

Technical Note

Project name Glen Earrach PSH	Subject Glen Earrach Grid Connection – Traffic and Transport Review	Date April 2026	
Prepared by JG Senior Consultant	Checked by DD Associate Director	Verified by DL Technical Director	Approved by MC Project Manager

Background

Glen Earrach Energy (GEE) has instructed AECOM to undertake a desk-based traffic assessment of the potential effects of a proposed grid connection (hereafter the Grid Connection Project) for the Glen Earrach Pumped Storage Hydro project (the Proposed Development). An indicative connection route has been identified between the substation forming part of the Proposed Development and the indicative connection point for the Proposed Development at the Bingally substation to the west (hereafter the Connection Route).

The Connection Route comprises an initial section (approximately 2km) of underground 400kV cable (UGC) from the Glen Earrach Pumped Storage Hydro substation to the start of a 400kV overhead line (OHL) section. The 400kV overhead line has an approximate length of 16km and connects the underground cable section to the Bingally Substation. The Connection Route is as shown in Figure A. To inform the assessment it is assumed that the 2km of 400kV cable will be installed through micro-tunnelling. It is also assumed that access tracks and temporary working areas will be required in the vicinity of the Connection Route during construction with construction lasting approximately 3 years.

The aim of this assessment is to identify whether the Grid Connection Project has the potential to result in any likely significant effects on traffic and transport, having regard to the cumulative assessment approach used in the Environmental Impact Assessment Report (EIAR) for the Proposed Development, during both the Construction Phase and the Operation Phase. This Technical Note should be read in conjunction with Chapter 13: Access, Traffic and Transport of the EIAR for the Proposed Development and Additional Information.

Assessment Scope and Methodology

This technical paper assesses the environmental effects of traffic and movement associated with the Proposed Development and the associated Grid Connection. Environmental effects of traffic and movement are assessed in accordance with the Institute of Environmental Management and Assessment (IEMA) Guidelines: Environmental Assessment of Traffic and Movement, July 2023 (the “IEMA Guidelines”)¹.

The construction phase of the Proposed Development and the Grid Connection has been assessed. Operational traffic for both developments will not exceed IEMA Guidelines threshold for assessment and is not considered further. Any decommissioning traffic would be in the distant future, with traffic generation likely to be lower than the construction phase. Distant future baseline traffic cannot reasonably be forecast at this time and decommissioning is not considered any further.

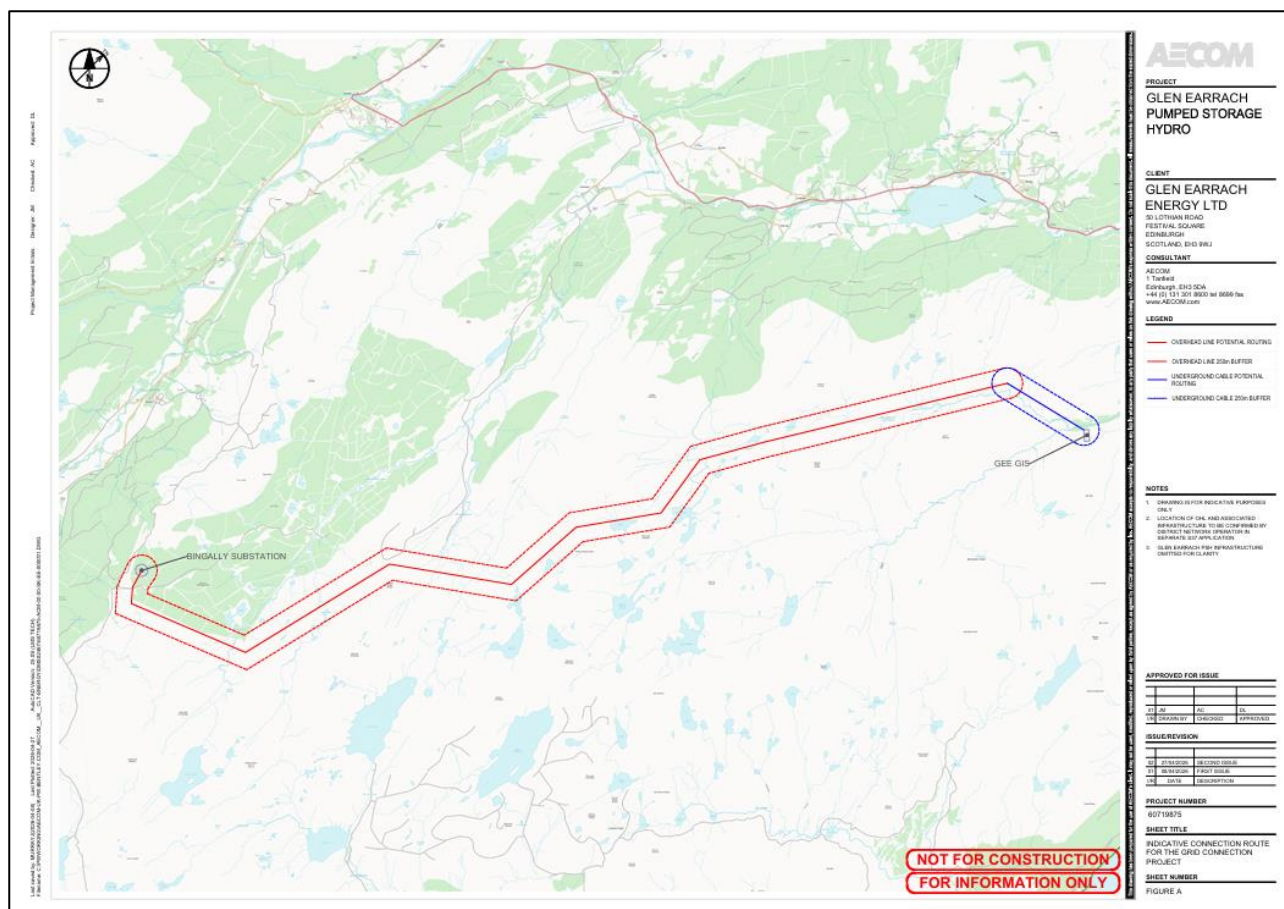
This paper forecasts the likely significance of environmental effects resulting from vehicle traffic generated by the Proposed Development and Grid Connection. The assessment considers the sensitivity of study area roads, and road users and their surroundings, against temporary changes in traffic forecast to result from construction of the Proposed Development and Grid Connection. Environmental topics assessed include severance, fear and intimidation, road safety, non-motorised traffic, road vehicle driver delay, and hazardous/large loads.

¹ Institute of Environmental management and Assessment (IEMA) Guidelines: Environmental Assessment of Traffic and Movement, July 2023. IEMA is now named ISEP, The Institute of Sustainability and Environmental Professionals.

Grid Connection and Site Access

For the purposes of this assessment, the Grid Connection is assumed to comprise a connection between Glen Earrach PSH and the consented Bingally Substation site, principally in the form of an overhead line (OHL). The indicative OHL section is estimated to be approximately 16 km in length, although the final routing and design would be a matter for the transmission operator through the future development and consenting process. The initial part of the Grid Connection in the environs of Glen Earrach is assumed to be underground. An indicative Grid Connection route is shown in Figure 2. The Grid Connection OHL route is estimated to be 16km in length with the exact routing yet to be determined. The initial part of the Grid Connection route in the environs of Glen Earrach can be reasonably assumed to be underground given the local constraints. An indicative Grid Connection route is shown in **Figure 1**.

Figure 1 - Indicative Grid Connection Route



For the purposes of this assessment as noted above, it is reasonably assumed that that Grid Connection construction traffic would use both the eastern (Glen Earrach) and western (Bingally) ends of the indicative route for access. Access at the Glen Earrach end is assumed to be via the same access as construction of the Glen Earrach PSH. This is a priority junction on the A831 east of Balnain that will provide access to upgraded tracks to the site.

Access from the west is assumed to be via the Bingally Substation construction access. This is a priority junction on the A831 east of Cannich which would provide access to approximately 8km of new or upgraded tracks to the substation site. For the purposes of this assessment the A831 Bingally junction is assumed to be used by Grid Connection traffic only once the Bingally Substation construction work is completed.

Study Area

The geographical extent of the traffic and movement assessment has been informed by IEMA Guidelines. Criteria within the guidelines are used to establish an appropriate study area. The study area is based on public roads that provide sub-

regional and local access to the Proposed Development site, and on which the impact of development traffic may need to be considered. Principal study area roads are the A82, A831 and A833. An additional section of the A831, previously not considered in **Chapter 13 Traffic and Movement (Volume 2: Main Report)** is included in the assessment. This is the section of A831 between the settlement of Balnain and the Bingally site access junction. Traffic surveys were carried out on these roads during 2024 to provide baseline traffic for the environmental assessment. Baseline traffic information for the additional A831 section between Balnain and the Bingally site access has been obtained from the published Bingally Environmental Assessment². Baseline daily vehicle traffic for this section of the A831 is shown in **Table 1**.

Table 1. A831 Bingally Baseline Traffic (12-hour)

Road	HGV	Car / LGV	Total
A831 Bingally	2	560	562

Source: Bingally Substation Environmental Assessment Chapter 11

Construction Traffic Forecast and Distribution

The EIAR used construction material volumes for the Proposed Development to establish a construction vehicle forecast. The Proposed Development's construction vehicle forecast considers materials which can be sourced and or retained within the Proposed Development Site, as well as materials which would require to be imported by road. Grid Connection traffic volumes have been estimated by the project team using a scaled approach informed by environmental impact assessment traffic modelling from comparable OHL projects. These estimates have been reviewed by AECOM and are considered appropriate on a precautionary basis given the level of detail available at this stage.

Figure 2 shows Proposed Development and Grid Connection HGV construction traffic in the context other development HGV traffic on the A831 study area road.

Figure 2 – A831 Development Traffic

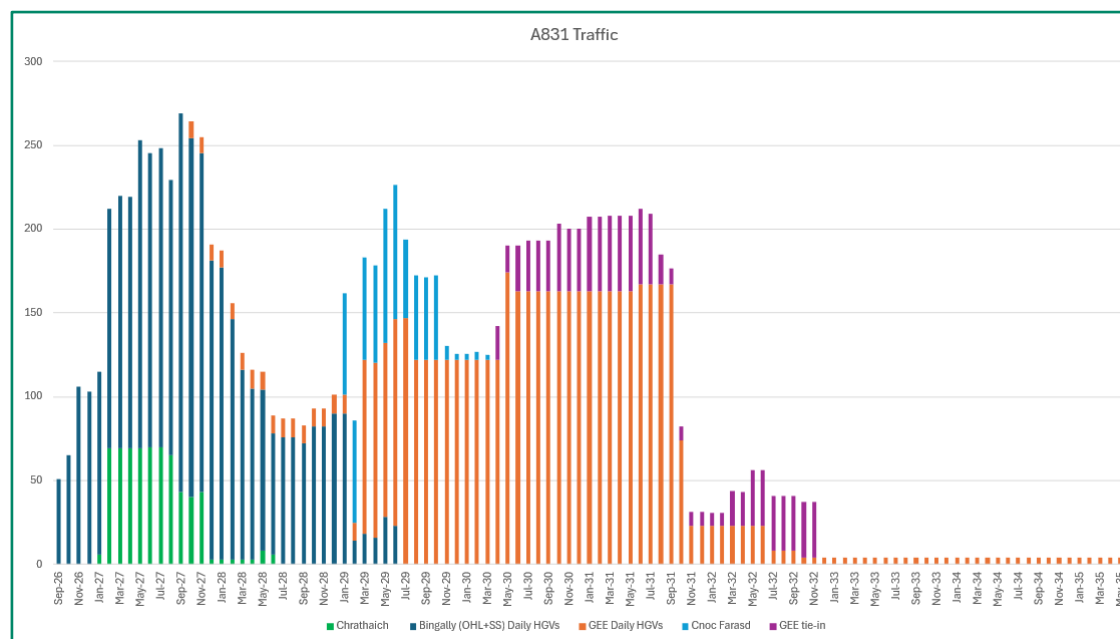


Figure 2 shows that the Proposed Development and Grid Connection HGV traffic are forecast to appear together on the A831 only after completion of the Bingally, Chrathaich and Cnoc Farasd developments. As such there will be no cumulative development scenario for the Proposed Development and Grid Connection that also features Bingally, Chrathaich or Cnoc Farasd HGV traffic.

² Highland Council ref 25/00592/FUL

Figure 2 shows that peak Proposed Development and Grid Connection HGV traffic is forecast in June 2031. This June 2031 peak is less than the peak cumulative assessment HGV traffic previously assessed for October 2027 and June 2029.

For this assessment, it is assumed that all Grid Connection construction materials and components using public roads will be delivered to site from the direction of Inverness via the A82. Table 13-14 within **Chapter 13: Access, Traffic and Transport (Volume 2: Main Report)** provided the assumptions regarding origins on materials for the Proposed Development. The majority of materials were assumed to originate from Inverness and included materials similar to those likely to be used in the Grid Connection works such as steel, plant and fuel. It is therefore not unreasonable to assume grid connection materials and components using public roads will travel from the direction of Inverness on the A82.

The Proposed Development and Grid Connection construction traffic forecast for the June 2031 peak is shown in **Table 2**.

Table 2. Proposed Development and Grid Connection Daily Construction Traffic (June 2031 peak)

Study Area Road	Proposed Development Daily Traffic (GE PSH + Grid Connection)		
	Car / LGV	HGV	Total Vehicles
A82 Inverness	82	121	203
A82 North Drumnadrochit	82	121	203
A82 Drumnadrochit	0	4	4
A82 Lewiston	0	4	4
A82 Urquhart Castle	0	4	4
A82 Grottag	0	4	4
A82 Alltsigh	0	4	4
A82 Invermoriston	0	4	4
A82 Fort Augustus	0	4	4
A887 Invermoriston	0	0	0
A831 Milton	82	125	207
A831 Strathnacro	82	223	305
A831 Balnain	24	22	46
A833	0	98	98
A831 Bingally	24	22	46

48 Car / LGV daily movements (24 arrivals and 24 departures) are assumed for Grid Connection construction personnel. This assumption is based on the forecast daily construction personnel movements for the comparable OHL tie-ins. All forecast traffic associated with the Grid Connection has been split equally between the Proposed Development site access and the Bingally site access. Daily Proposed Development Car / LGV traffic using public roads remains the 34 movements reported in **Chapter 13: Access, Traffic and Transport (Volume 2: Main Report)**

Additional abnormal indivisible load (AIL) movements will likely be generated by the Grid Connection construction. These movements would be associated with bringing plant including cranes to site but are expected to be low in number. Such limited movements can be controlled and managed to minimise disruption to public roads and are unlikely to significantly affect the local road network.

Mitigation

Proposed Development mitigation remains as that reported in **Chapter 13: Access, Traffic and Transport (Volume 2: Main Report)** at section 13.12 Embedded Mitigation and section 13.15 Additional Mitigation.

Environmental Assessment

IEMA Guidelines provide a methodology to forecast the significance of environmental effects of development traffic on study area roads by considering the sensitivity of receptors, and magnitude of change (in traffic) resulting from development traffic.

Sensitivity of Receptors

An assessment of the sensitivity of receptors on study area roads was undertaken in **Chapter 13: Access, Traffic and Transport (Volume 2: Main Report)**. However, as noted previously, an additional study area road has been added to account for the section of the A831 between Balnain and Bingally. **Table 3** summarises the sensitivity of receptor assessment for this study area road.

Table 3. Sensitivity of Receptor

Road	Description	Sensitivity of Receptor	Commentary
A831 Bingally	Single carriageway A-road between Balnain and Bingally site access junction.	Low	Rural A-road with limited frontages. Residences are set back from carriageway. No footways or active travel infrastructure along road.

IEMA Guidelines Rule 1 and Rule 2

IEMA Guidelines Rule 1 and Rule 2 are used to identify roads to be included in the environmental assessment:

- Rule 1. Include highway links where traffic flows will increase by more than 30% (or the number of heavy goods vehicles will increase by more than 30%).
- Rule 2. Include any other specifically sensitive areas where traffic flows have increased by 10% or more.

Table 4 shows that following IEMA Guidelines seven study area roads including the A831 require to be assessed for potential environmental effects generated by Proposed Development and Grid Connection development traffic.

Table 4 contains the Rule 1 and Rule 2 assessment for the Proposed Development and Grid Connection construction traffic.

Table 4. Study Area Roads to be Assessed for Environmental Effects (Construction Phase)

Study Area Road	2031 Baseline (12-hour Traffic)		Proposed Development & Grid Connection Project Daily Traffic		% Increase		Include in Assessment (Yes / No)
	HGV	All Veh	HGV	All Veh	HGV	All Veh	
A82 Inverness	169	4,070	121	203	72%	5%	Yes
A82 North Drumnadrochit	169	4,070	121	203	72%	5%	Yes
A82 Drumnadrochit	243	4,938	4	4	2%	0%	No
A82 Lewiston	207	4,181	4	4	2%	0%	No
A82 Urquhart Castle	318	2,821	4	4	1%	0%	No
A82 Grottag	149	2,447	4	4	3%	0%	No

Study Area Road	2031 Baseline (12-hour Traffic)		Proposed Development & Grid Connection Project Daily Traffic		% Increase		Include in Assessment (Yes / No)
	HGV	All Veh	HGV	All Veh	HGV	All Veh	
A82 Alltigh	147	2,461	4	4	3%	0%	No
A82 Invermoriston	156	2,530	4	4	3%	0%	No
A82 Fort Augustus	124	1,962	4	4	3%	0%	No
A887 Invermoriston	67	1,078	0	0	0%	0%	No
A831 Milton	54	2,152	125	207	233%	10%	Yes
A831 Strathnacro	27	1,398	223	305	822%	22%	Yes
A831 Balnain	22	1,016	22	46	100%	5%	Yes
A833	25	902	98	98	385%	11%	Yes
A831 Bingally	2	591	22	46	1046%	8%	Yes

Assessment of Environmental Effects

An assessment of the Proposed Development and Grid Connection following the same IEMA Guidelines methodology as **Chapter 13: Access, Traffic and Transport (Volume 2: Main Report)** has been undertaken.

Severance of Communities

The Department for Transport historically set out a range of indicators for determining the significance of severance. Changes in traffic flow of 30%, 60% and 90% are regarded as producing 'slight', 'moderate' and 'substantial' changes in severance respectively. These thresholds have been applied in this assessment to determine the magnitude of change and significance of effects for severance. **Table 5** summarises forecast environmental effects for severance of communities.

Table 5. Severance of Communities

Road	Sensitivity of Receptor	Traffic Increase (%)	Magnitude of Change	Significance of Effect
A82 Inverness	High	5%	Negligible	Minor
A82 North Drumnadrochit	High	5%	Negligible	Minor
A831 Milton	High	10%	Negligible	Minor
A831 Strathnacro	Low	22%	Negligible	Negligible
A831 Balnain	Medium	5%	Negligible	Negligible
A833	Low	11%	Negligible	Negligible
A831 Bingally	Low	8%	Negligible	Negligible

Classifying the significance of effects: prior to additional mitigation, the likely effect of construction traffic on severance is a direct, temporary, **Minor Adverse (Not Significant) effect**.

Fear and Intimidation

IEMA Guidelines provide a degree of hazard methodology for assessing Fear and Intimidation. Degree of hazard is established by scoring traffic on study area roads for baseline and Proposed Development and Grid Connection traffic conditions. The methodology considers:

- The total volume of traffic;
- The heavy vehicle composition;

- The speed of vehicles; and
- The proximity of traffic to people.

Table 6 summarises forecast environmental effects for fear and intimidation on and by road users.

Table 6. Fear and Intimidation on and by Road Users

Road	Sensitivity of Receptor	Step Change	Magnitude of Change	Significance of Effect
A82 Inverness	High	0	Negligible	Minor
A82 North Drumnadrochit	High	0	Negligible	Minor
A831 Milton	High	0	Negligible	Minor
A831 Balnain	Medium	0	Negligible	Negligible
A831 Strathnacro	Low	0	Negligible	Negligible
A833	Low	0	Negligible	Negligible
A831 Bingally	Low	0	Negligible	Negligible

Classifying the significance of effects: prior to additional mitigation, the likely effect of construction traffic on Fear and Intimidation is a direct, temporary, **Minor Adverse (Not Significant) effect**.

Road User and Pedestrian Safety

IEMA Guidelines consider the calculation of accident rates a relevant approach for approximating the potential for road safety impacts to materialise as a result of a development. By calculating the expected increase in vehicle kilometres driven on study area roads resulting from Proposed Development and Grid Connection traffic, it is possible to forecast increases or decreases in accidents resulting from changes in traffic flows on study area roads.

Table 7 summarises forecast environmental effects for road user and pedestrian safety.

Table 7. Road User and Pedestrian Safety

Road	Sensitivity of Receptor	Forecast Injury Accidents			Magnitude of Change	Significance of Effect
		Slight	Severe	Fatal		
A82 Inverness	High	0.0	0.0	0.0	Negligible	Minor
A82 North Drumnadrochit	High	0.0	0.0	0.0	Negligible	Minor
A831 Milton	High	0.0	0.0	0.0	Negligible	Minor
A831 Strathnacro	Low	0.0	0.0	0.0	Negligible	Negligible
A831 Balnain	Medium	0.0	0.0	0.0	Negligible	Negligible
A833	Low	0.0	0.0	0.0	Negligible	Negligible
A831 Bingally	Low	0.0	0.0	0.0	Negligible	Negligible

Classifying the significance of effects: prior to additional mitigation, the likely effect of construction traffic on Road User and Pedestrian Safety is a direct, temporary, **Minor Adverse (Not Significant) effect**.

Non-Motorised Amenity and Non-Motorised User Delay

These effects are closely related to severance as changes in the volume, composition or speed of traffic may affect the relative pleasantness (amenity) or progress (delay) of non-motorised users. In general, increases in traffic levels are likely to lead to reductions in amenity and increases in delay for non-motorised users. Absolute levels of change to non-motorised amenity and delay will depend on the general level of pedestrian and active travel activity on study area roads. The same magnitude of change thresholds used for Severance of Communities are adopted for non-motorised environmental effects.

Table 8 summarises forecast environmental effects for non-motorised amenity and non-motorised user delay.

Table 8. Non-Motorised Amenity and Non-Motorised User Delay

Road	Sensitivity of Receptor	Traffic Increase (%)	Magnitude of Change	Significance of Effect
A82 Inverness	High	5%	Negligible	Minor
A82 North Drumnadrochit	High	5%	Negligible	Minor
A831 Milton	High	10%	Negligible	Minor
A831 Strathnacro	Low	22%	Negligible	Negligible
A831 Balnain	Medium	5%	Negligible	Negligible
A833	Low	11%	Negligible	Negligible
A831 Bingally	Low	8%	Negligible	Negligible

Classifying the significance of effects: prior to additional mitigation, the likely effect of construction traffic on Non-motorised User Amenity and Delay is a direct, temporary, **Minor Adverse (Not Significant) effect**.

Road Vehicle Driver and Passenger Delay

Study Area roads are assessed by link flow and Congestion Reference Flows (CRF) of study area roads is used to forecast magnitude of change. The CRF of a road is an estimate of the daily traffic flow at which the road is likely to be 'congested' in peak periods on an average day. CRF is calculated in accordance with CD100 DMRB Extract Volume 5 Section 1 (TA 46/97) which remains applicable to trunk roads in Scotland. CRF magnitude of change adopts 30%, 60% and 90% traffic 'levels' to represent thresholds for changes in vehicle delay, with the stipulation that for Low, Medium and High magnitudes of change there must also be at least one change in traffic 'level' as a result of Proposed Development and Grid Connection traffic.

Table 9 summarises forecast environmental effects for road vehicle driver and passenger delay.

Table 9. Road Vehicle Driver and Passenger Delay

Road	Sensitivity of Receptor	Change in Junction Level of Service	Congestion Reference Flow %	Magnitude of Change	Significance of Effect
A82 Inverness	High	-	No Step Change	Negligible	Minor
A82 North Drumnadrochit	High	No Change	No Step Change	Negligible	Minor
A831 Milton	High	B to C	No Step Change	Low	Moderate
A831 Strathnacro	Low	No Change	No Step Change	Negligible	Negligible
A831 Balnain	Medium	-	No Step Change	Negligible	Negligible
A833	Low	No Change	No Step Change	Negligible	Negligible
A831 Bingally	Low	-	No Step Change	Negligible	Negligible

Classifying the significance of effects: prior to mitigation, the likely effect of construction traffic on Road Vehicle Driver and Passenger Delay is a direct, temporary, **Moderate Adverse (Significant) effect** on the A831 Milton. The likely effect on all other Study Area roads is either a direct, temporary, **Minor Adverse (Not Significant) effect** or direct, temporary, **Negligible (Not Significant) effect**.

The A831 Milton is forecast to experience a significant environmental effect. This relates to A831 traffic approaching the A82 junction at Drumnadrochit. From the direction of the Proposed Development and Grid Connection sites A831 traffic gives way to A82 traffic at this junction. Capacity testing has shown the A831 approach arm dropping from Level of Service (LoS) B to C in the evening peak hour. LoS is based on vehicle delay at the junction.

- LoS B vehicle delay is $< 10 \leq 15$ seconds delay per vehicle queuing to exit the A831 onto the A82.
- LoS C vehicle delay is $< 15 \leq 25$ seconds delay per vehicle queuing to exit the A831 onto the A82.

Proposed Development and Grid Connection traffic arguably contribute to the slight increase in evening peak hour delay experienced on the A831 approach arm of this junction. However, the junction is still forecast to operate with ample

practical reserve capacity overall, and the A831 approach arm is forecast to have a ratio of flow to capacity (RFC) that indicates the arm will operate satisfactorily without excessive queuing or delay materialising.

Proposed Development Construction Traffic Management Plan (CTMP) mitigation will manage HGV construction traffic activity in the vicinity of sensitive receptors such as the A82 / A831 junction at Drumnadrochit during peak hours to minimise effects on vehicle delays. It is not unreasonable to expect that any CTMP for the Grid Connection will do similar.

Conclusion

Peak Proposed Development and Grid Connection HGV traffic is forecast in June 2031. This June 2031 peak is less than peak cumulative assessment HGV traffic previously assessed for October 2027 and June 2029.

Table 10 summarises the significance of effects reported in **Chapter 13: Access, Traffic and Transport (Volume 2: Main Report)** for the construction phase of the Proposed Development. These are compared to the significance of effects forecast with the addition of traffic associated with the Grid Connection works.

Table 10. Significance of Environmental Effects

Road	Proposed Development		Proposed Development and Grid Connection	
	Prior to Mitigation	Post Mitigation	Prior to Mitigation	Post Mitigation
A82 Inverness	Minor	Negligible	Minor	Negligible
A82 North Drumnadrochit	Minor	Negligible	Minor	Negligible
A82 Drumnadrochit	Negligible	Negligible	Negligible	Negligible
A82 Lewiston	Negligible	Negligible	Negligible	Negligible
A82 Urquhart Castle	Negligible	Negligible	Negligible	Negligible
A82 Grotai	Negligible	Negligible	Negligible	Negligible
A82 Alltigh	Negligible	Negligible	Negligible	Negligible
A82 Invermoriston	Negligible	Negligible	Negligible	Negligible
A82 Fort Augustus	Negligible	Negligible	Negligible	Negligible
A887 Invermoriston	Negligible	Negligible	Negligible	Negligible
A831 Milton	Moderate	Minor	Moderate	Minor
A831 Strathnacro	Negligible	Negligible	Negligible	Negligible
A831 Balnain	Negligible	Negligible	Negligible	Negligible
A833	Minor	Negligible	Minor	Negligible
A831 Bingally	Negligible	Negligible	Negligible	Negligible

Table 10 shows that the effects reported in **Chapter 13: Access, Traffic and Transport (Volume 2: Main Report)** remain unchanged following the addition of Grid Connection works traffic. Additionally, Negligible (Not Significant) effects are forecast on the A831 Bingally, a new study area road added for this assessment. On that basis, no likely significant effects on traffic and transport have been identified arising from the Grid Connection Project, having regard to the cumulative assessment approach used in the EIAR for the Proposed Development.

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