Fred. Olsen Renewables

Chapter 12

Traffic and Transport Assessment

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Glossary

Term	Definition
Environmental Impact Assessment	Environmental Impact Assessment (EIA) is a means of drawing together by the developer, in a systematic way, a description of the development and information relating to of the likely significant environmental effects arising from a proposed development
Environmental Impact Assessment Report	A document reporting the findings of the EIA and produced in accordance with the Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017 Regulation 5
Present Windy Standard Developments	The 'present Windy Standard Developments' refers collectively to the operational existing Windy Standard I Wind Farm, Windy Standard II Wind Farm and the consented Windy Standard III Wind Farm.
The Proposed Development	The Proposed Windy Standard I Repower Wind Farm
The Proposed Development Area	The area shown delineated by the red line boundary shown on Figure 1.2.

List of Abbreviations

Abbreviation	Description
AADT	Average Annual Daily Traffic
ARA	Aryshire Road Alliance
AILs	Abnormal Indivisible Loads
BoP	Balance of Plant
CMS	Construction Method Statement
CTMP	Construction Traffic Management Plan
DAS	Design and Advisory Services
DfT	Department for Transport
DGC	Dumfries and Galloway Council
EIA	Environmental Impact Assessment
EIAR	Environmental Impact Assessment Report
ES	Environmental Statement
HGV	Heavy Goods Vehicle
IEA/IEMA	Institute of Environmental Assessment (now Institute of Environmental Management and Assessment)
IHT	Institute of Highways and Transportation
LGV	Light Goods Vehicles
SR	Scoping Response
TIA	Traffic Impact Assessment

12.1 STATEMENT OF COMPETENCE

12.1.1 Natural Power's Design and Advisory Services (DAS) team have over 20 years' experience in undertaking access assessments, traffic impact assessment, transport studies and traffic management plans for the renewable industry. As well as undertaking these assessments, the DAS team regularly undertake due diligence reviews of third party access studies for project financial closure. The team works closely with developers, turbine suppliers and haulage contractors to keep abreast of the latest developments in turbine component transport.

12.1.2 The DAS team is involved in all stages of wind farm developments from conception, through planning, planning condition discharge, construction and asset management/maintenance. This range provides the team with detailed experience of the various stages and how the traffic related issues follow and influence these stages. This experience is particularly valuable for the current planning stage where the traffic impacts and preliminary traffic management plan will be picked up and further refined during planning condition discharge and into construction.

12.2 INTRODUCTION

12.2.1 This section of the Environmental Impact Assessment Report (EIAR) assesses the effects due to the traffic and transport impacts for the construction of the Proposed Development, including the decommissioning and restoration of the existing wind farm.

12.2.2 Construction traffic required to construct the wind farm falls into three broad categories; namely Abnormal Indivisible Loads (AILs), Heavy Goods Vehicles (HGVs) and Light Goods Vehicles (LGVs).

12.2.3 The construction phase of the Proposed Development is expected to last approximately 22 months, from site mobilisation through to installation and commissioning of the turbines, ending with site re-instatement and demobilisation. There will be a temporary site shut down during winter months December (Month 12) through February (Month 14) as this is anticipated to coincide with poorer weather conditions. The turbine erection works is estimated to then commence in month 17.

12.2.4 The following Appendices accompany this EIAR chapter:

- Appendix 12.1: Abnormal Indivisible Load Route Survey;
- Appendix 12.2: Preliminary Construction Traffic Management Plan.

12.2.5 The traffic and transport assessment has assessed the traffic impacts associated with the Proposed Development. The assessment considered a worst-case scenario and assumes all stone would need to be imported onto site and all foundation concrete would need to be brought to site in ready mix lorries. In reality, the import of stone may be reduced as this planning application also includes proposals for onsite borrow pits, to take advantage of any site-won stone, and onsite concrete batching plants, for the mixing of concrete within the wind farm site.

12.2.6 In addition, the traffic impacts associated with the abnormal load deliveries were also assessed. An Abnormal Indivisible Load Route Survey, including swept path analysis at particular pinch points was also prepared demonstrating the viability of the proposed abnormal load route, see Appendix 12.1.

12.2.7 The assessment concludes that, with the incorporation of suitable mitigation measures secured through a Construction Traffic Management Plan (CTMP), there will be no significant traffic effects associated with the Proposed Development.

12.2.8 A preliminary Construction Traffic Management Plan has been prepared. The assessment has been based on a number of conservative assumptions around the construction programme/sequencing, source of stone and concrete deliveries. These assumptions can only be clarified post consent and once a Balance of Plant (BoP) contractor is engaged. Therefore, it is expected a Planning Condition will be applied to the development for a final construction CTMP to be prepared and approved by Dumfries & Galloway Council (DGC) post consent and prior to construction works commencing.

12.2.9 In addition, the increase in traffic levels that are likely to be experienced due to the decommissioning and restoration of the existing wind farm have been considered and assessed, concluding that the vehicle movements anticipated for the decommissioning activities will not surpass any assessment thresholds.

12.3 LEGISLATION, POLICY AND GUIDANCE

12.3.1 This section outlines the legislation, policy and guidance that has been reviewed. The transport and traffic issues described in the following planning advice and guidance documents have been taken into account in this assessment:

- Scotland's Third National Planning Framework (2014), The Scottish Government;
- Scottish Planning Policy (SPP) (2014), The Scottish Government;
- Planning Advice Note (PAN) 75: Transport and Planning (2005), The Scottish Government;
- Onshore Wind Turbines; Online Renewables Planning Advice, The Scottish Government;
- Transport Assessment Guidance (2012), Transport Scotland;
- Guidelines for the Environmental Assessment of Road Traffic (1993), Institute of Environmental Assessment (IEA), now the Institute of Environmental Management and Assessment (IEMA); and
- Dumfries and Galloway Council Local Development Plan 2 (2019).

12.3.2 Much of the above policy and guidance deals principally with developments that generate significant increases in travel as a direct consequence of their function (e.g. retail parks, housing, etc) and measures to implement a more sustainable transport solution. The traffic generated by the Proposed Development would almost entirely be limited to vehicle movements during the construction phase. As such, the impact of traffic from the Proposed Development is temporary and of a short-term duration.

12.4 DECOMMISSIONING AND RESTORATION OF EXISTING WINDY STANDARD I WIND FARM

12.4.1 Prior to the construction of the Proposed Development commencing, work will be undertaken for the decommissioning and restoration of the existing Windy Standard I wind farm which has come to the end of its life. In accordance with the planning conditions under the original consent for the existing Windy Standard I Wind Farm, a detailed decommissioning plan will be prepared and agreed with the authorities prior to commencement. Whilst the decommissioning activities associated with the existing Windy Standard I Wind Farm have been considered and assessed as part of the original consenting process, consideration has been given to the decommissioning process in relation to the Proposed Development as part of this assessment. This assessment has reviewed the decommissioning process in line with the programme of works for the Proposed Development to identify any cumulative effect which may arise for consideration with the Proposed Development, for which this EIAR has been developed.

12.4.2 The decommissioning and restoration of the existing Windy Standard I Wind Farm will be undertaken in advance of the Proposed Development construction phase. As they will not occur concurrently, the HGV movements arising from the decommissioning and restoration of the existing Windy Standard I wind farm have not been considered as a cumulative project. The anticipated duration for decommissioning and restoration of the existing Windy Standard I wind farm is 13 months.

12.4.3 The decommissioning of the existing Windy Standard I wind farm will be in line with current best practice, with all turbine components including blades, nacelles and towers being removed from the site. Each component will be processed to manageable sizes on site and removed from site using normal HGV vehicles. No AILs are anticipated to be required for the decommissioning and restoration of the existing Windy Standard I wind farm. It is anticipated that some material will be imported to site for the purpose of preparing the existing tracks and hardstands for the

decommissioning activities, with subsequent vehicle movements required for removal of waste materials from the site of excavated foundations and platforms.

12.4.4 Based on the anticipated decommissioning and restoration works for the existing Windy Standard I Wind Farm, it is estimated to lead to around 1488 HGV movements. These movements will be distributed across the 13 month13-month programme, with activities expected to generate a peak Average Daily Movements of circa 206 HGV movements.

12.4.5 The anticipated HGV traffic generated by the decommissioning and restoration of the existing Windy Standard I wind farm does not exceed assessment thresholds identified in IEMA regarding the increase in traffic levels that are likely to affect the environmental conditions of the road. Accordingly this does not require to be taken forward for further assessment.

12.5 TRAFFIC AND TRANSPORT METHODOLOGY

12.5.1 The methodology employed in this assessment has been developed from guidance given in the "Guidelines for the Environmental Assessment of Road Traffic" (IEMA 1993). To assess the effects of the additional traffic generated by the Proposed Development during the construction phase, the sequence of steps detailed below has been followed.

- Establishment of baseline traffic conditions;
- Estimate the traffic numbers and routing for the Proposed Development;
- Determine the magnitude of impact to the baseline traffic conditions due to the Proposed Development;
- Undertake a screening test to delimit the scale and extent of the assessment;
- Identify and assess the sensitivity of receptors with best practice embedded mitigation considered;
- Synthesise the sensitivity of the receptor with the magnitude of impact to determine the significance of effect; and
- If the significance is elevated, review opportunities to implement impact mitigation measures and re-assess the significance of effect.

12.5.2 Consideration was given to the decommissioning and restoration of the existing wind farm and construction, operation and decommissioning phases of the Proposed Development.

12.5.3 When considering the magnitude of the impact it should be recognised that the traffic generated by the Proposed Development would be short term due entirely to vehicle movements relating to the construction phase of the Proposed Development. Following completion of the construction phase, traffic levels will return to their baseline conditions as the impact of vehicle movements during the operational phase, largely LGVs, is deemed to be negligible within the context of baseline traffic.

12.5.4 The method of decommissioning of the Proposed Development would be agreed with the relevant planning authority as outlined in Chapter 5: Project Description of this EIAR. In line with current practice all turbine components, including blades, nacelles and towers would be removed from the site. If not to be re-used, turbine components would likely be cut to manageable sizes on site to allow use of normal HGV vehicles. Above ground infrastructure would be removed with foundations generally removed to around 1 m below ground level, with the remainder left in-situ. Therefore, the HGV movements will be less than during the construction period. The decommissioning would be likely to take place over a similar time period shown. Baseline traffic flows on all of the affected roads may have altered by the end of the up to 35-year lifetime of the wind farm leading to the possibility of a different effect on the roads for HGV traffic. It is envisaged that the decommissioning would result in lesser effects than those identified for this assessment and no further assessment has been undertaken. Decommissioning would be managed in accordance to a decommissioning plan to be agreed with relevant authorities at the time.

12.5.5 As such this assessment will consider the effects during the construction phase only.

Magnitude of Impact

12.5.6 The magnitude of traffic impacts is a function of the existing traffic volumes, the percentage increase due to the Proposed Development and the changes in type of traffic. The IEMA Guidelines identify magnitude thresholds based on percentage changes in traffic levels as being applicable to severance and intimidation effects. The magnitude of impact arising from the increase in traffic volumes (taken as being either the traffic flow including all vehicles or the HGV traffic flow, whichever is higher) is categorised in Table 12.1.

Table 12.1: Definitions of magnitude of impact criteria

Magnitude	Criteria	Percentage Increase
High	Total loss or major alteration to key elements/features of the baseline conditions	**>90%**
Medium	Partial loss or alteration to one or more key elements/features or the baseline conditions	**60-90%**
Low	Minor shift away from baseline conditions	**30-60%**
Negligible	Very slight change from baseline conditions	**<30%**

Source: Natural Power

12.5.7 The assessment has considered both the change in magnitude of the impacts as well as their absolute levels.

12.5.8 Consideration was given to the composition of the traffic on the road network under both baseline and predicted conditions. For example, LGVs generally have less effect on traffic and the road system than HGVs. Within the assessment the estimated numbers of LGVs, HGVs and abnormal load vehicles associated with the Proposed Development have been calculated and the resultant percentage increase in these vehicles compared to baseline conditions established to determine the increase in traffic.

12.5.9 Consideration was given to the timing and duration of traffic effects. For example, LGVs may be concentrated to particular times of the day and week (start / end of the working day from Monday to Friday) whereas HGVs may be spread over the working day. Abnormal loads may have a considerable effect on the road congestion and delay if they occur during peak periods. Without details of the contractor's proposed working methods, suppliers, detailed construction sequencing, contractor's material procurement procedures and deliveries it was considered inappropriate to include timing and duration of traffic within the assessment. Therefore, good practice recommendations are made for the contractor to manage the timing of works and deliveries to avoid peak traffic periods.

Screening Test

12.5.10 The IEMA Guidelines suggest two general rules for establishing the increase in traffic levels that are likely to affect the environmental conditions of the road, and that therefore warrant consideration, namely:

- **Rule 1** - Include highway links where traffic flows would increase by more than 30% (or the number of HGVs would increase by more than 30%)
- **Rule 2** - Include any other specifically sensitive areas where traffic flows would increase by 10% or more. (IEA Guidelines Paragraph 3.20 defines sensitive areas as including *"accident blackspots, conservation areas, hospitals, links with pedestrian flows etc.").* Paragraph 3.20 also notes that *"normally it would not be appropriate to consider links where traffic flows have changed by less than 10% unless there is a significant change in the composition of traffic, e.g. a large increase in the number of heavy goods vehicles".*

12.5.11 Where the predicted increase in traffic flow is lower than these thresholds, the IEMA guidelines suggest that the significance of the effects can be stated to be low or insignificant, and further detailed assessments are not warranted. Further guidance is given for Rule 1 with regard to certain aspects of traffic effects. These indicate that projected changes in traffic of less than 10% create no discernible environmental effect.

12.5.12 These guidelines are intended to be used for the assessment of the environmental effect of road traffic associated with major new developments. The assessment is therefore more pertinent to the operational phase of the wind farm than the construction phase. However, they are used here to assess the short-term transport flow during construction.

12.5.13 The matrix shown in Table 12.2 has been used for traffic assessment.

Table 12.2: Screening criteria

Rule 1	Rule 2	Further assessment required
Yes	Yes	**Yes**
Yes	No	**Yes**
No	Yes	**Yes**
No	No	**No**

Source: Natural Power

Embedded Mitigation

12.5.14 Embedded mitigation is measures that have been incorporated into the design of the development. In terms of Traffic and Transport, embedded mitigation is primarily delivered through a Construction Traffic Management Plan (CTMP). As part of the Traffic and Transport Chapter a preliminary CTMP has been prepared (Appendix 12.2) and it is expected a Planning Condition will be applied to the development for a final construction CTMP to be prepared and approved by Dumfries and Galloway Council post consent and prior to construction works commencing.

12.5.15 Embedded mitigation includes “best practice” processes which are implemented during construction, regardless of the outcome of the traffic impact assessment. Measures which have been included for the Proposed Development are:

- Scheduling of HGV deliveries to avoid peak times;
- Temporary signage to direct HGV drivers to the Proposed Development and advise of routes not permitted;
- Temporary signage, including Variable Message Signs, to inform both drivers and pedestrians of risks and highlight rights of ways/ priorities;
- Reduced speed limits;
- Scheduling of construction activities, with focus on concrete and AIL deliveries to reduce deliveries whilst key activities occurring;
- Trial run for AIL movements prior to commencement of construction;
- Consultation with Local highway authorities and Police to co-ordinate AIL deliveries; and
- Consultation with the Local highway authorities and the local community and individuals who will be most affected during the construction period.

12.5.16 This Traffic and Transport assessment has been based on a number of conservative assumptions. The most important in terms of the impact on traffic flows being the construction programme/sequencing, source of stone and concrete deliveries. These assumptions can only be clarified post consent and once a BoP contractor is engaged. Hence the requirement for a Planning Condition for a final construction CTMP to be prepared and approved prior to construction commencing.

Assessment of Sensitivity

12.5.17 The sensitivity of the roads used by the Proposed Development have been assessed in accordance with the IEMA Guidelines and although not providing specific criteria for evaluating sensitivity, for the purpose of this assessment, a scale of 'low', 'medium' and 'high' has been used.

12.5.18 The assessment has considered three categories of receptors, which consist of;

- Road network and road users;
- Local settlements along the proposed access route(s); and
- Road structure.

12.5.19 When judging the sensitivity of the road to the anticipated temporary increase in traffic movements associated with the Proposed Development, a variety of considerations were taken in account including, classification of the road, proximity of schools, housing and local amenities and existing traffic management (e.g. roundabouts, passing places etc.).

Road Network and Road Users

12.5.20 In this Chapter, the sensitivity of the road networks and its users has been determined with respect to its capacity to absorb an increase in traffic. A road with a high capacity to absorb an increase in traffic will have a lower sensitivity to change than a road with little or no capacity to absorb an increase in traffic.

Local Settlements

12.5.21 The sensitivity of local settlements are reviewed in terms of pedestrian severance, pedestrian delay, pedestrian and cyclist amenity, pedestrian intimidation and pedestrian safety.

Pedestrian Severance

12.5.22 Severance is the perceived division that can occur within a community when it becomes separated by a major traffic artery and is used to describe the factors that separate people from other people and places. For example, severance may result from the difficulty of crossing a heavily trafficked road.

Pedestrian Delay

12.5.23 Changes in the volume, composition or speed of traffic may affect the ability of people to cross roads and, therefore, increases in traffic levels can lead to increases to pedestrian delay. Pedestrian delay will also depend on factors such as level of pedestrian activity, visibility and presence of pedestrian crossing points. For example, a settlement with several designated pedestrian crossing points will be less sensitive to increased traffic volumes than a settlement with few or no designated pedestrian crossing points.

Pedestrian and Cyclist Amenity

12.5.24 Pedestrian and cyclist amenity can be broadly defined as the perceived pleasantness of a journey and is considered to be affected by traffic flow, traffic composition and pavement width/separation from traffic. For example, a settlement with wide pavements and segregated cycle lanes will be less sensitive to increased traffic volumes than a settlement with narrow pavements.

Pedestrian Intimidation

12.5.25 Intimidation experienced by pedestrians is dependent on the volume of traffic, its composition, its proximity to people and the perceived lack of protection caused by such factors as pavement widths, traffic speed and vehicle size. For example, a settlement with narrow pavements and no pedestrian guardrails will be more sensitive to increased traffic volumes than a settlement with wide pavements that are lined with pedestrian guardrails.

Pedestrian Safety

12.5.26 Safety is affected by such matters as traffic speed, traffic volumes and complexities in the road structure. For example, a straight road is easier to navigate than a road with several junctions and bends, which can lead to increased safety risk. Similarly, the presence of islands can create locations where pedestrians cross the road rather than using the designated crossing points.

Road Structure

12.5.27 The sensitivity of the road structure has been assessed based on its importance and a high-level visual assessment of its condition. For example, a national route or motorway in good condition will be less sensitive to an increase in traffic flow than a regional route with some physical defects.

12.5.28 Table 12.3 summarises the sensitivity criteria adopted for the different receptors.

Table 12.3: Receptor Grouping and Sensitivity Criteria

Receptor	Low sensitivity	Medium sensitivity	High sensitivity
Public Road Network and Users	Major highways with no junctions, such as motorways, or a road network with suitable capacity to absorb an increase in traffic.	Road networks with some capacity to absorb an increase in traffic.	Road network with little or no capacity to absorb an increase in traffic.
Local Settlements	Local settlements and properties which are set back from the route and/or are located on a single side of the route. No requirement for direct pedestrian access to the road. Good pedestrian facilities (i.e. wide footpaths, barrier provisions, formal crossing facilities).	Local settlements and properties which are near the route and/or potentially on both sides of the route. Limited requirements to cross the road. Adequate pedestrian provisions (i.e. footpaths are available where needed, albeit may be narrow, crossing facilities, some level of barrier provision).	Local settlements and properties directly fronting the route and/or are located on both sides of the route. Facilities and services result in requirement to cross the road. Poor pedestrian provisions (i.e. limited or no footpaths, footpaths narrow, no crossing facilities, no barrier provision). Near to sensitive locations such as hospitals, retirement homes, schools, places of worship, public open spaces and tourist attractions.
Road Structure	Major highways or roads with no obvious physical defects.	Regional highways or roads with some minor physical defects.	Local roads with some physical defects or local roads, infrequently maintained with reoccurring physical defects.

Source: Natural Power

Assessment of Significance

12.5.29 The significance of any given effect is taken to be a synthesis of both the magnitude of the effect and the sensitivity of the receptor. The criteria used in determining significance are set out in Table 12.4.

Table 12.4: Significance of Effect

		Magnitude of Change			
		High	**Medium**	**Low**	**Negligible**
Sensitivity	**High**	Major	Major/Moderate	Moderate	Moderate/Minor
	Medium	Major/Moderate	Moderate	Moderate/Minor	Minor
	Low	Moderate	Moderate/Minor	Minor	Minor/Negligible

Note: Only **Major** and **Major / Moderate** significance are considered significant in terms of the EIA Regulations

Uncertainties and Assumptions

12.5.30 A range of uncertainties are present with any assessment of traffic effects. With respect to this EIAR, such uncertainties and assumptions are detailed below. These uncertainties are minimised by maintaining conservative assumptions and the provision of estimates based on recent wind farm construction experience.

Existing Traffic Flows

12.5.31 The assessment relies on the availability and accuracy of traffic flow data to establish baseline traffic conditions on the surrounding network. The available data for the A713 is reasonably extensive covering a sufficiently broad timeframe. This ensures that the baseline traffic conditions derived for this road is an accurate reflection of actual conditions.

Traffic Generation

12.5.32 The estimated traffic generated by the Proposed Development comprises general construction loads such as bulk materials; abnormal loads for turbine components; and LGVs. Best estimates based on Natural Power and FORL experience have been used (with conservative assumptions) for each of these components, including:

- Concrete for turbine bases (assumptions have been made as to base sizes and concrete designs);
- Geogrids and culverts for road construction (assumptions have been made as to the likely number of cross drains and culverts required and the pavement design);
- LGVs (construction worker traffic) for the construction period (it is not possible to exactly determine the likely size of the construction team); and
- The duration and sequencing of the construction period will affect the calculation of traffic intensities. If the actual programme is lengthened the traffic intensities would be lower than those assumed. Conversely, but unlikely, if the construction period were to be shortened the traffic intensities would increase.

Assessment of Traffic Effects

12.5.33 The effects on the proposed construction traffic routes and surrounding communities have been assessed with regards to severance, driver and pedestrian delay, safety, pedestrian amenity and fear and intimidation, in line with the IEMA Guidelines. The effects of factors such as ecological impact and noise are assessed in Chapter 9 and 14 respectively of this EIAR.

12.5.34 The methods for assessing the likely effects on traffic volumes, delays and trip times are subject to some uncertainty. These methods have been developed by roads authorities and research bodies over a number of decades and have been found to be reasonably representative. However, the actual capacity of a road segment or junction at any given time may differ from the calculated value due to a wide range of factors.

12.6 CONSULTATION

Scoping Opinion

12.6.1 Transport Scotland confirmed they were content with the proposed assessment as detailed in the Scoping Report, which included the following key elements:

- The impact of the Proposed Development on the public road network should be assessed using the latest guidance, including the Guidelines for the Environmental Assessment of Road Traffic (IEMA 1993) and Transport Scotland Guidance on Transport Assessment;
- The study would consider effects during construction, but the effects of the operation and decommissioning have been scoped out of this assessment; and
- The Traffic and Transport Chapter of the EIAR will include the Traffic Impact Assessment, AIL Access Assessment and a preliminary Traffic Management Plan.

Dumfries and Galloway Council

12.6.2 The methodology employed on this assessment has been agreed with DGC in the past.

Transport Scotland

12.6.3 No meeting/call was held with Transport Scotland to discuss access EIA methodology for the Proposed Development. However, from the scoping response Transport Scotland did provide the following request:

- Transport Scotland indicated the proposed methodology was satisfactory but requested that the Bankfield Roundabout at the end of the A713 be included within the threshold assessment.

Ayrshire Roads Alliance

12.6.4 No meeting/call was held with Ayrshire Roads Alliance to discuss the Proposed Development and traffic implications. However, the methodology employed on this assessment has been agreed with ARA in the past.

12.7 BASELINE TRAFFIC CONDITIONS

Construction Traffic Routes

Abnormal Indivisible Loads (AIL)

12.7.1 An Abnormal Indivisible Load Route Survey has been undertaken for the major component deliveries and is included in Appendix 12.1 of the EIAR.

12.7.2 Due to the size of components being assessed it is not considered possible to transport all components through the Port of Ayr. As such the preferred route for the major component deliveries is as follows:

- From King George V (KGV) Dock, Glasgow loads would depart KGV Dock and travel west on Kings Inch Drive before turning left onto Mayo Avenue;
- Loads would join the eastbound M8 and continue to Junction 8;
- Loads would leave the M8 and join the M73 travelling south;
- At Junction 4, loads would join the westbound M74;
- Loads would depart the M74 at Junction 1 and join the M8 westbound before leaving at Junction 22 and join the M77 travelling southbound; and
- Loads would continue south onto the A77 to Whitletts Roundabout east of Ayr.
- Loads would join the A77 southbound carriageway;
- Loads would depart the A77 at Bankfield Roundabout and turn left onto the A713; and
- Loads would continue southeast on the A713 to the proposed site entrance.

12.7.3 The AIL route assumes a Port of Entry at KGV Docks, Glasgow and generally utilises trunk roads. The final approved AIL route will not be known until the turbine supplier is appointed and they have in turn reached contractual agreements with the port, sea freight/shipping company and a road haulier.

12.7.4 A review of the weight restrictions on the AIL route was undertaken through the Electronic Service Delivery for Abnormal Loads (ESDAL) gateway. This review did not identify any weight restrictions along the route. Prior to the delivery of abnormal loads and as part the AIL permitting process to obtain approvals for transporting AILs an updated assessment of the structures, with specific vehicle set-ups and axle loadings, will be undertaken in consultation with the relevant road/bridge authorities. Prior to and throughout the construction phase regular road condition inspections will be undertaken on the HGV routes and these inspections would include bridges on the AIL route. Should deterioration in condition of any bridges be identified, remedial works would be instigated.

12.7.5 Various road widenings, bridge strengthenings and bridge assessments have been undertaken on the structures along the A713 by other wind farm developers and the route has been used for wind turbine component deliveries. Correspondence from ARA through the ESDAL process has identified that while these structures have been assessed and strengthened, the Proposed Development will need to undertake their own assessments in due course. ARA has noted that the suitability of two Network Rail bridges on the A713 (Holeshouse and Downieston) should be advised by Network Rail as part of that assessment. Network Rail has not provided a response through the ESDAL process.

General Construction Traffic

12.7.6 General construction traffic and material deliveries will travel to site via the A713, depending on their origin, either via Dalmellington or via St John's Town of Dalry. Beyond these routes the general construction traffic would be more dispersed.

Road Description

A713

12.7.7 The A713 is a Local Authority maintained road which runs from northwest to southeast through the East Ayrshire, South Ayrshire and Dumfries and Galloway Council areas. The Proposed Development is located near Carsphairn, between Dalmellington to the north and St Johns Town of Dalry to the south. The A713 is a two-lane single carriageway and a major road artery for the area. The geometry of the road is considered to be mixed with several sections reasonably clear while other sections are tight with corners and constrained. National speed limit applies to the majority of the route.

12.7.8 The overall the condition of the A713 is considered to be good, being well maintained as would be expected given its strategic importance to East Ayrshire, South Ayrshire and Dumfries and Galloway Councils.

12.7.9 The route is a proven delivery route for a number of recent wind farm developments.

Geographical Scope of Assessment

12.7.10 As described in Section 12.2.5, the distribution of general construction traffic from potential material sources to the site was considered to utilise the A713 from either Dalmellington or St John's Town of Dalry as the primary routes to site. Beyond these routes the general construction traffic would be more dispersed.

12.7.11 The number of AIL deliveries are likely to be limited to one delivery or convoy per day and will not contribute significant vehicle movements. Hence, it is not considered appropriate to assess the percentage increase on baseline traffic numbers that these would cause beyond the primary routes used by the AILs (i.e. A713 from Dalmellington).

12.7.12 The Abnormal Load Access Assessment identified a number of pinch points from the Port of Entry to the site entrance. The proposed modifications works to enable AIL loads to navigate these pinch points range from oversail over the pavement edge, temporary removal of street furniture, vegetation trimming and clearance to forming temporary overrun areas. The works are considered localised, short term and minor in nature and do not involve significant modifications to the highway network. It is considered the type of work being proposed could predominantly be undertaken off, of the highway with, appropriate traffic management.

12.7.13 Therefore, the geographical scope of the assessment includes consideration of the traffic effects associated with:

- General construction traffic on the A713 from the site entrance, heading north to, and including, the junction with the A77 (Bankfield Roundabout) and heading south to St John's Town of Dalry; and
- The AIL deliveries over the whole AIL route from Port of Entry to the site entrance.

Baseline Traffic Data

12.7.14 Data for traffic baseline for the A713 road was taken from the Department for Transport (DfT) website. Five count locations were adopted:

- DfT Count ID 1074 on the A713 north of Carsphairn (2019 data adopted);
- DfT Count ID 50995 on the A713 south of Carsphairn (2019 data adopted);
- DfT Count ID 74362 on the A713 south-east of Bankfield Roundabout (2019 data adopted);
- DfT Count ID 50750 on the A77 north of Bankfield Roundabout (2019 data adopted); and
- DfT Count ID 30757 on the A77 south of Bankfield Roundabout (2019 data adopted).

12.7.15 The most up to date data for the five DfT traffic counters is 2019. This was adopted for the baseline traffic data with no adjustment (growth) figures applied to bring it to the intended construction year. Consideration was given to adjusting the data by applying standard growth factors. However, for the following reasons it was considered more appropriate to maintain the 2019 figures:

- Applying the standard growth factors would result in an increased Average Annual Daily Traffic (ADDT) figure for the roads. Therefore, any increase in traffic due to the Proposed Development would be measured against this increased AADT figure, resulting in lower percentage increases than presented in this assessment. Therefore, maintaining the latest AADT figures will present a conservative assessment.
- Current transport planning policies are generally all aimed at reducing traffic flows and adopting more sustainable transport methods. It is hoped in future the impact of these policies will result in a reduction in traffic flows. As such it is considered contradictory to forecast increasing traffic flows in the future in which to set as a baseline for the assessment.
- The impact of COVID-19 on traffic flows is unknown at this stage. The temporary change in working patterns during the COVID pandemic (i.e. increased working from home) may become a more permanent state with the potential to reduce traffic flows.

12.7.16 Baseline AADT flows are shown in Table 12.5.

Table 12.5: Baseline Traffic Data

COUNT ID	LOCATION	AADT (Total Traffic)	AADT (HGV Traffic)
1074	A713 North of Carsphairn, by Brocklochrig loch	1,330	166
50995	A713 South of Carsphairn, adjacent to Earlstoun Loch	1,254	143
74362	A713, South-east of Bankfield Roundabout	3,881	230
50750	A77 (T), North of Bankfield Roundabout	23,709	1,305
30757	A77 (T), South of Bankfield Roundabout	16,960	1,078

Source: DfT Website

12.8 INITIAL SCREENING ASSESSMENT

Quantification of Development Activities

12.8.1 A programme of construction activities has been included in Chapter 5: Project Description of the EIAR.

12.8.2 Vehicles and equipment would be delivered to site at the commencement of the relevant construction phase and would remain on site until work relating to that stage was completed. Such equipment would include excavators, dump trucks and bulldozers for access track and crane pad earthworks, drainage, turbine foundations and cable installation, and cranes for erecting the turbines. An indicative list of the equipment needed is given in Chapter 5: Project Description, of the EIAR.

12.8.3 Each vehicle travelling to the site will generate two "vehicle movements"; one movement to the proposed wind farm and one movement away from the wind farm i.e. one delivery to the wind farm = two vehicle movements.

12.8.4 The application includes onsite borrow pits that would be utilised to source stone for the construction of the access tracks and hardstands. It is anticipated these will provide sufficient quantities and quality of stone for the Proposed Development. Similarly, given the size of the anticipated turbine foundations it is anticipated the concrete would be mixed on site to reduce the risks associated with the volumes and supply for these critical structural elements.

12.8.5 However, this Chapter assesses the worst-case scenario and assumes all stone would need to be imported onto site and all foundation concrete would need to be brought to site in ready mix lorries.

12.8.6 Most vehicles used during the construction activities would be below the width requirement for wide loads, with the exception of the turbine deliveries (nacelle, tower sections and blades) and possibly the 800/1000 tonne and 400/500 (or less) tonne cranes that would be used for the erection of the turbines. The roads authorities and local constabulary are likely to request a police escort necessary for the abnormal loads. The cranes are likely to require only a single journey along the public highway to and from the Proposed Development. Road axle weights would not exceed regulated levels unless agreed with the relevant authorities. Consultations with local authorities will be held prior to movement of any abnormal loads.

12.8.7 The Abnormal Indivisible Load Route Survey identified a number of points of interest from the Port of Entry to the site entrance. The proposed modifications works to enable AIL loads to navigate these points of interest range

from oversail over the pavement edge, temporary removable of street furniture, vegetation trimming and forming temporary overrun areas. The modification works are considered temporary and minor in nature and do not involve significant modifications to the highway network.

12.8.8 Given the potential for a variation to the route to be adopted, the minor nature of the modifications works and the short duration of the modification works (particularly with reference to the overall Proposed Development assessment period), it was not considered appropriate to assess the potential traffic impacts associated with the construction of all the points of interest modification works identified. However, traffic delay has still been considered in the Preliminary CTMP(Appendix 12.2).

12.8.9 **Abnormal Load Deliveries**. In addition to the deliveries noted above, the abnormal load deliveries have also been assessed. The number of these vehicles has been included within the assessment of general construction traffic to ensure a robust assessment including all vehicles. It is however important to consider the effect of these particular vehicles in isolation, as the effects are quite different to those attributed to general construction traffic, hence they have been assessed separately.

12.8.10 Indicative HGV traffic loads for the various phases of the construction operations are as follows:

- **Mobilisation to Site**: Mobilisation to site would involve the transport of plant for the construction works (including dump trucks, dozers/graders, excavators, forklifts), temporary office facilities, welfare units and storage containers, and general construction equipment such as fencing for site compounds and fuel bowsers. Rock crusher/processing plant would also be transported to site to crush and grade material from the borrow pits suitable for use in the construction works. It is estimated up to 63 HGV deliveries (126 movements) would be required for site mobilisation. Site demobilisation would require the same number of vehicle movements;
- **Forestry**: includes for the advance works undertaken to clear fell an area prior to construction activities commencing. The majority of the Proposed Development is free of tree coverage, with a small amount of felling anticipated across the Proposed Development. To remove 18.5 hectares, it is assumed that 285 HGV loads will be removed from site (570 movements);
- **Site Tracks, Crane Pads and Compounds** It is assumed that all stone for the site tracks, crane pads and compounds (temporary construction compound platform) would be imported from a local quarry. It is considered unpractical for HGVs delivering the stone to transport it throughout the site due to the number of deliveries potentially sterilising access around the site as well as the damage road going HGVs would inflict on the site tracks. Therefore, it has been assumed that HGVs would deliver the stone to a temporary compound with site dump trucks transporting it from there around the site;

  This scenario would only occur if the onsite borrow pits were unable to produce enough stone or stone of sufficient quality for the permanent works. Even if this were the case, it is likely the majority of the material would still be sourced from site with only the top running surface (c. 150 mm) of the tracks, crane-pads, and hardstands finished with imported material. However, this has not been taken into account in this scenario and a full depth of construction material (c. 500mm) has been adopted;

  The access tracks will primarily follow the footprint of the existing wind farm tracks and therefore the tracks will primarily upgraded for the Proposed Development. For some sections of the access tracks, the access track geometry and gradient will need to be modified to meet the turbine component delivery vehicle requirements and therefore effectively require new access tracks. The crane pads will be in new locations from the original wind farm layout, therefore new crane pads will be constructed. For 7.1 km of access track, 8 turbine crane-pads and associated hardstand laydown areas and three other hardstands it is estimated around 80,386 tonnes of stone would be required, resulting in around 3,828 HGV deliveries (7,656 movements);

  Several hardstand platforms within the redline boundary, such as the concrete batching plant platform, main construction compound, gatehouse, temporary carpark, storage area and laydown area platforms have been excluded from the stone quantities and this assessment as these hardstands are already constructed or will be constructed, prior to the construction of the Proposed Development;
- **Geogrid and Culverts**: An allowance has been included for laying geogrids along the access tracks and crane-pads. Geogrid rolls are generally 4 m wide and therefore it is assumed two geogrids would be required per length of track to provide sufficient width coverage. For 7.1 km of track and 8 crane-pads it is estimated 208 rolls of geogrid at 75 m per roll would be required. It is estimated a total of 11 deliveries would be required (22 movements). Similarly, an allowance has been included for culverts for drainage and pipe crossings at a rate of one culvert for every 100 m of track plus an additional allowance for specific locations and widenings resulting in an estimate of 59 culverts. It is estimated a total of two deliveries would be required (four movements);
- **Turbine Foundations**: Based upon the proposed tip heights it is estimated a typical gravity foundation design would require up to 1,000 m^3 of concrete and 135 tonnes of steel reinforcement. A typical concrete lorry can carry between six to eight cubic metres of concrete, equating to a rate of up to 17 deliveries per hour over a 12-hour day for turbine foundation pours. As noted previously, due to the risks associated with the logistics, travel time and criticality of foundation concrete, it is considered unlikely ready-mix concrete would be adopted for the project. However, to present a worst-case scenario, this assessment assumes ready-mix concrete. For ready-mix concrete it is estimated 2,672 HGV deliveries (1,336 movements) would be required. For reinforcement it is estimated 36 HGV deliveries (72 movements) would be required. Combined this equates to 1,408 HGV deliveries (2,816 movements) for the turbine foundations;
- **Turbine Abnormal Loads:** For the size of turbines being considered for the site, the abnormal loads would consist of three blade deliveries, up to five tower section deliveries, one nacelle delivery and one hub delivery (ten abnormal load deliveries per turbine). The transport of abnormal loads is undertaken by specialist vehicles designed and manufactured for the purpose of wind turbine component delivery. These vehicles are designed such that following delivery, they can reduce to a standard HGV size. Therefore, they arrive to site as an abnormal load but they will leave as a standard HGV. In this assessment, they are included in the HGV numbers although they are referred to as abnormal loads. Hence, there would be 80 abnormal load deliveries (160 movements) for transporting the turbine components to site;
- **Turbine Assembly**: Around five HGV deliveries for items that would be fitted within the turbines would be required for each turbine. The cranes (larger 800/1000 tonne and smaller 400/500 tonne crane) for assembling the wind turbines would be brought to site at the start of turbine assembly and remain on site until completion. It is estimated up to approximately 72 HGV deliveries (144 movements) would be required for mobilising and demobilising the cranes. This equates to 36 HGV deliveries (72 movements) at the start of turbine assembly works, 40 HGV deliveries (80 movements) throughout the turbine assembly period and 36 HGV deliveries (72 movements) following completion of turbine assembly. Combined this equates to 112 HGV deliveries (224 movements) for the turbine ancillary items and assembly equipment;
- **Substation**: The grid connection for the Proposed Development will be provided through two existing substations located within the redline boundary, with modifications required to accommodate the connection of the new wind turbines. The modifications will include installation of new control and switching equipment, as well as upgrades within the compound. It is estimated 60 HGV deliveries (120 movements) would be required for the substation upgrade works including control and switchgear within the buildings;
- **Cable Installation**: There will be two points of connection for the Proposed Development. Cable installation works will include the Low Voltage (LV) electrical cables, SCADA signalling/control cables and sand associated with the cable bedding and surround in the cable trench. The cable route will follow existing cable trenches as much as possible. Depending on the ground conditions encountered, it is possible that the sand could be sourced from site borrow pits. However, this is uncommon on wind farm construction and hence sand has been assumed to be imported. It is estimated 12 HGV deliveries would be required for the LV cables, four

HGV deliveries for the SCADA cables and 203 HGV deliveries for the sand bedding and surround. This equates to a total of 219 HGV deliveries (438 movements) for the cable installation; and

- **Transport of site personnel**: Approximately 40 car/van movements per day would be required for the construction personnel and any small deliveries, at the peak of the site activity.

12.8.11 Table 12.6 summarises the HGV movements for the expected construction.

Table 12.6: Estimated HGV construction traffic volumes

Item	HGV Deliveries	HGV Movements	Notes
Mobilisation to Site	63	126	At start of construction.
Forestry	285	570	Advance clearance works ahead of construction activities
Site Tracks, Crane Pads and Compounds	3,828	7,656	Assessment is based upon import of all stone.
Geogrids and Culverts	16	32	
Turbine Foundations	1,408	2,816	Assessment is based on concrete being imported to site.
Wind Turbine Abnormal Loads	80	160	These are included in the HGV numbers although referred to as abnormal loads.
Turbine Assembly	112	224	HGVs at start and end of turbine assembly for crane mob/de-mob. HGVs throughout turbine assembly period.
Substation area	60	120	
Cable Installation	219	438	Sand imported.
Demobilisation from Site	63	126	At the end of construction. Demobilisation will occur partially following completion of earthworks, with the remainder following completion of the project.

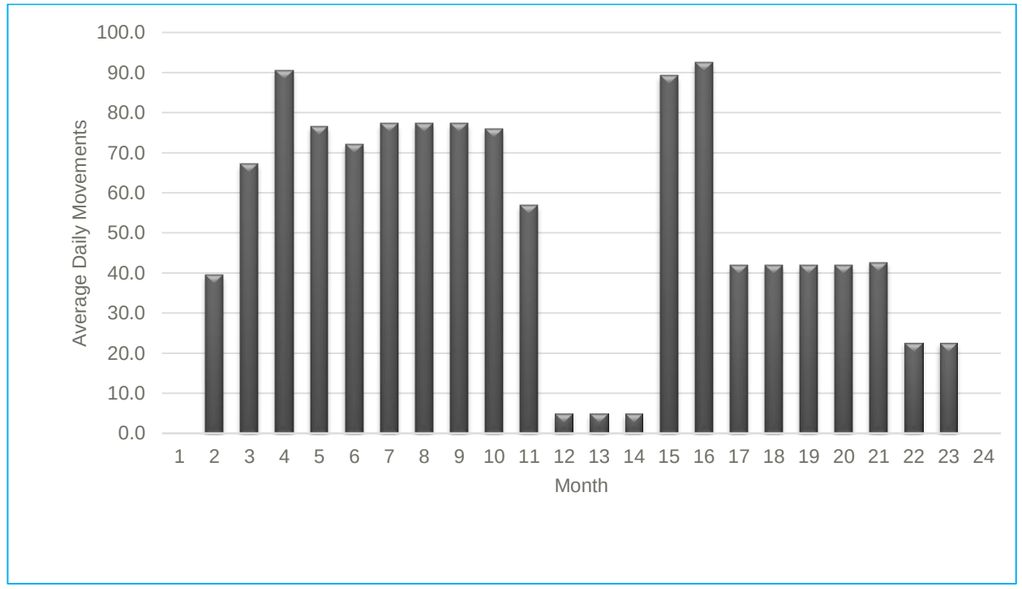
Source: Natural Power

12.8.12 The increase in traffic movements that would be generated by the Proposed Development have been assessed against the baseline traffic flow figures for the A713 (southbound and northbound) and A77. The construction of the Proposed Development is estimated to lead to around 9,962 HGV movements (including AILs) and 15,620 light personnel and LGV movements over the proposed 22 -month period.

12.8.13 Plate 12.1 illustrates this distribution of traffic over the 22-month construction period. Within the table, the turbine foundations numbers only include for reinforcement deliveries as it is not considered appropriate to simply distribute HGV numbers for concrete pours for the foundations over a month duration. Concrete pours for turbine foundations typically take place over a single day and hence the estimated 1000 m^3 of concrete for a foundation would be delivered by HGVs within typically a 12-hour period. Therefore, the effect of this is discussed separately in Section 12.9 .

12.8.14 Month 16 is expected to generate the most Average Daily Movements (circa 1,888 combined HGV and LGV movements with circa 1,022 of those HGV movements and the remaining circa 866 LGV movements).

Plate 12.1: Average daily vehicle movements over proposed 22-month construction period



Source: Natural Power

Table 12.7: Predicted Vehicle Movement Table

Activity	Month																								
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total
Heavy Goods Vehicles Movements (including abnormal loads)																									
Mobilisation to site		126																							126
Forestry		190	190	190																					570
Offsite AIL Enabling Works																									0
Import of Bulk Fill																									0
Access / site tracks			384	384	384	384	384	384	384	384					652	652									4378
Crane Hard-Standing				298	298	298	298	298	298	298	298				447	447									3278
Misc Hardstands			128	128	128																				384
Geogrids & Culverts			8	8	8	8																			32
Turbine foundations							36	36	36	36															144
Turbine Transformer and Housing																									0
Substation						30	30	30	30																120

Activity	Month																								
Cabling							88	88	88	88	88														438
Turbine Abnormal Loads																	40	40	40	40					160
Turbine Assembly, Commissioning and Testing																72	16	16	16	16	72				224
Demob / Site clearance																						63	63		126
Monthly HGV Total Movements	**0**	**316**	**710**	**1008**	**818**	**720**	**836**	**836**	**836**	**806**	**386**	**0**	**0**	**0**	**1099**	**1171**	**56**	**56**	**56**	**56**	**72**	**63**	**63**	**0**	**9962**
Light Vehicle Movements (car, minibuses and small van deliveries)																									
Forestry LGV	3	119	119	119	0																				358
General Construction Traffic	0	433	650	866	866	866	866	866	866	866	866	108	108	108	866	866	866	866	866	866	866	433	433	0	15,263
Monthly total LGV Movements	**0**	**552**	**769**	**985**	**866**	**866**	**866**	**866**	**866**	**866**	**866**	**108**	**108**	**108**	**866**	**866**	**866**	**866**	**866**	**866**	**866**	**433**	**433**	**0**	**15,620**
Monthly	**0**	**868**	**1479**	**1993**	**1684**	**1586**	**1702**	**1702**	**1702**	**1672**	**1252**	**108**	**108**	**108**	**1965**	**2037**	**922**	**922**	**922**	**922**	**938**	**496**	**496**	**0**	**25,584**

Activity	Month																								
Total Vehicle Movements																									
Average Daily Movements (assumes 5 working days per week)	0.0	39.5	67.2	90.6	76.6	72.1	77.4	77.4	77.4	76.0	56.9	4.9	4.9	4.9	89.3	92.6	41.9	41.9	41.9	41.9	42.6	22.5	22.5	0.0	
Average Daily HGV Movements (assumes 5 working days per week)	0.0	14.4	32.3	45.8	37.2	32.7	38.0	38.0	38.0	36.6	17.5	0.0	0.0	0.0	49.9	53.2	2.5	2.5	2.5	2.5	3.3	2.9	2.9	0.0	

Source: Natural Power

Distribution of Construction Traffic

12.8.15 Consideration was given to the likely distribution of construction traffic from material/supply sources to the site, Due to the limited routes available traffic will travel to site along the A713 either from the north via Dalmellington or from the south via St Johns Town of Dalry.

12.8.16 The AIL deliveries will only approach site from the north and therefore the figures used in the assessment for traffic from the south will be inflated.

12.8.17 From the distribution of material sources (concrete, aggregate, etc) and the route to site it is considered that a 50% split between the north and south is likely. At this stage, it was not considered appropriate to refine this split further as it may result in skewed results and omission of potential receptors that could subsequently be impacted once the construction stage commences and contractors determine their material sources. Therefore, a conservative approach has been undertaken to assume 100% of the traffic would approach from both the north and the south on the A713. A comparative 50% split in traffic distribution has also been presented as part of the screening process to illustrate the highway links that would exceed the thresholds and merit more detailed assessment.

12.8.18 Applying 100% of traffic movements to the A713 (southbound and northbound), the resultant percentage increase in traffic versus the baseline is indicated in Table 12.8 over the 22-month construction duration for the total vehicles and HGV vehicles. The 50% split is also presented in Table 12.8 for comparative purposes.

Table 12.8: Estimated percentage increases in traffic over construction period

Location	Construction Month 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
	% Increase in Total Traffic																							
A713 (southbound from Dalmellington) Carrying a 50% split of traffic	0.0	1.5	2.5	3.4	2.9	2.7	2.9	2.9	2.9	2.9	2.1	0.2	0.2	0.2	3.4	3.5	1.6	1.6	1.6	1.6	1.6	0.8	0.8	0.0
A713 (northbound from St John's Town of Dalry) Carrying a 50% split of traffic	0.0	1.6	2.7	3.6	3.1	2.9	3.1	3.1	3.1	3.0	2.3	0.2	0.2	0.2	3.6	3.7	1.7	1.7	1.7	1.7	1.7	0.9	0.9	0.0
A713 (southbound from Bankfield Roundabout) Carrying a 50% split of traffic	0.0	0.5	0.9	1.2	1.0	0.9	1.0	1.0	1.0	1.0	0.7	0.1	0.1	0.1	1.2	1.2	0.5	0.5	0.5	0.5	0.5	0.3	0.3	0.0
A77 (T) (northbound from Bankfield Roundabout)	0.0	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.0	0.0	0.0	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0
A77 (T) (southbound from Bankfield Roundabout)	0.0	0.1	0.2	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.0	0.0	0.0	0.3	0.3	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0
A713 (southbound from Dalmellington) Carrying 100% of traffic	0.0	3.0	5.1	6.8	5.8	5.4	5.8	5.8	5.8	5.7	4.3	0.4	0.4	0.4	6.7	7.0	3.2	3.2	3.2	3.2	3.2	1.7	1.7	0.0
A713 (northbound from St John's Town of Dalry) Carrying 100% of traffic	0.0	3.1	5.4	7.2	6.1	5.7	6.2	6.2	6.2	6.1	4.5	0.4	0.4	0.4	7.1	7.4	3.3	3.3	3.3	3.3	3.4	1.8	1.8	0.0
A713 (southbound from Bankfield Roundabout) Carrying a 100% split of traffic	0.0	1.0	1.7	2.3	2.0	1.9	2.0	2.0	2.0	2.0	1.5	0.1	0.1	0.1	2.3	2.4	1.1	1.1	1.1	1.1	1.1	0.6	0.6	0.0
A77 (T) (northbound from Bankfield Roundabout) 100%	0.0	0.2	0.3	0.4	0.3	0.3	0.3	0.3	0.3	0.3	0.2	0.0	0.0	0.0	0.4	0.4	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.0
A77 (T) (southbound from Bankfield Roundabout) 100%	0.0	0.2	0.4	0.5	0.5	0.4	0.5	0.5	0.5	0.4	0.3	0.0	0.0	0.0	0.5	0.5	0.2	0.2	0.2	0.2	0.3	0.1	0.1	0.0
	% Increase in HGV Traffic																							
A713 (southbound from Dalmellington) Carrying a 50% split of traffic	0.0	4.3	9.7	13.8	11.2	9.9	11.4	11.4	11.4	11.0	5.3	0.0	0.0	0.0	15.0	16.0	0.8	0.8	0.8	0.8	1.0	0.9	0.9	0.0
A713 (northbound from St John's Town of Dalry) Carrying a 50% split of traffic	0.0	5.0	11.3	16.0	13.0	11.4	13.3	13.3	13.3	12.8	6.1	0.0	0.0	0.0	17.5	18.6	0.9	0.9	0.9	0.9	1.1	1.0	1.0	0.0
A713 (southbound from Bankfield Roundabout) Carrying a 50% split of traffic	0.0	3.1	7.0	10.0	8.1	7.1	8.3	8.3	8.3	8.0	3.8	0.0	0.0	0.0	10.9	11.6	0.6	0.6	0.6	0.6	0.7	0.6	0.6	0.0
A77 (T) (northbound from Bankfield Roundabout)	0.0	0.6	1.2	1.8	1.4	1.3	1.5	1.5	1.5	1.4	0.7	0.0	0.0	0.0	1.9	2.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0
A77 (T) (southbound from Bankfield Roundabout)	0.0	0.7	1.5	2.1	1.7	1.5	1.8	1.8	1.8	1.7	0.8	0.0	0.0	0.0	2.3	2.5	0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.0
A713 (southbound from Dalmellington) Carrying 100% of traffic	0.0	8.6	19.4	27.6	22.4	19.7	22.9	22.9	22.9	22.1	10.6	0.0	0.0	0.0	**30.1**	**32.1**	1.5	1.5	1.5	1.5	2.0	1.7	1.7	0.0

Location	Construction Month 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
A713 (northbound from St John's Town of Dalry) Carrying 100% of traffic	0.0	10.0	22.6	32.0	26.0	22.9	26.6	26.6	26.6	25.6	12.3	0.0	0.0	0.0	**34.9**	**37.2**	1.8	1.8	1.8	1.8	2.3	2.0	2.0	0.0
A713 (southbound from Bankfield Roundabout) Carrying a 100% split of traffic	0.0	6.2	14.0	19.9	16.2	14.2	16.5	16.5	16.5	15.9	7.6	0.0	0.0	0.0	21.7	23.1	1.1	1.1	1.1	1.1	1.4	1.2	1.2	0.0
A77 (T) (northbound from Bankfield Roundabout) 100%	0.0	1.1	2.5	3.5	2.8	2.5	2.9	2.9	2.9	2.8	1.3	0.0	0.0	0.0	3.8	4.1	0.2	0.2	0.2	0.2	0.3	0.2	0.2	0.0
A77 (T) (southbound from Bankfield Roundabout) 100%	0.0	1.3	3.0	4.3	3.4	3.0	3.5	3.5	3.5	3.4	1.6	0.0	0.0	0.0	4.6	4.9	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.0

12.8.19 Assessing against the criteria in Table 12.8 against 50% of traffic movements being applied from each direction:

- the requirements of the Rule 1 threshold is not exceeded from the site entrance in either direction to St John's Town of Dalry and Dalmellington as the HGV numbers have not increased by more than 30%.
- the A713 to site via the Bankfield Roundabout does not exceed the requirements of Rule 1 threshold as traffic flows have not increased by more than 30% nor have HGV numbers have increased by more than 30%;
- the A77 (T) at the Bankfield Roundabout, both north and south of the roundabout, do not exceed the requirements of Rule 1 threshold as traffic flows have not increased by more than 30% nor have HGV numbers have increased by more than 30%;

Both routes from the site entrance along the A713 have exceeded the Rule 2 threshold as, although traffic flows remain below 10%, there is an increase of more than 10% of HGVs which is deemed to represent a major change in composition of traffic flow. The Bankfield roundabout has not exceeded the Rule 2 threshold on the A77 (T) but has marginally exceeded an increase of more than 10% of HGVs on the A713.

Table 12.9: Assessment for 50% Traffic Movements

Location	Rule 1	Rule 2
A713 to site via Dalmellington	no	yes
A713 to site via St Johns Town of Dalry	no	yes
A713 to site via the Bankfield Roundabout	no	yes
A77 (T) at the Bankfield Roundabout	no	no

Source: Natural Power

12.8.20 Assessing against the criteria in Table 12.8 against 100% of traffic movements being applied from each direction;

- the requirements of the Rule 1 threshold is exceeded from the site entrance in either direction to St John's Town of Dalry and Dalmellington as the HGV numbers have increased by more than 30%.
- the A713 to site via the Bankfield Roundabout does not exceed the requirements of Rule 1 threshold as traffic flows have not increased by more than 30% nor have HGV numbers have increased by more than 30%;
- the A77 (T) at the Bankfield Roundabout, both north and south of the roundabout, do not exceed the requirements of Rule 1 threshold as traffic flows have not increased by more than 30% nor have HGV numbers have increased by more than 30%;

Both routes from the site entrance along the A713 have exceeded the Rule 2 threshold as, although traffic flows remain below 10%, there is an increase of more than 10% of HGVs which is deemed to represent a major change in composition of traffic flow. The Bankfield roundabout has not exceeded the Rule 2 threshold on the A77 (T) but has exceeded an increase of more than 10% of HGVs on the A713.

Table 12.10: Assessment for 100% Traffic Movements

Location	Rule 1	Rule 2
A713 to site via Dalmellington	yes	yes
A713 to site via St Johns Town of Dalry	yes	yes
A713 to site via the Bankfield Roundabout	no	yes
A77 (T) at the Bankfield Roundabout	no	no

Source: Natural Power

12.8.21 Accordingly, the links identified as having exceeded Rule 1 or Rule 2 have been taken forward for further assessment, using the 100% distribution of traffic, to ensure a worst-case scenario. Those links which did not exceed Rule 1 or Rule 2 have not been taken further through the assessment.

12.8.22 As noted earlier, the above numbers do not include for the concrete foundation pours. For a 1000 m^3 foundation it is anticipated 167 HGV deliveries (234 movements) will be required over a single 12-hour period. With an AADT total traffic of 1,330 movements and AADT HGVs of 166 movements from Dalmellington, this equates to an increase in total traffic of around 12.6 % and in HGVs of 100.6 % in a single day. With eight foundations, this increase in traffic will occur on eight separate days over the 4-month foundation construction period, equating to around two days per month.

12.8.23 Although the impacts from this are infrequent and over a very short period, the concrete foundation pours have been taken forward for further assessment.

12.9 DETAILED ASSESSMENT OF EFFECTS

12.9.1 This section assesses the resulting environmental effects for receptors requiring detailed assessment in accordance with Rules 1 and 2 of the IEMA Guidelines, specifically, highway links where traffic flows would increase by more than 30% and/or sensitive areas where traffic flows would increase by 10% or more.

12.9.2 As identified in Section 12.8.19 and 12.8.20, the screening identified both directions of travel on the A713 as links meriting more detailed assessment when 100% of Proposed Development traffic was applied. Table 12.8 shows the duration over which the percentage increase in HGV traffic exceeded the thresholds as follows:

- A713 (south from Dalmellington) carrying 100% of construction traffic exceeded the thresholds with an HGV traffic increase above 30% (Rule 1) in months 15 and 16 and HGV traffic increase above 10% (Rule 2) between months 3 and 11 inclusive.
- A713 (north from St John's Town of Dalry) carrying 100% of construction traffic exceeded the thresholds with an HGV traffic increase above 30% (Rule 1) in months 15 and 16 and HGV traffic increase above 10% (Rule 2) between months 3 and 11 inclusive.
- A713 (southbound from Bankfield Roundabout) carrying 100% of construction traffic exceeded the thresholds with an HGV traffic increase above 10% (Rule 2) between months 3 and 11 inclusive .

12.9.3 Based on the criteria in Table 12.1, the following magnitudes of impact have been assigned to the highway links:

- A713 (south from Dalmellington): maximum of 32.1 %, results in magnitude of Low.
- A713 (north from St John's Town of Dalry): maximum of 37.2 %, results in magnitude of Low.
- A713 (southbound from Bankfield Roundabout): maximum of 23.1 %, results in magnitude of negligible.

12.9.4 In addition to the above, the impact of the abnormal loads has also been assessed in further detail.

Assessment of Receptor Sensitivity

12.9.5 A detailed assessment of the receptors on each of the highway links has been undertaken and their sensitivity assessed in accordance with the criteria outlined in Section 12.4. Table 12.11 summarises the assessment of the sensitivity (L = Low, M = Medium, H = High) for the receptors identified on the applicable highway links.

Table 12.11: Receptor Sensitivity Assessment

Receptor Description	Effect	L	M	H	Rationale
Public Road Network and Users					
A713 (Dalmellington to Site)	Increase in HGV movements		X		Two lane major road artery that is well maintained reasonably good geometry. Generally considered to have capacity to absorb more traffic.
	Vehicle delays due to increase in traffic		X		
A713 (Site to St Johns Town of Dalry)	Increase in HGV movements		X		Two lane major road artery that is well maintained reasonably good geometry. Generally considered to have capacity to absorb more traffic.
	Vehicle delays due to increase in traffic		X		
A713 (Bankfield Roundabout)	Increase in HGV movements		X		Two lane major road artery that is well maintained reasonably good geometry. Generally considered to have capacity to absorb more traffic.
	Vehicle delays due to increase in traffic		X		
Local Settlements					
Dalmellington	Pedestrian Severance		X		Two lane carriageway with properties and shops fronting onto A713. Footpaths on both sides along majority of route. On street parking. Speed reduction measures in place through settlement.
	Pedestrian Delay		X		
	Pedestrian Amenity	X			
	Pedestrian Fear and Intimidation	X			
	Pedestrian Safety	X			
Carsphairn	Pedestrian Severance		X		Two lane carriageway with no formal crossing points, additional widening for on street parking. Wide footpath provision on both sides of carriageway. Properties and businesses fronting A713. Restricted parking to assist
	Pedestrian Delay		X		
	Pedestrian Amenity		X		
	Pedestrian Fear and Intimidation	X			
	Pedestrian Safety	X			

Receptor Description	Effect	L	M	H	Rationale
					pedestrian crossing at school location.
St John's Town of Dalry A713/A702	Pedestrian Severance		X		Properties and shops fronting onto A713. On street parking which can reduce the traffic flow through the town. Footpath provision along sections. Reduced traffic speed, no formal crossing points.
	Pedestrian Delay		X		
	Pedestrian Amenity		X		
	Pedestrian Fear and Intimidation		X		
	Pedestrian Safety		X		
Road Structure					
A713 (Dalmellington to Site)	Degradation of highway structure	X			Major road artery that is well maintained, designed to carry vehicle loads and with no obvious physical defects.
A713 (Site to St Johns Town of Dalry)	Degradation of highway structure	X			Major road artery that is well maintained, designed to carry vehicle loads and with no obvious physical defects.
A713 (Bankfield Roundabout)	Degradation of highway structure	X			Major road artery that is well maintained, designed to carry vehicle loads and with no obvious physical defects.

Source: Natural Power

12.9.6 Synthesising the magnitude and sensitivity provides the resultant significance for these highway links and associated receptors as detailed in Table 11.10.

Table 12.12: Significance of Effect

Receptor Description	Effect	Sensitivity	Magnitude	Significance
Public Road Network and Users				
A713 (Dalmellington to Site)	Increase in HGV movements	Medium	Low	Moderate / Minor
	Vehicle delays due to increase in traffic	Medium	Low	Moderate / Minor
A713 (Site to St Johns Town of Dalry)	Increase in HGV movements	Medium	Low	Moderate / Minor
	Vehicle delays due to increase in traffic	Medium	Low	Moderate / Minor
A713 (Bankfield Roundabout)	Increase in HGV movements	Medium	Negligible	Minor
	Vehicle delays due to increase in traffic	Medium	Negligible	Minor
Local Settlements				
Dalmellington	Severance	Medium	Low	Moderate / Minor
	Pedestrian Delay	Medium	Low	Moderate/ Minor
	Pedestrian Amenity	Low	Low	Minor
	Pedestrian Fear and Intimidation	Low	Low	Minor
	Safety	Low	Low	Minor
Carsphairn	Severance	Medium	Low	Moderate / Minor
	Pedestrian Delay	Medium	Low	Moderate / Minor
	Pedestrian Amenity	Medium	Low	Moderate / Minor
	Pedestrian Fear and Intimidation	Low	Low	Minor
	Safety	Low	Low	Minor
St John's Town of Dalry A713/A702	Severance	Medium	Negligible	Minor
	Pedestrian Delay	Medium	Negligible	Minor
	Pedestrian Amenity	Medium	Negligible	Minor
	Pedestrian Fear and Intimidation	Medium	Negligible	Minor

Receptor Description	Effect	Sensitivity	Magnitude	Significance
	Safety	Medium	Negligible	Minor
Road Structure				
A713 (Dalmellington to Site)	Degradation of highway structure	Low	Low	Minor
A713 (Site to St Johns Town of Dalry)	Degradation of highway structure	Low	Low	Minor
A713 (Bankfield Roundabout)	Degradation of highway structure	Low	Negligible	Minor / Neglible

Source: Natural Power

Turbine Foundation Concrete Pours

12.9.7 As noted, it is expected that concrete would be batched on site. However, to provide a worst-case analysis, the assessment assumes ready-mix concrete. The concrete turbine foundation pour HGV numbers were not included in the above assessment and have been assessed separately. A 1000m^3 foundation is anticipated to require 167 HGV deliveries (334 movements) over a single 10–12-hour period, equating to an increase of 100% in HGV numbers. Based upon Table 12.1, this results in a magnitude of High.

12.9.8 With eight foundations, this increase in traffic will occur on eight separate days over the 4-month foundation construction period, equating to around two days per month. Given the criticality of the foundation pours and the number of HGV movements involved it is assumed limited, if any, other site works would be undertaken on a foundation pour day to ensure concrete deliveries through the site road network remain un-interrupted. For such a unique and infrequent event with extremely short durations (i.e. 10-12 hours) and limited occurrences (i.e. eight times over a six month period) the sensitivity is considered Medium, with a resultant Effect of Major / Moderate.

12.9.9 Should the import of concrete be adopted for the project then the sensitivity would be considered Medium, based upon the assessment criteria in Table 12.4the resultant effects associated would be considered Major / Moderate which is classed as significant. However, with incorporation of impact mitigation, such as advanced notification of concrete pour days and specific signate from concrete plant to site, and recognising the very short duration (single day event) and infrequency (eight occasions), the effects of this can be suitably managed to minimise the brief effects caused.

12.9.10 With the development of larger wind turbines, the design of foundations is also evolving to ensure the design is optimised and materials minimised. As part of the foundation design process, the type of foundation and the construction sequencing will be developed further. Given the history of the site and the use of rock anchor foundations at some locations on the existing wind farm, design measures will be considered to reduce the volume of concrete used on site and also the amount of concrete poured in one day (i.e. a two pour foundation may be developed). These measures would assist in reducing the number of vehicle movements associated with the wind turbine foundation concrete.

Abnormal Load Modification Works

12.9.11 It was recognised that the construction of the modification works required to facilitate abnormal load deliveries would have the potential to effect traffic. Due to the distance from the Proposed Development and advanced nature of the works the HGV movements associated with the construction of these works has not been included in the assessment.

Abnormal Load Transportation

12.9.12 As noted previously, the abnormal load numbers have been included within the assessment of general construction traffic to ensure a robust assessment including all vehicles. It is however important to consider the effect of these particular vehicles in isolation, as the effects are different to those attributed to general construction traffic.

12.9.13 The primary effect associated with the transportation of abnormal loads is considered to be driver delays on other road users. The effect on local settlements (i.e. severance, pedestrian, delay, safety, etc) and road structure are not considered to merit further detailed assessment as:

- The duration of an abnormal load delivery through/past the settlement is short (i.e. a timescale of minutes);
- A significant level of preparation goes into planning these deliveries with the police and local authorities and the management/control measures in place during the delivery (i.e. police escorts, etc);and
- Prior to any abnormal load delivery, the structural capacity of the road and bridges/culverts would be assessed, and any strengthening works implemented. The necessary permits to deliver abnormal loads would not be released from the relevant road authorities until they are satisfied that this aspect has been fully addressed.

12.9.14 As part of the EIAR an Abnormal Indivisible Load Route Survey was undertaken to assess the abnormal load delivery route from both the Port of Ayr and King George V docks, Glasgow to the Proposed Development site (Refer to Appendix 12.1). In the Abnormal Indivisible Load Route Survey 45 points of interest were identified requiring further consideration including oversail outwith the carriageway and engineering works to create areas of overrun to negotiate these points.

12.9.15 The transportation of abnormal loads requires careful planning in consultation with the Local Authority, Police Scotland and Transport Scotland. The anticipated distribution of abnormal loads indicates that abnormal loads would occur over a four -month period with a peak vehicle movement of 16 per month.

12.9.16 During the period when the loads are being transported there is potentially some effect on driver delays. This effect is increased at junction locations where vehicles in both directions would be required to wait until each load has negotiated the obstacle. There are sections where the abnormal load would use both carriageways while negotiating a point of interest or narrow sections of the road. This possible cause for journey delay to other road users would occur along the route from port to site.

12.9.17 Discussions with Police Scotland would determine the likely traffic management arrangements for these vehicle movements. These would be incorporated into the construction programme and the Traffic Management Plan to be produced by the contractors and would be agreed with the Local Authority, Police Scotland and Transport Scotland prior to commencement of construction. Particularly important details to be established within the CTMP would include determining an acceptable time for transporting abnormal loads and the number of loads it may be possible to transport at one time. It has been assumed that each abnormal load would require an escort of two police vehicles and one haulage company escort vehicle.

12.9.18 Careful management of the timing of the abnormal loads and management of the traffic during abnormal load delivery would minimise driver delay. There are various options available to minimise the impact of journey delay, such as:

- Vehicles permitted to overtake the abnormal loads at either existing passing places or on suitable sections of roads in conjunction with escort vehicles managing the traffic flows reducing the risk of any large build-up of traffic. This provision is considered appropriate on the sections of route where dual carriageway is available such as the A77;
- Night-time deliveries of the abnormal loads to avoid delays to the general public; and/or
- Scheduling deliveries to avoid peak travel times at sensitive locations (e.g. morning and evening peak on the A77 around Ayr).

12.9.19 The A713 is a major “A” road, with the national speed limit of 60mph. Due to the various turns and towns present it can be assumed that the average speed is 45mph. Applying this to the 23-mile length from the junction with the A77 to the site entrance it would take around 31 minutes to travel this section under normal conditions. The abnormal load will be required to travel at a reduced speed and would take approximately 1.5 hours to travel along the same section. This equates to an estimated driver delay of approximately 1 hour for vehicles following the abnormal load.

12.9.20 The abnormal load will, for the majority of the route from the A77 to the site entrance, be required to utilise the full width of the A713 carriageway. Oncoming vehicles to the abnormal load would be stopped at the junction with the site entrance and hence would have an estimated delay of around 1.5 hours.

12.9.21 Driver delay may also occur in Glasgow where the abnormal load is required to contraflow roundabouts. Such delays should be limited to a matter of minutes as the AIL vehicle negotiates the particular junction. Following the junction, the route is predominantly on dual carriageway/motorway and hence any vehicles would be able pass the AIL convoy.

12.9.22 Proactive communication with the local community and road users on the delivery arrangements, dates and timings of the abnormal load deliveries will also provide advance warning to residents on the route and frequent road users. This will enable them to plan their journeys and avoid abnormal load delivery times if possible.

12.9.23 Given the delay which will be incurred by road users during the AIL delivery, along with the frequency of the event while taking cognisance of the short duration of AIL deliveries over the lifetime of the wind farm, in Natural Power’s professional opinion it is considered the effect on driver delay is assessed to be moderate.

12.10 IMPACT MITIGATION

12.10.1 As noted previously, the above assessment has included best practice mitigation that would be embedded in the Proposed Development through the CTMP. Many of the mitigation measures proposed are considered good practice for wind farm construction and would be incorporated into the CTMP regardless of the outcome of the traffic impact assessment.

12.10.2 Where no Effects were assessed as Major nor Major / Moderate significance, no further impact mitigation measures are required.

12.11 CUMULATIVE IMPACT ASSESSMENT

12.11.1 The decommissioning and restoration of the existing wind farm was considered, with no works undertaken concurrently with the Proposed Development. Anticipated HGV movements do not exceed IEMA thresholds for assessment and so no further assessment was required.

12.11.2 Other developments in the areas served by the roads assessed herein may generate their own construction, operational and decommissioning traffic (new urban development, shopping centres, quarries, forestry, etc.). The greatest changes in traffic associated with the Proposed Development will be short term, occurring during the construction phase.

12.11.3 If the construction of another development were to coincide with that of the Proposed Development and was considered to have an unacceptable joint impact, then discussions would be held between developers and other relevant parties (in conjunction with the Roads Authorities) prior to the commencement of the projects, with a view to mitigating any such effects. The measures to be adopted would be contained in a robust Traffic Management Plan applying to each development, to ensure that any cumulative effects were avoided (e.g. by staging of deliveries and construction phasing).

12.12 CONCLUSIONS

12.12.1 The traffic and transport assessment has assessed the traffic impacts associated with the Proposed Development. The assessment considered a worst-case scenario and assumes all stone would need to be imported onto site and all foundation concrete would need to be brought to site in ready mix lorries.

12.12.2 In addition, the traffic effects associated with the abnormal load deliveries were also assessed. An Abnormal Indivisible Load Route Survey, including swept path analysis at particular pinch points was also prepared demonstrating the viability of the proposed abnormal load route and is included as an appendix to this chapter (Appendix 12.1).

12.12.3 The assessment concludes that, with the incorporation of suitable mitigation measures secured through a construction Traffic Management Plan, there will be no significant traffic effects associated with the Proposed Development.

12.12.4 A preliminary Construction Traffic Management Plan has been prepared and is included as an appendix to this chapter (Appendix 12.2). The assessment has been based on a number of conservative assumptions around the construction programme/sequencing, source of stone and concrete deliveries. These assumptions can only be clarified post consent. Hence it is expected a Planning Condition will be applied to the development for a final construction CTMP to be prepared and approved by the Local Authority post consent and prior to construction works commencing.

12.12.5 In relation to potential cumulative impacts, these will be assessed if other developments are constructed concurrently. If the construction of the Proposed Development coincided with another, using the same transport routes, then communication with the other developers would take place with the aim to mitigate effects to a non-significant level. This would be delivered through the construction Traffic Management Plan.