BALLYKETT GREEN ENERGY

BALLYKETT WIND FARM

COUNTY CLARE

TRAFFIC MANAGEMENT PLAN (TMP)

February 2023

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BALLYKETT WIND FARM

TRAFFIC MANAGEMENT PLAN

CONTENTS

APPENDICES

BALLYKETT WIND FARM

TRAFFIC MANAGEMENT PLAN

1 INTRODUCTION

1.1 Brief

Jennings O'Donovan & Partners Limited has been appointed by Ballykett Green Energy to prepare a Traffic Management Plan ("TMP") for the proposed Ballykett Wind Farm, Co. Clare. The proposed wind farm site is located in south-west County Clare 3.5km north-east of the town of Kilrush and 3.0km southwest of Coorraclare village. The wind farm site is located within the townlands of Ballykett, and Tullabrack East. It is located within an area comprised of agricultural livestock grazing farmland, cutaway bog and conifer forestry plantation. The wind farm will consist of 4 No. 4-5MW wind turbines with an overall ground to blade tip height of 150m. The wind farm will be linked to the public road network via a site entrance on the L6132 The Electrical Substation will be linked to the national grid via a 38kV connection to the existing Tullabrack 110kV substation. A permanent Met Mast with a height of 82m for monitoring wind speeds will be constructed within the wind farm site. Material arising from excavations at the wind farm site will be used to landscape road and hardstand embankments and to backfill the onsite borrow pit.

This TMP considers the potential impact of the proposed Development on traffic flows and the public road network in the area during the construction, operation and decommissioning of the wind farm.

1.2 Statement of Authority

The Traffic Management Plan has been prepared by John Doogan of Jennings O'Donovan & Partners Limited, Finisklin Business Park, Sligo. Established in Sligo in 1950, Jennings O'Donovan & Partners Limited is a clean tech company providing consulting engineering services in the areas of renewable energy, civil and structural engineering, road design, water supply, wastewater collection and treatment, environmental resource management and impact assessment and in the area of housing and commercial development.

1.3 Site Location, Context and Proposed Development

The proposed wind farm site is located in south-west County Clare 3.5km north-east of the town of Kilrush and 3km southwest of Cooraclare village. The wind farm site is located within

the townlands of Ballykett, and Tullabrack East. It is located within an area comprised of agricultural livestock grazing farmland, cutaway bog and conifer forestry plantation. The Wind Farm will consist of 4 No. 4-5MW wind turbines with an overall ground to blade tip height of 150m. The candidate wind turbine will have a rotor diameter of 136m and a hub height of 82m. Each turbine will be erected on an insitu concrete foundation with steel reinforcement and will have a Turbine Hardstand constructed from granular material, the Turbine Hardstand will be used to store turbine components and to support a crane during the erection of the turbine. Each Turbine Hardstand will be linked to the site entrance on the L6132 by a network of access tracks constructed from granular materials with associated drainage and fencing. The turbines will be linked to the Electrical Substation by electrical cabling laid in buried ducts alongside the site access track. The substation will be linked to the national grid via an underground grid connection to the existing Tullabrack 110kV substation. A permanent Met Mast with a height of 82m for monitoring wind speeds will be constructed within the wind farm site. Surplus material arising from excavations at the wind farm site will be used to landscape site access track and hardstand embankments and to backfill the onsite borrow pit. The Location and layout of the wind farm site is shown on **Figure 1**. The location of the wind farm Grid Connection is shown on **Figure 2**.

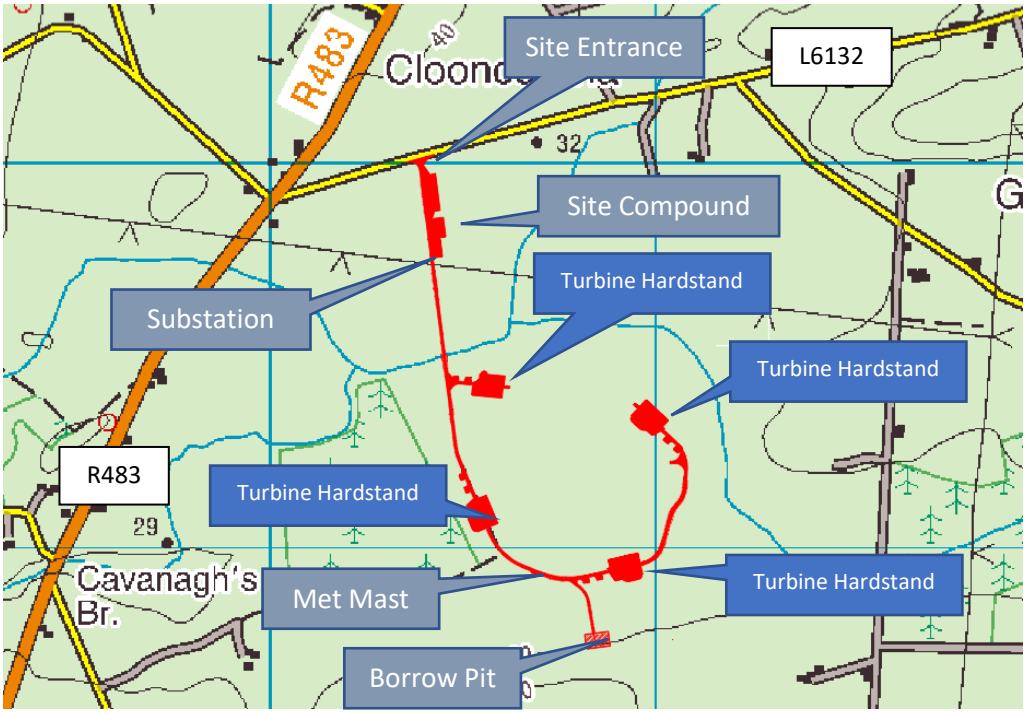


Figure 1 – Wind Farm Site Location & Layout

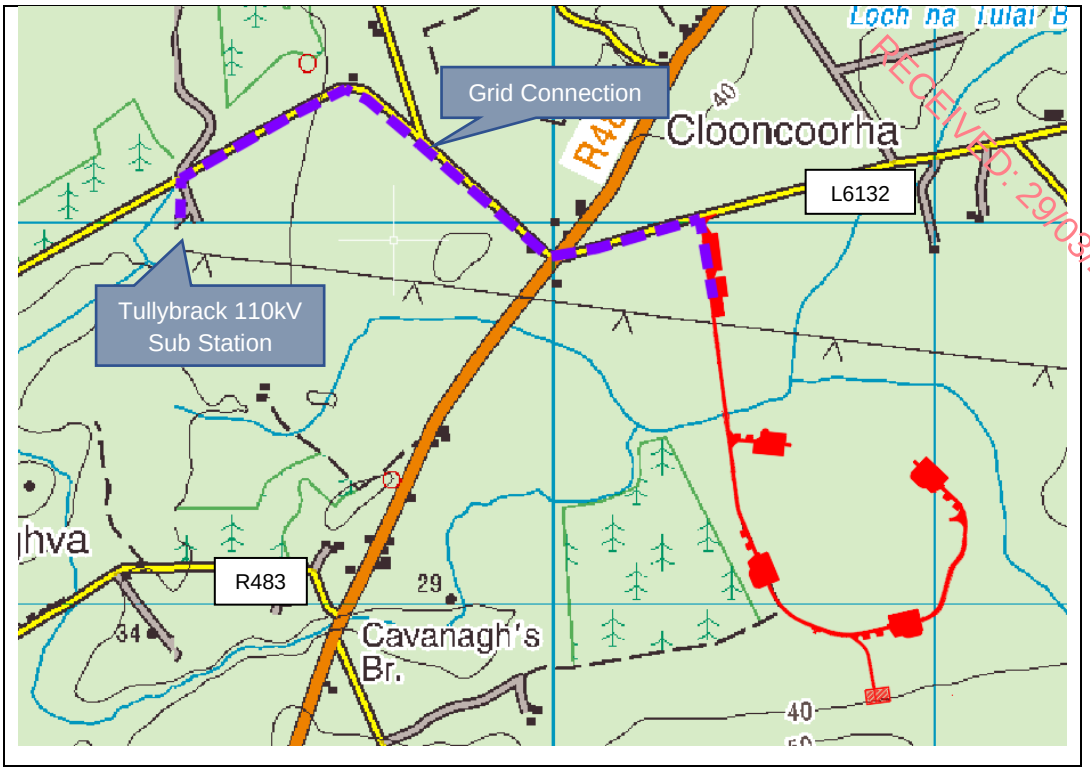


Figure 2 - Location of Wind Farm Grid Connection

It is proposed that the turbine components including rotor blades, towers, nacelles, hubs and drivetrains will be landed by ship and stored for transportation at Foynes Port, Co. Limerick. From Foynes Port, they will be transported to the Site using specialised abnormal load vehicles. Turbine delivery vehicles will travel eastbound on the N69 towards Limerick City and join the N18, delivery vehicles which satisfy the 4.65m height restriction in Limerick tunnel will continue on the N18 northbound through the tunnel. Delivery vehicles with high loads will join the R510 at junction 2 on the N18, cross the River Shannon on the R527, join the R445 at Coonagh roundabout and re-join the N18 at junction 4. On the N18 / M18 delivery vehicles will travel northbound towards Ennis and join the N85 at Junction 9. Vehicles will travel eastbound on the N85 to the N68 junction where they will join the N68 and continue southbound towards Kilrush to the L6132 junction. Delivery vehicles will travel westbound on the L6132 to the wind farm site entrance. The proposed Turbine Delivery Route (TDR) traffic from Foynes Port is shown on **Figure 3**, The Turbine Delivery Route in the vicinity of the site is shown on **Figure 4**. Detailed analysis of the proposed Turbine Delivery Route between the N68 / L6132 and the site entrance have been carried out by Jennings O'Donovan and are included in Appendix A. The TDR analysis shows that enabling works such as verge strengthening, and junction modifications will be required at isolated locations on the route to accommodate abnormal load vehicles. The location of the works is identified in **Section 5** of

this report. The turbine components will be transported using specialist abnormal load vehicles and will require abnormal load permits during transit. Delivery times and size of abnormal load convoys will be agreed with An Garda Síochána, Limerick County Council and Clare County Council staff to avoid peak hours on the public road. Turbine delivery convoys will be accompanied by support personnel who will carry out enabling works to allow the convoy to pass and to reinstate traffic lights etc. when the convoy has passed. Turbine delivery convoys may also be accompanied by An Garda Síochána who will provide traffic management at sensitive locations along the route.

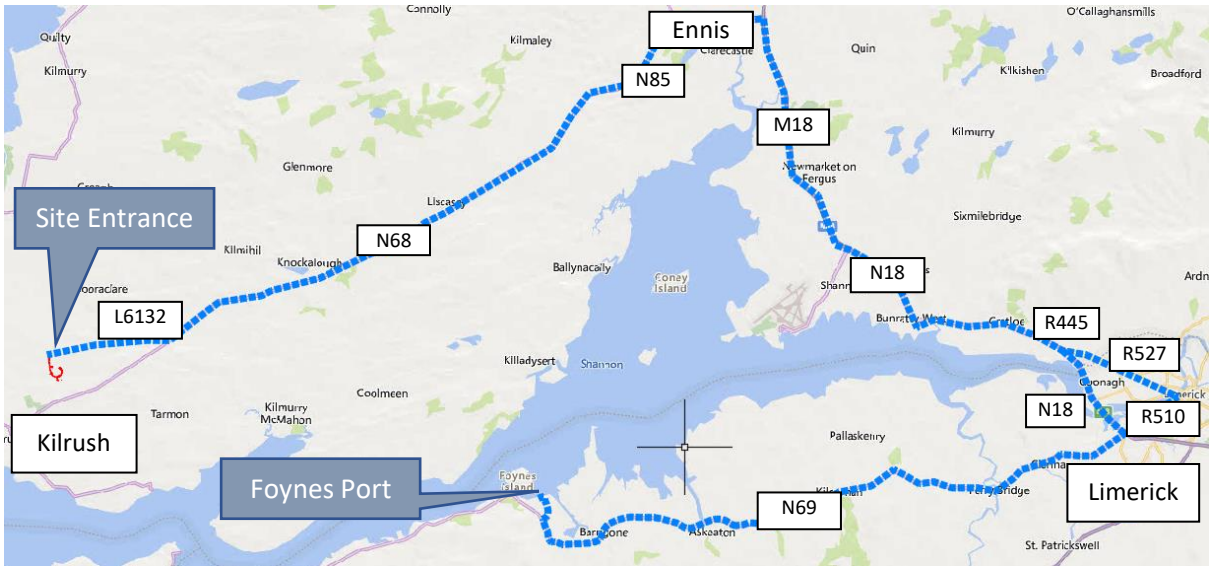


Figure 3 – Turbine Delivery Route

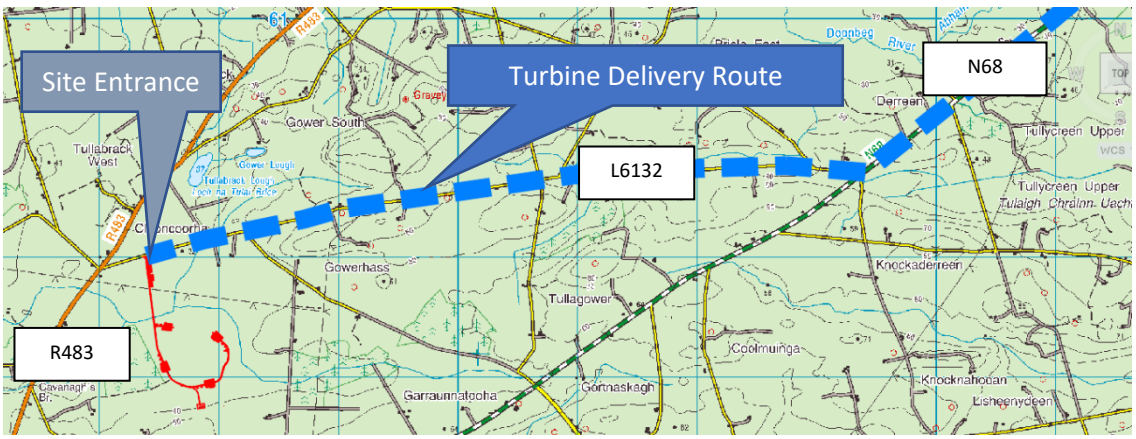


Figure 4 – Turbine Delivery Route N68 to Site Entrance

The Haul Route for wind farm construction traffic will use the national and regional road network to access the site. The use of local roads for construction traffic will be prohibited unless the local road provides access to a licenced suppliers quarry/batching plant or forms

part of the wind farm Haul Route, such as the L6132. It is envisaged that the majority of granular materials for site access tracks and Turbine Hardstand construction will be sourced from a borrow pit within the Site and from local suppliers. It is also envisaged that ready-mix concrete for Turbine Foundation construction and Electrical Substation foundations will be sourced from a local authorised quarry located along the N68 national secondary route and the R483 regional road corridors. The location of aggregate and concrete suppliers in the vicinity of the proposed wind farm Site are shown in **Figure 5,** The Haul Routes for general construction traffic are shown in **Figure 6.**

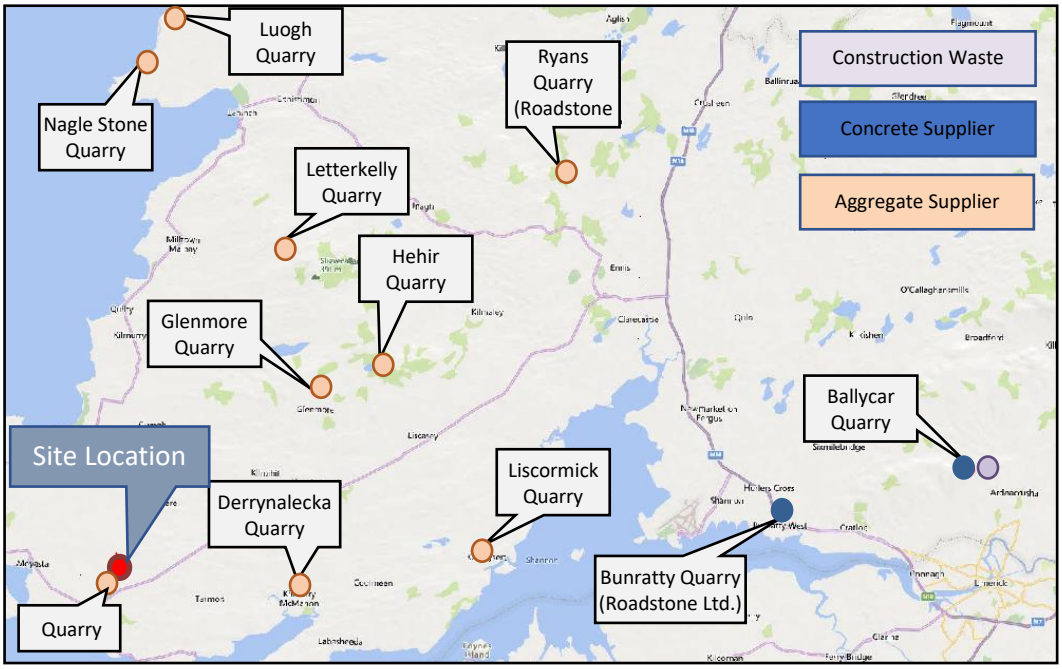


Figure 5 – Concrete and Aggregate Suppliers

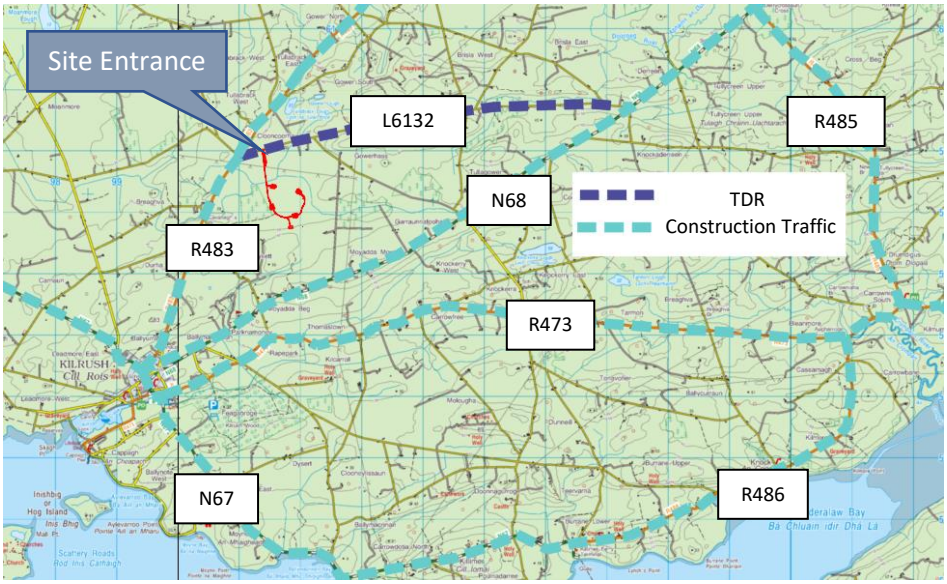


Figure 6 – Turbine Delivery Route (TDR) and Haul Routes for Construction Traffic

Construction workers will use the Site entrance on the L6132 to access the site but will need to have flexibility in the roads they use to reach the Site.

1.4 Consultation with Local Authorities

Ballykett Green Energy have consulted with representatives from Clare County Council Planning and Roads Departments, Transport Infrastructure Ireland, Department of Transport and other roads stakeholders during the planning process to discuss the proposed site entrance on the L6132, Grid Connection and wind farm TDR and Haul Routes for abnormal loads and general construction traffic during the construction of the Ballykett Wind Farm.

2 ACCESS TO THE PROPOSED DEVELOPMENT

2.1 The Road Network around the Proposed Development

The proposed wind farm Site is located in the townlands of Ballykett, and Tullabrack East. The site access point is located on the L6132 local road near Tullabrack Cross approximately 3.5km north-east of the town of Kilrush and 3km south west of Cooraclare village. The Site is generally served by the N68 national road, the R483 regional road and the L6132 local road. The N68 runs in a north east-south west direction from Ennis to Kilrush in County Clare. The R483 runs in a north-south direction from the N67 junction near Quilty to the N67 junction in Kilrush. The L6132 runs in an east-west direction between the N68 and the R483 and will be used by all construction and wind farm operations traffic to access the Site.

2.2 Road access to the proposed Development

All general construction traffic and turbine delivery traffic generated by the proposed wind farm Development will use the N68 national secondary road, R483 regional and the L6132 local road to access the Site via the site entrance located on the L6132.

2.3 Site Access

Access to the wind farm Site will be from a simple priority T-Junction on the L6132 as shown in **Figure 1**. The junction will be constructed to accommodate the swept path of abnormal load vehicles accessing the Site during the delivery of turbine components. The junction will be a stop-controlled junction with priority for L6132 traffic. Visibility splays of 160m will be available in both directions from a 3.0m setback in accordance with TII specifications for a design speed of 80km/h. The location of the junction will be signposted in accordance with Chapter 8 of the Traffic Signs Manual during the construction of the wind farm. The location of the wind farm Site access is shown on **Plate 1.**

Plate 1 – L6132 Access to Wind Farm Site

2.4 Turbine Delivery Routes to site for delivery traffic.

All turbine component delivery vehicles will use the site access junction on the L6132 local road. Turbine delivery traffic will travel to the wind farm Site from Foynes Port using the national and regional road network. The TDR to site is shown in **Figure 3.** A TDR analysis for the transportation of turbine components along the L6132 from the N68 / L6132 junction to the site entrance has been caried out by JOD and shows that enabling works such as verge strengthening, and junction modifications will be required at isolated locations on the L6132. The works locations are identified in **Section 5** of this report.

2.5 Haul Routes to Site for general construction traffic

Granular materials for wind farm access roads and Turbine Hardstands will be imported from local quarry's and sourced from a borrow pit within the Site. Concrete for Turbine Foundations and structures will be transported to site from a local concrete supplier. General building materials and ducting for Grid Connection works will be supplied from local hardware providers if possible. Permanent and temporary surfacing for Grid Connection works will be sourced from a local asphalt supplier, asphalt and granular materials arising from trench excavations during Grid Connection works will be transported to licenced recycling centre. While the sourcing of concrete and granular materials will be the responsibility of the contractor appointed to carry out the construction of the wind farm and Grid Connection, supplies of concrete and granular materials are likely to be chosen from the quarries shown in **Figure 5.**

3 EXISTING ROADS AND JUNCTIONS IN PROXIMITY TO THE SITE

3.1 Existing Roads in the Vicinity of the Site

The existing N68 national secondary road (Reference Plate 2) is typically a 6.0m wide two lane single carriageway road in the vicinity of the Site. The road is delineated with road markings and signposted with regulatory and directional signs.

Plate 2 – N68 National Road

The existing R483 (Reference Plate 3) is a 6.0m wide two lane single carriageway with regulatory signs and roadmarkings.

Plate 3 – R483 Regional Road

The existing L6132 (Reference Plate 4) is a 2.8m / 3.0m wide two lane local road with regulatory signs and roadmarkings at junctions.

Plate 4 – L6132 Local Road

3.2 Existing Junctions in the Vicinity of the Site

The existing junction between the N68 and the L6132 (Reference plate 5) is a staggered crossroads junction with priority for N68 traffic. The junction is located in a 100km/h speed limit zone. The junction is a stop-controlled junction with regulatory road markings and signage. The junction is not lit by public lighting.

Plate 5 – N68 / L6132 Junction

The existing junction between the R483 and the L6132 at Tullabrack Cross (Reference plate 6) is crossroads junction with priority for R483 traffic. The junction is located in a 100km/h speed limit zone. The junction is a stop-controlled junction with regulatory road markings and signage. The junction is not lit by public lighting.

Plate 6 – R483 / L6132 Tullabrack Cross Junction

3.3 Works on the Public Road Network

Temporary and permanent works are required at the following locations on the public road network to facilitate the construction of the Ballykett Wind Farm:

- L6132 wind farm site entrance – Construct new entrance to accommodate the swept path of abnormal load vehicles.

- N68/L6132 Junction – Modifications to existing junction to accommodate the swept path of abnormal load vehicles. Modifications will include road widening in verges, relocation of signs and poles.
- L6132 Local Road – Verge widening and strengthening at various locations along the L6132 from the N68/L6132 Junction to the site entrance. Widening to withstand wheel loading from abnormal load vehicles. Final widening requirements will be determined by the turbine haulage contractor due to the wide range of vehicles which can be selected to transport turbine components.
- L6132 Local Road – Road widening and strengthening on the L6132 from the site entrance to the R483 junction at Tullabrack Cross. Road widening at this location will incorporate Grid Connection works.
- L6132 Local Road – Removal of vegetation.
- Grid Connection works – Construct a new underground Grid Connection within the public road and verge between the wind farm site substation and the existing 110kV ESBN substation at Tullabrack.

Works on the public road network will be carried out in consultation with Clare County Council Roads Department using an approved Traffic Management Plan and Road Opening Licence. All permanent works area locations are accommodated within the Redline Boundary of the Site. The construction of the Grid Connection will be carried out under a number of phased operations which will involve traffic management. The first phase of the works will involve the excavation of a 0.6m wide cable trench, construction of 2m wide x 4m long joint bays, installation of cable ducting, backfilling of trench and temporary reinstatement of road surfacing. The second phase of the works will involve installing the grid cable in the ducting. During the cable installation traffic management will be required at the joint bays to allow cable pulling and jointing. The final phase of the works will involve permanent reinstatement of the road surfacing and surface dressing. The phased works will be carried out using lane closures and will require traffic management to be removed and reinstalled a number of times over the course of the project.

An outline Traffic Management Plan for works on the public road is included in **Appendix B**.

4 PRE-CONSTRUCTION WORKS REQUIREMENTS

4.1 Location and Diversion of Existing Services

A desk-based study will be carried out to locate existing services in the area before works commences on Site. Prior to the commencement of works, the location of existing services shall be confirmed by ground penetrating radar. All service diversions and works to protect existing services which are necessary for the construction of the wind farm shall be agreed with the relevant service provider prior to works commencing on Site.

4.2 Permits to Work on the Public Road Network

Prior to the commencement of works, the contractor shall obtain all necessary road opening licenses and road closure permits to work on the public road network. The contractor shall inform the public in advance of road closures and provide alternative means of access to properties, businesses and farms.

4.3 Traffic Management Plan

All works carried out on Site shall be carried out in accordance with the requirements of Chapter 8 of the Traffic Signs Manual. The appointed contractor shall compile a detailed Traffic Management Plan for the works which will specify the precise traffic management measures for each works section and submit to Clare County Council. The contractor will appoint a competent traffic management coordinator who will be the main point of contact for all traffic management matters during the course of the works. The agreed traffic management systems shall be installed and maintained by operatives with the appropriate training to carry out works on traffic management systems. The TMP shall be submitted to the owners engineer and Developer for review 1 month before scheduled works.

4.4 Site Access Roads

All construction traffic shall access the site from the N68 and the R483. Construction traffic shall be prohibited from using local roads which are not directly affected by the works. The location of site access points shall be signposted and assigned a site access number for the duration of the works. Haul Routes for construction and delivery traffic shall be signposted from the national and regional road network.

4.5 Road Condition Survey

A road condition survey will be carried on the L6132 between the wind farm site entrance and N68 / R483. This will consist of a Road Surface Profile (RSP) condition survey and Pavement Condition Index (PCI) report carried out by an independent contractor using a Road Surface Profiler machine testing to assess the condition of the carriageway. A post-construction condition survey shall be carried out following the completion of the works in consultation with Clare County Council.

4.6 Public Information and Access

The appointed Contractor shall inform local residents, businesses and emergency services of road closures in advance of any works taking place on Site. Access shall be maintained to properties at all times during the course of the works. The Contractor will appoint a project coordinator who will be the main point of contact for matters relating to traffic which will affect the general public, local businesses and emergency services. An out of hours contact number shall also be provided.

4.7 Emergency Access Routes

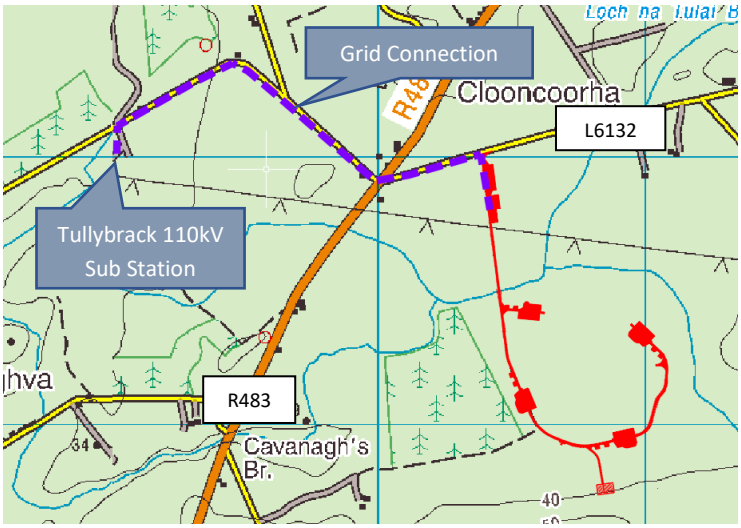
Emergency access routes shall be provided at all times for emergency service vehicles to access the Site or to bypass the works in the event of an emergency.

5 WORKS LOCATIONS

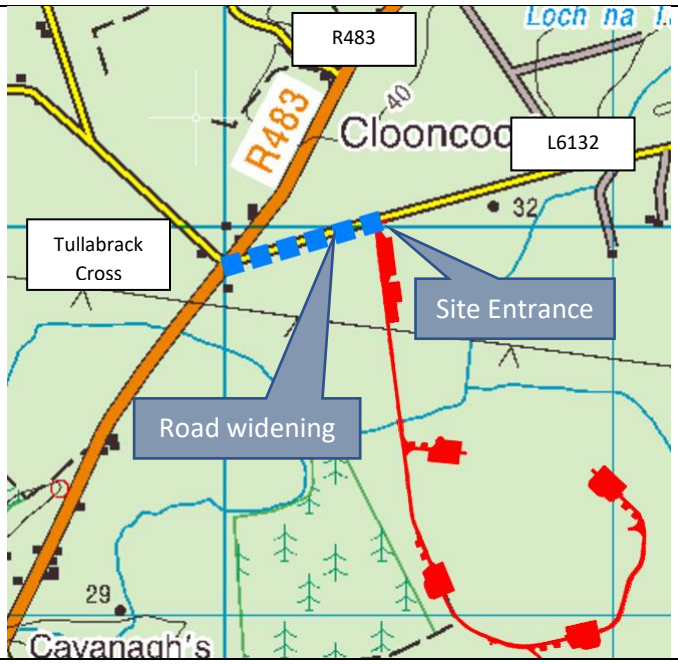
5.1 Permanent Works Location No.1

Works Location No.1	Site entrance construction
Road Number	L6132
Description of Works to be Undertaken	Construction of a new priority junction on the L6132 for permanent wind farm site access
Drawing Reference	
Traffic Management System	Temporary Traffic Lights / Stop & Go / Flagman
	
Local Access	Maintained at all times,
Duration of Works	2 Days Construction / 2 Days reprofiling and landscaping following completion of wind farm construction
Duration of Road Closure	N/A
Emergency Access	Maintained at all times

5.2 Permanent Works Location No.2

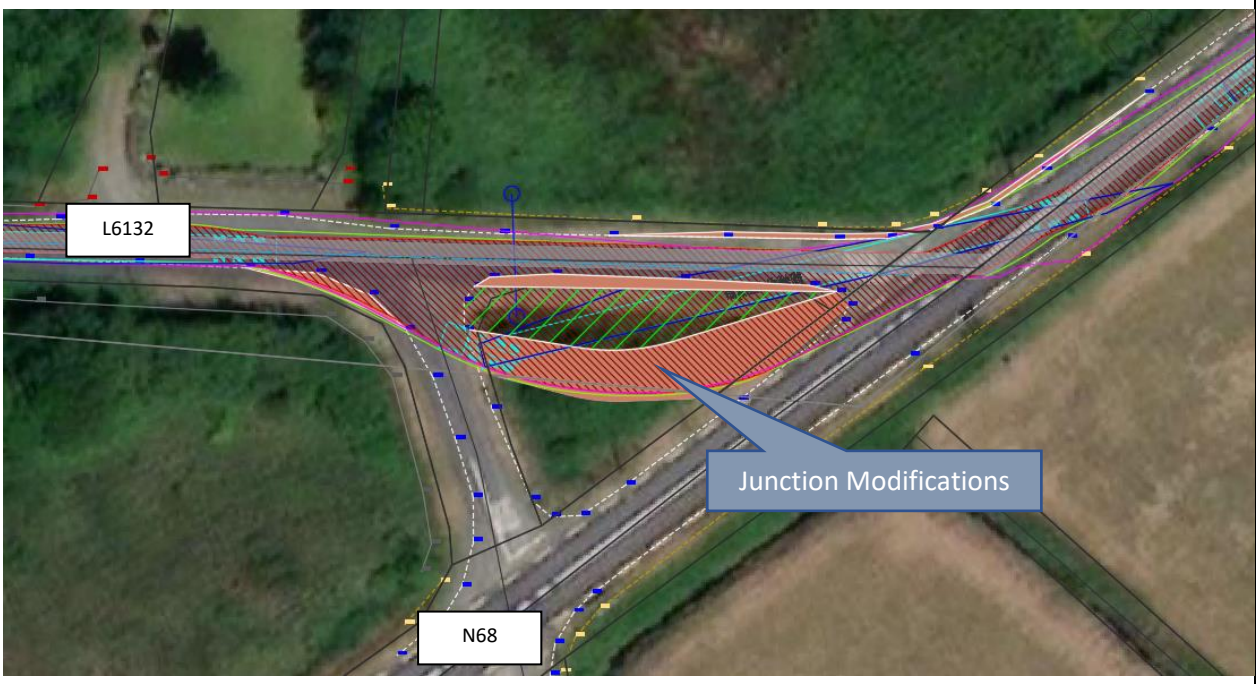
Works Location No.2	Grid Connection –to Tullybrack 110kV Substation
Road Number	L6132 /R483 /Tullabrack West
Description of Works to be Undertaken	Construction of Grid Connection between the wind farm and 110kV Tullabrack Substation
Drawing Reference	
Traffic Management System	Temporary Traffic Lights / Lane Closure / Flagman / Road Closure
	
Local Access	Maintained at all times
Duration of Works	20 days trench and ducting works 3 days cable installation 5 days reinstatement of permanent surfacing
Duration of Road Closure	N/A
Emergency Access	Maintained at all times

5.3 Permanent Works Location No.3

Works Location No.4	Road widening between R483 Tullabrack Cross and wind farm site entrance on the L6132
Road Number	L6132
Description of Works to be Undertaken	Road upgrade works between Tullabrack Cross and the wind farm site entrance to widen the existing road. (Road widening will incorporate Grid Connection works).
Drawing Reference	
Traffic Management System	Temporary Traffic Lights / Flagman / Stop & Go / Road Closure
	
Local Access	Maintained at all times
Traffic Management System	Diversion / Stop & Go / Flagman
Duration of Works	10 Days
Duration of Lane Closure/ Traffic Management	N/A
Emergency Access	Maintained at all times

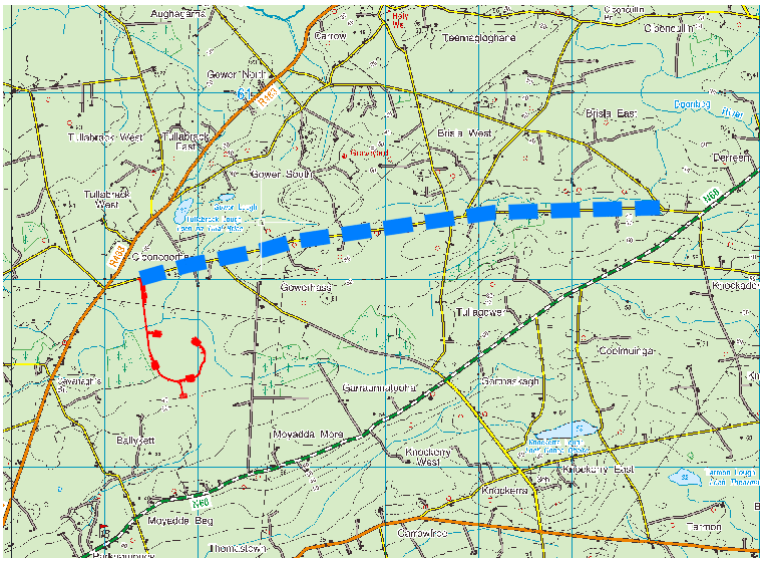
5.4 Temporary Works Location No.4

Works Location No.5	N68 / L6132 Junction
Road Number	N68 / L6132
Description of Works to be Undertaken	Road widening and strengthening at junction to withstand wheel loading from abnormal load vehicles. relocation of telegraph poles, traffic signs and street furniture.
Drawing Reference	
Traffic Management System	Temporary Traffic Lights / Flagman / Lane Closure



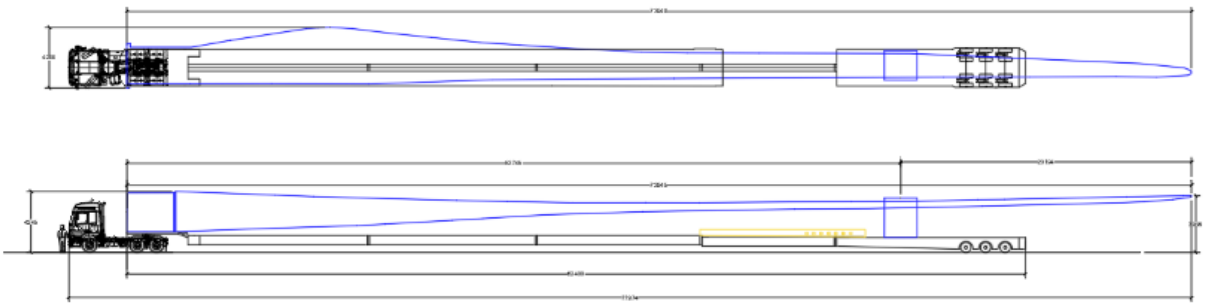
Local Access	Maintained at all times
Duration of Works	2 days construction, 2 days reinstatement
Duration of Road Closure	N/A
Emergency Access	Maintained at all times

5.5 Temporary Works Location No.5

Works Location No.6	N68 / L6132 junction to site entrance
Road Number	L6132
Description of Works to be Undertaken	Verge strengthening to withstand wheel loading from abnormal load vehicles and removal of vegetation.
Drawing Reference	
Traffic Management System	Temporary Traffic Lights / Road Closure / Flagman
	
Local Access	Maintained at all times / Flagman
Duration of Works	15 Days of construction, 5 days of reinstatement
Duration of Road Closure	15 days
Emergency Access	Maintained at all times, through traffic lights

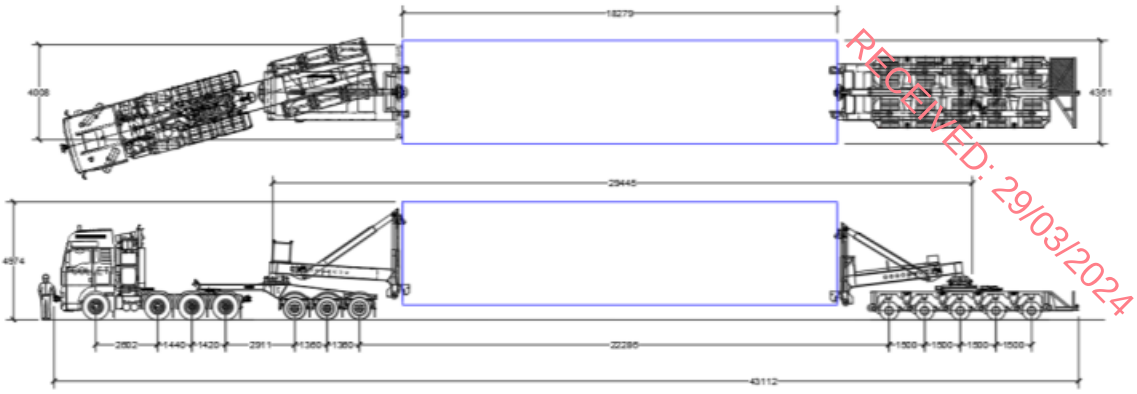
6 DELIVERY VEHICLE SPECIFICATION

Delivery of road construction materials, concrete for Turbine Foundations, building materials, drainage, ducting and cables will be carried out using standard heavy goods vehicles (HGV). Delivery of turbine components will be carried out using specialist abnormal load vehicles. Turbine blades will be delivered on an extendable semi-trailer, one per trailer. Each turbine blades will be 68m long, approximately 10m to 15m of the blade will overhang the rear of the trailer. Following delivery to the Site, the trailer will be retracted for the return trip. Each turbine tower will be delivered to site in three sections on extendable semi-trailers, the tower sections range in length from 30.0m to 23.0m with a maximum width of 4.3m. All material deliveries will have a maximum axle load of up to 12 tonnes per axle, and a maximum total truck weight 63 tonnes approx. The main crane for turbine erection will have a maximum axle loading of 12 tonnes per axle and a maximum total weight of 100 tonnes approx. Vehicles delivering counter-weights for the crane will have a maximum axle loading of up to 12 tonnes per axle. The transport vehicles used for transportation of components may differ from those shown below depending on the haulage contractor's preferences.

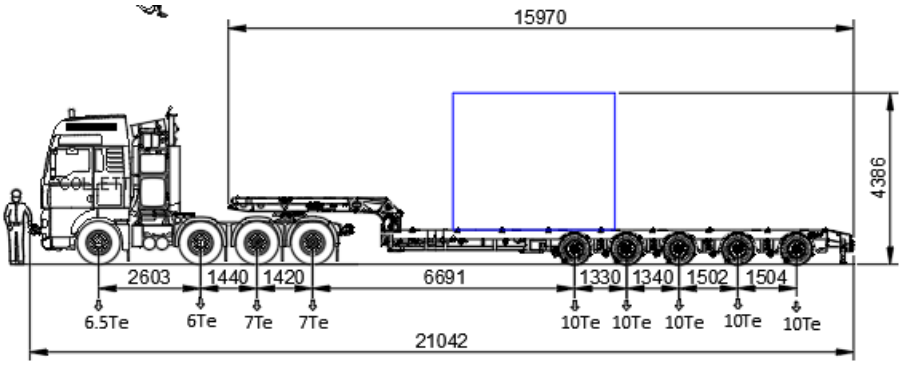


Typical Turbine Blade Transport Vehicle

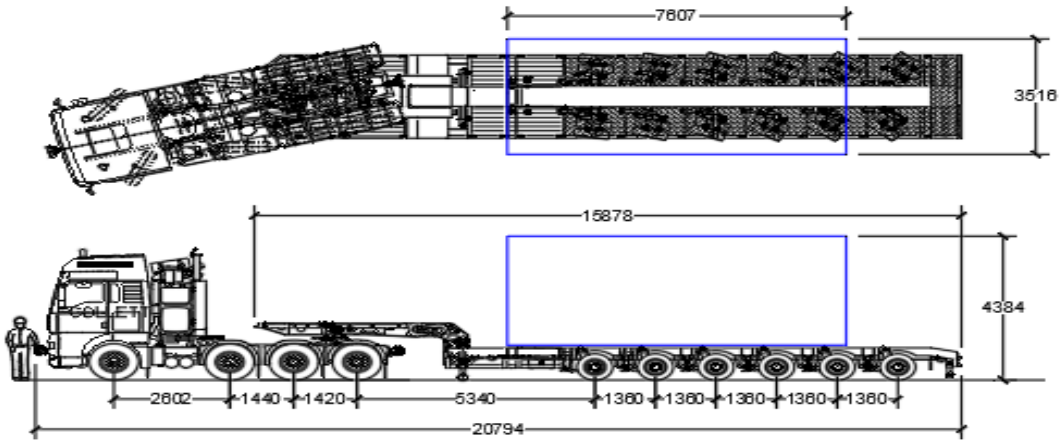
Typical Turbine Tower Transport Vehicle



Typical Nacelle Transport Vehicle



Typical Hub Transport Vehicle



Typical Generator Transport Vehicle

7 CONSTRUCTION, OPERATION & DECOMMISIONING TRAFFIC VOLUMES

7.1 Construction Period

The construction period of the Development is anticipated to take approximately 10 months with the majority of HGV deliveries to site concluding in month 6. The project timeframe is summarised in **Table 7.1** below. It is expected that construction hours will be between 07:00 and 19:00 Monday to Friday and 08:00 and 16:30 on Saturday. There may be periods outside of these times whereby specialist works such as turbine installation may be required, in order to avail of more favourable weather conditions such as low wind speeds.

Table 7.1: Project Timeframe

Proposed Works	Timetable (Week No.)
Civil Works	
Mobilise on Site	1
Construction of L6132 Site Entrance	1-2
Construction of Site Compound	1-2
Construction of Floating Site Access Roads Leading to Borrow Pit	2-8
Clause 804 Material for Surfacing Site Access Tracks, Turbine Hardstands and Staging Area	6-10
Construction of 0.4km Road Widening (Site Entrance to Tullybrack Cross)	2-8
Construction of L6132 Verge Strengthening on Turbine Delivery route 5.6km (Site Entrance to N68)	8-16
Site Drainage and Fencing	8-16
Ready Mix Concrete for turbine Foundations	12-20
Steel Reinforcement for Turbine Foundations	8-16
Foundation Bolts	8-16
Substation Building Materials	8-20
Electrical Switchgear	20-38
Electrical Cables	4-20
Grid Connection Works	20-28
Wind Turbine Components	20-28
Crane	20-28
Reinstatement and Demobilisation	28-40

7.2 Construction Period – Trip Generation HGV's

The estimated HGV deliveries to the Site during the construction period are shown in **Table 7.2.** The expected HGV volumes are based on trips generated during the construction of similar sized wind farms and will be subject to amendment based on local conditions and contractors working practices.

Table 7.2: HGV and Abnormal Load Deliveries to Site During Construction

Materials	Quantity	No. Of Deliveries	Timeframe (Week)	Maximum Loads / Day	Vehicle Type
Mobilise on Site		14	1	5	OGV1
Construction of L6132 Site Entrance	700m^3	70	1-2	10	OGV1
Construction of Site Compound	1,000m^3	100	1-2	10	OGV1
Construction of Floating Site Access Roads Leading to Borrow Pit	3,000m^3	300	2-8	10	OGV1
Clause 804 Material for Surfacing Site Access Tracks, Turbine Hardstands and Staging Area	2,300m^3	230	6-10	10	OGV1
Construction of 0.4km Road Widening (Site Entrance to Tullybrack Cross)	250m^3	50	2-8	20	OGV1
Construction of L6132 Verge Strengthening on Turbine Delivery route 5.6km (Site Entrance to N68)	1,700m^3	340	8-16	10	OGV1
Site Drainage and Fencing		20	8-16	2	OGV2
Ready Mix Concrete for turbine Foundations	2,400m^3	300	12-20	75	OGV2
Steel Reinforcement for Turbine Foundations	200T	10	8-16	3	OGV2
Foundation Bolts	4 Turbines	4	8-16	1	OGV2
Substation Building Materials		15	8-20	1	OGV2
Electrical Switchgear		2	20-38	1	OGV2
Electrical Cables		5	4-20	1	OGV2
Grid Connection Works	1.8km (540m^3)	220	20-28	12	OGV2
Wind Turbine Components	4 Turbines	40	20-28	3	OGV2
Crane		10	20	5	OGV2
Reinstatement and Demobilisation		90	28-40	5	OGV2
Total		**1,800**			

It is estimated that during the wind farm construction, an approximate total of 1800 loads of material and building supplies will be delivered and removed from the Site. The majority of HGV movements to and from Site will occur during the first six months of the construction period and will be associated with site road construction, Turbine Hardstand construction and Turbine Foundation construction. The trips generated by the construction of the wind farm are based on earthworks calculations using site investigation data. The calculations are based on extraction of granular material from an onsite borrow pit supplemented by imported material from local quarries. A schedule of maximum predicted daily traffic movements to site over a 10-month construction period is shown in **Table 7.3**.

Table 7.3 HGV and Abnormal Load Deliveries to Site During Construction

Activity	Weeks 1-4	Weeks 4-8	Weeks 8-12	Weeks 12-16	Weeks 16-20	Weeks 20-24	Weeks 24-28	Weeks 28-32	Weeks 32-36	Weeks 36-40
Mobilise on Site	5									
Construction of L6132 Site Entrance	10									
Construction of Site Compound	10									
Construction of Floating Site Access Roads Leading to Borrow Pit – (1.3km)	10	10								
Clause 804 Material for Surfacing Site Access Tracks, Turbine Hardstands and Staging Area		10	10	10						
Construction of 0.4km Road Widening (Site Entrance to Tullybrack Cross)	20	20								
Construction of L6132 Verge Strengthening and widening on Turbine Delivery route 5.6km (Site Entrance to N68)			10	10						
Site Drainage and Fencing			2	2						
Ready Mix Concrete for turbine Foundations				75	75	75				
Steel Reinforcement for Turbine Foundations			3	3						
Foundation Bolts			1	1						
Substation Building Materials		1	1	1	1					
Electrical Switchgear					1	1				
Electrical Cables		1	1	1	1	1				
Grid Connection Works					12	12	12			
Wind Turbine Components					3	3	3			

Activity	Weeks 1-4	Weeks 4-8	Weeks 8-12	Weeks 12-16	Weeks 16-20	Weeks 20-24	Weeks 24-28	Weeks 28-32	Weeks 32-36	Weeks 36-40
Crane					5			5		
Reinstatement and Demobilisation								5	5	5
Total	55	42	28	103	98	92	15	10	5	5

Weeks 1 to 8 will involve deliveries of materials for site access works, site access tracks, site compound, site offices, site security, and drainage. This period will include deliveries of fencing materials for site boundaries and compounds, temporary fencing to protect trees, hedges and ecological buffer zones where necessary, road construction materials for access tracks and site entrance, and delivery of temporary site office units. It is anticipated that a maximum of 55 HGV vehicles (110 HGV movements) will visit the Site on a daily basis during the period of weeks 1 to 8.

Weeks 8 to 20 will involve deliveries of materials for site access works, Turbine Hardstand, Turbine Foundations, site access tracks, Electrical Substation building and cable / ducting works, turbine component delivery and Grid Connection works. This period will include deliveries of fencing materials for site boundaries, road construction materials for access tracks, site entrances and Turbine Hardstands, ready mix concrete and steel reinforcement for Turbine Foundations. It is anticipated that a maximum of 28 HGV vehicles (56 HGV movements) will visit the site on a daily basis during the period of weeks 8 to 20 with an additional 75 HGV vehicles (150 HGV movements) delivering concrete for Turbine Foundations on two / three separate days during the eight week period between weeks 12 to 20. During concrete deliveries for Turbine Foundations a total of 103 HGV vehicles (206 HGV movements) will visit the Site.

Weeks 20 to 40 will involve HGV movements for works associated with Turbine Foundation construction, turbine delivery, turbine erection, turbine commissioning, electrical works, road reinstatement site landscaping and the removal of temporary works materials such as offices and fencing from site. It is anticipated that a maximum of 15 HGV vehicles (30 HGV movements) will visit the site on a daily basis during the period of weeks 20 to 40 with an additional 75 HGV vehicles (150 HGV movements) delivering concrete for Turbine Foundations on one / two separate days during the four week period between weeks 20 to 24.

During concrete deliveries for Turbine Foundations a total of 92 HGV vehicles (184 HGV movements) will visit the Site.

The expected HGV volumes are based on earthworks calculations, peat depths and traffic profiles generated by similar sized wind farms and will be subject to amendment based on local conditions and contractor working practices.

Based on the indicative timetable outlined above the peak times for HGV deliveries per day will be months 1 to 6 when site access roads, Turbine Hardstands and Turbine Foundations will be constructed.

7.3 Construction Period – Light Vehicles\Vans and Construction Personnel

The number of staff on site will vary according to the phase of the construction, peaking at approximately 40 at the height of the construction period. It is expected that the majority of workers will arrive on site in mini-buses and crew vehicles which are used to transport teams of workers from different construction disciplines. Labour vehicle sharing will be actively encouraged to reduce vehicular movements.

It is estimated that 35-40 vehicles will visit the site on a daily basis during the peak construction period. Parking for staff will be provided within the Temporary Construction Compound and no parking will be allowed for construction workers on the public road network in the vicinity of the Site. A number of additional unscheduled visits may be required throughout the construction period for site inspections and unforeseen circumstances.

7.4 Operational Period – Traffic

The vehicle movements associated with the operational period of the proposed Development will be very low. Trips during the operational period would normally be made by vans associated with site monitoring, servicing, cleaning and maintenance operations. During the operational period, parking will be provided at the Temporary Construction Compound and security gates will be set back from the public road to allow operatives to access the site without obstructing the public road network.

Scheduled Site Visits

Weekly maintenance, estimated two visits by two technicians – 208 trips

Six-month service, estimated of two visits by two technicians – 4 trips
Annual service, two visits by two technicians – 4 trips
Monthly visit by Developer or agents to check over the site, grass cutting etc. – 12 trips

Unscheduled Site Visits

Visits which may arise as a result of malfunction, damage or vandalism. – 5 trips

The frequency of vehicle trips associated with servicing, monitoring and upkeep of the Site are expected to be in the region of 230 trips per year.

7.5 Decommissioning Period – Traffic

The vehicle movements associated with the Decommissioning period of the Development are similar to the construction period. The Decommissioning period will take approximately 20 weeks, during which time the entire infrastructure will be removed from Site.

8 TRAFFIC IMPACT DURING CONSTRUCTION, OPERATION AND DECOMMISIONING PERIODS

8.1 Traffic Impact During Construction Period

Increased volumes of traffic will be generated by the proposed Development during the construction period. The Development will generate a maximum daily volume of 103 HGV trips (206 HGV movements) and 40 LGV (80 traffic movements) at the L1632 site entrance. Peak traffic generated by the Development will correspond to the construction of Turbine Foundations and will occur during four days within the 10 month construction period.

Outside these times, daily construction traffic will typically consist of 28 HGV trips (56 HGV movements) and 30 LGV (60 traffic movements) at the L6132 site entrance. Development traffic will be distributed throughout the day with morning, afternoon and evening peaks. The distribution of Development traffic is shown in **Table 8.1** during the construction of Turbine Foundations.

Table 8.1 Development Traffic Profile

Time	Arrivals		Departures	
	HGV	LGV	HGV	LGV
06.00 – 07.00		20		
07.00 – 08.00	10	15	10	
08.00 – 09.00	10	5	10	2
09.00 – 10.00	10		10	
10.00 – 11.00	10		10	
11.00 – 12.00	10		10	
12.00 – 13.00	10		10	
13.00 – 14.00	5	5	5	5
14.00 – 15.00	10		10	
15.00 – 16.00	10		10	
16.00 – 17.00	10		10	
17.00 – 18.00	5	2	5	5
18.00 – 19.00	3		3	15
19.00 – 20.00				20

Existing traffic volumes on the N68, R483 and L6132 were obtained from the classified traffic counts carried out by JOD in January 2023 at the N68 / L6132 junction and the R483 / L6132. Using the methodology from TII publication PE-PAG-02039 to calculate annual average daily traffic (AADT) from short period traffic counts, the resulting AADT on the N68, R483 and L6132 are calculated as follows. The N68 regional road has an AADT of 2,870 vehicles near its junction with the L6132 which equates to a two-way traffic flow of approximately 300 vehicles during peak hour traffic periods. The L6132 has an AADT of 170 vehicles near its junction with the N68 which equates to a two-way traffic flow of approximately 20 vehicles during peak hour traffic periods. HGV traffic accounts for approximately 5% of the total traffic on the N68 passing the L6132 junction. The R483 regional road has an AADT of 1,370 vehicles at its junction with the L6132 corresponding to a two-way traffic flow of approximately 150 vehicles during peak hour periods. The L6132 local road has an AADT of

135 vehicles at the R483 junction which equates to a two-way traffic flow of 20 vehicles during peak hour traffic periods. HGV traffic accounts for approximately 1% of the total traffic on the R483 passing the L6132 junction. The capacity of the N68 which consists of a Type 3, 6.0m single carriageway is in the region of 5,000 AADT. The data from the traffic counts shows that the N68 is currently running at 57% capacity and has reserve capacity to cater for future traffic growth on the public road network and short tern traffic generated by wind farm construction as shown in **Table 8.2**.

Table 8.2 - Future Traffic Flows – With / Without Construction Traffic

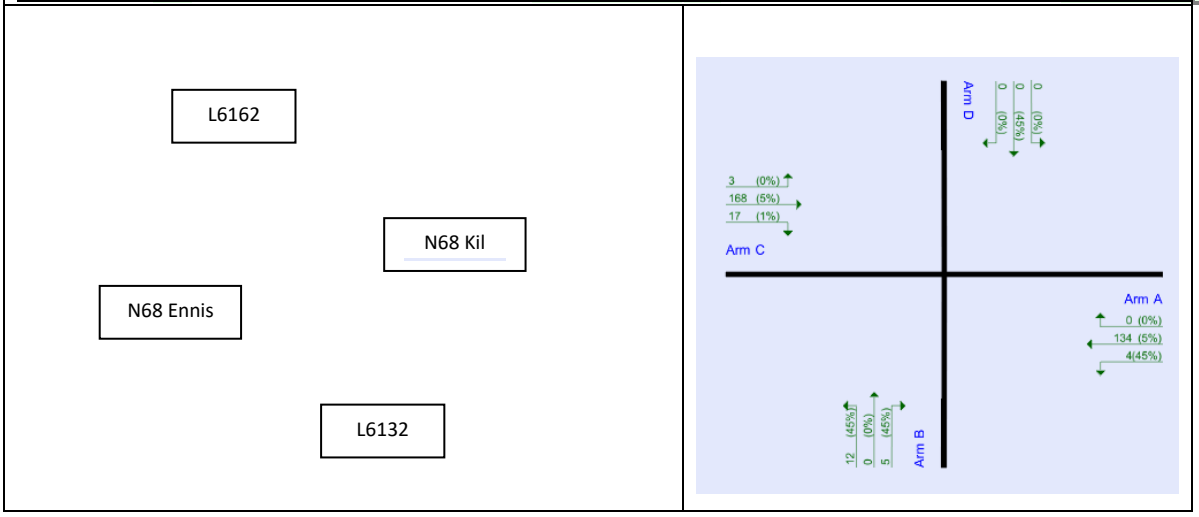
Year	N68			R483			L6132		
	AADT	HGV's Per Hour	%HGV	AADT	HGV's Per Hour	%HGV	AADT	HGV's Per Hour	%HGV
2023–No Development Traffic	2,870	15	5.0%	1,370	1	1.0%	170	1	<1.0%
2023–With Development Traffic	3,062	35	11.0%	1,599	21	12.0%	384	21	45.00%
2024–No Development Traffic	2,890	16	5.00%	1,385	1	1.0%	175	1	<1.0%
2024–With Development Traffic	3,082	36	11.0%	1,515	21	12.0%	390	21	45.00%
2025–No Development Traffic	2,930	17	5.00%	1,400	2	1.0%	180	1	<1.0%
2025–With Development Traffic	3,122	37	11.0%	1,630	22	12.0%	395	21	45.00%
2026–No Development Traffic	2,960	18	5.00%	1,415	2	1.0%	185	1	<1.0%
2026–With Development Traffic	3,152	38	11.0%	1645	22	12.0%	400	21	45.00%

Traffic analysis carried out at the existing N68/L6132/L6162 junction during the construction period is shown in **Table 8.3**. The analysis shows that the junction will operate within capacity during the construction of the wind farm and will not exceed the 0.85 Ratio to Flow Capacity (RFC) during the peak traffic periods. The ratio of flow to capacity (RFC) is calculated from Junctions 9 PICADY software. An RFC value of 1.0 indicates that the junction is operating at full capacity with a value of 0.85 considered to be the maximum RFC value after which the junction will begin to experience some capacity issues.

Table 8.3 – N68 / L6132 / L6162 Junction – Traffic Analysis

N68 / L6132 / L6162 Junction – 2026 Traffic Analysis and Turning Movements with Construction Traffic

	AM									PM								
	Set ID	Queue (PCU)	95% Queue (PCU)	Delay (s)	RFC	LOS	Junction Delay (s)	Junction LOS	Network Residual Capacity	Set ID	Queue (PCU)	95% Queue (PCU)	Delay (s)	RFC	LOS	Junction Delay (s)	Junction LOS	Network Residual Capacity
	2026 Construction Traffic - N68 / L6132 / L6162 Junction																	
Stream B-ACD	D1	0.1	0.7	10.53	0.05	B	1.28	A	478 % [Stream B-ACD]	D2	0.1	0.7	10.95	0.04	B	0.88	A	435 % [Stream B-ACD]
Stream A-BCD		0.0	~1	0.00	0.00	A					0.0	~1	0.00	0.00	A			
Stream D-ABC		0.0	~1	0.00	0.00	A					0.0	~1	0.00	0.00	A			
Stream C-ABD		0.1	0.6	7.38	0.03	A					0.0	0.5	5.34	0.03	A			

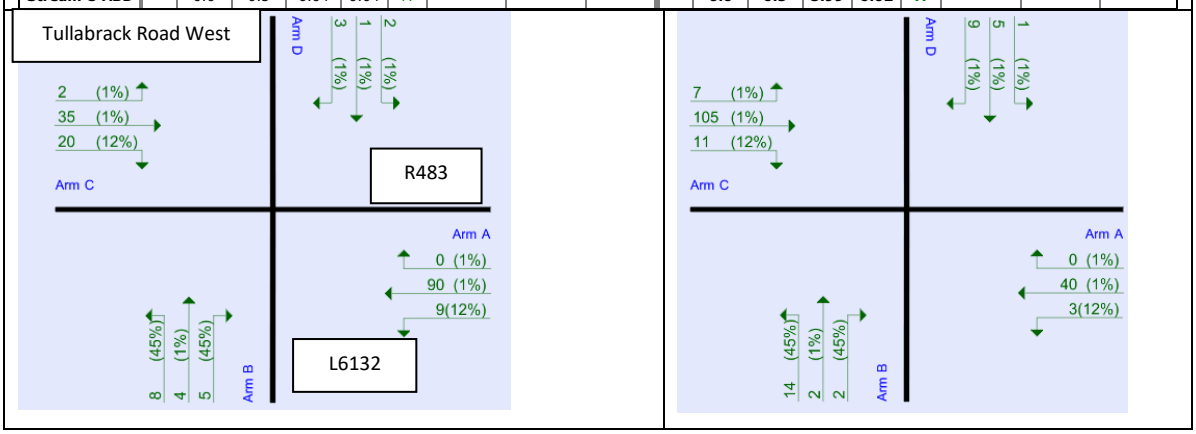


Traffic analysis carried out for the existing R483/L6132/Tullabrack Road West junction during the construction period is shown in **Table 8.4**. The analysis shows that the junction will operate within capacity during the construction of the wind farm and will not exceed the 0.85 Ratio to Flow Capacity (RFC) during the peak traffic periods on the R483. The ratio of flow to capacity (RFC) is calculated from Junctions 9 PICADY software. An RFC value of 1.0 indicates that the junction is operating at full capacity with a value of 0.85 considered to be the maximum RFC value after which the junction will begin to experience some capacity issues.

Table 8.4 – R483 / L6132 / Tullabrack Road West – Traffic Analysis

R483 / L6132 / T.West Junction – 2026 Traffic Analysis and Turning Movements with Construction Traffic

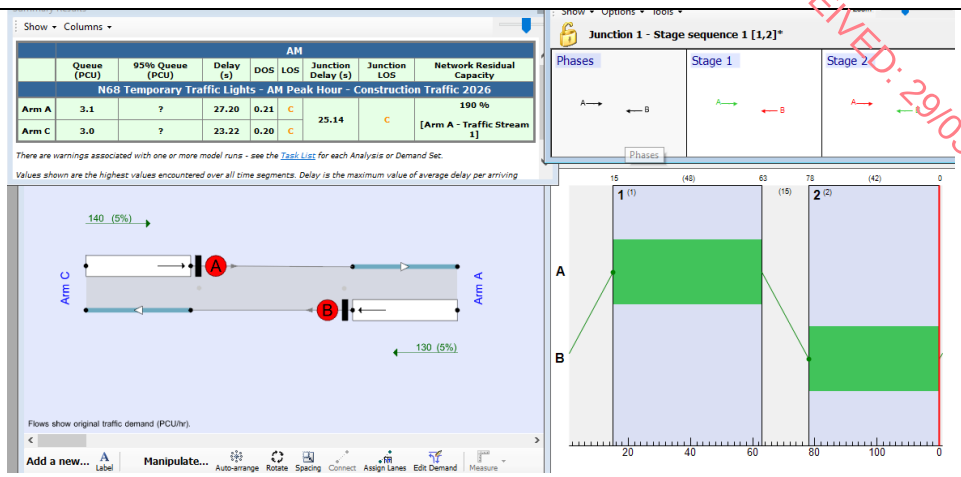
	AM									PM								
	Set ID	Queue (PCU)	95% Queue (PCU)	Delay (s)	RFC	LOS	Junction Delay (s)	Junction LOS	Network Residual Capacity	Set ID	Queue (PCU)	95% Queue (PCU)	Delay (s)	RFC	LOS	Junction Delay (s)	Junction LOS	Network Residual Capacity
2026 Construction Traffic - R483 / L6132 Tullabrack Cross																		
Stream B-ACD	D1	0.1	0.6	10.48	0.04	B	2.05	A	626 % [Stream B-ACD]	D2	**0.1**	**0.7**	**9.82**	**0.04**	**A**	**1.96**	**A**	**579 % [Stream D-ABC]**
Stream A-BCD		0.0	~1	0.00	0.00	A					**0.0**	**~1**	**0.00**	**0.00**	**A**			
Stream D-ABC		0.0	0.5	8.03	0.01	A					**0.0**	**0.5**	**9.04**	**0.04**	**A**			
Stream C-ABD		0.0	0.5	6.64	0.04	A					**0.0**	**0.5**	**5.99**	**0.02**	**A**			



Traffic management for turbine delivery enabling works at the N68 / L6132 and grid connection works crossing the R483 will be carried out using lane closures and temporary traffic lights / flagmen. Traffic analysis carried out during the wind farm construction period for works involving temporary traffic lights on the N68 and the R483 during the morning peak hour traffic periods is shown in **Table 8.5.** The analysis shows that the temporary signalised junction which are necessary to carry out works involving lane closures on the public road will operate within capacity and will not exceed the 0.85 Degree of Saturation index (DOS) during modifications to the N68 / L6132 junction for turbine component delivery and Grid connection works crossing the R483. The Degree of Saturation (DOS) is calculated from Junctions 9 OSCADY software for signalised junctions. A DOS value of 1.0 indicates that the junction is operating at full capacity with a value of 0.85 considered to be the maximum DOS value after which the junction will begin to experience some capacity issues. The analysis has been carried out with signals having a green time of 45 seconds with a 15 second inter-green period between signal phases. The analysis shows that motorists on the N68 and R483 will experience average delays of approximately 30 seconds resulting in queues of approximately 4 vehicles at the temporary traffic signals during the Grid Connection and enabling works on the turbine delivery route. Lane closures and temporary traffic signals will be required at the locations shown in **Table 8.6.**

Table 8.5 – N68 and R483 Temporary Traffic Lights – Traffic Analysis

N68 – 2026 Construction Traffic Analysis – Temporary Traffic Lights



R483 – 2026 Construction Traffic Analysis – Temporary Traffic Lights

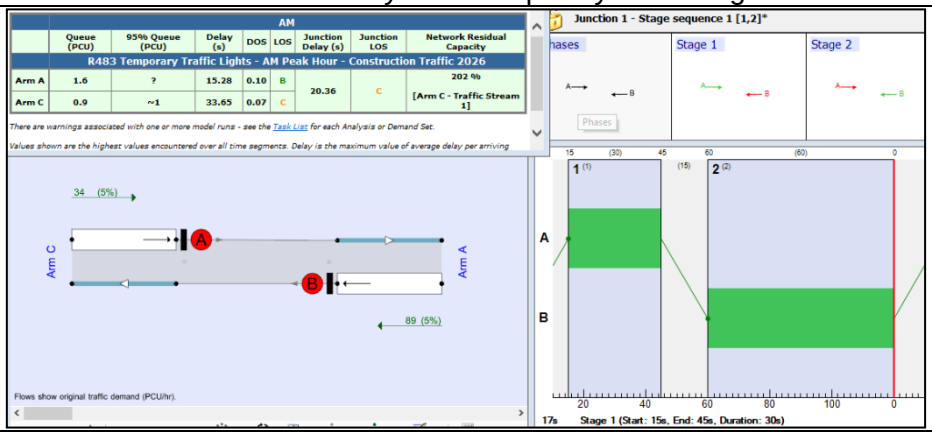


Table 8.6 – Location of Lane Closures on Public Roads

Location	Road Number	Construction Activity
L6132 Site Entrance	L6132	Construction of Site Entrance
N68 / L6132 Junction	N68	Junction Widening
L6132 Local Road	L6132	Road Widening and Verge Strengthening. Removal of Vegetation
Grid Connection to Tullabrack	L6132, R483, Tullabrack West (Local Road)	Grid Connection Works to Tullabrack 110kV Substation

Traffic analysis shows that public road network in the vicinity of the proposed Development is capable of accommodating HGVs and will cater for the increased traffic volumes during the construction period. The proposed road and junction upgrade works will accommodate construction and abnormal load vehicles during the construction of the wind farm.

8.2 Traffic Impact During Operational Period

The impact of traffic associated with the operation of the proposed Development on the existing public road network will be negligible due to the low volume of traffic generated by the proposed Development.

8.3 Traffic Impact During Decommissioning Period

During the Decommissioning phase of the proposed Development, the total volume of HGV traffic will be similar to the construction period.

9 PROPOSED MITIGATION MEASURES

The impact of the proposed Development has been identified as being temporary in nature and associated with short construction and Decommissioning stages only. It is still important that any impact is minimised as far as possible and, in light of this, the following mitigation measures have been considered:

- HGV movements will generally be limited to 08:00 - 18:00 Monday to Saturday. Deliveries will be scheduled to avoid peak times around the morning and evening peak hours. This will avoid HGV traffic arriving during the morning peak hour creating conflict with local residents on their commute/school run. Construction personnel will be encouraged to car-pool, or to travel to site in minibuses.

- Wheel wash equipment will be used on site to prevent mud and stones being transferred from the Development to the public highway. All drivers will be required to check that their vehicle is free from dirt and stones prior to departure from the construction Site. In addition, any dust generating activities will be minimised where practical during windy conditions, and drivers will adopt driving practices to minimise dust creation. Finally, loads will be covered into and out of the site where required to ensure that the spillage or deposit of clay, rubble or other debris on the public road network is prevented.

- Construction works on the public road network will be carried out using an agreed traffic management plan in accordance with Chapter 8 of the Traffic Signs Manual.

- During the construction phase, clear construction warning signs will be placed on the N68, R483 and L6132 advising the general public as to the presence of the construction Site. The site entry points will also be appropriately signed. Access to the construction site will be controlled by on site personnel and all visitors will be asked to sign in and out of the site by security / site personnel. Security gates will be sufficiently set back from the road, so that vehicles entering the Site will stop well clear of the public road, thus obviating the queuing of construction traffic on the public road network. Site visitors will all receive a suitable Health and Safety site induction, and Personal Protective Equipment ("PPE") will be worn.

- Grid Connection works will proceed at a rate of approximately 100m per work shift, the rate will depend on the ground conditions and the number of existing services encountered

in the excavation. The works area will be fully enclosed within the traffic management system. Traffic management using temporary traffic lights shall be kept to the minimum length necessary to accommodate the works being undertaken and to minimise delays to the public.

- Longitudinal trench excavations in the public road shall be straight and parallel to the centre of the road/footway where practicable. Transverse road or footway crossings shall be at right angles to the kerb or property line. Bituminous and concrete road surfaces and footways be cut using a road saw, concrete saw or equivalent mechanical means to the full depth of the bituminous or concrete material prior to any excavation work. The edges of the road shall be trimmed to provide an overlap for permanent road reinstatement in accordance with chapter 7 of the Managing Openings in Public Roads Specification.

- The Grid Connection cable trench shall be excavated using a rubber tyre excavator on all public roads. The sides of the trench shall be supported to prevent damage to the road. Material arising from trench excavations may be stored at a safe location within the works area and used to backfill trenches, surplus excavated material shall be removed from Site and disposed at licenced landfills.

- All excavated trenches in the public road network are to be reinstated at the end of the work shift, A temporary reinstatement shall be carried out in the event that the works are not completed at the end of the work shift.

- Once construction of the Development is completed, all portacabins, machinery and equipment will be removed and temporary hardstanding's excavated and reinstated. The area will be re-graded with the topsoil to a natural profile and allowed to regenerate from the seed bank within the topsoil.

10 CONCLUSION

This TMP has been undertaken to detail the management of traffic movements for the Ballykett Wind Farm.

Increased volumes of traffic will be generated by the proposed Development during the construction period. However, the overall volumes of traffic generated by the Development during the construction period can be accommodated on the existing public road network.

During the operational phase of the project the Site will be accessed by a light vehicle an estimated 230 times per year for routine monitoring, servicing and site maintenance.

Priority at junctions for existing public road users will remain unchanged during the construction and operational phases of the proposed Development.

All traffic accessing and leaving the Site will use the designated Haul Route for construction traffic from the site entrance on the L6132.

A number of mitigation measures have been proposed to minimise impacts on the public road network and local road users. Security gates will be provided at the site access. Gates will be set back from the L6132 carriageway edge to accommodate articulated vehicles. Wheel wash facilities will be provided at the site entrance and at works locations on the public road network to prevent mud and dust spreading to the public road.

Temporary Construction Compounds will be provided on Site and will remain for the duration of the construction period. The compound will be used to store construction materials for the proposed Development and as a parking and turning facility for construction and delivery traffic.

Components for each turbine will be delivered to site in three separate abnormal load convoys over the period of one week. The convoys will travel at times agreed with An Garda Síochána. The haulage contractor will obtain all necessary permits for the transportation of abnormal loads from the Clare County Council.

Grid Connection works carried out on the public road network will be fully enclosed within the traffic management system.

Increased volumes of traffic will be generated by the proposed Development during the construction period. However, traffic analysis has shown that the additional volumes of traffic generated by the proposed Development during the construction of the wind farm and during the Grid Connection can be accommodated by the existing public road network and will not impact adversely on existing road or junction capacity. Impacts from construction of the proposed Development have been assessed as being temporary in nature and will vary throughout the construction phase of the project. Upon completion of the turbine construction the turbine site will generate low volumes of operational traffic which will have a negligible impact on the public road network.

APPENDIX A

DRAWINGS

APPENDIX B

OUTLINE TRAFFIC MANAGEMENT PLAN

SCOPE

This document is intended to provide design level guidance for Temporary Traffic Management. The document should be read in conjunction with the following publications covering all aspects of TTM on Irish roads:

- Chapter 8 of the Traffic Signs Manual;
- Temporary Traffic Management Design Guidance;
- Temporary Traffic Management Operations Guidance.

TTM CRITERIA

The main criteria in selecting the type of TTM Design required are the road classification on which the works are to take place and the type of works involved.

The road classifications in chapter 8 of the Traffic Signs Manual are listed in Table C1, Where roadworks take place across more than one classification the design parameters for the higher classification of road should be used.

Level		Carriageway Type	Speed / Speed Limit (km/h)
Main	Sub		
Level 1	i	Single	≤ 30
	ii	Single	40
	iii	Single	50
	iv	Single	60
		Multi-lane / Dual	≤ 60
Level 2	i	Single	80
	ii	Single	100
Level 3	i	Dual and Motorway	80
	ii	Dual and Motorway	≥ 100

Table C1 – Road Classifications

The three levels of road are listed in Table C2.

Level	Description
1	Low Speed and Urban areas using geometric standards set out in DMURS
2	Rural single roads that allow a flexible range of implementation approaches and where vehicles may be expected to stop
3	High Speed Duals and Motorways whereby traffic may be expected to merge or change lane

Table C2 – Road Level

ROADWORKS TYPES

The roadworks types identified in chapter 8 of the Traffic Signs Manual are listed in Table C3.
In selecting the works type, duration, traffic flow, visibility and road level are taken into consideration.
Where works type falls between two categories the TTM Designer should design to the higher works level subject to a risk assessment.

TTM Type	Description	Traffic Flow Conditions	Visibility Conditions	Planned Duration
Static Type A	Works requiring full time Temporary Traffic Management (TTM)	All	All	Permitted for any duration but required for durations in excess of 12 hours
Static Type B	Works that normally involve the use of one or two vehicles in the operation. This type of work is typically maintenance and repair type operations, including maintenance of utilities or street furniture.	Unrestricted by either traffic volume or weather conditions	All	Permitted for a duration of up to 12 hours
Static Type C	Works at a discrete location that are of a short duration (excluding signage setup/removal).	Unrestricted by either traffic volume or weather conditions	Good	Permitted for a duration of up to 15 minutes
Semi Static Operation (SSO)	Works where the operations are mobile or making short duration stops continuously along a road where static warning signs are used. A SSO is only suitable on Level 1 to 2 roads.	Unrestricted by either traffic volume or weather conditions	Good	Permitted for stop durations of up to 15 minutes
Mobile Lane Closure (MLC)	Works where the operations are mobile or making short duration stops continuously along a road where mobile warning signs and Impact Protection Vehicles (IPV) are used. A MLC is only suitable for Level 3 roads.	Unrestricted by either traffic volume or weather conditions	Good	Permitted for stop durations of up to 15 minutes

Table C3 – Roadworks Types

LANE WIDTHS

Two-Way operation of traffic should be maintained on single carriageway roads, where practicable. When this cannot be achieved, the through passage should be further restricted using cones to a single traffic lane not less than 3.0m but not exceeding 4.3m and alternate one-way traffic (shuttle working) introduced using the most appropriate method of traffic control. When the traffic volume is low and expected to consist only of cars and other light vehicles, an absolute minimum of 2.5m may be used. Whenever this situation arises, advanced warning of the narrow lanes should be given using appropriate signs.

VISIBILITY REQUIREMENTS

Approaching traffic must have adequate visibility of TTM signage and in particular the first sign. Sign visibility requirements are dependent on the road level and speed and are defined as the uninterrupted sight distance of an approaching vehicle to the first sign (WK 001 Roadworks Ahead).
Minimum visibility requirements are shown in Table C4.

Level		Carriageway Type	Speed / Speed Limit (km/h)	Sign Visibility (m)	Visibility to Stop / Go & Traffic Signals (m)
Main	Sub				
Level 1	i	Single	≤ 30	25	25
	ii	Single	40	35	35
	iii	Single	50	50	50
	iv	Single	60	60	60
		Multi-lane / Dual	≤ 60	60	60
Level 2	i	Single	80	90	90
	ii	Single	100	120	120
Level 3	i	Dual	80	90	120[1]
	ii	Dual	≥ 100	160	N/A[2]

Table C4 – Visibility Requirements at Roadworks

DESIGN SPEED FOR TTM

TTM should be designed on the basis of the regulatory posted speed limit prevailing at the works location. The use of a Roadworks Speed Limit Order may be appropriate where works of a significant nature and duration are undertaken on a carriageway greater than 60km/h. For such works a roadworks speed limit should be applied while a hazard exists that reduces the appropriate travel speed through the site below that of the permanent speed limit. Only speed limits set out in the Road Traffic Act 2004 (30, 40, 50, 60, 80 or 100km/h) can be selected.

Where it is impractical to apply a roadworks speed limit (e.g., for unpredictable maintenance works, short duration works etc.) or where the desired speed limit is below any enforceable limit, consideration should be given to the application of a cautionary speed plate. Cautionary speed plates shall be selected from the following list: 25, 35, 45, 55, 65, 75 or 85km/h.

VMS

Mobile VMS may be used as driver information signs to inform road users of the timing and reason for works and to explain delays.

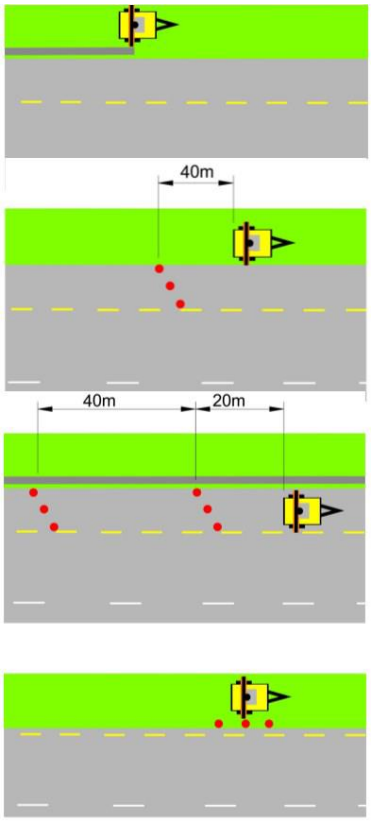
	Scenario 1: VMS protected by existing barrier if access is available.
	Scenario 2: VMS in verge no barrier, full hard shoulder, single line of cones in hard shoulder 40m in advance of sign.
	Scenario 3: VMS on hard shoulder if no access to verge or barrier. 2 lines of cones 20m and 60m in advance of VMS for a 100km/h road (15m and 45m for an 80km/h road).
	Scenario 4: VMS on verge, no hard shoulder. Line of cones placed parallel to the VMS outside of its closest point along the edge of the carriageway.

Figure C1 - Positioning VMS Signs

STATIC OPERATIONS

Static operations are those where the works are confined to a fixed site location. The length of a fixed site should be kept to the minimum required to carry out the operation safely.

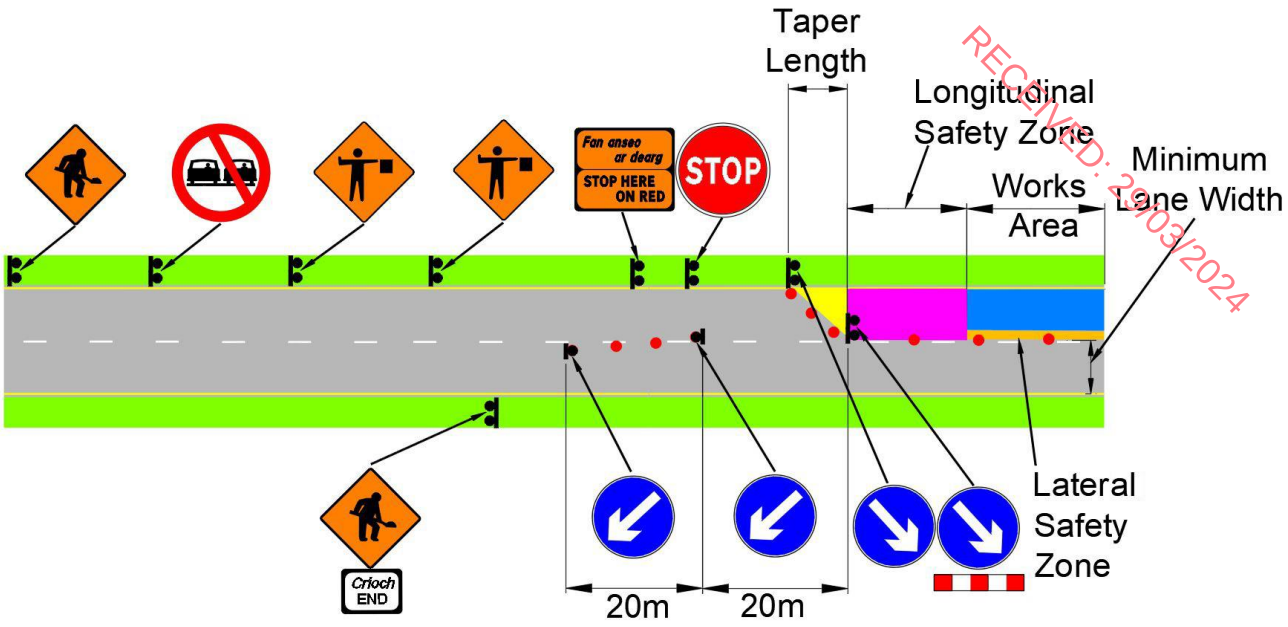


Figure C2 – Works Area Terminology

TRAFFIC CONTROL MEASURES

The following Traffic Control Methods are used for Static Type A and Type B operations:

• Two-Way Traffic;

Two-Way traffic should be maintained past the works where practicable.

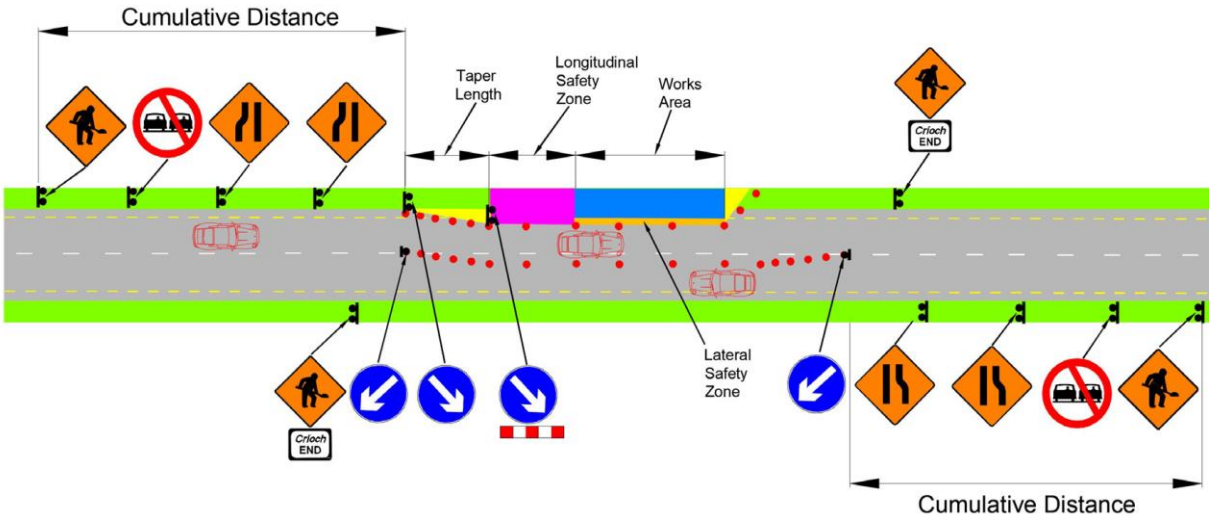


Figure C3 – Two Way traffic Operation

• Give and Take;

The Give and Take system may be used for shuttle working during day light hours provided that:

- there is clear visibility of and through the site for drivers approaching from either direction;

- the speed limit is 50km/h or less (this limitation does not apply where the method is used in conjunction with Semi Static operations);
- the total two-way traffic flow is less than 400 veh/hr (max 3min count 20);
- the total HGV traffic is less than 20 veh/hr (max 3min count 1); and
- the length of shuttle lane past the works does not exceed 50m between ends of tapers.

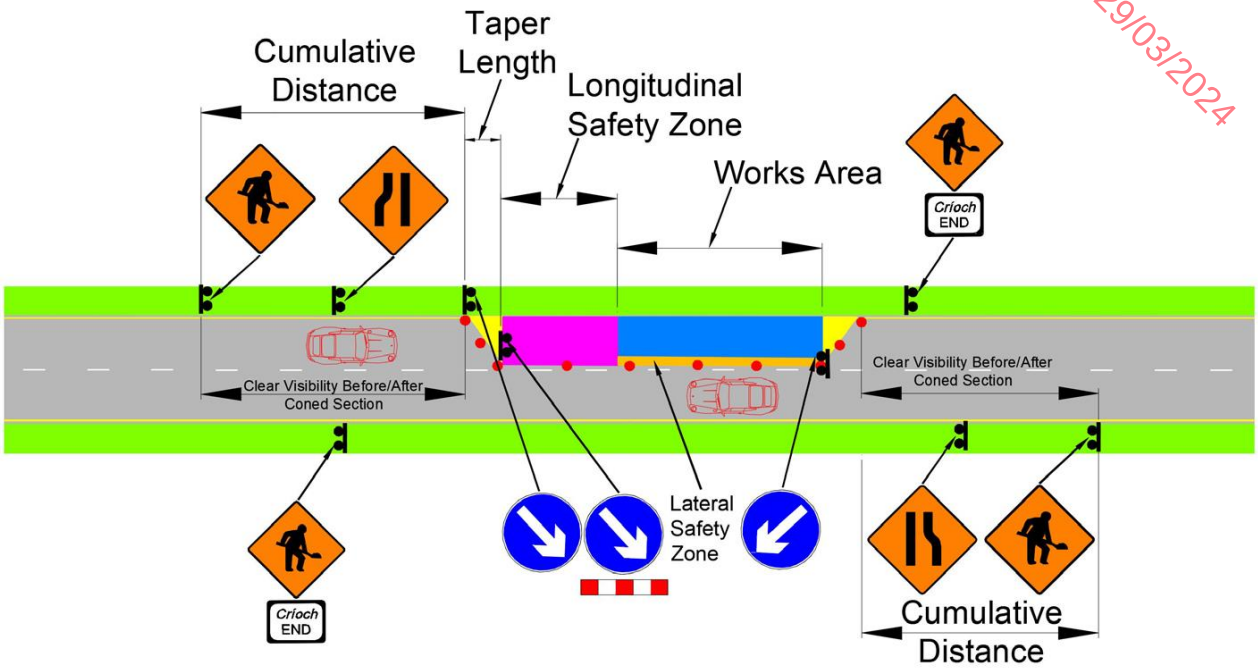


Figure C4 – Give & Take Traffic Control

• Priority;

Priority is established on one approach to the works site by placing a Yield sign, RUS 026, on the opposing approach. The yield sign is in addition to the required number of advance warning signs. Priority control may be applied where all of the following conditions are met:

- the clear visibility requirements either side of the coned area specified in Table C5 are satisfied;

Maximum Speed Limit (km/h)	Clear visibility before and after the coned area (m)
≤ 50	60
60	70
80	80
100	100

Table C5 – Priority Visibility Requirements

- Two-Way traffic flow is less than 850 veh/h (max 3 min count 40)
- the site length (measured from the first cone of the entry taper to the last cone of the exit taper) is not more than 80m.

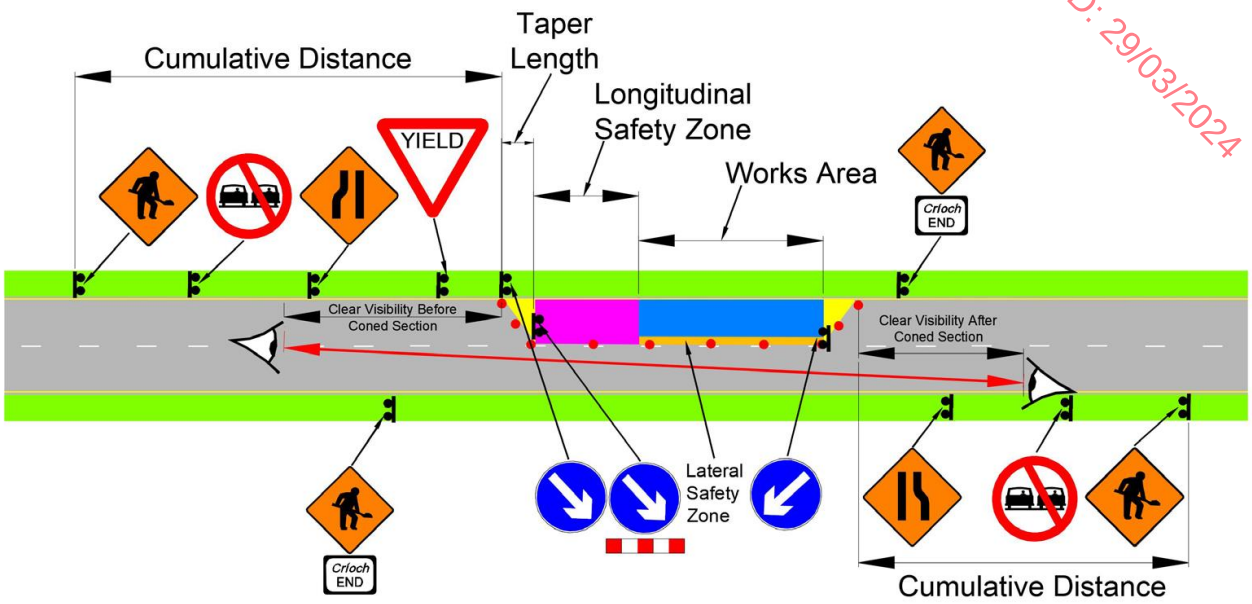


Figure C5 – Priority Traffic Control

• Stop and Go discs;

The Contractor must consult with the Gardaí prior to the implementation of Stop and Go discs.

Using manual or mechanically operated methods, Stop and Go discs can be used at plant crossing points, site access points or on single carriageway roads where traffic is reduced to shuttle working. This method allows traffic flows to move according to the actual demand, thereby reducing congestion, delay and driver frustration. Stop and Go discs are often specified and/or required during peak traffic flow periods on sites where remote control methods, such as temporary traffic signals, are
used during the off-peak periods. For short works (20m or less) manual control at one end or in the middle may be sufficient. For short works at site crossing points or exits, a single operator may use a double-sided STOP batten to control traffic. For works longer than 20m and less than 200m remotely operated Stop and Go discs may be used provided the operator has an unobstructed view of both ends of the site and is not more than 100m from either end. For works longer that 200m, two operators will be required, one at either end of the controlled section. Additional operators may be required to regulate traffic emerging from any junctions within the controlled section. The work site should be limited to a maximum of 500m, including tapers. Preferably, operators should be inter-visible and should be in contact by a suitable and reliable means of communication (e.g., two-way radios).

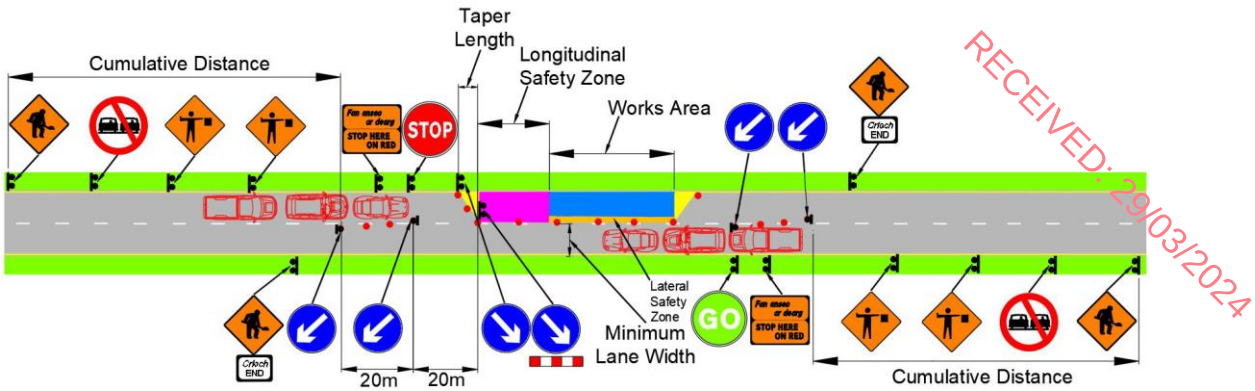


Figure C6 – Stop & Go Traffic Control

• Temporary Traffic Signals;

The Contractor must consult with the Gardaí prior to the implementation of Temporary Traffic Signals. Temporary Traffic Signals may be used at plant crossing points and site access points. They may also be used on single carriageway roads where traffic is reduced to shuttle working at all times on low traffic volume roads and at off-peak times only on roads with high traffic volume. Temporary traffic signals should have an adequate and reliable power supply and be capable of running a number of different phases. Vehicle actuated temporary traffic signals should be used where possible

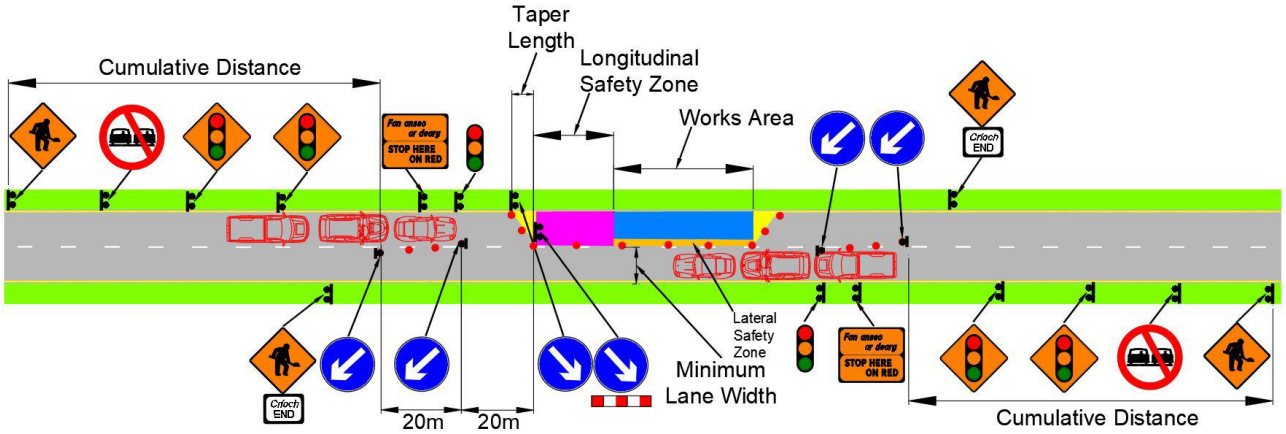


Figure C7 – Temporary Traffic Signals

• All Stop;

An All Stop is generally suitable for short duration works that can be quickly and easily suspended to relieve unacceptable queues and allow for emergency access through the site. The All Stop period should not exceed 10 minutes in rural areas and 3 minutes in urban areas. This method of working is generally not suitable where traffic flows exceed 300veh/hr. This method does not require a Manager's Order. It should not be used if a suitable alternative route is available. Stop and Go discs are operated such that both discs remain on Stop whilst works are being carried out. Traffic queues are relieved periodically by opening up one or both lanes, as applicable.

• **Marshalling;**

Marshalling may be used in conjunction with another traffic control method such as Stop and Go or All Stop where minimum lane widths cannot be provided and traffic is required to encroach on the works area to pass the site. It may also be used to remove the lateral safety zone or move the longitudinal cone run to allow for larger vehicles to pass the works area. All works must be suspended while traffic is being marshalled through the site as minimum lane widths and safety zones are not in place.

• **Convoy Working;**

Where standard TTM arrangements are not feasible because of restricted roadway width and diversion is impractical, a method of Convoy traffic management may be used. In this method, traffic is brought to a halt in advance of the roadworks (usually by using Stop and Go discs) and is then led slowly, in single file, through the site and past the works by an appropriately signed works vehicle. A lateral safety zone is not required for Convoy working. Convoy lane widths should be in accordance with shuttle working lane width requirements and the maximum coned area length for Convoy working should not exceed 500m (except in relation to surface dressing.Traffic flows should be less than 900 - 1000 veh/hr two-way flow when considering the use of Convoy traffic control and the maximum queue to convoy should be 30 vehicles or less. If volumes exceed these values a 3-convoy vehicle system should be deployed.

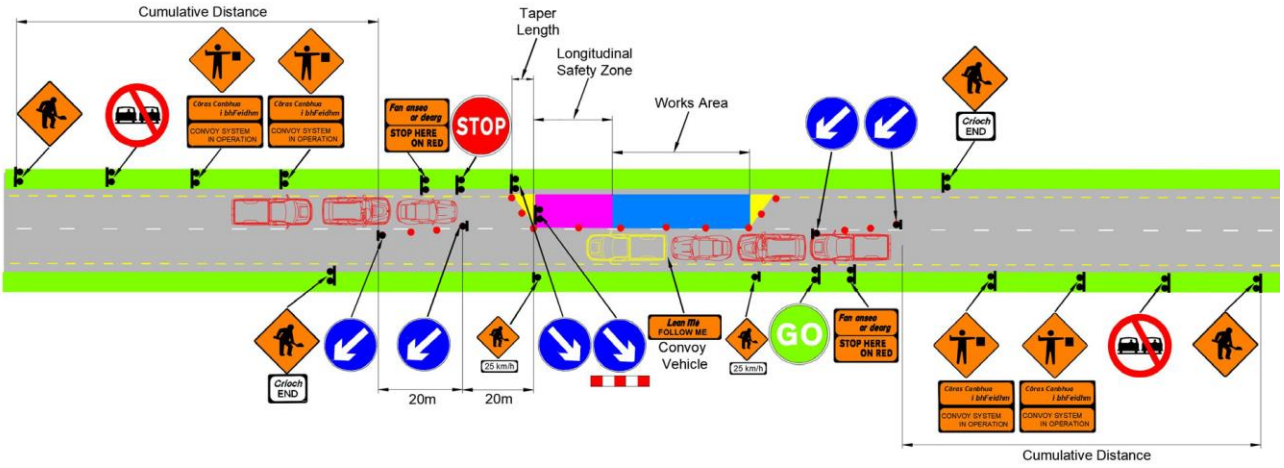


Figure C8 – Convoy Traffic Control

- **Road Closures and Detours.**

The following should be taken into account when planning a road closure with a diversion:

- Suitability of the diversionary route with respect to expected traffic type, flow, etc;
- Suitability of the diversionary route with respect to capacity, width and surface condition;
- Ensuring that the location of access for works vehicles do not adversely affect the diversion route (e.g., by introducing right turn movements);
- Establishing contractual responsibility relating to the signing of the diversion routes;
- Advanced signing detailing the nature, duration and necessity for the works and requirements for detailed directional signing throughout the diversion (per Chapter 8);
- Priority junctions (existing priorities may need to be altered to maintain diverted traffic flow);
- Introducing one-way traffic flow and prohibiting turning movements;
- Changing priority and restricting movements according to vehicle size/weight;

- Presence of railway crossings, narrow bridges or other restrictions on the diversionary route;
- Other works and /or winter maintenance on the diversion route;
- Effect on the environment and safety; and
- Requirements for vulnerable road users.

Traffic should be diverted onto roads with an adequate capacity. Where this is not possible, a oneway diversion should be considered for diverted traffic.

If the effect of the proposed road closure on road users, local residents or businesses is likely to be significant, an information campaign should be undertaken in advance of the works. This should include the following:

- Letter drop to surrounding area explaining the nature, diversions, duration and necessity for the works;
- Notification to local media outlets and AA Road Watch;
- Advance signs detailing nature, duration and necessity for the works;

JUNCTIONS

The preferred objective is to maintain two-way traffic past the obstruction when it is safe to do so. This may be achieved by providing temporary road markings and also “yield” road markings to assist in marshalling traffic. Traffic restrictions such as the prohibition of turning movements may be required, subject to agreement of the Road Authority in consultation with the Gardaí. If suitable, convenient alternative roads are available, temporary diversions should be arranged and signed. Appropriate safety zones should be maintained when working in proximity to a junction. If the full length of a longitudinal safety zone cannot be achieved between the works and the junction the safety zone should be extended past the junction and the full length incorporated prior to the junction.Where the junction is controlled by ‘Yield’ or ‘Stop’ signs and traffic or visibility problems require that the side road or access to be controlled by signals, both the junction and the shuttle lane should be controlled by a multiphase portable signal controller. As appropriate, permanent signage and road markings should be temporarily masked or removed.

Guidance and sample standard TTM layouts for works at junctions are given below. Layouts are shown for works on the junction and where works are on a side road but in close proximity to the junction. The layouts are for guidance purposes and show example scenarios, the TTM Designer should use the principles shown and design parameter tables for each road level when designing TTM for junctions. The examples given are for Type A works on Level 2 roads.

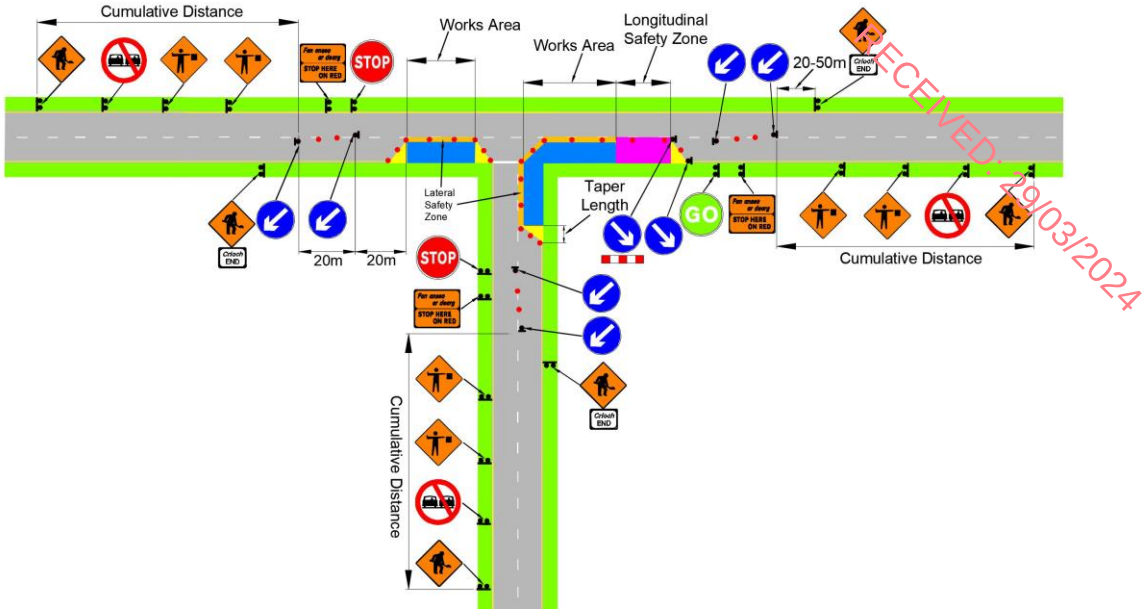


Figure C9 – Works on Main Road at Junction

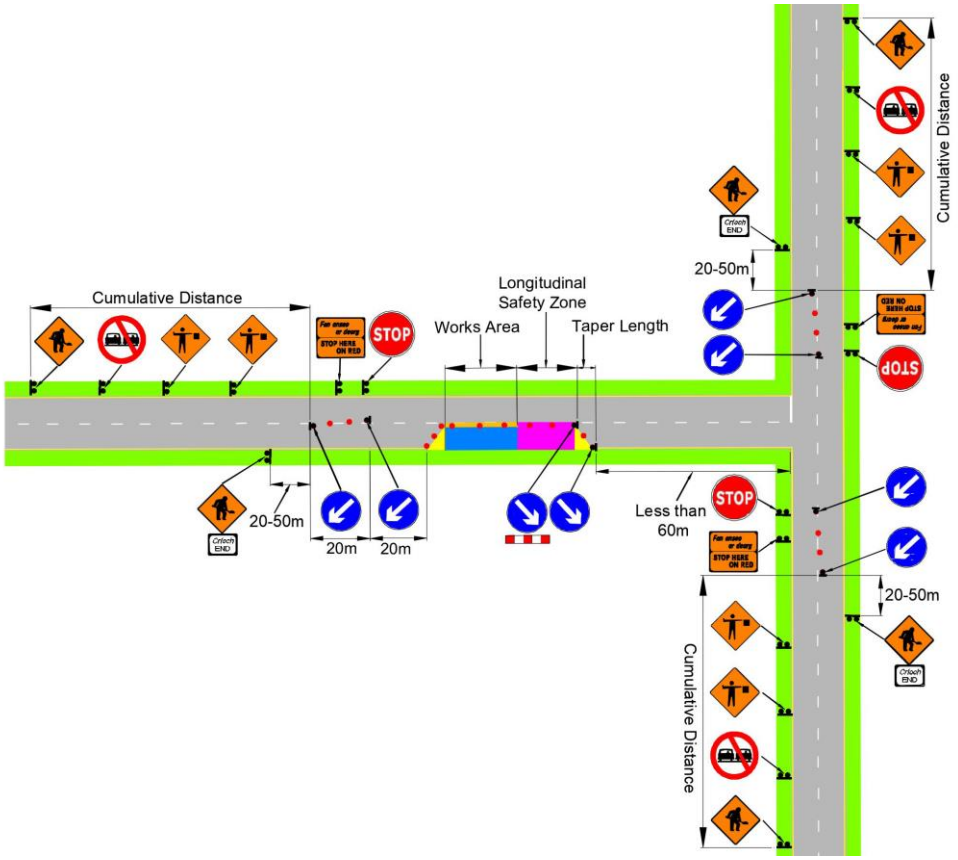


Figure C10 – Works on Side Road <= 60m From Junction

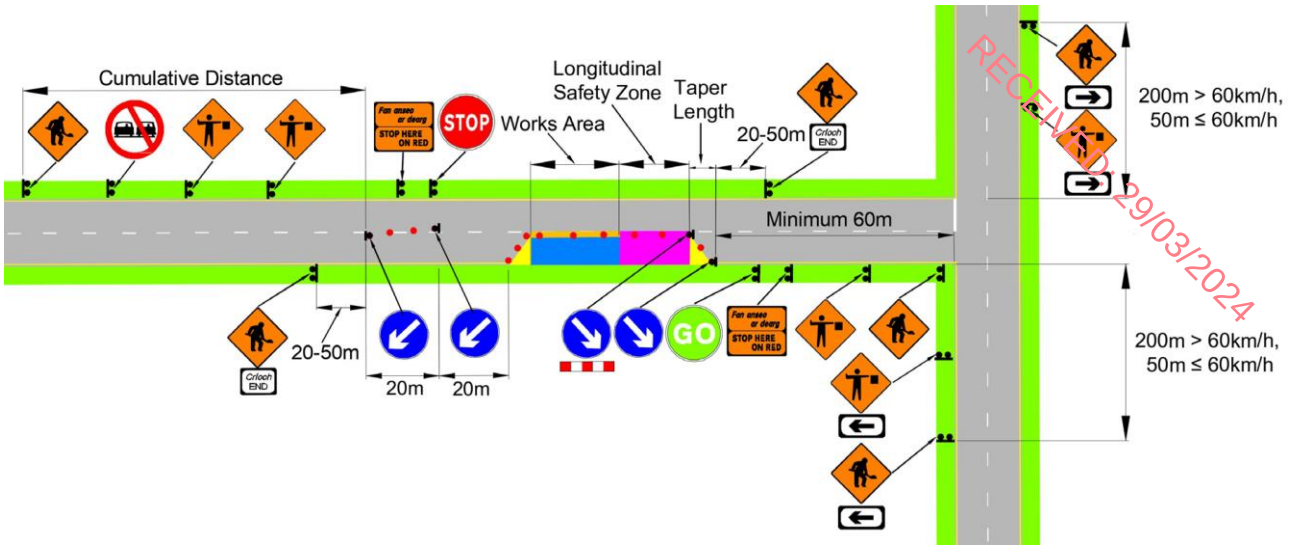


Figure C11 – Works on Side Road > 60m From Junction

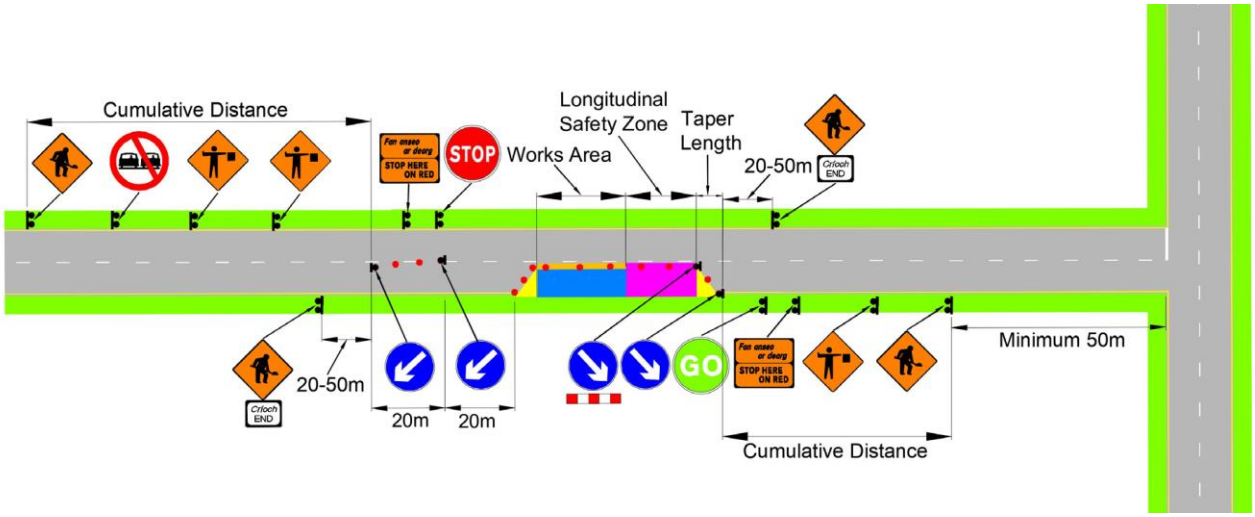


Figure C12 – Works on Side Road > 90m From Junction

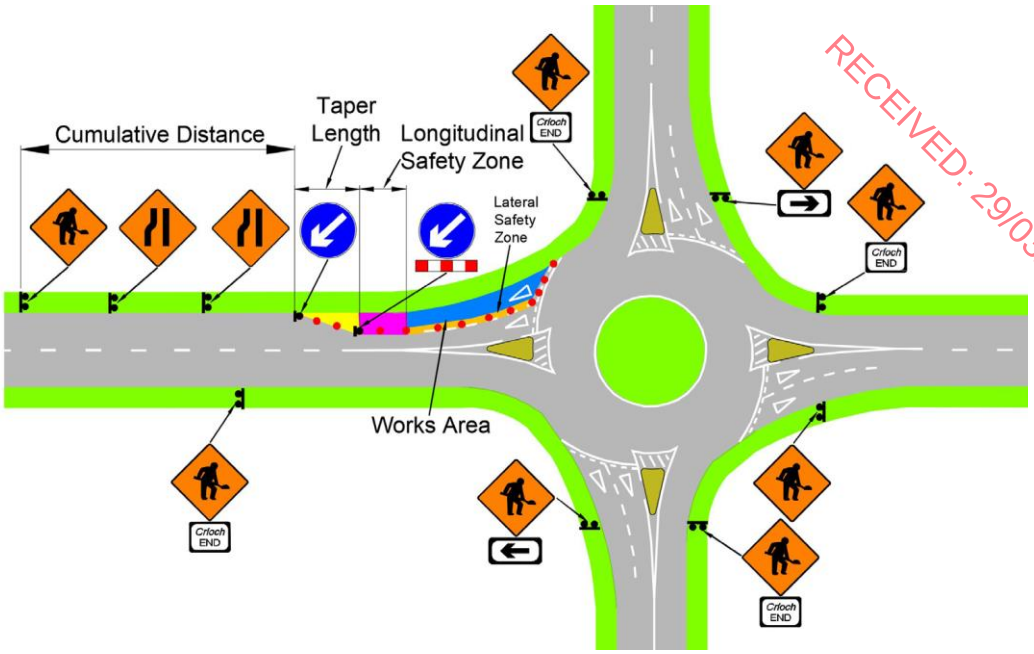


Figure C13 – Works at Entrance to Roundabout

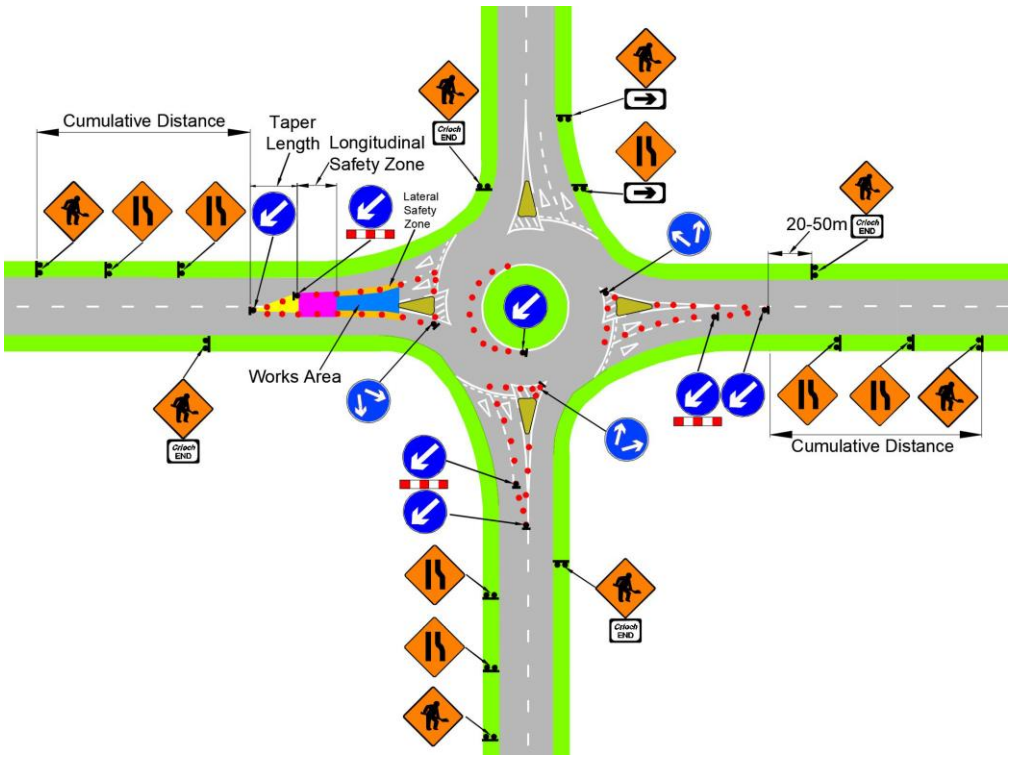


Figure C14 – Works on Central Island at Entrance to Roundabout

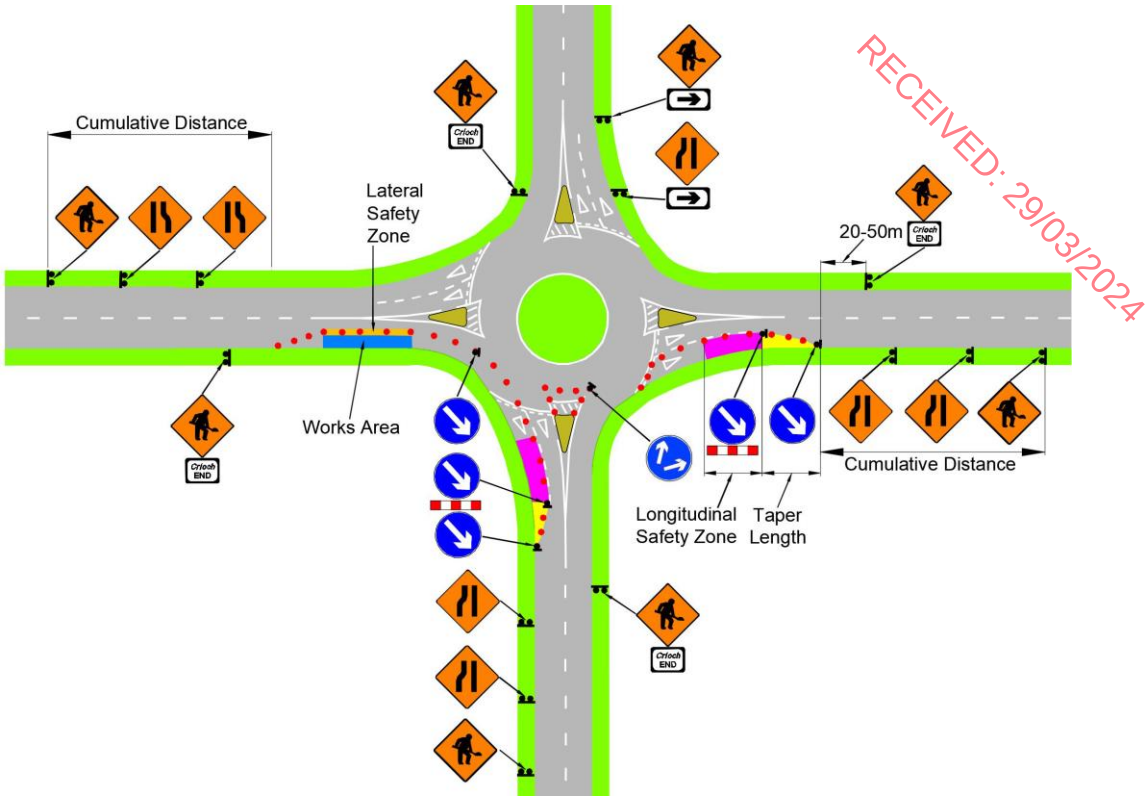


Figure C15 – Works at Exit From Roundabout

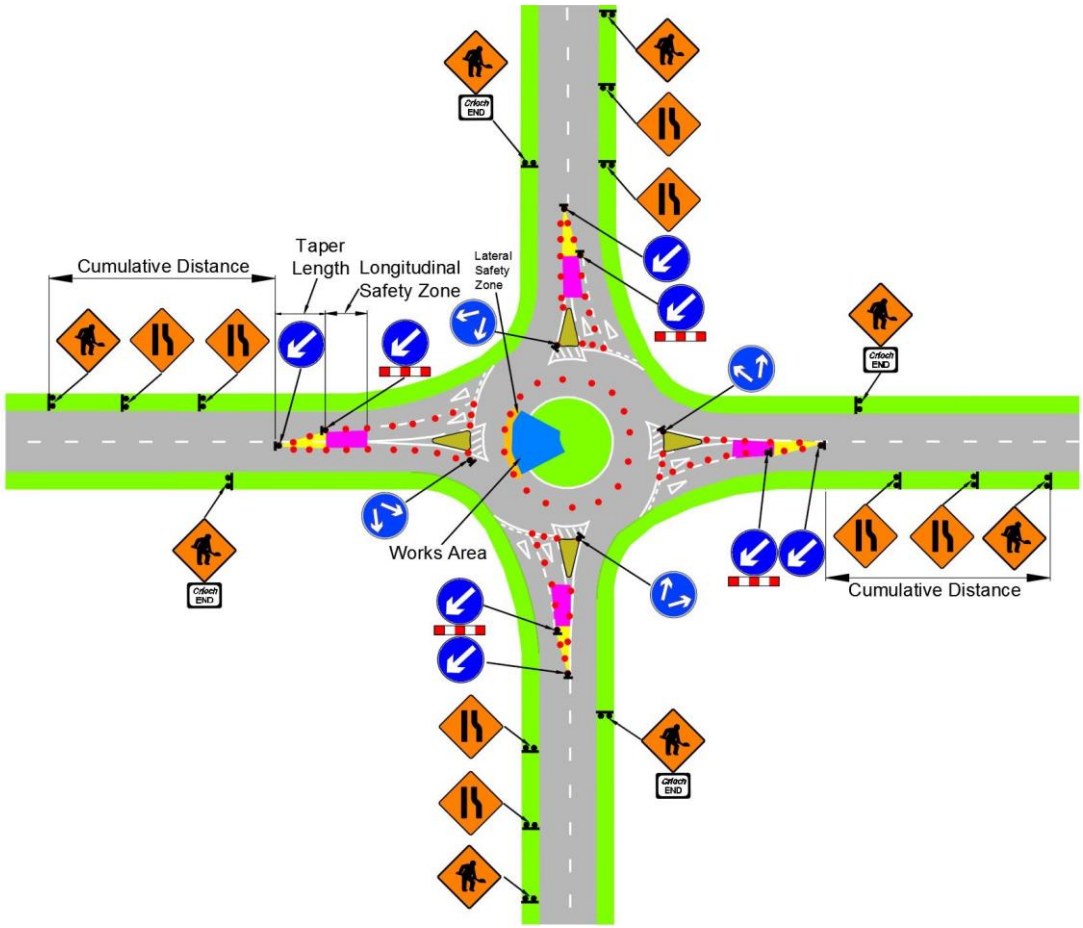


Figure C16 – Works on Roundabout Circulatory

WORKS IN URBAN AREAS

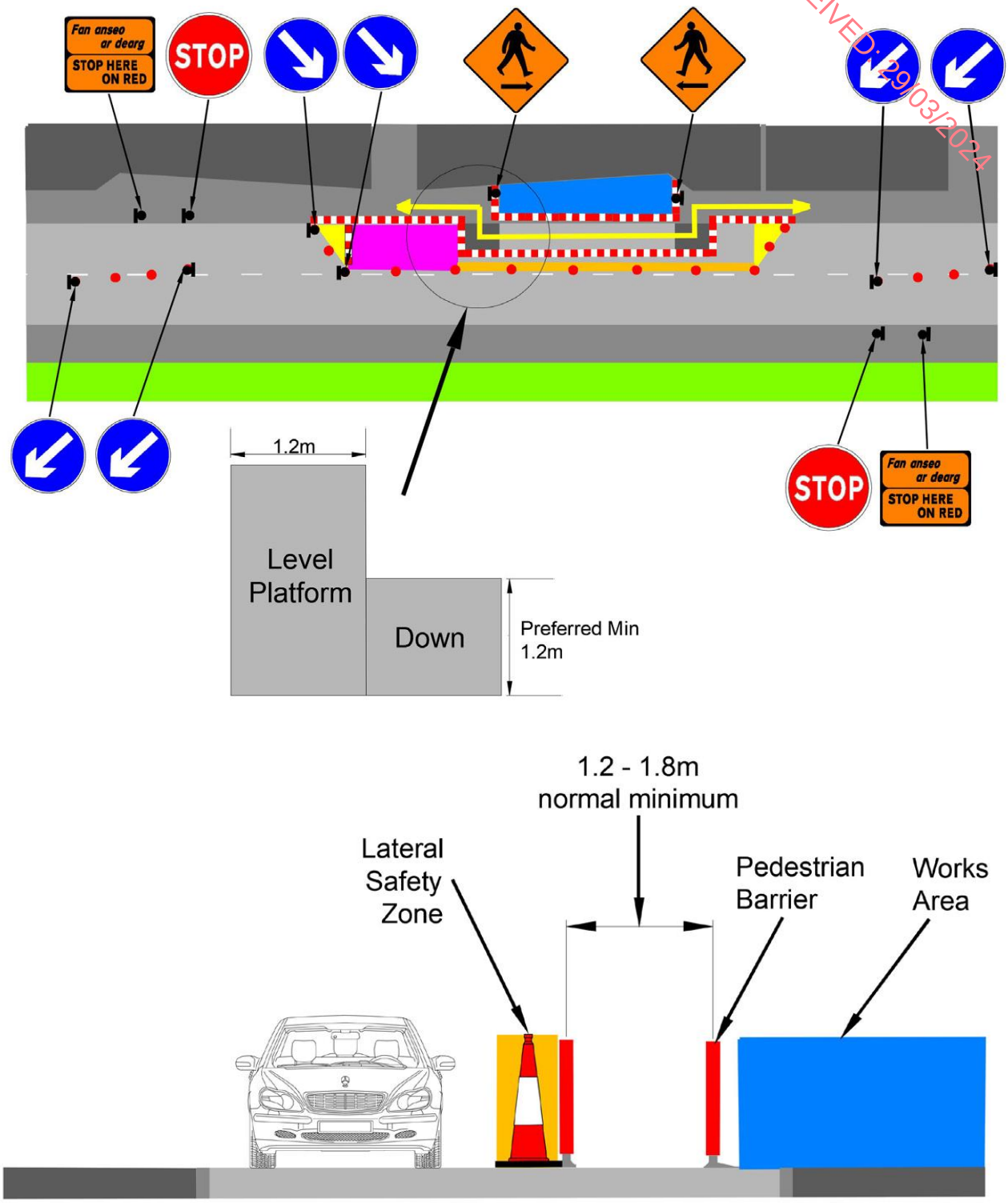


Figure C17 – Temporary Footpath on Carriageway

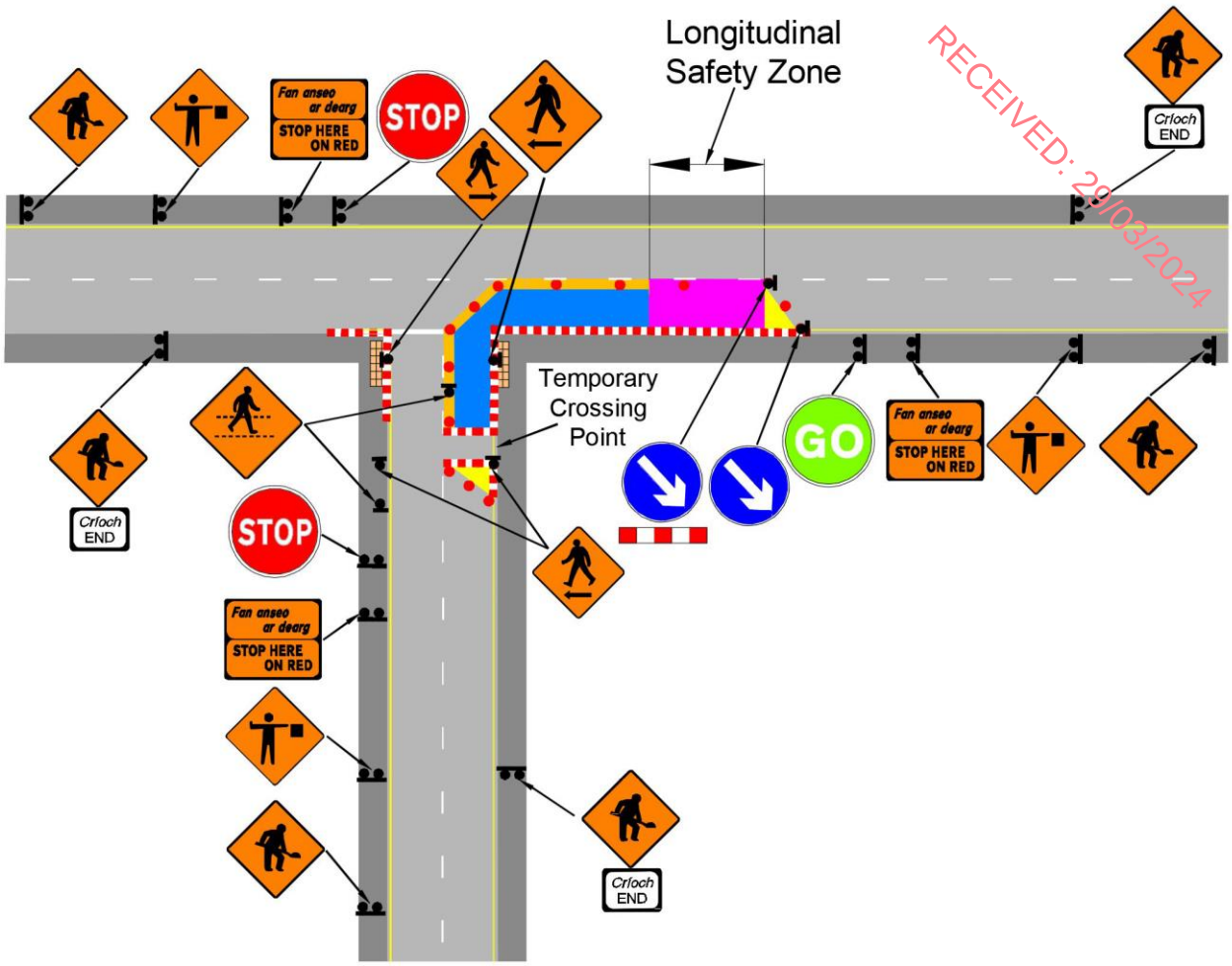


Figure C18 – Temporary Pedestrian Crossing

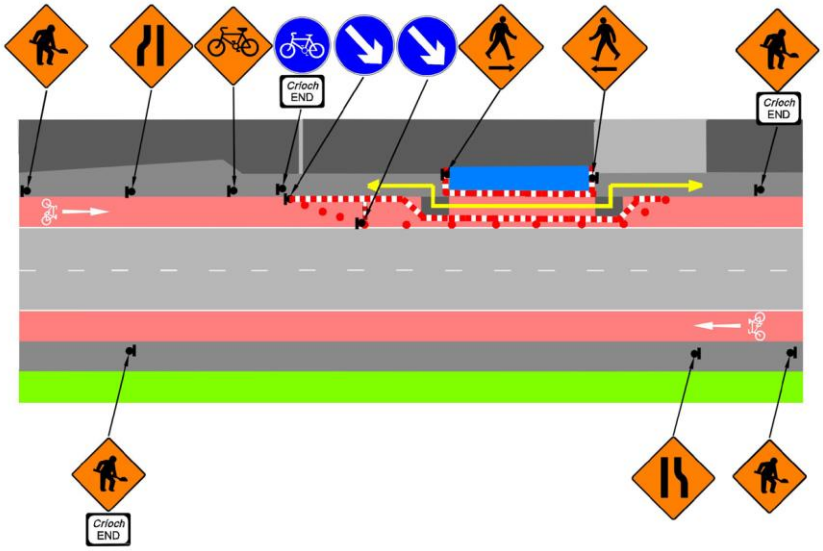


Figure C19 – Closure of Cycle Track

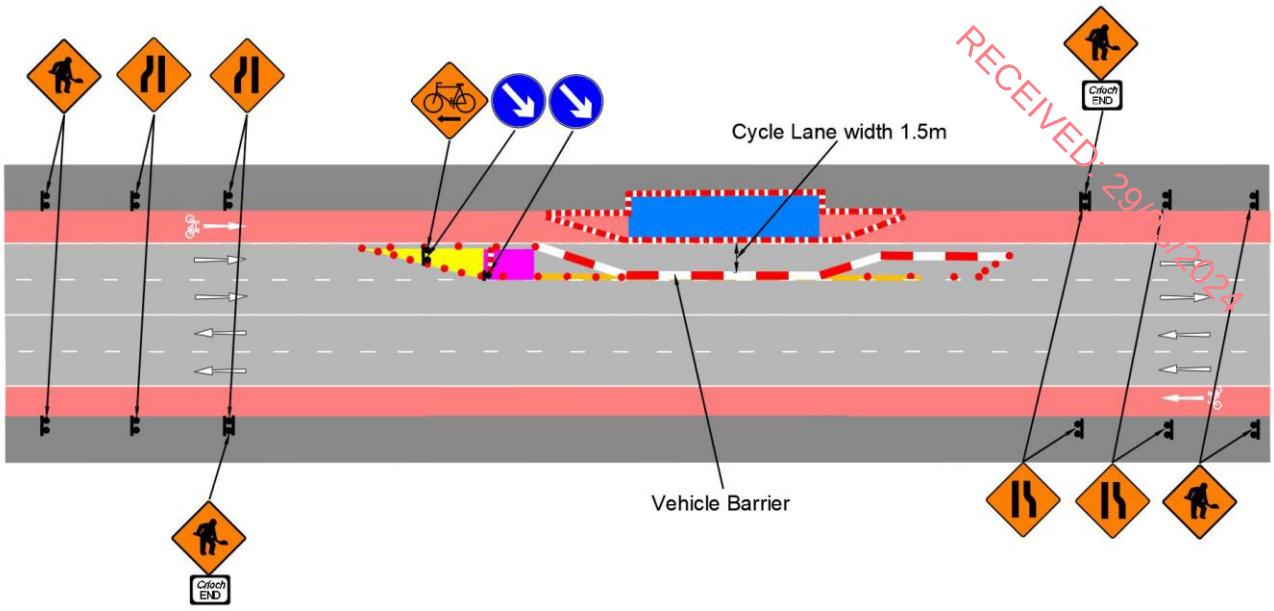


Figure C19 – Closure of Cycle Track With Dedicated Cycle Lane

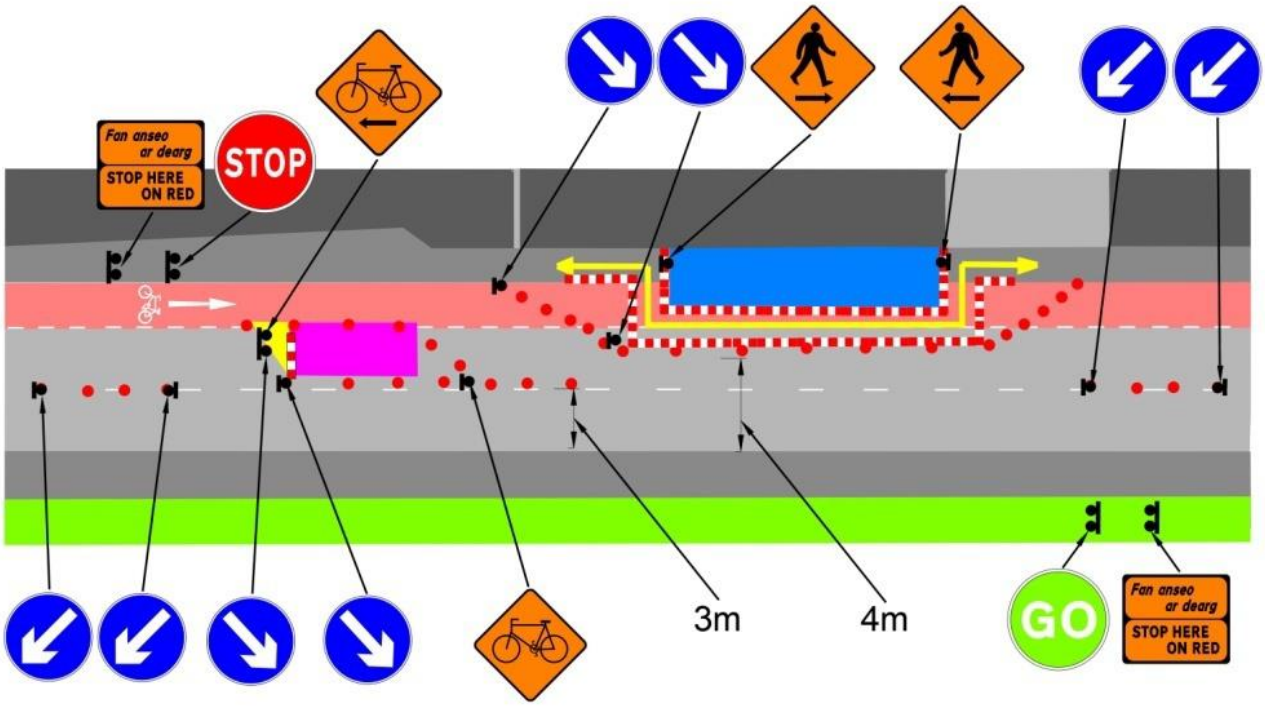


Figure C20 – Provision of Merge Lane for Cyclists