1403	207	207	207	207	207
Wind Turbine Supplier Staff									184	184	184	184	184
Electrical Contractor Staff			368	368	368	368	368	368	368	368	368	368	
Total	**1137**	**1156**	**2562**	**3544**	**3510**	**3508**	**2605**	**2635**	**1225**	**1188**	**1188**	**1208**	**813**

HGV (including Abnormal Loads)	68	41	527	1417	1383	1381	478	508	87	52	52	70	66
Private Vehicles	1069	1115	2035	2127	2127	2127	2127	2127	1138	1136	1136	1138	747
Abnormal Loads	0	0	0	0	0	0	0	0	56	32	32	40	0
HGV Daily Average	3	2	21	55	54	54	19	20	4	2	2	3	3
Private Daily Average	42	43	79	82	82	82	82	82	44	44	44	44	29
Total Daily Average	45	45	100	137	136	136	101	102	48	46	46	47	32
Hourly Average	5	5	10	14	14	14	10	10	5	5	5	5	3
2-way hourly average	9	9	20	27	27	27	20	20	10	9	9	9	6

Predicted Peak Month highlighted in red.

Assessment of Residual Construction Effects

Geographical Boundary of Assessment

12.10.4 When considering the effect of construction traffic on the local roads network, there are relevant sites for which ATC data is available. The flows at these locations are shown in Table 12.9 along with the predicted increase in HGV traffic at those locations, attributable to estimated levels of construction traffic. In this table, the predicted daily average number of construction vehicle trips from the predicted peak month (month 4) is compared against each ATC data site. This would represent 100% of the generated construction traffic passing each ATC location. In reality, once contractors have been appointed and materials sourced, it is expected that generated construction traffic would arrive at site using the various routes and would not pass each ATC location. As a result, the assessment included in Table 12.9 is based on a worst-case scenario.

Table 12.9: Summary of Predicted Daily Increases in Traffic at ATC Sites

Site Ref.	Weekday AADF	Week day %HGV	Week day HGV[2]	Predicted Average Daily Increases			Predicted Average Daily Percentage Increases		Predicted temporary Traffic		
				HGV Traffic (two-way)	Non-HGV Traffic (two-way)	All Traffic (two-way)[3]	HGV Traffic (two-way)	All Traffic (two-way)	AADF	HGV	HGV%
1	1837	15%	276	110	164	274	40%	15%	2111	386	18%
2	2613	-	353	110	164	274	31%	10%	2887	463	16%
3	3878	-	524	110	164	274	21%	7%	4152	634	15%
4	4562	-	616	110	164	274	18%	6%	4836	726	15%
5	4045	-	547	110	164	274	20%	7%	4319	657	15%
6	6260	12%	752	110	164	274	15%	4%	6534	862	13%
7	6347	-	857	110	164	274	13%	4%	6621	967	15%
8	7471	-	1009	110	164	274	11%	4%	7745	1119	14%
9	7089	-	958	110	164	274	11%	4%	7363	1068	15%
10	9370	-	1265	110	164	274	9%	3%	9644	1375	14%
11	8672	-	1171	110	164	274	9%	3%	8946	1281	14%
12	11065	-	1494	110	164	274	7%	2%	11339	1604	14%
13	289	6%	18	110	164	274	611%	95%	563	128	23%

[2] Note, an average of the weekday HGV percentages from sites 1 and 6 has been used to calculate the weekday HGV's at all other A9 locations where HGV data is not available.

[3] Assuming a 10-hour day, the all traffic average hourly flows equate to a maximum of 28 two-way movements.

Site Ref.	Weekday AADF	Week day %HGV	Week day HGV[2]	Predicted Average Daily Increases			Predicted Average Daily Percentage Increases		Predicted temporary Traffic		
				HGV Traffic (two-way)	Non-HGV Traffic (two-way)	All Traffic (two-way)[3]	HGV Traffic (two-way)	All Traffic (two-way)	AADF	HGV	HGV%
14	84	5%	5	110	164	274	2200%	326%	358	115	32%

12.10.5 The following points should be borne in mind when assessing the likely effect of these increases:

- The predicted daily average increase in traffic represents 100% of the generated construction traffic passing each ATC location, a situation which would not occur in reality;
- No traffic growth has been applied to the baseline traffic used in the assessment and, therefore, the assessment can be deemed to be robust i.e. if the existing traffic flows were factored to future year levels the calculated percentage increases would be less (e.g. an increase of 100 vehicles to a nominal existing flow of 5,000 vehicles means a percentage increase of 2.0%, whereas an increase of 100 vehicles to a nominal future year flow of, say, 6,000 vehicles means a percentage increase of 1.7%);
- The increase in traffic during the construction phase is temporary;
- The predicted temporary percentage of HGVs is within normal parameters for the A9 (T) section of the route to the Development site;
- The high percentage increases in HGV traffic highlighted in Table 12.9 are as a consequence of the low number of existing HGVs on the routes recorded during the traffic surveys; and
- The percentage increases at the locations listed above are solely a result of the temporary increase in HGV traffic. This estimated increase is a total of 66 HGVs, on average, per day, which is equivalent to approximately 7 HGVs per hour (averaged over an assumed 10-hour delivery period). This is not deemed to be a significant increase in real terms.

12.10.6 Considering the above bullet points, the assessment in Table 12.9 highlights that the road links and any other specifically sensitive areas where traffic flows are predicted to increase by more than that suggested in the rules taken from the IEA 1993 guidelines, and hence need to be considered further, are:

- 1, A9 Berriedale (north of Helmsdale) – predicted 40% average daily increase in HGV traffic;
- 2, A9 Brora to Helmsdale – predicted 31% average daily increase in HGV traffic;
- 13, Clynelish Distillery Road – predicted 611% average daily increase in HGV traffic and a predicted 95% average daily increase in all traffic; and
- 14, C6 Strath Brora Road – predicted 2,200% average daily increase in HGV traffic and a predicted 326% average daily increase in all traffic.

12.10.7 On the basis that the predicted traffic increases are particularly robust and the actual traffic volume increases are not deemed to be considerable, although assessed as being high in percentage terms, it is CH2M's professional judgement that the estimated increases in traffic are unlikely to have a significant effect. However, the above road links and neighbouring communities are considered further.

Receptor Sensitivity

12.10.8 The settlements identified from the geographical boundary assessment lie on the potential access route to the site, consideration has been given to the size and function of each settlement, and particular characteristics identified during the Baseline Review. The results are shown in Table 12.10.

Table 12.10: Receptor Sensitivity (Communities)

Receptor	High	Medium	Low	Negligible
Helmsdale		X		
Brora		X		
Adjacent to the Clynelish Distillery Road and the C6 Strath Brora Road (Killin; Oldtown; Kilcalmkill; Gordonbush)			X	

12.10.9 The roads identified from the geographical boundary assessment, and summarised in Table 12.11, are part of the potential access route to the site. Consideration has been given to their existing condition and ability to accommodate HGV traffic, and characteristics identified during the Baseline Review.

Table 12.11: Receptor Sensitivity (Roads)

Receptor	High	Medium	Low	Negligible
A9			X	
Clynelish Distillery Road		X		
C6 Strath Brora Road		X		

Effects Magnitude and Effects Significance – Severance, Fear and Intimidation

12.10.10 The increases in traffic flow affecting the receptors are summarised in Table 12.9. Based on the two-way average daily percentage increase in traffic, the percentage increase at:

- Helmsdale on the A9 is between 10% and 15% (based on the counter located between Brora and Helmsdale and the counter located north of Helmsdale respectively);
- Brora on the A9 is between 7% and 10% (based on the counter located at the southern boundary of Brora and the counter located between Brora and Helmsdale respectively); and
- The communities adjacent to the Clynelish Distillery Road and the C6 Strath Brora Road is between 95% and 326% (based on the counters installed at these locations).

12.10.11 Considering the indicator described in DMRB Volume 11 (see Section 12.5.10), the magnitude of the severance effect at Helmsdale and Brora is considered slight i.e. a

negligible magnitude of effect. With regard to the communities adjacent to Clynelish Distillery Road and the C6 Strath Brora Road, it can be seen that the Development construction traffic could potentially see a very high percentage increase in traffic between Brora and the site entrance. This equates to a magnitude of effect on severance at settlement receptors on this route being classed as high. However, although the percentage increase in trips is assessed as being high, the existing flow on this part of the transport route and the additional traffic is low in actual volumes. Also there are no pedestrian facilities and, therefore, negligible pedestrian activity. As a result, professional judgement has been used to determine that the significance of the effects on severance is minor.

12.10.12 It is anticipated that journey patterns will be maintained without pedestrians being dissuaded from making trips and, therefore, this alternative assessment from DMRB reinforces the slight i.e. a negligible magnitude, severance effect.

12.10.13 To determine the magnitude of the effect on fear and intimidation the same assessment, as that undertaken for severance, has been applied. As a result, the magnitude of the fear and intimidation effect at the settlements is considered to be negligible or minor.

Effects Magnitude and Effects Significance – Driver and Pedestrian Delay

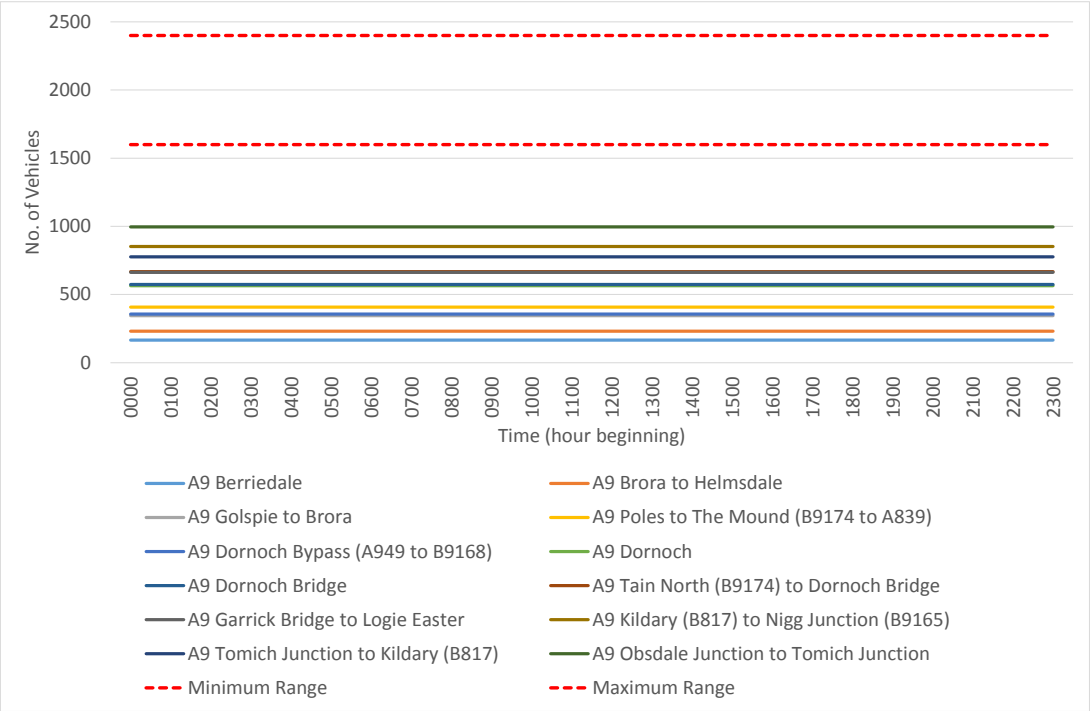
12.10.14 To inform the assessment of driver and pedestrian delay, the capacity of the surrounding road network has been considered. As described in 12.7.1, delays to non-development traffic and pedestrians is related to the volume of traffic on the road network.

12.10.15 The average link capacities for the various links within the study area using the DMRB guidance indicate that the A-class roads are theoretically capable of accommodating between 800 and 1,200 vehicles per hour per direction, depending on the speed limit. To demonstrate the theoretical capacity of the Clynelish Distillery Road and the C6 Strath Brora Road they have been classified as a poor single carriageway rural road with varying width of between 4.0m – 5.5m. The theoretical capacities are described below:

- A9 – rural typical single 7.3m, 60mph = 1,200 vehicles per hour per direction;
- A9 – urban single 7.3m, 30mph = 800 vehicles per hour per direction;
- Clynelish Distillery Road – rural poor single 5.5m, 60mph = 800 vehicles per hour per direction; and
- C6 Strath Brora Road – rural poor single 4.0m, 60mph = 140 vehicles per hour per direction.

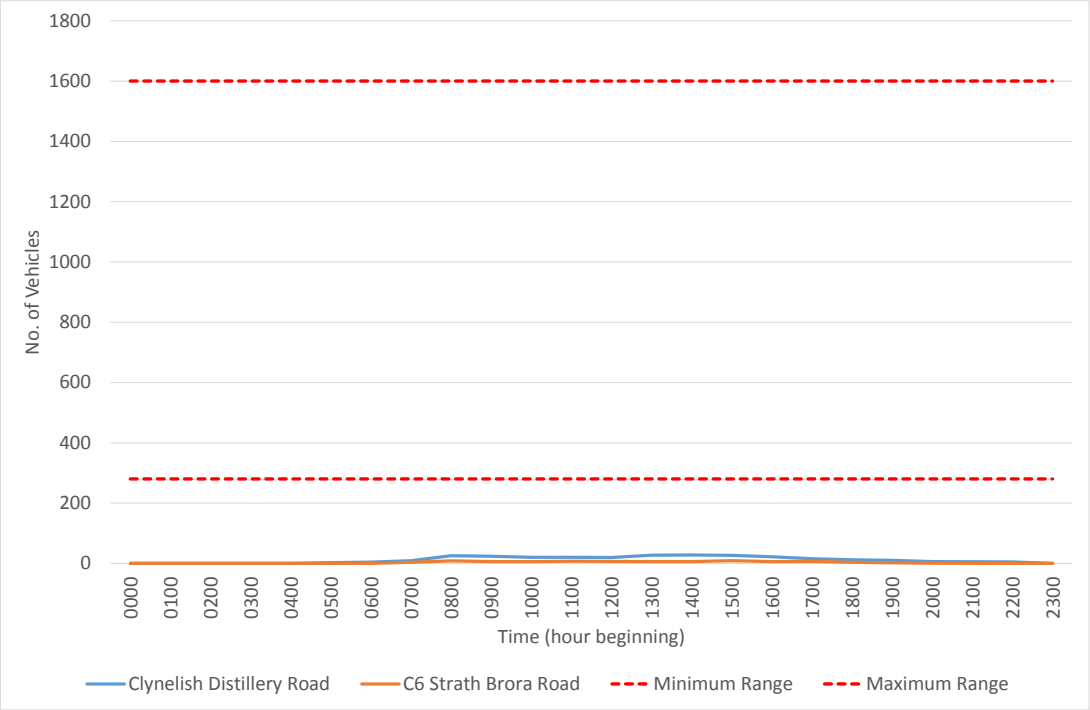
12.10.16 Using the 800 and 1200 vehicles per hour per direction for the A9, this equates to a combined (two-way) theoretical capacity of 1,600 and 2,400 vehicles per hour, and these values are used as a minimum and maximum capacity limit to compare with the recorded flows from the ATC surveys. The comparison has been made between the theoretical capacity and the annual average PM peak flows recorded, summarised in Table 12.9, for count sites 1-12. The comparison is illustrated in Chart 12.2. This indicates that there is significant spare capacity on all links and, therefore, adding the estimated project construction traffic, estimated at 33 vehicles per hour, is unlikely to have any detrimental effect on capacity.

Chart 12.2: Road Capacity Review



12.10.17 Using the values of 140 and 800 vehicles per hour per direction, for the C6 Strath Brora Road and Clynelish Distillery Road respectively, this equates to a combined (two-way) theoretical capacity of 280 and 1,600 vehicles per hour, and these values are used as a minimum and maximum capacity limit to compare with the recorded flows from the ATC surveys. The comparison has been made between the theoretical capacity and the average weekday hourly flows recorded at sites 13 and 14. The comparison is illustrated in Chart 12.3. This indicates that there is significant spare capacity and adding the project construction traffic, estimated at 28 vehicles per hour, is unlikely to have any detrimental effect on capacity.

Chart 12.3: Road Capacity Review



12.10.18 Based on the above assessment, it has been determined that the magnitude of the effects on driver and pedestrian delay will be negligible.

Effects Magnitude and Effects Significance – Pedestrian Amenity

12.10.19 The magnitude of the effect on pedestrian amenity has been considered in terms of the threshold described in the Guidelines for the Environmental Assessment of Road Traffic which suggests that a meaningful change in amenity would be where traffic flow (or its lorry component) is halved or doubled. Hence, based on the estimated two-way average daily percentage increase in construction traffic and the estimated two-way average daily percentage increase in HGV traffic summarised in Table 12.9, it can be seen that the Development construction traffic could potentially see a more than two-fold increase in HGV and all traffic on the Clynelish Distillery Road and the C6 Strath Brora Road between Brora and the site entrance. This equates to a magnitude of effects on pedestrian amenity at settlement receptors on this route being classed as high. However, although the percentage increase in trips is assessed as being high, the additional traffic is low in actual volumes and, as indicated above, this route has significant spare capacity, as well as there being no pedestrian facilities and, therefore, negligible pedestrian activity. As a result, professional judgement has been used to determine that the significance of the effects on pedestrian amenity is minor.

Effects Magnitude and Effects Significance – Accidents and Safety

12.10.20 The increase in traffic volume associated with the Development is the main factor in the potential increase in risk regarding accidents and safety. Another potential effect on road safety is the transfer of dirt and debris from the site and associated vehicles onto the surrounding road network. However, there is no threshold assessment to determine the significance of the effects of the construction related traffic. Given that the increased

traffic levels are temporary and the mitigation measures that are required to be employed to minimise these effects such as: regular monitoring of the road conditions; the traffic management plan; and abnormal vehicle escorts (outlined in Section 12.9), there is unlikely to be a determinable increase on the risk of accidents. As a result, the magnitude of the accidents and safety effects has been determined as being low at all sensitive settlement receptors.

Summary

12.10.21 The magnitude of the effect of the construction traffic on the road and junction sensitive receptors has been based solely on traffic volumes and is summarised in Table 12.12. The magnitude of the effect at all receptors as a result of the estimated construction traffic volumes has been determined as being low as the additional movements, although on some roads assessed as being statistically high, are low in actual volumes.

12.10.22 Based on the magnitude of the effects and the sensitivity of the receptors, Table 12.13 summarises the significance of the additional construction related traffic movements during the construction phase.

Table 12.12: Receptor Sensitivity (Magnitude)

Receptor	Severance	Driver Delay	Pedestrian Delay	Pedestrian Amenity	Fear and Intimidation	Accidents and Safety	Road Capacity
Helmsdale	negligible	negligible	negligible	negligible	negligible	low	-
Brora	negligible	negligible	negligible	negligible	negligible	low	-
Adjacent to the Clynelish Distillery Road and the C6 Strath Brora Road (Killin; Oldtown; Kilcalmkill; Gordonbush)	negligible	negligible	negligible	negligible	negligible	low	-
A9	-	-	-	-	-	-	low
Clynelish Distillery Road	-	-	-	-	-	-	low
C6 Strath Brora Road	-	-	-	-	-	-	low

Table 12.13: Receptor Sensitivity (Significance)

Receptor	Severance	Driver Delay	Pedestrian Delay	Pedestrian Amenity	Fear and Intimidation	Accidents and Safety	Road Capacity
Helmsdale	no	no	no	no	no	minor	-
Brora	no	no	no	no	no	minor	-
Adjacent to the Clynelish Distillery Road and the C6 Strath Brora Road (Killin; Oldtown; Kilcalmkill; Gordonbush)	no	no	no	no	no	minor	-
A9	-	-	-	-	-	-	no
Clynelish Distillery Road	-	-	-	-	-	-	minor
C6 Strath Brora Road	-	-	-	-	-	-	minor

12.11 Cumulative Effects

12.11.1 The consultation responses did not highlight any other significant projects in the area that would have an overlapping construction phase with the Development, nor alter the baseline to be assessed in this ES. Nevertheless, it is noted that a planning application has been submitted for West Garty Wind Farm, and this is considered in this section.

12.11.2 The West Garty Wind Farm proposal, to consist of 18 wind turbines, is situated between Helmsdale and Brora in the Scottish Highlands, with access proposed to be taken from the A9. The assessment undertaken to determine the effects of additional traffic associated with the construction, operation and decommissioning of the wind farm concludes that some driver and pedestrian delay is predicted, however, this impact will be moderate in magnitude and temporary in duration. With regard to the estimated HGV increase, this is reasoned to be within capacity for all potentially affected receptors, and total traffic volumes are well within the flow capacity of the road. Overall the impact of the West Garty development is predicted to be of negligible significance.

12.11.3 The associated Access, Transport and Traffic Chapter of the Environmental Statement[4] submitted to support the planning application provides a breakdown of the estimated

[4] West Garty Wind Farm Environmental Statement (December 2014).

construction phase traffic movements and these have been applied to determine the potential cumulative effects.

12.11.4 A comparison of the relevant traffic count data used in both assessments has been undertaken and is summarised in Table 12.14.

Table 12.14: Traffic Count Data Comparison

			Gordonbush Extension Assessment		West Garty Assessment	
Site Ref.	**Transport Scotland Site Ref.**	**Location Description**	**Weekday AADF**	**Weekday %HGV[5]**	**Weekday AADF**	**Weekday %HGV[6]**
1	104890	A9 Berriedale	1837	15%	1987	13.20%
2	ATC01026	A9 Brora to Helmsdale	2613	-	2532	10%
3	ATC01025	A9 Golspie to Brora	3878	-	4312	10%
4	ATC01334	A9 Poles to The Mound (B9174 to A839)	4562	-	4443	10%
5	ATC01023	A9 Dornoch Bypass (A949 to B9168)	4045	-	3284	10%
6	JTC08225	A9 Dornoch	6260	12%	5893	8.70%
7	ATC01020	A9 Dornoch Bridge	6347	-	5798	10%
8	ATC01021	A9 Tain North (B9174) to Dornoch Bridge	7471	-	6820	10%
9	ATCNW007	A9 Garrick Bridge to Logie Easter	7089	-	7719	10%
10	ATC01333	A9 Kildary (B817) to Nigg Junction (B9165)	9370	-	8608	10%
11	ATC01018	A9 Tomich Junction to Kildary (B817)	8672	-	8123	10%
12	ATC01017	A9 Obsdale Junction to Tomich Junction	11065	-	-	-
13	-	Clynelish Distillery Road	289	6%	-	-
14	-	C6 Strath Brora Road	84	5%	-	-

[5] The Gordonbush assessment has used a percentage HGV's for the A9 sites that HGV data has not been recorded based on an average calculated from the two sites that did record this information.

[6] The West Garty assessment has used 10% HGV's for the A9 sites that HGV data has not been recorded.

12.11.5 Henceforth, to determine the cumulative effects the Gordonbush Extension, base traffic data has been considered as the basis of the assessment.

12.11.6 The West Garty Wind Farm assessment provides a summary of construction traffic generation which determined a worst-case monthly average increase in total traffic of 991 vehicles. This is broken down into a worst-case monthly average increase in non-HGV traffic of 616 vehicles and a worst-case monthly average increase in HGV traffic of 407 vehicles. Using the methodology used in this Environmental Statement chapter, this equates to 24 non-HGV daily 2-way movements and 16 HGV daily 2-way movements.

12.11.7 When considering the effect of the cumulative construction traffic on the local roads network, there are relevant sites for which ATC data is available (all on the A9). The flows at these locations are shown in Table 12.15 along with the predicted increase in HGV traffic at those locations, attributable to estimated levels of construction traffic. In this table, the predicted daily average number of construction vehicle trips is compared against each ATC data site. This would represent 100% of the generated construction traffic passing each ATC location. In reality, once contractors have been appointed and materials sourced, it is expected that generated construction traffic would arrive at site using the various routes and would not pass each ATC location. It should also be considered that the construction of both sites at the same time will not necessarily become a reality. As a result, the assessment included in Table 12.15 is based on a worst-case scenario.

Table 12.15: Summary of Predicted Daily Increases in Traffic at ATC Sites

Site Ref.	Weekday AADF	Week day %HGV	Week day HGV[7]	Predicted Average Daily Increases			Predicted Average Daily Percentage Increases		Predicted temporary Traffic		
				HGV Traffic (two-way)	Non-HGV Traffic (two-way)	All Traffic (two-way)[8]	HGV Traffic (two-way)	All Traffic (two-way)	AADF	HGV	HGV%
1	1837	15%	276	126	188	314	46%	17%	2151	402	19%
2	2613	-	353	126	188	314	36%	12%	2887	463	16%
3	3878	-	524	126	188	314	24%	8%	4152	634	15%
4	4562	-	616	126	188	314	20%	7%	4836	726	15%
5	4045	-	547	126	188	314	23%	8%	4319	657	15%
6	6260	12%	752	126	188	314	17%	5%	6534	862	13%
7	6347	-	857	126	188	314	15%	5%	6621	967	15%
8	7471	-	1009	126	188	314	12%	4%	7745	1119	14%

[7] Note, an average of the weekday HGV percentages from sites 1 and 6 has been used to calculate the weekday HGV's at all other A9 locations where HGV data is not available.

[8] Assuming a 10-hour day, the all traffic average hourly flows equate to a maximum of 28 two-way movements.

Site Ref.	Weekday AADF	Week day %HGV	Week day HGV[7]	Predicted Average Daily Increases			Predicted Average Daily Percentage Increases		Predicted temporary Traffic		
				HGV Traffic (two-way)	Non-HGV Traffic (two-way)	All Traffic (two-way)[8]	HGV Traffic (two-way)	All Traffic (two-way)	AADF	HGV	HGV%
9	7089	-	958	126	188	314	13%	4%	7363	1068	15%
10	9370	-	1265	126	188	314	10%	3%	9644	1375	14%
11	8672	-	1171	126	188	314	11%	4%	8946	1281	14%

12.11.8 Considering the bullet points in Section 12.10.5, the assessment in Table 12.15 highlights that the road links and any other specifically sensitive areas where traffic flows are predicted to increase by more than that suggested in the rules taken from the IEA 1993 guidelines, and hence need to be considered further, are:

- 1, A9 Berriedale (north of Helmsdale) – predicted 46% average daily increase in HGV traffic;
- 2, A9 Brora to Helmsdale – predicted 36% average daily increase in HGV traffic;

12.11.9 On the basis that the predicted traffic increases are particularly robust and the actual traffic volume increases are not deemed to be considerable, although assessed as being high in percentage terms, it is CH2M's professional judgement that the estimated increases in traffic are unlikely to have a significant effect. Considering the additional West Garty Wind Farm traffic, the cumulative potential construction traffic effects will not materially affect the assessment undertaken in Section 12.10 i.e. on severance; driver delay; pedestrian delay; pedestrian amenity; fear and intimidation; accidents and safety; or road capacity. The magnitude of the effect at all receptors as a result of the estimated cumulative construction traffic volumes is determined as being low as the additional movements, although on some roads assessed as being statistically high, are low in actual volumes.

12.11.10 Therefore, based on the magnitude of the effects and the sensitivity of the receptors the significance of the cumulative additional construction related traffic movements during the construction phase are determined as being of no significance or minor significance.

12.12 Statement of Significance

12.12.1 This Chapter has assessed the likely significance of effects of the traffic associated with the Development during construction and the cumulative effect with the proposed West Garty Wind Farm proposal. The assessment of the residual effects has been based on: existing traffic data; the estimated volume of construction traffic; the methodology outlined; and the implementation of mitigation measures, such as an appropriate traffic management plan and suitable liaison with the relevant authorities. The residual traffic and transport effects are temporary and have been assessed as having no significant effect.

12.13 References

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