Remedial Natura Impact Statement

Cleanrath Wind Farm

DOCUMENT DETAILS

Client:	**Cleanrath Windfarm Ltd.**
Project Title:	**Cleanrath Wind Farm**
Document Title:	**Remedial Natura Impact Statement**
Document File Name:	***rNIS – F – 2020.08.13 – 191223a***
Prepared By:	**MKO** **Tuam Road** **Galway** **Ireland** **H91 VW84**

MKO Planning and Environmental Consultants

Table of Contents

TABLE OF FIGURES

APPENDICES

1. INTRODUCTION

1.1 Background

In May 2017, An Board Pleanála granted permission for a wind energy development at the site of the Cleanrath wind farm development (ABP Ref. PL04.246742) (hereafter referred to as the 2017 Permission). An Environmental Impact Assessment (EIA) and Appropriate Assessment (AA) was completed by the Board in their consideration of the application and the decision to grant permission for eleven turbines and associated works (including substation and all grid connection works). The decision to grant permission issued on the 19th May 2017 and subject to 22 no. conditions.

The wind farm development has been constructed, has been operational for a short-term period (December 2019 to the end of April 2020) and is now currently operating in Sleep Mode where the turbines are in a controlled mode which is maintained by the turbine manufacturer and are generally not producing electricity pending the outcome of the Substitute Consent process.

This remedial Natura Impact Statement (rNIS) assesses the potential for adverse effects on European Sites arising from all phases of the Cleanrath wind farm development and includes the construction, operational (including the short term operation, current Sleep Mode operation and full operation) and decommissioning phases.

The development and all associated works is hereafter referred to as the Cleanrath wind farm development Judicial Review proceedings challenging the decision of the Board were instituted in July 2017 and culminated in a Supreme Court judgment delivered on 12th December 2019 which held that it was necessary to quash the decision made by the Board to grant the 2017 permission. Subsequently, by way of Order of the Supreme Court, the order quashing the decision to grant the 2017 permission was stayed pending the decision of the Board on this application for substitute consent, on the undertaking of Cleanrath Windfarm Ltd. not to operate the wind farm development other than in accordance with the terms of its letter dated the 30th day of April 2020. In that letter, Cleanrath Windfarm Ltd. confirmed that:

- with effect from 1 May 2020, Cleanrath Windfarm Limited will not operate the Cleanrath wind farm development pending the decision of An Bord Pleanála on the substitute consent procedure received by the Board on 20 December 2019;
- no electricity whatever will be generated by the nine constructed Cleanrath wind farm turbines for export to the national grid (other than in the context of the Eirgrid testing and the 10% protection mode, as set out below). However, Cleanrath Windfarm Limited will run the Cleanrath turbines in "sleep mode" (FM05), whereby the rotors may turn very slowly and which will not generate any electricity for export.
- In circumstances where there is a series of tests that EirGrid plc, as the Transmission Systems Operator (TSO), needs to carry out on the turbines – including Grid Code Compliance tests – , completed in three or four phases over the course of the year(each phase taking 2 or 3 days) and where EirGrid requires that the turbines are in a fully operational mode and exporting to the grid for the duration of each test phase, in order to enable all testing to be undertaken by EirGrid, the turbines will be required to be made fully operational for a maximum of 15 days over the period up to 30 April 2021;
- the grid connection between both the Cleanrath and Derragh wind farm developments and the national grid is authorised by the 2017 permission, whilst the construction of the Derragh turbines and onsite infrastructure is authorised pursuant to a separate grant of permission (ref. no. PL02.245082). In order to enable the continuation of export to the national grid of electricity generated by the operation of the six turbines located at the Derragh windfarm development (which has been ongoing since late 2019), it will be necessary to utilise the grid connection authorised under the 2017 permission. In these circumstances, no electricity whatever will be generated from the Cleanrath wind farm turbines and exported to the

national grid (other than for the purposes of the Eirgrid testing and the 10% protection mode referenced above). Rather, only electricity generated from the Derragh windfarm turbines will be exported to the national grid via the grid connection from Derragh.

On 20 December 2019, an application was made for leave to apply for substitute in relation to the Cleanrath wind farm development and on the May 5th 2020, An Bord Pleanála granted leave to apply for substitute consent (ABP-306272-19) and directed that a remedial Environmental Impact Assessment and a remedial Natura Impact Statement be prepared and included with the application.

McCarthy Keville O'Sullivan Ltd. (MKO) has been appointed to prepare a Remedial Natura Impact Statement (rNIS) to allow the competent authority to conduct an Appropriate Assessment under Part XAB of the Planning and Development Acts 2000-2020 of a constructed wind energy development and all associated infrastructure located at Cleanrath, Co. Cork. This rNIS assesses the potential for effects on European Sites to have occurred prior to and during construction, during the brief period that the wind farm was operational and during the period that the development has been in sleep mode. It also assesses any potential for effects that may yet occur during any future operation and/or decommissioning (either at the end of the 25year lifespan of the wind farm or should it be decommissioned at another time)

A remedial Appropriate Assessment Screening Report has been prepared for this application. This remedial Appropriate Assessment Screening Report identified the European Sites upon which the constructed development has the potential to result or have resulted in significant effects and the pathways by which those effects may occur. It has also identified those qualifying interests/special conservation interests that have the potential to be affected by the Cleanrath wind farm development. The Screening Report identifies the European Sites upon which significant effects could not be excluded at the screening stage and those sites are assessed in this Natura Impact Statement.

This report has been prepared in compliance with Part XAB of the Planning and Development Acts 2000-2020, the Planning and Development Regulations 2001-2020 and relevant jurisprudence of the European and Irish courts. It has also been prepared in accordance with the European Commission guidance document Assessment of Plans and Projects Significantly affecting Natura 2000 Sites: Methodological Guidance on the provisions of Article 6(3) and 6(4) of the Habitats Directive 92/43/EEC (EC, 2001), European Communities (2018) Managing Natura 2000 Sites: the provisions of Article 6 of the 'Habitats' Directive 92/43/EEC, Office for Official Publications of the European Communities, Luxembourg. European Commission and the Department of the Environment's Guidance on the Appropriate Assessment of Plans and Projects in Ireland (December 2009, amended 11 February 2010).

In addition to the guidelines referenced above, the following relevant guidance was considered in preparation of this report:

Council of the European Commission (1992) Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora. Official Journal of the European Communities. Series L 20, pp. 7-49.
European Communities (2000) Managing Natura 2000 Sites: the provisions of Article 6 of the 'Habitats' Directive 92/43/EEC, Office for Official Publications of the European Communities, Luxembourg. European Commission,
EC (2007) Guidance document on Article 6(4) of the 'Habitats Directive' 92/43/EEC – Clarification of the concepts of: alternative solutions, imperative reasons of overriding public interest, compensatory measures, overall coherence, opinion of the commission. European Commission.
EC (2013) Interpretation Manual of European Union Habitats. Version EUR 28. European Commission.
CIEEM (2018) Institute of Ecology and Environmental Management Guidelines for Ecological Impact Assessment.

1.2 Statement of Authority

This report has been prepared by Sarah Mullen (B.Sc., Ph.D., ACIEEM) and Pat Roberts (B.Sc. Environmental Science, MCIEEM). Pat has over 15 years' experience in ecological management and assessment and is a full member of the Chartered Institute of Ecology and Environmental Management. Sarah has 4 years' professional ecological consultancy experience.

Ecological surveys were conducted by McCarthy Keville O'Sullivan (MKO) ecologists; Pat Roberts (B.Sc., MCIEEM), David McNicholas (B.Sc., M.Sc., MCIEEM), Julie O'Sullivan (B.Sc., M.Sc.), Claire Stephens (B.Sc (Env.)) and Luke Dodebier (B.Sc. (Ecol.). All surveyors have relevant academic qualifications and experience in undertaking the ecological surveys and assessments that they undertook.

Ecological surveys were undertaken by Dixon Brosnan ecological consultants to inform the EIS for the project that was submitted for planning in 2015. These surveys and assessments are referred to in this document and were ground truthed and updated by the surveyors listed above.

1.3 Structure and Format of this rNIS

This rNIS firstly provides a summary of the findings of the Article 6(3) Remedial Appropriate Assessment Screening Report (which clearly identifies the European Sites that have the potential to be (or have been) significantly affected by the Cleanrath wind farm development and the pathways by which they might be affected). Following this, all elements of the Cleanrath wind farm development are fully described, as is the baseline environment, with respect to the relevant QI/SCI of the European Sites "screened in" for Stage 2 Appropriate Assessment.

Section 5 provides an assessment of the potential for adverse effects to occur or have occurred on the identified European Sites and prescribes mitigation to robustly prevent or have prevented impacts.

Section 6 provides an assessment of residual effects taking into consideration the proposed and implemented mitigation.

In Section 7, the potential in combination effects of the Cleanrath wind farm development on European Sites to occur or have occurred, when considered in combination with other plans and projects are considered.

A concluding statement is provided in Section 8.

.

2. CONCLUSIONS OF ARTICLE 6(3) APPROPRIATE ASSESSMENT SCREENING REPORT

The Article 6(3) Appropriate Assessment Screening report identified the potential for the Cleanrath wind farm development to result or have resulted in significant effects on the following European Sites:

- The Gearagh cSAC
- The Gearagh SPA
- Mullaghanish to Musheramore SPA

Each of these sites is discussed individually below in terms of the Qualifying Interests/Special Conservation Interests with the potential to be affected and the pathways by which any such effects may occur or have occurred.

2.1 The Gearagh cSAC

This cSAC is located hydrologically downstream of the development via the River Toon which runs through the development site and via the River Lee, which is located downstream of the development site. Therefore, taking a precautionary approach, a potential pathway for indirect effects to occur or have occurred on the following QI habitats and species, in the form of deterioration of surface water quality resulting from pollution, associated with the construction, operational and decommissioning phases of the development was identified:

- Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation [3260]
- Rivers with muddy banks with Chenopodion rubri p.p. and Bidention p.p. vegetation [3270]
- Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae) [91E0]
- *Lutra lutra* (Otter) [1355]

It cannot be excluded, on the basis of objective information, that the Cleanrath wind farm development, individually or in combination with other plans or projects, will not have or has not had a significant effect on this European site. Accordingly, a Stage Two Appropriate Assessment is required.

2.2 The Gearagh pSPA

This pSPA is located hydrologically downstream of the development via the River Toon which runs through the development site and via the River Lee, which is located downstream of the development site. Therefore, taking a precautionary approach, a potential pathway for indirect effects to occur or have occurred on the following SCI habitat, in the form of deterioration of surface water quality resulting from pollution, associated with the construction, operational and decommissioning phases of the development was identified:

- Wetland and Waterbird [A999]

It cannot be excluded, on the basis of objective information, that the Cleanrath wind farm development, individually or in combination with other plans or projects, will not have or has not had a significant effect on this European site. Accordingly, a Stage Two Appropriate Assessment is required.

2.3 Mullaghanish to Musheramore Mountains SPA

Whilst this European Site is located outside the Core Foraging Range of the SCI Species, hen harrier (as identified in '*Assessing Connectivity with Special Protection Areas'* (Scottish Natural Heritage, 2016)), it is located within the maximum foraging range for this species. As hen harrier were recorded on the

Cleanrath wind farm development site during the extensive surveys undertaken (occasionally during the winter period), following the precautionary principle, the potential for significant effects on this species could not be excluded:

- Hen harrier [A082]

It cannot not be excluded, on the basis of objective information, that the Cleanrath wind farm development, individually or in combination with other plans or projects, will not have or has not had a significant effect on this European site. Accordingly, a Stage Two Appropriate Assessment is required.

3. DESCRIPTION OF CLEANRATH WIND FARM DEVELOPMENT

3.1 Site Location

The Cleanrath wind farm development is located approximately 2.7 km south of the village of Reanaree, Co. Cork. The majority of the cable route is located in County Cork with a relatively short portion (1.99 km) located in County Kerry. The townlands within which the windfarm development are listed below in Table 3.1. The Grid Reference co-ordinates for the approximate centre of the site are E120,520 N69,583. The town of Macroom is located approximately 12 kilometres south west of the study area and Inchigeelagh is located approximately 2.5 kilometres to the south. The site location including the grid connection route is shown in Figure 3 -1.

Table 3-3-1 Townlands within which the Cleanrath wind farm development is located

Townland	
Reananerree	Cloontycarthy
Cleanrath North	Derrineanig
Cleanrath South	Milmorane
Coombilane	Rathgaskig
Augeris	Gorteenakilla
Carrignadoura	Gurteenowen
Gurteenflugh	Lyrenageeha
Lackabaun	

3.2 Characteristics of the Cleanrath wind farm development

This section of the rNIS describes the Cleanrath wind farm development. The full description of the Cleanrath wind farm development is as follows:

1. *9 No. wind turbines with a ground to blade tip height of 150 metres and all associated foundations and hard-standing areas.*
2. *All associated underground electrical (33kV & 38kV) and communications cabling connecting the turbines to the national electricity grid.*
3. *Upgrade of existing access junctions and roads.*
4. *Upgrade of existing and provision of new site access roads.*
5. *Borrow pit.*
6. *Temporary construction compound.*
7. *Accommodation works along the turbine delivery route*

8. *Temporary roadway to facilitate turbine delivery.*
9. *Forestry Felling*
10. *Site Drainage*
11. *The operation of the wind farm for a period of 25 years.*
12. *The decommissioning of the wind farm, removal of turbines and restoration of the site.*
13. *All associated site development and ancillary works.*

The application for substitute consent for the Cleanrath wind farm development includes the connection to the national electricity grid. All elements of the Cleanrath wind farm development, including grid connection and any works completed on public roads to accommodate turbine delivery, have been assessed. Any effects associated with the ongoing operation of the wind farm and its decommissioning have been assessed.

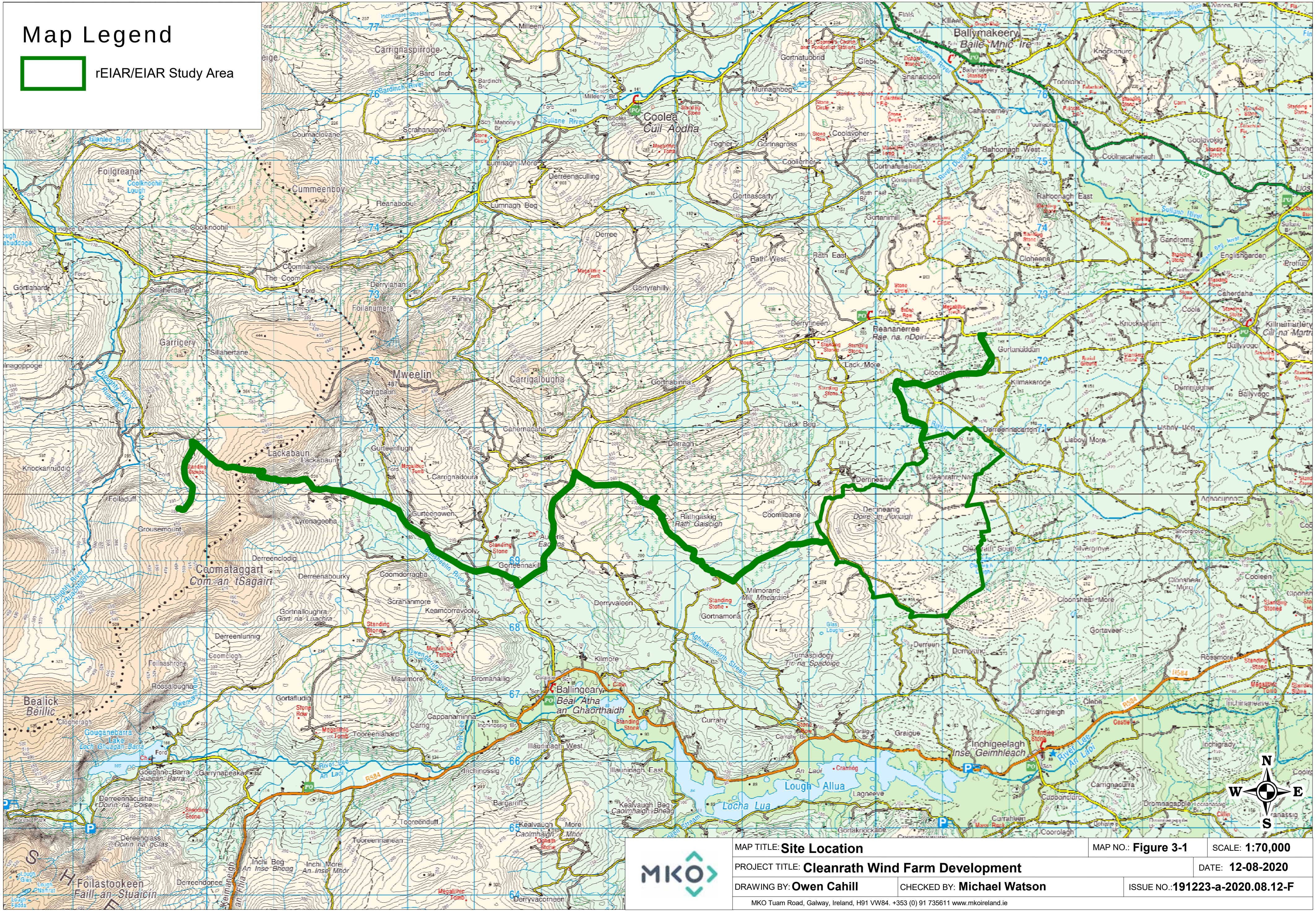
This application seeks substitute consent for 25-year operational life from the date of commissioning of the entire wind farm.

A fully detailed description of the Cleanrath wind farm development is provided below.

3.3 Development Layout

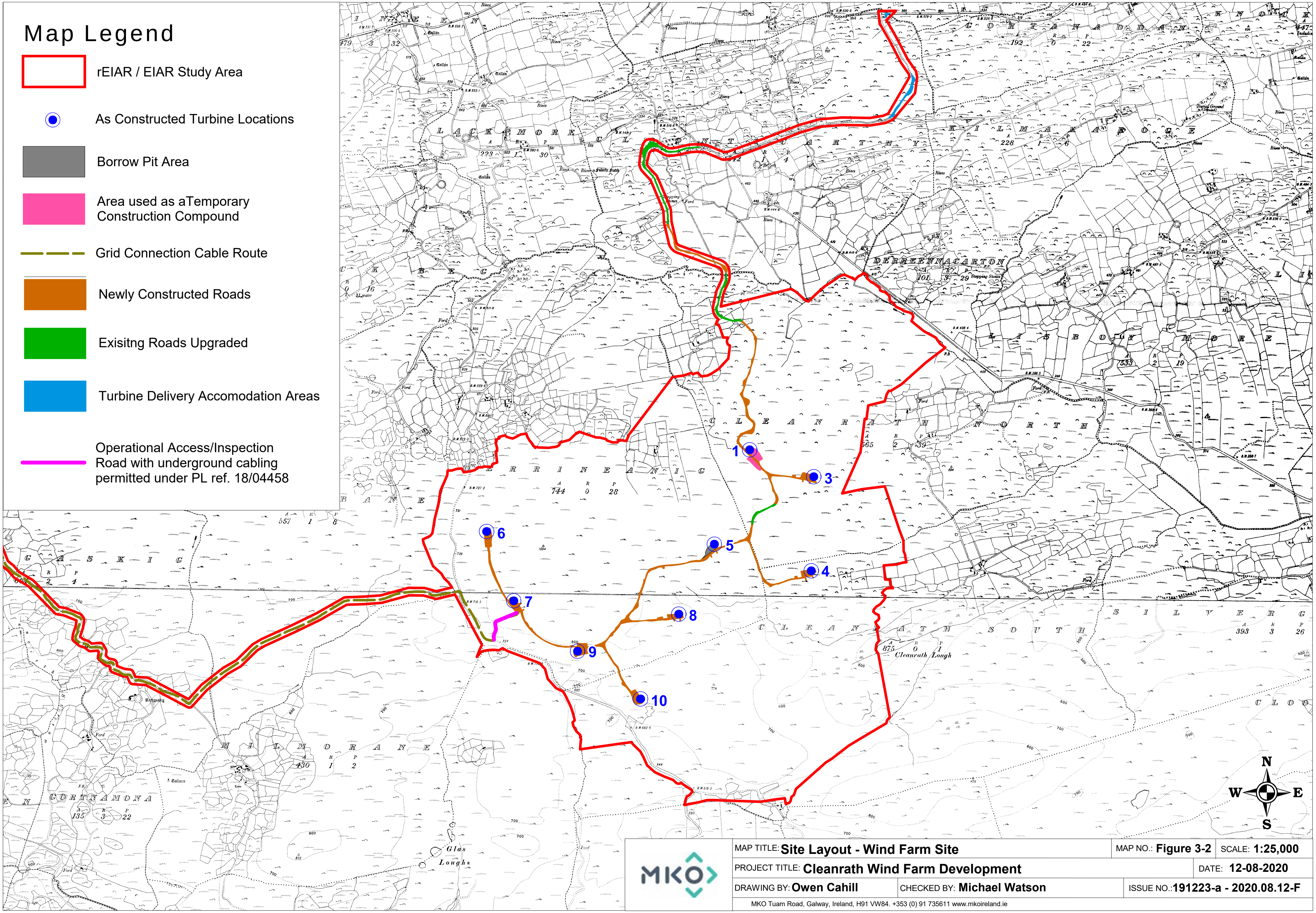
The layout of the Cleanrath wind farm development was designed to minimise the potential environmental impacts while at the same time maximising the energy yield of the wind resource passing over the site. A detailed constraints study was carried out in order to ensure that no turbines or ancillary infrastructure are located in the more environmentally sensitive areas of the site. The layout of the Cleanrath wind farm development makes maximum use of the existing access road and tracks within the site.

The overall layout of the Cleanrath wind farm development is shown on Figure 3-2. This map shows the current locations of the wind turbines (as previously permitted), borrow pit, internal roads layout, the main site entrance and the area used as a temporary construction compound during construction. Detailed layout drawings of the Cleanrath wind farm development are included as Appendix 1 to this report.



MAP TITLE: Site Location		MAP NO.: Figure 3-1	SCALE: 1:70,000
PROJECT TITLE: Cleanrath Wind Farm Development			DATE: 12-08-2020
DRAWING BY: Owen Cahill	CHECKED BY: Michael Watson	ISSUE NO.: 191223-a-2020.08.12-F	

MKO Tuam Road, Galway, Ireland, H91 VW84. +353 (0) 91 735611 www.mkoireland.ie


Map Legend
rEIAR / EIAR Study Area
As Constructed Turbine Locations
Borrow Pit Area
Area used as aTemporary Construction Compound
Grid Connection Cable Route
Newly Constructed Roads
Exisitng Roads Upgraded
Turbine Delivery Accomodation Areas
Operational Access/Inspection Road with underground cabling permitted under PL ref. 18/04458
1
3
4
5
6
7
8
9
10
N
W
E
S
MKO
MAP TITLE: Site Layout - Wind Farm Site
MAP NO.: Figure 3-2
SCALE: 1:25,000
PROJECT TITLE: Cleanrath Wind Farm Development
DATE: 12-08-2020
DRAWING BY: Owen Cahill
CHECKED BY: Michael Watson
ISSUE NO.:191223-a - 2020.08.12-F
MKO Tuam Road, Galway, Ireland, H91 VW84. +353 (0) 91 735611 www.mkoireland.ie

3.4 Development Components

3.4.1 Wind Turbines

3.4.1.1 Wind Turbine Locations

The current installed wind turbine layout was constructed in accordance with a design which was optimised using wind farm design software to maximise the energy yield from the site, while maintaining sufficient distances between the turbines to ensure turbulence and wake effects would not compromise turbine performance. The as constructed grid reference co-ordinates of the installed turbine locations and associated foundation levels are listed in Table 3-1 below. The turbine numbering of the installed turbines was altered for operational purposes, however for ease of reference, the turbine numbering used corresponds to that of 2017 Permission application documentation. The corresponding installed turbine number is provided in the Table 3-2 below.

Table 3-2 Wind Turbine Locations and Elevations

Turbine Number	New Turbine Number (as per signage on site)	Irish Grid Coordinates		Top of Foundation Elevation (m OD)
		Easting	Northing	
1	15	120871	70057	209
3	14	121213	69913	213
4	13	121200	69411	190
5	12	120682	69553	208
6	7	119466	69620	260
7	8	119610	69250	253
8	11	120493	69178	222
9	9	119952	68981	228
10	10	120288	68725	229

3.4.1.2 Turbine Type

Wind turbines harness the energy from the wind and convert it into electricity. A wind turbine, as shown in Plate 3-1 below, consists of four main components:

- Foundation unit
- Tower
- Nacelle (turbine housing)
- Rotor

Plate 3-1 Wind Turbine Components.

The installed wind turbines have a ground to blade tip height of approximately 150 metres.

The turbine model installed on site is the Nordex N117 which has a hub height of 91m and a rotor diameter of 117m

The wind turbines are conventional three-blade turbines and are all geared to ensure the rotors of all turbines rotate in the same direction at all times. The turbines are light grey matt colour.

A drawing of the wind turbine is shown in Appendix 1. The individual components of a typical geared wind turbine nacelle and hub are shown in Figure 3-3 below.

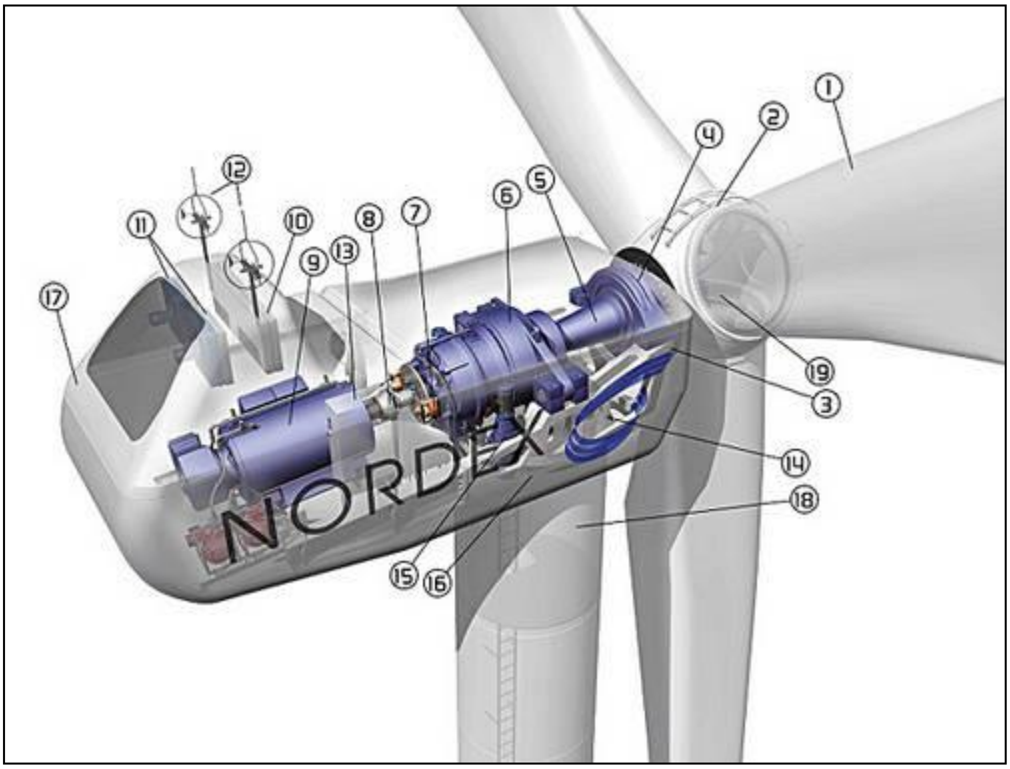


Figure 3-3 Turbine nacelle and hub components

1.Rotor Blades	2.The Hub	3.The Turbine Frame
4.The Rotor Bearing	5.The Rotor Shaft	6.The Gearbox
7.The Disk Brake	8.The Generator Coupling	9.The Generator
10.The Cooling Radiator	11.The Fan Coolers	12.The Wind Measuring System
13.The Control System	14.The Hydraulic System	15.The Yaw Drive
16.The Yaw Bearing	17.The Nacelle Cover	18.The Tower
19.The Pitch system		

3.4.1.3 Turbine Foundations

Each wind turbine is secured to a reinforced concrete foundation that is installed below the finished ground surface. The size of the foundations installed vary between 20.2 – 21.8 metres in diameter in a circular configuration. The turbine foundation transmits any load on the wind turbine into the ground. The horizontal and vertical extent of a turbine's foundation is shown in Appendix 1.

After the foundation level of each turbine has been formed on competent strata, the bottom section of the turbine tower "Anchor Cage" is levelled and reinforcing steel is then built up around and through the anchor cage (Plate 3-2 below). The outside of the foundation is shuttered with demountable formwork to allow the pouring of concrete (Plate 3-3 below) and is backfilled accordingly with appropriate granular fill to finished surface level (Plate 3-4 below).

Plate 3-2 Turbine Base 'Anchor Cage'

Plate 3-3 Turbine Foundation Poured

Plate 3-4 Turbine Foundation Back-fill Complete

3.4.1.4 Hard Standing Areas

Hard standing areas consisting of levelled and compacted hardcore are installed around each turbine base to facilitate access, turbine assembly and turbine erection. The hard standing areas are used to accommodate cranes used in the assembly and erection of the turbine, offloading and storage or turbine components, and generally provide a safe, level working area around each turbine position. The hard standing areas are extended to cover the turbine foundations once the turbine foundation is in place. The sizes, arrangement and positioning of hard standing were installed as per turbine supplier's requirements. The installed turbine hard standing areas which have been optimised at each turbine location so that they were accommodated by the topography, position of the site access road, the turbine position and the turbine supplier's requirements are shown on the layout drawings included as Appendix 1.

The hard standing areas were developed to provide levelled assembly areas within the footprint of each hard stand. This ensured an appropriately sized area for offloading turbine blades and tower sections from trucks prior to being lifted into position by cranes., These levelled areas were provided within the hard standing areas outlined in the as constructed drawings in Appendix 1 with an example from the Cleanrath wind farm development in Plate 3-5.

Plate 3-5 Access Road at the entrance to Turbine no. 10 with Turbine no. 9 and hardstand area arrangement in the background

3.4.2 Site Roads

The Cleanrath wind farm development site is accessed via the existing junction between the L3402 and the local road in the townland of Cloontycarthy adjacent to the sawmill, through a new turbine delivery accommodation roadway for abnormal loads and then via an existing commercial forestry entrance off the local road and into the site as outlined in Figure 3-2 above. From this site entrance, a network of forestry tracks and a local public road traverse the northern half of the site. Maximum use was made of the existing road and tracks in accessing the turbine locations which minimised the requirement for new roadways within the site.

Straight sections of existing and new roadways were installed to a running width of c.6 metres to accommodate the transportation of large turbine components. Corners and junctions are installed wider than six metres to allow the trucks to manoeuvre around bends. All site access roads as part of the Cleanrath wind farm development, both existing and new, were installed to comply with the turbine supplier's requirements. The material used for upgrade and construction of roads within the site was obtained from an on-site borrow pit and areas where stone material was won on site as part of the cut and fill of roads and turbine areas. Plate 3-6 shows a site road under construction with a completed site road shown in Plate 3-7.

Plate 3-6 Site Road Under Construction

Plate 3-7 Completed Site Road

3.4.2.1 Existing Roads for Use and Upgrade

The existing roadways through the site have been upgraded and widened where required for providing access to the turbine locations. The road upgrade involved the widening of 1.3 kilometres of existing on-site roadways to as part of the Cleanrath wind farm development to a total running width of approximately six metres, with wider section at corners and on the approaches to turbine locations, and the laying of a new surface dressing on the existing section of roadway where necessary. Widening was carried out on either side of the existing road whilst respecting the location of existing roadside drainage already in place and where necessary widening taking place on the opposite side of the road to the roadside drainage. The locations of the existing on-site roads that required upgrade are shown in Figure 3-2.

3.4.2.2 New Roads

New roadways have been installed for access to turbine locations in areas where existing roads were not already present. A total of 4.8 kilometres of new roadway was installed as part of the Cleanrath wind farm development. The extent of the new roads are shown in Figure 3-2.

3.4.2.3 Road Construction

3.4.2.3.1 *New Excavated Roads*

Where relatively shallow depths of overburden were encountered on site, new or improved existing roads were installed directly on a solid formation. This solid formation for these excavate and replace roads was bedrock or a competent stratum.

The construction methodology for excavate and replace roads is outlined as follows:

- Prior to the construction of the road commencing, peat movement monitoring posts were put in place where required and appropriate drainage measures installed upslope of the access road alignment and construction area.
- Excavation was carried out until a competent stratum was reached.
- Road construction was carried out in sections of approximately 50 metres in length.
- The competent stratum was overlain typically with 500mm of granular fill and up to 1m in places.
- A layer of geogrid/geotextile was installed where required at the surface of the competent stratum.
- A final surface layer was placed over the excavated road to provide a road profile to accommodate construction and turbine delivery traffic.

A typical section of a new excavated road is shown in Appendix 1.

3.4.2.3.2 *New Floating Roads*

Floating roads minimise impact on the peat, particularly peat hydrology, and significantly reduce the volumes of peat requiring management as there is no excavation required and no peat arisings are generated. Floating roads were constructed where deeper peat depths were found within the site (generally above 2m).

The construction methodology of floating roads is outlined as follows:

- Prior to the construction of the floating road, movement monitoring posts were put in place where the peat depth is greater than three metres.
- Base geogrid was laid onto the existing peat surface.
- The typical make-up of the new floating road was 1m of granular fill with two layers of geogrid.

- A basal layer of tree trunks/brash saved from the tree felling phase of the Cleanrath wind farm development was used where practical.
- Stone used in the floating road construction area was end tipped over at least a ten metre stretch, on to the constructed floating road.
- Following the tipping of the stone a suitable bulldozer/excavator was used to spread and place the stone over the basal geogrid layer along the line of the road.
- A final surface layer was placed over the floating road to provide a road profile to accommodate construction and turbine delivery traffic.

At transitions between floating and excavated roads, a length of road of approximately ten to twenty metres had the peat excavated and replaced with suitable fill. The fill was graded so that the road surface transitions smoothly from floating road to excavated road and vice versa.

All new roadways were constructed with a camber to aid drainage and surface water runoff where the terrain could accommodate this. The gradient and slope of the camber depended on the site characteristics where the road is actually being constructed.

A typical section of a new floating road is shown in in Appendix 1.

3.4.3 Borrow Pit and Rock Extraction Areas

One on-site borrow pit was developed as part of the Cleanrath wind farm development. The rock and hardcore material that was required during the construction of the Cleanrath wind farm development was sourced from the on-site borrow pit and areas where stone material was won on site as part of the cut and fill of turbine areas and roads. A limited amount of hardcore and other aggregate materials were imported that may not be possible to source from the on-site borrow pit, such as bedding sand for duct laying, and hardcore for initial site enabling works required before the borrow pit was accessed and developed. The location and extent of the developed borrow pit is shown on Figure 3-2 and on the detailed site layout drawings included as Appendix 1 to this rNIS.

The Borrow Pit is located in the centre of the site, adjacent to Turbine No. 5. The developed area measures 2,550m^2 in area and supplied hardcore materials for the construction of turbines, construction compound and associated site access roads.

The total volume of rock and hardcore material that were extracted from the borrow pit as well as material won in other site areas as part of the cut and fill of roads and turbine areas was 51,905m^3.

Post-construction, the borrow pit area has been secured and made safe by reinstatement of the area with overburden and peat from site excavations and therefore, the provision of a perimeter stock-proof fence around the borrow pit area to prevent access to this area is not necessary. The borrow pit now blends in with the hardstanding area of Turbine no. 5 as can be seen in Plates 3-8 and 3-9 below. .

Hardcore materials were extracted from the borrow pit by means of rock breaking and blasting. Blasting was considered to be a more effective rock extraction method producing significant volumes of rock in a matter of milliseconds. Blasting was only carried out after an appropriate method of notifying local residents was submitted to and agreed with the Planning Authority. Notifying the residents involved a letter drop to each property within 1,300m of the borrow pit area which comprised 7 no. houses. Blast notifications took place 24 hours prior to each blast event

The extraction of rock from the borrow pit was a temporary operation run over a short period of time relative to the duration of the entire project. The two rock extraction methods utilised during construction are detailed below.

Plate 3-8 Borrow Pit Area adjacent to Turbine no. 5

Plate 3-9 Borrow Pit Area

3.4.3.1 Rock Breaking

Rock can typically be extracted from borrow pits or other infrastructure areas where weathered or brittle rock is encountered by means of a hydraulic excavator and a ripper attachment. This is a common extraction methodology where fragmented rock can be carefully extracted in layers by a competent operator. In areas where rock of a much higher strength is encountered and cannot be removed by means of excavating then a rock breaking methodology can be used. Where rock breaking is required, a large hydraulic 360-degree excavator with a rock breaker attachment is typically used. Given the power required to break out tight and compact stone at depth, the machines are generally large and in the 40-60 tonne size range. Even where rock might appear weathered or brittle at the surface, the extent of weathering can quickly diminish with depth resulting in strong rock requiring significant force to extract it at depths of only a few metres.

A large rock breaking excavator progressively breaks out the solid rock from the ground where necessary. The large rock breaker is typically supported by a smaller rock breaker which can often be in the 30-40 tonne size range and works to break the rocks down to a size that they can be fed into a crusher.

The extracted broken rock was typically loaded into a mobile crusher using a wheeled loading shovel and crushed down to the necessary size of graded stone required for the on-site civil works. The same wheeled loader took the stone from the crusher conveyor stockpile and stockpiled it away from the immediate area of the crusher until it was required elsewhere on the site.

3.4.3.2 Rock Blasting

Where blasting was used as an extraction method, a mobile drilling rig was used to drill vertical boreholes into the area of rock that was to be blasted. The drilling rigs used were self-propelled machines, designed for drilling blast boreholes. A drilling rig worked 4 days drilling the necessary number of boreholes required for a single blast. The locations, depth and number of boreholes were determined by the blast engineer, a specialist role fulfilled by the blasting contractor employed to undertake the works.

The blast engineer arranged for the necessary quantity of explosive to be brought to site to undertake a single blast. The management of explosives on site and the actual blasting operation was agreed in advance with and supervised by An Gardaí Siochána. The blast engineer set the explosives in place in the boreholes, set the charges, and fired the blast. Each blast took only a matter of milliseconds but may have been perceived to have taken longer as blast noise echoes around the area.

The blast generated rock of a size that could be loaded directly into a mobile crusher, using the same wheeled loader description outlined above. From that point on, the same method was used for processing the rock generated from a blast, as would be used to process rock generated by rock breaking. The drilling rig recommenced drilling blast holes for the next blast as soon one blast had been finished. A total of 4 no. blast events were completed as part of the Cleanrath wind farm development.

3.4.4 Peat and Overburden Management

3.4.4.1 Quantities

The quantity of peat and overburden that required management on the site was calculated, as 9,160m^3. The volumes are calculated based on the quantity of material generated by the cut and fill design prepared by Ionic Consulting Engineers which was deemed to be unusable for reuse as suitable construction material. This material comprised soft overburden and peat from shallow areas.

3.4.4.2 Management of Peat and Subsoils

The majority of overburden and peat was stored temporarily adjacent to the works areas for reinstatement of temporary works areas after the main construction activities had been completed. For example, the working area required around each turbine foundation was backfilled on completion of the turbine foundation. Similarly, the roadways were graded back to the level of the adjacent ground and embankments were covered with a layer of suitable material to encourage re-vegetation of the site. In both these and other cases, the necessary volumes of overburden was stored adjacent to the works areas, for reuse in reinstatement. All have been assessed by an ecologist, geotechnical engineer and hydrologist as part of this assessment the details of which is summarised in the relevant sections throughout this document. This approach of using temporary storage areas was considered more sustainable than hauling the material to the borrow pit and transporting it back from there again to where it is needed for the reinstatement works. Considering also that only one borrow pit was developed reduced the relocation options for this material as part of reinstatement. The stored material was sealed with the machine bucket and surrounded by silt fences to ensure sediment-laden run-off did not occur prior to its subsequent use for site reinstatement.

3.4.5 Derragh Wind Farm Substation

The grid connection cabling from the Cleanrath wind farm development connects to the existing 38kV Derragh Wind Farm Substation constructed as part of the Derragh Wind Farm development and is located approximately 3km west of Cleanrath Wind Farm in the townland of Rathgaskig. The cabling loops back out of this substation and runs mainly within the public road corridor on to the 110kV Coomataggart substation located in the townland of Grousemount, Co. Kerry.

The electricity substation compound includes a wind farm control building and the electrical components necessary to consolidate the electrical energy generated by Cleanrath wind farm development and export that electricity to the national grid. Further details regarding the connection of the onsite substation to the national electricity grid are provided in Section 4.3.7 below.

The location of the Derragh Wind Farm Substation is outlined in Figure 3-5 (below) with layout and elevations of the substation shown on Layout Drawings in Appendix 1. The substation compound is surrounded by an approximately 2.6 metre high steel palisade fence (or as otherwise required by ESB), and internal fences also segregate different areas within the main substation. The layout of electrical equipment in the electricity substation has been constructed to Eirgrid/ESB networks specifications.

3.4.6 Site Cabling

The electricity and fibre optic cabling from each turbine passes through the various site access roads in the direction of Turbine no. 7. Within Turbine no. 7, the power was combined for export off site. The electricity and fibre-optic cable ducting is approximately 1.2 metres below the ground surface as outlined on the application drawings included as Appendix 1 to this report. Figure 3-4 below shows a typical cable trench.

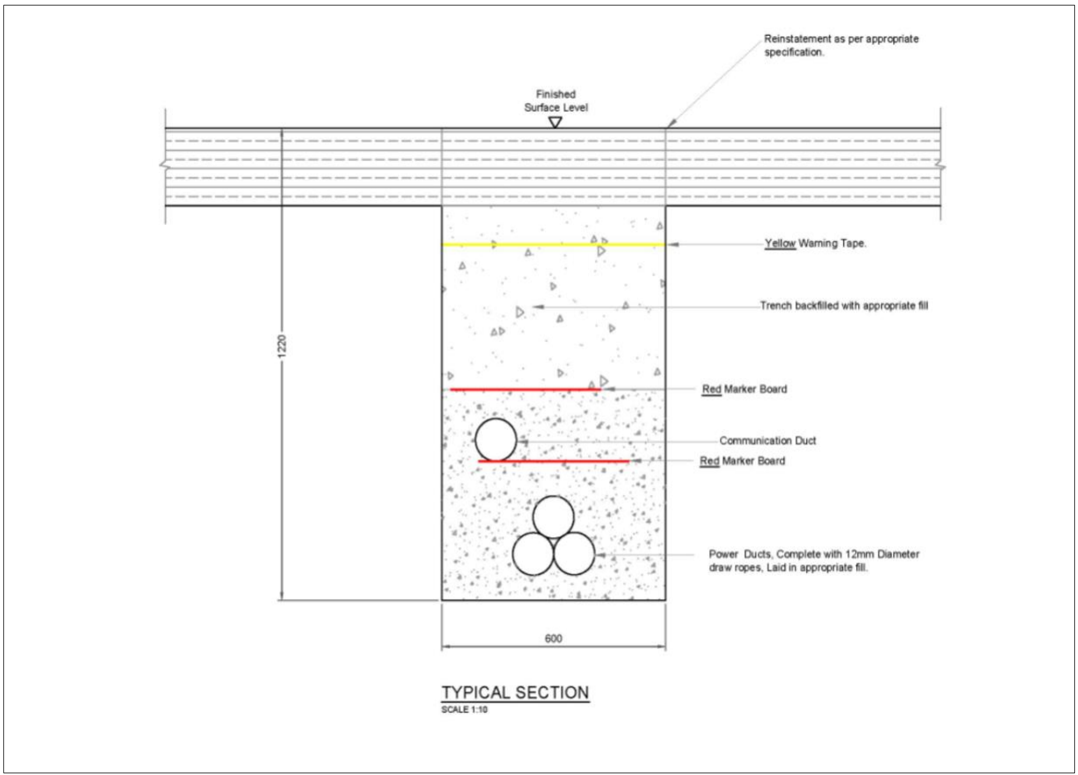


Figure 3-4 Typical 38kV Cable trench cross section detail

Cable trenches have been developed and ducting installed to ESB Networks specifications.

3.4.7 Grid Connection

The grid connection cable route comprises electricity cabling (33kV) from Turbine no. 7 within cable ducting along the permitted Operational Access/Inspection Road (Pl Ref. 18/04458) southwest of Turbine no. 7 and on to the local public road until it turns onto the access track of the constructed Derragh Wind Farm development and connects to the constructed 38kV electricity substation. The grid connection is approximately c15km in length. The cabling loops back out of the Derragh Wind Farm Substation (38kV) and runs mainly within the public road corridor on to the 110kV Coomataggart substation located in the townland of Grousemount, Co. Kerry. The final 1.5km of the cable route within Co. Cork and the 2km of the cabling in Co. Kerry is located on existing private access tracks. The entire grid connection route passes through the townlands listed in Table 3-1 of this rNIS. The grid connection route is illustrated in Figure 3-5. Figure 3-6 illustrates the watercourse crossing points along the grid route.

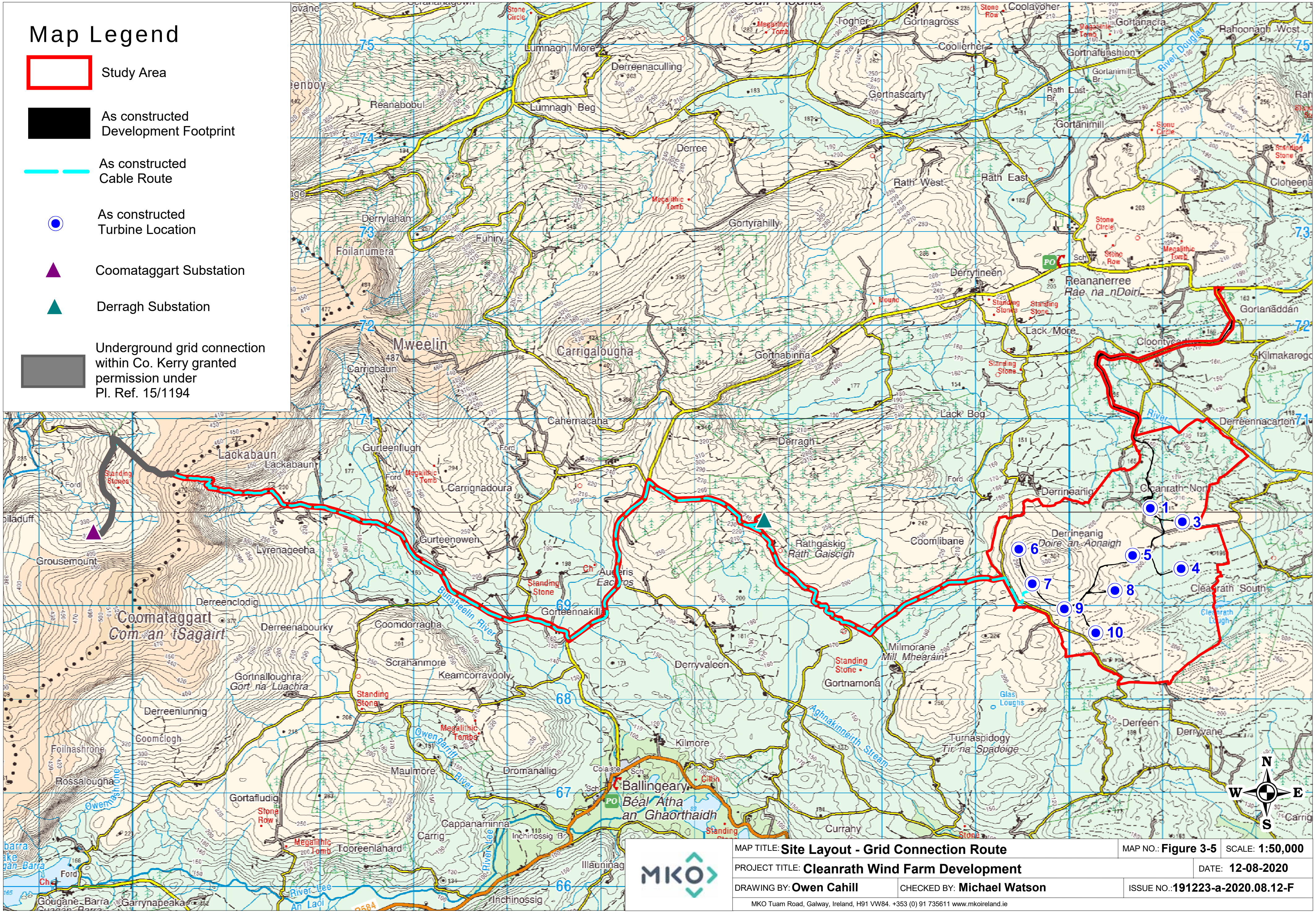
3.4.8 Temporary Construction Compound

A Site Office/Canteen and storage container was temporarily located along the access road west of Turbine no. 7 at the outset of construction works. As the works progressed into the site, these facilities were relocated to the access road South West of Turbine no. 8 as outlined in Figure 3-2. These were the only facilities required at this stage the construction. As the works progressed, a temporary construction compound measuring approximately 80 metres by 50 metres was installed in the north of the site adjacent to Turbine No. 1 and located along a section of new road. An additional area of temporary construction compound was also provided on the south side of the access road adjacent to Turbine no. 1 which was used mainly by the turbine supplier as their compound during turbine installation The location and extent of the construction compound is shown on the site layout drawing in Figure 3-2.

During construction, the compound included the provision of temporary site offices, staff facilities and car-parking areas for staff and visitors. The layout of the construction compound is shown in Appendix 1. Construction materials and turbine components were brought directly to the turbine locations following their delivery to the site.

Temporary port-a-loo toilets located within a staff portakabin were used during the construction phase. Wastewater from staff toilets were directed to a sealed storage tank, with all wastewater being tankered off site by permitted waste collector to wastewater treatment plants.

Since the completion of construction, all offices, welfare facilities and equipment has been removed and the area repurposed as the hardstanding for Turbine No. 1. The area of temporary construction compound on the south side of the access road has been decommissioned with all offices, containers and welfare facilities removed from site. The stoned area that remains will be allowed to revegetate naturally over time.



MAP TITLE: Site Layout - Grid Connection Route

MAP NO.: Figure 3-5

SCALE: 1:50,000

PROJECT TITLE: Cleanrath Wind Farm Development

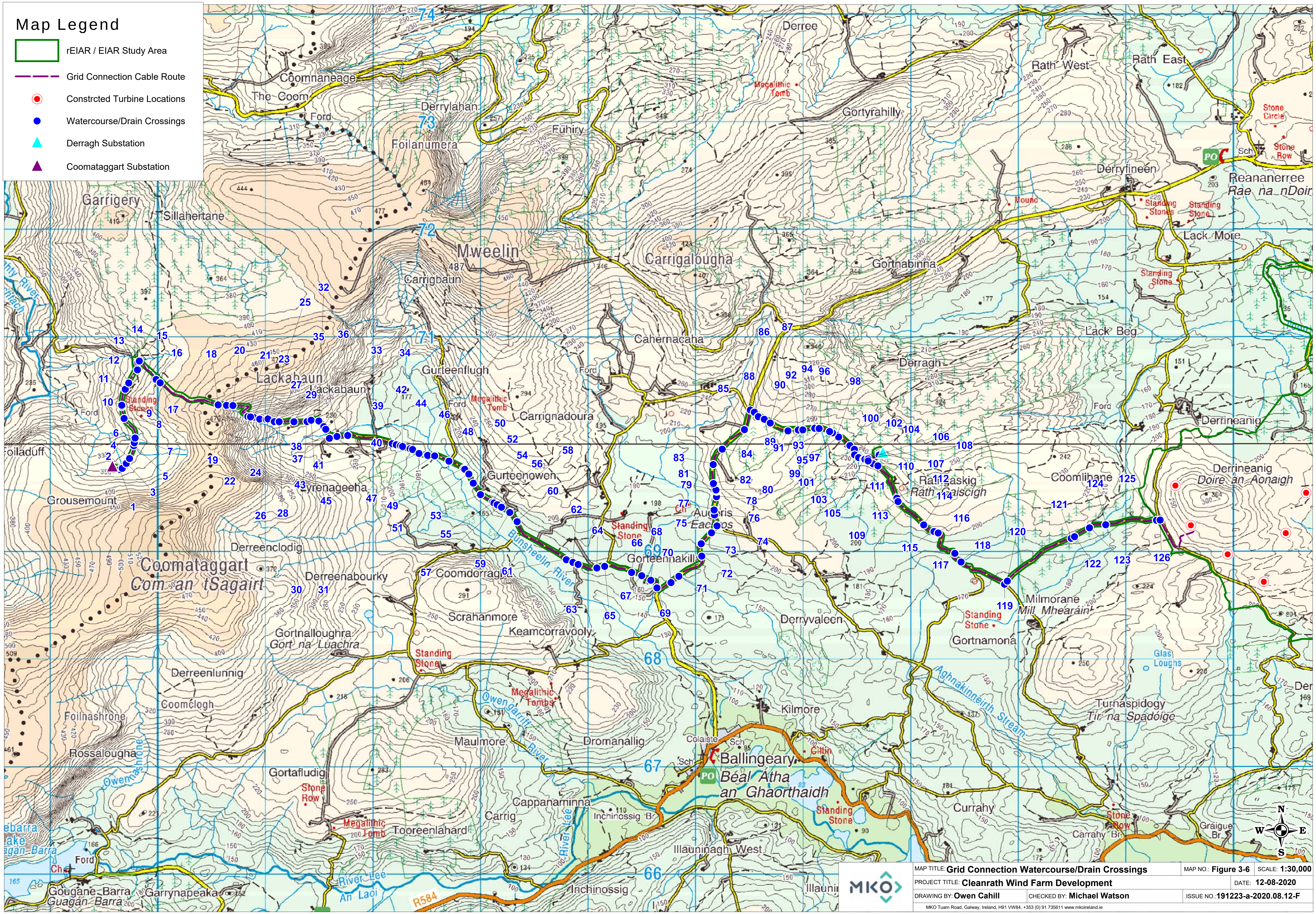
DATE: 12-08-2020

DRAWING BY: Owen Cahill

CHECKED BY: Michael Watson

ISSUE NO.: 191223-a-2020.08.12-F

MKO Tuam Road, Galway, Ireland, H91 VW84. +353 (0) 91 735611 www.mkoireland.ie



Ordnance Survey Ireland Licence No. AR 0021819© Ordnance Survey Ireland/Government of Ireland

3.4.9 Associated Works

3.4.9.1 Peatland Habitat Restoration

The construction of the Cleanrath wind farm development has resulted in the permanent loss of 4.13ha of the peatland habitat mosaic within the site. The development was specifically designed to avoid the larger areas of blanket bog that are mapped separately from the overall peatland mosaic. It has also led to the temporary physical disturbance of peatland habitats adjacent to the development footprint during the construction of the wind farm. A habitat restoration and enhancement plan has been prepared to mitigate for this habitat loss.

The details of this habitat restoration plan are provided in Appendix 2.

3.4.9.2 Tree Felling

A portion of the Cleanrath wind farm development site comprises a commercial coniferous forestry plantation, with approximately 32.5% of the site originally under forestry. As part of the Cleanrath wind farm development, permanent tree felling was required within and around the development footprint to allow the construction of turbine bases, access roads and the other ancillary infrastructure. Along sections of access road in forested areas, an area of approximately three times the width of the access road was felled. Temporary felling was also required in the vicinity of turbine locations, the purpose of which is to achieve the required setback between the trees and the turbines for the protection of bats.

A total of 8.14 hectares of forestry was felled within and around the development footprint. An additional 4.18 hectares of trees were temporary felled around the turbine locations. The total amount of tree felling completed as part of the Cleanrath wind farm development was 12.32 hectares, or 7.2% of the current forested area. Figure 3-7 shows the extent of the area that was felled as part of the Cleanrath wind farm development. Tree felling licences were obtained for the area of trees that was felled for the construction of the Cleanrath wind farm development.

An additional hectare of felling is proposed to provide an area of enhanced peatland which is intended to offset the permanent loss of Peatland Habitat due to the permanent footprint of the Cleanrath wind farm development. This area will be restored to peatland habitat. Any further felling proposed for the site will be the subject of a Limited Felling Licence (LFL) application to the Forest Service.

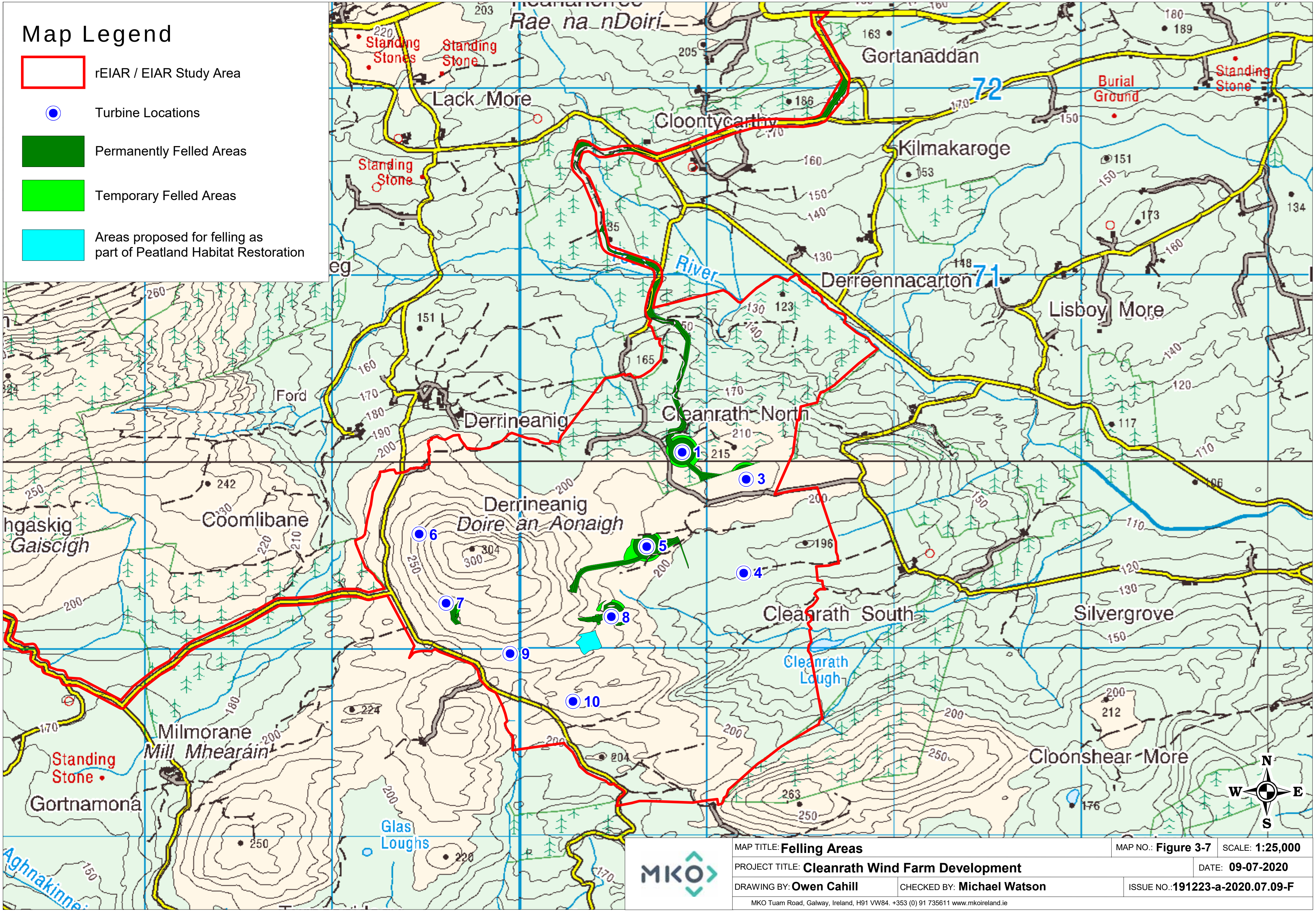
3.4.9.3 Tree Planting

In line with the Forest Service's published policy on granting felling licences for wind farm developments, areas cleared of forestry for turbine bases, access roads, and any other wind farm-related uses are to be replaced by replanting at an alternative location.

The Forest Service policy requires replanting on a hectare for hectare basis and states that where turbulence or temporary felling is necessary, a 'short rotate//on forestry' (SRF) approach is generally made a condition of the felling licence. The SRF approach recommends the use of lodgepole pine or another suitable species as the replanting choice. The north coastal variety of lodgepole pine is preferred because it is unlikely to reach ten metres in height, the height at which the trees would again have to be felled to prevent turbine turbulence effects or interfere with the vegetation setback requirement for bats, over the 25-year lifetime of the wind farm project.

A total of 12.32 hectares of new forestry will therefore be replanted as a condition of the felling licences that have been issued in respect of the Cleanrath wind farm development. Replanting is a requirement of the Forestry Act and is primarily a matter for the statutory licensing processes that are under the control of the Forest service. The replacement replanting of forestry can occur anywhere in the State subject to licence. Some replanting will take place on the site of the Cleanrath wind farm development.

It is standard practice to maximise the allowed 2 years fallow period between felling and replanting where replanting is due to take place on site, therefore this replacement planting of temporary felled areas will be due to occur before 31/03/2022. In addition, two replanting area were identified and assessed as part of the replacement of permanent felling with an availability of 2.95 hectares and 5.38 hectares located in the townlands of Glantane Beg and Claraghatlea, Co. Cork respectively. The lands proposed as part of the replacement of permanent felling required for the areas of Peatland Habitat Restoration are located in the townland of Sheehaun in Co. Roscommon. All these lands were granted Forest Service Technical Approval for afforestation and the planting of these areas has been completed.



Ordnance Survey Ireland Licence No. AR 0021819 © Ordnance Survey Ireland/Government of Ireland

4. CHARACTERISTICS OF THE RECEIVING ENVIRONMENT

The ecological surveys that were undertaken to inform this rNIS are fully described in this section. A general description of the ecology of the site of the Cleanrath wind farm development is provided in the Remedial Appropriate Assessment Screening Report (rAASR). The specific surveys that were undertaken to assess the potential effects on the identified European Sites are described below.

4.1 Ecological Survey Methodologies

4.1.1 Desk Study

A comprehensive desk study was undertaken to inform this ecological impact assessment. This study included a thorough review of available information that is relevant to the ecology of the site of the development and grid connection. This information provides valuable existing data and also helps in the assessing the requirement for additional ecological surveys.

The following list describes the sources of data consulted:

- Review of Site Specific information with regard to the 'Screened In' European Sites as available from www.NPWS.ie.
- Review of The EPA web-mapper (https://gis.epa.ie/EPAMaps/) to provide data on the EPA River Catchments and Watercourses.
- Consultation with relevant Statutory Authorities (Department of Culture, Heritage and the Gaeltacht, Inland Fisheries Ireland)

4.1.2 Ecological Multidisciplinary Walkover Surveys

Multi-disciplinary ecological walkover surveys were undertaken of the Cleanrath wind farm development site including the turbine delivery route and grid connection route on various dates between 2010 and 2020 in accordance with NRA Guidelines on Ecological Surveying Techniques for Protected Flora and Fauna on National Road Schemes (NRA, 2009). The walkover surveys were undertaken in October 2010, March, May and October, November and December 2011, January-March 2012, February-December 2015, 27th November 2018 and 20th December 2018. Additional surveys were also undertaken on the 3rd, 4th & 28th January 2019, 7th, 8th, 20th and 21st March 2019 and 30th March & 14th May 2020. The surveys provided baseline data on the ecology of the study area prior to, during and after construction. They enabled an assessment of whether further, more detailed habitat or species-specific ecological surveys were required. The multi-disciplinary ecological walkover surveys comprehensively covered the study area of the wind farm, including all elements of the development and grid connection.

Habitats were classified in accordance with the Heritage Council's '*A Guide to Habitats in Ireland*' (Fossitt, 2000). Habitat mapping was undertaken with regard to guidance set out in '*Best Practice Guidance for Habitat Survey and Mapping*' (Smith et al., 2011).

Plant nomenclature for vascular plants follows 'New Flora of the British Isles' (Stace, 2010), while mosses and liverworts nomenclature follow '*Mosses and Liverworts of Britain and Ireland - a field guide*' (British Bryological Society, 2010).

The walkover surveys were designed to detect the presence, or suitable habitat for a range of protected faunal species that may occur in the vicinity of the development.

ring the multidisciplinary surveys, a search for Invasive Alien Species (IAS), with a focus on those listed under the Third Schedule of the European Communities Regulations 2011 (S.I. 477 of 2011), was also conducted.

4.1.3 Otter Survey

Areas identified during the multidisciplinary walkover survey as providing potential habitat for otter were subject to targeted surveys. Dedicated otter surveys were undertaken in December 2015 by MKO ecologists and again on the 13th, 14th and 15th November 2018 by Julie O'Sullivan of MKO. Further surveys were undertaken by Pat Roberts on 14th May 2020. Otter surveys were undertaken at all locations where the construction footprint occurs in close proximity to or crosses watercourses. Particular attention was paid to the River Toon within the development site. The otter surveys were conducted as per NRA (2009) guidelines (Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Road Schemes). This involved a search for all otter signs e.g. spraints, scat, prints, slides, trails, couches and holts. In addition to the width of the rivers/watercourses, a 10m riparian buffer (both banks) was considered to comprise part of the otter habitat (NPWS 2009). The dedicated otter survey also flowed the guidance as set out in NRA (2008) *'Guidelines for the Treatment of Otters Prior to the Construction of National Roads Schemes'* and following CIEEM best practice competencies for species surveys (CIEEM, 2013[1]).

4.1.4 Watercourse Surveys

Sampling was carried out downstream of the study area at 11 sites on the 14th May 2020. All watercourses were assessed if they were located within or downstream of the wind farm development or the grid connection route and contained flowing water. The locations of each watercourse surveyed are provided in Figure 4.1.

Biological water quality was assessed through kick-sampling each of these watercourses. Macro-invertebrate samples were converted to Q-ratings as per Toner et al. (2005)[2]. The applied Q ratings followed the EPA water quality classes and Water Framework Directive status categories. All riverine samples were taken with a standard kick sampling hand net (250mm width, 500µm mesh size) from areas of riffle/glide utilising a two-minute sample, as per ISO standards for water quality sampling (ISO 10870:2012). Large cobble was also washed at each site where present.

In addition to the biological water quality assessment, each watercourse was visually assessed for signs of pollution or instream activity that could be attributable to the construction of the windfarm.

The results of the surveys at all 11 sites are provided in Appendix 3.

4.1.5 Surveys for Hen Harrier

Field surveys were undertaken by McCarthy Keville O'Sullivan Ltd. (MKO) between February 2015 and March 2017, which includes two full breeding seasons and two non-breeding seasons in line with SNH (2017). This data comprises the core data set used to inform the impact assessment. It is supplemented by bird survey data gathered during pre-commencement monitoring at the Cleanrath wind farm development between June 2018 and August 2018, and bird survey data gathered during operational monitoring at the Cleanrath wind farm development, between January 2020 and May 2020. The supplementary data gathered during pre-commencement and operational is clearly defined

[1] *CIEEM, 2013, Technical Guidance Series – Competencies for Species Survey, Online, Available at: https://cieem.net/resource/competencies-for-species-survey-css/ Accessed: 20.06.2019*

[2] *Toner, P., Bowman, J., Clabby, K., Lucey, J., McGarrigle, M., Concannon, C.,. & MacGarthaigh, M. (2005). Water quality in Ireland. Environmental Protection Agency, Co. Wexford, Ireland.*

throughout this report and has been used to compare against the predictions made using the core dataset (February 2015 to March 2017) during the impact assessment.

The data provided in this report is robust and allows clear, precise and definitive conclusions to be made on the avian receptors identified within the subject site. Field survey methodologies were devised to survey for the bird species composition and assemblages that occur within the study area and its hinterland and which are potentially susceptible to impacts from this type of development.

4.1.5.1 Initial Site Assessment

Based on the results of a desk study, consultation and 2011/12 winter season bird surveys, the likely importance of the study area for bird species was ascertained. Based on the collated information available from the above preliminary assessment and adopting a precautionary approach, a site-specific scope for the ornithological surveys was developed.

4.1.5.2 Survey Methodologies

The survey work undertaken between February 2015 and March 2017 forms the core dataset for the assessment of effects on ornithology, which includes two full breeding seasons and two non-breeding seasons in line with SNH (2017). This data is supplemented by pre-commencement and operational monitoring bird surveys which took place between June and August 2018, and January and May 2020 respectively. Full details of the surveys carried out and the data recorded are provided in Chapter 7 of the rEIAR and its associated appendices. The methodologies followed in relation to hen harrier are provided below.

In the absence of specific national bird survey guidelines, the ornithological surveys were designed and undertaken in full accordance with '*Recommended bird survey methods to inform impact assessment of onshore wind farms*' (SNH, 2017).

The various survey types undertaken are described below.

4.1.5.2.1 *Vantage Point Surveys*

Vantage point surveys were undertaken in accordance with SNH guidance from February 2015 and February 2017. Surveys were conducted monthly throughout this survey period from three fixed point vantage points (VP1 – VP3) to allow comprehensive coverage of all turbines in accordance with SNH 2017. Vantage point surveys are designed to quantify the level of flight activity and its distribution over the survey area. The primary purpose of the survey is to provide data to inform the collision risk model, which makes predictions of mortality, from collisions with turbines. The validity of vantage point surveys were confirmed by MKO by conducting viewshed analysis, as described below, and further checked during initial field surveys. Figure 7-1 in Appendix 4 shows the locations of all vantage points relative to the development site.

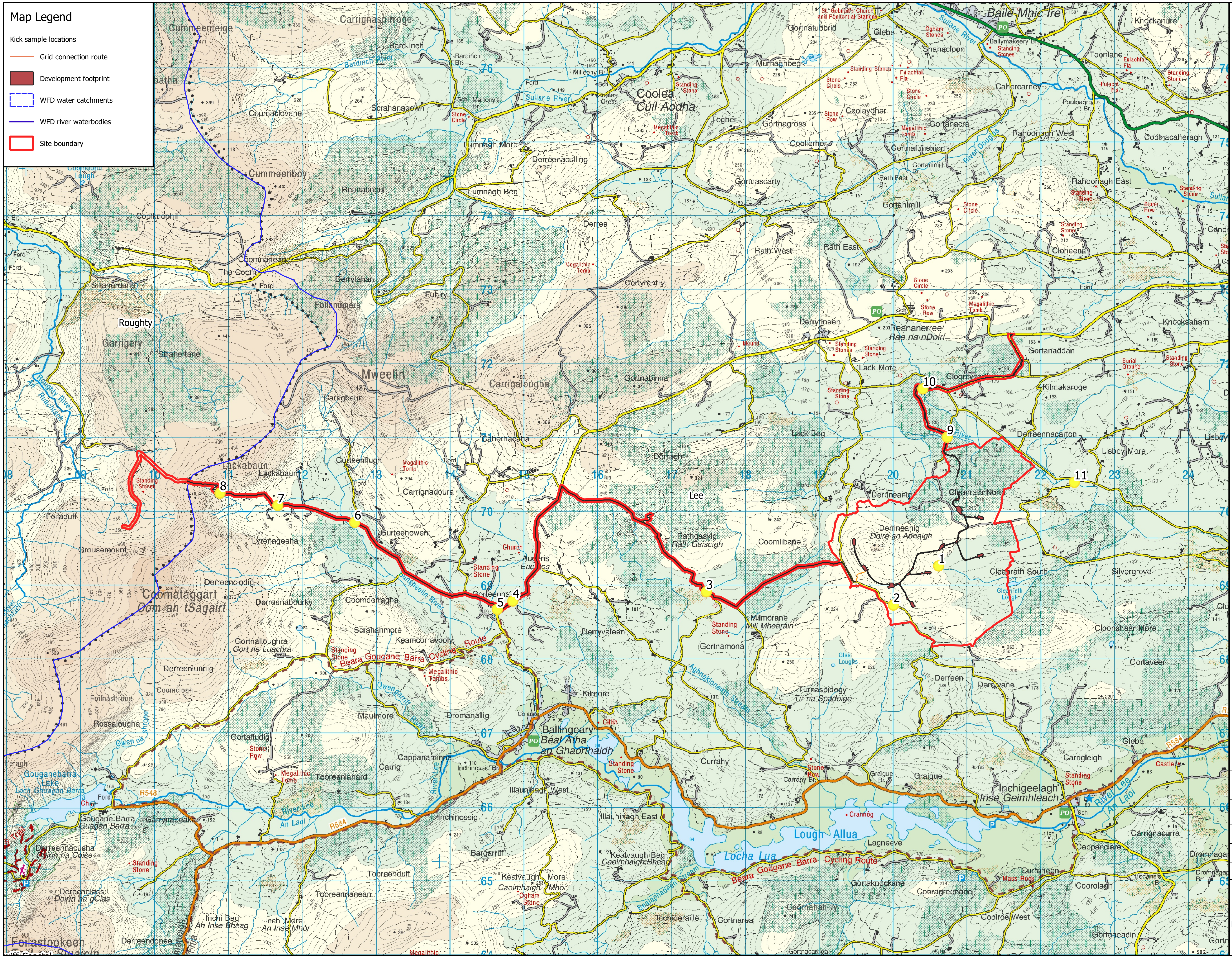
Viewshed Analysis

Viewshed analysis was carried out to confirm coverage of the study area from fixed vantage point locations (i.e. VP1 – VP3). Viewsheds were calculated using Resoft Wind Farm ZTV (Zone of Theoretical Visibility) software in combination with Mapinfo Professional (Version 10.0) using a notional layer suspended at 32.5m, which is representative of the lowest swept rotor height of the turbines at the Cleanrath wind farm development. While the relevance of being able to view as much of the site to ground level is acknowledged, the SNH guidance emphasises the importance of visibility of the 'collision risk volume' when the data is to be used to estimate the risk of collision with turbines by birds.

The area visible from each vantage point was ground-truthed (i.e. confirmed during field surveys) to incorporate landscape features (e.g. woodland, spoil heaps etc.) into the analysis that would not otherwise be accounted for in the computer modelling programme. The vantage points were selected to effectively survey the rotor swept area of all turbines.

The viewshed analysis involved testing each VP location for its visibility coverage by creating a viewshed point 1.5 meters in height (to represent the height of observer) on a map using 10 metre contours terrain data. The relative height of forestry and its effects on visibility is also accounted for in the analysis. Using the ZTV software, a viewshed of 360 degrees was produced calculating an area 32.5 metres from ground level up to a 2km radius from the VP location. The resulting viewshed image was then cropped to 180 degrees to give the viewshed orientation and visible survey area from each VP location in line with SNH (2014, 2017).

In order to ensure that the viewsheds provided sufficient coverage of the proposed turbines and 500m of same, a 500m buffer was applied to the outer most turbines of the Cleanrath wind farm development in line with SNH (2014, 2017). The viewshed analysis highlights that the rotor swept area (i.e. potential collision height) of all turbines was visible and surveyed throughout the two-year survey period. The visible view shed at 32.5m is presented on Figures7-2, 7-2-1, 7-2-2 and 7-2-3 in Appendix 4.



Ordnance Survey Ireland Licence No. AR 0021820© Ordnance Survey Ireland/Government of Ireland

Drawing Title: Kick sample locations

Project Title: Cleanrath EIAR

Drawn By	Checked By
DMN	PR
Project No.	Drawing No.
191223a	Figure 4-1
Scale	Date
1:45000	18.05.2020

MKO
Planning and Environmental Consultants
Tuam Road, Galway Ireland, H91 VW84
+353 (0) 91 735611
email:info@mkoireland.ie
Website: www.mkoireland.ie

Data Recording and Digitisation

Data on bird observations and flight activity was collected from a scanning arc of 180° within a 2km radius of each fixed VP by a surveyor for six hours per month (SNH 2017). Due to weather constraints, some surveys ended early but were continued at a later date in the month to ensure that six hours of surveys were conducted per month in accordance with SNH guidance (2017). Surveys were scheduled to provide a spread over the full daylight period including dawn and dusk watches to coincide with the peaks in bird activity.

Survey effort for vantage point watches is presented in Appendix 4, This includes full details of dates, times, survey locations, survey duration and weather conditions for each survey. Table 1 below shows a summary of the VP survey work undertaken.

Table 4-1 Vantage Point Survey Effort

Survey Season	Months	Minimum Effort per VP
2015 Breeding Season (3VPs)	Feb-Aug	40 hours/VP
2015/2016 Non-Breeding Season (3VPs)	Sep-Feb	36 hours/VP
2016 Breeding Season (3VPs)	Mar-Aug	45 hours/VP
2016/2017 Non-Breeding Season (3VPs)	Sep-Feb	36 hours/VP

Birds which use the airspace around turbines are susceptible to collision with operating turbines. The swept area of the rotor blade is the area in which a collision is theoretically possible. Possible collision height (PCH) is therefore defined as the area of space occupied by the turbine rotors. Observed flight activity was recorded as per defined flight bands which were chosen in relation to the dimensions of potential turbine models to be used at the Cleanrath wind farm development.

Bands were determined prior to final selection and construction of the turbines. Initial height bands used for recording flight data were split into bands 0-10m, 10-100m and 100m+ which were used during VP surveys between February 2015 and March 2016. In April 2016 height bands were revised to incorporate modern turbine dimensions. Height bands 0-10m, 10-25m, 25-175m and 175m+ were used for the period April 2016 to February 2017. Taking a highly precautionary approach, both height bands were combined, for collision risk modelling purposes, the height bands 10-100m and 100m+, were both combined and included in the newer height band of 25-175m. All flight activity within the combined height band of 25-175m is considered to be within the Potential Collision Height (PCH) with regard to the turbine swept area, based on a worst-case scenario for collisions risk modelling. This height band incorporates the actual swept area of the turbines (i.e. 32.5m – 150m), leaving a considerable amount of height below and above PCH to account for any potential surveyor error.

Each flight observation was assigned a unique identifier when mapped in the field and subsequently digitised using GIS software.

4.1.5.2.2 *Breeding Bird Surveys (Adapted Brown & Shepherd Methodology)*

Breeding walkover surveys were undertaken to determine the presence of bird species of high conservation concern and identify areas of possible, probable or confirmed breeding territories for bird species observed within the study area. The survey methodology followed the Adapted Brown and Shepherd method for upland sites as outlined in Gilbert et al. (1998) and SNH (2017) ('adapted Brown and Shepherd surveys'). In addition, surveyors visited prominent features (e.g. fence posts) within the Cleanrath wind farm development to search for signs of raptor activity (e.g. merlin) such as pellets or plucked feathers.

Transect routes were devised to ensure coverage of different habitats within the study area. Target species were waders, raptors, waterbirds, gulls and other birds of conservation concern. Along with target species, all additional species observed were recorded to inform the evaluation of supporting habitat.

Walkover surveys were carried out between daylight hours during the core breeding season months of April, June, July, August and September of 2015 and April, May, June, July and August 2016. Following all survey visits, the field maps were analysed to determine the number and location of breeding territories. All non-breeding individuals and species encountered were also recorded.

Survey effort is presented in Appendix 4, Table 3. This includes full details of dates, times, survey locations, survey duration and weather conditions for each survey. Figure 7-3 in Appendix 4 shows the transect routes surveyed.

4.1.5.2.3 Breeding Raptor Surveys

Breeding raptor surveys (i.e. birds of prey and owls) were conducted within the study area and its immediate surrounds during both the 2015 and 2016 breeding seasons (April – July). Survey methodology was as outlined in Hardey et al. (2013). Breeding Raptor Surveys aimed to cover all areas of suitable raptor breeding habitat within 2km of the site boundary, including hen harrier, merlin, peregrine, barn owl and other raptor species. This included surveying suitable buildings (where access allowed) (as per SNH 2017 recommendations for surveying owls) of the site for barn owl.

Raptor surveys, in the form of walked transects and short VP watches, were conducted within a 2km radius of the site boundary on a monthly basis during the core breeding season (April – July). The aim of these surveys was to identify occupied territories and establish whether breeding was successful within the study area.

Survey effort details are provided in Appendix 4.

4.1.5.2.4 Hen Harrier Roost Surveys

These surveys were undertaken in areas of suitable roosting habitat to a 2km radius of the Cleanrath wind farm development during the winter season (as per SNH 2017).

Survey work was undertaken in accordance with the methodology devised by Gilbert et al. (1998) and the 'Irish Hen Harrier Winter Roost Survey' (unpublished document coordinated by members of NPWS). Surveys were carried out throughout both non-breeding seasons (November 2015 - March 2016 & Oct 2016 – February 2017). Full details of survey effort are provided in Appendix 4.

4.1.5.2.5 *Waterfowl Surveys*

Waterfowl surveys were carried out at Lough Allua, approximately 2km south of the Cleanrath wind farm development at its closest point, for waterbird populations (i.e. waders, waterfowl, gulls, grebes and rails) during both winter seasons (November 2015 – March 2016 and August 2016 – February 2017 (as per SNH 2017). The survey methodology employed followed the 'I-WeBS Counter Manual – Guidelines for Irish Wetland Bird Survey Counters' co-ordinated by BirdWatch Ireland. Broadly in accordance with SNH (2017), counts were undertaken monthly during the first winter surveyed and bimonthly during the second winter surveyed, at each target wetland site during the wintering/migratory period. Counts were undertaken during daylight hours (including dawn and dusk) from suitable vantage points at the wetland site.

Survey effort, including details of survey duration and weather condition, is presented in Appendix 4.

4.1.5.2.6 *Winter Transect Surveys*

Winter transect surveys were conducted during the 2016/17 winter season to determine the presence of bird species of high conservation concern within areas of potential suitable habitat in the study area.

Transect routes were devised to ensure coverage of different habitat complexes between vantage point locations within the study area, during winter months. Methodology was broadly based on methods described in Bibby et al. (2000). Target species were raptors, waterbirds, gulls and ground birds of conservation interest. Along with target species, all additional species observed were recorded to inform the evaluation of supporting habitat. Surveys were conducted monthly between November 2016 and February 2017.

Survey effort, including details of survey duration and weather condition, is presented in Appendix 4.

4.1.5.2.7 *Pre-Commencement Monitoring Bird Surveys*

Pre-commencement bird surveys were conducted during the 2018 breeding season to determine the presence of bird species of high conservation concern within areas of potential suitable habitat in the study area, particularly breeding raptors, prior to commencement of construction activities. Surveys were carried in compliance with the requirement of Planning Condition 12 of Pl. Ref. No. 15/06966 (ABP Ref. PL 04.246742). The condition states that:

"Pre-construction and post-construction monitoring and reporting programmes for birds (particularly Hen Harrier and Merlin) shall be submitted to, and agreed in writing with, the planning authority prior to commencement of development. The surveys shall be undertaken by suitably qualified and experienced specialists."

Pre-commencement bird surveys were undertaken between June 2018 and August 2018. Survey methodologies consisted of adapted Brown & Shepard walkover surveys within 500m of the Cleanrath wind farm development and Breeding raptor surveys within 2km of the Cleanrath wind farm development (with a particular emphasis on hen harrier and merlin. A total of 25 hours and 30 minutes of breeding raptor surveys were carried out between June and August 2018, while a total of 31 hours and 30 minutes of adapted Brown & Shepard walkover surveys were carried out between June and August 2018.

Survey effort, including details of survey duration and weather condition, for Breeding Bird Surveys and Breeding Raptor Surveys is presented in Appendix 4.

4.1.5.2.8 Operational Monitoring Bird Surveys

Operational monitoring bird surveys were begun in January 2020 when the wind farm went operational and continues at the Cleanrath wind farm development. Surveys consist of Vantage Point Surveys, Breeding Bird Surveys, Breeding Raptor Surveys, Hen Harrier Roost Surveys, Winter Transect Surveys and Corpse Searching Surveys. All of the survey methodologies described below are in line with conditions of the previous planning permission (ABP Ref. PL04.246742) which are currently ongoing at the Cleanrath wind farm development to ensure no lapse in bird surveys. Operational monitoring surveys are in full compliance with SNH (2017) recommended survey methodologies ensuring that the same level of survey effort is continued to allow for a direct comparison of the surveys conducted prior to construction (2015 – 2017). This rEIAR only contains Operational Monitoring results up to the end of May 2020. Due to time sensitivity of the application it was not possible to process, digitise and incorporate the results from June and July 2020 in the assessment. June and July surveys have been completed and August operational monitoring has since commenced with the view to continuing surveying up to the time of the board's decision, and beyond should consent be granted, to ensure no lapse in surveys.

Survey effort, including details of survey duration and weather condition, for Operational Bird Monitoring surveys is presented in Appendix 4

Vantage Point Surveys

Vantage Point surveys were conducted from two fixed VP locations at the Cleanrath wind farm development. Two rounds of surveys were conducted in February 2020 to account for January and February survey rounds. VP surveys consisted of a minimum of 6 hours per VP each month, culminating in 30 hours of surveys per VP between February and May 2020. Survey methods were in line with SNH (2017) recommendations.

Survey effort, including details of survey duration and weather condition, is presented in Appendix 4.

Breeding Bird Surveys

Breeding Bird surveys were commenced at the Cleanrath wind farm development site during the 2020 breeding season as part of the operational bird monitoring programme. Surveys were initially intended to commence in April 2020, however due to travel restriction put in place by the government as a result of the Covid-19 outbreak in Ireland, surveys could not be conducted in April. Surveys therefore commenced in May 2020 as a result. Survey methods were in line with SNH (2017) recommendations.

Survey effort, including details of survey duration and weather condition, is presented in Appendix 4.

Breeding Raptor Surveys

Breeding Raptor surveys were commenced at the Cleanrath wind farm development during the 2020 breeding season as part of the operational bird monitoring programme. Surveys were initially intended to commence in April 2020, however due to travel restriction put in place by the government as a result of the Covid-19 outbreak in Ireland, surveys could not be conducted in April. Surveys therefore commenced in May 2020 as a result. Survey methods were in line with SNH (2017) recommendations.

Survey effort, including details of survey duration and weather condition, is presented in Appendix 4.

Hen Harrier Roost Surveys

Hen Harrier Roost surveys were conducted in February 2020 from three survey locations overlooking areas of suitable hen harrier roosting habitat within 2km of the Cleanrath wind farm development . Two rounds were undertaken at each survey location during the month of February to account for January surveys. In March 2020 Hen Harrier Roost survey locations were revised to ensure adequate coverage of all suitable hen harrier roosting areas, adding an additional two survey locations. Survey methods were in line with SNH (2017) recommendations.

Survey effort, including details of survey duration and weather condition, is presented in Appendix 4.

Winter Transect Surveys

Winter Transect surveys were conducted at the Cleanrath wind farm development and within 500m of same between February and March 2020. Two rounds of transect surveys were undertaken during the month of February to account for January surveys. Survey methods were in line with SNH (2017) recommendations.

Survey effort, including details of survey duration and weather condition, is presented in Appendix 4.

Corpse Searching Surveys

Corpse searching surveys were conducted between January and May 2020. Surveys for bird casualties will follow survey methods broadly based on guidelines issued by the SNH (2009) and search methods adopted by Duffy & Steward (2008). Searcher efficiency and carcass removal trials were conducted in advance of the commencement of the bird fatality searches to account for ability of the trained search dog to find bird corpses and the effect of scavengers on search results. This allowed for an estimate of the total number of collisions at the wind farm for each survey year.

During each visit, searches are undertaken at each operating turbine location by a team consisting of one surveyor with a trained search dog with a GPS collar attached, so that all finds could be plotted, subject to review by the accompanying surveyor. A plot measuring 130m x 130m from the centre of each turbine location was the subject of target searches for bird casualties. Recording sheets are used to document bird carcasses encountered in the field. The following details are considered during field surveys: GPS location of each bird carcass, photographic record, carcass condition (intact (carcass that is completely intact or not badly decomposed), scavenged (evidence that the carcass was fed upon by a scavenger/predator) or feather patch (ten or more feathers indicating predation or scavenging or two or more primary feathers must be present to consider the carcass a casualty)), distance from the turbine location, date, time, etc. Results of bird casualties will be issued in a final report at the end of each monitoring year.

4.2 Results of Ecological Surveys

4.2.1 Desk Study Results

4.2.1.1 The Gearagh cSAC (000106)

The Cleanrath wind farm development has the potential to cause or have caused deterioration in surface water quality during the construction, operation, sleep mode and decommissioning phase of the development due to the release of pollutants including suspended solids and hydrocarbons, potentially affecting the following downstream aquatic habitats and supporting habitats for QI aquatic fauna:

- Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation [3260]

- Rivers with muddy banks with Chenopodion rubri p.p. and Bidention p.p. vegetation [3270]
- Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae) [91E0]
- *Lutra lutra* (Otter) [1355]

The relevant QIs and the associated conservation objectives (as in the detailed Conservation Document (Version 1, Sep 2016) are presented in Table 4-2.

Table 4-2 Qualifying Interest and Conservation Objectives

Qualifying Interest	Conservation Objective
Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation [3260]	To maintain the favourable conservation condition of Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation in The Gearagh cSAC
Rivers with muddy banks with Chenopodion rubri p.p. and Bidention p.p. vegetation [3270]	To maintain the favourable conservation condition of Rivers with muddy banks with *Chenopodion rubri* p.p. and *Bidention* p.p. vegetation in The Gearagh cSAC
*Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno- Padion, Alnionincanae, Salicionalbae*) [91EO]	To maintain the favourable conservation condition of Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*)* in The Gearagh cSAC
Lutra lutra (Otter) [1355]	To maintain the favourable conservation condition of Otter in The Gearagh cSAC

4.2.1.1.1 Site Specific Pressures and Threats

As per the Natura 2000 Data Form, the site-specific threats, pressures and activities with potential to impact on the SAC were reviewed and considered in relation to the Cleanrath wind farm development. These are provided in Table 4-3.

Table 4-3 Site-specific threats, pressures and activities

Negative Impacts			
Rank	Threats and Pressures		Inside/Outside/Both
Medium	H01.05	Diffuse pollution to surface waters due to agricultural and forestry activities	Both
High	J02	human induced changes in hydraulic conditions	Both

No pathways for the Cleanrath wind farm development to result or have resulted in impacts with regard to the listed threats and pressures were identified.

4.2.1.1.2 Species Specific Information

Site specific information on each of the relevant Qualifying Interests was reviewed as part of this desk assessment.

Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation

The mapped extent of this habitat within the cSAC is shown in Map 2 of the site-specific conservation objectives. However, according to The Gearagh cSAC conservation objectives supporting document, '*Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation and Rivers with muddy banks with Chenopodion rubri p.p. and Bidention p.p. vegetation*' data on the vegetation of the river channels within The Gearagh cSAC are limited and, therefore, the distribution of this habitat and the sub-types/communities that occur in the site are currently unknown. The basis for the selection of the cSAC for the habitat was records from O'Reilly (1955), surveys by NPWS staff and the Irish Biogeographical Society survey of 1983 (McGough, 1983; FitzGerald, 1984; White, 1985a). While aquatics were not the focus of these surveys, Callitriche spp., Myriophyllum spp., Potamogeton spp., Ranunculus cf. penicillatus and Fontinalis antipyretica were recorded and these taxa are listed as characteristic of the habitat (European Commission, 2013). The conservation importance of The Gearagh SAC streams is attributable to the geomorphology (anastomosing channels) and mosaic of stream, woodland and wetland communities.

Rivers with muddy banks with Chenopodion rubri p.p. and Bidention p.p. vegetation

The extent of this habitat within the cSAC is shown in Map 2 of the site-specific conservation objectives. According to The Gearagh cSAC conservation objectives supporting document, '*Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation and Rivers with muddy banks with Chenopodion rubri p.p. and Bidention p.p. vegetation*" the area of the habitat is expected to vary, naturally, inter-annually, with flooding regime. In Ireland, the habitat is mainly found within turloughs that have areas from which the flood water recedes late and that are prone to summer flooding. In the rest of Europe, the habitat is found on muddy banks of rivers in late-receding river floodplains (European Commission, 2013). The Gearagh SAC is the only known Irish example of Rivers with muddy banks with Chenopodion rubri p.p. and Bidention p.p. vegetation occurring in the floodplain of a 'surface' river.

Otter (Lutra lutra)

There is no mapped distribution of this species within the cSAC in the site-specific conservation documents, however the extent of terrestrial habitat is calculated as 23.7ha along river banks,/lake shoreline/around ponds and 62.3ha of wet woodland giving a total of 86.0ha. This includes the entire area of wet woodland that occurs on islands where the River Lee main channel breaks into a complex and dynamic network of channels. The extent of freshwater habitat is calculated as 10.6km

Detailed site-specific conservation objectives document are not available for this cSAC. According to the site synopsis form the site holds a population of Otter, a species listed on Annex II of the E.U. Habitats Directive (NPWS, 2013).

**Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnionincanae, Salicionalbae)*

According to the site-specific conservation objectives document alluvial forest was surveyed in The Gearagh cSAC by Perrin et al. (2008) as part of the National Survey of Native Woodlands (NSNW). The minimum area based on this survey is 101.2 ha. The extent of this habitat (101.2ha) within the cSAC is mapped on Map 4 of the site-specific conservation objectives, however, further un-surveyed areas may be present within the cSAC.

According to the site synopsis form, the alluvial woodland which remains today at the Gearagh is of unique scientific interest, and qualifies as a priority habitat under Annex I of the EU Habitats Directive. The area has probably been wooded since the end of the last Ice Age, around 10,000 years ago. Originally the area of alluvial woodland extended as far as the Lee Bridge. However, around 60% of the former woodland was lost during extensive tree felling and flooding carried out the facilitate the operation of a hydro-electric scheme in 1954/55.

4.2.1.2 The Gearagh pSPA (004109)

There is hydrological connectivity between the Cleanrath wind farm development and this pSPA via the River Toon which flows through the development site and the River Lee which is located hydrologically downstream of the development site.

The works have the potential to cause or have caused deterioration of water quality during the construction, brief period of operation, period of sleep mode, any future operation and decommissioning phase of the development potentially affecting the downstream SCI

- 'Wetland and Waterbirds'.

The relevant SCI and associated conservation objective is presented in Table 4.4.

Table 4-4 SCIs and Conservation Objectives

Special Conservation Interest (SCI)	Conservation Objective
Wetland and Waterbirds	*'To maintain or restore the favourable conservation condition of the wetland habitat at The Gearagh SPA as a resource for the regularly-occurring migratory waterbirds that utilise it.'*

4.2.1.2.1 *Review of site-specific pressures and threats*

As per the Natura 2000 Data Form, the site-specific threats, pressures and activities with potential to impact on the pSPA were reviewed and considered in relation to the Cleanrath wind farm development. These are provided in Table 4-5.

Table 4-5 Site-specific threats, pressures and activities

Negative Impacts			
Rank	Threats and Pressures		Inside/Outside
Low	F03.01	Hunting	Inside
Medium	A04	Grazing	Inside
High	J02.04	Flooding Modifications	Outside
High	J02	Human induced changes in hydraulic conditions	Inside

No pathways for the Cleanrath wind farm development to result or have resulted in impacts with regard to the listed threats and pressures were identified.

4.2.1.2.2 Species Specific Information

The following relevant information on the special conservation interests of The Gearagh pSPA has been extracted from the site synopsis (NPWS, 2012).

> '*At the time this site was designated as a Special Protection Area (SPA) it was utilised by nationally important populations of four species, i.e. Wigeon, Teal, Mallard and Coot, and each of these species is regarded as a special conservation interest for this SPA.*
>
> *The Gearagh supported nationally important population of Wigeon (1,060), Teal (929) Mallard (478) and Coot (369) - all figures are two year mean peaks for the period 1994/95 to 1995/96. Other species that occurred at that time include Mute Swan (76), Whooper Swan (78), Gadwall (9), Shoveler (32), Pochard (106), Tufted Duck (237), Goldeneye (25), Cormorant (23), Lapwing (1,560), Golden Plover (1,748) and Curlew (335). A feral Greylag Goose flock is present in the area. A few pairs each of Great Crested Grebe and Tufted Duck breed.*

The Gearagh is a Nature Reserve, a Ramsar Convention site and a Council of Europe Biogenetic Reserve'.

4.2.1.3 Mullaghanish to Musheramore Mountains SPA (004162)

Whilst this European Site is located outside the Core Foraging Range of the SCI Species, hen harrier (as identified in '*Assessing Connectivity with Special Protection Areas'* (Scottish Natural Heritage, 2016)), it is located within the maximum foraging range for this species. As hen harrier were recorded on the wind farm site during the extensive surveys undertaken (occasionally during the winter period), following the precautionary principle, the potential for adverse effects on this species could not be excluded:

The works have the potential to cause or have caused disturbance of the Cleanrath wind farm development potentially affecting the SCI

- 'Hen Harrier (Circus cyaneus) [A082].

The relevant SCI and associated conservation objective is presented in Table 4.6.

Table 4-6 SCIs and Conservation Objectives

Special Conservation Interest (SCI)	Conservation Objective
Hen Harrier (*Circus cyaneus*) [A082]	*'To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA*

4.2.1.3.1 Review of site-specific pressures and threats

As per the Natura 2000 Data Form, the site-specific threats, pressures and activities with potential to impact on the SPA were reviewed and considered in relation to the Cleanrath wind farm development. These are provided in Table 4-7.

Table 4-7 Site-specific threats, pressures and activities

Negative Impacts			
Rank	Threats and Pressures		Inside/Outside
Medium	A04	Grazing	Inside
Medium	C01.03	Peat Extraction	Inside
High	B	Silviculture/Forestry	Inside
Low	D01.02	Roads/Motorways	Inside
Medium	A04	Grazing	Outside
High	B	Silviculture/Forestry	Outside
Low	D01.01	Paths, tracks and cycling tracks	Inside
Low	E01.03	Dispersed habitation	Inside

No pathways for the Cleanrath wind farm development to result or have resulted in impacts with regard to the listed threats and pressures were identified.

4.2.1.3.2 Species Specific Information

The following relevant information on the special conservation interest of the Mullaghanish to Musheramore Mountains SPA has been extracted from the site synopsis (NPWS, 2012).

> '*This site is a stronghold for Hen Harrier. A survey in 2005 recorded 5 pairs, which represents over 2% of the all-Ireland total. A similar number had been recorded in the 1998-2000 period. The mix of forestry and open areas provides optimum habitat conditions for this rare bird, which is listed on Annex I of the E.U. Birds Directive. The early stages of new and second-rotation conifer plantations are the most frequently used nesting sites, though some pairs may still nest in tall heather of unplanted bogs and heath. Hen Harriers will forage up to c. 5 km from the nest site, utilising open bog and moorland, young conifer plantations and hill farmland that is not too rank. Birds will often forage in openings and gaps within forests. In Ireland, small birds and small mammals appear to be the most frequently taken prey.'*

> *'The site is of ornithological importance because it provides excellent nesting and foraging habitat for breeding Hen Harrier. The presence of two species, Hen Harrier, and Merlin, which are listed on Annex I of the E.U. Birds Directive is of note.'*

4.2.1.4 Results of Consultation

MKO undertook a scoping exercise during preparation of this rNIS. No response received from the Department of Culture, Heritage and the Gaeltacht as of 27.07.2020

A response was received from the Department of Arts, Heritage and the Gaeltacht in February 2016 in relation to the development (Pl.Ref. 15/6966). The points raised within this submission were fully addressed during the construction and operation of the wind farm and have been taken into account in the current sleep mode. They will be taken into account in the continued sleep mode operation and in any future full operation or decommissioning of the Cleanrath wind farm development.

In addition to the above, there was ongoing consultation with the Department in relation to surveying and mitigation for Kerry Slug. Surveying and translocation were undertaken under licence – *Der/Kerry Slug-2018-88*

4.2.1.5 EPA River Catchments and Watercourses

The EPA web-mapper (https://gis.epa.ie/EPAMaps/) was consulted on the 02/04/2020 to provide data regarding the water quality and status of waterbodies that are located within and downstream of the site of the development.

The wind farm development site is situated within the WFD catchment 19: Lee, Cork Harbour and Youghal Bay catchment.

The WFD River Waterbody Status 2013 – 2018 for the watercourses which flow through and around the site have been assessed in Table

Table 4-8 EPA Water Quality Status and Risk Scores for Watercourses within and Adjacent to the Development Site

Name	Location	Status	Not at Risk
Toon River	Flows in a south-easterly direction through the northern section of the site	Good	Not at Risk
Lack	Flows in a south-easterly direction through the northern section of the site	Good	Not at Risk
Cluain Ti Cairtigh	Flows north into the Toon River	Good	Not at Risk
Doire An Aonaigh	Flows north into the Toon River	Good	Not at Risk
Ré na nDoirí	Flows south into the Toon River	Good	Not at Risk
Claonráthe Thuaidh	Flows south into Toon River	Good	Not at Risk
Silvergrove	Flows east adjacent to the southern section of the site	Good	Not at Risk
Graigue	Flows south adjacent to the southern section of the site	Good	Not at Risk
Cloch Eidhneach	Flows in a north easterly direction close to the northernmost section of the site	Good	Not at Risk

The Biotic Index of Water Quality (BIWQ) was developed in Ireland by the Environmental Protection Agency (EPA). Q-values are assigned using a combination of habitat characteristics and structure of the macro-invertebrate community within the waterbody. Individual macro-invertebrate families are classified according to their sensitivity to organic pollution and the Q-value is assessed based primarily on their relative abundance within a sample.

Table 4-4-1 illustrates the respective Q-value status results from monitoring stations located along rivers which flow through the site (as is the case with the Toon River) or along rivers which are fed directly by watercourses which flow through or around the site (in the case of the Sullane River, for example).

Table 4-4-1 Q-value Results from Monitoring Stations on Rivers which Drain the Site

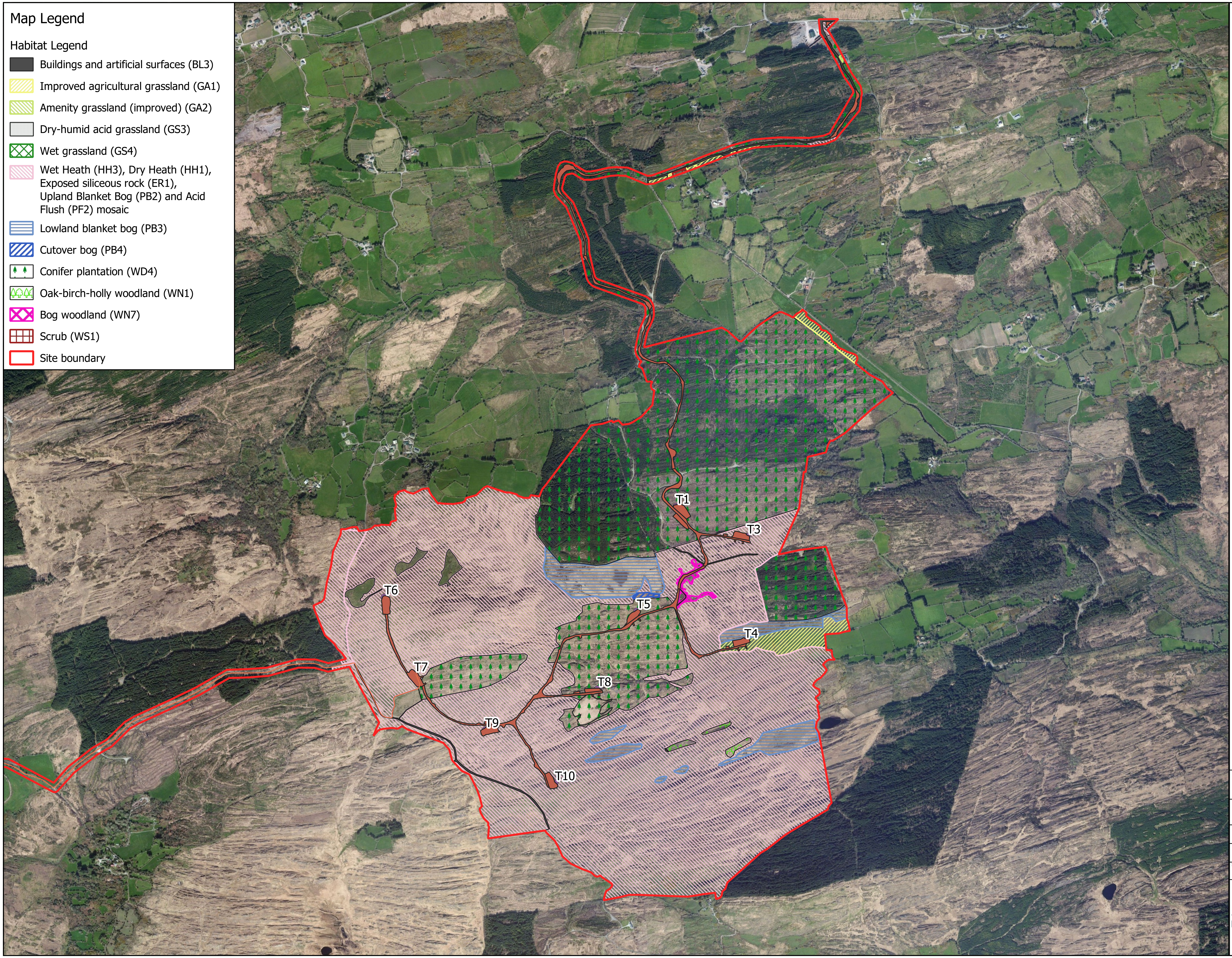
Name	Location	Status	Risk
Toon - Br NE of Cleanrath North	E122449, N70396	4 (Good)	2005

Toon - Second Br u/s Lee R confl	E126067, N69249	4-5 (High)	2017
Sullane – Sullane Br	E126046, N74088.	4-5 (High)	2019

4.2.2 General description of Ecology of the Site

The wind farm site (excluding the grid connection route) is located in an area that is dominated by upland coniferous forestry and a mosaic of exposed siliceous rock and peatland habitats. The northern section of the wind farm site consists predominantly of conifer plantation (WD4) with a range of other associated habitats located within the plantation (Plate 4.1). The southern half of the wind farm site consists predominantly of a mosaic of peatland habitats including Wet Heath (HH3), Exposed siliceous rock (ER1), Dry Heath (HH1) and small areas of Upland blanket bog (PB2), where deeper peat occurs between bands of rock (Plate 4.2). In addition, a number of small areas of conifer plantation (WD4) and agricultural grassland occur in this area. The following text provides a description of the habitats on the site prior to the construction of the wind farm following surveys undertaken from 2015 and throughout the pre-commencement and construction phase up to 2020. A habitat map of the site, with the infrastructure footprint overlain, is provided in Figure 4-2.

Plate 4-1 Example of plantation forestry (WD4) around T8 with larger rocky outcrops left unplanted. These areas retain patches of wet heath vegetation.



Drawing Title	
Habitat Map	
Project Title	
Cleanrath Wind Farm	
Drawn By: DMN	Checked By: PR
Project No.: 191223a	Drawing No.: Figure 4-2
Scale: 1:16000	Date: 21.07.2020

MKO
Planning and Environmental Consultants
Tuam Road, Galway
Ireland, H91 VW84
+353 (0) 91 735611
email:info@mkoireland.ie
Website: www.mkoireland.ie

Plate 4-2. Example of Exposed siliceous rock (ER1), Wet Heath and Bog Mosaic to the north of T10

The habitats within the study area include several habitat mosaics where the habitat patterns were too complex to map the individual habitats separately. The peatland mosaics comprised mainly Wet Heath (HH3), Exposed Siliceous Rock (ER1), Upland Blanket Bog (PB2) and Acid Flush (PF2) (Within these mosaics wet heath was the dominant habitat, while exposed siliceous rock while widespread, occupied only a small portion of the overall area. Dry Siliceous Heath (HH1) was only found occasionally within the mosaic and was associated with the Exposed Siliceous Rock (ER1). Other peatland habitats including Cutover Bog (PB4) and small areas of Lowland Blanket Bog (PB3). The Conifer Plantation is mapped as a single habitat but in reality, included several ancillary habitats such as small areas of Mixed Broadleaved Woodland (WD1), Immature Woodland (WS2), Scrub (WS1), and Dry Meadows & Grassy Verges (GS2) that form a small component of the overall conifer plantation habitat and have been mapped and evaluated as a matrix.

The access road crosses the Toon River to the north of the development site. The river, is classified as eroding/upland river (FW2) habitat. The river was 3-4 m in width, with a gravel/cobble substrate (Plate 4.3). Several other watercourses, which are tributaries of the Toon River flow through the forestry plantation in the northern section of the site. These are generally very small streams with eroding/upland river (FW2) habitat with steep gradients and usually heavily shaded and lacking significant in-channel vegetation. The forestry plantations also have numerous drainage ditches, with some of these functioning as seasonal streams. A number of watercourses flow through the bog habitats in the eastern section of the wind farm site, ultimately feeding into Cleanrath Lough. Close to the development footprint, the watercourses are artificially created, very narrow and flow through deeply cut, or straightened channels. The steeper sections have gravelly substrates, while level sections have deep silt/peat substrates with extensive growth of Bog Pondweed (*Potomogeton polygonifolius*). The south-western section of the wind farm site has a number of small watercourses, often associated with areas of acid flush habitat (PF2; see above), see Plate 4.4. Within the habitat survey area, these are mainly artificial Drainage Ditches (FW4) that have been excavated to improve drainage. These watercourses usually have very steep gradients and generally lack distinct vegetation communities (although many wetland plant species occur in the associated flush habitat; see above). Many are seasonal watercourses with no flow during dry periods.

Plate 4.3. The Toon River adjacent to the access route

Plate 4.4. Example of small watercourse (FW2), associated with acid flush habitat to the south of T9

The constructed development footprint comprises mainly of Buildings and artificial surfaces (BL3) as the turbine hardstands, foundations, access roads and blade set down areas comprise of recently constructed infrastructure.

In some areas, the lands surrounding the constructed development have been temporarily disturbed and are in the early stages of post-construction restoration. These areas are classified as Recolonising Bare Ground (ED3) or where they are more bare, Spoil and Bare Ground (ED2). In some areas, the disturbed ground is recolonising with typical heathland species such as tormentil, deergrass, purple moor grass and sweet vernal grass. In other areas it is still bare or, in the wetter areas, becoming colonised with rushy vegetation. Bare rock habitats have been created within the temporary disturbance area in order to recreate the habitat mosaic that surrounds the development. Plate 4.5 shows a typical area of temporarily disturbed habitat surrounding the built wind farm infrastructure. This shows the surrounding undisturbed habitat along with the reinstated and recolonising area. It also shows the inclusion of bare rock habitat in the restoration design.

Plate 4.5. Example of reinstatement of roadside verges along the site access track infrastructure classified as Buildings and artificial surfaces (BL3).

The grid connection cable route comprises electricity cabling (33kV) from Turbine no. 7 within cable ducting along the permitted Operational Access/Inspection Road (Pl Ref. 18/04458) southwest of Turbine no. 7 and on to the local public road until it turns onto the access track of the constructed Derragh Wind Farm development and connects to the constructed 38kV electricity substation, which is located in a forestry plantation approximately 3km west of the Cleanrath wind farm development in the townland of Rathgaskig (Plate 4.6). The grid connection is approximately c15km in length. The cabling loops back out of the Derragh Wind Farm Substation (38kV) and runs mainly within the public road corridor on to the 110kV Coomataggart substation located in the townland of Grousemount, Co. Kerry. The final 1.5km of the cable route within Co. Cork and the 2km of the cabling in Co. Kerry is located on existing private access tracks. The first section runs from the south western boundary of the wind farm site on an unbound road through a large conifer plantation (WD4), much of which has been recently clearfelled (Plate 4-7) The next section continues on public roads, which are surrounded by coniferous forestry and open agricultural land mainly occupied by improved agricultural grassland (GA1) with heath (HH) habitat on rock outcrops, and a larger area of wet heath (HH3) on the ridge south of the forestry plantation at Rathgaskig. A short section of the road is surrounded by a strip of birch-dominated oak-birch holly woodland (WN1). The roadside boundaries along this section of the route are mainly earth banks (BL2), and lack well-developed hedgerows/treelines, although there are occasional small Ash trees and conifers. In the next section, the road in which the cable is laid is surrounded by another large conifer plantation to the west of Rathgaskig.

The grid connection route then follows a series of local roads through a largely improved agricultural landscape before reaching an upland landscape at Lackabaun. The road margins comprise largely of Dry meadows and grassy verges (GS2) and Dry-humid acid grassland (GS3).

The grid connection route then follows a steep upland track from the termination of the public road to the boundary with Co. Cork and continuing until it reaches the infrastructure associated with the Grousemount Wind Farm and associated Coomataggart Substation. This track is surrounded by Acid Grassland, Bog and Heath habitats. This section of the route passes through edge of the Sillahertane Bog NHA at the Kerry border but is confined to the existing track with no encroachment onto the adjacent bog and heath habitats. The habitats along the grid connection route are provided in plates 4-8 – 4-11.

The entire grid connection is located within the curtilage of existing roads and tracks with no encroachment onto adjacent habitats. During the walkover surveys undertaken in May 2020, no signs of habitat loss or degradation were identified, with all signs of any disturbance at all located within the footprint of the existing roads.

The grid connection route crosses a number of streams between the windfarm site and the sub-station. These are in the Lee Catchment. There were no instream works undertaken as part of the construction of the grid connection and during surveys undertaken in May 2020, no evidence of any water pollution in the watercourses that were crossed was identified.

Plate 4-6. Constructed Derragh Substation - located within forestry plantation.

Plate 4.7. Example of unbound forestry (WD4) access track along the grid connection route outside the south of the site (Cal's road).

Plate 4-8. Cable laid within the road carriageway

Plate 4-9 Cable attached to side of bridge along cable route

Plate 4-10 Upgrade of mountain track at Lackabaun to facilitate cable connection

Plate 4.11. Location of grid connection in local track at edge of Sillahertane Bog NHA.

4.2.3 Watercourse and hydrological Survey

4.2.3.1 Conclusions of the Hydrological Assessment

The baseline hydrology of the site and surrounding area has been fully assessed and this assessment is provided in full in Appendix 5 to this rNIS. The relevant Sections of the hydrological assessment (Chapter 9 'Water'), which describe the baseline hydrological environment, are provided in the below subsections.

4.2.3.1.1 *Description of the hydrological baseline*

Regional Hydrology

'Regionally the wind farm development site is located in the River Lee surface water catchment. The grid connection route which is approximately 15km in length is located in both the River Lee (~12.6km) and the Roughty River (~2.4km) surface water catchments. All of the 9 no. constructed turbines and access roads etc are located in the River Lee Catchment.

The River Lee is located in (Hydrometric Area 19 of the South Western River Basin District) and flows in an easterly direction approximately 2.7km to the south of the development site via Lough Allua. The Roughty River catchment, which exists ~9km to the west of the development site, is also located in the South Western River Basin District. A regional hydrology map is shown as Error! Reference source not f ound.' Chapter 9 'Water' of the rEIAR – Appendix 5 to this rNIS.

Local Hydrology

'The western section of the development site drains into Lough Allua (i.e. turbines T7 to T10) which exists on the River Lee. The eastern section of the site (i.e. turbines T11 to T15) drain into the Toon River which is an also tributary of the River Lee. The site entrance and approximately 0.8km of access road is located in the Sullane Beg River which is also a tributary of the River Lee.

The length of the grid connection route within the River Lee catchment drains into Lough Allua. The remaining section of grid route within the Roughty River catchment drains directly into the Roughty River via minor streams. A local hydrology map is shown as Error! Reference source not found.' Chapter 9 'Water' of the rEIAR. – Appendix 5 to this rNIS

Site Drainage

'The topography at the site is locally undulating with the Hill of Derrineanig being the dominant feature. The ridges running below this peak slope gently off into five main sub-catchments. Two sub-catchments drain to Lough Allua and three of the sub-catchments drain to the Toon River'.

4.2.3.1.2 *Conclusion of Hydrological assessment*

Chapter 9 of the rEIAR (Appendix 5 of this rNIS) concludes that, in the absence of mitigation, there is no potential for the development to result in effects on any downstream European Site within the River Lee catchment. This further confirms the findings of this rNIS and accompanying Screening report. The conclusion, as provided in Chapter 9 of the rEIAR is provided below and in Appendix 5 to this rNIS:

As stated in impact Section 9.6.2.1 and Section 9.6.2., Chapter 9 'Water' (Appendix 5), '*there was only an "imperceptible and temporary impact" on local streams and rivers but this would have been very localised and over a very short time period (i.e. hours). This lack of significant effects was demonstrated by the construction surface water quality monitoring data*'. '*No significant impacts on any designated site occurred*' during the construction phase or current operation phase of the development. It also concludes that the operational phase will have '*no significant effects on downstream surface water flows/levels have occurred or are likely to occur as a result of the Development*'.

4.2.3.2 Results of biological evaluation of watercourses

The small streams that flow off the site of the development, and downstream watercourses, were subject to biological evaluation and assessment through kick sampling. Full details of the results of these surveys are provided in Appendix 3. A map of the kick sample locations is provided in Figure 4.1.

The survey included a general habitat assessment and biological water quality assessment at every watercourse where flowing water was present within or downstream of the Cleanrath wind farm development following construction and operation of the wind farm. In none of the 11 survey stations was there any evidence to indicate that there had been any impact on water quality or any other aspect of the watercourse as a result of the construction or the operation of the wind farm and grid connection.

4.2.4 Otter Survey

No otter (*Lutra lutra*) breeding or resting sites (holts) and no potential tree roots, riverbank excavations or rock formations with the potential to support an otter holt were recorded within the development site including the grid connection route during the dedicated otter surveys. Many of the watercourses within the survey area comprise of field drains or narrow upland streams and are too small to provide significant otter habitat. No signs of otter were recorded during dedicated kick sampes undertaken both within and downstream of the site undertaken in May 2020. However, evidence of otter usage (slides and spraints) was recorded during surveys undertaken in 2018 at a number of locations. The results are presented in Table and 4.11 below and in Figure 3-1 of the *Pre-Commencement Surveys Report* in Appendix 6 to this rNIS.

Table 4-10 Otter survey results - development site

Location on Site	Grid Reference	Comment
Bridge over the River Toon	W20739, 70999	Spraint on bridge
East of Derrineaning Hill (within wind farm site and not associated with a significant watercourse)	W20998, 69552	Spraint on rock

Table 4-11 Otter survey results - watercourse crossings along grid connection route

Watercourse Number	Grid Reference	Comment
44	W 14603, 68593	Spraint on rock on the bank of the Cathair Na Cáithe River
35	W 12597, 69861	Otter slide; recorded on the banks of the Bunsheelin Rive

Otter are likely to utilise other small watercourses within the study area and along the grid connection route for foraging and commuting.

4.2.5 Hen harrier surveys – SCI Mullaghanish to Musheramore Mountains SPA

The results of the surveys undertaken for hen harrier are provided below. Raw Survey data for hen harrier is not provided in this rNIS but is available in Appendix 4. Results summary tables are present in Appendix 4.

4.2.5.1 Vantage Point Surveys

Hen harrier were recorded on fourteen occasions during Vantage Point Surveys between February 2015 and February 2017 All fourteen observations occurred during winter months between September and February. Only five of the fourteen observations occurred within, or partially within, the height band considered for PCH. All fourteen observations occurred within the Cleanrath wind farm development, predominantly within the north-western section of the site. All observations were of individual birds in hunting or travelling flights. There was no evidence of breeding or roosting activity observed.

Four observations were recorded during February 2015 between the 21st and 22nd. Each of the four observation were of an individual male in flight. Three observations occurred during the 2015/16 winter season. Each observation consisted of individuals in flight between September and October 2015. The remaining seven observations were recorded during the 2016/17 winter season, between December 2016 and January 2017. Five of the seven observations occurred during December while the remaining two observations occurred on the 13th of January 2017.

4.2.5.2 Breeding Bird Surveys

Hen harrier were only recorded on one date during Breeding Bird Surveys On the 15th of April 2015 two hen harrier were recorded in separate flights. One individual was flying directly over the site, while the other was seen offsite to the north from the Cleanrath wind farm development site. No evidence of breeding activity was observed.

4.2.5.3 Hen Harrier Roost Surveys

Hen harrier were only recorded twice during dedicated Hen Harrier Roost Surveys Both observations occurred on the 21st of November 2016 as an individual was observed in flight on two occasions within a fifteen-minute period before dusk. Both observations consisted of individuals in flight, between one and two kilometres to the east of the Cleanrath wind farm development site, with no evidence of roosting behaviour recorded.

4.2.5.4 Per-Commencement Surveys (2018)

Hen harrier was not recorded during the pre-commencement surveys that were undertaken prior to the construction of the windfarm.

4.2.5.5 Operational Monitoring Surveys

Surveys of the operational windfarm were undertaken from February to May 2020. The results of the hen harrier observations during this period are provided below.

Breeding Raptor Surveys

Hen harrier was observed on one date during a Breeding Raptor Survey on the 15th of May 2020 (see Figure 3-1 Appendix 4). An adult male was recorded hunting and soaring on two occasions during the survey, more than 2km from the Cleanrath wind farm development. No evidence of breeding activity was observed.

5. ASSESSMENT OF POTENTIAL EFFECTS & ASSOCIATED MITIGATION

5.1 Potential for Direct Effects on the European Sites

The development site lies entirely outside of the boundaries of European Sites, with the closest being approximately 4.6km distant from the site. Therefore, there is no potential for direct impact on any European Site.

5.2 Potential for Indirect Effects on the European Sites

5.2.1 Deterioration of Surface Waters

5.2.1.1 Impacts During Construction

There was potential for the construction activity to have resulted in the run-off of silt, nutrients and other pollutants such as hydrocarbons and cementitious material into the watercourses on the wind farm site and on the grid connection route. This could have occurred during the removal of scrub and conifer plantation, earthworks associated with the construction process or the use of concrete and other construction materials.

However, the construction or operation of the wind farm did not have any significant effect on any watercourse was identified during the comprehensive environmental monitoring of the construction phase of the development. In addition, following the construction and operation of the wind farm, ecological surveys of the identified relevant watercourses on and downstream of the wind farm site and grid connection route were undertaken. During these surveys, the results of which are presented in Appendix 5, no kind of water pollution was recorded, which could have potentially arisen from the construction phase of the Cleanrath wind farm development.

The Gearagh cSAC is located hydrologically downstream of the development via the River Toon which runs through the development site and via the River Lee, which is located downstream of the development site. Therefore, taking a precautionary approach, a potential pathway for indirect effects to occur or have occurred on the following QI habitats and species, in the form of deterioration of surface water quality resulting from pollution, associated with the construction and operational phases of the development was identified:

- Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation [3260]
- Rivers with muddy banks with Chenopodion rubri p.p. and Bidention p.p. vegetation [3270]
- Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae) [91E0]
- *Lutra lutra* (Otter) [1355]

The Gearagh pSPA is located hydrologically downstream of the development via the River Toon which runs through the development site and via the River Lee, which is located downstream of the development site. Therefore, taking a precautionary approach, a potential pathway for indirect effects to occur or have occurred on the following SCI habitat, in the form of deterioration of surface water quality resulting from pollution, associated with the construction and operational phases of the development was identified:

- Wetland and Waterbird [A999]

5.2.1.2 Impacts During Operation

The increased amount of hard standing associated with the windfarm infrastructure has the potential to result in faster run off of water from the site to the surrounding watercourses. This may have the indirect effect of causing erosion, which could lead to deterioration of surface water and supporting habitat quality. Additionally, there is the potential for the faster run off of any pollutants that may be associated with vehicular usage on the site.

In addition, the felling of forestry will be undertaken to facilitate the habitat management Plan and this activity could result in the run off of pollutants from the site in the same manner are it could have during construction.

However, following comprehensive surveys of the site and of the surrounding watercourses (as described in Appendix 3), no such effects have occurred since the wind farm commenced operation.

The same European Sites, QIs and SCIs are potentially affected during operation as during construction and for the period that the wind farm was operational.

5.2.1.3 Impacts During Decommissioning

The Wind farm is designed for a period of operation of 25 years at which point, it will be decommissioned and removed. In the event that early removal is required, the same procedures would be followed as if decommissioning were to occur at the end of the lifespan of the turbines/development.

Decommissioning will involve primarily the removal of the above ground elements of the turbines, with the foundations left in-situ and covered with soil (thus avoiding large scale excavations). The existing site roads would be used during decommissioning. The Grid Connection cables will be pulled from their trenches without the requirement for significant excavation.

Whilst the works required to decommission the wind farm will be considerably smaller in scale than those required for construction, they will be similar in nature (though without large scale excavation or use of concrete). The impacts on biodiversity will also be similar in nature to those experienced during construction but on a far lesser scale and magnitude. As with construction, a suite of measures is in place to avoid any adverse effects on European Sites. These measures are set out Decommissioning Plan (DP), which is provided as Appendix 7 to this rNIS and will be carried out in accordance with Scottish Natural Heritage report *(SNH) Research and Guidance on Restoration and Decommissioning of Onshore Wind Farms (SNH, 2013).* All prescribed measures will be employed in full during any works associated with the decommissioning of the Cleanrath wind farm development at any stage. The decommissioning phase of the development will be overseen and supervised by an ECoW to ensure that the prescribed measures are fully and correctly implemented. It can be concluded that following the implementation of preventative mitigation, there is no potential for the decommissioning of the wind farm to result in adverse effects on European Sites.

5.2.1.4 Mitigation to prevent water pollution

The development has been designed so that all large-scale infrastructure such as turbines, site compound and borrow pit are located over 50 metres from any significant watercourses and so that water crossings that occur on access tracks etc. were minimised and where possible, use existing bridges. The Construction Environmental Management Plan (CEMP)/Operational and Environmental Management Plan (OEMP) & Decommissioning Plan (DP) (Appendices 7/8/9) describe the measures in place for the protection of water quality. This includes site drainage design and maintenance. The CEMP also describes the procedures for refuelling, fuel and hazardous materials storage, cement-based products control measures, peat management, dust/debris control, noise & vibration control and waste management. All such measures are designed for the protection of water quality both within and downstream of the site.

The CEMP describes the 'Drainage Management Plan'. This management plan describes the baseline site drainage features, drainage design principles, silt management & pollution prevention, silt management & pollution prevention and drainage maintenance. Water quality monitoring for pre-construction, during-construction and post-constriction of the Cleanrath wind farm development are fully described in the CEMP/OEMP & DP.

The CEMP also provides for the appointment of a Site Supervisor/Construction Manager and/or Environmental Manager to maintain responsibility for monitoring the works and Contractors/Sub-contractors from an environmental perspective. In addition, a Project Ecologist, Project Hydrologist and Project Geotechnical engineer undertook inspections during construction and reported to the Site Supervisor/ Environmental officer This structure provided a "triple lock" review/interaction by external specialists during the construction phase.

A summary of all mitigation undertaken for the protection of water quality, set out in the rEIAR and associated documentation, is provided in the CEMP/OEMP&DP (which are provided as Appendix 7/8/9). The best practice construction measures described below are a summary of the measures referred to above and are designed to avoid impacts on areas that are outside the site including watercourses.

- Only ready-mixed concrete was used during the construction phase, with all concrete being delivered from local batching plants in sealed concrete delivery trucks. Concrete trucks were washed out fully at the batching plant, where facilities are already in place.
- The small volume of water that were generated from washing of the concrete lorry's chute were directed into a temporary lined impermeable containment area.
- Temporary port-a-loo toilets were used during the construction phase, these were serviced by a waste contractor. In addition, there was a portacabin from which, wastewater from was directed to a sealed storage tank, with all wastewater being tankered off site by permitted waste collector to wastewater treatment plants.
- There were no discharge of surface water runoff from the wind farm construction areas, or hardstanding areas, directly into flush/wetland areas.
- All surface water runoff from the wind farm construction areas was released onto natural vegetated surfaces away from flushes.
- There were no direct discharges to any natural watercourses, with all drainage waters being dispersed as overland flows or directly into artificial drainage ditches following the installation of silt traps, check dams and/or stilling ponds to these ditches. All discharges, over land, from the works areas was made over vegetation filters at a minimum of 50 metres distance from natural watercourses.
- Where infrastructure was located within 50 metres of a natural watercourse, stringent drainage measures were put in place to ensure the protection of the water quality of the natural watercourse.
- Where artificial drains occurred in the vicinity of the works areas, these drains were diverted around the works areas to minimise the amount of water in the vicinity of works areas. Where it was not possible to divert artificial drains around work areas, the drains were blocked to ensure potentially sediment laden water from the works areas has no direct route to other watercourses. Where drains were blocked, the blocking was only put in place after an alternative drainage system to handle the same water had been put in place.
- A level spreader was constructed at the end of each interceptor drain to convert concentrated flows in the drain, into diffuse sheet flow on areas of vegetated ground. The

levels spreaders were located downgradient of any works areas in locations where they were not likely to contribute further to water ingress to construction areas of the site.

- Piped slope drains were be used to convey surface runoff from diversion drains safely down slopes to flat areas without causing erosion. Once the runoff reaches the flat areas it was reconverted to diffuse sheet flow. Level spreaders were established on slopes of less than 6% in grade. Piped slope drains were used to transfer water away from areas where slopes were too steep to use level spreaders.
- Vegetation filters, i.e. the existing vegetated areas of land, were used to accept surface water runoff from upgradient areas. The selection of suitable areas to use as vegetation filters was determined by the size of the contributing catchment, slope and ground conditions.
- Drainage swales were installed downgradient of any works areas to collect surface flow runoff where it had come into contact with exposed surfaces and picked up silt and sediment. Swales were intercept the potentially silt-laden water from the excavations and construction areas of the site and prevent it reaching natural watercourses.
- The velocity of flow in the interceptor drains and drainage swales, particularly on sloped sections of the channel, were controlled by check dams, which were installed at regular intervals along the drains to ensure flow in the swale is non-erosive. Check dams were also installed in some existing artificial drainage channels that received waters from works areas of the site.
- Stilling ponds were used to attenuate runoff from works areas of the site during the construction phase. The purpose of the stilling ponds was to intercept runoff, potentially laden with sediment, and to reduce the amount of sediment leaving the disturbed area by reducing runoff velocity. Reducing runoff velocity will allow larger particles to settle out in the stilling ponds, before the run-off water is redistributed as diffuse sheet flow in filter strips downgradient of any works areas.
- Silt fences were installed as an additional water protection measure around existing watercourses in certain locations, particularly where works were undertaken within the 50-metre buffer zone from natural watercourses, which is inevitable where existing roads in proximity to watercourses were upgraded as part of the Cleanrath wind farm development.

In addition, the development includes a detailed drainage plan that is included in full in Chapter 4 of the rEIAR. This plan and all the associated measures have been taken into account in this assessment but are not included in full in this chapter (to avoid repetition). The drainage philosophy overall was to minimise waters arising on site, to adequately treat any water that may have arisen and to ensure that the hydrological function of the watercourses on the site and in the wider catchment was not affected by the works. This philosophy, including all associated mitigation measures to protect local surface water quality, is fully described in Chapter 4 (Description of the Development) and Chapter 9 (Hydrology & Hydrogeology) of the rEIAR. Further details are also provided in the CEMP/OEMP & DP in Appendix 7/8/9 to this rNIS.

The NRA Guidelines for the Crossing of Watercourses during the Construction of National Road Schemes and the Scottish Natural Heritage (SNH) Good Practice During Wind Farm Construction were also adhered to.

The OEMP also includes the measures that will be undertaken to protect water quality during the 25 year lifespan of the wind farm and the decommissioning phase.

5.2.2 Potential Impacts on Hen Harrier

5.2.2.1 Construction

5.2.2.1.1 *Habitat Loss*

No breeding or roosting was recorded within the Cleanrath wind farm development site or 2km of same between February 2015 and March 2017. Hen harrier were recorded on 16 occasions during winter months. Observations consisted of male and female birds foraging within the Cleanrath wind farm development site on occasion.

Significant effects have not occurred and will not occur, particularly given the low levels of activity recorded. Extensive areas of suitable foraging habitat exist post construction and there is an abundance of suitable habitat in the surrounding area.

There is no potential for adverse effects on any SPA population in this regard.

5.2.2.1.2 *Displacement*

Hen harrier were recorded on 16 occasions during winter months. Observations consisted of male and female birds foraging within the Cleanrath wind farm development site on occasion. No breeding or roosting was observed within the Cleanrath wind farm development Site. Based on the core dataset there is no potential for significant displacement effects to have occurred given that hen harrier were not dependent on the habitats located in close proximity to development infrastructure for roosting or breeding. Extensive areas of suitable foraging habitat exist post construction and there is an abundance of suitable habitat in the surrounding area.

There is no potential for adverse effects on any SPA population in this regard.

5.2.2.2 Operation

5.2.2.2.1 *Habitat Loss*

No additional direct or indirect habitat loss has occurred or will occur as a result of the operation of the Cleanrath wind farm development.

5.2.2.2.2 *Displacement*

Turbine avoidance has been observed in hen harrier at one wind farm installation to extend to within 250 m of turbines (Pearce-Higgins et al. 2009). This study predicted a 52% reduction in breeding population within 500 m of a wind energy array but found no significant modification in flight height near turbines.

There was a single observation of a hen harrier during the four months of operational phase monitoring.

However, based on the core dataset there is no potential for significant displacement effects to occur given that hen harrier were not dependent on the habitats located in close proximity to development infrastructure for roosting or breeding. And foraging was only occasionally recorded onsite.

There is no potential for adverse effects on any SPA population in this regard.

5.2.2.2.3 *Collision*

The species was recorded flying within the potential collision risk zone during VP surveys. A “Random” collision risk analysis has been undertaken and full details are provided in Appendix 4.

The collision risk has been calculated at a ratio of 0.003 collisions per year, or one bird every 333 years. The predicted collision risk is insignificant in the context of the county, national and international population.

There is no potential for adverse effects on any SPA population in this regard.

5.2.2.3 Decommissioning

As discussed above, the impacts associated with the decommissioning of the wind farm (either at the end of the operational lifespan of the wind farm or at an earlier time, if required), the potential effects will be similar to those experienced during construction but on a much smaller scale. All decommissioning will be undertaken in accordance with the Decommissioning Plan (DP) that is provided in Appendix 9 and with Scottish Natural Heritage report (SNH) *Research and Guidance on Restoration and Decommissioning of Onshore Wind Farms* (SNH, 2013)

5.2.2.4 Mitigation to prevent effects on Hen Harrier

- No felling of conifers, trees or bushes were carried out during the bird breeding season (i.e. 1st of March until the 31st of August) without the direct supervision of a suitably trained ecologist to ensure there were no impacts on nesting birds.
- Removal of brash surrounding felled areas in proximity of turbines to discourage hen harrier and other birds of prey from foraging and nesting in these areas. (MM53)
- During the construction phase, noise limits, noise control measures, hours of operation (i.e. dusk and dawn is high faunal activity time) and selection of plant items was considered in relation to disturbance of birds.
- Plant and machinery were turned off when not in use.
- All plant and equipment for use were selected in compliance with the Construction Plant and the European Communities (Noise Emission by Equipment for Use Outdoors) Regulations 2001 (S.I. No. 632 of 2001).
- An Ecological Clerk of Works (ECoW) and a project ecologist was appointed for the Cleanrath wind farm development site which operated for the duration of construction works. Duties included:

    - Undertake a pre-construction bird surveys to ensure that significant effects on breeding birds will be avoided, particularly hen harrier and merlin (MX5).
    - Informing and educating on-site personnel of the ornithological and ecological sensitivities within the Cleanrath wind farm development site.
    - Oversee management of ornithological and ecological issues during the construction period, including the implementation of the Habitat Enhancement Plan and advising on ornithological issues as they arise.
    - Provide guidance to contractors to ensure legal compliance with respect to protected species onsite.
    - Liaising with officers of consenting authorities and other relevant bodies with regular updates in relation to construction progress.

A Construction and Environmental Management Plan (CEMP) has been prepared. The CEMP was in place prior to the start of the construction phase. Best practice measures which form part of the design of the project are included in Chapter 4 of the rEIAR. The CEMP is included as Appendix 7. An Operation and Environmental Management Plan (OEMP) (Appendix 8) and a Decommissioning Plan

(DP) (Appendix 9) have been prepared to ensure that any best practice and mitigation measures are fully implemented during any future operation and decommissioning of the Wind Farm.

6. ASSESSMENT OF RESIDUAL EFFECTS

6.1 The Gearagh cSAC

The potential for adverse effects on each of the individual Qualifying Interests that were identified as being at risk of potential effects in the AA Screening Report is assessed in this section in view of the Conservation Objectives of those habitats and species and following the implementation of mitigation.

This cSAC is located hydrologically downstream of the development via the River Toon which runs through the development site and via the River Lee, which is located downstream of the development site. Therefore, taking a precautionary approach, a potential pathway for indirect effects to occur or have occurred on the following QI habitats and species, in the form of deterioration of surface water quality resulting from pollution, associated with the construction, brief period of operation, current phase of sleep mode and any future operational and decomissioning phases of the development was identified:

- Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260]
- Rivers with muddy banks with *Chenopodion rubri* p.p. and Bidention p.p. vegetation [3270]
- Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*) [91E0]
- *Lutra lutra* (Otter) [1355]

6.1.1 Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260]

Site specific conservation objectives for Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260] are as follows:

"To maintain the favourable conservation condition of Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation in The Gearagh SAC"

An assessment of the Cleanrath wind farm development against the nominated attributes and targets for this habitat is provided in Table 6.1 below.

Table 6-6-1 Targets and attributes associated with the conservation objectives for Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation [3260]

<table>
<tr><th>Attribute</th><th>Target</th><th>Assessment</th></tr>
<tr><td>Habitat area</td><td>Area stable or increasing, subject to natural processes</td><td rowspan="2">The Cleanrath wind farm development has not had any adverse effect on the area and distribution of this habitat within or outside this European Site. There is no pathway for the operational phase of the windfarm to result in adverse effects habitat loss in terms of area and/or distribution.

The Cleanrath wind farm development will not have any adverse effect on the area and distribution of this habitat within or outside this European Site.</td></tr>
<tr><td>Habitat distribution</td><td>No decline, subject to natural processes.</td></tr>
</table>

Attribute	Target	Assessment
Hydrological regime: river flow	Maintain appropriate hydrological regime necessary to support the typical species and vegetation composition of the habitat	The Cleanrath wind farm development has not had any adverse effect on the ground or surface water hydrological regime or substratum within this European Site. Following the implementation of mitigation, there is no pathway for the operational phase of the windfarm to result in any hydrological effects on this European Site. The Cleanrath wind farm development will not have any adverse effect on the ground or surface water hydrological regime or substratum within this European Site
Hydrological regime: groundwater discharge	Maintain appropriate groundwater contribution necessary to support the typical species and vegetation composition of the habitat	
Substratum: variety and extent	Maintain variety and extent of substratum necessary to support the typical species and vegetation composition of the habitat	
Water quality: nutrients	Maintain the concentration of nutrients in the water column necessary to support the typical species and vegetation composition of the habitat	The Cleanrath wind farm development has not had any adverse effect on water quality, vegetation composition or fringing habitats within or outside this European Site. Following the implementation of mitigation, there is no pathway for the operational phase of the windfarm to result in adverse effects on these parameters . The Cleanrath wind farm development will not have any adverse effect on water quality, vegetation composition or fringing habitats within this European Site
Water quality: biological indicators	Maintain good or high biological status necessary to support the typical species and vegetation composition of the habitat	
Vegetation composition: typical species	Maintain typical species in good condition, including appropriate distribution and abundance	
Vegetation composition: vegetation communities	Maintain vegetation communities/ zonation/ mosaic characteristic of the site	
Fringing habitats	Maintain marginal fringing habitats that support the typical species and vegetation composition of the habitat	
Floodplain connectivity	Maintain floodplain connectivity necessary to support the typical species and vegetation composition of the habitat	The Cleanrath wind farm development has not had any adverse effect on floodplain connectivity within or outside this European Site. Following the implementation of mitigation, there is no pathway for the operational phase of the windfarm to result in adverse effects habitat loss in terms of floodplain connectivity.The Cleanrath wind farm development will not have any adverse effect on floodplain connectivity within this European Site

6.1.1.1 Determination

It can be objectively concluded that the Cleanrath wind farm development has not affected, and will not adversely affect, 'Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260] within this European Site.

6.1.2 Rivers with muddy banks with *Chenopodion rubri* p.p. and Bidention p.p. vegetation [3270]

Site specific conservation objectives for Rivers with muddy banks with *Chenopodion rubri* p.p. and *Bidention* p.p. vegetation [3270] is as follows:

"To maintain the favourable conservation condition of Rivers with muddy banks with Chenopodion rubri p.p. and Bidention p.p. vegetation in The Gearagh SAC"

An assessment of the Cleanrath wind farm development against the nominated attributes and targets for this habitat is provided in Table 6-2 below.

Table 6-2 Targets and attributes associated with the conservation objectives for Rivers with muddy banks with Chenopodion rubri p.p. and Bidention p.p. vegetation [3270]

Attribute	Target	Assessment
Habitat area	Area stable or increasing, subject to natural fluctuations	The Cleanrath wind farm development has not had any adverse effect on the habitat area or distribution or the ground or surface water hydrological regime or substratum within this European Site. Following the implementation of mitigation, ther is no pathway for the operational phase of the windfarm to result in any hydrological effects on this European Site. The Cleanrath wind farm development will not have any adverse effect on the habitat area or distribution or the ground or surface water hydrological regime or substratum within this European Site .
Habitat distribution	No decline, subject to natural processes.	
Hydrological regime: groundwater contribution; flood duration, flood frequency, flood area and depth	Maintain appropriate hydrological regime necessary to support the typical species and vegetation composition of the habitat	
Soil/substratum type: variety and extent	Maintain variety and extent of substratum necessary to support the typical species and vegetation composition of the habitat	The Cleanrath wind farm development has not had any adverse effect on the soil substratum type, nutrient status or physical structure within or outside this European Site. Following the implementation of mitigation, there is no pathway for the operational phase of the windfarm to result in adverse effects on these . The Cleanrath wind farm development will not have any adverse effect on the soil/substratum and physical structure of this habitat within this European Site .
Soil/substratum nutrient status: nitrogen and phosphorus	Maintain nutrient status necessary to support the typical species and vegetation composition of the habitat	
Physical structure: Bare ground	Maintain sufficient wet bare ground to support the typical species and vegetation composition of the habitat	
Water quality: nutrients; phytoplankton biomass	Maintain water quality necessary to support the typical species and vegetation composition of the habitat	The Cleanrath wind farm development has not had any adverse effect on water quality, vegetation composition or fringing habitats within or outside this European Site. Following

Attribute	Target	Assessment
Typical species	Maintain typical species in good condition, including appropriate distribution and abundance	the implementation of mitigation, there is no pathway for the operational phase of the windfarm to result in adverse effects on these parameters . The Cleanrath wind farm development will not have any adverse effect on water quality nutrients, typical species, vegetation composition or fringing habitats within this European Site .
Vegetation composition: vegetation zonation	Maintain vegetation zonation/mosaic characteristic of the site	
Fringing habitats	Maintain marginal fringing habitats that support the typical species and vegetation composition of the habitat	
Floodplain connectivity	Maintain floodplain connectivity necessary to support the typical species and vegetation composition of the habitat	The Cleanrath wind farm development has not had any adverse effect on floodplain connectivity within or outside this European Site. Following the implementation of mitigation, there is no pathway for the operational phase of the windfarm to result in adverse effects habitat loss in terms of floodplain connectivity. The Cleanrath wind farm development will not have any adverse effect on floodplain connectivity within this European Site .

6.1.2.1 Determination

It can be objectively concluded that the Cleanrath wind farm development has not affected, and will not adversely affect, 'Rivers with muddy banks with *Chenopodion rubri p.p.* and *Bidention p.p.* vegetation;'[3270] within this European Site.

6.1.3 Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae) [91E0]

Site specific conservation objectives for Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae) [91E0] is as follows:

"To maintain the favourable conservation condition of Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*)* in The Gearagh SAC

An assessment of the Cleanrath wind farm development against the nominated attributes and targets for this habitat is provided in Table 6.3 below.

Table 6-3 Targets and attributes associated with the conservation objectives for Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae) [91E0]

Attribute	Target	Assessment
Habitat area	Area stable or increasing, subject to natural processes, at least 101.2ha for site surveyed.	The Cleanrath wind farm development has not had any adverse effect on the habitat area or distribution or the ground or the woodland size within this European Site. Following the implementation of mitigation, there is no
Habitat distribution	No decline	

Attribute	Target	Assessment
Woodland Size	Area stable or increasing. Where topographically possible, "large" woods at least 25ha in size and “small” woods at least 3ha in size	pathway for the operational phase of the windfarm to result in any effects on the size, area or distribution of this habitat within this European Site. The Cleanrath wind farm development will not have any adverse effect on the habitat area or distribution or the ground or the woodland size within this European Site.
Woodland structure: cover and height	Diverse structure with a relatively closed canopy containing mature trees; subcanopy layer with semimature trees and shrubs; and well-developed herb layer	The Cleanrath wind farm development has not had any adverse effect on the woodland structure within this European Site. Following the implementation of mitigation, there is no pathway for the operational phase of the windfarm to result in any effects on woodland structure within this European Site. The Cleanrath wind farm development will not have any adverse effect on woodland structure within this European Site .
Woodland Structure: community diversity and extent	Maintain diversity and extent of community types	
Woodland structure: natural regeneration	Seedlings, saplings and pole age-classes occur in adequate proportions to ensure survival of woodland canopy	
Hydrological regime: Flooding Depth/height of water table	Appropriate hydrological regime necessary for maintenance of alluvial vegetation	The Cleanrath wind farm development has not had any adverse effect on the hydrological regime this European Site. Following the implementation of mitigation, there is no pathway for the operational phase of the windfarm to result in any hydrological effects on this European Site. The Cleanrath wind farm development will not have any adverse effect on the hydrological regime within this European Site .
Woodland structure: dead wood	At least 30m³/ha of fallen timber greater than 10cm diameter; 30snags/ha; both categories should include stems greater than 40cm diameter (greater than 20cm diameter in the case of alder (Alnus glutinosa))	The Cleanrath wind farm development has not had any adverse effect on the woodland structure within this European Site. Following the implementation of mitigation, there is no pathway for the operational phase of the windfarm to result in any effects on woodland structure within this European Site has been identified. The Cleanrath wind farm development will not have any adverse effect on woodland structure within this European Site .
Woodland structure: veteran trees	No decline	
Woodland structure: indicators of local distinctiveness.	No decline	
Vegetation composition: native tree cover	No decline. Native tree cover not less than 95%	The Cleanrath wind farm development has not had any adverse effect on vegetation composition within this European Site.

Attribute	Target	Assessment
Vegetation composition: typical species	A variety of typical native species present, depending on woodland type, including A variety of typical native species present, including oak (Quercus spp.), ash (Fraxinus excelsior), birch (Betula pubescens), alder (Alnus glutinosa) and willows (Salix spp.)	Following the implementation of mitigation, there is no pathway for the operational phase of the windfarm to result in any effects on vegetation composition within this European Site. The Cleanrath wind farm development will not have any adverse effect on vegetative composition within this European Site .
Vegetation composition: negative indicator species	Negative indicator species, particularly non-native invasive species, absent or under contro	

6.1.3.1 Determination

It can be objectively concluded that the Cleanrath wind farm development has not affected, and will not, adversely affect 'Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*)' [91E0] within this European Site.

6.1.4 *Lutra lutra* (Otter) [1355]

Site specific conservation objectives for otters is as follows:

"To maintain the favourable conservation condition of Otter in The Gearagh SAC,"

An assessment of the Cleanrath wind farm development against the nominated attributes and targets for this species are provided in Table 6-4 below.

Table 6-4 Targets and attributes associated with the conservation objectives for Lutra lutra (Otter) [1355]

Attribute	Target	Assessment
Distribution	No significant decline	The Cleanrath wind farm development has not had any adverse effect on the extent of freshwater and/or terrestrial habitat or couching/holting sites within or outside this European Site. There is no pathway for the operational phase of the windfarm to result in any effects on the size, area or distribution of otter habitat within or outside this European Site. The Cleanrath wind farm development will not have any adverse effect on the extent of freshwater and/or terrestrial habitat or couching/holting sites within or outside this European Site. . .
Extent of terrestrial habita	No significant decline. Area mapped and calculated as 23.7ha along river banks/lake shoreline/around ponds and 62.3ha of wet woodland, giving a total of 86.0ha	
Extent of freshwater (river) habitat	No significant decline. Length mapped and calculated as 10.6km	
Extent of freshwater (lake) habitat	No significant decline. Area mapped and calculated as 129.5ha	
Couching sites and holts	No significant decline	

Attribute	Target	Assessment
Fish biomass available	No significant decline	The Cleanrath wind farm development has not had any adverse effect on fish biomass available within or outside this European Site. Following the implementation of mitigation, there is no pathway for the operational phase of the windfarm to result in any effects on fish biomass within or outside this European Site. The Cleanrath wind farm development will not have any adverse effect on fish biomass availability within this European Site .
Barriers to connectivity	No significant increase	The Cleanrath wind farm development has not led to any barriers to connectivity either within or outside this European Site. There is no pathway for the operational phase of the windfarm to result in any barriers to connectivity within or outside this European Site. The Cleanrath wind farm development will not result in barriers to connectivity within this European Site .

6.1.5 Determination

It can be objectively concluded that the Cleanrath wind farm development has not affected, and will not, adversely affect '*Lutra lutra* (Otter)' [1355] within this European Site.

6.2 The Gearagh pSPA

The potential for adverse effects on each of the individual Special Conservation Interests that were identified as being at risk of potential effects in the AA Screening Report is assessed in this section in view of the Conservation Objectives of those habitats and species and following the implementation of mitigation.

This pSPA is located hydrologically downstream of the development via the River Toon which runs through the development site and via the River Lee, which is located downstream of the development site. Therefore, taking a precautionary approach, a potential pathway for indirect effects to occur or have occurred on the following SCI habitat, in the form of deterioration of surface water quality resulting from pollution, associated with the construction and operational phases of the development was identified:

- Wetland and Waterbird [A999]

6.2.1 Wetland and Waterbirds [A999]

Site specific conservation objectives for Wetland and Waterbirds [A999] is as follows:

"To maintain or restore the favourable conservation condition of the wetland habitat at The Gearagh SPA as a resource for the regularly-occurring migratory waterbirds that utilise it"

There are no specific nominated attributes and targets prepared for this habitat. However, following best practice, attributes and targets of another pSPA (NPWS, 2013[3]) for the same feature have been taken here for consideration in the absence of site- specific targets and attributes.

Table 6-5 Targets and attributes associated with the conservation objectives for wetlands [1355] (NPWS, 2013)

Attribute	Target	Assessment
Habitat area	The permanent area occupied by the wetland habitat should be stable and not significantly less than the area of occurring from natural patterns of variation.	The Cleanrath wind farm development has not had any adverse effect on the wetland habitat area within this European Site. Following the implementation of mitigation, there is no pathway for the operational phase of the windfarm to result in any effects on habitat area within this European Site. The Cleanrath wind farm development will not have any adverse effect on the wetland habitat area within this European Site. .

6.2.2 Determination

It can be objectively concluded that the Cleanrath wind farm development has not affected, and will not adversely, affect 'Wetland and Waterbirds' [A999] within this European Site.

6.3 Mullaghanish to Musheramore Mountains SPA

Whilst this European Site is located outside the Core Foraging Range of the SCI Species, hen harrier (as identified in 'Assessing Connectivity with Special Protection Areas' (Scottish Natural Heritage, 2016)), it is located within the maximum foraging range for this species. As hen harrier were recorded on the wind farm site during the extensive surveys undertaken (occasionally during the winter period), following the precautionary principle, the potential for adverse effects on this species could not be excluded:

- Hen harrier [A082]

Site specific conservation objectives documents are not available for this site. The conservation objective for this SCI is:

"To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA"

The Cleanrath wind farm development has not had any adverse effect on the favourable conservation condition of this species within this European Site. Following the implementation of mitigation, there is no pathway for the operational phase of the windfarm to result in any effects on this species within this European Site.

[3] *NPWS (2013) Conservation Objectives: Inner Galway Bay SPA 004031. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht. Available at:* https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO004031.pdf

6.3.1 Determination on Potential Adverse Effects on Mullaghanish to Musheramore Mountains SPA

Following the results of the extensive bird monitoring that has been undertaken at this site and following the implementation of mitigation, it can be objectively concluded that the Cleanrath wind farm development has not affected and will not adversely affect the favourable conservation status of Hen harrier [A082] within this European Site.

7. CUMULATIVE EFFECTS

The development was considered in combination with other plans and projects in the area that could result or have resulted in cumulative impacts on relevant European Sites. This included a review of online Planning Registers and served to identify past, present and future plans and projects, their activities and their predicted environmental effects. The plans and projects considered are listed below.

7.1.1 Assessment of Plans

The review focused on policies and objectives that relate to European Sites. An overview of the search results with regard to plans is provided in Table 7.1.

The following development plans have been reviewed and taken into consideration as part of this assessment:

- Cork County Development Plan 2014-2020
- Kerry County Development Plan 2015-2021
- River Basin Management Plan for Ireland 2018–2021

Table 7.1 Review of Plans and Policies

Plans	Key Policies/Issues/Objectives Directly Related to European Sites, Biodiversity and Sustainable Development In The Zone of Influence	Assessment of development compliance with policy
Cork County Development Plan 2014-2020 and all relevant environmental documents and assessments associated with that plan	NATURA 2000 Sites: Policies & Objective HE-2-1 Provide protection to all natural heritage sites designated or proposed for designation under National and European legislation and International Agreements, and to maintain or develop linkages between these. This includes Special Areas of Conservation, Special Protection Areas, Natural Heritage Areas, Statutory Nature Reserves, Refuges for Fauna and Ramsar Sites. HE-2-2 Provide protection to species listed in the Flora Protection Order 1990, on Annexes of the Habitats and Birds Directives, and to animal species protected under the Wildlife Acts in accordance with relevant legal requirements.	The development plan was comprehensively reviewed, with particular reference to Policies and Objectives that relate to the Natura 2000 network. In addition, the Natura Impact Report that was completed in respect of this plan was reviewed. There is no potential for cumulative impacts to occur or have occurred when considered in conjunction with the Cleanrath wind farm development.
Kerry County Development Plan 2015-2021 and all relevant environmental documents and assessments associated with that plan	NE-2 Ensure that the requirements of relevant national and EU legislation, including the Habitats Directive (92/43/EEC), the EU (Birds) Directive (79/409/EEC), the Environmental Impact Assessment Directive (85/337/EEC), the Water Framework Directive (2000/60/EC), and the Flood Directive (2007/60/EC), are met by the Council in undertaking its functions. NE-11 Ensure that all projects likely to have a significant effect on a Natura 2000 / European site will be subject to Habitats Directive Assessment prior to approval. NE-12 Ensure that no projects which will be reasonably likely to give rise to significant adverse direct, indirect or secondary impacts on the integrity of any Natura 2000 sites having regard to their conservation objectives, shall be permitted on the basis of this Plan (either individually or in combination with other plans or projects) unless imperative reasons of overriding public interest can be established and there are no feasible alternative solutions. NE-14 Protect species of plants listed in the Flora Protection Order (S.I. No. 94 of 1999) and their habitats, species and the habitats of species that require strict protection under the Habitats Regulations (S.I. No. 94 of 1997, 233 of 1998 and 378 of 2005) and animal and bird species and their habitats protected under the Wildlife Acts 1976-2000.	The Development plan was comprehensively reviewed, with particular reference to Policies and Objectives that relate to the Natura 2000 network. In addition, the Natura Impact Report that was completed in respect of this plan was reviewed. There is no potential for cumulative impacts to occur or have occurred when considered in conjunction with the Cleanrath wind farm development. Detailed ecological surveys have been undertaken within the study area to provide robust scientific data on which the findings of this report rely.

Plans	Key Policies/Issues/Objectives Directly Related to European Sites, Biodiversity and Sustainable Development In The Zone of Influence	Assessment of development compliance with policy
		The Cleanrath wind farm development has been designed in order to avoid any potential for direct or indirect impact on European Sites or other sensitive ecological receptors to occur or have occurred.

7.1.2 Assessment of Projects

7.1.2.1 Applications Within the Subject Wind Farm Site

A review of Cork County Council and Kerry County Council Planning Registers, undertaken on the 20th July 2020, indicates that (apart from the planning history detailed above in sections 2.4.1 and 2.4.2) only 1 no. valid application was lodged within and/or immediately adjacent to the subject site boundary. R. Toibin lodged an application for a dwelling house (Pl Ref. 05/509) to Cork County Council in February 2005. Cork County Council decided to refuse permission for the development. No further planning applications were lodged to either Cork or Kerry County Councils regarding either residential, agricultural or other related wind energy development, excluding those planning applications already discussed.

7.1.2.2 Applications in the Vicinity of the Subject Site

The majority of planning applications in the immediate vicinity of the Cleanrath wind farm development are related to the provision and/or alteration of one-off housing and agricultural developments. Where relevant, these applications have been considered in the design of the project and are considered within the relevant sections of this rEIAR.

Between 2003 to March 2020, 102 no. valid applications were lodged to Cork and Kerry County Councils within the vicinity of the Cleanrath wind farm development with the majority (84 no.) lodged pre-2010. The most recent application for new residential development was Pl Ref. 19/5334 lodged by G. Hyde to construct a new dwelling house at Gortanaddan, Co. Cork. This site is located c. 1.3km north-east of the Cleanrath wind farm development. The Planning Authority granted conditional permission on the 7th January 2020 in the context of the Cleanrath wind farm being constructed.

Other applications lodged within the vicinity of the Cleanrath wind farm development, which don't relate to residential or agricultural development, include the following:

- Pl Ref. 13/5671: Application lodged by Coiste Forbartha Reidh na nDoiri to provide 1 no. finger post sign located at the site entrance to a holy well, installation of various light fittings throughout the site including any associated electrical works, and erection of 1 no. public information board at Reananerree, Cloheena, Co. Cork on the 28th August 2013. The Planning Authority granted conditional permission on the 18th November 2013.
- Pl Ref. 08/8074: Application lodged by D. O'Tuama for the construction of an engineering workshop, underground fuel storage tank, truck washing facility, treatment plant and percolation area, site infrastructure, vehicular entrance and associated site works at Cloontycarthy, Reananeree Co. Cork on 24th July 2008. The Planning Authority granted conditional permission on the 17th October 2008.

Due to the volume of historic applications lodged within the vicinity of the Cleanrath wind farm development over the past two decades, Table 7-2 below records valid consented planning applications lodged between 2010 – 2020 on the basis that any consented development prior to 2010 has been fully established within the receiving environment.

Table 7-7-1. Applications Lodged within the Vicinity of the Cleanrath wind farm development (Post-2010)

Pl Ref.	Lodgement Date	Description of Development	Location	Planning Authority Decision
105715	09/07/2010	Construction of dwelling to include a ground floor garage and storage area for machinery for own private	Milmorane, Inchigeela, Co. Cork	Conditional (08/02/2011)

Pl Ref.	Lodgement Date	Description of Development	Location	Planning Authority Decision
		use, septic tank and associated site works		
105911	28/07/2010	New vehicular entrance, entrance lane, and parking & turning area to serve a holy well.	Reananerree, Cloheena, Co. Cork	Conditional (21/11/2010)
108782	22/12/2010	Construction of Dwelling house	Lackabaun, Ballingeary, Co. Cork	Conditional (14/03/2011)
125144	28/05/2012	Retention of existing ground excavation works and permission for new timber storage area, weighbridge and associated site works	Cloontycarthy Reananeree, Co. Cork	Conditional (27/08/2012)
125577	18/07/2012	Construction of dwelling and domestic garage	Augeris, Ballingeary, Co. Cork	Conditional (16/10/2012)
125816	23/08/2012	Dwellinghouse and garage, extension of duration to permission granted under ref. no. 07/9729	Cloontycarthy Reananerree, Co. Cork	Unconditional
134901	15/05/2013	Retention of minor elevational changes to existing Dwellinghouse including extra window to gable end together with retention of existing domestic garage	Gorteennakilla, Ballingeary, Co. Cork	Conditional (06/08/2013)
135336	11/07/2013	Construction of dwelling house, domestic garage and new entrance	Gortanaddan Kilnamartyra, Co. Cork	Conditional (27/11/2013)
135671	28/08/2013	To carry out the following works to serve a holy well: erection of 1 no. finger post sign located at the site entrance, installation of various light fittings throughout the site including any associated electrical works, and erection of 1 no. public information board	Reananerree, Cloheena, Co. Cork	Conditional (18/11/2013)
15/262	04/02/2015	An electrical transformer station consisting of three single storey control buildings with associated outdoor electrical equipment, including transformers, lightning protection masts and scada poles, effluent holding tank, internal roads, boundary fencing, associated access track and all other associated site development works. The proposed development is an amendment to the previously approved electrical transformer station at Grousemount wind farm (ref. No. 10/1333)	Grousemount, Co. Kerry	Conditional 05/08/2015
154478	11/03/2015	Construction of two storey Dwellinghouse, new entrance and domestic garage	Gurteenflugh, Ballingeary, Co. Cork	Conditional (12/11/2015)
154821	22/04/2015	Retention of (a) extension to side of dwelling, (b) domestic garage, and (c) altered septic	Lisboy More Kilnamartyra Macroom, Co. Cork	Conditional (23/07/2015)

Pl Ref.	Lodgement Date	Description of Development	Location	Planning Authority Decision
		tank location (Previous Planning Ref. No. 1266/77)		
155738	05/08/2015	Construction of a split level dwelling house wastewater treatment system and all associated site works	Cloontycarthy Reananerree, Co. Cork	Conditional (04/12/2015)
151150	21/12/2015	Construct a dwelling house	Sillahertane, Kilgarvan, Co. Kerry	Conditional (23/02/2016)
16233	10/03/2016	Construct A Sheep House	Knockanruddig Kilgarvan Co Kerry	Conditional (27/04/2016)
165878	27/07/2016	Construction of two storey Dwellinghouse, domestic garage, domestic effluent treatment system and all ancillary works	Reananerree, Co. Cork	Conditional (01/11/2016)
176117	16/08/2017	Construct a calving house and a cubicle/loose house with underground effluent storage tank and associated site work	Cloontycarthy Reananerree Macroom, Co. Cork	Conditional (12/09/2018)
185108	02/05/2018	Construct an extension to Dwellinghouse, alterations to the elevations, installation of a stairs to the existing attic space and all associated site works	Eachros, Augeris, Ballingeary, Co. Cork	Conditional (06/12/2018)
185692	29/06/2018	Construction of Dwellinghouse, domestic garage, new entrance together with all other ancillary site works	Gortanaddan Kilnamartyra, Co. Cork	Conditional (12/11/2018)
185848	13/07/2018	To construct a new dwelling house	Lisboy More, Kilnamartyra, Co. Cork	Conditional (30/11/2018)
194024	10/01/2019	Construction of an extension, new dormer window, elevational changes, demolitions and internal refurbishments to an existing dwelling, landscaping and all associated site works	Gorteennakilla, Cahir, Ballingeary, Co. Cork	Conditional (09/05/2019)
194193	30/01/2019	Construction of new dwellinghouse	Kilmore Ballingeary Co. Cork	Conditional (29/07/2019)
194245	06/02/2019	Alterations and 2-storey extension to existing dwellinghouse together with demolition of existing rear extension to existing dwellinghouse	Gortnabinna Ballingeary Macroom Co. Cork	Conditional (22/11/2019)
195334	24/05/2019	Dwellinghouse	Gortanaddan, Co. Cork	Conditional (26/08/2019)
195979	07/08/2019	1. Construction of agricultural building to include straw bedded livestock housing and associated livestock crush facilities, ancillary dry goods and machinery store, 2. Construction of unroofed slatted slurry tank and unroofed manure store, 3. Erection of 2 no. meal bins along with associated site works.	Gorteennakilla Ballingeary, Co. Cork	Conditional (19/11/2019)

Pl Ref.	Lodgement Date	Description of Development	Location	Planning Authority Decision
196405	04/10/2019	To construct new single storey and two storey extension to rear of existing dormer style dwelling, facade alterations to dwelling and all associated site works	Gortanaddan, Co. Cork	Conditional (07/01/2019)
204131	29/01/2020	Retention for a building extension for a disabled WC and circulation space, re-location of plant room and all associated site works.	Scoil Mhuire Dromanallig Ballingeary Co. Cork	Conditional (22/06/2020)

7.1.2.3 Other Wind Farm Sites

Within the wider area, there have been a large number of planning applications for wind farm developments (comprising two or more turbines) lodged within a 20-kilometre radius of the Cleanrath wind farm development. These wind farms applications are based on a review of the Cork County Council and Kerry County Council Planning Register and include those listed below. This record lists the main relevant applications in relation to the wind turbine applications. It is not intended to be exhaustive and list every application associated with the sites.

Table 7-7-2. Wind Farm Applications Lodged within the Vicinity of the Cleanrath wind farm development (20km)

Wind Farm	Pl. Ref.	Lodgement	Description	Location	Local Authority Decision
Derragh	12/5270	08/06/2012	Development of a wind farm consisting of 6 turbines (each with a maximum hub height of 100, maximum rotor diameter of 100m, and with a total tip height of 150m), a substation, one borrow pit, new internal access roads, upgrading of existing internal access roads and all ancillary works	Derragh, Rathgaskig and Lack Beg near Ballingeary, Co. Cork. Adjacent to the grid connection route for the Cleanrath wind farm development	CCC – Conditional Grant (18/06/2013) ABP – Grant (PL04.242223 - 15/11/2013) and Further Grant following Judicial Review (O'Grianna Judgement) and remittal PL04.245082 (15/06/2016)
Coomagearlahy	02/1241	22/05/2002	Construct a windfarm consisting of 17 [14 no. turbines built during Phase 1] wind turbines, an electrical substation with control building, 2 no. 50m high meteorological masts, construct and extend existing internal site tracks and associated works - EIS Received	Coomagearlahy Kilgarvan, Co. Kerry (c. 11km north-west of the Cleanrath wind farm development)	KCC – Conditional Grant (27/12/2002)
	03/2306	07/08/2003	Construct a wind farm extension to planning reg no 1241/02, extension will consist of 4 wind turbines [1 no. built during Phase 2] (hub height 80 m, blade diameter 80 m), construction and extension of existing internal site tracks and associated works. EIS Received		KCC – Conditional Grant (01/10/2003)
Sillahertane	03/1359	20/05/2003	Erect 10 no. 1 mw wind turbines, 1 no. 40m wind monitoring mast(temporary), service roadways and control house. EIS received	Sillahertane Kilgarvan, Co. Kerry (c. 10km west of the Cleanrath wind farm development)	KCC – Conditional Grant (18/12/2003)
Grousemount and Barnastooka	10/197	04/03/2010	The development will consist of fourteen (14) wind turbines of 80 metre hub height and 90 metre rotor diameter, control building, electrical compound, associated site roads, drainage and site works. Environmental impact statement accompanied (EIS)	Gortlahard, Coolnagoppoge and Barnastooka Kilgarvan Co Kerry (c. 8 - 12km west of the Cleanrath wind farm development)	KCC – Conditional Grant(25/11/2010). 3rd Party Appeal (PL08.237551) Appeal Withdrawn
	10/1333	23/12/2010	Erect 24 wind turbines each having a rated electrical output of 2,000 kilowatts. Each wind turbine will have an overall maximum dimension of 126 metres, comprising a tower 80 - 85 metres high, with a diameter of about 4 metres at the base, to which three blades of 41 - 45 metres length will be attached.		KCC – Conditional Grant(26/01/2012)
	15/262	02/04/2015	The proposed development is an amendment to the previously approved electrical transformer station at Grousemount Wind Farm (ref. No. 10/1333)		KCC – Conditional Grant (05/08/2015)

Wind Farm	Pl. Ref.	Lodgement	Description	Location	Local Authority Decision
Lettercannon	03/2508	27/08/2003	4 no. 1mw wind turbines service roadways and control house and 1 no. 40m wind monitoring mast (temporary) and river crossing (temporary) for construction purposes	Lettercannon Kilgarvan Co Kerry (c. 13km west of the Cleanrath wind farm development)	3rd Party Appeal (PL08.209629). Granted Conditional Permission with revised Conditions (27/04/2005)
	07/4515	12/12/2007	Move one wind turbine (T1) as an alteration to a six wind turbine development granted planning permission by An Bord Pleanála (ABP Ref PL. 08.209629 and Kerry County Council planning register Ref 03/2508). It is proposed to move the turbine approximately 480m to the northeast of its current location.		KCC – Conditional Grant (19/03/2008)
	07/4701	21/12/2007	Erect one wind turbine (T9), hub height 80m, blade diameter 90m, as an addition to a six wind turbine development granted planning permission by An Bord Pleanála (ABP Ref PL. 08.209629 and Kerry County Council planning register Ref 03/2508).		KCC – Conditional Grant (27/03/2008)
Clydaghroe / Creedon	04/3152	20/08/2004	Development of a wind farm, the wind farm will consist of 2 wind turbines and service roadways on a site, (an EIS has been submitted with this application)	Clydaghroe Clonkeen Co. Kerry (c. 12km north-west of the Cleanrath wind farm development)	KCC – Conditional Grant (16/11/2004)
	07/306	29/01/2007	The development will consist of 1 wind turbine and service roadway. EIS submitted.	Clydaghroe Clonkeen Co. Kerry (c. 12km north-west of the Cleanrath wind farm development)	KCC – Conditional Grant (25/04/2007)
	10/1302	21/12/2010	Construct a single turbine extension to an existing three turbine windfarm. The maximum hub height will be 68.3m and the maximum rotor diameter will be 82.4m resulting in a maximum tip height of 109.5.	Clydaghroe Clonkeen Co. Kerry (c. 12km north-west of the Cleanrath wind farm development)	KCC – Refused 1st Party Appeal (PL08.238677). Grant conditional permission (21/07/2011)
Clydaghroe / Cummeennabuddoge	06/1680	15/05/2006	Construct a wind farm, the development will consist of two wind turbines, two transformers, a control and metering building, a meteorological mast, site tracks and all associated works	Cummeennabuddoge and Clydaghroe Clonkeen Co Kerry	KCC – Conditional Grant (11/08/2006)

Wind Farm	Pl. Ref.	Lodgement	Description	Location	Local Authority Decision
				(c. 11km north of the Cleanrath wind farm development)	
Inchincoosh	07/1605	20/04/2007	Erect six wind turbines hub height 80m, blade diameter 90m, one 80m high meteorological mast, four borrow pits, construction of internal site tracks and associated works	Inchincoosh Kilgarvan Co Kerry (c. 14km north-west of the Cleanrath wind farm development)	KCC – Conditional Grant (05/09/2007)
	07/4364	27/11/2007	Erect one wind turbine, hub height 80m, blade diameter 90m (as an addition to a five wind turbine development granted permission under planning ref. No. 07/1605)		KCC – Conditional Grant (29/02/2008)
Midas	03/1188	02/05/2003	Develop wind farm consisting of 9 no. Wind turbines of 78 metres hub height and 80 metres rotor blade diameter; wind monitoring mast of 40 metres height; on site tracks and electrical control house together with necessary cabling [6 no. turbines built]	Inchee Poulbatha & Foilgreana (c. 9 - 10km west of the Cleanrath wind farm development)	KCC – Conditional Grant (12/11/2003). 1st Part Appeal (PL08.204953) Appeal Withdrawn
	01/3571	03/12/2001	Construct a wind farm(8 no. Turbines) EIS received [4 no. turbines built]	Coolknoohil Co. Kerry (c. 10 - 11km west of the Cleanrath wind farm development	KCC – Conditional Grant (03/12/2002)
	02/719	03/22/2002	Construct a wind farm consisting of 6 no. Wind turbine generators, electrical substation, septic tank, percolation area, access roadways, buried cable ducts and a 50m anemometer mast. EIS received.		KCC – Conditional Grant (07/01/2003)
	03/2610	08/09/2003	Erect four wind turbines of 60m hub height, 52m rotor blade diameter, on-site tracks and cabling [3 no. turbines built]		KCC – Conditional Grant (18/02/2004)
	03/2609	08/09/2003	Erect 5 wind turbines of 60m hub height, 52m rotor blade diameter, on site tracks and cabling [4 no. turbines built]		KCC – Conditional Grant (18/02/2004)
	03/3665	10/12/2003	To increase the hub heights of 7 wind turbines of planning reg no. 01/3571 from 49m to 60m hub height		KCC – Conditional Grant (15/03/2004)
Bawnmore	01/6529	03/12/2001	Wind farm to include 7 no. turbines, substation and site tracks (5 no. turbines built)	Cahernafulla, Kilberrihert, Co. Cork (c. 17km to the north-east of the Cleanrath wind farm development.)	CCC – Conditional Grant (22/04/2003)
	08/8770	05/09/2008	An increase in hub height from 60 to 85 metres and rotor blade diameter from 66 to 82 metres as well as the addition of 1no. wind turbine to the permitted wind farm development at Cahernafulla.	Cahernafulla, Kilberrihert, Co. Cork (c. 17km to the north-east of the Cleanrath	CCC – Conditional Grant (27/03/2009). 3rd Party Appeal (PL04.232274)

Wind Farm	Pl. Ref.	Lodgement	Description	Location	Local Authority Decision
				wind farm development.)	Appeal Withdrawn
Bawnmore 2 (Carriganimma Community Wind Farm)	07/4102	08/01/2007	Wind farm with 6 no. wind turbines (80m hub height and 80m blade diameter with total height not exceeding 120m), a 38kV.	Carriganimmy Macroom, Co. Cork (c. 15km to the north-east of the Cleanrath wind farm development.)	CCC – Conditional Grant (28/06/2007
Curraglass	20/350	03/07/2020	A renewable energy development with a 30-year operational life (from the date of commissioning) and will consist of up to 7 no. wind turbines with an overall blade tip height of up to 178.5 metres, a 38 kV electricity substation, including 4 no. battery storage containers and all associated site development and ancillary works.	Derreendonee, Curraglass and Cappaboy Beg Co. Cork (c. 12km to the south west of the Cleanrath wind farm development.)	Decision Due Date: 27/08/2020
Shehy More	13/551	30/09/2013	Ten year permission sought to construct a windfarm and all associated infrastructure. The proposed windfarm will comprise the provision of a total of 12 no. wind turbines [11 no. granted], with a maximum overall blade tip height of up to 131m. The Planning Application is accompanied by an Environmental Impact Statement (EIS) and a Natura Impact Statement (NIS).	Cloghboola, Gortnacarriga, Tooreenalour, Garryantorna, Shehy More, Dunmanway, Co. Cork (c. 6-10 km to the south west of the Cleanrath wind farm development)	CCC - Conditional Permission. 3rd Party Appeal (PL04.243486) Granted Conditional Permission on the 23rd of December, 2016
Derreenacrinning West	10/857	16/12/2010	Development to comprise of seven (7) electricity generating wind turbines with a hub height of 55 metres and a rotor diameter of 52 metres, an Electrical Compound, Sub-Station Building.	Derreenacrinnig West Drimoleague Co. Cork (c. 19km to the south of the Cleanrath wind farm development)	CCC – Conditional Permission. 3rd Party Appeal (PL88.239767) Conditional Permission Granted (05/12/2012)
Carrigarierk	15/730	22/12/2015	Ten year planning permission for the construction of a wind farm of up to 5 No. wind turbines, with a maximum ground to blade tip height of up to 140m.	Barnadivane (Kneeves), Co. Cork	CCC - Refused 1st Party Appeal (PL04.246353)

Wind Farm	Pl. Ref.	Lodgement	Description	Location	Local Authority Decision
				(c. 7km to the south of the Cleanrath wind farm development)	Conditional Permission Granted (28/10/2016)
Dromleena	09/63	28/01/2009	Ten year permission to erect 11no. Wind Turbines on single site. This planning application will be accompanied by an EIS	Dromleena, Inchanadreen & Derrynasafagh Dunmanway, Co. Cork (c. 15-16km to the south of the Cleanrath wind warm development)	CCC – Conditional Grant (23/12/2009)
Kilvinane	01/980	28/02/2001	Windfarm consisting of 4 wind turbines, electrical substation with control building, 50m meteorological mast, upgrading of entrance & assoc. works [3 no. turbines built]	Garranure, Co. Cork (c. 20km to the south-east of the Cleanrath wind farm development)	CCC – Conditional Grant 1st / 3rd Party Appeal (PL04.127137) Conditional Grant (19/07/2002)
Gneeves	99/0616	12/02/1999	15.6 MW windfarm to incl. 13 turbines, 45m high measuring mast, control building, hard standing areas, compound, access roads, signs & anc. site works [11 no. turbines built]	Gneeves, Co. Cork (c. 14km to the north of the Cleanrath wind farm development)	CCC – Conditional Grant 3rd Party Appeal (PL04.111211) Appeal Withdrawn
	03/6585	18/12/2003	Modifications to windfarm permitted under Reg. No. N/99/0616 to include increase of the turbine height from 44m to 65m		CCC – Conditional Grant (29/03/2004)
	04/188	16/01/2004	Extension to windfarm permitted under reg. no. N/99/0616 to consist of 4 no. wind turbines (hub height 65m, blade tip 91m), construction of an extension of internal site tracks and associated works		CCC – Conditional Grant (16/08/2004)
	13/5717	04/09/2013	Ten year planning permission for an extension to existing Gneeves Wind Farm (Planning Refs. 99/0616, 03/6585, 04/1355, 04/0188, 08/5636, 13/4566). The proposed extension will comprise of 3no. turbines (each with a maximum tip height of 91m)		CCC – Conditional Grant (03/09/2014)
Curragh	07/10105	03/08/2007	Windfarm development comprising of 8 no. wind turbines, substation, meteorological mast, associated access roads, borrow pit and associated works	Curragh Drishane, Millstreet, Co. Cork	CCC – Conditional Grant (21/08/2008)

Wind Farm	Pl. Ref.	Lodgement	Description	Location	Local Authority Decision
				(c. 14km north-east of Cleanrath wind farm development)	
Coomacheo	03/1997	29/04/2003	Windfarm to include 17 no. turbines, 60m meteorological mast,120KV substation, control building, fencing, compound and ancillary works [15 no. turbines built]	Coomacheo, Co. Cork (c. 14km north of Cleanrath wind farm development)	CCC – Conditional Grant (25/07/2003)
Caherdowney	03/3079	23/06/2003	Windfarm to include 4 no. turbines, meteorological mast, transformers,38kv substation, control building, site tracks and associated works	Caherdowney, Co. Cork (c. 13km north of Cleanrath wind farm development)	CCC – Conditional Grant (31/10/2003)
Knocknamork	19/4972	18/04/2019	Renewable energy development consisting of the provision of a 7 turbine wind farm, solar photovoltaic array, electricity substation, battery storage compound and all associated works.	Slievereagh and Coomnaclohy Ballyvourney Co. Cork (c. 10-11km north of the Cleanrath wind farm development)	CCC – Conditional Grant (02/01/2020)
Knockeenboy	11/59	08/02/2011	Development is to comprise of seven (7) electricity generating wind turbines with a hub height of up to 70 metres and a rotor diameter of up to 71 metres	Cashloura Kilronane West and Knockeenboy Dunmanway, Co. Cork (c. 20km to the south of the Cleanrath wind farm development)	CCC – Conditional Grant 3rd Party Appeal (PL88.240070) Conditional Permission Granted with Revised Conditions (24/08/2012)
Milane Hill	98/1482	14/04/1998	Construction of windfarm comprising of 10 no. turbines, transformers,1 meteorological mast, control building, access tracks ,gates, signs & anc. Works [9 no. turbines built]	Milane Hill, Drimoleague, Co. Cork (c. 19km to the south of the Cleanrath wind warm development)	CCC – Conditional Grant 3rd Party Appeal (PL04.108950) Conditional Permission Granted with Revised Conditions (25/05/1999)

Wind Farm	Pl. Ref.	Lodgement	Description	Location	Local Authority Decision
Barnadivane	05/5907	17/08/2005	18 no. wind turbines, 18 no. transformers, 110kV substation, 110kV switch station, 1 no. 70m high wind monitoring mast, construction and upgrading of site entrances, site tracks and associated works	Barnadivane, Co. Cork (c. 13 kilometres to the south east of the Cleanrath wind farm development)	CCC – Conditional Grant (39 no. Conditions) 3rd Party Appeal (PL04.219620) Conditional Permission Granted (14/02/2007)
	14/6760	19/12/2014	The construction of six wind turbines, with a maximum tip height of up to 131m and associated turbine foundations and hardstanding areas. This application is intended to replace the development already granted permission under PL04.219620 (05/5907) and subsequently extended under 11/6605. This application is seeking a 10-year planning permission. An Environmental Impact Statement and AA Screening Report have been prepared in respect of the planning application.	Lackareagh and Garranereagh Lissarda and Barnadivane (Kneeves) Teerelton Co Cork (c. 13 kilometres to the south east of the Cleanrath wind farm development)	CCC – Conditional Grant 3rd Party Appeal (PL04.245824). *Grant of Permission with Revised Conditions (Quashed following Judicial Review)* 3rd Party Appeal (PL04.248153) *Granted Conditional Permission with revised Conditions on 2nd of April 2019 – Quashed by High Court in May 2020 and remitted back to the Board*
Garranereagh	03/2047	01/05/2003	Wind farm to include 5 no. turbines, control housing and electrical compound anemometer mast, anemometer, service roadways & assoc. works	Garranereagh, Co. Cork (c. 15 kilometres to the south east of the Cleanrath wind farm development)	CCC – Conditional Grant (27/11/2003)
	10/5711	09/07/2010	Construction of a wind farm development comprising of 4 wind turbines with a hub height of up to 80m with blade length of 41m. This development requires an EIS and the EIS has been submitted with the application).		CCC – Conditional Grant(16/12/2010)

For the purposes of this cumulative assessment, wind farms within a 10-kilometre radius of the Cleanrath wind farm development area are considered to be within the potential cumulative Zone of influence and are described in further detail below.

Clydaghroe / Creedon (Ref: 04/3152)
Location: Clydaghroe, Clonkeen, Co. Kerry. Approx. 10km from Cleanrath wind farm.

The potential for the Cleanrath wind farm development to result or have resulted in cumulative or in combination effects on any European Site when assessed alongside Clydaghroe wind farm was considered. The planning file was reviewed on the Kerry County Council Planning Register.

Given that there is no potential for the Cleanrath wind farm to result or have resulted in adverse effects on any European Site when considered on its own, there is no potential for it to contribute or have contributed to any adverse effect, when considered cumulatively or in- combination with any other development, including the Clydaghroe/Creedon Wind Farm.

Midas, (Ref: 01/3571)

Location: Coolknoohil, Co. Kerry. Approx. 10km from Cleanrath wind farm.

The potential for the Cleanrath wind farm development to result or have resulted in cumulative or in combination effects on any European Site when assessed alongside Midas wind farm was considered. The planning file was reviewed on the Kerry County Council Planning Register.

Given that there is no potential for the Cleanrath wind farm to result or have resulted in adverse effects on any European Site when considered on its own, there is no potential for it to contribute or have contributed to any adverse effect, when considered cumulatively or in- combination with any other development, including the Midas Wind Farm.

Shehy More (Ref: 13/551)
Location: Cloghboola, Gortnacarriga, Tooreenalour, Garryantorna, Shehy More, Dunmanway, Co. Cork. Approx. 6km from Cleanrath wind farm.

The potential for the Cleanrath wind farm development to result or have resulted in adverse cumulative or in combination effects on European Sites when assessed alongside Shehy More wind farm was considered. The planning file was reviewed on the Cork County Council Planning Register.

Given that there is no potential for the Cleanrath wind farm to result or have resulted in adverse effects on any European Site when considered on its own, there is no potential for it to contribute or have contributed to any adverse effect, when considered cumulatively or in- combination with any other development, including the Shehy More Wind Farm.

Carrigarierk (Ref: 15/730)
Location: Carrigdangan, Co. Cork. Approx. 8km from Cleanrath wind farm.

The potential for the Cleanrath wind farm development to result or have resulted in adverse cumulative or in combination effects on European Sites when assessed alongside Carrigarierk wind farm was considered. The planning file was reviewed on the Cork County Council Planning Register.

Given that there is no potential for the Cleanrath wind farm to result or have resulted in adverse effects on any European Site when considered on its own, there is no potential for it to contribute or have contributed to any adverse effect, when considered cumulatively or in- combination with any other development, including the Carrigarierk Wind Farm.

Knocknamork (Ref: 19/4972)
Location: Slievereagh and Coomnaclohy, Ballyvourney, Co. Cork. Approx. 10km from Cleanrath wind farm.

The potential for the Cleanrath wind farm development to result or have resulted in adverse cumulative or in combination effects when assessed alongside Knocknamork wind farm was considered. The planning file was reviewed on the Cork County Council Planning Register.

Given that there is no potential for the Cleanrath wind farm to result or have resulted in adverse effects on any European Site when considered on its own, there is no potential for it to contribute or have contributed to any adverse effect, when considered cumulatively or in- combination with any other development, including the Knocknamork Wind Farm.

Derragh Wind Farm & Grousemount / Coomatagart Sub Station
Location: Adjacent to Cleanrath wind farm..

The Cleanrath wind farm development includes an entirely underground 33/38 kV cable running predominantly within the public road corridor from the wind farm to the 110 kV Coomataggart substation located in the townland of Grousemount, Co. Kerry. It also includes the Derragh Substation (Pl. Ref. 17/5126). Potential cumulative effects arising from the Cleanrath wind farm development have been comprehensively assessed with regard to Derragh Wind Farm (ABP PL04.245082), and Coomataggart 110 kV substation (Pl Ref. 15/262).

The potential for the Cleanrath wind farm development to result or have resulted in adverse cumulative or in combination effects when assessed alongside Derragh wind farm was considered. The planning files ware reviewed on the Cork and Kerry County Council Planning Registers. In addition, the previous An Bord Pleanála decision on the Cleanrath wind farm development was reviewed.

Following a review of the available online documentation, the decision by ABP states that it can be concluded '*beyond reasonable scientific doubt, that the proposed development (including the proposed grid connection), either individually or in combination with other plans and projects, would not adversely affect the integrity of these European sites, in view of those sites' conservation objectives, or of any other European sites*'. It was further '*concluded that the proposed development, subject to compliance with the mitigation measures proposed, and subject to compliance with the conditions set out ..* (in the planning permission conditions), *would not be likely to have significant effects on the environment*'.

Given that there is no potential for the Cleanrath wind farm development to result or have resulted in adverse effects on any European Site when considered on its own, there is no potential for it to contribute or have contributed to any adverse effect, when considered cumulatively or in- combination with any other development, including the Derragh Wind Farm & Grousemount wind farm / Coomatagart Sub Station .

In the review of the other projects that was undertaken, no connection between the sites, that could potentially result in additional or cumulative impacts was identified. Neither was any potential for different (new) impacts resulting from the combination of the various projects and plans in association with the subject wind farm.

Taking into consideration the reported residual effects from other plans and projects in the area and the identified or predicted effects with the Cleanrath wind farm development, there is no potential for adverse cumulative effects on European Sites to occur or have occurred.

Other Developments

The review of the Cork County Council and Kerry County Council planning register documented relevant general development planning applications in the vicinity of the Cleanrath wind farm development, most of which relate to the provision and/or alteration of one-off rural housing and agriculture-related structures, as listed in Table 7.2.

In the review of the other projects that was undertaken, no connection between the sites, that could potentially result in additional or cumulative impacts was identified. Neither was any potential for different (new) impacts resulting from the combination of the various projects and plans in association with the subject windfarm.

Taking into consideration the reported residual effects from other plans and projects in the area and the predicted effects with the current proposal, no potential for cumulative effects to occur or have occurred on any European site exists.

7.1.3 Conclusion of Cumulative Assessment

The residual construction, operational and decommissioning impacts of the Cleanrath wind farm development are considered cumulatively with other plans and projects as described above. Particular focus has been placed on those plans and projects that are in closest proximity to the Cleanrath wind farm development and those that could be or have been potentially affected via downstream surface water.

Following the detailed surveys undertaken and impact assessment provided above, it is concluded that there have not been and will not be adverse residual effects on European Sites, associated with the wind farm project and therefore it has not and will not contribute to any cumulative effect when considered in combination with other plans and projects. The other wind farms in the area were considered (among other projects) but the Cleanrath wind farm development has been deliberately designed to minimise the effects on European Sites by blocking the identified pathways for effect during construction, the brief period of operation, the current phase of sleep mode or any future operation.

No adverse effects as a result of the development in relation to disturbance, displacement or mortality of faunal species has been identified. Therefore, there is no potential for the Cleanrath wind farm development to contribute to any cumulative effect in this regard.

The Cleanrath wind farm development has not and will not result in any adverse residual effects on European Sites and has not contributed and will not contribute to any cumulative effect when considered in combination with other plans and projects. In the review of the projects and plans that was undertaken, no connection that could potentially result in additional or cumulative impacts was identified. Neither was any potential for different (new) impacts resulting from the combination of the various projects and plans in association with the Cleanrath wind farm development.

8. CONCLUDING STATEMENT

This rNIS has provided an assessment of all potential direct or indirect adverse effects on European Sites.

Where the potential for any adverse effect on any European Site to have occurred or to occur has been identified, the pathway by which any such effect may occur has been robustly blocked through the use of avoidance, appropriate design and mitigation measures as set out within this report and its appendices. The measures ensure that the construction, operation and decommissioning of the Cleanrath wind farm development has not and will not adversely affect the integrity of any European sites.

Therefore, it can be objectively concluded beyond reasonable scientific doubt that the Cleanrath wind farm development (including all its elements: the turbine delivery route, the Derragh Substation and the grid connection route), individually or in combination with other plans or projects, has not and will not adversely affect the integrity of any European Site.

BIBLIOGRAPHY

Bailey, M. and Rochford J. (2006) Otter Survey of Ireland 2004/2005. Irish Wildlife Manuals, No. 23. National Parks and Wildlife Service, Department of Environment, Heritage and Local Government, Dublin, Ireland.

Balmer, D.E., Gillings, S., Caffrey, B.J., Swann, R.L., Downie, I.S. and Fuller, R.J. (2013). Bird Atlas 2007-11: the breeding and wintering birds of Britain and Ireland. BTO Books, Thetford, UK.

Birds Directive (2009/47/EC) – http://ec.europa.eu/environment/nature /legislation/birdsdirective /index _en.htm

Blumstein DT, Anthony LL, Harcourt R, Ross G. 2003. Testing a key assumption of wildlife buffer zones: is flight initiation distance a species-specific trait? Biological Conservation 110:97–100.

Blumstein DT, Fernández-Juricic E, Zollner PA, Garity SC. 2005. Inter-specific variation in avian responses to human disturbance. Journal of Applied Ecology 42:943–953. Blumstein DT 2006b. The multi-predator hypothesis and the evolutionary persistence of antipredator behavior. Ethology 112: 209–217.

Bowers Marriott, B. (1997) Practical Guide to Environmental Impact Assessment: A Practical Guide. Published by McGraw-Hill Professional, 1997, 320 pp.

Chandler, J.R. (1970) A Biological Approach to water Quality Management. Water Poll. Cont. 69:415-421.

Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora (Habitats Directive) and Directive 2009/147/EC (codified version of Directive 79/409/EEC as amended) (Birds Directive) – transposed into Irish law as European Communities (Birds and Natural Habitats) Regulations 2011 (SI 477/2011).

CIEEM (2018) Institute of Ecology and Environmental Management Draft Guidelines for Ecological Impact Assessment.

Crowe, O., Wilson, J., Aznar, I. and More, S.J. (2009). A review of Ireland's waterbirds, with emphasis on wintering migrants and reference to H5N1 avian influenza. Irish Veterinary Journal 62, 800–811.

Crowe, O. (2005) Ireland's Wetlands and their Waterbirds: Status and Distribution. BirdWatch Ireland, Rockingham, Co. Wicklow.

Del Hoyo, J., Elliott, A., and Sargatal, J. 1996. Handbook of the Birds of the World, vol. 3: Hoatzin to Auks. Lynx Edicions, Barcelona, Spain

DEHLG (2009) Appropriate Assessment of Plans and Projects in Ireland: Guidance for Planning Authorities. DEHLG, Dublin.

DoEHLG (2010). Appropriate Assessment of Plans and Projects in Ireland. Guidance for Planning Authorities. Revision, February, 2010. Department of the Environment, Heritage and Local Government.

EC (2018) Managing Natura 2000 Sites: the provisions of Article 6 of the 'Habitats' Directive 92/43/EEC, Office for Official Publications of the European Communities, Luxembourg. European Commission.

EC (2001) Assessment of plans and projects significantly affecting Natura 2000 sites: Methodological guidance on the provisions of Articles 6(3) and (4) of the Habitats Directive 92/43/EEC.

EC (2002) Assessment of Plans and Projects Significantly Affecting Natura 2000 Sites: Methodological guidance on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC, Office for Official Publications of the European Communities, Luxembourg. European Commission.

EC (2006) Nature and biodiversity cases: Ruling of the European Court of Justice. Office for Official Publications of the European Communities, Luxembourg.

EC (2007a) Guidance document on Article 6(4) of the 'Habitats Directive' 92/43/EEC – Clarification of the concepts of: alternative solutions, imperative reasons of overriding public interest, compensatory measures, overall coherence, opinion of the commission. Office for Official Publications of the European Communities, Luxembourg. European Commission.

EC (2007b) Interpretation Manual of European Union Habitats. Version EUR 27. European Commission, DG Environment.

EPA (2002) Guidelines on the information to be contained in Environmental Impact Statements. Environmental Protection Agency.

EPA (2003) Advice Notes on current practice in the preparation of Environmental Impact Statements. Environmental Protection Agency.

EPA website: http://www.epa.ie.

European Communities (Conservation of Wild Birds) Regulations, 1985, SI 291/1985 & amendments – http://www.irishstatutebook.ie.

European Communities (Environmental Impact Assessment) Regulations, 1989 to 2001.

European Communities (Natural Habitats) Regulations, SI 94/1997, SI 233/1998 & SI 378/2005 – http://www.irishstatutebook.ie.

Fossitt, J. A. (2000). A Guide to Habitats in Ireland. Dublin: The Heritage Council.

Habitats Directive (92/43/EEC).

McGuinness, D., Muldoon, C., Tierney, N., Cummins, S., Murray, A., Egan, S. & Crowe, O. (2015). Bird Sensitivity Mapping for Wind Energy Developments and Associated Infrastructure in the Republic of Ireland. Guidance Document. Birdwatch Ireland.

Møller AP. 2008b. Flight distance and blood parasites in birds. Behavioural Ecology 19:1305–1313.

Møller AP. 2008c. Flight distance and population trends in European birds. Behavioural Ecology 19:1095–1102.

Møller AP, Erritzøe J. 2010. Flight distance and eye size in birds. Ethology 116:458–465.

Murphy, D.F. (2004) Requirements for the Protection of Fisheries Habitat During Construction and Development Works at River Sites. Eastern Regional Fisheries Board, Dublin.

NPWS (2008) The Status of EU Protected Habitats and Species in Ireland. Conservation Status in Ireland of Habitats and Species listed in the European Council Directive on the Conservation of Habitats, Flora and Fauna 92/43/EEC.

NPWS of the DEHLG (2008) The Report on Status of Habitats and Species in Ireland: Technical Reports and Forms.

NPWS (2020) Conservation objectives for Mullaghanish to Musheramore Mountains SPA [004162]. Generic Version 7.0. Department of Culture, Heritage and the Gaeltacht.

NPWS (2020) Conservation objectives for The Gearagh SPA [004109]. Generic Version 7.0. Department of Culture, Heritage and the Gaeltacht.

NPWS (2016) Conservation Objectives: The GearaghSAC 000108. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.

NPWS Protected Areas Site Synopses and maps available on http://www.npws.ie/en/ProtectedSites/.

NRA (2004) Environmental Impact Assessment of National Road Schemes – A Practical Guide, National Roads Authority, Dublin.

NRA (2004) Guidelines for the Treatment of Noise and Vibration in National Road Schemes (1 ed.). Dublin: National Roads Authority.

NRA (2005) Guidelines for the Crossing of Watercourses during the Construction of National Road Schemes. Dublin: National Roads Authority.

NRA (2006) A Guide to Landscape Treatments for National Road Schemes in Ireland. Dublin: National Roads Authority.

NRA (2006) Guidelines for the Protection and Preservation of Trees, Hedgerows and Scrub Prior to, During and Post-Construction of National Road Schemes. Dublin: National Roads Authority.

NRA (2009). Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Road Schemes. Dublin: National Roads Authority.

Oliver, G. (2007). Inventory of Irish coastal lagoons (version 2). Unpublished Report to NPWS.

O'Neill, F.H., Martin, J.R., Devaney, F.M. & Perrin, P.M. (2013) The Irish semi-natural grasslands survey 2007-2012. Irish Wildlife Manuals, No. 78. National Parks and Wildlife Service, Department of Arts,Heritage and the Gaeltacht, Ireland.

Pease, M. L., Rose, R. K. & Butler, M. J. Effects of human disturbances on the behavior of wintering ducks. Wildlife Society Bulletin33, 103-112 (2005).

Richards, A. 1990. Seabirds of the northern hemisphere. Dragon's World Ltd, Limpsfield, U.K.

Rodgers Jr, J.A. and Smith, H.T., 1995. Set-back distances to protect nesting bird colonies from human disturbance in Florida. Conservation Biology, 9(1), pp.89-99.

Bay Intertidal Surveys 2009 & 2010. Unpublished report to NPWS & Marine Institute.

Scottish Natural Heritage (SNH) (July 2013) Assessing Connectivity with Special Protection Areas (SPA)

Scottish Natural Heritage (SNH) (2011) The Fen Management Handbook, A. McBride, I. Diack, N Droy, B. Hamill, P.Jones, J. Schutten, A. Skinner, and M. Street. Scottish Natural Heritage, Perth.

Shannon Regional Fisheries Board (2009). Protection and Conservation of Fisheries Habitat with Particular reference to Road Construction (2009)

Therivel R. (2009) Workshop Material on the Habitats Directive Assessment of Plans Levett-Therivel Sustainability Consultants on behalf of the Heritage Council, Kilkenny.

Water status data available on http://www.epa.ie and http://www.wfdireland.ie

Wildlife Act 1976 and Wildlife (Amendment) Act 2000.

APPENDIX 1

PROJECT LAYOUT DRAWINGS

Project Design Drawing Notes

1. Drawings issued are for planning application purposes only.
2. Drawings not to be used for construction/contract conditions.
3. Copyright, all rights reserved. No part herewith may be copied or reproduced partially or wholly in any form whatsoever without the prior notice of the copyright owner McCarthy Keville O'Sullivan.
4. Do not scale off this drawing. Figured metric dimensions only should be taken off this drawing.
5. All contractors, whether main or sub-contractors, must visit the site and are responsible for taking and checking any and all dimensions and levels that relate to the works.
6. The use of or reliance upon this drawing shall be deemed to be acceptance of these conditions of use unless otherwise agreed in writing, such written agreement to be sought from and issued by the copyright holder to the use or reliance upon this drawing.
7. Layout plans show typical Turbine rotor diameter as per turbine drawing.

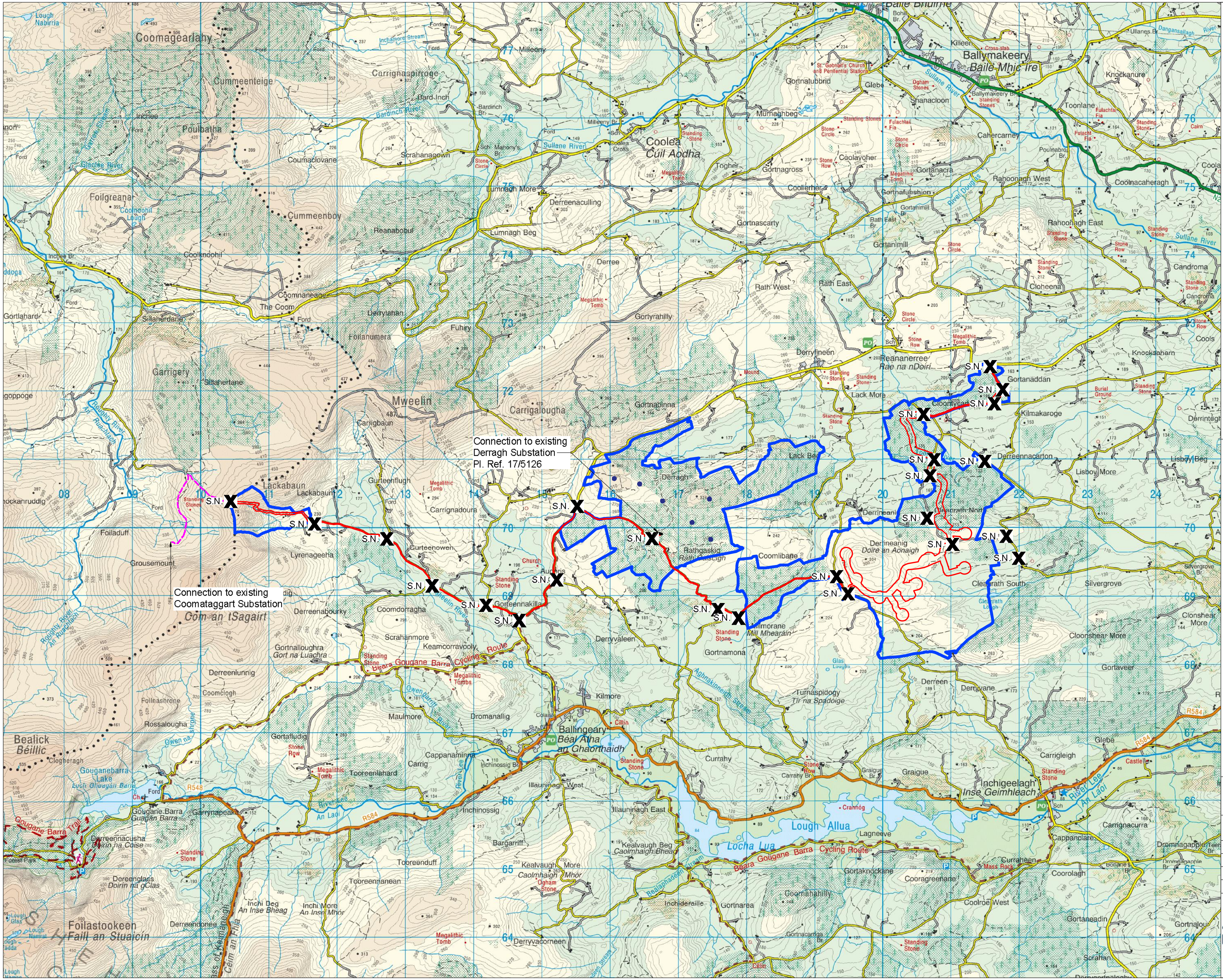
DRAWING TITLE:

Location Map

PROJECT TITLE:
Cleanrath Wind Farm, Co. Cork

DRAWING BY: Joseph o Brien	CHECKED BY: Owen Cahill
PROJECT No.: 191223a	DRAWING No.: 191223a - 01
SCALE: 1:50,000 @A3	DATE: 13.08.2020
OS SHEET No.: OS1006, OS1206	

MKO
Planning and Environmental Consultants
Tuam Road, Galway
Ireland, H91 VW84
+353 (0) 91735611
email: info@www.mkoireland.ie
Website: www.mkoireland.ie



Project Design Drawing Notes

1. Drawings issued are for planning application purposes only.
2. Drawings not to be used for construction/contract conditions.
3. Copyright, all rights reserved. No part herewith may be copied or reproduced partially or wholly in any form whatsoever without the prior notice of the copyright owner McCarthy Keville O'Sullivan.
4. Do not scale off this drawing. Figured metric dimensions only should be taken off this drawing.
5. All contractors, whether main or sub-contractors, must visit the site and are responsible for taking and checking any and all dimensions and levels that relate to the works.
6. The use of or reliance upon this drawing shall be deemed to be acceptance of these conditions of use unless otherwise agreed in writing, such written agreement to be sought from and issued by the copyright holder to the use or reliance upon this drawing.
7. Layout plans show typical Turbine rotor diameter as per turbine drawing.

Drainage Design Note

Drawing Legend

- Planning Application Boundary
- Landowners Boundary
- S.N. X Site Notice
- Grid Connection in Co. Kerry
- Derragh Wind Farm Turbines

N

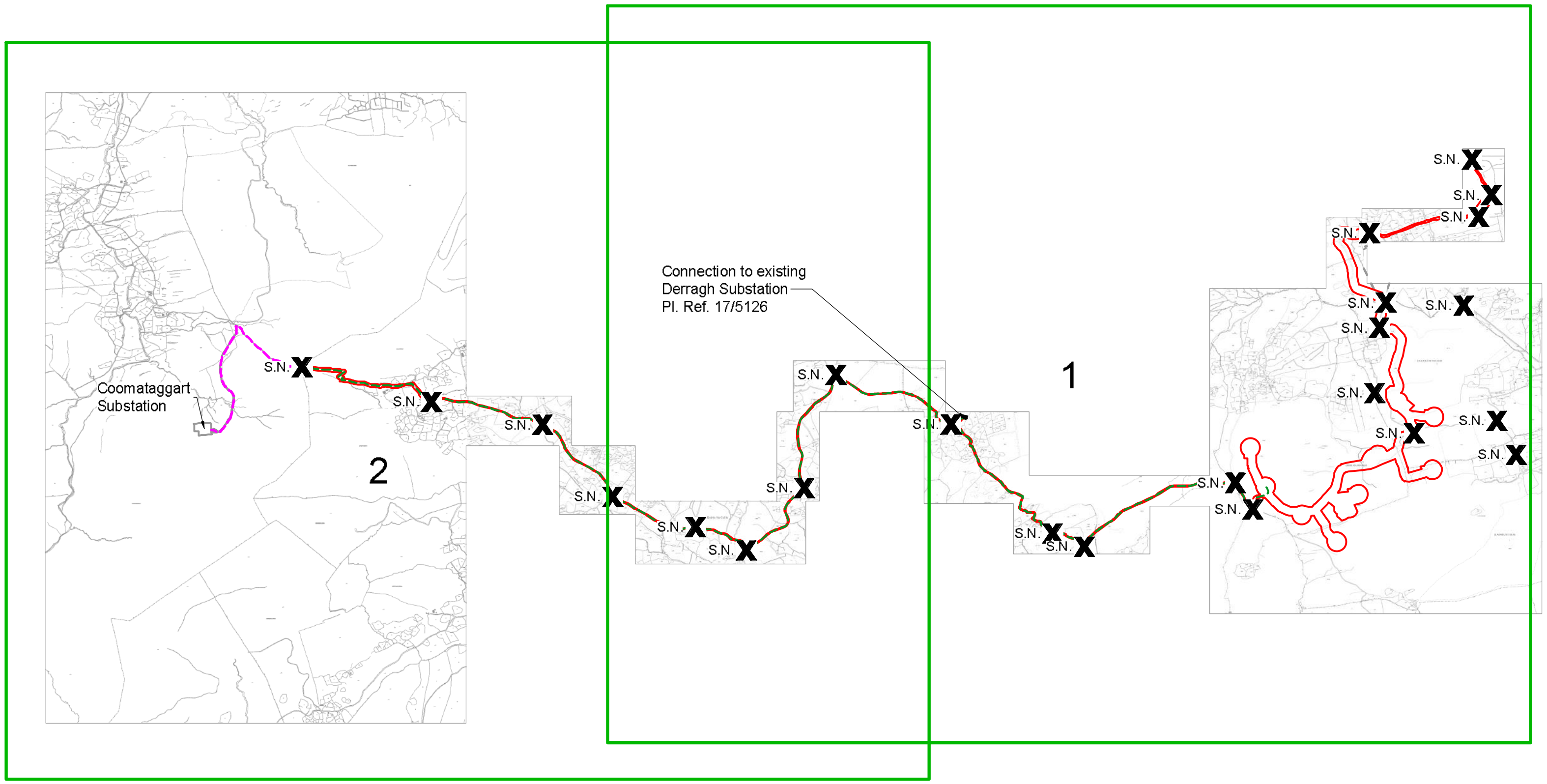
DRAWING TITLE:

Site Notice Location Map

PROJECT TITLE: Cleanrath Wind Farm, Co. Cork

DRAWING BY: Joseph o Brien	CHECKED BY: Owen Cahill
PROJECT No.: 191223a	DRAWING No.: 191223a - 02
SCALE: 1:50,000 @A3	DATE: 13.08.2020
OS SHEET No.: OS1006, OS1206	

MKO
Planning and Environmental Consultants
Tuam Road, Galway
Ireland, H91 VW84
+353 (0) 91735611
email: info@www.mkoireland.ie
Website: www.mkoireland.ie



Project Design Drawing Notes

1. Drawings issued are for planning application purposes only.
2. Drawings not to be used for construction/contract conditions.
3. Copyright, all rights reserved. No part herewith may be copied or reproduced partially or wholly in any form whatsoever without the prior notice of the copyright owner McCarthy Keville O'Sullivan.
4. Do not scale off this drawing. Figured metric dimensions only should be taken off this drawing.
5. All contractors, whether main or sub-contractors, must visit the site and are responsible for taking and checking any and all dimensions and levels that relate to the works.
6. The use of or reliance upon this drawing shall be deemed to be acceptance of these conditions of use unless otherwise agreed in writing, such written agreement to be sought from and issued by the copyright holder to the use or reliance upon this drawing.
7. Layout plans show typical Turbine rotor diameter as per turbine drawing.

Drainage Design Note

Drainage details are included in drawings prepared by Hydro Environmental Services

Drawing Legend

Planning Application Boundary

S.N. X Site Notice

Cable Trench to Grid Connection

Grid Connection in Co. Kerry

N

DRAWING TITLE:

Site Location Key Plan

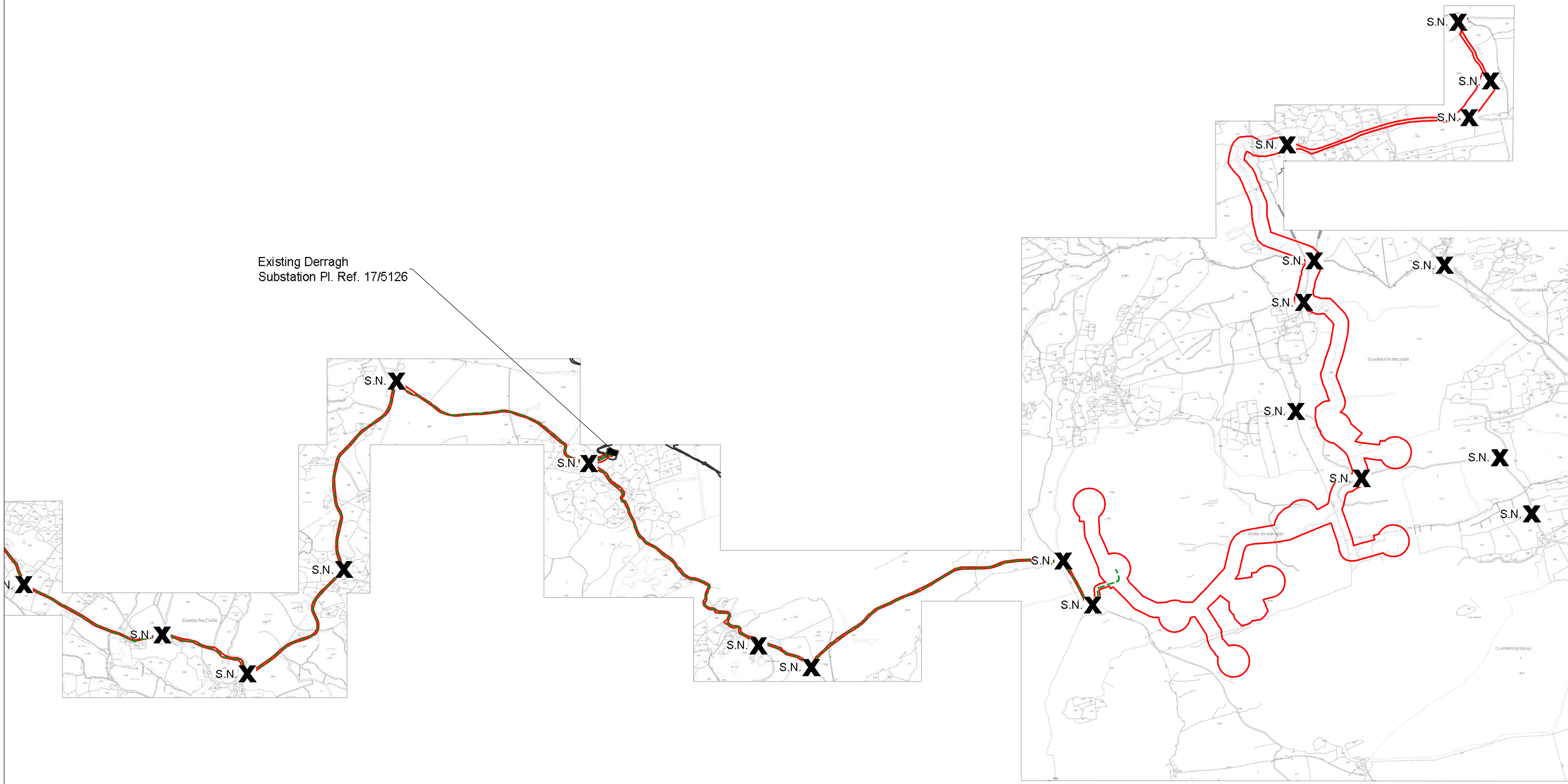
PROJECT TITLE:

Cleanrath Wind Farm, Co. Cork

DRAWING BY: Joseph o Brien	CHECKED BY: Owen Cahill
PROJECT No.: 191223a	DRAWING No.: 191223a - 02A
SCALE: 1:50,000 @A3	DATE: 13.08.2020

OS SHEET No.: 6367,6368,6369,6370,6371,6412,6413,6413,6415,6416

MKO
Planning and Environmental Consultants
Tuam Road, Galway
Ireland, H91 VW84
+353 (0) 91735611
email: info@www.mkoireland.ie
Website: www.mkoireland.ie



Project Design Drawing Notes

1. Drawings issued are for planning application purposes only.
2. Drawings not to be used for construction/contract conditions.
3. Copyright, all rights reserved. No part herewith may be copied or reproduced partially or wholly in any form whatsoever without the prior notice of the copyright owner McCarthy Keville O'Sullivan.
4. Do not scale off this drawing. Figured metric dimensions only should be taken off this drawing.
5. All contractors, whether main or sub-contractors, must visit the site and are responsible for taking and checking any and all dimensions and levels that relate to the works.
6. The use of or reliance upon this drawing shall be deemed to be acceptance of these conditions of use unless otherwise agreed in writing, such written agreement to be sought from and issued by the copyright holder to the use or reliance upon this drawing.
7. Layout plans show typical Turbine rotor diameter as per turbine drawing.

Drainage Design Note

Drainage details are included in drawings prepared by Hydro Environmental Services

Drawing Legend

Planning Application Boundary

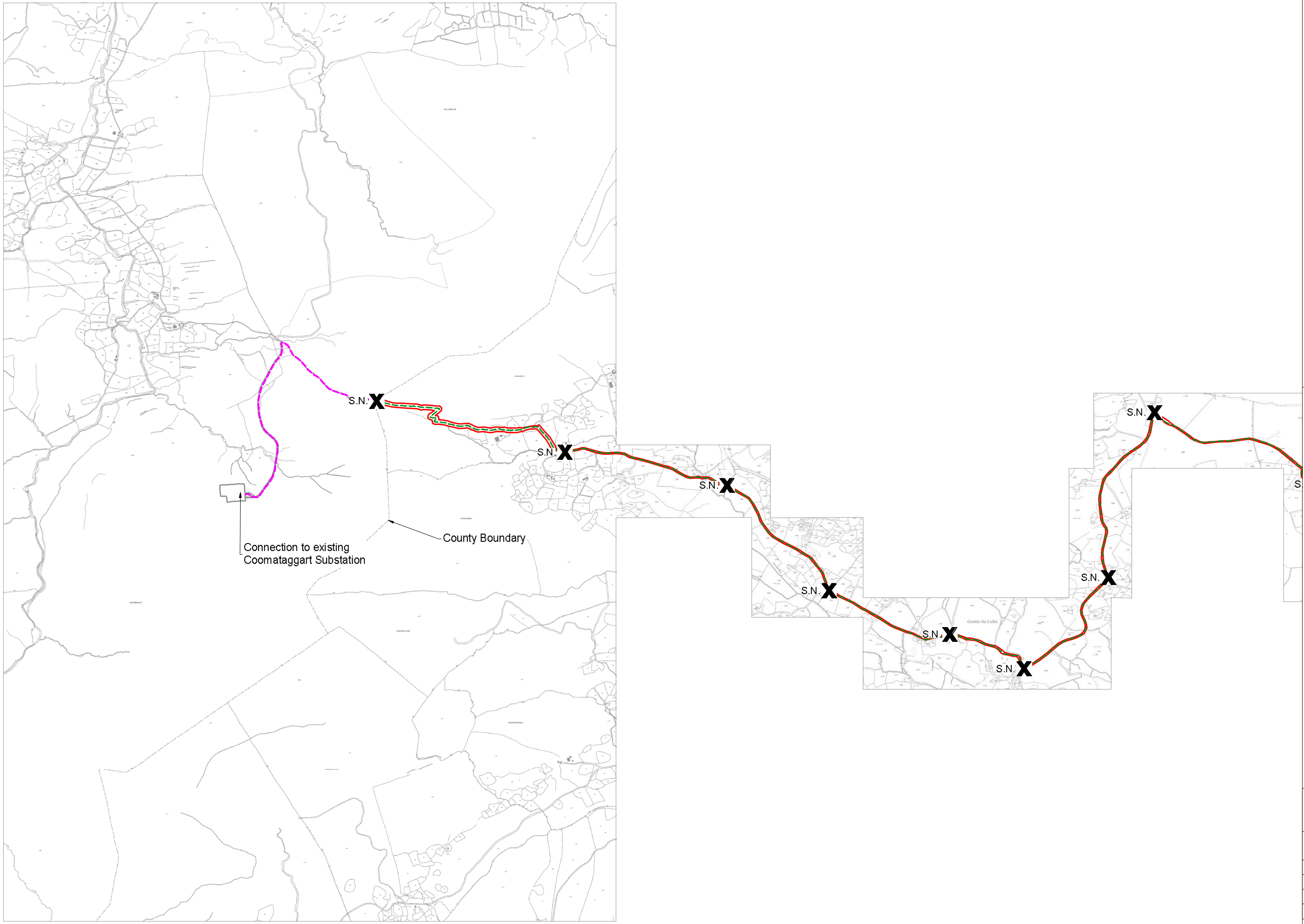
S.N. X Site Notice

Grid Connection Cable Route

N

DRAWING TITLE: **Site Location Key Plan - Sheet 1 of 2**	
PROJECT TITLE: Cleanrath Wind Farm, Co. Cork	
DRAWING BY: Joseph o Brien	CHECKED BY: Owen Cahill
PROJECT No.: 191223a	DRAWING No.: 191223a - 02B
SCALE: 1:25,000 @A3	DATE: 13.08.2020
OS SHEET No.: 6367,6368,6369,6370,6371,6412,6413,6413,6415,6416	

MKO
Planning and Environmental Consultants
Tuam Road, Galway
Ireland, H91 VW84
+353 (0) 91 735611
email: info@www.mkoireland.ie
Website: www.mkoireland.ie



Project Design Drawing Notes

1. Drawings issued are for planning application purposes only.
2. Drawings not to be used for construction/contract conditions.
3. Copyright, all rights reserved. No part herewith may be copied or reproduced partially or wholly in any form whatsoever without the prior notice of the copyright owner McCarthy Keville O'Sullivan.
4. Do not scale off this drawing. Figured metric dimensions only should be taken off this drawing.
5. All contractors, whether main or sub-contractors, must visit the site and are responsible for taking and checking any and all dimensions and levels that relate to the works.
6. The use of or reliance upon this drawing shall be deemed to be acceptance of these conditions of use unless otherwise agreed in writing, such written agreement to be sought from and issued by the copyright holder to the use or reliance upon this drawing.
7. Layout plans show typical Turbine rotor diameter as per turbine drawing.

Drainage Design Note

Drainage details are included in drawings prepared by Hydro Environmental Services

Drawing Legend

- Planning Application Boundary
- S.N. X Site Notice
- Grid Connection in Co. Kerry
- Grid Connection Cable Route

N

DRAWING TITLE:

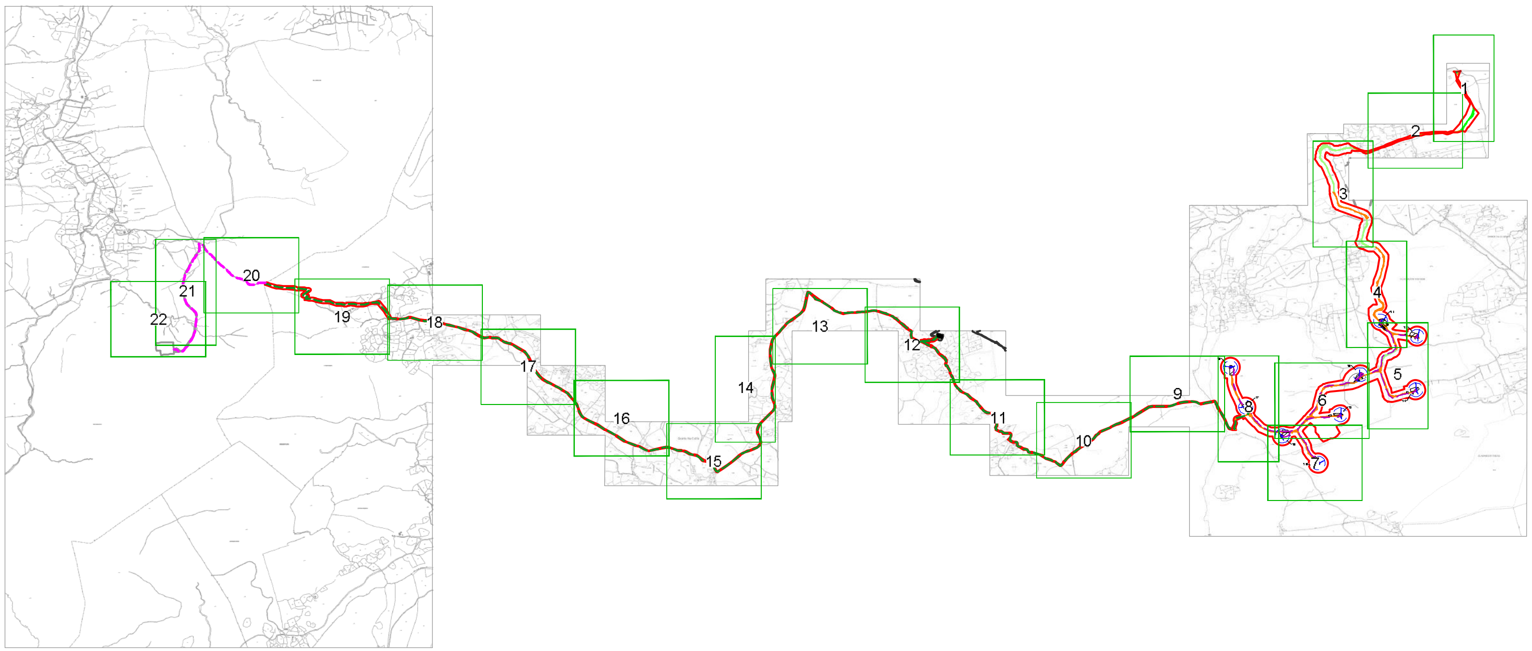
Site Location
Key Plan - Sheet 2 of 2

PROJECT TITLE:

Cleanrath Wind Farm, Co. Cork

DRAWING BY: Joseph o Brien	CHECKED BY: Owen Cahill
PROJECT No.: 191223a	DRAWING No.: 191223a - 02C
SCALE: 1:25,000 @A3	DATE: 13.08.2020
OS SHEET No.: 6367,6368,6369,6370,6371,6412,6413,6413,6415,6416	

MKO
Planning and Environmental Consultants
Tuam Road, Galway
Ireland, H91VW84
+353 (0) 91735611
email: info@www.mkoireland.ie
Website: www.mkoireland.ie



Project Design Drawing Notes

1. Drawings issued are for planning application purposes only.
2. Drawings not to be used for construction/contract conditions.
3. Copyright, all rights reserved. No part herewith may be copied or reproduced partially or wholly in any form whatsoever without the prior notice of the copyright owner McCarthy Keville O'Sullivan.
4. Do not scale off this drawing. Figured metric dimensions only should be taken off this drawing.
5. All contractors, whether main or sub-contractors, must visit the site and are responsible for taking and checking any and all dimensions and levels that relate to the works.
6. The use of or reliance upon this drawing shall be deemed to be acceptance of these conditions of use unless otherwise agreed in writing, such written agreement to be sought from and issued by the copyright holder to the use or reliance upon this drawing.
7. Layout plans show typical Turbine rotor diameter as per turbine drawing.

Drainage Design Note

Drainage details are included in drawings prepared by Hydro Environmental Services

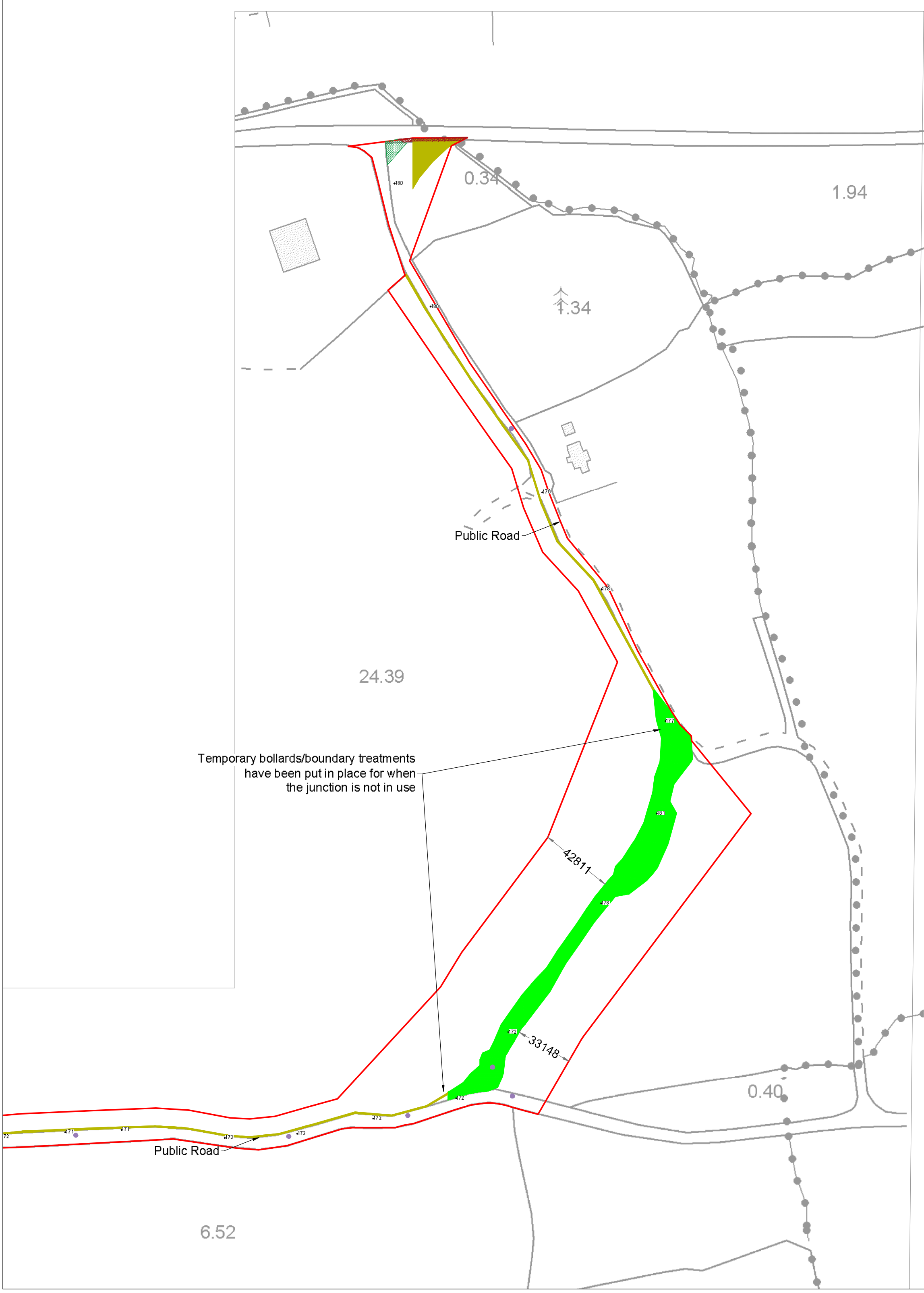
Drawing Legend

- Planning Application Boundary
- Existing Road Upgraded
- New Road
- Temporary Road for Turbine Delivery
- Junction/Road Widening
- Crane Pad Hardstanding Area
- Electrical Cable Trench
- Turbine Foundation
- Turbine Sweep Area
- Grid Connection into Co. Kerry
- Grid Connection Cable Route

N

DRAWING TITLE: **Site Layout Key Plan**	
PROJECT TITLE: Cleanrath Wind Farm, Co. Cork	
DRAWING BY: Joseph o Brien	CHECKED BY: Owen Cahill
PROJECT No.: 191223a	DRAWING No.: 191223a - 03
SCALE: 1:50,000 @A3	DATE: 13.08.2020
OS SHEET No.: 6367,6368,6369,6370,6371,6412,6413,6413,6415,6416	

MKO
Planning and Environmental Consultants
Tuam Road, Galway
Ireland, H91 VW84
+353 (0) 91 735611
email: info@www.mkoireland.ie
Website: www.mkoireland.ie



Project Design Drawing Notes

1. Drawings issued are for planning application purposes only.
2. Drawings not to be used for construction/contract conditions.
3. Copyright, all rights reserved. No part herewith may be copied or reproduced partially or wholly in any form whatsoever without the prior notice of the copyright owner McCarthy Keville O'Sullivan.
4. Do not scale off this drawing. Figured metric dimensions only should be taken off this drawing.
5. All contractors, whether main or sub-contractors, must visit the site and are responsible for taking and checking any and all dimensions and levels that relate to the works.
6. The use of or reliance upon this drawing shall be deemed to be acceptance of these conditions of use unless otherwise agreed in writing, such written agreement to be sought from and issued by the copyright holder to the use or reliance upon this drawing.
7. Layout plans show typical Turbine rotor diameter as per turbine drawing.

Drainage Design Note

Drainage details are included in drawings prepared by Hydro Environmental Services

Drawing Legend

- Planning Application Boundary
- New Road
- Temporary Road for Turbine Delivery
- Junction/Road Widening
- Vegetation Area
- Berm
- Watercourse/Drain Crossings

DRAWING TITLE:
Site Layout Plan
Sheet 1 of 22

PROJECT TITLE:
Cleanrath Wind Farm, Co. Cork

DRAWING BY: Joseph o Brien	CHECKED BY: Owen Cahill
PROJECT No.: 191223a	DRAWING No.: 191223a - 04
SCALE: 1:2,500 @A3	DATE: 13.08.2020
O S SHEET No.: 6367,6368,6369,6370,6371,6412,6413,6413,6415,6416	

MKO
Planning and Environmental Consultants
Tuam Road, Galway
Ireland, H91 VW84
+353 (0) 91 735611
email: info@www.mkoireland.ie
Website: www.mkoireland.ie

Project Design Drawing Notes

1. Drawings issued are for planning application purposes only.
2. Drawings not to be used for construction/contract conditions.
3. Copyright, all rights reserved. No part herewith may be copied or reproduced partially or wholly in any form whatsoever without the prior notice of the copyright owner McCarthy Keville O'Sullivan.
4. Do not scale off this drawing. Figured metric dimensions only should be taken off this drawing.
5. All contractors, whether main or sub-contractors, must visit the site and are responsible for taking and checking any and all dimensions and levels that relate to the works.
6. The use of or reliance upon this drawing shall be deemed to be acceptance of these conditions of use unless otherwise agreed in writing, such written agreement to be sought from and issued by the copyright holder to the use or reliance upon this drawing.
7. Layout plans show typical Turbine rotor diameter as per turbine drawing.

Drainage Design Note

Drainage details are included in drawings prepared by Hydro Environmental Services

Drawing Legend

- Planning Application Boundary
- Temporary Road for Turbine Delivery
- Junction/Road Widening
- Watercourse/Drain Crossings

DRAWING TITLE:

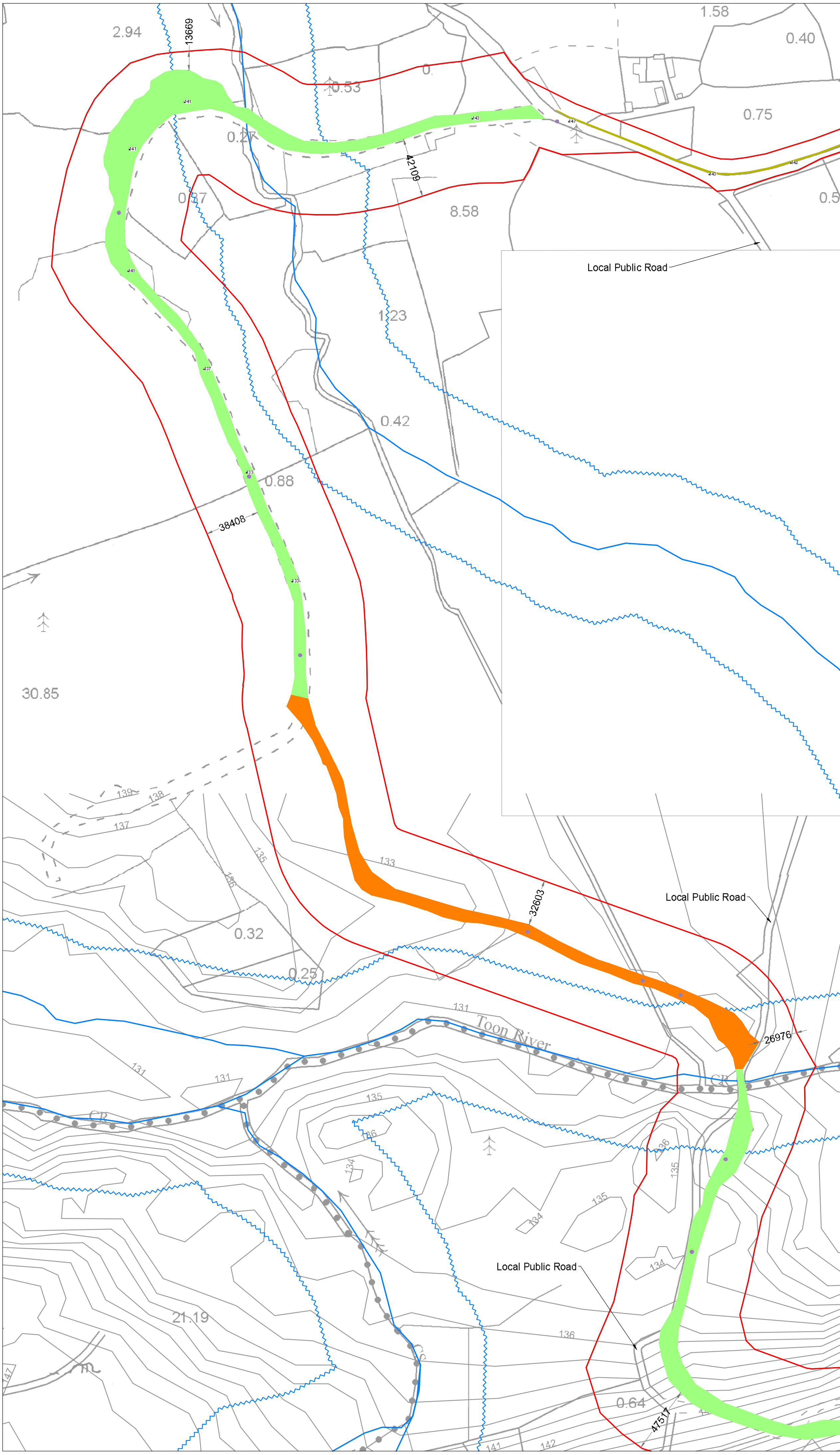
Site Layout Plan Sheet 2 of 22

PROJECT TITLE:

Cleanrath Wind Farm, Co. Cork

DRAWING BY: Joseph o Brien	CHECKED BY: Owen Cahill
PROJECT No.: 191223a	DRAWING No.: 191223a - 05
SCALE: 1:2,500 @A3	DATE: 13.08.2020
OS SHEET No.: 6367,6368,6369,6370,6371,6412,6413,6413,6415,6416	

MKO
Planning and Environmental Consultants
Tuam Road, Galway
Ireland, H91 VW84
+353 (0) 91735611
email: info@www.mkoireland.ie
Website: www.mkoireland.ie



Project Design Drawing Notes

1. Drawings issued are for planning application purposes only.
2. Drawings not to be used for construction/contract conditions.
3. Copyright, all rights reserved. No part herewith may be copied or reproduced partially or wholly in any form whatsoever without the prior notice of the copyright owner McCarthy Keville O'Sullivan.
4. Do not scale off this drawing. Figured metric dimensions only should be taken off this drawing.
5. All contractors, whether main or sub-contractors, must visit the site and are responsible for taking and checking any and all dimensions and levels that relate to the works.
6. The use of or reliance upon this drawing shall be deemed to be acceptance of these conditions of use unless otherwise agreed in writing, such written agreement to be sought from and issued by the copyright holder to the use or reliance upon this drawing.
7. Layout plans show typical Turbine rotor diameter as per turbine drawing.

Drainage Design Note

Drainage details are included in drawings prepared by Hydro Environmental Services

Drawing Legend

- Planning Application Boundary
- Existing Road Upgraded
- New Road
- Junction/Road Widening
- River/Stream/Drain
- River/Stream/Drain Buffer 50m
- Watercourse/Drain Crossings

N

DRAWING TITLE:

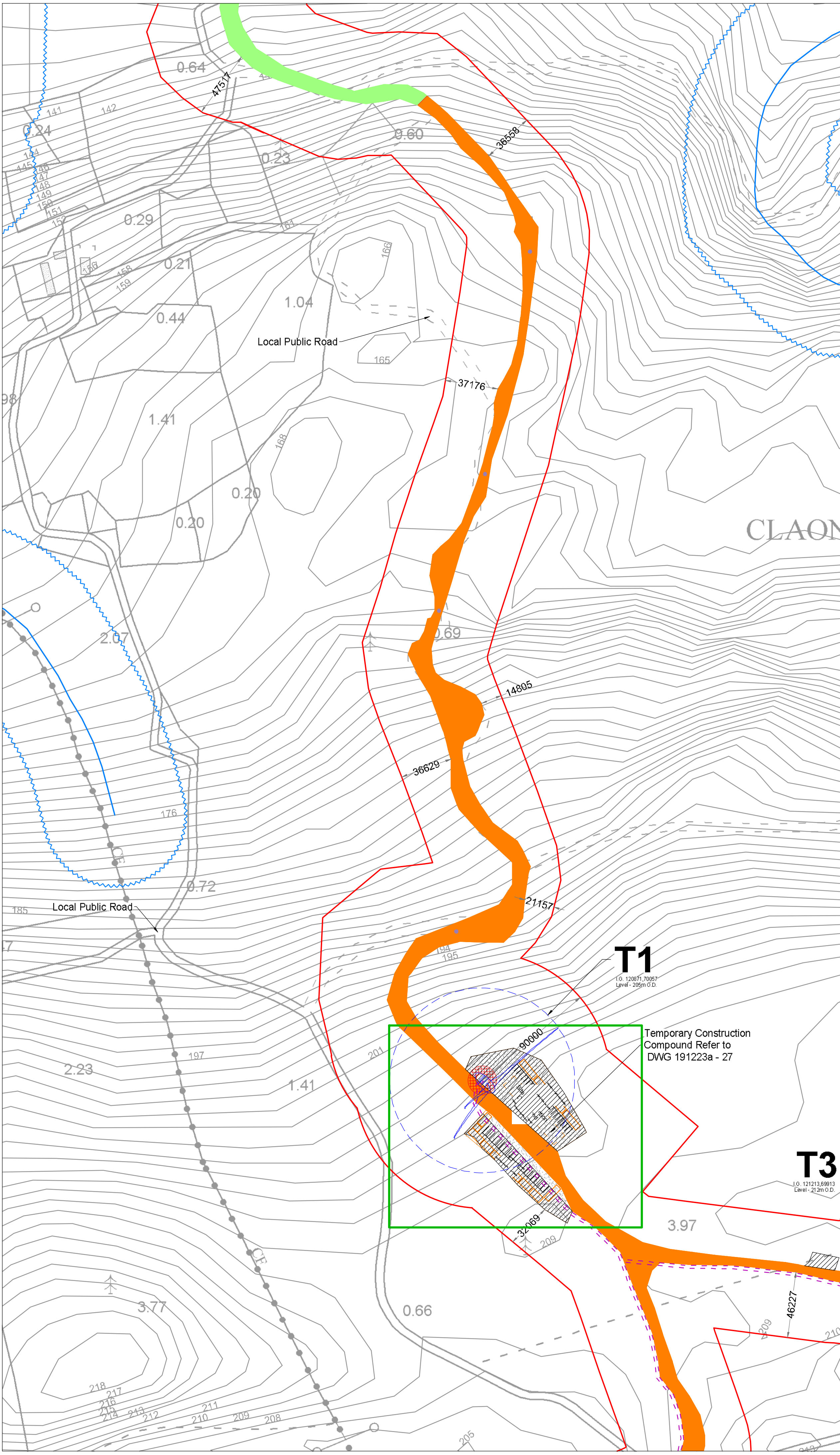
Site Layout Plan
Sheet 3 of 22

PROJECT TITLE:

Cleanrath Wind Farm, Co. Cork

DRAWN BY: Joseph o Brien	CHECKED BY: Owen Cahill
PROJECT No.: 191223a	DRAWING No.: 191223a - 06
SCALE: 1:2,500 @A3	DATE: 13.08.2020
OS SHEET No.: 6367,6368,6369,6370,6371,6412,6413,6413,6415,6416	

MKO
Planning and Environmental Consultants
Tuam Road, Galway
Ireland, H91 VW84
+353 (0) 91 735611
email: info@www.mkoireland.ie
Website: www.mkoireland.ie



Project Design Drawing Notes

1. Drawings issued are for planning application purposes only.
2. Drawings not to be used for construction/contract conditions.
3. Copyright, all rights reserved. No part herewith may be copied or reproduced partially or wholly in any form whatsoever without the prior notice of the copyright owner McCarthy Keville O'Sullivan.
4. Do not scale off this drawing. Figured metric dimensions only should be taken off this drawing.
5. All contractors, whether main or sub-contractors, must visit the site and are responsible for taking and checking any and all dimensions and levels that relate to the works.
6. The use of or reliance upon this drawing shall be deemed to be acceptance of these conditions of use unless otherwise agreed in writing, such written agreement to be sought from and issued by the copyright holder to the use or reliance upon this drawing.
7. Layout plans show typical Turbine rotor diameter as per turbine drawing.

Drainage Design Note

Drainage details are included in drawings prepared by Hydro Environmental Services

Drawing Legend

- Planning Application Boundary
- Existing Road Upgraded
- New Road
- Crane Pad Hardstanding Area
- Electrical Cable Trench
- Turbine Foundation
- Turbine Sweep Area
- River/Stream/Drain
- River/Stream/Drain Buffer 50m
- Watercourse/Drain Crossings

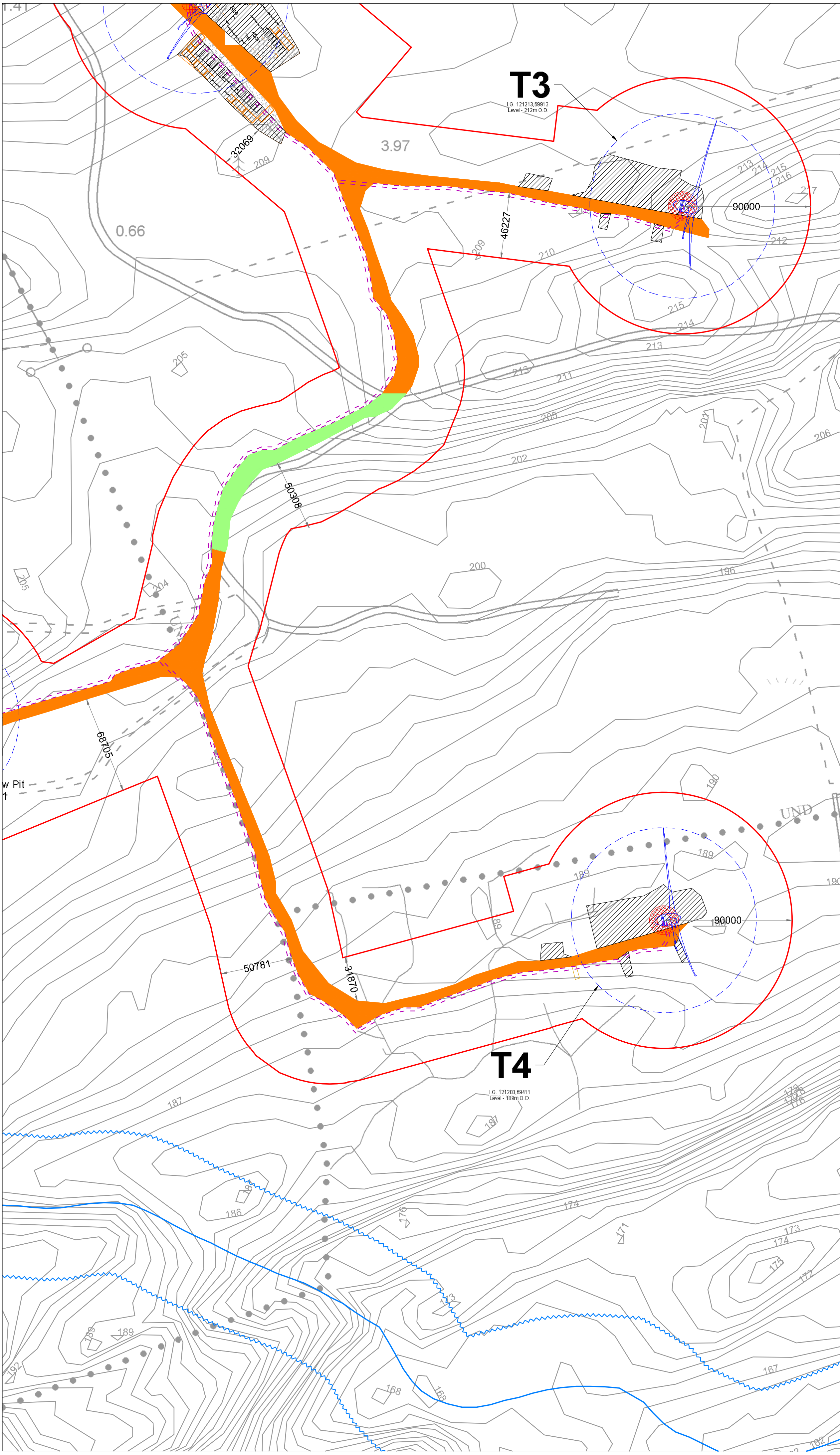
N

DRAWING TITLE:
Site Layout Plan Sheet 4 of 22

PROJECT TITLE:
Cleanrath Wind Farm, Co. Cork

DRAWING BY: Joseph o Brien	CHECKED BY: Owen Cahill
PROJECT No.: 191223a	DRAWING No.: 191223a - 07
SCALE: 1:2,500 @A3	DATE: 13.08.2020
OS SHEET No.: 6367,6368,6369,6370,6371,6412,6413,6413,6415,6416	

MKO
Planning and Environmental Consultants
Tuam Road, Galway
Ireland, H91 VW84
+353 (0) 91735611
email: info@www.mkoireland.ie
Website: www.mkoireland.ie



Project Design Drawing Notes

1. Drawings issued are for planning application purposes only.
2. Drawings not to be used for construction/contract conditions.
3. Copyright, all rights reserved. No part herewith may be copied or reproduced partially or wholly in any form whatsoever without the prior notice of the copyright owner McCarthy Keville O'Sullivan.
4. Do not scale off this drawing. Figured metric dimensions only should be taken off this drawing.
5. All contractors, whether main or sub-contractors, must visit the site and are responsible for taking and checking any and all dimensions and levels that relate to the works.
6. The use of or reliance upon this drawing shall be deemed to be acceptance of these conditions of use unless otherwise agreed in writing, such written agreement to be sought from and issued by the copyright holder to the use or reliance upon this drawing.
7. Layout plans show typical Turbine rotor diameter as per turbine drawing.

Drainage Design Note

Drainage details are included in drawings prepared by Hydro Environmental Services

Drawing Legend

- Planning Application Boundary
- Existing Road Upgraded
- New Road
- Crane Pad Hardstanding Area
- Electrical Cable Trench
- Turbine Foundation
- Turbine Sweep Area
- River/Stream/Drain
- River/Stream/Drain Buffer 50m

N

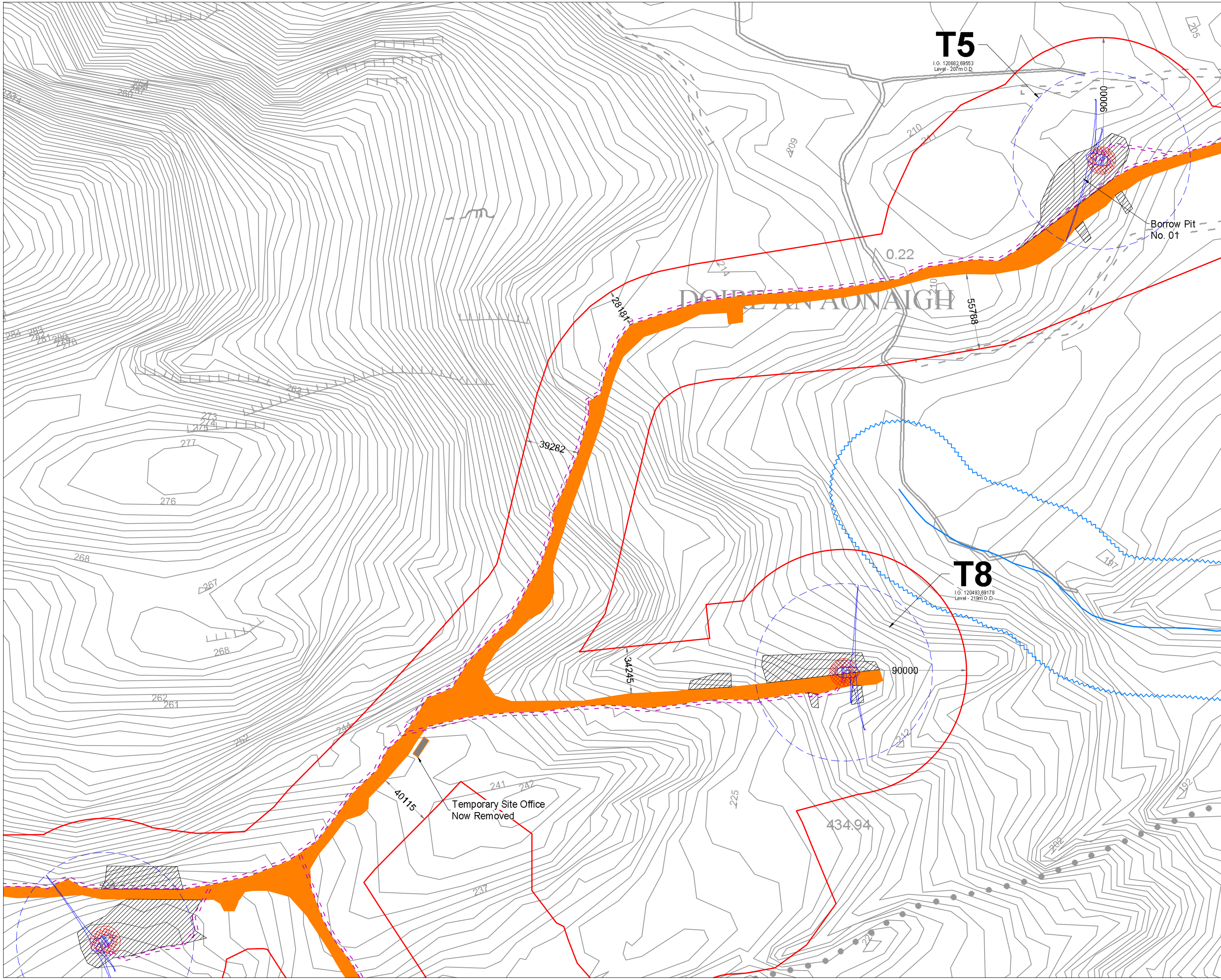
DRAWING TITLE:

Site Layout Plan Sheet 5 of 22

PROJECT TITLE: Cleanrath Wind Farm, Co. Cork

DRAWING BY: Joseph o Brien	CHECKED BY: Owen Cahill
PROJECT No.: 191223a	DRAWING No.: 191223a - 08
SCALE: 1:2,500 @A3	DATE: 13.08.2020
O S SHEET No.: 6367,6368,6369,6370,6371,6412,6413,6413,6415,6416	

MKO
Planning and Environmental Consultants
Tuam Road, Galway
Ireland, H91 VW84
+353 (0) 91 735611
email: info@www.mkoireland.ie
Website: www.mkoireland.ie



Project Design Drawing Notes

1. Drawings issued are for planning application purposes only.
2. Drawings not to be used for construction/contract conditions.
3. Copyright, all rights reserved. No part herewith may be copied or reproduced partially or wholly in any form whatsoever without the prior notice of the copyright owner McCarthy Keville O'Sullivan.
4. Do not scale off this drawing. Figured metric dimensions only should be taken off this drawing.
5. All contractors, whether main or sub-contractors, must visit the site and are responsible for taking and checking any and all dimensions and levels that relate to the works.
6. The use of or reliance upon this drawing shall be deemed to be acceptance of these conditions of use unless otherwise agreed in writing, such written agreement to be sought from and issued by the copyright holder to the use or reliance upon this drawing.
7. Layout plans show typical Turbine rotor diameter as per turbine drawing.

Drainage Design Note

Drainage details are included in drawings prepared by Hydro Environmental Services

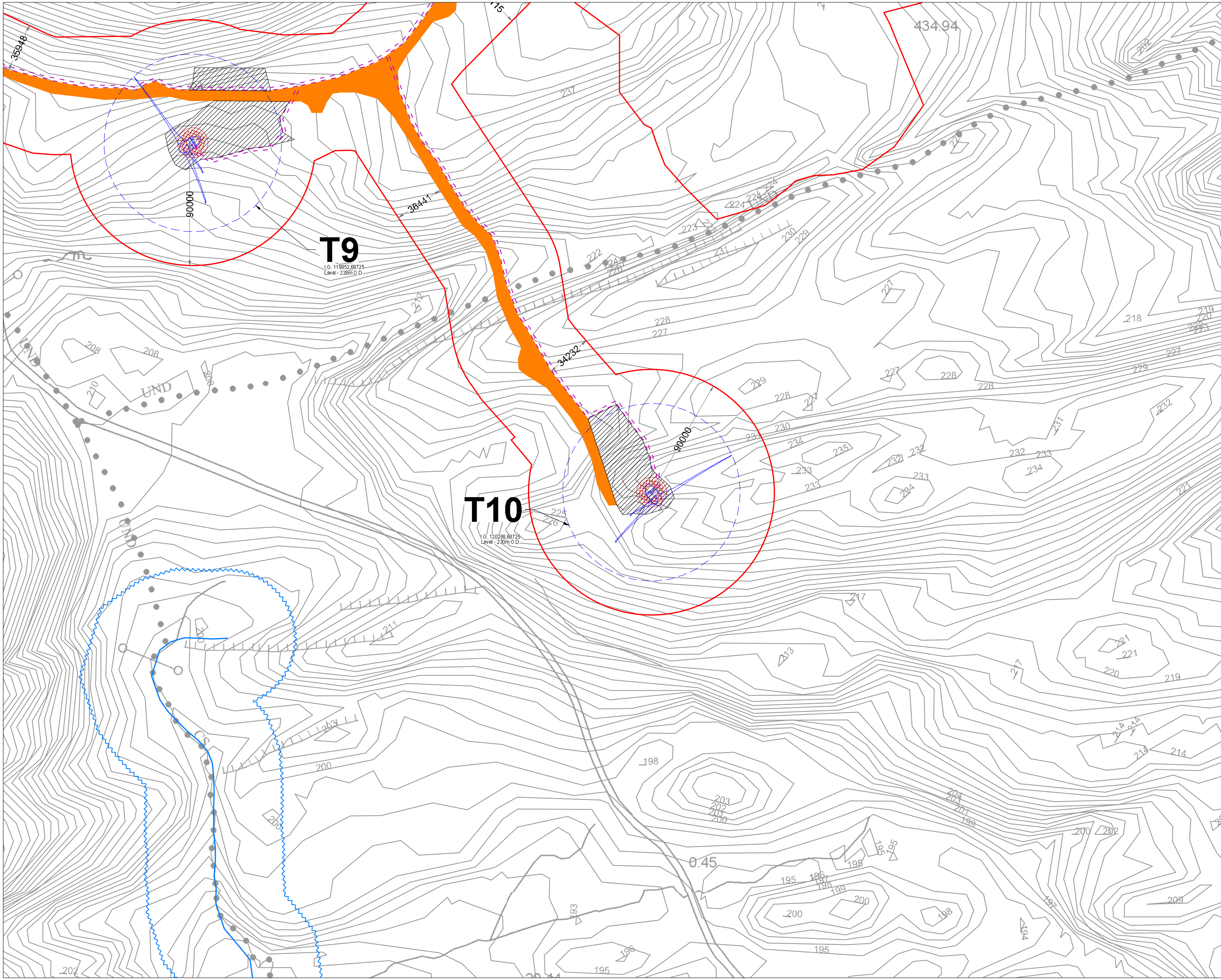
Drawing Legend

- Planning Application Boundary
- New Road
- Crane Pad Hardstanding Area
- Electrical Cable Trench
- Turbine Foundation
- Turbine Sweep Area
- River/Stream/Drain
- River/Stream/Drain Buffer 50m

N

DRAWING TITLE: Site Layout Plan Sheet 6 of 22	
PROJECT TITLE: Cleanrath Wind Farm, Co. Cork	
DRAWING BY: Joseph o Brien	CHECKED BY: Owen Cahill
PROJECT No.: 191223a	DRAWING No.: 191223a - 09
SCALE: 1:2,500 @A3	DATE: 13.08.2020
OS SHEET No.: 6367,6368,6369,6370,6371,6412,6413,6413,6415,6416	

MKO
Planning and Environmental Consultants
Tuam Road, Galway
Ireland, H91 VW84
+353 (0) 91735611
email: info@www.mkoireland.ie
Website: www.mkoireland.ie



Project Design Drawing Notes
1. Drawings issued are for planning application purposes only.
2. Drawings not to be used for construction/contract conditions.
3. Copyright, all rights reserved. No part herewith may be copied or reproduced partially or wholly in any form whatsoever without the prior notice of the copyright owner McCarthy Keville O'Sullivan.
4. Do not scale off this drawing. Figured metric dimensions only should be taken off this drawing.
5. All contractors, whether main or sub-contractors, must visit the site and are responsible for taking and checking any and all dimensions and levels that relate to the works.
6. The use of or reliance upon this drawing shall be deemed to be acceptance of these conditions of use unless otherwise agreed in writing, such written agreement to be sought from and issued by the copyright holder to the use or reliance upon this drawing.
7. Layout plans show typical Turbine rotor diameter as per turbine drawing.

Drainage Design Note
Drainage details are included in drawings prepared by Hydro Environmental Services

Drawing Legend
- Planning Application Boundary
- New Road
- Crane Pad Hardstanding Area
- Electrical Cable Trench
- Turbine Foundation
- Turbine Sweep Area
- River/Stream/Drain
- River/Stream/Drain Buffer 50m

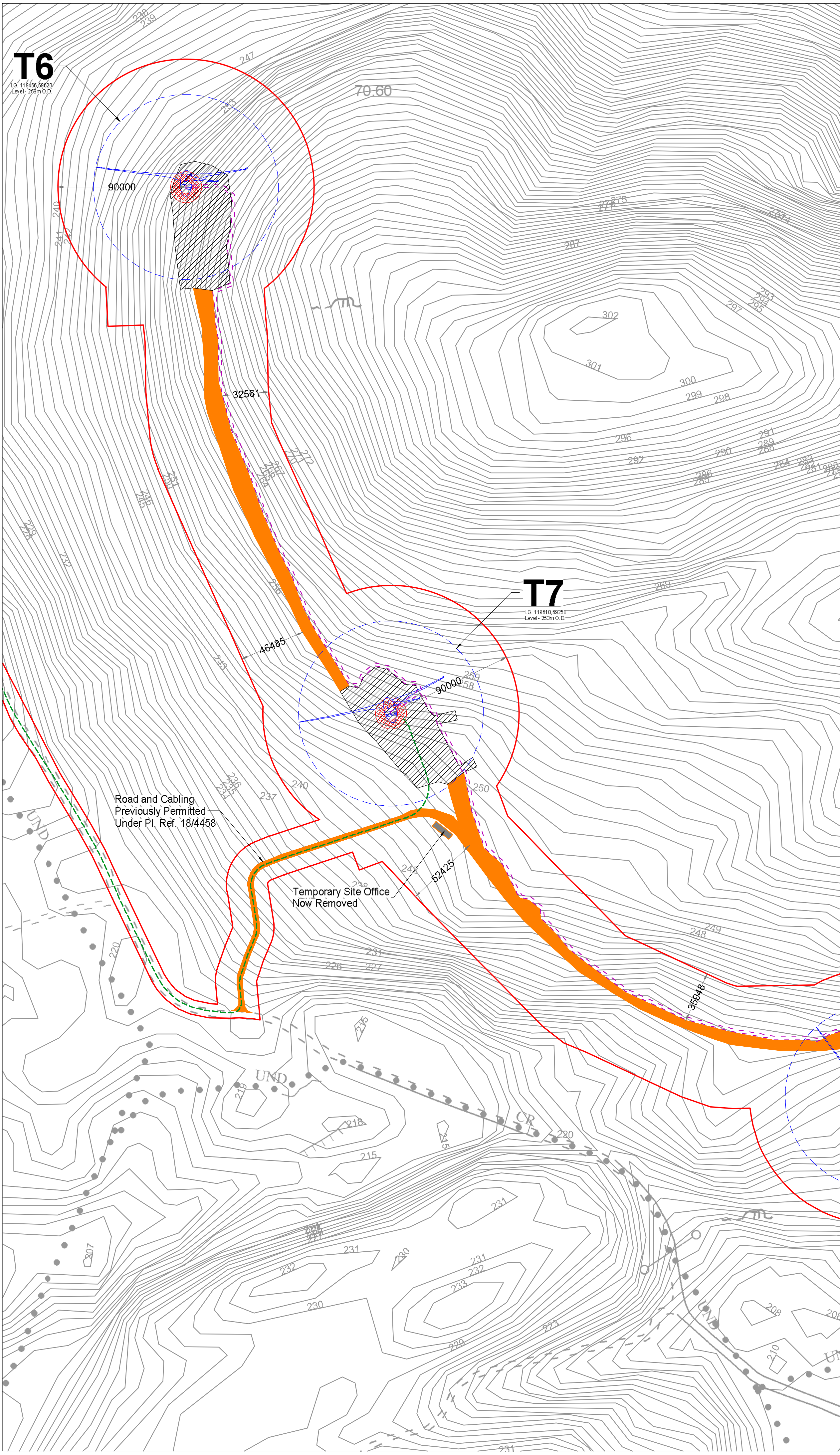
N

DRAWING TITLE:
Site Layout Plan Sheet 7 of 22

PROJECT TITLE:
Cleanrath Wind Farm, Co. Cork

DRAWING BY: Joseph o Brien	CHECKED BY: Owen Cahill
PROJECT No.: 191223a	DRAWING No.: 191223a - 10
SCALE: 1:2,500 @A3	DATE: 13.08.2020
OS SHEET No.: 6367,6368,6369,6370,6371,6412,6413,6413,6415,6416	

MKO
Planning and Environmental Consultants
Tuam Road, Galway
Ireland, H91 VW84
+353 (0) 91735611
email: info@www.mkoireland.ie
Website: www.mkoireland.ie



Project Design Drawing Notes

1. Drawings issued are for planning application purposes only.
2. Drawings not to be used for construction/contract conditions.
3. Copyright, all rights reserved. No part herewith may be copied or reproduced partially or wholly in any form whatsoever without the prior notice of the copyright owner McCarthy Keville O'Sullivan.
4. Do not scale off this drawing. Figured metric dimensions only should be taken off this drawing.
5. All contractors, whether main or sub-contractors, must visit the site and are responsible for taking and checking any and all dimensions and levels that relate to the works.
6. The use of or reliance upon this drawing shall be deemed to be acceptance of these conditions of use unless otherwise agreed in writing, such written agreement to be sought from and issued by the copyright holder to the use or reliance upon this drawing.
7. Layout plans show typical Turbine rotor diameter as per turbine drawing.

Drainage Design Note

Drainage details are included in drawings prepared by Hydro Environmental Services

Drawing Legend

- Planning Application Boundary
- New Road
- Crane Pad Hardstanding Area
- Electrical Cable Trench
- Turbine Foundation
- Turbine Sweep Area

DRAWING TITLE:

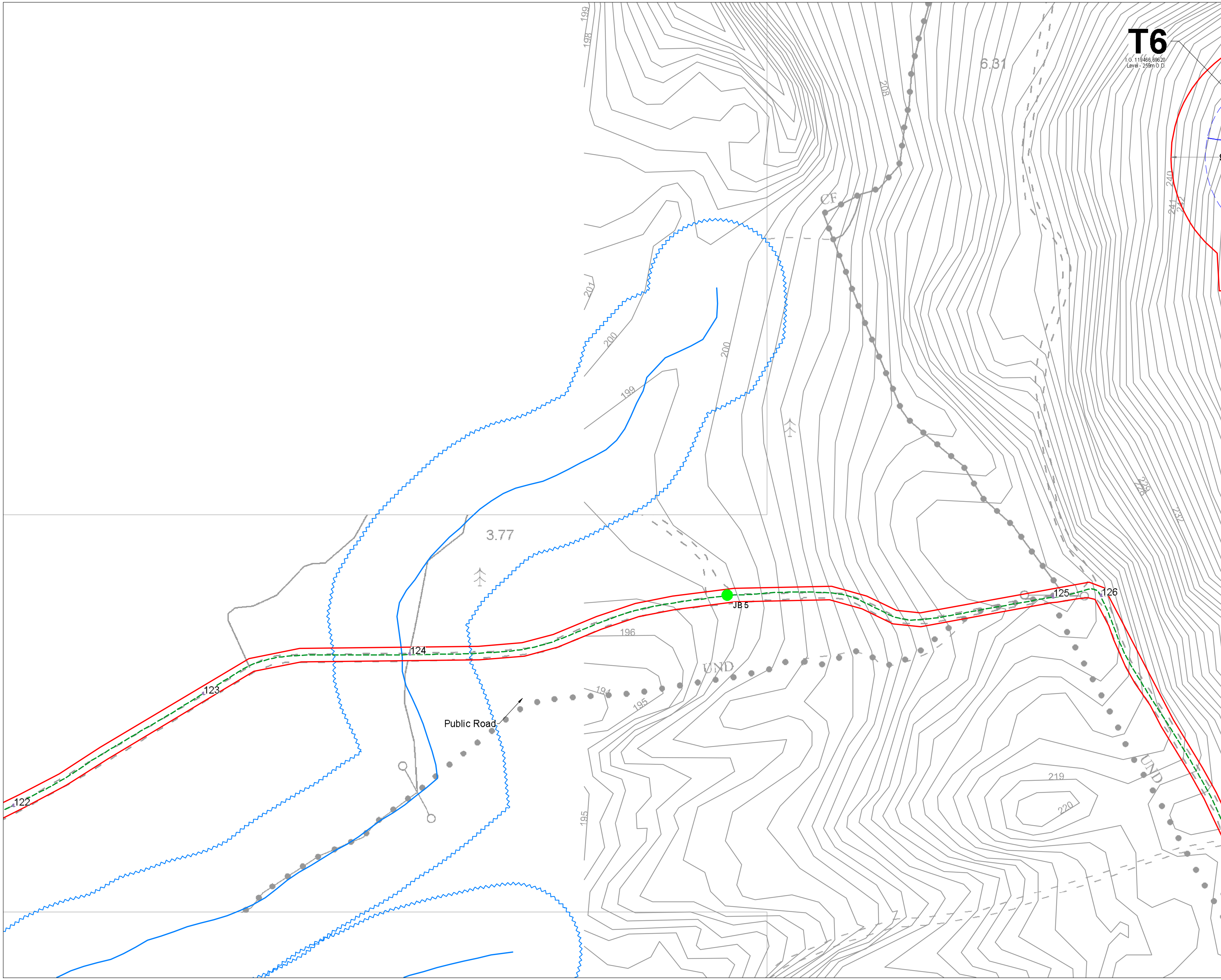
Site Layout Plan Sheet 8 of 22

PROJECT TITLE:

Cleanrath Wind Farm, Co. Cork

DRAWING BY: Joseph o Brien	CHECKED BY: Owen Cahill
PROJECT No.: 191223a	DRAWING No.: 191223a - 11
SCALE: 1:2,500 @A3	DATE: 13.08.2020
O.S SHEET No.: 6367,6368,6369,6370,6371,6412,6413,6413,6415,6416	

MKO
Planning and Environmental Consultants
Tuam Road, Galway
Ireland, H91 VW84
+353 (0) 91 735611
email: info@www.mkoireland.ie
Website: www.mkoireland.ie



Project Design Drawing Notes

1. Drawings issued are for planning application purposes only.
2. Drawings not to be used for construction/contract conditions.
3. Copyright, all rights reserved. No part herewith may be copied or reproduced partially or wholly in any form whatsoever without the prior notice of the copyright owner McCarthy Keville O'Sullivan.
4. Do not scale off this drawing. Figured metric dimensions only should be taken off this drawing.
5. All contractors, whether main or sub-contractors, must visit the site and are responsible for taking and checking any and all dimensions and levels that relate to the works.
6. The use of or reliance upon this drawing shall be deemed to be acceptance of these conditions of use unless otherwise agreed in writing, such written agreement to be sought from and issued by the copyright holder to the use or reliance upon this drawing.
7. Layout plans show typical Turbine rotor diameter as per turbine drawing.

Drawing Legend

- Planning Application Boundary
- Turbine Sweep Area
- River/Stream/Drain
- River/Stream/Drain Buffer 50m
- Cable Route Grid Connection
- Joint Bay
- Watercourse/Drain Crossings

N

DRAWING TITLE:

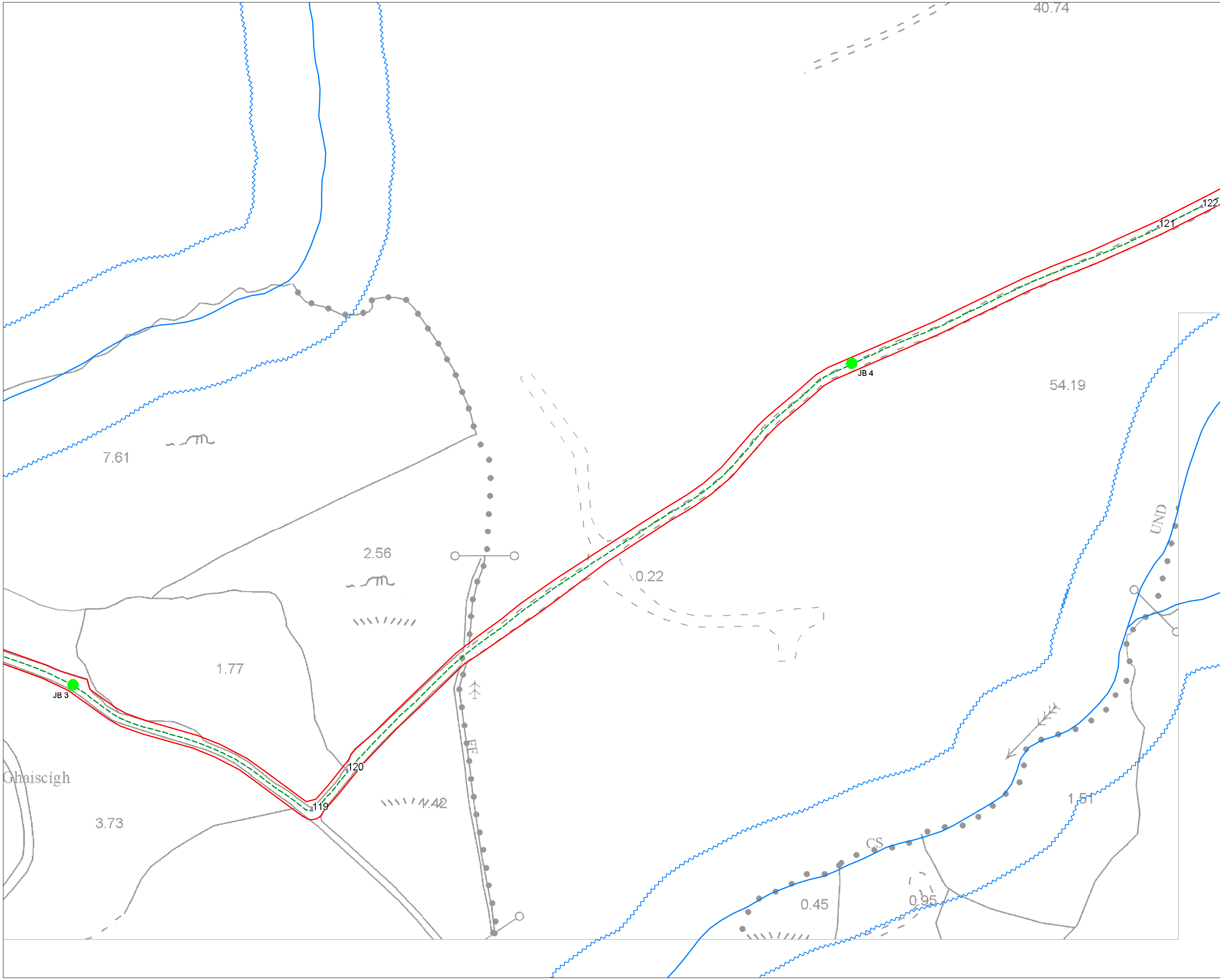
Site Layout Plan Sheet 9 of 22

PROJECT TITLE: Cleanrath Wind Farm, Co. Cork

DRAWING BY: Joseph o Brien	CHECKED BY: Owen Cahill
PROJECT No.: 191223a	DRAWING No.: 191223a - 12
SCALE: 1:2,500 @A3	DATE: 13.08.2020

OS SHEET No.: 6367,6368,6369,6370,6371,6412,6413,6413,6415,6416

MKO
Planning and Environmental Consultants
Tuam Road, Galway
Ireland, H91 VW84
+353 (0) 91735611
email: info@www.mkoireland.ie
Website: www.mkoireland.ie



Project Design Drawing Notes

1. Drawings issued are for planning application purposes only.
2. Drawings not to be used for construction/contract conditions.
3. Copyright, all rights reserved. No part herewith may be copied or reproduced partially or wholly in any form whatsoever without the prior notice of the copyright owner McCarthy Keville O'Sullivan.
4. Do not scale off this drawing. Figured metric dimensions only should be taken off this drawing.
5. All contractors, whether main or sub-contractors, must visit the site and are responsible for taking and checking any and all dimensions and levels that relate to the works.
6. The use of or reliance upon this drawing shall be deemed to be acceptance of these conditions of use unless otherwise agreed in writing, such written agreement to be sought from and issued by the copyright holder to the use or reliance upon this drawing.
7. Layout plans show typical Turbine rotor diameter as per turbine drawing.

Grid Connection Drawing Notes

1. Grid connection cabling works along the public road corridor carried out under Road Opening Licence
2. Location of grid connection cable is 'as constructed'
3. All public/private services and utilities to be accommodated during grid connection cabling works.

Drawing Legend

- Planning Application Boundary
- River/Stream/Drain
- River/Stream/Drain Buffer 50m
- Cable Route Grid Connection
- Joint Bay
- Watercourse/Drain Crossings

N

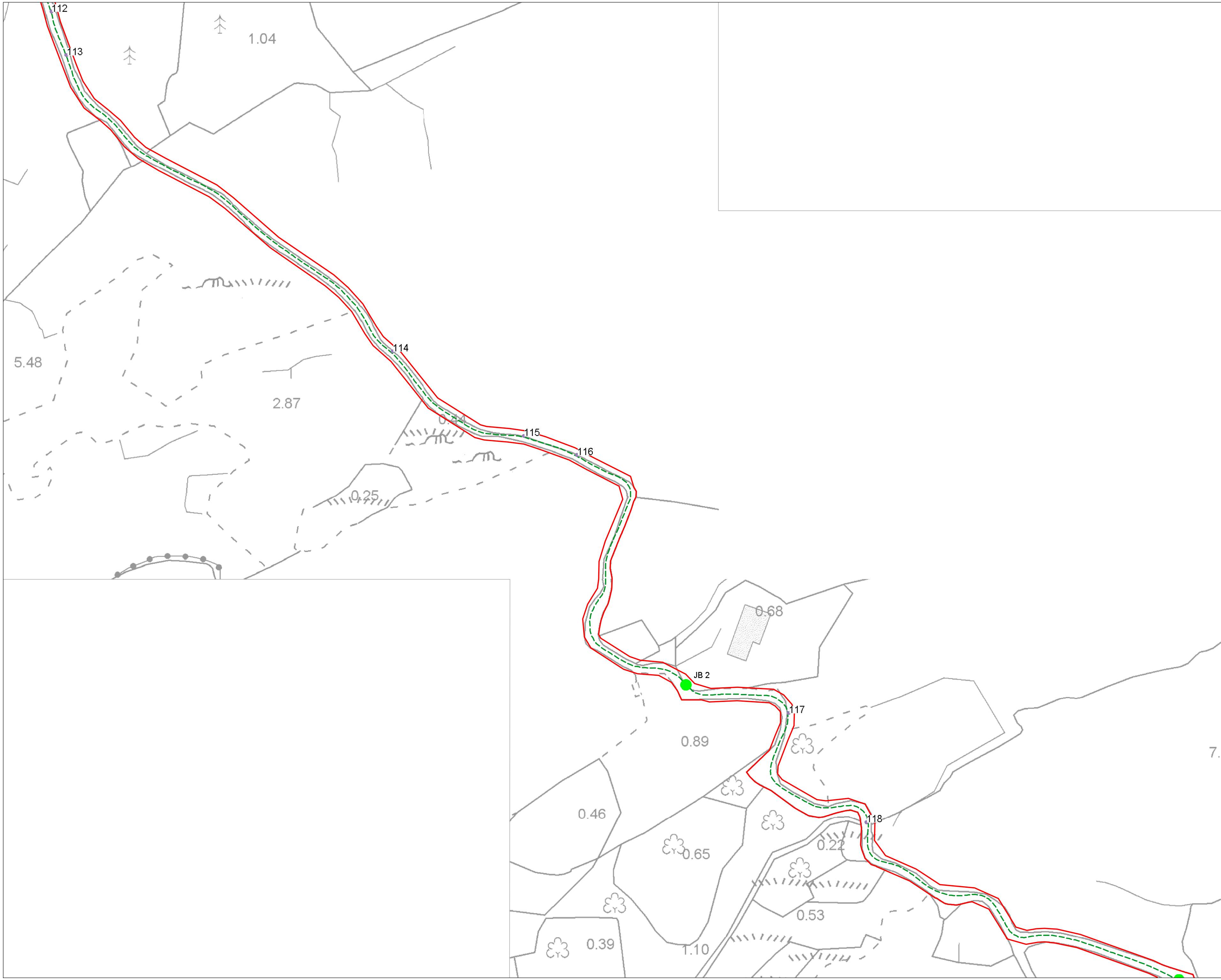
DRAWING TITLE:
Site Layout Plan Sheet 10 of 22

PROJECT TITLE:
Cleanrath Wind Farm, Co. Cork

DRAWING BY: Joseph o Brien	CHECKED BY: Owen Cahill
PROJECT No.: 191223a	DRAWING No.: 191223a - 13
SCALE: 1:2,500 @A3	DATE: 13.08.2020

OS SHEET No.: 6367,6368,6369,6370,6371,6412,6413,6413,6415,6416

MKO
Planning and Environmental Consultants
Tuam Road, Galway
Ireland, H91 VW84
+353 (0) 91735611
email: info@www.mkoireland.ie
Website: www.mkoireland.ie



Project Design Drawing Notes

1. Drawings issued are for planning application purposes only.
2. Drawings not to be used for construction/contract conditions.
3. Copyright, all rights reserved. No part herewith may be copied or reproduced partially or wholly in any form whatsoever without the prior notice of the copyright owner McCarthy Keville O'Sullivan.
4. Do not scale off this drawing. Figured metric dimensions only should be taken off this drawing.
5. All contractors, whether main or sub-contractors, must visit the site and are responsible for taking and checking any and all dimensions and levels that relate to the works.
6. The use of or reliance upon this drawing shall be deemed to be acceptance of these conditions of use unless otherwise agreed in writing, such written agreement to be sought from and issued by the copyright holder to the use or reliance upon this drawing.
7. Layout plans show typical Turbine rotor diameter as per turbine drawing.

Grid Connection Drawing Notes

1. Grid connection cabling works along the public road corridor carried out under under Road Opening Licence
2. Location of grid connection cable is 'as constructed'
3. All public/private services and utilities to be accommodated during grid connection cabling works.

Drawing Legend

- Planning Application Boundary
- Cable Trench to Grid Connection
- Joint Bay
- Watercourse/Drain Crossings

DRAWING TITLE:

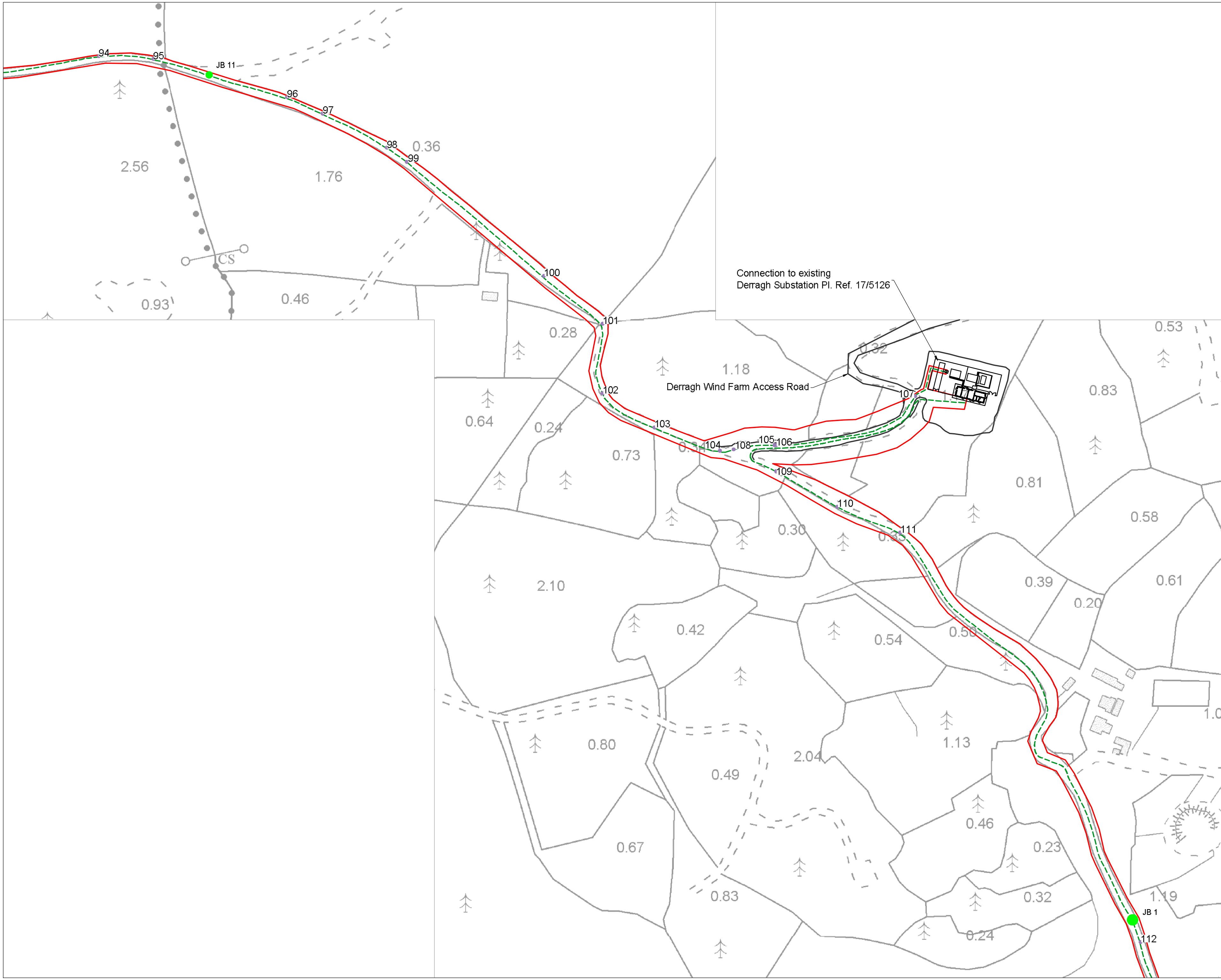
Site Layout Plan Sheet 11 of 22

PROJECT TITLE:

Cleanrath Wind Farm, Co. Cork

DRAWING BY: Joseph o Brien	CHECKED BY: Owen Cahill
PROJECT No.: 191223a	DRAWING No.: 191223a - 14
SCALE: 1:2,500 @A3	DATE: 13.08.2020
OS SHEET No.: 6367,6368,6369,6370,6371,6412,6413,6413,6415,6416	

MKO
Planning and Environmental Consultants
Tuam Road, Galway
Ireland, H91VW84
+353 (0) 91735611
email: info@www.mkoireland.ie
Website: www.mkoireland.ie



Project Design Drawing Notes

1. Drawings issued are for planning application purposes only.
2. Drawings not to be used for construction/contract conditions.
3. Copyright, all rights reserved. No part herewith may be copied or reproduced partially or wholly in any form whatsoever without the prior notice of the copyright owner McCarthy Keville O'Sullivan.
4. Do not scale off this drawing. Figured metric dimensions only should be taken off this drawing.
5. All contractors, whether main or sub-contractors, must visit the site and are responsible for taking and checking any and all dimensions and levels that relate to the works.
6. The use of or reliance upon this drawing shall be deemed to be acceptance of these conditions of use unless otherwise agreed in writing, such written agreement to be sought from and issued by the copyright holder to the use or reliance upon this drawing.
7. Layout plans show typical Turbine rotor diameter as per turbine drawing.

Grid Connection Drawing Notes

1. Grid connection cabling works along the public road corridor carried out under under Road Opening Licence
2. Location of grid connection cable is 'as constructed'
3. All public/private services and utilities to be accommodated during grid connection cabling works.

Drawing Legend

- Planning Application Boundary
- Cable Trench to Grid Connection
- Joint Bay
- Watercourse/Drain Crossings

N

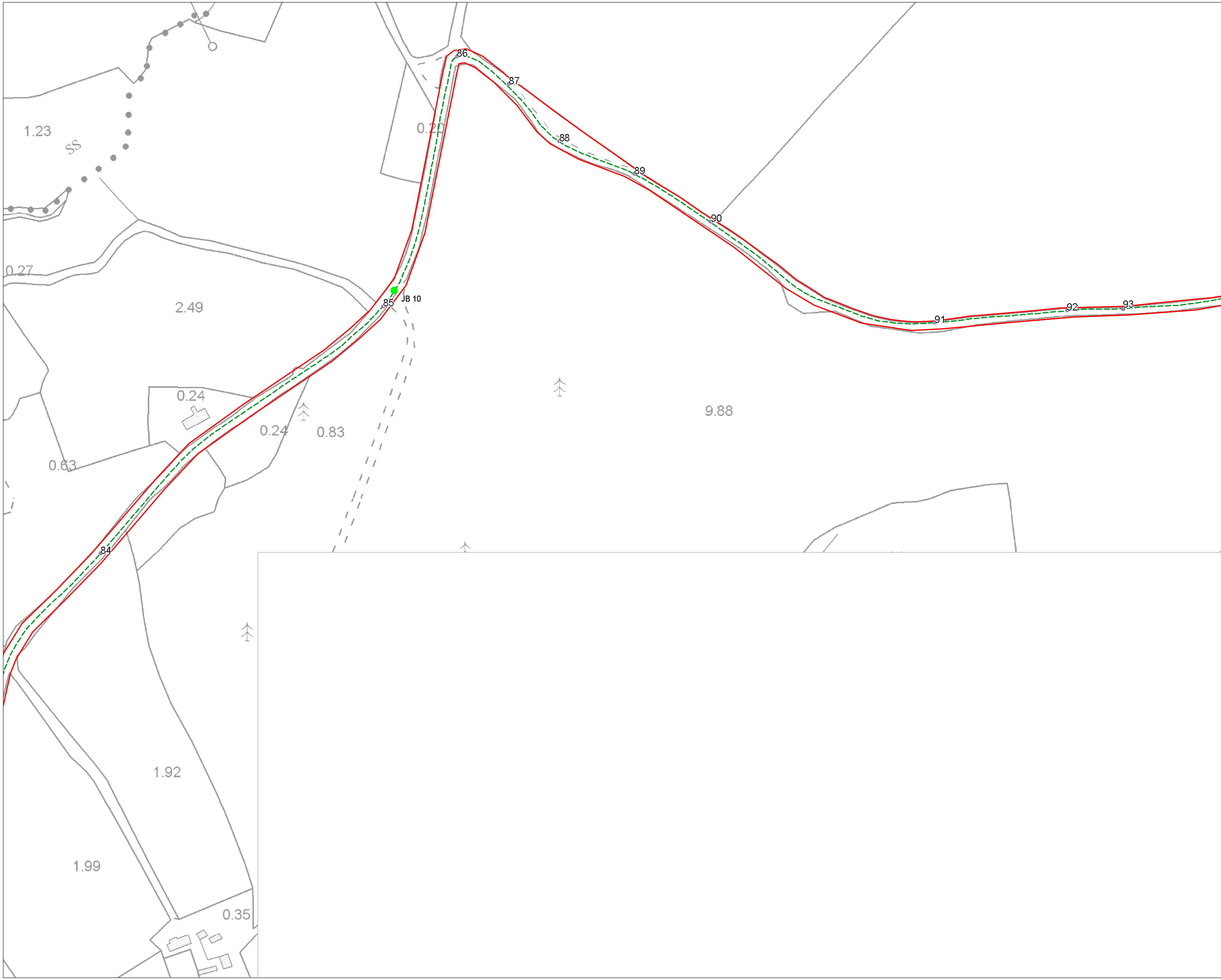
DRAWING TITLE:
Site Layout Plan Sheet 12 of 22

PROJECT TITLE:
Cleanrath Wind Farm, Co. Cork

DRAWING BY: Joseph o Brien	CHECKED BY: Owen Cahill
PROJECT No.: 191223a	DRAWING No.: 191223a - 15
SCALE: 1:2,500 @A3	DATE: 13.08.2020

OS SHEET No.: 6367,6368,6369,6370,6371,6412,6413,6413,6415,6416

MKO
Planning and Environmental Consultants
Tuam Road, Galway
Ireland, H91 VW84
+353 (0) 91735611
email: info@www.mkoireland.ie
Website: www.mkoireland.ie



Project Design Drawing Notes

1. Drawings issued are for planning application purposes only.
2. Drawings not to be used for construction/contract conditions.
3. Copyright, all rights reserved. No part herewith may be copied or reproduced partially or wholly in any form whatsoever without the prior notice of the copyright owner McCarthy Keville O'Sullivan.
4. Do not scale off this drawing. Figured metric dimensions only should be taken off this drawing.
5. All contractors, whether main or sub-contractors, must visit the site and are responsible for taking and checking any and all dimensions and levels that relate to the works.
6. The use of or reliance upon this drawing shall be deemed to be acceptance of these conditions of use unless otherwise agreed in writing, such written agreement to be sought from and issued by the copyright holder to the use or reliance upon this drawing.
7. Layout plans show typical Turbine rotor diameter as per turbine drawing.

Grid Connection Drawing Notes

1. Grid connection cabling works along the public road corridor carried out under under Road Opening Licence
2. Location of grid connection cable is 'as constructed'
3. All public/private services and utilities to be accommodated during grid connection cabling works.

Drawing Legend

- Planning Application Boundary
- Cable Trench to Grid Connection
- Joint Bay
- Watercourse/Drain Crossings

N

DRAWING TITLE:

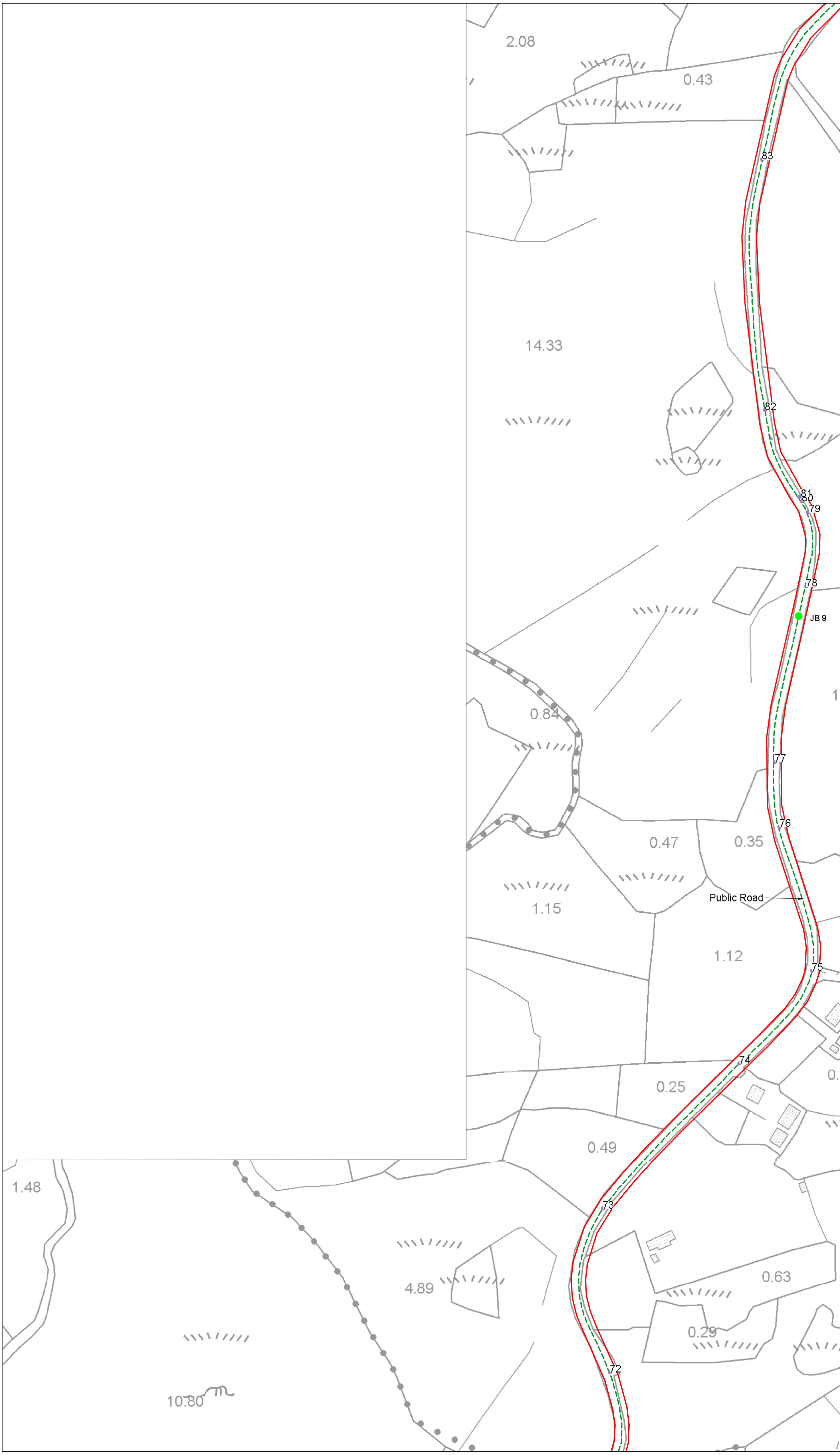
Site Layout Plan
Sheet 13 of 22

PROJECT TITLE:

Cleanrath Wind Farm, Co. Cork

DRAWING BY: Joseph o Brien	CHECKED BY: Owen Cahill
PROJECT No.: 191223a	DRAWING No.: 191223a - 16
SCALE: 1:2,500 @A3	DATE: 13.08.2020
OS SHEET No.: 6367,6368,6369,6370,6371,6412,6413,6413,6415,6416	

MKO
Planning and Environmental Consultants
Tuam Road, Galway
Ireland, H91 VW84
+353 (0) 91735611
email: info@www.mkoireland.ie
Website: www.mkoireland.ie



Project Design Drawing Notes

1. Drawings issued are for planning application purposes only.
2. Drawings not to be used for construction/contract conditions.
3. Copyright, all rights reserved. No part herewith may be copied or reproduced partially or wholly in any form whatsoever without the prior notice of the copyright owner McCarthy Keville O'Sullivan.
4. Do not scale off this drawing. Figured metric dimensions only should be taken off this drawing.
5. All contractors, whether main or sub-contractors, must visit the site and are responsible for taking and checking any and all dimensions and levels that relate to the works.
6. The use of or reliance upon this drawing shall be deemed to be acceptance of these conditions of use unless otherwise agreed in writing, such written agreement to be sought from and issued by the copyright holder to the use or reliance upon this drawing.
7. Layout plans show typical Turbine rotor diameter as per turbine drawing.

Grid Connection Drawing Notes

1. Grid connection cabling works along the public road corridor carried out under under Road Opening Licence
2. Location of grid connection cable is "as constructed"
3. All public/private services and utilities to be accommodated during grid connection cabling works.

Drawing Legend

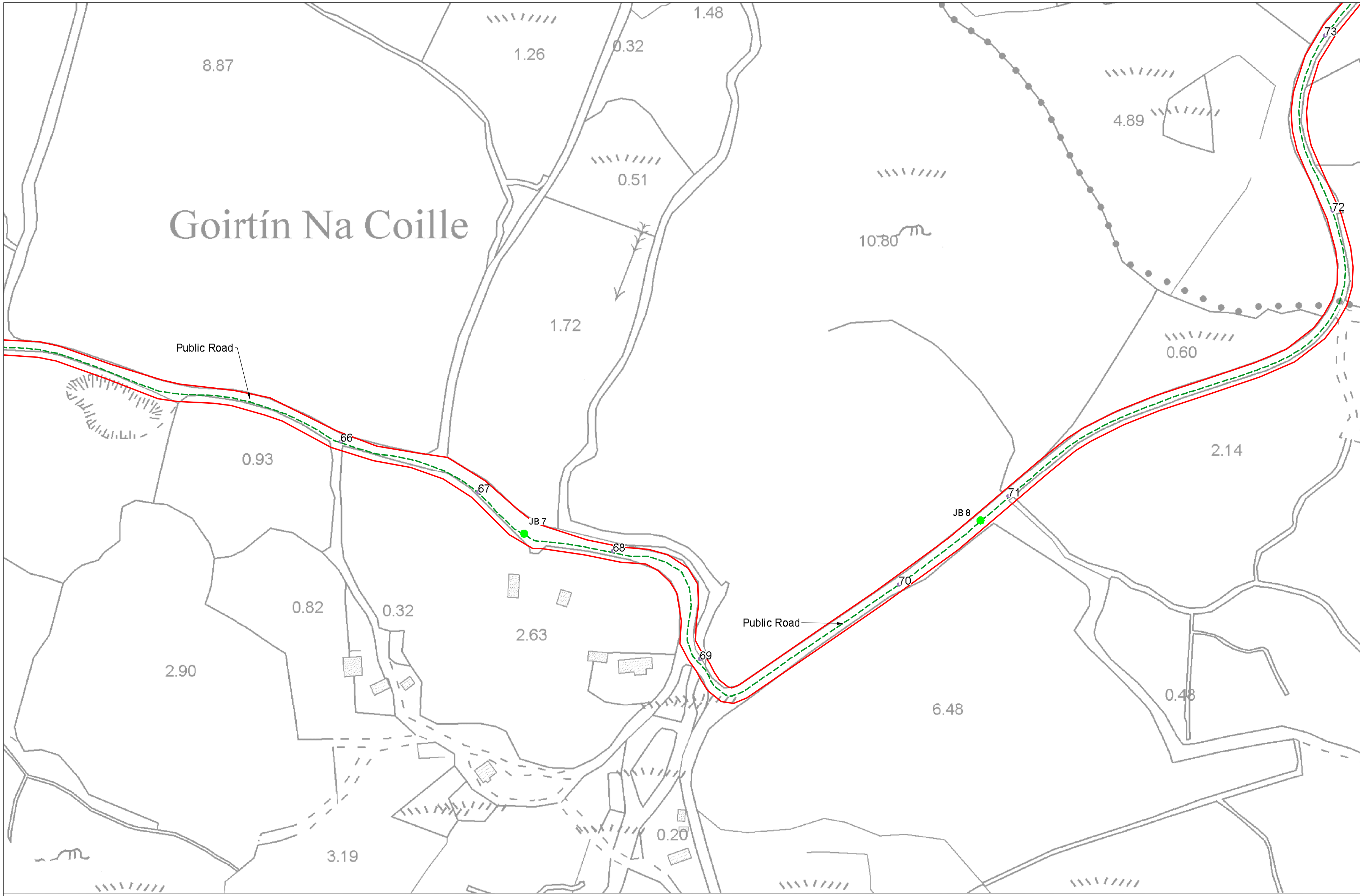
- Planning Application Boundary
- Cable Trench to Grid Connection
- Joint Bay
- Watercourse/Drain Crossings

DRAWING TITLE:
Site Layout Plan Sheet 14 of 22

PROJECT TITLE:
Cleanrath Wind Farm, Co. Cork

DRAWING BY: Joseph o Brien	CHECKED BY: Owen Cahill
PROJECT No.: 191223a	DRAWING No.: 191223a - 17
SCALE: 1:2,500 @A3	DATE: 13.08.2020
OS SHEET No.: 6367,6368,6369,6370,6371,6412,6413,6413,6415,6416	

MKO
Planning and Environmental Consultants
Tuam Road, Galway
Ireland, H91 VW84
+353 (0) 91 735611
email: info@www.mkoireland.ie
Website: www.mkoireland.ie



Project Design Drawing Notes

1. Drawings issued are for planning application purposes only.
2. Drawings not to be used for construction/contract conditions.
3. Copyright, all rights reserved. No part herewith may be copied or reproduced partially or wholly in any form whatsoever without the prior notice of the copyright owner McCarthy Keville O'Sullivan.
4. Do not scale off this drawing. Figured metric dimensions only should be taken off this drawing.
5. All contractors, whether main or sub-contractors, must visit the site and are responsible for taking and checking any and all dimensions and levels that relate to the works.
6. The use of or reliance upon this drawing shall be deemed to be acceptance of these conditions of use unless otherwise agreed in writing, such written agreement to be sought from and issued by the copyright holder to the use or reliance upon this drawing.
7. Layout plans show typical Turbine rotor diameter as per turbine drawing.

Grid Connection Drawing Notes

1. Grid connection cabling works along the public road corridor carried out under under Road Opening Licence
2. Location of grid connection cable is 'as constructed'
3. All public/private services and utilities to be accommodated during grid connection cabling works.

Drawing Legend

- Planning Application Boundary
- Cable Trench to Grid Connection
- Joint Bay
- Watercourse/Drain Crossings

DRAWING TITLE:

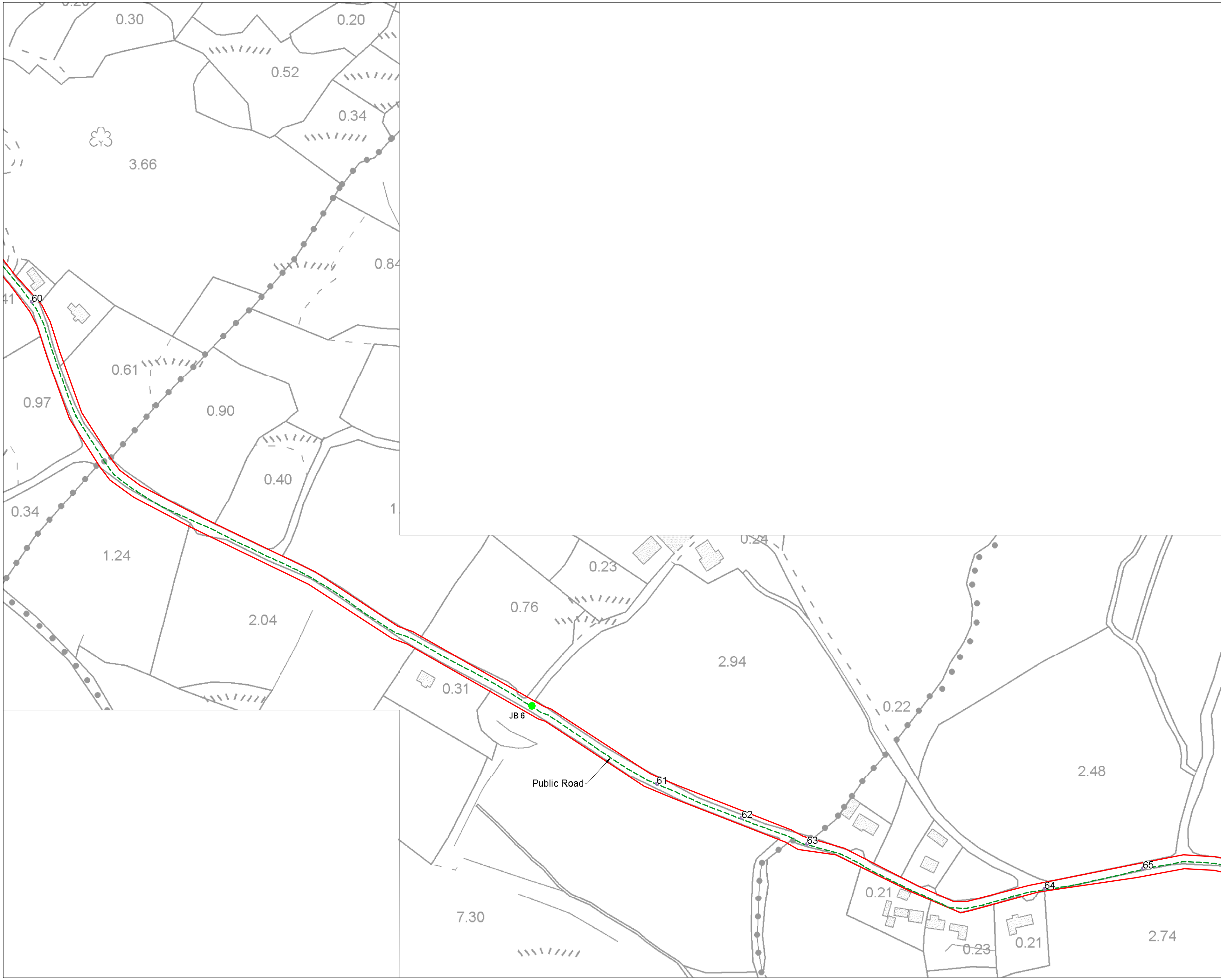
Site Layout Plan
Sheet 15 of 22

PROJECT TITLE:

Cleanrath Wind Farm, Co. Cork

DRAWING BY: Joseph o Brien	CHECKED BY: Owen Cahill
PROJECT No.: 191223a	DRAWING No.: 191223a - 18
SCALE: 1:2,500 @A3	DATE: 13.08.2020
OS SHEET No.: 6367,6368,6369,6370,6371,6412,6413,6413,6415,6416	

MKO
Planning and Environmental Consultants
Tuam Road, Galway
Ireland, H91 VW84
+353 (0) 91735611
email: info@www.mkoireland.ie
Website: www.mkoireland.ie



Project Design Drawing Notes

1. Drawings issued are for planning application purposes only.
2. Drawings not to be used for construction/contract conditions.
3. Copyright, all rights reserved. No part herewith may be copied or reproduced partially or wholly in any form whatsoever without the prior notice of the copyright owner McCarthy Keville O'Sullivan.
4. Do not scale off this drawing. Figured metric dimensions only should be taken off this drawing.
5. All contractors, whether main or sub-contractors, must visit the site and are responsible for taking and checking any and all dimensions and levels that relate to the works.
6. The use of or reliance upon this drawing shall be deemed to be acceptance of these conditions of use unless otherwise agreed in writing, such written agreement to be sought from and issued by the copyright holder to the use or reliance upon this drawing.
7. Layout plans show typical Turbine rotor diameter as per turbine drawing.

Grid Connection Drawing Notes

1. Grid connection cabling works along the public road corridor carried out under under Road Opening Licence
2. Location of grid connection cable is 'as constructed'
3. All public/private services and utilities to be accommodated during grid connection cabling works.

Drawing Legend

- Planning Application Boundary
- Cable Trench to Grid Connection
- Joint Bay
- Watercourse/Drain Crossings

DRAWING TITLE:

Site Layout Plan
Sheet 16 of 22

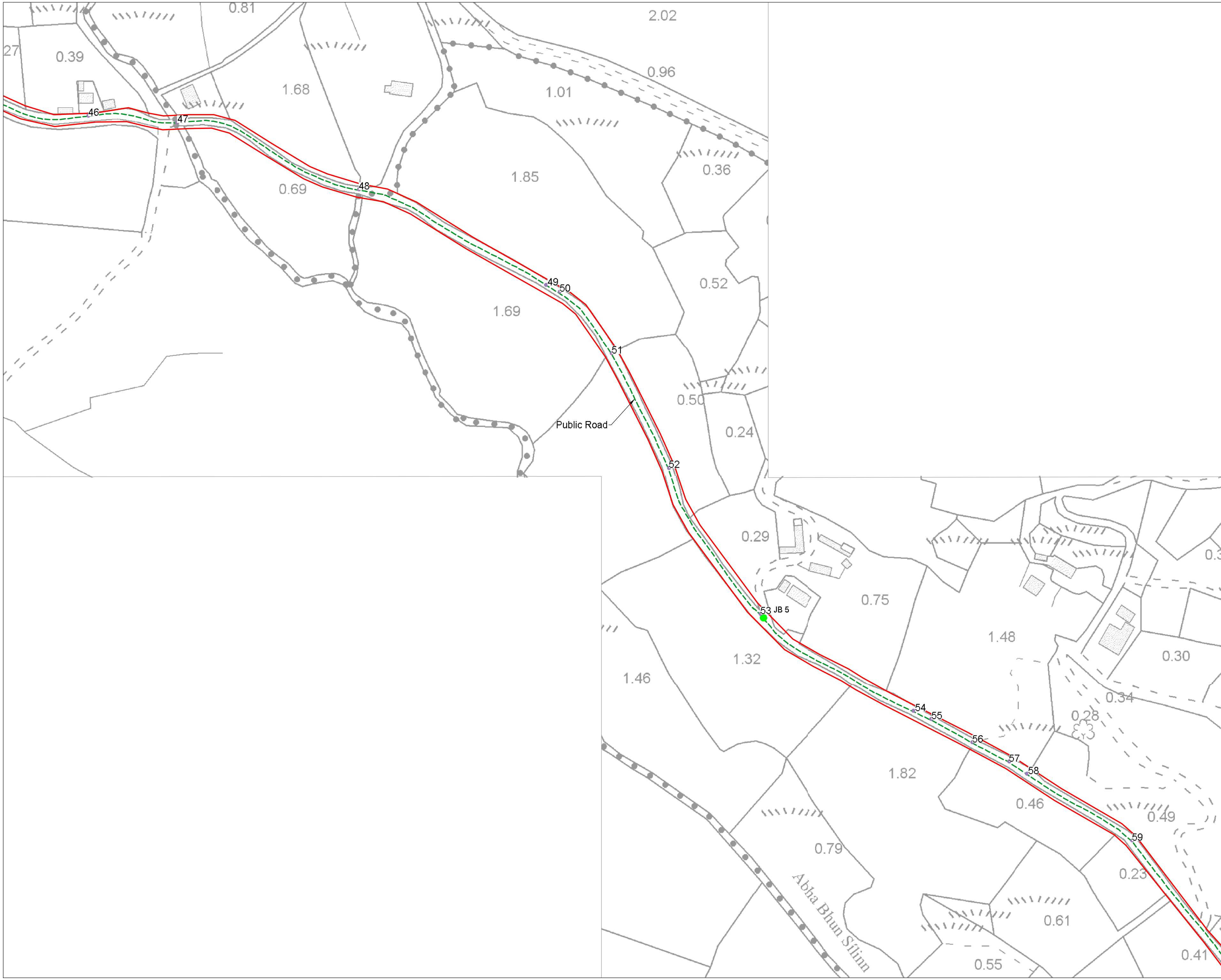
PROJECT TITLE:

Cleanrath Wind Farm, Co. Cork

DRAWING BY: Joseph o Brien	CHECKED BY: Owen Cahill
PROJECT No.: 191223a	DRAWING No.: 191123a - 19
SCALE: 1:2,500 @A3	DATE: 13.08.2020

OS SHEET No.: 6367,6368,6369,6370,6371,6412,6413,6413,6415,6416

MKO
Planning and Environmental Consultants
Tuam Road, Galway
Ireland, H91 VW84
+353 (0) 91735611
email: info@www.mkoireland.ie
Website: www.mkoireland.ie



Project Design Drawing Notes

1. Drawings issued are for planning application purposes only.
2. Drawings not to be used for construction/contract conditions.
3. Copyright, all rights reserved. No part herewith may be copied or reproduced partially or wholly in any form whatsoever without the prior notice of the copyright owner McCarthy Keville O'Sullivan.
4. Do not scale off this drawing. Figured metric dimensions only should be taken off this drawing.
5. All contractors, whether main or sub-contractors, must visit the site and are responsible for taking and checking any and all dimensions and levels that relate to the works.
6. The use of or reliance upon this drawing shall be deemed to be acceptance of these conditions of use unless otherwise agreed in writing, such written agreement to be sought from and issued by the copyright holder to the use or reliance upon this drawing.
7. Layout plans show typical Turbine rotor diameter as per turbine drawing.

Grid Connection Drawing Notes

1. Grid connection cabling works along the public road corridor carried out under under Road Opening Licence
2. Location of grid connection cable is 'as constructed'
3. All public/private services and utilities to be accommodated during grid connection cabling works.

Drawing Legend

- Planning Application Boundary
- Cable Trench to Grid Connection
- Joint Bay
- Watercourse/Drain Crossings

N

DRAWING TITLE:

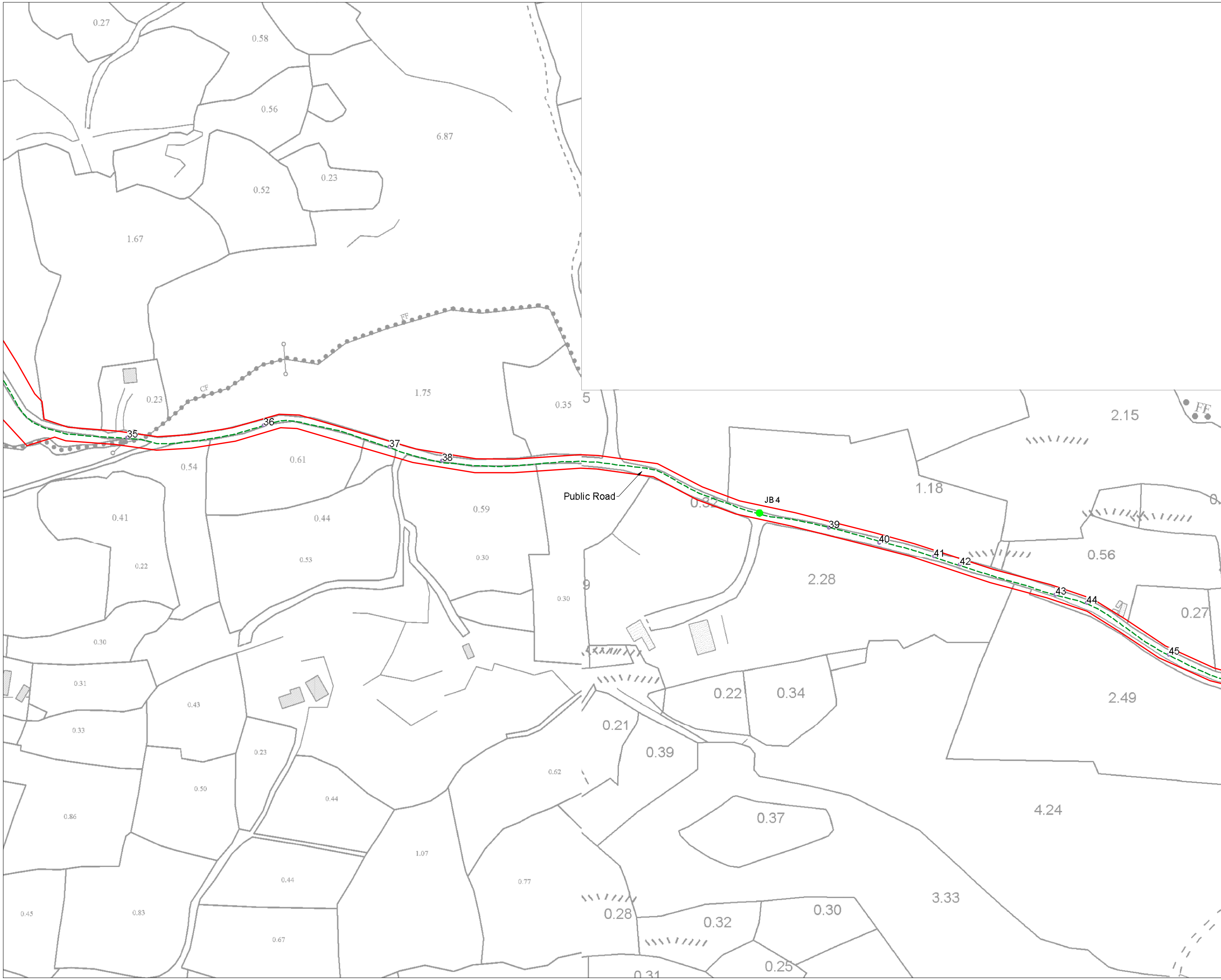
Site Layout Plan Sheet 17 of 22

PROJECT TITLE: Cleanrath Wind Farm, Co. Cork

DRAWING BY: Joseph o Brien	CHECKED BY: Owen Cahill
PROJECT No.: 191223a	DRAWING No.: 191223a - 20
SCALE: 1:2,500 @A3	DATE: 13.08.2020

OS SHEET No.: 6367,6368,6369,6370,6371,6412,6413,6413,6415,6416

MKO
Planning and Environmental Consultants
Tuam Road, Galway
Ireland, H91 VW84
+353 (0) 91735611
email: info@www.mkoireland.ie
Website: www.mkoireland.ie



Project Design Drawing Notes

1. Drawings issued are for planning application purposes only.
2. Drawings not to be used for construction/contract conditions.
3. Copyright, all rights reserved. No part herewith may be copied or reproduced partially or wholly in any form whatsoever without the prior notice of the copyright owner McCarthy Keville O'Sullivan.
4. Do not scale off this drawing. Figured metric dimensions only should be taken off this drawing.
5. All contractors, whether main or sub-contractors, must visit the site and are responsible for taking and checking any and all dimensions and levels that relate to the works.
6. The use of or reliance upon this drawing shall be deemed to be acceptance of these conditions of use unless otherwise agreed in writing, such written agreement to be sought from and issued by the copyright holder to the use or reliance upon this drawing.
7. Layout plans show typical Turbine rotor diameter as per turbine drawing.

Grid Connection Drawing Notes

1. Grid connection cabling works along the public road corridor carried out under under Road Opening Licence
2. Location of grid connection cable is 'as constructed'
3. All public/private services and utilities to be accommodated during grid connection cabling works.

Drawing Legend

- Planning Application Boundary
- Cable Trench to Grid Connection
- Joint Bay
- Watercourse/Drain Crossings

DRAWING TITLE:

Site Layout Plan
Sheet 18 of 22

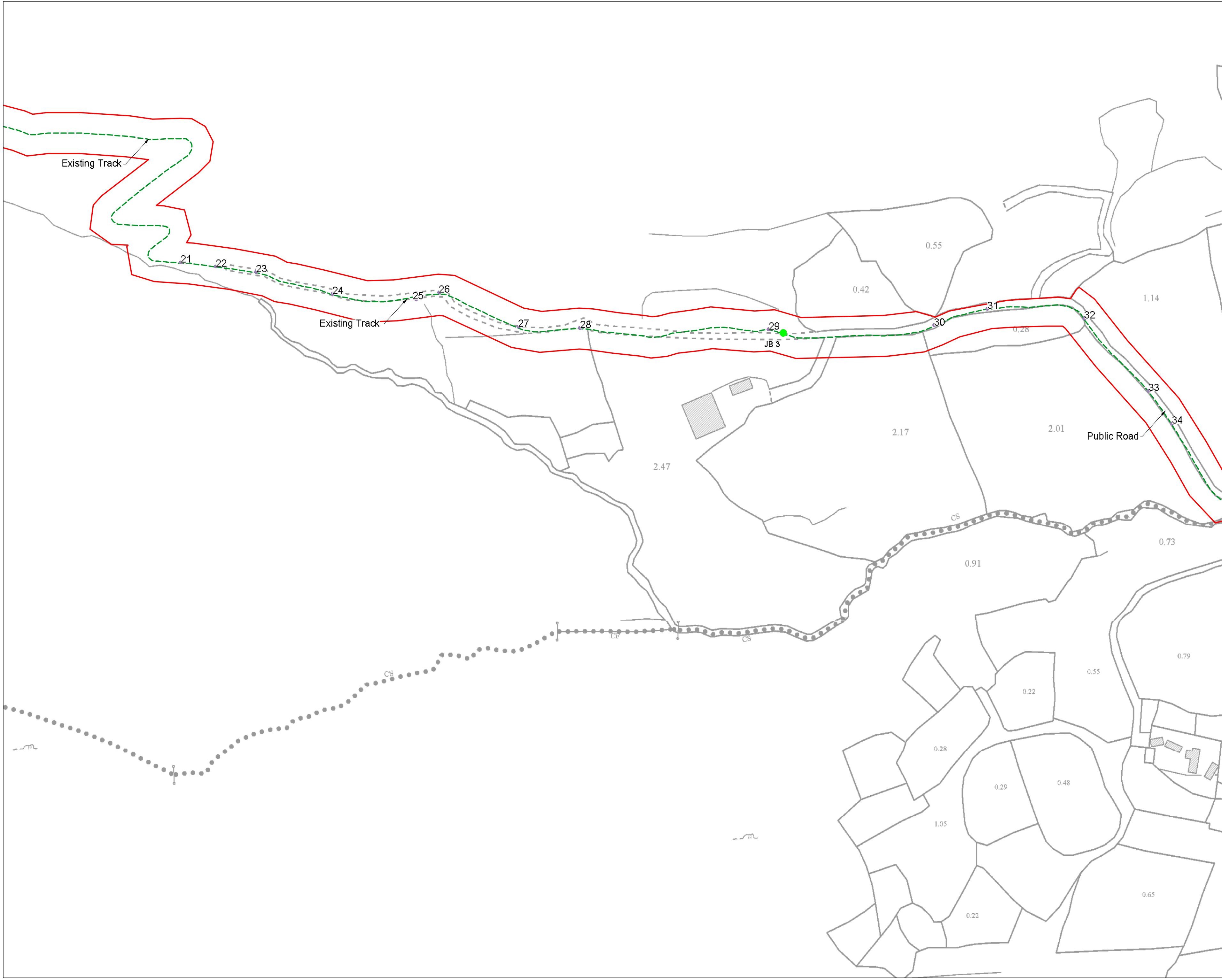
PROJECT TITLE:

Cleanrath Wind Farm, Co. Cork

DRAWING BY: Joseph o Brien	CHECKED BY: Owen Cahill
PROJECT No.: 191223a	DRAWING No.: 191223a - 21
SCALE: 1:2,500 @A3	DATE: 13.08.2020

OS SHEET No.: 6367,6368,6369,6370,6371,6412,6413,6413,6415,6416

MKO
Planning and Environmental Consultants
Tuam Road, Galway
Ireland, H91 VW84
+353 (0) 91735611
email: info@www.mkoireland.ie
Website: www.mkoireland.ie



Project Design Drawing Notes

1. Drawings issued are for planning application purposes only.
2. Drawings not to be used for construction/contract conditions.
3. Copyright, all rights reserved. No part herewith may be copied or reproduced partially or wholly in any form whatsoever without the prior notice of the copyright owner McCarthy Keville O'Sullivan.
4. Do not scale off this drawing. Figured metric dimensions only should be taken off this drawing.
5. All contractors, whether main or sub-contractors, must visit the site and are responsible for taking and checking any and all dimensions and levels that relate to the works.
6. The use of or reliance upon this drawing shall be deemed to be acceptance of these conditions of use unless otherwise agreed in writing, such written agreement to be sought from and issued by the copyright holder to the use or reliance upon this drawing.
7. Layout plans show typical Turbine rotor diameter as per turbine drawing.

Grid Connection Drawing Notes

1. Grid connection cabling works along the public road corridor carried out under under Road Opening Licence
2. Location of grid connection cable is 'as constructed'
3. All public/private services and utilities to be accommodated during grid connection cabling works.

Drawing Legend

- Planning Application Boundary
- Cable Trench to Grid Connection
- Joint Bay
- Watercourse/Drain Crossings

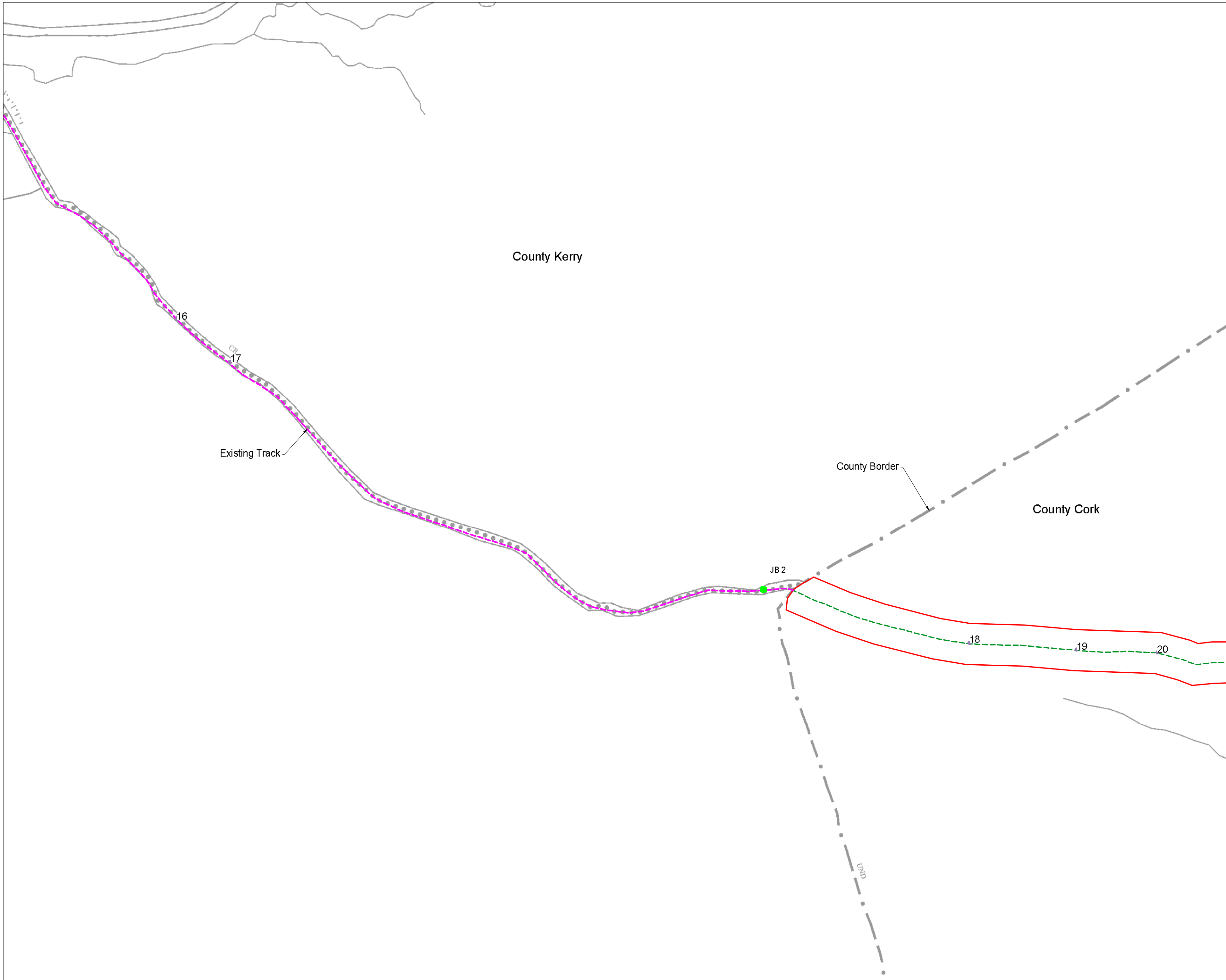
N

DRAWING TITLE:
Site Layout Plan Sheet 19 of 22

PROJECT TITLE:
Cleanrath Wind Farm, Co. Cork

DRAWING BY: Joseph o Brien	CHECKED BY: Owen Cahill
PROJECT No.: 191223a	DRAWING No.: 191223a - 22
SCALE: 1:2,500 @A3	DATE: 13.08.2020
OS SHEET No.: 6367,6368,6369,6370,6371,6412,6413,6413,6415,6416	

MKO
Planning and Environmental Consultants
Tuam Road, Galway
Ireland, H91 VW84
+353 (0) 91735611
email: info@www.mkoireland.ie
Website: www.mkoireland.ie



Project Design Drawing Notes

1. Drawings issued are for planning application purposes only.
2. Drawings not to be used for construction/contract conditions.
3. Copyright, all rights reserved. No part herewith may be copied or reproduced partially or wholly in any form whatsoever without the prior notice of the copyright owner McCarthy Keville O'Sullivan.
4. Do not scale off this drawing. Figured metric dimensions only should be taken off this drawing.
5. All contractors, whether main or sub-contractors, must visit the site and are responsible for taking and checking any and all dimensions and levels that relate to the works.
6. The use of or reliance upon this drawing shall be deemed to be acceptance of these conditions of use unless otherwise agreed in writing, such written agreement to be sought from and issued by the copyright holder to the use or reliance upon this drawing.
7. Layout plans show typical Turbine rotor diameter as per turbine drawing.

Grid Connection Drawing Notes

1. Grid connection cabling works along the public road corridor carried out under under Road Opening Licence
2. Location of grid connection cable is 'as constructed'
3. All public/private services and utilities to be accommodated during grid connection cabling works.

Drawing Legend

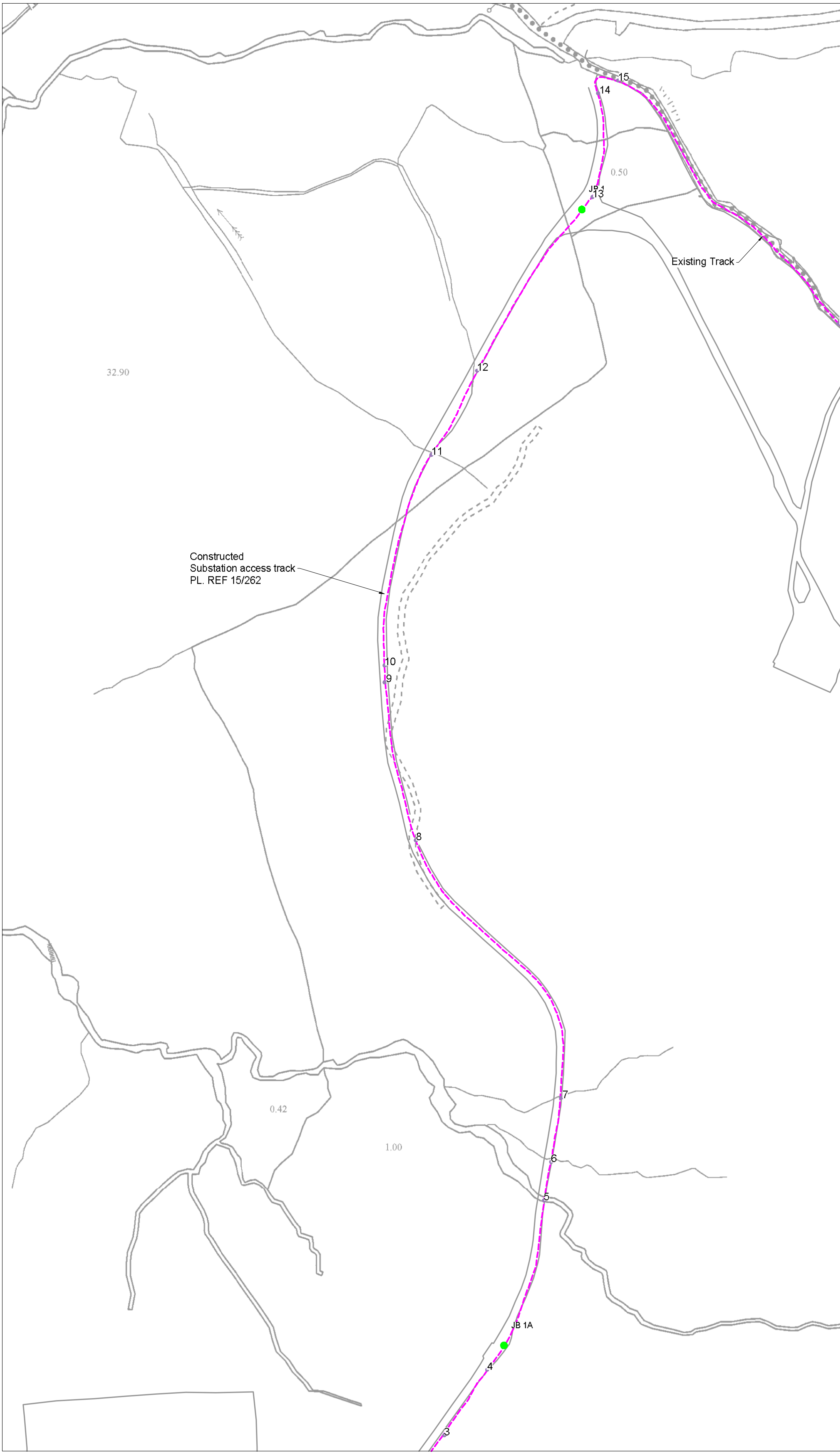
- Planning Application Boundary
- Cable Trench to Grid Connection
- Cable Route within Co. Kerry
- Joint Bay
- Watercourse/Drain Crossings

DRAWING TITLE:
Site Layout Plan Sheet 20 of 22

PROJECT TITLE: Cleanrath Wind Farm, Co. Cork

DRAWING BY: Joseph o Brien	CHECKED BY: Owen Cahill
PROJECT No.: 191223a	DRAWING No.: 191223a - 23
SCALE: 1:2,500 @A3	DATE: 13.08.2020
OS SHEET No.: 6367,6368,6369,6370,6371,6412,6413,6413,6415,6416	

MKO
Planning and Environmental Consultants
Tuam Road, Galway
Ireland, H91 VW84
+353 (0) 91735611
email: info@www.mkoireland.ie
Website: www.mkoireland.ie



Project Design Drawing Notes
1. Drawings issued are for planning application purposes only.
2. Drawings not to be used for construction/contract conditions.
3. Copyright, all rights reserved. No part herewith may be copied or reproduced partially or wholly in any form whatsoever without the prior notice of the copyright owner McCarthy Keville O'Sullivan.
4. Do not scale off this drawing. Figured metric dimensions only should be taken off this drawing.
5. All contractors, whether main or sub-contractors, must visit the site and are responsible for taking and checking any and all dimensions and levels that relate to the works.
6. The use of or reliance upon this drawing shall be deemed to be acceptance of these conditions of use unless otherwise agreed in writing, such written agreement to be sought from and issued by the copyright holder to the use or reliance upon this drawing.
7. Layout plans show typical Turbine rotor diameter as per turbine drawing.

Grid Connection Drawing Notes
1. Grid connection cabling works along the public road corridor carried out under under Road Opening Licence
2. Location of grid connection cable is 'as constructed'
3. All public/private services and utilities to be accommodated during grid connection cabling works.

Drawing Legend
- Cable Route within Co. Kerry
- Joint Bay
- Watercourse/Drain Crossings

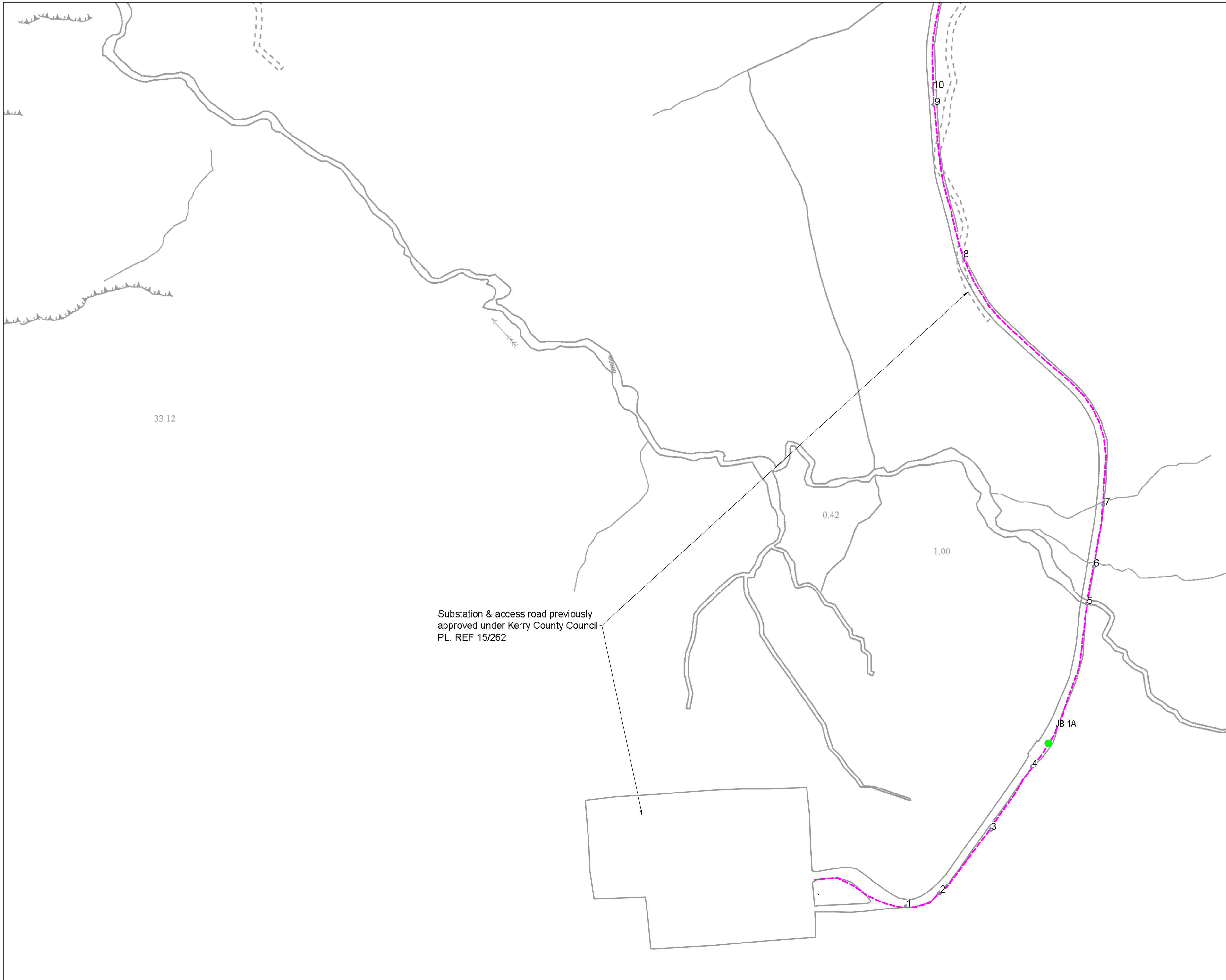
N

DRAWING TITLE:
Site Layout Plan
Sheet 21 of 22

PROJECT TITLE:
Cleanrath Wind Farm, Co. Cork

DRAWING BY: Joseph o Brien	CHECKED BY: Owen Cahill
PROJECT No.: 191223a	DRAWING No.: 191223a - 24
SCALE: 1:2,500 @A3	DATE: 13.08.2020
OS SHEET No.: 6367,6368,6369,6370,6371,6412,6413,6413,6415,6416	

MKO
Planning and Environmental Consultants
Tuam Road, Galway
Ireland, H91 VW84
+353 (0) 91 735611
email: info@www.mkoireland.ie
Website: www.mkoireland.ie



Project Design Drawing Notes

1. Drawings issued are for planning application purposes only.
2. Drawings not to be used for construction/contract conditions.
3. Copyright, all rights reserved. No part herewith may be copied or reproduced partially or wholly in any form whatsoever without the prior notice of the copyright owner McCarthy Keville O'Sullivan.
4. Do not scale off this drawing. Figured metric dimensions only should be taken off this drawing.
5. All contractors, whether main or sub-contractors, must visit the site and are responsible for taking and checking any and all dimensions and levels that relate to the works.
6. The use of or reliance upon this drawing shall be deemed to be acceptance of these conditions of use unless otherwise agreed in writing, such written agreement to be sought from and issued by the copyright holder to the use or reliance upon this drawing.
7. Layout plans show typical Turbine rotor diameter as per turbine drawing.

Grid Connection Drawing Notes

1. Grid connection cabling works along the public road corridor carried out under under Road Opening Licence
2. Location of grid connection cable is 'as constructed'
3. All public/private services and utilities to be accommodated during grid connection cabling works.

Drawing Legend

- Cable Route within Co. Kerry as permitted under KCC Pl. Ref. 15/1164
- Joint Bay
- Watercourse/Drain Crossings

N

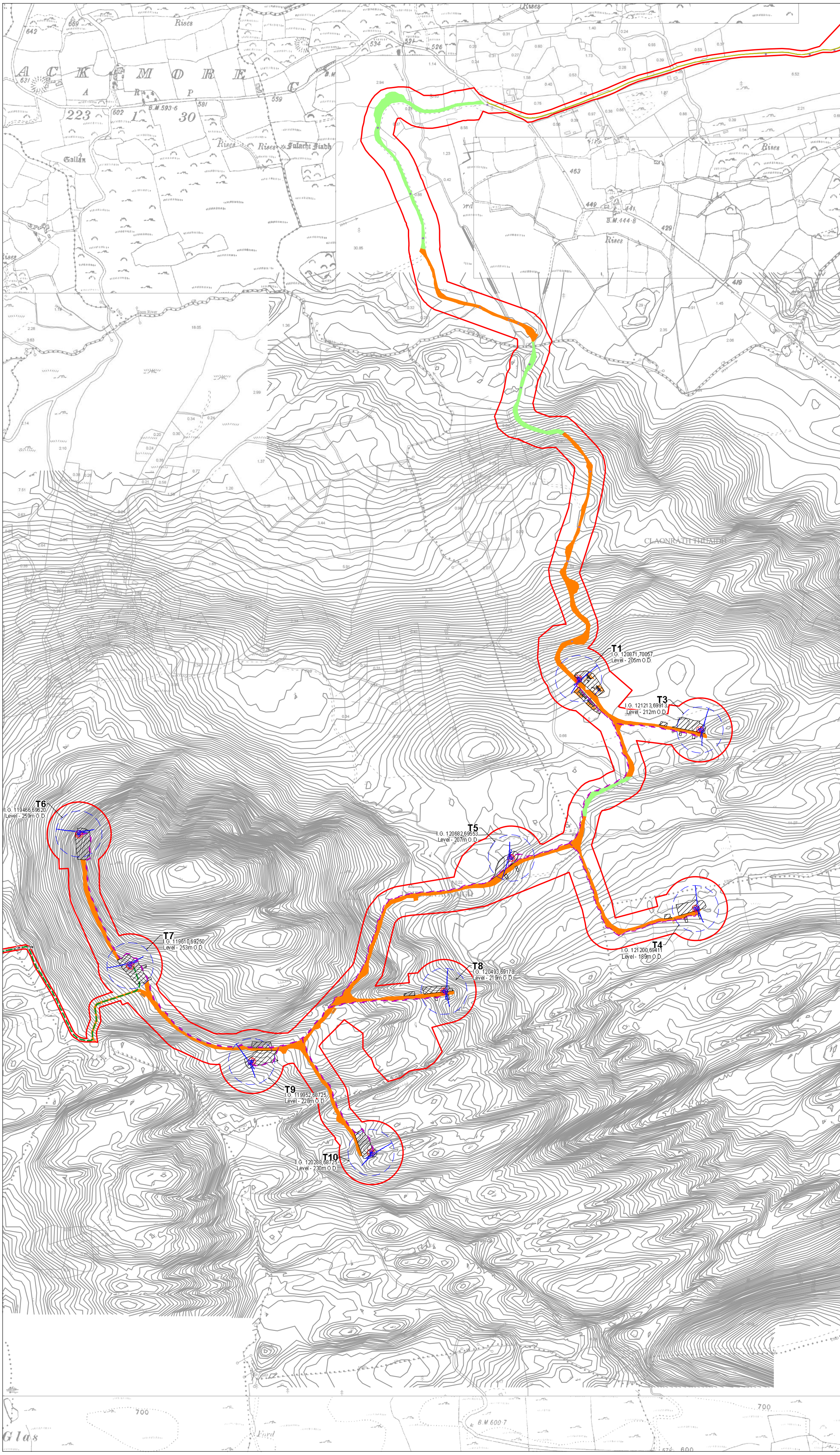
DRAWING TITLE:
Site Layout Plan Sheet 22 of 22

PROJECT TITLE:
Cleanrath Wind Farm, Co. Cork

DRAWING BY: Joseph o Brien	CHECKED BY: Owen Cahill
PROJECT No.: 191223a	DRAWING No.: 191223a - 25
SCALE: 1:2,500 @A3	DATE: 13.08.2020

OS SHEET No.: 6367,6368,6369,6370,6371,6412,6413,6413,6415,6416

MKO
Planning and Environmental Consultants
Tuam Road, Galway
Ireland, H91VW84
+353 (0) 91735611
email: info@www.mkoireland.ie
Website: www.mkoireland.ie



Project Design Drawing Notes

1. Drawings issued are for planning application purposes only.
2. Drawings not to be used for construction/contract conditions.
3. Copyright, all rights reserved. No part herewith may be copied or reproduced partially or wholly in any form whatsoever without the prior notice of the copyright owner McCarthy Keville O'Sullivan.
4. Do not scale off this drawing. Figured metric dimensions only should be taken off this drawing.
5. All contractors, whether main or sub-contractors, must visit the site and are responsible for taking and checking any and all dimensions and levels that relate to the works.
6. The use of or reliance upon this drawing shall be deemed to be acceptance of these conditions of use unless otherwise agreed in writing, such written agreement to be sought from and issued by the copyright holder to the use or reliance upon this drawing.
7. Layout plans show typical Turbine rotor diameter as per turbine drawing.

Drainage Design Note

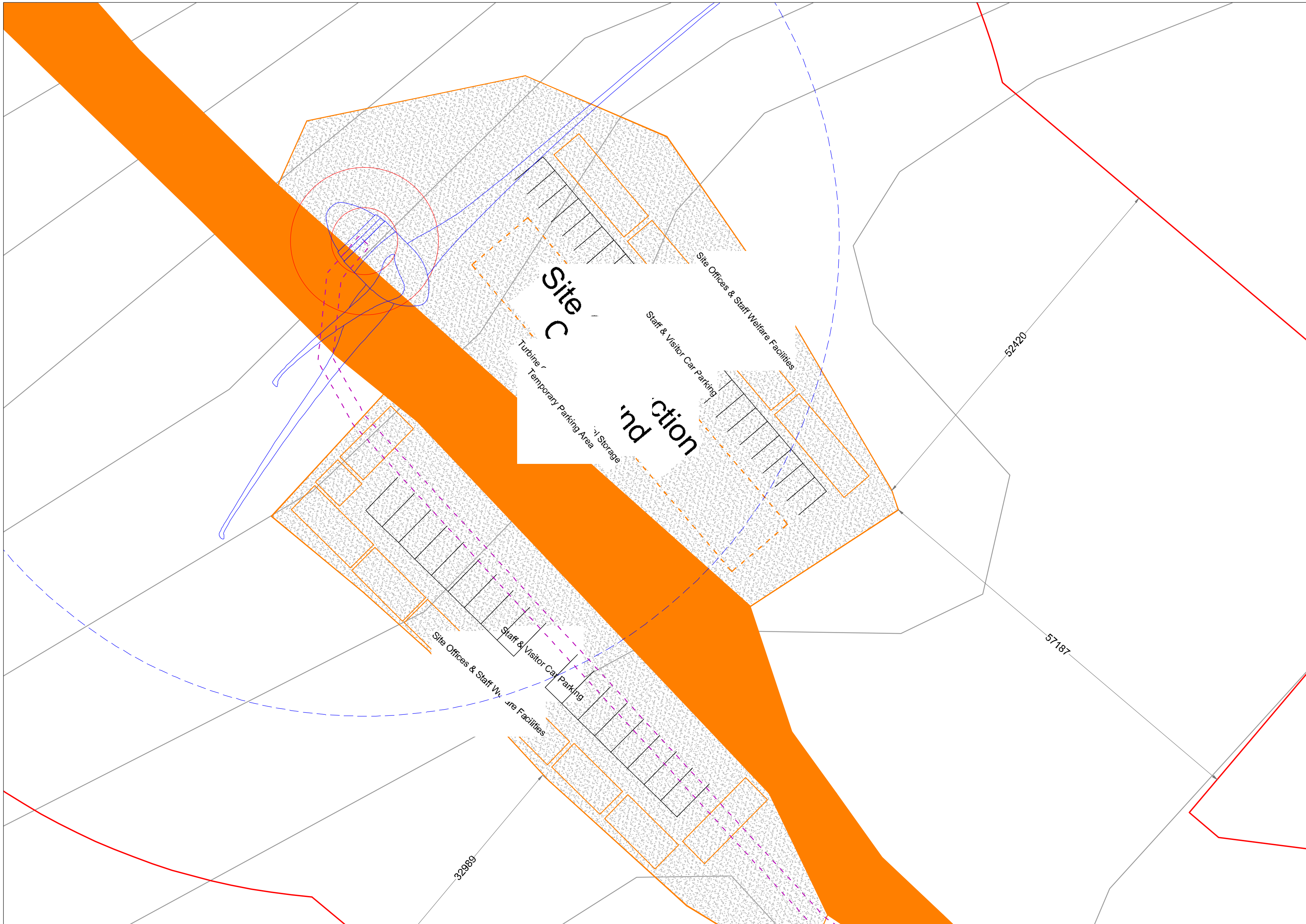
Drainage details are included in drawings prepared by Hydro Environmental Services

DRAWING TITLE:
Turbine Infrastructure Master Plan

PROJECT TITLE: Cleanrath Wind Farm, Co. Cork

DRAWING BY: Joseph o Brien	CHECKED BY: Owen Cahill
PROJECT No.: 191223a	DRAWING No.: 191223a - 26
SCALE: 1:10,000 @A3	DATE: 13.08.2020
OS SHEET No.: 6367,6368,6369,6370,6371,6412,6413,6413,6415,6416	

MKO
Planning and Environmental Consultants
Tuam Road, Galway
Ireland, H91 VW84
+353 (0) 91735611
email: info@www.mkoireland.ie
Website: www.mkoireland.ie



Note
1. All components of the Site Construction Compound have been removed and it has been re-purposed as a hardstanding for Turbine no. 1
2. Site offices and welfare facilities were in place during construction phase but have now been removed

Project Design Drawing Notes

1. Drawings issued are for planning application purposes only.
2. Drawings not to be used for construction/contract conditions.
3. Copyright, all rights reserved. No part herewith may be copied or reproduced partially or wholly in any form whatsoever without the prior notice of the copyright owner McCarthy Keville O'Sullivan.
4. Do not scale off this drawing. Figured metric dimensions only should be taken off this drawing.
5. All contractors, whether main or sub-contractors, must visit the site and are responsible for taking and checking any and all dimensions and levels that relate to the works.
6. The use of or reliance upon this drawing shall be deemed to be acceptance of these conditions of use unless otherwise agreed in writing, such written agreement to be sought from and issued by the copyright holder to the use or reliance upon this drawing.
7. Layout plans show typical Turbine rotor diameter as per turbine drawing.

Drainage Design Note

Drainage details are included in drawings prepared by Hydro Environmental Services

Drawing Legend

- Planning Application Boundary
- New Road
- Turbine Sweep Area

N

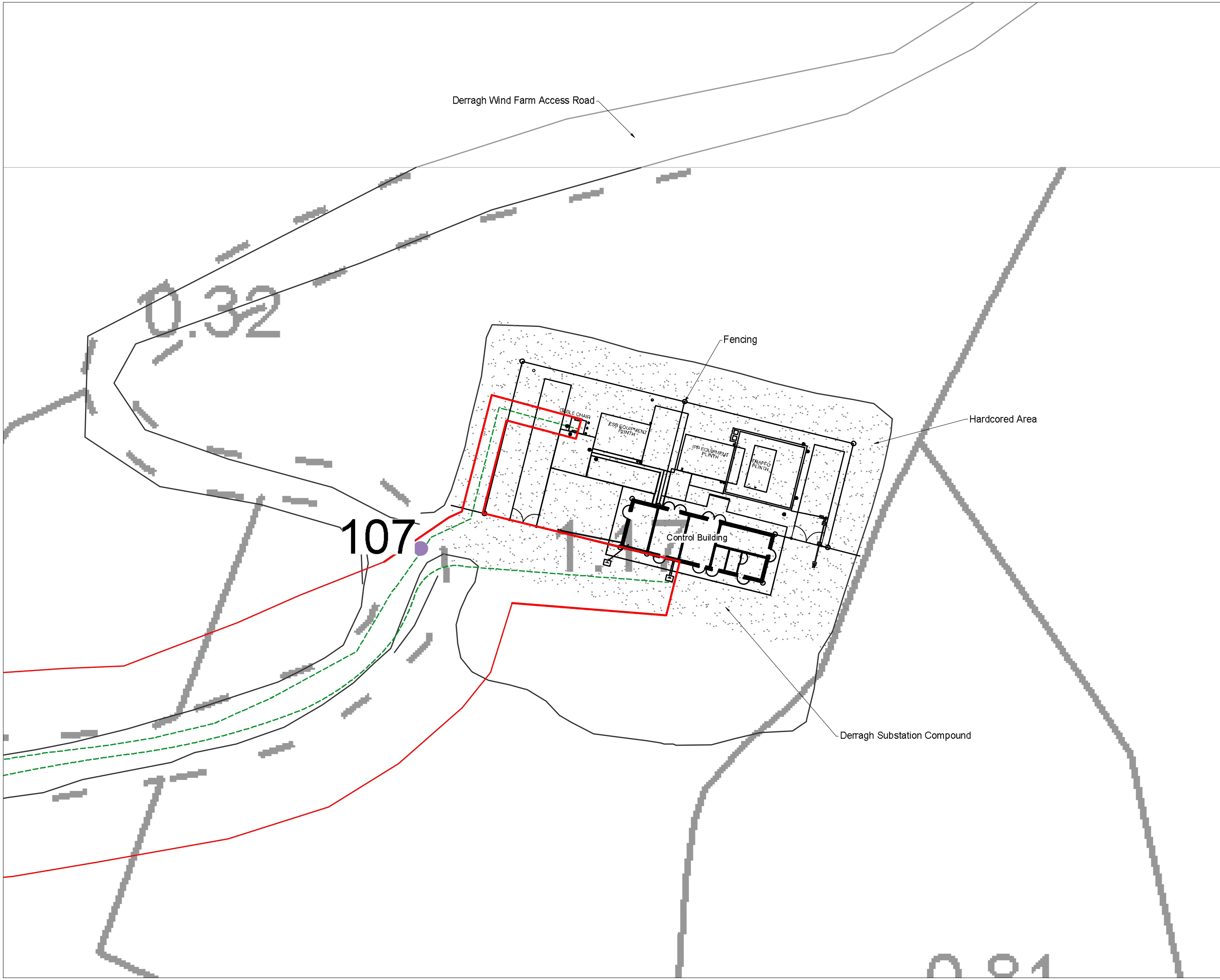
DRAWING TITLE:
Temporary Construction Compound

PROJECT TITLE:
Cleanrath Wind Farm, Co. Cork

DRAWING BY: Joseph o Brien	CHECKED BY: Owen Cahill
PROJECT No.: 191223a	DRAWING No.: 191223a - 27
SCALE: 1:500 @A3	DATE: 13.08.2020

OS SHEET No.: 6367,6368,6369,6370,6371,6412,6413,6413,6415,6416

MKO
Planning and Environmental Consultants
Tuam Road, Galway
Ireland, H91 VW84
+353 (0) 91 735611
email: info@www.mkoireland.ie
Website: www.mkoireland.ie



Project Design Drawing Notes

1. Drawings issued are for planning application purposes only.
2. Drawings not to be used for construction/contract conditions.
3. Copyright, all rights reserved. No part herewith may be copied or reproduced partially or wholly in any form whatsoever without the prior notice of the copyright owner McCarthy Keville O'Sullivan.
4. Do not scale off this drawing. Figured metric dimensions only should be taken off this drawing.
5. All contractors, whether main or sub-contractors, must visit the site and are responsible for taking and checking any and all dimensions and levels that relate to the works.
6. The use of or reliance upon this drawing shall be deemed to be acceptance of these conditions of use unless otherwise agreed in writing, such written agreement to be sought from and issued by the copyright holder to the use or reliance upon this drawing.
7. Layout plans show typical Turbine rotor diameter as per turbine drawing.

Grid Connection Drawing Notes

1. Grid connection cabling works along the public road corridor carried out under under Road Opening Licence
2. Location of grid connection cable is 'as constructed'
3. All public/private services and utilities to be accommodated during grid connection cabling works.

Drawing Legend

- Planning Application Boundary
- Cable Trench to Grid Connection
- Watercourse/Drain Crossings

N

DRAWING TITLE:

Substation Layout Plan

PROJECT TITLE:

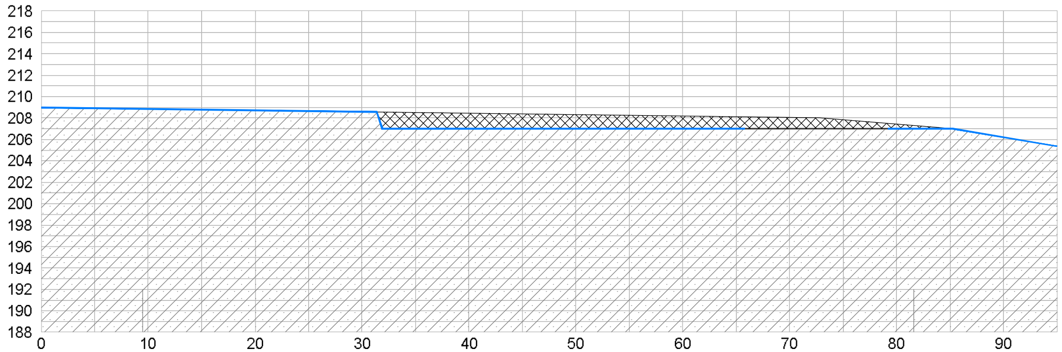
Cleanrath Wind Farm, Co. Cork

DRAWING BY: Joseph o Brien	CHECKED BY: Owen Cahill
PROJECT No.: 191223a	DRAWING No.: 191223a - 28
SCALE: 1:500 @A3	DATE: 13.08.2020
OS SHEET No.: 6367,6368,6369,6370,6371,6412,6413,6413,6415,6416	

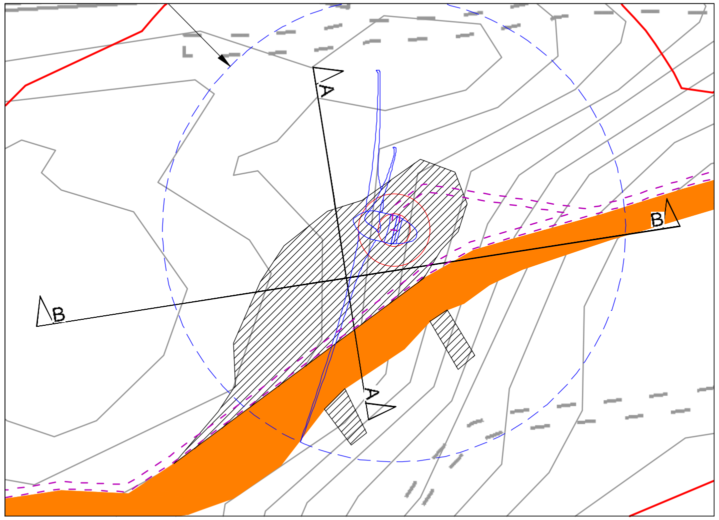
MKO
Planning and Environmental Consultants
Tuam Road, Galway
Ireland, H91VW84
+353 (0) 91735611
email: info@www.mkoireland.ie
Website: www.mkoireland.ie

Drawing Legend

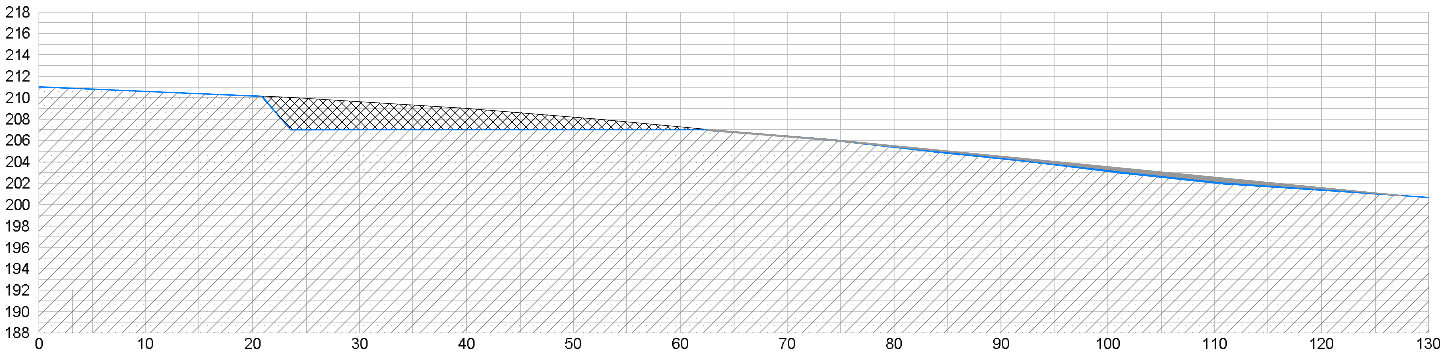
- Bedrock
- Excavated Area
- Roads
- Existing ground



Borrow Pit Section A-A



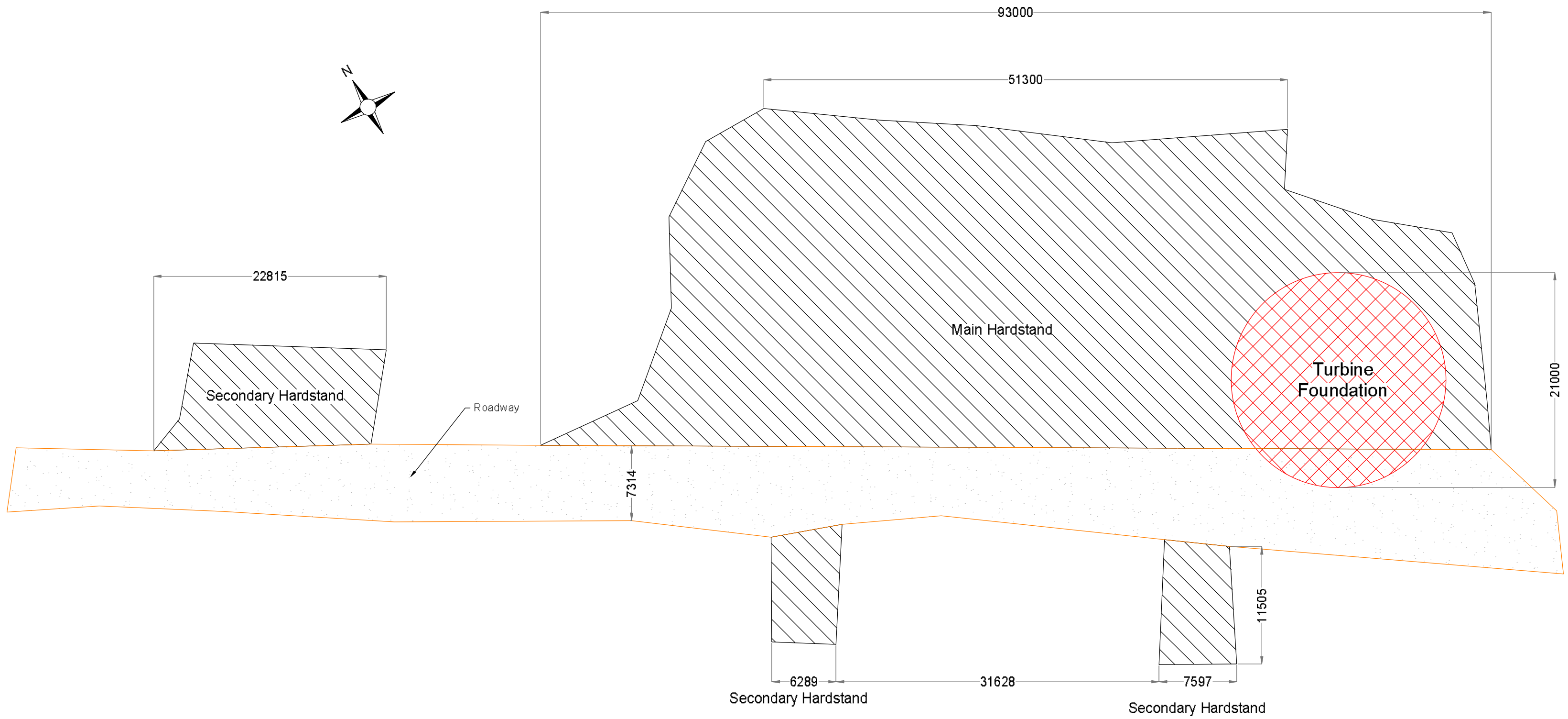
Borrow Pits No. 1 Scale 1:1,500



Borrow Pit Section B-B

DRAWING TITLE: **Borrow Pit Layouts & Sections**	
PROJECT TITLE: Cleanrath Wind Farm, Co. Cork	
DRAWING BY: Joseph o Brien	CHECKED BY: Owen Cahill
PROJECT No.: 191223a	DRAWING No.: 191223a - 29
SCALE: 1:500 @A3	DATE: 13.08.2020
OS SHEET No.: 6367,6368,6369,6370,6371,6412,6413,6413,6415,6416	

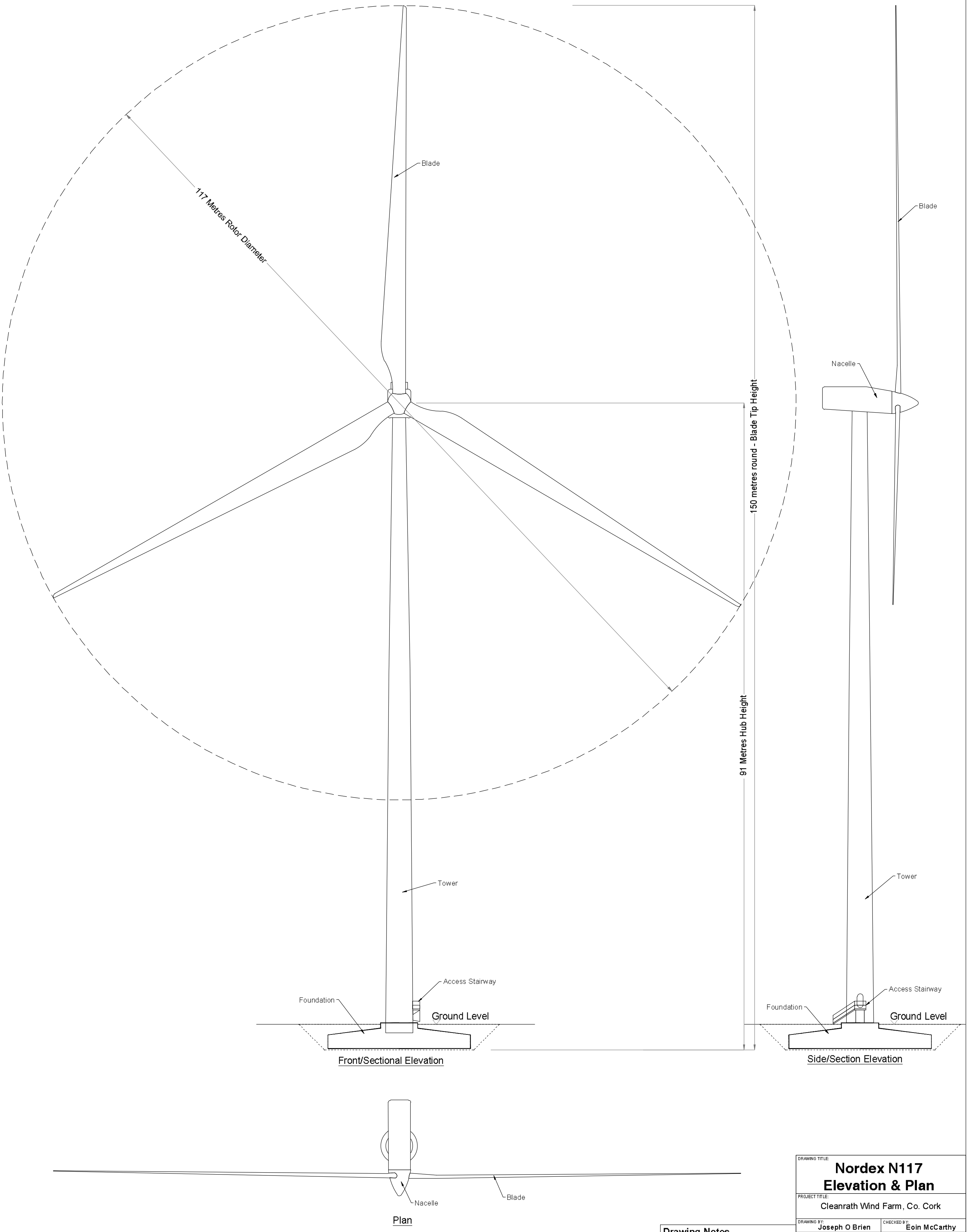
MKO
Planning and Environmental Consultants
Tuam Road, Galway
Ireland, H91 VW84
+353 (0) 91 735611
email: info@www.mkoireland.ie
Website: www.mkoireland.ie



DRAWING TITLE: **Turbine Hardstand Layout Standard Detail Based on Turbine 3**	
PROJECT TITLE: Cleanrath Wind Farm, Co. Cork	
DRAWING BY: **Joseph O Brien**	CHECKED BY: **Eoin McCarthy**
PROJECT No.: **191223a**	DRAWING No.: **191223a - 30**
SCALE: **1:500 @A3**	DATE: **13.08.2020**

MKO

MKO
Planning and Environmental Consultants
Tuam Road, Galway
Ireland, H91 VW84
+353 (0) 91 735611
email: info@www.mkoireland.ie
Website: www.mkoireland.ie



Drawing Notes

1. Wind turbines have a maximum ground to blade tip height of 150m.
2. Installed wind turbine is as per maximum size envelope set out above in blade length and hub-height configuration.

DRAWING TITLE:

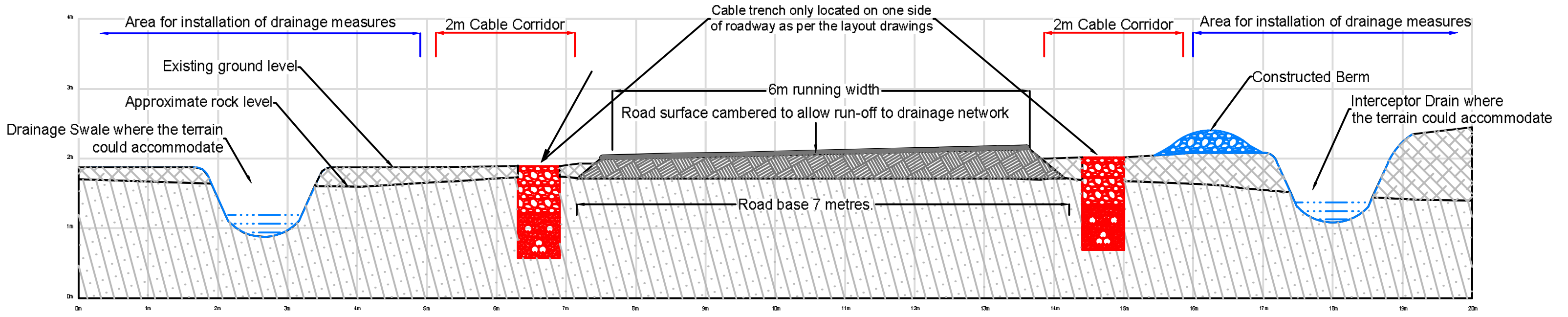
Nordex N117 Elevation & Plan

PROJECT TITLE: Cleanrath Wind Farm, Co. Cork

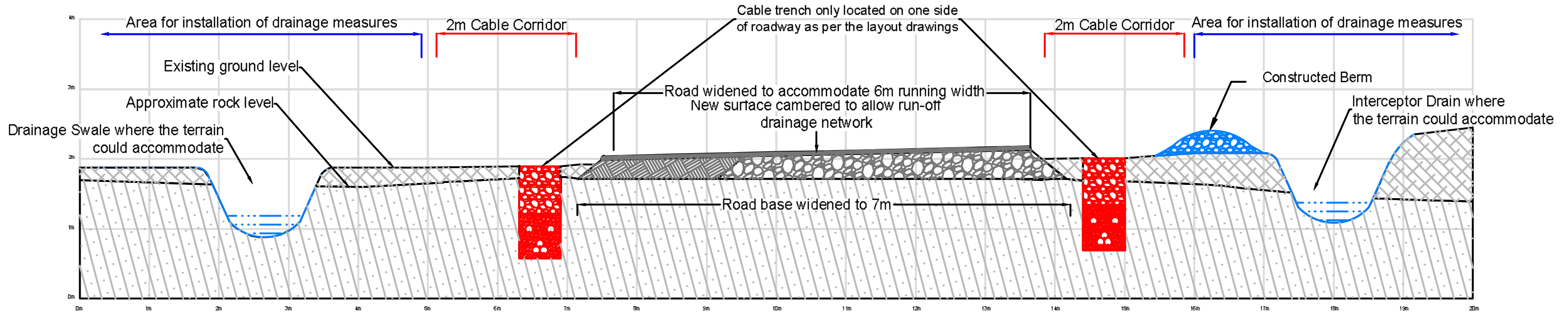
DRAWING BY: Joseph O Brien	CHECKED BY: Eoin McCarthy
PROJECT No.: 191223a	DRAWING No.: 191223a - 31
SCALE: 1:500 @A3	DATE: 13.08.2020

MKO
Planning and Environmental Consultants
Tuam Road, Galway
Ireland, H91 VW84
+353 (0) 91 735611
email: info@www.mkoireland.ie
Website: www.mkoireland.ie

Drawing Notes
1. Widening occured on either side of existing roads dependent on site conditions.
2. Depths of road fill varied dependent on site conditions.



Typical excavated road section.

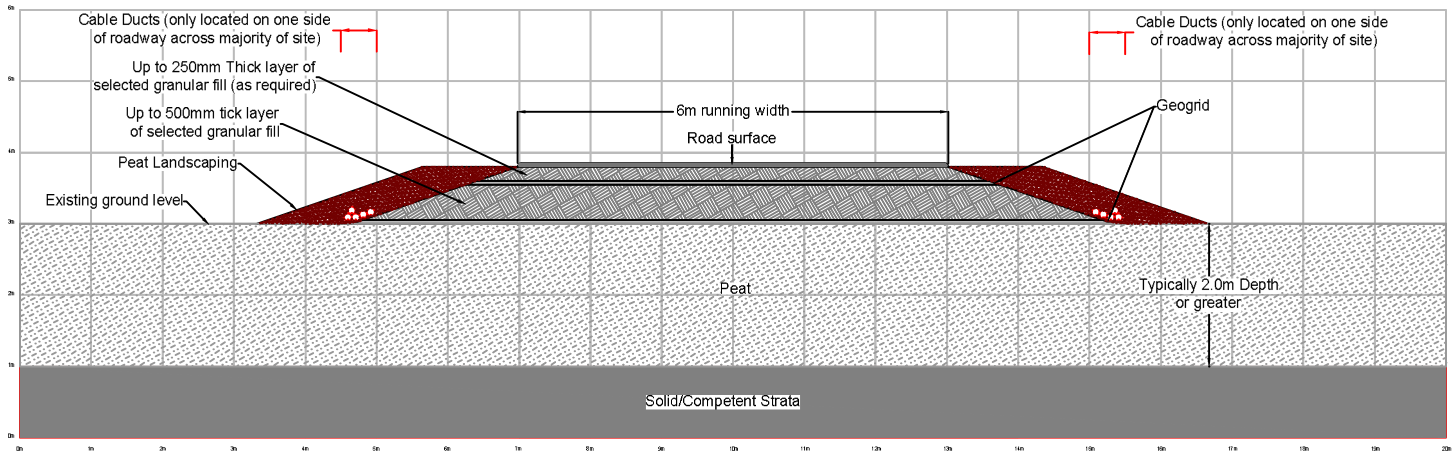


Typical existing excavated road widening section.

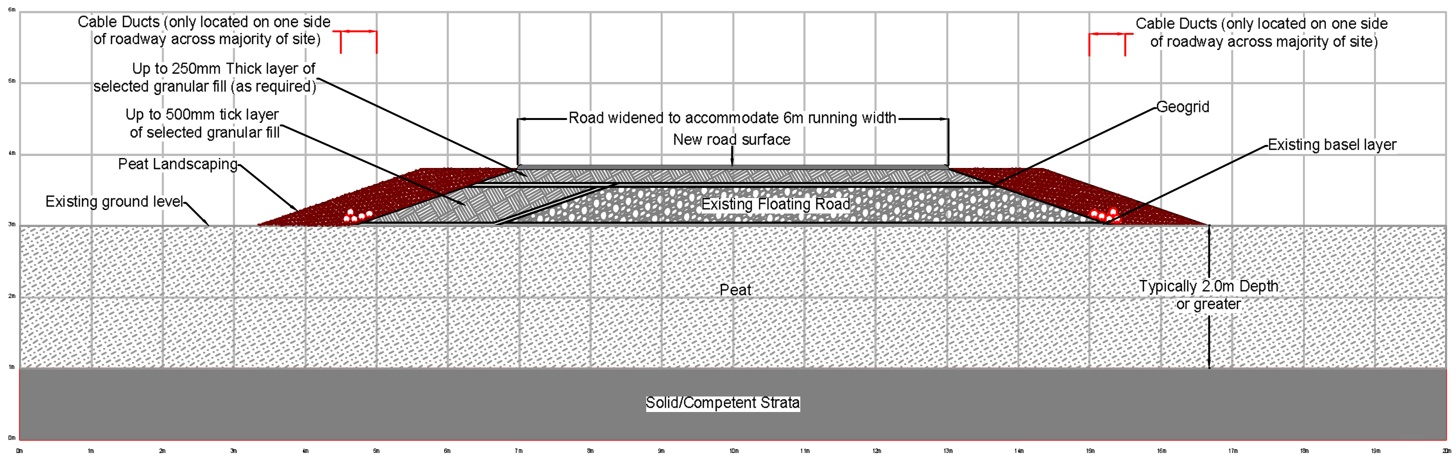
DRAWING TITLE: **Typical Excavated Road Sections**	
PROJECT TITLE: Cleanrath Wind Farm, Co. Cork	
DRAWING BY: Joseph O Brien	CHECKED BY: Owen Cahill
PROJECT No.: 191223a	DRAWING No.: 191223a - 32
SCALE: 1:75 @A3	DATE: 13.08.2020

MKO
Planning and Environmental Consultants
Tuam Road, Galway
Ireland, H91 VW84
+353 (0) 91 735611
email: info@www.mkoireland.ie
Website: www.mkoireland.ie

Drawing Notes
1. Widening occured on either side of existing roads dependent on site conditions.
2. Depths of road fill varied dependent on site conditions.



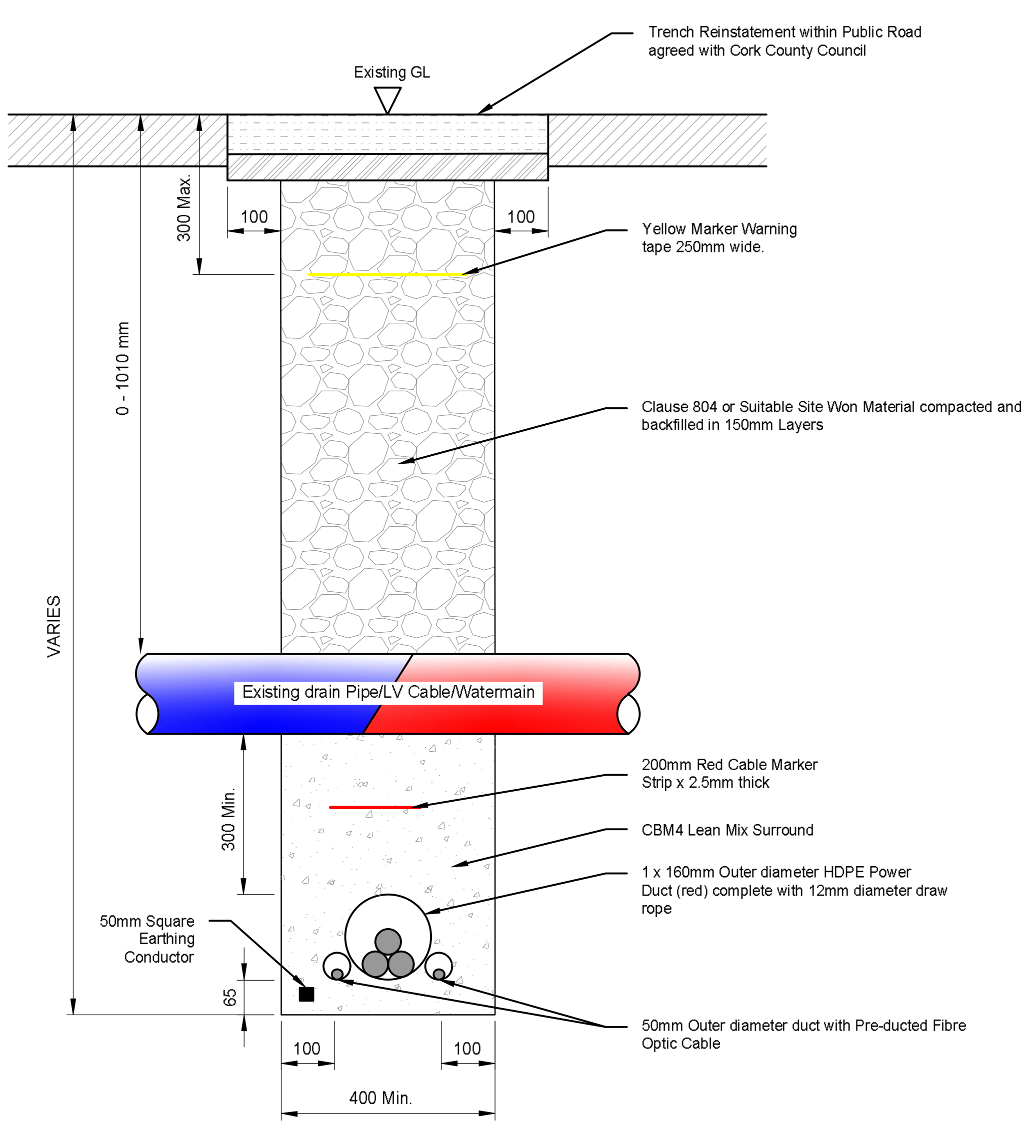
Typical floating road section.



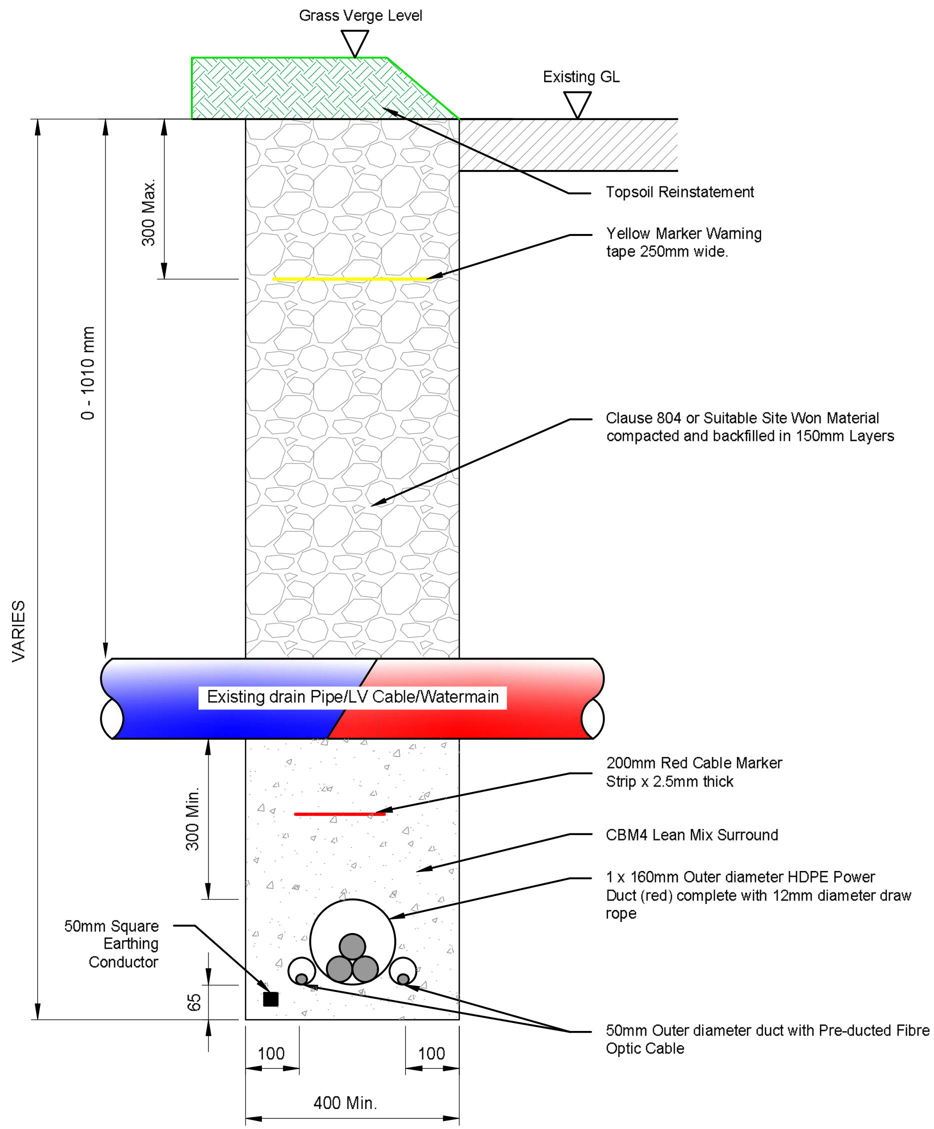
Typical floating road widening section.

DRAWING TITLE:	
Typical Floating Road Sections	
PROJECT TITLE: Cleanrath Wind Farm, Co. Cork	
DRAWING BY: Joseph O Brien	CHECKED BY: Owen Cahill
PROJECT No.: 191223a	DRAWING No.: 191223a - 33
SCALE: 1:75 @A3	DATE: 13.08.2020

MKO
Planning and Environmental Consultants
Tuam Road, Galway
Ireland, H91 VW84
+353 (0) 91 735611
email: info@www.mkoireland.ie
Website: www.mkoireland.ie



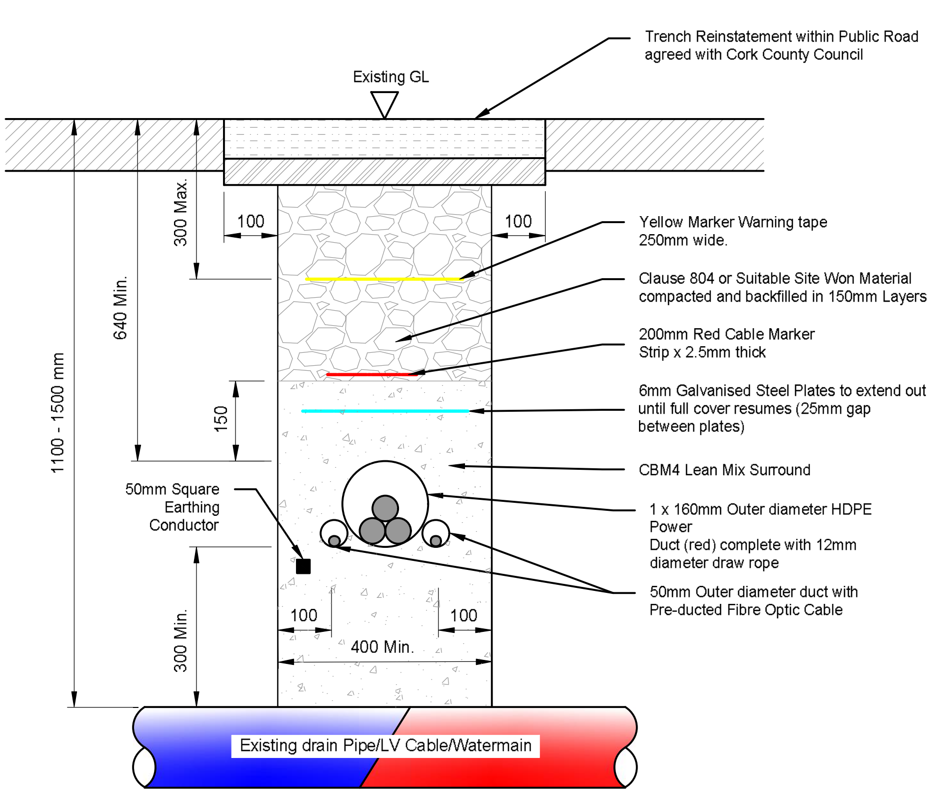
Typical 33kV Cable Trench Crossing Under Existing Services In Public Road Detail Scale 1:10



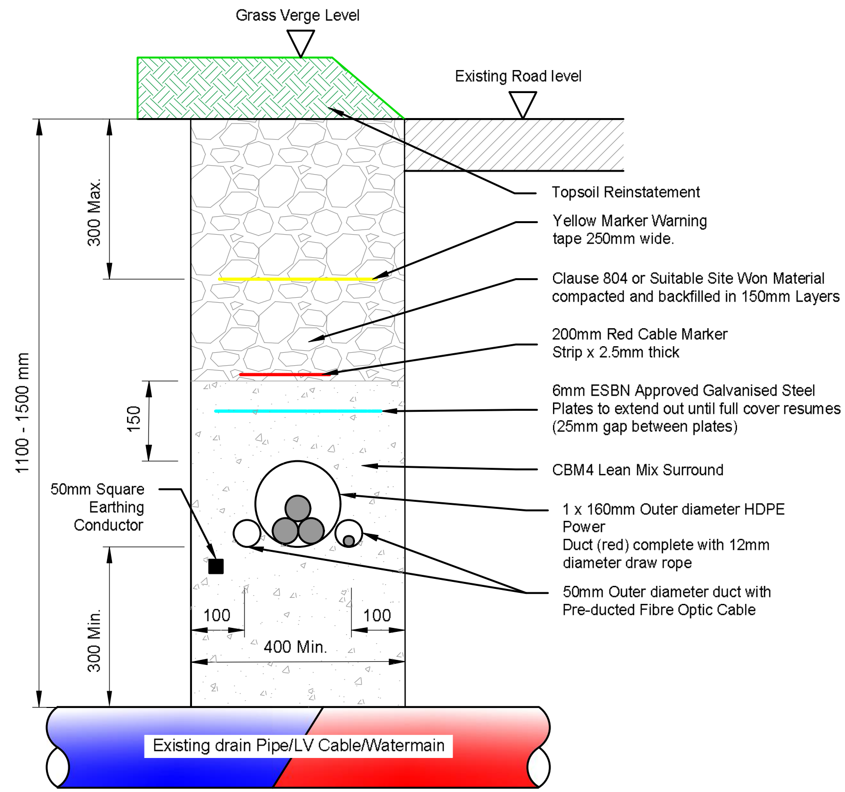
Typical 33kV Cable Trench Crossing Under Existing Services In Public Road Verge Detail Scale 1:10

DRAWING TITLE: Typical 33kV Cable Trench Crossing Under Existing Services in Public Road & Verge Detail		DRAWING No.: 191223a - 34	
PROJECT TITLE: Cleanrath Wind Farm, Co. Cork		PROJECT No.: 191223a	
DRAWING/MODIFIED BY: Joseph O Brien	CHECKED BY: Owen Cahill	SCALE: 1:10@A3	DATE: 13.08.2020

MKO Planning & Environmental Consultants Tuam Road, Galway, Ireland, H91 VW84. **email:** info@mkoireland.ie **Tel:** +353 91 735611



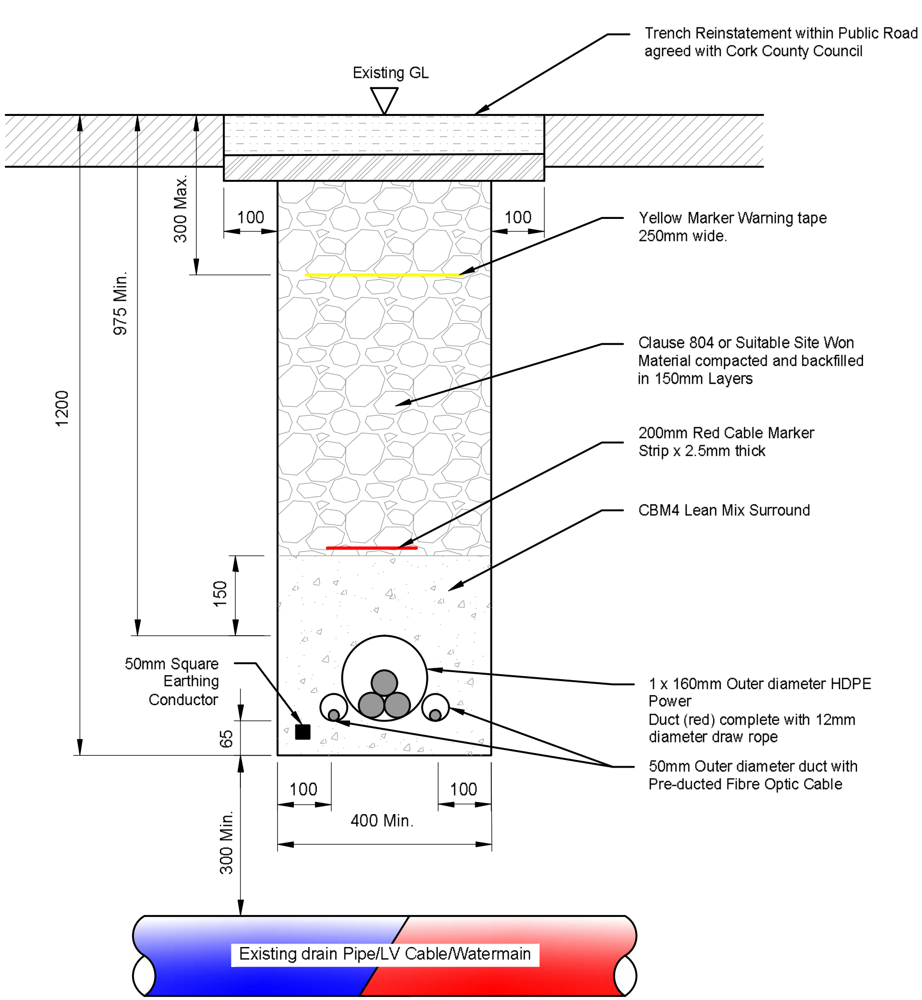
Typical 33kV Cable Trench Crossing Over Existing Services In Public Road Detail Scale 1:10



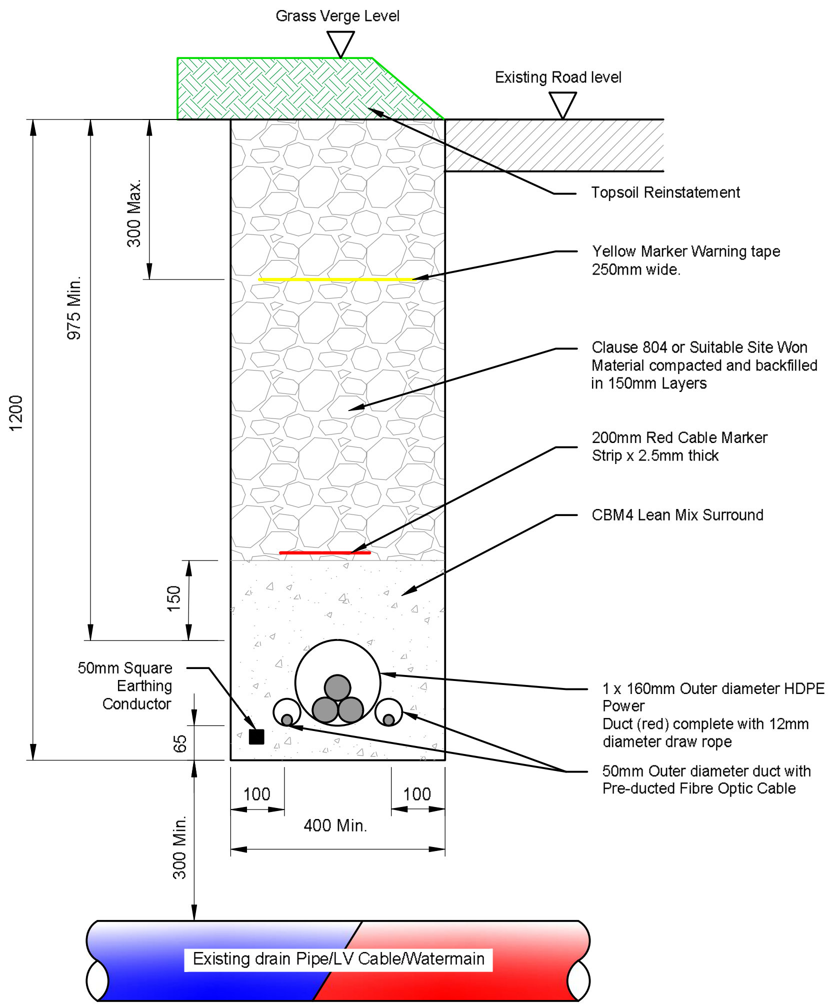
Typical 33kV Cable Trench Crossing Over Existing Services In Public Road Verge Detail Scale 1:10

DRAWING TITLE: Typical 33kV Cable Trench Crossing Over Existing Services in Public Road & Verge Detail Where Standard Separation Depth not Available		DRAWING No.: 191223a - 35	
PROJECT TITLE: Cleanrath Wind Farm, Co. Cork		PROJECT No.: 191223a	
DRAWING/MODIFIED BY: Joseph O Brien	CHECKED BY: Owen Cahill	SCALE: 1:10@A3	DATE: 13.08.2020

MKO Planning & Environmental Consultants Tuam Road, Galway, Ireland, H91 VW84. **email:** info@mkoireland.ie **Tel:** +353 91 735611



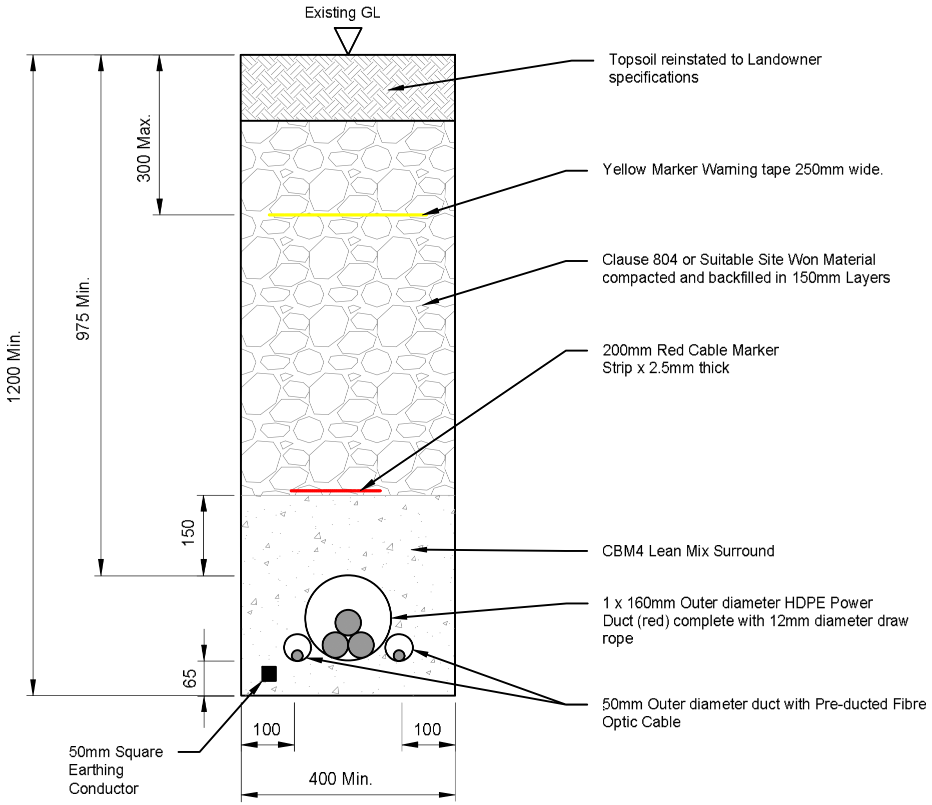
Typical 33kV Cable Trench Crossing Over Existing Services In Public Road Detail Scale 1:10



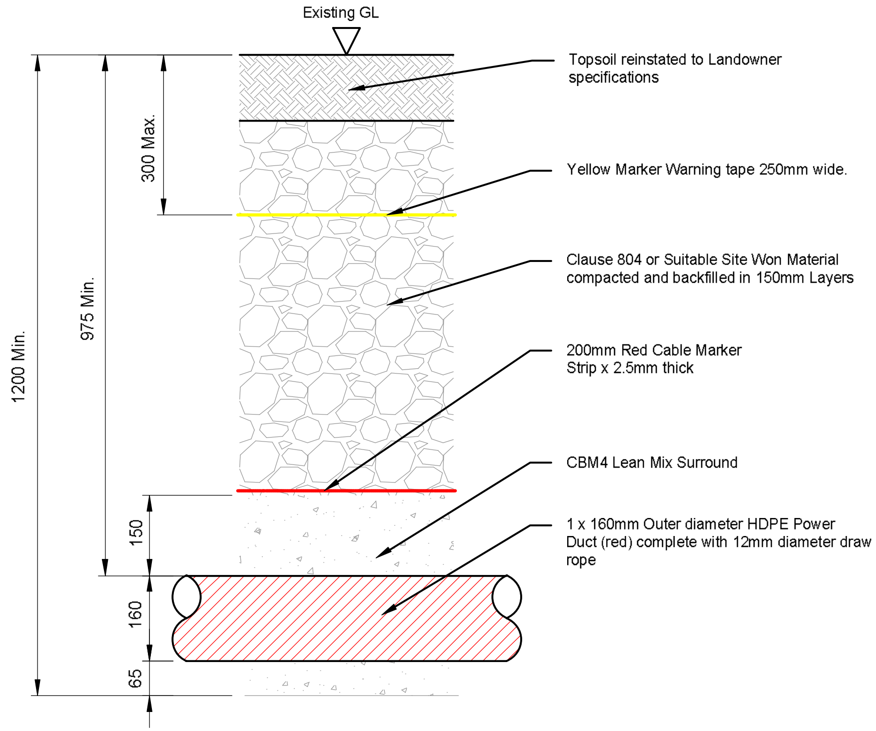
Typical 33kV Cable Trench Crossing Over Existing Services In Public Road Verge Detail Scale 1:10

DRAWING TITLE: Typical 33kV Cable Trench Crossing Over Where Standard Separation Depth/Cover is Available		DRAWING No.: 191223a - 36	
PROJECT TITLE: Cleanrath Wind Farm, Co. Cork		PROJECT No.: 191223a	
DRAWING/MODIFIED BY: Joseph O Brien	CHECKED BY: Owen Cahill	SCALE: 1:10@A3	DATE: 13.08.2020

MKO Planning & Environmental Consultants Tuam Road, Galway, Ireland, H91 VW84. email: info@mkoireland.ie Tel: +353 91 735611



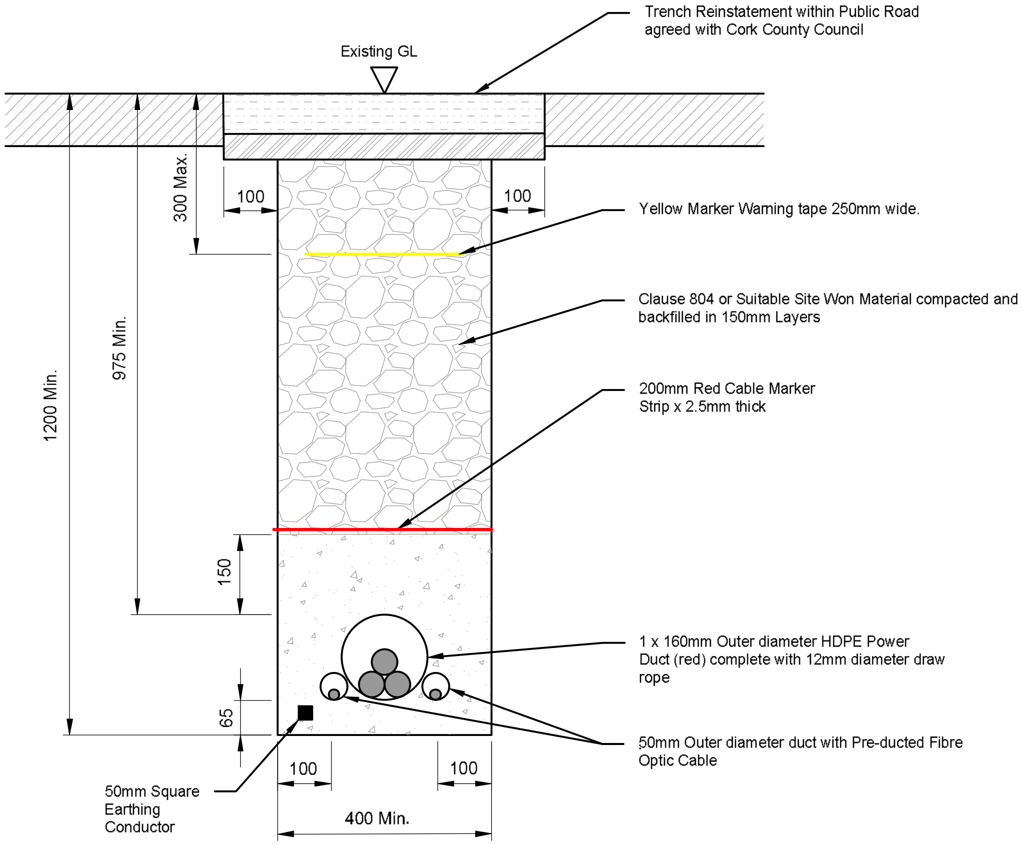
33kV Cable Trench In Open Ground End View Scale 1:10



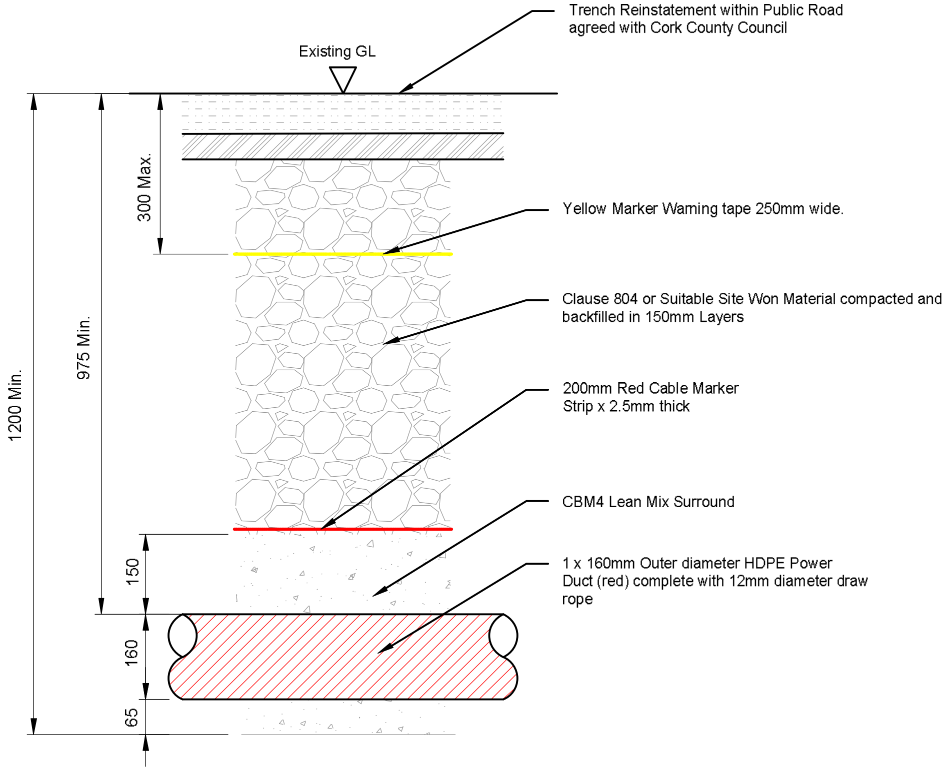
33kV Cable Trench In Open Ground Elevation Scale 1:10

DRAWING TITLE: 33kV Cable Trench In Open Ground Details		DRAWING No.: 191223a - 37	
PROJECT TITLE: Cleanrath Wind Farm, Co. Cork		PROJECT No.: 191223a	
DRAWING/MODIFIED BY: Joseph O Brien	CHECKED BY: Owen Cahill	SCALE: 1:10@A3	DATE: 13.08.2020

MKO Planning & Environmental Consultants Tuam Road, Galway, Ireland, H91 VW84. email: info@mkoireland.ie Tel: +353 91 735611



33kV Cable Trench In Public Roadway End View
Scale 1:10

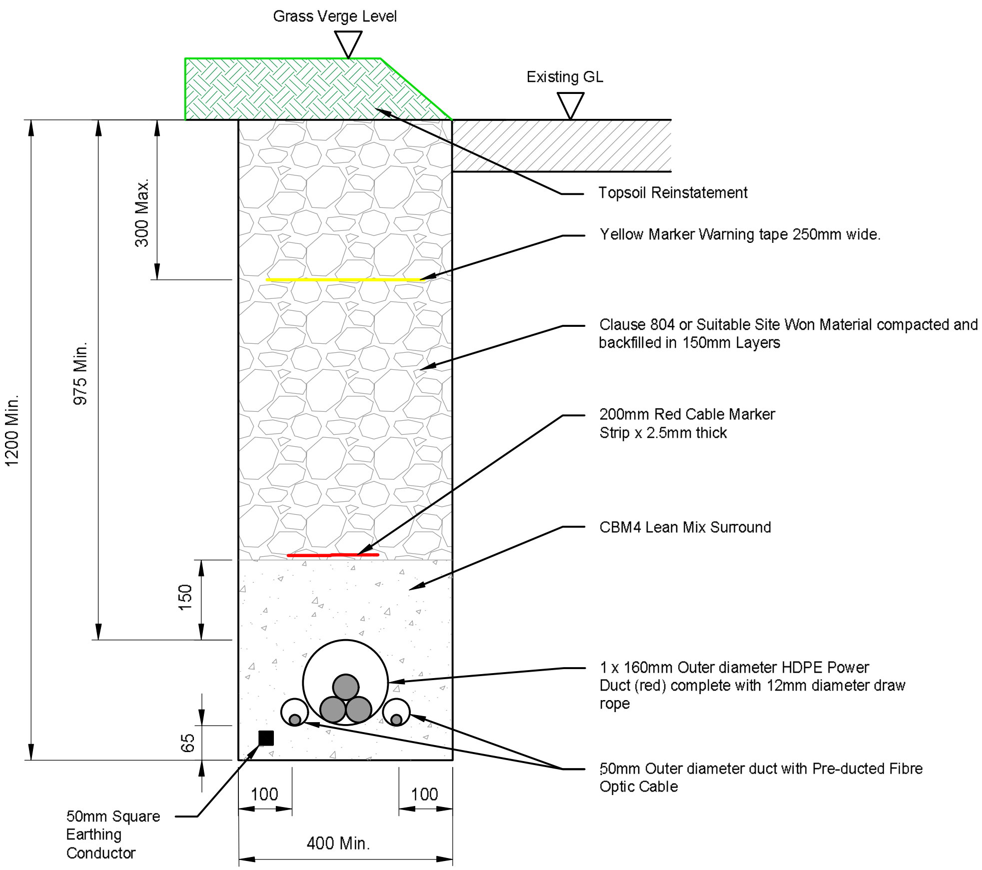


33kV Cable Trench In Public Roadway Elevation
Scale 1:10

DRAWING TITLE: 33kV Cable Trench In Roadway Details		DRAWING No.: 191223a - 38	
PROJECT TITLE: Cleanrath Wind Farm, Co. Cork		PROJECT No.: 191223a	
DRAWING/MODIFIED BY: Joseph O Brien	CHECKED BY: Owen Cahill	SCALE: 1:10@A3	DATE: 13.08.2020

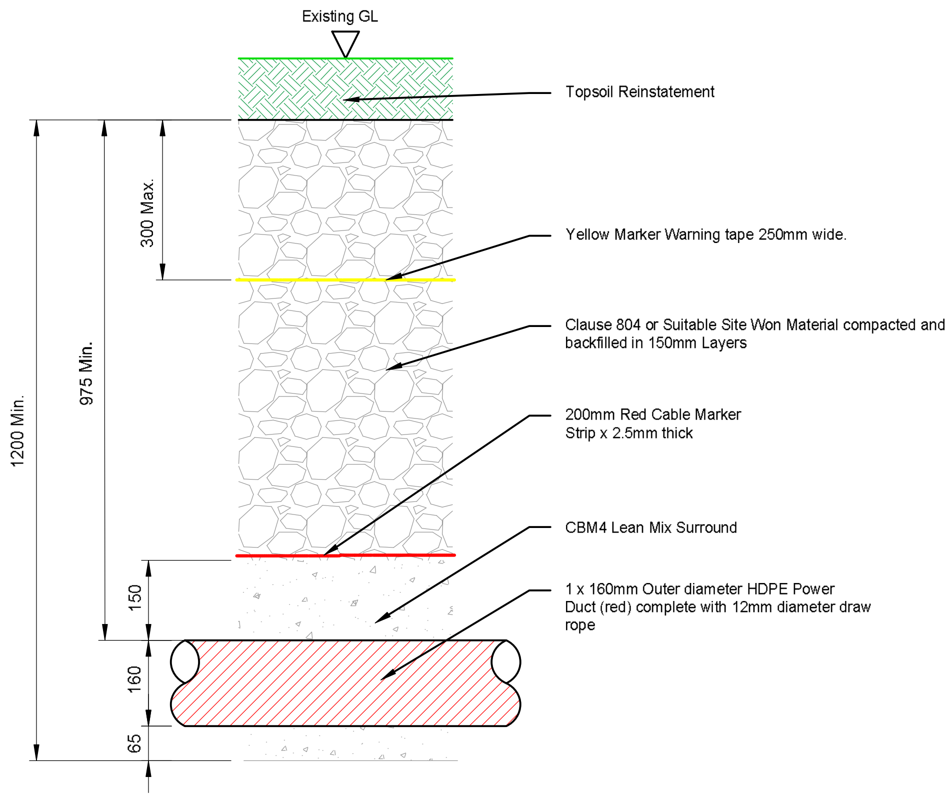
MKO

MKO Planning & Environmental Consultants Tuam Road, Galway, Ireland, H91 VW84. **email:** info@mkoireland.ie **Tel:** +353 91 735611



33kV Cable Trench In Road Verge End View

Scale 1:10



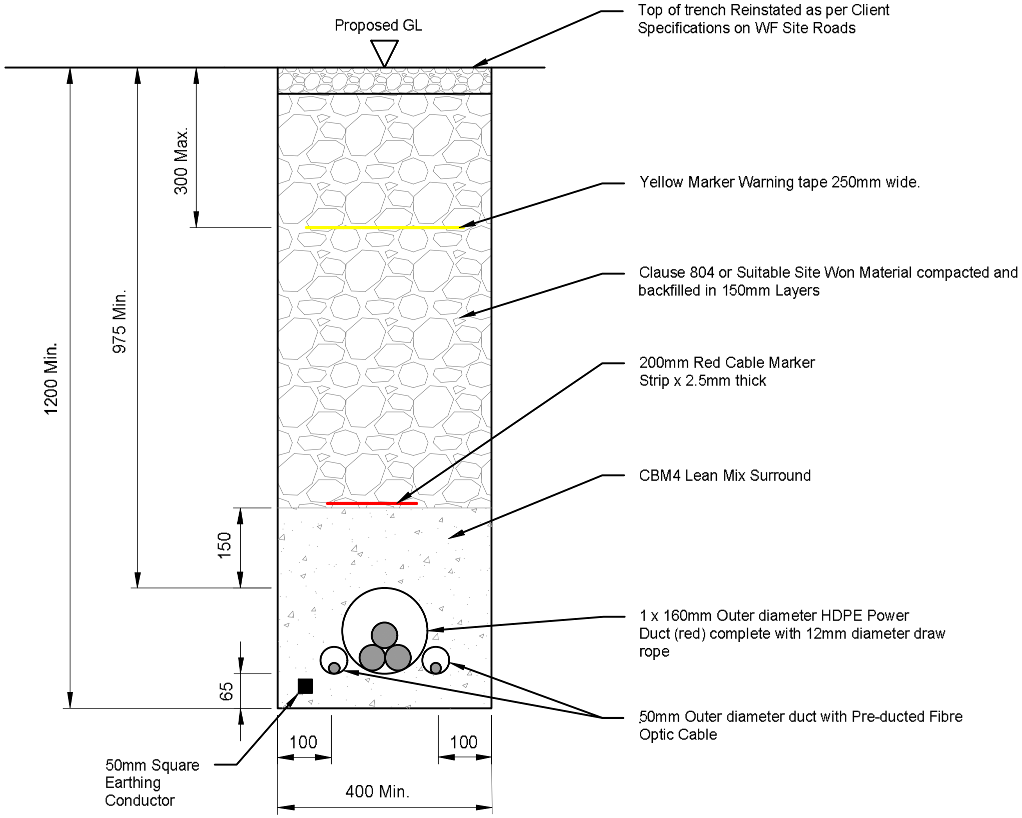
33kV Cable Trench In Road Verge Elevation

Scale 1:10

MKO

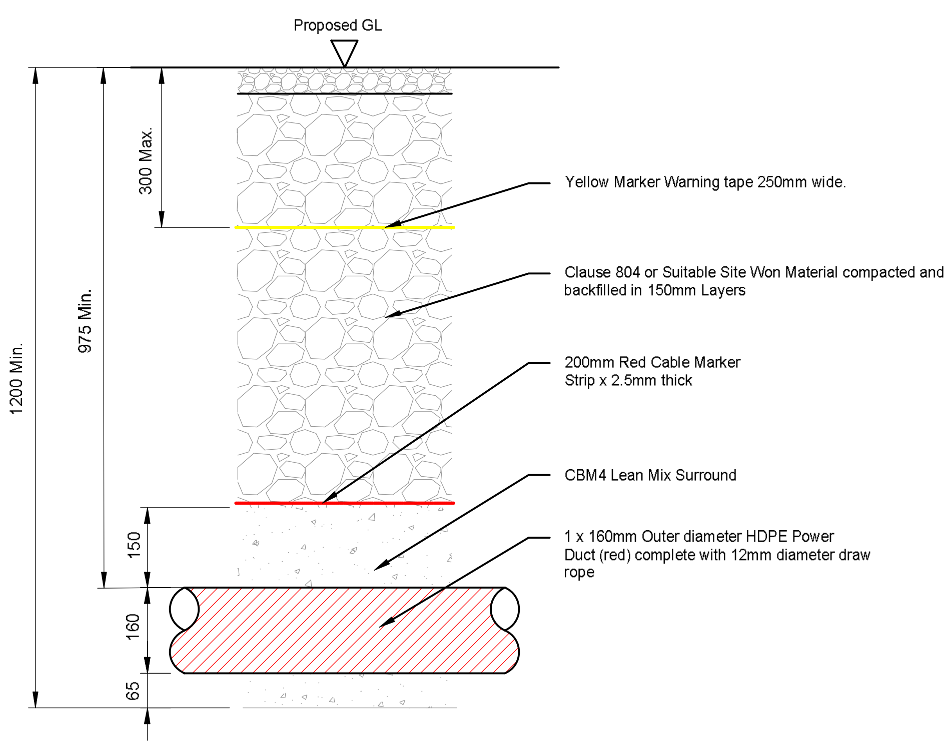
DRAWING TITLE: 33kV Cable Trench In Road Verge Details		DRAWING No.: 191223a - 39	
PROJECT TITLE: Cleanrath Wind Farm, Co. Cork		PROJECT No.: 191223a	
DRAWING/MODIFIED BY: Joseph O Brien	CHECKED BY: Owen Cahill	SCALE: 1:10@A3	DATE: 13.08.2020

MKO Planning & Environmental Consultants Tuam Road, Galway, Ireland, H91 VW84. email: info@mkoireland.ie Tel: +353 91 735611



33kV Cable Trench In WF Site Road Detail End View

Scale 1:10

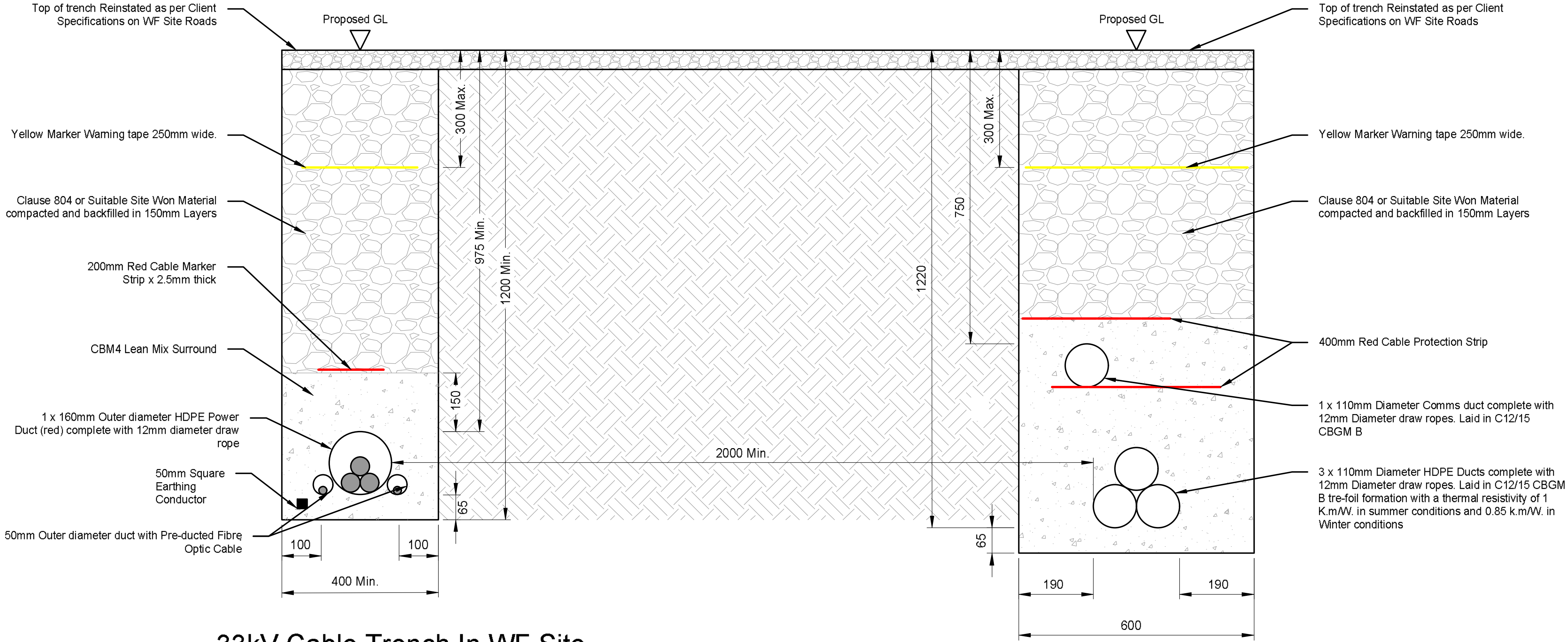


33kV Cable Trench In WF Site Road Detail Elevation

Scale 1:10

DRAWING TITLE: Typical 33kV Cable Trench In Wind Farm Site Road Details		DRAWING No.: 191223a - 40	
PROJECT TITLE: Cleanrath Wind Farm, Co. Cork		PROJECT No.: 191223a	
DRAWING/MODIFIED BY: Joseph O Brien	CHECKED BY: Owen Cahill	SCALE: 1:10@A3	DATE: 13.08.2020

MKO Planning & Environmental Consultants Tuam Road, Galway, Ireland, H91 VW84. **email:** info@mkoireland.ie **Tel:** +353 91 735611

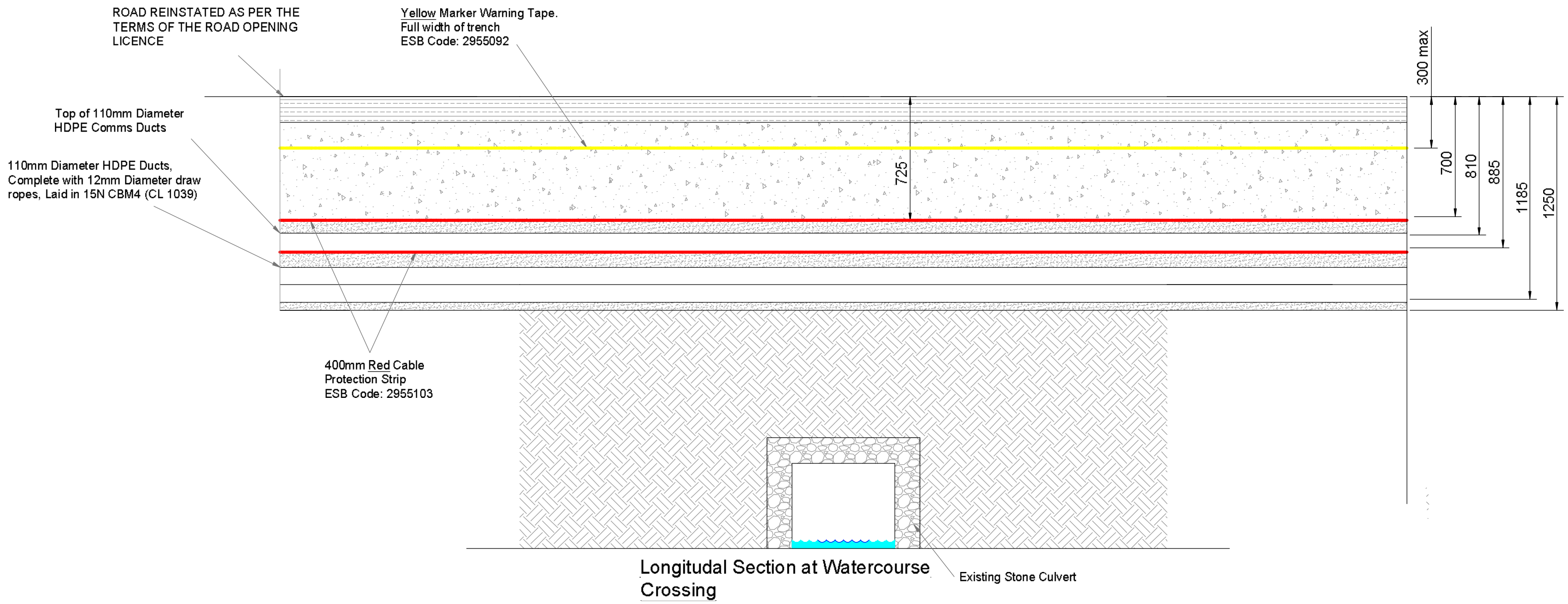


33kV Cable Trench In WF Site Road Detail End View
Scale 1:10

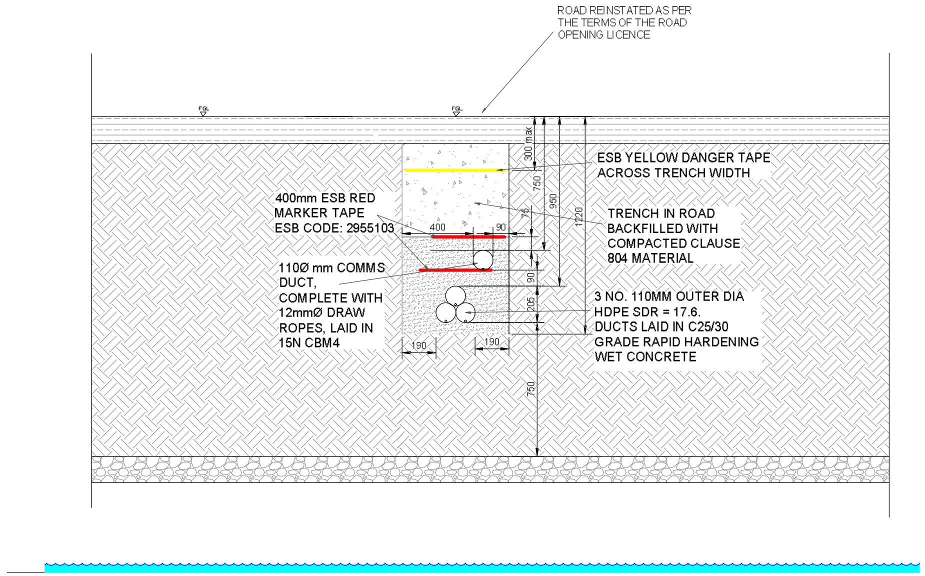
38kV Cable Trench In WF Site Road Detail End View
Scale 1:10

DRAWING TITLE: Typical 33kV and 38 kV Cable Trench In Wind Farm Site Road Details		DRAWING No.: 191223a - 41
PROJECT TITLE: Cleanrath Wind Farm, Co. Cork		PROJECT No.: 191223a
DRAWING/MODIFIED BY: Joseph O Brien	CHECKED BY: Owen Cahill	SCALE: 1:10@A3 / DATE: 13.08.2020

MKO Planning & Environmental Consultants Tuam Road, Galway, Ireland, H91 VW84. **email:** info@mkoireland.ie **Tel:** +353 91 735611



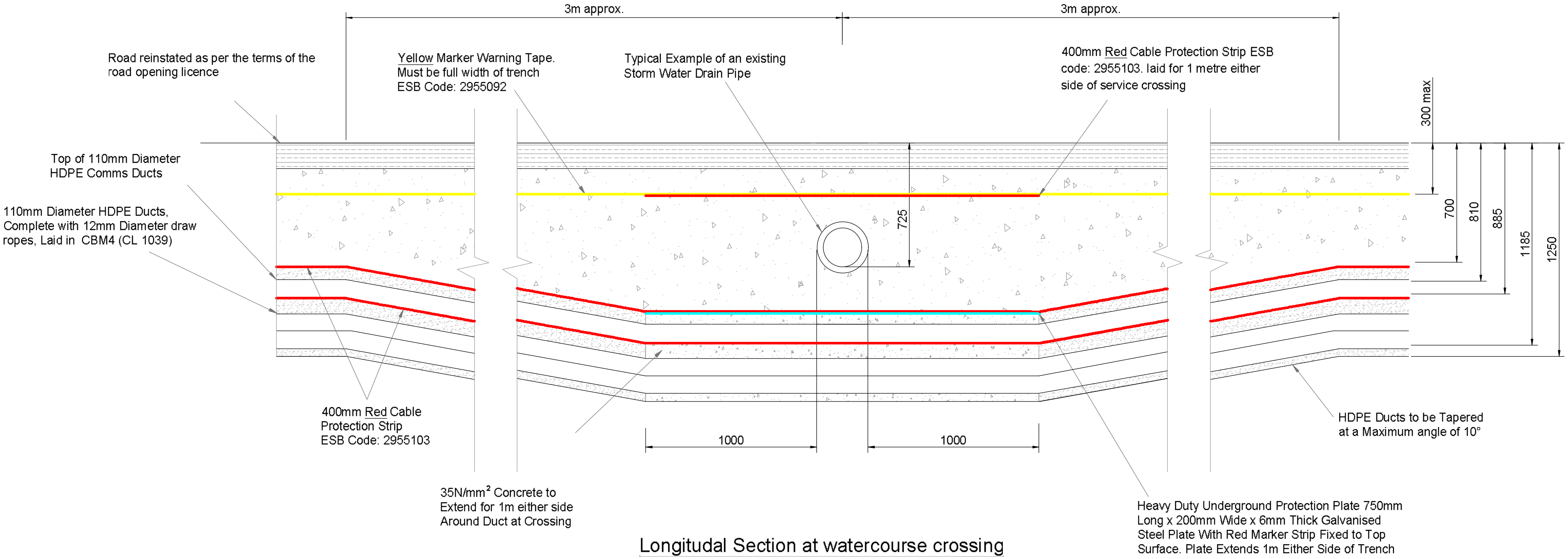
Longitudal Section at Watercourse Crossing



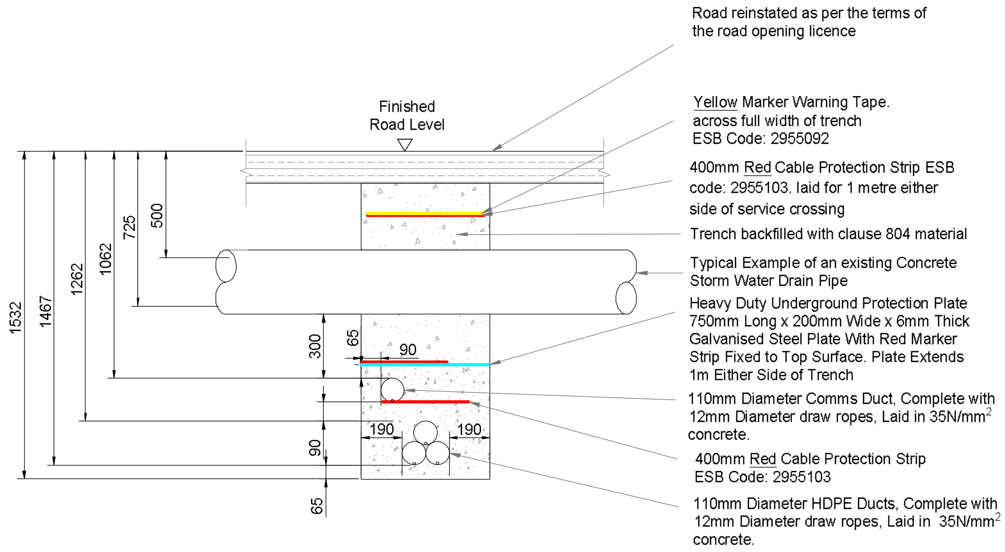
Cross Section at Watercourse Crossing

DRAWING TITLE: Typical Cable Trench Over Culvert in Trefoil Arrangement - Option 1		DRAWING No.: 191223a - 42	
PROJECT TITLE: Cleanrath Wind Farm, Co. Cork		PROJECT No.: 191223a	
DRAWING/MODIFIED BY: Joseph O Brien	CHECKED BY: Owen Cahill	SCALE: 1:30@A3	DATE: 13.08.2020

MKO Planning & Environmental Consultants Tuam Road, Galway, Ireland, H91 VW84. **email:** info@mkoireland.ie **Tel:** +353 91 735611



Longitudal Section at watercourse crossing

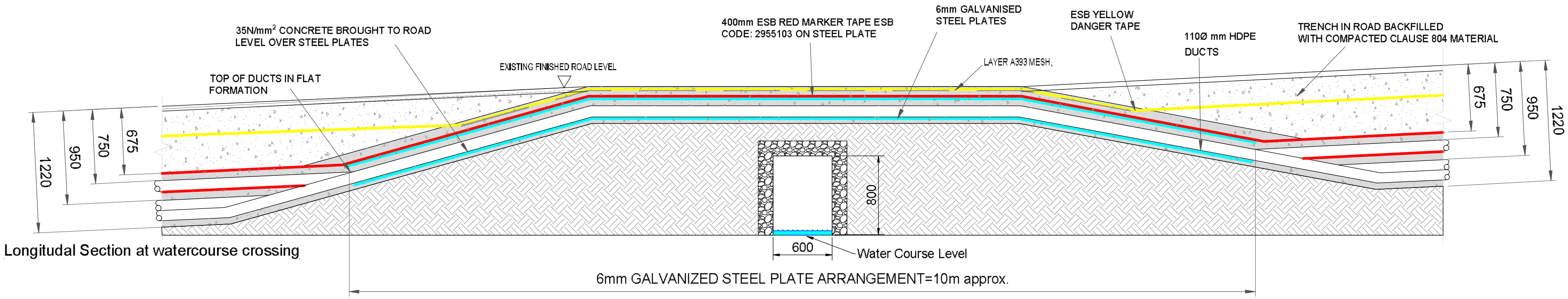


Cross Section at Watercourse Crossing

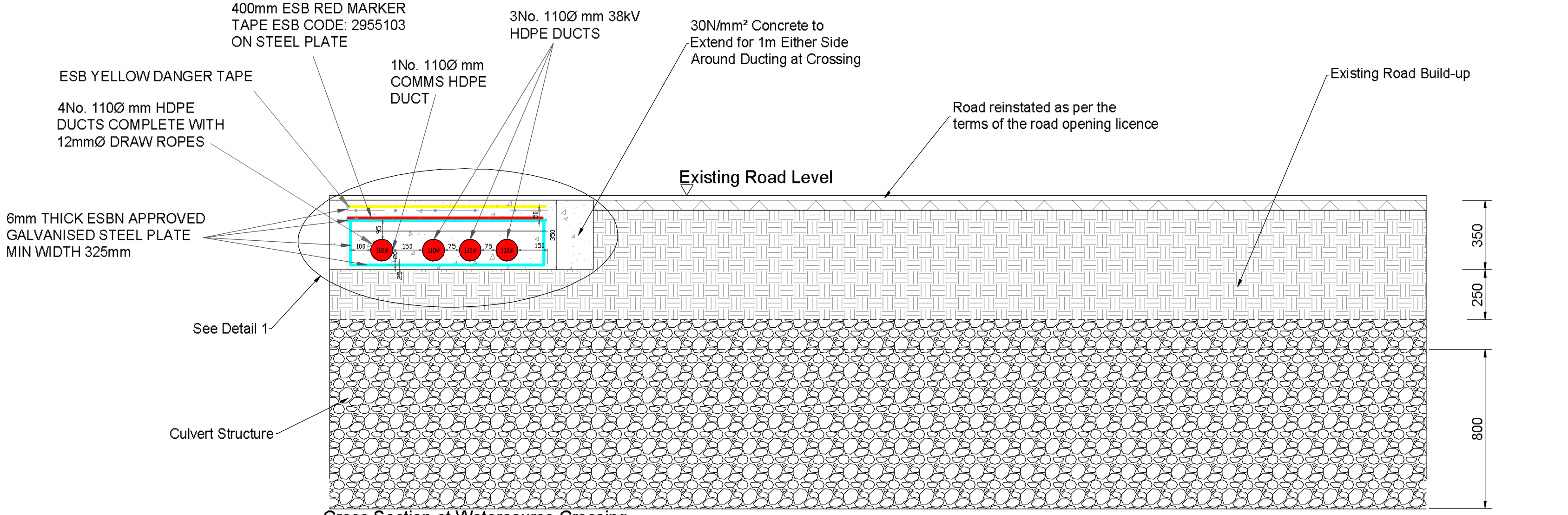
DRAWING TITLE: Typical Cable Trench under Piped Culvert in Trefoil Arrangement - Option 2		DRAWING No.: 191223a - 43	
PROJECT TITLE: Cleanrath Wind Farm, Co. Cork		PROJECT No.: 191223a	
DRAWING/MODIFIED BY: Joseph O Brien	CHECKED BY: Owen Cahill	SCALE: 1:25@A3	DATE: 13.08.2020

MKO

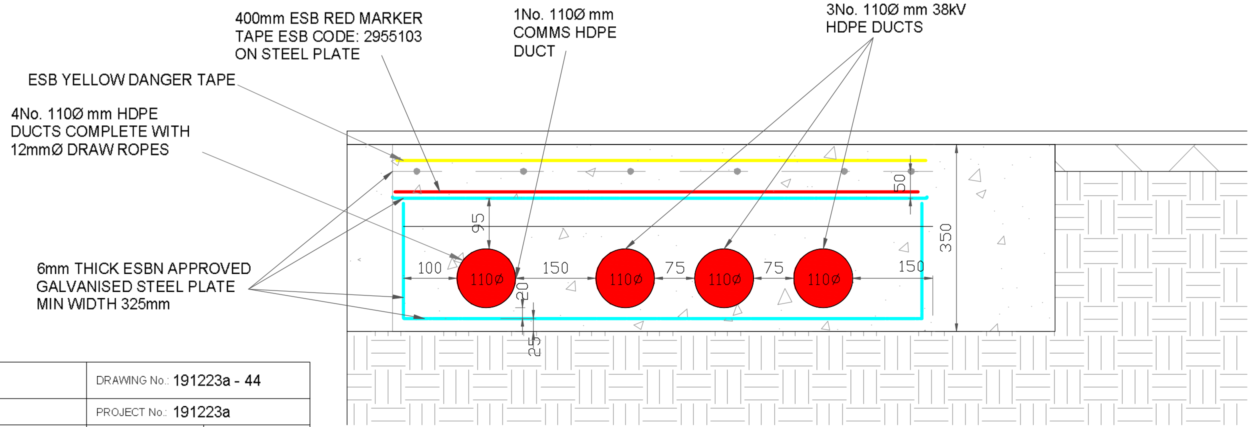
MKO Planning & Environmental Consultants Tuam Road, Galway, Ireland, H91 VW84 email: info@mkoireland.ie Tel: +353 91 735611



Longitudal Section at watercourse crossing



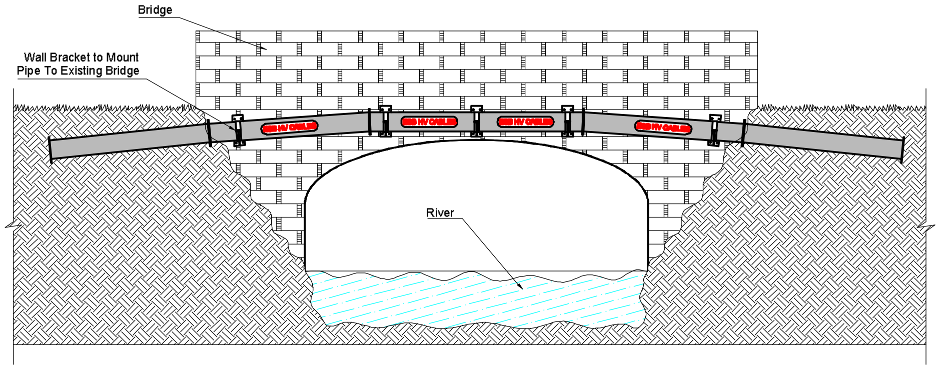
Cross Section at Watercourse Crossing



Detail 1
Scale 1:10

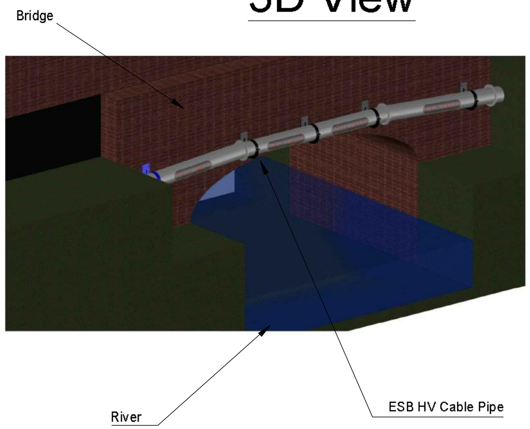
DRAWING TITLE: Typical Cable Trench Flatbed Formation Over Culvert - Option 3		DRAWING No.: 191223a - 44	
PROJECT TITLE: Cleanrath Wind Farm, Co. Cork		PROJECT No.: 191223a	
DRAWING/MODIFIED BY: Joseph O Brien	CHECKED BY: Owen Cahill	SCALE: As Shown @A3	DATE: 13.08.2020

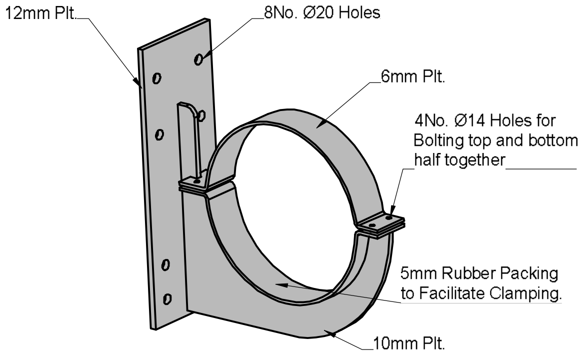
MKO Planning & Environmental Consultants Tuam Road, Galway, Ireland, H91 VW84. **email:** info@mkoireland.ie **Tel:** +353 91 735611



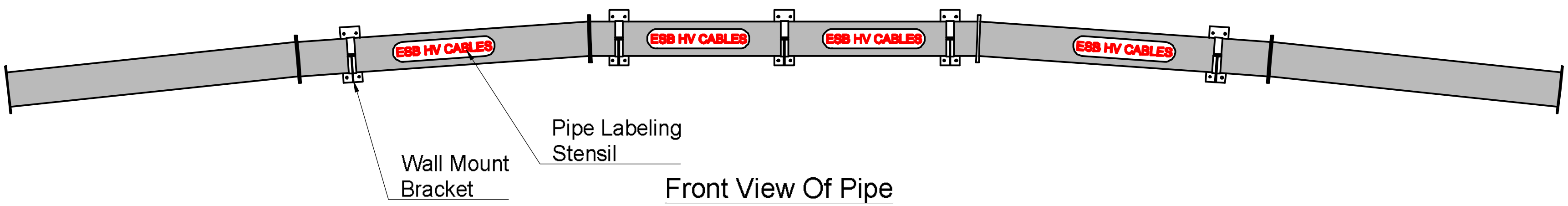
Front View
Showing Section of Bridge
1:100

3D View





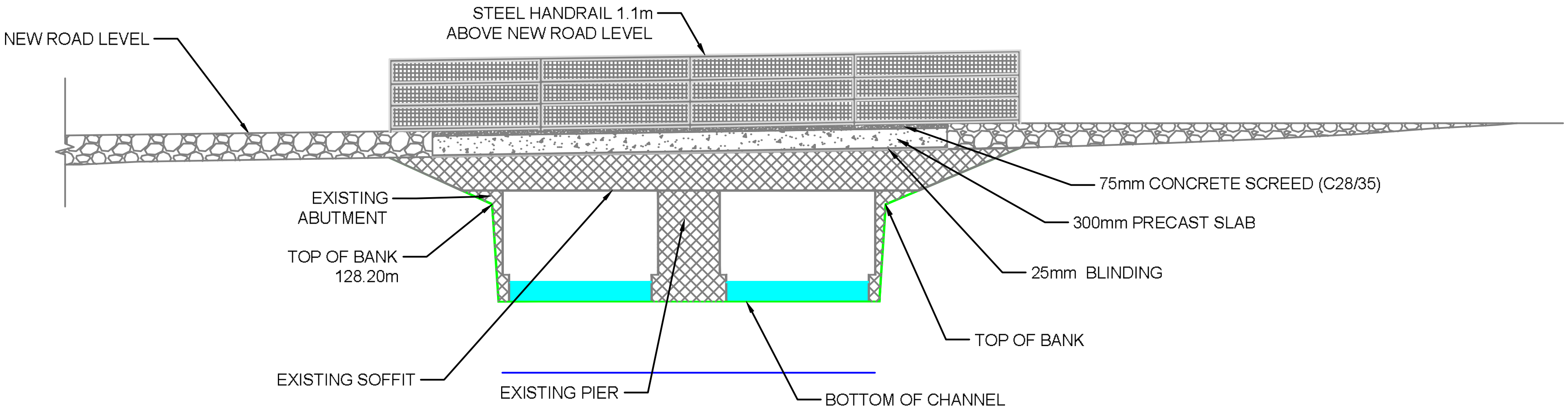
3D View Of Wall Bracket



Front View Of Pipe
1:50

DRAWING TITLE: Typical Piped Crossing Attached or Adjacent to Concrete Bridge Option 4	
PROJECT TITLE: Cleanrath Wind Farm, Co. Cork	
DRAWING BY: Joseph O Brien	CHECKED BY: Owen Cahill
PROJECT No.: 191223a	DRAWING No.: 191223a - 45
SCALE: As Shown @ A3	DATE: 13.08.2020

MKO
Planning and
Environmental
Consultants
Tuam Road, Galway
Ireland, H91 VW84
+353 (0) 91735611
email: info@www.mkoireland.ie
Website: www.mkoireland.ie




View of Bridge Facing South

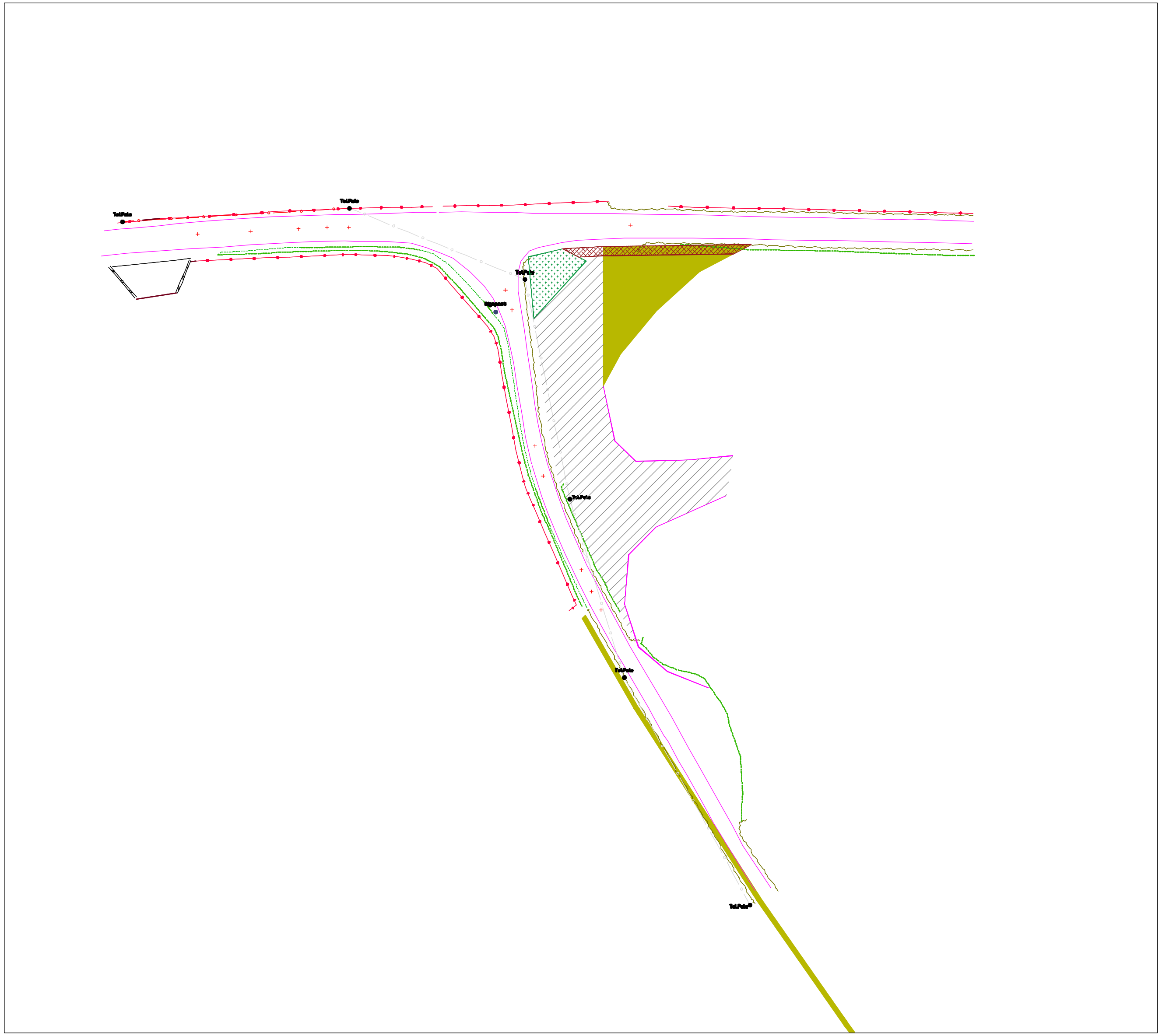

End View of Bridge Upgrade

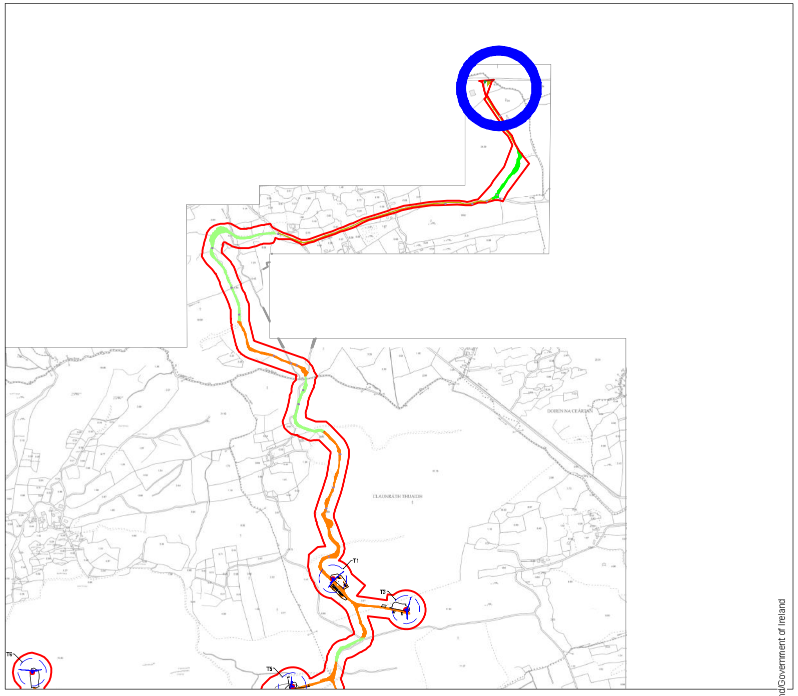
DRAWING TITLE: **Upgrade Works to Bridge at Northern Access**	
PROJECT TITLE: Cleanrath Wind Farm, Co. Cork	
DRAWING BY: Joseph O Brien	CHECKED BY: Owen Cahill
PROJECT No.: 191223a	DRAWING No.: 191223a - 46
SCALE: 1:75 @ A3	DATE: 13.08.2020

MKO
Planning and Environmental Consultants
Tuam Road, Galway
Ireland, H91 VW84
+353 (0) 91735611
email: info@www.mkoireland.ie
Website: www.mkoireland.ie

Drawing Legend

- Existing Road Edge
- Junction/Road Widening
- Existing Dwelling Access Area
- Embankment
- Vegetation Area
- Berm





1:25,000 Location on Context Map

Ordnance Survey Ireland Licence No. AR0021820 © Ordnance Survey Ireland/Government of Ireland

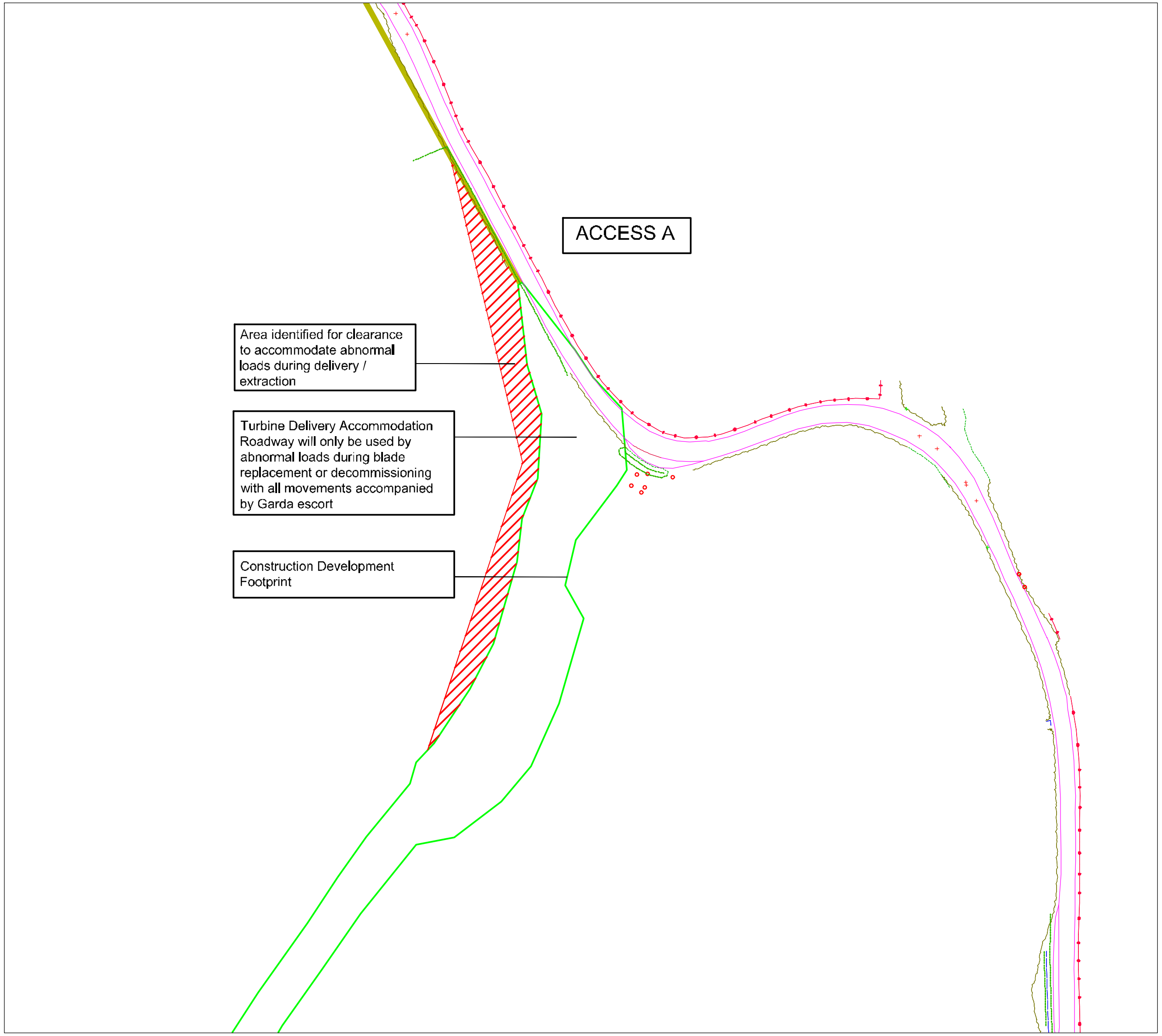
N

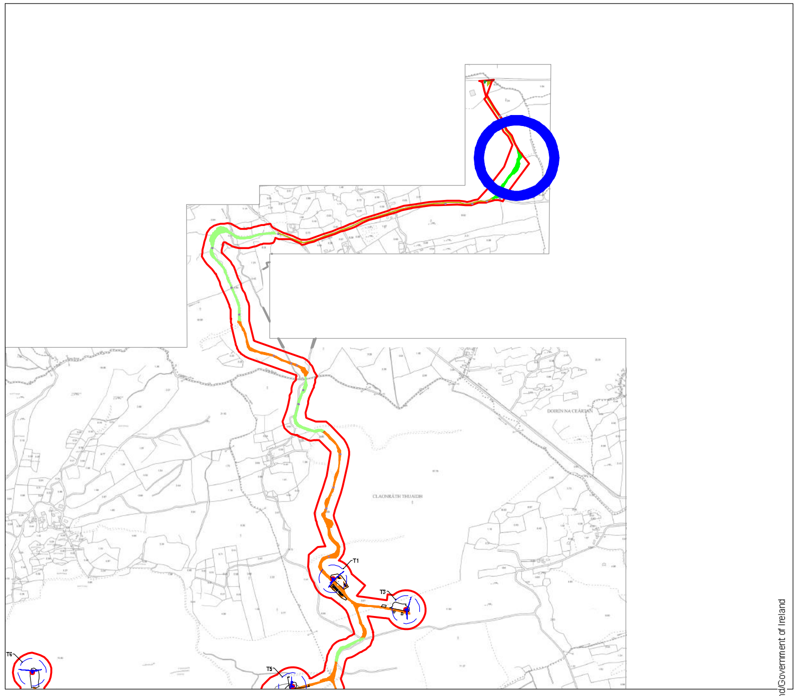
DRAWING TITLE: **Junction at Sawmill at Cloontycarthy**	
PROJECT TITLE: Cleanrath Wind Farm, Co. Cork	
DRAWING BY: Joseph o Brien	CHECKED BY: Owen Cahill
PROJECT No.: 191223a	DRAWING No.: 191223a - 47
SCALE: 1:1,000 @A3	DATE: 13.08.2020
OS SHEET No.: 6367,6368,6369,6370,6371,6412,6413,6413,6415,6416	

MKO
Planning and Environmental Consultants
Tuam Road, Galway
Ireland, H91 VW84
+353 (0) 91 735611
email: info@www.mkoireland.ie
Website: www.mkoireland.ie

Drawing Legend

- Existing Road Edge
- As Constructed Accomodation Roadway
- Transport Runover Area
- Junction/Road Widening





1:25,000 Location on Context Map

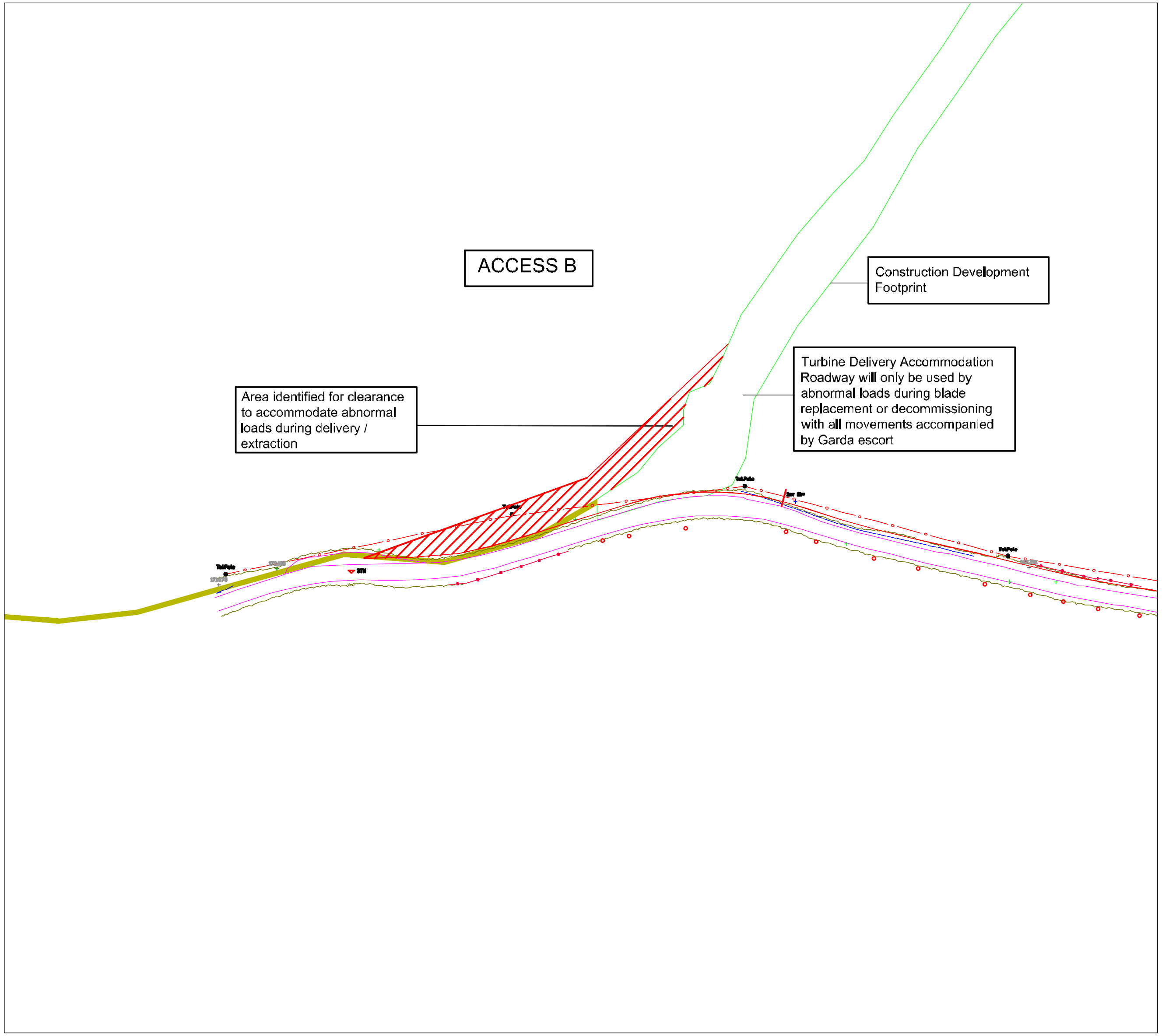
N

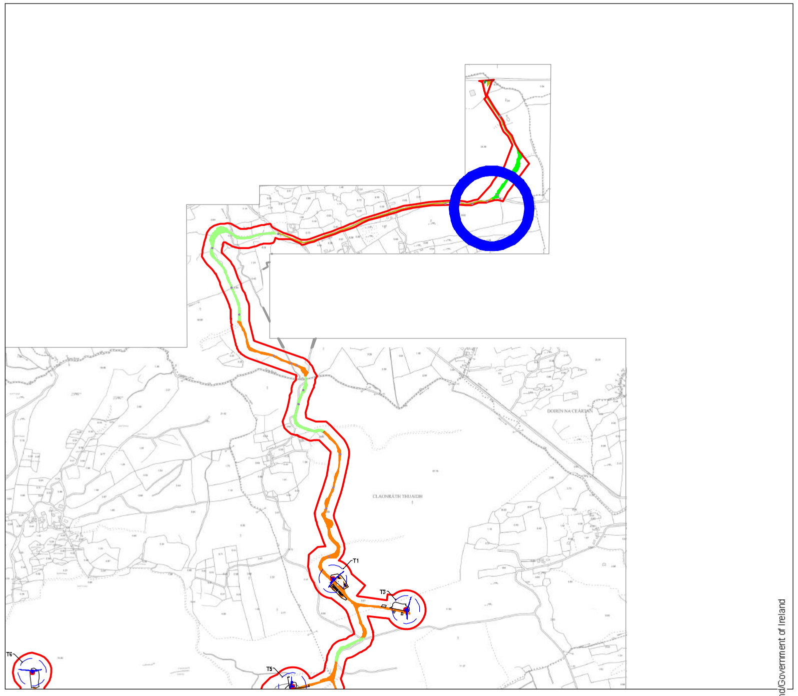
DRAWING TITLE: **Access Junction A**	
PROJECT TITLE: Cleanrath Wind Farm, Co. Cork	
DRAWING BY: Joseph o Brien	CHECKED BY: Owen Cahill
PROJECT No.: 191223a	DRAWING No.: 191223a - 48
SCALE: 1:1,000 @A3	DATE: 13.08.2020
OS SHEET No.: 6367,6368,6369,6370,6371,6412,6413,6413,6415,6416	

MKO
Planning and Environmental Consultants
Tuam Road, Galway
Ireland, H91 VW84
+353 (0) 91 735611
email: info@www.mkoireland.ie
Website: www.mkoireland.ie

Drawing Legend

- Existing Road Edge
- As Constructed Accomodation Roadway
- Transport Runover Area
- Junction/Road Widening





1:25,000 Location on Context Map

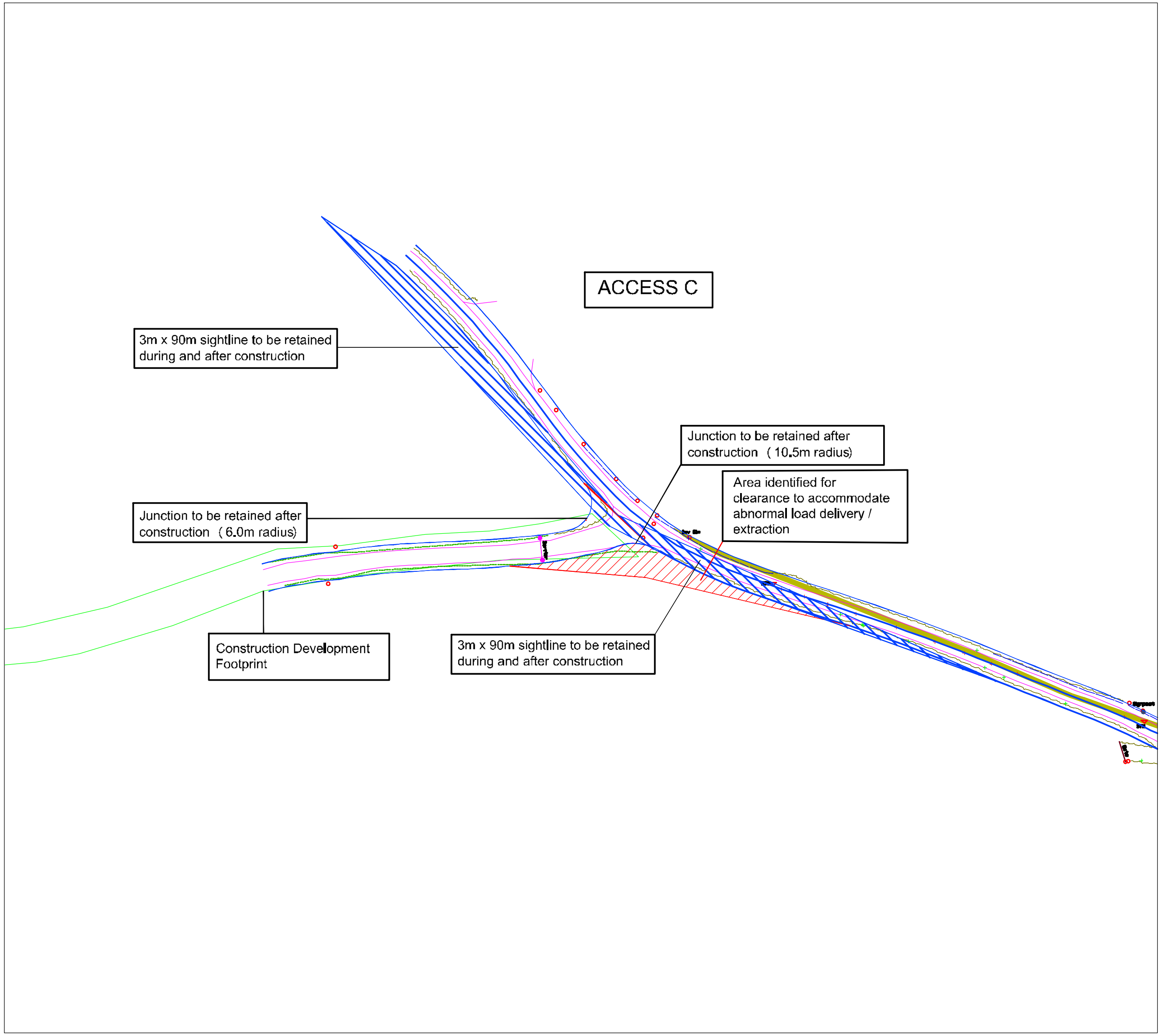
N

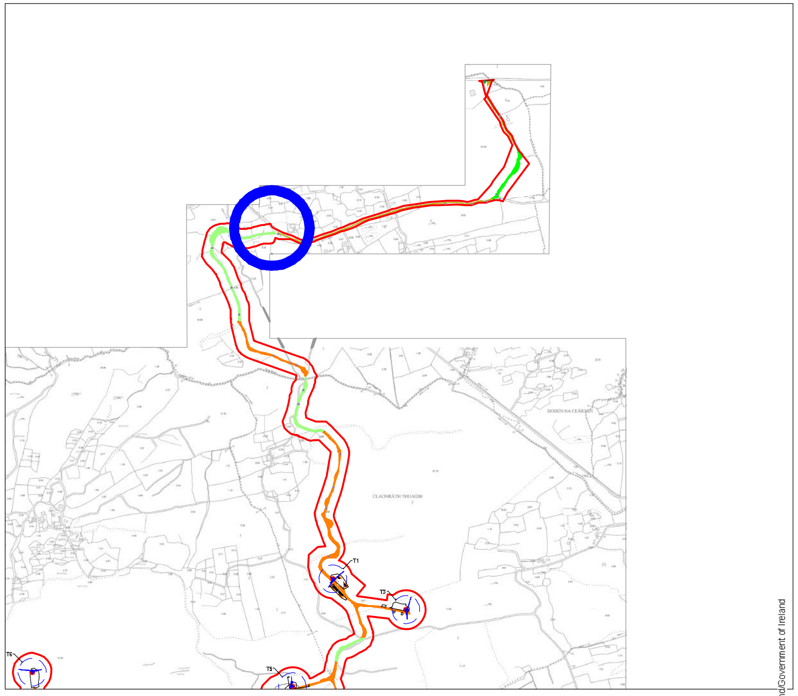
DRAWING TITLE: **Access Junction B**	
PROJECT TITLE: Cleanrath Wind Farm, Co. Cork	
DRAWING BY: Joseph o Brien	CHECKED BY: Owen Cahill
PROJECT No.: 191223a	DRAWING No.: 191223a - 49
SCALE: 1:1,000 @A3	DATE: 13.08.2020
OS SHEET No.: 6367,6368,6369,6370,6371,6412,6413,6413,6415,6416	

MKO
Planning and Environmental Consultants
Tuam Road, Galway
Ireland, H91 VW84
+353 (0) 91 735611
email: info@www.mkoireland.ie
Website: www.mkoireland.ie

Drawing Legend

- Existing Road Edge
- As Constructed Wind Farm Access Track
- Transport Runover Area
- Sight line
- Junction/Road Widening





1:25,000 Location on Context Map

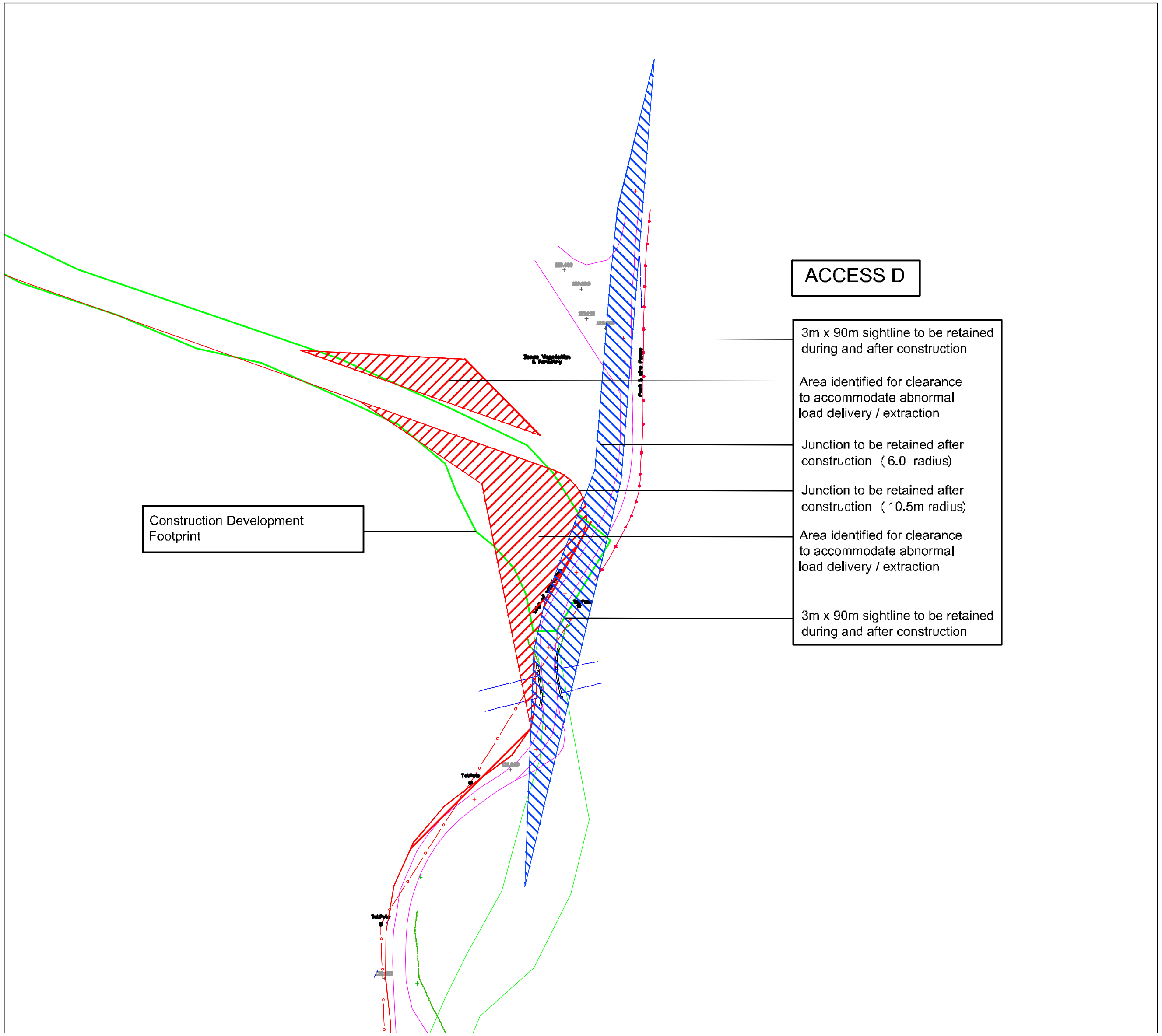
N

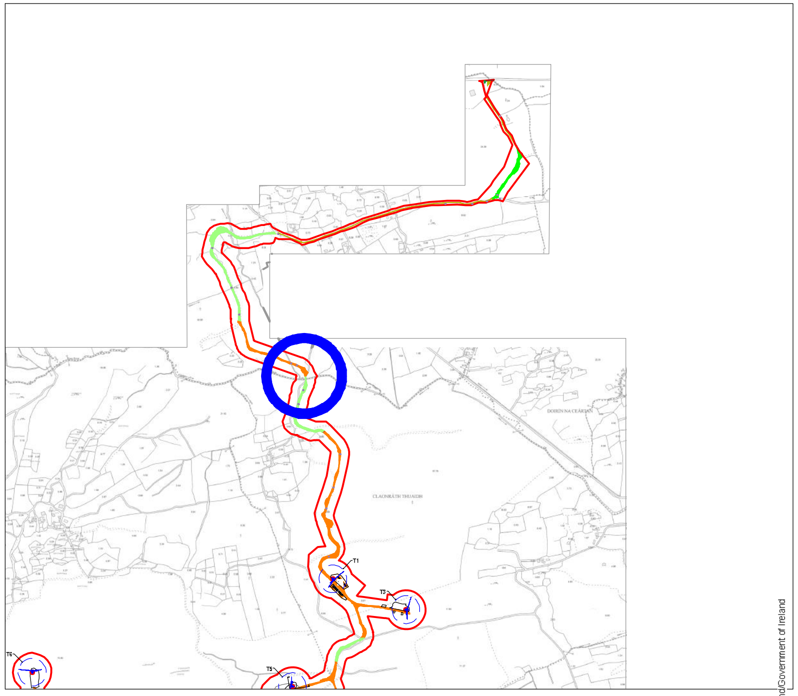
DRAWING TITLE: **Access Junction C**	
PROJECT TITLE: Cleanrath Wind Farm, Co. Cork	
DRAWING BY: Joseph o Brien	CHECKED BY: Owen Cahill
PROJECT No.: 191223a	DRAWING No.: 191223a - 50
SCALE: 1:1,000 @A3	DATE: 13.08.2020
OS SHEET No.: 6367,6368,6369,6370,6371,6412,6413,6413,6415,6416	

MKO
Planning and Environmental Consultants
Tuam Road, Galway
Ireland, H91 VW84
+353 (0) 91 735611
email: info@www.mkoireland.ie
Website: www.mkoireland.ie

Drawing Legend

- Existing Road Edge
- As Constructed Wind Farm Access Track
- Transport Runover Area
- Sight line





1:25,000 Location on Context Map

N

DRAWING TITLE:
Access Junction D

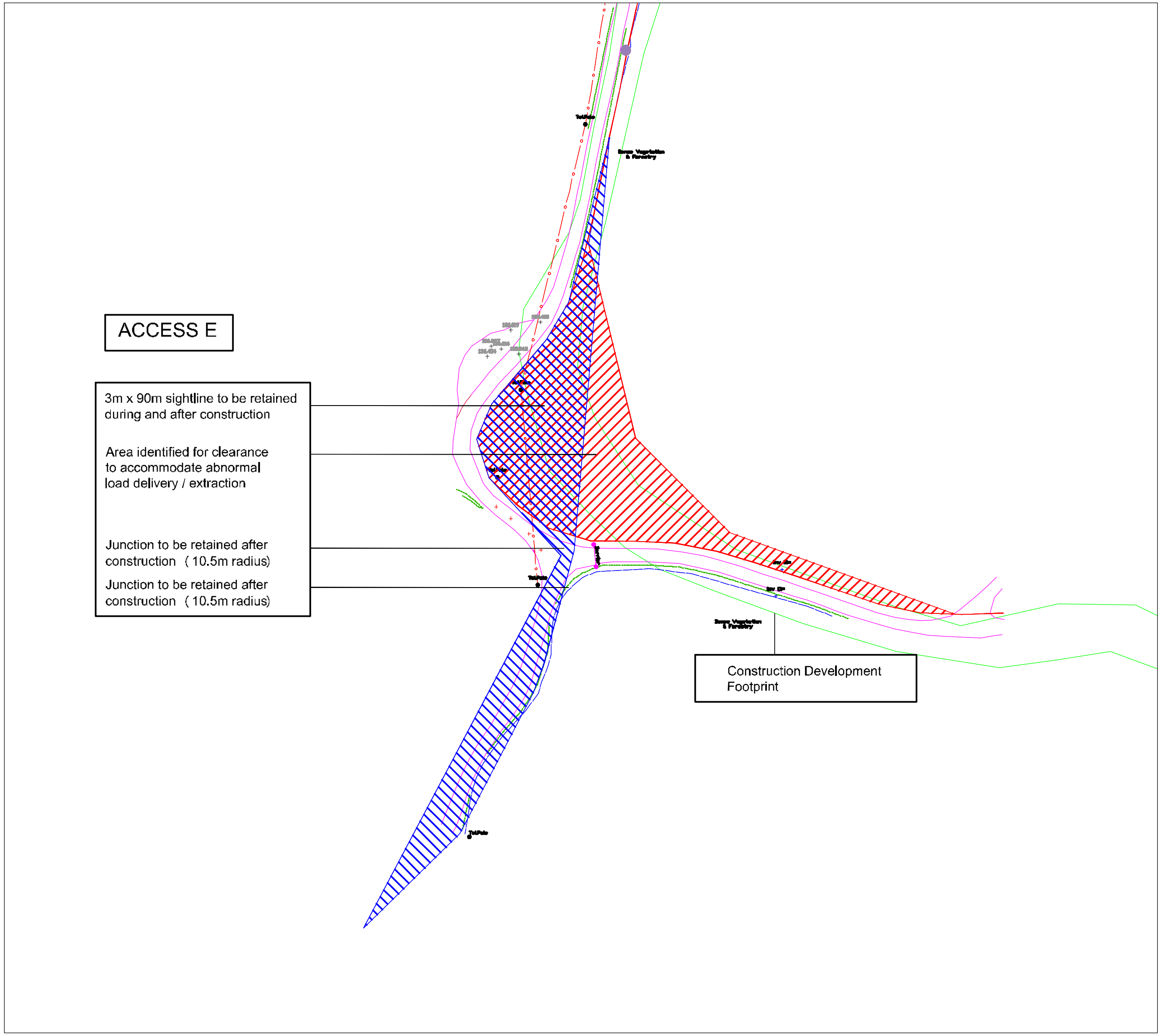
PROJECT TITLE:
Cleanrath Wind Farm, Co. Cork

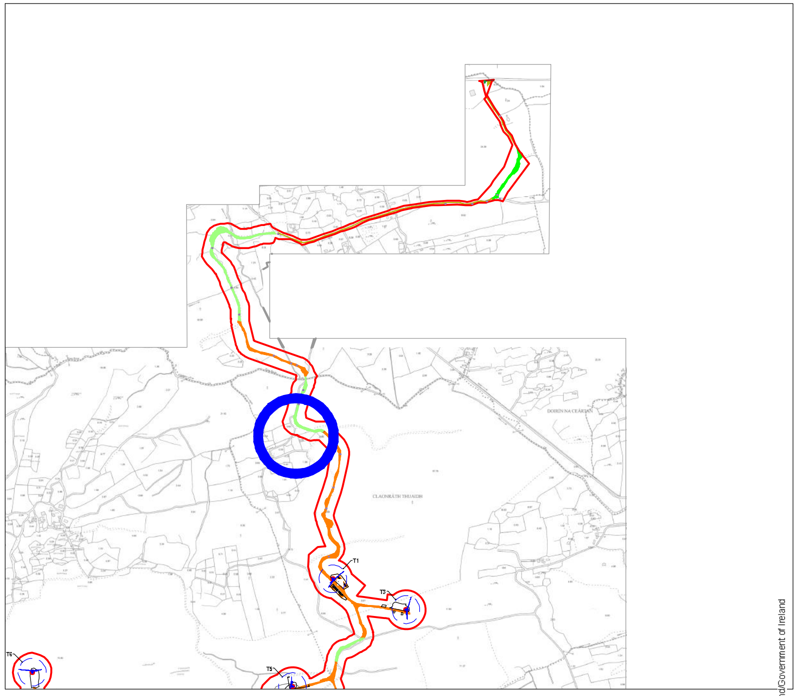
DRAWING BY: Joseph o Brien	CHECKED BY: Owen Cahill
PROJECT No.: 191223a	DRAWING No.: 191223a - 51
SCALE: 1:1,000 @A3	DATE: 13.08.2020
OS SHEET No.: 6367,6368,6369,6370,6371,6412,6413,6413,6415,6416	

MKO
Planning and Environmental Consultants
Tuam Road, Galway
Ireland, H91 VW84
+353 (0) 91 735611
email: info@www.mkoireland.ie
Website: www.mkoireland.ie

Drawing Legend

- Existing Road Edge
- As Constructed Wind Farm Access Track
- Transport Runover Area
- Sight line





1:25,000 Location on Context Map

N

DRAWING TITLE:	**Access Junction E**
PROJECT TITLE:	Cleanrath Wind Farm, Co. Cork
DRAWING BY: Joseph o Brien	CHECKED BY: Owen Cahill
PROJECT No.: 191223a	DRAWING No.: 191223a - 52
SCALE: 1:1,000 @A3	DATE: 13.08.2020
OS SHEET No.: 6367,6368,6369,6370,6371,6412,6413,6413,6415,6416	

MKO
Planning and Environmental Consultants
Tuam Road, Galway
Ireland, H91 VW84
+353 (0) 91 735611
email: info@www.mkoireland.ie
Website: www.mkoireland.ie

Pond Size W [m] x L [m] x D [m]			Catchment Size (m²)		
Return Period	50 yrs	Storm Duration	500	1000	2000
6hr retention for coarse silt		6 hrs	2.8 x 9 x 1 m	4 x 13 x 1 m	5.7 x 18 x 1 m
11hr retention for medium silt		12 hrs	3.2 x 10 x 1 m	4.5 x 14 x 1 m	6.4 x 20 x 1 m
24hr retention for fine silt		24 hrs	3.5 x 11 x 1 m	5 x 16 x 1 m	7 x 22 x 1 m

Drainage Design Notes

1. All drainage subject to micro-siting and optimisation on site.
2. The locations of the interceptor drains, check dams, culverts, swales, stilling ponds and level spreaders are shown as indicative, and may be changed to suit the requirements of the local topography.
3. Supervising hydrologist or environmental clerk of works (environmental scientist) to oversee installation of drainage features following detailed drainage design.
4. Drainage measures to be installed prior to, or at the same time as the works areas they are intended to drain.
5. Design elevation of the water surface along the route of the interceptor drains or swales will not be lower then the design elevation of the water surface in the outlet at the level spreader or stilling pond.
6. The spacing and frequency of the check dams will be dependant on the gradient of the interceptor drain or swale in which they are being installed.
7. Check dam designs to be selected best to suit particular topography and hydrological environment.
8. Down gradient slope below level spreader onto which the water will dissipate to have a grade less the 6%.
9. No direct discharge or pumping to watercourses will be permitted. All discharges from level spreaders or stilling ponds to be via vegetated filters. Selection or suitable areas to use as vegetation filters will be determined by the size of the contributing catchment, slope and ground conditions.
10. Stilling ponds to be sized according to the area they will be receiving water from.
11. Diversion of drainage ditches will only take place when alternative drainage ditch has been installed to handle the same water.
12. Existing drains/ditches to be incorporated or removed during wind farm construction.
13. All drainage system features to be subject of inspection and maintenance plan.
14. The layout shown is slightly offset for scale purposes, and all drainage would be installed as close to the road as possible, and within the planning boundary for the development.

Pollution Prevention Notes:

1. Site management proposals are intended to ensure complete protection against surface and groundwater pollution, siltation and erosion.
2. Suitable drainage control measures should be in place at all times to prevent the conveyance of silts to receiving watercourses.
3. Silty water can arise from dewatering excavations, erosion of exposed/disturbed ground, stockpiles, plant and wheel wash, site roads/tracks, and disturbance of stream/river beds.

Discharges

4. Water containing silt will not be pumped directly to any watercourse / drain / or ditch. All discharges will be made over open vegetated ground at a minimum 20m from nearest watercourse unless otherwise stated.
5. A 15m buffer zone (or greater) to be maintained around all sensitive watercourses and waterbodies. No excavated material is to be stored within any surface water buffer zone.
6. Pumped water will be directed into track side ditches and treated in settlement ponds and vegetation swales prior to overland discharge.
7. Pumping of clean water from excavations / or over-pumping in streams will be completed in a manner that does not cause scour or erosion at the point of discharge. This will be done by reducing the flow velocities or use of splash plates, and discharge controls.
8. Vegetation will NOT be stripped from existing ditches unless absolutely necessary.

Excavations

9. Where deep excavations are proposed cut-off drains will be use to reduce the amount of surface water entering the excavation. This will be the case around turbine base excavations.

Exposed Ground & Stockpiles

10. The amount of exposed ground and stockpiles open at any one time will be minimised as far as practicable.
11. Temporary stockpiles will be covered or sealed as soon as possible.
12. Silt fences will be used to reduce silty runoff from temporary peat storage areas, and/or bare peat areas as required.

Site Tracks

13. Use of track side swales with check dams, and/or filtration check dams will reduce silt in runoff water.
14. Check dams to be inspected and cleaned regularly.
15. Discharges from site tracks will be via outfall spillways, settlement ponds and vegetation swales.

Refueling

16. Refuel mobile plant in designated refueling area only, preferably on an impermeable surface and away from drains / ditches and watercourses / waterbodies.
17. Spill kits and drip trays should be available on site.

Concrete

18. Care will be taken when completing concrete works on site to ensure no discharges occur.
19. Concrete wash water, and waste concrete will be managed appropriately on site.

If water pollution is identified the following steps would be adhered to:

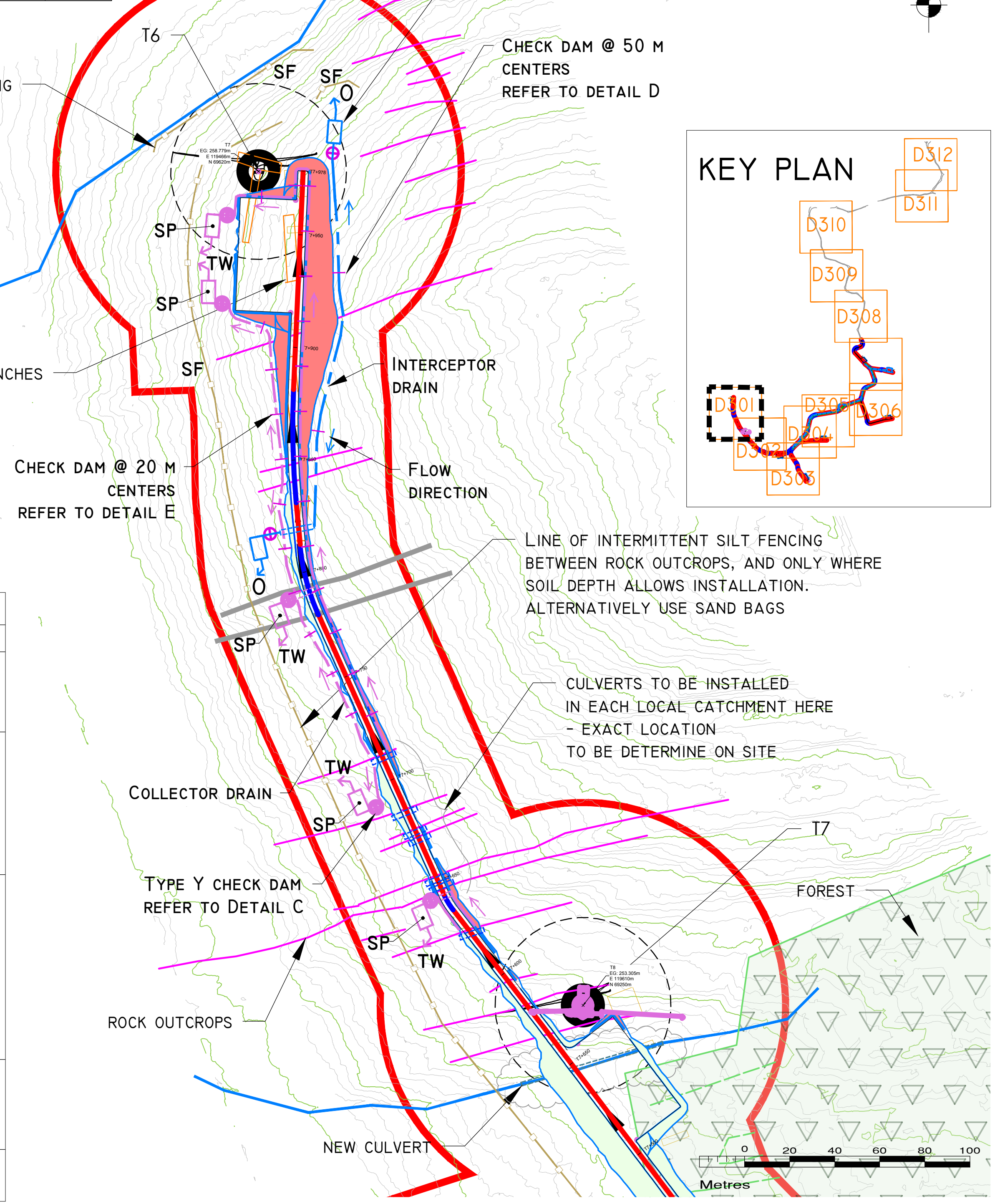
STOP - work in the immediate area should be stopped and the source of the pollution identified.

CONTAIN - the source of the pollution should be bunded using a suitable method. Natural watercourses should be temporarily diverted around the source of pollution.

Drainage Drawing Notes:

1. These drawing are prepared based on the permitted 2D layout, and partial 3D design provided by the client.
2. These drawings have been prepared using available lidar topography data, no detailed site survey is available.
3. Where possible we have attempted to account for changes in ground level based on site observations, and available aerial photo information.
4. Settlement ponds and new drain locations shown on these drawings are indicative, and subject to site proofing by Site Engineer.
5. Settlement pond sizes and locations are indicative, and need to be scaled according to the catchment draining into each proposed pond. This needs to be determined on the ground. Pond sizes per catchment area are outlined in the Table provided within this drawing.

Mitigation / Drainage Cointrols Available for use across the site	
Management Type	Description of SUDS Drainage Control Methods
Avoidance Controls	1) Application of 50m buffer zones to natural Watercourses where possible 2) Application of 10m buffer zones to main drains where possible 3) Using small working areas 4) Working in appropriate weather, and suspending certain work activities in advance of forecasted wet weather
Source Controls:	1) Use of upstream interceptor drains and downstream collector drains / oversized swales, vee-drains, diversion drains, flumes and culvert pipes 2) erosion and velocity control measures such as: a) sand bags b) oyster bags filled with gravel; c) filter fabrics d) and other similar/equivalent or appropriate systems 3) Using small working areas 4) covering stockpiles 5) weathering off / sealing peat stockpiles
In-Line Controls:	1) Interceptor drains, vee-drains, oversized swales/collector drains 2) erosion and velocity control measures such as: a) sand bags b) oyster bags filled with gravel c) filter fabrics d) straw bales e) flow limiters f) weirs or baffles g) and/or other similar/equivalent or appropriate systems. 3) silt fences, filter fabrics 4) In stream Sedimats 5) collection sumps, temporary sumps, pumping systems 5) attenuation lagoons 6) sediment traps, stilling / settlement ponds
Water Treatment Controls:	1) Temporary sumps 2) attenuation ponds 3) Temporary storage lagoons 4) Sediment traps, Stilling / Settlement ponds 5) Proprietary settlement systems such as Siltbuster, and/or other similar/equivalent or appropriate systems. 6) Silt dewatering bags
Outfall Controls:	1) Levelspreaders 2) Buffered outfalls 3) Vegetation filters 4) Silt dewatering bags 5) Flow limiters and weirs



Legend

Existing Drainage:
- Rivers/streams
- Rivers/streams 50m buffer
- Existing drain
- Existing culvert
- Forest drain
- Land streams/drains

Proposed Drainage:
- Upstream Interceptor Drain
- Swales/Downstream Collector Drain
- Direction of flow
- Settlement pond
- Cross drain
- Check Dam 'Type A'
- Check Dam 'Type B'
- Proposed culvert

- Silt fence
- Interceptor Ditches
- Direction of Flow
- Drainage swale - collector drain
- Stilling Pond (STP)
- Level spreader (LP)
- Planning boundary
- Cut area
- Fill area
- Rock outcrops (approx.)
- Farm access road
- Trenches
- Forest
- Existing ground surface intermediate contour (5 m interval)
- Existing ground surface minor contour (1 m interval)
- Turbine and swept area

Drawing Notes

2. Do not scale off this drawing. Figured metric dimensions only should be taken off this drawing.

Date	Description	Chkd	Signed
14.01.19	Construction	MG	MG

Revisions

HYDRO ENVIRONMENTAL SERVICES
22 Lower Main St
Dungarvan
Co. Waterford
Ireland
tel: +353 (0) 58-44122
fax: +353 (0) 58-44244
email: info@hydroenvironmental.ie
web: www.hydroenvironmental.ie

Client: Cleanrath Windfarm Ltd.

Job: Cleanrath Wind Farm

Title: Drainage Plan

Figure No: D301

Drawing No: P1272-4-0619-A3-D301-00A	
Sheet Size: A3	Project No.: P1272-4
Scale: 1:2,000 (A3)	Drawn By: MG/GD
Date: 25/06/2019	Checked By: MG

Drainage Design Notes

1. All drainage subject to micro-siting and optimisation on site.
2. The locations of the interceptor drains, check dams, culverts, swales, stilling ponds and level spreaders are shown as indicative, and may be changed to suit the requirements of the local topography.
3. Supervising hydrologist or environmental clerk of works (environmental scientist) to oversee installation of drainage features following detailed drainage design.
4. Drainage measures to be installed prior to, or at the same time as the works areas they are intended to drain.
5. Design elevation of the water surface along the route of the interceptor drains or swales will not be lower then the design elevation of the water surface in the outlet at the level spreader or stilling pond.
6. The spacing and frequency of the check dams will be dependant on the gradient of the interceptor drain or swale in which they are being installed.
7. Check dam designs to be selected best to suit particular topography and hydrological environment.
8. Down gradient slope below level spreader onto which the water will dissipate to have a grade less the 6%.
9. No direct discharge or pumping to watercourses will be permitted. All discharges from level spreaders or stilling ponds to be via vegetated filters. Selection or suitable areas to use as vegetation filters will be determined by the size of the contributing catchment, slope and ground conditions.
10. Stilling ponds to be sized according to the area they will be receiving water from.
11. Diversion of drainage ditches will only take place when alternative drainage ditch has been installed to handle the same water.
12. Existing drains/ditches to be incorporated or removed during wind farm construction.
13. All drainage system features to be subject of inspection and maintenance plan.
14. The layout shown is slightly offset for scale purposes, and all drainage would be installed as close to the road as possible, and within the planning boundary for the development.

POLLUTION PREVENTION NOTES:

1. Site management proposals are intended to ensure complete protection against surface water and groundwater pollution, siltation and erosion.
2. Suitable drainage control measures should be in place at all times to prevent the conveyance of silts to receiving watercourses.
3. Silty water can arise from dewatering excavations, erosion of exposed/disturbed ground, stockpiles, plant and wheel wash, site roads/tracks, and disturbance of stream/river beds.

Discharges

4. Water containing silt will not be pumped directly to any watercourse / drain / or ditch. All discharges to be made over open vegetated ground at a minimum 20m from nearest watercourse unless otherwise stated.
5. A 15m buffer zone (or greater) to be maintained around all sensitive watercourses and waterbodies.
   No excavated material is to be stored within any surface water buffer zone.
6. Pumped water will be directed into track side ditches and treated in settlement ponds and vegetation swales prior to overland discharge.
7. Pumping of clean water from excavations / or over-pumping in streams will be completed in a manner that does not cause scour or erosion at the point of discharge. This will be done by reducing the flow velocities or use of splash plates, and discharge controls.
8. Vegetation will NOT be stripped from existing ditches unless absolutely necessary.

Excavations

9. Where deep excavations are proposed cut-off drains will be use to reduce the amount of surface water entering the excavation. This will be the case around turbine base excavations.

Exposed Ground & Stockpiles

10. The amount of exposed ground and stockpiles open at any one time will be minimised as far as practicable.
11. Temporary stockpiles will be covered or sealed as soon as possible.
12. Silt fences will be used to reduce silty runoff from temporary peat storage areas, and/or bare peat areas as required.

Site tracks

13. Use of track side swales with check dams, and/or filtration check dams will reduce silt in runoff water.
14. Check dams to be inspected and cleaned regularly.
15. Discharges from site tracks will be via outfall spillways, settlement ponds and vegetation swales.

Refueling

16. Refuel mobile plant in designated refueling area only, preferably on an impermeable surface and away from drains / ditches and watercourses / waterbodies.
17. Spill kits and drip trays should be available on site.

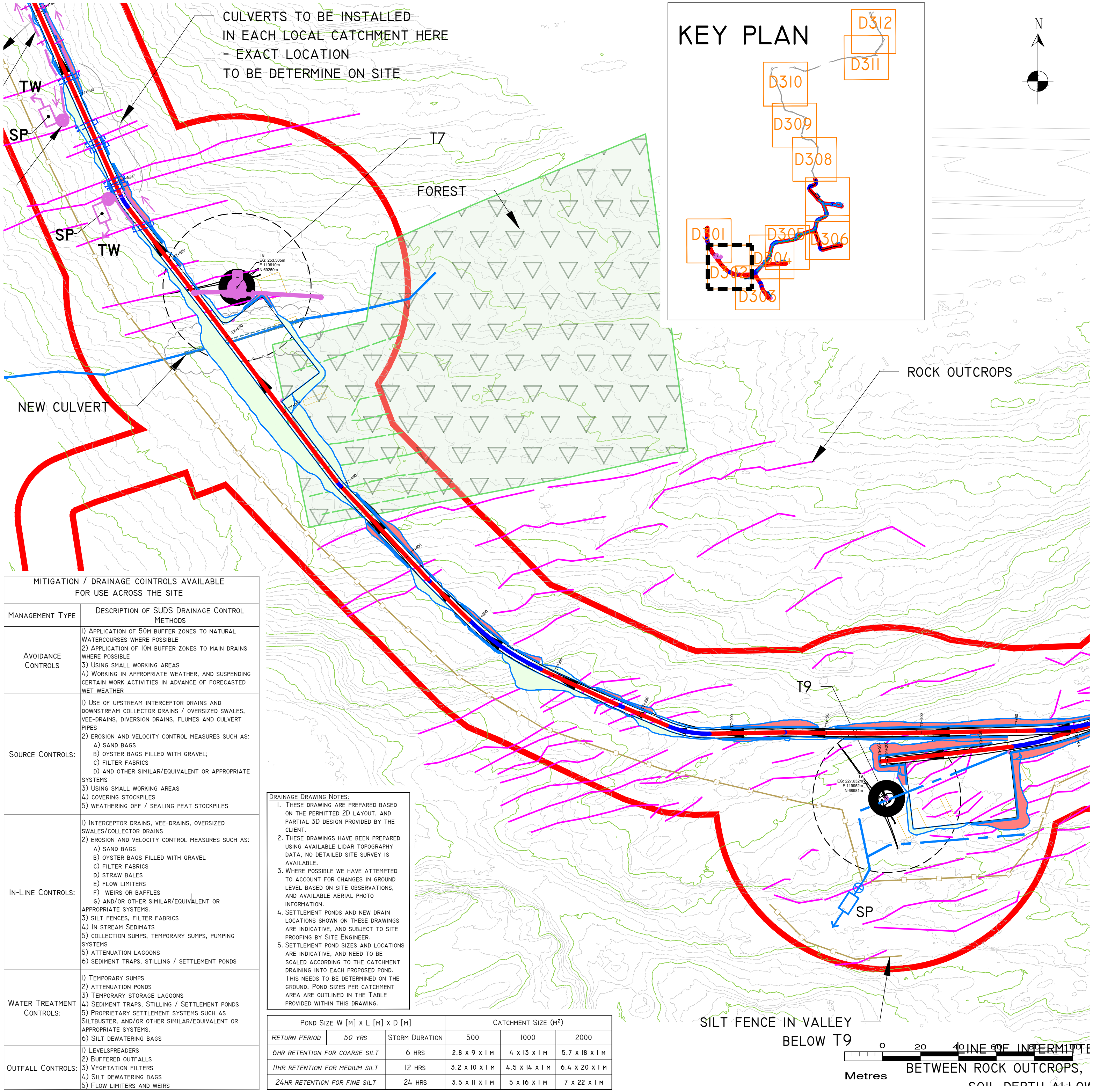
Concrete

18. Care will be taken when completing concrete works on site to ensure no discharges occur.
19. Concrete wash water, and waste concrete will be managed appropriately on site.

If water pollution is identified the following steps would be adhered to:

STOP - work in the immediate area should be stopped and the source of the pollution identified.

CONTAIN - the source of the pollution should be bunded using a suitable method. Natural watercourses should be temporarily diverted around the source of pollution.



Mitigation / Drainage Controls Available for use across the site	
Management Type	Description of SUDS Drainage Control Methods
Avoidance Controls	1) Application of 50m buffer zones to natural watercourses where possible 2) Application of 10m buffer zones to main drains where possible 3) Using small working areas 4) Working in appropriate weather, and suspending certain work activities in advance of forecasted wet weather
Source Controls:	1) Use of upstream interceptor drains and downstream collector drains / oversized swales, vee-drains, diversion drains, flumes and culvert pipes 2) Erosion and velocity control measures such as: a) sand bags b) oyster bags filled with gravel; c) filter fabrics d) and other similar/equivalent or appropriate systems 3) Using small working areas 4) covering stockpiles 5) weathering off / sealing peat stockpiles
In-Line Controls:	1) Interceptor drains, vee-drains, oversized swales/collector drains 2) Erosion and velocity control measures such as: a) sand bags b) oyster bags filled with gravel c) filter fabrics d) straw bales e) flow limiters f) weirs or baffles g) and/or other similar/equivalent or appropriate systems. 3) Silt fences, filter fabrics 4) In stream sedimats 5) collection sumps, temporary sumps, pumping systems 5) attenuation lagoons 6) sediment traps, stilling / settlement ponds
Water Treatment Controls:	1) Temporary sumps 2) attenuation ponds 3) temporary storage lagoons 4) Sediment traps, stilling / settlement ponds 5) Proprietary settlement systems such as siltbuster, and/or other similar/equivalent or appropriate systems. 6) Silt dewatering bags
Outfall Controls:	1) Levelspreaders 2) Buffered outfalls 3) Vegetation filters 4) Silt dewatering bags 5) Flow limiters and weirs

Drainage Drawing Notes:

1. These drawing are prepared based on the permitted 2D layout, and partial 3D design provided by the client.
2. These drawings have been prepared using available lidar topography data, no detailed site survey is available.
3. Where possible we have attempted to account for changes in ground level based on site observations, and available aerial photo information.
4. Settlement ponds and new drain locations shown on these drawings are indicative, and subject to site proofing by Site Engineer.
5. Settlement pond sizes and locations are indicative, and need to be scaled according to the catchment draining into each proposed pond. This needs to be determined on the ground. Pond sizes per catchment area are outlined in the Table provided within this drawing.

Pond Size W [m] x L [m] x D [m]			Catchment Size (m²)		
Return Period	50 yrs	Storm Duration	500	1000	2000
6hr retention for coarse silt		6 hrs	2.8 x 9 x 1 m	4 x 13 x 1 m	5.7 x 18 x 1 m
11hr retention for medium silt		12 hrs	3.2 x 10 x 1 m	4.5 x 14 x 1 m	6.4 x 20 x 1 m
24hr retention for fine silt		24 hrs	3.5 x 11 x 1 m	5 x 16 x 1 m	7 x 22 x 1 m

Legend

Existing Drainage
- Rivers/Streams
- Rivers/Streams 50m buffer
- Existing drain
- Existing culvert
- Forest drain
- Land streams/drains

Proposed Drainage
- Upstream Interceptor Drain
- Swales/Downstream Collector Drain
- Direction of Flow
- Settlement pond
- Cross drain
- Check Dam 'Type A'
- Check Dam 'Type B'
- Proposed culvert
- Silt fence

- Interceptor Ditches
- Direction of Flow
- Drainage swale - collector drain
- Stilling Pond (STP)
- Level spreader (LP)
- Planning boundary
- Cut area
- Fill area
- Rock outcrops (approx.)
- Farm access road
- Trenches
- Forest
- Existing ground surface intermediate contour (5 m interval)
- Existing ground surface minor contour (1 m interval)
- Turbine and swept area

Drawing Notes

2. Do not scale off this drawing. Figured metric dimensions only should be taken off this drawing.

14.01.19	Construction	MG	MG
Date	Description	Chkd	Signed

Revisions

HYDRO ENVIRONMENTAL SERVICES
22 Lower Main St
Dungarvan
Co. Waterford
Ireland
tel: +353 (0) 58-44122
tel: +353 (0) 58-44244
email: info@hydroenvironmental.ie
web: www.hydroenvironmental.ie

Client: Cleanrath Windfarm Ltd.

Job: Cleanrath Wind Farm

Title: Drainage Plan

Figure No: D302

Drawing No: P1272-4-0619-A3-D302-00A	
Sheet Size: A3	Project No.: P1272-4
Scale: 1:2,000 (A3)	Drawn By: MG/GD
Date: 25/06/2019	Checked By: MG

Drainage Design Notes

1. All drainage subject to micro-siting and optimisation on site.
2. The locations of the interceptor drains, check dams, culverts, swales, stilling ponds and level spreaders are shown as indicative, and may be changed to suit the requirements of the local topography.
3. Supervising hydrologist or environmental clerk of works (environmental scientist) to oversee installation of drainage features following detailed drainage design.
4. Drainage measures to be installed prior to, or at the same time as the works areas they are intended to drain.
5. Design elevation of the water surface along the route of the interceptor drains or swales will not be lower then the design elevation of the water surface in the outlet at the level spreader or stilling pond.
6. The spacing and frequency of the check dams will be dependant on the gradient of the interceptor drain or swale in which they are being installed.
7. Check dam designs to be selected best to suit particular topography and hydrological environment.
8. Down gradient slope below level spreader onto which the water will dissipate to have a grade less the 6%.
9. No direct discharge or pumping to watercourses will be permitted. All discharges from level spreaders or stilling ponds to be via vegetated filters. Selection or suitable areas to use as vegetation filters will be determined by the size of the contributing catchment, slope and ground conditions.
10. Stilling ponds to be sized according to the area they will be receiving water from.
11. Diversion of drainage ditches will only take place when alternative drainage ditch has been installed to handle the same water.
12. Existing drains/ditches to be incorporated or removed during wind farm construction.
13. All drainage system features to be subject of inspection and maintenance plan.
14. The layout shown is slightly offset for scale purposes, and all drainage would be installed as close to the road as possible, and within the planning boundary for the development.

Pollution Prevention Notes:

1. Site management proposals are intended to ensure complete protection against surface water and groundwater pollution, siltation and erosion.
2. Suitable drainage control measures should be in place at all times to prevent the conveyance of silts to receiving watercourses.
3. Silty water can arise from dewatering excavations, erosion of exposed/disturbed ground, stockpiles, plant and wheel wash, site roads/tracks, and disturbance of stream/river beds.

Discharges

4. Water containing silt will not be pumped directly to any watercourse / drain / or ditch. All discharges to be made over open vegetated ground at a minimum 20m from nearest watercourse unless otherwise stated.
5. A 15m buffer zone (or greater) to be maintained around all sensitive watercourses and waterbodies. No excavated material is to be stored within any surface water buffer zone.
6. Pumped water will be directed into track side ditches and treated in settlement ponds and vegetation swales prior to overland discharge.
7. Pumping of clean water from excavations / or over-pumping in streams will be completed in a manner that does not cause scour or erosion at the point of discharge. This will be done by reducing the flow velocities or use of splash plates, and discharge controls.
8. Vegetation will NOT be stripped from existing ditches unless absolutely necessary.

Excavations

9. Where deep excavations are proposed cut-off drains will be use to reduce the amount of surface water entering the excavation. This will be the case around turbine base excavations.

Exposed Ground & Stockpiles

10. The amount of exposed ground and stockpiles open at any one time will be minimised as far as practicable.
11. Temporary stockpiles will be covered or sealed as soon as possible.
12. Silt fences will be used to reduce silty runoff from temporary peat storage areas, and/or bare peat areas as required.

Site Tracks

13. Use of track side swales with check dams, and/or filtration check dams will reduce silt in runoff water.
14. Check dams to be inspected and cleaned regularly.
15. Discharges from site tracks will be via outfall spillways, settlement ponds and vegetation swales.

Refueling

16. Refuel mobile plant in designated refueling area only, preferably on an impermeable surface and away from drains / ditches and watercourses / waterbodies.
17. Spill kits and drip trays should be available on site.

Concrete

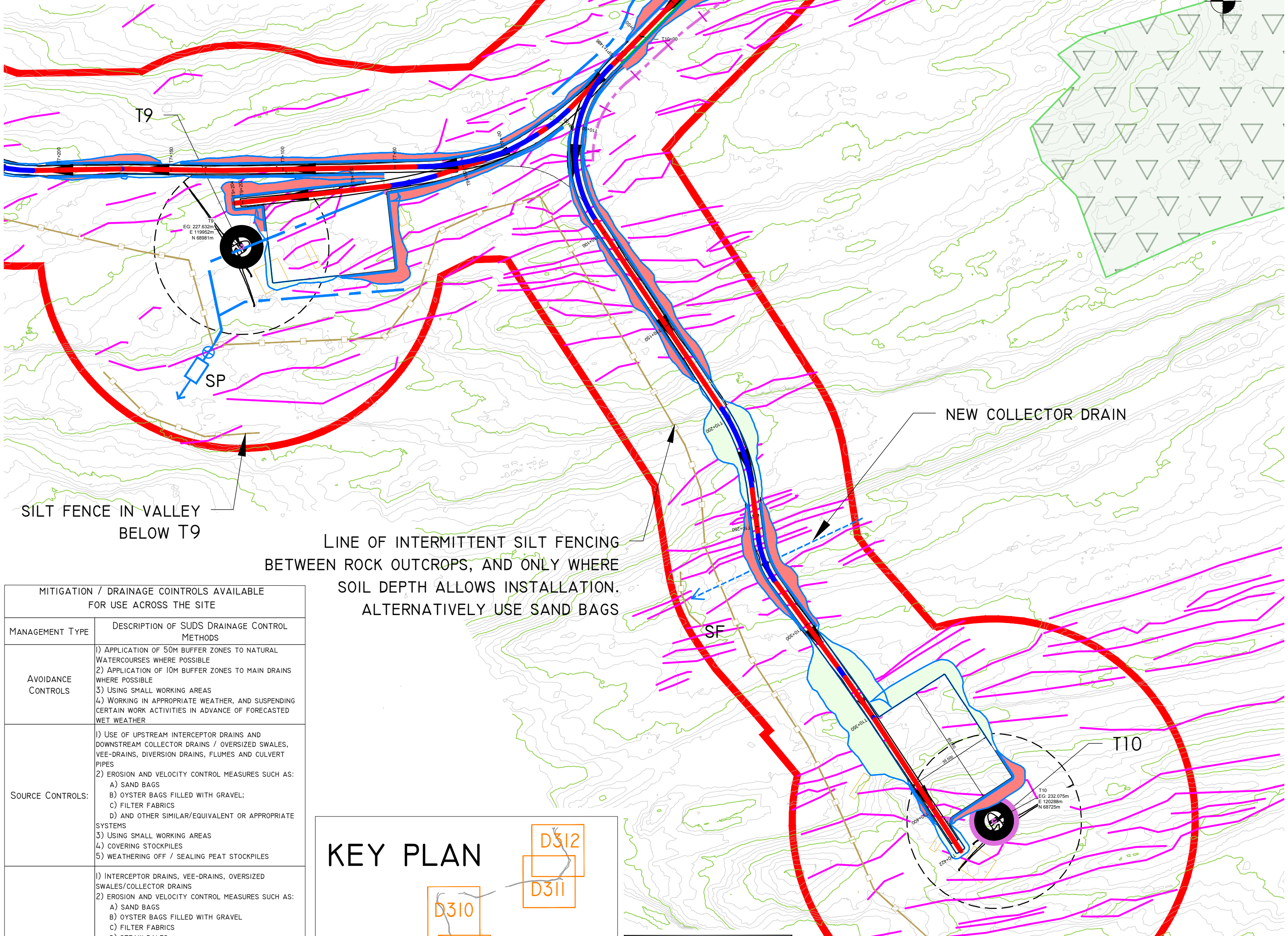
18. Care will be taken when completing concrete works on site to ensure no discharges occur.
19. Concrete wash water, and waste concrete will be managed appropriately on site.

If water pollution is identified the following steps would be adhered to:

STOP - work in the immediate area should be stopped and the source of the pollution identified.

CONTAIN - the source of the pollution should be bunded using a suitable method. Natural watercourses should be temporarily diverted around the source of pollution.

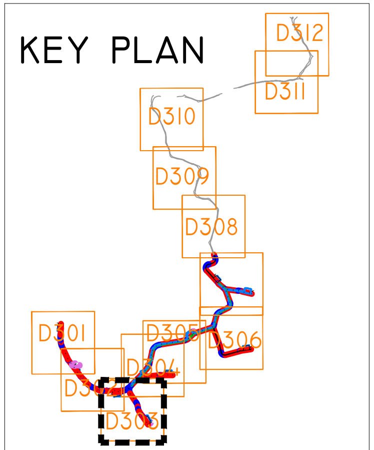
Pond Size W [m] x L [m] x D [m]		Catchment Size (m²)		
Return Period 50 yrs	Storm Duration	500	1000	2000
6hr retention for coarse silt	6 hrs	2.8 x 9 x 1 m	4 x 13 x 1 m	5.7 x 18 x 1 m
11hr retention for medium silt	12 hrs	3.2 x 10 x 1 m	4.5 x 14 x 1 m	6.4 x 20 x 1 m
24hr retention for fine silt	24 hrs	3.5 x 11 x 1 m	5 x 16 x 1 m	7 x 22 x 1 m



Mitigation / Drainage Cointrols available for use across the site

Management Type	Description of SUDS Drainage Control Methods
Avoidance Controls	1) Application of 50m buffer zones to natural watercourses where possible 2) Application of 10m buffer zones to main drains where possible 3) Using small working areas 4) Working in appropriate weather, and suspending certain work activities in advance of forecasted wet weather
Source Controls:	1) Use of upstream interceptor drains and downstream collector drains / oversized swales, vee-drains, diversion drains, flumes and culvert pipes 2) Erosion and velocity control measures such as: a) sand bags b) oyster bags filled with gravel; c) filter fabrics d) and other similar/equivalent or appropriate systems 3) Using small working areas 4) covering stockpiles 5) weathering off / sealing peat stockpiles
In-Line Controls:	1) Interceptor drains, vee-drains, oversized swales/collector drains 2) Erosion and velocity control measures such as: a) sand bags b) oyster bags filled with gravel c) filter fabrics d) straw bales e) flow limiters f) weirs or baffles g) and/or other similar/equivalent or appropriate systems. 3) Silt fences, filter fabrics 4) In stream Sedimats 5) collection sumps, temporary sumps, pumping systems 5) attenuation lagoons 6) sediment traps, stilling / settlement ponds
Water Treatment Controls:	1) Temporary sumps 2) attenuation ponds 3) temporary storage lagoons 4) Sediment traps, Stilling / Settlement ponds 5) Proprietary settlement systems such as Siltbuster, and/or other similar/equivalent or appropriate systems. 6) Silt dewatering bags
Outfall Controls:	1) Levelspreaders 2) Buffered outfalls 3) Vegetation filters 4) Silt dewatering bags 5) Flow limiters and weirs

KEY PLAN



Drainage Drawing Notes:

1. These drawing are prepared based on the permitted 2D layout, and partial 3D design provided by the client.
2. These drawings have been prepared using available LiDAR topography data, no detailed site survey is available.
3. Where possible we have attempted to account for changes in ground level based on site observations, and available aerial photo information.
4. Settlement ponds and new drain locations shown on these drawings are indicative, and subject to site proofing by Site Engineer.
5. Settlement pond sizes and locations are indicative, and need to be scaled according to the catchment draining into each proposed pond. This needs to be determined on the ground. Pond sizes per catchment area are outlined in the Table provided within this drawing.

0 20 40 60 80 100
Metres

Legend

Existing Drainage:
- Rivers/Streams
- Rivers/Streams 50m Buffer
- Existing Drain
- Existing Culvert
- Forest Drain
- Land Streams/Drains

Proposed Drainage:
- Upstream Interceptor Drain
- Swales/Downstream Collector Drain
- Direction of Flow
- Settlement Pond
- Cross Drain
- Check Dam 'Type A'
- Check Dam 'Type B'
- Proposed Culvert

- Silt Fence
- Interceptor Ditches
- Direction of Flow
- Drainage Swale - Collector Drain
- Stilling Pond (STP)
- Level Spreader (LP)
- Planning Boundary
- Cut Area
- Fill Area
- Rock Outcrops (Approx.)
- Farm Access Road
- Trenches
- Forest
- Existing Ground Surface Intermediate Contour (5 m Interval)
- Existing Ground Surface Minor Contour (1 m Interval)
- Turbine and Swept Area

Drawing Notes

1. Copyright, all rights reserved. No part here with may be copied or reproduced partially or wholly in any form whatsoever without the prior notice of the copyright owner Hydro-Environmental Services.
2. Do not scale off this drawing. Figured metric dimensions only should be taken off this drawing.

Date	Description	Chkd	Signed
14.01.19	Construction	MG	MG

Revisions

HYDRO ENVIRONMENTAL SERVICES
22 Lower Main St Dungarvan Co. Waterford Ireland
tel: +353 (0) 58-44122
fax: +353 (0) 58-44244
email: info@hydroenvironmental.ie
web: www.hydroenvironmental.ie

Client: Cleanrath Windfarm Ltd.

Job: Cleanrath Wind Farm

Title: Drainage Plan

Figure No: D303

Drawing No: P1272-4-0619-A3-D303-00A	
Sheet Size: A3	Project No.: P1272-4
Scale: 1:2,000 (A3)	Drawn By: MG/GD
Date: 25/06/2019	Checked By: MG

Drainage Design Notes

1. All drainage subject to micro-siting and optimisation on site.
2. The locations of the interceptor drains, check dams, culverts, swales, stilling ponds and level spreaders are shown as indicative, and may be changed to suit the requirements of the local topography.
3. Supervising hydrologist or environmental clerk of works (environmental scientist) to oversee installation of drainage features following detailed drainage design.
4. Drainage measures to be installed prior to, or at the same time as the works areas they are intended to drain.
5. Design elevation of the water surface along the route of the interceptor drains or swales will not be lower then the design elevation of the water surface in the outlet at the level spreader or stilling pond.
6. The spacing and frequency of the check dams will be dependant on the gradient of the interceptor drain or swale in which they are being installed.
7. Check dam designs to be selected best to suit particular topography and hydrological environment.
8. Down gradient slope below level spreader onto which the water will dissipate to have a grade less the 6%.
9. No direct discharge or pumping to watercourses will be permitted. All discharges from level spreaders or stilling ponds to be via vegetated filters. Selection or suitable areas to use as vegetation filters will be determined by the size of the contributing catchment, slope and ground conditions.
10. Stilling ponds to be sized according to the area they will be receiving water from.
11. Diversion of drainage ditches will only take place when alternative drainage ditch has been installed to handle the same water.
12. Existing drains/ditches to be incorporated or removed during wind farm construction.
13. All drainage system features to be subject of inspection and maintenance plan.
14. The layout shown is slightly offset for scale purposes, and all drainage would be installed as close to the road as possible, and within the planning boundary for the development.

Pollution Prevention Notes:

1. Site management proposals are intended to ensure complete protection against surface water and groundwater pollution, siltation and erosion.
2. Suitable drainage control measures should be in place at all times to prevent the conveyance of silts to receiving watercourses.
3. Silty water can arise from dewatering excavations, erosion of exposed/disturbed ground, stockpiles, plant and wheel wash, site roads/tracks, and disturbance of stream/river beds.

Discharges

4. Water containing silt will not be pumped directly to any watercourse / drain / or ditch. All discharges to be made over open vegetated ground at a minimum 20m from nearest watercourse unless otherwise stated.
5. A 15m buffer zone (or greater) to be maintained around all sensitive watercourses and waterbodies. No excavated material is to be stored within any surface water buffer zone.
6. Pumped water will be directed into track side ditches and treated in settlement ponds and vegetation swales prior to overland discharge.
7. Pumping of clean water from excavations / or over-pumping in streams will be completed in a manner that does not cause scour or erosion at the point of discharge. This will be done by reducing the flow velocities or use of splash plates, and discharge controls.
8. Vegetation will NOT be stripped from existing ditches unless absolutely necessary.

Excavations

9. Where deep excavations are proposed cut-off drains will be use to reduce the amount of surface water entering the excavation. This will be the case around turbine base excavations.

Exposed Ground & Stockpiles

10. The amount of exposed ground and stockpiles open at any one time will be minimised as far as practicable.
11. Temporary stockpiles will be covered or sealed as soon as possible.
12. Silt fences will be used to reduce silty runoff from temporary peat storage areas, and/or bare peat areas as required.

Site tracks

13. Use of track side swales with check dams, and/or filtration check dams will reduce silt in runoff water.
14. Check dams to be inspected and cleaned regularly.
15. Discharges from site tracks will be via outfall spillways, settlement ponds and vegetation swales.

Refueling

16. Refuel mobile plant in designated refueling area only, preferably on an impermeable surface and away from drains / ditches and watercourses / waterbodies.
17. Spill kits and drip trays should be available on site.

Concrete

18. Care will be taken when completing concrete works on site to ensure no discharges occur.
19. Concrete wash water, and waste concrete will be managed appropriately on site.

If water pollution is identified the following steps would be adhered to:

STOP - work in the immediate area should be stopped and the source of the pollution identified.

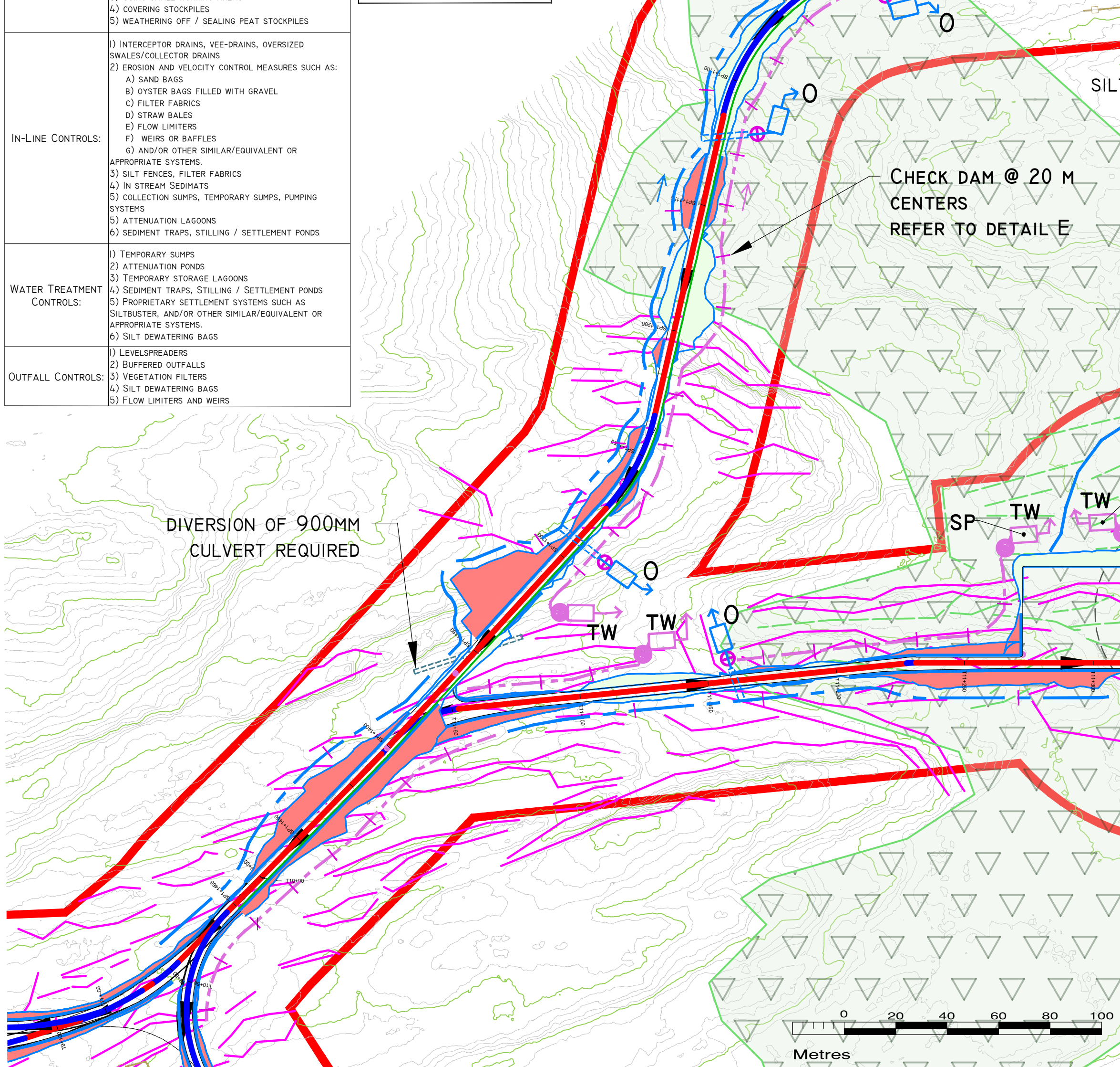
CONTAIN - the source of the pollution should be bunded using a suitable method. Natural watercourses should be temporarily diverted around the source of pollution.

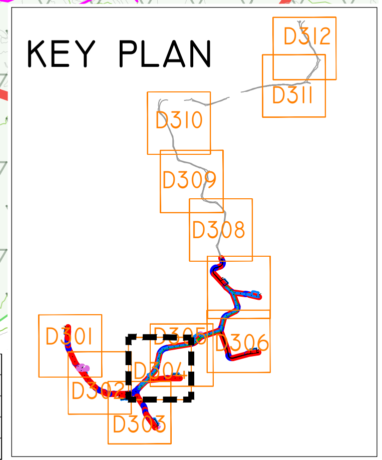
Mitigation / drainage cointrols available for use across the site

Management Type	Description of SUDS Drainage Control Methods
Avoidance Controls	1) Application of 50m buffer zones to natural Watercourses where possible 2) Application of 10m buffer zones to main drains where possible 3) Using small working areas 4) Working in appropriate weather, and suspending certain work activities in advance of forecasted wet weather
Source Controls:	1) Use of upstream interceptor drains and downstream collector drains / oversized swales, vee-drains, diversion drains, flumes and culvert pipes 2) erosion and velocity control measures such as: a) sand bags b) oyster bags filled with gravel; c) filter fabrics d) and other similar/equivalent or appropriate systems 3) Using small working areas 4) covering stockpiles 5) weathering off / sealing peat stockpiles
In-Line Controls:	1) Interceptor drains, vee-drains, oversized swales/collector drains 2) erosion and velocity control measures such as: a) sand bags b) oyster bags filled with gravel c) filter fabrics d) straw bales e) flow limiters f) weirs or baffles g) and/or other similar/equivalent or appropriate systems. 3) silt fences, filter fabrics 4) In stream Sedimats 5) collection sumps, temporary sumps, pumping systems 5) attenuation lagoons 6) sediment traps, stilling / settlement ponds
Water Treatment Controls:	1) Temporary sumps 2) attenuation ponds 3) Temporary storage lagoons 4) Sediment traps, Stilling / Settlement ponds 5) Proprietary settlement systems such as Siltbuster, and/or other similar/equivalent or appropriate systems. 6) Silt dewatering bags
Outfall Controls:	1) Levelspreaders 2) Buffered outfalls 3) Vegetation filters 4) Silt dewatering bags 5) Flow limiters and weirs

Drainage Drawing Notes:

1. These drawing are prepared based on the permitted 2D layout, and partial 3D design provided by the client.
2. These drawings have been prepared using available lidar topography data, no detailed site survey is available.
3. Where possible we have attempted to account for changes in ground level based on site observations, and available aerial photo information.
4. Settlement ponds and new drain locations shown on these drawings are indicative, and subject to site proofing by Site Engineer.
5. Settlement pond sizes and locations are indicative, and need to be scaled according to the catchment draining into each proposed pond. This needs to be determined on the ground. Pond sizes per catchment area are outlined in the Table provided within this drawing.





Pond Size W [m] x L [m] x D [m]			Catchment Size (m²)		
Return Period	50 yrs	Storm Duration	500	1000	2000
6hr retention for coarse silt		6 hrs	2.8 x 9 x 1 m	4 x 13 x 1 m	5.7 x 18 x 1 m
11hr retention for medium silt		12 hrs	3.2 x 10 x 1 m	4.5 x 14 x 1 m	6.4 x 20 x 1 m
24hr retention for fine silt		24 hrs	3.5 x 11 x 1 m	5 x 16 x 1 m	7 x 22 x 1 m

Legend

Existing Drainage
- Rivers/Streams
- Rivers/Streams 50m buffer
- Existing drain
- Existing culvert
- Forest drain
- Land streams/drains

Proposed Drainage
- Upstream Interceptor Drain
- Swales/Downstream Collector Drain
- Direction of flow
- Settlement pond
- Cross drain
- Check Dam 'Type A'
- Check Dam 'Type B'
- Proposed culvert
- Silt fence
- Interceptor Ditches
- Direction of Flow drainage swale - collector drain
- Stilling Pond (STP)
- Level spreader (LP)
- Planning boundary
- Cut area
- Fill area
- Rock outcrops (approx.)
- Farm access road
- Trenches
- Forest
- Existing ground surface intermediate contour (5 m interval)
- Existing ground surface minor contour (1 m interval)
- Turbine and swept area

Drawing Notes

2. Do not scale off this drawing. Figured metric dimensions only should be taken off this drawing.

Date	Description	Chkd	Signed
14.01.19	Construction	MG	MG

Revisions

HYDRO ENVIRONMENTAL SERVICES
22 Lower Main St
Dungarvan
Co. Waterford
Ireland
tel: +353 (0) 58-44122
tel: +353 (0) 58-44244
email: info@hydroenvironmental.ie
web: www.hydroenvironmental.ie

Client: Cleanrath Windfarm Ltd.

Job: Cleanrath Wind Farm

Title: Drainage Plan

Figure No: D304

Drawing No: P1272-4-0619-A3-D304-00A	
Sheet Size: A3	Project No.: P1272-4
Scale: 1:2,000 (A3)	Drawn By: MG/GD
Date: 25/06/2019	Checked By: MG

Drainage Design Notes

1. All drainage subject to micro-siting and optimisation on site.
2. The locations of the interceptor drains, check dams, culverts, swales, stilling ponds and level spreaders are shown as indicative, and may be changed to suit the requirements of the local topography.
3. Supervising hydrologist or environmental clerk of works (environmental scientist) to oversee installation of drainage features following detailed drainage design.
4. Drainage measures to be installed prior to, or at the same time as the works areas that they are intended to drain.
5. Design elevation of the water surface along the route of the interceptor drains or swales will not be lower then the design elevation of the water surface in the outlet at the level spreader or stilling pond.
6. The spacing and frequency of the check dams will be dependant on the gradient of the interceptor drain or swale in which they are being installed.
7. Check dam designs to be selected best to suit particular topography and hydrological environment.
8. Down gradient slope below level spreader onto which the water will dissipate to have a grade less the 6%.
9. No direct discharge or pumping to watercourses will be permitted. All discharges from level spreaders or stilling ponds to be via vegetated filters. Selection or suitable areas to use as vegetation filters will be determined by the size of the contributing catchment, slope and ground conditions.
10. Stilling ponds to be sized according to the area they will be receiving water from.
11. Diversion of drainage ditches will only take place when alternative drainage ditch has been installed to handle the same water.
12. Existing drains/ditches to be incorporated or removed during wind farm construction.
13. All drainage system features to be subject of inspection and maintenance plan.
14. The layout shown is slightly offset for scale purposes, and all drainage would be installed as close to the road as possible, and within the planning boundary for the development.

Pollution Prevention Notes:

1. Site management proposals are intended to ensure complete protection against surface water and groundwater pollution, siltation and erosion.
2. Suitable drainage control measures should be in place at all times to prevent the conveyance of silts to receiving watercourses.
3. Silty water can arise from dewatering excavations, erosion of exposed/disturbed ground, stockpiles, plant and wheel wash, site roads/tracks, and disturbance of stream/river beds.

Discharges

4. Water containing silt will not be pumped directly to any watercourse / drain / or ditch. All discharges to be made over open vegetated ground at a minimum 20m from nearest watercourse unless otherwise stated.
5. A 15m buffer zone (or greater) to be maintained around all sensitive watercourses and waterbodies. No excavated material is to be stored within any surface water buffer zone.
6. Pumped water will be directed into track side ditches and treated in settlement ponds and vegetation swales prior to overland discharge.
7. Pumping of clean water from excavations / or over-pumping in streams will be completed in a manner that does not cause scour or erosion at the point of discharge. This will be done by reducing the flow velocities or use of splash plates, and discharge controls.
8. Vegetation will NOT be stripped from existing ditches unless absolutely necessary.

Excavations

9. Where deep excavations are proposed cut-off drains will be use to reduce the amount of surface water entering the excavations. This will be the case around turbine base excavations.

Exposed Ground & Stockpiles

10. The amount of exposed ground and stockpiles open at any one time will be minimised as far as practicable.
11. Temporary stockpiles will be covered or sealed as soon as possible.
12. Silt fences will be used to reduce silty runoff from temporary peat storage areas, and/or bare peat areas as required.

Site Tracks

13. Use of track side swales with check dams, and/or filtration check dams will reduce silt in runoff water.
14. Check dams to be inspected and cleaned regularly.
15. Discharges from site tracks will be via outfall spillways, settlement ponds and vegetation swales.

Refueling

16. Refuel mobile plant in designated refueling area only, preferably on an impermeable surface and away from drains / ditches and watercourses / waterbodies.
17. Spill kits and drip trays should be available on site.

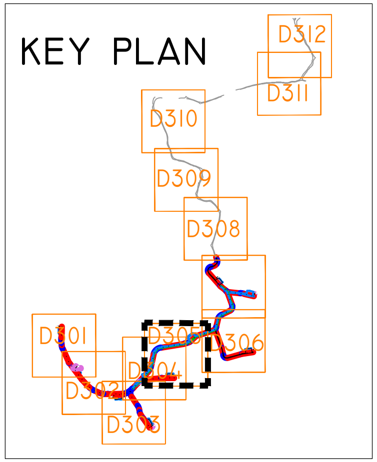
Concrete

18. Care will be taken when completing concrete works on site to ensure no discharges occur.
19. Concrete wash water, and waste concrete will be managed appropriately on site.

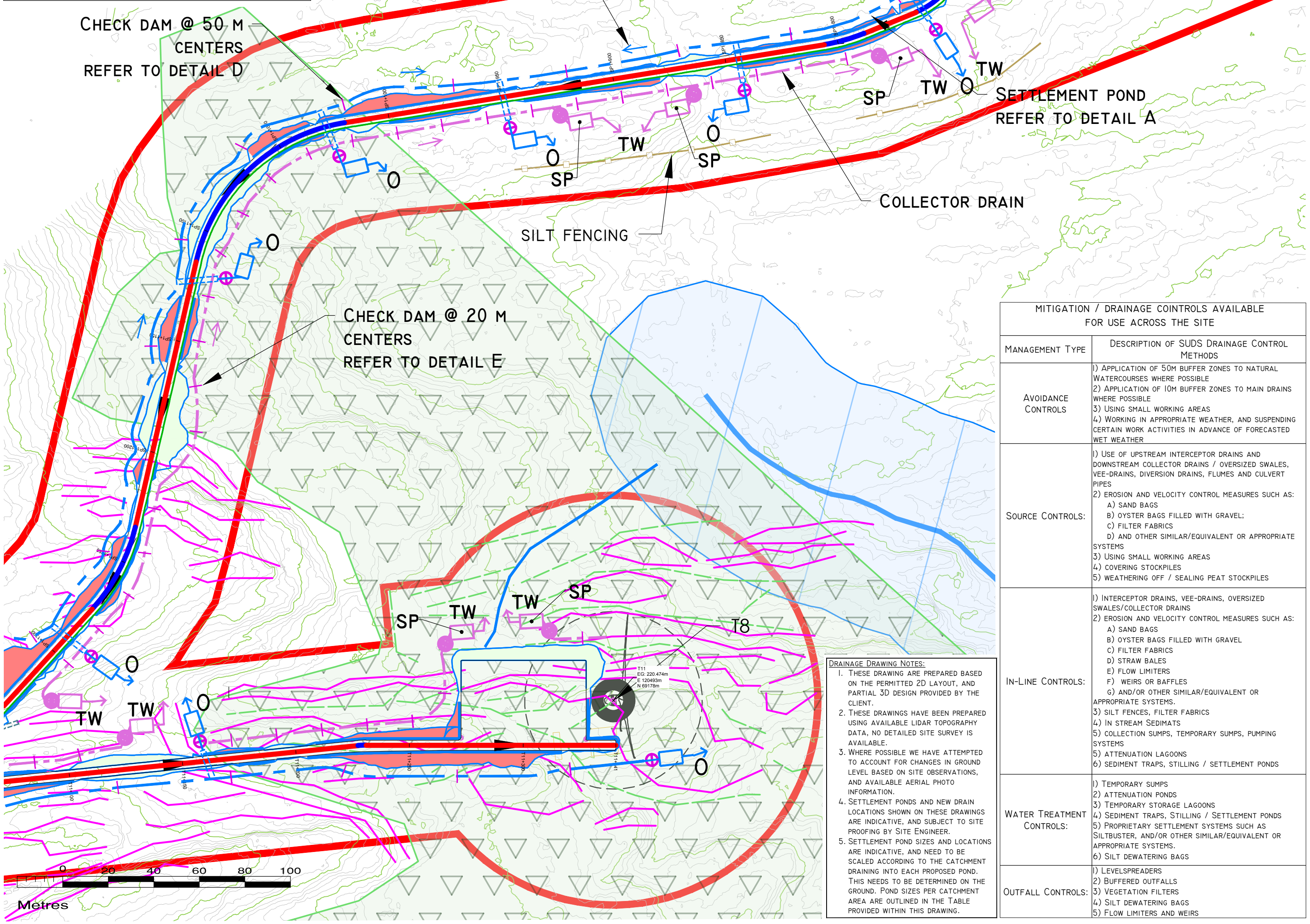
If water pollution is identified the following steps would be adhered to:

STOP - work in the immediate area should be stopped and the source of the pollution identified.

CONTAIN - the source of the pollution should be bunded using a suitable method. Natural watercourses should be temporarily diverted around the source of pollution.



Pond Size W [m] x L [m] x D [m]			Catchment Size (m²)		
Return Period	50 yrs	Storm Duration	500	1000	2000
6hr retention for coarse silt		6 hrs	2.8 x 9 x 1 m	4 x 13 x 1 m	5.7 x 18 x 1 m
11hr retention for medium silt		12 hrs	3.2 x 10 x 1 m	4.5 x 14 x 1 m	6.4 x 20 x 1 m
24hr retention for fine silt		24 hrs	3.5 x 11 x 1 m	5 x 16 x 1 m	7 x 22 x 1 m



Drainage Drawing Notes:

1. These drawing are prepared based on the permitted 2D layout, and partial 3D design provided by the client.
2. These drawings have been prepared using available LIDAR topography data, no detailed site survey is available.
3. Where possible we have attempted to account for changes in ground level based on site observations, and available aerial photo information.
4. Settlement ponds and new drain locations shown on these drawings are indicative, and subject to site proofing by Site Engineer.
5. Settlement pond sizes and locations are indicative, and need to be scaled according to the catchment draining into each proposed pond. This needs to be determined on the ground. Pond sizes per catchment area are outlined in the Table provided within this drawing.

Mitigation / Drainage Cointrols Available for Use Across the Site

Management Type	Description of SUDS Drainage Control Methods
Avoidance Controls	1) Application of 50m buffer zones to natural Watercourses where possible 2) Application of 10m buffer zones to main drains where possible 3) Using small working areas 4) Working in appropriate weather, and suspending certain work activities in advance of forecasted wet weather
Source Controls:	1) Use of upstream interceptor drains and downstream collector drains / oversized swales, vee-drains, diversion drains, flumes and culvert pipes 2) erosion and velocity control measures such as: a) sand bags b) oyster bags filled with gravel; c) filter fabrics d) and other similar/equivalent or appropriate systems 3) Using small working areas 4) covering stockpiles 5) weathering off / sealing peat stockpiles
In-Line Controls:	1) Interceptor drains, vee-drains, oversized swales/collector drains 2) erosion and velocity control measures such as: a) sand bags b) oyster bags filled with gravel c) filter fabrics d) straw bales e) flow limiters f) weirs or baffles g) and/or other similar/equivalent or appropriate systems. 3) silt fences, filter fabrics 4) In stream Sedimats 5) collection sumps, temporary sumps, pumping systems 5) attenuation lagoons 6) sediment traps, stilling / settlement ponds
Water Treatment Controls:	1) Temporary sumps 2) attenuation ponds 3) Temporary storage lagoons 4) Sediment traps, Stilling / Settlement ponds 5) Proprietary settlement systems such as Siltbuster, and/or other similar/equivalent or appropriate systems. 6) Silt dewatering bags
Outfall Controls:	1) Levelspreaders 2) Buffered outfalls 3) Vegetation filters 4) Silt dewatering bags 5) Flow limiters and weirs

Legend

Existing Drainage:
- Rivers/streams
- Rivers/streams 50m buffer
- Existing drain
- Existing culvert
- Forest drain
- Land streams/drains

Proposed Drainage:
- Upstream Interceptor Drain
- Swales/Downstream Collector Drain
- Direction of flow
- Settlement pond
- Cross drain
- Check Dam 'type A'
- Check Dam 'type B'
- Proposed culvert
- Silt fence
- Interceptor Ditches
- Direction of flow
- Drainage swale - collector drain
- Stilling Pond (STP)
- Level spreader (LP)

- Planning boundary
- Cut area
- Fill area
- Rock outcrops (approx.)
- Farm access road
- Trenches
- Forest
- Existing ground surface intermediate contour (5 m interval)
- Existing ground surface minor contour (1 m interval)
- Turbine and swept area

Drawing Notes

2. Do not scale off this drawing. Figured metric dimensions only should be taken off this drawing.

Date	Description	Chkd	Signed
14.01.19	Construction	MG	MG

Revisions

Hydro Environmental Services
22 Lower Main St
Dungarvan
Co. Waterford
Ireland
tel: +353 (0) 58-44122
fax: +353 (0) 58-44244
email: info@hydroenvironmental.ie
web: www.hydroenvironmental.ie

Client: Cleanrath Windfarm Ltd.

Job: Cleanrath Wind Farm

Title: Drainage Plan

Figure No: D305

Drawing No: P1272-4-0619-A3-D305-00A

Sheet Size: A3	Project No.: P1272-4
Scale: 1:2,000 (A3)	Drawn By: MG/GD
Date: 25/06/2019	Checked By: MG

Drainage Design Notes

1. All drainage subject to micro-siting and optimisation on site.
2. The locations of the interceptor drains, check dams, culverts, swales, stilling ponds and level spreaders are shown as indicative, and may be changed to suit the requirements of the local topography.
3. Supervising hydrologist or environmental clerk of works (environmental scientist) to oversee installation of drainage features following detailed drainage design.
4. Drainage measures to be installed prior to, or at the same time as the works areas they are intended to drain.
5. Design elevation of the water surface along the route of the interceptor drains or swales will not be lower then the design elevation of the water surface in the outlet at the level spreader or stilling pond.
6. The spacing and frequency of the check dams will be dependant on the gradient of the interceptor drain or swale in which they are being installed.
7. Check dam designs to be selected best to suit particular topography and hydrological environment.
8. Down gradient slope below level spreader onto which the water will dissipate to have a grade less the 6%.
9. No direct discharge or pumping to watercourses will be permitted. All discharges from level spreaders or stilling ponds to be via vegetated filters. Selection or suitable areas to use as vegetation filters will be determined by the size of the contributing catchment, slope and ground conditions.
10. Stilling ponds to be sized according to the area they will be receiving water from.
11. Diversion of drainage ditches will only take place when alternative drainage ditch has been installed to handle the same water.
12. Existing drains/ditches to be incorporated or removed during wind farm construction.
13. All drainage system features to be subject of inspection and maintenance plan.
14. The layout shown is slightly offset for scale purposes, and all drainage would be installed as close to the road as possible, and within the planning boundary for the development.

POLLUTION PREVENTION NOTES:

1. Site management proposals are intended to ensure complete protection against surface water and groundwater pollution, siltation and erosion.
2. Suitable drainage control measures should be in place at all times to prevent the conveyance of silts to receiving watercourses.
3. Silty water can arise from dewatering excavations, erosion of exposed/disturbed ground, stockpiles, plant and wheel wash, site roads/tracks, and disturbance of stream/river beds.

Discharges

4. Water containing silt will not be pumped directly to any watercourse / drain / or ditch. All discharges to be made over open vegetated ground at a minimum 20m from nearest watercourse unless otherwise stated.
5. A 15m buffer zone (or greater) to be maintained around all sensitive watercourses and waterbodies. No excavated material is to be stored within any surface water buffer zone.
6. Pumped water will be directed into track side ditches and treated in settlement ponds and vegetation swales prior to overland discharge.
7. Pumping of clean water from excavations / or over-pumping in streams will be completed in a manner that does not cause scour or erosion at the point of discharge. This will be done by reducing the flow velocities or use of splash plates, and discharge controls.
8. Vegetation will NOT be stripped from existing ditches unless absolutely necessary.

Excavations

9. Where deep excavations are proposed cut-off drains will be use to reduce the amount of surface water entering the excavation. This will be the case around turbine base excavations.

Exposed Ground & Stockpiles

10. The amount of exposed ground and stockpiles open at any one time will be minimised as far as practicable.
11. Temporary stockpiles will be covered or sealed as soon as possible.
12. Silt fences will be used to reduce silty runoff from temporary peat storage areas, and/or bare peat areas as required.

Site Tracks

13. Use of track side swales with check dams, and/or filtration check dams will reduce silt in runoff water.
14. Check dams to be inspected and cleaned regularly.
15. Discharges from site tracks will be via outfall spillways, settlement ponds and vegetation swales.

Refueling

16. Refuel mobile plant in designated refueling area only, preferably on an impermeable surface and away from drains / ditches and watercourses / waterbodies.
17. Spill kits and drip trays should be available on site.

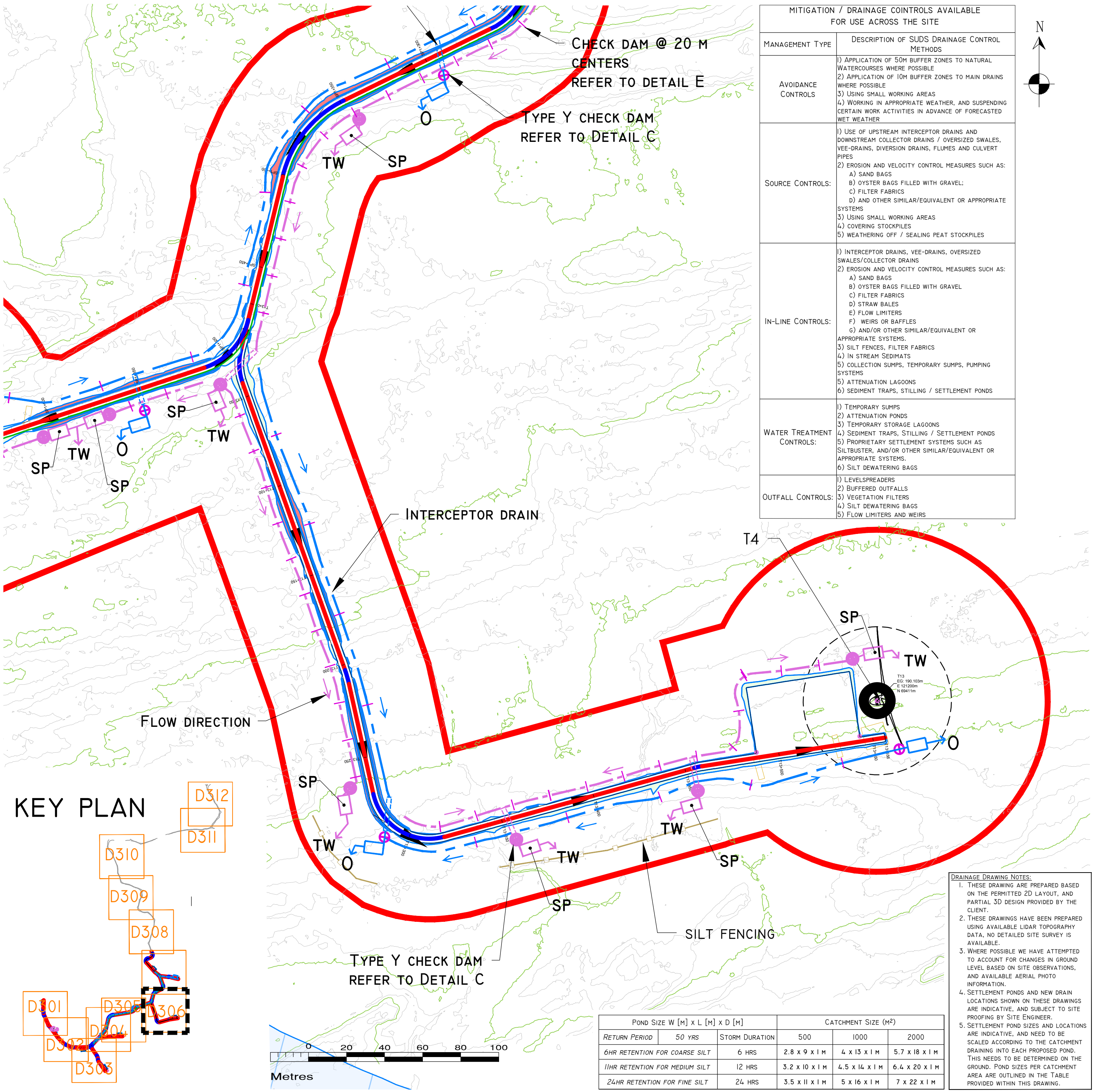
Concrete

18. Care will be taken when completing concrete works on site to ensure no discharges occur.
19. Concrete wash water, and waste concrete will be managed appropriately on site.

If water pollution is identified the following steps would be adhered to:

STOP - work in the immediate area should be stopped and the source of the pollution identified.

CONTAIN - the source of the pollution should be bunded using a suitable method. Natural watercourses should be temporarily diverted around the source of pollution.



MITIGATION / DRAINAGE COINTROLS AVAILABLE FOR USE ACROSS THE SITE

Management Type	Description of SUDS Drainage Control Methods
Avoidance Controls	1) Application of 50m buffer zones to natural Watercourses where possible 2) Application of 10m buffer zones to main drains where possible 3) Using small working areas 4) Working in appropriate weather, and suspending certain work activities in advance of forecasted wet weather
Source Controls:	1) Use of upstream interceptor drains and downstream collector drains / oversized swales, vee-drains, diversion drains, flumes and culvert pipes 2) erosion and velocity control measures such as: a) sand bags b) oyster bags filled with gravel; c) filter fabrics d) and other similar/equivalent or appropriate systems 3) Using small working areas 4) covering stockpiles 5) weathering off / sealing peat stockpiles
In-Line Controls:	1) Interceptor drains, vee-drains, oversized swales/collector drains 2) erosion and velocity control measures such as: a) sand bags b) oyster bags filled with gravel c) filter fabrics d) straw bales e) flow limiters f) weirs or baffles g) and/or other similar/equivalent or appropriate systems. 3) silt fences, filter fabrics 4) In stream Sedimats 5) collection sumps, temporary sumps, pumping systems 5) attenuation lagoons 6) sediment traps, stilling / settlement ponds
Water Treatment Controls:	1) Temporary sumps 2) attenuation ponds 3) Temporary storage lagoons 4) Sediment traps, Stilling / Settlement ponds 5) Proprietary settlement systems such as Siltbuster, and/or other similar/equivalent or appropriate systems. 6) Silt dewatering bags
Outfall Controls:	1) Levelspreaders 2) Buffered outfalls 3) Vegetation filters 4) Silt dewatering bags 5) Flow limiters and weirs

Pond Size W [m] x L [m] x D [m]			Catchment Size (m^2)		
Return Period	*50 yrs*	Storm Duration	500	1000	2000
6hr retention for coarse silt		6 hrs	2.8 x 9 x 1 m	4 x 13 x 1 m	5.7 x 18 x 1 m
11hr retention for medium silt		12 hrs	3.2 x 10 x 1 m	4.5 x 14 x 1 m	6.4 x 20 x 1 m
24hr retention for fine silt		24 hrs	3.5 x 11 x 1 m	5 x 16 x 1 m	7 x 22 x 1 m

Drainage Drawing Notes:

1. These drawing are prepared based on the permitted 2D layout, and partial 3D design provided by the client.
2. These drawings have been prepared using available LIDAR topography data, no detailed site survey is available.
3. Where possible we have attempted to account for changes in ground level based on site observations, and available aerial photo information.
4. Settlement ponds and new drain locations shown on these drawings are indicative, and subject to site proofing by Site Engineer.
5. Settlement pond sizes and locations are indicative, and need to be scaled according to the catchment draining into each proposed pond. This needs to be determined on the ground. Pond sizes per catchment area are outlined in the Table provided within this drawing.

N

Legend

Existing Drainage
- Rivers/Streams
- Rivers/Streams 50m buffer
- Existing drain
- Existing culvert
- Forest drain
- Land streams/drains

Proposed Drainage
- Upstream Interceptor Drain
- Swales/Downstream Collector Drain
- Direction of flow
- Settlement pond
- Cross drain
- Check Dam 'Type A'
- Check Dam 'Type B'
- Proposed culvert

- Silt fence
- Interceptor Ditches
- Direction of Flow
- Drainage swale - collector drain
- Stilling Pond (STP)
- Level spreader (LP)
- Planning boundary
- Cut area
- Fill area
- Rock outcrops (approx.)
- Farm access road
- Trenches
- Forest
- Existing ground surface intermediate contour (5 m interval)
- Existing ground surface minor contour (1 m interval)
- Turbine and swept area

Drawing Notes

1.
2. Do not scale off this drawing. Figured metric dimensions only should be taken off this drawing.

Date	Description	Chkd	Signed
14.01.19	Construction	MG	MG

Revisions

HYDRO ENVIRONMENTAL SERVICES
22 Lower Main St
Dungarvan
Co. Waterford
Ireland
tel: +353 (0) 58-44122
fax: +353 (0) 58-44244
email: info@hydroenvironmental.ie
web: www.hydroenvironmental.ie

Client: Cleanrath Windfarm Ltd.

Job: Cleanrath Wind Farm

Title: Drainage Plan

Figure No: D306

Drawing No: P1272-4-0619-A3-D306-00A	
Sheet Size: A3	Project No.: P1272-4
Scale: 1:2,000 (A3)	Drawn By: MG/GD
Date: 25/06/2019	Checked By: MG

Drainage Design Notes

1. All drainage subject to micro-siting and optimisation on site.
2. The locations of the interceptor drains, check dams, culverts, swales, stilling ponds and level spreaders are shown as indicative, and may be changed to suit the requirements of the local topography.
3. Supervising hydrologist or environmental clerk of works (environmental scientist) to oversee installation of drainage features following detailed drainage design.
4. Drainage measures to be installed prior to, or at the same time as the works areas they are intended to drain.
5. Design elevation of the water surface along the route of the interceptor drains or swales will not be lower then the design elevation of the water surface in the outlet at the level spreader or stilling pond.
6. The spacing and frequency of the check dams will be dependant on the gradient of the interceptor drain or swale in which they are being installed.
7. Check dam designs to be selected best to suit particular topography and hydrological environment.
8. Down gradient slope below level spreader onto which the water will dissipate to have a grade less the 6%.
9. No direct discharge or pumping to watercourses will be permitted. All discharges from level spreaders or stilling ponds to be via vegetated filters. Selection or suitable areas to use as
vegetation filters will be determined by the size of the contributing catchment, slope and ground conditions.
10. Stilling ponds to be sized according to the area they will be receiving water from.
11. Diversion of drainage ditches will only take place when alternative drainage ditch has been installed to handle the same water.
12. Existing drains/ditches to be incorporated or removed during wind farm construction.
13. All drainage system features to be subject of inspection and maintenance plan.
14. The layout shown is slightly offset for scale purposes, and all drainage would be installed as close to the road as possible, and within the planning boundary for the development.

Pollution Prevention Notes:

1. Site management proposals are intended to ensure complete protection against surface water and groundwater pollution, siltation and erosion.
2. Suitable drainage control measures should be in place at all times to prevent the conveyance of silts to receiving watercourses.
3. Silty water can arise from dewatering excavations, erosion of exposed/disturbed ground, stockpiles, plant and wheel wash, site roads/tracks, and disturbance of stream/river beds.

Discharges

4. Water containing silt will not be pumped directly to any watercourse / drain / or ditch. All discharges to be made over open vegetated ground at a minimum 20m from nearest watercourse unless otherwise stated.
5. A 15m buffer zone (or greater) to be maintained around all sensitive watercourses and waterbodies.
No excavated material is to be stored within any surface water buffer zone.
6. Pumped water will be directed into track side ditches and treated in settlement ponds and vegetation swales prior to overland discharge.
7. Pumping of clean water from excavations / or over-pumping in streams will be completed in a manner that does not cause scour or erosion at the point of discharge. This will be done by reducing the flow velocities or use of splash plates, and discharge controls.
8. Vegetation will NOT be stripped from existing ditches unless absolutely necessary.

Excavations

9. Where deep excavations are proposed cut-off drains will be use to reduce the amount of surface water entering the excavation. This will be the case around turbine base excavations.

Exposed Ground & Stockpiles

10. The amount of exposed ground and stockpiles open at any one time will be minimised as far as practicable.
11. Temporary stockpiles will be covered or sealed as soon as possible.
12. Silt fences will be used to reduce silty runoff from temporary peat storage areas, and/or bare peat areas as required.

Site Tracks

13. Use of track side swales with check dams, and/or filtration check dams will reduce silt in runoff water.
14. Check dams to be inspected and cleaned regularly.
15. Discharges from site tracks will be via outfall spillways, settlement ponds and vegetation swales.

Refueling

16. Refuel mobile plant in designated refueling area only, preferably on an impermeable surface and away from drains / ditches and watercourses / waterbodies.
17. Spill kits and drip trays should be available on site.

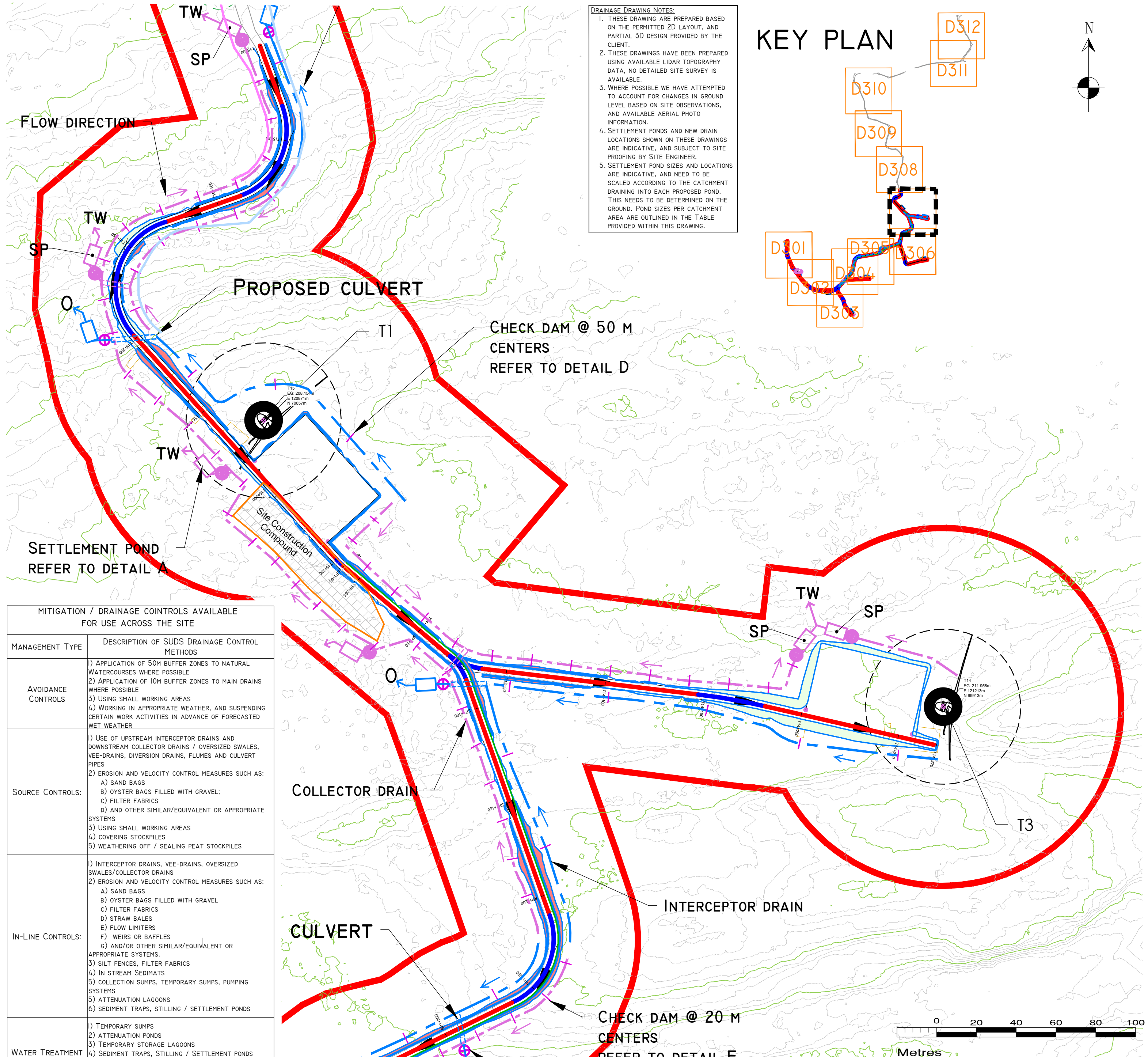
Concrete

18. Care will be taken when completing concrete works on site to ensure no discharges occur.
19. Concrete wash water, and waste concrete will be managed appropriately on site.

If water pollution is identified the following steps would be adhered to:

STOP - work in the immediate area should be stopped and the source of the pollution identified.

CONTAIN - the source of the pollution should be bunded using a suitable method. Natural watercourses should be temporarily diverted around the source of pollution.



Drainage Drawing Notes:

1. These drawing are prepared based on the permitted 2D layout, and partial 3D design provided by the client.
2. These drawings have been prepared using available lidar topography data, no detailed site survey is available.
3. Where possible we have attempted to account for changes in ground level based on site observations, and available aerial photo information.
4. Settlement ponds and new drain locations shown on these drawings are indicative, and subject to site proofing by Site Engineer.
5. Settlement pond sizes and locations are indicative, and need to be scaled according to the catchment draining into each proposed pond. This needs to be determined on the ground. Pond sizes per catchment area are outlined in the Table provided within this drawing.

Mitigation / drainage cointrols available for use across the site

Management Type	Description of SUDS Drainage Control Methods
Avoidance Controls	1) Application of 50m buffer zones to natural Watercourses where possible 2) Application of 10m buffer zones to main drains where possible 3) Using small working areas 4) Working in appropriate weather, and suspending certain work activities in advance of forecasted wet weather
Source Controls:	1) Use of upstream interceptor drains and downstream collector drains / oversized swales, vee-drains, diversion drains, flumes and culvert pipes 2) erosion and velocity control measures such as: a) sand bags b) oyster bags filled with gravel; c) filter fabrics d) and other similar/equivalent or appropriate systems 3) Using small working areas 4) covering stockpiles 5) weathering off / sealing peat stockpiles
In-Line Controls:	1) Interceptor drains, vee-drains, oversized swales/collector drains 2) erosion and velocity control measures such as: a) sand bags b) oyster bags filled with gravel c) filter fabrics d) straw bales e) flow limiters f) weirs or baffles g) and/or other similar/equivalent or appropriate systems. 3) silt fences, filter fabrics 4) In stream Sedimats 5) collection sumps, temporary sumps, pumping systems 5) attenuation lagoons 6) sediment traps, stilling / settlement ponds
Water Treatment Controls:	1) Temporary sumps 2) attenuation ponds 3) Temporary storage lagoons 4) Sediment traps, Stilling / Settlement ponds 5) Proprietary settlement systems such as Siltbuster, and/or other similar/equivalent or appropriate systems. 6) Silt dewatering bags
Outfall Controls:	1) Levelspreaders 2) Buffered outfalls 3) Vegetation filters 4) Silt dewatering bags 5) Flow limiters and weirs

Pond Size W [m] x L [m] x D [m]			Catchment Size (m^2)		
Return Period	50 yrs	Storm Duration	500	1000	2000
6hr retention for coarse silt		6 hrs	2.8 x 9 x 1 m	4 x 13 x 1 m	5.7 x 18 x 1 m
11hr retention for medium silt		12 hrs	3.2 x 10 x 1 m	4.5 x 14 x 1 m	6.4 x 20 x 1 m
24hr retention for fine silt		24 hrs	3.5 x 11 x 1 m	5 x 16 x 1 m	7 x 22 x 1 m

Legend

Existing Drainage:
- Rivers/streams
- Rivers/streams 50m buffer
- Existing drain
- Existing culvert
- Forest drain
- Land streams/drains

Proposed Drainage:
- Upstream Interceptor Drain
- Swales/Downstream Collector Drain
- Direction of flow
- Settlement pond
- Cross drain
- Check Dam 'Type A'
- Check Dam 'Type B'
- Proposed culvert

- Silt fence
- Interceptor ditches
- Direction of flow
- Drainage swale - collector drain
- Stilling Pond (STP)
- Level spreader (LP)
- Planning boundary
- Cut area
- Fill area
- Rock outcrops (approx.)
- Farm access road
- Trenches
- Forest
- Existing ground surface intermediate contour (5 m interval)
- Existing ground surface minor contour (1 m interval)
- Turbine and swept area

Drawing Notes

1. Copyright, all rights reserved. No part here with may be copied or reproduced partially or wholly in any form whatsoever without the prior notice of the copyright owner Hydro-Environmental Services.
2. Do not scale off this drawing. Figured metric dimensions only should be taken off this drawing.

Date	Description	Chkd	Signed
14.01.19	Construction	MG	MG

Revisions

HYDRO ENVIRONMENTAL SERVICES
22 Lower Main St
Dungarvan
Co. Waterford
Ireland
tel: +353 (0) 58-44122
fax: +353 (0) 58-44244
email: info@hydroenvironmental.ie
web: www.hydroenvironmental.ie

Client: Cleanrath Windfarm Ltd.

Job: Cleanrath Wind Farm

Title: Drainage Plan

Figure No: D307

Drawing No: P1272-4-0619-A3-D307-00A	
Sheet Size: A3	Project No.: P1272-4
Scale: 1:2,000 (A3)	Drawn By: MG/GD
Date: 25/06/2019	Checked By: MG

Drainage Design Notes

1. All drainage subject to micro-siting and optimisation on site.
2. The locations of the interceptor drains, check dams, culverts, swales, stilling ponds and level spreaders are shown as indicative, and may be changed to suit the requirements of the local topography.
3. Supervising hydrologist or environmental clerk of works (environmental scientist) to oversee installation of drainage features following detailed drainage design.
4. Drainage measures to be installed prior to, or at the same time as the works areas they are intended to drain.
5. Design elevation of the water surface along the route of the interceptor drains or swales will not be lower then the design elevation of the water surface in the outlet at the level spreader or stilling pond.
6. The spacing and frequency of the check dams will be dependant on the gradient of the interceptor drain or swale in which they are being installed.
7. Check dam designs to be selected best to suit particular topography and hydrological environment.
8. Down gradient slope below level spreader onto which the water will dissipate to have a grade less the 6%.
9. No direct discharge or pumping to watercourses will be permitted. All discharges from level spreaders or stilling ponds to be via vegetated filters. Selection or suitable areas to use as vegetation filters will be determined by the size of the contributing catchment, slope and ground conditions.
10. Stilling ponds to be sized according to the area they will be receiving water from.
11. Diversion of drainage ditches will only take place when alternative drainage ditch has been installed to handle the same water.
12. Existing drains/ditches to be incorporated or removed during wind farm construction.
13. All drainage system features to be subject of inspection and maintenance plan.
14. The layout shown is slightly offset for scale purposes, and all drainage would be installed as close to the road as possible, and within the planning boundary for the development.

Pollution Prevention Notes:

1. Site management proposals are intended to ensure complete protection against surface water and groundwater pollution, siltation and erosion.
2. Suitable drainage control measures should be in place at all times to prevent the conveyance of silts to receiving watercourses.
3. Silty water can arise from dewatering excavations, erosion of exposed/disturbed ground, stockpiles, plant and wheel wash, site roads/tracks, and disturbance of stream/river beds.

Discharges

4. Water containing silt will not be pumped directly to any watercourse / drain / or ditch. All discharges to be made over open vegetated ground at a minimum 20m from nearest watercourse unless otherwise stated.
5. A 15m buffer zone (or greater) to be maintained around all sensitive watercourses and waterbodies.
No excavated material is to be stored within any surface water buffer zone.
6. Pumped water will be directed into track side ditches and treated in settlement ponds and vegetation swales prior to overland discharge.
7. Pumping of clean water from excavations / or over-pumping in streams will be completed in a manner that does not cause scour or erosion at the point of discharge. This will be done by reducing the flow velocities or use of splash plates, and discharge controls.
8. Vegetation will NOT be stripped from existing ditches unless absolutely necessary.

Excavations

9. Where deep excavations are proposed cut-off drains will be use to reduce the amount of surface water entering the excavations. This will be the case around turbine base excavations.

Exposed Ground & Stockpiles

10. The amount of exposed ground and stockpiles open at any one time will be minimised as far as practicable.
11. Temporary stockpiles will be covered or sealed as soon as possible.
12. Silt fences will be used to reduce silty runoff from temporary peat storage areas, and/or bare peat areas as required.

Site Tracks

13. Use of track side swales with check dams, and/or filtration check dams will reduce silt in runoff water.
14. Check dams to be inspected and cleaned regularly.
15. Discharges from site tracks will be via outfall spillways, settlement ponds and vegetation swales.

Refueling

16. Refuel mobile plant in designated refueling area only, preferably on an impermeable surface and away from drains / ditches and watercourses / waterbodies.
17. Spill kits and drip trays should be available on site.

Concrete

18. Care will be taken when completing concrete works on site to ensure no discharges occur.
19. Concrete wash water, and waste concrete will be managed appropriately on site.

If water pollution is identified the following steps would be adhered to:

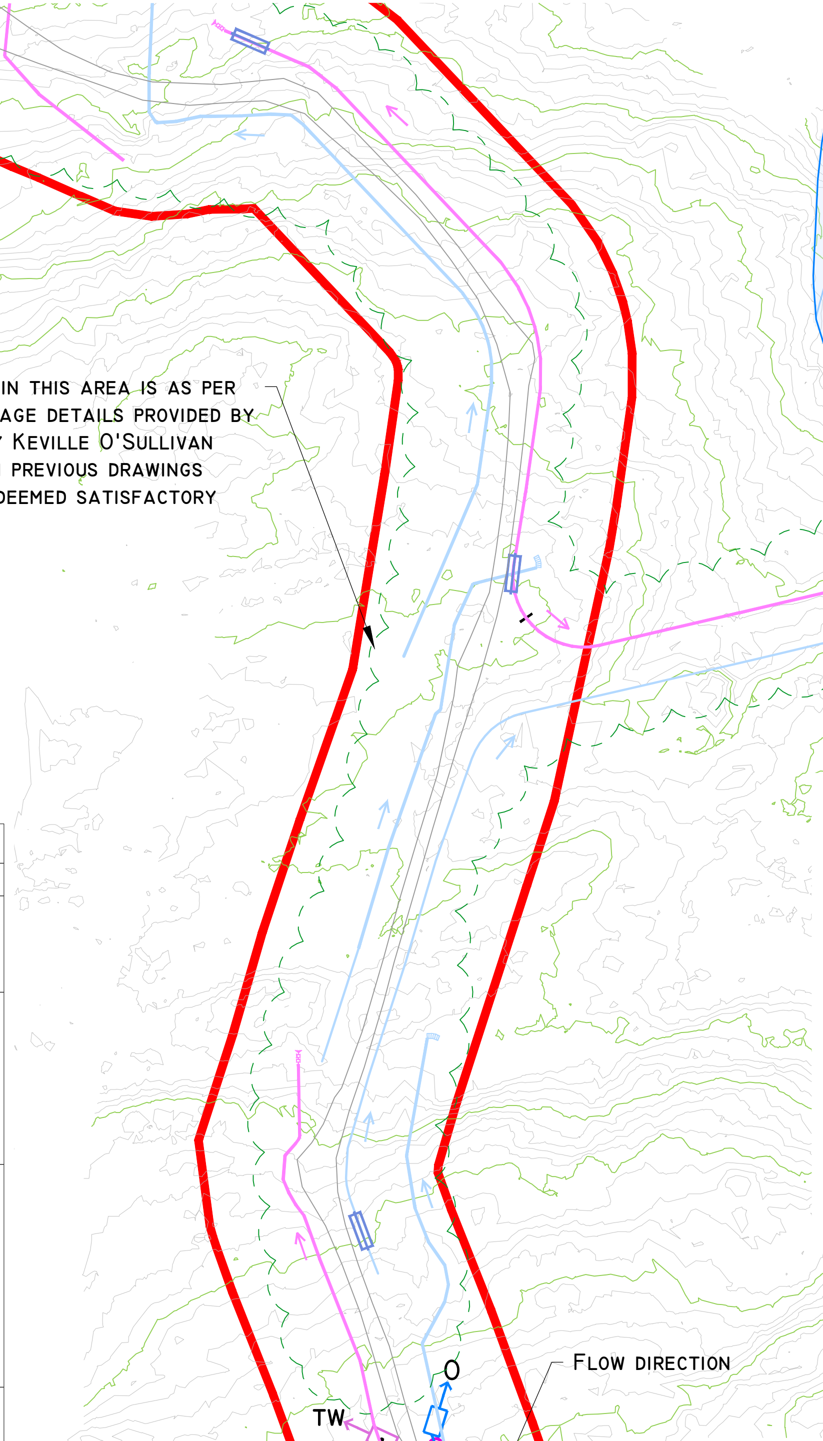
STOP - work in the immediate area should be stopped and the source of the pollution identified.

CONTAIN - the source of the pollution should be bunded using a suitable method. Natural watercourses should be temporarily diverted around the source of pollution.

Drainage Drawing Notes:

1. These drawing are prepared based on the permitted 2D layout, and partial 3D design provided by the client.
2. These drawings have been prepared using available LiDAR topography data, no detailed site survey is available.
3. Where possible we have attempted to account for changes in ground level based on site observations, and available aerial photo information.
4. Settlement ponds and new drain locations shown on these drawings are indicative, and subject to site proofing by Site Engineer.
5. Settlement pond sizes and locations are indicative, and need to be scaled according to the catchment draining into each proposed pond. This needs to be determined on the ground. Pond sizes per catchment area are outlined in the Table provided within this drawing.

Mitigation / Drainage Controls Available for use across the site	
Management Type	Description of SUDS Drainage Control Methods
Avoidance Controls	1) Application of 50m buffer zones to natural watercourses where possible 2) Application of 10m buffer zones to main drains where possible 3) Using small working areas 4) Working in appropriate weather, and suspending certain work activities in advance of forecasted wet weather
Source Controls:	1) Use of upstream interceptor drains and downstream collector drains / oversized swales, vee-drains, diversion drains, flumes and culvert pipes 2) Erosion and velocity control measures such as: a) sand bags b) oyster bags filled with gravel; c) filter fabrics d) and other similar/equivalent or appropriate systems 3) Using small working areas 4) covering stockpiles 5) weathering off / sealing peat stockpiles
In-Line Controls:	1) Interceptor drains, vee-drains, oversized swales/collector drains 2) Erosion and velocity control measures such as: a) sand bags b) oyster bags filled with gravel c) filter fabrics d) straw bales e) flow limiters f) weirs or baffles g) and/or other similar/equivalent or appropriate systems. 3) silt fences, filter fabrics 4) In stream sedimats 5) collection sumps, temporary sumps, pumping systems 5) attenuation lagoons 6) sediment traps, stilling / settlement ponds
Water Treatment Controls:	1) Temporary sumps 2) attenuation ponds 3) temporary storage lagoons 4) sediment traps, stilling / settlement ponds 5) proprietary settlement systems such as Siltbuster, and/or other similar/equivalent or appropriate systems. 6) silt dewatering bags
Outfall Controls:	1) Levelspreaders 2) Buffered outfalls 3) Vegetation filters 4) Silt dewatering bags 5) Flow limiters and weirs



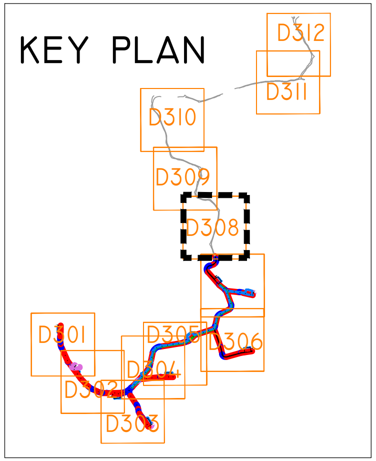
Legend

Existing Drainage
- Rivers/Streams
- Rivers/Streams 50m buffer
- Existing drain
- Existing culvert
- Forest drain
- Land streams/drains

Proposed Drainage
- Upstream Interceptor Drain
- Swales/Downstream Collector Drain
- Direction of flow
- Settlement pond
- Cross drain
- Check Dam 'Type A'
- Check Dam 'Type B'
- Proposed culvert
- Silt fence
- Interceptor Ditches
- Direction of Flow
- Drainage swale - collector drain
- Stilling Pond (STP)
- Level Spreader (LP)

- Planning boundary
- Cut area
- Fill area
- Rock outcrops (approx.)
- Farm access road
- Trenches
- Forest
- Existing ground surface intermediate contour (5 m interval)
- Existing ground surface minor contour (1 m interval)
- Turbine and swept area

KEY PLAN



Drawing Notes

1.
2. Do not scale off this drawing. Figured metric dimensions only should be taken off this drawing.

Pond Size W [m] x L [m] x D [m]			Catchment Size (m²)		
Return Period	50 yrs	Storm Duration	500	1000	2000
6hr retention for coarse silt		6 hrs	2.8 x 9 x 1 m	4 x 13 x 1 m	5.7 x 18 x 1 m
11hr retention for medium silt		12 hrs	3.2 x 10 x 1 m	4.5 x 14 x 1 m	6.4 x 20 x 1 m
24hr retention for fine silt		24 hrs	3.5 x 11 x 1 m	5 x 16 x 1 m	7 x 22 x 1 m

Date	Description	Chkd	Signed
14.01.19	Construction	MG	MG

Revisions

HYDRO ENVIRONMENTAL SERVICES
22 Lower Main St
Dungarvan
Co. Waterford
Ireland
tel: +353 (0) 58-44122
tel: +353 (0) 58-44244
email: info@hydroenvironmental.ie
web: www.hydroenvironmental.ie

Client: Cleanrath Windfarm Ltd.

Job: Cleanrath Wind Farm

Title: Drainage Plan

Figure No: D308

Drawing No: P1272-4-0619-A3-D308-00A	
Sheet Size: A3	Project No.: P1272-4
Scale: 1:2,000 (A3)	Drawn By: MG/GD
Date: 25/06/2019	Checked By: MG

Drainage Design Notes

1. All drainage subject to micro-siting and optimisation on site.
2. The locations of the interceptor drains, check dams, culverts, swales, stilling ponds and level spreaders are shown as indicative, and may be changed to suit the requirements of the local topography.
3. Supervising hydrologist or environmental clerk of works (environmental scientist) to oversee installation of drainage features following detailed drainage design.
4. Drainage measures to be installed prior to, or at the same time as the works areas they are intended to drain.
5. Design elevation of the water surface along the route of the interceptor drains or swales will not be lower then the design elevation of the water surface in the outlet at the level spreader or stilling pond.
6. The spacing and frequency of the check dams will be dependant on the gradient of the interceptor drain or swale in which they are being installed.
7. Check dam designs to be selected best to suit particular topography and hydrological environment.
8. Down gradient slope below level spreader onto which the water will dissipate to have a grade less the 6%.
9. No direct discharge or pumping to watercourses will be permitted. All discharges from level spreaders or stilling ponds to be via vegetated filters. Selection or suitable areas to use as
vegetation filters will be determined by the size of the contributing catchment, slope and ground conditions.
10. Stilling ponds to be sized according to the area they will be receiving water from.
11. Diversion of drainage ditches will only take place when alternative drainage ditch has been installed to handle the same water.
12. Existing drains/ditches to be incorporated or removed during wind farm construction.
13. All drainage system features to be subject of inspection and maintenance plan.
14. The layout shown is slightly offset for scale purposes, and all drainage would be installed as close to the road as possible, and within the planning boundary for the development.

Pollution Prevention Notes:

1. Site management proposals are intended to ensure complete protection against surface water and groundwater pollution, siltation and erosion.
2. Suitable drainage control measures should be in place at all times to prevent the conveyance of silts to receiving watercourses.
3. Silty water can arise from dewatering excavations, erosion of exposed/disturbed ground, stockpiles, plant and wheel wash, site roads/tracks, and disturbance of stream/river beds.

Discharges

4. Water containing silt will not be pumped directly to any watercourse / drain / or ditch. All discharges to be made over open vegetated ground at a minimum 20m from nearest watercourse unless otherwise stated.
5. A 15m buffer zone (or greater) to be maintained around all sensitive watercourses and waterbodies.
No excavated material is to be stored within any surface water buffer zone.
6. Pumped water will be directed into track side ditches and treated in settlement ponds and vegetation swales prior to overland discharge.
7. Pumping of clean water from excavations / or over-pumping in streams will be completed in a manner that does not cause scour or erosion at the point of discharge. This will be done by reducing the flow velocities or use of splash plates, and discharge controls.
8. Vegetation will NOT be stripped from existing ditches unless absolutely necessary.

Excavations

9. Where deep excavations are proposed cut-off drains will be use to reduce the amount of surface water entering the excavation. This will be the case around turbine base excavations.

Exposed Ground & Stockpiles

10. The amount of exposed ground and stockpiles open at any one time will be minimised as far as practicable.
11. Temporary stockpiles will be covered or sealed as soon as possible.
12. Silt fences will be used to reduce silty runoff from temporary peat storage areas, and/or bare peat areas as required.

Site Tracks

13. Use of track side swales with check dams, and/or filtration check dams will reduce silt in runoff water.
14. Check dams to be inspected and cleaned regularly.
15. Discharges from site tracks will be via outfall spillways, settlement ponds and vegetation swales.

Refueling

16. Refuel mobile plant in designated refueling area only, preferably on an impermeable surface and away from drains / ditches and watercourses / waterbodies.
17. Spill kits and drip trays should be available on site.

Concrete

18. Care will be taken when completing concrete works on site to ensure no discharges occur.
19. Concrete wash water, and waste concrete will be managed appropriately on site.

If water pollution is identified the following steps would be adhered to:

STOP - work in the immediate area should be stopped and the source of the pollution identified.

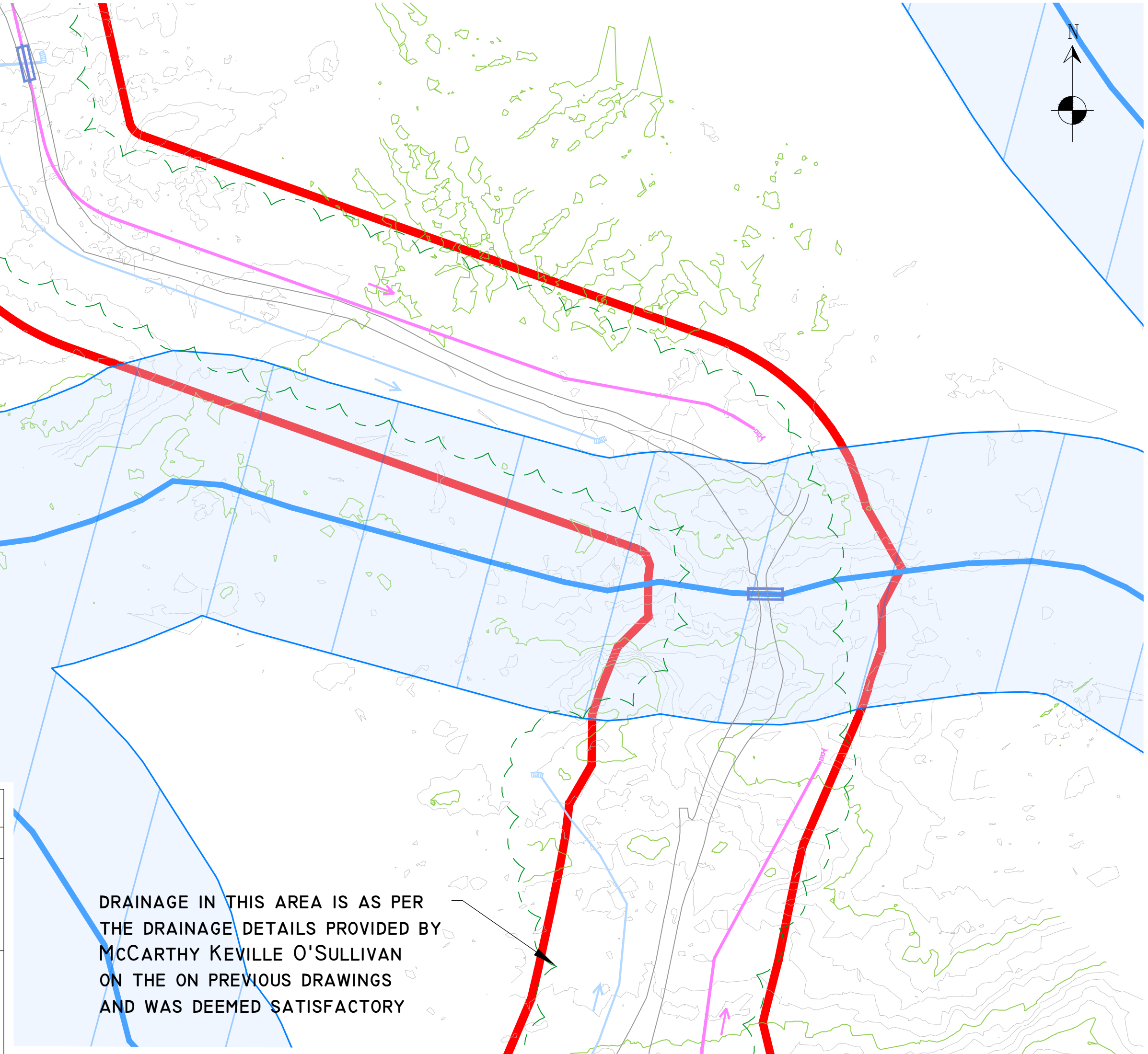
CONTAIN - the source of the pollution should be bunded using a suitable method. Natural watercourses should be temporarily diverted around the source of pollution.

Drainage Drawing Notes:

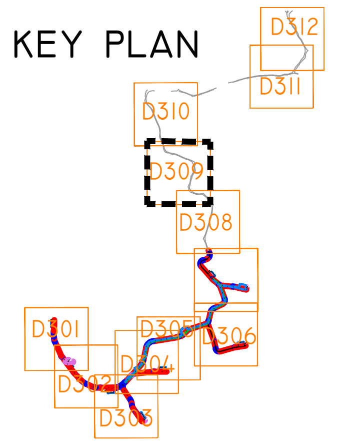
1. These drawing are prepared based on the permitted 2D layout, and partial 3D design provided by the client.
2. These drawings have been prepared using available LIDAR topography data, no detailed site survey is available.
3. Where possible we have attempted to account for changes in ground level based on site observations, and available aerial photo information.
4. Settlement ponds and new drain locations shown on these drawings are indicative, and subject to site proofing by Site Engineer.
5. Settlement pond sizes and locations are indicative, and need to be scaled according to the catchment draining into each proposed pond. This needs to be determined on the ground. Pond sizes per catchment area are outlined in the Table provided within this drawing.

Mitigation / Drainage Cointrols Available for Use Across the Site

Management Type	Description of SUDS Drainage Control Methods
Avoidance Controls	1) Application of 50m buffer zones to natural watercourses where possible 2) Application of 10m buffer zones to main drains where possible 3) Using small working areas 4) Working in appropriate weather, and suspending certain work activities in advance of forecasted wet weather
Source Controls:	1) Use of upstream interceptor drains and downstream collector drains / oversized swales, vee-drains, diversion drains, flumes and culvert pipes 2) Erosion and velocity control measures such as: A) sand bags B) oyster bags filled with gravel; C) filter fabrics D) and other similar/equivalent or appropriate systems 3) Using small working areas 4) covering stockpiles 5) weathering off / sealing peat stockpiles
In-Line Controls:	1) Interceptor drains, vee-drains, oversized swales/collector drains 2) Erosion and velocity control measures such as: A) sand bags B) oyster bags filled with gravel C) filter fabrics D) straw bales E) flow limiters F) weirs or baffles G) and/or other similar/equivalent or appropriate systems. 3) Silt fences, filter fabrics 4) In stream sedimats 5) collection sumps, temporary sumps, pumping systems 5) attenuation lagoons 6) sediment traps, stilling / settlement ponds
Water Treatment Controls:	1) Temporary sumps 2) attenuation ponds 3) Temporary storage lagoons 4) Sediment traps, stilling / settlement ponds 5) Proprietary settlement systems such as Siltbuster, and/or other similar/equivalent or appropriate systems. 6) Silt dewatering bags
Outfall Controls:	1) Levelspreaders 2) Buffered outfalls 3) Vegetation filters 4) Silt dewatering bags 5) Flow limiters and weirs



Key Plan



0 20 40 60 80 100
Metres

Pond Size W [m] x L [m] x D [m]			Catchment Size (m²)		
Return Period	50 yrs	Storm Duration	500	1000	2000
6hr retention for coarse silt		6 hrs	2.8 x 9 x 1 m	4 x 13 x 1 m	5.7 x 18 x 1 m
11hr retention for medium silt		12 hrs	3.2 x 10 x 1 m	4.5 x 14 x 1 m	6.4 x 20 x 1 m
24hr retention for fine silt		24 hrs	3.5 x 11 x 1 m	5 x 16 x 1 m	7 x 22 x 1 m

Legend

Existing Drainage
- Rivers/Streams
- Rivers/Streams 50m Buffer
- Existing Drain
- Existing Culvert
- Forest Drain
- Land Streams/Drains

Proposed Drainage
- Upstream Interceptor Drain
- Swales/Downstream Collector Drain
- Direction of Flow
- Settlement Pond
- Cross Drain
- Check Dam 'Type A'
- Check Dam 'Type B'
- Proposed Culvert

- Silt Fence
- Interceptor Ditches
- Direction of Flow
- Drainage Swale - Collector Drain
- Stilling Pond (STP)
- Level Spreader (LP)
- Planning Boundary
- Cut Area
- Fill Area
- Rock Outcrops (approx.)
- Farm Access Road
- Trenches
- Forest
- Existing Ground Surface Intermediate Contour (5 m interval)
- Existing Ground Surface Minor Contour (1 m interval)
- Turbine and Swept Area

Drawing Notes

2. Do not scale off this drawing. Figured metric dimensions only should be taken off this drawing.

Date	Description	Chkd	Signed
14.01.19	Construction	MG	MG

Revisions

Hydro Environmental Services
22 Lower Main St
Dungarvan
Co. Waterford
Ireland
tel: +353 (0) 58-44122
tel: +353 (0) 58-44244
email: info@hydroenvironmental.ie
web: www.hydroenvironmental.ie

Client: Cleanrath Windfarm Ltd.

Job: Cleanrath Wind Farm

Title: Drainage Plan

Figure No: D309

Drawing No: P1272-4-0619-A3-D309-00A	
Sheet Size: A3	Project No.: P1272-4
Scale: 1:2,000 (A3)	Drawn By: MG/GD
Date: 25/06/2019	Checked By: MG

Drainage Design Notes

1. All drainage subject to micro-siting and optimisation on site.
2. The locations of the interceptor drains, check dams, culverts, swales, stilling ponds and level spreaders are shown as indicative, and may be changed to suit the requirements of the local topography.
3. Supervising hydrologist or environmental clerk of works (environmental scientist) to oversee installation of drainage features following detailed drainage design.
4. Drainage measures to be installed prior to, or at the same time as the works areas they are intended to drain.
5. Design elevation of the water surface along the route of the interceptor drains or swales will not be lower then the design elevation of the water surface in the outlet at the level spreader or stilling pond.
6. The spacing and frequency of the check dams will be dependant on the gradient of the interceptor drain or swale in which they are being installed.
7. Check dam designs to be selected best to suit particular topography and hydrological environment.
8. Down gradient slope below level spreader onto which the water will dissipate to have a grade less the 6%.
9. No direct discharge or pumping to watercourses will be permitted. All discharges from level spreaders or stilling ponds to be via vegetated filters. Selection or suitable areas to use as
vegetation filters will be determined by the size of the contributing catchment, slope and ground conditions.
10. Stilling ponds to be sized according to the area they will be receiving water from.
11. Diversion of drainage ditches will only take place when alternative drainage ditch has been installed to handle the same water.
12. Existing drains/ditches to be incorporated or removed during wind farm construction.
13. All drainage system features to be subject of inspection and maintenance plan.
14. The layout shown is slightly offset for scale purposes, and all drainage would be installed as close to the road as possible, and within the planning boundary for the development.

POLLUTION PREVENTION NOTES:

1. Site management proposals are intended to ensure complete protection against surface water and groundwater pollution, siltation and erosion.
2. Suitable drainage control measures should be in place at all times to prevent the conveyance of silts to receiving watercourses.
3. Silty water can arise from dewatering excavations, erosion of exposed/disturbed ground, stockpiles, plant and wheel wash, site roads/tracks, and disturbance of stream/river beds.

Discharges

4. Water containing silt will not be pumped directly to any watercourse / drain / or ditch. All discharges to be made over open vegetated ground at a minimum 20m from nearest watercourse unless otherwise stated.
5. A 15m buffer zone (or greater) to be maintained around all sensitive watercourses and waterbodies.
No excavated material is to be stored within any surface water buffer zone.
6. Pumped water will be directed into track side ditches and treated in settlement ponds and vegetation swales prior to overland discharge.
7. Pumping of clean water from excavations / or over-pumping in streams will be completed in a manner that does not cause scour or erosion at the point of discharge. This will be done by reducing the flow velocities or use of splash plates, and discharge controls.
8. Vegetation will NOT be stripped from existing ditches unless absolutely necessary.

Excavations

9. Where deep excavations are proposed cut-off drains will be use to reduce the amount of surface water entering the excavation. This will be the case around turbine base excavations.

Exposed Ground & Stockpiles

10. The amount of exposed ground and stockpiles open at any one time will be minimised as far as practicable.
11. Temporary stockpiles will be covered or sealed as soon as possible.
12. Silt fences will be used to reduce silty runoff from temporary peat storage areas, and/or bare peat areas as required.

Site tracks

13. Use of track side swales with check dams, and/or filtration check dams will reduce silt in runoff water.
14. Check dams to be inspected and cleaned regularly.
15. Discharges from site tracks will be via outfall spillways, settlement ponds and vegetation swales.

Refueling

16. Refuel mobile plant in designated refueling area only, preferably on an impermeable surface and away from drains / ditches and watercourses / waterbodies.
17. Spill kits and drip trays should be available on site.

Concrete

18. Care will be taken when completing concrete works on site to ensure no discharges occur.
19. Concrete wash water, and waste concrete will be managed appropriately on site.

If water pollution is identified the following steps would be adhered to:

STOP - work in the immediate area should be stopped and the source of the pollution identified.

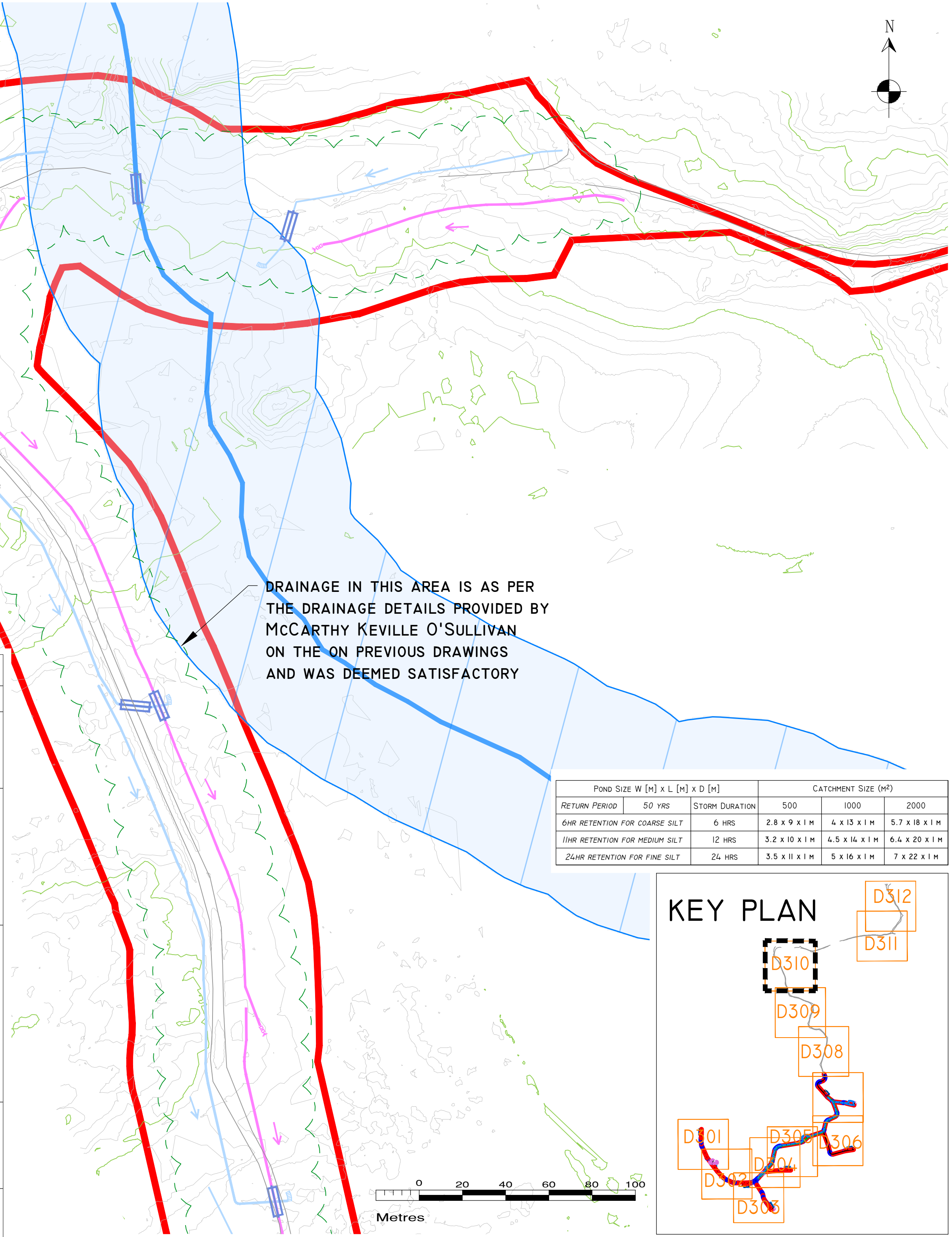
CONTAIN - the source of the pollution should be bunded using a suitable method. Natural watercourses should be temporarily diverted around the source of pollution.

Drainage Drawing Notes:

1. These drawing are prepared based on the permitted 2D layout, and partial 3D design provided by the client.
2. These drawings have been prepared using available LIDAR topography data, no detailed site survey is available.
3. Where possible we have attempted to account for changes in ground level based on site observations, and available aerial photo information.
4. Settlement ponds and new drain locations shown on these drawings are indicative, and subject to site proofing by Site Engineer.
5. Settlement pond sizes and locations are indicative, and need to be scaled according to the catchment draining into each proposed pond. This needs to be determined on the ground. Pond sizes per catchment area are outlined in the Table provided within this drawing.

MITIGATION / DRAINAGE COINTROLS AVAILABLE FOR USE ACROSS THE SITE

Management Type	Description of SUDS Drainage Control Methods
Avoidance Controls	1) Application of 50m buffer zones to natural Watercourses where possible 2) Application of 10m buffer zones to main drains where possible 3) Using small working areas 4) Working in appropriate weather, and suspending certain work activities in advance of forecasted wet weather
Source Controls:	1) Use of upstream interceptor drains and downstream collector drains / oversized swales, vee-drains, diversion drains, flumes and culvert pipes 2) erosion and velocity control measures such as: A) sand bags B) oyster bags filled with gravel; C) filter fabrics D) and other similar/equivalent or appropriate systems 3) Using small working areas 4) covering stockpiles 5) weathering off / sealing peat stockpiles
In-Line Controls:	1) Interceptor drains, vee-drains, oversized swales/collector drains 2) erosion and velocity control measures such as: A) sand bags B) oyster bags filled with gravel C) filter fabrics D) straw bales E) flow limiters F) weirs or baffles G) and/or other similar/equivalent or appropriate systems. 3) silt fences, filter fabrics 4) In stream Sedimats 5) collection sumps, temporary sumps, pumping systems 5) attenuation lagoons 6) sediment traps, stilling / settlement ponds
Water Treatment Controls:	1) Temporary sumps 2) attenuation ponds 3) Temporary storage lagoons 4) Sediment traps, Stilling / Settlement ponds 5) Proprietary settlement systems such as Siltbuster, and/or other similar/equivalent or appropriate systems. 6) Silt dewatering bags
Outfall Controls:	1) Levelspreaders 2) Buffered outfalls 3) Vegetation filters 4) Silt dewatering bags 5) Flow limiters and weirs



Pond Size W [m] x L [m] x D [m]			Catchment Size (m²)		
Return Period	50 yrs	Storm Duration	500	1000	2000
6hr retention for coarse silt		6 hrs	2.8 x 9 x 1 m	4 x 13 x 1 m	5.7 x 18 x 1 m
11hr retention for medium silt		12 hrs	3.2 x 10 x 1 m	4.5 x 14 x 1 m	6.4 x 20 x 1 m
24hr retention for fine silt		24 hrs	3.5 x 11 x 1 m	5 x 16 x 1 m	7 x 22 x 1 m

Legend

Existing Drainage:
- Rivers/streams
- Rivers/streams 50m buffer
- Existing drain
- Existing culvert
- Forest drain
- Land streams/drains

Proposed Drainage:
- Upstream Interceptor Drain
- Swales/Downstream Collector Drain
- Direction of flow
- Settlement pond
- Cross drain
- Check Dam 'type A'
- Check Dam 'type B'
- Proposed culvert
- Silt fence

- Interceptor Ditches
- Direction of Flow
- Drainage swale - collector drain
- Stilling Pond (STP)
- Level spreader (LP)
- Planning boundary
- Cut area
- Fill area
- Rock outcrops (approx.)
- Farm access road
- Trenches
- Forest
- Existing ground surface intermediate contour (5 m interval)
- Existing ground surface minor contour (1 m interval)
- Turbine and swept area

Drawing Notes

2. Do not scale off this drawing. Figured metric dimensions only should be taken off this drawing.

Date	Description	Chkd	Signed
14.01.19	Construction	MG	MG

Revisions

HYDRO ENVIRONMENTAL SERVICES
22 Lower Main St
Dungarvan
Co. Waterford
Ireland
tel: +353 (0) 58-44122
tel: +353 (0) 58-44244
email: info@hydroenvironmental.ie
web: www.hydroenvironmental.ie

Client: Cleanrath Windfarm Ltd.

Job: Cleanrath Wind Farm

Title: Drainage Plan

Figure No: D310

Drawing No: P1272-4-0619-A3-D310-00A	
Sheet Size: A3	Project No.: P1272-4
Scale: 1:2,000 (A3)	Drawn By: MG/GD
Date: 25/06/2019	Checked By: MG

Drainage Design Notes

1. All drainage subject to micro-siting and optimisation on site.
2. The locations of the interceptor drains, check dams, culverts, swales, stilling ponds and level spreaders are shown as indicative, and may be changed to suit the requirements of the local topography.
3. Supervising hydrologist or environmental clerk of works (environmental scientist) to oversee installation of drainage features following detailed drainage design.
4. Drainage measures to be installed prior to, or at the same time as the works areas they are intended to drain.
5. Design elevation of the water surface along the route of the interceptor drains or swales will not be lower then the design elevation of the water surface in the outlet at the level spreader or stilling pond.
6. The spacing and frequency of the check dams will be dependant on the gradient of the interceptor drain or swale in which they are being installed.
7. Check dam designs to be selected best to suit particular topography and hydrological environment.
8. Down gradient slope below level spreader onto which the water will dissipate to have a grade less the 6%.
9. No direct discharge or pumping to watercourses will be permitted. All discharges from level spreaders or stilling ponds to be via vegetated filters. Selection or suitable areas to use as vegetation filters will be determined by the size of the contributing catchment, slope and ground conditions.
10. Stilling ponds to be sized according to the area they will be receiving water from.
11. Diversion of drainage ditches will only take place when alternative drainage ditch has been installed to handle the same water.
12. Existing drains/ditches to be incorporated or removed during wind farm construction.
13. All drainage system features to be subject of inspection and maintenance plan.
14. The layout shown is slightly offset for scale purposes, and all drainage would be installed as close to the road as possible, and within the planning boundary for the development.

Pond Size W [m] x L [m] x D [m]			Catchment Size (m²)		
Return Period	50 yrs	Storm Duration	500	1000	2000
6hr retention for coarse silt		6 hrs	2.8 x 9 x 1 m	4 x 13 x 1 m	5.7 x 18 x 1 m
11hr retention for medium silt		12 hrs	3.2 x 10 x 1 m	4.5 x 14 x 1 m	6.4 x 20 x 1 m
24hr retention for fine silt		24 hrs	3.5 x 11 x 1 m	5 x 16 x 1 m	7 x 22 x 1 m

Pollution Prevention Notes:

1. Site management proposals are intended to ensure complete protection against surface water and groundwater pollution, siltation and erosion.
2. Suitable drainage control measures should be in place at all times to prevent the conveyance of silts to receiving watercourses.
3. Silty water can arise from dewatering excavations, erosion of exposed/disturbed ground, stockpiles, plant and wheel wash, site roads/tracks, and disturbance of stream/river beds.

Discharges

4. Water containing silt will not be pumped directly to any watercourse / drain / or ditch. All discharges to be made over open vegetated ground at a minimum 20m from nearest watercourse unless otherwise stated.
5. A 15m buffer zone (or greater) to be maintained around all sensitive watercourses and waterbodies. No excavated material is to be stored within any surface water buffer zone.
6. Pumped water will be directed into track side ditches and treated in settlement ponds and vegetation swales prior to overland discharge.
7. Pumping of clean water from excavations / or over-pumping in streams will be completed in a manner that does not cause scour or erosion at the point of discharge. This will be done by reducing the flow velocities or use of splash plates, and discharge controls.
8. Vegetation will NOT be stripped from existing ditches unless absolutely necessary.

Excavations

9. Where deep excavations are proposed cut-off drains will be use to reduce the amount of surface water entering the excavation. This will be the case around turbine base excavations.

Exposed Ground & Stockpiles

10. The amount of exposed ground and stockpiles open at any one time will be minimised as far as practicable.
11. Temporary stockpiles will be covered or sealed as soon as possible.
12. Silt fences will be used to reduce silty runoff from temporary peat storage areas, and/or bare peat areas as required.

Site Tracks

13. Use of track side swales with check dams, and/or filtration check dams will reduce silt in runoff water.
14. Check dams to be inspected and cleaned regularly.
15. Discharges from site tracks will be via outfall spillways, settlement ponds and vegetation swales.

Refueling

16. Refuel mobile plant in designated refueling area only, preferably on an impermeable surface and away from drains / ditches and watercourses / waterbodies.
17. Spill kits and drip trays should be available on site.

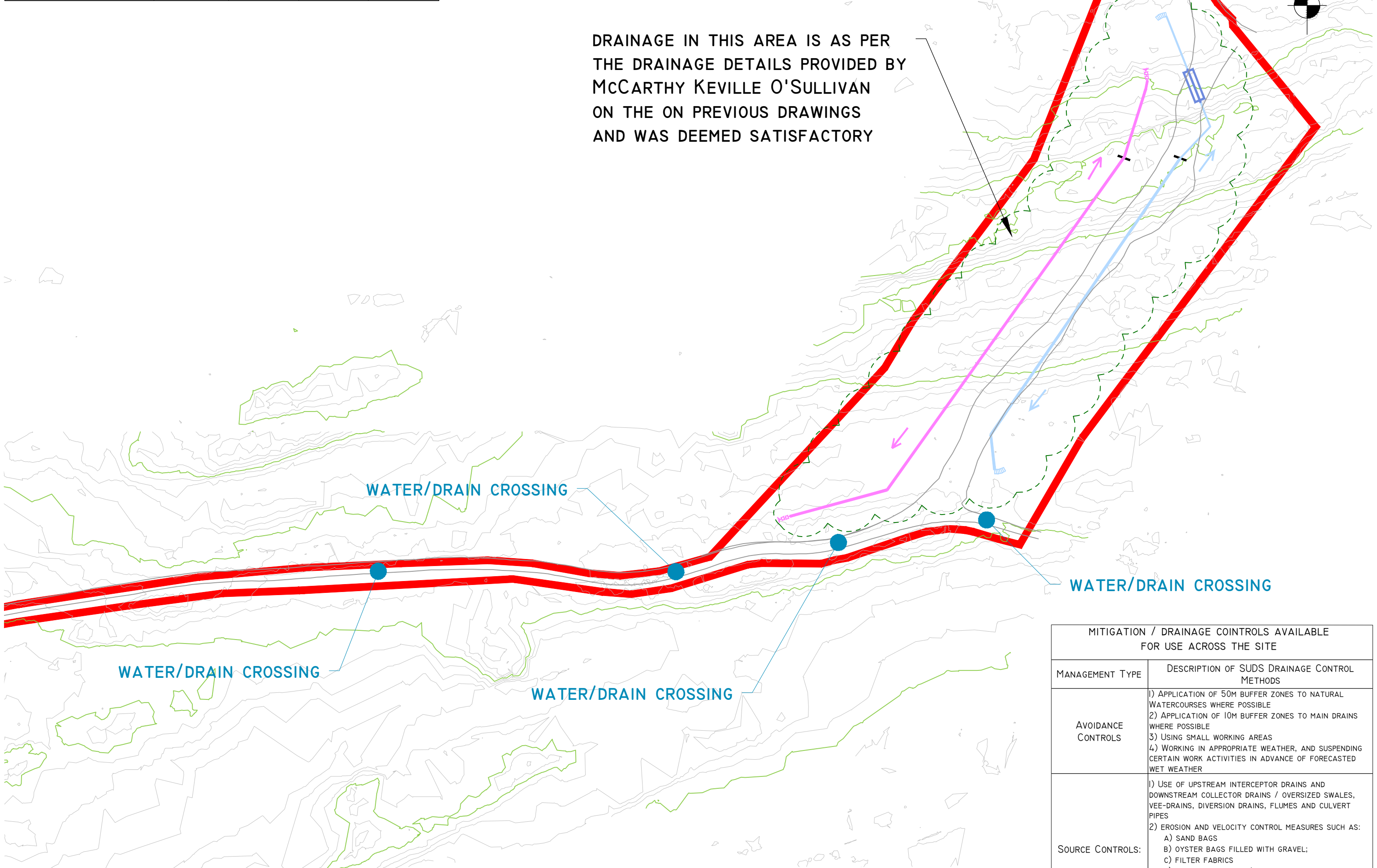
Concrete

18. Care will be taken when completing concrete works on site to ensure no discharges occur.
19. Concrete wash water, and waste concrete will be managed appropriately on site.

If water pollution is identified the following steps would be adhered to:

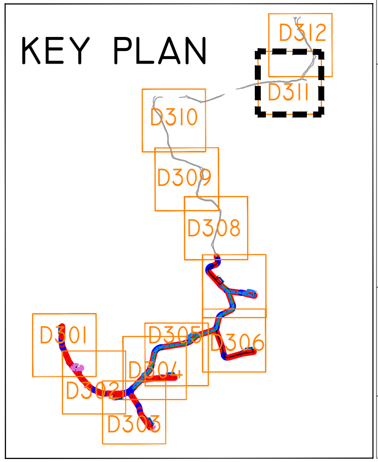
STOP - work in the immediate area should be stopped and the source of the pollution identified.

CONTAIN - the source of the pollution should be bunded using a suitable method. Natural watercourses should be temporarily diverted around the source of pollution.



0 20 40 60 80 100

Metres



Drainage Drawing Notes:

1. These drawing are prepared based on the permitted 2D layout, and partial 3D design provided by the client.
2. These drawings have been prepared using available LIDAR topography data, no detailed site survey is available.
3. Where possible we have attempted to account for changes in ground level based on site observations, and available aerial photo information.
4. Settlement ponds and new drain locations shown on these drawings are indicative, and subject to site proofing by Site Engineer.
5. Settlement pond sizes and locations are indicative, and need to be scaled according to the catchment draining into each proposed pond. This needs to be determined on the ground. Pond sizes per catchment area are outlined in the Table provided within this drawing.

MITIGATION / DRAINAGE COINTROLS AVAILABLE FOR USE ACROSS THE SITE	
Management Type	Description of SUDS Drainage Control Methods
Avoidance Controls	1) Application of 50m buffer zones to natural Watercourses where possible 2) Application of 10m buffer zones to main drains where possible 3) Using small working areas 4) Working in appropriate weather, and suspending certain work activities in advance of forecasted wet weather
Source Controls:	1) Use of upstream interceptor drains and downstream collector drains / oversized swales, vee-drains, diversion drains, flumes and culvert pipes 2) erosion and velocity control measures such as: a) sand bags b) oyster bags filled with gravel; c) filter fabrics d) and other similar/equivalent or appropriate systems 3) Using small working areas 4) covering stockpiles 5) weathering off / sealing peat stockpiles
In-Line Controls:	1) Interceptor drains, vee-drains, oversized swales/collector drains 2) erosion and velocity control measures such as: a) sand bags b) oyster bags filled with gravel c) filter fabrics d) straw bales e) flow limiters f) weirs or baffles g) and/or other similar/equivalent or appropriate systems. 3) silt fences, filter fabrics 4) In stream Sedimats 5) collection sumps, temporary sumps, pumping systems 5) attenuation lagoons 6) sediment traps, stilling / settlement ponds
Water Treatment Controls:	1) Temporary sumps 2) attenuation ponds 3) Temporary storage lagoons 4) Sediment traps, Stilling / Settlement ponds 5) Proprietary settlement systems such as Siltbuster, and/or other similar/equivalent or appropriate systems. 6) Silt dewatering bags
Outfall Controls:	1) Levelspreaders 2) Buffered outfalls 3) Vegetation filters 4) Silt dewatering bags 5) Flow limiters and weirs

Legend

Existing Drainage
- Rivers/Streams
- Rivers/Streams 50m buffer
- Existing drain
- Existing culvert
- Forest drain
- Land streams/drains

Proposed Drainage
- Upstream Interceptor Drain
- Swales/Downstream Collector Drain
- Direction of Flow
- Settlement pond
- Cross drain
- Check Dam 'Type A'
- Check Dam 'Type B'
- Proposed culvert
- Silt fence
- Interceptor Ditches
- Direction of Flow
- Drainage swale - collector drain
- Stilling Pond (STP)
- Level spreader (LP)

- Planning boundary
- Cut area
- Fill area
- Rock outcrops (approx.)
- Farm access road
- Trenches
- Forest
- Existing ground surface intermediate contour (5 m interval)
- Existing ground surface minor contour (1 m interval)
- Turbine and swept area

Drawing Notes

2. Do not scale off this drawing. Figured metric dimensions only should be taken off this drawing.

Date	Description	Chkd	Signed
14.01.19	Construction	MG	MG

Revisions

HYDRO ENVIRONMENTAL SERVICES
22 Lower Main St, Dungarvan, Co. Waterford, Ireland
tel: +353 (0) 58-44122
fax: +353 (0) 58-44244
email: info@hydroenvironmental.ie
web: www.hydroenvironmental.ie

Client: Cleanrath Windfarm Ltd.

Job: Cleanrath Wind Farm

Title: Drainage Plan

Figure No: D311

Drawing No: P1272-4-0619-A3-D311-00A	
Sheet Size: A3	Project No.: P1272-4
Scale: 1:2,000 (A3)	Drawn By: MG/GD
Date: 25/06/2019	Checked By: MG

Drainage Design Notes

1. All drainage subject to micro-siting and optimisation on site.
2. The locations of the interceptor drains, check dams, culverts, swales, stilling ponds and level spreaders are shown as indicative, and may be changed to suit the requirements of the local topography.
3. Supervising hydrologist or environmental clerk of works (environmental scientist) to oversee installation of drainage features following detailed drainage design.
4. Drainage measures to be installed prior to, or at the same time as the works areas they are intended to drain.
5. Design elevation of the water surface along the route of the interceptor drains or swales will not be lower then the design elevation of the water surface in the outlet at the level spreader or stilling pond.
6. The spacing and frequency of the check dams will be dependant on the gradient of the interceptor drain or swale in which they are being installed.
7. Check dam designs to be selected best to suit particular topography and hydrological environment.
8. Down gradient slope below level spreader onto which the water will dissipate to have a grade less the 6%.
9. No direct discharge or pumping to watercourses will be permitted. All discharges from level spreaders or stilling ponds to be via vegetated filters. Selection or suitable areas to use as vegetation filters will be determined by the size of the contributing catchment, slope and ground conditions.
10. Stilling ponds to be sized according to the area they will be receiving water from.
11. Diversion of drainage ditches will only take place when alternative drainage ditch has been installed to handle the same water.
12. Existing drains/ditches to be incorporated or removed during wind farm construction.
13. All drainage system features to be subject of inspection and maintenance plan.
14. The layout shown is slightly offset for scale purposes, and all drainage would be installed as close to the road as possible, and within the planning boundary for the development.

Pollution Prevention Notes:

1. Site management proposals are intended to ensure complete protection against surface water and groundwater pollution, siltation and erosion.
2. Suitable drainage control measures should be in place at all times to prevent the conveyance of silts to receiving watercourses.
3. Silty water can arise from dewatering excavations, erosion of exposed/disturbed ground, stockpiles, plant and wheel wash, site roads/tracks, and disturbance of stream/river beds.

Discharges

4. Water containing silt will not be pumped directly to any watercourse / drain / or ditch. All discharges to be made over open vegetated ground at a minimum 20m from nearest watercourse unless otherwise stated.
5. A 15m buffer zone (or greater) to be maintained around all sensitive watercourses and waterbodies.
   No excavated material is to be stored within any surface water buffer zone.
6. Pumped water will be directed into track side ditches and treated in settlement ponds and vegetation swales prior to overland discharge.
7. Pumping of clean water from excavations / or over-pumping in streams will be completed in a manner that does not cause scour or erosion at the point of discharge. This will be done by reducing the flow velocities or use of splash plates, and discharge controls.
8. Vegetation will NOT be stripped from existing ditches unless absolutely necessary.

Excavations

9. Where deep excavations are proposed cut-off drains will be use to reduce the amount of surface water entering the excavation. This will be the case around turbine base excavations.

Exposed Ground & Stockpiles

10. The amount of exposed ground and stockpiles open at any one time will be minimised as far as practicable.
11. Temporary stockpiles will be covered or sealed as soon as possible.
12. Silt fences will be used to reduce silty runoff from temporary peat storage areas, and/or bare peat areas as required.

Site Tracks

13. Use of track side swales with check dams, and/or filtration check dams will reduce silt in runoff water.
14. Check dams to be inspected and cleaned regularly.
15. Discharges from site tracks will be via outfall spillways, settlement ponds and vegetation swales.

Refueling

16. Refuel mobile plant in designated refueling area only, preferably on an impermeable surface and away from drains / ditches and watercourses / waterbodies.
17. Spill kits and drip trays should be available on site.

Concrete

18. Care will be taken when completing concrete works on site to ensure no discharges occur.
19. Concrete wash water, and waste concrete will be managed appropriately on site.

If water pollution is identified the following steps would be adhered to:

STOP - work in the immediate area should be stopped and the source of the pollution identified.

CONTAIN - the source of the pollution should be bunded using a suitable method. Natural watercourses should be temporarily diverted around the source of pollution.

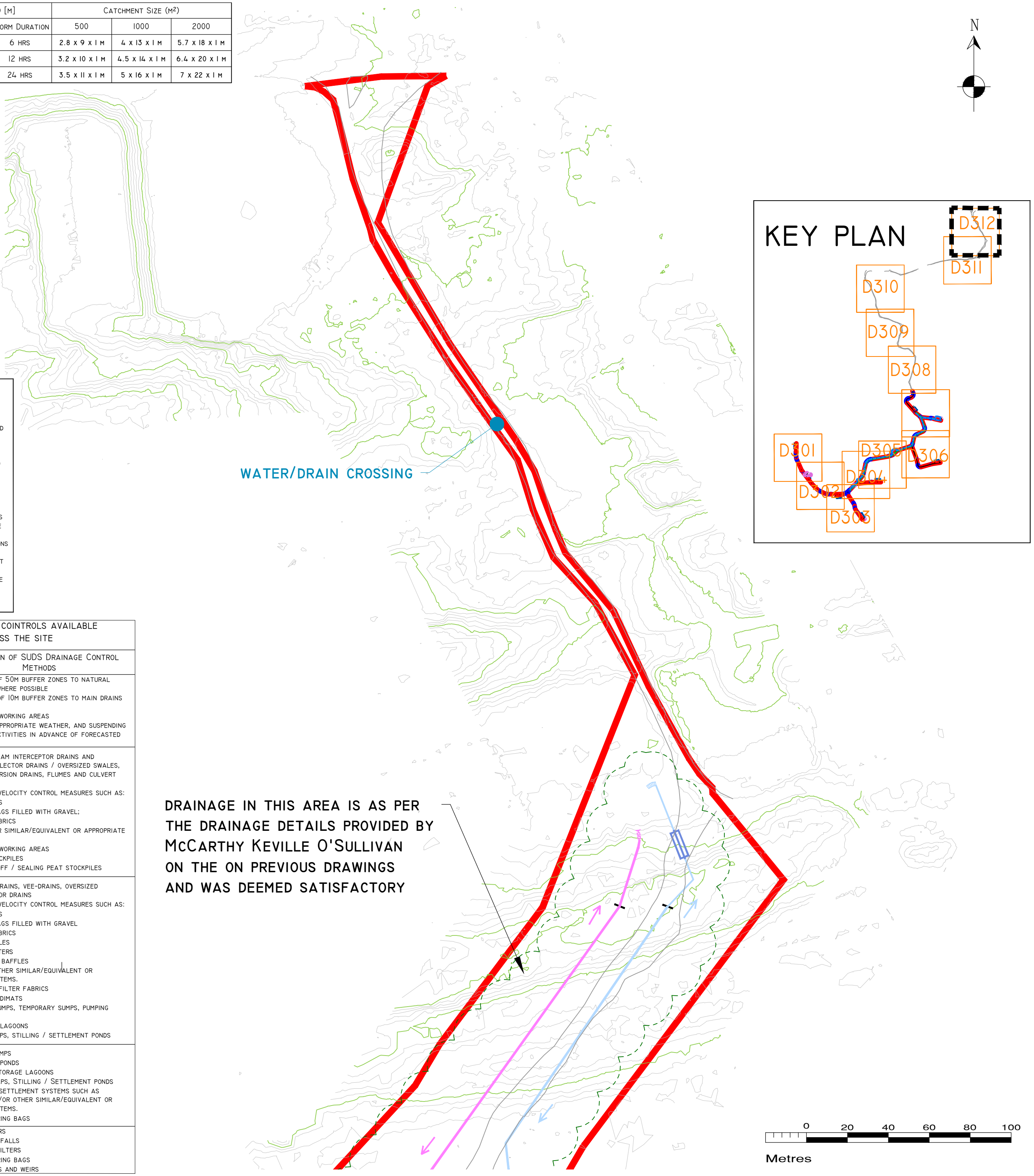
Pond Size W [m] x L [m] x D [m]			Catchment Size (m²)		
Return Period	50 yrs	Storm Duration	500	1000	2000
6hr retention for coarse silt		6 hrs	2.8 x 9 x 1 m	4 x 13 x 1 m	5.7 x 18 x 1 m
11hr retention for medium silt		12 hrs	3.2 x 10 x 1 m	4.5 x 14 x 1 m	6.4 x 20 x 1 m
24hr retention for fine silt		24 hrs	3.5 x 11 x 1 m	5 x 16 x 1 m	7 x 22 x 1 m

Drainage Drawing Notes:

1. These drawing are prepared based on the permitted 2D layout, and partial 3D design provided by the client.
2. These drawings have been prepared using available LiDAR topography data, no detailed site survey is available.
3. Where possible we have attempted to account for changes in ground level based on site observations, and available aerial photo information.
4. Settlement ponds and new drain locations shown on these drawings are indicative, and subject to site proofing by Site Engineer.
5. Settlement pond sizes and locations are indicative, and need to be scaled according to the catchment draining into each proposed pond. This needs to be determined on the ground. Pond sizes per catchment area are outlined in the Table provided within this drawing.

Mitigation / Drainage Coíntrols Available For Use Across the Site

Management Type	Description of SUDS Drainage Control Methods
Avoidance Controls	1) Application of 50m buffer zones to natural watercourses where possible 2) Application of 10m buffer zones to main drains where possible 3) Using small working areas 4) Working in appropriate weather, and suspending certain work activities in advance of forecasted wet weather
Source Controls:	1) Use of upstream interceptor drains and downstream collector drains / oversized swales, vee-drains, diversion drains, flumes and culvert pipes 2) Erosion and velocity control measures such as: A) sand bags B) oyster bags filled with gravel; C) filter fabrics D) and other similar/equivalent or appropriate systems 3) Using small working areas 4) covering stockpiles 5) weathering off / sealing peat stockpiles
In-Line Controls:	1) Interceptor drains, vee-drains, oversized swales/collector drains 2) Erosion and velocity control measures such as: A) sand bags B) oyster bags filled with gravel C) filter fabrics D) straw bales E) flow limiters F) weirs or baffles G) and/or other similar/equivalent or appropriate systems. 3) Silt fences, filter fabrics 4) In stream sedimats 5) collection sumps, temporary sumps, pumping systems 5) attenuation lagoons 6) sediment traps, stilling / settlement ponds
Water Treatment Controls:	1) Temporary sumps 2) attenuation ponds 3) Temporary storage lagoons 4) Sediment traps, Stilling / Settlement ponds 5) Proprietary settlement systems such as Siltbuster, and/or other similar/equivalent or appropriate systems. 6) Silt dewatering bags
Outfall Controls:	1) Levelspreaders 2) Buffered outfalls 3) Vegetation filters 4) Silt dewatering bags 5) Flow limiters and weirs



Legend

Existing Drainage
- Rivers/Streams
- Rivers/Streams 50m Buffer
- Existing Drain
- Existing Culvert
- Forest Drain
- Land Streams/Drains

Proposed Drainage
- Upstream Interceptor Drain
- Swales/Downstream Collector Drain
- Direction of Flow
- Settlement Pond
- Cross Drain
- Check Dam 'Type A'
- Check Dam 'Type B'
- Proposed Culvert

- Silt Fence
- Interceptor Ditches
- Direction of Flow
- Drainage Swale - Collector Drain
- Stilling Pond (STP)
- Level Spreader (LP)
- Planning Boundary
- Cut Area
- Fill Area
- Rock Outcrops (approx.)
- Farm Access Road
- Trenches
- Forest
- Existing ground surface intermediate contour (5 m interval)
- Existing ground surface minor contour (1 m interval)
- Turbine and swept area

Drawing Notes

2. Do not scale off this drawing. Figured metric dimensions only should be taken off this drawing.

Date	Description	Chkd	Signed
14.01.19	Construction	MG	MG

Revisions

Hydro Environmental Services
22 Lower Main St
Dungarvan
Co. Waterford
Ireland
tel: +353 (0) 58-44122
fax: +353 (0) 58-44244
email: info@hydroenvironmental.ie
web: www.hydroenvironmental.ie

Client: Cleanrath Windfarm Ltd.

Job: Cleanrath Wind Farm

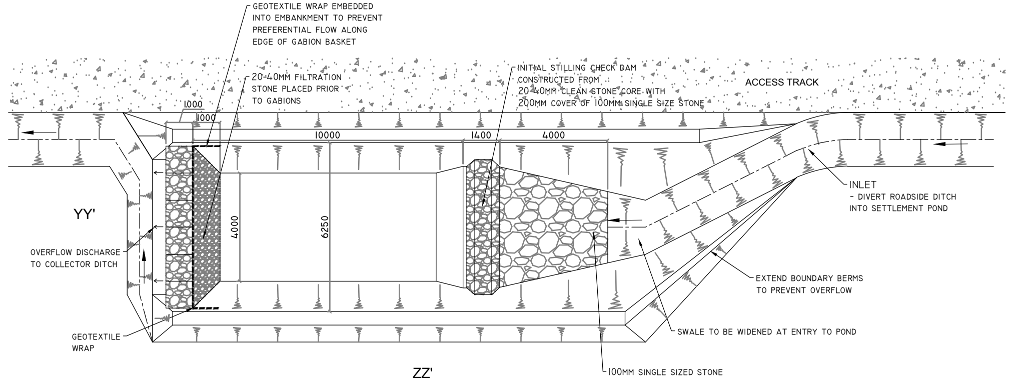
Title: Drainage Plan

Figure No: D312

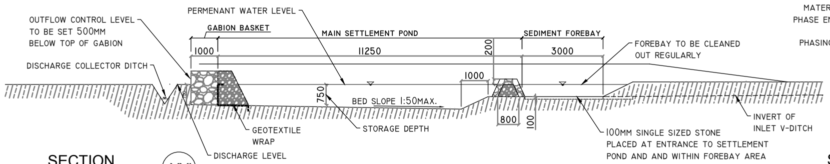
Drawing No: P1272-4-0619-A3-D312-00A

Sheet Size: A3	Project No.: P1272-4
Scale: 1:2,000 (A3)	Drawn By: MG/GD
Date: 25/06/2019	Checked By: MG

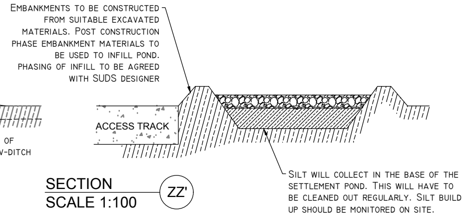
DETAIL A1



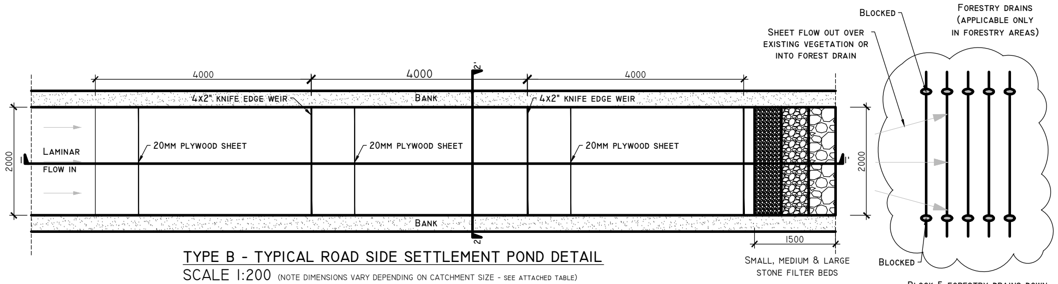
TYPE A - TYPICAL ROAD SIDE SETTLEMENT POND DETAIL
SCALE 1:200 (NOTE DIMENSIONS VARY DEPENDING ON CATCHMENT SIZE - SEE ATTACHED TABLE)



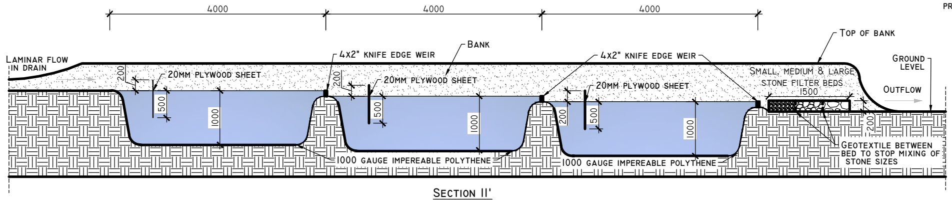
SECTION YY'
SCALE 1:100



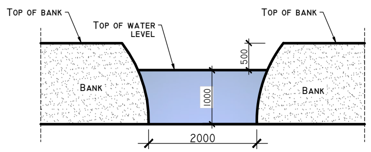
SECTION ZZ'
SCALE 1:100



TYPE B - TYPICAL ROAD SIDE SETTLEMENT POND DETAIL
SCALE 1:200 (NOTE DIMENSIONS VARY DEPENDING ON CATCHMENT SIZE - SEE ATTACHED TABLE)

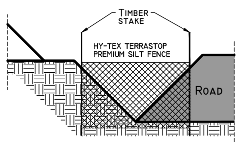


SECTION II'



SECTION 22'

SEDIMENT FENCE/CHECK DAM DETAIL



DETAIL A2

Project Design Drawing Notes

1. Drawings issued are for construction stage but are limited by available design information.
2.
3. Do not scale off this drawing. Figured metric dimensions only should be taken off this drawing. see notes on settlement pond sizes.
4. All contractors, whether main or sub-contractors, must visit the site and are responsible for taking and checking any and all dimensions and levels that relate to the works.
5. The use of or reliance upon this drawing shall be deemed to be acceptance of these conditions of use unless otherwise agreed in writing, such written agreement to be sought from and issued by the copyright holder to the use or reliance upon this drawing.

Date	Description	Chkd	Signed
21/06/19	Construction	MG	MG

Revisions

HYDRO ENVIRONMENTAL SERVICES
22 Lower Main St
Dungarvan
Co. Waterford
Ireland
tel: +353 (0) 58-44122
fax: +353 (0) 58-44244
email: info@hydroenvironmental.ie
web: www.hydroenvironmental.ie

Client: Inchee Energy Supply Ltd

Job: Cleanrath WF, Co.Cork

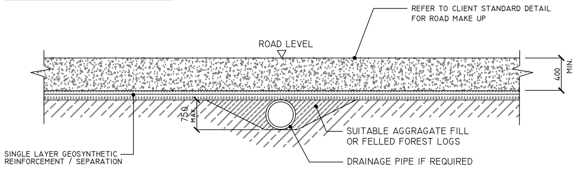
Title: Drainage Details 1

Figure No: D501

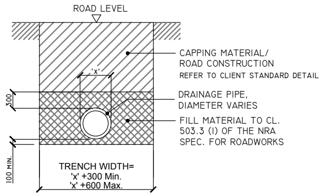
Drawing No: P1272-4-0619-A1-D501-00A

Sheet Size: A1	Project No.: P1272-4
Scale: as shown (A1)	Drawn By: MG/GD
Date: 21/06/2019	Checked By: M.G.

DETAIL B

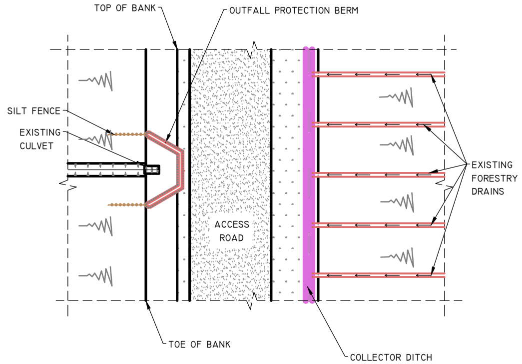


'TYPE A' CULVERT - DRAINAGE CROSSING BENEATH FLOATING ROAD
SCALE 1:100

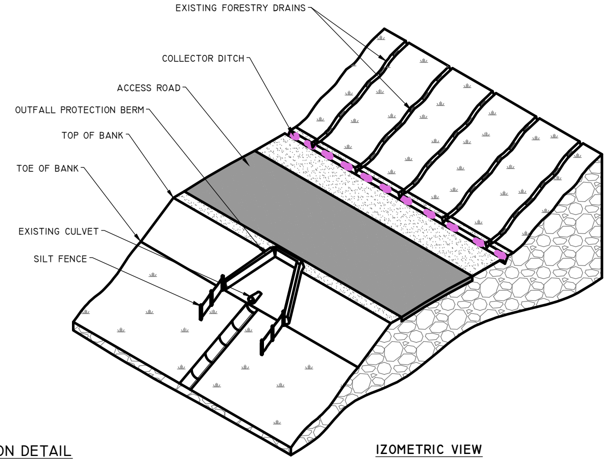


'TYPE B' CULVERT - DRAINAGE CROSSING BENEATH EXCAVATED ROAD
SCALE 1:50

DETAIL BI

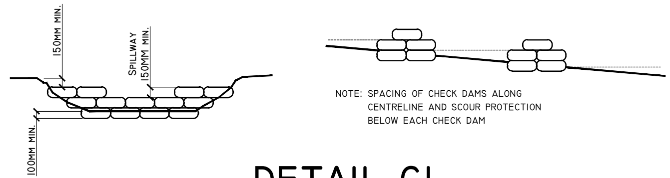


PLAN



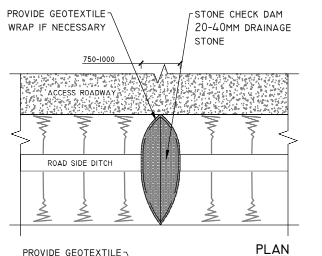
IZOMETRIC VIEW

CULVET - OUTFALL PROTECTION DETAIL
SCHEMATIC - NOT TO SCALE

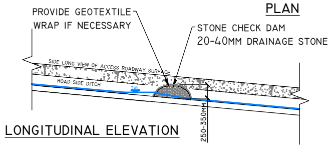


NOTE: SPACING OF CHECK DAMS ALONG
CENTRELINE AND SCOUR PROTECTION
BELOW EACH CHECK DAM

DETAIL C



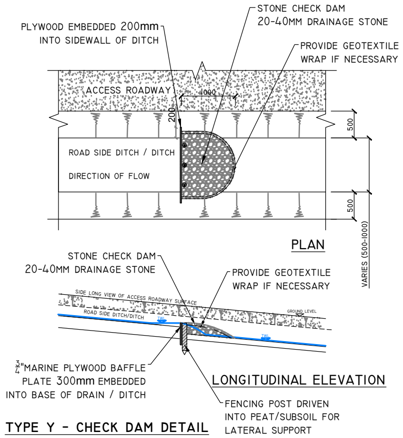
PLAN



LONGITUDINAL ELEVATION

TYPE X - CHECK DAM DETAIL
SCALE 1:50

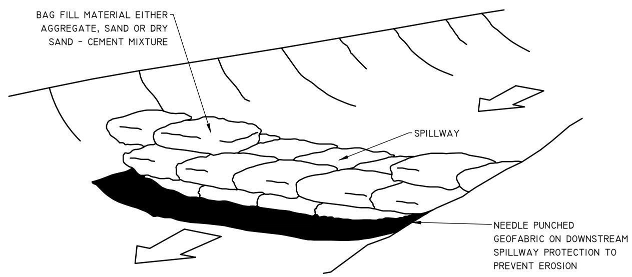
DETAIL D



LONGITUDINAL ELEVATION

TYPE Y - CHECK DAM DETAIL
SCALE 1:100

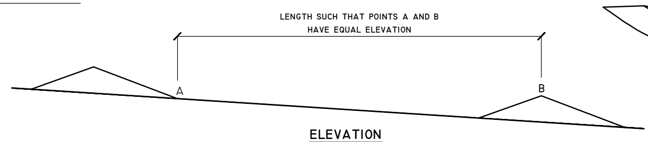
DETAIL CI



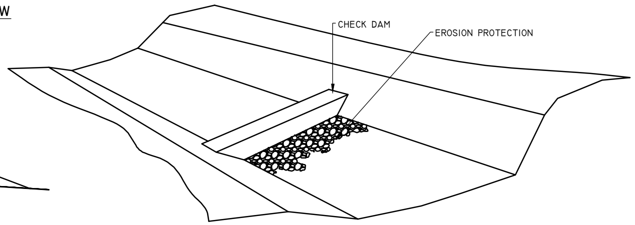
TEMPORARY CHECK DAM / SETTLEMENT POND OVERFLOW
SAND FILLED BAG CONSTRUCTION
SCHEMATIC - NOT TO SCALE

DETAIL C2

TEMPORARY CHECK DAM / SETTLEMENT POND OVERFLOW
SCHEMATIC - NOT TO SCALE



ELEVATION



Project Design Drawing Notes
1. Drawings issued are for construction stage but are limited by available design information.

3. Do not scale off this drawing. Figured metric dimensions only should be taken off this drawing. see notes on settlement pond sizes.
4. All contractors, whether main or sub-contractors, must visit the site and are responsible for taking and checking any and all dimensions and levels that relate to the works.

Date	Description	Chkd	Signed
21/06/19	Construction	MG	MG

Revisions

HYDRO ENVIRONMENTAL SERVICES
22 Lower Main St
Dungarvan
Co. Waterford
Ireland
tel: +353 (0) 58-44122
tel: +353 (0) 58-44244
email: info@hydroenvironmental.ie
web: www.hydroenvironmental.ie

Client: Inchee Energy Supply Ltd

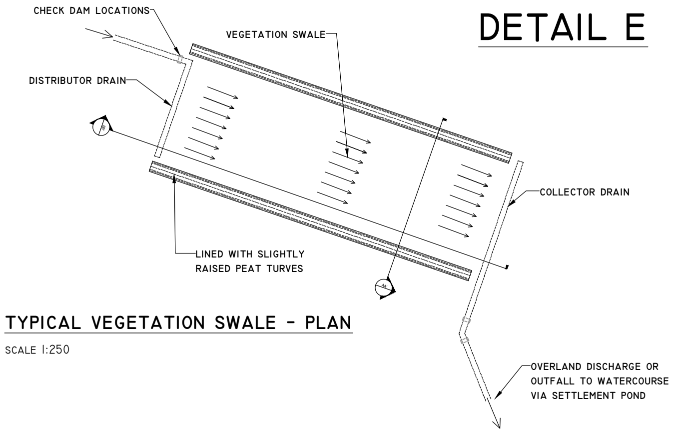
Job: Cleanrath WF, Co.Cork

Title: Drainage Details 2

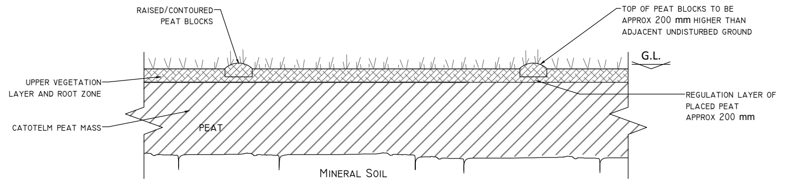
Figure No: D502

Drawing No: P1272-4-0619-A1-D502-00A	
Sheet Size: A1	Project No.: P1272-4
Scale: as shown (A1)	Drawn By: MG/GD
Date: 21/06/2019	Checked By: M.G.

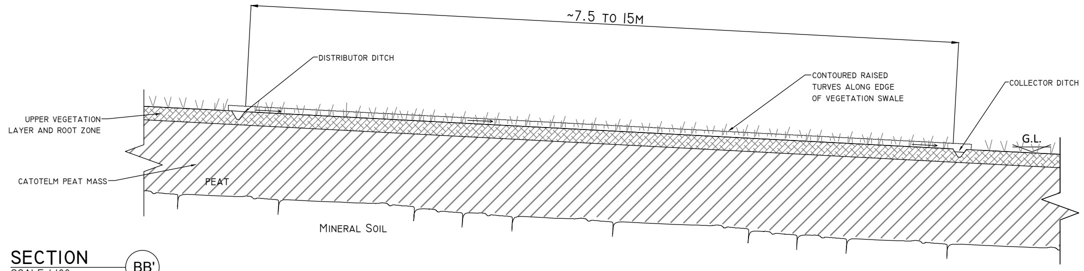
DETAIL E



TYPICAL VEGETATION SWALE - PLAN
SCALE 1:250

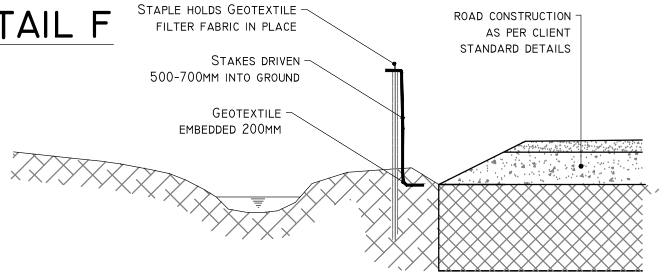


SECTION AA'
SCALE 1:200



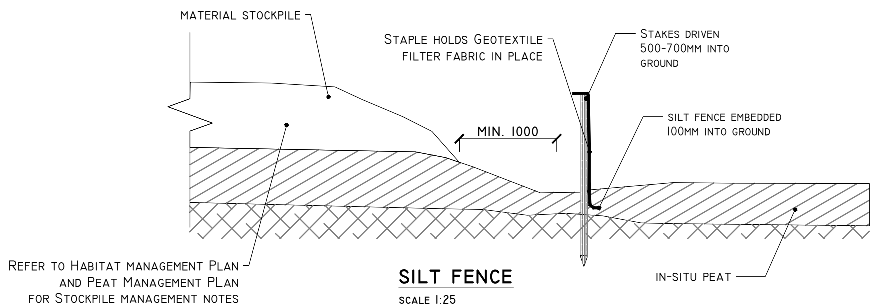
SECTION BB'
SCALE 1:100

DETAIL F



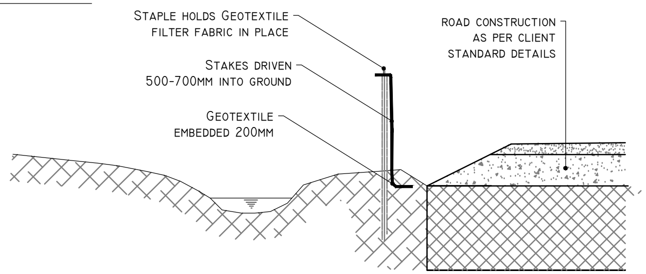
SILT FENCE FOR WATERCOURSE PROTECTION
SCALE 1:25

DETAIL G-I



SILT FENCE
SCALE 1:25

DETAIL G-II



SILT FENCE FOR WATERCOURSE PROTECTION
SCALE 1:25

PROJECT DESIGN DRAWING NOTES

1. DRAWINGS ISSUED ARE FOR CONSTRUCTION STAGE BUT ARE LIMITED BY AVAILABLE DESIGN INFORMATION.
2.
3. DO NOT SCALE OFF THIS DRAWING. FIGURED METRIC DIMENSIONS ONLY SHOULD BE TAKEN OFF THIS DRAWING. SEE NOTES ON SETTLEMENT POND SIZES.
4. ALL CONTRACTORS, WHETHER MAIN OR SUB-CONTRACTORS, MUST VISIT THE SITE AND ARE RESPONSIBLE FOR TAKING AND CHECKING ANY AND ALL DIMENSIONS AND LEVELS THAT RELATE TO THE WORKS.
5. THE USE OF OR RELIANCE UPON THIS DRAWING SHALL BE DEEMED TO BE ACCEPTANCE OF THESE CONDITIONS OF USE UNLESS OTHERWISE AGREED IN WRITING, SUCH WRITTEN AGREEMENT TO BE SOUGHT FROM AND ISSUED BY THE COPYRIGHT HOLDER TO THE USE OR RELIANCE UPON THIS DRAWING.

Date	Description	Chkd	Signed
21/06/19	Construction	MG	MG

Revisions

HYDRO ENVIRONMENTAL SERVICES
22 Lower Main St
Dungarvan
Co. Waterford
Ireland
tel: +353 (0) 58-44122
fax: +353 (0) 58-44244
email: info@hydroenvironmental.ie
web: www.hydroenvironmental.ie

Client: INCHEE ENERGY SUPPLY LTD

Job: CLEANRATH WF, CO.CORK

Title: DRAINAGE DETAILS 3

Figure No: D503

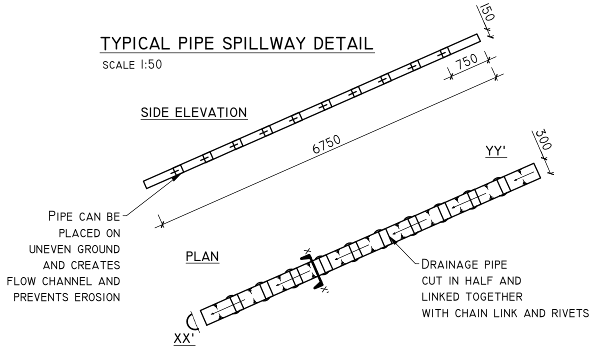
Drawing No: P1272-4-0619-A1-D503-00A

Sheet Size: A1	Project No.: P1272-4
Scale: as shown (A1)	Drawn By: MG/GD
Date: 21/06/2019	Checked By: M.G.

DETAIL H

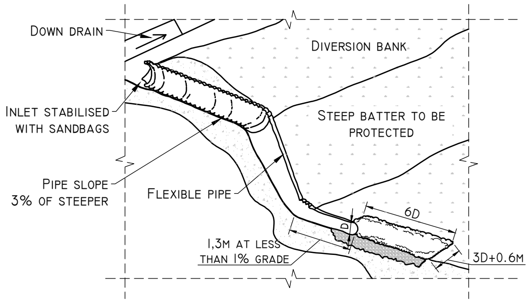
TYPICAL PIPE SPILLWAY DETAIL

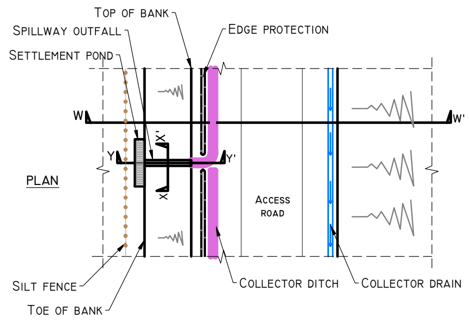
SCALE 1:50

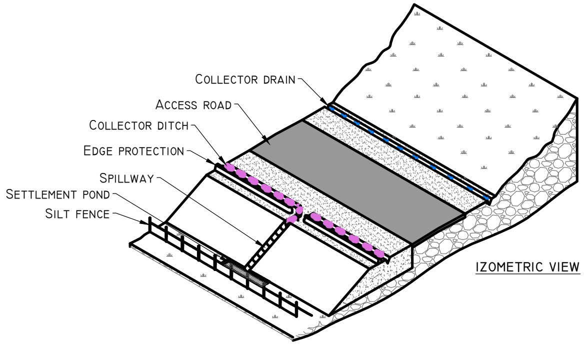


TYPICAL PIPE SPILLWAY DETAIL

SCHEMATIC - NOT TO SCALE

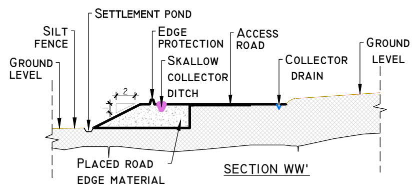






SPILLWAY OUTFALL PLAN

SCHEMATIC - NOT TO SCALE

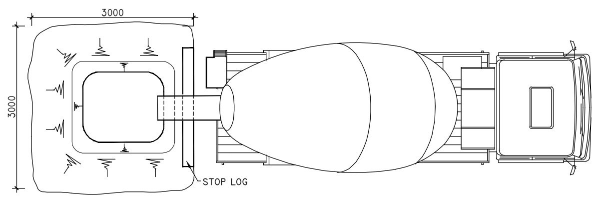


DETAIL I

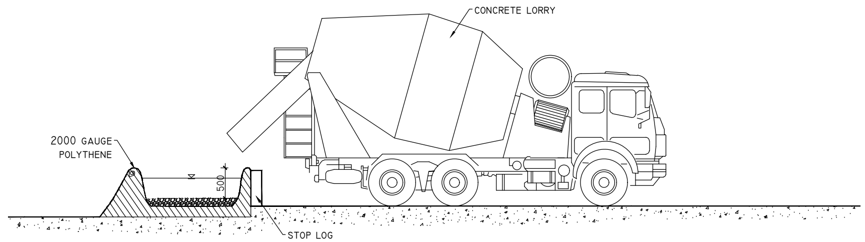
TEMPORARY CONCRETE WASH OUT PIT

SCALE 1:50

PLAN



ELEVATION



DETAIL J

Project Design Drawing Notes

1. Drawings issued are for construction stage but are limited by available design information.
2. Copyright, all rights reserved. No part here with may be copied or reproduced partially or wholly in any form whatsoever without the prior notice of the copyright owner Hydro-Environmental Services.
3. Do not scale off this drawing. Figured metric dimensions only should be taken off this drawing. see notes on settlement pond sizes.
4. All contractors, whether main or sub-contractors, must visit the site and are responsible for taking and checking any and all dimensions and levels that relate to the works.
5. The use of or reliance upon this drawing shall be deemed to be acceptance of these conditions of use unless otherwise agreed in writing, such written agreement to be sought from and issued by the copyright holder to the use or reliance upon this drawing.

Date	Description	Chkd	Signed
21/06/19	Construction	MG	MG

Revisions

HYDRO ENVIRONMENTAL SERVICES
22 Lower Main St
Dungarvan
Co. Waterford
Ireland
tel: +353 (0) 58-44122
tel: +353 (0) 58-44244
email: info@hydroenvironmental.ie
web: www.hydroenvironmental.ie

Client: Inchee Energy Supply Ltd

Job: Boolynaghleragh WF, Co.Clare

Title: Drainage Details 4

Figure No: D504

Drawing No: P1272-4-0619-A1-D504-00A

Sheet Size: A1	Project No.: P1272-4
Scale: as shown (A1)	Drawn By: MG/GD
Date: 21/06/2019	Checked By: M.G.

APPENDIX 2

PEATLAND HABITAT MANAGEMENT PLAN

Peatland Restoration and Management Plan

Cleanrath Wind Farm, Co. Cork

DOCUMENT DETAILS

Client:	**Cleanrath Windfarm Ltd.**
Project Title:	**Cleanrath Wind Farm, Co. Cork**
Project Number:	**180511**
Document Title:	**Peatland Restoration and Enhancement Plan**
Document File Name:	**PREP F – 2020.07.17 – 191223a**
Prepared By:	**MKO** **Tuam Road** **Galway** **Ireland** **H91 VW84**

MKO Planning and Environmental Consultants

Rev	Status	Date	Author(s)	Approved By
01	Final	17/07/2020	DMN	PR

Table of Contents

1. INTRODUCTION

1.1 Background

The EIAR that was prepared for this application prescribed the provision of a Habitat Restoration and Enhancement Plan to offset the loss of peatland habitats that are within the footprint of the subject development. The development footprint is located on 4.13 hectares of peatland habitat. This is less than Cleanrath wind farm development was originally predicted in the original application as two turbines have not been constructed. The peatland habitats on which the windfarm is located consists primarily of a mosaic of Wet Heath, Blanket Bog and Acid Flush with outcropping of Exposed siliceous rock (ER1). The areas of deep peat within the study area have been avoided in the design of the development and all areas that are within the construction footprint have been degraded through extensive grazing of sheep, cattle and/or horses, drainage, peat cutting, forestry or scrub encroachment.

This Peatland Restoration and Management Plan (PRMP) provides details of where measures will be employed to improve the ecological quality of the peatland habitats that are located outside the construction footprint but within the control of the windfarm developer.

The development has resulted in the loss of peatland habitat, associated with Turbines T3, T6, T7, part of T8, T9 & T10. Therefore, this Peatland Restoration and Management Plan (PRMP) provides for the restoration of forestry land, that has been planted on peatland mosaic habitats, back to this peatland habitat.

The extent of lands subject to peatland restoration are shown in Figure 1.1. This includes areas of forestry felling located around Turbines T1, 3, 5 and 8 as well as an additional area of 1.06 hectares of forestry located to the south of T8. Following the implementation of the measures outlined in this report, to offset the loss of peatland habitat, there will be no net loss of peatland habitats on the site.

The bog restoration programme described in this report will be implemented in accordance with the published guidelines and best practice such as the guidelines arising from the EU–LIFE/Coillte '*Irish Blanket Bog Restoration Project*' (2002-2007)', Scottish Natural Heritage (SNH)'s guidance note Planning for development: *What to consider and include in Habitat Management Plans* (Version 2, January 2014).

2. PEATLAND RESTORATION AND ENHANCEMENT

2.1 Forestry Felling and Peatland Restoration Around Turbines

As shown in Figure 1.1, it is proposed to reinstate areas of coniferous plantation forestry around turbines T1, 3, 5 and 8. These areas have been felled as part of the construction phase of the wind farm, however, some areas will require further maintenance to complete to the required reinstatement to peatland. As shown in Plate 2.3, areas where plantation forestry have been removed, still comprise of peatland vegetation beneath the conifers. In order to facilitate the reestablishment of peatland vegetation within these areas and maintain an effective hydrological regime, the following measures are proposed in these areas:

- Removal of brash from felled areas off-site.
- Drain blocking will be undertaken on a local scale in the immediate surroundings of felled plantation by installing dams at drainage ditches (largely remnant semi-functioning conifer forest drains) to maintain, enhance and restore the favorable baseline hydrological and ecological conditions at each site location. Drains can be dammed using peat dams.
- No additional drainage to be installed in proximity to these habitat areas during the lifetime of the development.
- The use of off road vehicles on the site will be restricted to the existing tracks.
- No application of chemical and organic fertilisers or herbicides and pesticides will be undertaken within the development footprint.
- Self-seeded conifers from adjacent conifer plantation areas will be cleared and removed (by hand or brushcutter) from the newly created peatland reinstatement areas on an ongoing basis during the operational phase.

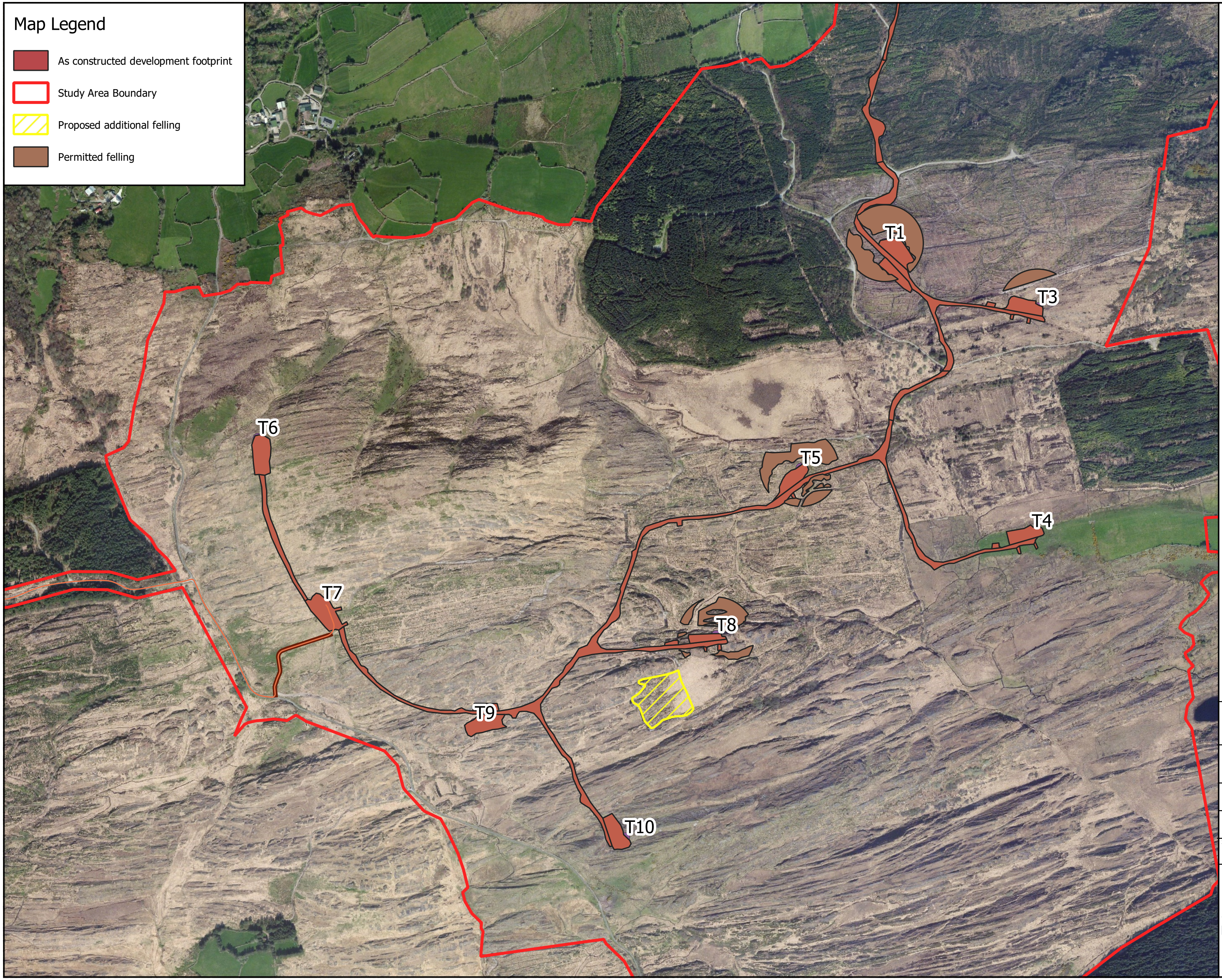
Plate 2.1 Example of forestry felling already undertaken to the north of T8 with typical peatland vegetation remaining beneath the conifers.

2.2 Additional Forestry Felling for Peatland Restoration

In order to achieve the required peatland restoration area, additional lands, comprising of immature forestry, located outside of the immediate development footprint will be acquired and restored to peatland habitat. The area identified as most appropriate for peatland restoration is located to the south of Turbine no. 8, see Figure 1.1. An example of the forestry occurring at this location is provided in Plate 2.2. The lands were chosen as the forestry is immature, the vegetation occurring beneath the conifers comprises of typical peatland species (see Plate 2.3) and could therefore successfully be reinstated to peatland if the conifer crop was sympathetically removed.

Plate 2.2 Location chosen for tree removal and restoration to bog, located to the south of T8.

Plate 2.3 Example of intact peatland vegetation occurring within existing forestry plantation



Drawing Title
Proposed peatland restoration area

Project Title
Cleanrath WindFarm

Drawn By	DMN
DMN	PR
Project No.	Drawing No.
191223a	Figure 1.1
Scale	Date
1:11061	1.07.2020

MKO
Planning and Environmental Consultants
Tuam Road, Galway
Ireland, H91 VW84
+353 (0) 91 735611
email:info@mkoireland.ie
Website: www.mkoireland.ie

The management techniques to be undertaken within the replacement area located south of Turbine no. 8 are as follows:

- All coniferous forestry will be felled.
- Following tree felling operations, brash material will be removed off-site and disposed of appropriately to a suitable location.
- Drains will be blocked, where appropriate, using peat dams or plastic dams, see Plate 2.4 & 2.5.
- No additional drainage to be installed in proximity to this habitat during the lifetime of the subject development.
- The planting of forestry will not be permitted in this area.
- No vehicular access will be permitted to or within the dedicated peatland reinstatement area once all initial works are completed.
- Self-seeded conifers from adjacent conifer plantation areas will be cleared and removed (by hand or brushcutter) from the newly created peatland reinstatement areas on an ongoing basis, following the felling of the existing forestry.
- Peat extraction within the proposed peatland reinstatement area will not be permitted.
- Burning and dumping will not be permitted.
- No application of chemical and organic fertilisers or herbicides and pesticides will be undertaken within the development footprint.

Plate 2.4 Example of peat dams to be used for on-site drain blocking.

Plate 2.5 Example of plastic dams to be used for on-site drain blocking.

2.3 Management of peatlands adjacent to windfarm infrastructure

In addition to the reinstatement measures proposed above, this plan also sets out measures that will enhance the existing peatlands that surround the wind farm development. These are listed below:

- Burning and dumping will not be permitted.
- Application of artificial fertilisers within rehabilitation or enhancement areas will be prohibited.
- The planting of forestry will not be permitted. There is currently forestry activity in the vicinity of the development and conifer seedlings are encroaching on the site on an annual basis during the lifetime of the windfarm development.
- Seedlings of coniferous or other trees or any invasive plants will be removed from this area on an annual basis during the lifetime of the windfarm development.
- Scrub species including Gorse (*Ulex europaeus*) and Bramble (*Rubus fruticosus* agg.) will be removed on an annual basis during the lifetime of the windfarm development.
- No vehicular access will be permitted to or within the dedicated habitat rehabilitation area once all initial works are completed.
- The rehabilitation area will be monitored to assess the success of the rehabilitation plan.
- Where possible, drains will be blocked to restore the natural hydrology of the blanket bog in the area.

2.4 Timing of Works

Replacement works will be conducted in line with the provisions of the Wildlife Acts 1979-2012 as amended.

2.5 Monitoring

To confirm that habitat restoration and enhancement has been successful, all areas of restored vegetation will be monitored post-restoration, monitoring results reported and any criteria failures identified and corrective actions implemented as part of the Cleanrath Operational Environmental Management Plan (OEMP) for the development.

Visual inspections of restored areas within the application site will be carried out biannually during the first two years after restoration to check for potential soil erosion or movement and degradation of replaced turves. Vegetation monitoring will be carried out in years 1, 3, 5 and 10 after restoration. Monitoring will involve the following:

<u>**Surface peat assessment**</u>

An assessment of the physical state of the surface peat with regard to:

- Percentage bare peat not covered by vegetation;
- Moisture status (qualitative);
- Intactness (e.g. presence of visible cracking in surface peat; and
- General stability (e.g. presence of peat erosion).

<u>**Vegetation sampling**</u>

- A number of fixed relevé sites (i.e. permanent quadrats) will be set up in areas where active management is proposed of previously forested areas. Baseline data will be recorded prior to the commencement of habitat management activities set out in this outline plan. The character of each relevé will be recorded (e.g. species proportions present, vegetation structure and height) and photographs will be taken of each relevé from a fixed point. These relevés will then be re-examined during years 1, 3, 5 and 10 following restoration in order to establish the extent of habitat improvement resulting from management practices.

<u>**Hydrological monitoring**</u>

- Water levels within areas where drains are blocked will be recorded bi-annually for two years. A number of phreatic stand pipes will be installed (prior to restoration) to allow monitoring of water levels within both the restoration and enhancement areas. In this way, any positive impacts on the local hydrology can be verified and quantified.

The efficacy of the habitat rehabilitation and enhancement measures employed will be reviewed in years 1, 3, 5 and 10 following commencement of the plan on the basis of the results of vegetation sampling and water level readings from the managed areas. Analysis of the data collected will be the basis for a review of the measures and techniques employed.

2.5.1 Monitoring of existing reinstated peatlands adjacent to existing infrastructure

Following the completion of the existing development, the roadside verges, berms and banks of hardstand infrastructure were capped with peat material. This material was initially removed during construction and temporarily stored adjacent to the development footprint for final reinstatement. This reinstatement has therefore further minimised the overall peatland loss associated with the development footprint by reinstating areas of temporarily disturbed ground adjacent to the infrastructure, see Plate 2.6. Many of these areas have begun to revegetate naturally, with purple moor-grass (*Molinia caerulea*) becoming established. In addition, some areas within temporarily disturbed ground were also reseeded with an appropriate upland seed mix to facilitate more rapid vegetation establishment.

The post construction monitoring associated with the peatland restoration measures outlined above will also continue to monitor the continued revegetation of these areas of temporally disturbed ground and where required, additional measures will be implemented to ensure establishment of peatland vegetation and reduce noxious weeds.

Plate 2.6 Example of reinstated site access track verge with stripped peat material showing signs of revegetation with purple moor-grass (Molinia caerulea) and other grass species.

2.6 Reporting

Reports detailing the monitoring works carried out, the results obtained and a review of their success, along with any suggestions for amendments to the plan will be prepared in years 1, 3, 5 and 10 following commencement of the plan's implementation.

3. BIBLIOGRAPHY

EU–LIFE/Coillte '*Irish Blanket Bog Restoration Project*' (2002-2007)', Online, Available at: http://www.irishbogrestorationproject.ie/downloads/4_progress_report.pdf, Accessed: 07.07.2020

Scottish Natural Heritage (SNH), 2014. Guidance note Planning for development: *What to consider and include in Habitat Management Plans* (Version 2, January 2014). Online, Available at: https://www.nature.scot/sites/default/files/2019-01/Guidance%20-%20Planning%20for%20development%20%20-%20What%20to%20consider%20and%20include%20in%20Habitat%20Management%20Plans.pdf, Accessed: 07.07.2020

APPENDIX 3

WATERCOURSE SURVEY REPORT

Planning and Environmental Consultants

Watercourse Survey Report

Cleanrath Windfarm

DOCUMENT DETAILS

Client:	**Cleanrath Windfarm Ltd**
Project Title:	**Cleanrath Wind Farm**
Project Number:	**191223a**
Document Title:	**Aquatic Macroinvertebrate Sampling Report**
Document File Name:	**AMS F – 191223a – 2020.06.05**
Prepared By:	**MKO** **Tuam Road** **Galway** **Ireland** **H91 VW84**

Planning and Environmental Consultants

Rev	Status	Date	Author(s)	Approved By
01	Final	05.06.2020	PR	PR

Table of Contents

1. INTRODUCTION

MKO. were appointed to conduct ecological surveys of the rivers and streams that are located downstream of the Cleanrath windfarm development. The survey work was conducted by suitably qualified ecologist, Pat Roberts. B.Sc. (Env.), MCIEEM.

Sampling was carried out downstream of the study area at 11 sites on the 14th May 2020. Watercourses were assessed if they were located within or downstream of the wind farm development or the grid connection route and contained flowing water. The locations of each watercourse surveyed are provided in Figure 1.1.

Biological water quality was assessed through kick-sampling each of these watercourses. Macro-invertebrate samples were converted to Q-ratings as per Toner et al. (2005)[1]. The applied Q ratings followed the EPA water quality classes and Water Framework Directive status categories. All riverine samples were taken with a standard kick sampling hand net (250mm width, 500µm mesh size) from areas of riffle/glide utilising a two-minute sample, as per ISO standards for water quality sampling (ISO 10870:2012). Large cobble was also washed at each site where present.

In addition to the biological water quality assessment, each watercourse was visually assessed for signs of pollution or instream activity that could be attributable to the construction of the windfarm.

The results of the surveys at all 11 sites are provided below.

[1] *Toner, P., Bowman, J., Clabby, K., Lucey, J., McGarrigle, M., Concannon, C.,. & MacGarthaigh, M. (2005). Water quality in Ireland. Environmental Protection Agency, Co. Wexford, Ireland.*


Map Legend
Kick sample locations
Grid connection route
Development footprint
WFD water catchments
WFD river waterbodies
Site boundary
Ordnance Survey Ireland Licence No. AR 0021820© Ordnance Survey Ireland/Government of Ireland
Drawing Title
Kick sample locations
Project Title
Cleanrath EIAR
Drawn By
DMN
Checked By
PR
Project No.
191223a
Drawing No.
Figure 1.1
Scale
1:44976
Date
18.05.2020
MKO
Planning and
Environmental
Consultants
Tuam Road, Galway
Ireland, H91 VW84
+353 (0) 91 735611
email:info@mkoireland.ie
Website: www.mkoireland.ie

2. RESULTS

The following sections outline the findings of the surveys.

2.1 Sample Station 1

Sample Station 1 was located in a drain through bog habitat within the windfarm site itself but located over 200m from the closest infrastructure. Whilst this was likely to be a natural stream, it had been straightened and managed to improve its drainage function in the past. It was in no way modified during the construction or operation of the windfarm and no signs of any such activity were recorded at or in close proximity to this stream. It flows into Cleanrath Lough and from there, into the Toon River after approximately 2km.

No instream or emergent macrophytes were recorded at the sample point and the stream had a silty substrate. bryophytes. The bankside vegetation was typical of bog and heath habitats and contained species such as purple moor grass (*Molinia caerulea*), Devil's bit scabious (*Succisa pratensis*), bog myrtle (*Vaccinium myrtillus*) and butterwort (*Pinguicula vulgaris*)

The stream was not suitable for freshwater pearl mussel and did not support any spawning habitat for salmonid fish at the sample point. The Q rating assigned to the channel was Q4. It was assigned this value as Group A invertebrates were common but there was only one taxon recorded. This was similar with Group B invertebrates. Group C invertebrates were common but not excessive and included three taxa. No group D or E taxa were recorded.

There were no riffles in the stream close to the sampling point and the silty stream was not ideal for the undertaking of a kick sample for the purposes of biological assessment of the watercourse. However, the results demonstrate that the stream is not polluted and no signs of any impacts resulting from the construction and operation of the windfarm were recorded.

Table 2.1: Invertebrate Sample Station 1 Results

Indicator Group	Taxon	Dominance
Group A - Very Pollution Sensitive		
	Ephemeroptera - Heptageniidae	Common (stone wash)
Group B - Moderately Pollution Sensitive		
	Trichoptera - Cased	Common
Group C - Moderately Pollution Tolerant		
	Ephemoptera – *Baetis rhodani*	Common
	Trichoptera - Caseless	Few
	Gammarus spp.	Few

Group D - Very Pollution Tolerant		
Group E - Most Pollution Tolerant		
Also Present	River Limpet (*Ancylus fluviatilis*)	Few
	Oligochaeta (non Tubificidae)	Few

2.2 Sample Station 2

Sample Station 2 was located in a narrow bog stream that is located to the south of an existing public road. There was no defined channel to the north of the road and no direct surface water connectivity with the wind farm site (the stream arises out of a wetland to the north. There were no riffles in the stream and it had a substrate comprising primarily of peat and bedrock. It was approximately 1.5m in width. This stream is shown in Plate 2.1. It flows to the south of the wind farm site and enters Lough Allua after approximately 2.5km.

Plate 2.1. Sample Station 2.

The instream macrophytes included bog pondweed (*Potamogeton polygonifolius*) and stoneworts (*Chara Sp.*). There was some growth of algae within the stream. Emergent vegetation included a number of small sedges (*Carex Spp.*). The bankside vegetation was dominated by typical bog species including bog myrtle, milkwort (*Polygala serpyfolia*), cross leaved heath (*Erica tetralix*) and butterwort.

The stream did not provide suitable habitat for freshwater pearl mussel and did not provide significant fisheries habitat as it was very narrow, steep and shallow with a substrate of bedrock and peat. The Q rating assigned to the channel was Q3. It was assigned this value as the density and diversity of invertebrates was low and no Group A species were present. Group B species were recorded and Groupd C species were common. This rating is likely due to the lack of riffle habitat and nature of the substrate, which was not ideal for undertaking a Q value assessment rather than any pollution within the channel. There was no luxuriant growth of algae, sewage fungus or any other slimes and the stream appeared clean – but peaty. No signs of any impacts resulting from the construction and operation of the windfarm were recorded.

Table 2.2: Invertebrate Sample Station 2 Results

Indicator Group	Taxon	Dominance
Group A - Very Pollution Sensitive		
Group B - Moderately Pollution Sensitive		
	Odonata -Zygoptera	Few
Group C - Moderately Pollution Tolerant		
	Ephemeroptera - *Baetis rhodani*	Numerous
	Trichoptera - caseless	Few
	Coleoptera	Few
Group D - Very Pollution Tolerant		
Group E - Most Pollution Tolerant		

2.3 Sample Station 3

Sample Station 3 was located along the grid connection route in the Townland of Rathgaskig. This watercourse is a tributary of the Aghnakinneigh Stream and is approximately 3.5 metres wise at the sample point. It was very shallow at the time of the survey. It had a substrate of gravels and cobbles but no riffles in the area surrounding the grid connection route. The sample was taken downstream of the grid connection (which was located in the road bed where it crossed the bridge on the public road).

There were no signs of pollution or any instream or bankside works having taken place. This stream is shown in Plate 2.2.

Plate 2.2. Sample Station 3.

No instream or emergent vegetation was recorded. The stream was very shaded and the bankside vegetation was dominated by dense bramble (*Rubus fruticosus agg.*), hazel (*Corylus avellana*), Herb Robert (*Geranium robertianum*), birch (*Betula pubescens*), holly (*Ilex aquifolium*) and grey willow (*Salix cinerea*). Filamentous algae, whilst present, was very sparse.

The Q rating assigned to the channel was Q4. It was assigned this value as 2 Group A taxa were recorded along with a Group B Taxon in fair numbers. Group C were well represented but not excessive. The sample was not undertaken in a riffle and thus not in ideal habitat for a biological sample. In addition, it was heavily shaded at the sample location. No suitable habitat for freshwater pear mussel was recorded at this location as the watercourse was too shallow and steep. The gravel substrate provides some potential habitat for salmonid fish. No signs of any impacts resulting from the construction of the grid connection were recorded.

Table 2.3: Invertebrate Sample Station 3 Results

Indicator Group	Taxon	Dominance
Group A - Very Pollution Sensitive		
	Ephemeroptera – *Heptageniidae* (Stone wash)	Few
	Plecoptera (Non Leuctra)	Few

Group B - Moderately Pollution Sensitive		
	Trichoptera (*Cased*) (Stone wash)	Numerous
	Odonata - Zygoptera	Few
Group C - Moderately Pollution Tolerant		
	Trichoptera - Caseless	Common
	Gammarus Sp.	Few
	Ephemeroptera (*Baetis rhodani*)	Few
Group D - Very Pollution Tolerant		
Group E - Most Pollution Tolerant		

2.4 Sample Station 4

Sample Station 4 was located alongside an agricultural track that had been recently surfaced with limestone chips and was surrounded by fields of improved agricultural grassland. The grid connection route passed along and within the bed of an adjacent public road with no instream works required. The sample was taken downstream of the grid connection. The drain was a managed drainage channel with a substrate of boulders and cobbles and a moderated degree of siltation. It was approximately one metre wide at the sample point. This drain converges with the River Lee at Ballinageary after approximately 3km. This drain is shown in Plate 2.3.

Plate 2.3. Sample Station 4.

The instream macrophytes included duckweed (*Lemna minor*) emergent vegetation including hemlock water dropwort (*Oenanthe crocata*) and floating sweet grass (*Glyceria fluitans*). The bankside vegetation was dominated by grassy vegetation and bramble and foxglove (*Digitalis purpurea*).

The Q rating assigned to the channel was Q3. It was assigned this value as Group A were absent, group B were represented in fair numbers and Group C were also numerous. There was also moderate growth of filamentous algae present. This result is typical of a drain that is surrounded by improved agricultural lands. The stream does not provide any suitable habitat for freshwater pearl mussel or any significant habitat for salmonid fish at the sample point. The cable was laid in the public road (not in the private agricultural track that is adjacent to the stream) No signs of any impacts resulting from the construction of the grid connection were recorded.

Table 2.4: Invertebrate Sample Station 4 Results

Indicator Group	Taxon	Dominance
Group A - Very Pollution Sensitive		
Group B - Moderately Pollution Sensitive		
	Trichoptera – Cased (Stone wash)	Numerous

Group C - Moderately Pollution Tolerant		
	Ephemeroptera – (*Baetis rhodani*)	Numerous
	Gastropoda	Common
	Coleoptera	Common
	Trichoptera - Caseless	Few
	Hemiptera (Corixidae)	Few
Group D - Very Pollution Tolerant		
Group E - Most Pollution Tolerant		

2.5 Sample Station 5

Sample Station 5 was located on a tributary of the Bunsheelin River that flows into the River Lee approximately 2km downstream at Ballinageary. It was approximately 6m wide at the survey point, with an average depth of 0.3m at the time of the survey. The substrate was dominated by bedrock, boulders and cobbles ant there was little siltation. The grid connection cable was strapped to the side of the bridge in this location and there was no requirement for instream works. This sample station is shown in Plate 2.4.

Plate 2.4. Sample Station 5.

The instream macrophytes included the aquatic moss *Fontinalis antipyretica* along with other bryophytes. Emergent vegetation included hemlock water dropwort. The bankside vegetation was included grassy vegetation and woodrush (*Luzula sylvatica*), .hemlock water dropwort and bramble. Ash (*Fraxinus excelsior*), Birch and sycamore (*Acer campestre*) were present surrounding the banks.

The Q rating assigned to the channel was Q4. It was assigned this value as Group A and B taxa were recorded in fair numbers with Group C numerous. The sample was undertaken in a riffle and was a suitable location to undertake an accurate biological water sample. The river offered potential habitat for freshwater pearl mussel (despite the presence of bedrock) though none were recorded at the sample site. The river also provided good quality fisheries habitat, with riffles, glides and pools present and a stony substrate. No signs of any impacts resulting from the construction of the grid connection were recorded.

Table 2.5: Invertebrate Sample Station 5 Results

Indicator Group	Taxon	Dominance
Group A - Very Pollution Sensitive		

	Ephemoptera – heptageniidae (Mainly in stone wash)	Common
	Plecoptera (Non Leuctra)	Few
Group B - Moderately Pollution Sensitive		
	Trichoptera - Cased	Common
	Plecoptera - Leuctra	Few
Group C - Moderately Pollution Tolerant		
	Ephemoptera – *Baetis rhodani*	Numerous
	Gammarus Sp.	Few
	Simulidae	Few
	Chironomidae	Few
Group D - Very Pollution Tolerant		
Group E - Most Pollution Tolerant		

2.6 Sample Station 6

Sample Station 6 was located at the confluence of two streams that are downstream of the grid connection route and form part of the Bunsheelin River that flows into the River Lee at Ballinageary, approximately four kilometres downstream. This river is approximately three metres wide at the sample point with a substrate of cobbles and gravels with no appreciable siltation. The sample point is surrounded by pasture lands along with a recently constructed house and garden. The grid connection was located in the existing road and there were no signs of pollution at either crossing point or downstream at the sample site. This sample site is shown in Plate 2.5.

Plate 2.5. Sample Station 6.

The instream macrophytes included the aquatic moss *Fontinalis antipyretica* along with other bryophytes. Emergent vegetation included hemlock water dropwort. The bankside vegetation was dominated by woodrush, willow, gorse and holly scrub. The river provided suitable habitat for freshwater pearl mussel, though none were recorded at the sample site. The stream is possibly a little steep and unstable for the species. The substrate of gravels and cobbles for provides good Salmonid fish habitat.

The Q rating assigned to the channel was Q4. It was assigned this value as Group A were recorded in fair numbers with Group B recorded and Group C recorded in fair numbers. There was no filamentous algae or sewage fungus and no signs of other pollution. No signs of any impacts resulting from the construction of the grid connection were recorded.

Table 2.6: Invertebrate Sample Station 6 Results

Indicator Group	Taxon	Dominance
Group A - Very Pollution Sensitive		
	Ephemoptera - Heptageniidae	Common
Group B - Moderately Pollution Sensitive		
	Trichoptera - Cased	Few
	Plecoptera - Leuctra	Few
Group C - Moderately Pollution Tolerant		
	Ephemoptera – *Baetis rhodani*	Common
	Gammarus	Few
	Trichoptera - Caseless	Few
	Coleoptera	Few
	Chironomidae	Few
	Hydracarina	Few
Group D - Very Pollution Tolerant		
	Hirudinea	Few
Group E - Most Pollution Tolerant		

2.7 Sample Station 7

Sample Station 7 was located at the edge of a private garden downstream of the grid connection route. It is a tributary of the Bunsheelin River and is approximately one kilometre upstream of sample station 6. The stream was approximately 2.5 metres wide and 0.1m deep at the time of survey and had a substrate of cobbles and gravels. The grid connection was located in the road upstream and no signs of disturbance or instream works were recorded. This sample station is shown in Plate 2.6.

Plate 2.6. Sample Station 7.

The instream macrophytes included the aquatic moss *Fontinalis antipyretica* along with other bryophytes. No emergent vegetation was recorded. The bankside vegetation was dominated by grassy vegetation associated with the lawn of a private house. It included species such as sorrel (*Rumex acetosa*), dandelion (*Taraxicum officinale agg.*), field speedwell (*Veronica serpyfolia*) and ribwort (*Plantago lanceolota*). The channel was steep, shallow and likely to be subject to large fluctuations in water levels. In this regard it is unsuitable for freshwater pearl mussel at this location. It does provide some potential habitat for salmonid species but is very small and shallow.

The Q rating assigned to the channel was Q4. It was assigned this value as Group A were recorded in fair numbers with Group B recorded and Group C recorded in fair numbers. There was no filamentous algae or sewage fungus and no signs of other pollution. No signs of any impacts resulting from the construction of the grid connection were recorded.

Table 2.7: Invertebrate Sample Station 7 Results

Indicator Group	Taxon	Dominance
Group A - Very Pollution Sensitive		

	Ephemeroptera – Heptageniidae (Stone wash)	Common
	Plecoptera – non leuctra	Few
Group B - Moderately Pollution Sensitive		
	Plecoptera - Leuctra	Few
Group C - Moderately Pollution Tolerant		
	Ephemeroptera – *Baetis rhodani*	Common
	Hydracarina	Few
	Simulidae	Few
	Trichoptera - Caseless	Few
	Gammarus	Few
Group D - Very Pollution Tolerant		
Group E - Most Pollution Tolerant		

2.8 Sample Station 8

Sample Station 8 was located on a very steep mountain stream that was located alongside the grid connection route as it travels up to the Kerry border at Lackabaun. The stream was approximately one metre wide at the sample station but was less than 0.1m deep and had a substrate of bedrock and boulders. This stream flows down the steep mountain for approximately one kilometre before reaching sample station 7. There was no evidence of any impacts having resulted from the construction of the nearby grid connection.

The instream macrophytes included the aquatic moss *Fontinalis antipyretica* along with other bryophytes. No emergent vegetation was recorded. The bankside vegetation was dominated by such as butterwort, primrose (*Primula vulgaris*), sweet vernal grass (*Anthoxanthum odoratum*), yellow pimpernel (*Lysimachia nemorum*) and Meadowsweet (*Filipendula ulmaria*). The stream was too shallow and too steep to effectively kick sample. Boulders were lifted and a rock washing exercise took was undertaken.

No Q value was assigned as no kick sample was possible. However, the stone washing revealed Group A and Group B species – indicating unpolluted waters. There was no filamentous algae or sewage fungus and no signs of other pollution. No signs of any impacts resulting from the construction of the grid connection were recorded.

Table 2.8: Invertebrate Sample Station 8 Results

Indicator Group	Taxon	Dominance
Group A - Very Pollution Sensitive		
	Ephemeroptera – Heptageniidae (Stone wash)	Common
Group B - Moderately Pollution Sensitive		
	Trichoptera - Cased	Common
Group C - Moderately Pollution Tolerant		
Group D - Very Pollution Tolerant		
Group E - Most Pollution Tolerant		

2.9 Sample Station 9

Sample Station 9 was located at a location where the access road to the wind farm crosses the Toon River. The river here is approximately 5 metres wide with a mixed substrate of boulders, cobbles, gravels and fine gravels. The river provides good quality salmonid habitat. It also provides suitable habitat for freshwater pearl mussel, though none were recorded at the sample location. Evidence of road enhancement works were noted on the bridge and on the surrounding road infrastructure but no signs of any effects on the river channel were identified. This sample station is shown in Plate 2.7.

Plate 2.7. Sample Station 9.

The instream macrophytes included the aquatic moss *Fontinalis antipyretica* along with other bryophytes. Water crowfoot was recorded upstream of the bridge, where the channel conforms to the EU Habitats Directive Annex I habitat '*water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation (3260)*'. Emergent vegetation included hemlock water dropwort. The bankside vegetation was included bramble, ferns and figwort (*Scrophularia sp.*) with shading from tree species including hawthorn (*Crataegus monogyna*), grey willow and ash.

The Q rating assigned to the channel was Q4. It was assigned this value as Group A were recorded in fair numbers with Group B recorded and Group C recorded in fair numbers. There was no filamentous algae or sewage fungus and no signs of other pollution. No signs of any impacts on the river resulting from the construction of the wind farm were recorded.

Table 2.9: Invertebrate Sample Station 9 Results

Indicator Group	Taxon	Dominance
Group A - Very Pollution Sensitive		
	Ephemeroptera – Heptageniidae (stone wash)	Numerous
	Plecoptera – non leuctra	Few
Group B - Moderately Pollution Sensitive		
	Trichoptera – Cased	Few

	Plecoptera - Leuctra	Common
Group C - Moderately Pollution Tolerant		
	Ephemeroptera – *Baetis rhodani*	Common
	Trichoptera - Caseless	Few
	Gammarus	Few
	Simulidae	Few
Group D - Very Pollution Tolerant		
Group E - Most Pollution Tolerant		

2.10 Sample Station 10

Sample Station 10 was located at a location where the access road to the wind farm crosses a tributary of the Toon River. The river here is approximately 4.5 metres wide with a mixed substrate of boulders, cobbles, gravels and silts. The river provides good quality salmonid habitat. It also provides suitable habitat for freshwater pearl mussel, though none were recorded at the sample location. Evidence of road enhancement works were noted on the bridge and on the surrounding road infrastructure. This included extensive works on the culvert. However, no signs of any instream works or effects on the river channel were identified. This sample station is shown in Plate 2.8.


Plate 2.8. Sample Station 10.

No submerged or emergent macrophytes were recorded. The bankside vegetation included meadowsweet, bramble, nettle (*Urtica dioica*) and wavy bittercress (*Cardamine flexuosa*).

The Q rating assigned to the channel was Q4. It was assigned this value as Group A were recorded in fair numbers with Group B recorded and Group C recorded in fair numbers. There was no filamentous algae or sewage fungus and no signs of other pollution. No signs of any impacts on the river resulting from the construction of the wind farm were recorded.

Table 2.10: Invertebrate Sample Station 10 Results

Indicator Group	Taxon	Dominance
Group A - Very Pollution Sensitive		
	Ephemeroptera – Heptageniidae (stone wash)	Numerous
	Plecoptera – non leuctra	Few
Group B - Moderately Pollution Sensitive		
	Trichoptera - cased	Few
	Plecoptera - leuctra	Few

Group C - Moderately Pollution Tolerant		
	Ephemeroptera – *Baetis rhodani*	Common
	Trichoptera - Caseless	Few
	Platyhelminthes	Few
Group D - Very Pollution Tolerant		
Group E - Most Pollution Tolerant		

2.11 Sample Station 11

Sample Station 10 was located on the Toon River approximately 1.8 kilometres downstream of sampling station 9. The river here is approximately 10 metres wide with a gravel substrate. The river provides good quality salmonid habitat. It also provides suitable habitat for freshwater pearl mussel, though none were recorded at the sample location. No signs of any effects of the windfarm on this river channel were identified. This sample station is shown in Plate 2.9.

Plate 2.9. Sample Station 11.

Submerged macrophytes included water crowfoot (*Ranunculus sp.*) and the channel conforms to the EU Habitats Directive Annex I habitat '*water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation (3260)*' at this location. Emergent vegetation included hemlock water dropwort, marsh ragwort (*Senecio aquaticus*) and figwort. The bank side vegetation included hemlock water dropwort, bramble, gorse and broom (*Sarothamnus* scoparius) scrub with willows on the banks.

The Q rating assigned to the channel was Q4. It was assigned this value as Group A were recorded in fair numbers with Group B recorded and Group C recorded in fair numbers. There was no filamentous algae or sewage fungus and no signs of other pollution. No signs of any impacts on the river resulting from the construction of the wind farm were recorded.

Table 2.11: Invertebrate Sample Station 11 Results

Indicator Group		Taxon	Dominance
Group A - Very Pollution Sensitive			

		Ephemeroptera – Heptageniidae (stone wash)	Numerous
		Plecoptera – non leuctra x 2 species	Common
Group B - Moderately Pollution Sensitive			
		Trichoptera - cased	Few
		Plecoptera - leuctra	Few
Group C - Moderately Pollution Tolerant			
		Ephemeroptera – *Baetis rhodani*	Numerous
		Simulidae	Few
Group D - Very Pollution Tolerant			
Group E - Most Pollution Tolerant			

3. CONCLUSION

The survey included a general habitat assessment and biological water quality assessment at every watercourse where flowing water was present within or downstream of the wind farm site and grid connection route following construction and operation of the wind farm. In none of the 11 survey stations was there any evidence to indicate that there had been any impact on water quality or any other aspect of the watercourse as a result of the construction or the operation of the wind farm and grid connection.

APPENDIX 4

HEN HARRIER SURVEY DATA

Appendix 4 – Hen Harrier Survey Data & Figures

Cleanrath Wind Farm

DOCUMENT DETAILS

Client: Cleanrath Windfarm Ltd

Project Title: Cleanrath Wind Farm

Project Number: 191223a

Document Title: Appendix 4 – Hen Harrier Survey Data & Figures

Document File Name: 191223a – 2020.07.28– F

Prepared By:

MKO
Tuam Road
Galway
Ireland
H91 VW84

Planning and Environmental Consultants

Rev	Status	Date	Author(s)	Approved By
01	Draft	28/07/2020	DN	PC
02	Final	28/07/2020	DN	PC

Table of Contents

TABLE OF TABLES

APPENDIX 4 (HEN HARRIER SURVEY DATA & FIGURES)

Table 1 Hen Harrier 2015 – 2017 Survey Data

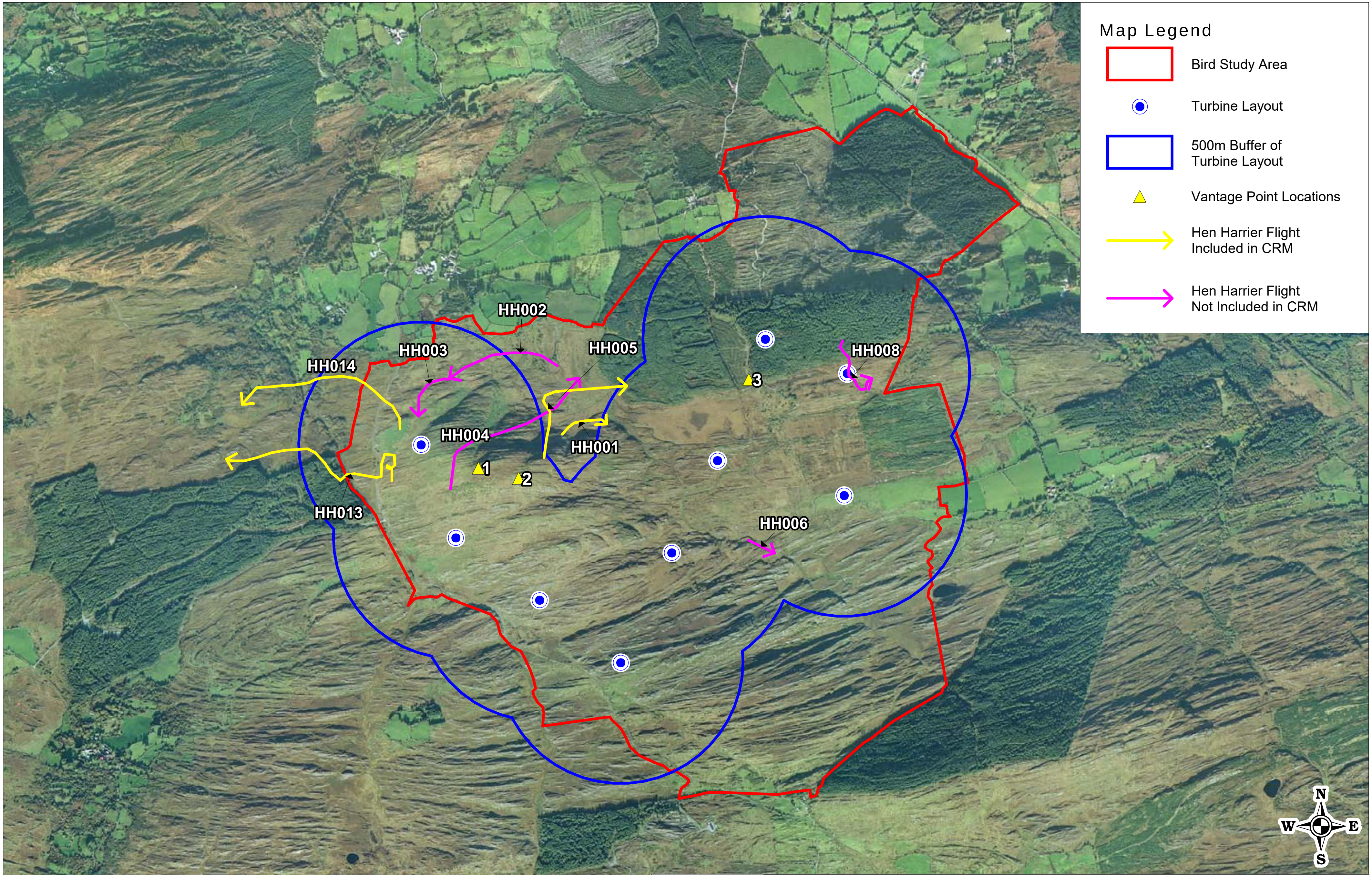
Vantage Point Surveys														
Obs. Ref. No.	Date	VP	Species	No. of Birds	Time of flight	Duration of flight (s)	Band 1 (0-10m)	Band 2 (10-25m)	Band 3 PCH (25-175m)	Band 4 (>175m)	Sex/Age	Notes on habitat and activity	Comments	Surveyor
HH001	21/02/2015	2	Hen Harrier	1	13:10:00	5			5		M	Male HH - Quick glimpse of bird as it rose from bracken and disappeared behind a rocky outcrop.	Headed East	SI
HH002	22/02/2015	1	Hen Harrier	1	12:03:00	45	45		0		M	Male HH - Quartering/hunting across heath/bog on the lower ground on-site, from E-W and landed in a patch of burned heather. Perched there for 20 mins (Perching spot = X on the map between flight line 2 and 3).	Headed West	SI
HH003	22/02/2015	1	Hen Harrier	1	12:23:00	60	60		0		M	Male HH - Same male left perching spot and hunted again over bog before disappearing around the hill.	Headed West	SI
HH004	22/02/2015	1	Hen Harrier	1	12:25:00	30	30		0		M	Male HH - Same male again flew over the summit of the hill behind VP 5m above summit and out of site (hence 300m) in a NE direction before lost sight of him due to glare.	Headed North East	SI
HH005	16/09/2015	1	Hen Harrier	1	08:27:00	30	10		30		F	Female seen flying east of VP 1, heading North over rough grassland, circling once before turning East and slowly declining in height heading towards area of conifer plantation, lost visual over conifer plantation.		D

Vantage Point Surveys														
Obs. Ref. No.	Date	VP	Species	No. of Birds	Time of flight	Duration of flight (s)	Band 1 (0-10m)	Band 2 (10-25m)	Band 3 PCH (25-175m)	Band 4 (>175m)	Sex/Age	Notes on habitat and activity	Comments	Surveyor
HH006	28/10/2015	2	Hen Harrier	1	14:50:00	5	5		0			Male		JC
HH007	29/10/2015	1	Hen Harrier	1	07:36:00	8			8			Male		JC
HH008	07/12/2016	3	Hen Harrier	1	14:14	25	20	5			M	WD4, (Conifer plantation) Male observed flying South over juvenile conifer plantation low to the ground hunting. Male then turned Northeast, over area of heath habitat and visual lost due to surrounding terrain.		D
HH009	20/12/2016	2	Hen Harrier	1	08:33	10	10				M	WS, (Scrub/ transitional woodland) Male observed hunting low to the ground when disturbed GP, flew North chasing after individuals where visual was quickly lost due to the terrain.		D
HH010	20/12/2016	2	Hen Harrier	1	08:34	35		35			M	E, (Exposed rock and disturbed ground) Same male observed at 08.33 seen again flying south east past VP 2. Individual proceeded to turn South directly, observed slowly declining in height and passed over juvenile forestry where visual was lost.		D
HH011	20/12/2016	2	Hen Harrier	1	08:41	20	20				F	E, (Exposed rock and disturbed ground) Initial call of HH can be heard a short distance from VP. Female observed circling over area of rough terrain and then joined by a second female in the same area.		D
HH012	20/12/2016	2	Hen Harrier	1	08:42	15	15				F	E, (Exposed rock and disturbed ground) Sighting of second		D

Vantage Point Surveys														
Obs. Ref. No.	Date	VP	Species	No. of Birds	Time of flight	Duration of flight (s)	Band 1 (0-10m)	Band 2 (10-25m)	Band 3 PCH (25-175m)	Band 4 (>175m)	Sex/Age	Notes on habitat and activity	Comments	Surveyor
												individual seen with first individual. Pair seen circling over area of scrub, losing visual frequently due to the terrain. Visual lost quite soon as pair moved off behind terrain and not seen again.		
HH013	13/01/2017	1	Hen Harrier	1	09:16	140	15	30	95		F	WS, (Scrub/ transitional woodland) Female observed flying North past VP 1 and dropped down low over area of scrub, turned back south briefly before turning westwards flying over area of scrub and juvenile forestry until visual was lost.		D
HH014	13/01/2017	1	Hen Harrier	1	10:12	120	20	50	50		F	WS, (Scrub/ transitional woodland) Female observed flying low over scrub heading north initially. Turned Northwest for a period of time. Seen dropping down in height over area of scrub and lost visual with distance.		D

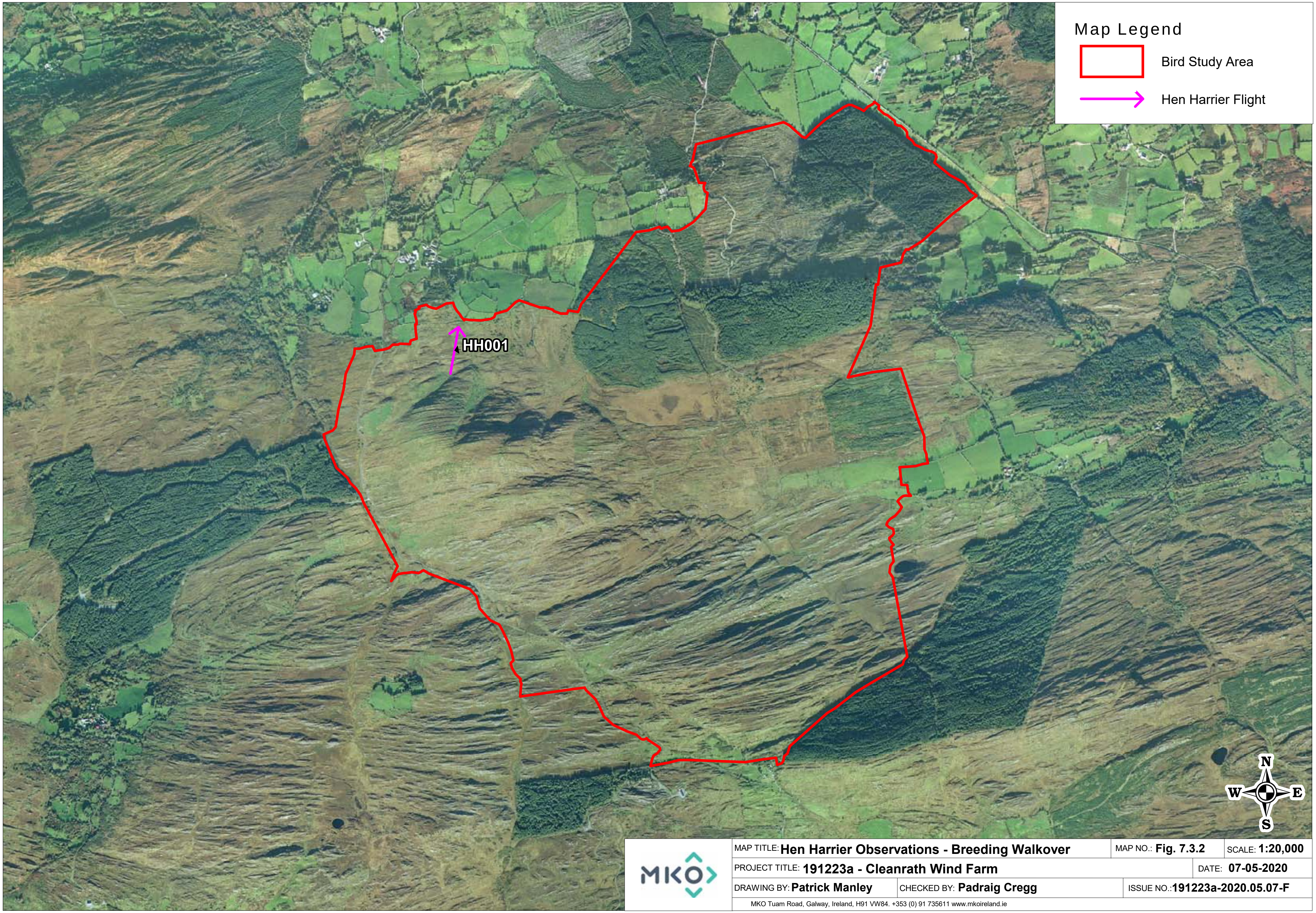
Breeding Bird Surveys								
Obs. Ref. No.	Survey Date	Time of observation	Species	Number of birds	Sex/age	Notes on Habitat and Activity	Comments	Surveyor
HH001	15/04/2015	13:05	Hen Harrier	2	F	One flying directly over site, the other seen (W) of site some distance away	on site	D

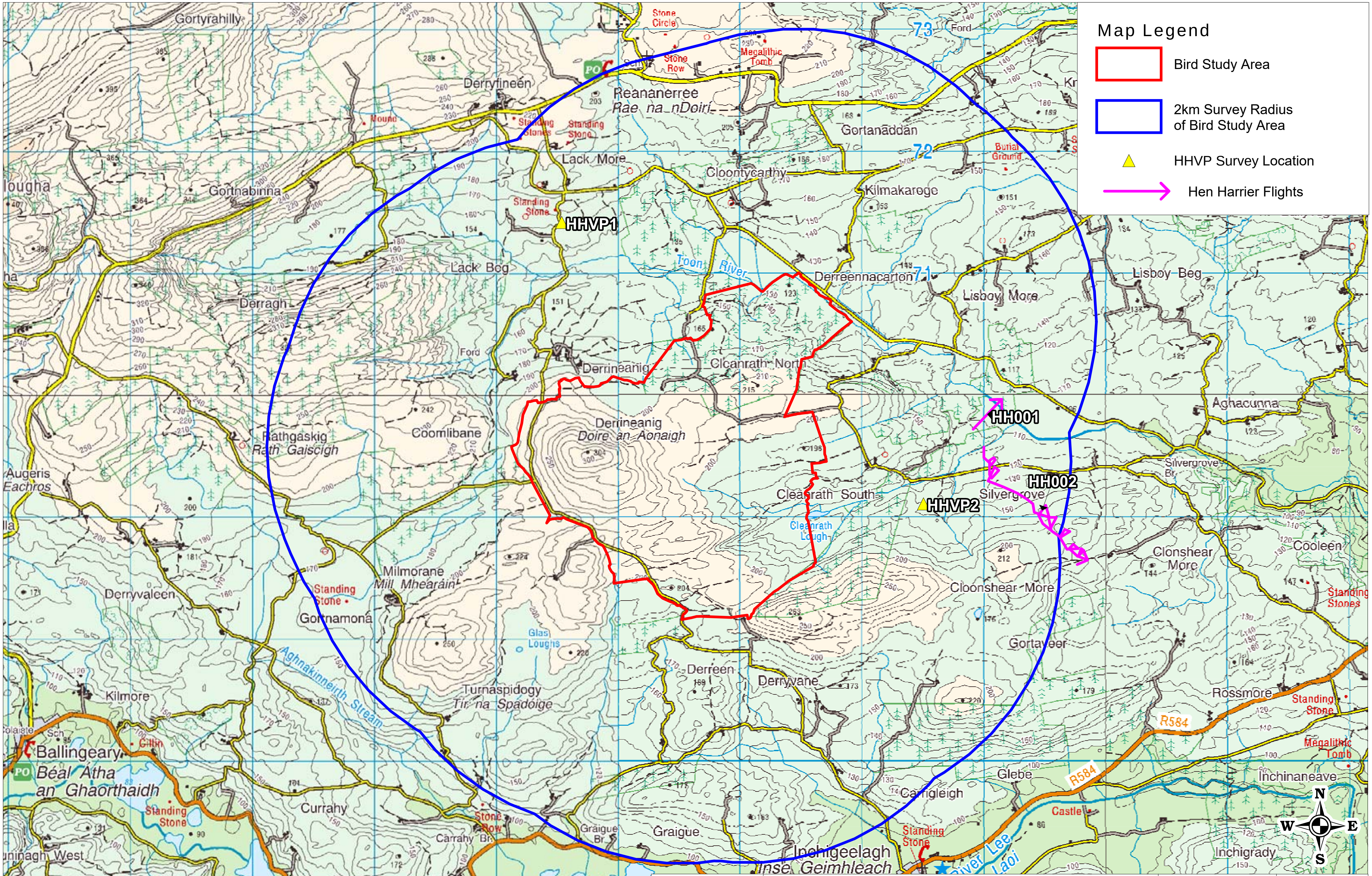
Hen Harrier Roost Surveys								
Obs. Ref. No.	Date	Species	No. of Birds	Time of flight	Duration of flight (s)	Notes on habitat and activity	Comments	Surveyor
HH001	21/11/2016	Hen Harrier	1	16:12	15	WS, (Scrub/ transitional woodland) GM1, (Marsh) Sex unknown due to direct sunlight. Individual observed gliding slowly Northeast over area of habitat and seen declining in height into area of habitat.		D
HH002	21/11/2016	Hen Harrier	1	16:25	280	WS, (Scrub/ transitional woodland) GM1, (Marsh) Distinct silhouette of HH, more than likely same individual rising out of scrub area. Individual heading Southeast and can be seen gaining a lot of height. Seen circling for long periods of time, moved a significant distance from original location. Lost visual due to distance in the end.		D



MKO	MAP TITLE: Hen Harrier Vantage Point Observations	MAP NO.: Fig. 7.1.2	SCALE: 1:20,000
	PROJECT TITLE: 191223a - Cleanrath Wind Farm		DATE: 07-05-2020
	DRAWING BY: Patrick Manley	CHECKED BY: Padraig Cregg	ISSUE NO.:191223a-2020.05.07-F

MKO Tuam Road, Galway, Ireland, H91 VW84. +353 (0) 91 735611 www.mkoireland.ie


Map Legend
Bird Study Area
Hen Harrier Flight
HH001
N
W
E
S
MKO
MAP TITLE: Hen Harrier Observations - Breeding Walkover
MAP NO.: Fig. 7.3.2
SCALE: 1:20,000
PROJECT TITLE: 191223a - Cleanrath Wind Farm
DATE: 07-05-2020
DRAWING BY: Patrick Manley
CHECKED BY: Padraig Cregg
ISSUE NO.: 191223a-2020.05.07-F
MKO Tuam Road, Galway, Ireland, H91 VW84. +353 (0) 91 735611 www.mkoireland.ie



MAP TITLE: **Hen Harrier Roost Survey Observations**

MAP NO.: **Fig. 7.6.1**

SCALE: **1:40,000**

PROJECT TITLE: **191223a - Cleanrath Wind Farm**

DATE: **07-05-2020**

DRAWING BY: **Patrick Manley**

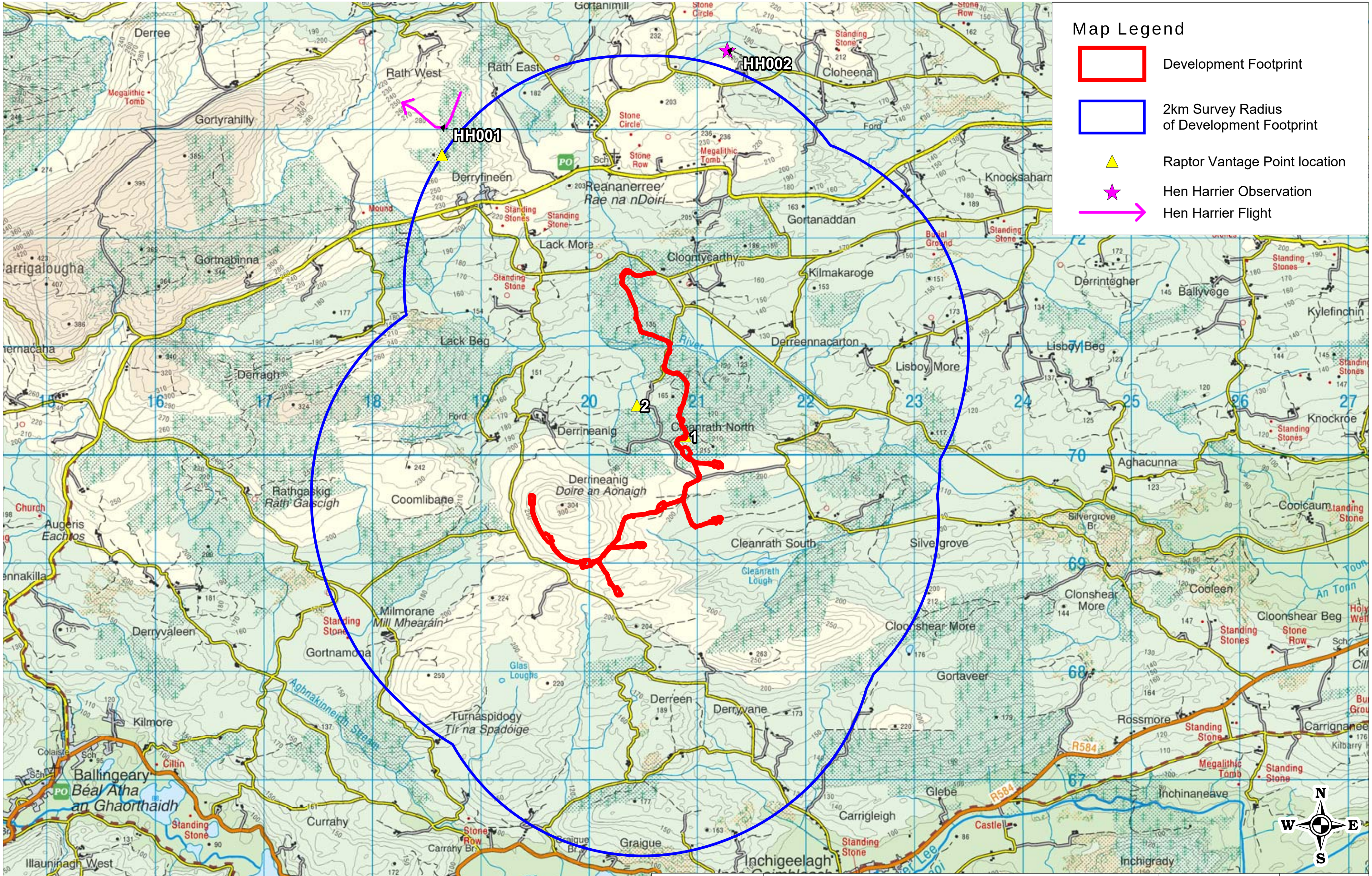
CHECKED BY: **Padraig Cregg**

ISSUE NO.: **191223a-2020.05.07-F**

MKO Tuam Road, Galway, Ireland, H91 VW84. +353 (0) 91 735611 www.mkoireland.ie

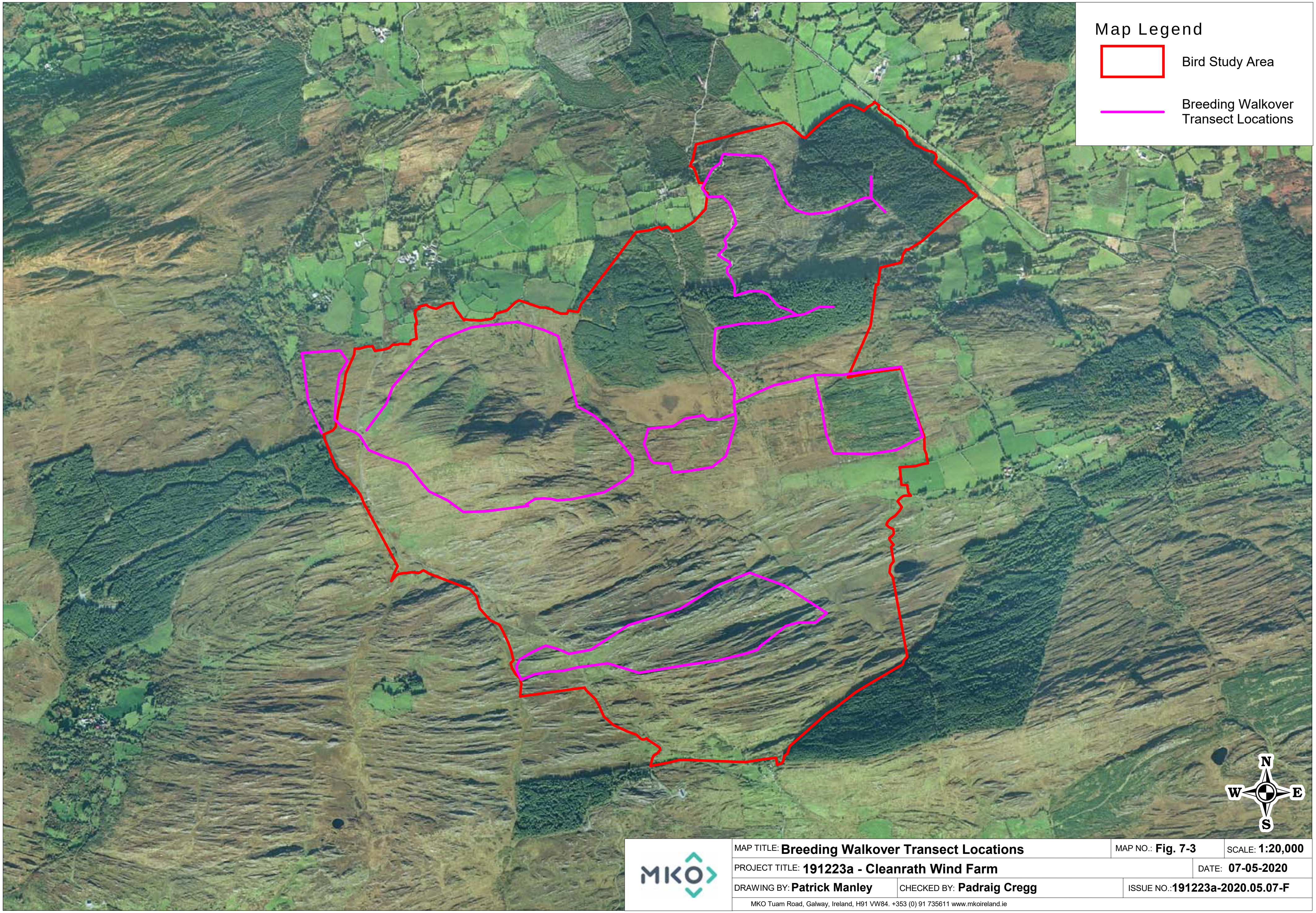
Table 2 Hen Harrier Operational Survey Data

Breeding Raptor Surveys								
Obs. Ref. No.	Date	RVP	Species	No. of Birds	Time of flight	Notes on habitat and activity	Comments	Surveyor
HH001	15/05/2020	3	Hen Harrier	1	16:45	PB1, (Raised bog) GS4, (Wet grassland) WD4, (Conifer plantation) Hunting & Soaring	Adult Male	SA
HH002	15/05/2020	3	Hen Harrier	1	19:30	PB1, (Raised bog) GS4, (Wet grassland) WD4, (Conifer plantation) Hunting & Soaring	Adult Male	SA



MAP TITLE: **Hen Harrier Observations - Breeding Raptor VPs**		MAP NO.: **Fig. 3-1**	SCALE: **1:45,000**
PROJECT TITLE: **191223-a - Cleanrath Windfarm Operational Surveys**			DATE: **24-07-2020**
DRAWING BY: **Patrick Manley**	CHECKED BY: **Padraig Cregg**		ISSUE NO.: **190730-2020.07.24-F**

MKO Tuam Road, Galway, Ireland, H91 VW84. +353 (0) 91 735611 www.mkoireland.ie

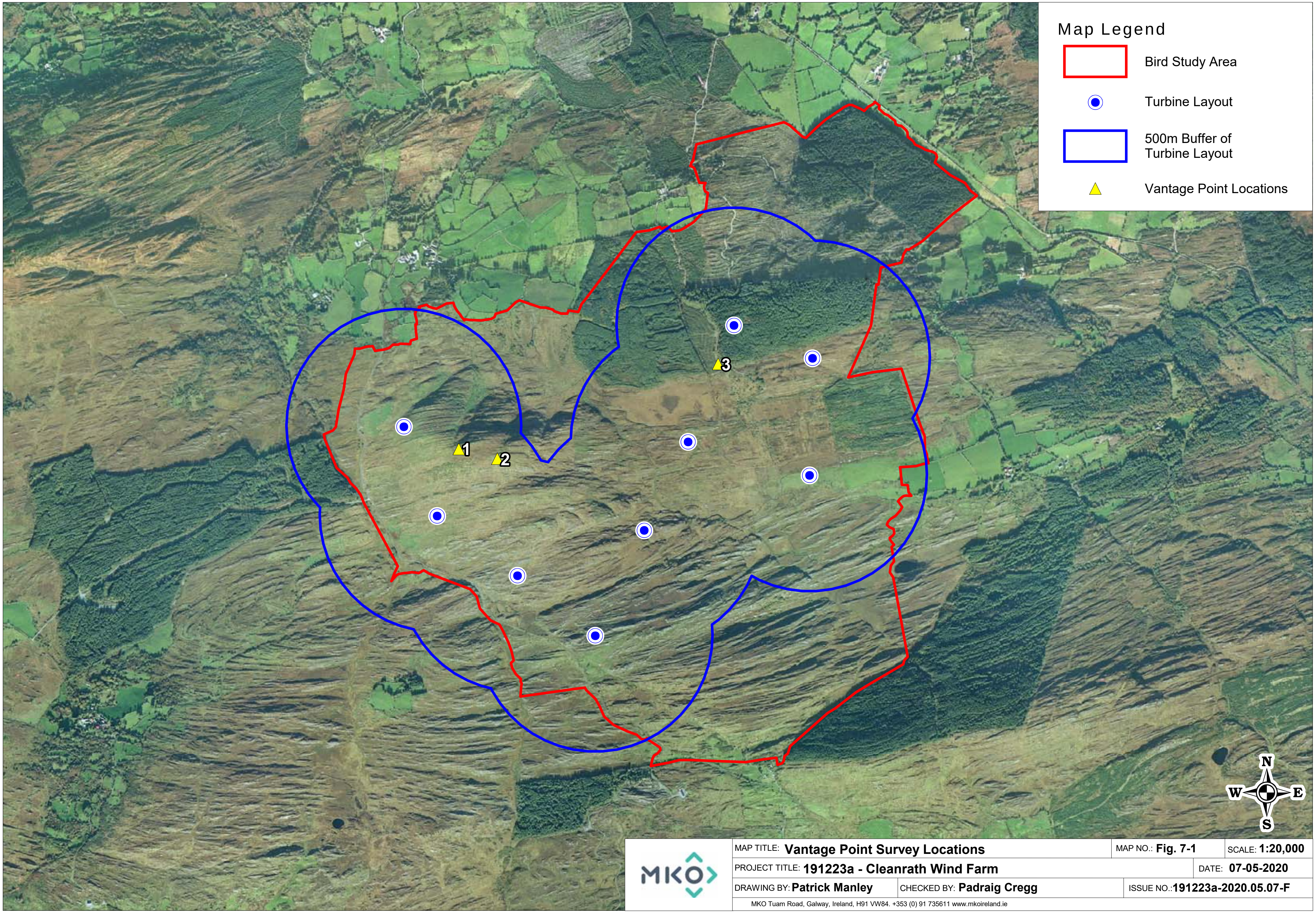


MAP TITLE: Breeding Walkover Transect Locations | MAP NO.: Fig. 7-3 | SCALE: 1:20,000

PROJECT TITLE: 191223a - Cleanrath Wind Farm | DATE: 07-05-2020

DRAWING BY: Patrick Manley | CHECKED BY: Padraig Cregg | ISSUE NO.: 191223a-2020.05.07-F

MKO Tuam Road, Galway, Ireland, H91 VW84. +353 (0) 91 735611 www.mkoireland.ie


Map Legend
Bird Study Area
Turbine Layout
500m Buffer of Turbine Layout
Vantage Point Locations
1
2
3
N
E
S
W
MKO
MAP TITLE: Vantage Point Survey Locations
MAP NO.: Fig. 7-1
SCALE: 1:20,000
PROJECT TITLE: 191223a - Cleanrath Wind Farm
DATE: 07-05-2020
DRAWING BY: Patrick Manley
CHECKED BY: Padraig Cregg
ISSUE NO.: 191223a-2020.05.07-F
MKO Tuam Road, Galway, Ireland, H91 VW84. +353 (0) 91 735611 www.mkoireland.ie

APPENDIX 5

HYDROLOGICAL ASSESSMENT

9. HYDROLOGY AND HYDROGEOLOGY

9.1 Introduction

9.1.1 Background and Objectives

Hydro-Environmental Services (HES) was engaged by MKO to carry out a remedial environmental assessment (rEIAR) of the effects of the construction, operation and decommissioning of the Cleanrath Wind Farm site, grid connection and junction accommodation works (the "Cleanrath wind farm development")on water aspects (hydrology and hydrogeology) of the receiving environment.

The objectives of the assessment are:

- Characterise the baseline water environment (surface water and groundwater) in the area of the Cleanrath wind farm development and associated works;
- Identify significant effects of the Cleanrath wind farm development on surface water and groundwater during the completed construction phase and operational and decommissioning phases of the development;
- Where required, appropriate remedial mitigation measures that were employed or that may need to be employed are described. The residual effects of the Cleanrath wind farm development are then presented; and,
- Assess cumulative effects of the development and other local developments.

9.1.2 Statement of Authority

Hydro-Environmental Services (HES) are a specialist hydrological, hydrogeological and environmental practice which delivers a range of water and environmental management consultancy services to the private and public sectors across Ireland and Northern Ireland. HES was established in 2005, and our office is located in Dungarvan, County Waterford.

Our core areas of expertise and experience include upland hydrology and wind farm drainage design. We routinely complete impact assessments for hydrology and hydrogeology for a large variety of project types.

This chapter of the rEIAR was prepared by Michael Gill and David Broderick.

Michael Gill (BA, BAI, Dip Geol., MSc, MIEI) is an Environmental Engineer and Hydrogeologist with over 18 years' environmental consultancy experience in Ireland. Michael has completed numerous hydrological and hydrogeological impact assessments of wind farms and renewable projects in Ireland. He has substantial experience in surface water drainage design and SUDs design and surface water/groundwater interactions. For example, Michael has worked on the EIS/EIAR for Meenbog WF, Shehymore WF, and Carrigarierk WF, Oweninny WF, Cloncreen WF, and Yellow River WF, and over 100 other wind farm-related projects.

David Broderick (BSc, H. Dip Env Eng, MSc) is a hydrogeologist with over 13 years' experience in both the public and private sectors. Having spent two years working in the Geological Survey of Ireland working mainly on groundwater and source protection studies David moved into the private sector. David has a strong background in groundwater resource assessment and hydrogeological/hydrological investigations in relation to developments such as quarries and wind farms. David has completed numerous geology and water sections for input into EIARs for a range of commercial developments including Meenbog WF, Shehymore WF, and Carrigarierk WF, Oweninny WF, and Yellow River WF.

9.1.3 Scoping and Consultation

The scope for this chapter of the rEIAR has also been informed by consultation with statutory consultees, bodies with environmental responsibility and other interested parties. This consultation process and the List of Consultees is outlined in Section 2.4 of this rEIAR. Matters raised by Consultees in their responses with respect to the water environment are summarised in Table 9-1 below.

Table 9-1: Summary of Water Environment Related Scoping Responses

Consultee	Description	Addressed in Section
Irish Water (IW)	• A generic response was provided with respect potential impacts in terms of any local groundwater and surface water abstractions	Local groundwater and surface water assessments addressed at Section 9.3.21
Geological Survey of Ireland (Groundwater Section)	• A generic response was provided with respect potential impacts on groundwater resources/sources	Groundwater resources assessment addressed at Sections 9.3.14 and 9.3.21
Health Services Executive	• A generic response was provided with respect potential impacts on surface water and groundwater quality	Local groundwater and surface water quality assessments addressed at Section 9.5

9.1.4 Relevant Legislation

The rEIAR is prepared in accordance with the requirements of European Union Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment (the 'EIA Directive') as amended by Directive 2014/52/EU.

The requirements of the following legislation are complied with:

- S.I. No. 349 of 1989: European Communities (Environmental Impact Assessment) Regulations, and subsequent Amendments (S.I. No. 84 of 1994, S.I. No. 101 of 1996, S.I. No. 351 of 1998, S.I. No. 93 of 1999, S.I. No. 450 of 2000 and S.I. No. 538 of 2001, S.I. 134 of 2013 and the Minerals Development Act 2017), the Planning and Development Act, and S.I. 600 of 2001 Planning and Development Regulations and subsequent Amendments. These instruments implement EU Directive 85/337/EEC and subsequent amendments, on the assessment of the effects of certain public and private projects on the environment;
- Directives 2011/92/EU and 2014/52/EU on the assessment of the effects of certain public and private projects on the environment, including Circular Letter PL 1/2017: Implementation of Directive 2014/52/EU on the effects of certain public and private projects on the environment (EIA Directive);
- Planning and Development Act, 2000, as amended;
- S.I. No 296 of 2018: European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018 which transposes the provisions of Directive 2014/52/EU into Irish law;
- S.I. No. 293 of 1988: European Communities (Quality of Salmonid Waters) Regulations, resulting from EU Directive 78/659/EEC on the Quality of Fresh Waters Needing Protection or Improvement in order to Support Fish Life;
- S.I. No. 272 of 2009: European Communities Environmental Objectives (Surface Waters) Regulations 2009 (as amended by S.I. No. 296/2009; S.I. No. 386/2015; S.I. No. 327/2012; and S.I. No. 77/2019 and giving effect to Directive 2008/105/EC on environmental quality

standards in the field of water policy and Directive 2000/60/EC establishing a framework for Community action in the field of water policy) and S.I. No. 722 of 2003 European Communities (Water Policy) Regulations which implement EU Water Framework Directive (2000/60/EC) establishing a framework for the Community action in the field of water policy and provide for implementation of 'daughter' Groundwater Directive (2006/118/EC) on the protection of groundwater against pollution and deterioration. Since 2000 water management in the EU has been directed by the Water Framework Directive (2000/60/EC) (as amended by Decision No. 2455/2011/EC; Directive 2008/32/EC; Directive 2008/105/EC; Directive 2009/31/EC; Directive 2013/39/EU; Council Directive 2013/64/EU; and Commission Directive 2014/101/EU ("WFD"). The WFD was given legal effect in Ireland by the European Communities (Water Policy) Regulations 2003 (S.I. No. 722 of 2003);

- S.I. No. 684 of 2007: Waste Water Discharge (Authorisation) Regulations 2017, resulting from EU Directive 80/68/EEC on the protection of groundwater against pollution caused by certain dangerous substances (the Groundwater Directive);S.I. No. 106 of 2007: European Communities (Drinking Water) Regulations 2007and S.I. No. 122 of 2014: European Communities (Drinking Water) Regulations 2014, arising from EU Directive 98/83/EC on the quality of water intended for human consumption (the "Drinking Water Directive") and EU Directive 2000/60/EC;
- S.I. No. 9 of 2010: European Communities Environmental Objectives (Groundwater) Regulations 2010 (as amended by S.I. No. 389/2011; S.I. No. 149/2012; S.I. No. 366/2016; the Radiological Protection (Miscellaneous Provisions) Act 2014; and S.I. No. 366/2016); and,
- S.I. No. 296 of 2009: The European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations 2009 (as amended by S.I. No. 355 of 2018).

9.1.5 Relevant Guidance

The Hydrology and Hydrogeology chapter of the rEIAR is carried out in accordance with guidance contained in the following:

- Institute of Geologists Ireland (2013): Guidelines for Preparation of Soils, Geology & Hydrogeology Chapters in Environmental Impact Statements;
- National Roads Authority (2005): Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes;
- Department of Environment, Heritage and Local Government (2006): Wind Energy Development Guidelines for Planning Authorities;
- Inland Fisheries Ireland (2016): Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters;
- Scottish Natural Heritage (2010): Good Practice During Wind Farm Construction;
- PPG1 - General Guide to Prevention of Pollution (UK Guidance Note);
- PPG5 – Works or Maintenance in or Near Watercourses (UK Guidance Note);
- CIRIA (Construction Industry Research and Information Association) (2006): Guidance on 'Control of Water Pollution from Linear Construction Projects' (CIRIA Report No. C648, 2006);
- CIRIA 2006: Control of Water Pollution from Construction Sites - Guidance for Consultants and Contractors (CIRIA C532, 2006).
- Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment (DoHPLG, 2018); and,
- Guidance on the preparation of the EIA Report (Directive 2011/92/EU as amended by 2014/52/EU), (European Union, 2017).

9.2 Methodology

9.2.1 Desk Study

A desk study of the site and the surrounding area was completed in advance of construction of the development and this data was reviewed and updated where relevant in the preparation of this rEIAR.

This involved collecting all relevant geological data for the site and surrounding area. This included consultation with the following data sources:

- The CEMP for the Cleanrath wind farm development updated as part of condition compliance for the 2017 Permission for the construction phase;
- Environmental Protection Agency databases (www.epa.ie);
- Geological Survey of Ireland - Groundwater Database (www.gsi.ie);
- Met Eireann Meteorological Databases (www.met.ie);
- National Parks and Wildlife Services Public Map Viewer (www.npws.ie);
- Water Framework Directive Map Viewer (www.catchments.ie);
- Bedrock Geology 1:100,000 Scale Map Series, Sheet 21 (Geology of Cork-Kerry). Geological Survey of Ireland (GSI, 2003);
- Geological Survey of Ireland (2003) – Groundwater Body Initial Characterization Reports,
- OPW Indicative Flood Maps (www.floodinfo.ie);
- Environmental Protection Agency – "Hydrotool" Map Viewer (www.epa.ie);
- CFRAM Flood Risk Assessment maps (www.cfram.ie); and,
- Department of Environment, Community and Local Government on-line mapping viewer (www.myplan.ie).

9.2.2 Pre-Construction Monitoring and Site Investigation Data

A hydrological walkover survey, including detailed drainage mapping and baseline monitoring, was undertaken by HES at the site and along sections of the grid connection during the pre-construction phase.

Investigations undertaken during the pre-construction included the following:

- Walkover surveys and hydrological mapping of the proposed site, grid connection route and the surrounding area were undertaken whereby water flow directions and drainage patterns were recorded;
- A total of over 225 no. peat probe depths were carried out by Fehily Timoney and Company - FT (formerly called AGEC Ltd) to determine the depths and geomorphology of the peat at the site; and,
- A Peat Stability Assessment was undertaken by FT (December, 2015).

9.2.3 Construction and Operational Phase Monitoring/Audit Data

In preparation of this rEIAR, walkover surveys and detailed geological mapping of the built development site were undertaken by HES during December 2019 and May 2020. A drone survey of the built development footprint was undertaken by MKO on 27th February 2020.

In addition, monitoring/audit data recorded during the construction phase and operational phase was also compiled and reviewed to address the Water Section of the rEIAR. This data includes the following:

- Ionic Consulting Ltd. construction phase records (quantity, volumes etc);
- ECoW (MKO) audit reports;
- HES construction phase site audits;
- Monthly surface water monitoring/sampling results;
- Automated surface water turbidity monitoring results; and
- Results from automated surface water flow/level monitoring in the Toon River and the River Lee.

9.2.4 Impact Assessment Methodology

The guideline criteria (EPA, August 2017) for the assessment of significant effects require that effects are described with respect to their extent, magnitude, type (i.e. negative, positive or neutral) probability, duration, frequency, reversibility, and transfrontier nature (if applicable). The descriptors used in this rEIAR are those set out in the EPA (2017) Glossary of effects as shown in Chapter 1 of this rEIAR.

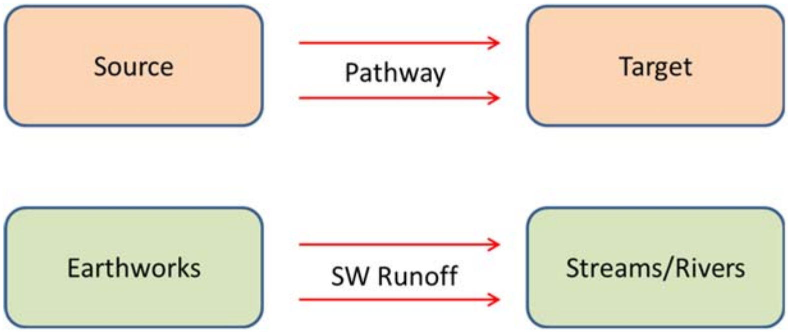
In addition to the above methodology, the sensitivity of the water environment receptors was assessed on completion of the desk study and baseline study. Levels of sensitivity which are defined in Table 9-2 are used to assess the potential effect that the Cleanrath wind farm development may have on them.

Table 9-2 Receptor Sensitivity Criteria (Adapted from www.sepa.org.uk)

Sensitivity of Receptor	
Not sensitive	Receptor is of low environmental importance (e.g. surface water quality classified by EPA as A3 waters or seriously polluted), fish sporadically present or restricted). Heavily engineered or artificially modified and may dry up during summer months. Environmental equilibrium is stable and is resilient to changes which are considerably greater than natural fluctuations, without detriment to its present character. No abstractions for public or private water supplies. GSI groundwater vulnerability "Low" – "Medium" classification and "Poor" aquifer importance.
Sensitive	Receptor is of medium environmental importance or of regional value. Surface water quality classified by EPA as A2. Salmonid species may be present and may be locally important for fisheries. Abstractions for private water supplies. Environmental equilibrium copes well with all natural fluctuations but cannot absorb some changes greater than this without altering part of its present character. GSI groundwater vulnerability "High" classification and "Locally" important aquifer.
Very sensitive	Receptor is of high environmental importance or of national or international value i.e. NHA or SAC. Surface water quality classified by EPA as A1 and salmonid spawning grounds present. Abstractions for public drinking water supply. GSI groundwater vulnerability "Extreme" classification and "Regionally" important aquifer

9.2.5 Overview of Impact Assessment Process

The conventional source-pathway-target model (see below, top) was applied to assess the impacts on downstream environmental receptors (see below, bottom as an example) as a result of the Cleanrath wind farm development.



Where potential impacts are identified, the classification of impacts in the assessment follows the descriptors provided in the Glossary of Impacts contained in the following guidance documents produced by the Environmental Protection Agency (EPA):

- Advice Notes on Current Practice in the Preparation of Environmental Impact Statements (EPA, 2003); and,
- Guidelines on the Information to be contained in Environmental Impact Statements (EPA, 2002).

The description process clearly and consistently identifies the key aspects of any potential impact source, namely its character, magnitude, duration, likelihood and whether it is of a direct or indirect nature.

In order to provide an understanding of the stepwise impact assessment process applied below (Section 9.6), we have firstly presented below a summary guide that defines the steps (1 to 7) taken in each element of the impact assessment process. The guide also provides definitions and descriptions of the assessment process and shows how the source-pathway-target model and the EPA impact descriptors are combined.

Using this defined approach, this impact assessment process is then applied to all wind farm construction and operation activities which have the potential to generate a source of significant adverse impact on the geological and hydrological/ hydrogeological (including water quality) environments.

Table 9-3: Impact Assessment Process Steps

Step 1	Identification and Description of Potential Impact Source This section presents and describes the activity that brings about the potential impact or the potential source of pollution. The significance of effects is briefly described.	
Step 2	Pathway / Mechanism:	The route by which a potential source of impact can transfer or migrate to an identified receptor. In terms of this type of development, surface water and groundwater flows are the primary pathways, or for example, excavation or soil erosion are physical mechanisms by which potential impacts are generated.
Step 3	Receptor:	A receptor is a part of the natural environment which could potentially be impacted upon, e.g. human health, plant / animal species, aquatic habitats, soils/geology, water resources, water sources. The potential impact can only arise as a result of a source and pathway being present.
Step 4	Pre-mitigation Impact:	Impact descriptors which describe the magnitude, likelihood, duration and direct or indirect nature of the potential impact before mitigation is put in place.
Step 5	Proposed Mitigation Measures:	Control measures that will be put in place to prevent or reduce all identified significant adverse impacts. In relation to this type of development, these measures are generally provided in two types: (1) mitigation by avoidance, and (2) mitigation by (engineering) design.
Step 6	Post-Mitigation Residual Impact:	Impact descriptors which describe the magnitude, likelihood, duration and direct or indirect nature of the potential impacts after mitigation is put in place.
Step 7	Significance of Effects:	Describes the likely significant post-mitigation effects of the identified potential impact source on the receiving environment.

9.3 Receiving Environment

9.3.1 Site Description and Topography

The Cleanrath wind farm development site is located approximately 13km to the southwest of Macroom, Co. Cork. The total site area is approximately 67ha. The landscape character of the region listed in the Cork County Development Plan is "Composite Middle Valley of Rugged scrub and Marginal Land". While the landscape character type is entitled "Ridged and Peaked Upland".

Access to the site is from local road at Gortanaddan and Cloontycarthy townlands which is located 1.5km east of Reananerree village. The 9 turbines and associated infrastructure are positioned around a distinct conical shaped hill feature (referred to as Derrineanig on the OSI mapping) which is located approximately 3.5km to the southwest of the site entrance. Turbines T6, T7, T9 and T10 are located on the steadily sloping western side of Derrineanig Hill (peak at 300m OD) where the ground elevation at the turbine locations varies between approximately 220m and 260m OD. Turbines T1, T3, T4, T5 and T8 are located on the more moderately sloping eastern side of Derrineanig Hill where the ground elevation at the turbine locations varies between approximately 190 and 220m OD. The total development footprint area is approximately 10ha.

Bedrock is at the surface over much of the site, particularly on the western slopes of the site, with pockets of soils or peat that are confined to small local dips/valleys between ridged outcrops of bedrock. Landuse locally comprises rough pasture or forestry where a soil and subsoil has formed. For the majority of the site where rock outcrops this precludes any use other than patchy grazing.

The Cleanrath wind farm development comprises a grid route connection route that consists of a electricity cabling (33kV) from Turbine no. 7 within cable ducting along the permitted Operational Access/Inspection Road (Pl Ref. 18/04458) southwest of Turbine no. 7 and on to the local public road until it turns onto the access track of the constructed Derragh Wind Farm development and connects to the constructed 38kV electricity substation, located approximately 3km west of the Cleanrath wind farm development in the townland of Rathgaskig. The grid connection is approximately c15km in length. The cabling loops back out of the Derragh Wind Farm Substation (38kV) and runs mainly within the public road corridor on to the 110kV Coomataggart substation located in the townland of Grousemount, Co. Kerry. The final 1.5km of the cable route within Co. Cork and the 2km of the cabling in Co. Kerry is located on existing private access tracks. There are 126 no. watercourse crossings along the grid connection route, and this includes 13 no. main existing bridge/culvert crossings (natural watercourses) and 113 no. existing smaller culvert crossings (manmade drain crossings).

9.3.2 Rainfall and Recharge

Long term rainfall and evaporation data was sourced from Met Éireann. The 30-year standard annual average rainfall (SAAR: 1981 - 2010) recorded at Ballyvourney (Cloontycarthy), 0.6km north of the site, are presented in Table 9-4. This is the closest station which is most similar to the elevation of the development site.

Table 9-4 Local Average long-term Rainfall Data (mm)

Station		X-Coord		Y-Coord		Ht (MAOD)		Opened		Closed		
Ballyvourney		110700		235200		101		1963		N/A		
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Total
201	150.5	138	102	102.5	91.5	85	102	119.5	186	177	189.5	1645

The closest synoptic station where the average potential evapotranspiration (PE) is recorded is at Cork Airport, approximately 60km east of the site. The long-term average PE for this station is 540mm/yr. This value is used as a best estimate of the site PE. Actual Evaporation (AE) at the site is estimated as 513mm/yr (which is 0.95 × PE).

The effective rainfall (ER) represents the water available for runoff and groundwater recharge. The ER for the site is calculated as follows:

Effective rainfall (ER) = AAR – AE

= 1644 mm/yr – 513mm/yr

ER = 1,131mm/yr

Based on groundwater recharge coefficient estimates from the GSI (www.gsi.ie) an estimate of between 51 – 200mm/year average annual recharge is given for the site due to its sloping nature. As a conservative measure the lower estimate is used in this study. This means that the hydrology of the study area is characterised by high surface water runoff rates and low groundwater recharge rates. Therefore, conservative annual recharge and runoff rates for the site are estimated to be 51mm/yr and 1,080mm/yr respectively.

9.3.3 Regional Hydrology

Regionally the Cleanrath wind farm development site is located in the River Lee surface water catchment. The grid connection route which is approximately 15km in length is located in both the River Lee (~12.6km) and the Roughty River (~2.4km) surface water catchments. All of the 9 no. constructed turbines and access roads etc are located in the River Lee Catchment.

The River Lee is located in (Hydrometric Area 19 of the South Western River Basin District) and flows in an easterly direction approximately 2.7km to the south of the development site via Lough Allua. The Roughty River catchment, which exists ~9km to the west of the development site, is also located in the South Western River Basin District.

A regional hydrology map is shown as Figure 9-1.

9.3.4 Local Hydrology

The western section of the wind farm site drains into Lough Allua (i.e. turbines T7 to T10) which exists on the River Lee. The eastern section of the wind farm site (i.e. turbines T1, T3, T4, T5, and T8) drains to the Toon River which is a tributary to the River Lee. The wind farm site entrance and approximately 0.8km of access road is located in the Sullane Beg River which is also a tributary of the River Lee.

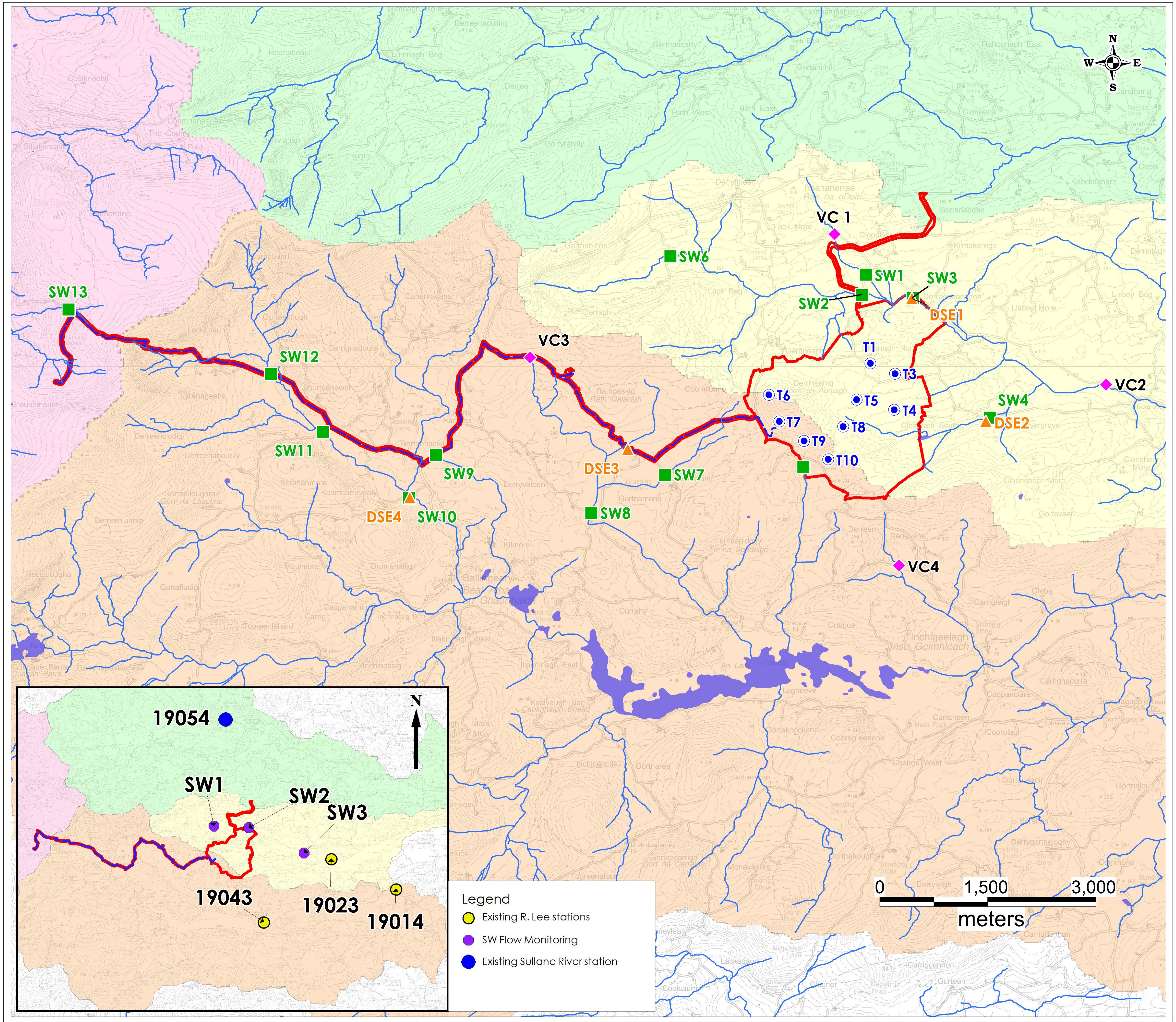
The length of the grid connection route within the River Lee catchment drains into Lough Allua. The remaining section of grid route within the Roughty River catchment drains directly into the Roughty River via minor upland streams.

A local hydrology map is shown as Figure 9-2.

9.3.5 Wind Farm Site Natural Drainage

The topography at the wind farm site is locally undulating with the Hill of Derrineanig being the dominant feature. The ridges running below this peak slope gently off into five main sub-catchments. Two sub-catchments drain to Lough Allua and three of the sub-catchments drain to the Toon River.

The topography of the Hill of Derrineanig is characterised by rocky ridgelines which have a westerly / south-westerly orientation. The natural channels/valleys formed between the ridgelines means surface



Legend

Study Area

As Constructed Turbine Locations

Grid Connection Cable Route

River/Streams

Flow Direction

Lakes

SW Sampling Location

Sonde Data Location (Turbidity)

Visual Surface Water Quality Point

WFD Subcatchments

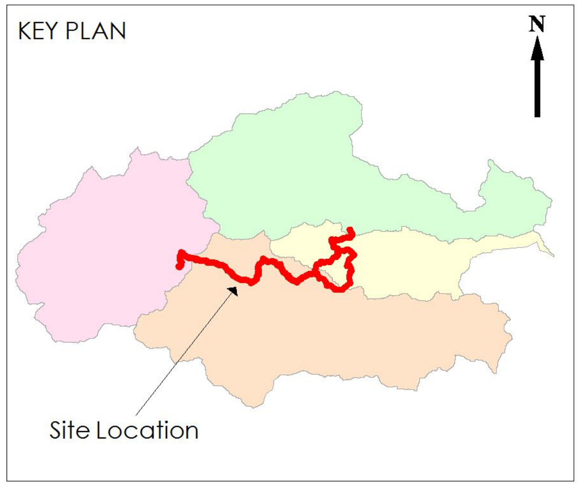
Lee[Cork]_SC_010

Lee[Cork]_SC_020

Roughty_SC_010

Sullane_SC_010

KEY PLAN



HYDRO ENVIRONMENTAL SERVICES

22 Lower Main St
Dungarvan
Co.Waterford
Ireland

tel: +353 (0)58 44122
fax: +353 (0)58 44244
email: info@hydroenvironmental.ie
web: www.hydroenvironmental.ie

Client: MKO

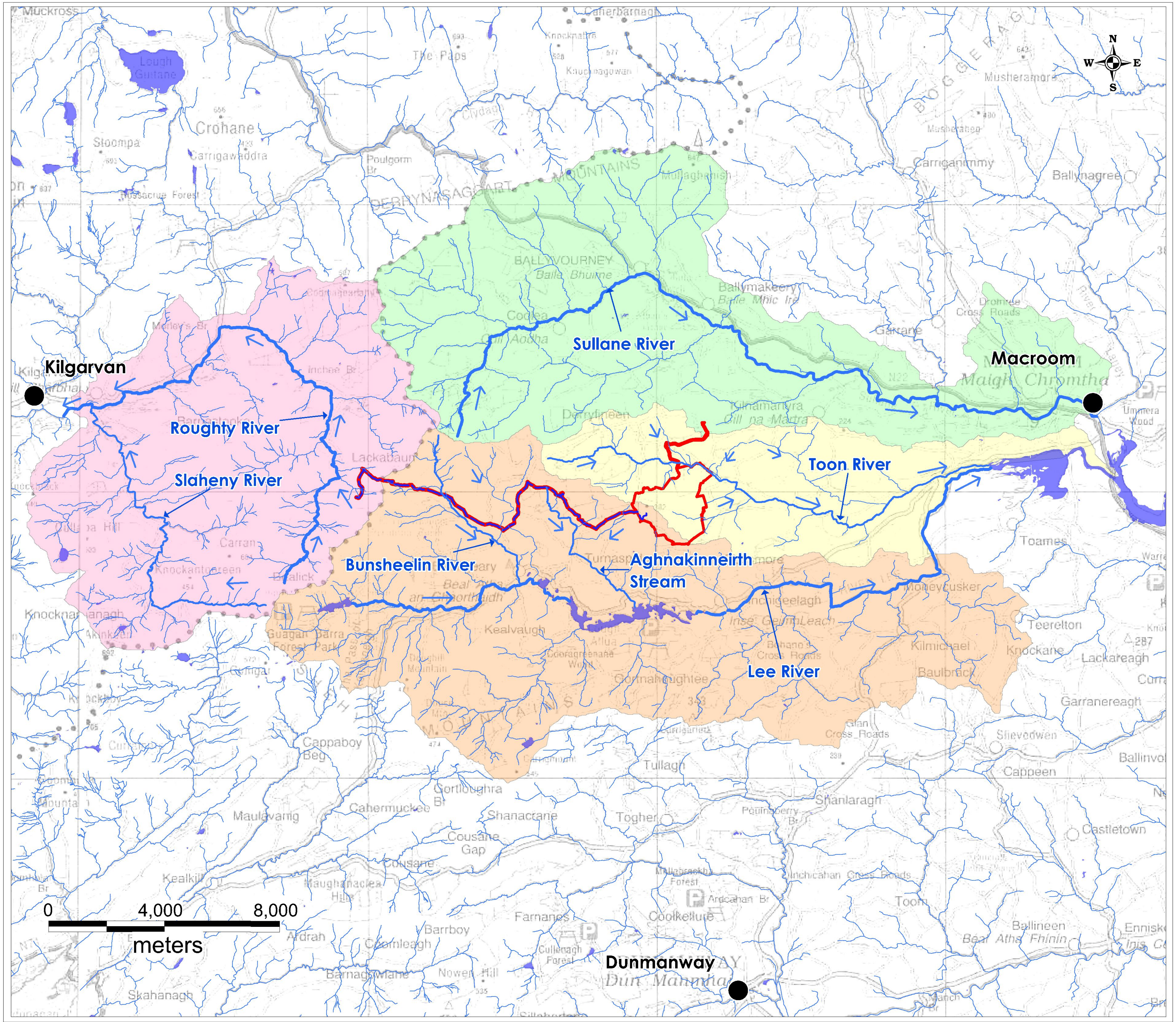
Job: Cleanrath WF, Co. Cork

Title: Local Hydrology Map

Figure No: 9-2

Drawing No: P1272-5-0720-A3-9-2-0A

Sheet Size: A3	Project No: P1272-5
Scale: 1:50,000	Drawn By: GD
Date: 17/07/2020	Checked By: MG



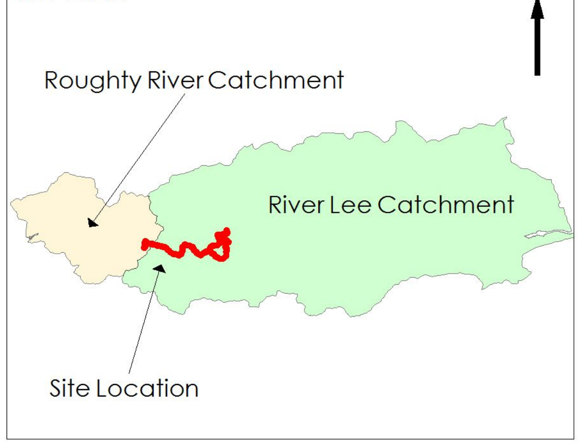
Legend

- Study Area
- Grid Connection Cable Route
- River/Streams
- Flow Direction
- Lakes

WFD Subcatchments

- Lee[Cork]_SC_010
- Lee[Cork]_SC_020
- Roughty_SC_010
- Sullane_SC_010

KEY PLAN



HYDRO ENVIRONMENTAL SERVICES

22 Lower Main St
Dungarvan
Co.Waterford
Ireland

tel: +353 (0)58 44122
fax: +353 (0)58 44244
email: info@hydroenvironmental.ie
web: www.hydroenvironmental.ie

Client: MKO	
Job: Cleanrath WF, Co. Cork	
Title: Regional Hydrology Map	
Figure No: 9-1	
Drawing No: P1272-5-0720-A3-9-1-0A	
Sheet Size: A3	Project No: P1272-5
Scale: 1:125,000	Drawn By: GD
Date: 17/07/2020	Checked By: MG

water runoff is constrained within these channels/valleys. The wind farm access roads intercept these channels at numerous locations across the wind farm site, particularly on the western portion of the wind farm site. The surface water flows within these natural channels have led to the formation of some local acid flushes (discussed in Section 9.3.6 below).

The eastern section of the wind farm site has existing forestry drains and man-made drains at roads and forest track side. The conifer plantation has itself got a well-developed drainage network which drains sections of the wind farm site. The main wind farm site entrance road passes through a significant area of forestry and in some instances the existing forestry tracks have been upgraded.

The installed wind farm drainage is discussed in Section 9.4.1 below.

A wind farm site drainage map is shown as Figure 9-3.

9.3.6 Flush Hydrology

This section discusses acid flush habitats that are present in the area of T9 and T4.

The topography of the area around turbine T9 is characterised by rocky ridgelines which have a westerly / south-westerly orientation. The natural channels/valleys formed between the ridgelines means surface water runoff is constrained within these channels/valleys and hence the increased surface water flows have led to the formation of local acid flushes. These acid flushes (including the ones in the area of T9) are formed solely by surface water flows and not groundwater flows. The hydrochemistry of these flush areas, which is dealt with further below, suggest that they are solely rainwater fed (meteoric in origin), hence the very low mineral content and the acidic hydrochemistry. If they were groundwater fed the hydrochemistry would indicate much higher mineral content in the water within the flushes.

Turbine T9 and its related access road are located in a localised valley (created by the rock ridgelines), which extends up-gradient of the turbine location in a predominately easterly / north-easterly upslope direction. In addition to the turbine T9 base and hardstanding area, there is approximately 200m of access roads within the catchment area to the flushes.

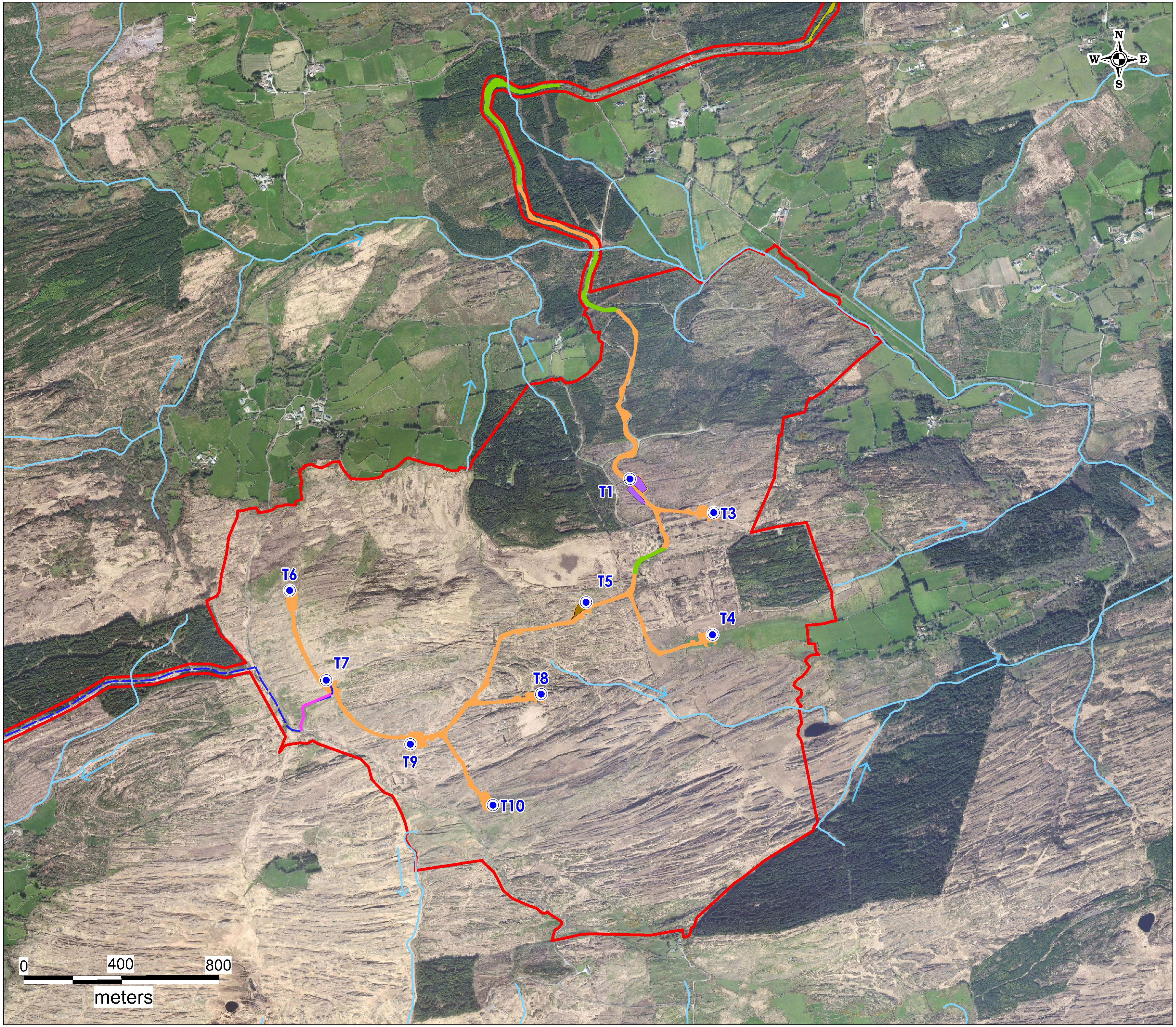
There are a number acid flush areas located in the vicinity of T9 and its access road that rely on surface water flows within this valley.

Gouge coring undertaken within the T9 flush catchment area indicate local peat depths in the range of 0 – 0.4m. The peat was found to rest directly on top of bedrock with an absence of mineral subsoils beneath the peat. Measurement of flush water hydrochemistry (i.e. pH and Electrical Conductivity – EC) indicate pH values in the 6.6 – 6.8 range and EC values less than 90µS/cm. These values confirm that the flushes are maintained by rainfall, and not more mineralised groundwater seepages.

The predominant surface water flow path direction within the T9 flush area surface water catchment is in a south-westerly direction. Typically, surface water flows were concentrated on the vegetated valley / channel floors. Surface water flows from the T9 flush area catchment collects at a low point approximately 50m to the south of the turbine T9 location where a manmade channel appears to have been created to help drain the upstream area.

Construction drainage at T9 includes a cross-drain at the access road and an interceptor drain along the western boundary of the T9 hardstand to direct any water around the turbine and towards the flush type habitat to the south. The flush habitat is predominantly located down gradient (south) of T9 and some flow arises from the area around T9 over exposed rock towards the lower flush habitat.

The topography of the area around T4 and its local access roads is gently gentle sloping to the southeast. Surface water flow through the flush area is generally evenly distributed diffuse flow on the bog surface. The peat depth in the area of the flush habitat is measured between 0.1 and 0.8m and is underlain directly by bedrock.



Legend

- Study Area
- As Constructed Turbine Locations
- Grid Connection Cable Route
- Borrow Pit Area
- Area used as aTemporary Construction Compound
- Turbine Delivery Accomodation Areas
- Newly Constructed Roads
- Exisitng Roads Upgraded
- Operational Access/Inspection Road with underground cabling permitted under PL ref. 18/04458
- Rivers/Streams

HYDRO ENVIRONMENTAL SERVICES

22 Lower Main St
Dungarvan
Co.Waterford
Ireland

tel: +353 (0)58 44122
fax: +353 (0)58 44244
email: info@hydroenvironmental.ie
web: www.hydroenvironmental.ie

Client: MKO	
Job: Cleanrath WF, Co. Cork	
Title: WF Site Drainage Map	
Figure No: 9-3	
Drawing No: P1272-5-0720-A3-9-3-00A	
Sheet Size: A3	Project No: P1272-5
Scale: 1:15,000	Drawn By: GD
Date: 17/07/2020	Checked By: MG

The wind farm access road in the vicinity of T4 does not intercept any PF2 habitat but it does pass up-gradient of flush areas to the northwest of the turbine location. Also, the spur road leading to the T4 location intercepts some PB3-PF2 habitat to the west of the turbine location.

Along the access track to T4, the low point at these locations (old drains/semi-natural watercourses) are piped and large stone fill material is placed on top, before finer stone was used to grade the road.

9.3.7 Wind Farm Site Water Balance

The water balance calculations are carried out for the month with the highest average recorded rainfall minus evapotranspiration, for the current baseline site conditions (Table 9-5). It represents therefore, the long-term average wettest monthly scenario in terms of volumes of surface water runoff from the site.

The surface water runoff co-efficient for the area is estimated to be approximately 95% based on the underlying bedrock geology, sloping ground and poorly draining soil coverage.

The highest long-term average monthly rainfall recorded at Ballyvourney over the period 1987 - present occurred in January, at 200.8mm. The average monthly evapotranspiration for the synoptic station at Cork Airport over the same period in January was 7 mm. The water balance indicates that an average estimate of surface water runoff for the study area (525ha) during the highest rainfall month is 968,100 m^3/month or 31,229m^3/day as outlined in Table 9-6.

Table 9-5: Water Balance and Baseline Runoff Estimates for Wettest Month (January)

Water Balance Component	Depth (m)
Average January Rainfall (R)	0.2008
Average January Potential Evapotranspiration (PE)	0.007
Average January Actual Evapotranspiration (AE = PE x 0.95)	0.00665
Effective Rainfall January (ER = R - AE)	0.19415
Recharge co-efficient (5% of ER)	0.0097
Runoff (95% of ER)	0.1844

Table 9-6: Baseline Runoff for the Site

Study Area (ha)	Baseline Runoff per month (m^3)	Baseline Runoff per day (m^3)
525	968,100	31,229

9.3.8 Surface Water Flow Monitoring

As part of the construction compliance a surface water flow/level monitoring network was installed in the downstream Toon River. An existing network exists within the River Lee and Sullane River catchments which was used during the monitoring. A summary of local catchment characteristics upstream of the stations is provided in Table 9-7.

The locations and proposed approach were agreed with Cork County Council in advance. 3 no. suitable locations were identified along the Toon River at SW1, SW2 and SW3.

The Toon River monitoring network included the permanent installation 3 no. OTT Orpheus mini water level loggers, recording water levels at 15-minute intervals at each of the SW monitoring locations. Water level monitoring began on 20/09/2018 and is still ongoing. Hydrographs for each of the stations are shown as shown in Appendix 9-1. The locations of the sondes are shown on Figure 9-2.

Table 9-7: Summary of Catchment Characteristics Upstream of Monitoring Stations

Location	Toon River (SW1)	Toon River (SW2)	Toon River (SW3)	Sullane River (19054)	River Lee (19017)
Area (km^2)	7.562	14.06	24.653	55.82	171.544
BFISOIL	0.5484	0.975	0.5996	0.5602	0.4257
SAAR (mm)	1797.81	1761.92	1760.84	2029.1	2068.45
FARL	1	1	0.995	0.997	0.892
DRAIND (km/km^2)	1.314	1.193	1.191	1.35	1.53
S1085 (m/km)	16.6	12.3867	9.2964	13.8748	3.3105
ARTDRAIN2	0	0	0	0	0
URBEXT	0	0	0	0	0
Qmed (m^3/s)	4.7108	6.9478	10.977	34.144	80.7705

Note: All data taken from http://opw.hydronet.com/

The data from SW1 are indicative of a small upstream river, with typical flows in the region of 100-150 L/s and with flashy responses to heavy rainfall events.

SW2 is located approximately 3.3 km downstream from SW1. Flows appear to increase as the river flows downstream i.e. from 60 l/s at SW1 to 125 l/s at SW2 on 01/10/2018. This suggests that at this point in time, the additional 6.5 km^2 of catchment area upstream of SW2, compared to SW1, is contributing to a near 100% increase in flow. The trend continues at different rates throughout the range of flow rates observed during the monitoring period.

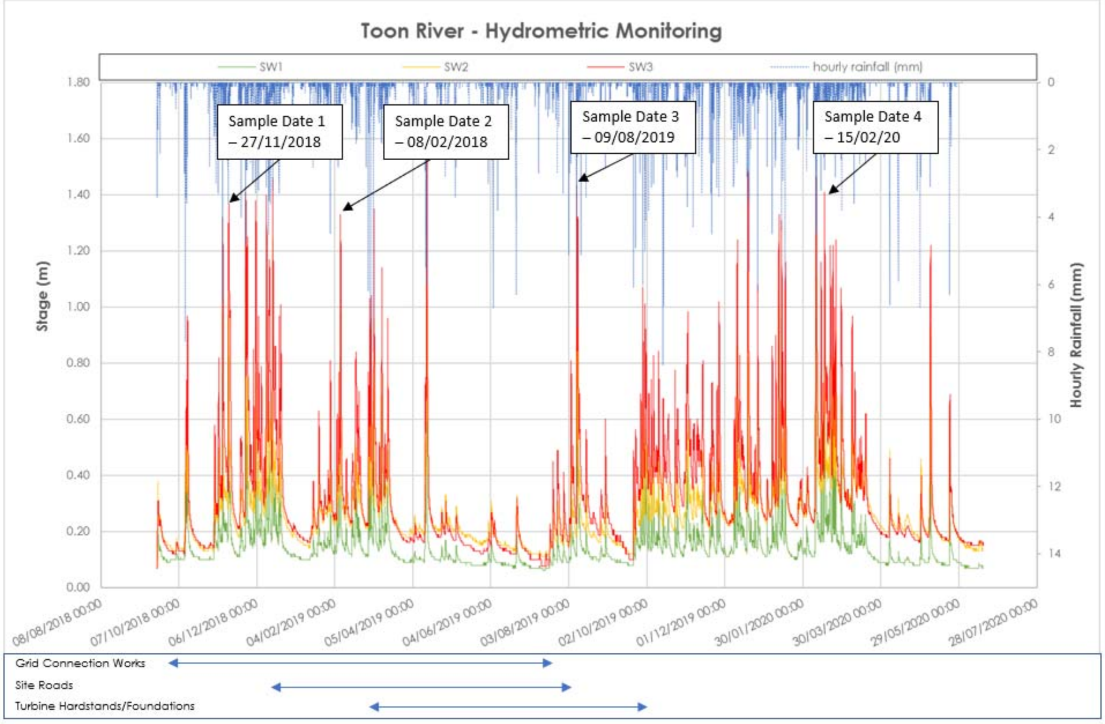
Flows of up to 3000 L/s were recorded at SW3, compared with flows of 750 L/s and 2250 L/s at SW1 and SW2 respectively on these dates.

In order to determine runoff characteristics of the Toon sub-catchment, data from each individual peak event was extracted from the larger dataset and analysed for SW1 and SW3 (no rating curve was developed for SW2, as the adequate data to develop one was not captured. The data from SW1 and SW3 are sufficient to undertake the analysis presented here).

The recession constant "*k*" (slope of the receding flood hydrograph) for each post peak fall in the hydrograph is a simple hydrological characteristic that was calculated for stations SW1 and SW3. For SW1 the recession constant was determined for various recessions (a recession is a decline/fall in the hydrograph after a peak flow event), and varied between 0.06 and 0.19, with an average of 0.14. For SW3 the recession constant varied between 0.04 and 0.07, with an average of 0.054.

Four sample dates of peak flows in the Toon River were selected (2 no. pre-wind farm site construction and 2 no. post construction) where the preceding 72-hour rainfall depth volumes are similar (or at least equal) for the pre and post construction are shown on Plate 9-1 below. The hydrographs shown that the maximum stage height of the peaks during the pre-construction flood events are similar if not less than the post construction events. The Toon River has significantly lower flows compared to the River Lee and therefore would be more sensitive with respective site runoff.

The analysis of hydrographs for the Toon River and River Lee shows that the development has no traceable/measurable impact on river flows or levels in either of the rivers. This is because the development runoff volumes are small/negligible compared to the total flows in the Toon River and River Lee. Runoff from the development site is having no measurable impact on river flows/river levels in either watercourse (i.e. the Toon River and the River Lee).



Date	SW1 Stage (m)	SW2 Stage (m)	SW3 Stage (m)	Preceeding 72hr rainfall (mm)
27/11/2019	0.88	1.14	1.4	19.5
08/02/2019	0.81	0.98	1.3	21.7
09/08/2019	0.86	0.96	1.41	49.4
15/02/2020	0.83	1.06	1.41	23.4

Plate 9-1: Hydrograph of the Toon River at SW1, SW2 and SW3

9.3.9 Flood Risk Assessment

To identify those areas as being at risk of flooding, OPW's indicative river and coastal flood map (www.floodmaps.ie), CFRAM Flood Risk Assessment maps and CFRAM Preliminary Flood Risk maps (PFRA) maps (www.cfram.ie), Department of Environment, Community and historical mapping (i.e. 6" and 25" base maps) were consulted.

No recurring flood incidents within the wind farm site boundary or immediately downstream were identified from OPW's indicative river and coastal flood map.

Where complete, the CFRAM OPW Flood Risk Assessment Maps are now the primary reference for flood risk planning in Ireland and supersede the PFRA maps. There are no CFRAM maps currently available for the area of the site and therefore the PFRA maps were reviewed.

The PFRA map no. 35 (www.cfram.ie) shows the extents of the indicative 1 in 100-year flood zone which relates to fluvial (i.e. river) and pluvial (i.e. rainfall) flood events. The 1 in 100-year fluvial flood zone incorporates some land area surrounding the River Toon in the vicinity the development site and the River Lee. The 1 in 100-year fluvial flood zones mapped within the study area generally occur in close proximity to the stream channel itself. All turbine locations and the majority of access roads are located at least 50m away from streams and are outside of the fluvial indicative 1 in 100-year flood zone. There is no identifiable map text on local available historical 6" or 25" mapping for the study area that identify lands that are "prone to flooding".

There are no areas within the study area mapped as "Benefiting Lands". Benefiting lands are defined as a dataset prepared by the Office of Public Works identifying land that might benefit from the implementation of Arterial (Major) Drainage Schemes (under the Arterial Drainage Act 1945) and indicating areas of land subject to flooding or poor drainage.

The grid connection route passes through a PFRA mapped flood zone relating to the Bunsheelin River. Due to the predominately underground nature of the works, therefore, the grid connection works had no influence on the surface water flow regime in the area.

It was a key mitigation measure of the Cleanrath wind farm development to ensure all surface water runoff was treated (water quality control) and attenuated (water quantity/flood management control), prior to diffuse discharge.

9.3.10 EPA Surface Water Quality

Within the Republic of Ireland Q-rating status data for EPA monitoring points on the River Lee and the Toon River are shown in Table 9-8 below. Most recent data available (2004 to present) show that the Q-rating for the Toon River and the River Lee is Q4 (Good Status) in the vicinity of the study area.

Table 9-8:EPA Water Quality Monitoring Q-Rating Values

Waterbody	EPA Location Description	Easting	Northing	EPA Q-Rating Status
Toon	Bridge South of Lack	119548	71027	Q4 Good
Toon	Bridge NE of Cleanrath North	122427	70383	Q4 Good
Lee	Footbridge D/S of Inchigeelagh	123850	66658	Q4 Good

9.3.11 Surface Water Quality Monitoring/Sampling

Surface water quality monitoring/sampling and field hydrochemistry monitoring (electrical conductivity and pH) at 13 no. downstream locations (SW1 – SW13) commenced monthly[1] from August 2018 and continued into the operational phase up to July 2020. The locations of the monitoring points are shown in Figure 9-2 and a summary of the field hydrochemistry results are shown in Table 9-9 below for each of the monitoring locations.

The key monitoring locations with respect the Cleanrath wind farm development are SW2, SW4, SW5 and SW7 as these are the closest monitoring points surrounding the wind turbines and are located along streams that emerge from within the site and therefore are less likely to be affected by external sources and activities. The remainder of the locations are located downstream of the grid connection.

The average pH value was between 6.9 and 7.3 and the average electrical conductivity was between 53 and 123µs/cm. There was no exceedance of the Surface Water Regulation (S.I. No. 272 of 2009) range with regard pH which is 6 to 9. There is no EQS for electrical conductivity with regard surface water.

[1] *Sample events were not completed in March and April 2020 due to the Covid-19 restrictions*

Overall, the pH and electrical conductivity values are typical for catchments underlain with non-calcareous bedrock and peat/acidic soil coverage.

Table 9-9: Summary of Field Hydrochemistry Monitoring

Location	pH (pH Units)			Electrical Conductivity (µS/cm)		
	Maximum	Minimum	Average	Maximum	Minimum	Average
SW1	8.1	6.2	6.9	183	64	117
SW2	7.8	6.4	7.1	123	48	93
SW3	7.9	6.6	7.1	122	61	93
SW4	7.4	6.4	7.0	101	38	77
SW5	7.7	6.3	6.9	109	30	67
SW6	7.4	6.2	6.9	166	42	74
SW7	7.6	6.4	7.0	158	43	85
SW8	7.5	6.5	7.0	159	78	122
SW9	8.1	6.5	7.2	175	87	123
SW10	7.9	6.5	7.3	109	58	87
SW11	7.7	6.7	7.0	86	51	71
SW12	7.7	6.5	7.1	121	53	79
SW13	7.8	6.1	7.1	69	39	53

Surface water quality monitoring/sampling at the 13 no. downstream locations (SW1 – SW13) was undertaken monthly between August 2018 and June 2020. Refer to Figure 9-2 for the monitoring locations.

A summary of the results for each of the parameters over the 21 no. rounds of sampling during the construction and operational phase (242 samples) are shown in Table 9-10 below.

Table 9-10: Summary of Surface Water Sampling

Parameter	Max	Min	Average	EQS	Exceedances	Exceedance Location and Number $^{(x)}$
Total Phosphorus (mg/L)	0.137	0.005	0.033	-	-	-
Chloride (mg/L)	24.0	5.5	12.13	250	0	-
Nitrate (mg/L NO_3)	20.7	0.02	2.34	37.5	0	-
Nitrite (mg/L NO_2)	0.066	0.02	0.023	-	-	-
Orthophosphate P (mg/L)	0.19	0.02	0.034	0.045*	14	SW4$^{(1)}$, SW9$^{(13)}$
Ammonia N (mg/L)	0.53	0.012	0.050	0.09*	22	SW1$^{(5)}$, SW2$^{(2)}$, SW3$^{(1)}$, SW5$^{(2)}$, SW6$^{(2)}$, SW7$^{(1)}$, SW8$^{(1)}$, SW9$^{(4)}$,

Parameter	Max	Min	Average	EQS	Exceedances	Exceedance Location and Number (x)
						SW10(1), SW12(2), SW13(1)
BOD (mg/L)	4	1	1.074	2.2*	1	SW2(1)
TSS (mg/L)	22	2	9.731	25+	0	-
pH (pH units)	8.14	6.03	7.044	6 – 9*	0	-
EC (µS/cm)	183	30	87.7	-	-	-

(+) S.I. No. 293 of 1988: European Communities (Quality of Salmonid Waters) Regulations.
(*) S.I. No. 272 of 2009: European Communities Environmental Objectives (Surface Waters) Regulations 2009 (as amended by S.I. No. 296/2009; S.I. No. 386/2015; S.I. No. 327/2012; and S.I. No. 77/2019 and giving effect to Directive 2008/105/EC on environmental quality standards in the field of water policy and Directive 2000/60/EC establishing a framework for Community action in the field of water policy).

Results for suspended solids ranged between 2 and 22mg/L with an overall average of 9.7mg/L for all the sampling locations. The actual average is likely to be significantly less than 9.5mg/L as the vast majority of the results were reported at <10mg/L which was the laboratory detection limit. There was no exceedance of S.I. No. 293 of 1988: European Communities (Quality of Salmonid Waters) Regulations which is 25mg/L. The highest value of 22mg/L was reported at SW1 on 25th September 2018 which was during the construction phase. However, only the grid connections works had commenced in September 2018, and there were no active works upstream of SW1 when this highest TSS value was recorded. There were four smaller peaks (14-19mg/L) between 2018 and 2020. 3 of the 5 elevated TSS readings were following significant periods of heavy rainfall, and the other two are at locations where no wind farm related works were being undertaken upgradient of the sampling points at the time of sampling. So, the recorded exceedances are not related to wind farm or grid connections works activities.

BOD was reported between 1 and 4mg/L with an average of 1.07 mg/L. There was only 1 no. exceedance with regard the surface water regulation values where both the "Good Status" and "High Status" was exceeded on 31st August 2018 at SW2 when the highest recorded value of 4mg/L was reported. The sampling undertaken on 31st August 2018 was actually pre-construction baseline monitoring.

Orthophosphate values ranged between 0.02 and 0.19mg/L with an average of 0.034mg/L. 13 of the 14 exceedances with respect the surface water regulation values were at SW9 which is upstream of the wind farm site (but downstream of the grid connection route). One other exceedance occurred at SW4 in September 2018. No wind farm related works were being undertaken upgradient of the SW4 sampling points at the time of this sampling event. Results for all the other sampling locations were below the "High Status" threshold value (High status ≤0.025 (mean) or ≤0.045 (95%ile)). High orthophosphate concentrations can be related to agriculture or wastewater system discharges.

Results for ammonia N ranged between 0.01 and 0.43mg/L with an average of 0.039mg/L. There were 9 no. exceedances in total which occurred 6 no. sampling locations. High ammonia concentrations can be related to peatland runoff, or from agriculture or wastewater system discharges.

The sampling demonstrates that the development had no effect on downstream waters during the construction or operational phase of the development.

9.3.12 Automated Turbidity Monitoring

Continuous automated turbidity monitoring is ongoing at 4 no. locations in the area of the Cleanrath wind farm development by means of permanently in-situ turbidity sondes. Sondes DSE 1 and DSE 2 are located immediately downstream of the development on the east of the site (i.e. within the Toon River catchment). Sonde DSE 3 and DSE 4 are located downstream of the grid connection route to the west of the site. The locations of the sondes are shown on Figure 9-2.

A summary of the in-situ sondes and the upstream Cleanrath wind farm development infrastructure is shown below in Table 9-11. A summary of the turbidity data is shown in Table 9-12 below. Turbidity plots for each of the sondes versus rainfall is shown in Appendix 9-2.

In general, significant turbidity spikes at the 4 no. sonde locations are associated with heavy or prolonged rainfall events and this is due to surface water runoff from within the overall catchment area. With respect DSE 1 and DES 4, the overall surface water catchment area is significantly larger than the wind farm site area (within the catchment) and therefore the potential for activities not related to the wind farm to affect turbidity levels is high.

In terms of baseline turbidity, which will be naturally higher is flood events, a range of 10 to 20 NTU would be considered a conservative natural baseline range for river turbidity in peak flows (albeit every catchment will be slightly different depending on the landuse activities). These turbidity spikes would be short term transient events with most rivers returning to an NTU of less than 5 during non-flood periods.

Therefore, assuming a baseline of 10 to 20 NTU, the readings for DSE 1 and DSE 2 in particular are very close to natural baseline conditions. The percentage of readings above 20 NTU is higher in DSE 4, but this is likely due to the topography in the catchment which is more mountainous and steep than the DSE 1 and DSE 2 catchments which would give rise to more erosional factors. Overall, the turbidity monitoring does not show any affects/trends relating to the wind farm construction or operation. Each of the sonde locations is discussed in more detail below.

Table 9-11: Summary of Turbidity Sonde Locations

Sonde Location	Catchment	Upstream Catchment Area (km^2)	Development Infrastructure in Catchment
DSE 1	Toon River	14	Turbines T1 & T3 construction compound and the Site Entrance Road (~3.5km)
DSE 2	Toon River	2.8	Turbines T4, T5 and T8, Borrow Pit 1 and 2.5km of access road
DSE 3	Aghnakinneirth Stream	1.3	~1km of grid connection
DSE 4	Bunsheelin River	16.5	7.5km of Grid Connection

Sonde DSE 1 is located on the upper channel of the Toon River and the upstream development relating to the Cleanrath Wind is described in Table 9-11 above. The overall average turbidity recorded at DSE 1 was 8NTU, with only 4.2% of the readings exceeding 10NTU and only 2.3% exceeding 20NTU.

There were very few turbidity peaks at DSE 1 during the construction civils phase (September 2018 – August 2019) which ran through the winter of 2018/2019 which suggests that the peaks during the autumn/winter 2019 are likely to be as a result of other non-wind farm development related activities within the catchment. Also, considering the footprint of the Cleanrath wind farm development upstream of DSE 1 only accounts for <1% (~0.3%) of the total catchment area of $14km^2$, it is unlikely that the turbidity peaks that occurred in the winter of 2018/2019 were as a result of the development.

Sonde DSE 2 is located on a tributary stream of the Toon River which flows through Cleanrath Lough on the southeast of the site. The catchment area upstream of DSE 2 is relatively small (2.8km^2) compared to the other sonde locations, however it is the most developed with respect Cleanrath Wind Farm infrastructure. DSE 2 has also been the most consistent with regard low levels of turbidity with 3.1% of the readings been above 10NTU and only 0.8% exceeding 20NTU. Significant turbidity spikes only occurred on a minimal number of occasions and this was during the summer of 2019. The consistently low levels of turbidity show that the development is having no effects on surface water quality.

Sonde DSE 3 is located on the Aghnakinneirth Stream where approximately 1km of the grid connection is upstream of the sonde. Sonde DSE 3 recorded the lowest number of readings above 5NTU (i.e. 2.1%). This suggest that the grid works had no influence on turbidity in the Aghnakinneirth Stream.

Sonde DSE 4 is located on the Bunsheelin River at a point where approximately 7.5km of the grid route is located upstream of its location. The overall average turbidity recorded at DSE 4 was 31NTU, with 11.2% of the readings exceeding 10NTU and 9.8% exceeding 20NTU. There were no turbidity trends evident with regard the grid connection works and therefore the elevated levels are likely to be related to local landuse practices (non-wind farm development). The catchment upstream of DSE4 is large (16.5km) and therefore there will be many off-site activities that could influence turbidity.

Table 9-12: Summary of Turbidity Data

Sonde	Average NTU	% of Readings Above 5NTU	% of Readings Above 10NTU	% of Readings Above 20NTU
DSE 1	8	8.8	4.2	2.3
DSE 2	2.2	7.1	3.1	0.8
DSE 3	3.79	2.1	1.14	0.7
DSE 4	31	13.6	11.2	9.8

9.3.13 Visual Surface Water Quality Checks

A key element of the construction phase surface water quality monitoring were the visual checks undertaken during the site inspections. As well as the on-site checks, visual checks were also undertaken at the 13 no. surface water sampling locations. Checks were also undertaken at off-site locations VC1 to VC4 (refer to Figure 9-2).

Approximately 813 no. visual checks were completed during 55 no. inspection days during the construction phase. 99% of the 813 no. visual checks show no impacts with regard surface water quality. This means that the waters inspected were visually clean with no trace of contaminants. The 1% were all minor, localised, temporary turbidity effects which were resolved by undertaking minor drainage adjustments.

9.3.14 Hydrogeology

The Devonian Old Red Sandstones are mapped to underlie the wind farm site and the grid connection route. The aquifer classification varies between Poor Aquifer (Bedrock which is Generally Unproductive except for Local Zones - Pl) and Locally Important Aquifer (Bedrock which is Moderately Productive only in Local Zones - LI). In terms of the wind farm site, the northern section of the site is underlain by a Locally Important Aquifer while the southern section is underlain by a Poor Aquifer. In terms of the grid connection the western half is underlain by a Poor Aquifer and the eastern half is underlain by a Locally Important Aquifer.

Devonian Old Red Sandstone units form sequences which can be several kilometres thick, however most groundwater flow occurs within the top 15-20 m of the aquifer, in the layer that comprises a weathered zone of a few metres and a connected fractured zone below this. Deeper flows occur along generally isolated faults or significant fractures. Diffuse recharge will occur via percolation or areas of outcropping rock. However, due to the generally low permeability of the aquifer and the high slopes, a high proportion of the recharge will discharge rapidly to surface watercourses via the upper layers of the aquifer, effectively reducing further the available groundwater resource in the aquifer (GSI, 2004).

9.3.15 Groundwater Vulnerability

The vulnerability rating of the aquifer within the overall wind farm site ranges between "High to Extreme (X)" and this reflects the varying depth of local subsoils (i.e. 10m to <3m). In areas where subsoil is shallow or absent and where bedrock is outcropping, an Extreme (X) vulnerability rating is given. The majority of the wind farm site is mapped as Extreme (X) vulnerability.

9.3.16 Groundwater Hydrochemistry

There is no groundwater quality data for the wind farm site and groundwater sampling would generally not be undertaken for this type of development in terms of rEIAR reporting, as groundwater quality impacts would not be anticipated, which is the actual case for the Cleanrath wind farm.

Based on data from GSI publication Calcareous/Non calcareous classification of bedrock in the Republic of Ireland (WFD,2004), alkalinity for Devonian Old Red sandstones generally averages 100mg/L while electrical conductivity and hardness in the volcanic rocks interbedded in this type of bedrock were reported to have mean values of 554µS/cm and 301mg/L respectively.

9.3.17 Water Framework Directive Water Body Status & Objectives

The River Basin Management Plan was adopted in 2018 and has amalgamated all previous river basin districts into one national river basin management district. The River Basin Management Plan (2018 - 2021) objectives, which have been integrated into the design of the Cleanrath wind farm development, include the following:

- Ensure full compliance with relevant EU legislation;
- Prevent deterioration and maintain a 'high' status where it already exists;
- Protect, enhance and restore all waters with aim to achieve at least good status by 2021;
- Ensure waters in protected areas meet requirements; and,
- Implement targeted actions and pilot schemes in focused sub-catchments aimed at (1) targeting water bodies close to meeting their objectives and (2) addressing more complex issues that will build knowledge for the third cycle.

Our understanding of these objectives is that surface waters, regardless of whether they have 'Poor' or 'High' status, should be treated the same in terms of the level of protection and mitigation measures employed, i.e. there should be no negative change in status at all.

9.3.18 Groundwater Body Status

Local Groundwater Body (GWB) and Surface water Body (SWB) status reports are available for download from (www.catchments.ie).

The Ballinhassig GWB (IE_NW_G_005) underlies the wind farm site and is assigned 'Good Status', which is defined based on the quantitative status and chemical status of the GWB.

9.3.19 Surface Water Body Status

The River Lee, Toon River and Sullane Beg River immediately downstream of the Cleanrath wind farm development have been given a "Good Status" but increases to "High Status" further downstream.

9.3.20 Designated Sites and Habitats

Designated sites include National Heritage Areas (NHAs), Proposed National Heritage Areas (pNHAs), Special Areas of Conservation (SACs), candidate Special Areas of Conservation (cSAC) and Special Protection Areas (SPAs). The Cleanrath wind farm development site is not located within any designated conservation site. Designated sites in proximity to the Cleanrath wind farm development study area are show in Figure 9-4.

The Gearagh cSAC covers an area of 557.95ha and comprises a 7km section of the River Lee, including the confluence with the River Toon, and is located ~7.5km east of the Cleanrath wind farm development site. It is situated in a wide flat valley and the eastern part of the site has been flooded by the Carrigadrohid dam and is subject to artificial fluctuations in water levels. The site contains the only extensive alluvial forest in Western Europe west of the Rhine, and there is also a good, though small, example of an intact oak woodland. The aquatic riverine vegetation is well-developed, areas of alluvial grassland are important for wintering waterfowl, and otters occur throughout the site.

The Gearagh SPA covers an area of 322.79ha from Annahala Bridge westwards to Toon bridge and, therefore, covers the central and western parts of the cSAC. The site supports important populations of wintering waterfowl, including swans, dabbling duck, diving duck and some waders. Six of the species have populations of national importance. The principal habitat for birds is a shallow lake which is fringed by wet woodland, scrub and grassland that is prone to flooding. Habitat quality is good and the site provides both feeding and roost sites for the birds.

Lough Allua which exists approximately 3km downstream of the wind farm site is a designated pNHA. The section of the grid connection route within the River Lee catchment drains into Lough Allua.

Approximately 2.4km of the grid connection route exists within the Roughty River catchment which is a designated pNHA.

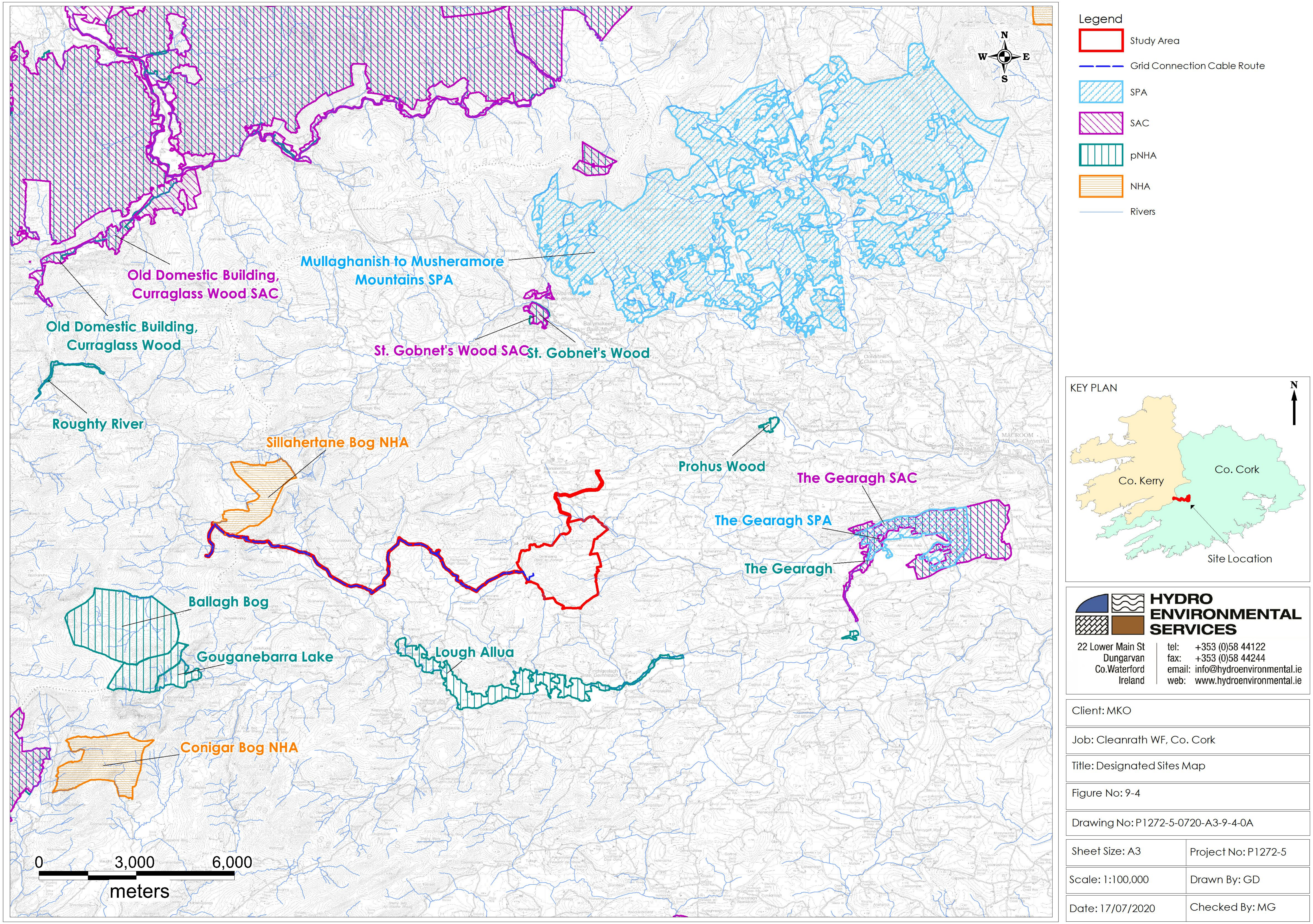
The grid connection route runs adjacent to Sillahertane Bog NHA which is located at the western end of the grid connection route within the Roughty River catchment. The grid connection cable route follows an existing track which runs along the south-western edge of the NHA for approximately 0.77km.

9.3.21 Water Resources

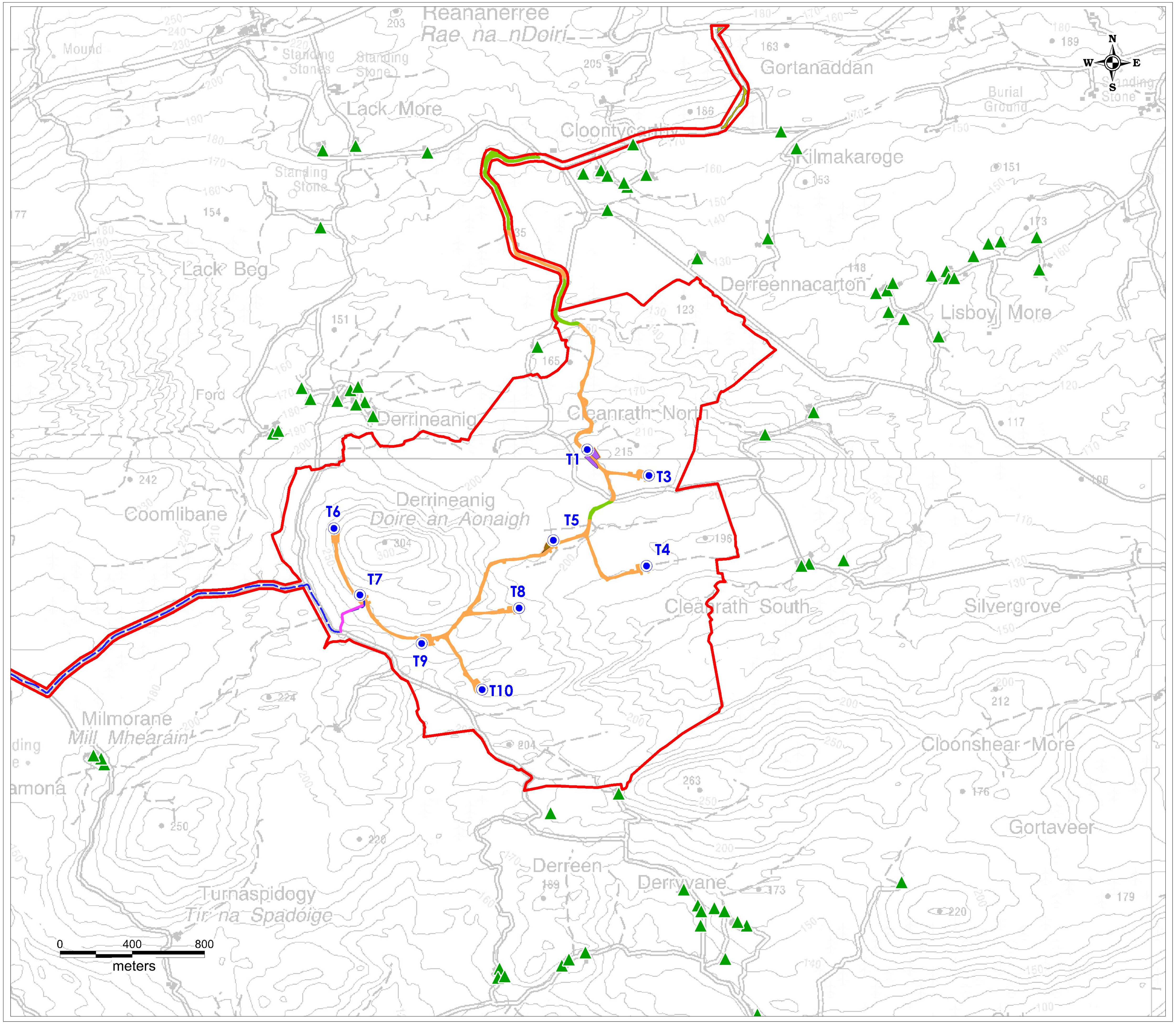
There are no groundwater protection zones mapped within the development site or study area or along the grid connection route. A search of the Geological Survey of Ireland (GSI) well database (www.gsi.ie) indicates that there are no private wells within 1km of the site.

As the GSI well database is not exhaustive in terms of the locations of all wells in the area (as the database relies on the submission of data by drillers and the public etc) it is assumed that every private dwelling in the vicinity of the Cleanrath wind farm development has a water supply well associated with it (this is a conservative assumption).

Shown on Figure 9-5 are the locations of private dwellings within 3km of the wind farm site boundary. The majority of development areas (i.e. all turbine locations and borrow pit etc) are very remote to these dwellings (Refer to Table 9-13 below) and it is not expected that there is any hydraulic connection between any potential wells and groundwater flow from the development areas. No issues were raised by local well users during the construction or operational phase.



Client: MKO	
Job: Cleanrath WF, Co. Cork	
Title: Designated Sites Map	
Figure No: 9-4	
Drawing No: P1272-5-0720-A3-9-4-0A	
Sheet Size: A3	Project No: P1272-5
Scale: 1:100,000	Drawn By: GD
Date: 17/07/2020	Checked By: MG



Legend

Study Area

As Constructed Turbine Locations

Grid Connection Cable Route

Borrow Pit Area

Area used as aTemporary Construction Compound

Turbine Delivery Accomodation Areas

Newly Constructed Roads

Exisitng Roads Upgraded

Operational Access/Inspection Road with underground cabling permitted under PL ref. 18/04458

Private Dwelling Location

KEY PLAN

HYDRO ENVIRONMENTAL SERVICES

22 Lower Main St
Dungarvan
Co.Waterford
Ireland

tel: +353 (0)58 44122
fax: +353 (0)58 44244
email: info@hydroenvironmental.ie
web: www.hydroenvironmental.ie

Client: MKO	
Job: Cleanrath WF, Co. Cork	
Title: Nearby Groundwater Wells Map	
Figure No: 9-5	
Drawing No: P1272-5-0720-A3-9-5-00A	
Sheet Size: A3	Project No: P1272-5
Scale: 1:20,000	Drawn By: GD
Date: 17/07/2020	Checked By: MG

Wells along the grid connection route and junction accommodation works were not assessed as these works were shallow with regard excavations, therefore the potential for effect was negligible.

Table 9-13: Summary WFD Information for Surface Water Bodies

Development Footprint Location(1)	Distance from Closest Private Dwelling (m)(2)	Location of Turbine in relation to the Closest Private Dwelling(3)
T1	643	Remote
T3	960	Remote
T4	860	Remote
T5	1,370	Remote
T6	612	Remote
T7	1,700	Remote
T8	1,500	Remote
T9	1,115	Remote
T10	783	Remote
Borrow Pit 1	1,370	Remote
Construction Compound[2]	643	Remote

Note:
1. Distance from closest turbine, compound, borrow pit or substation (i.e. bedrock excavation). Access roads and the grid connection cable trench are not considered a potential risk due to the shallow nature of the works. The distances listed above are from the nearest wind farm infrastructure within the same surface water catchment as the dwelling.
2. Each dwelling is assumed to have an on-site private water well.
3. Hydraulically up-gradient or remote. Remote meaning there is no dwelling (assumed well) down-gradient of the Cleanrath wind farm development infrastructure.

9.4 Characteristics of the Cleanrath wind farm development

The development comprises of the following:

- 9 wind turbines, having a maximum ground to blade tip height of up to 150m metres and all associated foundations and hard-standing areas;
- New access roads (4.8km) and upgrade of internal site access roads (1.3km) and the upgrade of an existing access junctions and junction accommodation works;
- All associated site drainage;
- 1 no borrow pit (BP1);
- 1 no. construction compound
- Underground electricity connection cabling;

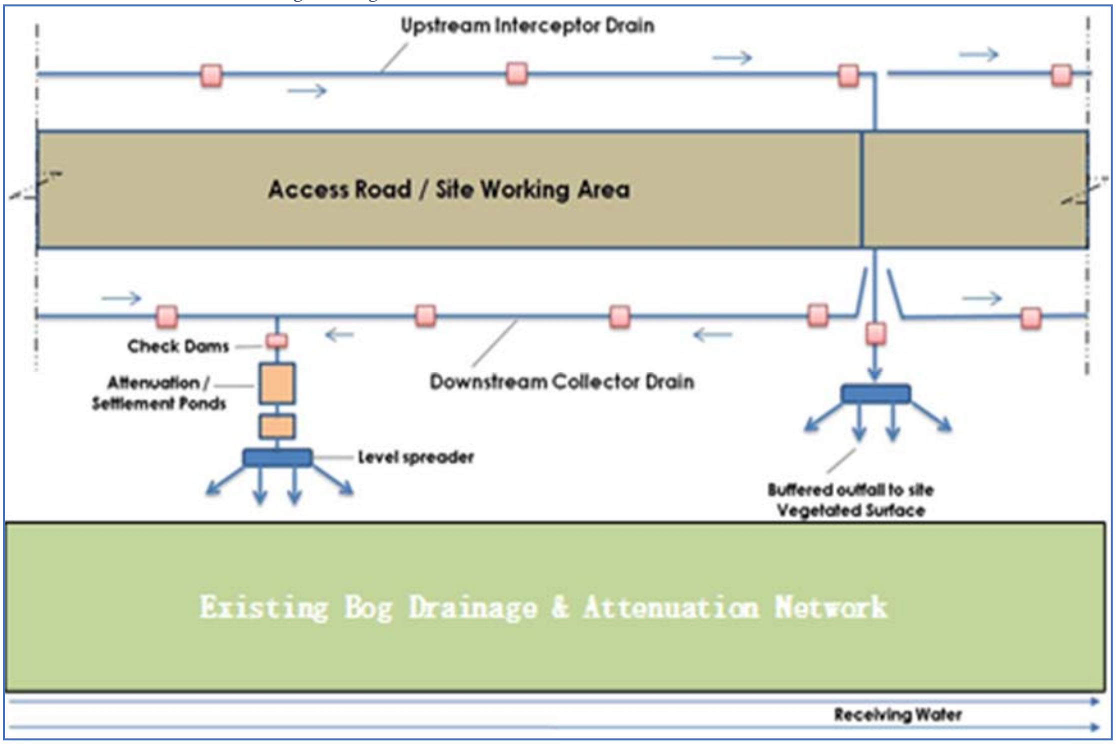
[2] Please refer to Section 4.3.8 of Chapter 4 for details of the Construction Compound

9.4.1 Drainage Management

Runoff control and drainage management are key elements in terms of mitigation against impacts on surface water bodies. Two distinct methods were employed to manage drainage water within the Cleanrath wind farm development. The first method involves 'keeping clean water clean' by avoiding disturbance to natural drainage features, minimising any works in or around artificial drainage features, and diverting clean surface water flow around excavations, construction areas and temporary storage areas. The second method involves collecting any drainage waters from works areas within the site that might carry silt or sediment, and nutrients, to route them towards settlement ponds (or stilling ponds) prior to controlled diffuse release over vegetated surfaces. There were no direct discharges to surface waters. During the construction phase all runoff from works areas (i.e. dirty water) were attenuated and treated to a high quality prior to being released. A schematic of the site drainage management is shown as Plate 9-2 below. A detailed drainage plan showing the layout of the drainage design elements as shown in Plate 9-2 is shown in Appendix 4-1 of this rEIAR.

Various combinations/adaptations of the runoff control and drainage management measures described above were employed at the site depending on the local conditions and topography.

Plate 9-2: Schematic of Site Drainage Management



9.5 Significant Effects and Mitigation Measures

This section provides a brief overview of the potential impacts that were identified in the 2015 EIS and then the actual observed impacts. The outcome of the assessment of the construction phase and operational phase effects (as discussed below) concluded that no remedial mitigation measures were required as a result of the Cleanrath wind farm development.

9.5.1 Do -Nothing Scenario

A do-nothing option to developing the Cleanrath wind farm development would have been to leave the site as it was prior to construction, with no changes made to the land-use practices of low-intensity agriculture, turf cutting and commercial forestry. This option would have no positive impact with regards to the production of renewable energy or the offsetting of greenhouse gas emissions. On the basis of the positive environmental effects arising from the Cleanrath wind farm development, the do–nothing scenario was not the chosen option. Instead, an application for planning permission was made and granted ultimately by An Bord Pleanála.

The Cleanrath wind farm development has been constructed, has been operational and is now operating in Sleep Mode with the site essentially in a shut-down mode with no export of electricity pending the outcome of the Substitute Consent process. In the event that Substitute Consent is obtained, the intention is to recommence and continue the full operation of the Cleanrath wind farm development until the end of 25 years from the formal commissioning of the turbines in July 2020 and implement the decommissioning plan for the Cleanrath wind farm development at the end of the operational period.

In the event that Substitute Consent is not granted and full operation of the development is not recommenced, it will remain in Sleep Mode which is, in effect, the "do nothing" option insofar as it represents the current situation as at the date of the application for Substitute Consent. There is the possibility that the decommissioning plan may need to be implemented early, should Substitute Consent not be granted. These scenarios are assessed in this chapter.

9.5.2 Construction Phase

9.5.2.1 Clear Felling of Coniferous Plantation

12.32ha (hectares) in total of existing plantation forestry was felled to allow for development of the wind farm infrastructure and the grid connection route. This includes 8.14ha that was felled within and around the development footprint and 4.18ha that was temporary felled around the turbine locations. The majority of the felling areas (92.7%) were within the Toon River catchment. The total felling area accounts for only 7.1% of the existing on-site forestry coverage. The main potential effect (in the absence of mitigation) was release of sediments to local surface waters

Pathways: Drainage and surface water discharge routes.

Receptors: Surface waters (Toon River, River Lee, Aghnakinneirth Stream, Bunsheelin River and Sullane Beg River) and associated dependant ecosystems.

Pre-Mitigation Impact: Indirect, negative, moderate, temporary, high probability impact.

Mitigation Measure Implemented During the Construction Phase:

Best practice methods related to water incorporated into the forestry management and mitigation measures were derived from:

- Forestry Commission (2004): Forests and Water Guidelines, Fourth Edition. Publ. Forestry Commission, Edinburgh;
- Coillte (2009): Forest Operations and Water Protection Guidelines;
- Coillte (2009): Methodology for Clear Felling Harvesting Operations;
- Forest Service (Draft): Forestry and Freshwater Pearl Mussel Requirements – Site Assessment and Mitigation Measures; and,
- Forest Service (2000): Forestry and Water Quality Guidelines. Forest Service, DAF, Johnstown Castle Estate, Co. Wexford.

Mitigation by Avoidance:

There is a requirement in the Forest Service Code of Practice and in the FSC Certification Standard for the installation of buffer zones adjacent to aquatic zones at planting stage. Minimum buffer zone widths recommended in the Forest Service (2000) guidance document "Forestry and Water Quality Guidelines" are shown in Table 9-14.

Table 9-14: Minimum Buffer Zone Widths (Forest Service, 2000)

Average slope leading to the aquatic zone		Buffer zone width on either side of the aquatic zone	Buffer zone width for highly erodible soils
Moderate	(0 – 15%)	10 m	15 m
Steep	(15 – 30%)	15 m	20 m
Very steep	(>30%)	20 m	25 m

During the wind farm design and construction phase a self-imposed buffer zone of 50m was maintained for all streams. These buffer zones are shown on Figure 9-6.

With the exception of existing road upgrades and existing stream crossings all tree felling areas were located outside of imposed buffer zones. The large distance between felling areas and sensitive aquatic zones meant that potential poor quality runoff from felling areas was adequately managed and attenuated prior to even reaching the aquatic buffer zone and primary drainage routes. Where tree felling was required in the vicinity of streams, the following additional design mitigation measures were employed.

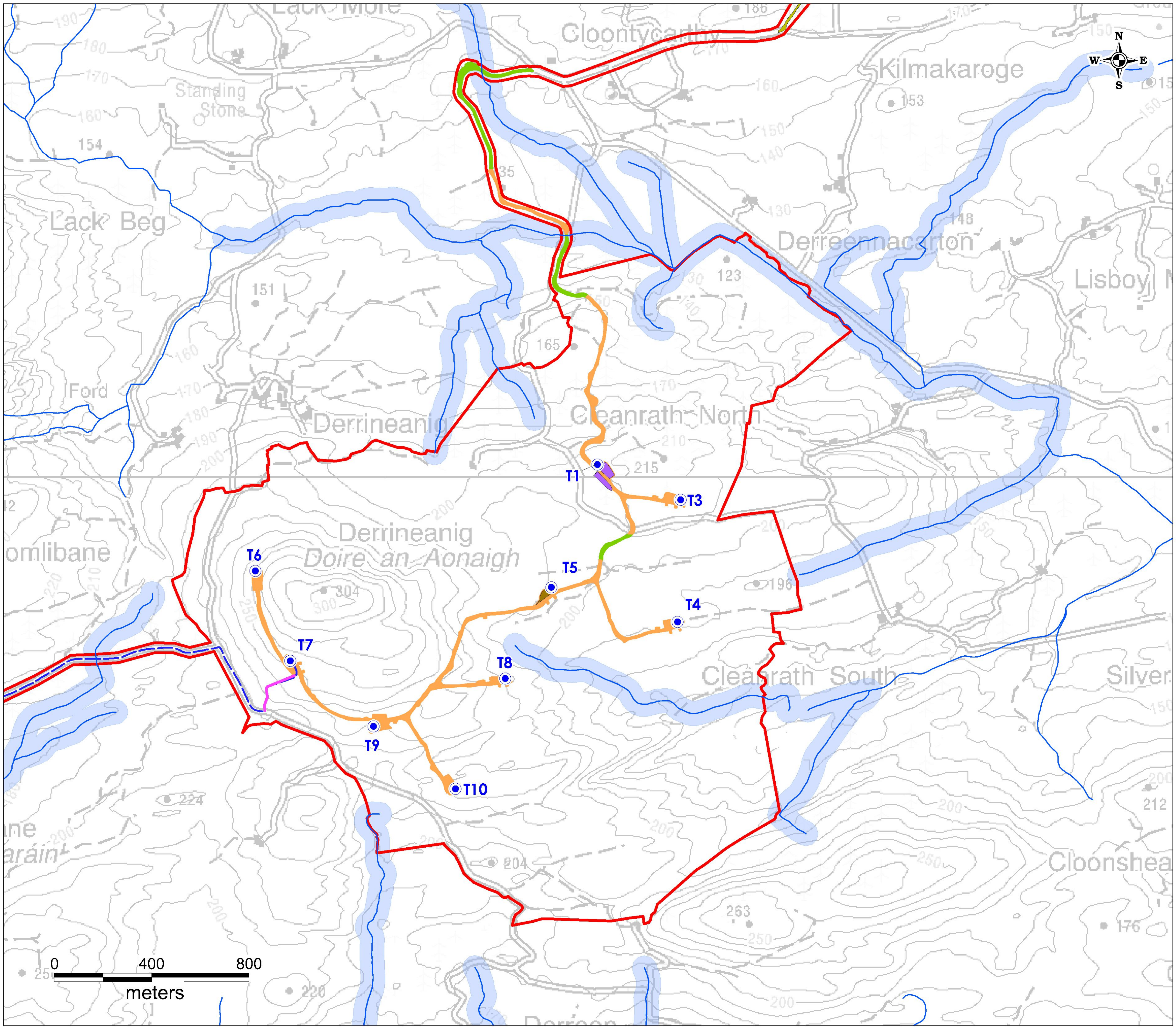
Mitigation by Design:

Mitigation measures that reduced the risk of entrainment of suspended solids and nutrient release in surface watercourses comprise best practice methods which were followed during the construction of the Cleanrath wind farm development are set out as follows:

- Machine combinations were chosen which were most suitable for ground conditions at the time of felling;
- Checking and maintenance of roads and culverts was on-going through the felling operation;
- Ditches which drained from the felling areas towards existing surface watercourses were blocked, and temporary silt traps were constructed. No direct discharge of such ditches to watercourses was allowed;
- Drains and sediment traps were installed during ground preparation. Collector drains were excavated at an acute angle to the contour (~0.3%-3% gradient), to minimise flow velocities. Main drains to take the discharge from collector drains included water drops and rock armour, as required, where there were steep gradients;
- Sediment traps were installed in drains downstream of felling areas. Machine access was maintained to enable the accumulated sediment to be excavated. Sediment was carefully disposed of in the peat disposal areas; and,
- In areas particularly sensitive to erosion, double or triple sediment traps were installed.

Silt Traps:
Silt traps were strategically placed down-gradient within forestry drains near streams. The main purpose of the silt traps and drain blocking was to slow water flow, increase residence time, and allow settling of silt in a controlled manner.

Drain Inspection and Maintenance:



Legend

- Study Area
- As Constructed Turbine Locations
- Grid Connection Cable Route
- Borrow Pit Area
- Area used as aTemporary Construction Compound
- Turbine Delivery Accomodation Areas
- Newly Constructed Roads
- Exisitng Roads Upgraded
- Operational Access/Inspection Road with underground cabling permitted under PL ref. 18/04458
- Rivers/Streams
- 50m River Buffer

KEY PLAN

HYDRO ENVIRONMENTAL SERVICES

22 Lower Main St
Dungarvan
Co.Waterford
Ireland

tel: +353 (0)58 44122
fax: +353 (0)58 44244
email: info@hydroenvironmental.ie
web: www.hydroenvironmental.ie

Client: MKO	
Job: Cleanrath WF, Co. Cork	
Title: Hydro-Constraints Map	
Figure No: 9-6	
Drawing No: P1272-5-0720-A3-9-6-00A	
Sheet Size: A3	Project No: P1272-5
Scale: 1:20,000	Drawn By: GD
Date: 17/07/2020	Checked By: MG

The following items were carried out during inspection pre-felling and after:

- Communication with tree felling operatives in advance to determine whether any areas had reported where there were unusual water logging or bogging of machines;
- Inspection of all areas reported as having unusual ground conditions;
- Inspection of main drainage ditches and outfalls. During pre-felling inspection the main drainage ditches were identified.
- Following tree felling all main drains were inspected to ensure that they are functioning;
- Extraction tracks nears drains were broken up and diversion channels created to ensure that water in the tracks spread out over the adjoining ground;
- Culverts on drains exiting the site were unblocked; and,
- All accumulated silt was removed from drains and culverts, and silt traps, and this removed material was deposited away from watercourses to ensure that it would not be carried back into the trap or stream during subsequent rainfall.

Surface Water Quality Monitoring:
As described in Section 9.3.11, Section 9.3.12 and Section 9.3.13, construction phase surface water quality monitoring was undertaken by means of regular visual inspections, monthly surface water quality sampling and automated turbidity monitoring.

Impact Assessment:
Over 800 no. visual inspection were carried out during the construction phase (which included tree felling) and there was no visual evidence of tree felling operations impacting on surface water quality locally within the site itself, therefore downstream effects did not occur as demonstrated by the surface water quality monitoring.

The majority of the tree felling occurred in the catchment upstream of turbidity sonde DSE 1. Tree felling mainly occurred in the early construction phase (i.e. November 2018 – February 2019) and there was a lack of significant turbidity spikes during this period. Monthly surface water sampling was completed downstream of the felling area at sampling location SW2. There were no exceedances with respect suspended solids or nutrients at monitoring location SW2.

Residual Impact
The potential for the release of suspended solids to watercourse receptors is a risk to water quality and the aquatic quality of the receptor. Best practice tree felling measures to mitigate the risk of releases of sediment were used to break the pathway between the potential sources and the receptor. The residual effect is assessed as - Negative, imperceptible, indirect, temporary, low probability effect on downstream water quality and aquatic habitats.

Significance of Effects: For the reasons outlined above, no significant effects on the water environment have occurred or are likely to occur as a result of the Cleanrath wind farm development.

9.5.2.2 Earthworks (Removal of Vegetation Cover, Excavations and Stock Piling) Resulting in Suspended Solids Entrainment in Surface Waters

Construction phase activities included access road construction, turbine base/hardstanding construction and grid cable trench excavation (including the loop in to Derragh substation) and this resulted in removal of vegetation cover and excavation of peat mineral subsoil and bedrock where present.

In the absence of mitigation these activities had the potential to release suspended solids to surface watercourses and which could have resulted in an increase in the suspended sediment load to local surface waters.

Pathways: Drainage and surface water discharge routes.

Receptors: Down-gradient rivers (Toon River, River Lee, Aghnakinneirth Stream, Bunsheelin River and Sullane Beg River) and dependant ecosystems.

Pre-Mitigation Impact Indirect, negative, significant, temporary, medium probability impact.

Mitigation Measure Implemented During the Construction Phase:

Mitigation by Avoidance:

The key mitigation measure during the construction phase was the avoidance of sensitive aquatic areas where possible. From Error! Reference source not found. it can be seen that all of the key development areas are actually significantly away from the delineated buffer zones with the exception of existing stream crossings that required upgrading. Additional control measures, which are outlined further on in this section, were undertaken at these locations).

Mitigation by Design:

The following control measures were used during the construction phase:

- Source controls:
    - Interceptor drains, vee-drains, diversion drains, flume pipes, erosion and velocity control measures such as use of sand bags, oyster bags filled with gravel, filter fabrics, and other similar/equivalent or appropriate systems.
    - Small working areas, covering stockpiles, weathering off stockpiles, cessation of works in certain areas or other similar/equivalent or appropriate measures.

- In-Line controls:
    - Interceptor drains, vee-drains, oversized swales, erosion and velocity control measures such as check dams, sand bags, oyster bags, straw bales, flow limiters, weirs, baffles, silt bags, silt fences, sedimats, filter fabrics, and collection sumps, temporary sumps/attenuation lagoons, sediment traps, pumping systems, settlement ponds, temporary pumping chambers, or other similar/equivalent or appropriates systems.

- Treatment systems:
    - Temporary sumps and attenuation ponds, temporary storage lagoons, sediment traps, and settlement ponds.

It should be noted for this site that a network of forestry and roadside drains already existed on the northeast of the site mainly, and these were integrated and enhanced as required and used within the Cleanrath wind farm development drainage system. The key elements being the upgrading and improvements to water treatment elements, such as in line controls and treatment systems, including silt traps, settlement ponds and buffered outfalls.

Silt Fences:

Silt fences were placed within drains and surface water flowpaths down-gradient of all construction areas. Silt fences were effective at removing heavy settleable solids. This prevented entry to watercourses of sand and gravel sized sediment, released from excavation of mineral sub-soils of glacial and glacio-fluvial origin, and entrained in surface water runoff. Inspection and maintenance of these structures was undertaken during the construction phase.

They were left in place throughout the entire construction phase. Double silt fences were placed within drains down-gradient of all construction areas inside the hydrological buffer zones, this also included off-road sections of grid connection cable route within hydrological buffer zones.

Silt fences were installed along the grid connection cable trench, where required. The emplacement of silt fences within the trench occurred where the terrain allowed. The specific locations are not shown as part of the drainage plan included in Appendix 4-1 of this rEIAR.

Silt Bags:

Silt bags were used where small to medium volumes of water needed to be pumped from excavations. As water was pumped through the bag, most of the sediment was retained by the geotextile fabric allowing filtered water to pass through. Silt bags were used with natural vegetation filters.

Pre-emptive Site Drainage Management:

The works programme for the initial construction stage of the development took account of weather forecasts, and predicted rainfall in particular. Large excavations and movements of peat/subsoil or vegetation stripping were suspended or scaled back if heavy rain was forecasted. The extent to which works were scaled back or suspended related directly to the amount of rainfall forecasted at that time.

Timing of Site Construction Works:

Construction of the site drainage system was only carried out during periods of low rainfall, and therefore minimum runoff rates. This minimised the risk of entrainment of suspended sediment in surface water runoff, and transport via this pathway to surface watercourses. Construction of the drainage system during low flow period also ensured that attenuation features associated with the drainage system was in place and operational for all subsequent construction works.

Monitoring:

The inspection of the on-site drainage system was carried out by an on-site ECoW as part of the daily visual monitoring and inspections by HES. Any maintenance requirements were then reported to the Site Manager. Regular inspections of all installed drainage systems was undertaken, especially after heavy rainfall, to check for blockages and ensure that there was no build-up of standing water in parts of the systems where it is not intended.

Any excess build-up of silt levels at dams, the settlement pond, or any other drainage features that decreased the effectiveness of the drainage feature, was removed.

As described in Section 9.3.11, Section 9.3.12 and Section 9.3.13, surface water quality monitoring was undertaken by means of regular visual inspections, monthly surface water quality sampling and automated turbidity monitoring.

Impact Assessment:

Over 800 no. visual inspections were carried out during the construction phase and 99% of these show no impact locally or at the 13 no. surface water monitoring locations with respect surface water quality impacts. The 1% were all minor, localised, temporary turbidity effects which were resolved by undertaking minor drainage adjustments. The affected watercourse returned to natural background turbidity after the drainage adjustments.

242 no. surface water samples were taken at the 13 no. surface water monitoring locations during the construction phase and there was no exceedance of suspended solids with respect the relevant surface water regulation value (i.e. 25mg/L).

The automated turbidity monitoring shown that levels were typically very low during the construction phase with the vast majority of readings been within the expected background range for surface waters (10 – 20NTU). The average NTU was highest at DSE4, however there were no turbidity trends evident with regard the grid connection works and the therefore the elevated levels are likely to be related to local landuse practices (non-wind farm development). The catchment upstream of DSE4 is large (16.5km) and therefore there will be many off-site activities that could influence turbidity.

Residual Effects: The potential for the release of suspended solids to watercourse receptors is a risk to water quality and the aquatic quality of the receptor. Proven and effective measures to mitigate the risk of releases of sediment were undertaken to break the pathway between the potential sources and the receptor. The residual effect is assessed to be - Negative, imperceptible, indirect, temporary, low probability effect on downstream water quality and aquatic habitats.

Significance of Effects: For the reasons outlined above, no significant effects on the water environment have occurred or are likely to occur as a result of the Cleanrath wind farm development.

9.5.2.3 Impacts on Groundwater Levels During Excavation Works & from the Borrow Pit

Dewatering of borrow pits (if required) and other deep excavations (i.e. turbine bases) have the potential to impact on local groundwater levels. However, no significant dewatering was required during the construction phase and this was due the local topographical and hydrogeological regime as well as the borrow pit excavation method as outlined below.

Pathway: Groundwater flowpaths.

Receptor: Groundwater levels.

Pre-Mitigation Impact: Direct, negligible, slight, short term, low probability impact.

Impact Assessment

No groundwater dewatering was required at BP1 as rock excavation progressed in a horizontal manner into the side of elevated outcropping bedrock. No groundwater inflows were encountered and there was only a requirement to manage surface water runoff at BP1 during wet periods.

Similarly, at the turbine base locations there was only a requirement to manage surface water runoff as no groundwater was encountered. Due to the fact that bedrock was close to the ground surface over much of the site, no deep excavations were required for the turbine bases.

Relevant environmental management guidelines from the EPA quarry 2006 guidance document – "Environmental Management in the Extractive Industry" in relation to groundwater issues were implemented during the construction phase.

Residual Impact: No residual impact on groundwater levels occurred as a result of borrow pit and turbine base excavation works as no significant groundwater inflows were encountered.

Significance of Effects: No impact on groundwater levels occurred as a result of borrow pit and turbine base excavation works.

9.5.2.4 Excavation Dewatering and Potential Impacts on Surface Water Quality

Only surface water seepages/runoff occurred in turbine base excavations and borrow pit and this created a small additional volumes of water to be treated by the runoff management system. Inflows required management and treatment to reduce suspended sediments. No contaminated land was noted at the site and therefore pollution issues did not occur.

Pathway: Overland flow and site drainage network.

Receptor: Down-gradient surface water bodies (Toon River and River Lee).

Pre-Mitigation Impact: Indirect, negative, significant, temporary, low probability impact to surface water quality.

Mitigation Measure Implemented During the Construction Phase

Mitigation by Design:

Management of excavation seepages and subsequent treatment prior to discharge into the drainage network was undertaken as follows:

- Appropriate interceptor drainage, to prevent upslope surface runoff from entering excavations was put in place;
- Regular pumping of excavation inflows was undertaken to prevent build up of water in the excavation;
- The interceptor drainage was discharged to the site constructed drainage system or onto natural vegetated surfaces and not directly to surface waters;
-
- There was no direct discharge to surface watercourses, and therefore no hydraulic loading or contamination did occur;
- Daily monitoring of excavations by a suitably qualified person was undertaken during the construction phase. If high levels of seepage inflow did occur, excavation work was immediately stopped and a geotechnical assessment was undertaken; and,
- All pumped water was discharged through a silt bag or upslope of silt fencing.

Impact Assessment:
There were no records/reports of any dirty water been released during the construction phase as a result of excavation pumping. No instances of dirty water been released occured during any of the site inspections/audits completed by HES or MKO and none have been reported by the site engineer or contractor. Due to the appropriate interceptor drainage been put in place, minimal excavation dewatering was required.

Residual Impact: The potential for the release of suspended solids to watercourse receptors is a risk to water quality and the aquatic quality of the receptor. Proven and effective measures to mitigate the risk of releases of sediment were undertaken to break the pathway between the potential sources and the receptor. The residual effect is assessed to be - Imperceptible, indirect, temporary, low probability effects on local surface water quality and associated aquatic habitats.

Significance of Effects: For the reasons outlined above, no significant effects on surface water quality have occurred or are likely to occur as a result of the Development.

9.5.2.5 Release of Hydrocarbons during Construction and Storage

Accidental spillage during refuelling of construction plant with petroleum hydrocarbons is a significant pollution risk to groundwater, surface water and associated ecosystems, and to terrestrial ecology. The accumulation of small spills of fuels and lubricants during routine plant use can also be a pollution risk. Hydrocarbon has a high toxicity to humans, and all flora and fauna, including fish, and is persistent in the environment. It is also a nutrient supply for adapted micro-organisms, which can rapidly deplete dissolved oxygen in waters, resulting in death of aquatic organisms.

Pathway: Groundwater flowpaths and site drainage network.

Receptor: Groundwater and surface water.

Pre-Mitigation Impact Indirect, negative, slight, short term, medium probability impact to local groundwater quality. Indirect, negative, significant, short term, low probability impact to surface water quality.

Mitigation Measure Implemented During the Construction Phase:

Mitigation by Design:

- Off-site refuelling of site vehicles was undertaken, where possible;
- On site re-fuelling was undertaken at the wind farm at designated refuelling areas using a fuel truck which came to site and in more remote areas of the site using a double skinned bowser with spill kits on the ready for accidental leakages or spillages. Refuelling was undertaken, where possible, outside of the self-imposed buffer zones to local watercourses;
- On site re-fuelling was only undertaken by suitably trained personnel;
- No refuelling was undertaken inside watercourse buffer zones;
- Fuel stored on site during the construction phase was minimised;
- The plant used during the construction phase were inspected regularly for leaks and fitness for purpose;
- No major spills or environmental incidents were recorded during the construction phase; and,
- An emergency plan for the construction phase to deal with accidental spillages was contained within the Construction and Environmental Management Plan, but no emergency measures had to be implemented during the construction phase.

Impact Assessment:
There were no records/reports of soil contamination incidences during the construction phase or operational phase of the development. There were no contamination issues/spills during any of the site inspections/audits. There were no visual residues of oils noted at any of the water quality inspection sites.

Residual Effect Assessment: The use and storage of hydrocarbons and small volumes of chemicals is a standard risk associated with all construction sites. Proven and effective measures to mitigate the risk of spills and leaks were applied during the construction phase. The residual effect is assessed as - Negative, imperceptible, direct, short-term, low probability effect on groundwater and surface water quality.

Significance of Effects: For the reasons outlined above, no significant effects on water have occurred or are likely to occur as a result of the Development.

9.5.2.6 Groundwater and Surface Water Contamination from Wastewater Disposal

Release of effluent from domestic wastewater treatment systems has the potential to impact on groundwater and surface waters if site conditions are not suitable for an on-site percolation unit.

Pathway: Groundwater flowpaths and site drainage network.

Receptor: Down-gradient well supplies, groundwater quality and surface water quality.

Pre mitigation Impact: Indirect, negative, significant, temporary, low probability impact to surface water quality. Indirect, negative, slight, temporary, low probability impact to local groundwater.

Mitigation Measure Implemented During the Construction Phase:

Mitigation by Avoidance:

- A self contained port-a-loo with an integrated waste holding tank was used at the site compound, maintained by the providing contractor, and removed from site on completion of the construction works;
- Water supply for the site office and other sanitation was brought to site and removed after use from the site to be discharged at a suitable off-site treatment location; and,
- No water was sourced on the site, or discharged to the site.

Impact Assessment:

No impact as there was no release of wastewater into the natural environment at the site.

Residual Effect: During the construction phase the measures listed above were implemented, therefore there are no residual effects.

Significance of Effects: For the reasons outlined above, no significant effects on water have occurred or are likely to occur as a result of the Development.

9.5.2.7 Release of Cement-Based Products

Concrete and other cement-based products are highly alkaline and corrosive and can have significant negative impacts on water quality. They generate very fine, highly alkaline silt (pH 11.5) that can physically damage fish by burning their skin and blocking their gills. A pH range of $\geq 6 \leq 9$ is set in S.I. No. 293 of 1988 Quality of Salmonid Water Regulations, with artificial variations not in excess of $\pm$ 0.5 of a pH unit. Entry of cement based products into the site drainage system, into surface water runoff, and hence to surface watercourses or directly into watercourses represents a risk to the aquatic environment. Peat ecosystems are dependent on low pH hydrochemistry. They are extremely sensitive to introduction of high pH alkaline waters into the system. Batching of wet concrete on site and washing out of transport and placement machinery are the activities most likely to generate a risk of cement based pollution.

Pathway: Site drainage network.

Receptor: Surface water and peat water hydrochemistry.

Pre-Mitigation Impact

Indirect, negative, moderate, short term, medium probability impact to surface water.

Mitigation Measure Implemented During the Construction Phase:

Mitigation by Avoidance:

- No batching of wet-cement products was carried out on site. Ready-mixed supply of wet concrete products was used and where possible, emplacement of pre-cast elements, took place;
- Where possible pre-cast elements for culverts and concrete works was used;
- Where concrete was delivered on site, only the chute was cleaned, using the smallest volume of water possible.
- The small volume of water generated from washing of the concrete lorry's chute were directed into a temporary lined impermeable containment area;
- No discharge of cement contaminated waters to the construction phase drainage system or directly to any artificial drain or watercourse was allowed. Chute cleaning water was tanked and removed from the site to a suitable, non-polluting, discharge location;
- Weather forecasting was used to plan dry days for pouring concrete; and,
- Pour sites were made free of standing water and plastic covers were ready in case of sudden rainfall event.

Impact Assessment:
There were no records/reports of water contamination incidences as a result of cement during the construction phase of the development. There were no cement contamination issues observed during any of the site inspections/audits completed by HES/MKO. All the pH values recorded at the 13 no. downstream monitoring locations were within the EQS range (i.e. pH 6 – 9).

Residual Effect: The potential for the release of cement-based products or cement truck wash water to groundwater and watercourse receptors is a risk to surface water and groundwater quality, and also the aquatic quality of the surface water receptors. Proven and effective measures to mitigate the risk of releases cement-based products or cement truck wash water were undertaken to break the pathway between the potential source and each receptor. The residual effect is assessed to be - Negative, imperceptible, indirect, short term, low probability impact.

Significance of Effects: For the reasons outlined above, no significant effects on surface water quality have occurred.

9.5.2.8 Impacts on Hydrologically Connected Designated Sites

As outlined above the Cleanrath wind farm development is situated upstream of the Gearagh and Lough Allua which is a designated SAC and pNHA respectively. An approximate 2.4km section of the grid connection route exists within the Roughty River catchment which is a designated pNHA in places. Possible effects include water quality impacts which could be significant if mitigation was not put in place.

The grid connection route also runs adjacent to Sillahertane Bog NHA which is located at the western end of the grid route. The grid cable connection follows an existing track which runs along the south-western edge of the NHA for approximately 0.77km. The cable was installed within a trench along this track.

Pathway: Surface water and groundwater flowpaths.

Receptor: Down-gradient surface water quality (Toon River, River Lee, Aghnakinneirth Stream, Bunsheelin River and Sullane Beg River) and designated sites.

Pre-Mitigation Impact: Indirect, negative, imperceptible, temporary, low probability.

Mitigation Measure Implemented During the Construction Phase

In relation to the downstream designated sites (i.e. The Gearagh SAC, Lough Allua pNHA and Roughty River pNHA), the mitigation measures for protection of surface water quality which included buffer zones and drainage control measures (i.e. interceptor drains, swales, settlement ponds) ensured that the quality of runoff from development areas was very high.

As stated in impact Section 9.5.2.1 and Section 9.5.2.2 above, there was only an "imperceptible and temporary impact" on local streams and rivers but this would have been very localised and over a very short time period (i.e. hours). Therefore, significant direct, or indirect impacts on the Gearagh SAC, Lough Allua pNHA or Roughty River pNHA did not occur.

The nature of the existing ground conditions, the shallow trench and hydrogeology and hydrology in the vicinity of Sillahertane Bog NHA, meant no mitigation measures were required with respect the underground grid cable works. This is described below.

Impact Assessment

As stated in impact Section 9.5.2.1 and Section 9.5.2.2 above, there was only an "imperceptible and temporary impact" on local streams and rivers but this would have been very localised and over a very short time period (i.e. hours). This lack of significant effects was demonstrated by the construction surface water quality monitoring data.

In relation to Sillahertane Bog NHA, the construction and presence of the cable trench did not alter any further the hydrological / drainage regime in the vicinity of the existing track and NHA. The initial 300m of the grid connection route is upslope (up-gradient) of Sillahertane Bog NHA and therefore the presence of the trench did not result in any significant groundwater seepages from the subsoils beneath the down-gradient NHA designed peat. The mineral subsoils comprise mainly of relatively low permeability silts and clays and therefore no significant groundwater seepages occurred during the construction. Surface water runoff from the upslope non-designated bog already enters the track (which acts as a drainage conduit) and the presence of the cable trench had no impacts in this respect.

Approximately 300m downslope of the NHA, the track is already cut into the peat and underlying mineral soil. On the lower section of the route the depth of the cut below the base of the NHA peat is extended even further by the presence of the drainage gully. The presence of cut track section and drainage gully means the subsoils beneath Sillahertane Bog NHA are already being drained to some extent. The temporary trench excavation and reinstatement, and ultimately the presence of the cable trench (which was placed on the opposite side of the track from the NHA which is at least 2.5m away from the subsoils at the base of the NHA peat) will not result in any additional drainage of subsoils beneath the NHA peat.

Also, the backfill material placed within the trench which comprised of concrete followed by gravel fill and provided with low permeability material plugs, the potential for the backfilled trench to act as a drainage conduit is very low. In addition, the backfilled trench was constructed in low permeability clays and silts and therefore the potential to impact on groundwater levels away from the trench does not exist.

In addition, the lower section of the route runs perpendicular to the ground contours, which means the cable trench is neither up-gradient nor down-gradient of Sillahertane Bog NHA (i.e. it is across gradient) and therefore significant groundwater seepages from the NHA into the cable trench will not occur.

Residual Effects: No hydrological or hydrogeological effects on designated sites have occurred or are likely to occur.

Significance of Effects: For the reasons outlined above, no significant impacts on any designated occurred.

9.5.2.9 Impact on Freshwater Pearl Mussel Populations within the River Lee Catchment

There are small non SAC designated freshwater pearl mussel (FWPM) sites downstream of the development site in the River Lee catchment. The closest known site is 1.5km downstream of the development site in the Toon River. FWPM are also present in the River Lee both upstream and downstream of Lough Allua and in the Sullan River catchment.

Pathway: Site drainage network.

Receptor: The River Lee and freshwater pearl mussel populations.

Potential Impact: Indirect, negative, moderate, temporary, low probability impact.

Mitigation Measure Implemented During the Construction Phase:

Best guidance in relation to protection of freshwater pear mussel (FPM) sites was obtained from guidance document Forestry and Freshwater Pearl Mussel Requirements – Site Assessment and Mitigation Measures (Draft).

Within catchments that contain FPM and especially populations that are designated (i.e. SAC) particular emphasis is placed upon forestry sites (i.e. or wind farm development sites) that lie less than 6km upstream of an identified FPM population. Table 9-15 shows the screening criteria taken from the FPM requirements guidance document.

Table 9-15: Forest Operations Screening Table (FPM Requirements)

Distance from nearest downstream FPM population (Note 1)		Soil (Note 2)	Requirements (see *below)
PART A within 6km from a FPM site	Site Adjoins Population	Erodible	FPM Requirements
		Peaty	FPM Requirements
		Mineral	FPM Requirements
	Site contains or adjoins an aquatic zone	Erodible	FPM Requirements
		Peaty	FPM Requirements
		Mineral	FPM Requirements
	Site does not contain or adjoin an aquatic zone	Erodible	FPM Requirements
		Peaty	FPM Requirements
		Mineral	FS Guidelines*
PART B greater than 6km from a FPM site		Erodible	FS Guidelines*
		Peaty	FS Guidelines*

*Note 1: Forestry Services Guidelines apply except in the following situations where the Forestry and FPM Requirements apply.

- >10% of catchment (Note 3)
- Afforestation >50ha (Note 4)
- Clear felling >25ha (Note 4)

The Cleanrath wind farm development is less than 6km upstream of the nearest mapped FPM site in the Toon River and therefore the Forestry Services Guidelines along with the FPM requirements were applied as outlined below.

Mitigation measures from best practice Forestry Service Guidelines along with the FPM requirements were applied during the construction phase to reduce the risk of entrainment of suspended solids and nutrient release in surface watercourses.

In addition to the Forestry Service Guidelines and FPM requirements the protection of surface watercourses during the construction phase of the wind farm was achieved by a combination of mitigation by avoidance and mitigation by design as described in the above sections.

The avoidance of sensitive hydrological features within the site and the drainage system ensured that the existing quality of surface waters was maintained and protected. The high level of protection provided to surface water bodies within the catchments of the development ensured that there was no potential to impact on freshwater pearl mussel sites downstream of the Cleanrath wind farm development site.

Impact Assessment: As stated above impacts on surface water quality locally was assessed to be imperceptible by means of the visual inspections/audits and the surface water quality monitoring and therefore there was no potential to impact on freshwater pearl mussel sites further downstream of the development.

Residual Effects: Due to the imperceptible effects on surface water quality locally to the development, there are no residual effects on freshwater pearl mussel sites.

Significance of Effects: For the reasons outlined above, no significant effects on freshwater pearl mussel sites have occurred or are likely to occur as a result of the Development.

9.5.2.10 Surface Water Impacts due to the Grid Connection and Temporary Junction Works

There was a requirement for 126 no. watercourse crossings along the grid connection route and this included 13 no. main existing bridge/culvert crossings and 113 no. existing smaller culvert crossings. In-stream works were required at the 113 no. existing smaller crossings where some of the culverts were replaced/upgraded as well as any watercourse crossings which required upgrade where delivery accommodation works occurred.

No in-stream works were required at any of the 13 no. main existing crossings, these crossings and the existing bridge/culverts were left in-situ, however due to the proximity of the streams to the construction work at the crossing locations, there was a potential for surface water quality impacts during trench excavation work. .

Due to the shallow nature of the grid connection and temporary junction works impacts on groundwater flows and levels did not occur.

Pathway: Surface water and groundwater flow paths.

Receptor: Down-gradient surface water quality (Toon River, River Lee, Aghnakinneirth Stream, Bunsheelin River and Sullane Beg River) & designated sites.

Potential Impact: Indirect, negative, slight, temporary, high probability impact on surface water quality.

Indirect, negative, slight, temporary, medium probability impact on groundwater quality.

Mitigation Measure Implemented During the Construction Phase:

Mitigation by Avoidance:

A self-imposed constraint/buffer zone was maintained for all crossing locations where possible whereby all watercourses were fenced off. In addition, measures which are outlined below were implemented to ensure that silt laden or contaminated surface water runoff from the excavation work did not discharge directly to the watercourse.

The purpose of the constraint zone was to:

- Avoid physical damage to surface water channels;
- Provide a buffer against hydraulic loading by additional surface water run-off;
- Avoid the entry of suspended sediment and associated nutrients into surface waters from excavation and earthworks;
- Provide a buffer against direct pollution of surface waters by pollutants such as hydrocarbons; and,
- Provide a buffer against construction plant and materials entering any watercourse.

General Pollution Prevention Measures also included:

- Protection of the riparian zone watercourses by implementing a constraints zone around stream crossing crossings, in which construction activity was limited to the minimum, i.e. works solely in connection with duct laying at the stream crossing;
- No stock-piling of construction materials took place within the constraints zone. No refuelling of machinery or overnight parking of machinery was permitted in this area;
- No concrete truck chute cleaning was permitted within constraint zones
- Works did not take place at periods of high rainfall, and were scaled back or suspended if heavy rain was forecasted;
- Plant travelled slowly across bare ground at a maximum of 5km/hr. Wide pad machines were employed to protect tracked areas as necessary;
- Any excess construction material was immediately removed from the area and taken to a licensed waste facility;
- No stockpiling of materials was permitted in the constraint zones;
- Spill kits were made available in all plant machines; and,
- Silt fencing was erected on ground sloping towards watercourses at the stream crossings as required.

Impact Assessment: As stated above impacts on surface water quality locally was assessed to be imperceptible by means of the visual inspections/audits and the surface water quality monitoring. Surface water monitoring locations SW7 to SW13 are located downstream of the grid connection route and there were no reported exceedances with respect suspended solids which would have been the primary potential contaminant during the works. Turbidity sondes DSE 3 & DSE 4 are also located down-gradient of the route and the data suggests no impact from the grid connection works which is consistent with the visual inspections and surface water quality monitoring data.

Residual Effects: Proven and effective measures to mitigate the risk of releases cement-based products, oils/fuels and suspended solids were undertaken to break the pathway between the potential source and each receptor. The residual effect is assessed to be - Negative, imperceptible, indirect, short term, low probability impact.

Significance of Effects: For the reasons outlined above, no significant effects on surface water quality have occurred or are likely to occur as a result of the Development.

9.5.2.11 Potential Impacts on Flush Habitats

Access roads etc emplaced in peat substrates can act as drains or barriers to flow, depending on their permeability relative to peat permeability. These potential effects of road construction could potentially impact the hydrology of the peat bog and flushes at the site. Access roads which cross flush areas have the potential to impact on groundwater and surface water flows that create and maintain the flush.

Turbine T9, and the associated access roads in a radius of around 200-300 m around the turbine, are in an extensive area of acid (surface water) flush habitat. The flush extends down slope below the footprint of these works. Flushes also occur along the access road to turbine location T4.

Pathway: Surface water flowpaths.

Receptor: Flush hydrology

Pre-Mitigation Impact

Direct, negative, moderate, permanent, high probability.

Impact Assessment/Mitigation Measure Implemented During the Construction Phase:

An ecological assessment of the flush areas was carried out by an ecologist from MKO post construction and there was no evidence of flush drainage being impeded or altered by the wind farm infrastructure. Windfarm drainage was installed as necessary to maintain flush hydrology along access road and at the turbine base locations.

There was no evidence of ponding of flush water upstream of the access tracks or any excessive/new drainage of existing wet areas of peatland/flush type vegetation as a result of the construction.

Impact Assessment: An inspection of the flush areas at T9 and T4 were undertaken post construction and the natural drainage of the flush areas has been maintained. There is no evidence of drying out along the main surface water flowpaths through the flush. Standing water levels within the body of the flush also appear to have been maintained.

Residual Effects: Due to the design measures implemented during the wind farm construction within the flush areas there has been no significant alteration of the hydrology of the flush. Therefore, the residual effect is assessed to be - Negative, imperceptible, direct, long term, low probability impact

Significance of Effects: For the reasons outlined above, no significant effects on surface water quality have occurred or are likely to occur as a result of the Development.

9.5.3 Operational Phase

9.5.3.1 Progressive Replacement of Natural Surface with Lower Permeability Surfaces

Progressive replacement of the vegetated surface with impermeable surfaces could potentially result in an increase in the proportion of surface water runoff reaching the surface water drainage network. The footprint comprises turbine hardstandings, upgraded access roads and compound (~10ha footprint in total). During storm rainfall events, additional runoff coupled with increased velocity of flow could increase hydraulic loading, resulting in erosion of watercourses and impact on aquatic ecosystems.

Pathway: Site drainage network.

Receptor: Surface waters and dependent ecosystems.

Pre-Mitigation Impact
Direct, negative, moderate, permanent, moderate probability impact.

Mitigation Measures Implemented During the Operational Phase

Mitigation by Design:

Various combinations/adaptations of the runoff control and drainage management measures during the operational phase are employed at the site depending on the local conditions and topography:

- Natural vegetation filters are used regularly across the site where the local drainage and topography allowed attenuation of surface water runoff.
- Where possible, interceptor drains are installed up-gradient of infrastructure to collect clean surface runoff, in order to minimise the amount of runoff reaching areas where suspended sediment could become entrained. It is now directed to areas where it can be re-distributed onto natural vegetation.
- Swales/roadside drains are used to collect runoff from access roads and turbine hardstanding areas of the site, likely to have entrained suspended sediment, and channeled it onto natural vegetation.

Impact Assessment:

<u>Runoff Calculations</u>

This section assesses the effect of the development site footprint on site runoff volumes compared to pre-development site runoff volumes. The water balance calculations were carried out for the month with the highest average recorded rainfall minus evapotranspiration, for the current baseline site conditions (refer to Table 9-5).

The emplacement of the permanent development footprint (9.5ha), as described in Chapter 4 of the rEIAR, (assuming emplacement of impermeable materials as a worst case scenario) is estimated to result in an average total site increase in surface water runoff of 7,378 m^3/month and 238 m^3/day for the site (Table 9-16).

This represents a potential increase of 0.76% in the average daily/monthly volume of runoff from the study area in comparison to the pre-development site runoff conditions. This is a very small increase in average runoff and results from a relatively small area of the study area being developed, the total permanent development footprint being approximately 9.5ha, representing 1.8% of the total study area of 525ha.

The additional volume in all sub-catchments is low due to the fact that the runoff potential from the site is naturally high (95%). Also, the calculation assumes that all hardstanding areas are impermeable which will not be the case as access tracks and hardstanding areas are constructed of permeable stone aggregate). The increase in runoff from the site is therefore be negligible.

Table 9-16: Water Balance and Estimated Post Development Runoff Volumes

Study Area (ha)	Site Baseline Runoff/month (m^3)	Baseline Runoff/day (m^3)	Permanent Hardstanding Area (m^2)	Hardstanding Area 100% Runoff (m^3)	Hardstanding Area 95% Runoff (m^3)	Net Increase/month (m^3)	Net Increase/day (m3)	% Increase from Baseline Conditions (m^3)
525	968,100	31,229	95,000	18,444	11,067	7,378	238	0.76

Toon River and River Lee Surface Water Level/Flow Monitoring

As described in Section 9.3.8, analysis of the hydrographs for the Toon River and River Lee shown that the development has no traceable/measurable impact on flows or levels in either of the rivers. This is because the development runoff volumes are less than negligible compared to the flows in the Toon River and River Lee. Runoff from the development site is having no measurable impact on flows/levels in either watercourse.

Residual Effects: Due to the sites natural hydrology, with its high surface water runoff rates, the overall small footprint of the development compared to the overall landholding (1.8%) and the introduced wind farm drainage measures, the increase in runoff from the site is negligible. Therefore, the residual effect is assessed to be - Negative, imperceptible, indirect, long term, low probability impact.

Significance of Effects: For the reasons outlined above, no significant effects on downstream surface water flows/levels have occurred or are likely to occur as a result of the Development.

9.5.3.2 Operational Phase Works

In conjunction with the above operational phase activities, and subject to substitute consent being granted, a peatland habitat restoration will be undertaken within a 4.3Ha area of the wind farm site during the operational phase of the Cleanrath wind farm development. The works will involve felling, chipping and removal of brash and restoring the peatland habitat to its original condition prior to planting which will include the blocking of drains with no further drainage to be installed around the area. During the initial restoration process, erosion of peat and subsoil and potential surface water quality effects is considered to be a potential negative, short term effect, however, over the long term the restored peatland will provide a positive impact on the wind farm site in terms of the water quality.

Ongoing maintenance with regard the turbines and the wind farm drainage will also form part of the operational phase works, but these activities will have no effect on the local hydrological or hydrogeological regime.

Pathway: Vehicle movement, surface water and wind action.

Receptor: Down-gradient surface water quality (Toon River, River Lee, Aghnakinneirth Stream, Bunsheelin River and Sullane Beg River)

Pre-Mitigation Potential Impact: Negative, slight, direct, short-term, medium probability effect on surface water quality.

Positive, significant, direct, long-term, likely effect on surface water quality (following stabilisation and growth of acrotelm).

Proposed Mitigation Measures for Habitat Restoration:

- Brash removed during the restoration process will be stored up slope of the cleared area, to provide a buffer to surface water flows which may have the potential to erode;
- During tree felling brash mats will be used to support vehicles on soft ground, reducing peat and mineral soils erosion and avoiding the formation of rutted areas; and,
- Drain blocking and use of silt fencing and check dams until stabilisation has taken place.

Residual Effect Assessment: The potential for the release of suspended solids to watercourse receptors is a risk to water quality and the aquatic quality of the receptor. Proven and effective measures to mitigate the risk of releases of sediment were undertaken to break the pathway between the potential sources and the receptor. The residual effect is assessed to be - Positive, indirect, long term, high probability effect on downstream water quality and aquatic habitats.

Significance of Effects: Overall Significant positive effect.

9.5.4 Decommissioning Phase

The potential impacts associated with decommissioning of the Development will be similar to those during the construction phase, but of reduced magnitude.

Turbine foundations would remain in place underground. Leaving the turbine foundations in-situ is considered a more environmentally prudent option, as to remove that volume of reinforced concrete from the ground could result in environment emissions such as dust and sediment.

The electrical cabling connecting the Cleanrath wind farm development to the substation in the townland of Rathgaskig will be removed from the underground cable ducting at the end of the useful life of the Cleanrath wind farm development or should early decommissioning be required. The cable ducting will be left in-situ as it is considered the most environmentally prudent option, avoiding unnecessary excavation, soil disturbance and potential surface water quality effects.

During decommissioning, it may be possible to reverse or at least reduce some of the impacts observed during construction phase by rehabilitating construction areas such as turbine bases after the dismantling of turbines. This will be completed using material imported to site as the required quantity of material does not currently exist at the site. This will require 1,547m^3 of inert soil to be imported to the site which will be sourced locally. Temporary drainage measures such as silt fencing, check dams and settlement ponds may be installed if required until the imported material has being stabilised by natural vegetation growth. However it is anticipated that the revegetation of the site during operation will have resulted in a return to the natural drainage management that will have existed prior to any construction. It is not anticipated that the restoration of turbine bases will impact this natural drainage system during decommissioning and turbine foundation reinstatement.

The decommissioning phase will also include the removal of underground cabling from the ducting on the grid connection route as described in Section 4.10 of this rEIAR. Other works during decommissioning will include the removal of soil berm at the temporary junction accommodation works and the turbine delivery accommodation roadway will also need to be removed during decommissioning to provide access to and from the site with abnormal loads. These works will be short-term, temporaray with no potential for impact on the local hydrology.

Other impacts such as possible soil compaction and contamination by fuel leaks will remain but will be of reduced magnitude.

A Decommissioning Plan has been prepared (Appendix 4-9) for an early decommission of the Cleanrath wind farm development the detail of which will be agreed with the local authority prior to any decommissioning. Should the Cleanrath wind farm development continue operation for the intended lifespan of approximately 25 years, the Decommissioning Plan will be updated prior to the end of the operational period in line with decommissioning methodologies that may exist at the time and will agreed with the competent authority at that time.

Mitigation measures applied during decommissioning phase activities will be similar to those applied successfully during construction phase where relevant. Some of the impacts will be avoided by leaving elements of the Development in place where appropriate (i.e. turbine bases). The turbine bases will be rehabilitated by covering with local soil in order to regenerate vegetation which will reduce runoff and sedimentation effects. Mitigation measures to avoid contamination by accidental fuel leakage and compaction of soil by on-site plant will be implemented as per the construction phase mitigation measures.

No significant impacts on the water environment are expected during the decommissioning phase of the Development.

9.5.5 Cumulative Effects

In terms of hydrological cumulative impacts arising from the wind farm infrastructure, grid connection route and junction accommodation works, no significant impacts have occurred, and this has been demonstrated by the surface water quality monitoring data and flow/level monitoring data as described above.

A hydrological cumulative impact assessment with regard to other wind farm developments within a 20km radius of the development site within the River Lee catchment was also undertaken. The wind farm developments assessed are listed in Table 9-17 below.

Table 9-17: Other Wind Farm Developments in the River Lee catchment within a 20km radius of the site

Catchment Area	Wind Farm Name	Status	Potential No. of Turbines in Catchment
River Lee	Knocknamork WF	7no. permitted	7
	Bawnmore 2 WF	6 no. existing	6
	Bawnmore 1 WF	5 no. existing	5
	Garranereagh WF	4 no. existing	4
	Shehy More WF	11 no. under construction	8
	Derragh WF	6 no. existing	6
Potential Total			36

The total number of turbines that will be operating inside a 20km radius within the River Lee catchment, including the existing Cleanrath 9 no. turbines is 45.

The catchment area of the River Lee within a 20km radius of the site is ~662km^2 and therefore this equates to one turbine for approximately every ~15km^2 which is considered imperceptible in terms of potential operational cumulative hydrological impacts.

As demonstrated by the surface water monitoring data, the drainage mitigation as implemented will ensure there will be no cumulative significant adverse impacts on the water environment from the

Cleanrath wind farm development, and other wind farm developments and non-wind farm developments within the River Lee catchment.

In terms of the overall Cleanrath wind farm development, approximately 2.4km of the total 15km grid route extends into the Roughty River catchment. Derragh wind Farm and Grousemount wind Farm, which are both located in the Roughty River catchment, were constructed over the same period as Cleanrath Wind Farm. Due to the fact that works within the Roughty River catchment relating to the Cleanrath wind farm development were limited to only 2.4km of grid connection, no hydrological cumulative impacts on watercourses within the Roughty River catchment occurred.

9.5.6 Assessment of Health Effects

Potential health effects arise mainly through the potential for groundwater and surface water contamination.

A wind farm is not a recognized source of pollution and so the potential for effects during the operational phase are negligible. Hydrocarbons were used onsite during the construction phase, however the volumes used were small in the context of the scale of the Development. In addition, they were handled and stored in accordance with best practice mitigation measures. There were no records/reports of groundwater or surface water contamination incidences during the construction phase or operational phase of the development.

Private wells are present along the grid connection route but due to the shallow nature of the works within the corridor of the public roads, there was no effect on these wells with respect water quality or quantity.

There were no soil contamination issues observed during any of the site inspections/audits completed by HES. As such, there are no impacts associated with water contamination and subsequent/associated health effects.

9.5.7 Conclusion

Extensive hydrological monitoring carried out during the construction and operational phase show that there were no observed significant effects on the downstream receiving waters. This is backed up by numerous site inspections/visual checks which showed that 99% of the time the waters inspected on-site were visually clean with no trace of contaminants. The 1% were all minor, localised, temporary turbidity effects which were resolved by undertaking minor drainage adjustments. There is no requirement to carry out any remedial mitigation measures as a result of the Cleanrath wind farm development.

During the decommissioning phase of the Cleanrath wind farm development, the majority of the site infrastructure will be removed from the wind farm site. The decommissioning phase will essentially involve the reverse procedures implemented during construction. No significant effects on the water environment will occur.

In summary, no significant effects on the water environmental occurred during the construction or operational phase of the wind farm.

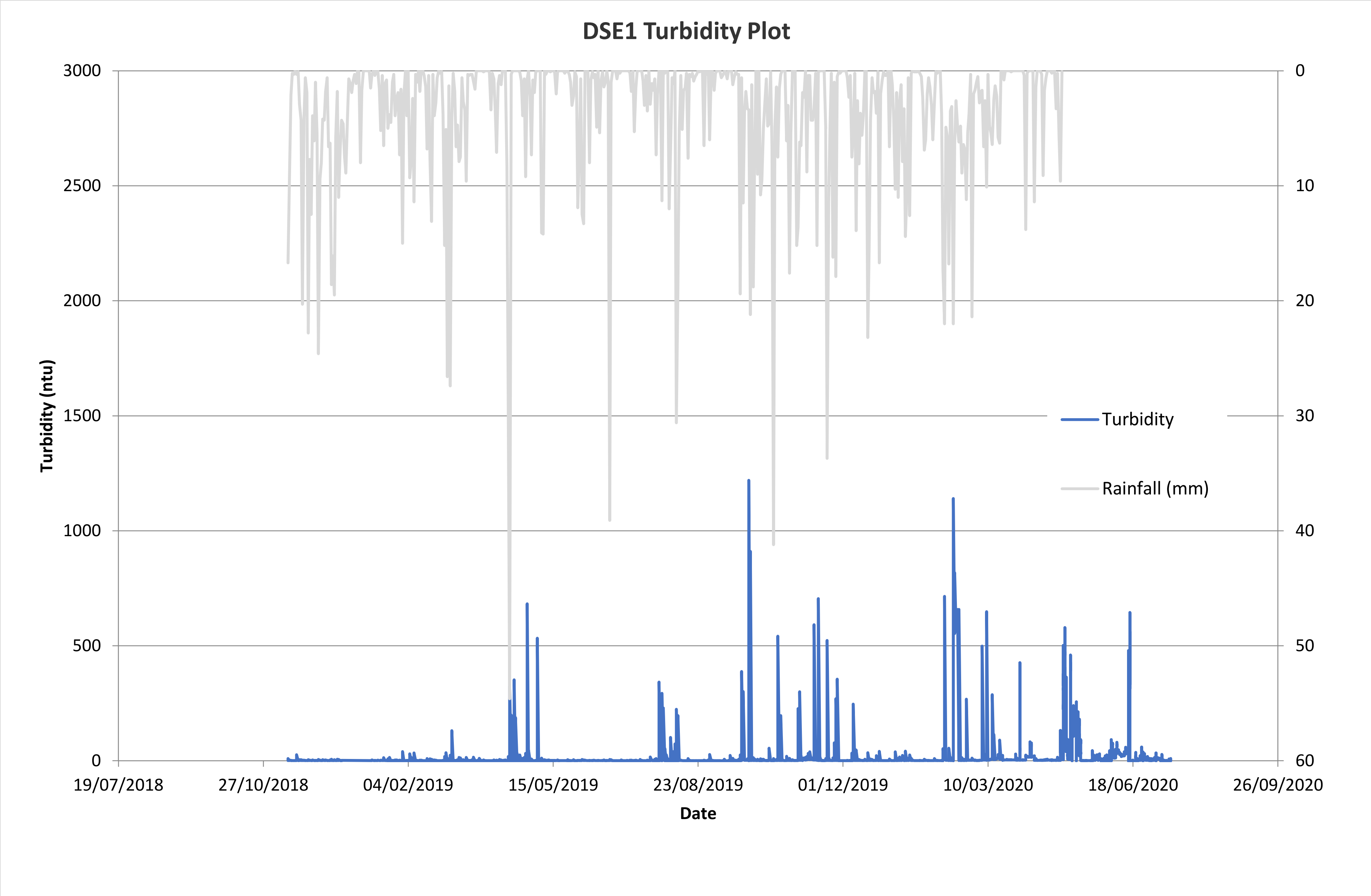
Effects during the decommissioning would be similar to the construction phase but of much less magnitude. No cumulative impacts on the water environmental occurred nor were there are health effects reported.

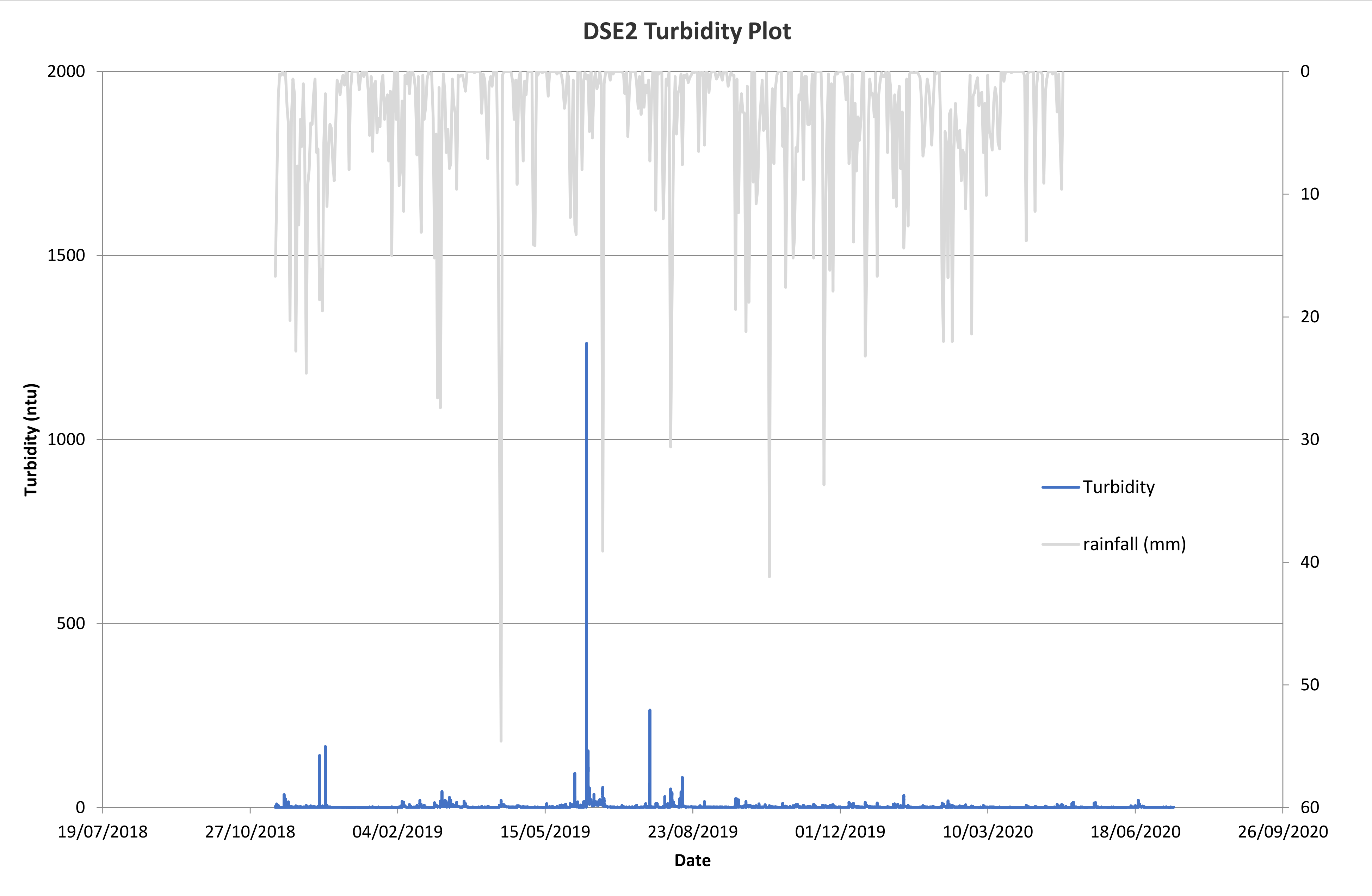
APPENDIX 6

PRE-CONSTRUCTION OTTER SURVEY

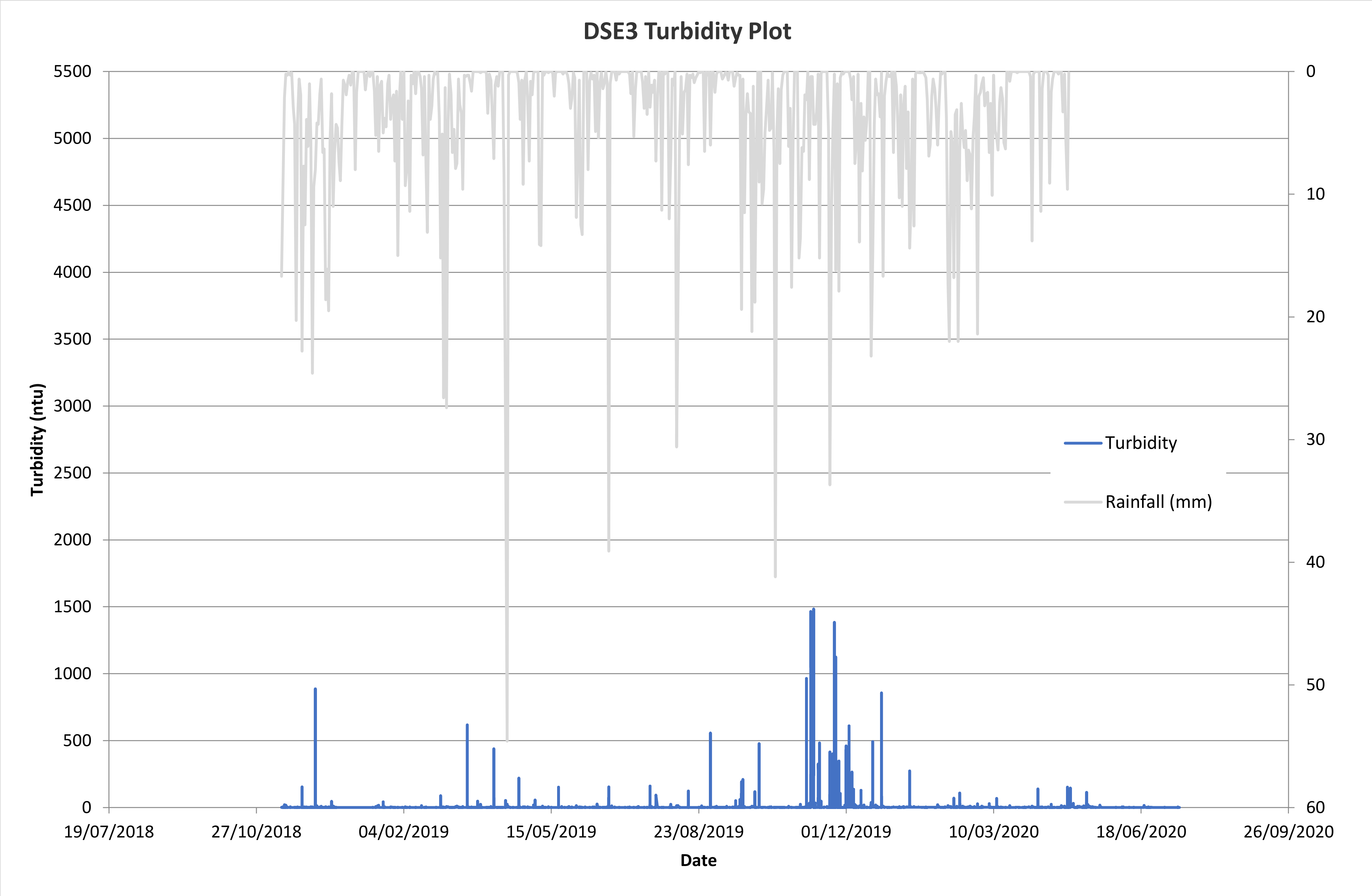
APPENDIX 9-1

WATER MONITORING DATA

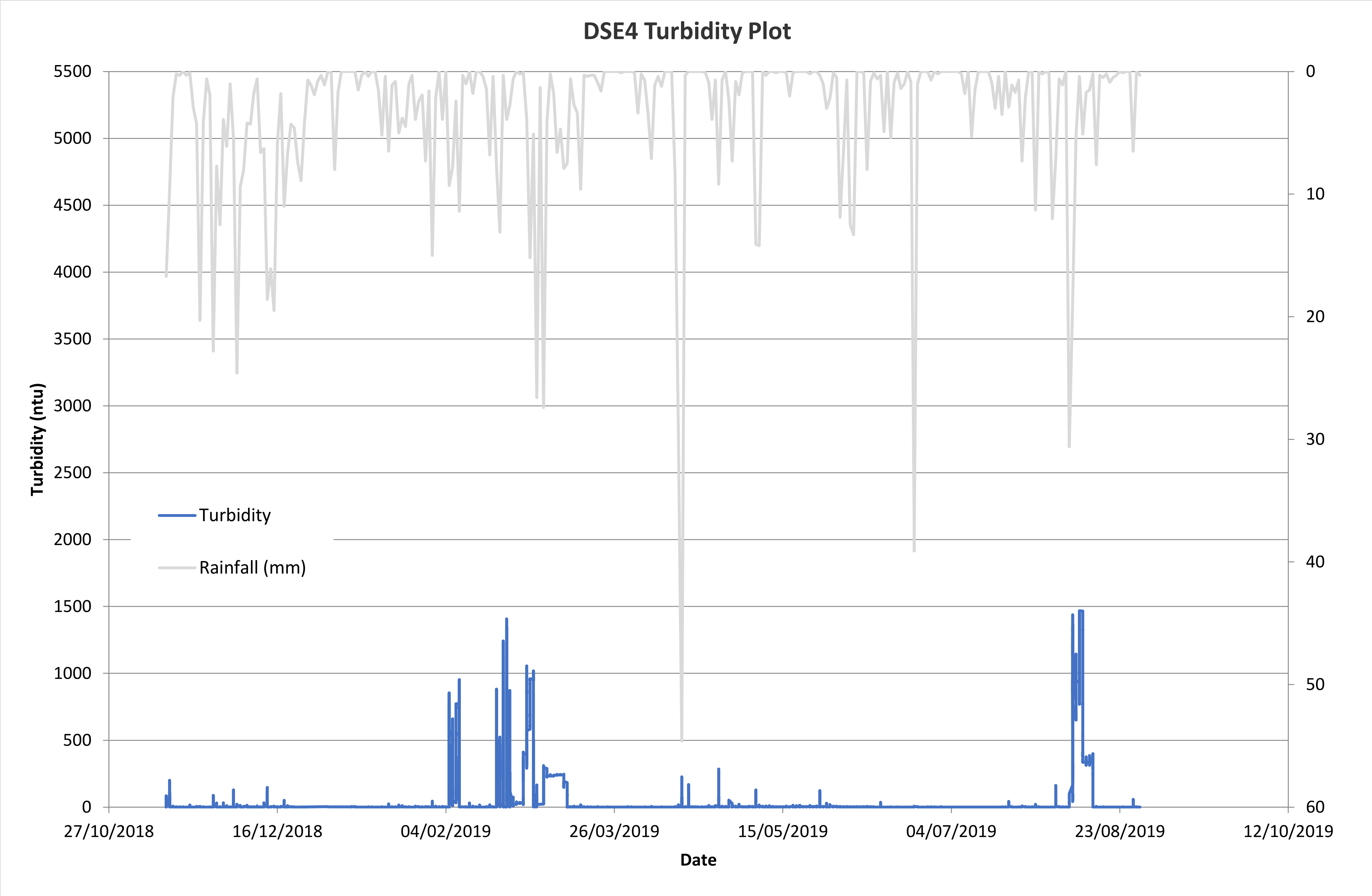

DSE1 Turbidity Plot
Turbidity (ntu)
3000
2500
2000
1500
1000
500
0
0
10
20
30
40
50
60
19/07/2018
27/10/2018
04/02/2019
15/05/2019
23/08/2019
01/12/2019
10/03/2020
18/06/2020
26/09/2020
Date
Turbidity
Rainfall (mm)



DSE2 Turbidity Plot
Turbidity (ntu)
2000
1500
1000
500
0
0
10
20
30
40
50
60
19/07/2018
27/10/2018
04/02/2019
15/05/2019
23/08/2019
01/12/2019
10/03/2020
18/06/2020
26/09/2020
Date
Turbidity
rainfall (mm)



DSE3 Turbidity Plot
Turbidity (ntu)
5500
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
0
0
10
20
30
40
50
60
Turbidity
Rainfall (mm)
19/07/2018
27/10/2018
04/02/2019
15/05/2019
23/08/2019
01/12/2019
10/03/2020
18/06/2020
26/09/2020
Date



DSE4 Turbidity Plot
Turbidity (ntu)
5500
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
0
0
10
20
30
40
50
60
Turbidity
Rainfall (mm)
27/10/2018
16/12/2018
04/02/2019
26/03/2019
15/05/2019
04/07/2019
23/08/2019
12/10/2019
Date

APPENDIX 7

CONSTRUCTION AND ENVIRONMENTAL MANAGEMENT PLAN

Construction and Environmental Management Plan

Cleanrath Wind Farm Development at Cloontycarthy, Cleanrath North, Cleanrath South, Derrineanig, Derreennacarton & adjacent townlands, Co. Cork

McCarthy Keville O'Sullivan

Planning & Environmental Consultants

DOCUMENT DETAILS

Client: Cleanrath Windfarm Ltd.

Project title: Cleanrath Wind Farm

Project Number: 110721e

Document Title: Construction and Environmental Management Plan

Doc. File Name: CEMP F– 2018.06.14– 110721e

Prepared By: McCarthy Keville O'Sullivan Ltd.
Planning & Environmental Consultants
Block 1, G.F.S.C.
Moneenageisha Road, Galway

Document Issue:

Rev	Status	Issue Date	Document File Name	Author(s)	Approved By:
01	Draft	17/12/2015	110721c–CEMP–2015.12.17–D1	OC	MW
02	Final	21/12/2015	110721c–CEMP–2015.12.18–F	OC	MW
03	Draft	18/12/2015	CEMP–2017.12.18–D1-171232	OC	MW
04	Draft	20/12/2015	CEMP–2017.12.20–D2-171232	OC	MW
05	Final	22/12/2015	CEMP–2017.12.22–F-171232	OC	MW
06	Draft	28/02/2018	CEMP–2018.02.28–D1-110721e	OC	MW
07	Final	14/06/2018	CEMP–2018.06.14–F-110721e	OC	MW

Table of Contents

1 INTRODUCTION

This Construction and Environmental Management Plan (CEMP) has been developed by McCarthy Keville O' Sullivan Ltd (MKO) on behalf of Cleanrath Windfarm Ltd. The CEMP provides the environmental management framework to be adhered to during the pre-commencement, construction and operational phases of the development and it incorporates the mitigating principles to ensure that the work is carried out in a way that minimises the potential for any environmental impacts to occur. This CEMP has been prepared in accordance with the mitigation measures and commitments made in the Environmental Impact Statement (EIS), Natura Impact Statement (NIS), Further Information Response (FIR), Grounds of Appeal (GOA) and the Condition Compliance Statement (CCS) of the permitted Cleanrath Wind Farm.

This CEMP identifies the key planning and environmental considerations that must be adhered to and delivered during site construction and operation. This report is intended as a single, amalgamated document that can be used during the future phases of the project, as a single consolidated point of reference relating to all construction, environmental and drainage requirements for the planning authority, developer and contractors alike.

The CEMP has been prepared in accordance with the planning permission conditions set by An Bord Pleanála under PL. 04/246742 which relates to the development of Cleanrath Wind Farm including junction accommodation works along the turbine delivery route and connection to the national grid including the revised grid connection route in the townland of Derrineanig permitted by Cork County Council under Pl Ref. 18/04458.

1.1 Scope of the Construction and Environmental Management Plan

This report is presented as a guidance document for the construction phase of the Cleanrath Wind Farm. It outlines clearly the mitigation measures and monitoring proposals that are required to be adhered to in order to construct the wind farm in an appropriate manner. The report is divided into ten sections, as outlined below.

Section 1 provides a brief introduction as to the scope of the report

Section 2 outlines the site and project details, detailing the targets and objectives of this plan along with providing an overview of anticipated construction methodologies that will be adopted throughout the project.

Section 3 sets out details of the environmental controls on site which looks at noise and dust controls. Site drainage measures, peat management and a waste management plan are also included in this section.

Section 4 sets out the development drainage management plan which provides details of the various drainage infrastructure that will be installed to manage and control the quality of surface water runoff from the site.

Section 5 sets out a fully detailed implementation plan for the environmental management of the project outlining the roles and responsibilities of the project team

Section 6 outlines the Emergency Response Procedure to be adopted in the event of an emergency in terms of site health and safety and environmental protection

Section 7 consists of a summary table of all mitigation proposals to be adhered to during the implementation of the project, categorised into three separate headings, 1) pre-commencement measures; 2) construction-phase measures and 3) operational-phase measures.

Section 8 consists of a summary table of all monitoring requirements and proposals to be adhered to during the implementation of the project, categorised into three separate headings, 1) pre-commencement measures; 2) construction-phase measures and 3) operational-phase measures.

Section 9 sets out an anticipated programme for the timing of the works.

Section 10 outlines the proposals for reviewing compliance with the provisions of this report.

2 SITE AND PROJECT DETAILS

2.1 Site Location and Description

The site of the wind farm development is located in the townlands of Cloontycarthy, Cleanrath North, Cleanrath South Derrineanig Derreennacarton and adjacent townlands in Co. Cork. The wind farm will comprise of the provision of a total of 11 No. wind turbines, with a maximum ground to top blade tip height of up to 150 metres and all associated infrastructure.

The wind farm study area measures approximately 524 hectares or 1,295 acres. The Grid Reference co-ordinates for the approximate centre of the site are E120,520 N69,583.

The electrical connection from the main wind farm site to the national grid will be via an underground cable which will run within the public road corridor through the townlands of Cleanrath South, Turnaspidogy, Derrineanig, Milmorane, Coomlibane, Rathgaskig, Derragh, Augeris, Gorteenakilla, Carrignadoura, Gurteenowen, Gurteenflugh, Lyrenageeha, Lackabaun, Co. Cork and Grousemount, Co. Kerry for c16.58km.

The town of Macroom is located approximately 12 kilometres south west of the permitted study area and Inchigeelagh is located approximately 2.5 kilometres to the south.

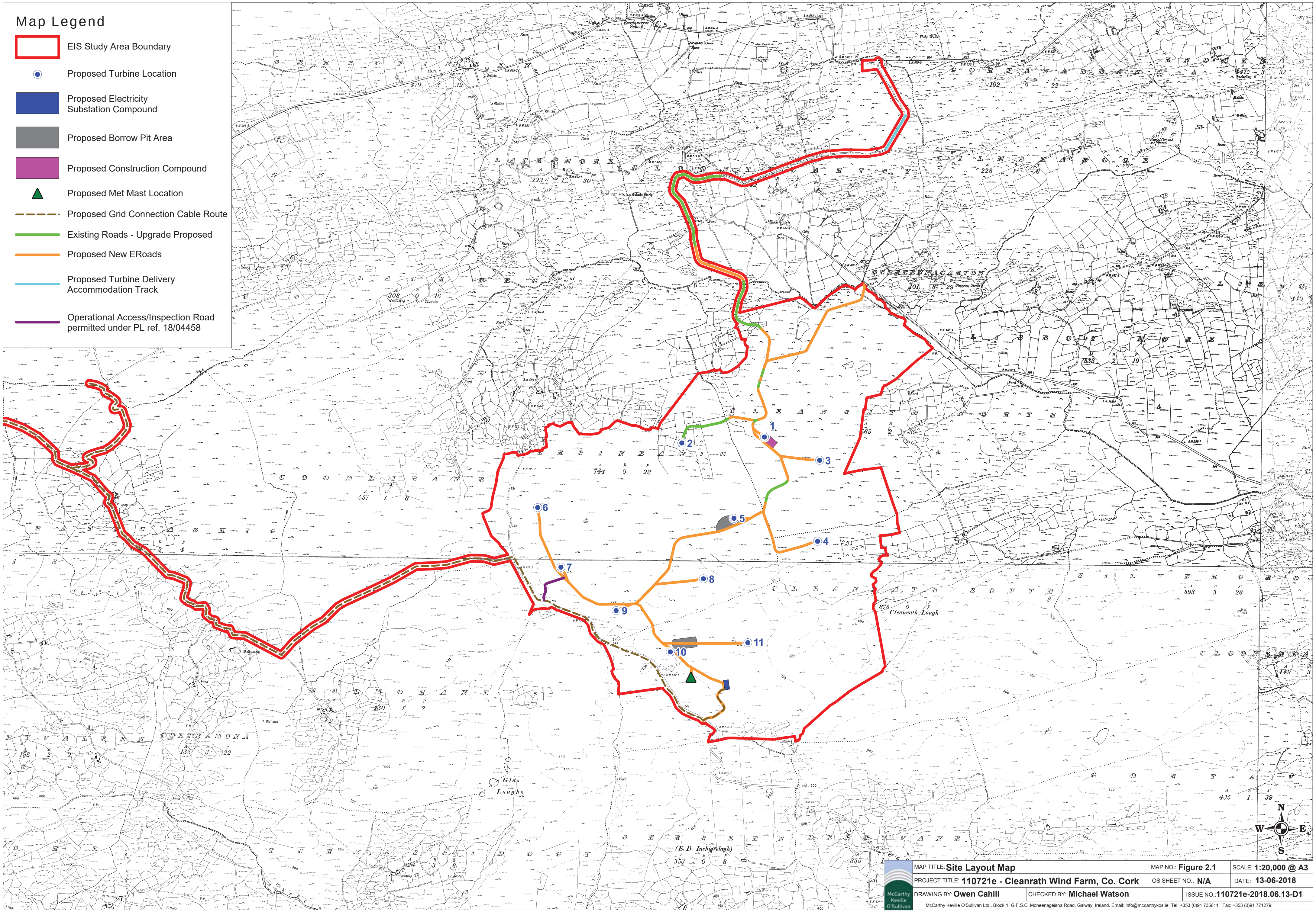
2.2 Description of the Development

During the construction phase of the project, civil works will include: constructing the reinforced concrete foundations; access road construction and widening of existing access roads; construction of a temporary compound; upgrading existing an installation of new watercourse crossings, construction of underground cabling; and a permanent meteorological mast.

The design life of the project is expected to be 25 years.

The key components of the wind farm include the following:

- 11 no. Wind Turbines with a maximum blade tip height of 150 metres;
- 11 no. Hardstand Areas to facilitate cranes for turbine erection and to act as construction material storage compounds;
- 1 no. Permanent Meteorological Mast;
- 1 no. temporary construction compounds for the location of the site office and staging facilities, on-site car-parking for site workers during the construction phase, material storage and construction refuse storage prior to its removal from the site;
- New and upgraded access tracks, including drainage;
- 2 no. borrow pits;
- Underground cabling to the national grid
- Junction accommodation and temporary works along the proposed turbine delivery route


Map Legend
EIS Study Area Boundary
Proposed Turbine Location
Proposed Electricity Substation Compound
Proposed Borrow Pit Area
Proposed Construction Compound
Proposed Met Mast Location
Proposed Grid Connection Cable Route
Existing Roads - Upgrade Proposed
Proposed New ERoads
Proposed Turbine Delivery Accommodation Track
Operational Access/Inspection Road permitted under PL ref. 18/04458
1
2
3
4
5
6
7
8
9
10
11
Cleanrath Lough
Glas Loughs
N
W
E
S
MAP TITLE: Site Layout Map
MAP NO.: Figure 2.1
SCALE: 1:20,000 @ A3
PROJECT TITLE: 110721e - Cleanrath Wind Farm, Co. Cork
OS SHEET NO.: N/A
DATE: 13-06-2018
DRAWING BY: Owen Cahill
CHECKED BY: Michael Watson
ISSUE NO.:110721e-2018.06.13-D1
McCarthy Keville O'Sullivan
McCarthy Keville O'Sullivan Ltd., Block 1, G.F.S.C, Moneenageisha Road, Galway, Ireland. Email: info@mccarthykos.ie Tel: +353 (0)91 735611 Fax: +353 (0)91 771279

2.3 Targets and Objectives

In so far as they have been completed to date, or are to be further completed in future, the construction phase works are designed to approved standards, which include specified materials, standards, specifications and codes of practice. The design of the project has considered environmental issues and this is enhanced by the works proposals.

The key site targets are as follows;

- Ensure construction works and activities are completed in accordance with mitigation and best practice approach presented in the Environmental Impact Statement (EIS) and associated planning documentation;
- Ensure construction works and activities are completed in accordance with all planning conditions for the development;
- Ensure construction works and activities have minimal impact/disturbance to local landowners and the local community;
- Ensure construction works and activities have minimal impact on the natural environment;
- Adopt a sustainable approach to construction; and,
- Provide adequate environmental training and awareness for all project personnel.

The key site objectives are as follows;

- Using recycled materials if possible, *e.g.* excavated stone, clay and peat material;
- Ensure sustainable sources for materials supply where possible;
- Avoidance of any pollution incident or near miss as a result of working around or close to existing watercourses and having emergency measures in place;
- Avoidance of vandalism;
- Keeping all watercourses free from obstruction and debris;
- Correct implementation of the SuDS drainage design principles;
- Keep impact of construction to a minimum on the local environment, watercourses, and wildlife;
- Correct fuel storage and refuelling procedures to be followed;
- Good waste management and house-keeping to be implemented;
- Air and noise pollution prevention to be implemented; and,
- Monitoring of the works and any adverse effects that it may have on the environment. Construction Methods and designs will be altered where it is found there is an adverse effect on the environment;
- Comply with all relevant water quality legislation;
- Ensure a properly designed, constructed and maintained drainage system appropriate to the requirements of the site is kept in place at all times.

2.4 Construction Methodologies Overview

2.4.1 Introduction

Mid Cork Electrical Ltd. have been appointed as the main contractors for the civil works of the construction phase. The main contractors will comply with this CEMP and any revisions made to this document throughout the construction phase. An overview of the anticipated Construction Methodologies is provided below.

2.4.2 Overview of Proposed Construction Methodology

The proposed anticipated construction methodology is summarised under the following main headings:

- Temporary Construction Compounds;
- Borrow Pits;
- Drainage System;
- Upgrade of Existing Roads;
- New Site Access Roads;
- Watercourse Crossing
- Crane Hardstands;
- Turbine Foundations;
- Peat Reinstatement Areas;
- Cable Trenching;
- Grid Connection;
- Turbine Delivery Route Accommodation Works; and,
- Site Reinstatement

2.4.2.1 Temporary Construction Compound

The site will consist of a temporary construction compound which will be located in the north of the site adjacent to Turbine No. 1. The construction compound will consist of temporary site offices, staff facilities and car-parking areas for staff and visitors.

The compound will typically be constructed as follows:

- The area to be used as the compound will be marked out at the corners using ranging rods or timber posts. Drainage runs and associated settlement ponds will be installed around the perimeter;
- The compound will be established using a similar technique as the construction of the excavated site tracks as discussed below;
- Where required, a layer of geogrid will be installed and compacted layers of well graded granular material will be spread and lightly compacted to provide a hard area for site offices and storage containers;
- Areas within the compound will be constructed as site roads and used as vehicle hardstandings during deliveries and for parking;
- A bunded containment area will be provided within the compound for the storage of lubricants, oils and site generators etc.;
- If necessary the compound will be fenced and secured with locked gates, although fencing would only be utilised where significant risk of danger to third parties or vandalism is envisaged;
- Upon completion of the project the compound will be decommissioned by backfilling the area with the material arising during excavation, landscaping with topsoil as required;
- During the construction phase, a self-contained port-a-loo with an integrated waste holding tank will be used on site for toilet facilities. This will be maintained by the service contractor on a regular basis and will be removed from the site on completion of the construction phase;
- The water supply to the site will be from a temporary water storage tank which will be filled using a mobile water tank which will source water locally as required.

2.4.2.2 Borrow Pits

Two borrow pits are permitted within the development as outlined shown on Figure 2.1. Borrow Pit No. 1 located in the centre of the site adjacent to Turbine No. 5. Borrow Pit No. 2 is located in the south west of the site situated north of Turbine No. 10.

The borrow pits will typically be excavated and backfilled as follows:

- The areas to be used for both borrow pits will be marked out at the corners using ranging rods or timber posts. Drainage runs and associated settlement ponds will be installed around the perimeter;
- The initial borrow pit excavation will involve removal of peat (if present) and mineral soil to the top of bedrock. These materials will be stored temporarily or placed around the borrow pits to form berms to prevent surface water inflow to the borrow pit excavations;
- Interceptor drainage ditches will be excavated on all sides of the borrow pit to catch surface water runoff, and direct it to downstream re-distribution locations;
- The bedrock material will be extracted from the borrow pits and stockpiled or used as required;
- The use of material won from the borrow pits will be sequential with new road construction or turbine base formations;
- Temporary stockpiling of aggregates will be required to accommodate the cut and fill operations within the borrow pits, and the progression of access roads and turbine excavations;
- As the borrow pit excavations progress and become deeper (not > 5 metres), surface water and groundwater ingress will be removed via pumping to settlement ponds, and re-distribution locally across natural vegetated areas. Where required, additional specialist treatment will be employed to ensure no deterioration in downstream water quality occurs;
- When extraction ceases within the borrow pit, the uphill face of the rock will be stepped and deposits of soil will be placed which will assist in the re-vegetation of the rock face;
- The extraction area of the borrow pit will have to be permanently secured and a stock-proof fence will be erected around the borrow pit to prevent access to these areas as well as the installation of appropriate health and safety signage.

Once the required volume of rock has been extracted from the borrow pit areas, it is intended to reinstate these areas with peat and overburden excavated from the works areas of the development. The total estimated volume of peat and spoil to be excavated and managed during the construction phase of the development is 25,372m^3. The borrow pit areas, within the site of the proposed development will undergo restoration with this peat and spoil material after all rock has been excavated from the borrow pit. The volume of excavated peat and overburden will be managed as outlined below:

- Excavators will remove the peat from the permanent development footprint areas i.e. excavated roads, hardstanding areas and turbine foundation areas.
- Temporary, sealed stockpiling areas, located adjacent to the hardstanding areas and turbine foundation areas, will be chosen following onsite discussions between the construction site manager, an ecologist, a geotechnical engineer and hydrologist.
- The excavators will move the excavated peat to the designated temporary stockpiling areas within the construction and soft levelled areas.
- The temporary stockpiling areas will be surrounded by silt fences to ensure sediment-laden run-off does not occur.

- The excavated peat will remain in these areas over a period of time until the volume of the peat has reduced as the water drains out of the mounded peat.
- The excavators will then load the peat directly into dump trucks, to transport the peat to the nearest borrow pit area.
- The material will be backfilled into the borrow areas and will be spread evenly across the area.
- The peat and subsoil will also be used for landscaping and reinstatement along access roads and turbine excavations.

This method of managing the volume of surplus peat and other overburden material will ensure that no excavated material will be left on-site, or stockpiled adjacent to access roads and turbine locations, following the completion of the construction works.

2.4.2.3 Drainage System

The early establishment of temporary drainage facilities will reduce the risk of pollution problems during construction. In addition, construction operations will adopt best working practices. The development of the site will need to be phased accordingly. The construction of the drainage will start from the downstream sections and progress upstream, connecting conveyance systems with other drainage features as each development phase progresses. They will therefore need to be designed with sufficient flexibility to respond to an early phase of limited incoming flow during the construction phase when sediment or other pollution may be a problem if upstream controls fail, and the final phase of maximum incoming flow.

The implementation of a Scheduling of Works Operating Record (SOWOR) prior to commencement will provide a series of pre-commencement triggers which set out specific conditions which will be met before the commencement of works particularly sensitive areas. These pre-commencement triggers will apply to the installation of any drainage infrastructure. An example of an SOWOR is included in Appendix 1.

Detailed measures to address surface water management based upon the design criteria and philosophy will be implemented. The drainage system will be excavated and constructed in conjunction with the road and hard standing construction. Drains will be excavated and settlement ponds constructed to eliminate any suspended solids within surface water running off the site. Surface water management and drainage design is dealt with in Section 3.2 and 4 below.

2.4.2.4 Upgrade of Existing Roads

It is proposed to utilise the existing road network as much as possible with approximately 1.89 kilometres of existing roadway requiring upgrade. These roads will require upgrading which will entail widening of the roadway to a total running width of approximately six metres, with wider sections at corners and on the approaches to turbine locations, and the laying of a new surface dressing on the existing section of roadway where necessary. The road widening will be undertaken as follows:

- If it is considered that the current road formation level is adequate to support required bearing, then no upgrade or widening works will be completed;
- Otherwise, where required, the subsoil in the existing road verge will be excavated down to a suitable formation layer of rock and the spoil deposited in the peat reinstatement areas;
- Well-graded imported granular fill or material won from the borrow pits will be spread and compacted to provide a homogeneous running surface. The thickness of layers and amount of compaction required will be decided by the Construction Manager based on the characteristics of the material and the

compaction plant to be used. These layers of granular fill will be brought to the same level as the top of the existing paved surface;

- A layer of geo-grid will be installed directly onto the top of the granular fill layer and the existing road surface where required and a layer of finer well graded stone for the running surface will be laid on the geo-grid and compacted.
- Prior to any works commencing on the upgrade of existing roads, the requirement for additional roadside drainage will be considered by the Project Hydrologist in line with the proposals outlined in Section 4 below.
- Where road widening is required in an area where the peat depth is greater than c2.0m, it will be necessary to complete the road upgrade using a floating road methodology as summarised in the Section 2.4.2.5 that follows.

2.4.2.5 New Site Access Roads

New roadway will be required in areas where existing roads are not already present, or where existing sections are too steep or otherwise unsuitable for the required purpose in the case of the development. There is 7.77 kilometres of new access roads to be installed at the site. In addition, the revised route for the grid connection cabling, will include a 220m operational access/inspection road which will be constructed west of Turbine no. 7

The new access roads will be constructed as follows:

- Establish alignment of the new site roads from the construction drawings and mark out the centre lines with ranging rods or timber posts;
- The road layout has been designed to avoid crossings of natural watercourses;
- Where existing culverts are to be upgraded or extended, the works will be carried out to follow a method statement to be agreed with Inland Fisheries Ireland.
- The access tracks will be of single-track design with an overall width of 6m. There will be some local widening on the bends, junctions and around turbine bases for the safe passage of large vehicles;
- All peat and overburden excavated will be used as part of the borrow pit restoration or in reinstatement areas. Topsoil will be temporarily stockpiled locally for reuse for landscaping the backfill placed above the foundations.
- The subsoil will be excavated down to a suitable formation layer of either firm clay or bedrock;
- Where floating roads are to be constructed, the subsoil will not be excavated but a layer of geo-grid or layers of brash and lumber will be laid directly on to the peat surface.
- Well-graded granular fill will be spread and compacted in layers to provide a homogeneous running surface. The thickness of layers and amount of compaction required will be decided by the Construction Manager based on the characteristics of the material and the compaction plant to be used;
- All new roadways will be constructed with a camber to aid drainage of surface water;
- Batters will generally be sloped to between 1:1 and 1:2 (depending on depth and type of material) and will be left as cut to re-vegetate naturally with local species. Design slopes will be informed by the Geotechnical Engineer;
- At bends or steep inclines from the roads, reflective snow poles will be erected to warn traffic on dark mornings and evenings that there is a turn in the road or a sharp incline beyond the site road.
- All rock won from the borrow pit areas that are to be used in road construction on site will be tested to BS812-111:1990 "Ten percent fines value".

2.4.2.6 Watercourse Crossing

A new watercourse crossing is required where the new access road traverses the Toon river in the North-eastern section of the site. The crossing will be completed using a clear span pre-cast concrete bridge structure and so avoid the requirement for an instream works during the installation. The culvert will be installed using the guidelines set out in the IFI's Guidelines on Protection of Fisheries during Construction Works in and Adjacent to Waters so as to minimise impacts on the watercourse channel. The crossing will be the subject of a consent application to the Office of Public Works under Section 50 of the Arterial Drainage Act, 1945. The installation methodology is summarised as follows:

- The access road on the approach to the watercourse will be completed to a formation level which is suitable for the passing of plant and equipment required for the installation of the watercourse crossing.
- All drainage measures along the proposed road will be installed in advance of the works.
- The abutment will consist of concrete panels which will be installed on a concrete lean mix foundation to provide a suitable base. The base will be excavated to rock or competent ground with a mechanical excavator with the foundation formed in-situ using a semi-dry concrete lean mix. The base will be excavated along the stream bank with no instream works required.
- Access to the opposite side of the river for excavation and foundation installation will be via existing public roads or via temporary precast concrete crossing.
- All pre-cast concrete panels and slabs/beams will be installed using a crane which will be set up on the southern side of the stream and will be lifted into place from the stream back with no contact with the watercourse.
- A concrete deck will be poured over the beams/slabs which span across the river. This will be shuttered, sealed and water tested before concrete pouring can commence. The deck will be leak tested before concrete pouring can commence.
- Once the culvert is in position stone backfill will be placed and compacted against the culvert up to the required level above the foundations.

When the concrete beams are cured the filling and compaction of the road will be completed. The road finish level will be decided by the Project Engineer.

All other new crossing will be completed using piped culvert, the crossing will be installed as follows:

- The access road on the approach watercourse will be completed to a formation level which is suitable for the passing of plant and equipment required for the installation of the watercourse crossing.
- The installation of the culvert will take place in low flow conditions.
- Where a flow exists, the water running through the watercourse channel will be pumped around the water crossing location and back into the watercourse channel downstream of the works area.
- Where over pumping is required, measures will be taken to ensure that the pumped water discharge does not disturb the stream bed with the force of water from the discharge. A steel plate to reduce the force of the flow will be used where appropriate.
- The project engineer will determine the required gradient of the culvert. The pipe must be laid at a gradient that will ensure water is contained within the

pipe at all times. Where necessary a rock armour dam will be installed within the stream to reduce flow and ensure an acceptable depth of water remains within the pipe. Where a gradient of 1 – 1.5% is identified, the use of a baffle has been recommended.

- The bed of the watercourse channel will be excavated, if necessary, to achieve the correct line and to allow the pipe to be embedded 300mm into the base of the existing drain.
- The embedded section will be allowed to fill naturally with existing material within the base of the drain or with suitable drainage material such as gravel or round shingle where deemed applicable.
- The culvert will be lowered into place using an excavator with a lifting mechanism.
- Large stone boulders (approx. 400mm), sourced from the on-site borrow pits, will be placed over the culvert to create a headwall for the culvert and a suitable sub-base for road construction.
- Smaller 50mm stone, sourced on site will be placed upon the sub-base to construct the road over the water crossing.

All of the above works will be supervised by the Environmental Clerk of Works or the Project Hydrologist.

2.4.2.7 Crane Hardstands

All crane pads will be designed taking account of the loadings provided by the turbine manufacturer and will consist of a compacted stone structure. The crane hardstands will be constructed in a similar manner to the excavated site roads and will measure approximately to the turbine manufacturer's requirements. The position of the crane pads varies between turbine locations depending on topography, position of the site access road, and the permitted turbine position.

2.4.2.8 Turbine and Anemometry Mast Foundations

The wind turbines and anemometry mast foundations will be a reinforced concrete base designed to Eurocode 2/BS8110. Foundation loads will be provided by wind turbine and mast supplier, and factors of safety will be applied to these in accordance with European design regulations. The turbine will be anchored to the foundation using a bolt assembly which shall be cast into the concrete. The anemometry mast is a free-standing structure which is also anchored to the reinforced concrete foundation. It is anticipated that the foundations for both the turbines and the anemometry mast will be either ground bearing foundations and that the formation level of the turbine foundations will be on the lower mineral subsoil or bedrock. Bases will measure approximately 20 metres in diameter. They will likely be formed one metre below the base of the peat layer on stiff subsoil material or bedrock, or at a suitable level directed by the Geotechnical Engineer/Designer. The foundations will be constructed as follows:

- The extent of the excavation will be marked out and will include an allowance for trimming the sides of the excavation to provide a safe working area and slope batter;
- No material will be removed from site and storage areas will be stripped of vegetation prior to stockpiling in line with best working practices;
- All groundwater and surface water arising from turbine base excavation will be pumped to the dirty water system and treated in settlement ponds, and/or specialist treatment systems, prior to discharge from the works area; and,

- Soil excavation shall be observed by a qualified archaeologist in accordance with a scheme of archaeological monitoring, in order to identify any significant remains as they come to light.

Ground bearing reinforced concrete bases will be completed as follows:

- A layer of concrete blinding will be laid approximately 75mm thick directly on top of the newly exposed formation, tamped and finished with a screed board to leave a flat level surface. The concrete should be protected from rainfall during curing and all surface water runoff from the curing concrete should be prevented from entering surface water drainage directly;
- High tensile steel reinforcement will be fixed in accordance with the designer's drawings & schedules. The foundation anchorage system will be installed, levelled and secured to the blinding using steel box section stools;
- Ductwork will be installed as required, and formwork erected around the steel cage and propped from the backside as required;
- The foundation anchorage system will be checked both for level and line prior to the concrete being installed in the base. These checks will be passed to turbine manufacturer for their approval;
- Concrete will be placed using a concrete pump and compacted when in the forms using vibrating pokers to the levels and profile indicated on the drawings. Upon completion of the concreting works the foundation base will be covered and allowed to cure;
- Steel shutters will be used to pour the circular chimney section;
- Earth wires will be placed around the base; and,
- The foundation will be backfilled with a cohesive material, where possible using the material arising during the excavation and landscaped using the vegetable soil set aside during the excavation. A gravel footpath will be formed from the access track to the turbine door and around the turbine for maintenance.
- Soil, rock and other materials excavated during construction shall not be left stockpiled on site following completion of works. Excavated areas shall be appropriately restored within three months of the date of commissioning of the wind farm

2.4.2.9 Electricity Substation and Control Buildings

An electricity substation and associated control building will be constructed within the site, as shown in Figure 2.1. The control building will be located within the substation compound which will be located south of Turbines No. 10 & 11.

The substation will be constructed by the following methodology:

- The area of the substation will be marked out using ranging rods or wooden posts and the soil stripped and removed to a temporary placement area for later use in landscaping. No material will be removed from site and the temporary placement areas will be stripped of vegetation prior to stockpiling in line with best working practices;
- Wind farm control buildings will also be built within the substation compound;
- All groundwater and surface water arising from turbine base excavation will be pumped to the dirty water system and treated in settlement ponds, and/or specialist treatment systems, prior to discharge from site; and,
- The foundations will be excavated down to the level indicated by the project engineer. The foundations will be shuttered and poured with reinforced concrete. An anti-bleeding admixture will be included in the concrete mix;

- The substation will be constructed with masonry blockwork. The block work walls will be built up from the footings to DPC level and the floor slab constructed, having first located any ducts or trenches required by the follow on mechanical and electrical contractors;
- The block work will then be raised to wall plate level and the gables & internal partition walls formed. Scaffold will be erected around the outside of the building for this operation;
- Concrete roof slabs will be lifted into position using an adequately sized mobile crane;
- The timber roof trusses will then be lifted into position using a telescopic load all or mobile crane depending on site conditions. The roof trusses will then be felted, battened, tiled and sealed against the weather.
- A rainwater harvesting system will be installed to provide the small volume of water required for the operation of the proposed substation and control building.
- The electrical equipment will be installed and commissioned.
- Perimeter fencing will be erected around the substation and control building compound area.
- All wastewater from the staff welfare facilities in the control buildings by means of a sealed storage tank which will be fitted with an automated alarm system that will provide sufficient notice that the tank requires emptying.

2.4.2.10Cable Trenching

The transformer in each turbine is connected to the substation through a network of buried electrical cables. Fibre-optic cables will also connect each wind turbine to the wind farm control building in the substation compound. The ground is trenched typically using a mechanical digging machine. The top layer of soil is removed and saved so that it is replaced on completion. The cables are bedded with suitable material unless the ground conditions are such that no bedding is required. The depth of the cables is to meet all national and international requirements, and will generally be up to 1.3m below ground level depending on the ground conditions that are encountered. A suitable marking tape is installed between the cables and the surface. On completion the ground will be reinstated as previously described above. The route of the cables will generally follow the access tracks to each turbine location.

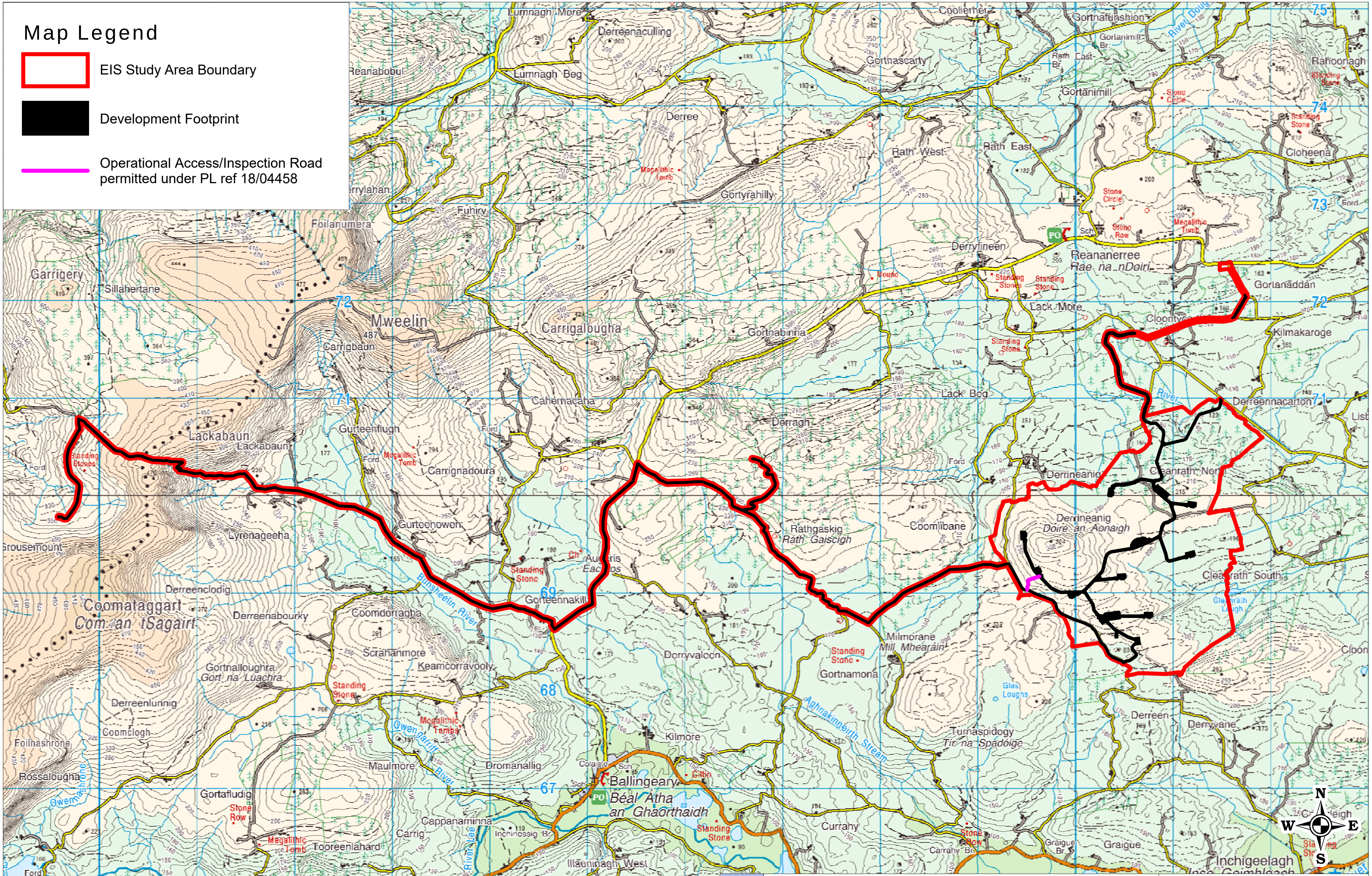
2.4.2.11 Grid Connection

A connection to the national electricity grid will be made by an underground electricity cable originating from the Cleanrath wind farm at Turbine no. 7 utilising the revised cable route and will run to an ESB Networks substation located at Coomataggart in the townland of Grousemount, Co. Kerry (Figure 2.2). The installation of the underground electrical cable will be completed using the following construction methodologies.

2.4.2.11.1 *Parallel Road Excavations inroad & in Grass margin*

The grid connection route generally follows the existing road corridor. The cabling is works are summarised as follows:

- The area where excavations are planned will be surveyed and all existing services will be identified.
- All relevant bodies i.e. ESB, Cork County Council etc. will be contacted and all drawings for all existing services sought.
- A traffic management plan will be set up prior to any works commencing.
- A road opening license will be obtained where required and all plant operators and general operatives will be inducted and informed as to the location of any services.



MAP TITLE: Site Layout - Overall		MAP NO.: Figure 2.2	SCALE: 1:50,000
PROJECT TITLE: 110721e - Cleanrath Wind Farm, Co. Cork		OS SHEET NO.: n/a	DATE: 13-06-2018
DRAWING BY: Owen Cahill	CHECKED BY: Michael Watson	ISSUE NO.: 110721e-2018.06.13-F	

McCarthy Keville O'Sullivan

McCarthy Keville O'Sullivan Ltd., Block 1, G.F.S.C, Moneenageisha Road, Galway, Ireland. Email: info@mccarthykos.ie Tel: +353 (0)91 735611 Fax: +353 (0)91 771279

- A rubber tracked 360-degree excavator will be used to excavate the trench to the dimensions specified in the ESB Networks *"Specification for the Installation of Ducts and Structures for Underground Power Cables and Communications Cables"*.
- All excavated material not used for backfilling will be removed to the on-site peat disposal areas or to an approved tip or if suitable stock piled and reused where appropriate.
- All excavated material not used for backfilling will be removed from site using trucks.
- The trench depth is specified at 1220mm and trench support will not be required, however where depths exceed 1250mm trench support will be installed or the trench sides will be benched or battered back where appropriate.
- Any ingress of ground water will be removed from the trench using submersible pumps.
- A silt filtration system will be used to prevent contamination of any watercourse.
- Once the trench has been excavated a base layer of 15 N CBM4 concrete will be installed and compacted. All concrete will be offloaded directly from the concrete truck directly into the trench.
- Ducting will then be placed in the trench as per specification, approved cable ties will be used where required to secure the trefoil ducts together (at 3 metre centres).
- Once the trefoil ducts have been installed couplers will be fitted and capped to prevent any dirt etc. entering the duct. In poor ground conditions the end of the trefoil ducts will be shimmed up off of the bed of the trench to prevent any possible ingress of water dirt. The shims will be removed again once the next length has been connected.
- Extreme care will be taken to ensure that all duct collars (both ends) are clean and in good condition prior to ducts being joined.
- The as built location of the ducting will be surveyed using a total station/GPS.
- 15 N CBM4 concrete will be carefully installed so as not to displace the ducting to the underside of the communications duct and compacted as per approved detail. See Plate 2.1.
- Spacers will be used to ensure that the correct cover is achieved at both sides of the trefoil ducting.
- ESB marker board will be fitted above the trefoil ducting.
- The Communication duct will be fitted and kept to one side of the trench ensuring that the minimum cover is achieved and 15N CBM4 concrete will be placed to the specified cover and compacted, see Plate 2.1.
- ESB red marker board will be installed and the remainder of trench will be backfilled in two compacted layers with approved material (lean mix concrete/clause 804).
- Yellow marker tape will be installed as per approved detail specifications, 300 mm maximum below finished road/ground level.
- Topsoil will be permanently reinstated where required or Clause 804 stone used to finish the trench on grass margins where appropriate to give a more trafficable surface.
- Road finish: Where the cable route runs within the carriageway of a road the excavated area will be resurfaced and finished to the requirements of the Roads Authority.

Plate 2.1 Cable Trench View

2.4.2.11.2 *Existing Underground Services*

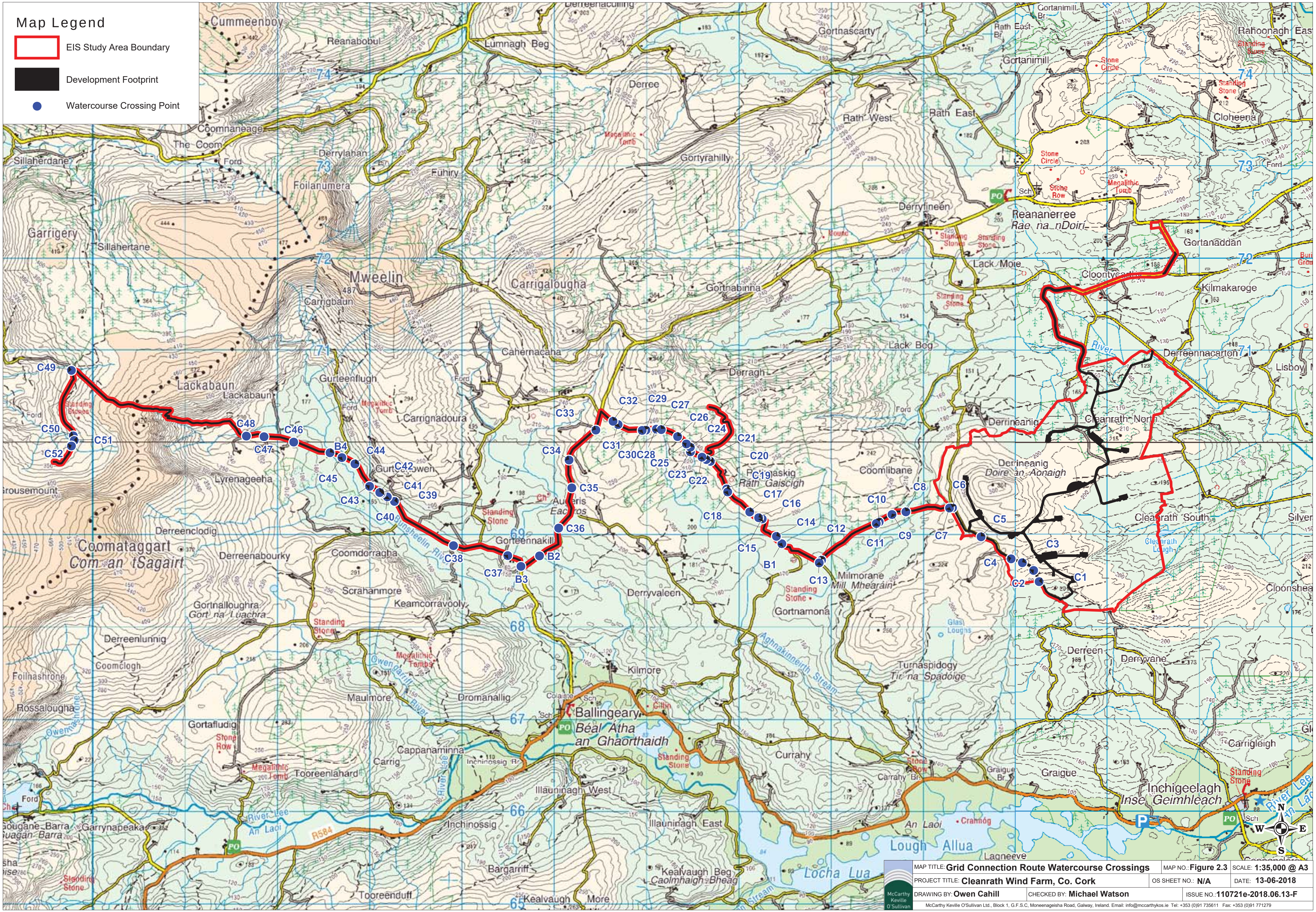
Any underground services encountered along the route will be surveyed for level and the ducting will pass over the service provided adequate cover is available. A minimum clearance of 300mm will be required between the bottom of the ducts and the service in question. If the clearance cannot be achieved the ducting will pass under the service and again 300 mm clearance between the top of the communications duct and bottom of the service will be achieved. In deeper excavations, an additional layer of marker tape will be installed between the communications layer and yellow top level marker tape. If the required separation distances cannot be achieved then a number of alternative options are available such as using steel plates laid across the width of the trench and using 35N concrete surrounding the ESB ducts where adjacent services are within 600mm, with marker tape on the side of the trench. Back fill around any utility services will be with dead sand/pea shingle where appropriate. All excavations will be kept within the roadway boundaries, i.e. in road or grass margin.

2.4.2.11.3 *Joint Bays*

Joint bays are pre-cast concrete chambers where lengths of cable ducting will be connected. They will be located at various points along the ducting route approximately every 600-1200 meters. Where possible joint bays will be located in areas where there is a natural widening/wide grass margin on the road in order to accommodate easier construction, cable installation and create less traffic congestion. During construction, the joint bay locations will be completely fenced off and will be incorporated into the traffic management system. Once they have been constructed they will be backfilled temporarily until cables are being installed.

2.4.2.11.4 *Watercourse/Culvert Crossing*

A total of 13 no. watercourse crossings and 39 no. minor culvert crossings were identified along the cable route. The locations are mapped in Figure 2.3. The proposed methodologies for crossing watercourses and culverts ensures that instream works are not required at any location along the cable route.



Ordnance Survey Ireland Licence No. AR 0021815© Ordnance Survey Ireland/Government of Ireland

The preferred methodologies for watercourse and culvert crossing points are outlined in Table 2.1 which provides examples of watercourse crossing types and a description of the works for each crossing methodology. One of the preferred methodologies will be chosen for any watercourse crossings or culverts encountered during the construction phase.

Crossings over Culverts using Standard Trefoil Arrangement – Option 1
In the majority of watercourse crossings, the watercourse will not have to be disturbed because no instream works or bridge/culvert alterations are proposed. Where adequate cover exists above a culvert, the standard ESB approved trefoil arrangement will be used where the cable ducts pass over a culvert without any contact with the existing culvert or water course. The cable trench will pass over the culvert in a standard trench as outlined in Figure 2.4

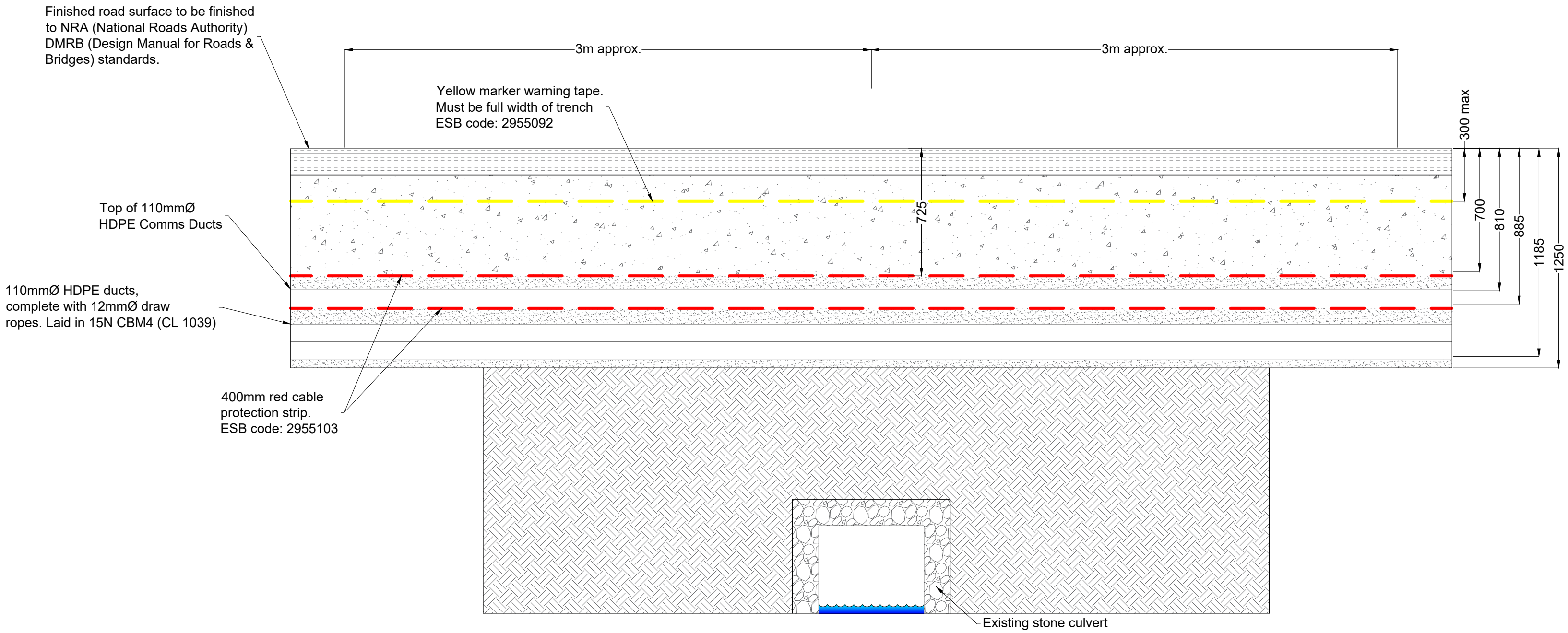
Trefoil Formation under Piped Culvert Crossings – Option 2
In the majority of watercourse crossings, the watercourse will not have to be disturbed because no instream works or bridge/culvert alterations are proposed. Where the culvert consists of a socketed concrete or sealed plastic pipe, a trench will then be excavated beneath the culvert and cable ducts will be passed under the sealed pipe as outlined in Figure 2.5. Works to replace any existing culverts, thereby giving rise to the requirement for in-stream works, will only be undertaken at the Local Authority's direction.

If this duct installation method cannot be achieved due to the invert level of the existing culvert or due to the composition of the culvert e.g. stone culverts, the ducts will be installed by alternative means as set out in the following sections.

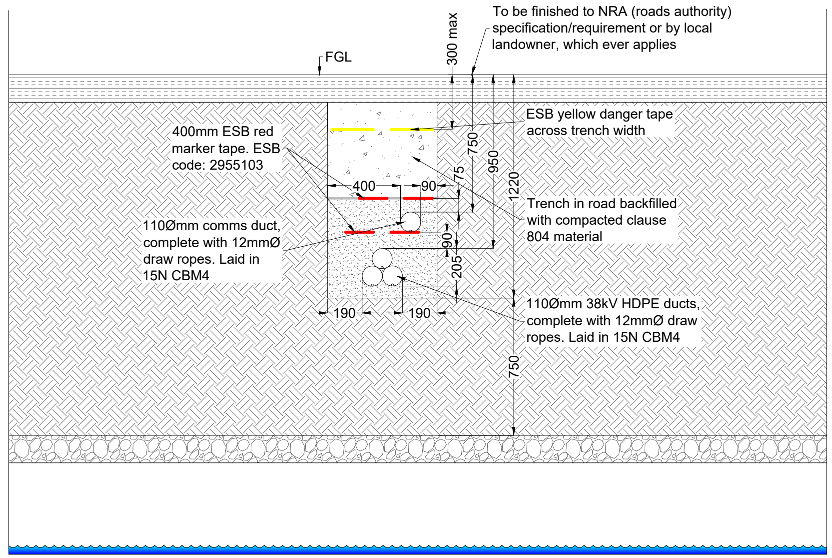
Flatbed Formation over Culverts or at Road Level– Option 3
Where cable ducts are to be installed over an existing culvert where sufficient cover cannot be achieved by installing the ducts in a trefoil arrangement, the ducts will be laid in a much shallower trench the depth of which will be determined by the location of the top of the culvert. The ducts will be laid in this trench in a flatbed formation over the existing culvert and will be incased in 6mm thick steel galvanized plate with a 30N concrete surround as per ESB Networks specification. This method of duct installation is further detailed in Figure 2.6.

Where a bridge or culvert has insufficient deck cover to fully accommodate the required ducts, the ducts can be laid in a flatbed formation partially within the existing road surface. Where this option is to be employed, the ducts will also be incased in steel with a concrete surround as per Eirgrid and/or ESB Networks specifications. In order to achieve cover over these ducts and restore the carriageway of the road, it may be necessary to locally raise the pavement level to fully cover the ducts. The increase road level will be achieved by overlaying the existing pavement with a new wearing course as required. Any addition of a new pavement will be tied back into the existing road pavement at grade. After the crossing over the culvert has been achieved, the ducts will resume to the trefoil arrangement within a standard trench. This method of duct installation is further detailed in Figure 2.7.

The flatbed formation methodology will also be used at bridge structures where there is an existing footpath. The cables will be installed in the same flatbed arrangement where the existing footpath will be excavated to allow for the installation of the cables. The footpath will be reinstated after cable ducts have been installed. Where there is no existing footpath, it is proposed to install a footpath to encase the cable ducts after they have been laid in the flatbed formation.



Longitudal Section at Watercourse Crossing



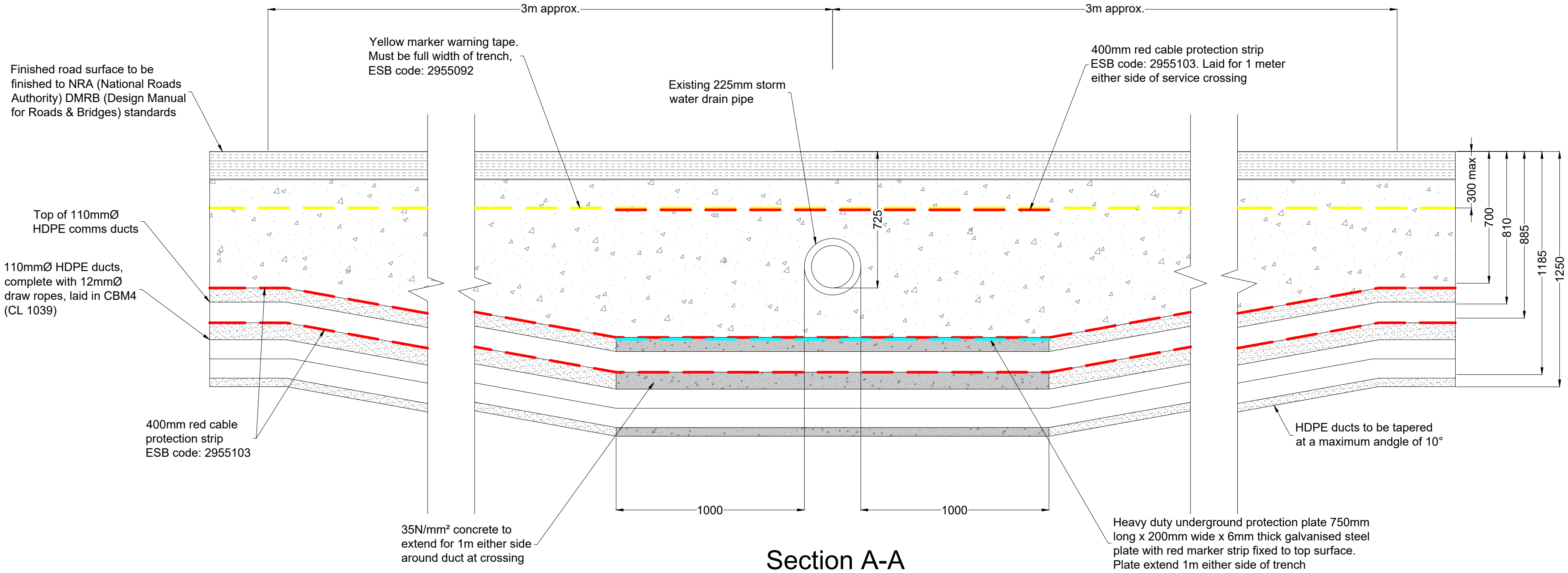
Cross Section at Watercourse Crossing

DRAWING TITLE:
Typical Cable Trench Over Culvert in Trefoil Arrangement - Option 1

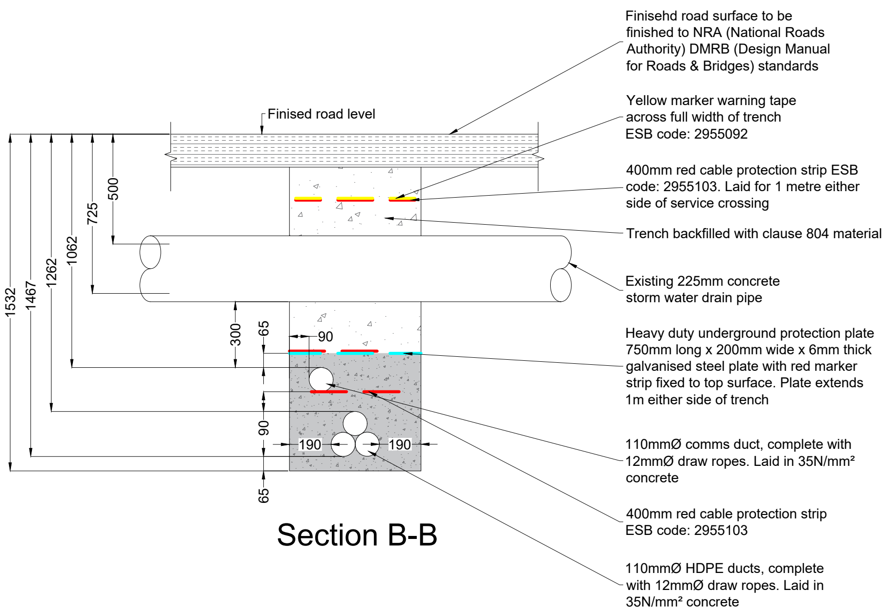
PROJECT TITLE:
Cleanrath Wind Farm, Co. Cork

DRAWING BY: Joseph O Brien	CHECKED BY: Owen Cahill
PROJECT No.: 110721e	DRAWING No.: Fig. 2.4
SCALE: 1:30 @ A3	DATE: 14.06.2018

McCarthy Keville O'Sullivan
McCarthy Keville O'Sullivan Ltd.
Planning & Environmental Consultants
Block 1,
Galway Financial Services Centre,
Moneenageisha Road,
Galway, Ireland.
email: info@mccarthykos.ie
website: www.mccarthykos.ie
Tel: +353 91 735611
Fax: +353 91 771279



Section A-A



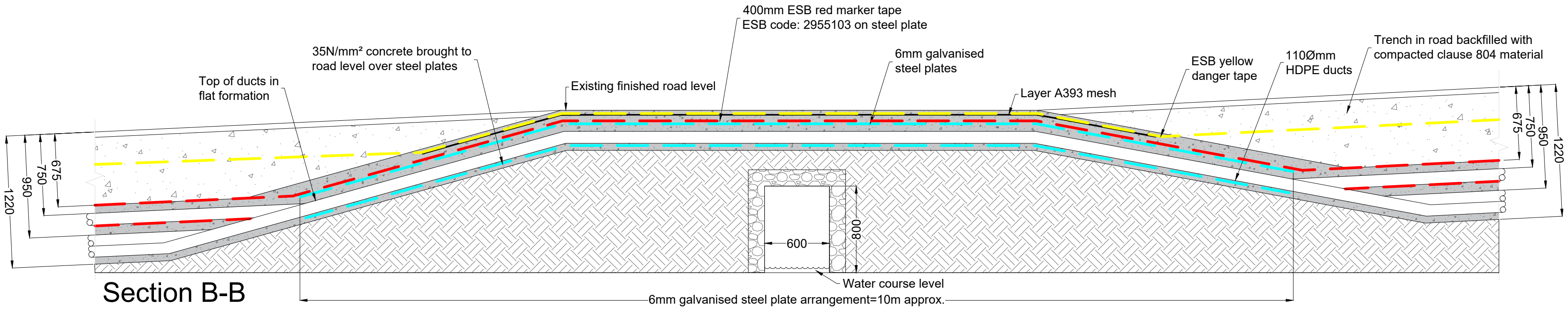
Section B-B

DRAWING TITLE:
Typical Cable Trench under Piped Culvert - Option 2

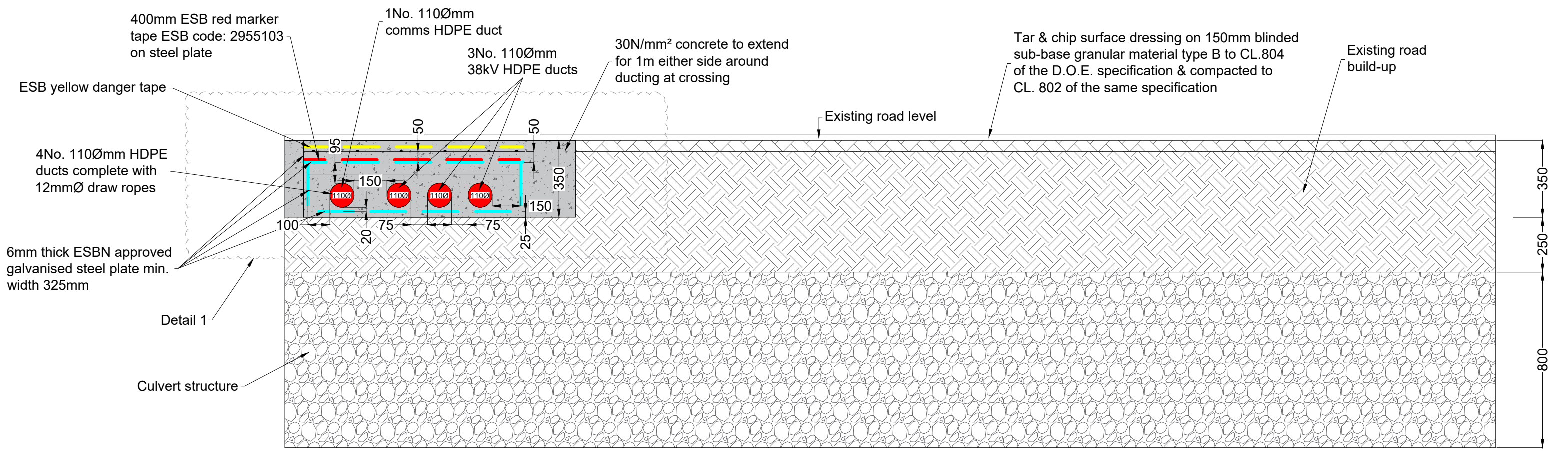
PROJECT TITLE:
Cleanrath Wind Farm, Co. Cork

DRAWING BY: Joseph O Brien	CHECKED BY: Owen Cahill
PROJECT No.: 110721e	DRAWING No.: Fig. 2.5
SCALE: 1:25 @ A3	DATE: 14.06.2018

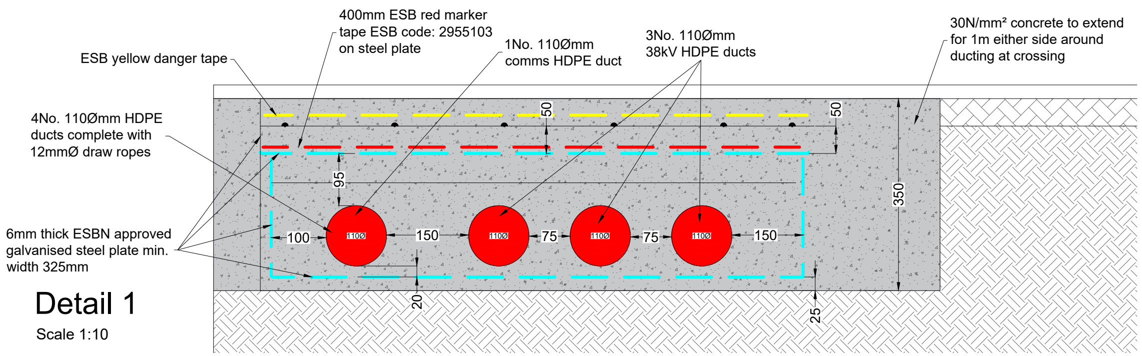
McCarthy Keville O'Sullivan
McCarthy Keville O'Sullivan Ltd.
Planning & Environmental Consultants
Block 1,
Galway Financial Services Centre,
Moneenageisha Road,
Galway, Ireland.
email: info@mccarthykos.ie
website: www.mccarthykos.ie
Tel: +353 91 735611
Fax: +353 91 771279



Section B-B
Scale 1:45



Section A-A
Scale 1:25



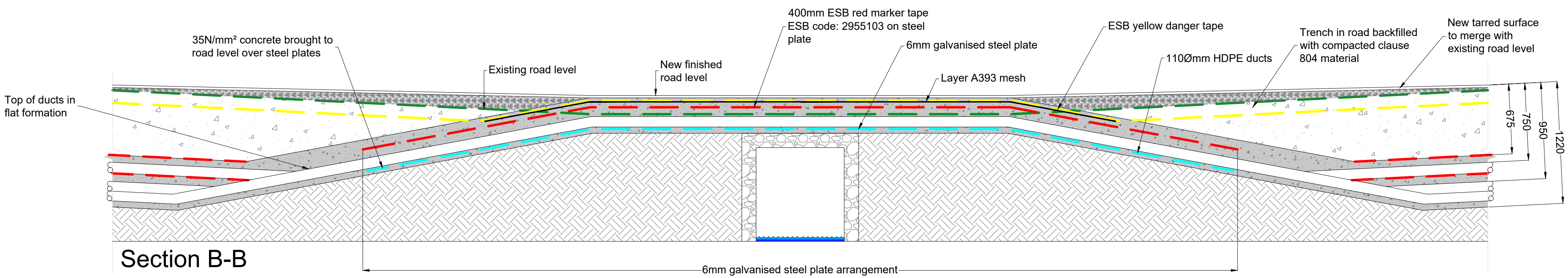
Detail 1
Scale 1:10

DRAWING TITLE:
Typical Cable Trench Flatbed Formation over Culvert - Option 3

PROJECT TITLE:
Cleanrath Wind Farm, Co. Cork

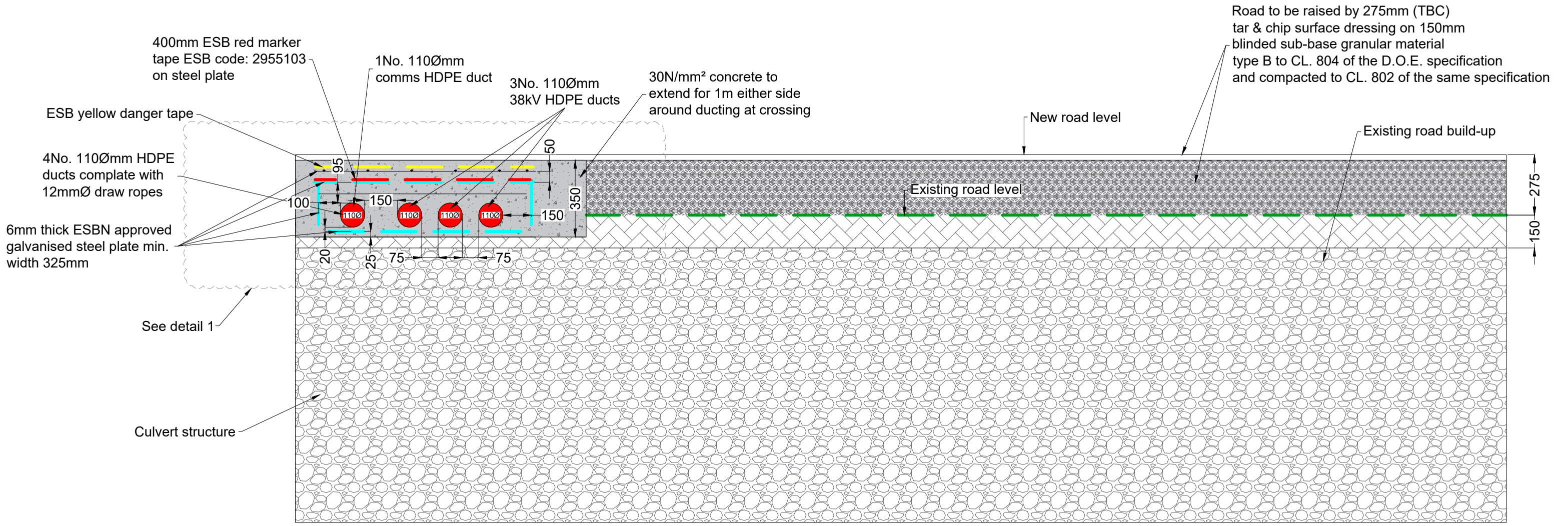
DRAWING BY: Joseph O Brien	CHECKED BY: Owen Cahill
PROJECT No.: 110721e	DRAWING No.: Fig. 2.6
SCALE: As Shown @ A3	DATE: 14.06.2018

McCarthy Keville O'Sullivan
McCarthy Keville O'Sullivan Ltd.
Planning & Environmental Consultants
Block 1,
Galway Financial Services Centre,
Moneenageisha Road,
Galway, Ireland.
email: info@mccarthykos.ie
website: www.mccarthykos.ie
Tel: +353 91 735611
Fax: +353 91 771279



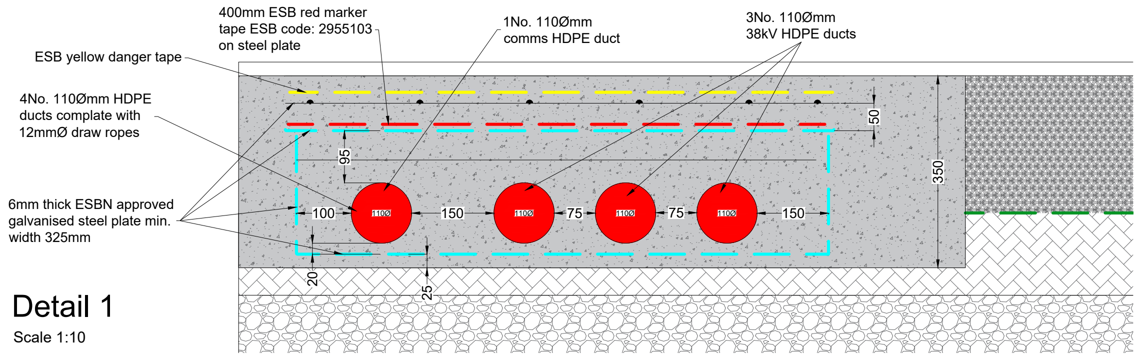
Section B-B

Scale 1:45



Section A-A

Scale 1:25



Detail 1

Scale 1:10

DRAWING TITLE:
Cable Trench Flatbed at Road Surface Level - Option 3

PROJECT TITLE:
Cleanrath Wind Farm, Co. Cork

DRAWING BY: Joseph O Brien	CHECKED BY: Owen Cahill
PROJECT No.: 110721e	DRAWING No.: Fig. 2.7
SCALE: As Shown @ A3	DATE: 14.06.2018

McCarthy Keville O'Sullivan

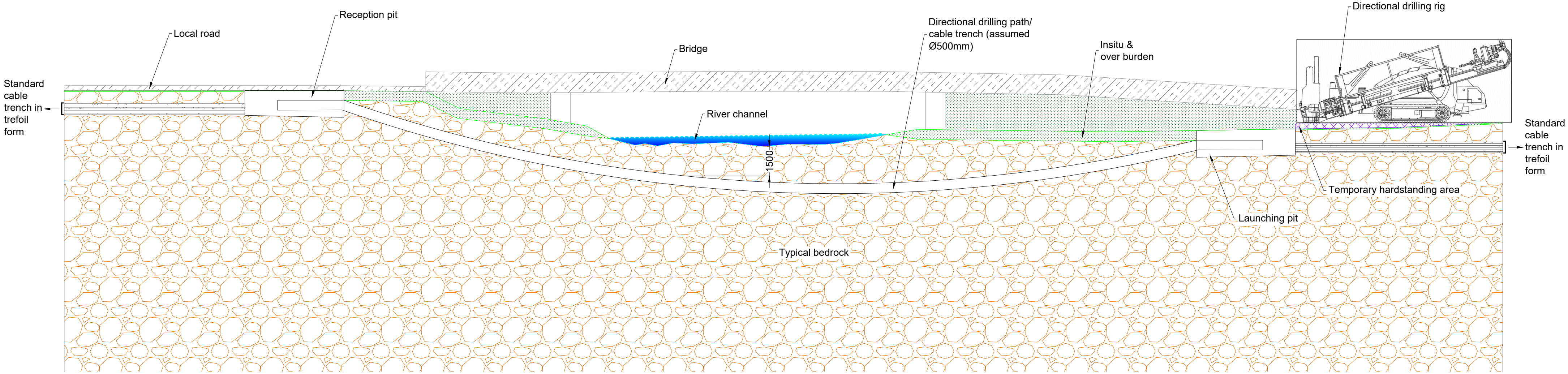
McCarthy Keville O'Sullivan Ltd.
Planning & Environmental Consultants
Block 1,
Galway Financial Services Centre,
Moneenageisha Road,
Galway, Ireland.
email: info@mccarthykos.ie
website: www.mccarthykos.ie
Tel: +353 91 735611
Fax: +353 91 771279

Directional Drilling – Option 4
In the event that none of the above methods are appropriate, directional drilling will be utilised.

The directional drilling method of duct installation will be carried out using Vermeer D36 x 50 Directional Drill (approximately 22 tonnes), or similar plant, will be utilised for the horizontal directional drilling at watercourse/culvert crossings listed above. The launch and reception pits will be approximately 0.55m wide, 2.5m long and 1.5m deep. The pits will be excavated with a suitably sized excavator. The drilling rig will be securely anchored to the ground by means of anchor pins which will be attached to the front of the machine. The drill head will then be secured to the first drill rod and the operator shall commence to drill into the launch pit to a suitable angle which will enable him to obtain the depths and pitch required to the line and level of the required profile. Drilling of the pilot bore shall continue with the addition of 3.0m long drill rods, mechanically loaded and connected into position.
During the drilling process, a mixture of a natural, inert and fully biodegradable drilling fluid such as *Clear Bore*™ and water is pumped through the centre of the drill rods to the reamer head and is forced into void and enables the annulus which has been created to support the surrounding sub soil and thus prevent collapse of the reamed length. Depending on the prevalent ground conditions, it may be necessary to repeat the drilling process by incrementally increasing the size of the reamers. When the reamer enters the launch pit, it is removed from the drill rods which are then passed back up the bore to the reception pit and the next size reamer is attached to the drill rods and the process is repeated until the required bore with the allowable tolerance is achieved.

The use of a natural, inert and biodegradable drilling fluid such as *Clear Bore*™ is intended to negate any adverse impacts arising from the use of other, traditional polymer-based drilling fluids and will be used sparingly as part of the drilling operations. It will be appropriately stored prior to use and deployed in the required amounts to avoid surplus. Should any excess drilling fluid accumulate in the reception or drilling pits, it will be contained and removed from the site in the same manner as other subsoil materials associated with the drilling process to an approved disposal site.

Backfilling of launch & reception pits will be conducted in accordance with the normal specification for backfilling excavated trenches. The directional drilling methodology is further detailed in Figure 2.8.



Typical Directional Drilling Rig

Typical Drilling Rig and Launch Pit

DRAWING TITLE:
Typical Directional Drilling - Option 4

PROJECT TITLE:
Cleanrath Wind Farm, Co. Cork

DRAWING BY: Joseph O Brien	CHECKED BY: Owen Cahill
PROJECT No.: 110721e	DRAWING No.: Fig. 2.8
SCALE: 1:200 @ A3	DATE: 14.06.2018

McCarthy Keville O'Sullivan Ltd.
Planning & Environmental Consultants
Block 1,
Galway Financial Services Centre,
Moneenageisha Road,
Galway, Ireland.
email: info@mccarthykos.ie
website: www.mccarthykos.ie
Tel: +353 91 735611
Fax: +353 91 771279

Table 2.1 Culvert Survey Summary and Preferred Crossing Methodology

Option No.	Example Culvert type and size	Cover from road level to top of culvert	Maximum depth of trench from road level under culvert	Description	Extent of Proposed Instream Works
1	600x600mm stone culvert	1900mm	n/a	Due to the depth of covering over the existing culvert, the cable ducts will be laid over the culvert in the standard trefoil arrangement. Therefore, no contact will be made with the watercourse during the works.	None. No in-stream works required.
2	225mm internal Ø corrugated plastic pipe	500mm	1500mm	No in-stream works required at this culvert crossing. The culvert consists of a sealed corrugated pipe under which the trench for the cable duct will be excavated. Therefore, no contact will be made with the watercourse during the works.	None. No in-stream works required.
3	800x600mm stone culvert	600mm	n/a	No in-stream works required at this culvert crossing. It is proposed to lay the cable ducts in a flatbed formation over the culvert. Therefore, no contact will be made with the watercourse during the works.	None. No in-stream works required.
4	600x600mm stone culvert	300mm	2400mm (directional drilling core)	As the top of the culvert is 300mm below the road surface, laying the duct over the culvert will not provide the necessary cover over the cable duct as well as the integrity of the stone culvert would be compromised by the excavation. Laying the ducts under the culvert is not an option as the structure of the stone culvert could not accommodate the excavation. Therefore, the cable duct will pass under the culvert by means of directional drilling 1500mm below the base of the culvert with no contact with the watercourse.	None. No in-stream works required.

2.4.2.11.5 *General Construction Measures*

Prior to any works commencing a dilapidation survey will be conducted of the entire route, photographing and noting any existing damage or defects to structure or road surfaces. A copy of this survey will be submitted to Cork County Council prior to works commencing.

Communication with the public, local residences and businesses along the route will be an important responsibility of the project supervisor. Keeping all affected parties up to date and informed both shortly prior and during the construction period at all times. Two to three weeks before any work commencing reasonable efforts will be made to inform all affected parties of the oncoming works.

Signage will be erected in the weeks prior to any works commencing along and on adjacent roads to the route notifying the public of the forthcoming construction. Contact details for the contractor and details of license will also be posted along the cable route during construction.

Every effort will be made to minimise the impact of the above works on local residences and traffic. Consideration will also be given to the agricultural community and works will be organised and sequenced so as not to inconvenience any such activities.

- All personnel will be inducted and made familiar with the method statements, risk assessments and traffic management plans involved.
- All site-specific safety rules will be adhered to.
- All plant operators will have appropriate CSCS training.
- All personnel will have FÁS Safe Pass training
- Fire extinguishers and first aid supplies will be available in the work area.
- The road way will be maintained in clean condition at all times.
- Helmets, High Visibility clothing and safety footwear will be worn at all times.
- A competent foreman will be on site at all times.
- Excavations are back filled at the end of each working day.
- The trench will not be over crowded.
- Unauthorised access will be monitored and prevented.
- Pipe work will be lifted into position manually.
- Hand dig will be used to expose any services detected during the survey.

2.4.2.12 Transport Route Accommodation Works

A turbine delivery accommodation roadway will be constructed as part development in the townland of Cloontycarthy. The roadway will eliminate the requirement for additional junction accommodation works other than those described in this Section. The location of the roadway is illustrated in Figure 2.2.
The construction methodology of the turbine delivery accommodation works is outlined as follows:

- Overburden within the required areas for the accommodation works will be excavated and temporarily stockpiled adjacent to the works area, where possible, until a competent stratum is reached.
- Any excess excavated overburden will be removed from the works area to the on-site peat management areas or a licensed tip or, if suitable, stockpiled and reused for backfilling where appropriate.
- A layer of geogrid/geotextile may be required at the surface of the competent stratum to provide further structural formation, if required.

- The competent stratum will be overlain with granular fill sourced from the on-site borrow pit or local quarries.
- A final surface running layer will be placed over the granular fill to provide a suitable surface to accommodate the turbine delivery/abnormal load vehicles.
- The temporary accommodation works along the turbine delivery route will only be used by the turbine delivery/abnormal load vehicles and other vehicles associated with the delivery process.
- The temporary accommodation works when not in use will be cordoned off from the public road, using bollards, where boundary walls, hedgerows or ditches have been removed.
- Upon completion of the turbine delivery phase of the proposed wind farm the granular surface of the accommodation works location will remain in place. All kerbing, barriers and boundary fencing will be reinstated.

Leaving the granular fill and final surface running layer in place within the accommodation areas will allow these to be used again in the future should it become necessary (i.e. at decommissioning stage for turbine removal, or in the unlikely event of having to swap out a blade component during the operational phase). Should this be required the boundary treatments will again be temporarily removed and managed as set out above.

2.4.2.13 Decommissioning

The design life of the wind farm is 25 years after which time decommissioning will occur unless planning permission is granted to extend the duration of operation. At the end of the design life of the wind farm, or if the operations at the wind farm cease for a period of greater than one year, the turbines, met mast and all their associated above ground components will be dismantled and removed from site. The turbine foundations will be covered with soil to facilitate re-vegetation. The management of waste materials arising from the decommissioning of the development is outlined in the Waste Management Plan (Section 3 below).

Site roadways could be in use for other purposes other than the wind operation of the wind farm by the time the decommissioning of the project is to be considered, and therefore it may be more appropriate to leave the site roads in situ for future use. If it were to be confirmed that the roads were not required in the future for any other useful purpose, they could be removed

Underground cables will be removed and the ducting left in place.

A full reinstatement plan will be submitted to Cork County Council three months prior to decommissioning.

3 ENVIRONMENTAL MANAGEMENT

3.1 Introduction

This CEMP has been prepared and presented as a standalone document and includes all drainage measures required to construct the wind farm. The drainage proposals will be developed further prior to the commencement of construction however, any such improvements will be in line with the principles set out here, and will also be in full compliance with the planning consent and mitigation presented in the EIS, NIS, FIR, GOA and CCS documents. The following sections give an overview of the drainage design, dust and noise control measures and a waste management plan for the site.

3.2 Protecting Water Quality

3.2.1 Environmental Management in the Construction Phase

Timing of road works can strongly influence the potential for damaging the freshwater environment. Operations during wetter periods of the year pose a significantly greater risk of causing erosion and siltation, which can be particularly severe following major rainfall or snowmelt events. Traditionally, wind farm construction undertaken during the drier summer months would result in significantly less erosion and siltation. Construction activities in the hydrological buffer zones shall be avoided during or after prolonged rainfall or an intense rainfall event and work will cease entirely near watercourses when it is evident that pollution is occurring. Given that this site has an established road network and existing watercourse crossing points, there will be minimal impacts on watercourses.

3.2.2 Site Drainage Design

The site drainage features for this site have previously been outlined in the EIS and are further developed in Section 4 of this CEMP. The protection of the watercourses within and surrounding the site, and downstream catchments that they feed is of utmost importance in considering the most appropriate drainage proposals for the site of the permitted development. No routes of any natural drainage features will be altered as part of the permitted development as new watercourse crossings are kept to a minimum to facilitate the permitted development. Turbine locations and associated roadways were originally selected to avoid natural watercourses and existing roads are to be used wherever possible. The permitted development has where possible, been kept a minimum of 50 metres from natural watercourses. There will be no direct discharges to any natural watercourses, with all drainage waters being dispersed as overland flows. Buffer zones around the existing natural drainage features have informed the layout of the permitted development.

Existing artificial drains in the vicinity of existing site roads will be maintained in their present location where possible. If it is expected that these artificial drains will receive drainage water from works areas, check dams will be added (as specified below) to control flows and sediment loads in these existing artificial drains. If road widening or improvement works are necessary along the existing roads, where possible, the works will take place on the opposite side of the road to the drain.

3.2.3 Legislation and Best Practice Guidance

The drainage design has been prepared based on experience of the project team of other wind farm sites in peat-dominated environments, and the number of best practice guidance documents.

There is no one guidance document that deals with drainage management and water quality controls for wind farm developments. However, a selection of good practice approaches have been adopted in preparation of this CEMP, and these are taken from the various best practice guidance documents listed below. These relate to infrastructure and operational works on forested sites, forest road design, water quality controls for linear projects, forestry road drainage and management of geotechnical risks. To achieve best practice in terms of water protection through construction management all drainage management is prepared in accordance with guidance contained in the following:

- Forestry Commission (2004): Forests and Water Guidelines, Fourth Edition. Publ. Forestry Commission, Edinburgh;
- Coillte (2009): Forest Operations & Water Protection Guidelines;
- Forest Service (Draft): Forestry and Freshwater Pearl Mussel Requirements – Site Assessment and Mitigation Measures;
- Forest Service (2000): Forestry and Water Quality Guidelines. Forest Service, DAF, Johnstown Castle Estate, Co. Wexford;
- Forest Service, (2000): Code of Best Forest Practice – Ireland. Forest Service, DAF, Johnstown Castle Estate, Co. Wexford;
- COFORD (2004): Forest Road Manual – Guidelines for the design, construction and management of forest roads;
- MacCulloch (2006): Guidelines for risk management of peat slips on the construction of low volume low cost roads over peat (Frank MacCulloch Forestry Civil Engineering Forestry Commission, Scotland);
- Authority (2005): Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes;
- Wind Farm Development Guidelines for Planning Authorities (September 1996);
- Requirements for the Protection of Fisheries Habitat during Construction and Development Works at River Sites. Eastern Regional Fisheries Board;
- Good Practice During Wind Farm Construction (Scottish Natural Heritage, 2010);
- PPG1 - General Guide to Prevention of Pollution (UK Guidance Note);
- PPG5 – Works or Maintenance in or Near Water Courses (UK Guidance Note);
- CIRIA (Construction Industry Research and Information Association) guidance on 'Control of Water Pollution from Linear Construction Projects' (CIRIA Report No. C648, 2006);
- Control of water pollution from construction sites - Guidance for consultants and contractors. CIRIA C532. London, 2001; and,
- Control of water pollution from linear construction projects -Technical guidance. CIRIA C648 London, 2006.

3.2.4 Site and Drainage Management

3.2.4.1 Preparative Site Drainage Management

All materials and equipment necessary to implement the drainage measures outlined above will be brought on-site in advance of any works commencing.

An adequate quantity of straw bales, clean stone, terram, stakes, etc. will be kept on site at all times to implement the drainage design measures as necessary. The drainage measures outlined in the above will be installed prior to, or at the same time as the works they are intended to drain.

3.2.4.2 Pre-emptive Site Drainage Management

The works programme for the groundworks part of the construction phase of the project will also take account of weather forecasts, and predicted rainfall in particular. Large excavations, large movements of overburden or large-scale overburden or soil stripping will be suspended or scaled back if heavy rain is forecast. The extent to which works will be scaled back or suspended will relate directly to the amount of rainfall forecast.

3.2.4.3 Reactive Site Drainage Management

The final drainage design prepared for the site has provided for reactive management of drainage measures. The effectiveness of drainage measures designed to minimise runoff entering works areas and capture and treat silt-laden water from the works areas, will be monitored continuously by the Environmental Clerk of Works (ECoW) on-site. The ECoW or supervising hydrologist will respond to changing weather, ground or drainage conditions on the ground as the project proceeds, to ensure the effectiveness of the drainage design is maintained in so far as is possible. This may require the installation of additional check dams, interceptor drains or swales as deemed necessary on-site. The drainage design may have to be modified on the ground as necessary, and the modifications will draw on the various features outlined above in whatever combinations are deemed to be most appropriate to situation on the ground as a particular time.

In the event that works are giving rise to siltation of watercourses, the ECoW or supervising hydrologist will stop all works in the immediate area around where the siltation is evident. The source of the siltation will be identified and additional drainage measures such as those outlined above will be installed in advance of works recommencing.

3.3 Refuelling, Fuel and Hazardous Materials Storage

The following mitigation measures are proposed to avoid release of hydrocarbons at the site:

- Minimal refuelling or maintenance of construction vehicles or plant will take place on site. Off-site refuelling should occur at a controlled fuelling station;
- On-site refuelling will take place using a mobile double skinned fuel bowser. The fuel bowser, a double-axel custom-built refuelling trailer will be re-filled off site, and will be towed around the site by a 4x4 jeep to where machinery is located. It is not practical for all vehicles to travel back to a single refuelling point, given the size of the cranes, excavators, etc. that will be used during the construction of the wind farm. The 4x4 jeep will also carry fuel absorbent material and pads in the event of any accidental spillages. The fuel bowser will be parked on a level area in the construction compound when not in use. Only designated trained and competent operatives will be authorised to refuel plant on site. Mobile measures such as drip trays and fuel absorbent mats will be used during all refuelling operations.
- Fuels volumes stored on site should be minimised. Any fuel storage areas will be bunded appropriately for the fuel storage volume for the time period of the construction. The bunded area will be roofed to prevent the ingress of rainwater and fitted with a storm drainage system and an appropriate oil interceptor;
- The electrical substation should be bunded appropriately to the volume of oils likely to be stored, and to prevent leakage of any associated chemicals and to groundwater or surface water. The bunded area will be fitted with a storm drainage system and an appropriate oil interceptor;

- The plant used should be regularly inspected for leaks and fitness for purpose; and,
- An emergency plan for the construction phase to deal with accidental spillages will be contained within Environmental Management Plan. Spill kits will be available to deal with and accidental spillage in and outside the refuelling area.

3.4 Cement Based Products Control Measures

The following mitigation measures are proposed to avoid release of cement leachate from the site:

- No batching of wet-cement products will occur on site;
- Ready-mixed supply of wet concrete products and where possible, emplacement of pre-cast elements, will take place. Where possible pre-cast elements for culverts and concrete works will be used;
- No washing out of any plant used in concrete transport or concreting operations will be allowed on-site;
- Where concrete is delivered on site, only the chute need be cleaned, using the smallest volume of water possible. No discharge of cement contaminated waters to the construction phase drainage system or directly to any artificial drain or watercourse will be allowed.
- Use weather forecasting to plan dry days for pouring concrete;
- Ensure pour site is free of standing water and plastic covers will be ready in case of sudden rainfall event;
- The small volume of water that will be generated from washing of the concrete lorry's chute will be directed into a concrete washout area, typically built using straw bales and lined with an impermeable membrane. Two examples are shown in Plates 3.1 and 3.2 below. The areas are generally covered when not in use to prevent rainwater collecting. In periods of dry weather, the areas can be uncovered to allow much of the water to be lost to evaporation. At the end of the concrete pours, any of the remaining liquid contents is tankered off-site. Any solid contents that will have been cleaned down from the chute will have solidified and can be broken up and disposed of along with other construction waste. 1.

The 50m wide river buffer zone and 20 m existing artificial drainage buffer will be emplaced for the duration of the construction phase. No construction activity will occur within the buffer zone with the exception of bridge and culvert construction. The buffer zone will:

- Prevent any cement based products accidentally entrained in the construction phase drainage system entering directly into watercourses, achieved in part by ending drain discharge outside the 50m buffer zone and allowing percolation across the vegetation of the buffer zone;
- Provide a buffer against accidental direct pollution of surface waters by any pollutants, or by pollutants entrained in surface water run-off.

Plate 3.1 Concrete washout area

Plate 3.2 Concrete washout area

3.5 Peat Management

The total estimated volume of peat and overburden to be excavated during the construction phase of the development of peat and other subsoils is 25,372m^3. This includes a reduction of 30% for drying out of peat as well as reuse of material for backfilling and landscaping. A detailed Peat Management Plan is included in the EIS which outlines the methodology by which peat will be handled and stored at the site. A summary of the good construction practices which will be employed include:

- Avoidance of placing arisings from excavations and local concentrated loads on peat slopes without first establishing adequacy of the ground to support the load.
- Avoidance of uncontrolled concentrated water discharge onto peat slopes identified as being unsuitable for such discharge. All water discharged from excavations during work shall be piped over areas specifically assessed as being unsuitable and hence directed into suitable drainage lines.
- Avoidance of unstable excavations. All excavation shall be suitably supported to prevent collapse and development of tension cracks.
- Avoidance of placing fill and excavations in the vicinity of steeper peat slopes, that is at the crest or toe of the slope.
- Installation and regular monitoring of geotechnical instrumentation, as appropriate, during construction in areas of possible poor ground, such as deeper peat deposits
- Site reporting procedures to ensure that working practices are suitable for the encountered ground conditions. Ground conditions to be assessed by suitably experienced geotechnical engineer.
- Regular briefing of all site staff (e.g. toolbox talks) to provide feedback on construction and ground performance and to promote reporting of any observed change in ground conditions.
- Routine inspection of wind farm site by contractor to include an assessment of ground stability conditions (e.g. cracking, excessive floating road settlement, disrupted surface, closed-up drains) and drainage conditions (e.g. blocked drains, absence of water in previously flowing drains, springs, etc).

3.5.1 Peat Stability Management

Peat instability or failure refers to a significant mass movement of a body of peat that would have an adverse impact on wind farm development and the surrounding environment. Peat failure excludes localised movement of peat that could occur below an access road, creep movement or erosion type events. In the absence of appropriate mitigation, the consequence of peat failure at the study area may result in:

- Death or injury to site personnel;
- Damage to machinery;
- Damage or loss of access tracks;
- Drainage disrupted;
- Site works damaged or unstable;
- Contamination of watercourses, water supplies by sediment particulates; and,
- Degradation of the environment.

3.5.2 General Recommendations for Good Construction Practice

The peat stability assessment indicates that there is insignificant risk of peat failure, although drainage mitigation measures would be required to prevent the buildup of water in the peat and reduce the risk of failure (AGEC, 2015).

The following issues incorporated into the construction phase of the project will assist in the management of the risks for this site (AGEC, 2015):

- Appointment of experienced and competent contractors;
- The site should be supervised by experienced and qualified personnel;
- Allocate sufficient time for the project (be aware that decreasing the construction time has the potential to increase the risk of initiating a peat movement);
- Prevent undercutting of slopes and unsupported excavations;
- Maintain a managed robust drainage system;
- Prevent placement of loads/overburden on marginal ground;
- Set up, maintain and report readings from peat stability monitoring systems;
- Ensure construction method statements are followed or where agreed modified/ developed; and,
- Revise and amend the Geotechnical Risk Register as construction progresses.

3.6 Traffic Management

A Traffic Management Plan for the construction phase of the wind farm is included in Appendix 2. The Traffic Management Plan has been prepared to consider the wind farm as a standalone project.

Where grid connection works relating to the Cleanrath Wind Farm are ongoing, the contractor will schedule and phase these works accordingly to ensure that these works do not coincide with intensive periods of construction on the wind farm development and thus reduce the impact of concurrent construction specific to the wind farm.

3.6.1 Turbine and Materials Transport Route

Material such as concrete will be sourced from a local quarry and will access the site using the haul routes outlined in Figure 2.9 via the N22. All other materials deliveries will access the site using these same routes via the N22. All deliveries of construction materials to the site will take place within the defined working hours of 7am – 7pm. It may be necessary on occasion, to commence works before 7am where concrete pours will be required to start earlier due to the volume of concrete required and the location of the concrete pour relative to the concrete supplier's batching plant. Main pours will be planned days and weeks in advance and will ensure disruption to work and school related traffic is avoided. The locations of all turbine foundations where large concrete pours will take place are off the public road and will be accessed by the internal site roads and will therefore eliminate the potential for queuing of trucks on the adjoining public road network. The typical vehicle type for delivery of construction materials to site with the exception of the wind turbines will be with standard heavy goods vehicles

(HGV). The proposed construction will run from August 2018 – January 2020 as summarised in Section 9 below. This is the timescale within which it is intended to use the public road network as outlined in Figures 2.1 & 2.9 to facilitate construction of the development.

A detailed traffic and transport management plan for turbine delivery will be prepared by the haulage company, when appointed and will be submitted to Cork County Council for approval. The plan will include:

- A delivery schedule.
- A schedule of control measures for exceptional wide and heavy loads.
- Details of temporary works or any other minor alteration identified.
- A dry run of the route using vehicles with similar dimensions.

The turbine transport route from the N22 National Secondary Road to the development sites are shown on Figure 2.9 also. The deliveries of turbine components to the site will be made in convoys of three to four vehicles at a time, and mostly at night when roads are quietest. Convoys will be accompanied by escorts at the front and rear operating a "stop and go" system. Although the turbine delivery vehicles are large, they will not prevent other road users or emergency vehicles passing, should the need arise. The delivery escort vehicles will ensure the turbine transport is carried out in a safe and efficient manner with minimal delay or inconvenience for other road users. It is not anticipated that any section of the local road network will be closed during transport of turbines, although there will be some delays to local traffic at pinch points. During these periods it may be necessary to operate local diversions for through traffic. All deliveries comprising abnormally large loads will be made outside the normal peak traffic periods to avoid disruption to work and school-related traffic.

Prior to the Traffic Management Plan for turbine delivery being finalised, a full dry run of the transport operation along the proposed route will be completed using vehicles with attachments to simulate the dimensions of the wind turbine transportation vehicles. This dry run will inform the final traffic management plan. All turbine deliveries will be provided for in a transport management plan which will have to be prepared in advance of the turbine delivery stage, when the exact transport arrangements are known, delivery dates confirmed and escort proposals in place. Such a transport management plan is typically submitted to the Planning Authority for agreement in advance of any abnormal loads using the local roads, and will provide for all necessary safety measures, including a convoy and Garda escort as required, off-peak turning/reversing movements and any necessary safety controls.

The roads and bridges along the haul route will be subject to a condition survey by a suitably qualified engineer both before and after construction. Protection measures for such infrastructure as specified by the appointed engineers report will be implemented in full prior to construction.

In the event of construction damage arising on any roads or bridges along the haul route it will be rectified immediately by the developer under consultation with the relevant roads engineer.

Prior to the delivery of oversized loads, the developer will engage with the local community to provided information on the scale, time and duration of such deliveries. This information will be informed by pre-delivery surveys which will be completed by the suppliers. This information will be relayed to the local community by information leaflet and a website if deemed necessary.

3.7 Dust/Debris Control

Construction dust can be generated from many on-site activities such as excavation and backfilling. The extent of dust generation will depend on the type of activity undertaken, the location, the nature of the dust, *i.e.* soil, sand, peat, etc and the weather. In addition, dust dispersion is influenced by external factors such as wind speed and direction and/or, periods of dry weather. Construction traffic movements also have the potential to generate dust as they travel along the haul route. The Measures below will also prevent construction debris arising on the public road network.

Proposed measures to control dust include:

- Any site roads with the potential to give rise to dust will be regularly watered, as appropriate, during dry and/or windy conditions;
- The designated public roads outside the site and along the main transport routes to the site will be regularly inspected by the Site Environmental Clerk of Works (ECoW) for cleanliness, and cleaned as necessary;
- Material handling systems and material storage areas will be designed and laid out to minimise exposure to wind;
- Water misting or bowsers will operate on-site as required to mitigate dust in dry weather conditions;
- The transport of soils or other material, which has significant potential to generate dust, will be undertaken in tarpaulin-covered vehicles where necessary;
- All construction related traffic will have speed restrictions on un-surfaced roads to 15 kph;
- Daily inspection of construction sites to examine dust measures and their effectiveness.
- When necessary, sections of the haul route will be swept using a truck mounted vacuum sweeper; and,
- All vehicles leaving the construction areas of the site will pass through a wheel cleansing area prior to entering the local road network.

3.8 Noise & Vibration Control

The operation of plant and machinery, including construction vehicles, is a source of potential impact that will require mitigation at all locations within the wind farm. Proposed measures to control noise include:

- Diesel generators will be enclosed in sound proofed containers to minimise the potential for noise impacts;
- Plant and machinery with low inherent potential for generation of noise and/or vibration will be selected. All construction plant and equipment to be used on-site will be modern equipment and will comply with the European Communities (Construction Plant and Equipment) (Permissible Noise Levels) Regulations;
- Plant with the potential of generating noise or vibration will be placed as far away from sensitive properties as permitted by site constraints.
- Regular maintenance of plant will be carried out in order to minimise noise emissions. In particular, attention will be paid to the lubrication of bearings and the integrity of silencers;

- All vehicles and mechanical plant will be fitted with effective exhaust silencers and maintained in good working order for the duration of the works;
- Compressors will be of the "sound reduced" models fitted with properly lined and sealed acoustic covers which will be kept closed whenever the machines are in use and all ancillary pneumatic tools shall be fitted with suitable silencers;
- Machines, which are used intermittently, will be shut down during those periods when they are not in use;
- Training will be provided by the Site Environmental Clerk of Works/appointed contractor's health and safety officer to drivers to ensure smooth machinery operation/driving, and to minimise unnecessary noise generation; and,
- Local areas of the haul route will be condition monitored and maintained if necessary.

3.8.1 Monitoring of Blast Operations

Where blasting is employed as a means of rock extraction from the on-site borrow pits, it will be carried out between 10:00 hours and 17:00 hours, Monday to Friday only. All blast events will be the subject of independent monitoring to ensure the blasting operations are carried out within acceptable levels of vibration. The monitoring programme will be carried out by Irish Industrial Explosives Ltd. and will include for the assessment ground borne vibration and air overpressure. Condition no. 9 of the decision to grant planning permission for Cleanrath Wind Farm has set an emissions limit value (ELV) of 12mm/sec for vibration levels at sensitive locations during a blast event. The monitoring programme will also include the assessment of air overpressure to ensure that no individual air overpressure event exceeds an ELV of 125 dBL by more than 5dBL.

Monitoring will be carried out for each blast event. It is not anticipated that blasting will occur any more than once in seven days therefore the reduced vibration limit of 8mm/sec will not apply. The results of the monitoring of each blast will submitted to the local authority with two weeks of the event

3.9 Invasive Species Management

A baseline invasive species survey will be carried out at the wind farm site, grid connection route, haul route including all locations where accommodation works are required to accommodate turbine delivery to identify the presence and location of any invasive species (listed under the Third Schedule of the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. 477 of 2011) by a suitably qualified ecologist. If the presence of such species is found at or adjacent to the site, particularly in areas where its excavation may be required, an invasive species management plan will be prepared for the site to prevent the introduction or spread of any invasive species within the footprint of the works. An invasive species management plan, if required, will set out best practice control methods as summarised in the following sections.

3.9.1 General Best Practice Control Methods

The following general best practice guidelines in the treatment and control of invasive species during construction works are outlined below having regard to guidance document issued by the National Roads Authority (2010) Management of Noxious Weeds and Non-native Invasive Plant Species on National Roads.

3.9.2 Good Practice on Site Management

Careful preparation of the site and planning of the works is crucial to successful treatment of invasive species. The following list of guidelines, which is not exhaustive, shall be followed by all on-site personnel. Only those who have been inducted into biosecurity measures on-site may enter the contaminated zones within the works areas. Should any risk of contaminated material escaping be observed by the site supervisor, the management plan for the site must be amended by an appropriately qualified person to mitigate against the risk.

3.9.3 Establishing Good Site Hygiene

The following measures are proposed to establish good site hygiene to ensure the control of any potential spread of invasive species during construction works:

- A risk assessment and method statement must be provided by the Contractor prior to commencing works.
- Fences will be erected around areas of infestation, as confirmed by test pits, and warning signs shall be erected.
- A designated wash-down area will be created, where power-washed material from machinery can be contained, collected and disposed of with other contaminated material. This area will contain a washable membrane or hard surface.
- Stockpile areas will be chosen to minimise movement of contaminated soil.
- Stockpiles will be marked and isolated.
- Contaminated areas which will not be excavated will be protected by a root barrier membrane if they are likely to be disturbed by machinery. Root barrier membranes will be protected by a layer of sand above and below and topped with a layer of hardcore.
- The use of vehicles with caterpillar tracks within contaminated areas will be avoided to minimise the risk of spreading contaminated material.
- An environmental clerk of works/suitably qualified ecologist will be on site to monitor and oversee the implementation of invasive species management plans.

The decontamination of vehicles will be undertaken as follows:

- Personnel may only clean down if they are familiar with the plant and rhizome material, and can readily identify it.
- Decontamination will only occur within designated wash-down areas.
- Vehicles will be cleaned using stiff-haired brush and pressure washers, paying special attention to any areas that might retain rhizomes e.g. wheel treads and arches.
- All run-off will be isolated and treated as contaminated material. This will be disposed of in already contaminated areas.

3.10 Waste Management

This section of the CEMP provides a Waste Management Plan (WMP) which outlines the best practice procedures during the excavation and construction phases of the project. The WMP will outline the methods of waste prevention and minimisation by recycling, recovery and reuse at each stage. Disposal of waste will be seen as a last resort.

This WMP has a number of key objectives as outlined below:

- To set out management prescriptions that adhere to a waste management hierarchy
- To outline the roles and responsibilities of the Waste Manager
- Prevention and minimisation of waste at the construction stage of the development.

3.10.1 Legislation

The Waste Management Act 1996 and its subsequent amendments provide for measures to improve performance in relation to waste management, recycling and recovery. The Act also provides a regulatory framework for meeting higher environmental standards set out by other national and EU legislation.

The Act requires that any waste related activity has to have all necessary licenses and authorisations. It will be the duty of the Waste Manager on the site of the development to ensure that all contractors hired to remove waste from the site have valid Waste Collection Permits. It will then be necessary to ensure that the waste is delivered to a licensed or permitted waste facility. The hired waste contractors and subsequent receiving facilities must adhere to the conditions set out in their respective permits and authorisations.

The Department of the Environment provides a document entitled, 'Best Practice Guidelines on the Preparation of Waste Management Plans for Construction and Demolition Projects.

3.10.2 Preliminary Plan

The Department of the Environment guidelines state that, at the design stage of the project, only a preliminary WMP is required,

> *"Formal production and presentation of the Plan may be at a later stage but a clear 'waste management philosophy' needs to be adopted…at the initial conceptual stage of the Project…"'*

This preliminary WMP has a number of key objectives as outlined below:

- To set out management prescriptions that adhere to a waste management hierarchy
- To outline the roles and responsibilities of the Waste Manager
- Prevention and minimisation of waste at the construction stage of the development.

3.10.3 Waste Management Hierarchy

The waste management hierarchy sets out the most efficient way of managing in the following order:

Prevention and Minimisation:
The primary aim of the WMP will be to prevent and thereby reduce the amount of waste generated at each stage of the project.

Reuse of Waste:
Reusing as much of the waste generated on site as possible will reduce the quantities of waste that will have to be transported off site to recovery facilities or landfill.

Recycling of Waste:

There are a number of established markets available for the beneficial use of Construction and Demolition waste such as using waste concrete as fill for new roads.

At all times during the implementation of the WMP, disposal of waste to landfill will be considered only as a last resort.

3.10.4 Construction Phase Waste Management Plan

3.10.4.1 Description of the Works

The construction of the development will involve the construction of wind turbines, associated new site roads and upgrade of some existing roads and anemometry mast.

The wind turbines will be manufactured off site and delivered to site where on site assembly will occur.

The turbine and anemometry mast foundations will consist of stone excavated from the onsite borrow pits and a concrete base which will contain reinforcing steel. These concrete foundations will be shuttered with steel formwork specifically designed for the works and re-usable off site on similar projects.

The site roads will be constructed with rock won from the onsite borrow pits.

The waste types arising from the construction phase of the development are outlined in Table 3.1 below.

Table 3.1 Expected waste types arising during the Construction Phase

Materials type	Example	EWC Code
Cables	Electrical wiring	17 04 11
Cardboard	Boxes, cartons	15 01 01
Composite packaging	Containers	15 01 05
Metals	Copper, aluminium, lead, iron and steel	17 04 07
Inert materials	Sand, stones, rock,	17 01 07
Mixed municipal waste	Daily canteen waste from construction workers, miscellaneous	20 03 01
Plastic	PVC frames, electrical fittings	17 02 03
Plastic packaging	Packaging with new materials	15 01 02
Wooden packaging	Boxes, pallets	15 01 03

Hazardous wastes that may occur on site during the construction phase of the development may include oil, diesel fuel, chemicals, paints, preservatives etc. All hazardous wastes will be stored in bunded containers/areas before being collected by an authorised waste contractor and brought to an EPA licensed waste facility. As mentioned above, hazardous wastes will be kept separate from non-hazardous wastes that contamination does not occur.

3.10.4.2 Waste Arisings and Proposals for Minimisation, Reuse and Recycling of Construction Waste

Construction waste will arise on the project mainly from excavation and unavoidable construction waste including material surpluses and damaged materials and packaging waste.

Appropriate measures should be taken to ensure excess waste is not generated during construction, including;

- Ordering of materials should be on an 'as needed' basis to prevent over supply to site. Co-ordination is required with suppliers enabling them to take/buy back surplus stock.
- Purchase of materials pre-cut to length to avoid excess scrap waste generated on site.
- Request that suppliers use least amount of packaging possible on materials delivered to the site.
- Ensuring correct storage and handling of goods to avoid unnecessary damage that would result in their disposal
- Ensuring correct sequencing of operations.
- Use reclaimed materials in the construction works.

Hazardous waste will be kept separate from all other construction waste to prevent contamination and removed appropriately.

3.10.4.3 Waste Arising from Construction Activities

All waste generated on site that will be contained in waste skips at a waste storage area on site. This waste storage area will be kept relatively tidy with a waste skip clearly labelled to indicate the allowable material to be disposed of therein.

The expected waste volumes generated on site are unlikely to be large enough to warrant source segregation. Therefore, all wastes streams generated on site will be deposited into a single skip. This waste material will be transferred to a MRF by a fully licensed waste contractor where the waste will be sorted into individual waste streams for recycling, recovery or disposal.

The waste generated from the turbine erection will be limited to the associated protective covers which are generally reusable. Considering the specialist nature of this packaging material the majority will be taken back by suppliers for their own reuse. Any other packaging waste generated from the turbine supply will be deposited in the on-site skip and subsequently transferred to the MRF.

It is not envisaged that there will be any waste material arising from the materials used to construct the road as only the quantity of stone necessary will be excavated from the borrow pits on an 'as needed' basis.

Site personnel will be instructed at induction that no under no circumstances can waste be brought to site for disposal in the on-site waste skip. It will also be made clear that the burning of waste material on site is forbidden.

3.10.4.4 Waste Arising from Decommissioning

The lengthy time frame between the completion of the construction phase and decommissioning will result in the only materials remaining on site at that time are

likely to be turbines and associated cabling and crushed stone used in construction of roads, hardstand, foundations etc.
The waste types arising from the decommissioning of the development are outlined in Table 3.2 below.

Table 3.2 Expected waste types arising during Decommissioning

Materials type	Example	EWC Code
Cables	Electrical wiring	17 04 11
Metals	Copper, aluminium, lead, iron and rebar	17 04 07
Inert materials	Crushed stone,	17 01 07

3.10.4.5 Reuse

Many construction materials can be reused a number of times before they have to be disposed of:

- Concrete can be reused as aggregate for roads cable trench backfilling material.
- Plastic packaging etc. can be used to cover materials on site or reused for the delivery of other materials.
- Excavated peat can be reused for reinstatement of the areas around turbine foundations and adjacent to site roads.

3.10.4.6 Recycling

If a certain type of construction material cannot be reused on site then recycling is the most suitable option. The opportunity for recycling on site will be restricted to the associated packaging from the wind turbines.

All waste that is produced during the construction phase including dry recyclables will be deposited in the on-site skip initially and sent for subsequent segregation at a remote facility. The low volume of such material that is anticipated to be generated at the development is the justification for adopting this method of waste management.

3.10.4.7 Implementation

3.10.4.7.1 Roles and Responsibilities for Waste Management

Prior to the commencement of the development a Construction Waste manager will be appointed by the project team. The Construction Waste Manager will be in charge of the implementation of the objectives of the plan, ensuring that all hired waste contractors have the necessary authorisations and that the waste management hierarchy is adhered to. The person nominated must have sufficient authority so that they can ensure everyone working on the development adheres to the management plan.

3.10.4.8 Training

It is important for the Construction Waste Manager to communicate effectively with colleagues in relation to the aims and objectives of the waste management plan. All employees working on site during the construction phase of the project will be trained in materials management and thereby, should be able to:

- Distinguish reusable materials from those suitable for recycling;
- Ensure maximum segregation at source;
- Co-operate with site manager on the best locations for stockpiling reusable materials;
- Separate materials for recovery; and

- Identify and liaise with waste contractors and waste facility operators.

3.10.4.9 Record Keeping

The WMP will provide systems that will enable all arisings, movements and treatments of construction waste to be recorded. This system will enable the contractor to measure and record the quantity of waste being generated. It will highlight the areas from which most waste occurs and allows the measurement of arisings against performance targets. The WMP can then be adapted with changes that are seen through record keeping.

The fully licensed waste contractor employed to remove waste from the site will be required to provide documented records for all waste dispatches leaving the site. Each record will contain the following:

- Consignment Reference Number
- Material Type(s) and EWC Code(s)
- Company Name and Address of Site of Origin
- Trade Name and Collection Permit Ref. of Waste Carrier
- Trade Name and Licence Ref. of Destination Facility
- Date and Time of Waste Dispatch
- Registration no. of Waste Carrier vehicle
- Weight of Material
- Signature of Confirmation of Dispatch detail
- Date and Time of Waste Arrival at Destination
- Site Address of Destination Facility

3.10.4.10 Waste Management Plan Conclusion

The WMP will be properly adhered to by all staff involved in the project which will be outlined within the induction process for all site personnel. The waste hierarchy will always be employed to ensure that the least possible amount of waste is produced during the construction phase. Reuse of certain types of construction wastes will cut down on the cost and requirement of raw materials therefore further minimising waste levels.

4 DRAINAGE MANAGEMENT PLAN

The drainage management plan is essential to ensure that the details submitted as part of the environmental impact statement and as part of the further information response are fully implemented on site during the construction of the development. This report incorporates a detailed silt management plan and pollution prevention plan, and including appropriately drainage infrastructure including interceptor & collector drains, check dams and settlement ponds as required. A programme for drainage maintenance has been provided to ensure the drainage system operates effectively and within its capacity.

4.1 Wind Farm Drainage

The drainage management plan is essential to ensure that the details submitted as part of the environmental impact statement and as part of the further information response are fully implemented on site during the construction of the development. This report incorporates a detailed silt management plan and pollution prevention plan, and including appropriately-sized silt traps and/or settlement ponds as required.

4.1.1 Statement of Experience

McCarthy Keville O'Sullivan (MKO) has extensive wind farm drainage and general peatland drainage experience relevant to this project. MKO conducts, monitors and implements wind farm environmental impact assessment in respect of geology, hydrology and hydrogeology. The design interactions on wind farm developments between the site layout designer, the geotechnical engineer, and the civil engineer/hydrologist are seen as a key element to a successful and safe wind farm development. MKO has routinely fulfilled the role of Environmental Clerk of Works on many wind farm developments across Ireland over the past 5 years, including developments in Counties Cork, Clare, Galway & Mayo.

MKO's experience also covers the key area of water quality and drainage controls and mitigation during construction phase of wind farm developments. MKO work at EIS/planning stage in the development of the optimal site layout (which involves development of hydrological constraints maps and interaction with the overall design team), MKO follow-on with detailed drainage design and construction management for drainage during wind farm development/construction stage. This practical on-site experience is invaluable as it has led to development of improved preliminary and detailed drainage layouts and also many improvements/optimisations to standard peatland drainage mitigation measures.

MKO have been involved in the construction of the following wind farm projects over the past 6 years:

- Lettergunnet wind farm, Co. Galway; 17 No. Enercon E82 turbines.
- Knockduff Wind Farm, Co. Cork; 26 No. Nordex N90 turbines.
- Slievecallan Wind Farm, Co. Clare; 29 No. Nordex N90 turbines.
- Knockalough Wind Farm, Co. Galway; 10 No. Siemens S101 turbines
- MCB Wind Farm, Co. Mayo; 18 No. turbines (type to be confirmed)

In addition, the developer for the wind farm, PWWP Developments Ltd is part of the Enerco Energy group of companies which has over 300 MW operational installed capacity with a further 400MW, that is currently within planning or under construction.

4.2 Site Drainage

4.2.1 Introduction

The protection of the watercourses within and surrounding the site, and downstream catchments that they feed is of utmost importance in considering the most appropriate drainage proposals for the site of the development. The development's drainage design has therefore been designed specifically with the intention of having no negative impact on the water quality of the site and its associated natural watercourses, and consequently no impact on downstream catchments and ecological ecosystems. There will be no direct discharges to any natural watercourses, with all drainage waters being dispersed as overland flows or directly into artificial drainage ditches following the installation of silt traps, check dams and/or settlement ponds to these ditches. Any discharges over land, from the works areas will be made over vegetation filters maintaining a 50 metre distance from natural watercourses. Buffer zones around the existing natural drainage features have informed, wherever possible, the layout of the permitted development.

4.2.2 Existing Drainage Features

The routes of natural drainage features will not be altered as part of the development. Turbine locations have been selected to avoid natural watercourses. The development has also been designed to require only one new watercourse crossings. Some extensions to existing culverts may be required under existing roadways to manage drainage waters where road widening and upgrade is required These will be sufficiently sized to accommodate peak flows from storm events.

There will be no direct discharges to natural watercourses. Discharges from the works areas or from interceptor drains will be made over vegetated ground at a minimum of 50 metres distance from natural watercourses in the majority of cases. There are exceptions to this where existing or new roadways traverse, or run alongside, natural watercourses and it is necessary to provide drainage measures along such sections of roadway. Discharges will be made at a minimum distance of 20 metres from artificial drainage ditches unless otherwise specified in future revisions of the drainage design. Buffer zones around the existing natural drainage features have informed the layout of the development, and are indicated on the drainage design drawings.

Where artificial drains are currently in place in the vicinity of works areas, these drains may have to be diverted around the works areas to minimise the amount of water in the vicinity of works areas. Where it may not be possible to divert artificial drains around proposed work areas, the drains will be blocked to ensure sediment laden water from the works areas has no direct route to other watercourses. Where drains have to be blocked, the blocking will only take place after an alternative drainage system to handle the same water has been put in place.

Existing artificial drains in the vicinity of existing site roads will be maintained in their present location where possible. If it is expected that these artificial drains will receive drainage water from works areas, check dams will be added (as specified below) to control flows and sediment loads in these existing artificial drains. If road widening or improvement works are necessary along the existing roads, where possible, the works will take place on the opposite side of the road to the drain.

4.2.3 Drainage Design Principles

Drainage water from any works areas of the site will not be directed to any natural watercourses within the site. Two distinct methods will be employed to manage drainage water within the site. The first method involves keeping clean water clean by avoiding disturbance to natural drainage features, minimising any works in or around artificial drainage features, and diverting clean surface water flow around excavations and construction areas. The second method involves collecting any drainage waters from works areas within the site that might carry silt or sediment, to allow attenuation and settlement prior to controlled diffuse release.

The drainage design is intended to maximise erosion control, which is more effective than having to control sediment during high rainfall. Such a system also requires less maintenance. The area of exposed ground will be minimised. The drainage measures will prevent runoff from entering the works areas of the site from adjacent ground, to minimise the volume of sediment-laden water that has to be managed. Discoloured run-off from any construction area will be isolated from natural clean run-off.

A schematic line drawing of the proposed drainage design is presented in Figure 4.1 below.

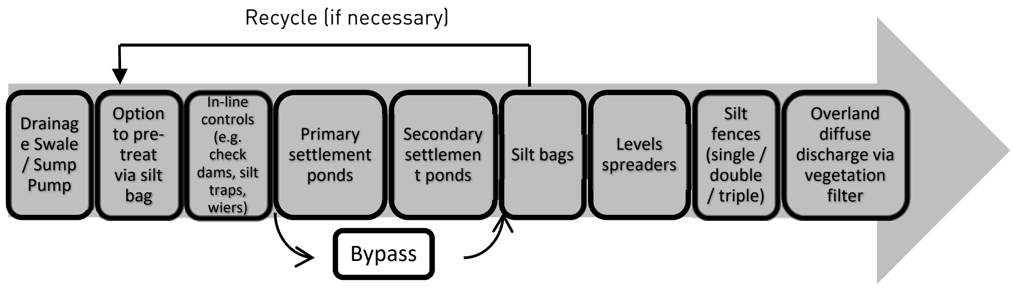


Figure 4.1 Schematic drawing of proposed drainage design

4.2.4 Silt Management & Pollution Prevention

The drainage management plan takes into account the principles of erosion and sediment control. Erosion control where runoff is prevented from flowing across exposed ground and sediment control where runoff is slowed to allow suspended sediment to settle are important elements in a drainage management plan. The drainage management plan has been prepared to provide erosion and sediment control to prevent sediment and potentially pollutant runoff entering watercourses during the construction phase. The drainage management plan will ensure the following:

- Implement erosion control to prevent runoff flowing across exposed ground and become polluted by sediments;
- Intercept and divert clean water runoff away from construction site runoff to avoid cross contamination of clean water with soiled water;
- Implement sediment control to slow down runoff allowing suspended sediments to settle in situ particularly on roads and hardstanding areas;
- Implement the erosion and sediment controls before starting site clearance works;
- Minimise area of exposed ground by maintaining existing vegetation that would otherwise be subject to erosion in the vicinity of the wind park infrastructure and keeping excavated areas to a minimum;
- Delay clearing of peat before construction begins rather than stripping the entire site months in advance particularly during road construction;
- Designate temporary stockpiling areas located away from drains and watercourses that are protected by silt trapping apparatus such as a geo-textile silt fence to prevent contaminated runoff where necessary; it is not envisaged that the stock piling areas will affect the drainage measures on site.

- Avoid working near watercourses during or after prolonged rainfall or an intense rainfall event and cease work entirely near watercourses when it is evident that pollution is occurring;
- Install a series of silt fences or other appropriate silt retention measure where there is a risk of erosion runoff to watercourses from construction related activity particularly if working during prolonged wet weather period or if working during intense rainfall event;
- Implement sediment control measures that includes for the prevention of runoff from adjacent intact ground that is for the separation of clean and 'dirty' water;
- Install appropriate silt control measures such as silt-traps, check dams and settlement ponds;
- Provide recommendations for road cleaning where needed particularly in the vicinity of watercourses; and
- Controls need to be regularly inspected and maintained otherwise a failure may result, such as a build-up of silt or tear in a fence, which could lead to water pollution. Controls must work effectively until the vegetation has re-established; inspection and maintenance is critical after prolonged or intense rainfall.

4.2.5 Pre-Construction Drainage Management

There are existing drainage features across the site, and due to the agricultural nature of the area as well as the ongoing commercial forestry operations, runoff drains relatively freely to local drains. This existing drainage system will continue to function as it is during the pre-construction phase. Prior to commencement of works in sub-catchments across the site main drain inspections will be competed to ensure ditches and streams are free from debris and blockages that may impede drainage.

The Project Hydrologist/Design Engineer will attend the site before construction commences and will assist with micro siting of drainage controls as outlined in Section 5 of this CEMP. The drainage system will be excavated and constructed in conjunction with the road and hard standing construction. Drains will be excavated and settlement ponds constructed to eliminate any suspended solids within surface water running off the site.

4.2.6 Construction Phase Drainage Management Plan

A drainage management plan is presented in this section of the CEMP to provide an overview for planning compliance and tendering purposes. This includes descriptions of the various drainage controls to be employed during the construction phase and operational phase of the wind farm development in addition to the proposals outlined in Sections 3 & 7 of the EIS.

The early establishment of temporary drainage facilities will reduce the risk of pollution problems during construction. In addition, construction operations will adopt best working practices for drainage controls. The construction of the drainage system will start from the downstream sections and progress upstream, connecting conveyance systems with other drainage features as each development phase of the site progresses. They will therefore need to be designed with sufficient flexibility to respond to an early phase of limited incoming flow during the construction phase when sediment or other pollution may be a problem if upstream controls perform poorly, and the final phase of maximum incoming flows within the various catchments.

The implementation of a Schedule of Works Operation Record (SOWOR) will continue through the construction phase of the project. The SOWOR provides number of abandonment triggers which will ensure that site management are well informed as to the level of incident that will require the abandonment of works. The various triggers both pre-commencement and abandonment ensure best practice in terms of water quality management is maintained prior to commencement and during the various felling and construction phases.

Best practice and practical experience on other similar projects suggests that in addition to the drainage plans that are included in this CEMP, there are additional site based decisions and plans that can only be made in the field through interaction between the Site Construction Manager, the Project Hydrologist and the Project Geotechnical Engineers. The mechanisms for interaction between these are outlined within Section 5 of this CEMP.

In relation to decisions that are made on site it is important to stress that these will be implemented in line with the associated drainage controls and mitigation measures outlined in Section 7 below, and to ensure protection of all watercourses.

4.2.6.1 Drainage Design

Detailed drainage design measures are included in the site layout drawings of the development included in Appendix 3 of this report. The drainage design employs the various measures further described below.

4.2.6.1.1 *Interceptor Drains*

Interceptor drains will be installed upgradient of any works areas to collect surface flow runoff and prevent it reaching excavations and construction areas of the site where it might otherwise have come into contact with exposed surfaces and picked up silt and sediment. The drains will be used to divert upslope runoff around the works area to a location where it can be redistributed over the ground surface as sheet flow. This will minimise the volume of potentially silty runoff to be managed within the construction area.

The interceptor drains will be installed in advance of any main construction works commencing. The material excavated to make the drain will be compacted on the downslope edge of the drain to form a diversion dike. On completion of the construction phase works, it is envisaged that the majority of the interceptor drains could be removed. At that stage, there will be no open excavations or large areas of exposed ground that are likely to give rise to large volumes of potentially silt-laden run off. Any areas in which works were carried out to construct roads, turbine bases or hardstands, will have been built up with large grade hardcore, which even when compacted in place, will retain sufficient void space to allow water to infiltrate the subsurface of these constructed areas. It is not anticipated that roadways or other installed site infrastructure will intercept ground-conveyed surface water runoff to any significant extent that would result in scouring or over-topping or spill over. Where the drains are to be removed, they will be backfilled with the material from the diversion dike. Interceptor drains may have to be retained in certain locations, for example where roadways are to be installed on slopes, to prevent the roadways acting as conduits for water that might infiltrate the roadway sub-base. In these cases, interceptor drains would be maintained in localised areas along the roadway with culverts under the roadway, which would allow the intercepted water to be discharged to vegetation filters downgradient of the roadway. Similarly, in localised hollows where water is likely to be funnelled at greater concentrations than on broader slopes, interceptor drains and culverts may be left in situ following construction.

Figure 4.2 shows an illustrative drawing of an interceptor drain.

The velocity of flow in the interceptor will be controlled by check dams (see Section 4.2.6.1.3 below), which will be installed at regular intervals along the drains to ensure flow in the channel is non-erosive. On steeper sections where erosion risks are greater, a geotextile membrane will be added to the channel.

Interceptor drains will be installed horizontally across slopes to run in parallel with the natural contour line of the slope. Intercepted water will travel along the interceptor drains to areas downgradient of works areas, where the drain will terminate at a level spreader (see Section 4.2.6.1.4 below). Across the entire length of the interceptor drains, the design elevation of the water surface along the route of the drains will not be lower than the design elevation of the water surface in the outlet at the level spreader.

4.2.6.1.2 *Swales*

Drainage swales are shallow drains that will be used to intercept and collect run off from construction areas of the site during the construction phase. Drainage swales will remain in place to collect runoff from roads and hardstanding areas of the development during the operational phase. A swale is an excavated drainage channel located along the downgradient perimeter of construction areas, used to collect and carry any sediment-laden runoff to a sediment-trapping facility and stabilised outlet. Swales are proven to be most effective when a dike is installed on the downhill side. They are similar in design to interceptor drains and collector drains described above. Figure 4.2 shows an illustrative example of a drainage swale.

Drainage swales will be installed downgradient of any works areas to collect surface flow runoff where it might have come into contact with exposed surfaces and picked up silt and sediment. Swales will intercept the potentially silt-laden water from the excavations and construction areas of the site and prevent it reaching natural watercourses.

Drainage swales will be installed in advance of any main construction works commencing. The material excavated to make the swale will be compacted on the downslope edge of the drain to form a diversion dike.

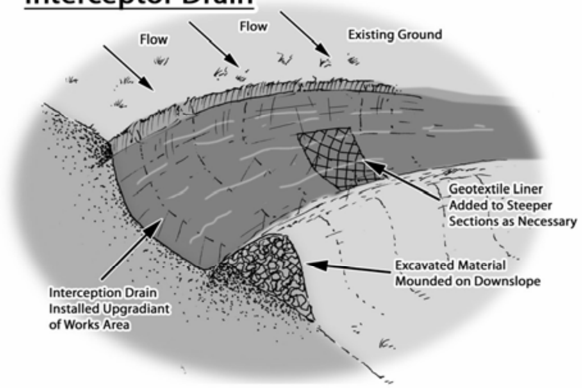
4.2.6.1.3 *Check Dams*

The velocity of flow in the interceptor drains and drainage swales, particularly on sloped sections of the channel, will be controlled by check dams, which will be installed at regular intervals along the drains to ensure flow in the swale is non-erosive. Check dams will also be installed in some existing artificial drainage channels that will receive waters from works areas of the site.

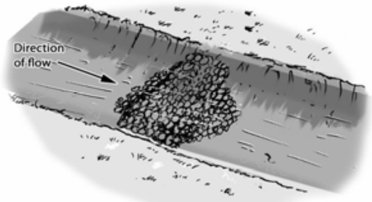
Check dams will restrict flow velocity, minimise channel erosion and promote sedimentation behind the dam. The check dams will be installed as the interceptor drains are being excavated. Check dams may also be installed in some of the existing artificial drainage channels on the site, downstream of where drainage swales connect in.

The check dams will be made up of straw bales or stone, or a combination of both depending on the size of the drainage swale it is being installed in. Where straw bales

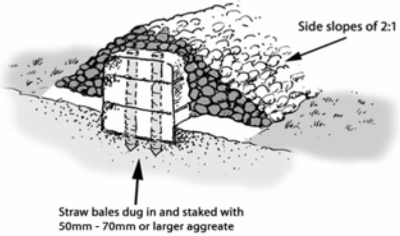
Interceptor Drain



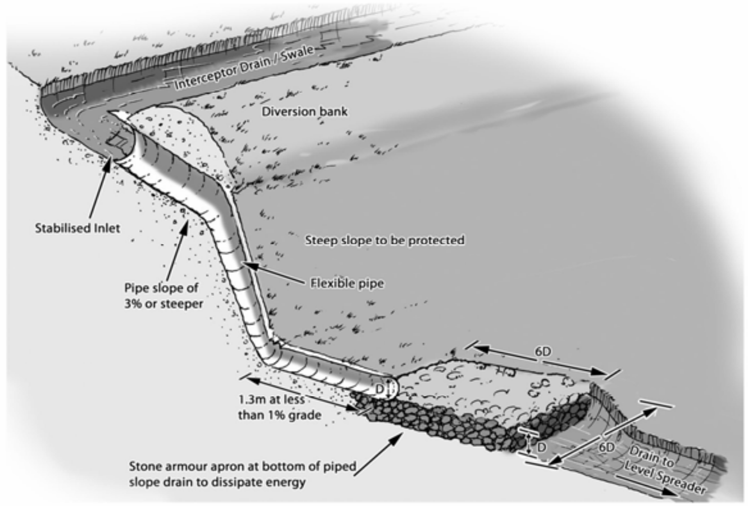
Check Dam (Stone Dam in Drain)



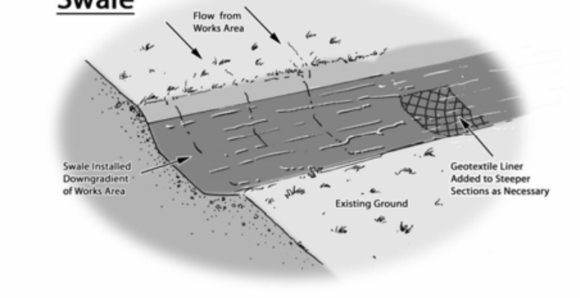
Check Dam
(Straw Bale & Stone Dam - Cross Section)



Slope Pipe Drain

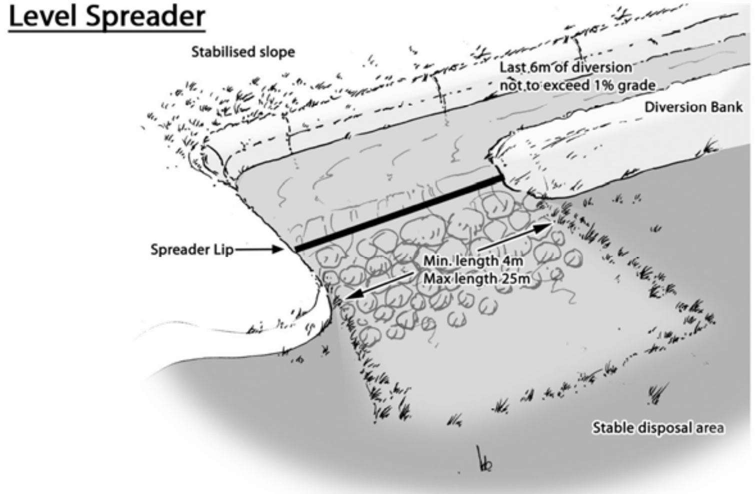


Swale

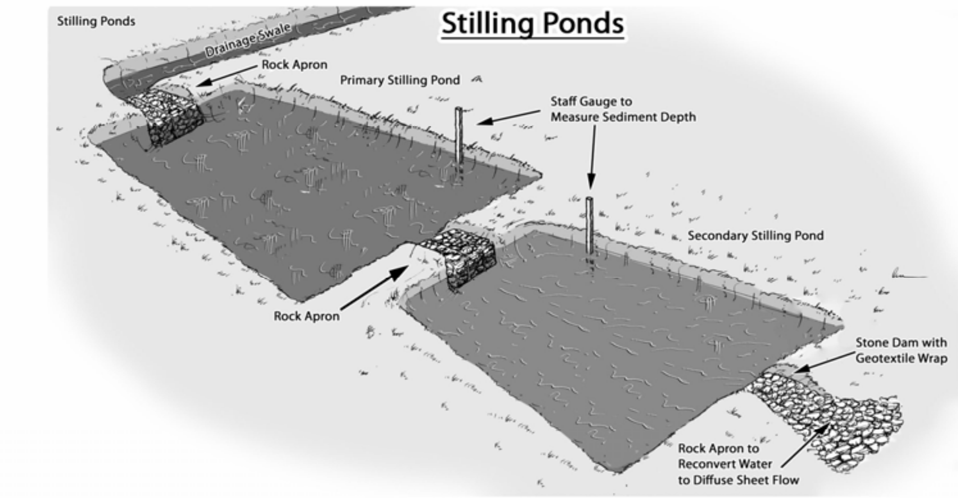


Drainage Design Measures

Level Spreader



Stilling Ponds



N
W E
S

MAP TITLE: Drainage Design Mesures		MAP NO.: Figure 4.2	SCALE: n/a
PROJECT TITLE: Cleanrath Wind Farm			DATE: 13-06-2018
DRAWING BY: Owen Cahill	CHECKED BY: Michael Watson	ISSUE NO.: 110721e-2018.06.14-F	

McCarthy Keville O'Sullivan

McCarthy Keville O'Sullivan Ltd., Block 1, G.F.S.C, Moneenageisha Road, Galway, Ireland. Email: info@mccarthykos.ie Tel: +353 (0)91 735611 Fax: +353 (0)91 771279

are to be used, they will be secured to the bottom of the drainage swale with stakes. Clean 4-6 inch stone will be built up on either side and over the straw bale to a maximum height of 600mm over the bottom of the interceptor drain. In smaller channels, a stone check dam will be installed and pressed down into place in the bottom of the drainage swale with the bucket of an excavator.

The check dams will be installed at regular intervals along the interceptor drains to ensure the bottom elevation of the upper check dam is at the same level as the top elevation of the next down-gradient check dam in the drain. The centre of the check dam will be approximately 150mm lower than the edges to allow excess water to overtop the dam in flood conditions rather than cause upstream flooding or scouring around the dams.

Check dams will not be used in any natural watercourses, only artificial drainage channels and interceptor drains. The check dams will be left in place at the end of the construction phase to limit erosive linear flow in the drainage swales during extreme rainfall events.

Check dams are designed to reduce velocity and control erosion and are not specifically designed or intended to trap sediment, although sediment is likely to build up. If necessary, any excess sediment build up behind the dams will be removed. For this reason, check dams will be inspected and maintained regularly to insure adequate performance. Maintenance checks will also ensure the centre elevation of the dam remains lower than the sides of the dam.

4.2.6.1.4 *Level Spreaders*

A level spreader will be constructed at the end of each interceptor drain to convert concentrated flows in the drain, into diffuse sheet flow on areas of vegetated ground. The levels spreaders will be located downgradient of any works areas in locations where they are not likely to contribute further to water ingress to construction areas of the site.
The water carried in interceptor drains will not have come in contact with works areas of the site, and therefore should be free of silt and sediment. The level spreaders will distribute clean drainage water onto vegetated areas where the water will not be reconcentrated into a flow channel immediately below the point of discharge. The discharge point will be on level or only very gently sloping ground rather than on a steep slope so as to prevent erosion. Figure 4.2 shows an illustrative example of a level spreader.

The slope in the channel leading into the spreader will be less than or equal to 1%. The slope downgradient of the spreader onto which the water will dissipate will have a grade of less than 6%. The availability of slopes with a grade of 6% or less will determine the locations of level spreaders. If a slope grade of less than 6% is not available in the immediate area downgradient of a works area at the end of a diversion drain, a piped slope drain (see Section 4.2.6.1.5 below) will be used to transfer the water to a suitable location.

The spreader lip over which the water will spill will be made of a concrete kerb, wooden board, pipe, or other similar piece of material that can create a level edge similar in effect to a weir. The spreader will be level across the top and bottom to prevent channelised flow leaving the spreader or ponding occurring behind the spreader. The top of the spreader lip will be 150mm above the ground behind it. The length of the spreader will be a minimum of four metres and a maximum length of 25 metres, with the actual length of each spreader to be determined by the size of the contributing catchment, slope and ground conditions.

Clean four-inch stone can be placed on the outside of the spreader lip, and pressed into the ground mechanically to further dissipate the flow leaving the level spreader over a larger area.

4.2.6.1.5 *Piped Slope Drains*

Piped slope drains will be used to convey surface runoff from diversion drains safely down slopes to flat areas without causing erosion. Once the runoff reaches the flat areas it will be reconverted to diffuse sheet flow. Level spreaders will only be established on slopes of less than 6% in grade. Piped slope drains will be used to transfer water away from areas where slopes are too steep to use level spreaders.

The piped slope drains will be semi-rigid corrugated pipes with a stabilised entrance and a rock apron at the outlet to trap sediment and dissipate the energy of the water. The base of drains leading into the top of the piped slope drain will be compacted and concavely formed to channel the water into the corrugated pipe. The entrance at the top of the pipe will be stabilised with sandbags if necessary. The pipe will be anchored in place by staking at approximately 3-4 metre intervals or by weighing down with compacted soil. The bottom of the pipe will be placed on a slope with a grade of less than 1% for a length of 1.5 metres, before outflowing onto a rock apron.

The rock apron at the outlet will consist of 6-inch stone to a depth equal to the diameter of the pipe, a length six times the diameter of the pipe. The width of the rock apron will be three times the diameter of the pipe where the pipe opens onto the apron and will fan out to six times the diameter of the pipe over its length. Figure 4.2 shows a diagrammatic example of a piped slope drain and rock apron.

Piped slope drains will only remain in place for the duration of the construction phase of the project. On completion of the works, the pipes and rock aprons will be removed and all channels backfilled with the material that was originally excavated from them.

Piped slope drains will be inspected weekly and following rainfall events. Inlet and outlets will be checked for sediment accumulation and blockages. Stake anchors or fill over the pipe will be checked for settlement, cracking and stability. Any seepage holes where pipe emerges from drain at the top of the pipe will be repaired promptly.

4.2.6.1.6 *Vegetation Filters*

Vegetation filters are the existing vegetated areas of land that will be used to accept surface water runoff from upgradient areas. The selection of suitable areas to use as vegetation filters will be determined by the size of the contributing catchment, slope and ground conditions.

Vegetation filters will carry outflow from the level spreaders as overland sheet flow, removing any suspended solids and discharging to the groundwater system by diffuse infiltration.

Vegetation filters will not be used in isolation for waters that are likely to have higher silt loadings. In such cases, silt-bearing water will already have passed through settlement ponds prior to diffuse discharge to the vegetation filters via a level spreader.

4.2.6.1.7 *Settlement Ponds*

Settlement ponds will be used to attenuate runoff from works areas of the site during the construction phase, and will remain in place to handle runoff from roads and hardstanding areas of the development during the operational phase. The purpose of the settlement ponds is to intercept runoff potentially laden with sediment and to reduce the amount of sediment leaving the disturbed area by reducing runoff velocity. Reducing runoff velocity will allow larger particles to settle out in the settlement ponds, before the run-off water is redistributed as diffuse sheet flow in filter strips downgradient of any works areas.

Settlement ponds will be excavated/constructed at each required location as two separate ponds in sequence, a primary pond and a secondary pond. The points at which water enters and exits the settlement ponds will be stabilised with rock aprons, which will trap sediment, dissipate the energy of the water flowing through the settlement pond system, and prevent erosion. The primary settlement pond will reduce the velocity of flows to less than 0.5 metres per second to allow settlement of silt to occur. Water will then pass from the primary pond to the secondary pond via another rock apron. The secondary settlement pond will reduce the velocity of flows to less than 0.3 metres per second. Water will flow out of the secondary settlement pond through a stone dam, partially wrapped in geo-textile membrane, which will control flow velocities and trap any sediment that has not settled out. Figure 4.2 shows an illustrative example of a settlement pond system.

Water will flow by gravity through the settlement pond system. The settlement ponds will be sized according to the size of the area they will be receiving water from, but will be sufficiently large to accommodate peak flows storm events. The settlement ponds will be dimensioned so that the length to width ratio will be greater than 2:1, where the length is the distance between the inlet and the outlet. Where ground conditions allow, settlement ponds will be constructed in a wedge shape, with the inlet located at the narrow end of the wedge. Each settlement pond will be a minimum of 1-1.5 metres in depth. Deeper ponds will be used to minimise the excavation area needed for the required volume.

The embankment that forms the sloped sides of the settlement ponds will be stabilised with vegetated turves, which will have been removed during the excavation of the settlement ponds area, or will be seeded after installation.

Settlement ponds will be located towards the end of swales, close to where the water will be reconverted to diffuse sheet flow. Upon exiting the settlement pond system, water will be immediately reconverted to diffuse flow via a fan-shaped rock apron if there is adequate space and ground conditions allow. Otherwise, a swale will be used to carry water exiting the settlement pond system to a level spreader to reconvert the flow to diffuse sheet flow.

A water level indicator such as a staff gauge will be installed in each settlement pond with marks to identify when sediment is at 10% of the settlement pond capacity. Sediment will be cleaned out of the still pond when it exceeds 10% of pond capacity. Settlement ponds will be inspected weekly and following rainfall events. Inlet and outlets will be checked for sediment accumulation and anything else that might interfere with flows.

4.2.6.1.8 *Dewatering Silt Bags*

Dewatering silt bags are made of a high quality geotextile fabric which allow the flow of water through them while trapping any silt or sediment suspended in the water. The silt bags provide a passive non-mechanical method of removing any remaining silt contained in the potentially silt-laden water collected from works areas within the site.

Dewatering silt bags are an additional drainage measure that can be used downgradient of the settlement ponds at the end of the drainage swale channels and will be located, wherever it is deemed appropriate, throughout the site. The water will flow, via a pipe, from the settlement ponds into the silt bag. The silt bag will allow the water to flow through the geotextile fabric and will trap any of the finer silt and sediment remaining in the water after it has gone through the previous drainage measures. The dewatering silt bags will ensure that there will be no loss of peaty silt into any watercourse.

The dewatering silt bags that will be used will be approximately three metres in width by 4.5 metres (see Plate 4.1 and Plate 4.2 below) in length and will be capable of trapping approximately four tonnes of silt.

Plate 4.1 Silt Bag with water being pumped through

Plate 4.2 Silt bag under inspection

4.2.6.1.9 *Siltbuster*

A "siltbuster" or similar equivalent piece of equipment will be available to filter any water pumped out of excavation areas if necessary, prior to its discharge to settlement ponds or swales.

Siltbusters are mobile silt traps that can remove fine particles from water using a proven technology and hydraulic design in a rugged unit. The mobile units are specifically designed for use on construction sites.

The unit stills the incoming water/solids mix and routes it upwards between a set of inclined plates for separation. Fine particles settle onto the plates and slide down to the base for collection, whilst treated water flows to an outlet weir after passing below a scum board to retain any floating material. The inclined plates dramatically increase the effective settling area of the unit giving it a very small footprint on site and making it highly mobile. Figure 4.3 below shows an illustrative diagram of the Siltbuster.

The Siltbuster units are now considered best practice for the management of dirty water pumped from construction sites. The UK Environment Agency and the Scottish Environmental Protection Agency have all recommended/specified the use of *Siltbuster* units on construction projects.

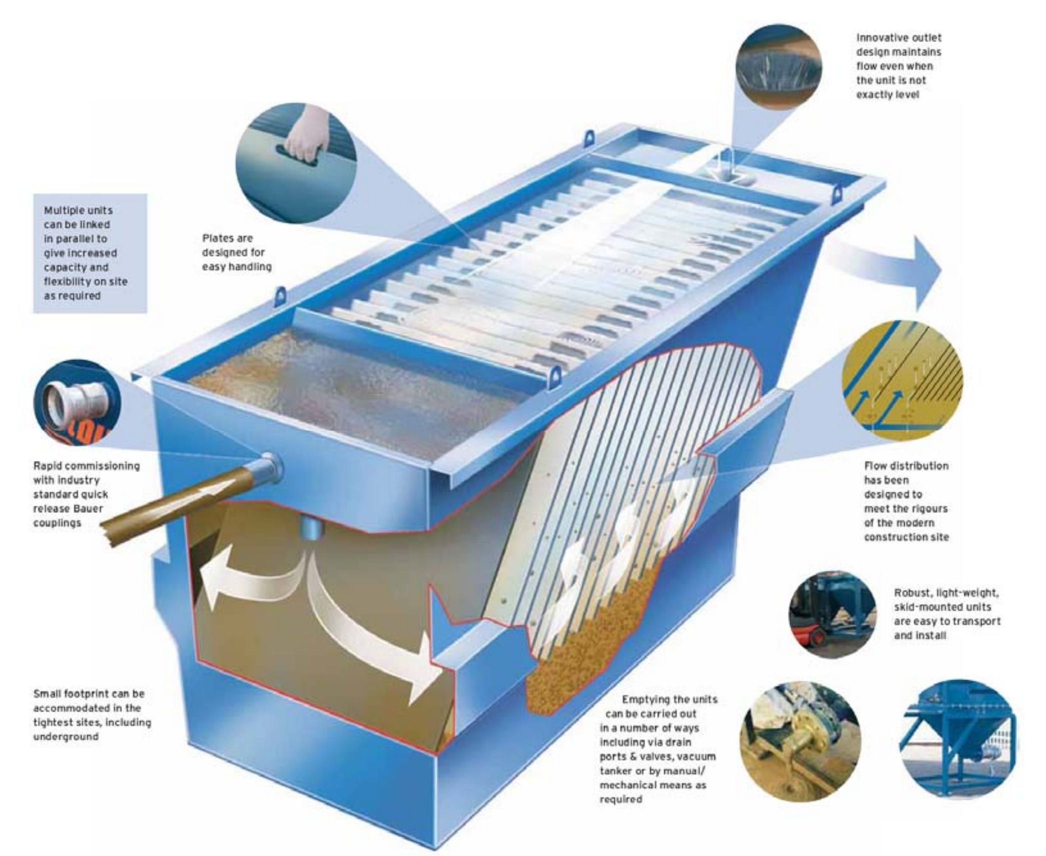


Figure 4.3 Siltbuster

4.2.6.1.10 *Culverts*

Where any new culverts of existing watercourses crossing are proposed, they will be the subject of consent applications to the Office of Public Works under Section 50 of the Arterial Drainage Act, 1945. Some culverts may be installed to manage drainage waters from works areas of the development, particularly where the waters have to be taken from one side of an existing roadway to the other for discharge. The size of culverts will be influenced by the depth of the track or road sub-base. In some cases, two, or more, smaller diameter culverts may be used where this depth is limited, though this will be avoided as they will have a higher associated risk of blockage than a single, larger pipe. In all cases, culverts will be oversized to allow mammals to pass through the culvert.

Culverts will be installed with a minimum internal gradient of 1% (1 in 100). Smaller culverts will have a smooth internal surface. Larger culverts may have corrugated surfaces which will trap silt and contribute to the stream ecosystem. Depending on the management of water on the downstream side of the culvert, large stone may be used to interrupt the flow of water. This will help dissipate its energy and help prevent problems of erosion. Smaller water crossings will simply consist of an appropriately sized pipe buried in the sub-base of the road at the necessary invert level to ensure ponding or pooling doesn't occur above or below the culvert and water can continue to flow as necessary.

All culverts will be inspected regularly to ensure they are not blocked by debris, vegetation or any other material that may impede conveyance.

4.2.6.1.11 *Silt Fences*

Silt fences will be installed as an additional water protection measure around existing watercourses in certain locations, particularly where works are proposed within the 50-metre buffer zone from natural watercourses, which is inevitable where existing roads in proximity to watercourses are to be upgraded as part of the development. These areas include around existing culverts, around the headwaters of watercourses, and the proposed locations are indicated on the site layout drawings included in Appendix 3.

Silt fences will be installed as single, double or a series of triple silt fences, depending on the space available and the anticipated sediment loading. The silt fence designs follow the technical guidance document *'Control of Water Pollution from Linear Construction Projects'* published by CIRIA (Ciria, No. C648, 1996). Up to three silt fences may be deployed in series as outlined in Figure 4.4.

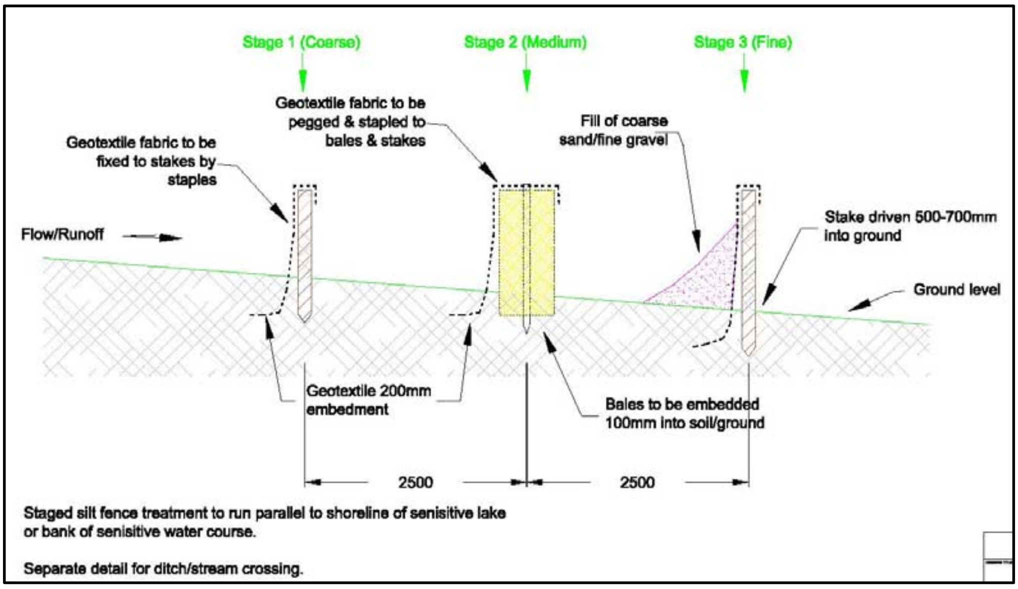


Figure 4.4 Silt Fence Detail

The Stage 1 (Coarse) silt fence will consist of a geotextile fabric such as Terram 1000 attached by staples to fixed stakes. The Terram sheets will be folded in an L shape with one metre extending horizontally in towards the works area. This horizontal section will be buried at a distance of approximately 150mm beneath a clean stone surface. Terram 1000 is a permeable fabric through which water can pass, but through which sediment particles cannot. It does however, impede water flow and can lead to the backing up of water and sediment, which reduce its effectiveness.

The Stage 2 (Medium) silt fence will consist of straw bales, embedded 100mm into the soil/ground and fixed in place with stakes. A geotextile fabric will be pegged and stapled to the straw bales and stakes.

The Stage 3 (Fine) silt fence will be similar to the Stage 1 fence, with the addition of a course sand and/or fine gravel at the base of the geotextile.

In the case of all three types of fence, the geotextile fabric will be embedded at least 150mm below the ground surface.

In a small number of locations around the site where space between the works areas and watercourses may be limited, silt fence designs will be combined to increase their effectiveness. For example, a straw bale silt fence (Stage 2) may be double wrapped with geotextile fabric (Stage 1) and course sand/fine gravel added on the upgradient side (Stage 3). See Figure 4.4. The most suitable type, number or combination of silt fences will be determined on a location specific basis for the various parts of the site. Site fences will be inspected regularly to ensure water is continuing to flow through the Terram, and the fence is not coming under strain from water backing up behind it.

4.2.6.2 Floating Road Drainage

In localised areas across the site, it may be necessary to construct some floating roads over peat. As outlined in the EIS, the floating road design will be used typically in areas with 2.0 metres of peat depth or greater. The most suitable type of road construction will be selected at the detailed design stage based on shear strength, slope, peat depth and factor of safety of the peat over which the road must traverse.

There will be no clean and dirty water drains constructed adjacent to floating roads as the additional loads imposed through the track could lead to underlying soft materials migrating to fill the created void, and potentially causing a weak point to be developed in the track. The drainage requirements are met by developing existing drains as clean water and dirty water drains and associated in line treatments.

Where sections of floating road are to be installed instead of excavated roads, cross drains will be installed beneath the road construction corridor to maintain existing clean water drainage paths. Large surface water drainage pipes will be placed at these locations below the level of the road sub-base. These drainage pipes will be extended each side of the road and cable trench construction corridor, along the paths of the existing drains.

With the exception of the installation of cross drains under the floating road corridor, minimal additional drainage will be installed to run parallel to the roads, in order to maintain the natural hydrology of the peatland areas over which the roads will be floated.

Floating roads minimise impact on the peat, particularly peat hydrology, and significantly reduce the volumes of peat requiring management as there is no excavation required and no peat arisings are generated.

4.2.6.3 Construction Compound Drainage

The principles of the drainage requirements in proximity to the construction compound are very similar to the principles adopted for access road and turbine base drainage.

Run-off from the construction compound will be controlled via a single outlet that will be installed at the edge of the compound. The single outfall point will be constructed to handle runoff from the compound and its immediate surrounds. Interceptor drains will already have been installed upgradient of the compound area before any excavation begins.

Run off from the single outlet point will be diverted via a drainage swale and on to a settlement pond prior to discharge over an area of vegetated ground.

4.2.6.4 Borrow Pit Drainage

While surface water will be contained in the borrow pit area, the design proposal is to control the level of water in the borrow pit area by creating a single point outlet from the basin-like area that will ensure the water does not overtop the pit area. Run-off from the borrow pit areas will be controlled via a single outlet that will be installed at the edge of the borrow pit. The single outfall point will be constructed to handle runoff from the borrow pit and its immediate surrounds. Interceptor drains will already have been installed upgradient of the borrow pit area before any extraction begins.
Run off from the single outlet point will be diverted via a drainage swale to a series of settlement ponds and onwards to a level spreader, which will convert concentrated flows in the drain, into diffuse sheet flow on areas of vegetated ground. The management of surface runoff from the peat disposal area by converting it to diffuse sheet flow removes the risk of contamination of surface water drains and removes the requirement for silt traps leading from this particular area.

During the construction phase of the project, it will be necessary to keep the borrow pit area free of standing water while rock is still being extracted. This will be achieved by using a mobile pump, which will pump water into the same series of drains, settlement ponds and level spreader, which will receive the water from the single outlet.

4.2.6.5 Tree Felling Drainage Controls

Mitigation measures which will reduce the risk of entrainment of suspended solids and nutrient release in surface watercourses comprise best practice methods which are set out as follows:

- Machine combinations will be chosen which are most suitable for ground conditions at the time of felling and to minimise soils disturbance;
- Use of buffer zones for aquatic zones (see Table 4.1 below);
- Checking and maintenance of roads and culverts will be on-going through any felling operation. No tracking of vehicles through watercourses will occur, as vehicles will use road infrastructure and existing watercourse crossing points. Where possible, existing drains will not be disturbed during felling works;
- Ditches which drain from the area to be felled towards existing surface watercourses will be blocked, and temporary silt traps will be constructed. No direct discharge of such ditches to watercourses will occur. Drains and sediment traps should be installed during ground preparation. Collector drains will be excavated at an acute angle to the contour (~0.3%-3% gradient), to minimise flow velocities. Main drains to take the discharge from collector drains will include water drops and rock armour, as required, where there are steep gradients, and should avoid being placed at right angles to the contour;
- Sediment traps will be sited outside of buffer zones and will have no direct outflow into the aquatic zone. Machine access will be maintained to enable the accumulated sediment to be excavated. Sediment will be carefully disposed of

away from all aquatic zones. Where possible, all new silt traps will be constructed on even ground and not on sloping ground;
- In areas, particularly sensitive to erosion, it may be necessary to install double or triple sediment traps. This measure will be reviewed on site during construction;
- All drainage channels will taper out before entering the aquatic buffer zone. This ensures that discharged water gently fans out over the buffer zone before entering the aquatic zone, with sediment filtered out from the flow by ground vegetation within the zone. On erodible soils, silt traps will be installed at the end of the drainage channels, to the outside of the buffer zone;
- Drains and silt traps will be maintained throughout all felling works, ensuring that they are clear of sediment build-up and are not severely eroded. Correct drain alignment, spacing and depth will ensure that erosion and sediment build-up are minimised and controlled;
- Brash mats will be used to support vehicles on soft ground, reducing peat and mineral soils erosion and avoiding the formation of rutted areas, in which surface water ponding can occur. Brash mat renewal should take place when they become heavily used and worn. Provision should be made for brash mats along all off-road routes, to protect the soil from compaction and rutting. Where there is risk of severe erosion occurring, extraction should be suspended during periods of high rainfall;
- Timber should be stacked in dry areas, and outside a local 50m stream buffer zone. Straw bales and check dams to be emplaced on the down gradient side of timber storage/processing sites;
- Works should be carried out during periods of no, or low rainfall, in order to minimise entrainment of exposed sediment in surface water run-off;
- Checking and maintenance of roads and culverts will be on-going through the felling operation;
- Refuelling or maintenance of machinery will not occur within 50m of an aquatic zone. Dedicated refuelling areas will be used during the felling works; and,
- Branches, logs or debris will not be allowed to build up in aquatic zones. All such material will be removed when harvesting operations have been completed, but care will be taken to avoid removing natural debris deflectors.

Table 4.1 Minimum Buffer Zone Widths (Forest Service, 2000)

Average slope leading to the aquatic zone		Buffer zone width on either side of the aquatic zone	Buffer zone width for highly erodible soils
Moderate	(0 – 15%)	10 m	15 m
Steep	(15 – 30%)	15 m	20 m
Very steep	(>30%)	20 m	25 m

The majority of the felling will be within and around the development footprint of turbine bases and access roads.

Best practice methods related to water incorporated into the forestry management and water quality protection measures will be derived from:

- Forestry Commission (2003) Forests and Water Guidelines, Fourth Edition. Publ. Forestry Commission, Edinburgh;
- Coillte (2009) Forest Operations & Water Protection Guidelines;
- Coillte (2009) Methodology for Clear Felling Harvesting Operations;

- Forest Service (2000): Forestry and Water Quality Guidelines. Forest Service, DAF, Johnstown Castle Estate, Co. Wexford; and,
- Forest Service, (2000): Code of Best Forest Practice – Ireland. Forest Service, DAF, Johnstown Castle Estate, Co. Wexford;

4.2.6.6 Cable Trench Drainage

Cable trenches are typically developed in short sections, thereby minimising the amount of ground disturbed at any one time, and minimising the potential for drainage runoff to pick up silt or suspended solids. Each short section of trench is excavated, ducting installed and bedded, and backfilled with the appropriate materials, before work on the next section commences.

To efficiently control drainage runoff from cable trench works areas, excavated material is stored on the upgradient side of the trench. Should any rainfall cause runoff from the excavated material, the material is contained in the downgradient cable trench. Excess subsoil is removed from the cable trench works area immediately upon excavation, and in the case of the development, would be transported to one of the on-site borrow pit disposal areas or used for landscaping and reinstatements of other areas elsewhere on site.

On steeper slopes, silt fences, as detailed in Section 4.2.6.1.11 above will be installed temporarily downgradient of the cable trench works area, or on the downhill slope below where excavated material is being temporarily stored to control run-off.

4.2.7 Drainage Maintenance

Drainage performance will form part of the civil works contract requirements. During the construction phase the effectiveness of drainage measures designed to minimise runoff entering works areas and capture and treatment of potentially silt-laden water from the works areas will be monitored periodically (daily, weekly, and event based monitoring, *i.e.* after heavy rainfall events as summarised in Section 5.2 below) by the ECoW and/or the Project Hydrologist. The ECoW will respond to changing weather and drainage conditions on the ground as the project proceeds, to ensure the effectiveness of the drainage design is maintained.

The abandonment triggers as set out in the SOWOR will be adopted as part of drainage inspections to ensure that any of the conditions prescribed under any abandonment trigger does not exist at the locations under inspection.

Regular inspections of all existing and installed drainage systems will be undertaken, especially after heavy rainfall, to check for blockages, and ensure there is no build-up of standing water within the system. Any excess build-up of silt levels at check dams, the settlement ponds, or any other drainage features that may decrease the effectiveness of the drainage feature, will be removed. For this reason, check dams will be inspected and maintained weekly during the construction phase of the project to insure adequate performance. Maintenance checks will also ensure the centre elevation of the dam remains lower than the sides of the dam.

Check dams will also be inspected weekly during the construction phase of the project and following rainfall events to ensure the structure of the dam is still effective in controlling flow. Any scouring around the edges of the check dams or overtopping of the dam in normal flow conditions will be rectified by reinforcement of the check dam. Drainage swales will be regularly inspected for evidence of erosion along the length of the swale. If any evidence of erosion is detected, additional check dams will be installed to limit the velocity of flow in the channel and reduce the likelihood of erosion occurring in the future.

A water level indicator such as a simple staff gauge or level marker will be installed in each settlement pond with marks to identify when sediment is at 50% of the pond's capacity. Sediment will be cleaned out of the settlement pond when it exceeds 50% of capacity. Settlement ponds will be inspected weekly during the construction phase of the project and following rainfall events. Inlet and outlets will be checked for sediment accumulation and anything else that might interfere with flows.

On completion of the civil and excavations works at the site, the frequency of inspections and monitoring of the drainage infrastructure will reduce to monthly as deemed appropriate by the ECoW

4.2.8 Operational Phase Drainage Management

The project hydrologist will inspect and review the drainage system after construction has been completed to provide guidance on the requirements of an operational phase drainage system. This operational phase drainage system will have been installed during the construction phase in conjunction with the road and hardstanding construction work as described below:

- Interceptor drains will be maintained up-gradient of all infrastructure to collect clean surface runoff, in order to minimise the amount of runoff reaching areas where suspended sediment could become entrained. It will then be directed through a series of in-line treatments prior to discharge.
- Swales/road side drains will be maintained to intercept and collect runoff from access roads and hardstanding areas of the site, likely to have entrained suspended sediment, and channel it to settlement ponds for sediment settling;
- Check dams will be maintained at regular intervals along interceptor drains and swales/roadside drains in order to reduce flow velocities and therefore minimise erosion within the system during storm rainfall events; and,
- Settlement ponds, emplaced downstream of swales and roadside drains, will buffer volumes of runoff discharging from the drainage system during periods of high rainfall, by retaining water until the storm hydrograph has receded, thus reducing the hydraulic loading to watercourses.

In operational phase of the wind farm, the reliance on the drainage system summarised above will become reduced as areas naturally revegetate. Once areas revegetate, this will result in a resumption of the natural drainage management that will have existed prior to any construction.

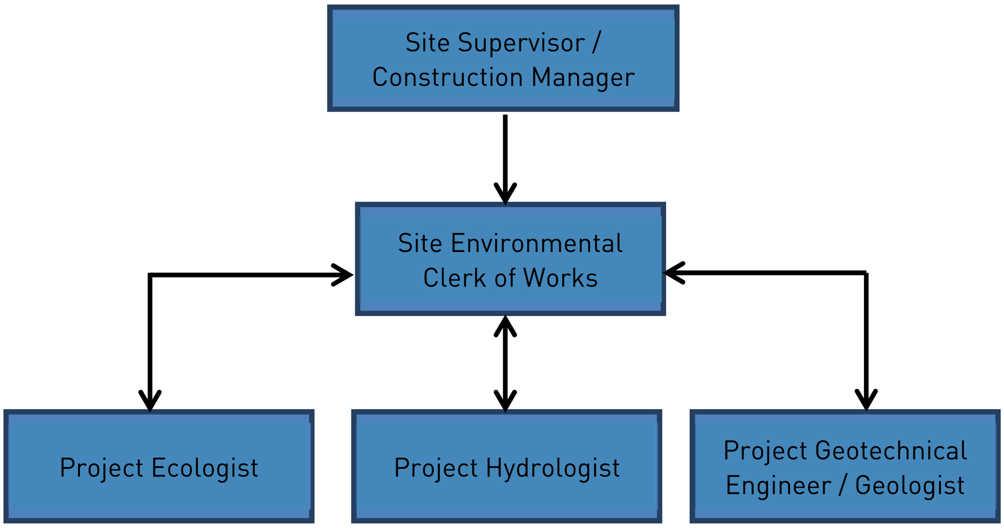
5 ENVIRONMENTAL MANAGEMENT IMPLEMENTATION

5.1 Roles and Responsibilities

The Site Supervisor/Construction Manager and/or Environmental Clerk of Works (ECoW) are the project focal point relating to construction-related environmental issues.

In general, the ECoW will maintain responsibility for monitoring the works and Contractors/Sub-contractors from an environmental perspective. The ECoW will act as the regulatory interface on environmental matters by reporting to and liaising with Cork County Council and other statutory bodies as required.

The ECoW will report directly to the Site Supervisor/Wind Farm Construction Manager. A Project Ecologist, Project Hydrologist and Project Geotechnical engineer will visit the site regularly and report to the Site Environmental Office. This structure provides a "triple lock" review/interaction by external specialists. An organogram structure for the construction stage is as follows:



Any requirement of the granted permission, for the works to be supervised by an engineer with professional indemnity insurance, who upon completion of the works, including site stability, shall certify the said works, will be adhered to. Such an engineer will be appointed to oversee and supervise the construction phase of the project.

5.1.1 Wind Farm Construction Manager/Site Supervisor

The Site Supervisor/Construction Manager will have overall responsibility for the organisation and execution of all related environmental activities as appropriate, in accordance with regulatory and project environmental requirements. The duties and responsibilities of the Site Supervisor/Construction Manager will include:

- Ensure that all works are completed safely and with minimal environmental risk;
- Approve and implement the Project CEMP and supporting environmental documentation, and ensure that all environmental standards are achieved during the construction phase of the project;

- Take advice from the ECoW on legislation, codes of practice, guidance notes and good environmental working practice relevant to their work;
- Ensure compliance through audits and management site visits;
- Ensure timely notification of environmental incidents; and,
- Ensure that all construction activities are planned and performed such that minimal risk to the environment is introduced.

5.1.2 Environmental Clerk of Works

The main contractor will be required to engage a qualified Environmental Engineer, Environmental Scientist, or equivalent, with experience in wind farm construction to fulfil the role of Environmental Clerk of Works (ECoW), and to monitor all site works and to ensure that methodologies and mitigation are followed throughout construction to avoid negatively impacting on the receiving environment.

The ECoW will report to the Site Supervisor/Construction Manager and will be responsible for the following:

- Preparation of the CEMP and supporting environmental documentation and review/approval of contractor method statements;
- Undertake inspections and reviews to ensure the works are carried out in compliance with the CEMP;
- Monitor the implementation of the CEMP, particularly all proposed/required Environmental Monitoring;
- Generate environmental reports as required to show environmental data trends and incidents and ensure environmental records are maintained throughout the construction period;
- Advise site management/contractor/sub-contractors on:
  - Prevention of environmental pollution and improvement to existing working methods;
  - Changes in legislation and legal requirements affecting the environment;
  - Suitability and use of plant, equipment and materials to prevent pollution;
  - Environmentally sound methods of working and systems to identify environmental hazards;
- Ensure proper mitigation measures are initiated and adhered to during the construction phase;
- Liaise with Project Ecologist, Project Hydrologist and Project Geotechnical Engineer to ensure regular site visits and audits/inspections are completed;
- Ensure adequate arrangements are in place for site personnel to identify potential environmental incidents;
- Ensure that details of environmental incidents are communicated in a timely manner to the relevant regulatory authorities, initially by phone and followed up as soon as is practicable by e-mail;
- Support the investigation of incidents of significant, potential or actual environmental damage, and ensure corrective actions are carried out, recommend means to prevent recurrence and communicate incident findings to relevant parties; and,
- Identify environmental training requirements, and arrange relevant training for all levels of site based staff/workers.
- The level, detail and frequency of reporting expected from the ECoW for the Construction Manager, developer's project manager, and any Authorities or other Agencies, will be agreed by all parties prior to commencement of

construction, and may be further adjusted as required during the course of the project.

5.1.3 Project Ecologist

The Project Ecologist will report to the ECoW and is responsible for the protection of sensitive habitats and species encountered during the construction phase of the wind farm. The Project Ecologist will not be full time on site but will visit the site as required during construction.

The responsibilities and duties of the Project Ecologist will include the following:

- Review and input to the final construction phase CEMP in respect of ecological matters;
- In liaison with ECoW, oversee and provide advice on all relevant ecology mitigation measures set out in EIS and planning permission conditions;
- Regular inspection and monitoring of the development, through all phases of construction/operation and provide ecological advice as required;
- Oversee the implementation of the Hen Harrier Conservation & Habitat Enhancement Plan in liaison with ECoW, developer and landowners; and,
- Carry out ecological monitoring and survey work as may be required by the planning authority.

5.1.4 Project Hydrologist

The Project Hydrologist will report to the ECoW and is responsible for inspection and review of drainage and water quality aspects associated with construction of the wind farm. The Project Hydrologist will not be full time on site but will visit the site at least once a month during construction.

The responsibilities and duties of the Project Hydrologist will include the following:

- Assist in compiling a detailed drainage design before construction commences and attend the site to set out and assist with micro siting of proposed drainage controls. This will be completed over several site visits at the start of the construction phase;
- Review and input to the final construction phase CEMP in respect of drainage and water quality management;
- Following the initial stage of drainage construction regular site visits will be required, at least once a month, to complete hydrological and water quality audits and reviews and report any issues noted to the Site Supervisor/Construction Manager; and,
- Complete ongoing inspection and monitoring of the development, particularly in areas of drainage control, through all phases of construction (including pre, during and post construction) and ensure construction is carried out as specified in the EIS, and in relevant planning conditions.

5.1.5 Project Geotechnical Engineer / Geologist

The Geotechnical Engineer or Project Geologist will report to the ECoW and is responsible for inspection and review of geotechnical aspects associated with construction of the wind farm. The Geotechnical Engineer will not be full time on site but will visit site at least once a month during construction phase.
The responsibilities and duties of the Geotechnical Engineer or Geologist will include the following:

- Visit site regularly, or at least once a month during the construction phase, to complete geotechnical audits and reviews and report any issues to the Site Supervisor/Construction Manager;
- Ensuring that identified hazards are listed in the Geotechnical Risk Register and that these are subject to ongoing monitoring; and,
- Ongoing inspection and monitoring of the development, particularly in areas of peatland and at borrow pits, and peat repository areas, through all phases of construction (including pre, during and post construction) and ensure construction is carried out as specified in the EIS, and in relevant planning conditions.

5.2 Water Quality and Monitoring

The water monitoring programme was prepared in accordance with the following legislation:

- S.I. No. 349 of 1989: European Communities (Environmental Impact Assessment) Regulations, and subsequent Amendments (S.I. No. 84 of 1995, S.I. No. 352 of 1998, S.I. No. 93 of 1999, S.I. No. 450 of 2000 and S.I. No. 538 of 2001), S.I. No. 30 of 2000, the Planning and Development Act, and S.I. 600 of 2001 Planning and Development Regulations and subsequent Amendments. These instruments implement EU Directive 85/373/EEC and subsequent amendments, on the assessment of the effects of certain public and private projects on the environment;
- S.I. No. 600 of 2001 Planning and Development Regulations, 2001;
- S.I. No. 94 of 1997 European Communities (Natural Habitats) Regulations, resulting from EU Directives 92/43/EEC on the conservation of natural habitats and of wild fauna and flora (the Habitats Directive) and 79/409/EEC on the conservation of wild birds (the Birds Directive);
- S.I. No. 293 of 1988 Quality of Salmon Water Regulations, resulting from EU Directive 78/659/EEC on the Quality of Fresh Waters Needing Protection or Improvement in order to Support Fish Life;
- S.I. No. 272 of 2009 European Communities Environmental Objectives (Surface Waters) Regulations 2009 and S.I. No. 722 of 2003 European Communities (Water Policy) Regulations which implement EU Water Framework Directive (2000/60/EC) and provide for implementation of 'daughter' Groundwater Directive (2006/118/EC). Since 2000 water management in the EU has been directed by the Water Framework Directive (WDF). The key objectives of the WFD are that all water bodies in member states achieve (or retain) at least 'good' status by 2015. Water bodies comprise both surface and groundwater bodies and the achievement of 'Good' status for these depends also on the achievement of 'good' status by dependent ecosystems. Phases of characterisation, risk assessment, monitoring and the design of programmes of measures to achieve the objectives of the WFD have either been completed or are ongoing. In 2015 it will fully replace a number of existing water related directives, which are successively being repealed, while implementation of other Directives (such as the Habitats Directive 92/43/EEC) will form part of the achievement of implementation of the objectives of the WFD;
- S.I. No. 41 of 1999 Protection of Groundwater Regulations, resulting from EU Directive 80/68/EEC on the protection of groundwater against pollution caused by certain dangerous substances (the Groundwater Directive);
- S.I. No. 249 of 1989 Quality of Surface Water Intended for Abstraction (Drinking Water), resulting from EU Directive 75/440/EEC concerning the quality required of surface water intended for the abstraction of drinking water in the Member States (repealed by 2000/60/EC in 2007);

- S.I. No. 439 of 2000 Quality of Water intended for Human Consumption Regulations and S.I. No. 278 of 2007 European Communities (Drinking Water No. 2) Regulations, arising from EU Directive 98/83/EC on the quality of water intended for human consumption (the Drinking Water Directive) and WFD 2000/60/EC (the Water Framework Directive);
- S.I. No. 272 of 2009 European Communities Environmental Objectives (Surface Waters) Regulations;
- S.I. No. 9 of 2010 European Communities Environmental Objectives (Groundwater) Regulations 2010; and,
- European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations 2009.

The water quality programme combines the use of laboratory analysis, water quality instrumentation and visual inspection to develop a comprehensive schedule of monitoring of all watercourse that exist both at the site and the surrounding area. The information collected by this schedule of water monitoring, particularly the continuous turbidity monitoring will inform the pre-commencement triggers in the SOWOR before works commence in an area. The use of continuous turbidity monitors both upstream and downstream of the site will provide instant data on the quality of water in which they are deployed and will be equipped with an alarm system to alert site management if a peak in turbidity occurs as set out in the SOWOR.

This water monitoring programme will be the subject of independent review by the supervising hydrologist who will provide the necessary guidance on the monitoring requirements. The water monitoring programme is outlined in the following sections.

5.2.1 Pre-Construction Drainage Inspection and Monitoring

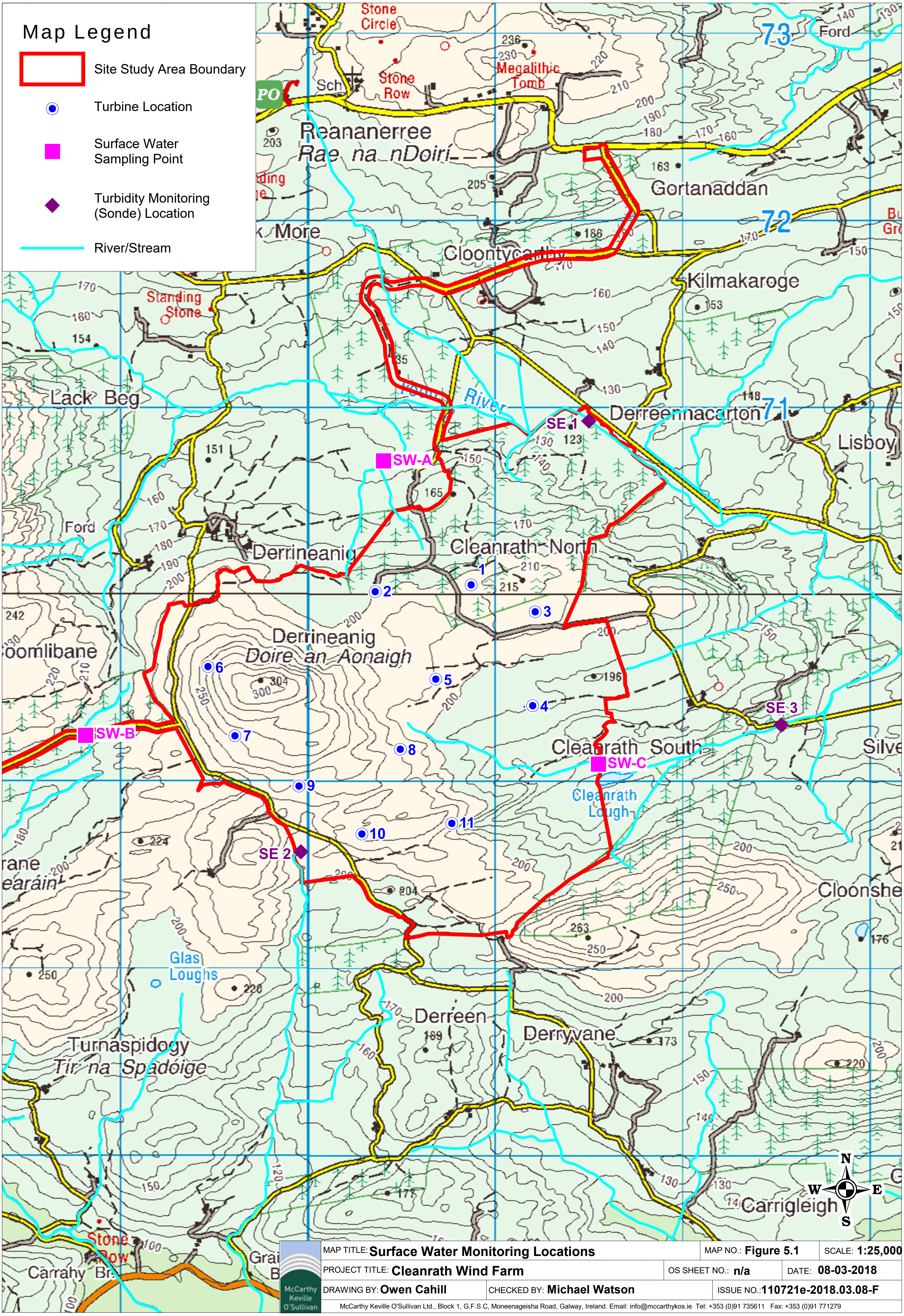
There is an existing drainage network across the site and runoff drains relatively freely to local watercourses and streams. This existing drainage system will continue to function as it is during the pre-construction phase.

However, prior to commencement of works in sub-catchments across the site main drain inspections will be competed to ensure ditches and streams are free from debris and blockages that may impede drainage. These inspections will be done on a catchment by catchment basis as the construction works develop across the site, as works in all areas will not commence simultaneously.

Monthly Laboratory Analysis Sampling: Baseline laboratory analysis for the parameters listed below with relevant regulatory limits and Environmental Quality Standards (EQSs) will be undertaken for each watercourse *e.g.* at SW1 – SW3 as outlined in Figure 5.1. This will not be restricted to just these three locations and further sampling points will be added as deemed necessary by the ECoW in consultation with the project hydrologist.

5.2.2 Construction Phase Drainage Inspection and Monitoring:

Inspection sheets and photographic records will be kept on site. Inspection points will include the in-situ field monitoring point locations and the laboratory analysis sampling points. Inspection points will depend on works being completed within the catchment upstream of the identified monitoring locations. Visual inspections will also be completed after major rainfall events, *i.e.* after events of >25mm rainfall in any 24-hour period and data including photographs will be collected by visual inspections and independently assessed by the supervising hydrologist who will monitor and advise on the records being received.



MAP TITLE: **Surface Water Monitoring Locations**	MAP NO.: **Figure 5.1**
	SCALE: **1:25,000**
PROJECT TITLE: **Cleanrath Wind Farm**	OS SHEET NO.: **n/a**
	DATE: **08-03-2018**
DRAWING BY: **Owen Cahill**	CHECKED BY: **Michael Watson**
	ISSUE NO.: **110721e-2018.03.08-F**

McCarthy Keville O'Sullivan Ltd., Block 1, G.F.S.C, Moneenageisha Road, Galway, Ireland. Email: info@mccarthykos.ie Tel: +353 (0)91 735611 Fax: +353 (0)91 771279

The following periodic inspection regime will be implemented:

- Daily general visual inspections of site operations and inspections of all watercourses within the site and in the surrounding area by the ECoW or a suitably qualified and competent person as delegated by the ECoW;
- Inspections to include all elements of drainage infrastructure to ensure the system is operating correctly and to identify and maintenance that is required. Any changes, such as discolouration, odour, oily sheen or litter should be noted and corrective action should be implemented. High risk locations such as settlement ponds will be inspected daily. Daily inspections checks will be completed on plant and equipment, and whether materials such as straw bales or oil absorbent materials need replacement;
- Event based inspections by the ECoW as follows:
    - >10 mm/hr (*i.e.* high intensity localised rainfall event);
    - >25 mm in a 24-hour period (heavy frontal rainfall lasting most of the day); or,
    - Rainfall depth greater than monthly average in 7 days (prolonged heavy rainfall over a week).
- Monthly site inspections by the Project Hydrologist/ ECoW during construction phase; and,
- Quarterly site inspections by the Project Hydrologist/ ECoW after construction for a period of one year following the construction phase.
- A written record will be maintained or available on-site within this Construction Environmental Management Plan (CEMP) which will be maintained on-site during the construction phase.

5.2.2.1 In-situ field monitoring:

Field chemistry measurements of unstable parameters, (pH, conductivity, dissolved oxygen and temperature) will be taken at all monitoring locations outlined in Figure 5.1. These analyses will be carried out by either the ECoW or the Project Hydrologist. In-situ field monitoring will be completed on a weekly basis. In-situ field monitoring will also be completed after major rainfall events, i.e. after events of >25mm rainfall in any 24-hour period. The supervising hydrologist will monitor and advise on the readings collected by in-situ field monitoring.

5.2.2.2 Monthly Laboratory Analysis Sampling

Laboratory analysis of a range of parameters with relevant regulatory limits and EQSs will continue throughout the construction phase for each watercourse *e.g.* at SW-A – SW-C as outlined in Figure 5.1. All samples will be sent for analysis to an independent laboratory. This sampling will also be completed on an event based basis, *i.e.* after major rainfall events (>25mm rainfall in any 24-hour period). The supervising hydrologist will monitor and advise on the readings being received from the testing laboratory.

5.2.2.3 Continuous Turbidity Monitoring

Turbidity monitors or sondes will be installed at locations surrounding the wind farm site as outlined in Figure 5.1. The sondes will provide continuous readings for turbidity levels in the watercourse. This equipment will be supplemented by daily visual monitoring at their locations as outlined in the sections below.

5.2.2.4 Monitoring Parameters

The analytical determinants of the monitoring programme (including limits of detection and frequency of analysis) will be as per S.I. No. 272 of 2009 European

Communities Environmental Objectives (Surface Waters) Regulations, S.I. No. 722 of 2003 European Communities (Water Policy) Regulations and European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations 2009. The likely suite of determinants will include:

- pH (field measured)
- Electrical Conductivity (field measured)
- Temperature (field measured)
- Dissolved Oxygen (field measured)
- Turbidity (NTU) (sonde measured)
- Flow (m/s)
- Total Suspended Solids (mg/l)
- Ammoniacal Nitrogen as NH3 (mg/l)
- Ammoniacal Nitrogen as NH4 (mg/l)
- Nitrite (NO2) (mg/l)
- Ortho-Phosphate (P) (mg/l)
- Nitrate (NO3) (mg/l)
- Phosphorus (unfiltered) (mg/l)
- Chloride (mg/l)
- BOD

5.2.3 Flow Monitoring

Condition 14 of the decision to grant planning permission for the development requires hydrological monitoring (water level and flow volume) within the Toon and the Lee catchments downstream of the Cleanrath Wind Farm site. The monitoring programme, which has been prepared by Hydro Environmental Services, a specialist hydrological, hydrogeological and environmental practice, has identified 6 no. monitoring points within both the Toon and Lee catchments. The location of the monitoring points will comprise of 3 no. existing and 3 no. additional monitoring points.
There are existing hydrological monitoring stations already in place at stations 19014, 19023, and 19043 within these catchments (Figure 5.2). Station 19014 is a gauged station, and the other two monitoring points are staff gauges. Eight of the eleven turbines for the Cleanrath Wind Farm are located in the Toon catchment, and the remaining 3 turbines are located within a sub-catchment of the River Lee, and also drains into Lough Allua. This lake in itself is a considerable buffer to flows and is a major attenuation feature within the overall Lee catchment upstream of the Gearagh Special Area of Conservation (SAC).

The existing hydrological monitoring on the catchments will provide historical data (at and in excess of 12 months) and it is proposed to use this data and supplement it with the 3 new stations as set out in Section 5.2.3.1 below. At least 12 flow monitoring records at each new gauge location will be taken by Hydro Environmental Services in the 3 months prior to construction in order to develop stage-discharge relationships at the monitoring locations. This will allow for a significant and appropriate level of flow and volume records to be compiled pre-construction. It is also proposed to continue the monitoring for 5 years post construction as required by the planning condition.

5.2.3.1 Proposed Hydrological Flow Monitoring

Three new locations are proposed (SW 1, SW 2, and SW 3). These will supplement the existing stations within the Lee and Toon catchments. The location of the proposed water level gauges stations may be the subject of micro siting of the locations shown on Figure 5.2 in order the best possible results. The monitoring devices will be OTT Orpheus mini probes (or equivalent) that record water level at selected/pre-programmed time intervals (15 minutes intervals). Brochures for this device, which is commonly used by OPW) are attached as Appendix 4. Example photographs of installed OTT monitoring device are included here as Plate 5.1 & 5.2

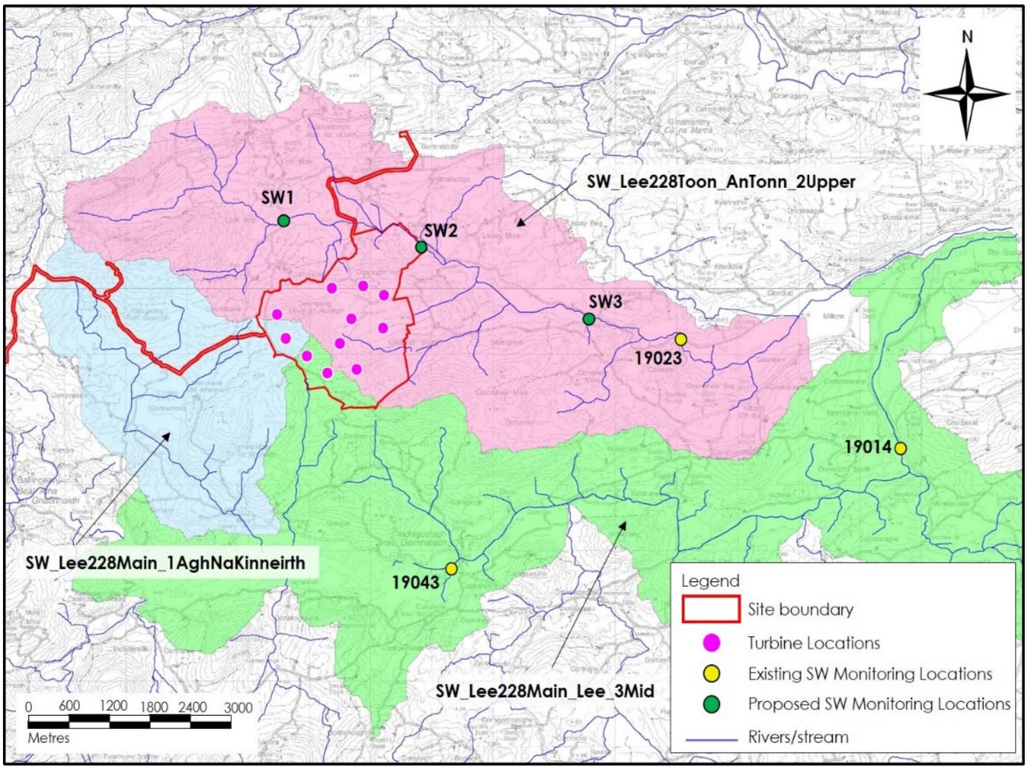


Figure 5.2 Proposed Gauging Station Locations

Plate 5.1 Example of Gauging Stations

Plate 5.2 Example of Gauging Stations

It is proposed to develop stage-discharge relationships at the monitoring locations by completing at least 12 flow monitoring records at each new gauge location in the first 3 months, and then supplementing these initial flow measurements with further monitoring when each future download is completed. The flow monitoring events will seek to provide a broad range of flows from low flow to high flow events, the latter being subject to health & safety restrictions.

It is proposed to download the devices every 3 months over the duration of the monitoring period. Once downloads are completed the data will be QA/QC checked, converted to flow volumes using the stage-discharge relationships, and a detailed monitoring report will be compiled. These reports will then be submitted to the Planning Authority.

5.2.3.2 Stage-Discharge Relationship

A stage-discharge relationship (or rating curve) is a curve, created using a number of individual measurements, which expresses the relationship between the stage (water level) and discharge (the flow) in an open channel at a given cross-section. In order to establish a rating curve, measurements are required over a range of flows. An example of a stage-discharge relationship is shown as Figure 5.3. A stage-discharge relationship allows continuous water level measurement to be converted to discharge (flow) volumes.

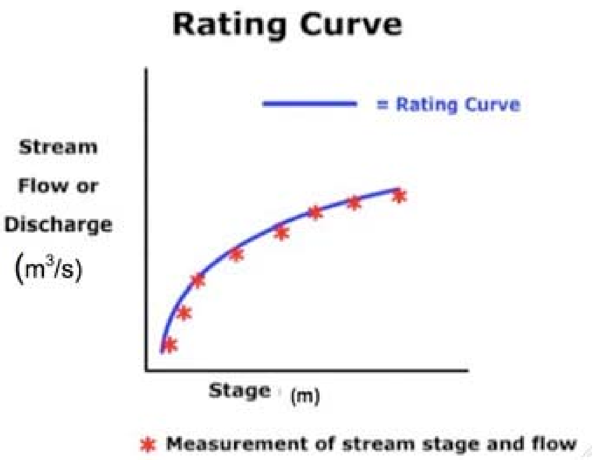


Figure 5.3 Example Rating Curve

5.2.3.3 Pre-commencement Monitoring Period

The proposed hydrological monitoring programme is considered extensive and far greater in scale and scope to those of other traditional wind farm or other projects. The proposal includes for a pre-construction monitoring period of 12 months data from the existing stations augmented with data from the proposed new monitoring stations of at least 3 months.

In order to provide a suitable level of pre-construction data, it is proposed to complete an initial intensive period of spot measurements (to develop stage-discharge relationships) and continuous water level monitoring over an initial period of 3 months. All data will then be collated and assessed at that time, and it is proposed to use the existing hydrological dataset from gauge 19014 (as a donor site) to supplement and extend (backwards for 12 months or in excess of 12 months as required) the data from the new gauge locations (SW 1, SW 2 and SW 3).
Flow monitoring will continue for a period of five years post commissioning of the wind farm and monitoring reports will continue to be made available to the Council for public inspection.
All pre-construction, construction phase, and 5 years post-construction, hydrological monitoring data collected data will be provided to Cork County Council in hard copy and digital formats. All final QA/QC verified digital data, from each phase of monitoring, will be provided on DVD and via a publicly accessible cloud-based database system/website.

5.2.4 Surface Water Monitoring Reporting

Visual inspection and laboratory analysis results of water quality monitoring shall assist in determining requirements for any necessary improvements in drainage controls and pollution prevention measures implemented on site.

It will be the responsibility of the Environmental Clerk of Works to present the ongoing results of water quality and weather monitoring at or in advance of regular site meetings.

Reports on water quality will consider all field monitoring and visual inspections, and results of laboratory analysis completed for that period. Reports will describe how the results compare with baseline data as well as previous reports on water quality. The reports will also describe whether any deterioration or improvement in water quality that has been observed, whether any effects are attributable to construction activities and what remedial measures or corrective actions have been implemented.

All water monitoring reports will be available to Cork County Council on request at any stage during the construction phase

5.2.5 Post-Construction Monitoring

Monthly sampling for laboratory analysis for a range of parameters as adopted during pre-commencement and construction phases will continue for 6 months after construction is complete. Flow monitoring will continue for a period of five years post commissioning of the wind farm. The supervising hydrologist will monitor and advise on the readings being received from the testing laboratory.

5.3 Environmental Awareness and Training

5.3.1 Environmental Induction

The Environmental Induction will be integrated into the general site induction on a case by case basis for each member of staff employed on-site depending on their assigned roles and responsibilities on site. Where necessary, the Environmental Induction will as a minimum include:

- A copy of the Environmental Management Site Plans and discussion of the key environmental risks and constraints;
- An outline of the CEMP structure;
- A discussion of the applicable Works Method Statement;
- The roles and responsibilities of staff, including contractors, in relation to environmental management; and,
- An outline of the environmental Incident Management Procedure.

5.3.2 Toolbox Talks

Tool box talks would be held by the ECoW/Construction Manager at the commencement of each day, or at the commencement of new activities. The aims of the tool box talks are to identify the specific proposed work activities that are scheduled for that day. In addition, the necessary work method statements and sub plans would be identified and discussed prior to the commencement of the day's activities. The toolbox talks will include training and awareness on:

- Ecological Sensitivities on site
- Buffers to be upheld – watercourses, archaeology, ecology
- Sediment and Erosion Control

- Good site practice
- On-site Traffic Routes and Rules
- Keeping to tracks – vehicle rules
- Strictly adhering to the development footprint
- Fuel Storage
- Materials and waste procedures

Site meetings would be held on a regular basis involving all site personnel. The objectives of a site meeting is to discuss the coming weeks proposed activities and identify the relevant work method statements and sub plans that will be relevant to that week's activities. Additionally, any non-compliance identified during the previous week would also be discussed with the aim to reduce the potential of the same non-compliance reoccurring.

6 EMERGENCY RESPONSE PLAN

An Emergency Response Plan (ERP) is presented in this section of the CEMP. It provides details of procedures to be adopted in the event of an emergency in terms of site health and safety and environmental protection.

6.1 Emergency Response Procedure

The Emergency Response Plan (ERP) is presented in this section of the CEMP. It provides details of procedures to be adopted in the event of an emergency. The site ERP includes details on the response required and the responsibilities of all personnel in the event of an emergency. The ERP will require updating and submissions from the contractor/PSCS and suppliers as the project progresses. Where sub-contractors that are contracted on site are governed by their own emergency response procedure a bridging arrangement will be adopted to allow for inclusion of the sub-contractor's ERP within this within this document.

This is a working document that requires updating throughout the various stages of the project.

6.1.1 Roles and Responsibilities

The chain of command during an emergency response sets out who is responsible for coordinating the response. The Site Manager, will lead the emergency response which makes him responsible for activating and coordinating the emergency response procedure. The other site personnel who can be identified at this time who will be delegated responsibilities during the emergency response are presented in Figure 6.1. In a situation where the Site Manager is unavailable or incapable of coordinating the emergency response, the responsibility will be transferred to the next person in the chain of command outlined in Figure 6.1. This will be updated throughout the various stages of the project.

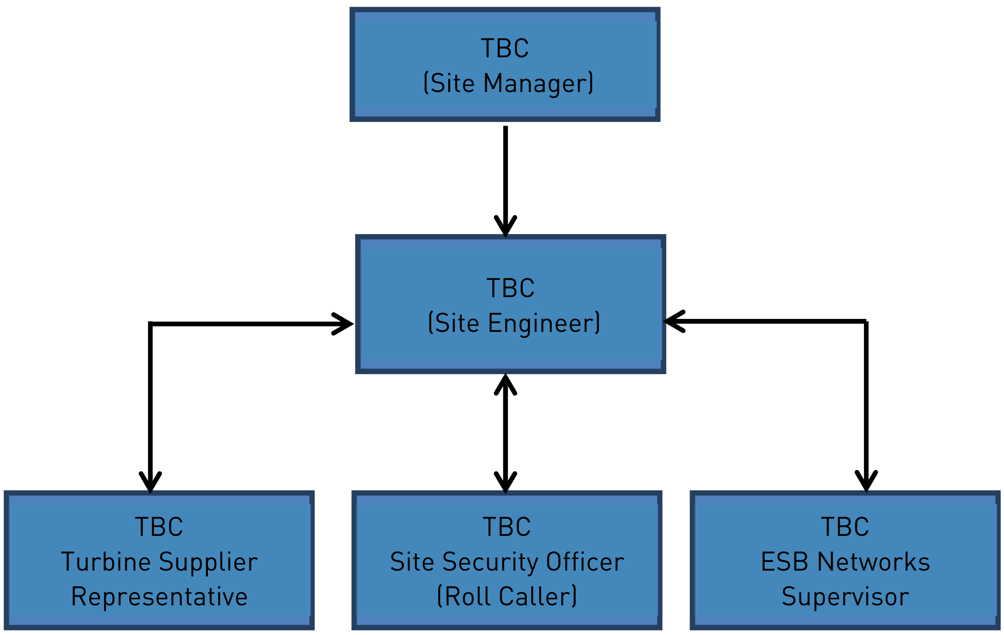


Figure 6.1 Emergency Response Procedure Chain of Command

6.1.2 Initial Steps

In order to establish the type and scale of potential emergencies that may occur, the following hazards have been identified as being potential situations that may require an emergency response in the event of an occurrence.

Table 6.1 Hazards associated with potential emergency situations

Hazard	Emergency Situation
Construction Vehicles: Dump trucks, tractors, excavators, cranes etc.	Collision or overturn which has resulted in operator or third-party injury.
Abrasive wheels/Portable Tools	Entanglement, amputation or electrical shock associated with portable tools
Contact with services	Electrical shock or gas leak associated with an accidental breach of underground services
Fire	Injury to operative through exposure to fire
Falls from heights including falls from scaffold towers, scissor lifts, and ladders	Injury to operative after a fall from a height
Sickness	Illness unrelated to site activities of an operative e.g. heart attack, loss of consciousness, seizure

In the event of an emergency situation associated with, but not restricted to, the hazards outlined in Table 6.1 the Site Manager will carry out the following:

- Establish the scale of the emergency situation and identify the number of personnel, if any, have been injured or are at risk of injury.
- Where necessary, sound the emergency siren/fog horn that activates an emergency evacuation on the site. The site evacuation procedure is outlined in Section 6.1.3.
- Make safe the area if possible and ensure that there is no identifiable risk exists with regard to dealing with the situation e.g. if a machine has turned over, ensure that it is in a safe position so as not to endanger others before assisting the injured.
- Contact the required emergency services or delegate the task to someone if he is unable to do so. If delegating the task, ensure that they follow the procedures for contacting the emergency services as set out in Section 6.2.1.
- Take any further steps that are deemed necessary to make safe or contain the emergency incident e.g. cordon off an area where an incident associated with electrical issues has occurred.
- Contact any regulatory body or service provider as required e.g. ESB Networks the numbers for which as provided in Section 6.2.2.
- Contact the next of kin of any injured personnel where appropriate. The procedure for this is outlined in Section 6.2.3.

6.1.3 Site Evacuation/Fire Drill

A site evacuation/fire drill procedure will provide basis for carrying out the immediate evacuation of all site personnel in the event of an emergency. The following steps will be taken:

- Notification of the emergency situation. Provision of a siren or fog horn to notify all personnel of an emergency situation.
- An assembly point will be designated in the construction compound area and will be marked with a sign. All site personnel will assemble at this point.
- A roll call will be carried out by the Site Security Officer to account for all personnel on site.
- The Site Security Officer will inform the Site Manager when all personnel have been accounted for. At this time, the Site Manager will decide the next course of action which be determined by the situation that exists at that time. The Site Manager will advise all personnel accordingly.

All personnel will be made aware of the evacuation procedure during site induction. The Fire Services Acts of 1981 and 2003 require the holding of fire safety evacuation drills at specified intervals and the keeping of records of such drills.

6.1.4 Excessive Peat Movement

Where there is excessive peat movement or continuing peat movement recorded at a monitoring location or identified at any location within the site but no apparent signs of distress to the peat (e.g. cracking, surface rippling) then the following shall be carried out.

1. All construction activities shall cease within the affected area.
2. Increased monitoring at the location shall be carried out. The area will be monitored, as appropriate, until such time as movements have ceased.
3. Re-commencement of limited construction activity shall only start following a cessation of movement and the completion of a geotechnical risk assessment by a geotechnical engineer.

6.1.5 Onset of Peat Slide

Where there is the onset or actual detachment of peat (e.g. cracking, surface rippling) then the following shall be carried out.

1. On alert of a peat slide incident, all construction activities will cease and all available resources will be diverted to assist in the required mitigation procedures.
2. Where considered possible action will be taken to prevent a peat slide reaching any watercourse. This will take the form of the construction of check barrages on land. Due to the terrain, the possible short run-out length to watercourses, speed of movement and the inability to predict locations it may not be possible to implement any on-land prevention measures, in this case a watercourse check barrage will be implemented.
3. For localised peat slides that do not represent a risk to a watercourse and have essentially come to rest the area will be stabilised initially by rock infill, if required. The failed area and surrounding area will then be assessed by the engineering staff and stabilisation procedures implemented. The area will be monitored, as appropriate, until such time as movements have ceased.

6.1.6 Spill Control Measures

Every effort will be made to prevent an environmental incident during the construction and operational phase of the project. Oil/Fuel spillages are one of the main environmental risks that will exist on the site which will require an emergency response procedure. The importance of a swift and effective response in the event of such an incident occurring cannot be over emphasised. The following steps provide the procedure to be followed in the event of such an incident.

- Stop the source of the spill and raise the alarm to alert people working in the vicinity of any potential dangers.
- If applicable, eliminate any sources of ignition in the immediate vicinity of the incident
- Contain the spill using the spill control materials, track mats or other material as required. Do not spread or flush away the spill.
- If possible, cover or bund off any vulnerable areas where appropriate such as drains, watercourses or sensitive habitats.
- If possible, clean up as much as possible using the spill control materials.
- Contain any used spill control material and dispose of used materials appropriately using a fully licensed waste contractor with the appropriate permits so that further contamination is limited.
- Notify the ECoW immediately giving information on the location, type and extent of the spill so that they can take appropriate action.
- The ECoW will inspect the site and ensure the necessary measures are in place to contain and clean up the spill and prevent further spillage from occurring.
- The ECoW will notify the appropriate regulatory body such as Cork County Council, Department of Communication, Energy and Natural Resources (DCENR) and Department of Environment, Community and Local Government (DECLG), if deemed necessary.

Environmental incidents are not limited to just fuel spillages. Therefore, any environmental incident must be investigated in accordance with the following steps.

- The ECoW must be immediately notified.
- If necessary, the ECoW will inform the appropriate regulatory authority. The appropriate regulatory authority will depend on the nature of the incident.
- The details of the incident will be recorded on an Environmental Incident Form which will provide information such as the cause, extent, actions and remedial measures used following the incident. The form will also include any recommendations made to avoid reoccurrence of the incident.
- If the incident has impacted on an ecologically sensitive receptor, such as a sensitive habitat, protected species or designated conservation site (pSPA or cSAC), the ECoW will liaise with the Project Ecologist.
- If the incident has impacted on a sensitive receptor such as an archaeological feature the ECoW will liaise with the Project Archaeologist.
- A record of all environmental incidents will be kept on file by the ECoW and the Main Contractor. These records will be made available to the relevant authorities such as Cork County Council, DCENR and DECLG if required.

The ECoW will be responsible for any corrective actions required as a result of the incident e.g. an investigative report, formulation of alternative construction methods or environmental sampling, and will advise the Main Contractor as appropriate.

6.2 Contacting the Emergency Services

6.2.1 Emergency Communications Procedure

In the event of requiring the assistance of the emergency services the following steps should be taken:

Stay calm. It's important to take a deep breath and not get excited. Any situation that requires 999/112 is, by definition, is an emergency. The dispatcher or call-taker knows that and will try to move things along quickly, but under control.

Know the location of the emergency and the number you are calling from. This may be asked and answered a couple of times but don't get frustrated. Even though many emergency call centres have enhanced capabilities meaning they are able to see your location on the computer screen they are still required to confirm the information. If for any reason you are disconnected, at least emergency crews will know where to go and how to call you back.

Wait for the call-taker to ask questions, then answer clearly and calmly. If you are in danger of assault, the dispatcher or call-taker will still need you to answer quietly, mostly "yes" and "no" questions.

If you reach a recording, listen to what it says. If the recording says your call cannot be completed, hang up and try again. If the recording says all call takers are busy, *WAIT*. When the next call-taker or dispatcher is available to take the call, it will transfer you.

Let the call-taker guide the conversation. He or she is typing the information into a computer and may seem to be taking forever. There's a good chance, however, that emergency services are already being sent while you are still on the line.

Follow all directions. In some cases, the call-taker will give you directions. Listen carefully, follow each step exactly, and *ask for clarification* if you don't understand.

Keep your eyes open. You may be asked to describe victims, suspects, vehicles, or other parts of the scene.

Do not hang up the call until directed to do so by the call taker.

Due to the remoteness of the site it may be necessary to liaise with the emergency services on the ground in terms of locating the site. This may involve providing an escort from a designated meeting point that may be located more easily by the emergency services. This should form part of the site induction to make new personnel and sub-contractors aware of any such arrangement or requirement if applicable.

6.2.2 Contact Details

A list of emergency contacts is presented in Table 6.2. A copy of these contacts will be included in the Site Safety Manual and in the site offices and the various site welfare facilities.

Table 6.2 Emergency Contacts

Contact	Telephone no.
Emergency Services – Ambulance, Fire, Gardaí	999/112
Doctor – Macroom Health Centre	026 20650
Hospital – Cork University Hospital	021 492 2000
ESB Emergency Services	1850 372 999
Bord Gáis Emergency	1850 20 50 50
Gardaí –Local Garda Station. Ballingeary	026 47002
Health and Safety Co-ordinator – Chris Murnane Mid-Cork Electrical Ltd	021 7336034
Health and Safety Authority	1890 289 389
Project Supervisor Construction Stage (PSCS): Mid-Cork Electrical Ltd	021 7336034
Project Supervisor Design Stage (PSDP): Ionic Consulting	01 8455031
Client. Cleanrath Windfarm Ltd	021 7336034

6.2.3 Procedure for Personnel Tracking

All operatives on site without any exception will have undergo a site induction where they will be required to provide personal contact details which will include contact information for the next of kin.

In the event of a site operative becoming in an emergency situation where serious injury has occurred and hospitalisation has taken place, it will be the responsibility of the Site Manager or next in command if unavailable to contact the next of kin to inform them of the situation that exists.

6.3 Induction Checklist

Table 6.3 provides a list of items highlighted in this ERP which must be included or obtained during the mandatory site induction of all personnel that will work on the site. This will be updated throughout the various stages of the project.

Table 6.3 Emergency Response Plan Items Applicable to the Site Induction Process

ERP Items to be included in Site Induction	Status
All personnel will be made aware of the evacuation procedure during site induction	
Due to the remoteness of the site it may be necessary to liaise with and assist the emergency services on the ground in terms of locating the site. This may involve providing an escort from a designated meeting point that may be located more easily by the emergency services. This should form part of the site induction to make new personnel and sub-contractors aware of any such arrangement or requirement if applicable.	
All operatives on site without any exception will have undergo a site induction where they will be required to provide personal contact details which will include contact information for the next of kin.	

7 MITIGATION PROPOSALS

All mitigation measures relating to the pre-commencement, construction and operational phases of the permitted development were set out in the relevant chapters of the EIS and all other relevant documents submitted as part of the planning permission application issued to Cork County Council.

This section of the CEMP groups together the mitigation measures presented in the EIS as well as Further Information submitted to Cork County Council and An Bord Pleanála. The Mitigation Measures are presented in the following pages.

By presenting the mitigation proposals in the below format, it is intended to provide an easy to audit list that can be reviewed and reported on during the future phases of the project. The tabular format in which the below information is presented, can be further expanded upon during the course of future project phases to provide a reporting template for site compliance audits

Table 7.1 Mitigation Measures

Reference No.	Reference	Mitigation Measure	Audit Result	Action Required
		Pre-Commencement Phase		
MM1	EIS Chapter 3	The on-site construction staff will be responsible for implementing the mitigation measures specified in the EIS and the CEMP. Their implementation will be overseen by supervising hydrogeologists, environmental scientists, ecologists or geotechnical engineers, depending on who is best placed to advise on the implementation.		
MM2	EIS Chapter 3	The removal and disposal of wastewater from the site will be carried out by a fully permitted waste collector holding valid Waste Collection Permits as issued under the Waste Management (Collection Permit) Regulations, 2007. Information on the appointed permitted contractor and evidence of a maintenance contract will be submitted to the Planning Authority prior to any construction works taking place.		
MM3	EIS Chapter 3, CEMP	All site activities will be provided for in an Construction Environmental Management Plan, prepared prior to the commencement of any operations onsite. The CEMP will set out all measures necessary to ensure works are carried out in accordance with the mitigation measures set out in the EIS, and will set out the monitoring and inspections procedures and frequencies.		
MM4	EIS Chapter 3	All materials and equipment necessary to implement the drainage measures outlined above, will be brought on-site in advance of any works commencing.		
MM5	EIS Chapter 3	The works programme for the groundworks part of the construction phase of the project will also take account of weather forecasts, and predicted rainfall in particular. Large excavations, large movements of overburden or large-scale overburden or soil stripping will be suspended or scaled back if heavy rain is forecast. The extent to which works will be scaled back or suspended will relate directly to the amount of rainfall forecast.		
MM6	EIS Chapter 3	Any underground services encountered along the cable route will be surveyed for level and the ducting will pass over the service provided adequate cover is available. A minimum		

		clearance of 300mm will be required between the bottom of the ducts and the service in question.		
MM7	EIS Chapter 5	A Habitat Restoration and Enhancement Plan will be prepared to restore and enhance areas of degraded blanket bog and acid flush habitat within the windfarm site. This will include restorations of areas of these habitats that are affected by temporary construction impacts.		
MM8	EIS Chapter 5	Even though works required for development are exempt from the condition stipulated in the Wildlife Acts, no felling of conifers, individual trees or bushes will be carried out during the general bird breeding season (the 1st of March to the 31st of August inclusive). In this way, disturbance to birds that have may have started to nest in any affected trees or bushes will be avoided. Any mature trees that are required to be felled will be assessed for the possible presence of roosting bats and felling plans will be adjusted to mitigate for any negative impacts that are identified. Although no Badger setts were identified during surveys of the footprint of the proposed development, pre-commencement surveys will be carried out at the sites of the turbines, road widening and construction routes, substation, borrow pits etc. If Badger sets are identified, Badger will be excluded using best practice under licence.		
MM9	EIS Chapter 5	The proposed development will not have significant impacts on Kerry Slug. However, in view of its conservation status, the Habitat Restoration and Enhancement Plan will include measures to create/enhance suitable habitat for Kerry Slug.		
MM10	EIS Chapter 11	▪ A structural engineer will assess bridges CH2 and CH8 along the proposed grid connection route prior to the commencement of development. ▪ The stepping stones in the river bed at CH8 will be preserved in situ. ▪ The remains of the stone structure at Grousemount (CH20) will be preserved in situ. This structure should be highlighted in the CEMP and will be fenced off from works prior to the commencement of development.		
MM11	EIS Chapter 11	The house structure (CH20) at Grousemount will be avoided as part of the construction works along the cable route and fenced off prior to development thus avoiding any potential direct impact.		

MM12	EIS Chapter 12	In the event of further scoping responses being received from telecoms operators, the comments of the consultees and any proposed mitigation measures will be considered in the construction and operation of the proposed development		
MM13	CEMP	Prior to the commencement of the proposed development a Construction Waste manager will be appointed by the project team. The Construction Waste Manager will be in charge of the implementation of the objectives of the plan, ensuring that all hired waste contractors have the necessary authorisations and that the waste management hierarchy is adhered to. The person nominated must have sufficient authority so that they can ensure everyone working on the proposed development adheres to the management plan.		
MM14	CCS	The wind farm developer has entered into a protocol agreement which will ensure that should any impacts or interference on radio or television or other telecommunications reception in the area arise it will be adequately dealt with.		
MM15	CEMP	To protect breeding birds, construction will not commence during the breeding bird season from April to July inclusive. Construction may commence at any stage from August onwards to the end of March, so that construction activities are ongoing by the time the next breeding bird season comes around, and can continue throughout the next breeding season.		
MM16	CEMP	An ECoW will oversee the site works and implementation of the Environmental Management Plan, and provide on-site advice on the mitigation measures as necessary to ensure the project proceeds as intended. The level, detail and frequency of reporting expected from the ECoW for the Construction Manager, developer's project manager, and any Authorities or other Agencies, will be agreed by all parties prior to commencement of construction, and may be further adjusted as required during the course of the project		
MM17	CEMP	The Environmental Induction will be integrated into the general site induction on a case by case basis for each member of staff employed on-site depending on their assigned roles and responsibilities on site.		
MM18	CCS	As part of the noise monitoring programme to be agreed with the Planning Authority prior to commencement, the details are set out as follows: ▪ Continuous noise monitoring will be required at three locations in the vicinity of the site.		

		▪ Baseline noise monitoring will be conducted using unattended noise logging instrumentation for a period of some 4 weeks or until a sufficient data set is collected.
		▪ Measurements will be taken externally at three locations.
		▪ All measurements will be conducted in line with the requirements imposed by Condition no. 7.
		▪ All measurements will be will conducted using Type 1 Precision Digital Sound Level Meters and associated hardware, for example:
		    ▪ - Bruel & Kjaer Type 2238 Sound Level Meter's (or similar) with environmental enclosure and proprietary double wind screens.
		▪ The instrument will have the following characteristics and features:
		    ▪ - Continuous noise monitoring in 10-minute sample durations.
		    ▪ - Each individual sample will consist of LA90 and LAeq parameters.
		▪ A rain gauge (in the form of a 0.2mm tipper bucket system) will be installed at one of the location for the duration of the noise monitoring period.		

Construction Phase				
Construction Management				
MM19	EIS Chapter 3	Only ready-mixed concrete will be used during the construction phase, with all concrete being delivered from local batching plants in sealed concrete delivery trucks. The use of ready-mixed concrete deliveries will eliminate any potential environmental risks of on-site batching. When concrete is delivered to site, only the chute of the delivery truck will be cleaned, using the smallest volume of water necessary, before leaving the site. Concrete trucks will be washed out fully at the batching plant, where facilities are already in place.		
MM20	EIS Chapter 3	The small volume of water that will be generated from washing of the concrete lorry's chute will be directed into a temporary lined impermeable containment area, or a Siltbuster-type concrete wash unit (http://www.siltbuster.com/sheets/RCW.pdf) or equivalent. This type of Siltbuster unit catches the solid concrete and filters and holds wash liquid for pH adjustment and further solids separation. The residual liquids and		

		solids can be disposed of off-site at an appropriate waste facility. Where temporary lined impermeable containment areas are used, such containment areas are typically built using straw bales and lined with an impermeable membrane.		
MM21	EIS Chapter 3, EIS Chapter 7	▪ The risks of pollution arising from concrete deliveries will be reduced by the following: ▪ Concrete trucks will not be washed out on the site, but will be directed back to their batching plant for washout. ▪ Site roads will be constructed to a high standard to allow transport of the turbine components around the site, and hence, concrete delivery trucks will be able to access all areas where the concrete will be needed. No concrete will be transported around the site in open trailers or dumpers so as to avoid spillage while in transport. All concrete used in the construction of turbine bases will be pumped directly into the shuttered formwork from the delivery truck. If this is not practical, the concrete will be pumped from the delivery truck into a hydraulic concrete pump or into the bucket of an excavator, which will transfer the concrete to the location where it is needed. ▪ The arrangements for concrete deliveries to the site will be discussed with suppliers before work starts, agreeing routes, prohibiting on-site washout and discussing emergency procedures ▪ Clearly visible signage will be placed in prominent locations close to concrete pour areas specifically stating washout of concrete lorries is not permitted on the site.		
MM22	EIS Chapter 3	Special procedures will be adopted in advance of and during all concrete pours to minimise the risk of pollution including. ▪ Using weather forecasting to assist in planning large concrete pours, and avoiding large pours where prolonged periods of heavy rain is forecast. ▪ Restricting concrete pumps and machine buckets from slewing over watercourses while placing concrete. ▪ Ensuring that excavations are sufficiently dewatered before concreting begins and that dewatering continues while concrete sets.		

		▪ Ensuring that covers are available for freshly placed concrete to avoid the surface washing away in heavy rain. ▪ Disposing of surplus concrete after completion of a pour in agreed suitable locations away from any watercourse or sensitive habitats.		
MM23	EIS Chapter 3	On-site refuelling of machinery will be carried out using a mobile double skinned fuel bowser. The fuel bowser, a double-axel custom-built refuelling trailer will be re-filled off site, and will be towed around the site by a 4x4 jeep to where machinery is located. It is not practical for all vehicles to travel back to a single refuelling point, given the size of the cranes, excavators, etc. that will be used during the construction of the proposed wind farm. The 4x4 jeep will also carry fuel absorbent material and pads in the event of any accidental spillages. The fuel bowser will be parked on a level area in the construction compound when not in use.		
MM24	EIS Chapter 3	Temporary port-a-loo toilets located within a staff portakabin will be used during the construction phase. Wastewater from staff toilets will be directed to a sealed storage tank, with all wastewater being tankered off site by permitted waste collector to wastewater treatment plants.		
MM25	OCWMP	All hazardous wastes will be stored in a roofed area in bunded containers before being collected by an authorised waste contractor and brought to an EPA licensed waste facility. Hazardous wastes will be kept separate from non-hazardous wastes so that contamination does not occur.		
MM26	OCWMP	Appropriate measures will be taken to ensure excess waste is not generated during construction, including; ▪ Ordering of materials should be on an 'as needed' basis to prevent over supply to site. Co-ordination is required with suppliers enabling them to take/buy back surplus stock. ▪ Purchase of materials pre-cut to length to avoid excess scrap waste generated on site. ▪ Request that suppliers use least amount of packaging possible on materials delivered to the site. ▪ Ensuring correct storage and handling of goods to avoid unnecessary damage that would result in their disposal		

		▪ Ensuring correct sequencing of operations. ▪ Use reclaimed materials in the construction works.		
MM27	CEMP	A detailed Waste Management Plan is included in Section 3.10 of the CEMP which outlines the best practice procedures during the excavation and construction phases of the project. The WMP will outline the methods of waste prevention and minimisation by recycling, recovery and reuse at each stage. Disposal of waste will be seen as a last resort.		
Drainage Design and Management				
MM28	EIS Chapter 7	Measures are to be incorporated into the design and construction of the access roads and turbine bases to prevent hydrological impacts to acid flush habitats outside the direct footprint of the proposed developed. These measures are as follows: ▪ Where flushes intersect access tracks there will be a requirement to form a drainage pathway within the stone fill make-up of the access track so that flush flows can be maintained. This can be achieved by making a section of the installed access track porous (free draining). Use of clean 4" - 6" crushed stone in a 300 mm to 400 mm layer at the base of access track will be sufficient to prevent flow impediment. A schematic of this arrangement is shown in Plate 7.3 and 7.4 in Chapter 7. ▪ An impermeable membrane will be installed above the porous fill within the track base to prevent vertical migration of surface water into the stone fill, and also to prevent finer material from the track surface layer being washed down and blocking the porous layer. ▪ There will be no discharge of surface water runoff from the wind farm construction areas, or hardstanding areas, directly into flush areas. ▪ All surface water runoff from the wind farm construction areas will be released onto natural vegetated surfaces away from flushes. ▪ Construction of access tracks in the area of flushes will be undertaken during dry periods, if possible.		
MM29	EIS Chapter 3	There will be no direct discharges to any natural watercourses, with all drainage waters being dispersed as overland flows or directly into artificial drainage ditches following the installation of silt traps, check dams and/or stilling ponds to these ditches. All		

		discharges, over land, from the proposed works areas will be made over vegetation filters at a minimum of 50 metres distance from natural watercourses. Where there is infrastructure proposed within 50 metres of a natural watercourse, stringent drainage measures will be put in place to ensure the protection of the water quality of the natural watercourse.		
MM30	EIS Chapter 3	Where artificial drains are currently in place in the vicinity of proposed works areas, these drains may have to be diverted around the proposed works areas to minimise the amount of water in the vicinity of works areas. Where it may not be possible to divert artificial drains around proposed work areas, the drains will be blocked to ensure potentially sediment laden water from the works areas has no direct route to other watercourses. Where drains have to be blocked, the blocking will only take place after an alternative drainage system to handle the same water has been put in place.		
MM31	EIS Chapter 3	Interceptor drains will be installed upgradient of any works areas to collect surface flow runoff and prevent it reaching excavations and construction areas of the site where it might otherwise have come into contact with exposed surfaces and picked up silt and sediment. The drains will be used to divert upslope runoff around the works area to a location where it can be redistributed over the ground surface as sheet flow. This will minimise the volume of potentially silty runoff to be managed within the construction area.		
MM32	EIS Chapter 3	A level spreader will be constructed at the end of each interceptor drain to convert concentrated flows in the drain, into diffuse sheet flow on areas of vegetated ground. The levels spreaders will be located downgradient of any works areas in locations where they are not likely to contribute further to water ingress to construction areas of the site.		
MM33	EIS Chapter 3	Piped slope drains will be used to convey surface runoff from diversion drains safely down slopes to flat areas without causing erosion. Once the runoff reaches the flat areas it will be reconverted to diffuse sheet flow. Level spreaders will only be established on slopes of less than 6% in grade. Piped slope drains will be used to transfer water away from areas where slopes are too steep to use level spreaders.		
MM34	EIS Chapter 3	Vegetation filters are the existing vegetated areas of land that will be used to accept surface water runoff from upgradient areas. The selection of suitable areas to use as vegetation filters will be determined by the size of the contributing catchment, slope and ground conditions.		

MM35	EIS Chapter 3	Drainage swales will be installed downgradient of any works areas to collect surface flow runoff where it might have come into contact with exposed surfaces and picked up silt and sediment. Swales will intercept the potentially silt-laden water from the excavations and construction areas of the site and prevent it reaching natural watercourses.		
MM36	EIS Chapter 3	The velocity of flow in the interceptor drains and drainage swales, particularly on sloped sections of the channel, will be controlled by check dams, which will be installed at regular intervals along the drains to ensure flow in the swale is non-erosive. Check dams will also be installed in some existing artificial drainage channels that will receive waters from works areas of the site.		
MM37	EIS Chapter 3	Stilling ponds will be used to attenuate runoff from works areas of the site during the construction phase, and will remain in place to handle runoff from roads and hardstanding areas of the proposed development during the operational phase. The purpose of the stilling ponds is to intercept runoff potentially laden with sediment and to reduce the amount of sediment leaving the disturbed area by reducing runoff velocity. Reducing runoff velocity will allow larger particles to settle out in the stilling ponds, before the run-off water is redistributed as diffuse sheet flow in filter strips downgradient of any works areas.		
MM38	EIS Chapter 3	Silt fences will be installed as an additional water protection measure around existing watercourses in certain locations, particularly where works are proposed within the 50-metre buffer zone from natural watercourses, which is inevitable where existing roads in proximity to watercourses are to be upgraded as part of the proposed development.		
MM39	EIS Chapter 3	A "siltbuster" or similar equivalent piece of equipment will be available to filter any water pumped out of excavation areas if necessary, prior to its discharge to settlement ponds or swales.		
MM40	EIS Chapter 3, CEMP	Dewatering silt bags are made of a high quality geotextile fabric which allow the flow of water through them while trapping any silt or sediment suspended in the water. The silt bags provide a passive non-mechanical method of removing any remaining silt contained in the potentially silt-laden water collected from works areas within the site		
MM41	EIS Chapter 3	Where sections of floating road are to be installed instead of excavated roads, cross drains will be installed beneath the road construction corridor to maintain existing clean water drainage paths. Large surface water drainage pipes will be placed at these locations		

		below the level of the proposed road sub-base. These drainage pipes will be extended each side of the proposed road and cable trench construction corridor, along the paths of the existing drains.		
MM42	EIS Chapter 3	To efficiently control drainage runoff from cable trench works areas, excavated material will be stored on the upgradient side of the trench. Should any rainfall cause runoff from the excavated material, the material is contained in the downgradient cable trench. Excess subsoil is removed from the cable trench works area immediately upon excavation, and in the case of the proposed development, would be transported to one of the on-site borrow pit disposal areas or used for landscaping and reinstatements of other areas elsewhere on site.		
MM43	EIS Chapter 3, CEMP	In the event that works are giving rise to siltation of watercourses, the environmental clerk of works or supervising hydrologist will stop all works in the immediate area around where the siltation is evident. The source of the siltation will be identified and additional drainage measures such as those outlined above will be installed in advance of works recommencing.		
MM44	EIS Chapter 7, CEMP	Best practice methods related to water incorporated into the forestry management and mitigation measures have been derived from: ▪ Forestry Commission (2004): Forests and Water Guidelines, Fourth Edition. Publ. Forestry Commission, Edinburgh; ▪ Coillte (2009): Forest Operations and Water Protection Guidelines; ▪ Coillte (2009): Methodology for Clear Felling Harvesting Operations; ▪ Forest Service (Draft): Forestry and Freshwater Pearl Mussel Requirements – Site Assessment and Mitigation Measures; and, ▪ Forest Service (2000): Forestry and Water Quality Guidelines. Forest Service, DAF, Johnstown Castle Estate, Co. Wexford.		
MM45	EIS Chapter 7	During the wind farm construction phase a self-imposed buffer zone of 50m will be maintained for all streams.		
MM46		Where tree felling is required in the vicinity of streams, the following additional mitigation measures will be employed.		

		- Machine combinations will be chosen which are most suitable for ground conditions at the time of felling, and which will minimise soils disturbance; - Checking and maintenance of roads and culverts will be on-going through any felling operation. No tracking of vehicle through watercourses will occur, as vehicles will use road infrastructure and existing watercourse crossing points. Where possible, existing drains will not be disturbed during felling works; - Ditches which drain from the proposed area to be felled towards existing surface watercourses will be blocked, and temporary silt traps will be constructed. No direct discharge of such ditches to watercourses will occur. Drains and sediment traps will be installed during ground preparation. Collector drains will be excavated at an acute angle to the contour (~0.3%-3% gradient), to minimise flow velocities. Main drains to take the discharge from collector drains will include water drops and rock armour, as required, where there are steep gradients, and should avoid being placed at right angles to the contour; - Sediment traps will be sited in drains downstream of felling areas. Machine access will be maintained to enable the accumulated sediment to be excavated. Sediment will be carefully disposed of in the peat disposal areas. Where possible, all new silt traps will be constructed on even ground and not on sloping ground; - In areas particularly sensitive to erosion, it may be necessary to install double or triple sediment traps. This measure will be reviewed on site during construction; - All drainage channels will taper out before entering the aquatic buffer zone. This ensures that discharged water gently fans out over the buffer zone before entering the aquatic zone, with sediment filtered out from the flow by ground vegetation within the zone. On erodible soils, silt traps will be installed at the end of the drainage channels, to the outside of the buffer zone;		

		▪ Drains and silt traps will be maintained throughout all felling works, ensuring that they are clear of sediment build-up and are not severely eroded. Correct drain alignment, spacing and depth will ensure that erosion and sediment build-up are minimized and controlled; ▪ Brash mats will be used to support vehicles on soft ground, reducing peat and mineral soils erosion and avoiding the formation of rutted areas, in which surface water ponding can occur. Brash mat renewal should take place when they become heavily used and worn. Provision should be made for brash mats along all off-road routes, to protect the soil from compaction and rutting. Where there is risk of severe erosion occurring, extraction should be suspended during periods of high rainfall; ▪ Timber will be stacked in dry areas, and outside a local 50m watercourse buffer. Straw bales and check dams to be emplaced on the down gradient side of timber storage/processing sites; ▪ Works will be carried out during periods of no, or low rainfall, in order to minimise entrainment of exposed sediment in surface water run-off; ▪ Checking and maintenance of roads and culverts will be on-going through the felling operation; ▪ Refuelling or maintenance of machinery will not occur within 100m of a watercourse. Mobile bowser, drip kits, qualified personnel will be used where refuelling is required; and, ▪ Branches, logs or debris will not be allowed to build up in aquatic zones. All such material will be removed when harvesting operations have been completed, but care will be taken to avoid removing natural debris deflectors.		
MM47	EIS Chapter 7	The following items shall be carried out during inspection pre-felling and after: ▪ Communication with tree felling operatives in advance to determine whether any areas have been reported where there is unusual water logging or bogging of machines; ▪ Inspection of all areas reported as having unusual ground conditions;		

		▪ Inspection of main drainage ditches and outfalls. During pre-felling inspection the main drainage ditches shall be identified. Ideally the pre-felling inspection shall be carried out during rainfall; ▪ Following tree felling all main drains shall be inspected to ensure that they are functioning; ▪ Extraction tracks nears drains need to be broken up and diversion channels created to ensure that water in the tracks spreads out over the adjoining ground; ▪ Culverts on drains exiting the site will be unblocked; and, ▪ All accumulated silt will be removed from drains and culverts, and silt traps, and this removed material will be deposited away from watercourses to ensure that it will not be carried back into the trap or stream during subsequent rainfall.		
MM48	EIS Chapter 7	The works programme for the initial construction stage of the development will also take account of weather forecasts, and predicted rainfall in particular. Large excavations and movements of peat/subsoil or vegetation stripping will be suspended or scaled back if heavy rain is forecast. The extent to which works will be scaled back or suspended will relate directly to the amount of rainfall forecast.		
MM49	EIS Chapter 7	Management of excavation seepages and subsequent treatment prior to discharge into the drainage network will be undertaken as follows: ▪ Appropriate interceptor drainage, to prevent upslope surface runoff from entering excavations will be put in place; ▪ If required, pumping of excavation inflows will prevent build up of water in the excavation; ▪ The interceptor drainage will be discharged to the site constructed drainage system or onto natural vegetated surfaces and not directly to surface waters; ▪ The pumped water volumes will be discharged via volume and sediment attenuation ponds adjacent to excavation areas, or via specialist treatment systems such as a Siltbuster unit;		

		▪ There will be no direct discharge to surface watercourses, and therefore no risk of hydraulic loading or contamination will occur; ▪ Daily monitoring of excavations by a suitably qualified person will occur during the construction phase. If high levels of seepage inflow occur, excavation work should immediately be stopped and a geotechnical assessment undertaken; and, ▪ A mobile 'Siltbuster' or similar equivalent specialist treatment system will be available on-site for emergencies in order to treat sediment polluted waters from settlement ponds or excavations should they occur. Siltbusters are mobile silt traps that can remove fine particles from water using a proven technology and hydraulic design in a rugged unit. The mobile units are specifically designed for use on construction-sites.		
MM50	EIS Chapter 7	An emergency plan for the construction phase to deal with accidental spillages will be contained within Environmental Management Plan. Spill kits will be available to deal with accidental spillages.		
MM51	EIS Chapter 7	▪ A self-contained port-a-loo with an integrated waste holding tank will be used at each of the site compounds, maintained by the providing contractor, and removed from site on completion of the construction works; ▪ Water supply for the site office and other sanitation will be brought to site and removed after use from the site to be discharged at a suitable off-site treatment location; and, ▪ No water will be sourced on the site, or discharged to the site.		
Flora and Fauna				
MM52	EIS Chapter 5	Detailed specifications for measures to be incorporated into the design and construction of the access roads and turbine bases will be used to prevent hydrological impacts to acid flush habitats outside the direct footprint of the proposed developed. These measures are as follows:		

		▪ Where flushes intersect access tracks there will be a requirement to form a drainage pathway within the stone fill make-up of the access track so that flush flows can be maintained. This can be achieved by making a section of the installed access track porous (free draining). Use of clean 4" - 6" crushed stone in a 300 mm to 400 mm layer at the base of access track will be sufficient to prevent flow impediment. A schematic of this arrangement is shown in Plate 7.3 and 7.4 in Chapter 7. ▪ An impermeable membrane will be installed above the porous fill within the track base to prevent vertical migration of surface water into the stone fill, and also to prevent finer material from the track surface layer being washed down and blocking the porous layer. ▪ There will be no discharge of surface water runoff from the wind farm construction areas, or hardstanding areas, directly into flush areas. ▪ All surface water runoff from the wind farm construction areas will be released onto natural vegetated surfaces away from flushes. ▪ Construction of access tracks in the area of flushes will be undertaken during dry periods, if possible.		
MM53	EIS Chapter 5	Felling will be carried out to ensure that the distance from the rotating blade tip of the turbine to the nearest part of the nearest trees will be a minimum of 50 m. This will require a horizontal felling distance from the edge of the remaining forestry to base of the turbine monopole of 70 m, even if the conifers present at the time of construction have not yet reached their final harvesting height. This mitigation measure is designed to avoid bats foraging in or close to planted conifers from coming into the close proximity of rotating turbines blades and is based on practice from the UK. Trees will not be replanted in the future within the felled areas. In areas of felling close to turbine bases brash will be removed from the site, where not required for the upgrade of existing roads and to prevent rutting of the ground surface during felling operations, and management will be put in place to keep the growth of regenerating scrubby/bushy vegetation down. This is intended to avoid the use of such areas by small prey species (i.e. of raptors like Hen Harrier), avoid the use of such areas for nesting by Hen Harrier, and avoid attracting bats to the areas close to wind turbines.		

MM54	EIS Chapter 7	Best guidance in relation to protection of freshwater pear mussel (FPM) sites will be followed from guidance document *Forestry and Freshwater Pearl Mussel Requirements – Site Assessment and Mitigation Measures (Draft).*		
MM55	Response to FI item 2	All mitigation measures as specified by the survey report and derogation licence will be implemented by the client. Compensation habitat will be provided to replace the relatively small area of habitat affected by the proposed development and no significant impact on Kerry slug populations is predicted to occur as a result of this development.		
MM56	CEMP	A baseline invasive species survey will be carried out at the wind farm site, grid connection route, haul route including all locations where accommodation works are required to accommodate turbine delivery to identify the presence and location of any invasive species (listed under the Third Schedule of the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. 477 of 2011) by a suitably qualified ecologist. If the presence of such species is found at or adjacent to the site, particularly in areas where its excavation may be required, an invasive species management plan will be prepared for the site to prevent the introduction or spread of any invasive species within the footprint of the works. An invasive species management plan, if required, will set out best practice control methods as summarised in section 3.9 of the CEMP.		
Peat, Subsoils and Bedrock				
MM57	EIS Chapter 6	Revise and amend the Geotechnical Risk Register as construction progresses.		
MM58	EIS Chapter 6	Once the required volume of rock has been extracted from the borrow pit areas, it is proposed to reinstate these areas with peat and overburden excavated from the works areas of the proposed development.		
MM59	EIS Chapter 6	Where possible, the acrotelm peat and / or top soil that has been excavated and not retained for reinstatement and landscaping works will be stored with the vegetated side facing up so as to promote the growth of vegetation across the surface of the stored peat within the borrow pit area.		
MM60	EIS Chapter 6	Where possible to mitigate impact on peat within the development.		

		▪ Placement of turbines and associated infrastructure in areas with shallower peat where possible; ▪ Use of the existing forestry road network to reduce peat excavation and borrow pit volumes; ▪ Use of floating roads (where geotechnically acceptable to do so) to reduce peat excavation volumes; ▪ The peat and subsoil which will be removed during the construction phase will be localised to the turbine location and access roads; ▪ No turbines or related infrastructure will be constructed in any designated sites such as NHAs or SACs; ▪ A minimal volume of peat and subsoil will be removed to allow for infrastructural work to take place in comparison to the total volume present on the site due to optimisation of the layout by mitigation by design; ▪ Construction of settlement ponds will be volume neutral, and all excess material will be used locally to form pond bunds and surrounding landscaping.		
MM61	EIS Chapter 6	Where possible to mitigate impact on soils within the development. ▪ Minimal refuelling or maintenance of construction vehicles or plant will take place on site. Off-site refuelling will occur at a controlled fuelling station; ▪ On site re-fuelling will be undertaken using a double skinned bowser with spill kits on the ready for accidental leakages or spillages; ▪ Fuels stored on site will be minimised. Storage areas where required will be bunded appropriately for the fuel storage volume for the time period of the construction and fitted with a storm drainage system and an appropriate oil interceptor; ▪ The electrical control building will be bunded appropriately to the volume of oils likely to be stored, and to prevent leakage of any associated chemicals and to groundwater or surface water. The bunded area will be fitted with a storm drainage system and an appropriate oil interceptor;		

		▪ The plant used during construction will be regularly inspected for leaks and fitness for purpose; and, ▪ An emergency plan for the construction phase to deal with accidental spillages will be contained within Environmental Management Plan. Spill kits will be available to deal with and accidental spillage in and outside the re-fuelling area. ▪ No refuelling will take place within watercourse buffers along the proposed grid connection cable route.		
MM62	EIS Chapter 6	Peat removed from turbine locations and access roads will be used for landscaping, cast aside and used for restoring the 2 no. proposed borrow pits. Where possible, the upper vegetative layer will be stored with the vegetation part of the sod facing the right way up to encourage growth of plants and vegetation at the surface of the peat used for reinstatement of the borrow pits. Re-seeding and spreading/planting of heather and moss cuttings will also be carried out in these areas. These measures will prevent erosion of stored peat in the long term. A full Peat Management Plan for the development is shown as Appendix 6.1.		
MM63	EIS Chapter 6	Any excess temporary mounded peat in storage for long periods will be covered by a polyethylene sheets or seeded at the earliest opportunity. This will prevent erosion of soil. Silt fences will be installed around stockpiles to limit movement of entrained sediment in surface water runoff. The use of bunds around earthworks and mounds will prevent egress of water from the works		
MM64	EIS Chapter 6	In order to minimize erosion of mineral subsoils stripping of peat will not take place during extremely wet periods (to prevent increased silt rich runoff). Temporary drainage systems will be required to limit runoff impacts during the construction phase.		
MM65	EIS Chapter 6	Brash mats will be used to support vehicles on soft ground, reducing peat and mineral soils erosion and avoiding the formation of rutted areas, in which surface water ponding can occur. Brash mat renewal will take place when they become heavily used and worn. Provision will be made for brash mats along all off-road routes, to protect the soil from compaction and rutting.		

MM66	CEMP	Borrow pits shall be excavated **to a depth not exceeding five metres** below existing ground level. Rock from the borrow pits shall be won only for the purposes of road/hardstand construction on the site, and shall not be sold or transported off site without a prior grant of planning permission.		
MM67	CEMP	A detailed Peat Management Plan is included in Section 3.4 of the CEMP which outlines the methodology by which peat will be handled and stored at the site. It includes a summary of the good construction practices which will be employed.		
MM68	CEMP	The following issues incorporated into the construction phase of the project will assist in the management of the risks for this site (AGEC, 2015): ▪ Appointment of experienced and competent contractors; ▪ The site should be supervised by experienced and qualified personnel; ▪ Allocate sufficient time for the project (be aware that decreasing the construction time has the potential to increase the risk of initiating a peat movement); ▪ Prevent undercutting of slopes and unsupported excavations; ▪ Maintain a managed robust drainage system; ▪ Prevent placement of loads/overburden on marginal ground; ▪ Set up, maintain and report readings from peat stability monitoring systems; ▪ Ensure construction method statements are followed or where agreed modified/ developed; and, ▪ Revise and amend the Geotechnical Risk Register as construction progresses.		
Air Quality/Dust				
MM69	EIS Chapter 3	Aggregate material for the construction of roads and turbine bases will be sourced onsite; therefore, there will be no need to transport this material to the site. Truck wheels will be washed to remove mud and dirt before leaving the site. All plant and materials vehicles shall be stored in the dedicated compound area. Areas of excavation will be kept to a minimum, and stockpiling will be minimised by coordinating excavation, spreading and		

		compaction. Construction traffic will be restricted to defined routes and a speed limit will be implemented.		
MM70	EIS Chapter 3, EIS Chapter 8	In periods of extended dry weather, dust suppression may be necessary along haul roads and around the borrow pit area to ensure dust does not cause a nuisance. If necessary, water will be taken from stilling ponds in the site's drainage system, and will be pumped into a bowser or water spreader to dampen down haul roads and site compounds to prevent the generation of dust. Silty or oily water will not be used for dust suppression, because this would transfer the pollutants to the haul roads and generate polluted runoff or more dust. Water bowser movements will be carefully monitored, as the application of too much water may lead to increased runoff.		
MM71	EIS Chapter 8	The wind farm development will utilise existing roads where possible to gain access to the proposed turbine locations and minimise the construction of additional roads through peat-based habitats.		
MM72	CEMP	A detailed plan for dust control is included in Section 3.7 of the CEMP which outlines the methodology by which dust levels will be controlled on site. It includes a summary of the good construction practices which will be employed.		
Noise				
MM73	EIS Chapter 4	Best practice measures for noise control will be adhered to onsite during the construction phase of the proposed development in order to mitigate the slight short-term negative impact associated with this phase of the development. The measures include: ▪ Sensitive location of equipment, taking account of local topography and natural screening. ▪ Working methods: construction noise will be controlled by prescribing that standard construction work will be restricted to the specified working hours. Any construction work carried out outside of these hours shall be restricted to activities that will not generate noise of a level that may cause a nuisance. The phasing of works has also been designed with regard to avoidance of noise impacts.		

		▪ Plant will be selected taking account of the characteristics of noise emissions from each item. All plant and machinery used on the site shall comply with E.U. and Irish legislation in relation to noise emissions. The timing of on- and off-site movements of plant near occupied properties will be controlled. ▪ Operation of plant: all construction operations shall comply with guidelines set out in British Standard documents 'BS 5338: Code of Practice for Noise Control on Construction and Demolition Sites' and 'BS5228: Part 1: 1997: Noise & Vibration Control on Construction and Open Sites'. The correct fitting and proper maintenance of silencers and/or enclosures, the avoidance of excessive and unnecessary revving of vehicle engines, and the parking of equipment in locations that avoid possible effects on noise-sensitive locations will be employed. ▪ Training and supervision of operatives in proper techniques to reduce site noise, and self-monitoring of noise levels, if appropriate.		
MM74	EIS Chapter 9	The contract documents will clearly specify that the Contractor undertaking the construction of the works will be obliged to take specific noise abatement measures and comply with the recommendations of *British Standard BS 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Noise.* These measures will ensure that: ▪ No plant used on site will be permitted to cause an on-going public nuisance due to noise. ▪ The best means practicable, including proper maintenance of plant, will be employed to minimise the noise produced by on site operations. ▪ All vehicles and mechanical plant will be fitted with effective exhaust silencers and maintained in good working order for the duration of the contract. ▪ Compressors will be attenuated models fitted with properly lined and sealed acoustic covers which will be kept closed whenever the machines		

		are in use and all ancillary pneumatic tools shall be fitted with suitable silencers. ▪ Machinery that is used intermittently will be shut down or throttled back to a minimum during periods when not in use. ▪ Any plant, such as generators or pumps, which is required to operate before 07:00hrs or after 19:00hrs will be surrounded by an acoustic enclosure or portable screen. ▪ During the course of the construction programme, supervision of the works will include ensuring compliance with the limits detailed in Table 9.1 using methods outlined in British Standard BS 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Noise.		
MM75	EIS Chapter 9	The methods used to minimise complaints on air overpressure could consist of some or all of the following: ▪ Restriction of hours within which blasting can be conducted (e.g. 09:00 – 18:00hrs). ▪ A publicity campaign undertaken before any work and blasting starts (e.g. 24 hour written notification). ▪ The firing of blasts at similar times to reduce the 'startle' effect. ▪ On-going circulars informing people of the progress of the works. ▪ The implementation of an onsite documented complaints procedure. ▪ The use of independent monitoring by external bodies for verification of results. ▪ Trial blasts in less sensitive areas to assist in blast designs and identify potential zones of influence.		
MM76	EIS Chapter 9	Specific to blasting the following mitigation measures will be employed to control the vibration impact during blasts: ▪ Trial blasts will be undertaken to obtain scaled distance analysis;		

		▪ Ensuring appropriate burden to avoid over or under confinement of the charge; ▪ Accurate setting out and drilling; ▪ Appropriate charging; ▪ Appropriate stemming with appropriate material such as sized gravel or stone chipping; ▪ Delay detonation to ensure small maximum instantaneous charges; ▪ Decked charges and in-hole delays; ▪ Blast monitoring to enable adjustment of subsequent charges; ▪ Good blast design to maximise efficiency and reduce vibration; ▪ Avoid using exposed detonating cord on the surface.		
MM77	CEMP	A detailed plan for noise control is included in Section 3.8 of the CEMP which outlines the methodology by which noise levels will be controlled on site. It includes a summary of the good construction practices which will be employed.		
Cultural Heritage				
MM78	EIS Chapter 11	▪ If archaeological features or finds are encountered during site works the archaeologist shall report the findings to the relevant authorities to discuss a suitable means of preservation of the features (preservation by record or *in situ* may be required). A report on the monitoring will be submitted to the Local Authorities and DAHG. The archaeologist should be licensed by the DAHG to allow any uncovered features to be dealt with appropriately.		
MM79	EIS Chapter 11	▪ The buffer zones and fencing should be established by an archaeologist prior to the commencement of site works.		
Traffic				
MM80	EIS Chapter 12	Prior to the construction stage a detailed traffic management plan will be prepared by the haulage company and submitted to Cork County Council for approval. The plan will include:		

		▪ A delivery schedule, ▪ Details of the alterations required to the infrastructure identified in this report and any other minor alteration identified (hedge rows etc), ▪ A dry run of the route using vehicles with similar dimensions.		
MM81	EIS Chapter 12	All of the deliveries comprising abnormally large loads will be made outside the normal peak traffic periods to avoid disruption to work and school related traffic.		
MM82	EIS Chapter 12	At locations where the grid connection crosses rivers/local steams by means of culverts/small bridges, the cable will be set under the river bed and on the days that directional drilling takes place these locations may be closed to traffic. Where required, the closure will take place for a maximum of 1 day at each location with local diversions and associated signing implemented on these days.		
MM83	EIS Chapter 4	Aggregate materials for the construction of any additional site tracks will be obtained from the permitted and proposed borrow pits on the site of the proposed development. This will significantly reduce the number of delivery vehicles required to access the site.		
MM84	EIS Chapter 3	Due to the volume of concrete required for each turbine foundations, and the requirement for the concrete pours to be continuous, deliveries are often carried out outside normal working hours in order to limit the traffic impact on other road users, particularly peak period school and work commuter traffic. Such activities are limited to the day of turbine foundation concrete pours, which are complete in a single day per turbine.		
MM85	EIS Chapter 3	Wheels or vehicle underbodies are often washed before leaving sites to prevent the build-up of mud on public (and site) roads. It is not anticipated that vehicle or wheel washing will be required as part of the construction phase of the proposed development because site roads will be already formed using on-site materials before other road-going trucks begin to make regular or frequent deliveries to the site (e.g. with steel or concrete). The site roads will be well finished with compacted hardcore, and so the public road-going vehicles will not be travelling over soft or muddy ground where they might pick up mud or dirt. A road sweeper will be available if any section of the public roads were to be dirtied by trucks associated with the proposed development.		

Operational Phase				
MM86	CEMP	The project hydrologist will inspect and review the drainage system after construction has been completed to provide guidance on the requirements of an operational phase drainage system. This operational phase drainage system will have been installed during the construction phase in conjunction with the road and hardstanding construction work and is described in Section 4.2. of the CEMP.		

8 MONITORING PROPOSALS

All monitoring proposals relating to the pre-commencement, construction and operational phases of the permitted development were set out in the relevant chapters of the Environmental Impact Statement (EIS) submitted as part of the original planning permission application, and subsequent responses to further information request issued by Cork County Council.

This section of the Construction and Environment Management Plan groups together all of the monitoring proposals presented in the EIS as well Further Information submitted to Cork County Council and An Bord Pleanála. The monitoring proposals are presented in the following pages.

By presenting the monitoring proposals in the below format, it is intended to provide an easy to audit list that can be reviewed and reported on during the future phases of the project. The tabular format in which the below information is presented, can be further expanded upon during the course of future project phases to provide a reporting template for site compliance audits.

Table 8.1 Schedule of Monitoring Measures

Ref. No.	Reference	Survey/Monitoring Measure	Frequency	Reporting Measures	Responsibility
Pre-Commencement Phase					
MX1	EIS Chapter 7	An inspection and maintenance plan for the on-site drainage system will be prepared in advance of commencement of any works. Regular inspections of all installed drainage systems will be undertaken, especially after heavy rainfall, to check for blockages, and ensure there is no build-up of standing water in parts of the systems where it is not intended. Inspections will also be undertaken after tree felling.	Once	Monthly	ECoW
MX2	EIS Chapter 7	Sampling will be completed before, during (if the operation is conducted over a protracted time) and after any felling activity. The 'before' sampling should be conducted within 4 weeks of any felling activity, preferably in medium to high water flow conditions. The "during" sampling will be undertaken once a week or after rainfall events. The 'after' sampling will comprise as many samplings as necessary to demonstrate that water quality has returned to pre-activity status (*i.e.* where an impact has been shown).	As required	Monthly	ECoW
MX3	Response to FI item 3	Otter surveys to be undertaken at all locations where the proposed construction footprint occurs in close proximity or crosses watercourses. Watercourses will be searched for a distance of 150m adjacent to any works or crossing point. Survey reports will be sent to the planning authority and to the NPWS for review.	Once, Pre-commenceme nt	On Completion	Project Ecologist
MX4	Ecological Monitoring Plan	All proposed works areas will be walked for signs of badger or badger setts, including a 150m buffer around each turbine.			

Ref. No.	Reference	Survey/Monitoring Measure	Frequency	Reporting Measures	Responsibility
MX5	Ecological Monitoring Plan	Pre-commencement bird surveys will be undertaken immediately prior to the initiation of works at the wind farm site and will comprise one round of thorough walkover surveys to cover the entire development footprint and 500m buffer thereof. Surveys will aim to establish the presence of any hen harrier or merlin at the site or any evidence of usage by these species during the breeding season. Reporting will be undertaken following the completion of each field season and issued to the planning authority and the National Parks and Wildlife Service (NPWS) as per Condition 12.	As required	As required	Project Ornithologist
MX6	Ecological Monitoring Plan	A Kerry Slug Management Plan was provided as part of the application documentation and will be implemented in full. The licence requires that the following actions are undertaken: ▪ Pre-construction walkover surveys of areas of suitable habitat within the construction footprint as identified in previous surveys for the species. ▪ Pre-construction removal of slugs from areas of suitable habitat and translocation to areas of suitable habitat.	Once, Pre-commenceme nt	On Completion	Project Ecologist
Construction Phase					
MX7	EIS Chapter 7	During the construction phase field testing and laboratory analysis of a range of parameters with relevant regulatory limits and EQSs should be undertaken for each primary watercourse, and specifically following heavy rainfall events (*i.e.* weekly, monthly and event based).	As required	Monthly	ECoW
MX8	EIS Chapter 7	Sampling will be done before, during (if the operation is conducted over a protracted time) and after the construction works. The 'before' sampling should be conducted within 4 weeks prior to the construction work beginning, preferably in medium to high water flow conditions. The "during" sampling will	As required	Monthly	ECoW

Ref. No.	Reference	Survey/Monitoring Measure	Frequency	Reporting Measures	Responsibility
		be undertaken once a week or after rainfall events. The 'after' sampling should comprise as many samplings as necessary to demonstrate that water quality has returned to pre-activity status (*i.e.* where an impact has been shown). Criteria for the selection of water sampling points include the following: • Avoid man-made drains and watercourses without all-year flow; • Select sampling points upstream and downstream of the works; • It is advantageous if the upstream location is outside/above the site in order to evaluate the impact of land-uses other than the development works; and, • Where possible, three downstream locations should be selected: one immediately below the working area, the second at exit from the site boundary, and the third some distance from the second (this allows demonstration of no impact through dilution effect or contamination by other land-uses where impact increases at third downstream location relative to second downstream location).			
MX9	Response to FI item 18, CEMP	A detailed water quality monitoring programme will be monitored independently by the supervising hydrologist who will provide the necessary guidance on the monitoring requirements.	On going	Monthly	ECoW
MX10	CEMP	Daily and weekly inspections by the Site Environmental Clerk of Works (ECoW) or a suitably qualified and competent person as delegated by the ECoW will be recorded for review as part of the environmental auditing process detailed in Section 9.2 of the CEMP.	On going	Monthly	ECoW

Ref. No.	Reference	Survey/Monitoring Measure	Frequency	Reporting Measures	Responsibility
MX11	CEMP	The effectiveness of drainage measures designed to minimise runoff entering works areas and capture and treat silt-laden water from the works areas, will be monitored continuously by the ECoW	On going	Monthly	ECoW
MX12	EIS Chapter 4	Check dams will be inspected and maintained regularly to insure adequate performance. Maintenance checks will also ensure the centre elevation of the dam remains lower than the sides of the dam.	As Required	As Necessary	ECoW
MX13	EIS Chapter 4	Inspection and maintenance of all stilling ponds will be ongoing through the construction period. A water level indicator such as a staff gauge will be installed in each stilling pond with marks to identify when sediment is at 10% of the settlement pond capacity. Sediment will be cleaned out of the still pond when it exceeds 10% of pond capacity.	As Required	As Necessary	ECoW
MX14	EIS Chapter 4	All culverts will be inspected regularly to ensure they are not blocked by debris, vegetation or any other material that may impede conveyance.	Weekly / Monthly	As Necessary	ECoW
MX15	EIS Chapter 9	Regular inspections of all installed drainage systems will be undertaken, especially after heavy rainfall, to check for blockages, and ensure there is no build-up of standing water in parts of the systems where it is not intended. Inspections will also be undertaken after tree felling.	Weekly Monthly	As Necessary	ECoW
MX16	EIS Chapter 11	Pre-development archaeological testing of proposed roads, turbine bases, hardstands, borrow pits, substation, compound etc should be undertaken where areas are not located in forestry. A report on the results should be submitted to the Planning Authority and DAHG prior to commencement of development. This excludes T6 and associated road as this was already tested under licence in 2011 by the same author.	As Required	On Completion	Project Archaeologist

Ref. No.	Reference	Survey/Monitoring Measure	Frequency	Reporting Measures	Responsibility
MX17	EIS Chapter 8, 9 CEMP	The plant used should be regularly inspected for leaks and fitness for purpose.	Daily	As Necessary	Plant Operators / ECoW
MX18	EIS Chapter 11	Archaeological monitoring of all ground works (to include site investigations, access roads, substation, turbine hardstands and bases and proposed cable route should be undertaken at the construction stage of the development.	As Required	On Completion	Project Archaeologist
MX19	EIS Chapter 11	If archaeological features or finds are encountered during site works the archaeologist shall report the findings to the relevant authorities to discuss a suitable means of preservation of the features (preservation by record or in situ may be required). A report on the monitoring will be submitted to the Local Authorities and DAHG. The archaeologist should be licensed by the DAHG to allow any uncovered features to be dealt with appropriately.	As Required	On Completion	Project Archaeologist
MX20	EIS Chapter 11	Archaeological testing in unforested areas is recommended followed by archaeological monitoring at the construction stage of the development (to include the cable route, in particular in the vicinity of the two nearest Recorded Monuments along the cable route CO069-072 and CO069-084).	As Required	On Completion	Project Archaeologist
MX21	EIS Chapter 11	It is recommended however, that any walls identified during archaeological monitoring of the site should be recorded prior to removal, if necessary.	As Required	On Completion	Project Archaeologist
MX22	EIS Chapter 11	• Given the proximity of the monuments CO069-072 and CO069-084 to the roadside it is recommended that the proposed grid cable route to Coomataggart substation will not extend down the west side of the public road where it extends past the aforementioned recorded monuments. • The presence of recorded monuments CO069-072 and CO069-084 along the roadside boundary of the proposed grid connection route to Coomataggart substation should be highlighted and included in the CEMP and all operatives informed of the presence of the monuments.	As Required	On Completion	Project Archaeologist

Ref. No.	Reference	Survey/Monitoring Measure	Frequency	Reporting Measures	Responsibility
		• Archaeological Monitoring in the vicinity of the aforementioned monuments should be undertaken at the construction stage of the project to ensure their continued preservation.			
Operational Phase					
MX23	EIS Chapter 5	Post-construction bird monitoring will commence in the year of completion/commissioning of the permitted development and will be undertaken between April to August period. Monitoring will consist of breeding hen harrier and merlin surveys including winter hen harrier roost surveys between October -March inclusive (as per national monitoring methods).	Monthly (April-August)	Annually	Project Ornithologist
MX24	Ecological Monitoring Plan	Breeding raptor surveys (birds of prey/owls) will be completed in April, May, June and July for each year of operational monitoring.	Monthly (April-July)	Annually	Project Ornithologist
MX25	Ecological Monitoring Plan	Winter roost surveys, focusing on hen harrier will be undertaken on six occasions (one survey per month) between October and March during each of the five years of post-construction surveys.	Monthly (October-March)	Annually	Project Ornithologist
MX26	Ecological Monitoring Plan	Post-construction surveys for badger and otter will be completed on the site for for five years. These surveys will be undertaken following the same scope and methodology as proposed for the pre-construction surveys. All results will be sent to the Planning Authority and to the NPWS.	Annually for 5 years	Annually	Project Ecologist
MX27	Ecological Monitoring Plan	The Kerry Slug Management Plan will be implemented in full, as will the conditions of the derogation licence. This provides for post-construction surveys that cover the five year period as required by Condition 12 of the grant of planning permission.	Annually for 5 years	Annually	Project Ecologist
MX28	CEMP	Pre-construction and post-construction monitoring and reporting programmes for birds (particularly Hen Harrier and Merlin), otter, badger and Kerry slug shall be submitted to, and agreed in writing with, the planning authority prior to	As required	As required	Project Ornithologist

Ref. No.	Reference	Survey/Monitoring Measure	Frequency	Reporting Measures	Responsibility
		commencement of development. The surveys shall be undertaken by suitably qualified and experienced specialists. Surveys shall be completed annually for a period of five years following commissioning of the wind farm and copies of the reports to the planning authority shall also be submitted to the National Parks and Wildlife Service.			
MX29	EIS Chapter 9	Post commissioning of the proposed turbine units it is recommended that the noise monitoring detailed in the relevant section of this report is repeated with a view to confirming that the operational units are compliant with the relevant day and night time noise criteria curves as presented in the body of this assessment. If this study work identifies any exceedances of the appropriate criteria relevant corrective actions will be taken/implemented.	Once	As required	ECoW

9 PROGRAMME OF WORKS

It is estimated that the construction phase will take approximately 18 months from starting on site to the commissioning of the electrical system. In the interest of breeding birds, construction will not commence during the breeding bird season from April to July inclusive. Construction may commence at any stage from August onwards to the end of March, so that construction activities are ongoing by the time the next breeding bird season comes around, and can continue throughout the next breeding season.

Works during the construction phase of the development, including delivery of construction materials will generally take place between 7 a.m. and 7 p.m. daily Monday to Saturday with large concrete pours requiring an earlier start when deemed necessary. Delivery of abnormal loads such as turbine tower sections and blades will take place at night outside of peak traffic hours.

The anticipated phasing and scheduling main construction task items are outlined in Figure 9.1 below.

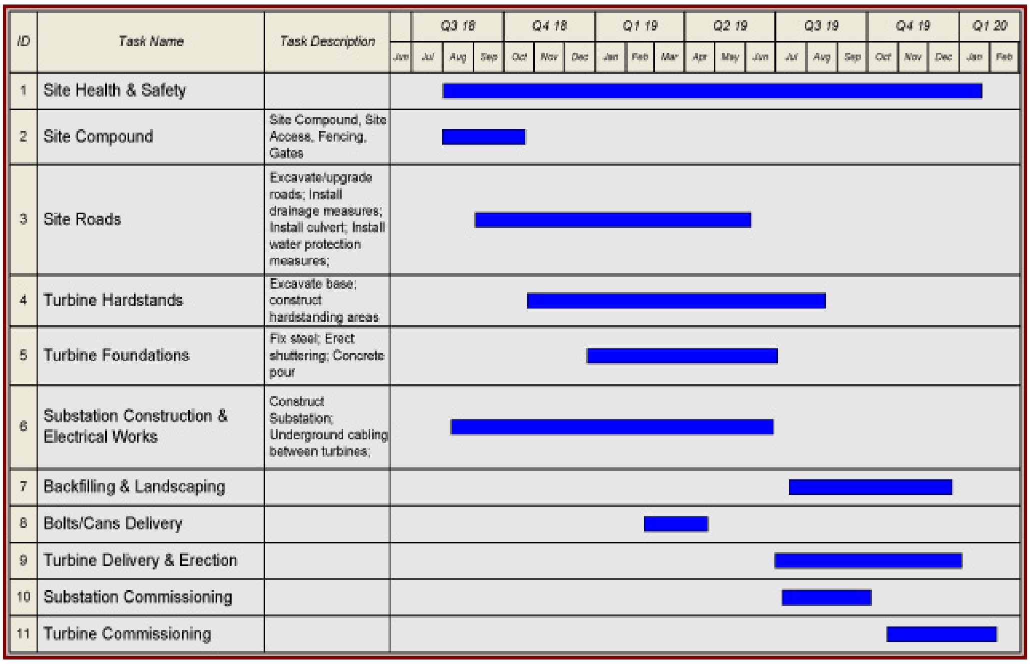


Figure 9.1 Indicative Construction Schedule

10 COMPLIANCE AND REVIEW

10.1 Site Inspections and Environmental Audits

Routine inspections of construction activities will be carried out on a daily and weekly basis by the Site Environmental Clerk of Works (ECoW) and the Construction Manager to ensure all controls to prevent environmental impact, relevant to the construction activities taking place at the time, are in place.

Environmental inspections will ensure that the works are undertaken in compliance with this CEMP and any subsequent updates to this document. Environmental site inspections will be carried out by suitably trained staff.

10.2 Auditing

Environmental audits will be carried out during the construction phase of the project. In contrast to monitoring and inspection activities, audits are designed to shed light on the underlying causes of non-compliance, and not merely detect the non-compliance itself. In addition, audits are the main means by which system and performance improvement opportunities may be identified. Environmental audits will be carried out by contractor staff or alternatively by external personnel acting on their behalf. It is important that an impartial and objective approach is adopted. Environmental audits will be conducted at planned intervals to determine whether the CEMP is being properly implemented and maintained. The results of environmental audits will be provided to project management personnel.

10.3 Environmental Compliance

The following definitions shall apply in relation to the classification of Environmental Occurrences during construction of the wind farm:

Environmental Near Miss: An occurrence which if not controlled or due to its nature could lead to an Environmental Incident.

Environmental Incident: Any occurrence which has potential, due to its scale and nature, to migrate from source and have an environmental impact beyond the site boundary.

Environmental Exceedance Event: An environmental exceedance event occurs when monitoring results indicate that limits for a particular environmental parameter (as indicated in the Environmental Monitoring Programme) has been exceeded.

An exceedance will immediately trigger an investigation into the reason for the exceedance occurring and the application of suitable mitigation where necessary.

Exceedance events can be closed out on achieving a monitoring result below the assigned limit for a particular environmental parameter.

Environmental Non-Compliance: Non-fulfilment of a requirement and includes any deviations from established procedures, programs and other arrangements related to the EMP.

10.4 Corrective Action Procedure

A corrective action is implemented to rectify an environmental problem on-site. Corrective actions will be implemented by the Construction Manager, as advised by the Site ECoW. Corrective actions may be required as a result of the following;

- Environmental Audits;
- Environmental Inspections and Reviews;
- Environmental Monitoring;
- Environmental Incidents; and,
- Environmental Complaints.

A Corrective Action Notice will be used to communicate the details of the action required to the main contractor. A Corrective Action Notice is a form that describes the cause and effect of an environmental problem on site and the recommended corrective action that is required. The Corrective Action Notice, when completed, will include details of close out and follow up actions.

If an environmental problem occurs on site that requires immediate attention direct communications between the Construction Manager and the Site ECoW will be conducted. This in turn will be passed down to the site staff involved. A Corrective Action Notice will be completed at a later date.

10.5 Construction Phase Plan Review

This CEMP will be updated and reviewed prior to commencement of construction, and also every six months thereafter during the construction phase of the project.

Appendix 1

Schedule of Works Operation Record

Works item no.	Description	Estimated Duration of the works	Risk Schedule 1:very high risk Schedule 2:high risk Schedule 3:intermediate risk	Pre-commencement Triggers all four triggers should be met				Works Abandonment Triggers If any four triggers are met			
				Trigger 1 Drainage treatment infrastructure installed prior to works commencing And in good working order	Trigger 2 River/ watercourse turbidity	Trigger 3 Turbidity measuring sonde installed prior to works commencing and operating correctly	Trigger 4 Weather forecast: (a) during the planned works period (b) observed on site	Trigger 1 Damage to silt fence/ other drainage measure or drainage point close to capacity	Trigger 2 River/ watercourse turbidity	Trigger 3 Alarm notification from sonde during the works activity. Immediate investigation	Trigger 4 Weather forecast: (a) during the planned works period (b) observed on site
1	Enabling works including felling, site compound establishment welfare facilities, site office and fencing	2 months	Schedule 2	Drainage measures to be installed as per EIS & drainage management plan	Turbidity at baseline levels	Determined by the proximity of the planned sonde location to the works and if readings will be of benefit *i.e.* if sonde is upstream of the works.	Schedule 2 rainfall figures (see below) utilising reliable forecasting source	Works cease and emergency response procedure activated including the use and installation of additional pumping equipment, sedimats, siltbags and silt fencing	Turbidity 20% above baseline conditions or >15ntu – subject to baseline data analysis	Works cease and investigation conducted.	Schedule 2 rainfall figures (see below)
2	Borrow pit establishment. Preliminary enabling works and rock excavation operations	6 months	Schedule 1	Drainage measures to be installed as per EIS & drainage management plan	Turbidity at baseline levels	Sonde must be operational with alarm and data analysed before works commence	Schedule 1 rainfall figures (see below) utilising reliable forecasting source	Works cease and emergency response procedure activated including the use and installation of additional pumping equipment, sedimats, siltbags and silt fencing	Turbidity 20% above baseline conditions or >15ntu – subject to baseline data analysis	Works cease and investigation conducted.	Schedule 1 rainfall figures (see below)

Works item no.	Description	Estimated Duration of the works	Risk Schedule 1:very high risk Schedule 2:high risk Schedule 3:intermediate risk	Pre-commencement Triggers all four triggers should be met				Works Abandonment Triggers If any four triggers are met			
				Trigger 1 Drainage treatment infrastructure installed prior to works commencing And in good working order	Trigger 2 River/ watercourse turbidity	Trigger 3 Turbidity measuring sonde installed prior to works commencing and operating correctly	Trigger 4 Weather forecast: (a) during the planned works period (b) observed on site	Trigger 1 Damage to silt fence/ other drainage measure or drainage point close to capacity	Trigger 2 River/ watercourse turbidity	Trigger 3 Alarm notification from sonde during the works activity. Immediate investigation	Trigger 4 Weather forecast: (a) during the planned works period (b) observed on site
3	Site Roads (Stage 1). Excavate new roads, upgrade/widen existing	3-4 months	Schedule 1	Drainage measures to be installed as per EIS & drainage management plan	Turbidity at baseline levels	Sondes in-situ and operational	Schedule 1 rainfall figures (see below) utilising reliable forecasting source	Works cease and emergency response procedure activated including the use and installation of additional pumping equipment, sedimats, siltbags and silt fencing	Turbidity 20% above baseline conditions or >15ntu – subject to baseline data analysis	Works cease and investigation conducted.	Schedule 1 rainfall figures (see below)
4	Turbine foundation excavation and installation	6 months	Schedule 1	Drainage measures to be installed as per EIS & drainage management plan	Turbidity at baseline levels	Sondes in-situ and operational	Schedule 1 rainfall figures (see below) utilising reliable forecasting source	Works cease and emergency response procedure activated including the use and installation of additional pumping equipment, sedimats, siltbags and silt fencing	Turbidity 20% above baseline conditions or >15ntu – subject to baseline data analysis	Works cease and investigation conducted.	Schedule 1 rainfall figures (see below)

Works item no.	Description	Estimated Duration of the works	Risk Schedule 1:very high risk Schedule 2:high risk Schedule 3:intermediate risk	Pre-commencement Triggers all four triggers should be met				Works Abandonment Triggers If any four triggers are met			
				Trigger 1 Drainage treatment infrastructure installed prior to works commencing And in good working order	Trigger 2 River/ watercourse turbidity	Trigger 3 Turbidity measuring sonde installed prior to works commencing and operating correctly	Trigger 4 Weather forecast: (a) during the planned works period (b) observed on site	Trigger 1 Damage to silt fence/ other drainage measure or drainage point close to capacity	Trigger 2 River/ watercourse turbidity	Trigger 3 Alarm notification from sonde during the works activity. Immediate investigation	Trigger 4 Weather forecast: (a) during the planned works period (b) observed on site
5	Substation construction and connection to the grid	6 months	Schedule 2	Drainage measures to be installed as per EIS & drainage management plan	Turbidity at baseline levels	Sondes in-situ and operational	Schedule 2 rainfall figures (see below) utilising reliable forecasting source	Works cease and emergency response procedure activated including the use and installation of additional pumping equipment, sedimats, siltbags and silt fencing	Turbidity 20% above baseline conditions or >15ntu – subject to baseline data analysis	Works cease and investigation conducted.	Schedule 2 rainfall figures (see below)
6	Duct installation between turbines and substation and cabling	4 months	Schedule 1	Drainage measures to be installed as per EIS & drainage management plan	Turbidity at baseline levels	Sondes in-situ and operational	Schedule 1 rainfall figures (see below) utilising reliable forecasting source	Works cease and emergency response procedure activated including the use and installation of additional pumping equipment, sedimats, siltbags and silt fencing	Turbidity 20% above baseline conditions or >15ntu – subject to baseline data analysis	Works cease and investigation conducted.	Schedule 1 rainfall figures (see below)

Works item no.	Description	Estimated Duration of the works	Risk Schedule 1:very high risk Schedule 2:high risk Schedule 3:intermediate risk	Pre-commencement Triggers all four triggers should be met				Works Abandonment Triggers If any four triggers are met			
				Trigger 1 Drainage treatment infrastructure installed prior to works commencing And in good working order	Trigger 2 River/ watercourse turbidity	Trigger 3 Turbidity measuring sonde installed prior to works commencing and operating correctly	Trigger 4 Weather forecast: (a) during the planned works period (b) observed on site	Trigger 1 Damage to silt fence/ other drainage measure or drainage point close to capacity	Trigger 2 River/ watercourse turbidity	Trigger 3 Alarm notification from sonde during the works activity. Immediate investigation	Trigger 4 Weather forecast: (a) during the planned works period (b) observed on site
7	Site Roads (Stage 2). Further upgrade/maintenance and final surfacing prior to turbine delivery	4 months	Schedule 1	Drainage measures to be installed as per EIS & drainage management plan	Turbidity at baseline levels	Sondes in-situ and operational	Schedule 1 rainfall figures (see below) utilising reliable forecasting source	Works cease and emergency response procedure activated including the use and installation of additional pumping equipment, sedimats, siltbags and silt fencing	Turbidity 20% above baseline conditions or >15ntu – subject to baseline data analysis	Works cease and investigation conducted.	Schedule 1 rainfall figures (see below)
8	Crane delivery and mobilisation	1 month	Schedule 3	Activity not dependent on drainage treatment infrastructure	Turbidity at baseline levels	Sondes in-situ and operational	Schedule 3 rainfall figures (see below) utilising reliable forecasting source	Activity not dependent on drainage treatment infrastructure	Activity not anticipated to effect turbidity	Activity not dependent on sonde data	Activity not weather dependent
9	Turbine delivery	3 months	Schedule 3	Activity not dependent on drainage treatment infrastructure	Activity not anticipated to effect turbidity	Activity not dependent on sonde data	Activity not weather dependent	Activity not dependent on drainage treatment infrastructure	Activity not anticipated to effect turbidity	Activity not dependent on sonde data	Activity not weather dependent

Works item no.	Description	Estimated Duration of the works	Risk Schedule 1:very high risk Schedule 2:high risk Schedule 3:intermediate risk	Pre-commencement Triggers all four triggers should be met				Works Abandonment Triggers If any four triggers are met			
				Trigger 1 Drainage treatment infrastructure installed prior to works commencing And in good working order	Trigger 2 River/ watercourse turbidity	Trigger 3 Turbidity measuring sonde installed prior to works commencing and operating correctly	Trigger 4 Weather forecast: (a) during the planned works period (b) observed on site	Trigger 1 Damage to silt fence/ other drainage measure or drainage point close to capacity	Trigger 2 River/ watercourse turbidity	Trigger 3 Alarm notification from sonde during the works activity. Immediate investigation	Trigger 4 Weather forecast: (a) during the planned works period (b) observed on site
10	Turbine erection	2-3 months	Schedule 3	Activity not dependent on drainage treatment infrastructure	Activity not anticipated to effect turbidity	Activity not dependent on sonde data	Activity not determined by rainfall	Activity not dependent on drainage treatment infrastructure	Activity not anticipated to effect turbidity	Activity not dependent on sonde data	Activity not weather dependent
11	Commissioning and testing of operational turbines	2 months	Schedule 3	Activity not dependent on drainage treatment infrastructure	Activity not anticipated to effect turbidity	Activity not dependent on sonde data	Activity not weather dependent	Activity not dependent on drainage treatment infrastructure	Activity not anticipated to effect turbidity	Activity not dependent on sonde data	Activity not weather dependent

Trigger 4: activities should not begin or should cease if the following rainfall amounts are forecasted:	
Schedule 1 – Very high-risk activities	>10 mm/hr (*i.e.* high intensity local rainfall events)
	>25 mm in a 24-hour period (heavy frontal rainfall lasting most of the day); or,
	>half monthly average rainfall in any 7 days.
	No overland flow or pathway for water movement
	Conditions on the ground match the forecast
Schedule 2 – High risk activities	>10 mm/hr (*i.e.* high intensity local rainfall events)
	>25 mm in a 24-hour period (heavy frontal rainfall lasting most of the day); or,
	>half monthly average rainfall in any 7 days.
	Conditions on the ground match the forecast
Schedule 3 – Intermediate risk	>10 mm/hr (*i.e.* high intensity local rainfall events)
	>25 mm in a 24-hour period (heavy frontal rainfall lasting most of the day); or,
	>half monthly average rainfall in any 7 days.
	Conditions on the ground match the forecast

Appendix 2

Traffic Management Plan

MCE Ltd.

Civil Engineering

Traffic Management Plan:

Cleanrath WF Ducting to Coomataggart 110 kV Substation

May 2018

Telephone: +353 (0) 21 733 6034, Fax: +353 (0) 21 733 6145
Web: www.mceengineering.ie, Email: office@mceengineering.ie
Lissarda Industrial Estate, Lissarda, Cork, Ireland.

Civil & Electrical Engineering Specialists

MCE – Cleanrath Cable Route Traffic Management Plan

Contractor: MCE ltd.

Project name: Cleanrath Windfarm

Address: Cleanrath, Co. Cork.

Name : James Crowley – 021-2066947
Chris Murnane – Tel: 086 -7955083

Email: james.crowley@turnkeydev.com
chris.murnane@gmail.com

Site supervisor: TBC

Safety officer: TBC

Description of task: Traffic Management Plan for Cleanrath WF Cable Route

Key plant: 360 excavators
8 tonne dumper
Lorries
Roller
Submersible Pumps
Plate compactor
Generator
Spill Kit
Diesel Bowser
Drip Trays

Specific Training: FAS safe pass
CSCS plant ticket
Site induction

MCE – Cleanrath Cable Route Traffic Management Plan

Method of Access and Egress to the work Area	All operatives must complete pre works MCE Ltd. site induction before commencing work on the ducting route.
Fall Protection Measures: (Where work at height cannot be eliminated)	No persons are permitted within 2 meters of excavation. Trench support will be utilized if required. Open trenches will be fenced off or backfilled every evening to ensure the areas are safe for workers and local traffic. No persons allowed in trench when exclusion zone is not achievable for passing vehicles or when deemed unsafe.
Hazardous Substances: Applicable:	No	No	No	No	No	Yes	No
Storage Arrangements:	No material will be used or generated during the course of this task
Mandatory and Additional PPE as Required:	Safety Boots Yes	Hard Hats Yes	Kevlar Yes Yes	Hearing Protection When required	Eye Protection Yes	Respiratory Protection N/A	Other: 1. Hi-Viz
Emergency Procedures:	MCE Emergency Procedures (All employees informed at site inductions) All employees to be made aware of the nearest exit routes from site. All personnel to be in possession of the site coordinates at all times in case of need to contact emergency services for any reasons.
First Aid Facilities:	On-Site First Aider: Chris Murnane / TBC First Aid Box Location: Site Vehicle & Site Office Nearest Hospital: Macroom Community Hospital – (026) 41002 Other Hospital: Cork University Hospital – (021) 4922000
Welfare Facilities:	Site office, canteen and toilet supplied by Mid Cork Electrical at site compound across from substation and assembly point.

MCE – Cleanrath Cable Route Traffic Management Plan

Introduction:

This traffic management plan outlines the affected roadways for an underground cable grid connection between Cleanrath WF and Coomataggart 110kV substation (Grousemount). A detailed Traffic Management Plan to follow as part of a Road Opening Licence Application This is to be read in conjunction with the works method statement in order to provide a safe system of work.

The total length of roadway affected is approximately 12.1km along points indicated on the drawings submitted. The proposed works will involve a ROAD CLOSURE system in some sections and STOP/GO in the remainder of the sections, see attached map Fig. 2.1. In situations where the road narrows and a STOP/GO system is not feasible, an ALL-STOP system will be used. Access will be prioritized to emergency vehicles and to local householders. Traffic calming measures will be utilized to slow down vehicles and ensure works can be carried out safely.

The total length of roadway affected by ROAD CLOSURE is approximately 2,893 metres along the L-34024-0. It is proposed that the road will be closed during the works, see Section 4 (1629 metres -Drawing No.610-612) and Section 5 (1264 metres - See Drawing No.613-615). Access will limited to emergency vehicles and to local householders who are unable otherwise to access their homes. Traffic calming measures will be utilized to slow down vehicles and ensure ducting can be carried out safely.

Prior to any works commencing a dilapidation survey will be completed of the entire route, photographing and noting any existing damage or defects to property or road surfaces. A copy of this will be submitted to Cork County Council prior to work commencing.

MCE – Cleanrath Cable Route Traffic Management Plan

Local Access for Residents

As part of the traffic management plan local residents affected by the road works will be alerted to the works by signage along the route.

Every effort will be made to limit the effect on local residents and any residents who require special provisions to be made will be accommodated (i.e. Home carer, etc.). Traffic management plans will be reviewed on a daily basis and take into account all local parameter in the area where work is being carried out. All required traffic management calculation forms will be completed and kept on site.

Pedestrian & Cyclist Management

Pedestrians and cyclists will be accommodated through the works. Operatives will be made aware to watch out for oncoming pedestrians / cyclists and to advise them accordingly.

Dealing With Emergency Services

Gardai will be advised of the intended works to be carried out prior to commencement on the Gardai Consultation form. Emergency services using the local roads will be made priority and areas where the works are being carried out will be covered immediately with road plates so as to allow access.

Signage Plan

All works will be signed in accordance with the "Guidance for the Control and Management of Traffic at Road Works" (Second Edition 2010). The Routine Works Traffic Management Design, including the layout parameters is illustrated on attachment.

MCE – Cleanrath Cable Route Traffic Management Plan

All traffic management will comply with guidance given in Chapter 8, Traffic Signs Manual, Department of Transport November 2010 and Control and management of Traffic at Road Work November 2007.

A fully certified and competent ‘Signing Lighting & Guarding ‘ officer will sign off on the works before commencement and carry out routine monitoring. A qualified supervisor will be onsite at all times.

✓See attached traffic management design sheet for signage etc.

✓The entire traffic management system will be set up prior to any works commencing.

✓Only approved signs will be used along the works area.

✓All signs will be clean and clearly visible.

✓Once signs are in place the route will be assessed to ensure adequate visibility for drivers and pedestrians.

✓All signs will be secured and weighted down where appropriate.

✓Traffic will be reduced to single flow during all excavations on the roadside along sections which do not require a closure.

✓ At the end of each day the excavation is back filled and all materials will be removed from the roadside.

✓Contractor vehicles will be parked with consideration given to traffic management plan.

✓Where flag men are required, both flag men, the foreman and guarding officer will all communicate via two-way radios.

MCE – Cleanrath WF Traffic Management Plan

Road Closure / Road Opening Licence Drawings:

The following drawings are included at the end of this document:

- ✓ Figure 2.1– Road Works – Overall Layout View
- ✓ Figure 2.2 - TM (A) – Traffic Calming Measures – Stop & Go (Floating Works)
- ✓ 0040 – 610 – Road Closure Section 4 – Overall Layout View
- ✓ 0040 – 611 - Sheet 1 of 4 - Location 1 Layout
- ✓ 0040 – 611 - Sheet 2 of 4 – Locations 2 Layout
- ✓ 0040 – 611 - Sheet 3 of 4 – Locations 3 Layout
- ✓ 0040 – 611 - Sheet 4 of 4 – Locations 4&5 Layout
- ✓ 0040 – 612 – Traffic Calming Measures – Typical Works Area Layout

- ✓ 0040 – 613 – Road Closure Section 5 – Overall Layout View
- ✓ 0040– 614 - Sheet 1 of 4 - Location 1 Layout
- ✓ 0040 – 614 - Sheet 2 of 4 – Locations 2 Layout
- ✓ 0040 – 614 - Sheet 3 of 4 – Locations 3 Layout
- ✓ 0040 – 614 - Sheet 4 of 4 – Locations 4&5 Layout
- ✓ 0040 – 615 – Traffic Calming Measures – Typical Works Area Layout

MCE – Cleanrath Cable Route Traffic Management Plan

Signage Layout

The following is the layout for signage that will be in place on the approach to the road works. See attached drawings showing signage layout for the road closure and traffic calming measures which will be occurring .

✓Sign no 1: WK 001 (man with shovel) 600m before road works

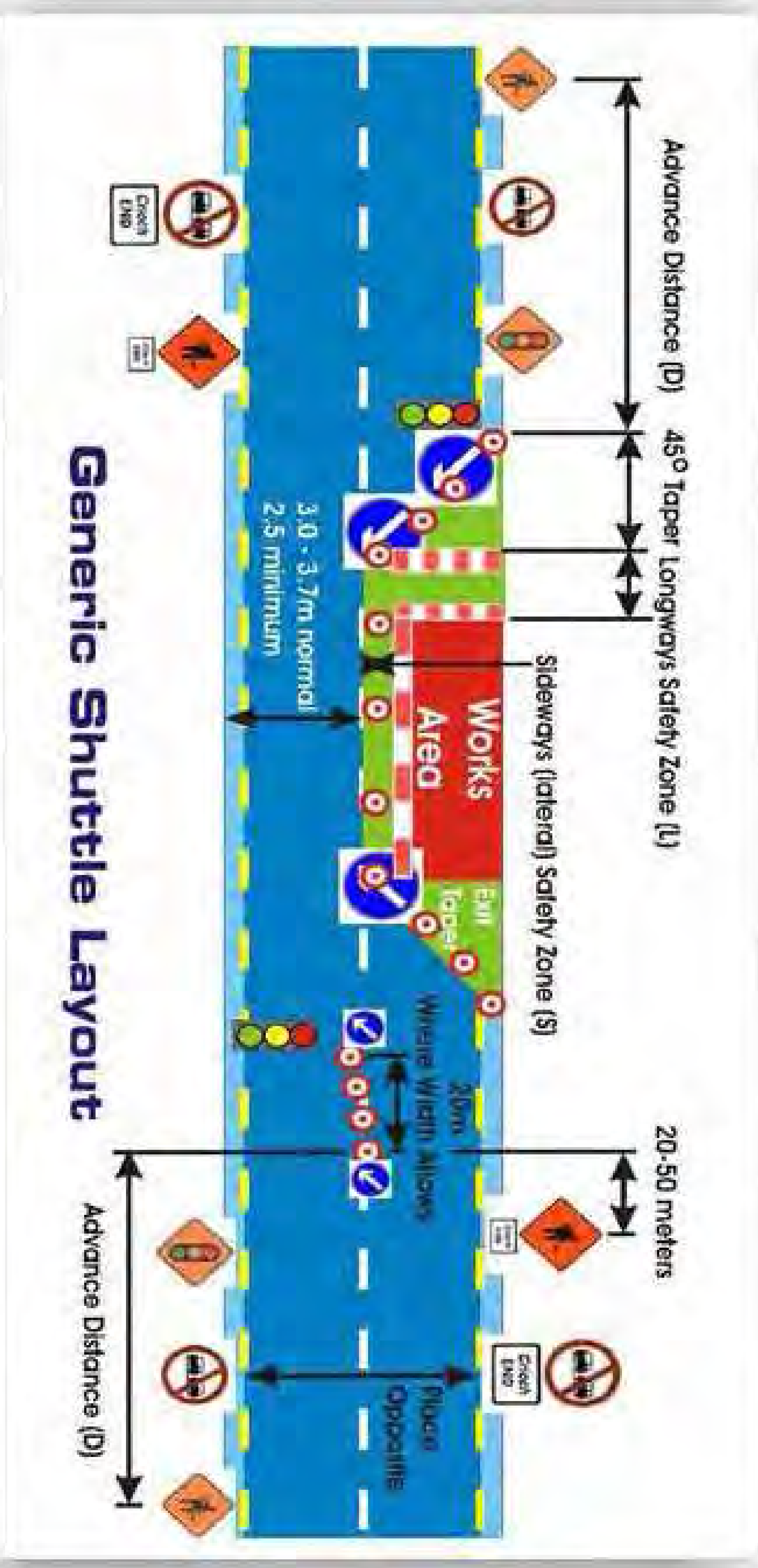
✓Sign no 2: (do not pass) 400m before road works

✓Cones with reflectors start 50m before works location.

✓ Signage after road words will indicate 'No Overtaking Ends' and ' End of Road Works'.

✓ Traffic entering and exiting existing secondary road will continue as normal with construction traffic kept to a minimum.

✓ See attached generic shuttle layout system for one-way stop and go. This shuttle layout ✓will be set up onsite by the qualified signing lighting and guarding officer.


Generic Shuttle Layout
Advance Distance (D)
45° Taper
Longways Safety Zone (L)
Sideways (lateral) Safety Zone (S)
Works Area
Exit Taper
3.0 - 3.7m normal
2.5 minimum
20m
Where Width Allows
20-50 meters
Place Opposite
Advance Distance (D)

ROUTINE WORKS TRAFFIC MANAGEMENT DESIGN

SHUTTLE CONTROL SELECTION

Method	Max Speed Limit (km/h)	Length of Works (m)	Max Traffic (veh/hr)	3 Min Count	Notes	
All Stop	100	n/a	300	15	5-10 mins max	
Give and Take	50	50	400	20	Clear visibility required from both directions	
Priority	100	80	840	42	Speed Limit	Distance
	These Distances indicate the clear visibility distance from before an obstruction to a point an equal distance beyond the obstruction. If used at night, will require a warning beacon.				50 km/h	60m
					80 km/h	70m
					80 km/h	80m
					100 km/h	100m
Stop/Go	100	20	500	25	Can be Single Man/Single Sign	
	100	100	1400	70	Can be single Man-Auto Sign	
	100	200	1250	62	Can be single Man-Auto Sign	
	100	300	1050	53	Has to be Two Man-Two Sign	
	100	400	950	48	Has to be Two Man-Two Sign	
	100	500	850	43	Has to be Two Man-Two Sign	
Traffic Lights	100	300	n/a	n/a	Vehicle Actuated	

NOTE: WHEN USING SHUTTLE CONTROL, TAPERS ARE AT 45 DEGREE!

LAYOUT PARAMETER SELECTION SHEET

Type of Road	Advance Sign Distance (D) (m)	Min No. & Type Of Advance Signs In Sequence	Min clear visibility of Signs (m)	Min size of signs (mm)	Min height of cones (mm)	Long. Safety Zone (L) (m)	Side Safety Zone (S) (m)	Long. Cone Space	Long. Lamp Space	Lane Taper Multiply factor	Taper Cone Spacing	Taper Lamp Spacing
Single carriageway road 30km/h	50	1 (w.a.) 1 (t.m.)	50	600	450	5	0.5	4	12	8	3	9
Single carriageway 60km/h	50	1 (w.a.) 1 (t.m.)	50	600	450	5	0.5	6	12	8	3	9
Single Carriageway 80km/h	500	1 (w.a.) 1 (n.o.) 1 (t.m.)	90	750* 900*	750	45	1.2	12	24	35	2.5	9
Single Carriageway 100 km/h	800	1 (w.a.) 1 (n.o.) 2 (t.m.)	120	750* 900*	750	60	1.2	12	24	40	1	9
Dual Carriageway 60 km/h	800	1 (w.a.) 2 (t.m.) X 2	50	900	450	5	0.5	6	12	8	3	9
Dual Carriageway 80 km/h	600	1 (w.a.) 2 (t.m.) X 2	90	900	750	45	0.75	12	24	35	3	9
Dual Carriageway 100 km/h	1000	2 (w.a.) 3 (t.m.) X 2	120	1200	750	45	1.2	12	24	40	1	9

Type of Road	Lead-in cone tapers (See Notes below) Recommended lengths	Width of hazard (including safety zone): 1m	2m	3m	4m	Hard Shoulder Taper Multiply factor
Single carriageway road 30km/h	Length of taper (T) in (m)	8	16	24	32	4
	Minimum No. of Cones	4	7	10	12	
	Minimum No. of Lamps	2	3	4	5	
Single carriageway 60km/h	Length of taper (T) in (m)	8	16	24	32	4
	Minimum No. of Cones	4	7	10	12	
	Minimum No. of Lamps	2	3	4	5	
Single Carriageway 80km/h	Length of taper (T) in (m)	35	70	105	140	20
	Minimum No. of Cones	16	30	44	58	
	Minimum No. of Lamps	5	9	13	17	
Single Carriageway 100 km/h	Length of taper (T) in (m)	40	80	120	160	20
	Minimum No. of Cones	42	82	122	162	
	Minimum No. of Lamps	6	10	15	19	
Dual Carriageway 60 km/h	Length of taper (T) in (m)	8	16	24	32	4
	Minimum No. of Cones	4	7	10	12	
	Minimum No. of Lamps	2	3	4	5	
Dual Carriageway 80 km/h	Length of taper (T) in (m)	35	70	105	140	10
	Minimum No. of Cones	13	25	37	48	
	Minimum No. of Lamps	5	9	13	17	
Dual Carriageway 100 km/h	Length of taper (T) in (m)	40	80	120	160	20
	Minimum No. of Cones	42	82	122	162	
	Minimum No. of Lamps	6	10	15	19	

NOTE: TAPERS ARE ONLY WHERE TWO WAY TRAFFIC MAINTAINED

* Use 750mm signs where Vehicles Per Day < 5,000. Use 900mm signs where Vehicles Per Day > 5,000

MCE Ltd

Civil & Electrical Engineering Specialists

TRAFFIC MANAGEMENT PLAN FOR ROUTINE WORKS

5) Road Schematic

6) Traffic Management Selection

6.1) Classification	Road Type	Road Width	Speed Limit	Urban/Rural	Traffic
					Heavy/ Light

6.2) Selection	All Stop	Give & Take	Priority	Stop/ Go	Lights	Tapers

6.3) Semi-Static	Will Semi-Static Management be used?	Yes		No	

7) Signage (Warn / Inform / Direct / End)

No	Sign	Dir	No	Sign	Dir	No	Sign	Dir	No	Sign	Dir
1	SELECT PLATE BELOW	A B C D	6		A B C D	11		A B C D	16	Pedestrian Barrier	A B C D
1 + 2 ARE SEMI-STATIC			7		A B C D	12		A B C D	17		A B C D
2		A B C D	8		A B C D	13		A B C D	18		A B C D
3		A B C D	9	YIELD (Priority)	A B C D	14	Barrier Board	A B C D	19		A B C D
5		A B C D	10		A B C D	15		A B C D	20		A B C D
If Using Traffic Lights/ Stop-Go, Have Gardai Been Notified?									YES		NO
Are All Required Cones /(Lamps & Beacons) In Place (and operating)?									YES		NO

8) Workforce Induction & Communication

8.1) Has this Plan been Communicated to the workforce and does everyone know their role? Operatives to Sign Below	Yes		No	

8.2) Supervisor	

NOTIFICATION OF POSITIVE TRAFFIC CONTROL

Under the following Road Traffic Acts/Regulations

- Section 37 of the Road Traffic Act, 1994
- Road Traffic (Signs) Regulations 2006 (S.I. No. 637 of 2006)
- Road Traffic (Control of Traffic) Regulations 2006 (S.I. No. 638 of 2006)

The Roads Authority of

Hereby notifies

Of the use of

TEMPORARY TRAFFIC LIGHTS ☐

STOP-GO BOARD(s) ☐

at the following location:

Road

From a point

To a point

ON/ BETWEEN (delete as appropriate) the following dates

and

Observations (if any) should be faxed to:

Signed: ______________________________

On behalf of the Roads Authority

PLANNED WORKS TRAFFIC MANAGEMENT SITE INSPECTION SHEET

PROJECT NAME:			Phase:	
Date:		Time:	1):	2):

1) TRAFFIC MANAGEMENT SET-UP/ MODIFICATION, INSPECTIONS

1-1) Installation Checks

Does the Traffic Management conform to the Design Layout and Parameters?	
Have all hazards been addressed in the Traffic Management Plan?	
Has allowance been made for the delivery and removal of materials?	
Have Gardai been informed of any Traffic Lights/ Stop-Go Boards in use?	
Have Gardai been informed of Roadworks Speed limits being introduced?	

2) TRAFFIC MANAGEMENT OPERATION INSPECTIONS

2-1) Operation Checks	1	2
Are Safety Zones being kept clear of operatives, plant and materials?		
Are all the signs in good condition/ are all cones in good condition with sleeves?		
Are sign vision lines free from bends, hills/dips in the road, parked vehicles, hedges etc?		
Will the site be safe at night or in wind, fog, snow or rain? (delete as appropriate)		
Are all misleading permanent signs and road markings covered?		
Is the carriageway/footway being kept clear of mud and surplus equipment?		
Are materials/ plant that are left on verges or lay-bys being properly guarded and lit?		
2-2) Traffic Checks		
Is there safe access to adjacent premises?		
Does Signing and Guarding meet the (changing) conditions?		
Are traffic control arrangements working at the optimum level to reduce traffic delays?		
If present, are the needs of cyclists or horse riders incorporated into the layout?		
2-3) Pedestrian & Vulnerable Road User Checks		
Have the needs of pedestrians & vulnerable road users been addressed in the layout?		
If pedestrian route blocked, has a suitable alternative route been provided?		
Are pedestrian routes clearly evident/ indicated?		
If a footway in the road is to be used, are ramps to the kerb provided?		
Are pedestrian hazards sufficiently GUARDED at night?		

3) TRAFFIC MANAGEMENT CESSATION INPECTIONS

3-1) Works Complete Checks

Have all signs, cones, barriers, and lamps been removed?	
Have any covered permanent signs been restored?	
Have Gardai been informed that Speed limits/ Traffic Signals/ Stop-Go removed?	

4) EXCEPTIONS REPORT

(Append attachments as necessary)

Check Completed By:	

PROJECT CLOSEOUT SHEET	
PROJECT NAME:	

1) Procedures	
The extents of construction have been completed per the plans	
Pavement Surface has been visually inspected and deemed satisfactory (incl. sweeping of surfaces that have been surface dressed)	
Temporary Traffic Management arrangements (incl. Orders) have been removed	
Any Permanent Road Markings, Road Studs, and Signs have been installed	
2) Works Extents	
The length of work completed was (m)	
The average width of work completed was (m)	
3) Appointments	
PSDP appointment terminated	
Designer appointment terminated	
PSCS appointment terminated	
Contractor given completion certificate	
4) Records	
The safety file is complete and will be stored	
5) Site Inspection	
The site has been inspected by (print name) and deemed to be satisfactory:	
Signature:	
Date of inspection:	

6) Procedure Monitoring (to be completed by supervisor of person listed in 5 above)	
I recommend that the Project be deemed complete (print name)	
Signature:	
Date:	

INCIDENT/ ACCIDENT REPORT FORM

1) Job Details

1.1) Job Name	
1.2) Job Location	

2) Incident

2.1) Date of Incident				2.2) Time of Incident					
2.3) Incident Involves	Public	Layout	Operatives	Plant	Materials	Hired	Contractor	Environment	

2.4) Incident Classification	Class 1		Class 2		Class3	Class 4	
	Long Traffic Delays	Pedestrian Danger	Near Miss	Minor Injury	3 Day Injury	Road Traffic Accident	Serious Injury or Death

2.5) Weather Conditions	Light:	Sunny	Cloudy	Fog	Dawn/Dusk	Night	Floodlit
	Rain:	Dry	Light Rain	Heavy Rain	Hailstones	Snow	
	Wind:	No Wind	Breeze	Windy	Gale		
	Temperature:	Warm	Cold	Freezing			

2.6) Locus	Carriageway	Footpath	Safety Zone	Working Space

2.7) Pavement Condition	Clean	Dirty	Dry	Wet	Granular	Wearing	Base	Chips	Markings

2.8) Number involved (Class 2 or greater)	

3) Traffic Management

	N/A	Yes	No
3.1) Were the appropriate signs in their correct place?			
3.2) Were the signs in a good condition?			
3.3) Were all cones in place and in good condition?			
3.4) Were all TM Lamps in place and operating?			
3.5) Were all TM Beacons in place and operating?			
3.6) Were Plant Hazard Beacons operating?			

4) Site Health and Safety

	N/A	Yes	No
4.1) Had operative appropriate CSCS card?			
4.2) Had plant/ equipment been checked for suitability?			
4.3) Were Safety Guards in place and in good condition?			
4.4) Were correct operating procedures/ guidelines used?			
4.5) Were operatives wearing appropriate PPE?			
4.6) Was there good housekeeping on site?			

5) Emergency Procedure

5.1) Services	None	First Aid	Driven to Aid	Ambulance	Fire Brigade	Gardai

5.2) Procedure		Good	Bad	None
	Training			
	Equipment			

6) Operatives (List operatives on site at time of incident)

7) Incident Description

8) Suggested Control Measures to Prevent Re-Occurance

9) Incident Sketch

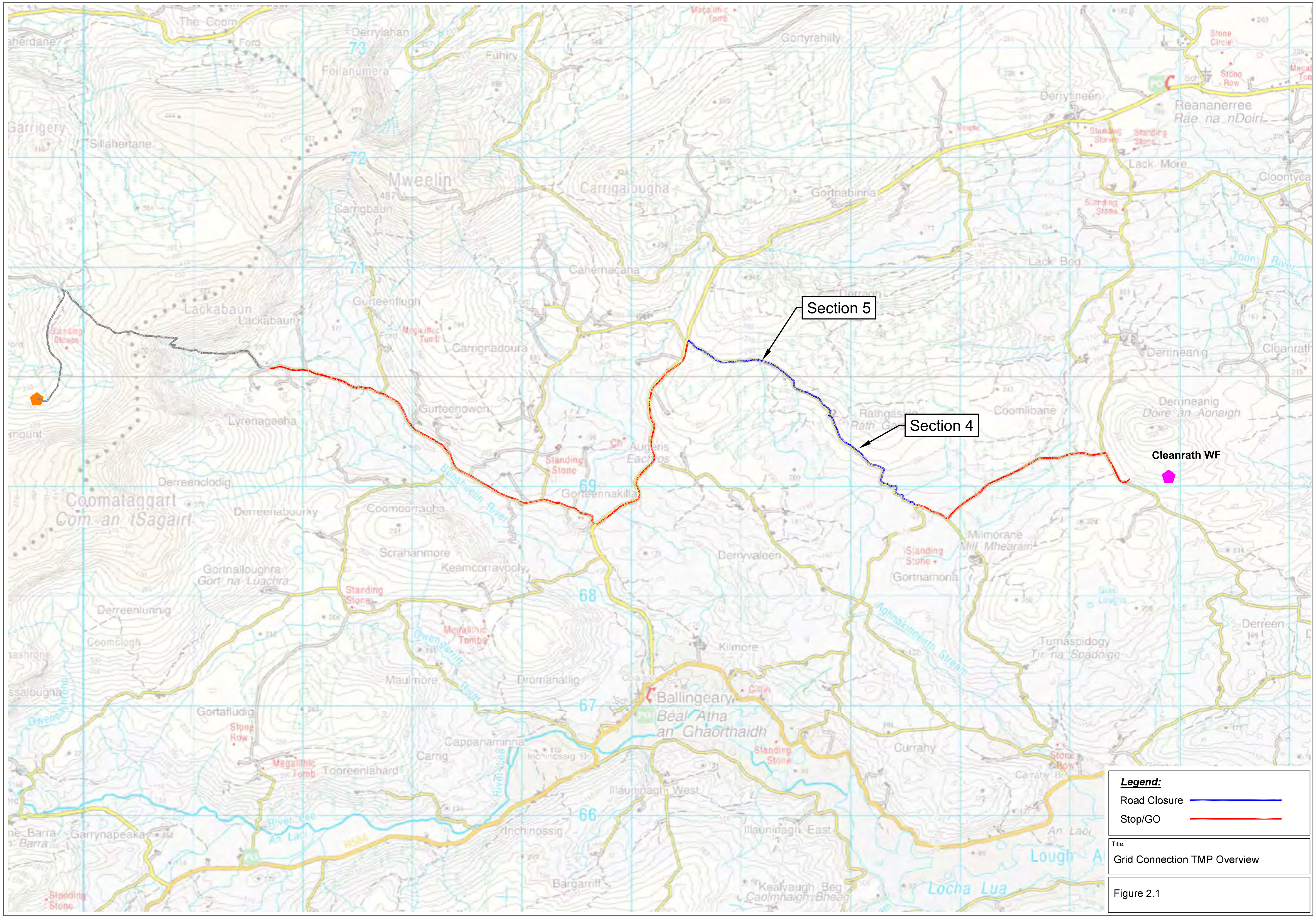
10) Report Completed By:		11) Report Noted By:	

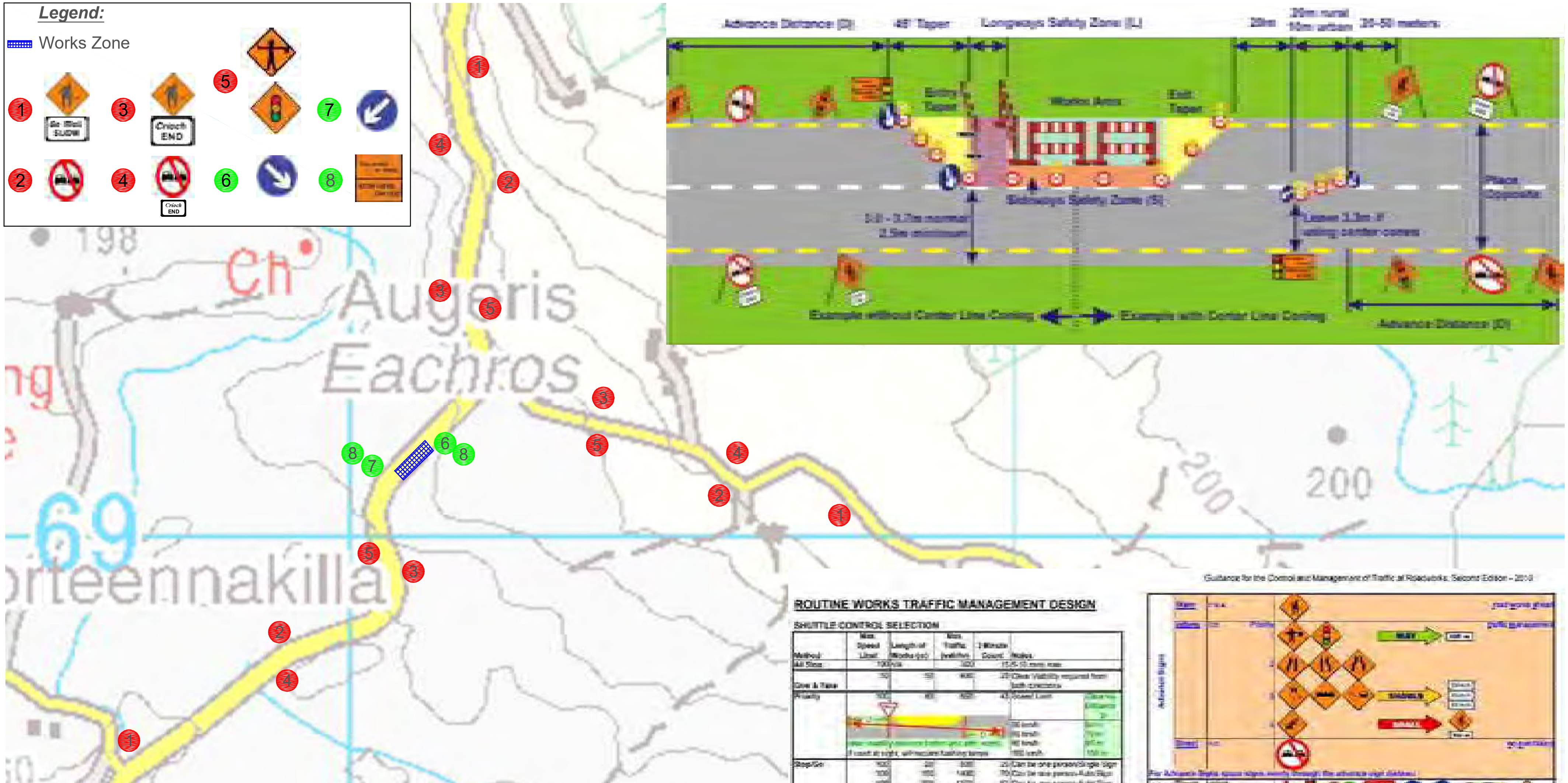
MCE Ltd

Civil & Electrical Engineering Specialists

MCE – Cleanrath Cable Route Traffic Management Plan

	Name (Print)	Signature	I understand the details in the traffic management plan and agree to sign off (tick)	Date
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				


Section 5
Section 4
Cleanrath WF
Ballingeary
Beal Atha an Ghaorthaidh
Mweelin
Carrigalbugha
Gortnabinna
Reananerree
Rae na nDoirí
Derrineanig
Doire an Aonaigh
Milmorane
Mill Mhearain
Gortnamona
Kilmore
Derryvaleen
Coomataggart
Com an tSagairt
Lackabaun
Lyrenageeha
Gurteenowen
Carrignadoura
Gurteenflugh
Rathgaskin
Coomlibane
Turnaspidogy
Tír na Spadóige
Currahy
Illauninagh West
Illauninagh East
Inchinossig
Cappanaminna
Carrig
Tooreenlahard
Gortafludig
Derreenlunnig
Gortnalloughra
Gort na Luachra
Derreenclodig
Derreenabourky
Coomdorragha
Scrahanmore
Keamcorravooly
Maulmore
Dromanallig
Gorteennakilla
Augeris
Lough Allua
Locha Lua
An Laoi
River Lee
Bunsheelin River
Owen Varriff River
Aghnakinneenath Stream
Toon River
Derrylahan
Foilanumera
Fuhiry
Gortyrahilly
Carrigbaun
Sillahertane
Garrigery
Cahernacaha
Lack More
Lack Beg
Derryfineen
Derreen
Cloontycarthy
Bargarriff
Kealvaugh Beg
Caolmhaigh Bheag
Garrynapeaka
Standing Stone
Megalithic Tomb
Stone Row
Stone Circle
R584
Legend:
Road Closure
Stop/GO
Title:
Grid Connection TMP Overview
Figure 2.1



TM (A) Traffic Lights OR Flagman

Date: 25/05/2018 **Author:** James Crowley

Project: Cleanrath Wind Farm **Example:** Typical Scenario

Works Type: Type A **Visibility:** 200m

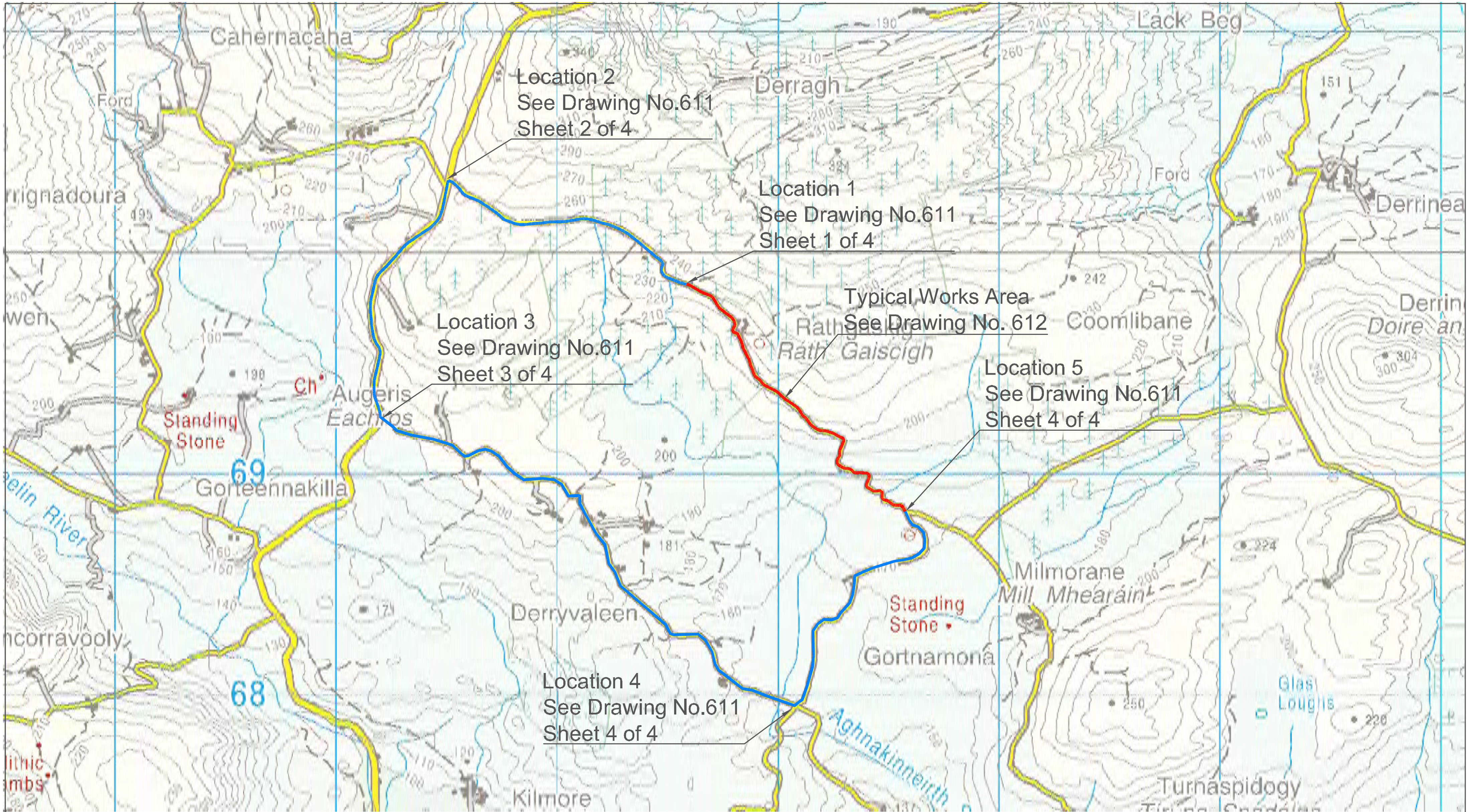
Approach Sign: 3 **Sign Spacing:** 200m **Lane Taper:** 45-Degrees

Longitudinal Safety Zone: 45m **Side Safety Zone:** 1.2m @ Taper: 1-3m

Min Size of Cones & Signs: 750mm

Note: Sign No.5 will either be Flagman or Traffic Light.

Figure 2.2 - Typical Stop / Go Scenario



LEGEND:

1,629m ROAD CLOSURE

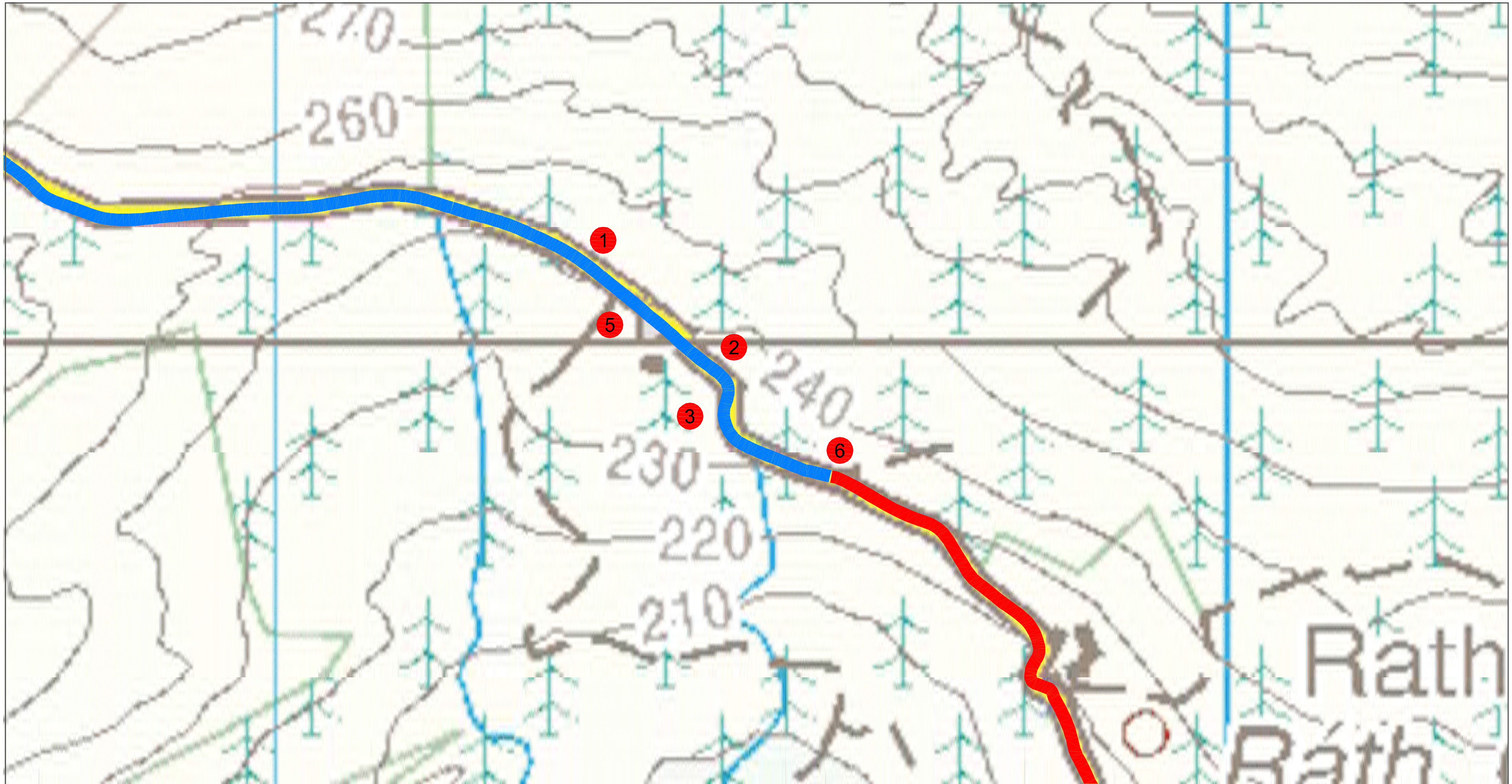
6,264m DIVERSION ROUTE

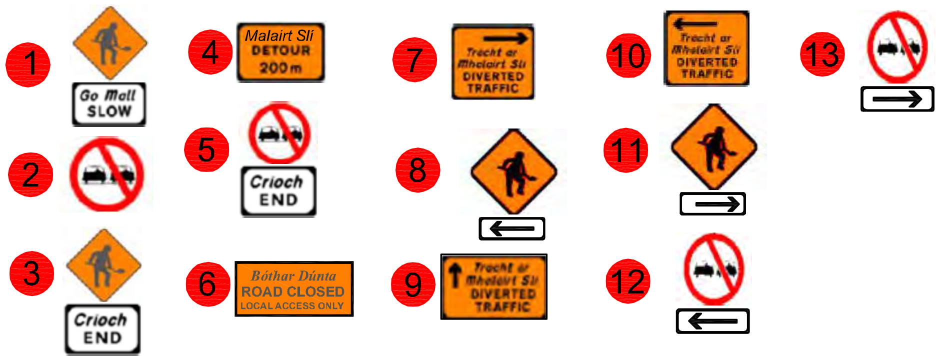
Rev:	Description:	Date:	By:
1	Issued for Road Opening Licence Application	07-12-2017	JOC

Project Title: Cleanrath Windfarm Underground Cable

Drawing Title: Section 4 - Road Closure Overall Layout View

Date:	07.12.17	Prepared by:	JOC	DRG No.	610
Scale:	NTS	Rev:	001	Job Ref:	0040





N

LEGEND:

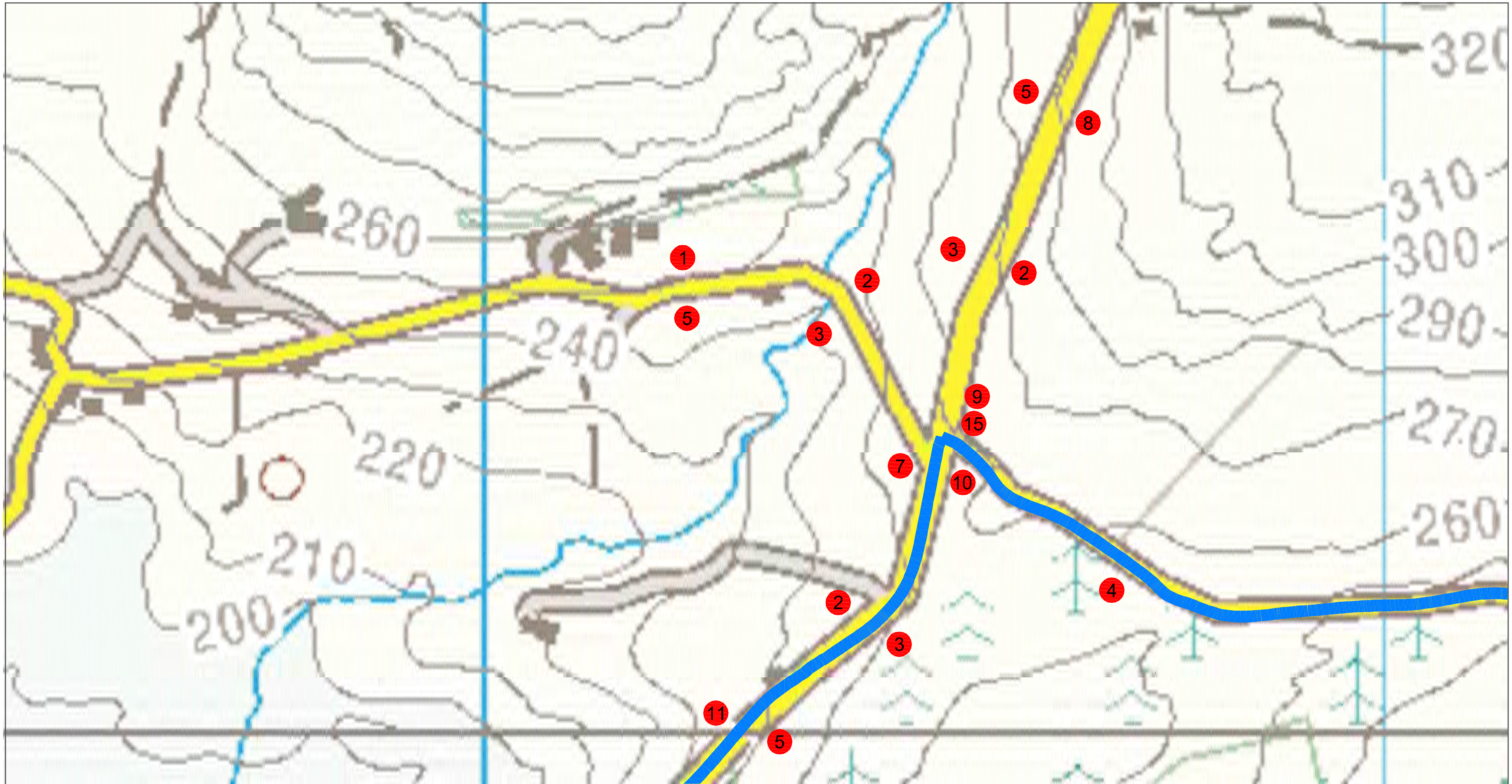
1,629m ROAD CLOSURE

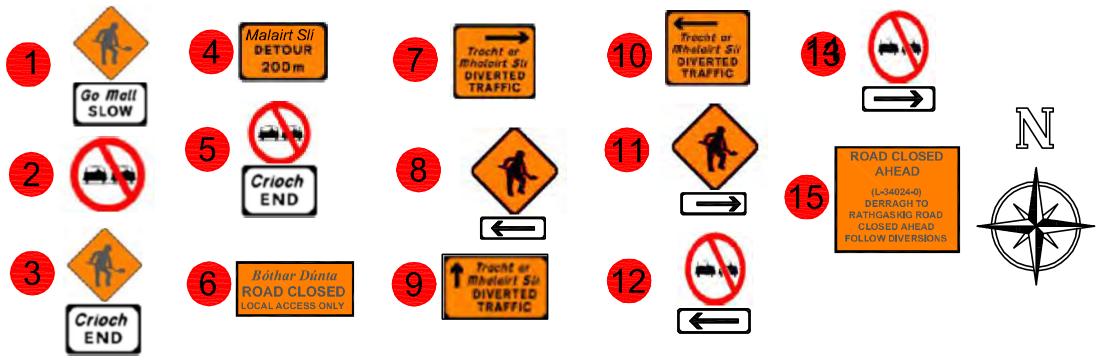
6,264m DIVERSION ROUTE

Rev:	Description:	Date:	By:
1	Issued for Road Opening Licence Application	07-12-2017	JOC

Project Title:	Cleanrath Windfarm Underground Cable
Drawing Title:	Section 4 - Road Closure Location 1- Layout Sheet 1of 4

Date:	07.12.17	Prepared by:	JOC	DRG No.	611-1
Scale:	NTS	Rev:	001	Job Ref:	0040





LEGEND:

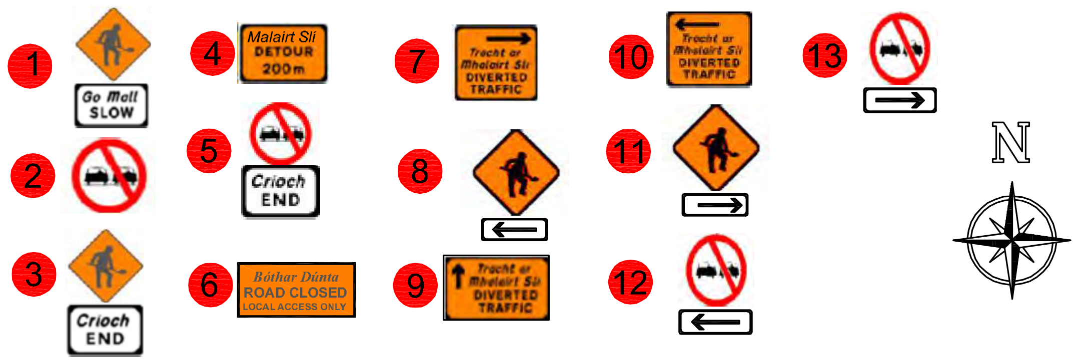
1,629m ROAD CLOSURE

6,264m DIVERSION ROUTE

Rev:	Description:	Date:	By:
1	Issued for Road Opening Licence Application	07-12-2017	JOC

Project Title:	Cleanrath Windfarm Underground Cable
Drawing Title:	Section 4 - Road Closure Location 2- Layout Sheet 2 of 4

Date:	07.12.17	Prepared by:	JOC	DRG No.	611-2
Scale:	NTS	Rev:	001	Job Ref:	0040



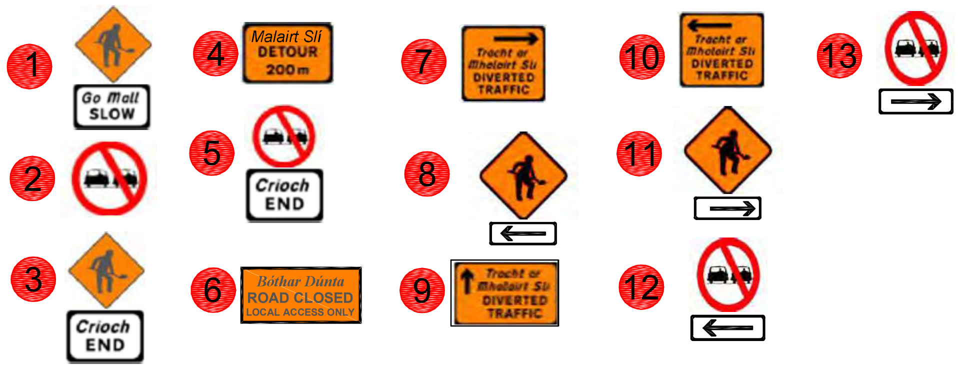
LEGEND:

1,629m ROAD CLOSURE

6,264m DIVERSION ROUTE

Rev:	Description:	Date:	By:
1	Issued for Road Opening Licence Application	07-12-2017	JOC

Project Title:	Cleanrath Windfarm Underground Cable				
Drawing Title:	Section 4 - Road Closure Location 3 - Layout Sheet 3 of 4				
Date:	07.12.17	Prepared by:	JOC	DRG No.	611-3
Scale:	NTS	Rev:	001	Job Ref:	0040



N

LEGEND:

1,629m ROAD CLOSURE

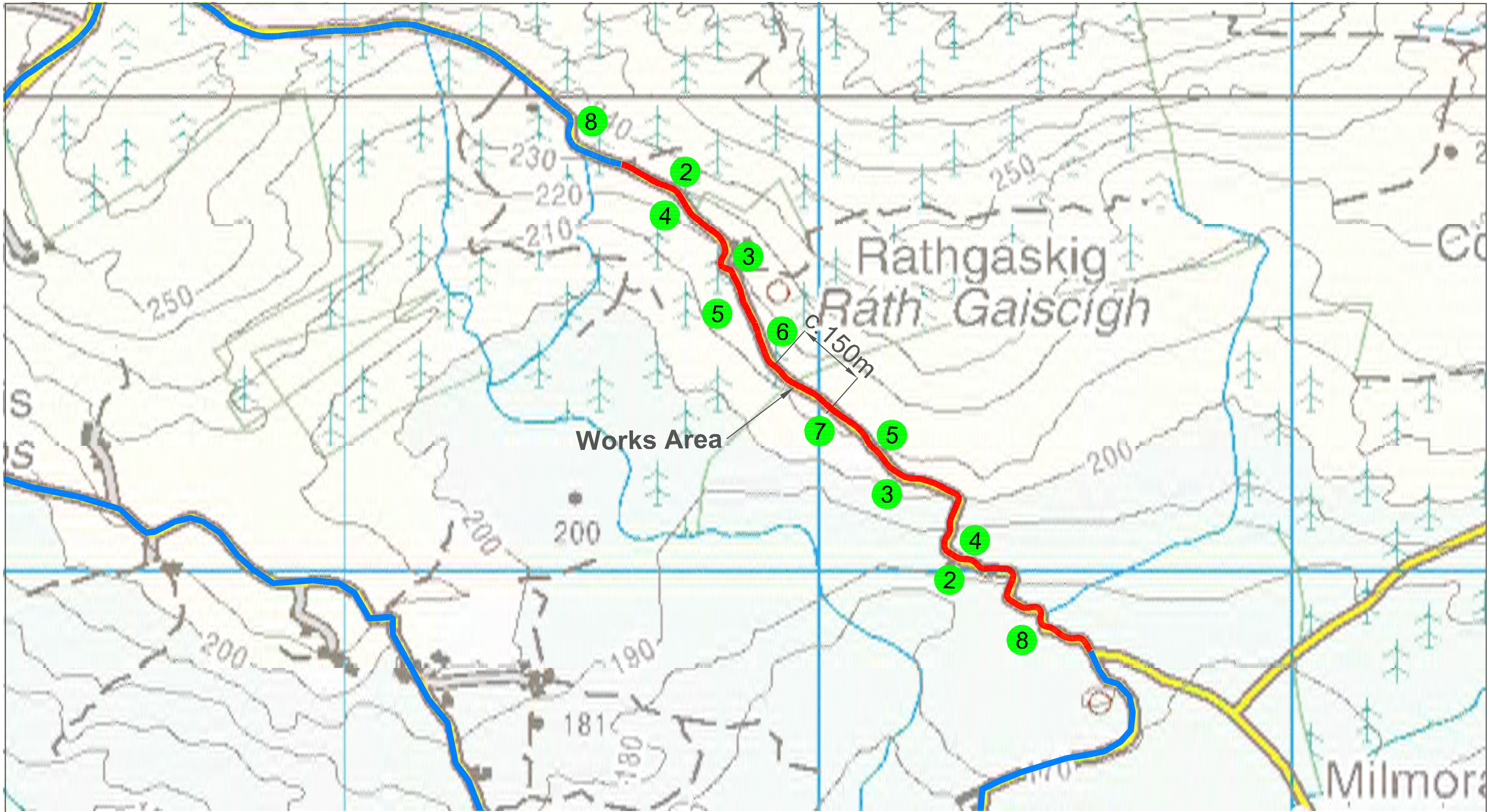
6,264m DIVERSION ROUTE

Rev:	Description:	Date:	By:
1	Issued for Road Opening Licence Application	07-12-2017	JOC

Project Title: Cleanrath Windfarm Underground Cable

Drawing Title: Section 4 - Road Closure Location 4&5 - Layout Sheet 4 of 4

Date:	07.12.17	Prepared by:	JOC	DRG No.:	611-4
Scale:	NTS	Rev:	001	Job Ref:	0040



N

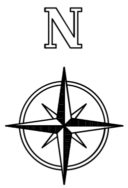
LEGEND:

1,629m ROAD CLOSURE

6,265m DIVERSION ROUTE

Rev:	Description:	Date:	By:
1	Issued for Road Opening Licence Application	07-12-2017	JOC

Project Title:	Cleanrath Windfarm Underground Cable				
Drawing Title:	Typical Works Area - Section 4 Traffic Calming Measures Floating Road Works				
Date:	07.12.17	Prepared by:	JOC	DRG No.	612
Scale:	NTS	Rev:	001	Job Ref:	0040



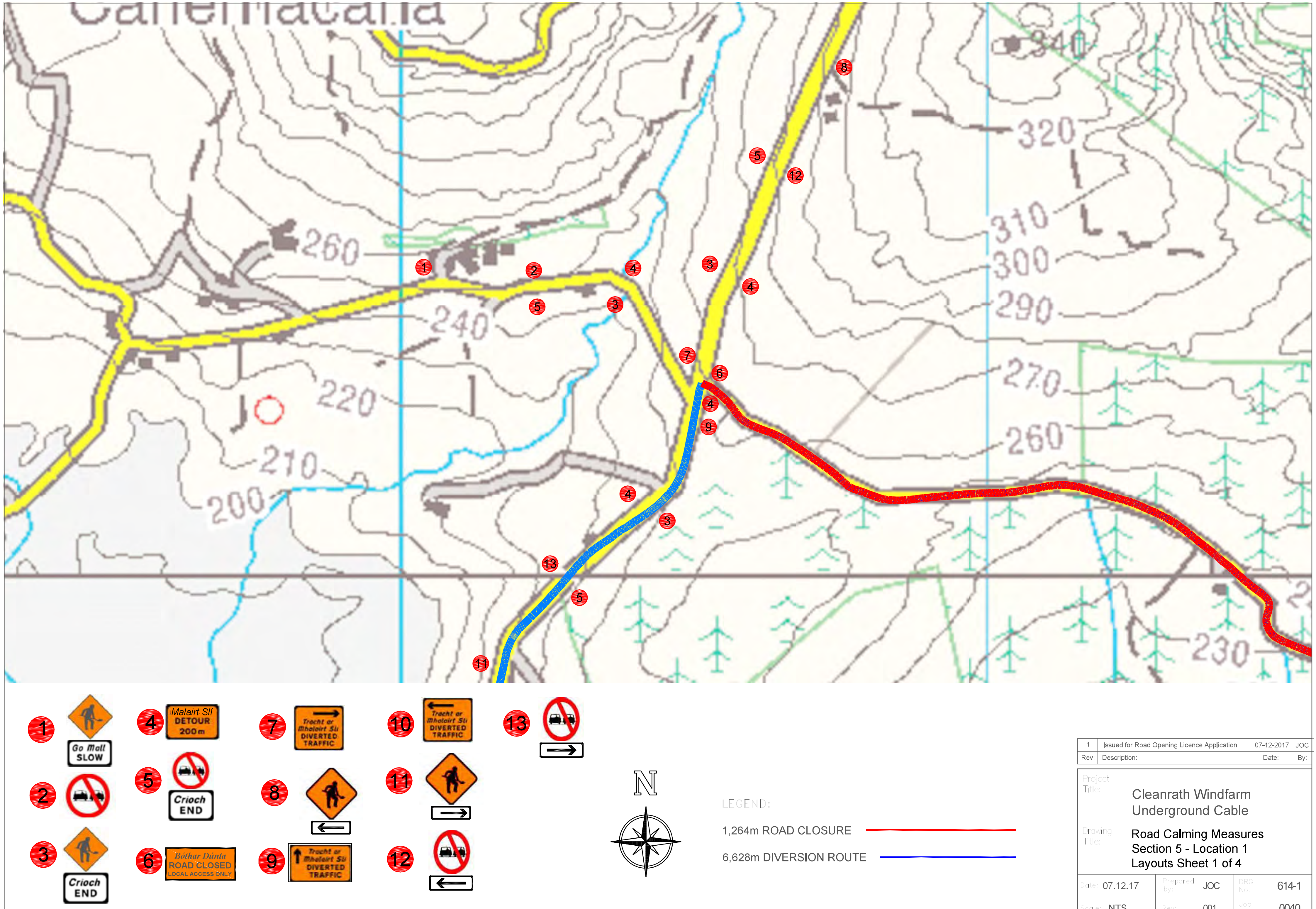
LEGEND:

1,264m ROAD CLOSURE

6,628m DIVERSION ROUTE

1	Issued for Road Opening Licence Application	07-12-2017	JOC
Rev:	Description:	Date:	By:

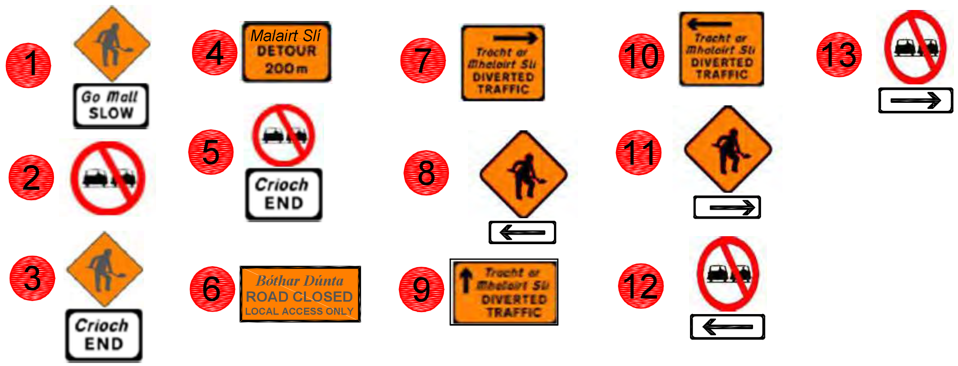
Project Title:	Cleanrath Windfarm Underground Cable				
Drawing Title:	Road Opening Application Section 5 Overview Layout				
Date:	07.12.17	Prepared by:	JOC	DRG No.	613
Scale:	NTS	Rev:	001	Job Ref:	0040



Rev:	Description:	Date:	By:
1	Issued for Road Opening Licence Application	07-12-2017	JOC

Project Title:	Cleanrath Windfarm Underground Cable
Drawing Title:	Road Calming Measures Section 5 - Location 1 Layouts Sheet 1 of 4

Date:	07.12.17	Prepared by:	JOC	DRG No.:	614-1
Scale:	NTS	Rev:	001	Job Ref:	0040



N

LEGEND:

1,264m ROAD CLOSURE

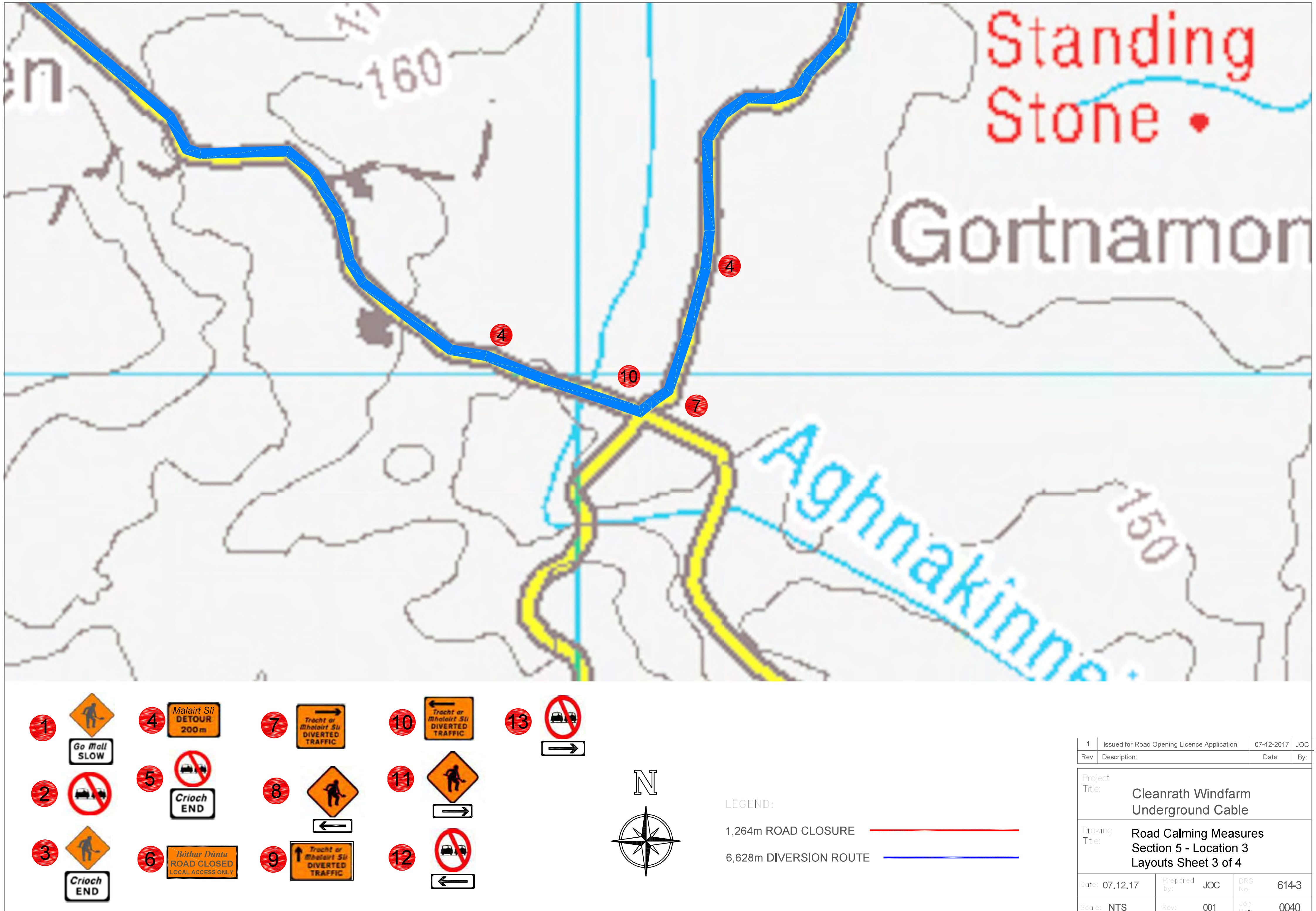
6,628m DIVERSION ROUTE

Rev:	Description:	Date:	By:
1	Issued for Road Opening Licence Application	07-12-2017	JOC

Project Title: Cleanrath Windfarm Underground Cable

Drawing Title: Road Calming Measures Section 5 - Location 2 Layouts Sheet 2 of 4

Date:	07.12.17	Prepared by:	JOC	DRG No.:	614-2
Scale:	NTS	Rev:	001	Job Ref:	0040



LEGEND:

1,264m ROAD CLOSURE

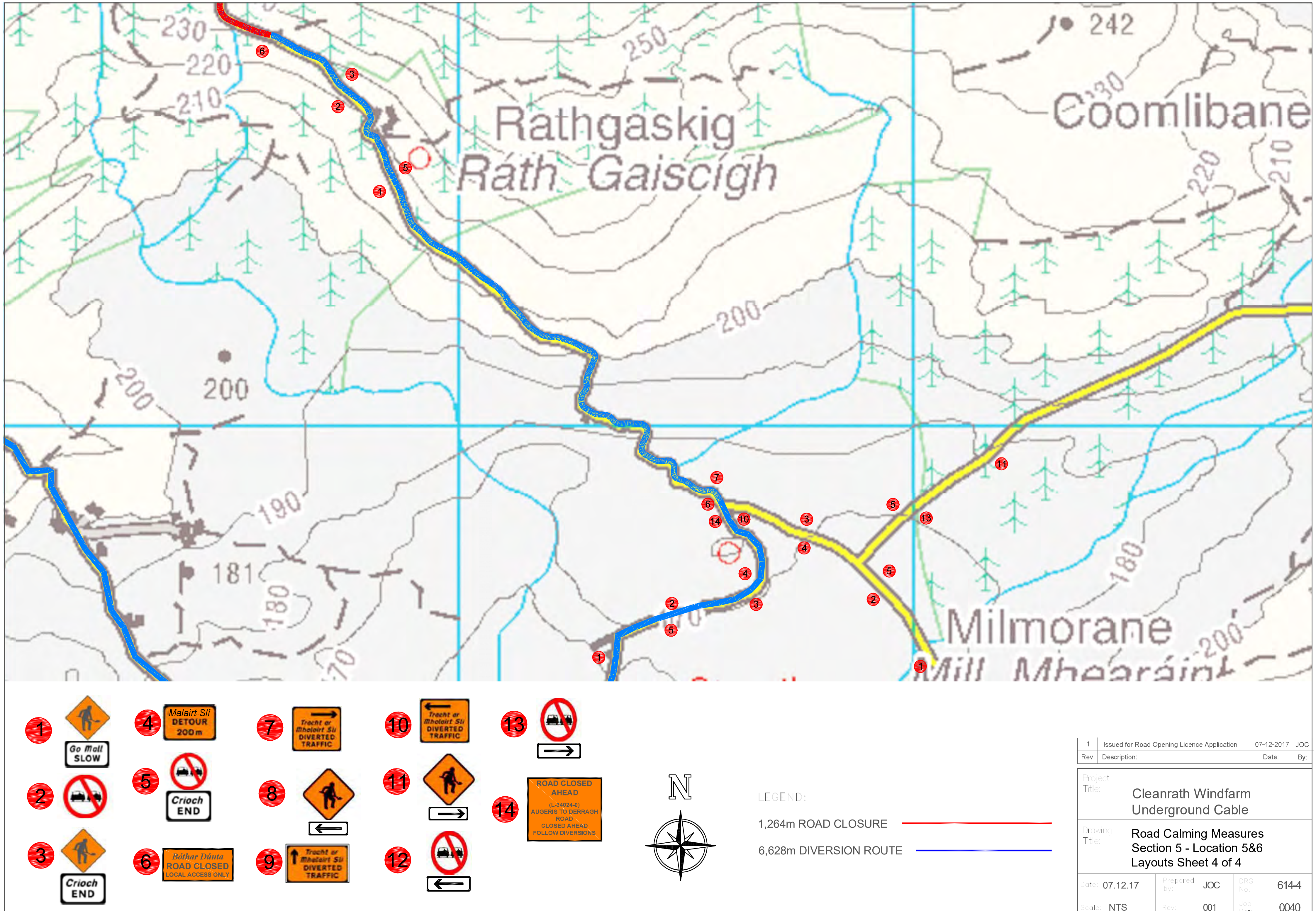
6,628m DIVERSION ROUTE

Rev:	Description:	Date:	By:
1	Issued for Road Opening Licence Application	07-12-2017	JOC

Project Title: Cleanrath Windfarm Underground Cable

Drawing Title: Road Calming Measures Section 5 - Location 3 Layouts Sheet 3 of 4

Date:	07.12.17	Prepared by:	JOC	DRG No.	614-3
Scale:	NTS	Rev:	001	Job Ref:	0040



LEGEND:

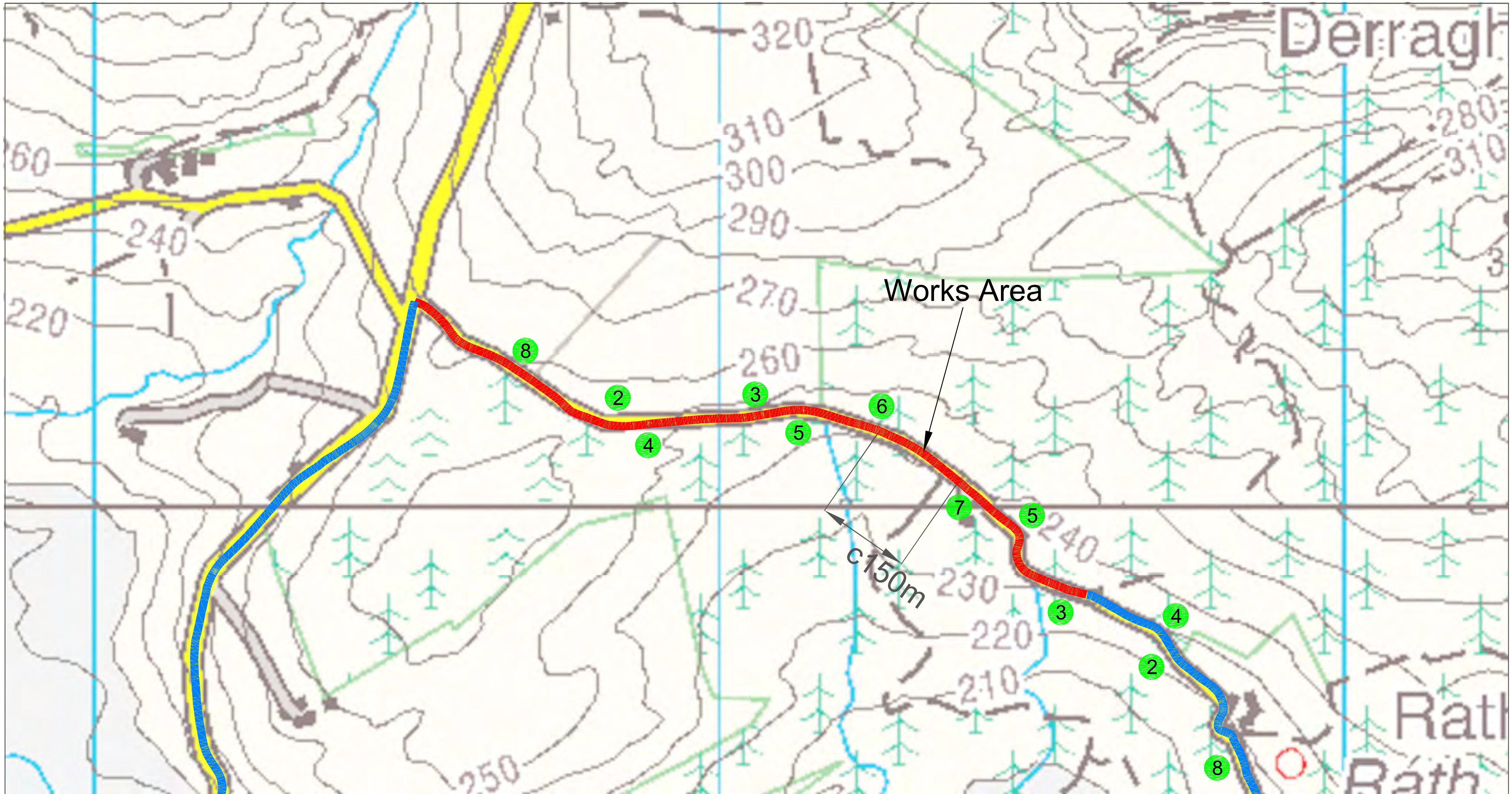
1,264m ROAD CLOSURE

6,628m DIVERSION ROUTE

Rev:	Description:	Date:	By:
1	Issued for Road Opening Licence Application	07-12-2017	JOC

Project Title:	Cleanrath Windfarm Underground Cable
Drawing Title:	Road Calming Measures Section 5 - Location 5&6 Layouts Sheet 4 of 4

Date:	07.12.17	Prepared by:	JOC	DRG No.:	614-4
Scale:	NTS	Rev:	001	Job Ref:	0040



LEGEND:

1,264m ROAD CLOSURE

6,628m DIVERSION ROUTE

Rev:	Description:	Date:	By:
1	Issued for Road Opening Licence Application	07-12-2017	JOC

Project Title:	Cleanrath Windfarm Underground Cable		
Drawing Title:	Typical Works Area - Section 5 Traffic Calming Measures Floating Road Works		
Date: 07.12.17	Prepared by: JOC	DRG No.: 615	
Scale: NTS	Rev: 001	Job Ref: 0040	

Civil Engineering

Traffic Management Plan: Cleanrath WF Haul Route

May 2018

Telephone: +353 (0) 21 733 6034, Fax: +353 (0) 21 733 6145
Web: www.mceengineering.ie, Email: office@mceengineering.ie
Lissarda Industrial Estate, Lissarda, Cork, Ireland.

Civil & Electrical Engineering Specialists

MCE – Cleanrath WF's Traffic Management Plan

Contractor: MCE ltd.

Project name: Cleanrath Wind Farm

Address: Cleanrath, Co. Cork.

Name : James Crowley – Tel: 021-2066947
Chris Murnane – Tel: 086 -7955083

Email: james.crowley@turnkeydev.com
chris.murnane@gmail.com

Site supervisor: TBC

Safety officer: TBC

Description of task: Traffic Management Plan for Cleanrath WF Haul Route

Key plant: Construction Traffic e.g.
Lorries,
Excavator transport vehicles
Site vehicles
Tractors & trailers

Specific Training: FAS safe pass
CSCS plant ticket
Site induction

MCE – Cleanrath WF's Traffic Management Plan

Introduction:

This traffic management plan outlines the haul route from the N22 and roadways around the wind farm main entrance for the construction stage process. All traffic management will comply with guidance given in Chapter 8, Traffic Signs Manual, Department of Transport November 2006 and Control and management of Traffic at Road Work October 2007.

Local Access for Residents

As part of the traffic management plan local residents will be alerted to the works through the use of letter drops and prior consultation, if required.

Every effort will be made to limit the effect on local residents and any residents who require special provisions to be made will be accommodated (i.e. Home carer, etc.). Traffic management plans will be reviewed on a daily basis and take into account all local parameter in the area. All required Roadwork Temporary Traffic Management Design Sheets will be completed and kept on site.

Pedestrian & Cyclist Management

Construction traffic & operatives will be made aware to watch out for oncoming pedestrians / cyclists.

MCE – Cleanrath WF's Traffic Management Plan

Dealing With Emergency Services

Gardaí will be advised of the intended works prior to commencement on the Gardaí Consultation form. Emergency services using the local roads will be given priority.

Signage Plan

All works will be signed in accordance with the "Guidance for the Control and Management of Traffic at Road Works" (Second Edition 2010). The Routine Works Traffic Management Design, including the layout parameters is illustrated on attachment.
A fully certified and competent 'Signing Lighting & Guarding' officer will sign off on the works before commencement and carry out routine monitoring. A qualified supervisor will be on site at all times.

✓See attached traffic management design sheet for signage etc.

✓The entire traffic management system will be set up prior to any works commencing.

✓Only approved signs will be used on approach to the wind farm entrances.

✓All signs will be clean and clearly visible.

✓Once signs are in place the route will be assessed to ensure adequate visibility for drivers and pedestrians.

✓All signs will be secured and weighted down where appropriate.

✓Contractor vehicles will be parked with consideration given to traffic management plan.

MCE – Cleanrath WF's Traffic Management Plan

Haul Route Overview Drawings:

The following drawings are included at the end of this document:

✓Figure 1.1 – Construction Stage Overall Layout View
✓Figure 1.2 – Sheet 1 of 5 – Location 1, 2, 3 & 4 Layouts
✓Figure 1.3 – Sheet 2 of 5 – Location 5 & 6 Layouts
✓Figure 1.4 – Sheet 3 of 5 – Location 6 & 7 Layouts
✓Figure 1.5 – Sheet 4 of 5 – Location 8 Layout
✓Figure 1.6 – Sheet 5 of 5 – Location 9 Layout

Signage Layout On Approach To The Wind Farm Entrances

The following is the layout for signage that will be in place on the approach to the wind farm entrances. See attached Figure 1.1 showing signage layout from N22 to the WF entrances:

✓Sign no 1: WK001 / P011D indicates sign 600m before entrance "Man with Shovel" & "55km/h".

✓Sign no 2: RUS014 indicates sign 400m before entrance "No Overtaking".

✓Signage after road words will indicate 'No Overtaking Ends' and ' End of Road Works'.

✓All other signs as shown in Figure 1.1 to Figure 1.6 indicates specific site directions to site.

Traffic entering and exiting existing secondary road will continue as normal with construction traffic kept to a minimum.

ROUTINE WORKS TRAFFIC MANAGEMENT DESIGN

SHUTTLE CONTROL SELECTION

Method	Max Speed Limit (km/h)	Length of Works (m)	Max Traffic (veh/hr)	3 Min Count	Notes	
All Stop	100	n/a	300	15	5-10 mins max.	
Give and Take	50	50	400	20	Clear Visibility required from both directions	
Priority	100	80	840	42	Speed Limit	Distance
	These Distances indicate the clear visibility distance from before an obstruction to a point an equal distance beyond the obstruction. If used at night, will require a warning beacon				50 km/h	60m
					60 km/h	70m
					80 km/h	80m
					100 km/h	100m
Stop/Go	100	20	500	25	Can be Single Man/Single Sign	
	100	100	1400	70	Can be single Man-Auto Sign	
	100	200	1250	63	Can be single Man-Auto Sign	
	100	300	1050	53	Has to be Two Man-Two Sign	
	100	400	950	48	Has to be Two Man-Two Sign	
	100	500	850	43	Has to be Two Man-Two Sign	
Traffic Lights	100	500	n/a	n/a	Vehicle Actuated	

NOTE: WHEN USING SHUTTLE CONTROL, TAPERS ARE AT 45 DEGREES

Advance Signs	Warn	r.w.a.			road works ahead
	Inform	t.m.	Priority	1	traffic management
				2	
				3	
				4	
	Direct	n.o.			no overtaking
For Advance Signs Space Signs evenly through the advance sign distance					
Works Signs	Direct	select appropriate			
End Signs	End				

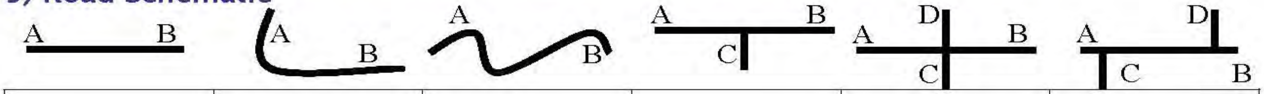
LAYOUT PARAMETER SELECTION SHEET

Type of Road	Advance Sign Distance (D) (m)	Min No. & Type Of Advance Signs In Sequence	Min clear visibility of Signs (m)	Min size of signs (mm)	Min height of cones (mm)	Long. Safety Zone (L) (m)	Side. Safety Zone (S) (m)	Long. Cone Space	Long. Lamp Space	Lane Taper Multiply factor	Taper Cone Spacing	Taper Lamp Spacing	Lead-in cone tapers (See Notes below) Recommended lengths	Width of hazard (including safety zone) NOTE: TAPERS ARE ONLY WHERE TWO WAY TRAFFIC MAINTAINED 1 m	2 m	3 m	4 m	Hard Shoulder Taper Multiply factor
Single carriageway road, 30km/h	50	1 (r.w.a.) 1 (t.m.)	50	600	450	5	0.5	6	12	8	3	9	Length of taper (T) in (m)	8	16	24	32	4
													Minimum No. of Cones	4	7	10	12	
													Minimum No. of Lamps	2	3	4	5	
Single carriageway, 60km/h	50	1 (r.w.a.) 1 (t.m.)	50	600	450	5	0.5	6	12	8	3	9	Length of taper (T) in (m)	8	16	24	32	4
													Minimum No. of Cones	4	7	10	12	
													Minimum No. of Lamps	2	3	4	5	
Single Carriageway 80km/h	600	1 (r.w.a.) 1 (n.o.) 1 (t.m.)	90	750* 900*	750	45	1.2	12	24	35	2.5	9	Length of taper (T) in (m)	35	70	105	140	20
													Minimum No. of Cones	16	30	44	58	
													Minimum No. of Lamps	5	9	13	17	
Single Carriageway 100 km/h	800	1 (r.w.a.) 1 (n.o.) 2 (t.m.)	120	750* 900*	750	60	1.2	12	24	40	1	9	Length of taper (T) in (m)	40	80	120	160	20
													Minimum No. of Cones	42	82	122	162	
													Minimum No. of Lamps	6	10	15	19	
Dual Carriageway 60 km/h	600	1 (r.w.a.) 2 (t.m.) X 2	50	900	450	5	0.5	6	12	8	3	9	Length of taper (T) in (m)	8	16	24	32	4
													Minimum No. of Cones	4	7	10	12	
													Minimum No. of Lamps	2	3	4	5	
Dual Carriageway 80 km/h	600	1 (r.w.a.) 2 (t.m.) X 2	90	900	750	45	0.75	12	24	35	3	9	Length of taper (T) in (m)	35	70	105	140	10
													Minimum No. of Cones	13	25	37	48	
													Minimum No. of Lamps	5	9	13	17	
Dual Carriageway 100 km/h	1000	2 (r.w.a.) 3 (t.m.) X 2	120	1200	750	45	1.2	12	24	40	1	9	Length of taper (T) in (m)	40	80	120	160	20
													Minimum No. of Cones	42	82	122	162	
													Minimum No. of Lamps	6	10	15	19	

* Use 750mm signs where Vehicles Per Day < 5,000. Use 900mm signs where Vehicles Per Day > 5,000

TRAFFIC MANAGEMENT PLAN FOR ROUTINE WORKS

5) Road Schematic



6) Traffic Management Selection

6.1) Classification	Road Type	Road Width	Speed Limit	Urban/Rural	Traffic
					Heavy/ Light

6.2) Selection	All Stop	Give & Take	Priority	Stop/ Go	Lights	Tapers

6.3) Semi-Static	Will Semi-Static Management be used?	Yes		No	

7) Signage (Warn / Inform / Direct / End)

No	Sign	Dir	No	Sign	Dir	No	Sign	Dir	No	Sign	Dir
1 (1 + 2 ARE SEMI-STATIC)	 SELECT PLATE BELOW	A B C D	6		A B C D	11		A B C D	16	 Pedestrian Barrier	A B C D
	Deisiú Bóthair ROAD REPAIRS Oibreacha Draeináil DRAINAGE WORKS Bearradh Fáil HEDGE CUTTING		7		A B C D	12		A B C D	17		A B C D
2	 2 km ar fad FOR 2 km	A B C D	8		A B C D	13		A B C D	18		A B C D
3		A B C D	9	 YIELD (Priority)	A B C D	14	 Barrier Board	A B C D	19		A B C D
5		A B C D	10		A B C D	15		A B C D	20	 Críoch END	A B C D

If Using Traffic Lights/ Stop-Go, Have Gardaí Been Notified?	YES		NO	
Are All Required Cones /(Lamps & Beacons) In Place (and operating)?	YES		NO	

8) Workforce Induction & Communication

8.1) Has this Plan been Communicated to the workforce and does everyone know their role? Operatives to Sign Below	Yes		No	

8.2) Supervisor		

NOTIFICATION OF POSITIVE TRAFFIC CONTROL

Under the following Road Traffic Acts/Regulations

- Section 37 of the Road Traffic Act, 1994
- Road Traffic (Signs) Regulations 2006 (S.I. No. 637 of 2006)
- Road Traffic (Control of Traffic) Regulations 2006 (S.I. No. 638 of 2006)

The Roads Authority of

Hereby notifies

Of the use of

TEMPORARY TRAFFIC LIGHTS ☐

STOP-GO BOARD(s) ☐

at the following location:

Road

From a point

To a point

ON/ BETWEEN (delete as appropriate) the following dates

and

Observations (if any) should be faxed to:

Signed: ______________________________

On behalf of the Roads Authority

MCE Ltd.

Civil & Electrical Engineering Specialists

PLANNED WORKS TRAFFIC MANAGEMENT SITE INSPECTION SHEET			
PROJECT NAME:		Phase:	
Date:		Time:	1). 2).

1) TRAFFIC MANAGEMENT SET-UP/ MODIFICATION, INSPECTIONS		
1-1) Installation Checks		
Does the Traffic Management conform to the Design Layout and Parameters?		
Have all hazards been addressed in the Traffic Management Plan?		
Has allowance been made for the delivery and removal of materials?		
Have Gardaí been informed of any Traffic Lights/ Stop-Go Boards in use?		
Have Gardaí been informed of Roadworks Speed limits being introduced?		
2) TRAFFIC MANAGEMENT OPERATION INSPECTIONS		
2-1) Operation Checks	**1**	**2**
Are Safety Zones being kept clear of operatives, plant and materials?		
Are all the signs in good condition/ are all cones in good condition with sleeves?		
Are sign vision lines free from bends, hills/dips in the road, parked vehicles, hedges etc?		
Will the site be safe at night or in wind, fog, snow or rain? (delete as appropriate)		
Are all misleading permanent signs and road markings covered?		
Is the carriageway/footway being kept clear of mud and surplus equipment?		
Are materials/ plant that are left on verges or lay-bys being properly guarded and lit?		
2-2) Traffic Checks		
Is there safe access to adjacent premises?		
Does Signing and Guarding meet the (changing) conditions?		
Are traffic control arrangements working at the optimum level to reduce traffic delays?		
If present, are the needs of cyclists or horse riders incorporated into the layout?		
2-3) Pedestrian & Vulnerable Road User Checks		
Have the needs of pedestrians & vulnerable road users been addressed in the layout?		
If pedestrian route blocked, has a suitable alternative route been provided?		
Are pedestrian routes clearly evident/ indicated?		
If a footway in the road is to be used, are ramps to the kerb provided?		
Are pedestrian hazards sufficiently GUARDED at night?		
3) TRAFFIC MANAGEMENT CESSATION INPECTIONS		
3-1) Works Complete Checks		
Have all signs, cones, barriers, and lamps been removed?		
Have any covered permanent signs been restored?		
Have Gardaí been informed that Speedlimits/ Traffic Signals/ Stop-Go removed?		
4) EXCEPTIONS REPORT		
(Append attachments as necessary)		

Check Completed By:	

PROJECT CLOSEOUT SHEET	
PROJECT NAME:	

1) Procedures	
The extents of construction have been completed per the plans	
Pavement Surface has been visually inspected and deemed satisfactory (incl. sweeping of surfaces that have been surface dressed)	
Temporary Traffic Management arrangements (incl. Orders) have been removed	
Any Permanent Road Markings, Road Studs, and Signs have been installed	
2) Works Extents	
The length of work completed was (m)	
The average width of work completed was (m)	
3) Appointments	
PSDP appointment terminated	
Designer appointment terminated	
PSCS appointment terminated	
Contractor given completion certificate	
4) Records	
The safety file is complete and will be stored	
5) Site Inspection	
The site has been inspected by (print name) and deemed to be satisfactory:	
Signature:	
Date of inspection:	
6) Procedure Monitoring (to be completed by supervisor of person listed in 5 above)	
I recommend that the Project be deemed complete (print name)	
Signature:	
Date:	

INCIDENT/ ACCIDENT REPORT FORM

1) Job Details

1.1) Job Name	
1.2) Job Location	

2) Incident

2.1) Date of Incident		2.2) Time of Incident	

2.3) Incident Involves

Public	Layout	Operatives	Plant	Materials	Hired	Contractor	Environment

2.4) Incident Classification

Class 1		Class 2		Class3	Class 4	
Long Traffic Delays	Pedestrian Danger	Near Miss	Minor Injury	3 Day Injury	Road Traffic Accident	Serious Injury or Death

2.5) Weather Conditions

Light:	Sunny	Cloudy	Fog	Dawn/Dusk	Night	Floodlit

Rain:	Dry	Light Rain	Heavy Rain	Hailstones	Snow

Wind:	No Wind	Breeze	Windy	Gale

Temperature:	Warm	Cold	Freezing

2.6) Locus

Carriageway	Footpath	Safety Zone	Working Space

2.7) Pavement Condition

Clean	Dirty	Dry	Wet	Granular	Wearing	Base	Chips	Markings

2.8) Number involved (Class 2 or greater)	

3) Traffic Management

3) Traffic Management	N/A	Yes	No
3.1) Were the appropriate signs in their correct place?			
3.2) Were the signs in a good condition?			
3.3) Were all cones in place and in good condition?			
3.4) Were all TM Lamps in place and operating?			
3.5) Were all TM Beacons in place and operating?			
3.6) Were Plant Hazard Beacons operating?			

4) Site Health and Safety

4) Site Health and Safety	N/A	Yes	No
4.1) Had operative appropriate CSCS card?			
4.2) Had plant/ equipment been checked for suitability?			
4.3) Were Safety Guards in place and in good condition?			
4.4) Were correct operating procedures/ guidelines used?			
4.5) Were operatives wearing appropriate PPE?			
4.6) Was there good housekeeping on site?			

5) Emergency Procedure

5.1) Services

None	First Aid	Driven to Aid	Ambulance	Fire Brigade	Gardaí

5.2) Procedure

	Good	Bad	None
Training			
Equipment			

6) Operatives (List operatives on site at time of incident)

7) Incident Description

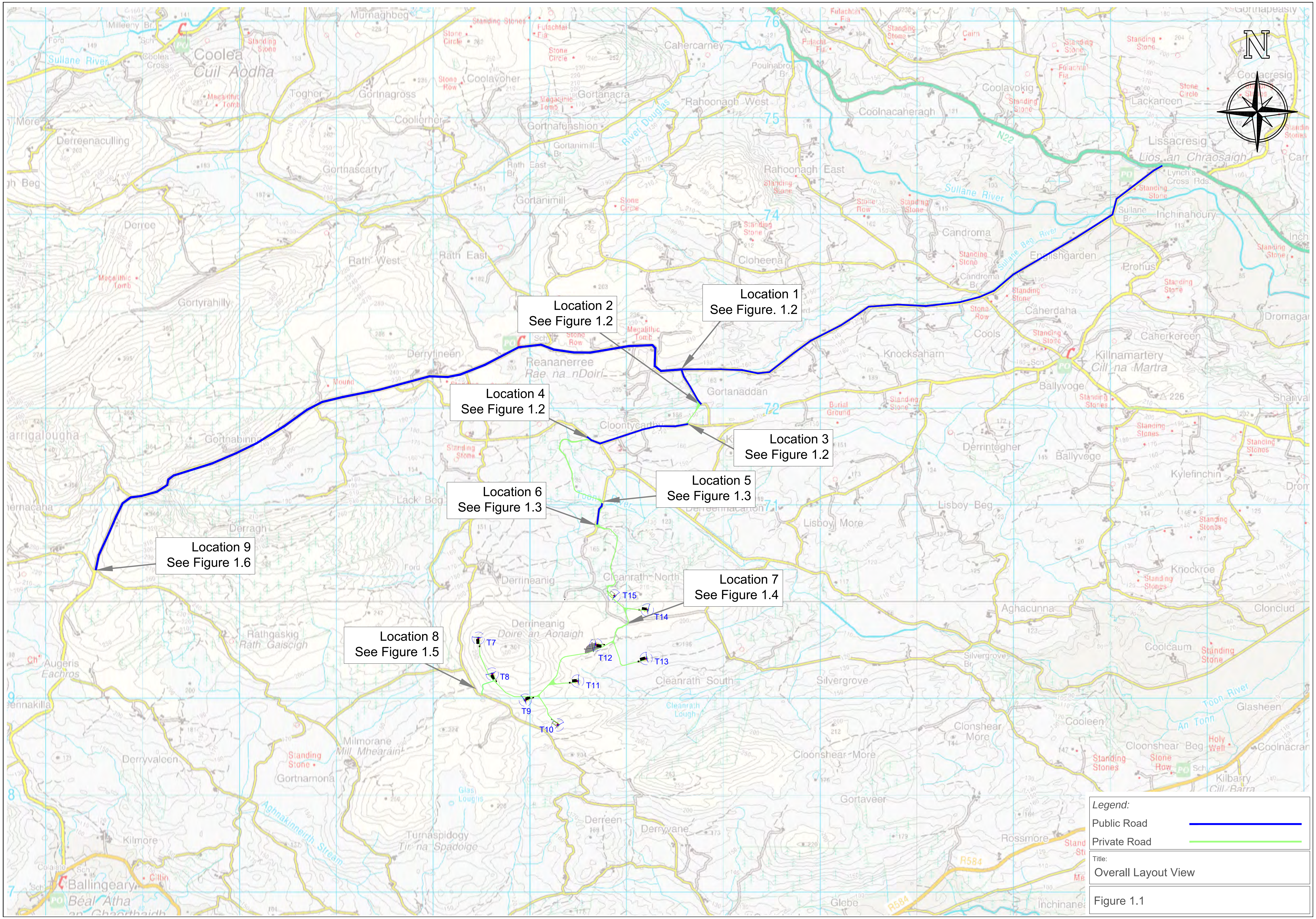
8) Suggested Control Measures to Prevent Re-Occurance

9) Incident Sketch

10) Report Completed By:		11) Report Noted By:	

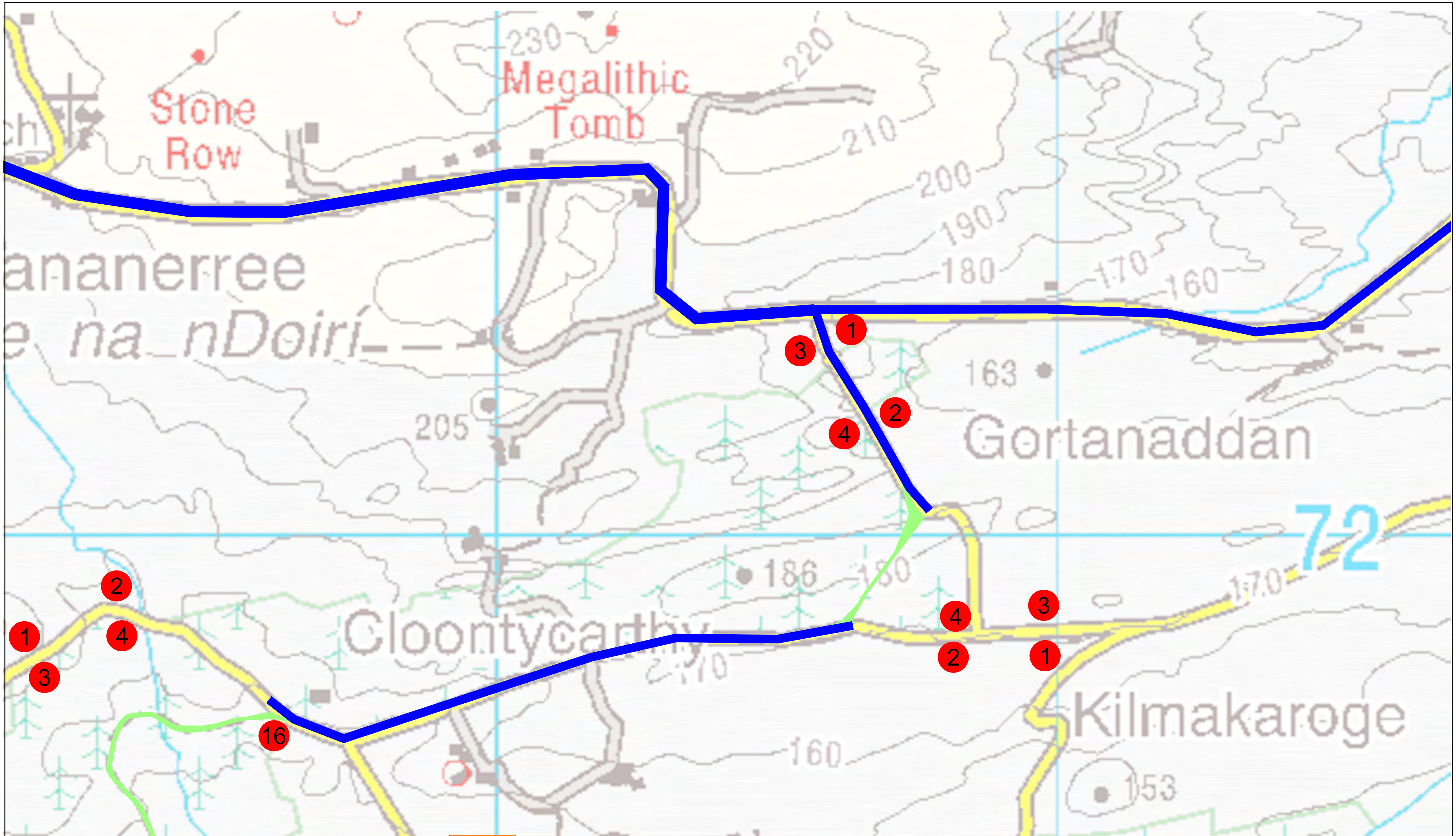
MCE – Cleanrath WF's Traffic Management Plan

	Name (Print)	Signature	I understand the details in the traffic management plan and agree to sign off (tick)	Date
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				



Title:
Overall Layout View

Figure 1.1



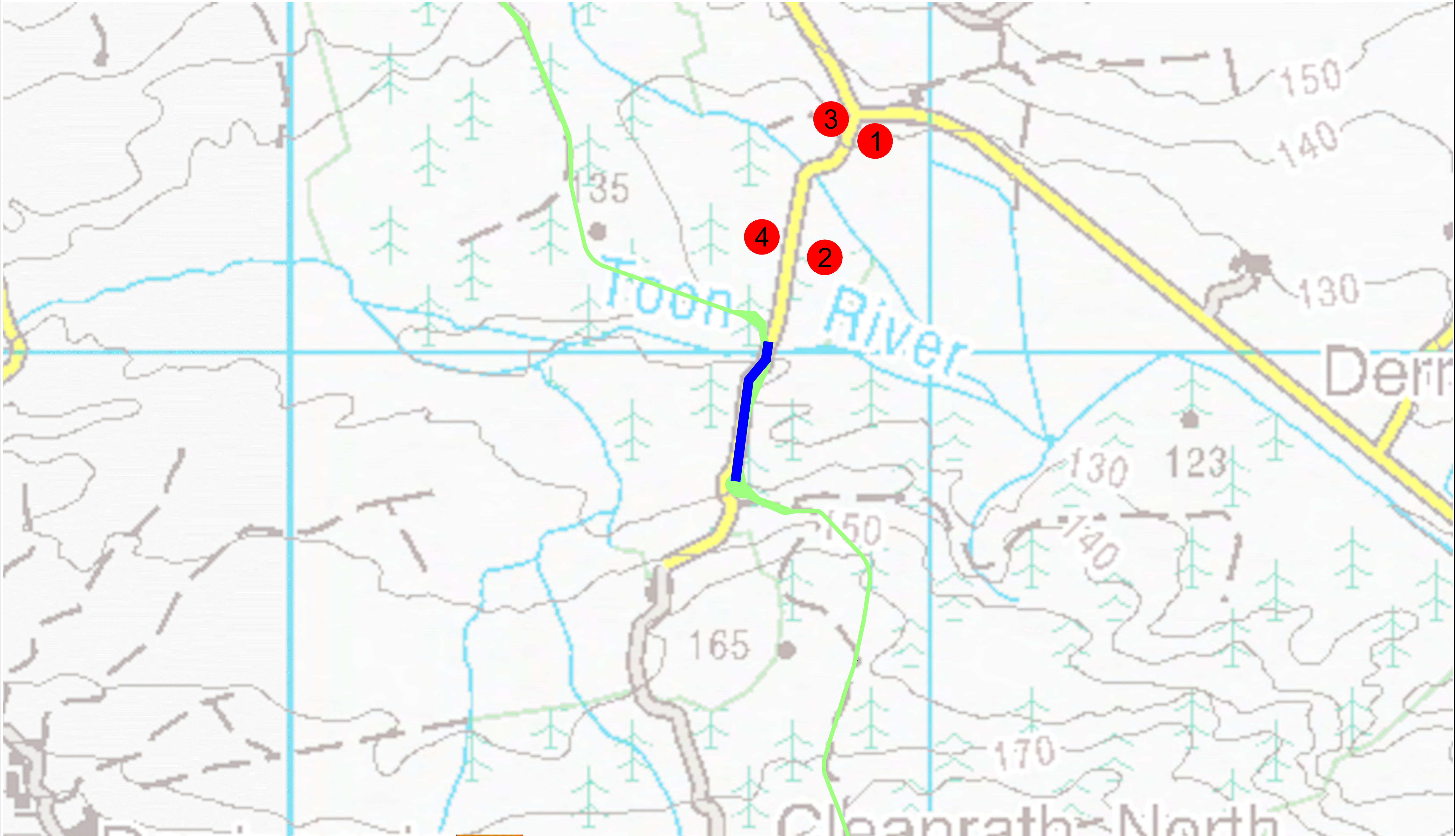
Legend:

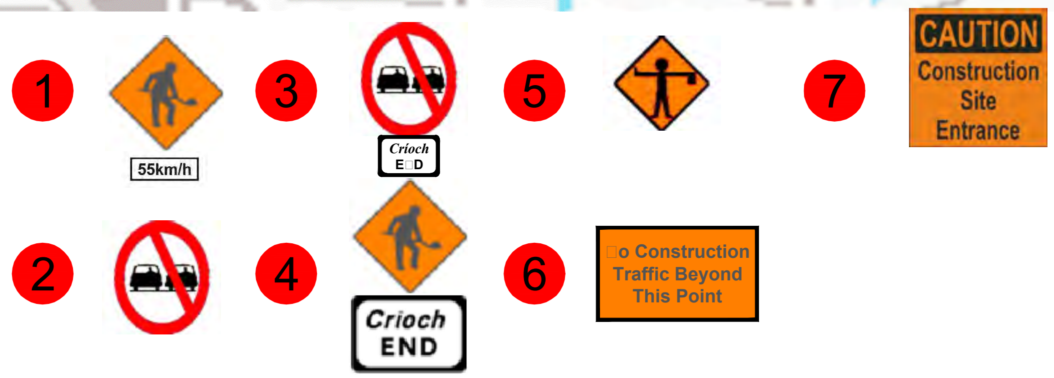
Public Road

Private Road

Title:
Location 1, 2, 3 & 4 Layout
Sheet 1 of 5

Figure 1.2



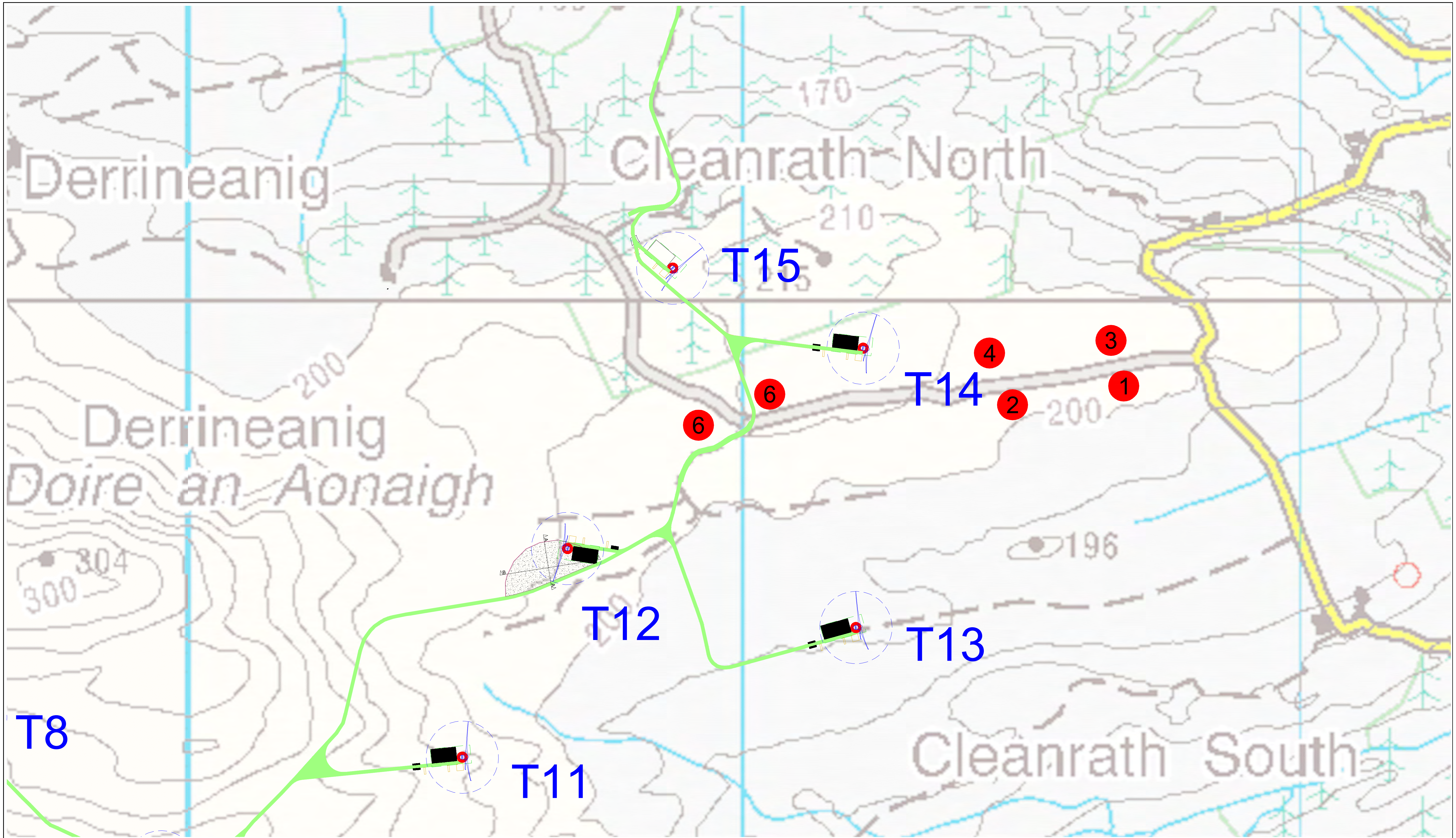


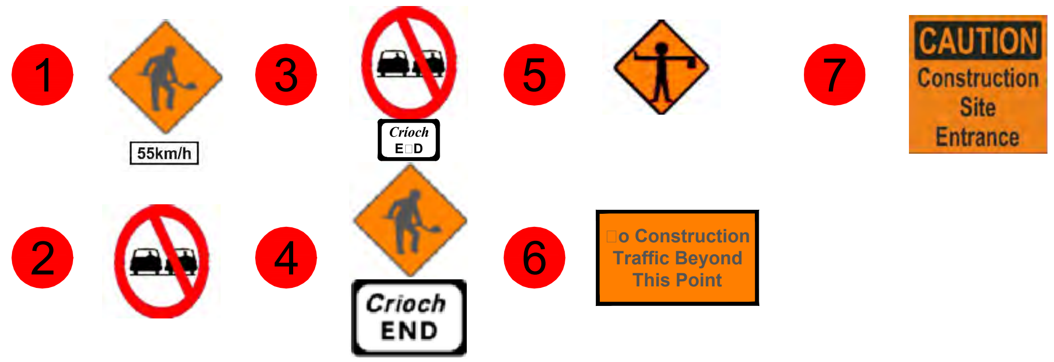
Legend:

Public Road	
Private Road	

Title:
Location 5 & 6 Layout - Sheet 2 of 5

Figure 1.3





Legend:

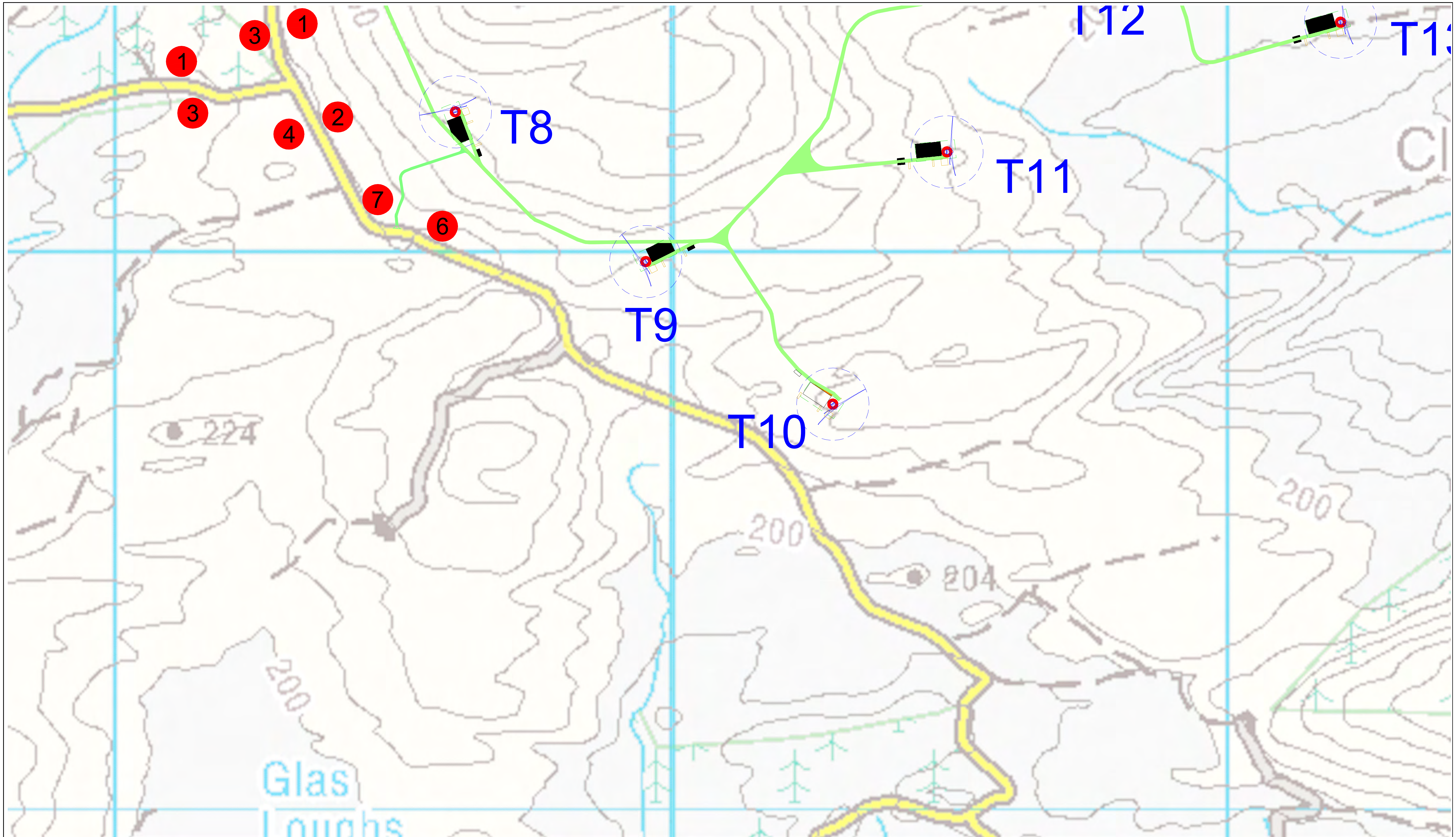
Public Road

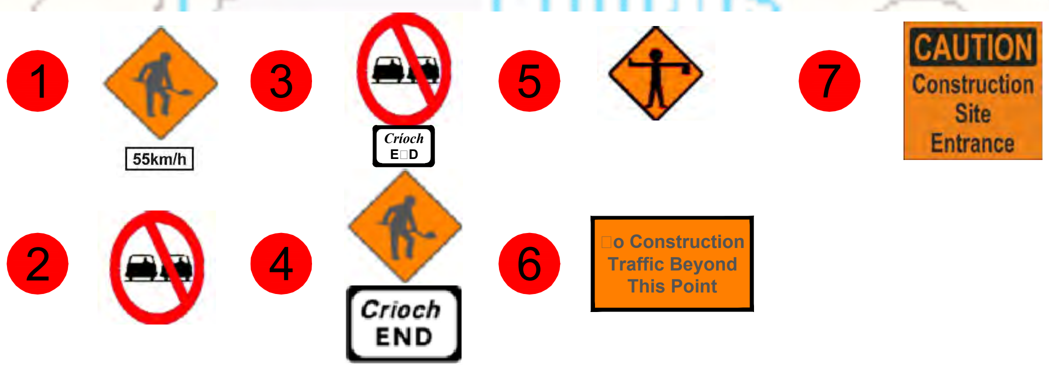
Private Road

Title:

Location 6 & 7 Layout - Sheet 3 of 5

Figure 1.4





Legend:

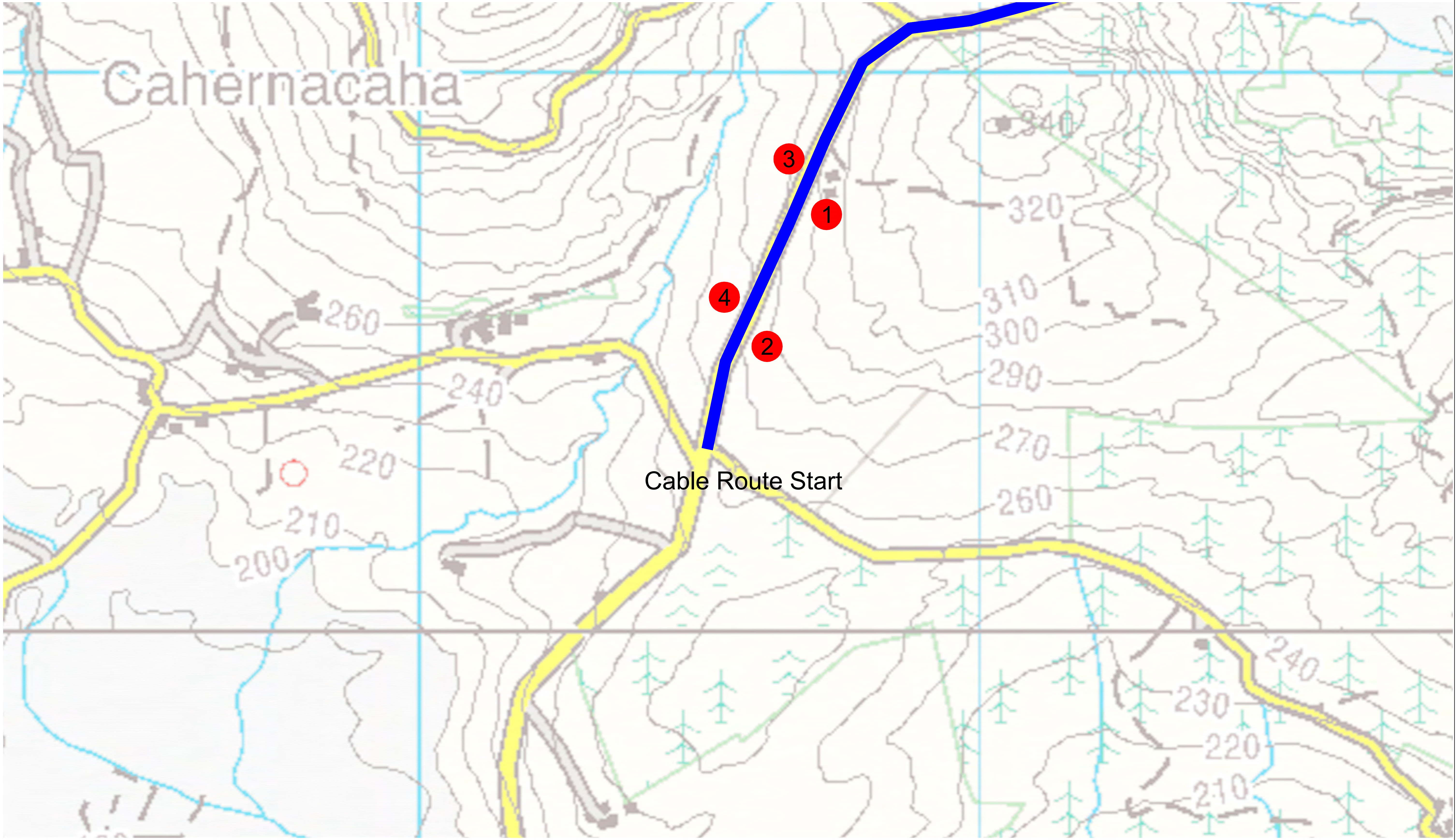
Public Road

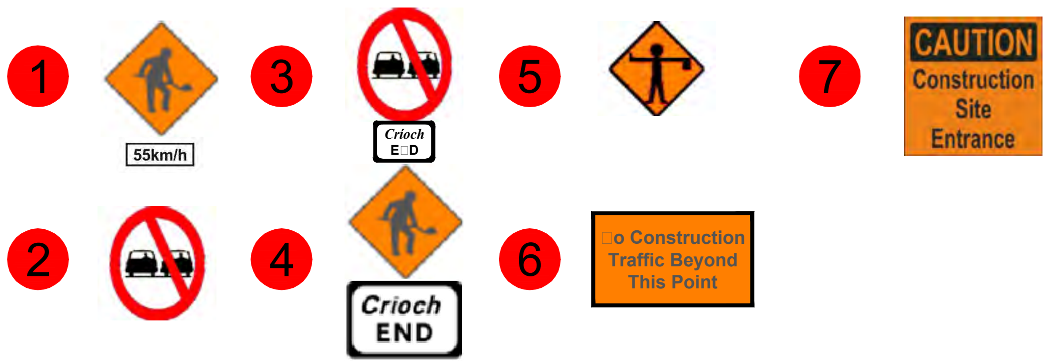
Private Road

Title:

Location 8 Layout - Sheet 4 of 5

Figure 1.5





Legend:

Public Road

Private Road

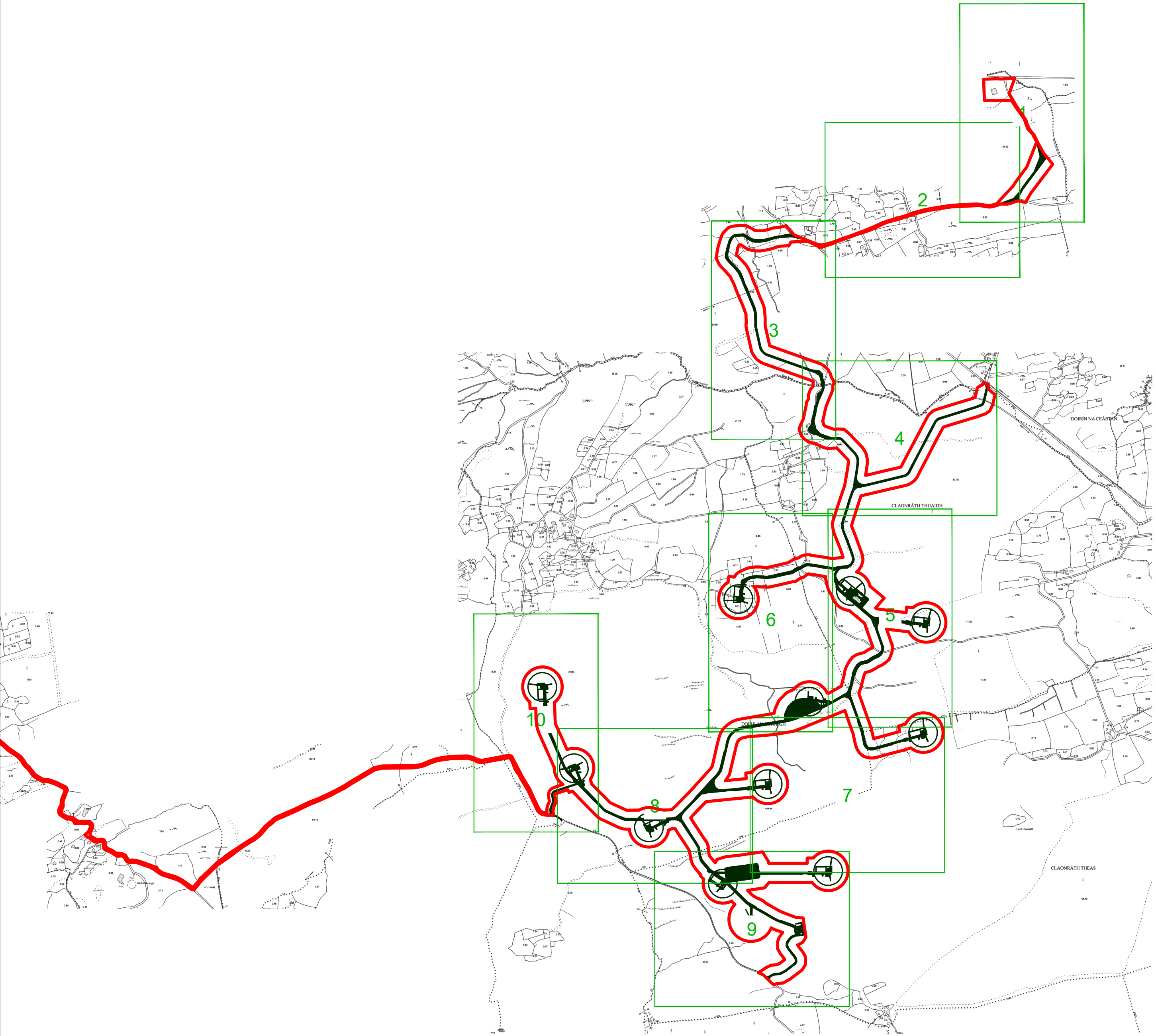
Title:

Location 9 Layout - Sheet 5 of 5

Figure 1.6

Appendix 3

Site Layout Drawings



Project Design Drawing Notes

Drawing Legend

- Planning Application Boundary
- Clenrath Wind Farm Infrastructure PL.REF 15/6966 ABP PL. 04.246742 & 18/04458
- Existing Fence

N

DRAWING TITLE:

Site Layout
Map Key Plan

PROJECT TITLE:

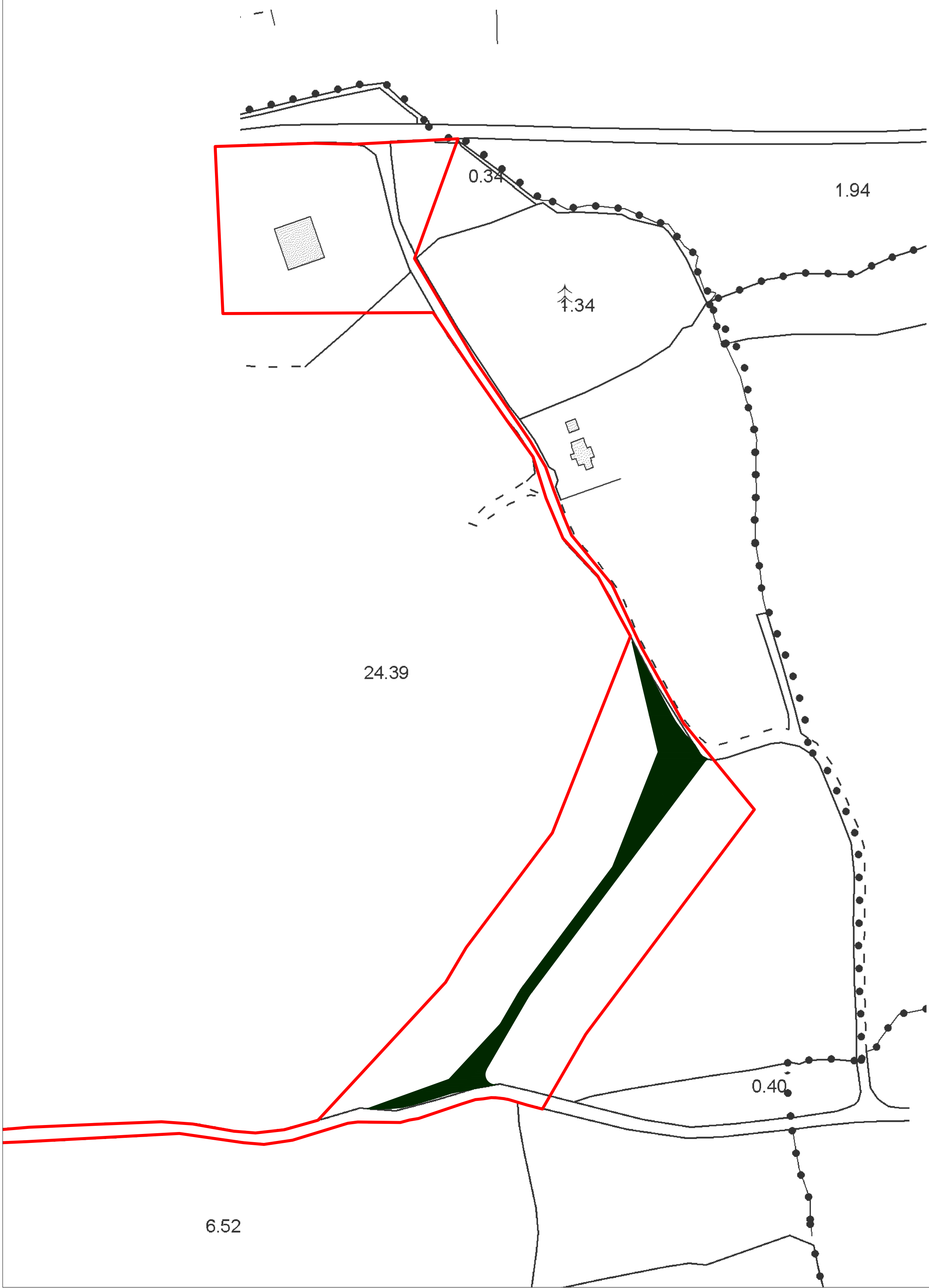
Cleanrath Wind Farm, Co. Cork

DRAWING BY: **Joseph O Brien**	CHECKED BY: **Colm Harte**
PROJECT No.: **110721e**	DRAWING No.: **0721 - 03**
SCALE: **1:20,000 @ A3**	DATE: **06.08.2020**

OS SHEET No.: **6367,6368,6369,6370,6371,6412,6413,6413,6415,6416**

McCarthy Keville O'Sullivan

McCarthy Keville O'Sullivan Ltd.
Planning & Environmental Consultants
Block 1,
Galway Financial Services Centre,
Moneenageisha Road,
Galway, Ireland.
email: info@mccarthykos.ie
website: www.mccarthykos.ie
Tel: +353 91 735611
Fax: +353 91 771279



Project Design Drawing Notes

1. Drawings issued are for planning application purposes only.
2. Drawings not to be used for construction/contract conditions.
3. Copyright, all rights reserved. No part here with may be copied or reproduced partially or wholly in any form whatsoever without the prior notice of the copyright owner McCarthy Keville O'Sullivan.
4. Do not scale off this drawing. Figured metric dimensions only should be taken off this drawing.
5. All contractors, whether main or sub-contractors, must visit the site and are responsible for taking and checking any and all dimensions and levels that relate to the works.
6. The use of or reliance upon this drawing shall be deemed to be acceptance of these conditions of use unless otherwise agreed in writing, such written agreement to be sought from and issued by the copyright holder to the use or reliance upon these drawings.

Drawing Legend

- Planning Application Boundary
- Clenrath Wind Farm Infrastructure PL.REF 15/6966 ABP PL. 04.246742 & 18/04458

DRAWING TITLE:

Site Layout
Sheet 1 of 10

PROJECT TITLE:

Cleanrath Wind Farm, Co. Cork

DRAWING BY: Joseph O Brien	CHECKED BY: Colm Harte
PROJECT No.: 110721e	DRAWING No.: 0721 - 04
SCALE: 1:2,500 @ A3	DATE: 06.08.2020

OS SHEET No.: 6367,6368,6369,6370,6371,6412,6413,6413,6415,6416

McCarthy Keville O'Sullivan

McCarthy Keville O'Sullivan Ltd.
Planning & Environmental Consultants
Block 1,
Galway Financial Services Centre,
Moneenageisha Road,
Galway, Ireland.
email: info@mccarthykos.ie
website: www.mccarthykos.ie
Tel: +353 91 735611
Fax: +353 91 771279

Project Design Drawing Notes

1. Drawings issued are for planning application purposes only.
2. Drawings not to be used for construction/contract conditions.
3. Copyright, all rights reserved. No part here with may be copied or reproduced partially or wholly in any form whatsoever without the prior notice of the copyright owner McCarthy Keville O'Sullivan.
4. Do not scale off this drawing. Figured metric dimensions only should be taken off this drawing.
5. All contractors, whether main or sub-contractors, must visit the site and are responsible for taking and checking any and all dimensions and levels that relate to the works.
6. The use of or reliance upon this drawing shall be deemed to be acceptance of these conditions of use unless otherwise agreed in writing, such written agreement to be sought from and issued by the copyright holder to the use or reliance upon these drawings.

Drawing Legend

Planning Application Boundary

Clenrath Wind Farm Infrastructure PL.REF 15/6966 ABP PL. 04.246742 & 18/04458

DRAWING TITLE:

Site Layout Sheet 2 of 10

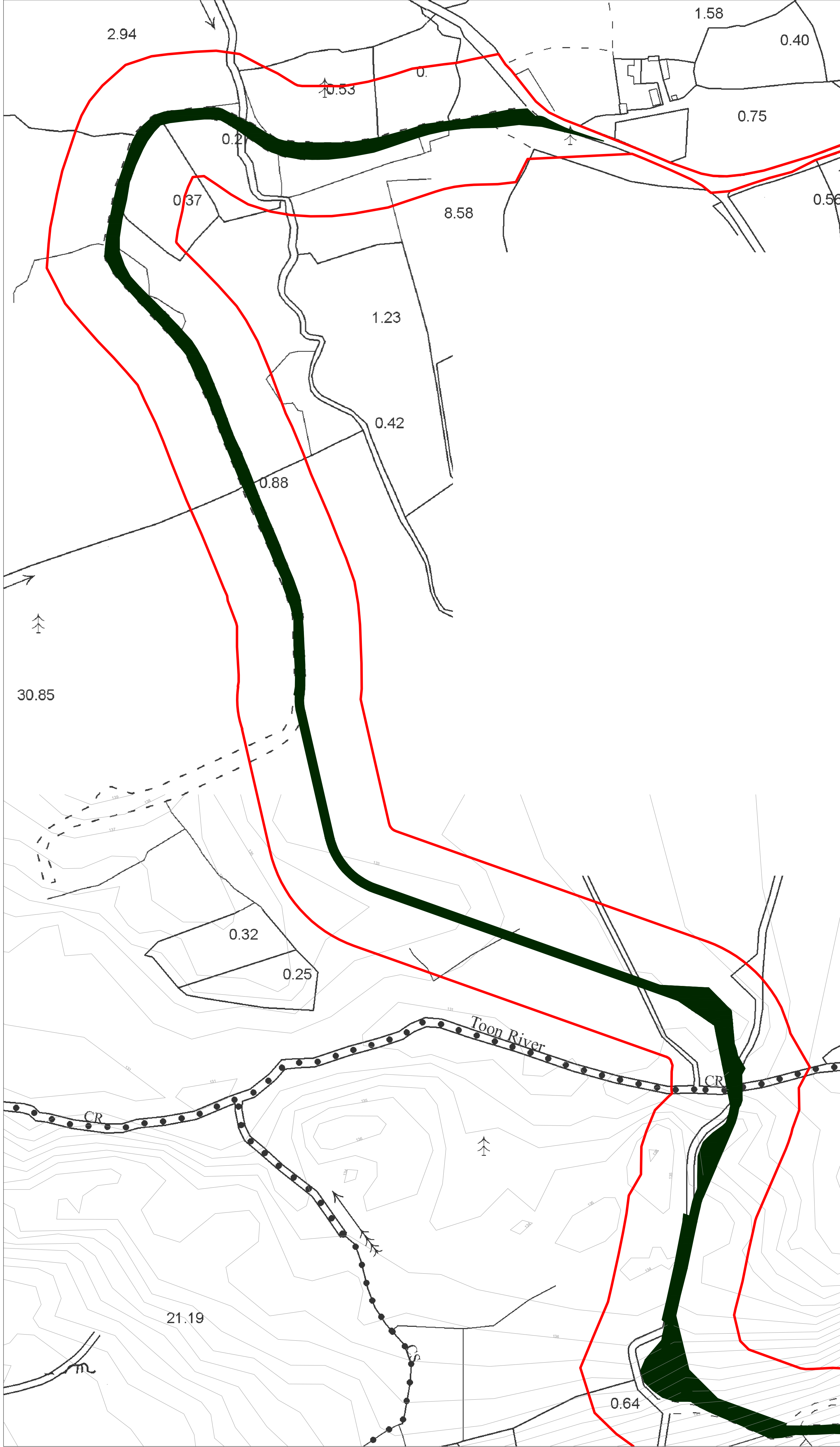
PROJECT TITLE:

Cleanrath Wind Farm, Co. Cork

DRAWING BY: **Joseph O Brien**	CHECKED BY: **Colm Harte**
PROJECT No.: **110721e**	DRAWING No.: **0721 - 05**
SCALE: **1:2,500 @ A3**	DATE: **06.08.2020**

OS SHEET No.: **6367,6368,6369,6370,6371,6412,6413,6413,6415,6416**

McCarthy Keville O'Sullivan Ltd.
Planning & Environmental Consultants
Block 1,
Galway Financial Services Centre,
Moneenageisha Road,
Galway, Ireland.
email: info@mccarthykos.ie
website: www.mccarthykos.ie
Tel: +353 91 735611
Fax: +353 91 771279



Project Design Drawing Notes

1. Drawings issued are for planning application purposes only.
2. Drawings not to be used for construction/contract conditions.
3. Copyright, all rights reserved. No part here with may be copied or reproduced partially or wholly in any form whatsoever without the prior notice of the copyright owner McCarthy Keville O'Sullivan.
4. Do not scale off this drawing. Figured metric dimensions only should be taken off this drawing.
5. All contractors, whether main or sub-contractors, must visit the site and are responsible for taking and checking any and all dimensions and levels that relate to the works.
6. The use of or reliance upon this drawing shall be deemed to be acceptance of these conditions of use unless otherwise agreed in writing, such written agreement to be sought from and issued by the copyright holder to the use or reliance upon these drawings.

Drawing Legend

- Planning Application Boundary
- Clenrath Wind Farm Infrastructure PL.REF 15/6966 ABP PL. 04.246742 & 18/04458

N

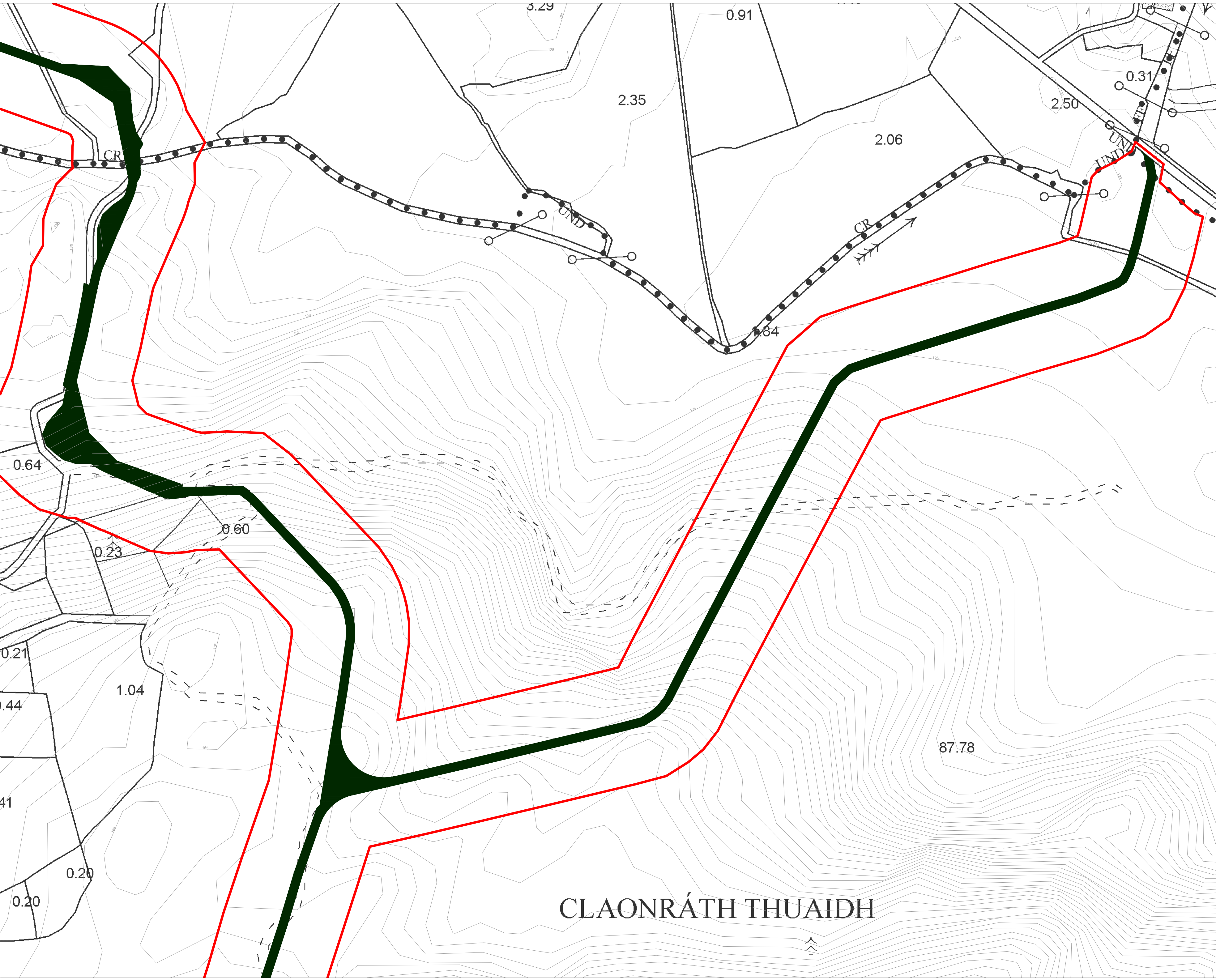
DRAWING TITLE:
Site Layout Sheet 3 of 10

PROJECT TITLE:
Cleanrath Wind Farm, Co. Cork

DRAWING BY: **Joseph O Brien**	CHECKED BY: **Colm Harte**
PROJECT No.: **110721e**	DRAWING No.: **0721 - 06**
SCALE: **1:2,500 @ A3**	DATE: **06.08.2020**
OS SHEET No.: **6367,6368,6369,6370,6371,6412,6413,6413,6415,6416**	

McCarthy Keville O'Sullivan

McCarthy Keville O'Sullivan Ltd.
Planning & Environmental Consultants
Block 1,
Galway Financial Services Centre,
Moneenageisha Road,
Galway, Ireland.
email: info@mccarthykos.ie
website: www.mccarthykos.ie
Tel: +353 91 735611
Fax: +353 91 771279



Project Design Drawing Notes

1. Drawings issued are for planning application purposes only.
2. Drawings not to be used for construction/contract conditions.
3. Copyright, all rights reserved. No part here with may be copied or reproduced partially or wholly in any form whatsoever without the prior notice of the copyright owner McCarthy Keville O'Sullivan.
4. Do not scale off this drawing. Figured metric dimensions only should be taken off this drawing.
5. All contractors, whether main or sub-contractors, must visit the site and are responsible for taking and checking any and all dimensions and levels that relate to the works.
6. The use of or reliance upon this drawing shall be deemed to be acceptance of these conditions of use unless otherwise agreed in writing, such written agreement to be sought from and issued by the copyright holder to the use or reliance upon these drawings.

Drawing Legend

Planning Application Boundary

Clenrath Wind Farm Infrastructure PL.REF 15/6966 ABP PL. 04.246742 & 18/04458

N

DRAWING TITLE:

Site Layout
Sheet 4 of 10

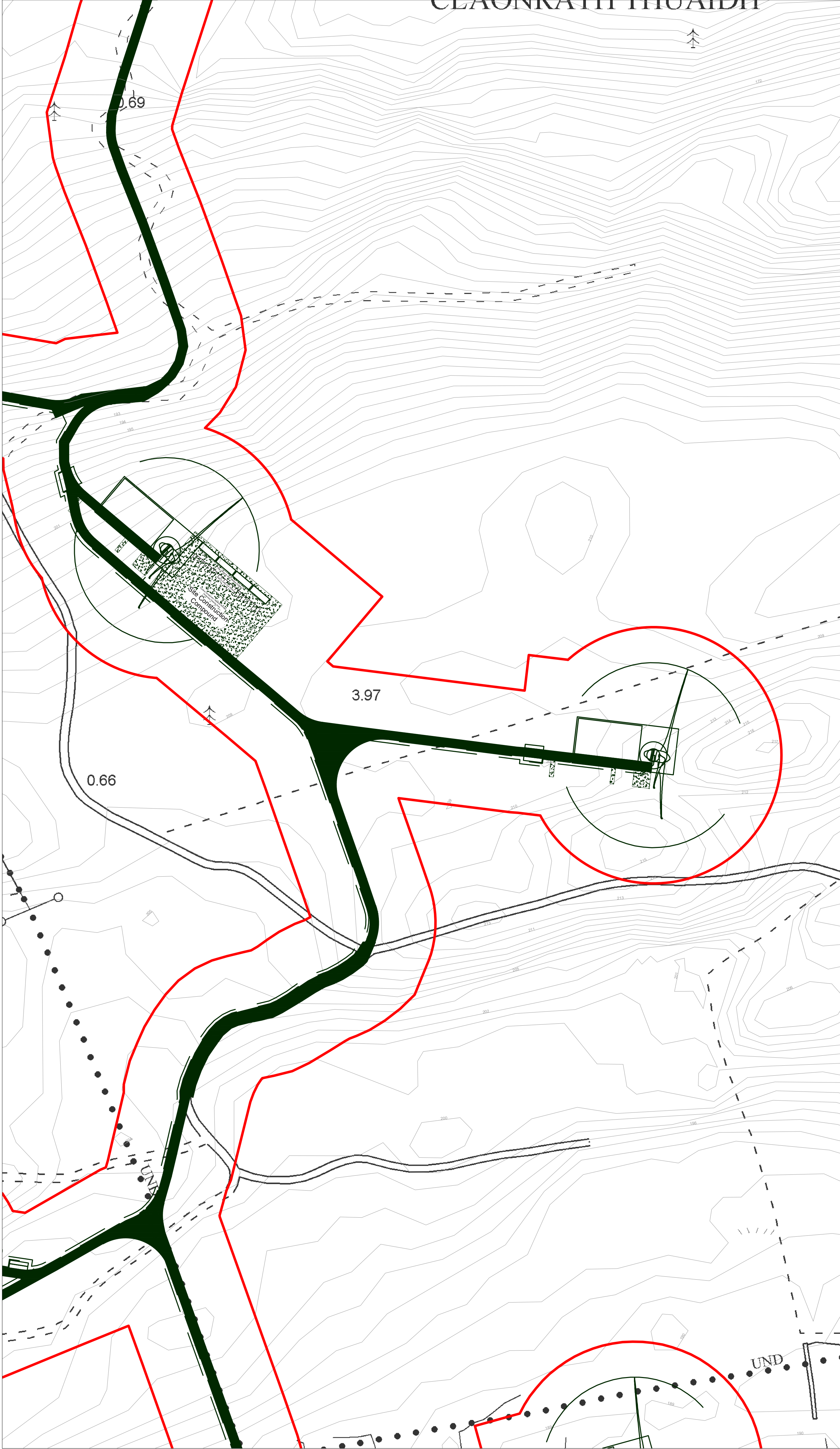
PROJECT TITLE:

Cleanrath Wind Farm, Co. Cork

DRAWING BY: **Joseph O Brien**	CHECKED BY: **Colm Harte**
PROJECT No.: **110721e**	DRAWING No.: **0721 - 07**
SCALE: **1:2,500 @ A3**	DATE: **06.08.2020**

OS SHEET No.: **6367,6368,6369,6370,6371,6412,6413,6413,6415,6416**

McCarthy Keville O'Sullivan Ltd.
Planning & Environmental Consultants
Block 1,
Galway Financial Services Centre,
Moneenageisha Road,
Galway, Ireland.
email: info@mccarthykos.ie
website: www.mccarthykos.ie
Tel: +353 91 735611
Fax: +353 91 771279



Project Design Drawing Notes

1. Drawings issued are for planning application purposes only.
2. Drawings not to be used for construction/contract conditions.
3. Copyright, all rights reserved. No part here with may be copied or reproduced partially or wholly in any form whatsoever without the prior notice of the copyright owner McCarthy Keville O'Sullivan.
4. Do not scale off this drawing. Figured metric dimensions only should be taken off this drawing.
5. All contractors, whether main or sub-contractors, must visit the site and are responsible for taking and checking any and all dimensions and levels that relate to the works.
6. The use of or reliance upon this drawing shall be deemed to be acceptance of these conditions of use unless otherwise agreed in writing, such written agreement to be sought from and issued by the copyright holder to the use or reliance upon these drawings.

Drawing Legend

- Planning Application Boundary
- Clenrath Wind Farm Infrastructure PL.REF 15/6966 ABP PL. 04.246742 & 18/04458

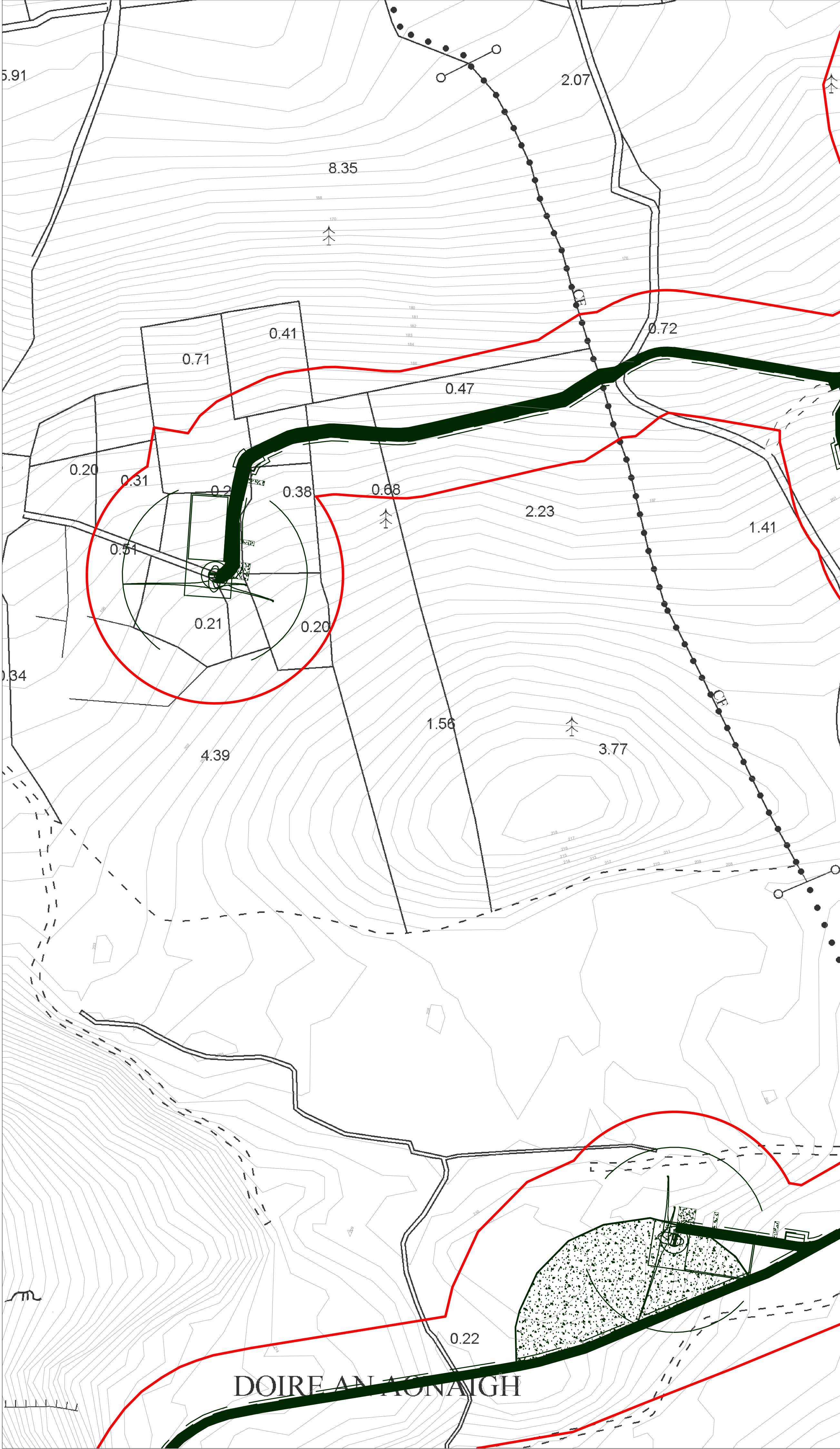
DRAWING TITLE:
Site Layout Sheet 5 of 10

PROJECT TITLE:
Cleanrath Wind Farm, Co. Cork

DRAWING BY: **Joseph O Brien**	CHECKED BY: **Colm Harte**
PROJECT No.: **110721e**	DRAWING No.: **0721 - 08**
SCALE: **1:2,500 @ A3**	DATE: **06.08.2020**

OS SHEET No.: **6367,6368,6369,6370,6371,6412,6413,6413,6415,6416**

McCarthy Keville O'Sullivan Ltd.
Planning & Environmental Consultants
Block 1,
Galway Financial Services Centre,
Moneenageisha Road,
Galway, Ireland.
email: info@mccarthykos.ie
website: www.mccarthykos.ie
Tel: +353 91 735611
Fax: +353 91 771279



Project Design Drawing Notes

1. Drawings issued are for planning application purposes only.
2. Drawings not to be used for construction/contract conditions.
3. Copyright, all rights reserved. No part here with may be copied or reproduced partially or wholly in any form whatsoever without the prior notice of the copyright owner McCarthy Keville O'Sullivan.
4. Do not scale off this drawing. Figured metric dimensions only should be taken off this drawing.
5. All contractors, whether main or sub-contractors, must visit the site and are responsible for taking and checking any and all dimensions and levels that relate to the works.
6. The use of or reliance upon this drawing shall be deemed to be acceptance of these conditions of use unless otherwise agreed in writing, such written agreement to be sought from and issued by the copyright holder to the use or reliance upon these drawings.

Drawing Legend

- Planning Application Boundary
- Clenrath Wind Farm Infrastructure PL.REF 15/6966 ABP PL. 04.246742 & 18/04458

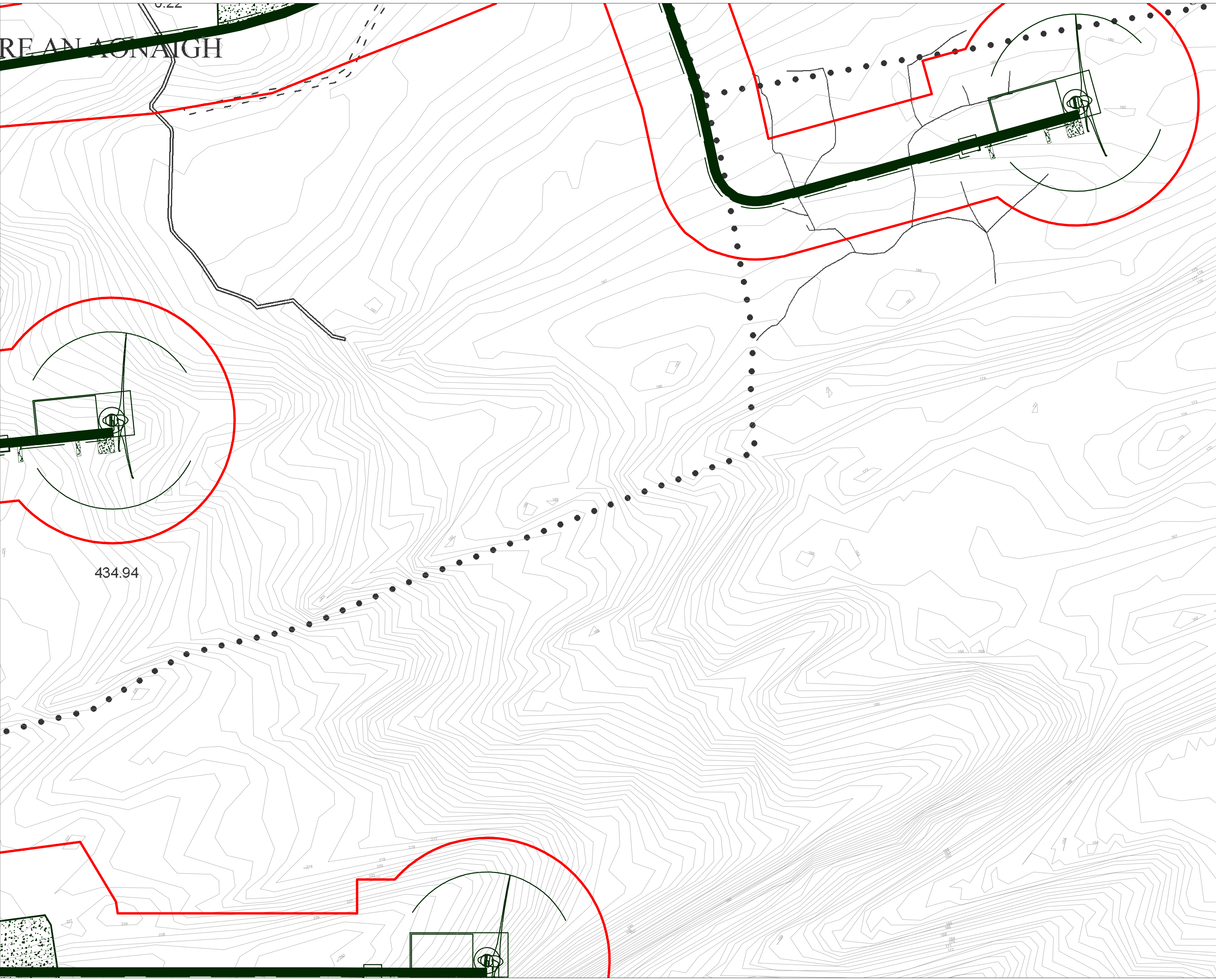
DRAWING TITLE:

Site Layout
Sheet 6 of 10

PROJECT TITLE: Cleanrath Wind Farm, Co. Cork

DRAWING BY: Joseph O Brien	CHECKED BY: Colm Harte
PROJECT No.: 110721e	DRAWING No.: 0721 - 09
SCALE: 1:2,500 @ A3	DATE: 06.08.2020
OS SHEET No.: 6367,6368,6369,6370,6371,6412,6413,6413,6415,6416	

McCarthy Keville O'Sullivan Ltd.
Planning & Environmental Consultants
Block 1,
Galway Financial Services Centre,
Moneenageisha Road,
Galway, Ireland.
email: info@mccarthykos.ie
website: www.mccarthykos.ie
Tel: +353 91 735611
Fax: +353 91 771279



Project Design Drawing Notes

1. Drawings issued are for planning application purposes only.
2. Drawings not to be used for construction/contract conditions.
3. Copyright, all rights reserved. No part here with may be copied or reproduced partially or wholly in any form whatsoever without the prior notice of the copyright owner McCarthy Keville O'Sullivan.
4. Do not scale off this drawing. Figured metric dimensions only should be taken off this drawing.
5. All contractors, whether main or sub-contractors, must visit the site and are responsible for taking and checking any and all dimensions and levels that relate to the works.
6. The use of or reliance upon this drawing shall be deemed to be acceptance of these conditions of use unless otherwise agreed in writing, such written agreement to be sought from and issued by the copyright holder to the use or reliance upon these drawings.

Drawing Legend

- Planning Application Boundary
- Clenrath Wind Farm Infrastructure PL.REF 15/6966 ABP PL. 04.246742 & 18/04458

N

DRAWING TITLE:

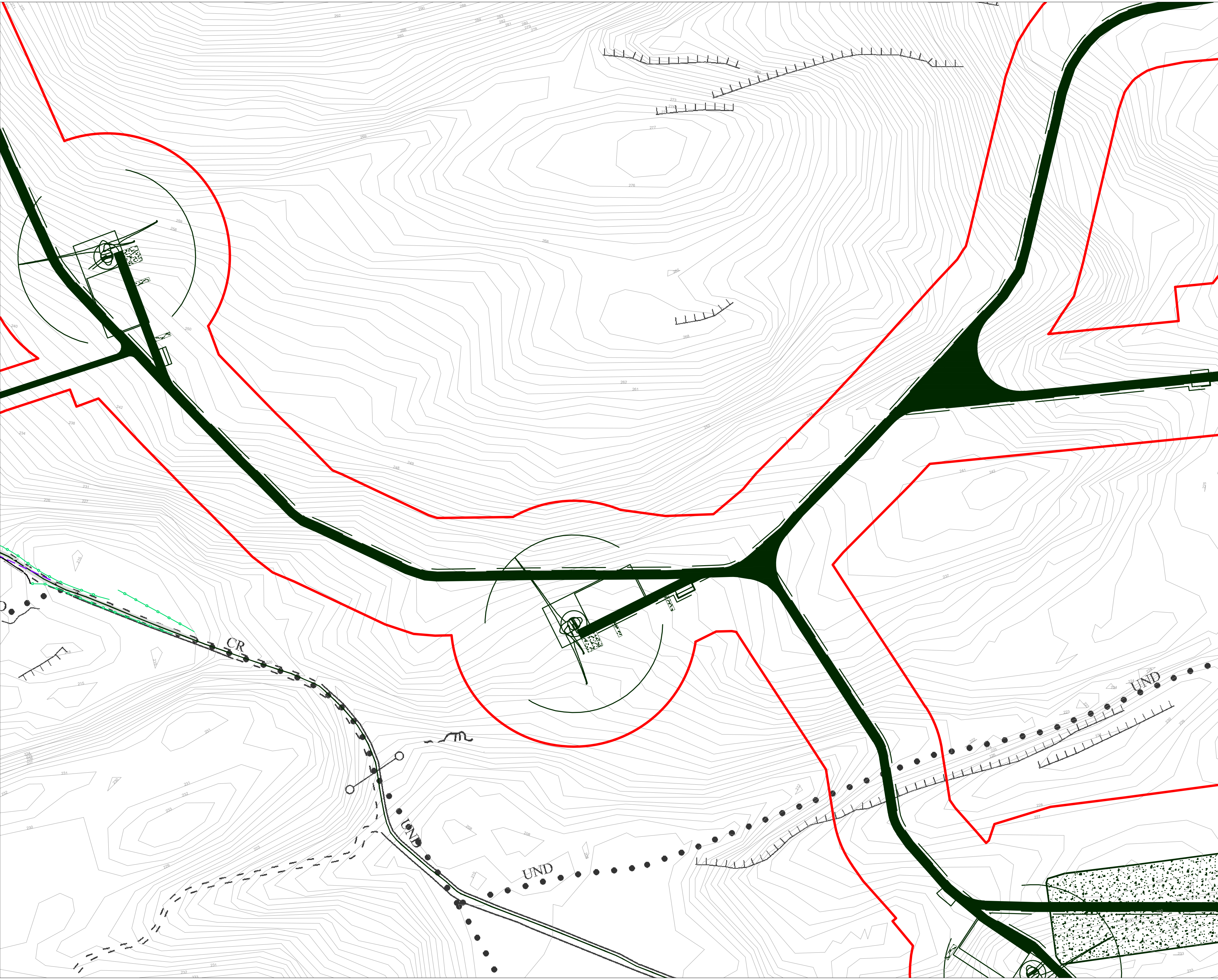
Site Layout Sheet 7 of 10

PROJECT TITLE: Cleanrath Wind Farm, Co. Cork

DRAWING BY: **Joseph O Brien**	CHECKED BY: **Colm Harte**
PROJECT No.: **110721e**	DRAWING No.: **0721 - 10**
SCALE: **1:2,500 @ A3**	DATE: **06.08.2020**

OS SHEET No.: **6367,6368,6369,6370,6371,6412,6413,6413,6415,6416**

McCarthy Keville O'Sullivan Ltd.
Planning & Environmental Consultants
Block 1,
Galway Financial Services Centre,
Moneenageisha Road,
Galway, Ireland.
email: info@mccarthykos.ie
website: www.mccarthykos.ie
Tel: +353 91 735611
Fax: +353 91 771279



Project Design Drawing Notes

1. Drawings issued are for planning application purposes only.
2. Drawings not to be used for construction/contract conditions.
3. Copyright, all rights reserved. No part here with may be copied or reproduced partially or wholly in any form whatsoever without the prior notice of the copyright owner McCarthy Keville O'Sullivan.
4. Do not scale off this drawing. Figured metric dimensions only should be taken off this drawing.
5. All contractors, whether main or sub-contractors, must visit the site and are responsible for taking and checking any and all dimensions and levels that relate to the works.
6. The use of or reliance upon this drawing shall be deemed to be acceptance of these conditions of use unless otherwise agreed in writing, such written agreement to be sought from and issued by the copyright holder to the use or reliance upon these drawings.

Drawing Legend

- Planning Application Boundary
- Clenrath Wind Farm Infrastructure PL.REF 15/6966 ABP PL. 04.246742 & 18/04458

N

DRAWING TITLE:

Site Layout
Sheet 8 of 10

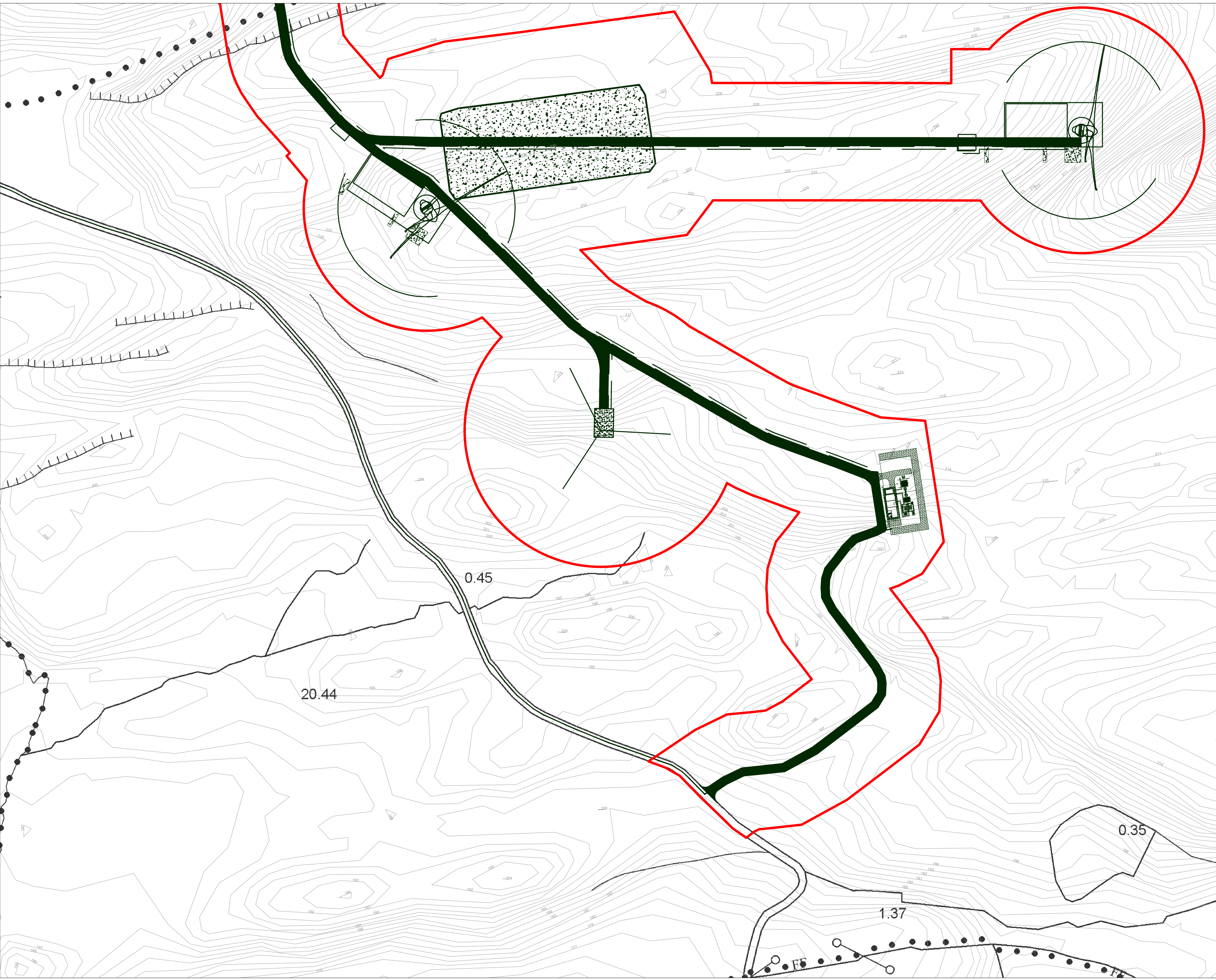
PROJECT TITLE:

Cleanrath Wind Farm, Co. Cork

DRAWING BY: Joseph O Brien	CHECKED BY: Colm Harte
PROJECT No.: 110721e	DRAWING No.: 0721 - 11
SCALE: 1:2,500 @ A3	DATE: 06.08.2020

OS SHEET No.: 6367,6368,6369,6370,6371,6412,6413,6413,6415,6416

McCarthy Keville O'Sullivan Ltd.
Planning & Environmental Consultants
Block 1,
Galway Financial Services Centre,
Moneenageisha Road,
Galway, Ireland.
email: info@mccarthykos.ie
website: www.mccarthykos.ie
Tel: +353 91 735611
Fax: +353 91 771279



Project Design Drawing Notes

1. Drawings issued are for planning application purposes only.
2. Drawings not to be used for construction/contract conditions.
3. Copyright, all rights reserved. No part here with may be copied or reproduced partially or wholly in any form whatsoever without the prior notice of the copyright owner McCarthy Keville O'Sullivan.
4. Do not scale off this drawing. Figured metric dimensions only should be taken off this drawing.
5. All contractors, whether main or sub-contractors, must visit the site and are responsible for taking and checking any and all dimensions and levels that relate to the works.
6. The use of or reliance upon this drawing shall be deemed to be acceptance of these conditions of use unless otherwise agreed in writing, such written agreement to be sought from and issued by the copyright holder to the use or reliance upon these drawings.

Drawing Legend

- Planning Application Boundary
- Clenrath Wind Farm Infrastructure PL.REF 15/6966 ABP PL. 04.246742 & 18/04458

DRAWING TITLE:

Site Layout
Sheet 9 of 10

PROJECT TITLE:

Cleanrath Wind Farm, Co. Cork

DRAWING BY: Joseph O Brien	CHECKED BY: Colm Harte
PROJECT No.: 110721e	DRAWING No.: 0721 - 12
SCALE: 1:2,500 @ A3	DATE: 06.08.2020

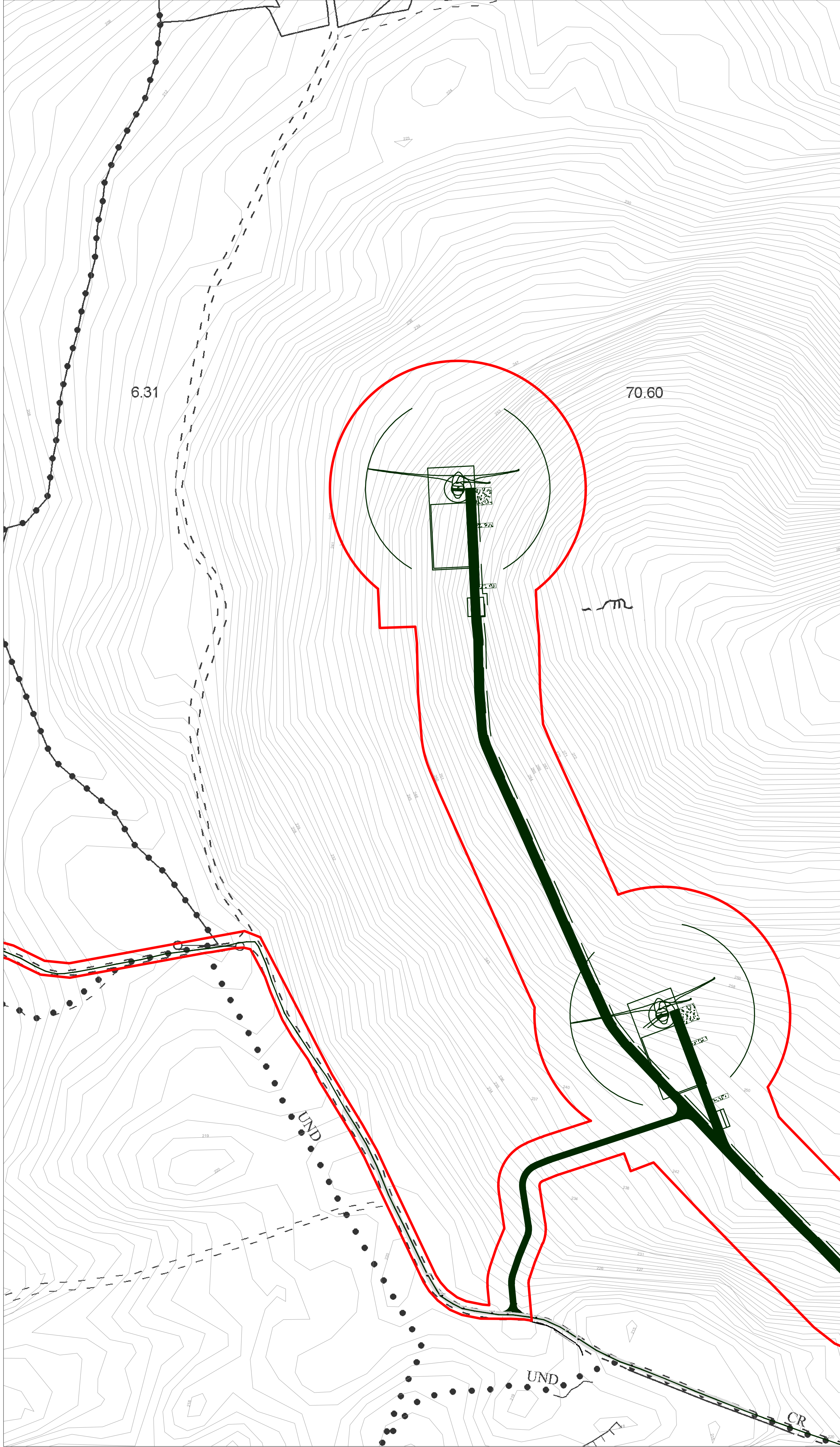
OS SHEET No.: 6367,6368,6369,6370,6371,6412,6413,6413,6415,6416

McCarthy Keville O'Sullivan

McCarthy Keville O'Sullivan Ltd.
Planning & Environmental Consultants

Block 1,
Galway Financial Services Centre,
Moneenageisha Road,
Galway, Ireland.

email: info@mccarthykos.ie
website: www.mccarthykos.ie
Tel: +353 91 735611
Fax: +353 91 771279



Project Design Drawing Notes

1. Drawings issued are for planning application purposes only.
2. Drawings not to be used for construction/contract conditions.
3. Copyright, all rights reserved. No part here with may be copied or reproduced partially or wholly in any form whatsoever without the prior notice of the copyright owner McCarthy Keville O'Sullivan.
4. Do not scale off this drawing. Figured metric dimensions only should be taken off this drawing.
5. All contractors, whether main or sub-contractors, must visit the site and are responsible for taking and checking any and all dimensions and levels that relate to the works.
6. The use of or reliance upon this drawing shall be deemed to be acceptance of these conditions of use unless otherwise agreed in writing, such written agreement to be sought from and issued by the copyright holder to the use or reliance upon these drawings.

Drawing Legend

- Planning Application Boundary
- Clenrath Wind Farm Infrastructure PL.REF 15/6966 ABP PL. 04.246742 & 18/04458

Ordnance Survey Ireland Licence No. AR0021818© Ordnance Survey Ireland/Government of Ireland

DRAWING TITLE:
Site Layout Sheet 10 of 10

PROJECT TITLE:
Cleanrath Wind Farm, Co. Cork

DRAWING BY: Joseph O Brien	CHECKED BY: Colm Harte
PROJECT No.: 110721e	DRAWING No.: 0721 - 13
SCALE: 1:2,500 @ A3	DATE: 06.08.2020
OS SHEET No.: 6367,6368,6369,6370,6371,6412,6413,6413,6415,6416	

McCarthy Keville O'Sullivan Ltd.
Planning & Environmental Consultants
Block 1,
Galway Financial Services Centre,
Moneenageisha Road,
Galway, Ireland.
email: info@mccarthykos.ie
website: www.mccarthykos.ie
Tel: +353 91 735611
Fax: +353 91 771279

Project Design Drawing Notes

1. Drawings issued are for planning application purposes only.
2. Drawings not to be used for construction/contract conditions.
3. Copyright, all rights reserved. No part here with may be copied or reproduced partially or wholly in any form whatsoever without the prior notice of the copyright owner McCarthy Keville O'Sullivan.
4. Do not scale off this drawing. Figured metric dimensions only should be taken off this drawing.
5. All contractors, whether main or sub-contractors, must visit the site and are responsible for taking and checking any and all dimensions and levels that relate to the works.
6. The use of or reliance upon this drawing shall be deemed to be acceptance of these conditions of use unless otherwise agreed in writing, such written agreement to be sought from and issued by the copyright holder to the use or reliance upon these drawings.

Drawing Legend

- Planning Application Boundary
- Clenrath Wind Farm Infrastructure PL.REF 15/6966 ABP PL. 04.246742 & 18/04458

N

DRAWING TITLE:
Temporary Construction Compound

PROJECT TITLE:
Cleanrath Wind Farm, Co. Cork

DRAWING BY: Joseph O Brien	CHECKED BY: Colm Harte
PROJECT No.: 110721e	DRAWING No.: 0721 - 14
SCALE: 1:500 @ A3	DATE: 06.08.2020

OS SHEET No.: 6367,6368,6369,6370,6371,6412,6413,6413,6415,6416

McCarthy Keville O'Sullivan Ltd.
Planning & Environmental Consultants
Block 1,
Galway Financial Services Centre,
Moneenageisha Road,
Galway, Ireland.
email: info@mccarthykos.ie
website: www.mccarthykos.ie
Tel: +353 91 735611
Fax: +353 91 771279

Appendix 4

OTT Orpheus Mini Probe Brochure

Water level sensor with built-in datalogger for surface and groundwater applications

- **Application**
  Surface water, Groundwater
- **Measurement technology**
  Vented pressure cell
- **Parameters measured**
  Waterlevel/Pressure, Water temperature
- **Product Highlights**
  Measures, stores, and transmits water level and temperature data
- **Accuracy**
  ± 0.05% FS
- **Internal data logger**
  Yes

The OTT ecoLog 500 is a complete system for water level and temperature measurement. Designed for full deployment inside groundwater wells as well as surface water applications, the OTT ecoLog 500 offers data and alarm message transmission options via SMS, HTTP, FTP and e-mail, giving users flexible remote data access from their office.

Water level measurement	
Measuring ranges	0 ... 4 m, 10 m, 20 m, 40 m, 100 m

Pressure resolution	0.01 % FS
Pressure accuracy	±0.05 % FS
Long-term stability	±0.1 % / year FS

Temperature measurement	
Measuring range	-25 °C … +70 °C
Temperature resolution	0.1 °C
Temperature accuracy	± 0.5 °C; higher accuracy optionally available

Electrical data	
Power supply	2 x 1.5 V C Alkaline cells (only for version with GSM/GPRS-Modem) Lithium cells, 3.6 V/13 Ah or Lithium cells, 3.6 V/26 Ah

Battery life @ 1 h measurement interval & one transmission per week	
Lithium-battery, DD	approx. 10 years
Alkaline batteries, CC (only for version with GSM/GPRS-Modem)	> 1 year

Modem	GSM/GPRS 900/1800, 850/1900 MHz GSM/GPRS; UMTS/HSPA+ 900/1800, 850/1900 MHz; 800/850, 900, AWS 1700, 1900, 2100 MHz
Antenna	Built-in, weather-proof, external antenna optionally available
Interface at site	Infrared (IrDA)

Memory	4 MB, approx. 500,000 measured values
Sampling/storage interval	5 seconds … 24 hours

Installation	≥ 2"

Environmental conditions	
Operating temperature	-30 °C … + 85 °C
Storage temperature	-40 °C … + 85 °C

Dimensions L x Ø	
Communication unit	520 mm x 50 mm
Probe	195 mm x 22 mm
System length	2 … 200 m ±1 % ±5 cm (Cable length incl. communication unit and pressure probe)

Material	
Communication unit	Aluminium, PA-GF

Sonde	Stainless steel (DIN 1.4539, 904 L)

Weight	
Communication unit (w/o. batteries)	approx. 0.920 kg
Probe	approx. 0.300 kg

Type of protection	
Communication unit	IP67
Probe	IP68

EMC limits	According to EG 204/108/EG, ETSI EN 301 486-1/-7, EN 61326-1 EN 60950-1:2006 + A11:2009 + A1:2010

Pressure level transducer with datalogger for longterm groundwater monitoring

- **Application**
  Surface water, Groundwater
- **Measurement technology**
  Vented pressure cell
- **Parameters measured**
  Waterlevel/Pressure, Water temperature
- **Product Highlights**
  Measures and stores water level and temperature data
- **Measurement range**
  0 ... 4, 10, 20, 40, and 100 m
- **Accuracy**
  ± 0.05% FS
- **Internal data logger**
  Yes

The OTT Orpheus Mini is an integrated pressure sensor and datalogger for level measurement in surface and groundwater applications. It features a robust ceramic measuring cell for long term accuracy and its built in datalogger manages and stores all measurements at user-programmable intervals. The Orpheus mini can be paired with the

OTT ITC for remote data transmission.

Waterlevel measurement	
Measuring ranges	0 ... 4 m, 10 m, 20 m, 40 m, 100 m
Accuracy, pressure sensor	± 0.05 % FS
Resolution, pressure sensor	0.01 % FS

Temperature measurement	
Measuring range temperature	-25 °C ... +70 °C (ice-free)
Accuracy temperature	± 0.5 °C
Resolution temperature	0.1 °C

Electrical data	

Power supply	3 x 1.5 V LR6-cells Alkaline- or Lithium-type

Lifetime (at 1 h reading interval)	
with Lithium batteries	min. 5 years
with Alkaline batteries	min. 1.5 years (high quality battery types)

Interface	Infrared (IrDA)

Data Logger	
Memory	4 MB non-volatile
Number of measured values	approx. 500,000
Reading interval	1 second ... 24 hours
Storage interval	1 second ... 24 hours

Logging type - selectable	linear, logarithmic - free progammable (logging table) for pumping tests , event triggered delta data logging

Installable in well pipes	≥ 1"

System length	1.5 ... 200 m ±1% ±5 cm (cable length incl. communication unit/pressure probe)

Material	ABS, POM, 904 L (DIN 1.4539)

Weight	
Communication unit (incl. batteries)	approx. 0.410 kg
Pressure probe	approx. 0.300 kg

Dimensions	
Communication unit L x Ø	400 mm x 22 mm
Pressure probe L x Ø	195 mm x 22 mm

Operating Conditions	
Temperature-compensated working range	-5 °C ... +45 °C (ice-free)
Storage temperature	-40 °C ... +85 °C
Operating Temperature	-20 °C ... +70 °C
Humidity	100 %

Type of protection	
Communication unit	IP67 (immersion depth max. 2 m duration of immersion max. 24 h)
Pressure probe	IP68

EMV limits	IEC61326/EN61326 are compliant with EN 61000-4-2, EN 61000-4-3, EN 61000-4-4, EN 61000-4-5, EN 61000-4-6, EN 550222 class B

APPENDIX 8

OPERATIONAL AND ENVIRONMENTAL MANAGEMENT PLAN

Operation and Environmental Management Plan

Cleanrath Wind Farm

DOCUMENT DETAILS

Client:	**Cleanrath Windfarm Ltd.**
Project Title:	**Cleanrath Wind Farm**
Project Number:	**191223-a**
Document Title:	**Operation and Environmental Management Plan**
Document File Name:	**OEMP Plan F – 2020.08.12 – 191223-a**
Prepared By:	**MKO** **Tuam Road** **Galway** **Ireland** **H91 VW84**

Planning and Environmental Consultants

Rev	Status	Date	Author(s)	Approved By
01	Draft	02/12/2019	OC	MW
02	Final	12/08/2020	OC	MW

Table of Contents

TABLE OF TABLES

TABLE OF FIGURES

1. INTRODUCTION

This Operation and Environmental Management Plan (OEMP) has been prepared by MKO on behalf of Cleanrath Windfarm Ltd. for the operation of the Cleanrath wind farm development. This document has been prepared for the operation of the Cleanrath wind farm development for the 25-year lifespan of the project.

This report provides the environmental management framework to be adhered to during the operational phase of the Cleanrath wind farm development and it incorporates the mitigating and monitoring principles that minimises the potential for any environmental impacts to occur.

This document has been prepared to accompany the Remedial Environmental Impact Assessment Report (rEIAR) and the Environmental Impact Assessment Report (EIAR) prepared as part of the substitute consent process.

1.1 Scope of the Operation and Environmental Management Plan

This report is presented as a guidance document for the operation of the Cleanrath wind farm development and is intended to replace the Construction and Environmental Management Plan (CEMP) which was provided during construction and the initial operation of the site up to July 2020. The OEMP is intended to provide a more concise document targeted specifically at the operation of the wind farm site. Where the term 'site' is used in this OEMP it refers to all works associated with the operation of the Cleanrath wind farm development. The OEMP clearly outlines the mitigation measures and monitoring proposals that are required to be adhered to in order to operate the site in an appropriate manner.

The report is divided into six sections, as outlined below:

Section 1 provides a brief introduction as to the scope of the report.

Section 2 outlines the Site and Project details, detailing the targets and objectives of this plan along with providing an overview of methodologies for works that will be carried out during the operational phase of the Cleanrath wind farm development.

Section 3 sets out details of the environmental controls to be implemented on site including the mechanisms for implementation.

Section 4 consists of a summary table of all mitigation proposals to be adhered to during the operational-phase of the project.

Section 5 consists of a summary table of all monitoring proposals to be adhered to during the operational-phase of the project.

Section 6 outlines the proposals for reviewing compliance with the provisions of this report.

2. SITE AND PROJECT DETAILS

2.1 Site Location and Description

The Cleanrath wind farm development is located in the townlands of Cloontycarthy, Cleanrath North, Cleanrath South, Derrineanig, Derreennacarton and adjacent townlands in Co. Cork. The Cleanrath wind farm development comprises a total of 9 No. wind turbines, with a maximum ground to top blade tip height of up to 150 metres and all associated infrastructure.

The electrical connection from the wind turbines to the national grid will be via an underground cable which runs predominately within the public road corridor through the townlands of Cleanrath South, Derrineanig, Milmorane, Coomlibane, Rathgaskig, Derragh, Augeris, Gorteenakilla, Carrignadoura, Gurteenowen, Gurteenflugh, Lyrenageeha, Lackabaun, Co. Cork and Grousemount, Co. Kerry.

The town of Macroom is located approximately 12 kilometres northeast of the Cleanrath wind farm development and Inchigeelagh is located approximately 2.5 kilometres to the south.

2.2 Description of the Cleanrath wind farm development

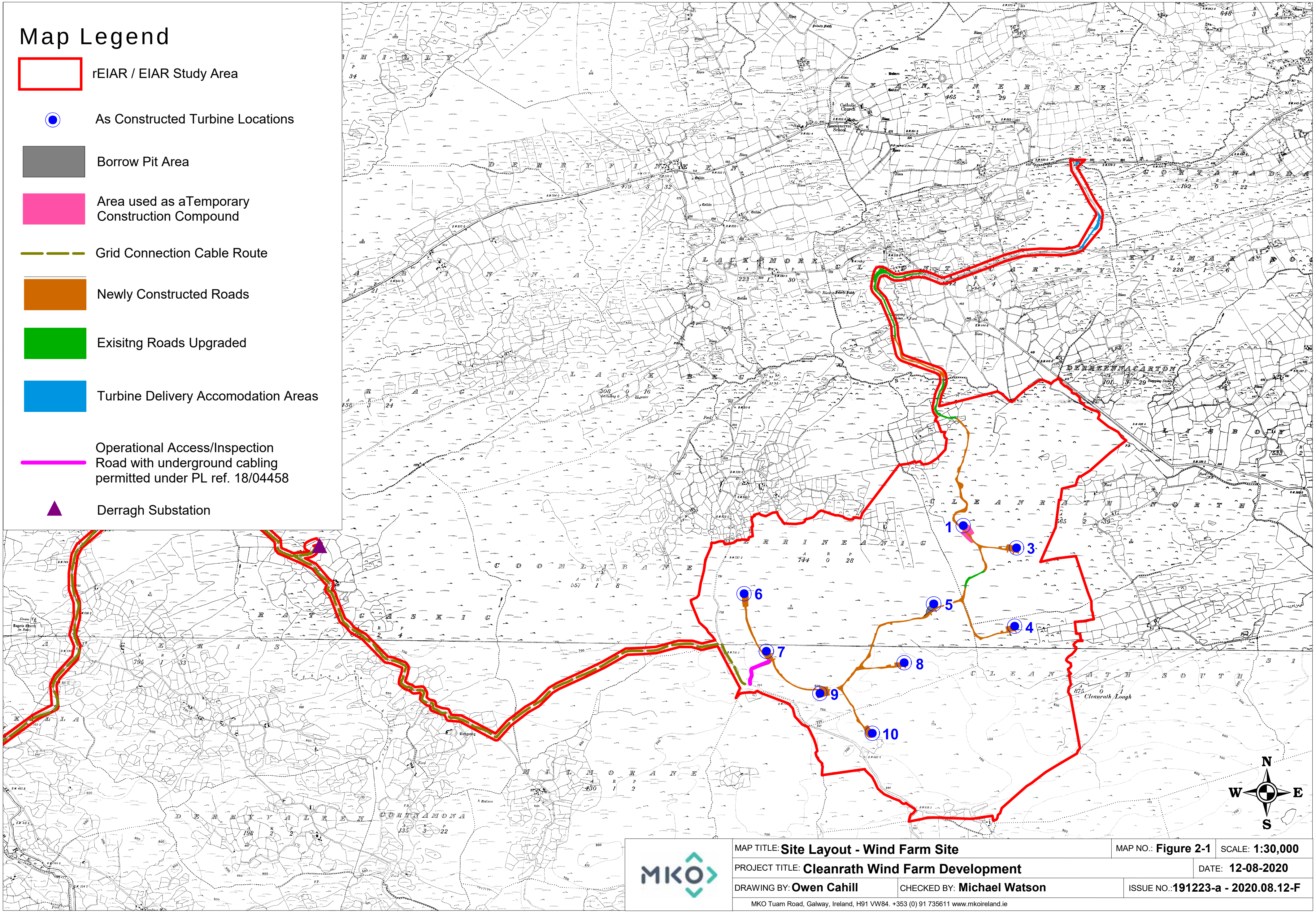
The design life of the project is expected to be 25 years.

The key components of the Cleanrath wind farm development include the following:

- 9 no. Wind Turbines with a maximum blade tip height of 150 metres;
- 9 no. Hardstand Areas
- Access tracks;
- Underground cabling, including connection to the national grid
- Site drainage
- All associated site development and ancillary works including the electricity substation and control building at Derragh Wind Farm.

The site layout showing individual elements of the Cleanrath wind farm development is shown in Figure 2-1.

As construction has been completed, elements of the project that were developed as a temporary facilitator have either been removed, restored to its original condition or will have naturally revegetated. These include the temporary construction compound and the borrow pit. All access roads and hardstandings areas form part of a site roadway network.



MAP TITLE: **Site Layout - Wind Farm Site**
MAP NO.: **Figure 2-1**
SCALE: **1:30,000**
PROJECT TITLE: **Cleanrath Wind Farm Development**
DATE: **12-08-2020**
DRAWING BY: **Owen Cahill**
CHECKED BY: **Michael Watson**
ISSUE NO.: **191223-a - 2020.08.12-F**

MKO Tuam Road, Galway, Ireland, H91 VW84. +353 (0) 91 735611 www.mkoireland.ie

2.3 Targets and Objectives

The site will be operated to an approved standard and codes of practice as outlined throughout the various chapters of the rEIAR and EIAR. This OEMP considers environmental issues and this is enhanced by the works proposals during operation.

The key site targets are as follows;

- Ensure works and activities are completed in accordance with mitigation and best practice approach presented in the all planning documentation prepared for the site;
- Ensure operational phase works and activities have minimal impact/disturbance to local landowners and the local community;
- Ensure operation and works have minimal impact on the natural environment;
- Adopt a sustainable approach to site operation; and,
- Provide adequate environmental training and awareness for all project personnel.

The key site objectives are as follows;

- Using recycled materials if possible;
- Ensure sustainable sources for materials supply where possible;
- Avoidance of any pollution incident or near miss as a result of working around or close to existing watercourses and having emergency measures in place;
- Avoidance of vandalism;
- Keeping all watercourses free from obstruction and debris;
- Correct implementation of the sustainable drainage system (SuDS) drainage design principles;
- Keep impact of operation to a minimum on the local environment, watercourses, and wildlife;
- Correct fuel storage and refuelling procedures to be followed;
- Good waste management and house-keeping to be implemented;
- Air and noise pollution prevention to be implemented;
- Monitoring of the works and any adverse effects that it may have on the environment. Working methods will be altered where it is found there is the potential to have an adverse effect on the environment;

2.4 Wind Farm Operation Overview

An appointed Operators Controller will install a Site Manager to manage the day to day operation of the wind farm. The Site Manager will be responsible for ensuring compliance with this OEMP and any revisions made to this documents throughout the operation. An overview of the anticipated operational phase activities is provided below.

2.4.1 Turbine Maintenance

The wind farm site will be the subject of on-going maintenance of the wind turbines throughout the operational life of the site. This will be undertaken by turbine suppliers and site personnel who will manage and operate the site from the substation and associated control building at Derragh Wind Farm located approximately 3km west of the Cleanrath wind farm development. The turbine maintenance will not require significant plant and equipment with all works localised in nature with operatives using vans to access the site and transport their equipment. Further details on the ongoing maintenance and scheduling is included in the Operational and Maintenance Health and Safety Plan (Appendix A).

2.4.2 Peatland Habitat Restoration

The restoration of peatland habitat as discussed in Chapter 6 of the rEIAR will be undertaken during the future operation of the site. The restoration will comprise the management of an area of forestry that was felled during construction along with an additional hectare of immature forestry which will be felled to establish suitable peatland habitat. The removal of woody vegetation will be undertaken in full compliance with Section 40 of the Wildlife Act 1976 – 2018. The works will involve felling, chipping and removal of brash and restoring the peatland habitat to its original condition prior to planting which will include the blocking of drains with no further drainage to be installed around the area. Further details are included in Appendix B.

2.4.3 Shadow Flicker Monitoring

An assessment of the potential effects associated with shadow flicker was undertaken using the WindPRO computer software was used to model the predicted daily and annual shadow flicker levels in significant detail. As part of this assessment it was determined that exceedances of the 2006 DoEHLG guidelines daily threshold for shadow flicker would be experienced at 14 properties. The operators of the wind farm have completed an assessment of the properties that were predicted to potentially exceed the daily shadow flicker threshold to determine whether either or both of the factors outlined above relate to any of the properties and therefore eliminate or reduce any shadow flicker below the acceptable threshold. The assessment found that of the 14 properties predicted to exceed the daily threshold for shadow flicker, 7 properties had a clear line of site between the turbine and the relevant section of the dwelling with no obstruction and therefore may require the mitigation strategy to be implemented with 3 of these properties directly involved in the Cleanrath wind farm development. The remaining 7 properties had either no clear line of sight to a turbine due to vegetation coverage or did the property did not have any windows orientated in the direction of a turbine. All predicted incidents of shadow flicker have been pre-programmed into the wind farm's control software. The wind farm's SCADA control system has been programmed to shut down any particular turbine at any particular time on any given day to ensure that shadow flickers occurrences at properties which are not naturally screened or cannot be screened with measures outlined above.

However, the prediction model will still require verification on resumption of operation due to the limitations of the computer modelling. Where an exceedance of the daily threshold is experienced, the appropriate mitigation will be implemented.

2.4.4 Turbine Noise Monitoring

A commissioning noise survey has been undertaken for the site. The survey has been completed to determine compliance with the noise condition of attached to a previous grant of permission for the site. The survey has determined that the relevant noise criteria have been complied with during operation of the windfarm

Details of this survey are included in Appendix 11-9 or the rEIAR.

The future operation of the Cleanrath wind farm development will adhere to any noise compliance requirements that may be conditioned subject to the outcome of the substitute consent process.

3. ENVIRONMENTAL MANAGEMENT

The following sections give an overview of the drainage design, dust and noise control measures, a waste management plan for the site and the implementation of the environmental management procedures for the site.

3.1 Site Drainage

During the operational phase, various combinations/adaptations of the runoff control and drainage management measures will be employed at the site depending on the local conditions and topography. These include:

- Natural vegetation filters are used regularly across the site where the local drainage and topography allowed attenuation of surface water runoff.
- Where possible, interceptor drains are installed up-gradient of infrastructure to collect clean surface runoff, in order to minimise the amount of runoff reaching areas where suspended sediment could become entrained. It is now directed to areas where it can be re-distributed onto natural vegetation.
- Swales/roadside drains are used to collect runoff from access roads and turbine hardstanding areas of the site, likely to have entrained suspended sediment, and channel it onto natural vegetation filters.

Site drainage measures were installed during the construction phase some of which have been retained. The retention of these drainage features has occurred in areas where revegetation has not yet fully been established. As the operation of the wind farm continues, these areas within the site will revegetate resulting in a resumption of the natural drainage management that will have existed prior to any construction. It is not anticipated that the operation of the wind farm will interrupt this restored drainage regime in any way.

Any drainage infrastructure retained in the operational phase will be the subject of ongoing maintenance where required. This will comprise the repairing and replacement of silt fencing along with the servicing of check dams, settlement ponds and any other infrastructure requiring maintenance. As outlined above, the revegetation of disturbed areas and return to the pre-construction drainage regime at the site will result in the requirement for maintenance of drainage infrastructure reducing as the operational phase progresses.

The water quality monitoring data collected during construction has shown that the site was constructed without having any impact on water quality and will continue to do so during operation. The water quality monitoring has continued for a period of 6 months post construction and will continue quarterly into the operational phase for a period of one year thereafter.

3.2 Refuelling, Fuel and Hazardous Materials Storage

Any plant and equipment used during the operational phase will require refuelling during the works. Appropriate management of fuels will be required to ensure that incidents relating to refuelling are avoided. The following mitigation measures are proposed to avoid release of hydrocarbons at the site:

- Road-going vehicles will be refuelled off site wherever possible;
- On-site refuelling will be carried out at designated refuelling areas at various locations throughout the site. Machinery will be refuelled directly by a fuel truck that will come to site as required

- Only designated trained and competent operatives will be authorised to refuel plant on site. Mobile measures such as drip trays and fuel absorbent mats will be used during all refuelling operations.
- Fuel volumes stored on site should be minimised. Any fuel storage areas will be bunded appropriately for the fuel storage volume;
- The electrical substation at Derragh Wind Farm which the Clenarath Wind Farm loops into on route to the national grid is bunded appropriately to the volume of oils being stored to prevent leakage to groundwater or surface water. The bunded area is fitted with a storm drainage system and an appropriate oil interceptor;
- The plant used will be regularly inspected for leaks and fitness for purpose; and,
- An emergency plan for the operational phase to deal with accidental spillages will be developed (refer to Appendix A) Spill kits will be available to deal with and accidental spillage in and outside the refuelling area.
- A programme for the regular inspection of plant and equipment for leaks and fitness for purpose will be developed at the outset of the operational phase.

3.2.1 Spill Control Measures

Every effort will be made to prevent an environmental incident during the operational phase of the project. Oil/fuel spillages are one of the main environmental risks that will exist on the site which will require an emergency response procedure. The importance of a swift and effective response in the event of such an incident occurring cannot be over emphasised. The following steps provide the procedure to be followed in the event of such an incident:

- Stop the source of the spill and raise the alarm to alert people working in the vicinity of any potential dangers.
- If applicable, eliminate any sources of ignition in the immediate vicinity of the incident.
- Contain the spill using the spill control materials, track mats or other material as required. Do not spread or flush away the spill.
- If possible, cover or bund off any vulnerable areas where appropriate such as drains, watercourses or sensitive habitats.
- If possible, clean up as much as possible using the spill control materials.
- Contain any used spill control material and dispose of used materials appropriately using a fully licensed waste contractor with the appropriate permits so that further contamination is limited.
- Notify the Site Manager immediately giving information on the location, type and extent of the spill so that they can take appropriate action.
- The Site Manager will inspect the site and ensure the necessary measures are in place to contain and clean up the spill and where necessary appoint a specialist contractor to undertake the clean-up and prevent further spillage from occurring.
- The Site Manager will notify the appropriate regulatory body such as Cork County Council, and the Environmental Protection Agency (EPA), if deemed necessary.

The importance of a swift and effective response in the event of such an incident occurring cannot be over emphasised. Environmental incidents are not limited to just fuel spillages. Therefore, any environmental incident must be investigated in accordance with the following steps.

- The Site Manager must be immediately notified.
- If necessary, the Site Manager will inform the appropriate regulatory authority. The appropriate regulatory authority will depend on the nature of the incident.
- The details of the incident will be recorded on an Environmental Incident Form which will provide information such as the cause, extent, actions and remedial measures used following the incident. The form will also include any recommendations made to avoid reoccurrence of the incident.

- If the incident has impacted on a sensitive receptor such as an archaeological feature the Site Manager will liaise with the Project Archaeologist.
- A record of all environmental incidents will be kept on file by the Site Manager and the Main Contractor. These records will be made available to the relevant authorities such as Cork County Council, EPA if required.

The Site Manager will be responsible for any corrective actions required as a result of the incident e.g. an investigative report, formulation of alternative works methodologies or environmental sampling, and will advise the Operators Controller as appropriate.

3.3 Dust Control

Dust can be generated from on-site activities during operation such as travelling on site roads during prolonged periods of dry weather. The extent of dust generation will depend on the type of activity undertaken, the location, the nature of the dust, i.e. soil, and the weather. In addition, dust dispersion is influenced by external factors such as wind speed and direction and/or, periods of dry weather. Site traffic movements also have the potential to generate dust as they travel along the haul route.

Proposed measures to control dust include:

- Any site roads with the potential to give rise to dust will be regularly watered, as appropriate, during dry and/or windy conditions;
- The designated public roads outside the site and along the main transport routes to the site will be regularly inspected by the Site Manager for cleanliness, and cleaned as necessary;
- Material handling systems and material storage areas will be designed and laid out to minimise exposure to wind;
- Water misting or sprays will be used as required if particularly dusty activities are necessary during dry or windy periods;
- The transport of soils or other material, which has significant potential to generate dust, will be undertaken in tarpaulin-covered vehicles where necessary;
- All site traffic will have speed restrictions on un-surfaced roads to 15 kph;
- Daily inspection of the site to examine dust measures and their effectiveness.
- When necessary, sections of the haul route will be swept using a truck mounted vacuum sweeper; and,

Given the reduced scale of traffic movement during operations in comparison to the construction phase, it is not anticipated that impacts associated with dust from site traffic will be experienced during operation when considering no significant impact was experienced during construction. However, the appropriate mitigation has been provided above for implementation as required.

3.4 Noise Control

The operation of plant and machinery, including site vehicles, is a source of potential impact that will require mitigation at all locations within the site. Proposed measures to control noise include:

- Diesel generators will be enclosed in sound proofed containers to minimise the potential for noise impacts;
- Plant and machinery with low inherent potential for generation of noise and/or vibration will be selected. All plant and equipment to be used on-site will be modern equipment and will comply with the European Communities (Construction Plant and Equipment) (Permissible Noise Levels) Regulations;
- Regular maintenance of plant will be carried out in order to minimise noise emissions. Particular attention will be paid to the lubrication of bearings and the integrity of silencers;

- All vehicles and mechanical plant will be fitted with effective exhaust silencers and maintained in good working order for the duration of the works;
- Compressors will be of the "sound reduced" models fitted with properly lined and sealed acoustic covers which will be kept closed whenever the machines are in use and all ancillary pneumatic tools shall be fitted with suitable silencers;
- Machines, which are used intermittently, will be shut down during those periods when they are not in use;
- Training will be provided by the Site Manager to drivers to ensure smooth machinery operation/driving, and to minimise unnecessary noise generation; and,
- Local areas of the haul route will be condition monitored and maintained, if necessary.

Given the reduced scale of plant and equipment that will be used during operations in comparison to the construction phase, it is not anticipated that impacts associated with noise from plant and equipment will be experienced during operation when considering no significant impact was experienced during construction. However, the appropriate mitigation has been provided above for implementation as required.

3.5 Traffic Management

A Traffic Management Plan (TMP) was prepared for the construction phase of the wind farm and is included in the Construction and Environmental Management Plan (CEMP, Appendix 2) included as Appendix 4-4 of the rEIAR. The TMP will be adopted for the operational phase as required although, the peatland habitat restoration is the only significant works proposed for the operational phase that will require its implementation. The ongoing turbine and general site maintenance will be completed by personnel using normal road going vehicles with an average of 3 vans on a normal day for the operational phase.

3.6 Environmental Management Implementation

3.6.1 Roles and Responsibilities

The Site Manager will be the project focal point relating to operation-related environmental issues.

In general, the Site Manager will maintain responsibility for monitoring site operations and Contractors/Sub-contractors from an environmental perspective. The Site Manager will act as the regulatory interface on environmental matters. The Site Manager will be responsible for reporting to and liaising with Cork County Council and other statutory bodies as required.

The Operation Controller will be responsible for employing the services of a suitably qualified ecologist, ornithologist and any other suitably qualified professionals as required throughout the operational phase.

3.6.2 Health and Safety

During the operational phase there will be ongoing maintenance of the wind turbines and associated infrastructure. Access to the turbines is through a door at the base of the structure, which will be locked at all times outside maintenance visits. ESB retains the rights to access the grid connection cables and substation as part of their routine infrastructure inspections.

Staff associated with the project will conduct frequent visits, which will include inspections to establish whether any signs have been defaced, removed or are becoming hidden by vegetation or foliage, with prompt action taken as necessary.

An Operational and Maintenance Health and Safety Plan has been prepared for the wind farm and is included as Appendix A.

3.7 Monitoring of Surface Water Quality

3.7.1 Monthly Laboratory Analysis Sampling

Monthly sampling for laboratory analysis for a range of parameters as adopted during pre-commencement and construction phases has continued for 6 months (although sample events were not completed in March and April 2020 due to the Covid-19 restrictions) after construction was completed Sampling will now continue quarterly into the operational phase for a period of one year.

It should be noted that additional monitoring locations were added during the construction phase and theses additional locations will continue to be sampled as appropriate. Flow monitoring will continue for a period of 12 months post construction of the wind farm and will be then be the subject of a review. The supervising hydrologist will monitor and advise on the readings being received from the testing laboratory.

Laboratory analysis of a range of parameters with relevant regulatory limits and EQSs will continue throughout the operational phase for each watercourse e.g. at SW-A – SW-C as outlined in Figure 3-1. All samples will be sent for analysis to an independent laboratory.

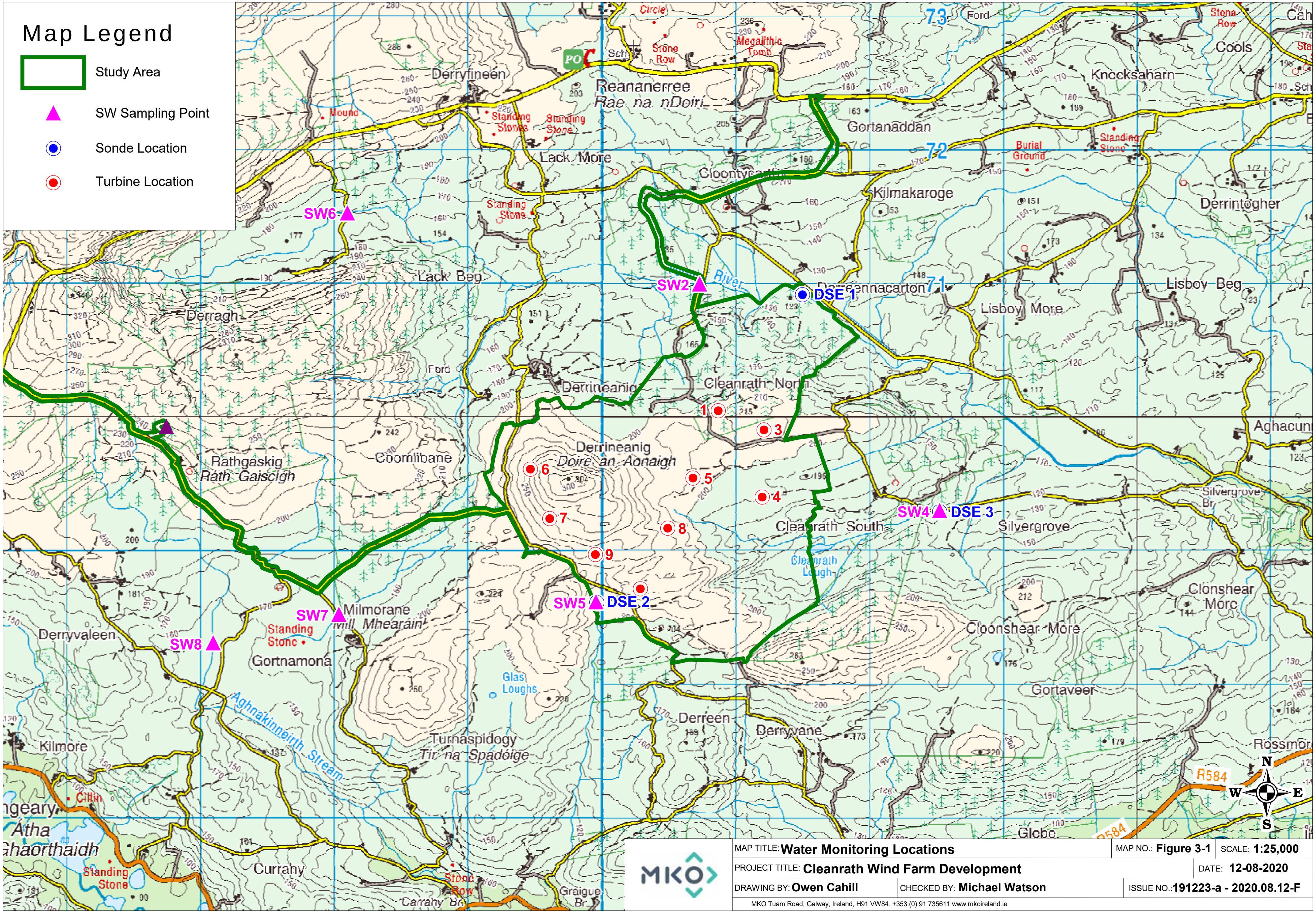
3.7.2 Continuous Turbidity Monitoring

Turbidity monitors or sondes have been installed at locations surrounding the wind farm site as outlined in Figure 3-1. The sondes provide continuous readings for turbidity levels in the watercourse and are scheduled for removal at the next quarterly surface water sampling event.

3.7.3 Monitoring Parameters

The analytical determinants of the monitoring programme (including limits of detection and frequency of analysis) will be as per S.I. No. 272 of 2009 European Communities Environmental Objectives (Surface Waters) Regulations, S.I. No. 722 of 2003 European Communities (Water Policy) Regulations and European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations 2009. The likely suite of determinants will include:

- pH (field measured)
- Electrical Conductivity (field measured)
- Temperature (field measured)
- Dissolved Oxygen (field measured)
- Turbidity (NTU) (sonde measured)
- Flow (m/s)
- Total Suspended Solids (mg/l)



MAP TITLE: **Water Monitoring Locations**

MAP NO.: **Figure 3-1**

SCALE: **1:25,000**

PROJECT TITLE: **Cleanrath Wind Farm Development**

DATE: **12-08-2020**

DRAWING BY: **Owen Cahill**

CHECKED BY: **Michael Watson**

ISSUE NO.: **191223-a - 2020.08.12-F**

MKO Tuam Road, Galway, Ireland, H91 VW84. +353 (0) 91 735611 www.mkoireland.ie

- Ammoniacal Nitrogen as NH3 (mg/l)
- Ammoniacal Nitrogen as NH4 (mg/l)
- Nitrite (NO2) (mg/l)
- Ortho-Phosphate (P) (mg/l)
- Nitrate (NO3) (mg/l)
- Phosphorus (unfiltered) (mg/l)
- Chloride (mg/l)
- BOD

3.8 Environmental Awareness and Training

3.8.1 Environmental Induction

The Environmental Induction will be integrated into the general site induction on a case by case basis for each member of staff employed on-site depending on their assigned roles and responsibilities on site. Where necessary, the Environmental Induction will as a minimum include:

- A copy of the OEMP and discussion of the key environmental risks and constraints;
- A discussion of the applicable Works Method Statement;
- The roles and responsibilities of staff, including contractors, in relation to environmental management; and,
- An outline of the Environmental Incident Management Procedure.

3.8.2 Toolbox Talks

Toolbox talks would be held by the Site Manager at the commencement of each day, or at the commencement of new activities particularly during the peatland habitat restoration works. The aims of the toolbox talks are to identify the specific work activities that are scheduled for that day or phase of work. In addition, the necessary work method statements and sub plans would be identified and discussed prior to the commencement of the day's activities.

Site meetings would be held on a regular basis involving all site personnel. The objectives of site meetings is to discuss the coming weeks activities and identify the relevant work method statements and sub plans that will be relevant to that weeks activities. Additionally, any non-compliance identified during the previous week would also be discussed with the aim to reduce the potential of the same non-compliance reoccurring.

4. MITIGATION PROPOSALS

All mitigation measures relating to the operational phases of the Cleanrath wind farm development were set out in the various sections of the Environmental Impact Assessment Report (EIAR) which accompanies this substitute consent application.

This section of the OEMP groups together all of the mitigation measures presented in the planning documentation. The mitigation measures are presented in the following pages.

By presenting the mitigation proposals in the below format, it is intended to provide an easy to audit list that can be reviewed and reported on during the operational phase of the project. The tabular format in which the below information is presented, can be further expanded upon during the course of operation and provides a reporting template for site compliance audits.

Table 4-1 Mitigation Measures

Ref. No.	Reference Location	Mitigation Measure	Audit Result	Action Required
		Operational Phase		
MM1	EIAR Chapter 6 OEMP Section 2	A habitat restoration and enhancement plan has been prepared to mitigate for peatland habitat loss		
MM2	EIAR Chapter 4 OEMP Section 2	An additional hectare of immature forestry will be removed to provide an area of enhanced peatland. Any further felling proposed for the site will be the subject of a Limited Felling Licence (LFL) application to the Forest Service. Replanting will be undertaken for any further felling		
MM3	EIAR Section 6,	The removal of woody vegetation will be undertaken in full compliance with Section 40 of the Wildlife Act 1976 – 2018.		
MM4	EIAR Chapter 8	As part of peatland restoration works, the following measures are proposed: - Brash removed during the restoration process should be stored up slope of the cleared area, to provide a buffer to surface water flows which may have the potential to erode, During tree felling brash mats will be used to support vehicles on soft ground, reducing peat and mineral soils erosion and avoiding the formation of rutted areas.		
MM5	EIAR Chapter 8, 9	Wherever possible, vehicles will be refuelled off-site, particularly for regular road-going vehicles. On-site refuelling of machinery will be carried out at designated refuelling areas at various locations throughout the site. Heavy Plant and		

Ref. No.	Reference Location	Mitigation Measure	Audit Result	Action Required
	OEMP Section 3	Machinery will be refuelled on site by a fuel truck. This will only take place for a short period during peatland habitat restoration works.		
MM6	REIAR Chapter 8	The electrical control building was bunded appropriately to the volume of oils likely to be stored, and to prevent leakage of any associated chemicals and to groundwater or surface water. The bunded area was fitted with a storm drainage system and an appropriate oil interceptor;		
MM7	EIAR Chapter 6 OEMP Section 3	The operational phase drainage of the development has been operated in full accordance with the design and mitigation measures that are fully described in Section 9.6 of Chapter 9: 'Water' and in the Operation and Environmental Management Plan. In addition, the same measures will be employed during any future operation. The Habitat Restoration Plan that is provided in Appendix 6.8 provides details of additional measures that will be implemented to protect water quality during the operation of the wind farm and the felling associated with the habitat restoration should it be granted permission.		
MM8	EIAR Chapter 9	Various combinations/adaptations of the runoff control and drainage management measures during the operational phase are employed at the site depending on the local conditions and topography: › Natural vegetation filters are used regularly across the site where the local drainage and topography allowed attenuation of surface water runoff. › Where possible, interceptor drains are installed up-gradient of infrastructure to collect clean surface runoff, in order to minimise the amount of runoff reaching areas where suspended sediment could become entrained. It is now directed to areas where it can be re-distributed onto natural vegetation.		

Ref. No.	Reference Location	Mitigation Measure	Audit Result	Action Required
		Swales/roadside drains are used to collect runoff from access roads and turbine hardstanding areas of the site, likely to have entrained suspended sediment, and channeled it onto natural vegetation.		
MM9	EIAR Chapter 9	As part of peatland restoration works, the following water protection measures are proposed: - Brash removed during the restoration process will be stored up slope of the cleared area, to provide a buffer to surface water flows which may have the potential to erode; - During tree felling brash mats will be used to support vehicles on soft ground, reducing peat and mineral soils erosion and avoiding the formation of rutted areas; and, - Drain blocking and use of silt fencing and check dams until stabilisation has taken place.		
MM 10	EIAR Chapter 7	Operational monitoring at the Cleanrath wind farm development commenced in January 2020 and continued into May 2020. Appendix 7-6 of this EIAR contains the Post-Construction Bird Monitoring Programme. Post construction monitoring included and will include the following surveys: - Flight activity surveys: Vantage Point Surveys - Breeding Bird Surveys: Adapted Brown & Shephard. - Winter Walkover Surveys - Breeding Raptor surveys - Hen Harrier Winter Roost Surveys		

Ref. No.	Reference Location	Mitigation Measure	Audit Result	Action Required
		› Targeted bird collision surveys (corpse searches) were/will be undertaken with training dogs. The surveys included detection and scavenger trials, to correct for these two biases and ensure the resulting data is robust.		
MM 11	EIAR Section 6	All mitigation measures as specified by the survey report and derogation licence was implemented by the client. Compensation habitat was provided to replace the relatively small area of habitat affected by the development and no significant impact on Kerry slug populations was predicted to occur as a result of this development.		
MM 12	EIAR Chapter 7	Following the precautionary principle and in accordance with the SNH (2019) guidelines, any future operation of the wind farm will be the subject of ongoing monitoring as described in Appendix 6-4. If, following monitoring, there is any uncertainty as to the impacts on bat species, mitigation will be implemented		
MM 13	EIAR Chapter 5 OEMP Section 3	During the operational phase there will be ongoing maintenance of the wind turbines and associated infrastructure. Access to the turbines is through a door at the base of the structure, which is locked at all times outside maintenance visits. An Operational and Maintenance Health and Safety Plan has been prepared for the wind farm and is included as Appendix A of the OEMP (Appendix 4-3).		
MM 14	EIAR Chapter 5, 11 OEMP Section 3	Best practice measures for noise control will be adhered to onsite during the operational phase of the Cleanrath wind farm development in order to mitigate the slight short-term negative impact associated with this phase of the development. These measures included: › No plant used on site will be permitted to cause an on-going public nuisance due to noise.		

Ref. No.	Reference Location	Mitigation Measure	Audit Result	Action Required
		• The best means practicable, including proper maintenance of plant, will be employed to minimise the noise produced by on site operations. • All vehicles and mechanical plant will be fitted with effective exhaust silencers and maintained in good working order for the duration of the contract. • Compressors will be attenuated models fitted with properly lined and sealed acoustic covers which will be kept closed whenever the machines are in use and all ancillary pneumatic tools were fitted with suitable silencers. • Machinery that will be used intermittently will be shut down or throttled back to a minimum during periods when not in use. • During the course of the construction programme, supervision of the works will be undertaken to ensure compliance with the limits detailed in Chapter 11 using methods outlined in British Standard BS 5228-1:2014+A1:2019 Code of practice for noise and vibration control on construction and open sites – Noise.		
MM 15	EIAR Chapter 5 OEMP Section 3	In periods of extended dry weather, dust suppression may be necessary along haul roads within the site to ensure dust does not cause a nuisance during use of plant or machinery. Where necessary, water will be spread with a bowser or water spreader to dampen down haul roads and the temporary site compound to prevent the generation of dust. Silty or oily water will not be used for dust suppression		
MM 16	EIAR Chapter 5 OEMP Section 2	All mitigation as outlined under noise and vibration, dust, traffic, visual amenity and shadow flicker in the EIAR, will be implemented in order to reduce insofar as possible impacts on residential amenity at properties located in the vicinity of the Cleanrath wind farm development works, including along the turbine and construction materials haul route.		

Ref. No.	Reference Location	Mitigation Measure	Audit Result	Action Required
		The installed wind turbines have been fitted with shadow flicker control units to allow the turbines to be controlled to prevent the occurrence of shadow flicker at properties surrounding the wind farm where necessary.		
MM 17	EIAR Chapter 10 OEMP Section 3	Any vehicles or plant brought onsite during the operational phase will be maintained in good operational order that comply with the Road Traffic Acts 1961 as amended, thereby minimising any emissions that arise.		
MM 18	EIAR Chapter 5, 11 OEMP Section 3	Best practice measures for noise control was adhered to onsite during the construction phase of the Cleanrath wind farm development in order to mitigate the slight short-term negative impact associated with this phase of the development. The measures include: - Sensitive location of equipment, taking account of local topography and natural screening. - Working methods: construction noise was controlled by prescribing that standard construction work was restricted to the specified working hours. Any construction work carried out outside of these hours shall be restricted to activities that did not generate noise of a level that may cause a nuisance. The phasing of works had also been designed with regard to avoidance of noise impacts. - Plant was selected taking account of the characteristics of noise emissions from each item. All plant and machinery used on the site shall comply with E.U. and Irish legislation in relation to noise emissions. The timing of on- and off-site movements of plant near occupied properties was controlled. - Operation of plant: all construction operations shall comply with guidelines set out in British Standard documents 'BS 5338: Code of Practice for Noise		

Ref. No.	Reference Location	Mitigation Measure	Audit Result	Action Required
		Control on Construction and Demolition Sites' and 'BS5228: Part 1: 1997: Noise & Vibration Control on Construction and Open Sites'. The correct fitting and proper maintenance of silencers and/or enclosures, the avoidance of excessive and unnecessary revving of vehicle engines, and the parking of equipment in locations that avoid possible effects on noise-sensitive locations were employed. › Training and supervision of operatives in proper techniques to reduce site noise, and self-monitoring of noise levels, if appropriate.		
MM 19	EIAR Chapter 14 OEMP Section 3	For a period of three weeks, a number of HGVs and excavator delivery vehicles will come to site as part of peatland habitat restoration works. These works will be undertaken in accordance with the Traffic Management Plan prepared for the construction phase which is included within Appendix 4-4 of the remedial EIAR		
MM 20	EIAR Chapter 14	In the event of further scoping responses being received from the EIA consultees, the comments of the consultees and any mitigation measures are considered during operation of the Cleanrath wind farm development, subject to the outcome of the Substitute Consent process. The terms of the signed 2RN Protocol Document for the Cleanrath wind farm development will be adhered to throughout operation		

Ref. No.	Reference Location	Mitigation Measure	Audit Result	Action Required
		Decommissioning Phase		
MM 21	EIAR Chapter 4	Prior to the end of the operational period the Decommissioning Plan (Appendix 4-4) will be updated in line with decommissioning methodologies that may exist at the time and will agreed with the competent authority at that time.		
MM 22	DP Section 3	Prior to decommissioning, a suitably qualified ecologist will complete an invasive species survey of the berms that will be temporarily removed during decommissioning at the turbine delivery accommodation roadway and the junction upgrade adjacent to the sawmill in Cloontycarthy. The invasive species survey will also be undertaken along the cable route to identify invasive species at joint bay locations where excavation to expose the cabling for removal will be required.		
MM 23	EIAR Chapter 9	Best guidance in relation to protection of freshwater pear mussel (FPM) sites will be followed from guidance document Forestry and Freshwater Pearl Mussel Requirements – Site Assessment and Mitigation Measures (Draft).		
MM 24	EIAR Section 6	All mitigation measures as specified by the survey report and derogation licence or any revision or renewals of this licence was implemented by the client. Compensation habitat was provided to replace the relatively small area of habitat affected by the development and no significant impact on Kerry slug populations was predicted to occur as a result of this development.		
MM 25	EIAR Chapter 6	Trees did not be replanted in the future within the felled areas. In areas of felling close to turbine bases brash was removed from the site, where not required for the upgrade of existing roads and to prevent rutting of the ground surface during felling operations, and management was put in place to keep the growth of regenerating scrubby/bushy vegetation down.		

Ref. No.	Reference Location	Mitigation Measure	Audit Result	Action Required
MM 26	EIAR Chapter 4 DP Section 2	On removal of turbines, the covering of the foundation will be completed using material imported to site as the required quantity of material does not currently exist at the site. The imported soil will be spread and graded over the foundation using a tracked excavator and revegetation enhanced by spreading of an appropriate seed mix to assist in revegetation and accelerate the resumption of the natural drainage management that will have existed prior to any construction		
MM 27	EIAR Chapter 4 DP Section 3	The following mitigation measures are proposed to avoid release of hydrocarbons at the site: › Road-going vehicles will be refuelled off site wherever possible; › On-site refuelling will be carried out at designated refuelling areas at various locations throughout the site. Machinery will be refuelled directly by a fuel truck that will come to site as required › Only designated trained and competent operatives will be authorised to refuel plant on site. › Fuel volumes stored on site should be minimised. Any fuel storage areas will be bunded appropriately; › The plant used will be regularly inspected for leaks and fitness for purpose; and, › An emergency plan for the decommissioning phase to deal with accidental spillages will be developed (refer to Section 4) Spill kits will be available to deal with and accidental spillage in and outside the refuelling area. › A programme for the regular inspection of plant and equipment for leaks and fitness for purpose will be developed at the outset of the decommissioning phase.		

Ref. No.	Reference Location	Mitigation Measure	Audit Result	Action Required
MM 28	EIAR Section 7	A Decommissioning Plan has been prepared (see Appendix 4-4) The following measures are proposed for the decommissioning phase: - During the decommissioning phase, disturbance limitation measures will be as per the construction phase (see Chapter 7 of the rEIAR). - Plant machinery will be turned off when not in use. - All plant and equipment for use will comply with the Construction Plant and the European Communities (Noise Emission by Equipment for Use Outdoors) Regulations 2001 (S.I. No. 632 of 2001). - A project ecologist will be appointed to oversee the decommissioning phase, with similar duties to those outlined above during the construction phase.		
MM 29	EIAR Chapter 14 DP Section 3	The Traffic Management Plan has been prepared to consider the decommissioning as a standalone project. The removal of turbines from site will be undertaken for a specialist haulier. The traffic management arrangements although similar to that implement for turbine delivery as outlined in the rEIAR will be agreed in advance of decommissioning (early or after 25 years of operation) with the competent authority. A traffic management plan has been prepared for the removal of cabling from cable duct on the grid connection route		

5. MONITORING PROPOSALS

All monitoring proposals relating to the operational phases of the Cleanrath wind farm development were set out in the various sections of the Environmental Impact Assessment Report (EIAR) which accompanies this substitute consent application.

This section of the OEMP groups together all of the monitoring proposals presented in the planning documentation. The monitoring proposals are presented in the following pages.

By presenting the monitoring proposals in the below format, it is intended to provide an easy to audit list that can be reviewed and reported on during the operational phase of the project. The tabular format in which the below information is presented, can be further expanded upon during the course of operation to provide a reporting template for site compliance audits.

Table 5-1 Schedule of Monitoring Proposals

Ref. No.	Reference Location	Monitoring Measure	Frequency	Reporting Period	Responsibility
		Operational Phase & Decommissioning Phases			
MX1	EIAR Chapter 4 OEMP Section 3	Monthly sampling for laboratory analysis for a range of parameters as adopted during pre-commencement and construction phases has continued for 6 months (although sample events were not completed in March and April 2020 due to the Covid-19 restrictions) after construction was completed Sampling will now continue quarterly into the operational phase for a period of one year	Quarterly	As Necessary	Site Manager
MX2	EIAR Chapter 4 OEMP Section 3	Turbidity monitors or sondes have been installed at locations surrounding the wind farm site as outlined in Figure 3-1. The sondes provide continuous readings for turbidity levels in the watercourse and are scheduled for removal at the next quarterly surface water sampling event	Ongoing	As Necessary	Site Manager
MX3	EIAR Chapter 7	Operational monitoring at the Cleanrath wind farm development commenced in January 2020 and continued into May 2020. The programme of works monitored and will continue to monitor parameters associated with collision, displacement/barrier effects and habituation during the lifetime of the project. Surveys commenced in January 2020 of Years 1. Thereafter surveys will be scheduled to coincide with Years 2, 3, 5, 10 and 15 of the lifetime of the wind farm. Monitoring measures were broadly based on guidelines issued by the Scottish Natural Heritage (SNH, 2009). Post construction monitoring included and will include the following surveys:			

Ref. No.	Reference Location	Monitoring Measure	Frequency	Reporting Period	Responsibility
		- Flight activity surveys: Vantage Point Surveys - Breeding Bird Surveys: Adapted Brown & Shephard. - Winter Walkover Surveys - Breeding Raptor surveys - Hen Harrier Winter Roost Surveys - Targeted bird collision surveys (corpse searches) were/will be undertaken with training dogs. The surveys included detection and scavenger trials, to correct for these two biases and ensure the resulting data is robust.			
MX4	EIAR Chapter 4, 6	Post-construction surveys for badger and otter will be completed on the site for five years. These surveys will be undertaken following the same scope and methodology as proposed for the pre-construction surveys. All results will be sent to the Planning Authority and to the NPWS.	Annually for 5 years	Annually	Project Ecologist
MX5	EIAR Chapter 4, 6	The Kerry Slug Management Plan will be implemented in full, as will the conditions of the derogation licence. This provides for post-construction surveys that cover a five year period	Annually for 5 years	Annually	Project Ecologist
MX6	EIAR Chapter 4, 6	Post-construction monitoring and reporting programmes for birds (particularly Hen Harrier and Merlin), otter, badger and Kerry slug shall be submitted to, and agreed in writing with, the planning authority prior to commencement of	As required	As required	Project Ornithologist

Ref. No.	Reference Location	Monitoring Measure	Frequency	Reporting Period	Responsibility
		development. The surveys shall be undertaken by suitably qualified and experienced specialists. Surveys shall be completed annually for a period of five years following commissioning of the wind farm and copies of the reports to the planning authority shall also be submitted to the National Parks and Wildlife Service.			
MX7	EIAR Chapter 5, 11	Post commissioning of the proposed turbine units it is recommended that the noise monitoring detailed in the relevant section of this report is repeated with a view to confirming that the operational units are compliant with the relevant day and night time noise criteria curves as presented in the body of this assessment. If this study work identifies any exceedances of the appropriate criteria relevant corrective actions will be taken/implemented.	Once	As required	Site Manager
MX8	DP Section 3	The Site Manager in consultation with the ECoW will be responsible for employing the services of a suitably qualified ecologist and any other suitably qualified professionals as required throughout the decommissioning works.	As required	As required	Site Manager
MX9	EAIR Chapter 6 DP Section 3	Prior to decommissioning, a suitably qualified ecologist will complete an invasive species survey of the berms that will be temporarily removed during decommissioning at the turbine delivery accommodation roadway and the junction upgrade adjacent to the sawmill in Cloontycarthy. The invasive species survey will also be undertaken along the cable route to identify invasive species at joint bay locations	As required	As required	Project Ecologist

Ref. No.	Reference Location	Monitoring Measure	Frequency	Reporting Period	Responsibility
		where excavation to expose the cabling for removal will be required.			
MX10	EAIR Chapter 6	Current and ongoing bat monitoring being conducted on site, where turbines are operating in sleep mode, will be utilised in conjunction with the 2015 bat survey findings. This will be used to assess bat activity patterns and to inform the design of any advanced site-specific mitigation requirements, including curtailment if deemed necessary, to ensure that there are no significant residual effects on bat species.	As required	As required	Project Ecologist

6. COMPLIANCE AND REVIEW

6.1 Site inspections and Environmental Audits

Routine inspections of site operations will be carried out on a daily and weekly basis by the Site Manager to ensure all controls to prevent environmental impacts, relevant to the operational activities taking place at the time, are in place.

Environmental inspections will ensure that the works are undertaken in compliance with this OEMP and all other planning application documents. The Site Manager will be suitably trained to undertake environmental site inspections.

6.2 Auditing

An Environmental audit will first be carried out monthly during the operational phase of the Cleanrath wind farm development to ensure the operational phase mitigation measures that are still in place as required are adequate.

In contrast to monitoring and inspection activities, audits are designed to shed light on the underlying causes of non-compliance, and not merely detect the non-compliance itself. In addition, audits are the main means by which system and performance improvement opportunities may be identified. Environmental audits will be carried out by the Site Manager on behalf of the Operation Controller. It is important that an impartial and objective approach is adopted. Environmental audits will be conducted at planned intervals to determine whether the OEMP is being properly implemented and maintained. The results of environmental audits will be provided to project management personnel.

6.3 Environmental Compliance

The following definitions shall apply in relation to the classification of Environmental Occurrences during the operation of the wind farm:

Environmental Near Miss: An occurrence which if not controlled or due to its nature could lead to an Environmental Incident.

Environmental Incident: Any occurrence which has potential, due to its scale and nature, to migrate from source and have an environmental impact beyond the site boundary.

Environmental Exceedance Event: An environmental exceedance event occurs when monitoring results indicate that limits for a particular environmental parameter (as indicated in the Environmental Monitoring Programme) has been exceeded.

An exceedance will immediately trigger an investigation into the reason for the exceedance occurring and the application of suitable mitigation where necessary.

Exceedance events can be closed out on achieving a monitoring result below the assigned limit for a particular environmental parameter.

Environmental Non-Compliance: Non-fulfilment of a requirement and includes any deviations from established procedures, programs and other arrangements related to the OEMP.

6.4 Corrective Action Procedure

A corrective action is implemented to rectify an environmental problem on-site. Corrective actions will be implemented by the Site Manager. Corrective actions may be required as a result of the following;

- Environmental Audits;
- Environmental Inspections and Reviews;
- Environmental Monitoring;
- Environmental Incidents; and,
- Environmental Complaints.

A Corrective Action Notice will be used to communicate the details of the action required to the main contractor. A Corrective Action Notice is a form that describes the cause and effect of an environmental problem on site and the recommended corrective action that is required. The Corrective Action Notice, when completed, will include details of close out and follow up actions.

If an environmental problem occurs on site that requires immediate attention direct communications between the Site Manager will be conducted. This in turn will be passed down to the site staff involved. A Corrective Action Notice will be completed at a later date.

6.5 Operation and Environmental Management Plan Review

This OEMP will be reviewed after every 6 months of operation and may also require updating after the substitute consent process to comply with any conditions should substitute consent be granted.

APPENDIX A

OPERATIONAL AND MAINTENANCE HEALTH AND SAFETY PLAN

Cleanrath Wind Farm Ltd.

Operational and Maintenance H&S Plan and Scheduled Activities Jan 2020 – Dec 2020

Document prepared by WFSO Ltd. for Cleanrath Wind Farm, Inchigeelagh, Co Cork

Confidentiality

The content of this report is for the exclusive use for the Cleanrath Wind Farm and Cleanrath 38kV Substation. If other parties, choose to rely on the contents of this report they do so at their own risk.

This document has been prepared by

……………………………………………………………………………………

Eamonn Lyons,
WFSO Ltd. Operators Controller,
Cleanrath Wind Farm.

This document has been approved by

……………………………………………………………………………………..
Christopher Murnane,
PSDP / PSCS Manager,
WFSO Ltd.

Contents

1.0 Introduction

The Health and Safety Plan has been prepared for the works associated with the maintenance and upkeep of Cleanrath Wind Farm, Inchigeelagh, Co Cork. The plan has been prepared in accordance with the requirements of the Safety, Health and Welfare at Work (Construction) Regulations 2013.

WFSO Ltd. is committed to the philosophy that all accidents are preventable and that the prevention of accidents through identification and control of the hazards inherent in the work being undertaken is a primary objective for all operations and maintenance projects undertaken at Cleanrath Wind Farm. The purpose of the plan is to describe the arrangements that are in place for OEM activities planned on-site during 2020 and to ensure the health and safety of all personnel involved in these activities. The PSDP / PSCS Manager will retain the master copy of this document. Documents and files associated with this plan will be held by the wind farm operations manager. The PSDP / PSCS Manager's office is located at Lissarda Industrial Estate, Lissarda, Co. Cork and the operations manager's office will be located on site in the Cleanrath wind farm.

Scope

Operation and maintenance activities at Cleanrath Wind farm come under the definition of "construction work" under the Safety, Health and Welfare at Work Act 2005. WFSO Ltd. has put in place a procedure for managing the PSDP / PSCS role for these works. Operations management on site will ensure that all procedures are adhered to and executed in an appropriate manner.

The works to which this plan applies are listed in Appendix 3. This plan is reviewed and revised as required every year in advance of the commencement of scheduled maintenance activities for the forthcoming calendar year and is valid for just over one year. It is not anticipated that new projects may arise during the 12-month period.

WFSO ltd. recognize that each individual activity will have hazards which will be specific to that task. This plan requires that tasks are risk assessed and a method statement prepared by the appropriate contractor. The PSDP / PSCS will review method statements in advance of works to ensure that a safe system of work is being employed. This task specific review and details of any additional specific control measures to be employed will be included in Appendix 4 which details the hazards of particular risk thought likely to occur during the completion of this plan. All operatives visiting the site are to complete an online site induction beforehand whereby they can upload training certificates and following successful completion of the induction they will be able to download a copy of;

- Cleanrath Site Layout
- Cleanrath Emergency Procedures
- Catastrophic Event Flowchart

2.1 Approach

To ensure a consistent and efficient approach, different work types and methods for ensuring a safe system of work have been defined for the site as follows:

Work Type 1 (Routine maintenance)

- Approximately 90% of turbine related work involves minor repairs, component replacement, troubleshooting, adjustment etc. These works will often require access to the nacelle. The works can be either planned or reactive (e.g. to a fault condition). Work is carried out by trained technicians from either the turbine manufacturer or an appointed OEM contractor. These works do not have a large design element as replacement of turbine components is done on a "like for like" basis. The work comes under the definition of "construction work" and involves particular risks (working at height, high voltage) and so requires appointment of Project Supervisors.

Approach

The site will operate under the Nordex Wind Turbine Safety Rules (Revision 3). WFSO will act as the Operational Controller for the site and no work will commence on a turbine unless WFSO are happy to "hand over control" of a turbine to an Approved Technician (AT).

The Approved Written Procedures (AWP), associated Risk Assessments and Method statements for these works will be reviewed by the PSDP / PSCS at the start of the contract period. Any new AWPs or amendments to existing AWPs will be reviewed as they occur. The method statements will typically consist of standard operation and maintenance procedures from the turbine manufacturers which will have been previously risk assessed by the turbine manufacturers. The PSDP / PSCS will document this review process, review any deficiencies in the procedure with the turbine vendor and carry forward any specific control actions to the construction stage safety and health plans for the appropriate site.

On receipt of method statements from a contractor, the PSDP / PSCS will review and ensure that:

- It details the work to be undertaken
- Includes a formal risk assessment
- Clearly identifies the area in which the work will happen
- Lists the plant and equipment that will be used for the work
- Clearly identifies hazards and controls in place
- There is First Aid provision

If there is any doubt about the contents of the method statements, these will be sent for further review by the WFSO Health and Safety Advisor.
Once the induction, training and certification details of contractor personnel assigned to a type 1 work task are in order AND the standard method statement for the task has been pre-approved by the PSDP / PSCS AND the work is to be carried out without deviation to that method

statement THEN work will be authorized by the PSDP / PSCS remotely using the WFSO Controller System as described in Section 8.1 of this document. Following authorization, the PSDP / PSCS will periodically inspect on-site the implementation of the safe working procedures and will address any non-compliance with approved method statements as appropriate. WFSO Ltd. will carry out monthly H&S inspections which will cover all aspects on the site from signage, to roads condition, to substation inspection, etc.

Work Type 2 (Major Turbine maintenance)

- Approximately 10% of turbine related work involves major repair works such as large component replacement or blade repair. These works typically involve additional sub-contractors such as crane companies and may involve other specialist sub-contractors. Approval of the contractors will be based on the procedure described in Section 7 of this document.
- The work is generally planned in advance. The work may have a design element (e.g. design of the crane lift). The work comes under the definition of "construction work" and involves particular risks (working at height, high voltage, lifting heavy prefabricated components) and so requires appointment of Project Supervisors

Approach

Method statements for these works will be reviewed by the PSDP / PSCS before work commences. Method statements will typically consist of standard turbine OEM procedures but there will be elements which may be specific to the exact task being carried out at the particular location i.e. the method statement will take account of site and task specific risks. The PSDP / PSCS will review the method statements, document this review process, action any deficiencies in the procedure with the turbine vendor and any other contractors before authorising the works.

The PSDP / PSCS will be present at the site at the commencement of the works to ensure that a safe system of work is being employed and that all PSDP / PSCS duties are addressed and periodically inspect the works thereafter.

Typically for these works, the turbine supplier will be appointed as the PSDP / PSCS for the works area in question for the duration of the works with WFSO Ltd. onsite and offering assistance where required.

Work Type 3 (Non-Turbine Contractor Works)

- General site maintenance work which involves road repairs, unblocking of drains, control building maintenance works
- Repair and maintenance activities within the onsite substation and HV switching which will typically involve electrical subcontractors (employed either by the client directly or by the turbine service contractor).

The above works comes under the definition of "construction work" and involve particular risks (working at height, high voltage) and so requires appointment of Project Supervisors.

Approach

Method statements for these works will be reviewed by the PSDP / PSCS before work commences. The method statements will typically be specific to the exact task being carried out at the particular location and will take account of site and task specific risks. The PSDP / PSCS will document this review process, review any deficiencies and action them with the contractors before authorising the works. The PSDP / PSCS will be present at the site at the commencement of the works by any new contractor to ensure that a safe system of work is being employed and that all PSDP / PSCS duties are addressed.

Work Type 4 [Operations Staff Works]

- The WFSO operations team is trained in working at height and is involved periodically in climbing turbines for the purpose of inspection, audit or contractor supervision.

These works involve the risks of working at height and working in the proximity of high voltage but do not come under the definition of "construction works" under the construction regulations.

Approach

The PSDP / PSCS will ensure that WFSO staff are inducted at the particular site and will authorize personnel to access the site remotely using the WFSO Work Authorization System. (Note Risk Assessment of these activities will be covered under the WFSO Safety Statement)

3. Project Details

3.1 Location

The site is located at the Cleanrath Wind farm, Inchigeelagh, Cork and is shown on the map in Appendix 1.

3.2 Nature of Work

A list of the works to be carried out is detailed in Appendix 3.

3.3 Information for Inclusion in the Safety File

Due to the nature of the work which involves routine maintenance it is not expected that a significant amount of information necessary for inclusion in the safety file should be generated during this project WFSO as the PSDP / PSCS shall ensure that the checklist attached in Appendix 3 is updated on an annual basis and information identified as being necessary for inclusion shall be added to the safety file.

3.4 Cleanrath Substation

3.4.1 Location

Accident Area: Cleanrath

Site Entrance Co-ordinates:

- Irish Grid: E 120600 N 71674
- GPS (degree/decimal): Lat: 51.89192 Lon: -9.1541867
- GPS (deg/min/sec): N: 51° 53' 30.9" W 9° 9' 15.1"

- **Closest Eircode: P12 H289**
- **Closest townland: Cloontycarthy**

Directions from Macroom to Cleanrath

- After going straight through Macroom from the Cork city side continue following the road west for 6.00km until you reach Moon's bar.
- Take the left at Moon's bar.

- Continue following this road for another 5.5km until you reach a left-hand turn:

- Continue on this road until you reach a T junction. Take the right-hand turn.

- After 1.00km at the next junction turn right. Directly after the house with the Eircode **P12 H289**.

- The entrance will be 0.3km down this road on the left-hand side.

3.4.2 Nature of work

A list of all work to be carried out is detailed in Appendix 7.

3.4.3 Information for inclusion in the Safety File

This 38kV substation serves all sections of the wind farm. Due to the nature of the work which involves routine maintenance it is not expected that a significant amount of information necessary for inclusion in the safety file should be generated during this project. WFSO as the PSDP / PSCS shall ensure that the checklist attached in Appendix 5 is updated on an annual basis and information identified as being necessary for inclusion shall be added to the safety file. The PSDP / PSCS requires no lone working on any electrical equipment in the substation.

4. The Environment

4.1 Access and Egress

Parking is available on site at the base of each turbine and in front of the substation. All cars should reverse into the chosen parking space. Access to the turbines is along a farm laneway and through two gates which are normally closed. All gates should be left in the state they were found. The access way is in continuous use for farming or bog activities.

4.2 Existing Services

All turbines are serviced by a single substation at Cleanrath which is in turn connected to an interconnector. As a result, there are underground cables present on the site. These are outlined on the as built services drawing in the Safety File. Should works be planned which may affect existing services on the site the exact location will be verified before work commences. Works likely to affect existing services are not envisaged as part of the existing scope of works to be undertaken under this plan. Overhead cables are present on potential access routes to the site and may affect the bringing to site of equipment such as cranes.

4.3 Site Access

Construction and maintenance activities will be restricted to daylight hours unless otherwise agreed with the PSDP / PSCS. Works will be scheduled so as to minimize disruption to local traffic and the ongoing agricultural activities on the Wind farm.

4.4 Other activities on-site

The normal functions of the farm will continue throughout the project. Where there are, any potential impact arising from works being by PSDP / PSCS before commencing carried out under this plan and agricultural activities, this will be coordinated by the PSDP / PSCS. The site operator will collaborate and coordinate with all personnel who will have accesses to roads on site to gain entry to forestry. Any non-day to day activities will need to be assessed and passed

4.5 Storage of plant and materials

Storage of plant and materials whilst on site shall only be in designated areas which will be pre-agreed with the PSDP / PSCS prior to works commencing. All materials shall be stored in a safe and tidy manner. Whilst on-site, contractors will be expected to maintain the site in a clean and tidy fashion. It is expected that all parts used in service and a small number of electrical and mechanical components will be store in the storage facilities provided to Nordex by WFSO. Nordex have a bunded storage cabin located next to the site office which is used to house COSHH plant and equipment.

4.6 Disposal of waste

Disposal of all waste from the construction activities must be in compliance with all relevant statutory provisions. The PSDP / PSCS requires contractors to ensure that all waste which is generated is disposed of in an appropriate manner. Waste generated should be removed from the site every evening. Oils and Coolants withdrawn from Turbines will be stored in the storage facility on site and will be disposed of by Nordex under their environmental standard.

4.7 Security arrangements

The works involved in this project will not generally require additional security arrangements to be put in place.
Contractors are required to erect appropriate signage and barriers at the area of work to ensure that persons do not enter the work area during works or after hours.
In accordance with normal safety procedures within the industry contractors shall also be obliged to ensure that exclusion zones are established and maintained during crane activities and when overhead working is taking place.

5. Management Arrangements

5.1 Construction Regulations Duty Holders

Client:
Inchee Energy Supply Ltd.,
Lissarda,
Co. Cork, Ireland.

PSDP / PSCS:
WFSO Ltd.,
Lissarda Industrial Estate.
Lissarda,
Co. Cork, Ireland.
PSDP / PSCS Manager Christopher Murnane (086 7955083).

5.2 PSDP / PSCS Manager Responsibilities

Mr. Christopher Murnane, will be PSDP / PSCS manager with assistance from the WFSO Ltd. team.

5.3 Relevant Legislation

The legislation that is relevant to this project is as follows:
Safety, Health and Welfare at Work (SHWW) Act, 2005.
Safety, Health and Welfare at Work (Construction) Regulations, 2013.
Safety, Health and Welfare at Work (General Applications) Regulations, 2007.
Safety, Health and Welfare at Work (Chemical Agents) Regulations, 2001.
European Communities (Classification, Packaging and Labeling and notification of Dangerous Substances) (Amendment) Regulations, 2006.

6. Informing Contractors

The PSDP / PSCS will manage the flow of information to inform the contractors and others of health and safety issues. The means of distributing information to contractors on the site are as follows:

- Site specific induction is given to the work force as well as any other personnel who require access to the site.
- Development and review of this safety and health plan when required.
- Review of contractor’s site-specific safety statements, method statements and risk assessments
- Conducting site audits of safety compliance and awareness.

Ensuring that information concerning particular risks which are likely to be encountered during the completion of these works and which have been identified at design stage are included in this plan and are considered by contractors when preparing safe systems of work

7. Contractor Selection Procedures

Contractors are obliged to assess their sub-contractors and suppliers and submit documentation to this effect when requesting approval for the sub-contractor. The PSDP / PSCS will monitor the compliance of individual contractors with site safety rules and approved method statements and will issue any appropriate directions to contractors as necessary. All contractors will be requested to provide the following information prior to starting work at Cleanrath Wind Farm:

- All relevant Training records for personnel who will work at Cleanrath.
- Method Statements and Risk Assessments for Maintenance at Cleanrath.
- Contact Details for personnel who will carry out work at Cleanrath.
- Insurance Certificates and Up to date Safety Statement.

8. Works Authorization and Coordination

8.1 Work Authorization Procedure

Approval to work will be based on detailed approved method statements and risk assessments for the works. A formal written permit to work system will not be in operation for this project. Approval to visit the site and work on the site must be sought and granted through the WFSO Operational Controller with online inductions completed before coming to site.

The turbines on the wind farm are operated under Nordex Wind Turbine Safety Rules and WFSO Operations are appointed as the Operational Controller. Nordex, the HV Operator and any contractor or personnel visiting Cleanrath wind farm for the purposes of work, inspection or testing on the wind farm plant or infrastructure must notify the WFSO duty Operational Controller of their presence before entering the wind farm.

Personnel entering the wind farm will provide the following information:

- work party details,
- reason for visit,
- expected finish time,
- any known issues or work being undertaken at the wind farm
- Relevant AWPs or ROPs where work is being carried out under the WTSRs.
- All non WTSR activity happening on site, the WFSO Operational Controller should have prior notice of the work, personnel involved and have been supplied with Risk Assessments and Method Statements where appropriate.

The WFSO Operational Controller Contact Number **is 021 7355898.** Notification of all planned work on site should be emailed to wfsoteam@tunkeydev.com .WFSO Operational Controller will use a Work Order system so that each package of work can be assigned a number for reference and record keeping.

8.2 Design Changes

Contractors will not undertake any design stages without seeking the approval of the PSDP / PSCS. Where a change in design is identified as being necessary this shall be brought to the immediate attention of the PSDP / PSCS manager. Contractors are required to notify any changes to the design as early as possible to ensure that sufficient time to assess the impact of this change is allowed.

8.3 Contractor Co-ordination

Where a number of contractors are working in one area or on one system the contractors are required to cooperate with the PSDP / PSCS in ensuring that all works being undertaken on site are coordinated. Where potential conflicts arise, this should be brought to the immediate attention of the PSDP / PSCS.
The PSDP / PSCS manager may arrange meetings with contractors at which safety and co-ordination issues will be discussed so that works is coordinated and a safe schedule of work is implemented.

9. Risk Management (Including Particular Risks)

9.1 Particular Risks Identified During the Design Stage

The SHWW Construction Regulations requires that the PSDP / PSCS includes in this plan specific measures concerning work which involves a particular risk, including but not limited to any risk referred to in Schedule 1 of the Regulations. Information which has been identified during the design stage and which is contained within the Preliminary Safety and Health plan is included in Appendix 4 and must be taken into account by those working on the site. In reviewing drafted safe systems of work the PSDP / PSCS will also consider any particular risks which have been identified in the Preliminary safety and Health Plan by the PSDP or Designers.

9.2 Other Significant Hazards

There may be other significant hazards which have been identified by the designers during the design process. For each of these contractors will be required to assess and control these hazards during the completion of construction activities. This information must be documented in a method statement which will need to be reviewed and approved by the PSDP / PSCS prior to the commencement of the work on-site.

9.3 Change of Construction Method/Design

No deviation from approved method statements will be undertaken without obtaining appropriate written approval of the revised method statement. Implementation of non-approved change represents a significant general hazard. The PSDP / PSCS reserves the right to halt any construction activity which deviates significantly from the activity as set out in a method statement.

9.4 Work Involving Hazardous Substances

Contractors shall be responsible for obtaining Safety Data Sheets and producing suitable and sufficient written risk assessments of all risks associated with the use of hazardous substances. The content of the risk assessments shall be communicated with all workers that are working with or affected by the substances. Copies of all hazardous substance Safety Data Sheets shall be made available to the PSDP / PSCS manager prior to bringing such a chemical on-site.

10. Emergency Procedures

10.1 General Emergency Procedures

10.1.1 Fire- No Personnel in WTG or Building (employee or member of public)

Immediate Reporting Checklist		
Contact	Telephone number	Tick box
Fire and rescue	999 or 112	
Site manager	00353 86 4109155	
Nordex Lead Technician	00353 86 7719707	
OEM	0049 40 30030 1820	

Emergency Procedures - Steps to Take		
Step	Actions to complete	Tick box
1.	On receiving the call assure the caller to be calm and follow your instructions.	
2.	Ask caller for a full description of the incident, if there are any injuries and to confirm what emergency services or if additional assistance is required	
3.	Inform the caller that you are going to call emergency services/additional assistance. Instruct the caller to go to assembly point if safe to do so or make their immediate area as safe as possible. Instruct the caller you will phone them back as soon as possible.	
4.	Raise alarm with the emergency services passing on all information we have received from the caller about the incident. Give the emergency services the following information: • OC phone number • Incident controllers phone number • Site address & gate entrance coordinates • Nearest Eircode to site entrance	
5.	Contact other people on site and inform them of the situation and ask for assistance where possible or to meet the emergency services at the site entrance where possible	
6.	Contact the site manager and inform him of the situation	
7.	Contact the OEM to inform them of the situation.	
8.	Contact ESB/NCC to see if they have any workers at their side of the substation	
9.	Call back the incident controller and inform them of what assistance is on the way	
10.	If safe to so, ask for the HV trip button to be pushed in the substation	

Actions to Complete When No Staff on Site
In the instance of a fire starting in a WTG or a building and there is no one present on site; a member of the public is most likely to be the one to raise the alarm and directly call fire and rescue services or else they will contact the control room number which is present on site. In this case the fire and rescue services will access the site using the signage or will be directed by the party reporting the fire. Under these circumstances the operational controller is to assume the role of the incident controller until the site manager can attend the site and take control

Follow Up Action- Steps to Take		
Steps	Follow up action	Tick box
1.	Contact site manager and get update.	
2.	Contact OEM and give feedback from site manager	
3.	Complete incident report form and send to site manager	
4.	Contact initial caller and ensure everything is OK and thank them for their help.	

10.1.2 Fire- Personnel in WTG Or Building (Employee or Member of Public)

Immediate Reporting Checklist		
Contact	Telephone number	Tick box
Fire and rescue	999 or 112	
Site manager	00353 86 4109155	
Nordex Lead Technician	00353 86 7719707	
Nordex Area Manager	00353 87 2893344	

Emergency Procedures - Steps to Take		
Step	Actions to complete	Tick box
1.	On receiving the call assure the caller to be calm and follow your instructions.	
2.	Ask caller for a full description of the incident, if there are any injuries and to confirm what emergency services or if additional assistance is required	
3.	Inform the caller that you are going to call emergency services/additional assistance. Instruct the caller to go to assembly point if safe to do so or make their immediate area as safe as possible. Instruct the caller you will phone them back as soon as possible. If normal exit routes are blocked, instruct the caller to exit the turbine using the escape/self-rescue kit if safe to do so	
4.	Raise alarm with the emergency services passing on all information we have received from the caller about the incident. Give the emergency services the following information: • OC phone number • Incident controllers phone number • Site address & gate entrance coordinates • Nearest Eircode to site entrance	
5.	Contact other people on site and inform them of the situation and ask for assistance where possible or to meet the emergency services at the site entrance where possible	
6.	Contact the site manager and inform him of the situation	
7.	Contact the OEM to inform them of the situation.	
8.	Contact ESB/NCC to see if they have any workers at their side of the substation	
9.	Call back the incident controller and inform them of what assistance is on the way. Instruct them to: 1. Nominate a person or person to establish a secure exclusion zone 2. If safe to do so, operate the emergency HV switch in the substation control room 3. If possible, nominate someone to meet the emergency services at the site entrance/nearest village	

Follow up action- Steps to take		
Steps	Follow up action	Tick box
1.	Contact site manager and get update.	
2.	Contact OEM and give feedback from site manager	
3.	Complete incident report form and send to site manager	
4.	Contact initial caller and ensure everything is OK and thank them for their help.	

10.1.3 Fire- Moorland or Forest (Employee or Member of Public)

Immediate Reporting Checklist		
Contact	Telephone number	Tick box
Fire and rescue	999 or 112	
Site manager	00353 86 4109155	
Nordex Lead Technician	00353 86 7719707	
Nordex Area Manager	00353 87 2893344	

Emergency Procedures - Steps to Take		
Step	Actions to complete	Tick box
1.	On receiving the call assure the caller to be calm and follow your instructions.	
2.	Ask caller for a full description of the incident, if there are any injuries and to confirm what emergency services or if additional assistance is required	
3.	Inform the caller that you are going to call emergency services/additional assistance. Instruct the caller to go to assembly point if safe to do so or make their immediate area as safe as possible. Instruct the caller you will phone them back as soon as possible.	
4.	Raise alarm with the emergency services passing on all information we have received from the caller about the incident. Give the emergency services the following information: • OC phone number • Incident controllers phone number • Site address & gate entrance coordinates • Nearest Eircode to site entrance	
5.	Contact other people on site and inform them of the situation and ask for assistance where possible or to meet the emergency services at the site entrance where possible	
6.	Contact the site manager and inform him of the situation	
7.	Contact the OEM to inform them of the situation.	
8.	Contact ESB/NCC to see if they have any workers at their side of the substation	
9.	Call back the incident controller and inform them of what assistance is on the way. Ask them to: 1. If safe to do so evacuate adjacent buildings and WTG by raising alarm. 2. Nominate a person or person to establish a secure exclusion zone 3. If safe to do so, operate the emergency HV switch in the substation control room 4. If possible, nominate someone to meet the emergency services at the site entrance/nearest village	

Actions to complete when no staff on site
In the instance of a fire-starting moorland or forest and there is no one present on site, a member of the public is most likely to be the one to raise the alarm and directly call fire and rescue services or else they will contact the control room number which is present on site. In this case the fire and rescue services will access the site using the signage or will be directed by the party reporting the fire. Under these circumstances the operational controller is to assume the role of the incident controller until the site manager can attend the site and take control

Follow up action- Steps to take		
Steps	Follow up action	Tick box
1.	Contact site manager and get update.	
2.	Contact OEM and give feedback from site manager	
3.	Complete incident report form and send to site manager	
4.	Contact initial caller and ensure everything is OK and thank them for their help.	

10.1.4 Fire- Vehicle or Plant (Employee or Member of Public)

Immediate Reporting Checklist		
Contact	Telephone number	Tick box
Fire and rescue	999 or 112	
Site manager	00353 86 4109155	
Nordex Lead Technician	00353 86 7719707	
OEM	0049 40 30030 1820	

Emergency Procedures - Steps to Take		
Step	Actions to complete	Tick box
1.	On receiving the call assure the caller to be calm and follow your instructions.	
2.	Ask caller for a full description of the incident, if there are any injuries and to confirm what emergency services or if additional assistance is required If safe to do so, ask them to make a brief attempt to fight the fire.	
3.	Inform the caller that you are going to call emergency services/additional assistance. Instruct the caller to go to assembly point if safe to do so or make their immediate area as safe as possible. Instruct the caller you will phone them back as soon as possible.	
4.	Raise alarm with the emergency services passing on all information we have received from the caller about the incident. Give the emergency services the following information: • OC phone number • Incident controllers phone number • Site address & gate entrance coordinates • Nearest Eircode to site entrance	
5.	Contact other people on site and inform them of the situation and ask for assistance where possible or to meet the emergency services at the site entrance where possible	
6.	Contact the site manager and inform him of the situation	
7.	Contact the OEM to inform them of the situation.	
8.	Contact ESB/NCC to see if they have any workers at their side of the substation	
9.	Call back the incident controller and inform them of what assistance is on the way. Ask them to: 1. If safe to do so evacuate adjacent buildings and WTG by raising alarm. 2. Nominate a person or person to establish a secure exclusion zone 3. If safe to do so, operate the emergency HV switch in the substation control room If possible, nominate someone to meet the emergency services at the site entrance/nearest village	

Actions to Complete When No Staff on Site
In the instance of a fire-starting in a vehicle or plant and there is no one present on site, a member of the public is most likely to be the one to raise the alarm and directly call fire and rescue services or else they will contact the control room number which is present on site. In this case the fire and rescue services will access the site using the signage or will be directed by the party reporting the fire. Under these circumstances the operational controller is to assume the role of the incident controller until the site manager can attend the site and take control

Follow Up Action- Steps to Take		
Steps	Follow up action	Tick box
1.	Contact site manager and get update.	
2.	Contact OEM and give feedback from site manager	
3.	Complete incident report form and send to site manager	
4.	Contact initial caller and ensure everything is OK and thank them for their help.	

10.1.5 Injury- Walking Casualty (Employee or Member of Public)

Immediate Reporting Checklist		
Contact	Telephone number	Tick box
Fire and rescue	999 or 112	
Site manager	00353 86 4109155	
Nordex Lead Technician	00353 86 7719707	
Nordex Area Manager	00353 87 2893344	

Emergency Procedures - Steps to Take		
Step	Actions to complete	Tick box
1.	On receiving the call assure the caller to be calm and follow your instructions.	
2.	Ask caller for a full description of the incident, if there are any injuries and to confirm what emergency services or if additional assistance is required.	
3.	If emergency services are not required, ask the caller: 1. If they are suitably trained, to give first aid using the first aid kit if available. 2. Ask them if possible, to go to the substation and wait for further assistance. Using Baze, check to see if there are other people available on site to assist. Arrange for the casualty to be collected and brought to the nearest hospital/doctor for treatment if required. If there is any doubt as to the seriousness of an injury, medical treatment must always be sought.	
3(A).	Inform the caller that you are going to call emergency services/additional assistance. Instruct the caller to go to assembly point if safe to do so or make their immediate area as safe as possible. Instruct the caller you will phone them back as soon as possible.	
4.	Raise alarm with the emergency services passing on all information we have received from the caller about the incident. Give the emergency services the following information: • OC phone number • Incident controllers phone number • Site address & gate entrance coordinates • Nearest Eircode to site entrance	
5.	Contact other people on site and inform them of the situation and ask for assistance where possible or to meet the emergency services at the site entrance where possible	
6.	Contact the site manager and inform him of the situation	
7.	Contact the OEM to inform them of the situation.	
8.	Contact ESB/NCC to see if they have any workers at their side of the substation	
9.	Call back the incident controller and inform them of what assistance is on the way	

Actions to complete when no first aid staff on site
All work parties should include at least Two persons trained in first aid; however, should a situation arise where suitably trained staff are not available to render first aid, a suitably trained person is to attend site immediately; where this cannot be achieved within 30 minutes the casualty is to be conveyed to the nearest medical facility. During any delay in attending to the casualty, first aid advice is to be given by telephone by the operational controller or by emergency services.

Follow up action- Steps to take		
Steps	Follow up action	Tick box
1.	Contact site manager and get update.	
2.	Contact OEM and give feedback from site manager	
3.	Complete incident report form and send to site manager	
4.	Contact initial caller and ensure everything is OK and thank them for their help.	

10.1.6 Injury- Stretcher Casualty (Employee or Member of Public)

Immediate Reporting Checklist		
Contact	Telephone number	Tick box
Fire and rescue	999 or 112	
Site manager	00353 86 4109155	
Nordex Lead Technician	00353 86 7719707	
Nordex Area Manager	00353 87 2893344	

Emergency Procedures - Steps to Take		
Step	Actions to complete	Tick box
1.	On receiving the call assure the caller to be calm and follow your instructions.	
2.	Ask caller for a full description of the incident, if there are any injuries and to confirm what emergency services or if additional assistance is required	
3.	Inform the caller that you are going to call emergency services/additional assistance. Instruct the caller to go to assembly point if safe to do so or make their immediate area as safe as possible. Instruct the caller you will phone them back as soon as possible.	
4.	Raise alarm with the emergency services passing on all information we have received from the caller about the incident. Give the emergency services the following information: • OC phone number • Incident controllers phone number • Site address & gate entrance coordinates • Nearest Eircode to site entrance	
5.	Contact other people on site and inform them of the situation and ask for assistance where possible or to meet the emergency services at the site entrance where possible	
6.	Contact the site manager and inform him of the situation	
7.	Contact the OEM to inform them of the situation.	
8.	Contact ESB/NCC to see if they have any workers at their side of the substation	
9.	Call back the incident controller and inform them of what assistance is on the way Instruct the caller to: 1. Prepare the casualty for evacuation and await assistance 2. Evacuate the casualty using evacuation equipment stored at your location; if this is inappropriate due to the nature of the injury, ask the caller to monitor the casualty and await assistance Transfer the casualty to the emergency services when they are in attendance.	

Actions to Complete by Operational Controller
All work parties should include at least Two persons trained in first aid and evacuation equipment is located in the nacelle of each WTG; however, should a situation arise where suitably trained staff are not available to render First aid or manage the casualty, suitably trained personnel must attend the situation to provide assistance. Emergency services must always be dispatched to site. During any delay in attending to the casualty, first aid advice is to be given by telephone by the operational controller or by emergency services.

Follow Up Action- Steps to Take		
Steps	Follow up action	Tick box
1.	Contact site manager and get update.	
2.	Contact OEM and give feedback from site manager	
3.	Complete incident report form and send to site manager	
4.	Contact initial caller and ensure everything is OK and thank them for their help.	

10.1.8 Injury- Fatality (Employee or Member of Public)

Immediate Reporting Checklist		
Contact	Telephone number	Tick box
Fire and rescue	999 or 112	
Site manager	00353 86 4109155	
Nordex Lead Technician	00353 86 7719707	
Nordex Area Manager	00353 87 2893344	

Emergency Procedures - Steps to Take		
Step	Actions to complete	Tick box
1.	On receiving the call assure the caller to be calm and follow your instructions.	
2.	Ask caller for a full description of the incident, if there are any injuries and to confirm what emergency services or if additional assistance is required	
3.	Inform the caller that you are going to call emergency services/additional assistance. Instruct the caller to go to assembly point if safe to do so or make their immediate area as safe as possible. Instruct the caller you will phone them back as soon as possible.	
4.	Raise alarm with the emergency services passing on all information we have received from the caller about the incident. Give the emergency services the following information: • OC phone number • Incident controllers phone number • Site address & gate entrance coordinates • Nearest Eircode to site entrance	
5.	Contact other people on site and inform them of the situation and ask for assistance where possible or to meet the emergency services at the site entrance where possible	
6.	Contact the site manager and inform him of the situation	
7.	Contact the OEM to inform them of the situation.	
8.	Contact ESB/NCC to see if they have any workers at their side of the substation	
9.	Call back the incident controller and inform them of what assistance is on the way Instruct caller to: 1. Arrange for the emergency services to be met at the site entrance and escort them to site. 2. If it is safe to do so, make the plant safe and isolate the equipment from all sources of energy supply 3. Secure the scene of the accident by establishing an exclusion zone Remain at the scene until the necessary support is in attendance, then transfer control of the incident to the emergency services that are in attendance.	

Follow up action- Steps to take		
Steps	Follow up action	Tick box
1.	Contact site manager and get update.	
2.	Contact OEM and give feedback from site manager	
3.	Complete incident report form and send to site manager	
4.	Contact initial caller and ensure everything is OK and thank them for their help.	

10.1.9 Adverse Weather (Employee or Member of Public)

Immediate Reporting Checklist		
Contact	Telephone number	Tick box
Fire and rescue	999 or 112	
Site manager	00353 86 4109155	
Nordex Lead Technician	00353 86 7719707	
Nordex Area Manager	00353 87 2893344	

Emergency Procedures - Steps to Take		
Step	Actions to complete	Tick box
1.	If the weather exceeds the safe parameters, immediately contact all parties on site (find on Bazefield) and advise that the cease all works and proceed to a safe area.	
2.	Contact site manager and inform him of the situation	
3.	Contact OEM and inform them of the situation	
4.	Instruct all parties to stay in CLEANRATH substation and monitor condition using Scada or lightning detection.	
5.	If conditions continue to get worse evacuate site full on earliest safe opportunity.	
6.	Instruct parties to ensure access gate is fully locked and no access is permitted	
7.	Confirm all parties have left site	
8.	Should weather conditions deteriorate to the extent that it is unsafe to attempt to leave site, instruct all parties to stay in substation until it's possible to leave.	

Actions to Complete When No Staff on Site
If the Weather Conditions Exceed the Safe Parameters, Contact Site Manager to Advise That No Work May Proceed and Access to Site Is to Be Restricted. Also, Prevent Transfer of Control for All Assets at Site Until Conditions Are Safe. For Planned Work, Site Manager Is to Notify Working Parties in Advance to Prevent Attempt of Access.

Follow Up Action- Steps to Take		
Steps	Follow up action	Tick box
1.	If a dangerous event has occurred, complete incident report form and send to relevant parties.	
2.	Infor site manager of all actions taken and downtime due to adverse weather.	

10.1.10 Adverse Weather (Overspeed) - Personnel in WTG Or Building (Employee or Member of Public)

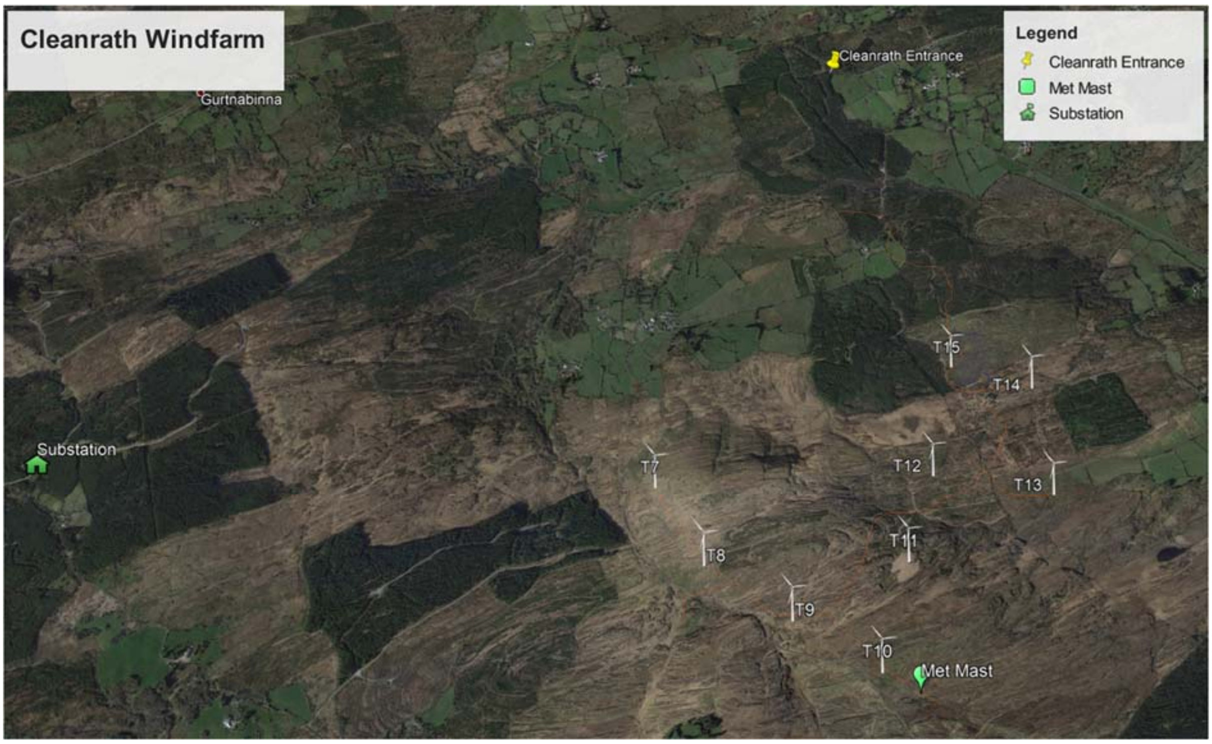
Emergency Procedures - Steps to Take		
Step	Actions to complete	Tick box
1.	Instruct caller to: 1. Cease all operations and evacuate the site by the route furthest from the affected turbine if safe to do so 2. Instruct all personnel to proceed to the furthest assembly point from the overspeed at CLEANRATH windfarm 3. Inform neighboring windfarm. 4. Secure the site and post sentries at all likely points of access	
2.	Instruct OEM to remove all turbines from service via Scada	
3.	Contact site manager and inform them of the situation	

Immediate Reporting Checklist		
Contact	Telephone number	Tick box
Fire and rescue	999 or 112	
Site manager	00353 86 4109155	
Nordex Lead Technician	00353 86 7719707	
Nordex Area Manager	00353 87 2893344	

Actions to Complete When No Staff on Site
In the instance of a turbine over-speed and there is no one present on site, a member of the public is most likely to be the one to raise the alarm and directly call fire and rescue services or else they will contact the control room number which is present on site. Under these circumstances the operational controller is to assume the role of the incident controller until the site manager can attend the site and take control

Follow up action- Steps to take		
Steps	Follow up action	Tick box
1.	Contact site manager and check if situation is under control	
2.	Complete incident report form.	

10.2 Site Entrance Coordinates



Turbine and Entrance Co-Ordinates.

Cleanrath	Irish Grid		GPS (Degree Decimal)		GPS (Degree Min Sec)					
					Latitude (N)			Longitude (W)		
	Easting	Northing	Latitude	Longitude	Deg	Min	Sec	Deg	Min	Sec
Entrance 2	120600	71674	51.89192	-9.15419	51	53	30.9	9	9	15.1
T7	119446	69620	51.8733	-9.17047	51	52	23.9	9	10	13.7
T8	119610	69251	51.87	-9.168	51	52	12	9	10	4.8
T9	119952	68981	51.86763	-9.16297	51	52	3.5	9	9	46.7
T10	120288	68725	51.86537	-9.15804	51	51	55.3	9	9	28.9
T11	120493	69178	51.86947	-9.15517	51	52	10.1	9	9	18.6
T12	120682	69553	51.87287	-9.15251	51	52	22.3	9	9	9
T13	121200	69411	51.87167	-9.14496	51	52	18	9	8	41.8
T14	121213	69913	51.87618	-9.14488	51	52	34.3	9	8	41.6
T15	120871	70057	51.87743	-9.14988	51	52	38.7	9	8	59.6
Substatio	116745	69916	51.87556	-9.20975	51	52	32	9	12	35.1
Mast	120416	68562	51.86393	-9.15614	51	51	50.1	9	9	22.1

10.3 Directions to Cork University Hospital

Site Entrance Turbines 7 - 15

Access information

Directions from Cork University Hospital to Cleanrath Substation.

Directions from Macroom to Cleanrath

- After going straight through Macroom from the Cork city side continue following the road west for 6.00km until you reach Moon's bar.
- Take the left at Moon's bar.
- Continue on this road of 12.00km and the windfarm entrance will be on your left-hand side.
- The site entrance will be 1.00km before the house with the Eircode **P12 N704**.
- The substation is located past the entrance for turbine 6.

11. Notification of Accidents/Dangerous Occurrences

All Contractors shall inform the Project Supervisor for the Construction Stage of any accidents/dangerous occurrences immediately and without unreasonable delay in accordance with the SHWW (General Application) Regulations 2007.

The PSDP / PSCS shall investigate all accidents, incidents and near misses which occur on the site including all accidents involving contractor personnel. The PSDP / PSCS Manager shall be responsible for ensuring that any action items which are raised are closed out as soon as possible. The PSDP / PSCS manager shall ensure that full and comprehensive records of all accident, incident and near miss report and investigations are maintained on file.

12. Welfare Arrangements

The site compound being provided is in the Cleanrath Substation. Provided in the compound is a toilet, an office with broadband and a stores facility for spare parts for the turbines.

13. Information and Training

13.1 Site Induction

A site-specific online induction has been developed by the PSDP / PSCS Manager and this is to be completed by all operatives before proceeding onto the windfarm site. During this induction operatives, will be able to upload a copy of their training certificates for review.

Once the induction has been successfully completed, operatives will be able to download a copy of:

- Cleanrath Site Layout
- Cleanrath Emergency Procedures
- Catastrophic Event Flowchart

13.2 Toolbox Talks

Toolbox talks will take place when deemed necessary by risk assessment or method statement. Where required they shall involve the PSDP / PSCS Manager, Contractor Supervisor and the work force that are involved in the work activity. In addition to giving the employees information on a specific topic, the supervisor will encourage feedback and questions from the operatives.

Records of toolbox talks will be made and be passed to the PSDP / PSCS manager. The records will include the Supervisor's name, topic discussed, attendee's names and signatures and the questions raised, complete with the answers given and any remaining concerns of the employees and supervisors.

13.3 Statutory training

In order to comply with the provisions made under regulations 4, 19, 25 and 29 of the SHWW (Construction) Regulations 2013, The PSDP / PSCS requires that all employees working on this project are in possession of a valid FAS Safe Pass card prior to commencing works on-site.

WFSO Operation's further requires that all plant operators be in possession of a valid registration card (Construction Skills Certification Scheme, or accredited equivalent). The particulars of this card shall be in compliance with schedule 4 of the SHWW (Construction) Regulations 2013. It is the contractor's responsibility to ensure that valid training records for all employees are provided to the PSDP / PSCS Manager prior to an employee commencing work on-site.

14. Consultation with People on Site

Employees will be consulted through the site induction's and site safety meetings. Given the small number of employees likely to be on site at any one time it is not considered likely that a safety representative will be nominated. However, employees are encouraged to make the PSDP / PSCS Manager aware of any issues which concern health and safety on site. Should the number of employees on-site exceed 20 people the PSDP / PSCS Manager shall facilitate the election and appointment of a site safety representative in accordance with the relevant legislation.

15. Site Rules

Site Rules are detailed in Appendix 2. A copy of these site rules shall be made available to all employees at induction. Site rules may also be posted in the project area.

16. Safety File

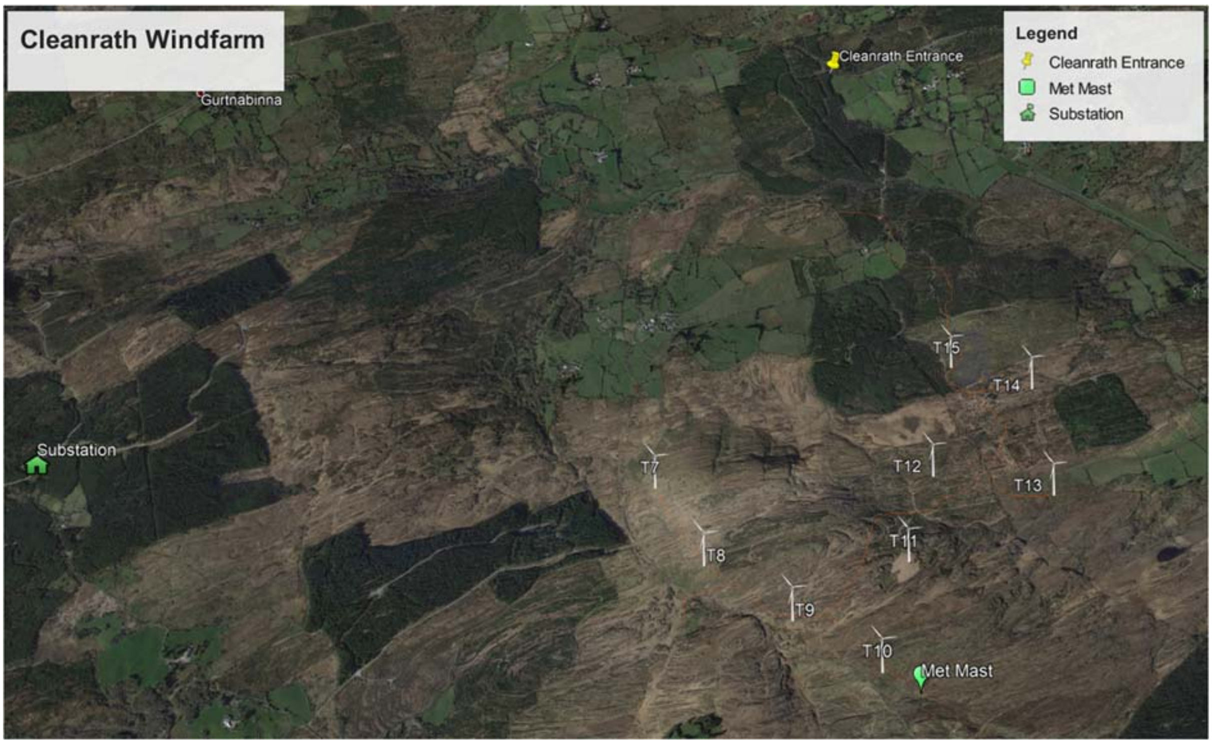
It is not envisaged that any additions to the safety file will be required as all replacements will be on a like for like basis, however any changes will be recorded. Contractors are required to provide details to the PSDP / PSCS Manager for inclusion in the Safety file. In particular, any modification to services must be redlined on to the master site drawings / documents and included in the Safety file. This should be done immediately after the modification is made. Operation and maintenance manuals for equipment are required for any new equipment installed on the Windfarm. Specifications and data sheets for materials are required.

17. Arrangements for Monitoring (Inspections/Audits)

The PSDP / PSCS will monitor the Contractor's health and safety activities. This monitoring will involve inspections appropriate to the scale and complexity of the works. The inspection will be led by the PSDP / PSCS manager or his representative and involve representatives from the contractor's supervisory staff.

The results of inspections and audits will be published and reviewed by the PSDP / PSCS manager and the contractor supervisors. The PSDP / PSCS Manager will ensure that corrective actions are subsequently completed

Appendix 1: Site Location Drawing



Appendix 2: Construction and Maintenance Projects Site Rules

(A) Personnel Identification & Safety Induction

All personnel must attend site induction, signing on completion that they understand the site rules.

(B) Personal Protective Equipment

It is a mandatory requirement for all construction and maintenance personnel and their visitors including vendors and truck drivers to wear the following protective equipment at all times on site.
Safety Boots
Hi-Visibility Vests
Hard Hats
Gloves
For certain specific tasks personnel, will also be required to additional PPE such as eye/hearing protection, personal fall arrest equipment and respiratory protection.

(C) Smoking

SMOKING is not permitted in enclosed areas at Cleanrath Wind Farm. Smoking is only allowable in external areas but is not allowed whilst working. In addition, all cigarettes and matches must be properly quenched to eliminate potential bush fires.

(D) Clean-up

A daily clean-up of all areas is required to prevent the accumulation of combustible materials such as paper, wood, etc.

(E) Compressed Gas

Secure all compressed gas cylinders in an upright position so they cannot be knocked over. Do not drop from a height. Close the main cylinder valve when left unattended for extended period of time. Compressed gas cylinders should be stored in a safe manner when not in use. Flammable gas cylinders should be fitted with flash back arrestors when in use.

(F) Motor Vehicles

Only authorized vehicles are allowed onsite. Authorization must be sought from the PSDP / PSCS. Speed limits within the site access roads are restricted to 15 kmph.

(G) Alcoholic beverages and Drugs

The consumption of alcohol or drugs is strictly prohibited. Any person found under the influence of either substance will be escorted from the project.

(H) Eating

The eating of food of any kind on site is prohibited other than in contractor’s own vehicles. And in the compounds provided

(I) Tools and Equipment

Contractors are responsible for providing all of their own tools and equipment. They are also responsible for ensuring that this equipment is kept in a safe and usable manner. Contractors will also be responsible for ensuring that tools are stored in safe location when not in use.

(J) Transport of Fuels / Solvents

The transport of any liquid type solvent onto site for construction and maintenance purposes must be in an appropriate type, fully labeled container. An appropriate type container does not mean soft drink bottles or such like. Specific permission must be obtained from the PSDP / PSCS prior to bringing in and storing any flammable liquid.

(K) Contractors Safety Management

Contractors shall have a safety statement that is in compliance with statutory and company policy and shall implement effective safety programs accordingly. Contractors shall manage the activities of their own employees. Contractors must also co-operate with each other and the PSDP / PSCS, any areas of contention should be immediately brought to the attention of the PSDP / PSCS for resolution.

(L) Contractor Responsibilities

Each new Contractor employee arriving at the work site shall be clearly instructed on the contents of the contractor's safety statement and their role in emergencies. Before being allowed to commence work, contractor's employees shall be made fully aware of the potential hazards of their particular working environment. Hazardous areas must be explained and identified to the employees.

Contractor's employees shall be made fully aware of the safety regulations applicable to the work site including the smoking regulations, traffic/parking restrictions etc., and properly instructed regarding the danger of handling hazardous materials with which they may be involved.

Contractors shall ensure that employees are provided with appropriate personal protective equipment (at no cost to the employees). The equipment shall be used in accordance with job requirements and replaced as necessary.

All Contractors equipment and tools shall be kept in a good and safe condition and be inspected at regular intervals as determined by the company. They should be replaced when, damaged or broken and never used on work for which they were not designed. Contractors will be required to conduct risk assessments and submit detailed written method statements for part, or all of their scope of operations as required by the PSDP / PSCS.

(M) PSDP / PSCS Roles & Responsibilities

The PSDP / PSCS will monitor and enforce these rules and regulations. If necessary, PSDP / PSCS Supervision may stop or suspend all or part of a Contractors operation when safety hazards or poor work practices exist. Such suspension may remain in effect until all discrepancies are corrected.

(N) Contractors Supervision

Contractor's Supervision will be held responsible for:

- Maintaining safe working conditions with their work crews.
- Correcting unsafe practices of his workmen and instructing same in proper methods.
- Enforcement of the wearing of personal protective equipment as deemed necessary for the job being performed.
- Attending safety meetings as required.
- Setting a good example for all personnel.
- Reporting all injuries and incidents involving bodily harm, property damage and near misses regardless of the craft involved.
- Assisting in accident investigations when required.
- Instructing new employees on job specific safe work practice, procedures and ensuring they are familiar with safety features of tools and equipment used.
- Continually inspecting work locations as work is in progress. Noting and take corrective action on any discrepancies.

(O) Employees Responsibilities

Every employee is responsible for their own safety and the safety of other personnel on the project. Every employee is responsible for ensuring work is carried out in a safe manner. It is therefore necessary for each employee to know and adhere to all applicable regulations which apply to them and to identify and report hazards. It is also important that accidents, incidents and near misses are reported to avoid reoccurrence. The responsibilities of the employees shall include but not be limited to the following:

- Carry out their duties in a safe manner with due regard to safety.
- Work in compliance with statutory regulations and the instructions of their supervisors and comply with safe working practices and procedures.
- Maintain tools and equipment in good work order and report defects to supervision.
- Obtain necessary work permits and abide by their respective requirements.
- Report all unsafe acts or conditions including near misses without delay to supervision.
- Wear personal protective equipment and clothing correctly as and when required and maintain these in good order.
- Reports any accident, incident or, near miss to their immediate supervisor without delay.

Appendix 3: Tasks Scheduled for Completion under This Plan

No.	Activity	Details
1	Routine maintenance to the wind turbine machinery and systems	There are two types of turbine on site. • N117 3.6MW • N117 2.4MW The N100 & N117 will require different maintenance schedules and these are given in detail in Appendix 6 Nordex will carry out this work under the wind turbine safety rules version 3
2	Closure of original snag items	There are a number of outstanding snags on numerous Turbines and are to be repaired by Nordex to meet their specifications.
3	High Voltage switching equipment maintenance.	The High Voltage electrical switching equipment will undergo routine maintenance during the year by a company called H&MV and it is expected that this work will be completed during the summer and the work will last one week.
4	Site Infrastructure upkeep	• All roads will be maintained to a high standard on site. This will involve spraying and general maintenance work and will be carried out when required by an appointed contractor. • Site welfare unit's sewage system to be emptied and maintained by an appointed contractor. This work will commence when required by the appointed contractor. • Site drainage will be constantly monitored to ensure no blockages occur in any silt traps work carried out weekly by site operation manager
5	Health and Safety Audit	Two Health and safety Audits will be carried out by WFSO. Christopher Murnane the PSDP / PSCS Manager will conduct monthly Audits on site.

Appendix 4: Items of Particular Risk Thought Likely to Arise During Planned Activities

Work which puts persons at work at risk of -

(a) Falling from a height, where the risk is particularly aggravated by the nature of the work, process or environment.
Identified Work Activities:

- Work on the fairing of the nacelle.
- Routine maintenance activities requiring access to the roof of the nacelle.
- Mitigation measures taken / required:
- Detailed method statements are required for working at height during turbine maintenance or snagging activities.
- Competence and Experience of Crane Company engaged by contractor to be addressed prior to any crane operations.

(b) Burial under earth falls where the risk associated with working in an excavation is aggravated by the nature of the work, process or environment.

Identified Work Activities:
It is not envisaged that this risk will occur.

Mitigation measures taken / required:
None required

(c) Engulfment in swampland where the risk is aggravated by the nature of the work, process or environment

Identified Work Activities:
It is not envisaged that this risk will occur.

Mitigation measures taken / required:
None required b

Work which puts persons at work at risk from chemical or biological substances constituting a particular danger to the safety and health of such persons or involving a statutory requirement for health monitoring.

Identified Work Activities:
- Works involving cleaning, degreasing of component parts of turbines.
- Maintenance activities involving oils or lubricants

Mitigation measures taken / required:
- Safe systems of work identifying and risk assessing the chemicals to be used during these works to be developed by the contractor during these works.
- Appropriate means of disposing of chemically contaminated waste material to be identified by the contractor prior to commencement of works.

Work with ionising radiation requiring the designation of controlled or supervised areas as defined in Directive 96/29/Euratom.

Identified Work Activities:
It is not envisaged that this risk will occur.
Mitigation measures taken / required:
None required

Work near high voltage power lines.

Identified Work Activities:
At Site:

- Underground cables on site supplying power from the turbines to the substation
- Overhead cables present on access routes to the site.

Mitigation measures taken / required:

- All contractors must verify the extent and location of all existing services and take all appropriate precautions in respect of these services before carrying out any work. The approach of contractors to the carrying out of any excavations must be in accordance with the HSA "Code of Practice for Avoiding Danger from Underground Services" and must be detailed in a method statement. Work in the vicinity of ESB cables must be coordinated with ESB in advance and the appropriate permissions sought and precautions taken.
- For works or any ancillary works in the vicinity of HV lines the contractor must take all measures to deal with the risks and ensure that the ESB Guidance on working near Overhead Lines is fully complied with.
- When bringing high loads or machinery to site a road survey must be completed to ensure that adequate clearance is in place to ensure safe access to the site for all machinery.

Work exposing persons at work to the risk of drowning

Identified Work Activities:

- Water samples to be taken from specific rivers on site

Mitigation measures taken / required:

- Employee must notify PSDP / PSCS manager of when the work is starting and when job is complete.
- PSDP / PSCS manager to have detailed maps of sample locations.
- Proper standing banks to be allocated where employee is competent to withdraw water from the river

Work on wells, underground earthworks and tunnels.

Identified Work Activities:
None envisaged.

Mitigation measures taken / required:
None required

Work carried out by divers at work having a system of air supply.

Identified Work Activities:
None envisaged

Mitigation measures taken / required:
None required

Work carried out in a caisson with a compressed-air atmosphere.

Identified Work Activities:
None Envisaged

Mitigation measures taken / required:
None required

Work involving the use of explosives.

Identified Work Activities:
None Envisaged.

Mitigation measures taken / required:
None required

Work involving the assembly or dismantling of heavy prefabricated components.

Identified Work Activities:
It is not envisaged that this risk will occur.
Mitigation measures taken / required:
None required

Appendix 5: Information for Inclusion in the Safety File

1. **General Health and Safety**
    - 1.1. Operational and Maintenance H&S Plan and Emergency Procedure Documents
        - 1.1.1. H&S plan
        - 1.1.2. Catastrophic Event Flowchart
        - 1.1.3. Emergency Plan
        - 1.1.4. Emergency Response Plan
        - 1.1.5. Layout
        - 1.1.6. Site Access Procedure
        - 1.1.7. Word documents
    - 1.2. Site Inductions
    - 1.3. AF1 & AF2 Documents
    - 1.4. Site Documents
        - 1.4.1. AWP's
        - 1.4.2. As Builds
        - 1.4.3. Site Layout
        - 1.4.4. Accident Incident Register
        - 1.4.5. Turbine Conformity Certs
    - 1.5. Statutory Inspections
    - 1.6. Health and Safety Audits
    - 1.7. Windfarm Company Documents
        - 1.7.1. Safety Statement
        - 1.7.2. WFSO RAMS

Call Operational Controller for Most Recent Documents (021 7355 898)

Appendix 6 Site Plan for Scheduled Maintenance 2020

Month		2021	January				February				March				April				May				June				
Week			2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
Type 1 Maintenance														Type 1													
Type 2 Maintenance																											
Type 3 Maintenance																											
Type 4 Maintenance (optional)																											
HV Maintenance																											
Stat Inspections																											
EOW inspections																											

Month		2020	July				August				September					October				November				December				
Week			27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52
Type 1 Maintenance																												
Type 2 Maintenance																												
Type 3 Maintenance																												
Type 4 Maintenance (optional)																												
HV Maintenance																												
Stat Inspections																												
EOW inspections																												

Appendix 7 Tasks planned for Completion Cleanrath Substation

No.	Activity	Details
1	High voltage Switching	• All switching will be conducted to contractor's HMV Telemess procedures. Lock out systems will be in operation this is included in Appendix 8 • PSDP / PSCS will be notified on any switching taking place on site.
2	SCADA	• Data files to be backed up weekly on a Monday. • Faults on system will require specialist attention any such work will be reviewed by the PSDP / PSCS.
3	Fire Alarm	• Routine inspections and service will take place on all detectors and panel once every three months first service due is in March. Any faults and extra works required will be inspected before completion by PSDP / PSCS.
4	Security Alarm	• One-year service on system. It is planned that this work will be carried out in September. • Any further works to be accessed by PSDP / PSCS and passed before work completion

5	Transformers	• Oil samples to be taken on all transformers this work will commence in the summer • Routine service to also be carried out once a year and the summer months is scheduled for this also.
6	HV Circuit Breaker	• All CB's will need to be greased and serviced on a yearly basis. This work will coincide with transformers inspections in the summer months.
7	Forestry	• Coillte will have full access to all roads through the site they shall inform the PSDP / PSCS on entering and leaving the site.

Appendix 8 Telemess Procedures at Substation

GENERATOR INTERFACES (WINDFARMS) – User's Guide

Each DG (Dispersed Generation) must nominate their Operators, whether their own staff or an Electrical Contractor's staff. In the case of dealing with Wind Generation these must be approved Windfarm Operators. These names must be advised in writing to the controller of the ESB's System. The nominated Operators must be contactable within one hour and be at the DG site within two hours

Note: Approved Windfarm Operator = DeCorkd as competent to act as an Operator by the Windfarm owner/Management and have successfully completed Telemess Assessment.

ESB's Operations staff must never operate customer's equipment – except in a life-threatening situation.

The Telemess procedure requires six Telemess to disconnect the Windfarm and another six to reconnect the Windfarm from the system.

The Windfarm Operations staff must be familiar with their own electrical installation, and in particular they must know how to operate their own equipment, use of voltage detectors, and how and when to apply earths to their own equipment.

The ESB Operator in Charge should be familiar with the type of switchgear used by a Dispersed Generator – including the switching and earthing mechanisms – and be satisfied re same.

ESB and the Dispersed Generation staff will familiarize themselves with the installation by carrying out a site visit and checking that the installation is as shown on the SLD.

ESB Operator in Charge must be the first to apply Main Earths.

ESB Operator in Charge must be the first to connect to the system.

To Disconnect a Windfarm the Telemess procedure is as follows:

Telemess

1. The Windfarm Operator gives a Request for Disconnection to the ESB Operator in Charge.

2. The ESB Operator in Charge then receives permission from the Controller of the System to proceed with the switching. The ESB Operator in Charge then gives a Request for Disconnection to the Windfarm Operator.
This must include the statement "Do Not Apply Main Earths".

The Windfarm Operator disconnects at 20kV & at 38kV.
The Windfarm Operator applies a HOLD OFF notice at the 20kV side,
(ESB Operator in Charge may have to remove a DANGER LOCK to allow this.)

3. The Windfarm Operator gives a Proof of Disconnection to the ESB Operator in charge. The ESB Operator OPENS the ESB incomer to the Windfarm & applies a HOLD OFF to the DL.ESB Operator in Charge checks for loss of Voltage then applies Main Earths with Main Earth Notice.

4. The ESB Operator in Charge then gives a Request for Application of Main Earths (RAME) to the Windfarm Operator. The Windfarm Operator checks for Loss of Voltage, Applies Main Earth & affixes a Main Earth Notice. (ESB Operator in Charge may have to remove a DANGER LOCK to allow this. If so the DANGER LOCK should be re-applied after Main Earths are applied)

5. The Windfarm Operator then gives a Proof of Application of Main Earths to the ESB Operator in Charge.

6. The ESB Operator in Charge then gives an overall Proof of Disconnection to the Windfarm Operator. Windfarm Operator will now fit a Not to Be Operated notice on all LV supplies.

THIS TELEMESS PROCEEDURE CANNOT AND MUST NOT BE SHORTENED IN ANY WAY

To Reconnect a Windfarm the Telemess procedure is as follows:

The Windfarm Operator removes all Local Earths ONLY and all Not to Be Operated notices.

Telemess

1 The Windfarm Operator gives a Request for Connection (which includes a Proof of Readiness in the body of the text) to the ESB Operator in Charge. A Declaration of Fitness may be required by the Controller of the ESB System prior to permission being given to allow re-connection of plant.

2 The ESB Operator in Charge then receives permission from the Controller of the System to proceed with the switching. The ESB Operator in Charge then gives a Request for Removal of Main Earth to the Windfarm Operator (which includes the statement Do Not
Remove any Hold Off notice & Do Not Connect)

The Windfarm Operator removes the Main Earth notice & OPENS the Main Earth switch. (ESB Operator in Charge may have to remove a DANGER LOCK for this. If so the lock should be refitted once the Main Earth is removed)

4 The Windfarm Operator then gives a Proof of Removal of Main Earth to the ESB Operator in Charge.

The ESB Operator in Charge removes the Main Earth Notice & Main Earth from the ESB side of the 110kV Cubicle, then Removes the HOLD OFF notice from the DL.
Following a verbal request from the Windfarm Operator the ESB Operator in Charge then Closes the DL.

4 The ESB Operator in Charge then gives a Request for Connection to the Windfarm Operator to allow removal of HOLD OFF notice (which includes the statement DO NOT CLOSE the CB at this stage.

The Windfarm Operator removes the HOLD OFF from the 20kV side and racks back in the CB, but Does Not Close the CB.

5: The Windfarm Operator then gives a Proof of Connection to the ESB Operator in Charge.

6: The ESB Operator in Charge then gives an overall Proof of Connection to the Windfarm Operator.

The Windfarm Operator may now under normal operating procedure with ESB Networks as the 110kV system controller for permission to close their 38kV CB.
THIS TELEMESS PROCEEDURE CANNOT AND MUST NOT BE SHORTENED IN ANY WAY.

APPENDIX B

PEATLAND HABITAT RESTORATION PLAN

Planning and Environmental Consultants

Peatland Restoration and Management Plan

Cleanrath Wind Farm, Co. Cork

DOCUMENT DETAILS

Client: **Cleanrath Windfarm Ltd.**

Project Title: **Cleanrath Wind Farm, Co. Cork**

Project Number: **180511**

Document Title: **Peatland Restoration and Enhancement Plan**

Document File Name: **PREP F – 2020.07.17 – 191223a**

Prepared By: **MKO**
Tuam Road
Galway
Ireland
H91 VW84

Planning and Environmental Consultants

Rev	Status	Date	Author(s)	Approved By
01	Final	17/07/2020	DMN	PR

Table of Contents

1. INTRODUCTION

1.1 Background

The EIAR that was prepared for this application prescribed the provision of a Habitat Restoration and Enhancement Plan to offset the loss of peatland habitats that are within the footprint of the subject development. The development footprint is located on 4.13 hectares of peatland habitat. This is less than Cleanrath wind farm development was originally predicted in the original application as two turbines have not been constructed. The peatland habitats on which the windfarm is located consists primarily of a mosaic of Wet Heath, Blanket Bog and Acid Flush with outcropping of Exposed siliceous rock (ER1). The areas of deep peat within the study area have been avoided in the design of the development and all areas that are within the construction footprint have been degraded through extensive grazing of sheep, cattle and/or horses, drainage, peat cutting, forestry or scrub encroachment.

This Peatland Restoration and Management Plan (PRMP) provides details of where measures will be employed to improve the ecological quality of the peatland habitats that are located outside the construction footprint but within the control of the windfarm developer.

The development has resulted in the loss of peatland habitat, associated with Turbines T3, T6, T7, part of T8, T9 & T10. Therefore, this Peatland Restoration and Management Plan (PRMP) provides for the restoration of forestry land, that has been planted on peatland mosaic habitats, back to this peatland habitat.

The extent of lands subject to peatland restoration are shown in Figure 1.1. This includes areas of forestry felling located around Turbines T1, 3, 5 and 8 as well as an additional area of 1.06 hectares of forestry located to the south of T8. Following the implementation of the measures outlined in this report, to offset the loss of peatland habitat, there will be no net loss of peatland habitats on the site.

The bog restoration programme described in this report will be implemented in accordance with the published guidelines and best practice such as the guidelines arising from the EU–LIFE/Coillte '*Irish Blanket Bog Restoration Project*' (2002-2007)', Scottish Natural Heritage (SNH)'s guidance note Planning for development: *What to consider and include in Habitat Management Plans* (Version 2, January 2014).

2. PEATLAND RESTORATION AND ENHANCEMENT

2.1 Forestry Felling and Peatland Restoration Around Turbines

As shown in Figure 1.1, it is proposed to reinstate areas of coniferous plantation forestry around turbines T1, 3, 5 and 8. These areas have been felled as part of the construction phase of the wind farm, however, some areas will require further maintenance to complete to the required reinstatement to peatland. As shown in Plate 2.3, areas where plantation forestry have been removed, still comprise of peatland vegetation beneath the conifers. In order to facilitate the reestablishment of peatland vegetation within these areas and maintain an effective hydrological regime, the following measures are proposed in these areas:

- Removal of brash from felled areas off-site.
- Drain blocking will be undertaken on a local scale in the immediate surroundings of felled plantation by installing dams at drainage ditches (largely remnant semi-functioning conifer forest drains) to maintain, enhance and restore the favorable baseline hydrological and ecological conditions at each site location. Drains can be dammed using peat dams.
- No additional drainage to be installed in proximity to these habitat areas during the lifetime of the development.
- The use of off road vehicles on the site will be restricted to the existing tracks.
- No application of chemical and organic fertilisers or herbicides and pesticides will be undertaken within the development footprint.
- Self-seeded conifers from adjacent conifer plantation areas will be cleared and removed (by hand or brushcutter) from the newly created peatland reinstatement areas on an ongoing basis during the operational phase.

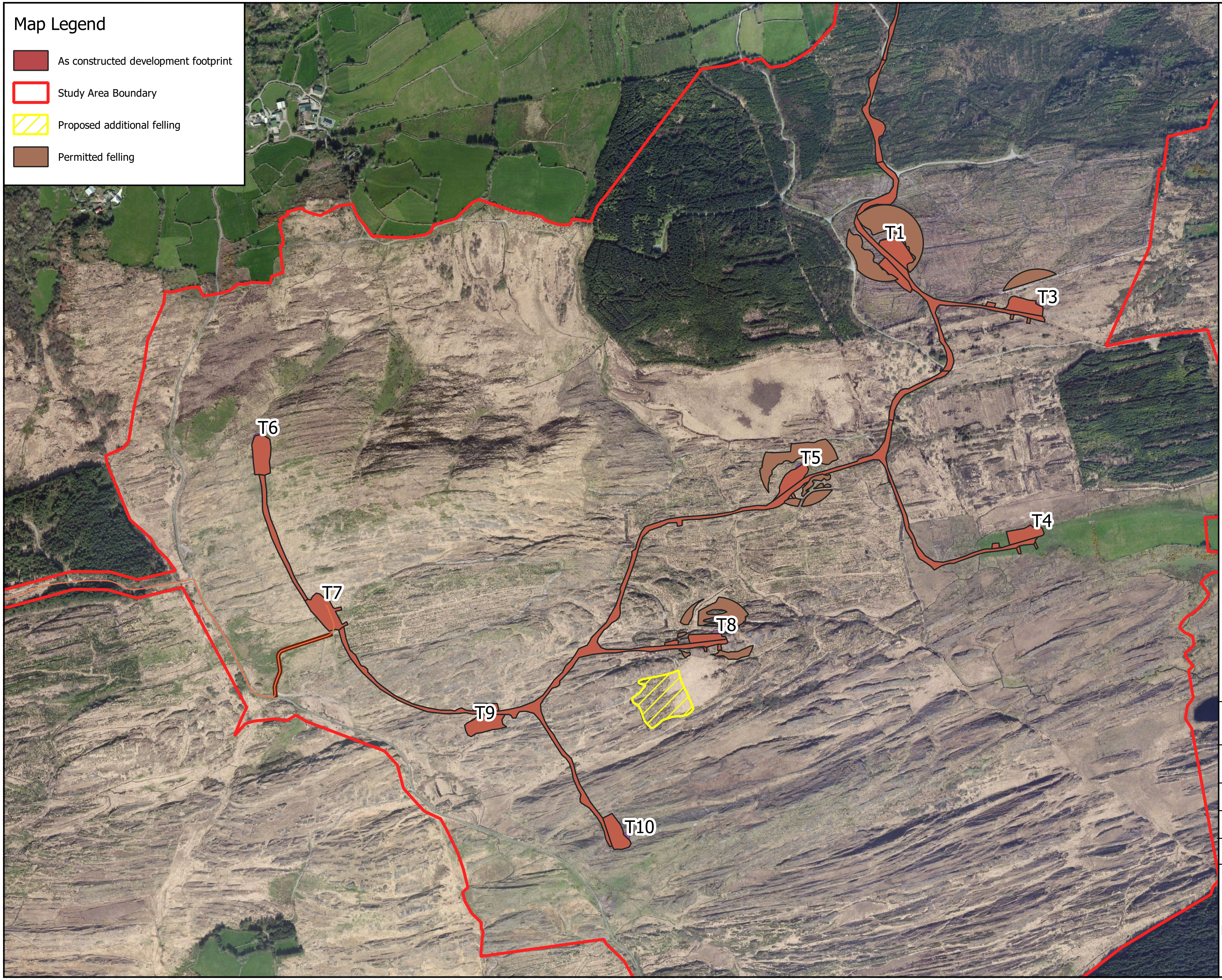
Plate 2.1 Example of forestry felling already undertaken to the north of T8 with typical peatland vegetation remaining beneath the conifers.

2.2 Additional Forestry Felling for Peatland Restoration

In order to achieve the required peatland restoration area, additional lands, comprising of immature forestry, located outside of the immediate development footprint will be acquired and restored to peatland habitat. The area identified as most appropriate for peatland restoration is located to the south of Turbine no. 8, see Figure 1.1. An example of the forestry occurring at this location is provided in Plate 2.2. The lands were chosen as the forestry is immature, the vegetation occurring beneath the conifers comprises of typical peatland species (see Plate 2.3) and could therefore successfully be reinstated to peatland if the conifer crop was sympathetically removed.

Plate 2.2 Location chosen for tree removal and restoration to bog, located to the south of T8.

Plate 2.3 Example of intact peatland vegetation occurring within existing forestry plantation



Ordnance Survey Ireland Licence No. AR 0021820© Ordnance Survey Ireland/Government of Ireland

N

Drawing Title
Proposed peatland restoration area

Project Title
Cleanrath WindFarm

Drawn By	DMN
DMN	PR
Project No.	Drawing No.
191223a	Figure 1.1
Scale	Date
1:11061	1.07.2020

MKO
Planning and Environmental Consultants
Tuam Road, Galway
Ireland, H91 VW84
+353 (0) 91 735611
email:info@mkoireland.ie
Website: www.mkoireland.ie

The management techniques to be undertaken within the replacement area located south of Turbine no. 8 are as follows:

- All coniferous forestry will be felled.
- Following tree felling operations, brash material will be removed off-site and disposed of appropriately to a suitable location.
- Drains will be blocked, where appropriate, using peat dams or plastic dams, see Plate 2.4 & 2.5.
- No additional drainage to be installed in proximity to this habitat during the lifetime of the subject development.
- The planting of forestry will not be permitted in this area.
- No vehicular access will be permitted to or within the dedicated peatland reinstatement area once all initial works are completed.
- Self-seeded conifers from adjacent conifer plantation areas will be cleared and removed (by hand or brushcutter) from the newly created peatland reinstatement areas on an ongoing basis, following the felling of the existing forestry.
- Peat extraction within the proposed peatland reinstatement area will not be permitted.
- Burning and dumping will not be permitted.
- No application of chemical and organic fertilisers or herbicides and pesticides will be undertaken within the development footprint.

Plate 2.4 Example of peat dams to be used for on-site drain blocking.

Plate 2.5 Example of plastic dams to be used for on-site drain blocking.

2.3 Management of peatlands adjacent to windfarm infrastructure

In addition to the reinstatement measures proposed above, this plan also sets out measures that will enhance the existing peatlands that surround the wind farm development. These are listed below:

- Burning and dumping will not be permitted.
- Application of artificial fertilisers within rehabilitation or enhancement areas will be prohibited.
- The planting of forestry will not be permitted. There is currently forestry activity in the vicinity of the development and conifer seedlings are encroaching on the site on an annual basis during the lifetime of the windfarm development.
- Seedlings of coniferous or other trees or any invasive plants will be removed from this area on an annual basis during the lifetime of the windfarm development.
- Scrub species including Gorse (*Ulex europaeus*) and Bramble (*Rubus fruticosus* agg.) will be removed on an annual basis during the lifetime of the windfarm development.
- No vehicular access will be permitted to or within the dedicated habitat rehabilitation area once all initial works are completed.
- The rehabilitation area will be monitored to assess the success of the rehabilitation plan.
- Where possible, drains will be blocked to restore the natural hydrology of the blanket bog in the area.

2.4 Timing of Works

Replacement works will be conducted in line with the provisions of the Wildlife Acts 1979-2012 as amended.

2.5 Monitoring

To confirm that habitat restoration and enhancement has been successful, all areas of restored vegetation will be monitored post-restoration, monitoring results reported and any criteria failures identified and corrective actions implemented as part of the Cleanrath Operational Environmental Management Plan (OEMP) for the development.

Visual inspections of restored areas within the application site will be carried out biannually during the first two years after restoration to check for potential soil erosion or movement and degradation of replaced turves. Vegetation monitoring will be carried out in years 1, 3, 5 and 10 after restoration. Monitoring will involve the following:

Surface peat assessment

An assessment of the physical state of the surface peat with regard to:

- Percentage bare peat not covered by vegetation;
- Moisture status (qualitative);
- Intactness (e.g. presence of visible cracking in surface peat; and
- General stability (e.g. presence of peat erosion).

Vegetation sampling

- A number of fixed relevé sites (i.e. permanent quadrats) will be set up in areas where active management is proposed of previously forested areas. Baseline data will be recorded prior to the commencement of habitat management activities set out in this outline plan. The character of each relevé will be recorded (e.g. species proportions present, vegetation structure and height) and photographs will be taken of each relevé from a fixed point. These relevés will then be re-examined during years 1, 3, 5 and 10 following restoration in order to establish the extent of habitat improvement resulting from management practices.

Hydrological monitoring

- Water levels within areas where drains are blocked will be recorded bi-annually for two years. A number of phreatic stand pipes will be installed (prior to restoration) to allow monitoring of water levels within both the restoration and enhancement areas. In this way, any positive impacts on the local hydrology can be verified and quantified.

The efficacy of the habitat rehabilitation and enhancement measures employed will be reviewed in years 1, 3, 5 and 10 following commencement of the plan on the basis of the results of vegetation sampling and water level readings from the managed areas. Analysis of the data collected will be the basis for a review of the measures and techniques employed.

2.5.1 Monitoring of existing reinstated peatlands adjacent to existing infrastructure

Following the completion of the existing development, the roadside verges, berms and banks of hardstand infrastructure were capped with peat material. This material was initially removed during construction and temporarily stored adjacent to the development footprint for final reinstatement. This reinstatement has therefore further minimised the overall peatland loss associated with the development footprint by reinstating areas of temporarily disturbed ground adjacent to the infrastructure, see Plate 2.6. Many of these areas have begun to revegetate naturally, with purple moor-grass (*Molinia caerulea*) becoming established. In addition, some areas within temporarily disturbed ground were also reseeded with an appropriate upland seed mix to facilitate more rapid vegetation establishment.

The post construction monitoring associated with the peatland restoration measures outlined above will also continue to monitor the continued revegetation of these areas of temporally disturbed ground and where required, additional measures will be implemented to ensure establishment of peatland vegetation and reduce noxious weeds.

Plate 2.6 Example of reinstated site access track verge with stripped peat material showing signs of revegetation with purple moor-grass (Molinia caerulea) and other grass species.

2.6 Reporting

Reports detailing the monitoring works carried out, the results obtained and a review of their success, along with any suggestions for amendments to the plan will be prepared in years 1, 3, 5 and 10 following commencement of the plan's implementation.

3. BIBLIOGRAPHY

EU–LIFE/Coillte '*Irish Blanket Bog Restoration Project*' (2002-2007)', Online, Available at: http://www.irishbogrestorationproject.ie/downloads/4_progress_report.pdf, Accessed: 07.07.2020

Scottish Natural Heritage (SNH), 2014. Guidance note Planning for development: *What to consider and include in Habitat Management Plans* (Version 2, January 2014). Online, Available at: https://www.nature.scot/sites/default/files/2019-01/Guidance%20-%20Planning%20for%20development%20%20-%20What%20to%20consider%20and%20include%20in%20Habitat%20Management%20Plans.pdf, Accessed: 07.07.2020

APPENDIX 9

DECOMMISSIONING PLAN

Planning and Environmental Consultants

Decommissioning Plan

Cleanrath Wind Farm

DOCUMENT DETAILS

Client:	**Cleanrath Windfarm Ltd.**
Project Title:	**Cleanrath Wind Farm**
Project Number:	**191223-a**
Document Title:	**Decommissioning Plan**
Document File Name:	**Decommissioning Plan F – 2020.08.12 – 191223-a**
Prepared By:	**MKO** **Tuam Road** **Galway** **Ireland** **H91 VW84**

MKO Planning and Environmental Consultants

Rev	Status	Date	Author(s)	Approved By
01	Draft	15/07/2020	OC	MW
02	Final	12/08/2020	OC	MW

Table of Contents

TABLE OF TABLES

TABLE OF FIGURES

1. INTRODUCTION

This Decommission Plan has been prepared by MKO on behalf of Cleanrath Windfarm Ltd. for the decommissioning of Cleanrath Wind Farm and relevant infrastructure including the grid connection to the national electricity grid which is hereafter referred to as the Cleanrath wind farm development . This document has been prepared as part of a Remedial Environmental Impact Assessment Report (rEIAR) for a substitute consent application to An Bord Pleanála. Decommissioning of the Cleanrath wind farm development is intended to take place after the planned 25-year lifespan of the Cleanrath wind farm development pending the outcome of the substitute consent process.

Should the Cleanrath wind farm development not be consented, there is the possibility that the decommissioning may need to be implemented early. If that situation were to arise, the content of this document will be agreed with the local authority prior to any decommissioning. Should the Cleanrath wind farm development continue operation for the intended lifespan of approximately 25 years, the Decommissioning Plan will be updated prior to the end of the 25-year operational period in line with decommissioning methodologies that may exist at the time and will be agreed with the competent authority at that time.

This report provides the environmental management framework to be adhered to during the decommissioning phase of the Cleanrath wind farm development and it incorporates the mitigating principles to ensure that the work is carried out in a way that minimises the potential for any environmental impacts to occur.

1.1 Scope of the Decommissioning Plan

This report is presented as a guidance document for the decommissioning of the Cleanrath wind farm development including its connection to the national grid. Where the term 'site' is used in the Decommissioning Plan it refers to all works associated with the Cleanrath wind farm development including enabling works. The Decommissioning Plan clearly outlines the mitigation measures and monitoring proposals that are required to be adhered to in order to complete the works in an appropriate manner.

The report is divided into six sections, as outlined below:

Section 1 provides a brief introduction as to the scope of the report.

Section 2 outlines the Site and Project details, detailing the targets and objectives of this plan along with providing an overview of works methodologies that will be adopted throughout decommissioning.

Section 3 sets out details of the environmental controls to be implemented on site including the mechanisms for implementation. A waste management plan is also included in this section.

Section 4 outlines the Emergency Response Procedure to be adopted in the event of an emergency in terms of site health and safety and environmental protection.

Section 5 sets out a programme for the timing of the works.

Section 6 outlines the proposals for reviewing compliance with the provisions of this report.

2. SITE AND PROJECT DETAILS

2.1 Site Location and Description

The Cleanrath wind farm development is located in the townlands of Cloontycarthy, Cleanrath North, Cleanrath South, Derrineanig, Derreennacarton and adjacent townlands in Co. Cork. The Cleanrath wind farm development comprises a total of 9 No. wind turbines, with a maximum ground to top blade tip height of up to 150 metres and all associated infrastructure.

The electrical connection from the main wind farm site to the national grid will be via an underground cable which will run within the public road corridor through the townlands of Cleanrath South, Derrineanig, Milmorane, Coomlibane, Rathgaskig, Derragh, Augeris, Gorteenakilla, Carrignadoura, Gurteenowen, Gurteenflugh, Lyrenageeha, Lackabaun, Co. Cork and Grousemount, Co. Kerry.

The town of Macroom is located approximately 12 kilometres northeast of the Cleanrath wind farm development and Inchigeelagh is located approximately 2.5 kilometres to the south.

2.2 Description of the Cleanrath Wind Farm Development

The construction phase of the Cleanrath wind farm development comprised civils works which included constructing the reinforced concrete foundations; access road construction and widening of existing access roads and junctions; construction of a temporary compound; upgrading existing an installation of new watercourse crossings and construction of underground cabling.

The design life of the project is expected to be 25 years.

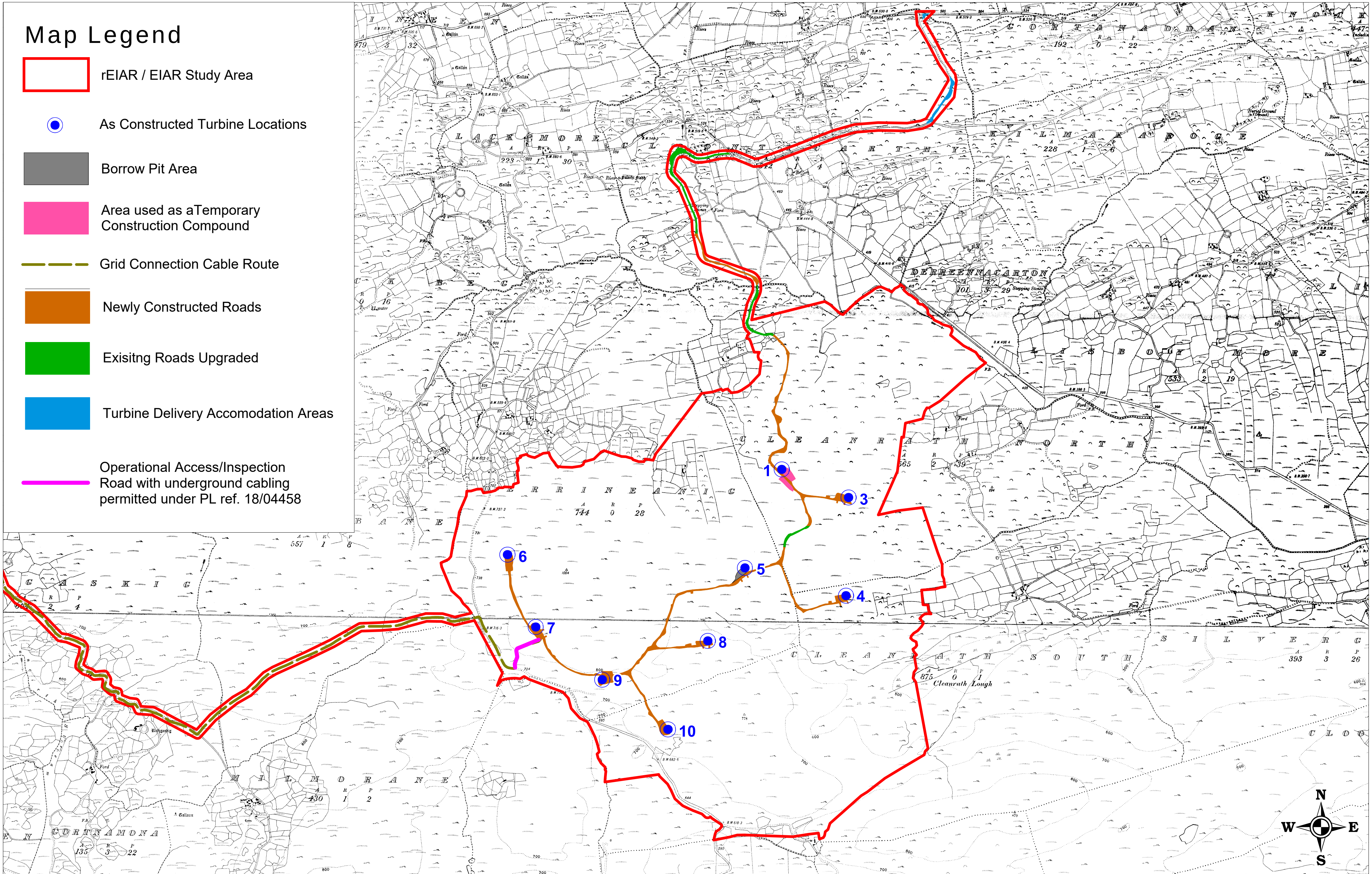
The key components of the Cleanrath wind farm development include the following:

- 9 no. Wind Turbines with a maximum blade tip height of 150 metres;
- 9 no. Hardstand Areas to facilitate cranes for turbine erection and to act as construction material storage compounds;
- 1 no. temporary construction compound for the location of the site office and staging facilities, on-site car-parking for site workers during the construction phase, material storage and construction refuse storage prior to its removal from the site;
- New and upgraded access tracks;
- 1 no. borrow pit;
- Underground cabling, including connection to the national grid
- Accommodation works along the turbine delivery route
- Site drainage
- All associated site development and ancillary works.

The site layout showing individual elements of the Cleanrath wind farm development is shown in Figure 2-1 and 2-2.

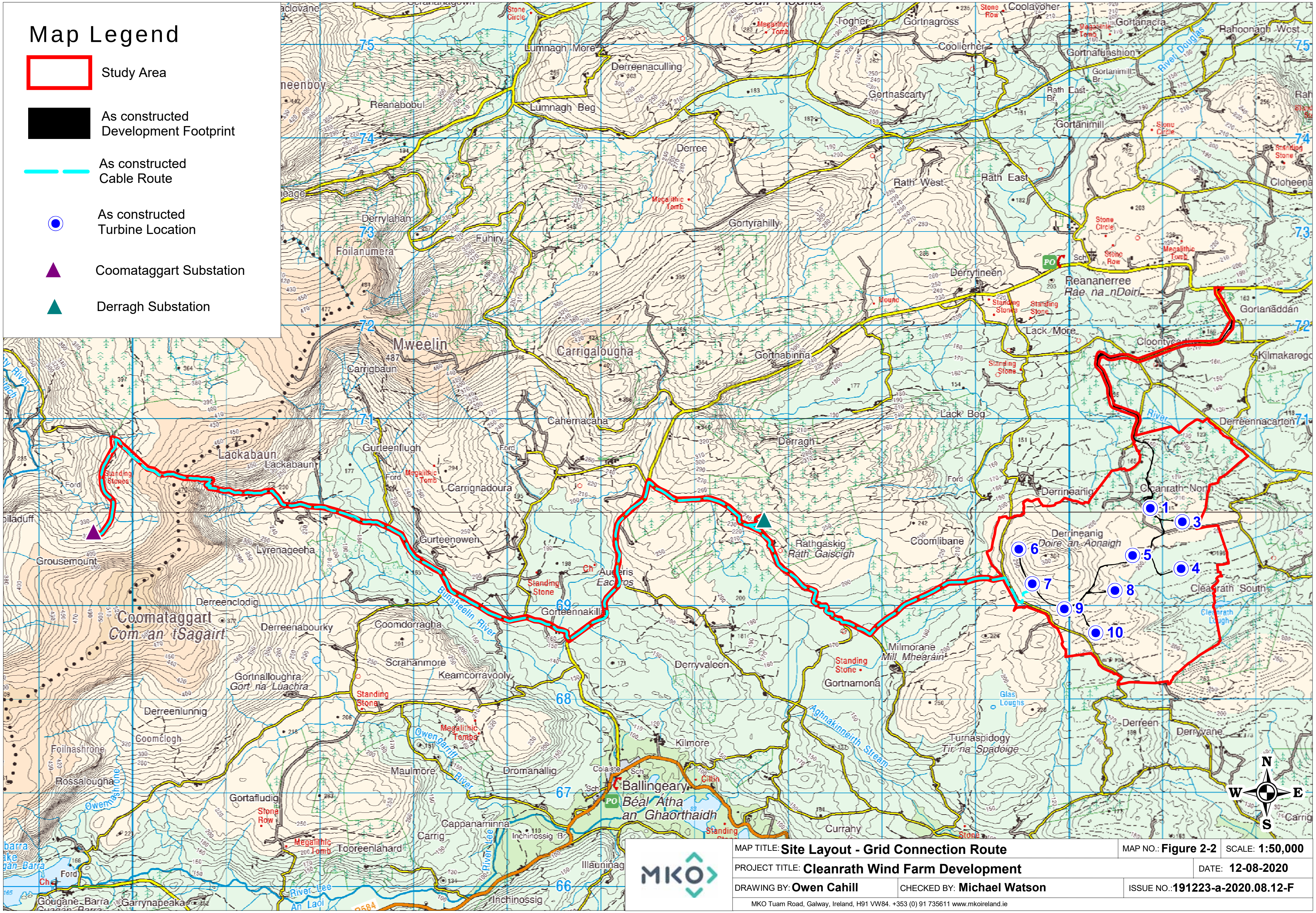
As construction has been completed, elements of the project that were developed as a temporary facilitator have either been removed, restored to its original condition or will have naturally revegetated. These include the temporary construction compound and the borrow pit. All access roads and hardstandings areas form part of a site roadway network which will be required by the ongoing farming and forestry operations, and therefore will be left in situ for future use. It is intended that decommissioning will remove all above ground components from the site, underground cabling and reinstate areas where infrastructure is removed. The following elements are included:

- Wind turbines dismantling and removal off site.
- Underground cabling removal (ducting remaining)
- Turbine foundation backfilling (Underground reinforced concrete remaining in-situ)



MAP TITLE: Site Layout - Wind Farm Site	MAP NO.: Figure 2-1	SCALE: 1:25,000
PROJECT TITLE: Cleanrath Wind Farm Development		DATE: 12-08-2020
DRAWING BY: Owen Cahill	CHECKED BY: Michael Watson	ISSUE NO.: 191223-a - 2020.08.12-F

MKO Tuam Road, Galway, Ireland, H91 VW84. +353 (0) 91 735611 www.mkoireland.ie



Ordnance Survey Ireland Licence No. AR 0021819 © Ordnance Survey Ireland/Government of Ireland

2.3 Targets and Objectives

The decommissioning phase works will be completed to approved standards, which include specified materials, standards, specifications and codes of practice. This decommissioning plan has considered environmental issues and this is enhanced by the works proposals as part of decommissioning.

The key site targets are as follows;

- Ensure decommissioning works and activities are completed in accordance with mitigation and best practice approach presented in the Remedial Environmental Impact Assessment Report (rEIAR), the accompanying Environmental Impact Assessment Report (EIAR) and associated planning documentation;
- Ensure decommissioning works and activities have minimal impact/disturbance to local landowners and the local community;
- Ensure decommissioning works and activities have minimal impact on the natural environment;
- Adopt a sustainable approach to decommissioning; and,
- Provide adequate environmental training and awareness for all project personnel.

The key site objectives are as follows;

- Using recycled materials if possible, e.g. soil and overburden material for backfilling and reinstatement;
- Ensure sustainable sources for materials supply where possible;
- Avoidance of any pollution incident or near miss as a result of working around or close to existing watercourses and having emergency measures in place;
- Avoidance of vandalism;
- Keeping all watercourses free from obstruction and debris;
- Correct implementation of the sustainable drainage system (SuDS) drainage design principles;
- Keep impact of decommissioning works to a minimum on the local environment, watercourses, and wildlife;
- Correct fuel storage and refuelling procedures to be followed;
- Good waste management and house-keeping to be implemented;
- Air and noise pollution prevention to be implemented;
- Monitoring of the works and any adverse effects that it may have on the environment. Decommissioning methods will be altered where it is found there is the potential to have an adverse effect on the environment;

2.4 Decommissioning Methodologies Overview

2.4.1 Introduction

An experienced main contractor will be appointed to undertake the of the decommissioning of the Cleanrath wind farm development . The main contractors will comply with the Construction and Environmental Management Plan (CEMP) prepared for the construction phase and the Operation and Environmental Management Plan (OEMP) implemented during operation and any revisions made to those documents throughout the phases in which they were adopted. An overview of the anticipated decommissioning methodologies is provided below.

2.4.2 Decommissioning Methodology

The proposed anticipated decommissioning methodology is summarised under the following main headings:

- Wind turbines
- Turbine Foundations;
- Underground Cabling;
- Transport Route Accommodation Works.

2.4.2.1 Wind Turbines

Prior to any works being undertaken on wind turbines, they will be disconnected from the grid by the site operator in conjunction with ESB Networks and Eirgrid. The dismantling and removal of wind turbines of this scale is a specialist operation which will be undertaken by the turbine supplier that completed the installation where possible. Turbine dismantling will be undertaken in reverse order to methodology employed during their construction. A number of large-scale cranes will be brought back to site utilising the existing hard stand areas. The dismantling of turbines will be bound by the same safety considerations as was the case during construction in terms of weather conditions where works will not be undertaken during adverse weather conditions and in particular not during high winds.

The turbines will most likely be removed from site in a similar manner to how they were transported to the site originally in extended articulated trucks the details of which are assessed in Chapter 14 of the rEIAR and the EIAR which accompany this application. The destination of the turbines post decommissioning is unclear at this time as a re-use option may be sourced if early decommissioning occurs. Therefore the removal of turbines from site is considered in terms of all turbine components being removed intact and as they transported to site.

The transport of disassembled turbines from the site will be undertaken in accordance with a Transport Management Plan which will be issued to and agreed with the competent authority at that time as part of a permit application for the delivery of abnormal loads using the local roads under the Road Traffic (Special Permits for Particular Vehicles) Regulations 2007. The Transport Management Plan will provide for all necessary safety measures, including a convoy and Garda escort as required, off-peak turning/reversing movements and any necessary safety controls.

2.4.2.2 Turbine Foundations

On the dismantling of turbines, it is not intended to remove the concrete foundation from the ground. It is considered that its removal will be the least preferred options in terms of having potential effects on the environment. Therefore, the nine turbine foundations will be backfilled and covered with soil material. As there is no usable soil or overburden material on the site after construction, this material will be sourced locally and imported to site on heavy good vehicles (HGVs). The imported soil will be spread and graded over the foundation using a tracked excavator and revegetation enhanced by spreading of an appropriate seed mix to assist in revegetation and accelerate the resumption of the natural drainage management that will have existed prior to any construction.

2.4.2.3 Underground Cabling

The electrical and fibre optic cabling that connects each turbine to Turbine no.7 on the wind farm as well as the 33kV cabling from Turbine no. 7 to the existing substation in the townland of Rathgaskig will be removed from the cable ducting. The cabling will be pulled from the cable duct using a mechanical winch which will extract the cable and re-roll it on to a cable drum. This will be undertaken at each of the joint bays/pull pits along the cable. The road will be excavated using a mechanical excavator at each cable pulling pit location and will be fully re-instated once the cables are removed. A decommissioning phase Traffic Management Plan has been prepared for these works (Appendix 1) The cable ducting will be left in-situ as it is considered the most environmentally prudent option, avoiding unnecessary excavation and soil disturbance for an underground element that is not visible.

The 38kV grid connection cabling from the existing substation at Rathgaskig to the existing substation in Coomataggart will be an ESB networks asset and will be part of the national electricity grid and therefore it is not proposed to remove this cable. However, should its removal be required it will be completed using the same methodology as outlined here.

2.4.2.4 Transport Route Accommodation Works

During the construction of the Cleanrath wind farm development , a number of road and junction improvements and the provision of a turbine delivery accommodation roadway were completed to provide access to the site during turbine delivery. All these accommodation areas remain in place for use during decommissioning and turbine component removal. The turbine delivery accommodation roadway and the junction upgrade adjacent to the sawmill in Cloontycarthy have boundary treatments and roadside berms installed to prevent access to these areas when not in use. This will all be removed temporarily for turbine component transport from the Cleanrath wind farm development and will be reinstated after the works. The berm will be reinstated using an excavator and will again be allowed to revegetate naturally.

3. ENVIRONMENTAL MANAGEMENT

The following sections give an overview of the drainage design, dust and noise control measures, a waste management plan for the site and the implementation of the environmental management procedures for the site.

3.1.1 Site Drainage

The site drainage features for this site during its construction and operation are outlined in Section 4.6 of the rEIAR and Section 4.4 the EIAR which accompany this application. As this Decommissioning Plan is a working document and is presented as an Appendix to the rEIAR and EIAR, the drainage measures are not included in this document. When the final plan is prepared prior to decommissioning and presented as a standalone document, all drainage measures will be included in that document as required. The drainage proposals will be developed further prior to the commencement of decommissioning if deemed necessary. However, it should be noted that by the time decommissioning is undertaken, early decommissioning or after the planned 25-year lifespan of the Cleanrath wind farm development, the areas within the site will have revegetated resulting in a resumption of the natural drainage management that will have existed prior to any construction. It is not anticipated that the decommissioning phase will interrupt this restored drainage regime in any way with the works proposed.

3.1.2 Refuelling, Fuel and Hazardous Materials Storage

The plant and equipment used during decommissioned will require refuelling during the works. Appropriate management of fuels will be required to ensure that incidents relating to refuelling are avoided. The following mitigation measures are proposed to avoid release of hydrocarbons at the site:

- Road-going vehicles will be refuelled off site wherever possible;
- On-site refuelling will be carried out at designated refuelling areas at various locations throughout the site. Machinery will be refuelled directly by a fuel truck that will come to site as required
- Only designated trained and competent operatives will be authorised to refuel plant on site. Mobile measures such as drip trays and fuel absorbent mats will be used during all refuelling operations.
- Fuel volumes stored on site should be minimised. Any fuel storage areas will be bunded appropriately;
- The plant used will be regularly inspected for leaks and fitness for purpose; and,
- An emergency plan for the decommissioning phase to deal with accidental spillages will be developed (refer to Section 4) Spill kits will be available to deal with and accidental spillage in and outside the refuelling area.
- A programme for the regular inspection of plant and equipment for leaks and fitness for purpose will be developed at the outset of the decommissioning phase.

3.2 Dust Control

Dust can be generated from on-site activities during decommissioning such as backfilling of foundations and travelling on site roads during prolonged periods of dry weather. The extent of dust generation will depend on the type of activity undertaken, the location, the nature of the dust, i.e. soil, and the weather. In addition, dust dispersion is influenced by external factors such as wind speed and direction and/or, periods of dry weather. Site traffic movements also have the potential to generate dust as they travel along the haul route.

Proposed measures to control dust include:

- Any site roads with the potential to give rise to dust will be regularly watered, as appropriate, during dry and/or windy conditions;
- The designated public roads outside the site and along the main transport routes to the site will be regularly inspected by the Site Manager for cleanliness, and cleaned as necessary;
- Material handling systems and material storage areas will be designed and laid out to minimise exposure to wind;
- Water misting or sprays will be used as required if particularly dusty activities are necessary during dry or windy periods;
- The transport of soils or other material, which has significant potential to generate dust, will be undertaken in tarpaulin-covered vehicles where necessary;
- All site related traffic will have speed restrictions on un-surfaced roads to 15 kph;
- Daily inspection of the site to examine dust measures and their effectiveness.
- When necessary, sections of the haul route will be swept using a truck mounted vacuum sweeper; and,

3.3 Noise Control

The operation of plant and machinery, including site vehicles, is a source of potential impact that will require mitigation at all locations within the site. Proposed measures to control noise include:

- Diesel generators will be enclosed in sound proofed containers to minimise the potential for noise impacts;
- Plant and machinery with low inherent potential for generation of noise and/or vibration will be selected. All plant and equipment to be used on-site will be modern equipment and will comply with the European Communities (Construction Plant and Equipment) (Permissible Noise Levels) Regulations;
- Regular maintenance of plant will be carried out in order to minimise noise emissions. Particular attention will be paid to the lubrication of bearings and the integrity of silencers;
- All vehicles and mechanical plant will be fitted with effective exhaust silencers and maintained in good working order for the duration of the works;
- Compressors will be of the “sound reduced” models fitted with properly lined and sealed acoustic covers which will be kept closed whenever the machines are in use and all ancillary pneumatic tools shall be fitted with suitable silencers;
- Machines, which are used intermittently, will be shut down during those periods when they are not in use;
- Training will be provided by the Site Manager to drivers to ensure smooth machinery operation/driving, and to minimise unnecessary noise generation; and,
- Local areas of the haul route will be condition monitored and maintained, if necessary.

3.4 Invasive Species Management

The soil material that will be imported to site as part of the foundation backfilling will be free of any invasive species (listed under the Third Schedule of the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. No. 477 of 2011). The site manager will take steps to ensure this sourcing suitably clean material and verify the quality of the material by having it inspected prior to bringing it to site by a suitably qualified ecologist. Prior to decommissioning, a suitably qualified ecologist will complete an invasive species survey of the berms that will be temporarily removed during decommissioning at the turbine delivery accommodation roadway and the junction upgrade adjacent to the sawmill in Cloontycarthy. The invasive species survey will also be undertaken along the cable route to identify invasive species at joint bay locations where excavation to expose the cabling for removal will be required.

3.5 Traffic Management

The Traffic Management Plan has been prepared to consider the decommissioning as a standalone project. The removal of turbines from site will be undertaken for a specialist haulier. The traffic management arrangements although similar to that implement for turbine delivery as outlined in the rEIAR will be agreed in advance of decommission (early or after 25 years of operation) with the competent authority.

A Traffic Management Plan for the decommissioning phase for the grid connection cabling is included in Appendix 1. Where grid connection decommissioning works are ongoing, the contractor will schedule and phase these works accordingly to ensure that these works do not coincide with turbine component transport from site and thus reduce the impact of concurrent construction specific to the wind farm.

3.6 Waste Management

This section of the Decommissioning Plan provides a waste management plan (WMP) which outlines the best practice procedures during the decommissioning of the Cleanrath wind farm development . The WMP will outline the methods of waste prevention and minimisation by recycling, recovery and reuse at each stage of decommissioning. Disposal of waste will be seen as a last resort.

3.6.1 Legislation

The Waste Management Act 1996 and its subsequent amendments provide for measures to improve performance in relation to waste management, recycling and recovery. The Act also provides a regulatory framework for meeting higher environmental standards set out by other national and EU legislation.

The Act requires that any waste related activity has to have all necessary licenses and authorisations. It will be the duty of the Waste Manager on the site of the Cleanrath wind farm development to ensure that all contractors hired to remove waste from the site have valid Waste Collection Permits. It will then be necessary to ensure that the waste is delivered to a licensed or permitted waste facility. The hired waste contractors and subsequent receiving facilities must adhere to the conditions set out in their respective permits and authorisations.

The Department of the Environment provides a document entitled, '*Best Practice Guidelines on the Preparation of Waste Management Plans for Construction and Demolition Projects' (2006).* It is important to emphasise that no demolition will take place at this site, however, this document was referred to throughout the process of completing this WMP.

3.6.2 Waste Management Hierarchy

The waste management hierarchy sets out the most efficient way of managing in the following order:

Prevention and Minimisation:

The primary aim of the WMP will be to prevent and thereby reduce the amount of waste generated at each stage of the project.

Reuse of Waste:

Reusing as much of the waste generated on site as possible will reduce the quantities of waste that will have to be transported off site to recovery facilities or landfill.

Recycling of Waste:

There are a number of established markets available for the beneficial use of Construction and Demolition waste such as using waste concrete as fill for new roads.

At all times during the implementation of the WMP, disposal of waste to landfill will be considered only as a last resort.

3.6.3 Waste Arising from Decommissioning

The relevant components will be removed from site for re-use, recycling or waste disposal. Any structural elements that are not suitable for recycling will be disposed of in an appropriate manner. All lubrication fluids will be drained down and put aside for appropriate collection, storage, transport and disposal. Any materials which cannot be re-used or recycled will be disposed of by an appropriately licenced contractor.

The waste types arising from the decommissioning of the Cleanrath wind farm development are outlined in Table 3-1 below.

Table 3-1 Expected waste types arising during the Decommissioning Phase

Material Type	Example	EWC Code
Cables	Electrical wiring	17 04 11
Metals	Copper, aluminium, lead and iron	17 04 07
Fibreglass	Turbine blade component	10 11 03
Hydrocarbons	Oils and lubricants drained from the turbines	13 01 01,13 02 04

3.6.3.1 Reuse

Many construction materials can be reused a number of times before they have to be disposed of:

- Electrical wiring can be reused on similar wind energy projects
- Elements of the turbine components can be reused but this will be determined by the condition that they are as well as when decommissioning actually takes place.

3.6.3.2 Recycling

If a certain type of construction material cannot be reused onsite, then recycling is the most suitable option. The opportunity for recycling during decommissioning will be limited and restricted to components of the wind turbines.

All waste that is produced during the decommissioning phase including dry recyclables will be deposited in the on-site skip initially and sent for subsequent segregation at a remote facility. The anticipated volume of all waste material to be generated at the Cleanrath wind farm development is low which provides the justification for adopting this method of waste management.

3.6.3.3 Implementation

3.6.3.3.1 *Roles and Responsibilities*

Prior to the commencement of the decommissioning, a Construction Waste Manager will be appointed by the Contractor. The Construction Waste Manager will be in charge of the implementation of the objectives of the plan, ensuring that all hired waste contractors have the necessary authorisations and that the waste management hierarchy is adhered to. The person nominated must have sufficient authority so that they can ensure everyone working on the decommissioning adheres to the management plan.

3.6.3.3.2 *Training*

It is important for the Construction Waste Manager to communicate effectively with colleagues in relation to the aims and objectives of the waste management plan. All employees working on site during the decommissioning phase of the project will be trained in materials management and thereby, should be able to:

- Distinguish reusable materials from those suitable for recycling;
- Ensure maximum segregation at source;
- Co-operate with site manager on the best locations for stockpiling reusable materials;
- Separate materials for recovery; and
- Identify and liaise with waste contractors and waste facility operators.

3.6.3.3.3 *Record Keeping*

The WMP will provide systems that will enable all arisings, movements and treatments of construction waste to be recorded. This system will enable the contractor to measure and record the quantity of waste being generated. It will highlight the areas from which most waste occurs and allows the measurement of arisings against performance targets. The WMP can then be adapted with changes that are seen through record keeping.

The fully licensed waste contractor employed to remove waste from the site will be required to provide documented records for all waste dispatches leaving the site. Each record will contain the following:

- Consignment Reference Number
- Material Type(s) and EWC Code(s)
- Company Name and Address of Site of Origin
- Trade Name and Collection Permit Ref. of Waste Carrier
- Trade Name and Licence Ref. of Destination Facility
- Date and Time of Waste Dispatch
- Registration no. of Waste Carrier vehicle
- Weight of Material
- Signature of Confirmation of Dispatch detail

- Date and Time of Waste Arrival at Destination
- Site Address of Destination Facility

3.6.3.4 Waste Management Plan Conclusion

The WMP will be properly adhered to by all staff involved in the project which will be outlined within the induction process for all site personnel. The waste hierarchy should always be employed when designing the plan to ensure that the least possible amount of waste is produced during decommissioning. Reuse of certain types of construction wastes will cut down on the cost and requirement of raw materials therefore further minimising waste levels.

This WMP has been prepared to outline the main objectives that are to be adhered to and it will be updated as required prior to decommissioning.

3.7 Environmental Management Implementation

3.7.1 Roles and Responsibilities

The Site Manager and/or Environmental Clerk of Works (ECoW) are the project focal point relating to decommissioning-related environmental issues.

In general, the ECoW will maintain responsibility for monitoring the decommissioning works and Contractors/Sub-contractors from an environmental perspective. The ECoW will act as the regulatory interface on environmental matters. The Site Manager will be responsible for reporting to and liaising with Cork County Council and other statutory bodies as required.

The Site Manager in consultation with the ECoW will be responsible for employing the services of a suitably qualified ecologist and any other suitably qualified professionals as required throughout the decommissioning works.

4. EMERGENCY RESPONSE PLAN

An Emergency Response Plan (ERP) is presented in this section of the Decommissioning Plan. It provides details of procedures to be adopted in the event of an emergency in terms of site health and safety and environmental protection.

4.1 Emergency Response Procedure

The site ERP includes details on the response required and the responsibilities of all personnel in the event of an emergency. The ERP will require updating and submissions from the contractor/PSCS and sub-contractors as decommissioning progresses. Where sub-contractors that are contracted on site are governed by their own emergency response procedure a bridging arrangement will be adopted to allow for inclusion of the sub-contractor's ERP within this within this document.

This is a working document that requires updating throughout the various stages of the project.

4.1.1 Roles and Responsibilities

The chain of command during an emergency response sets out who is responsible for coordinating the response. The Site Supervisor/Construction Manager will lead the emergency response which makes him responsible for activating and coordinating the emergency response procedure. The other site personnel who can be identified at this time who will be delegated responsibilities during the emergency response are presented in Figure 4-1. In a situation where the Site Supervisor/ Construction Manager is unavailable or incapable of coordinating the emergency response, the responsibility will be transferred to the next person in the chain of command outlined in Figure 4-1. This will be updated throughout the various stages of the project.

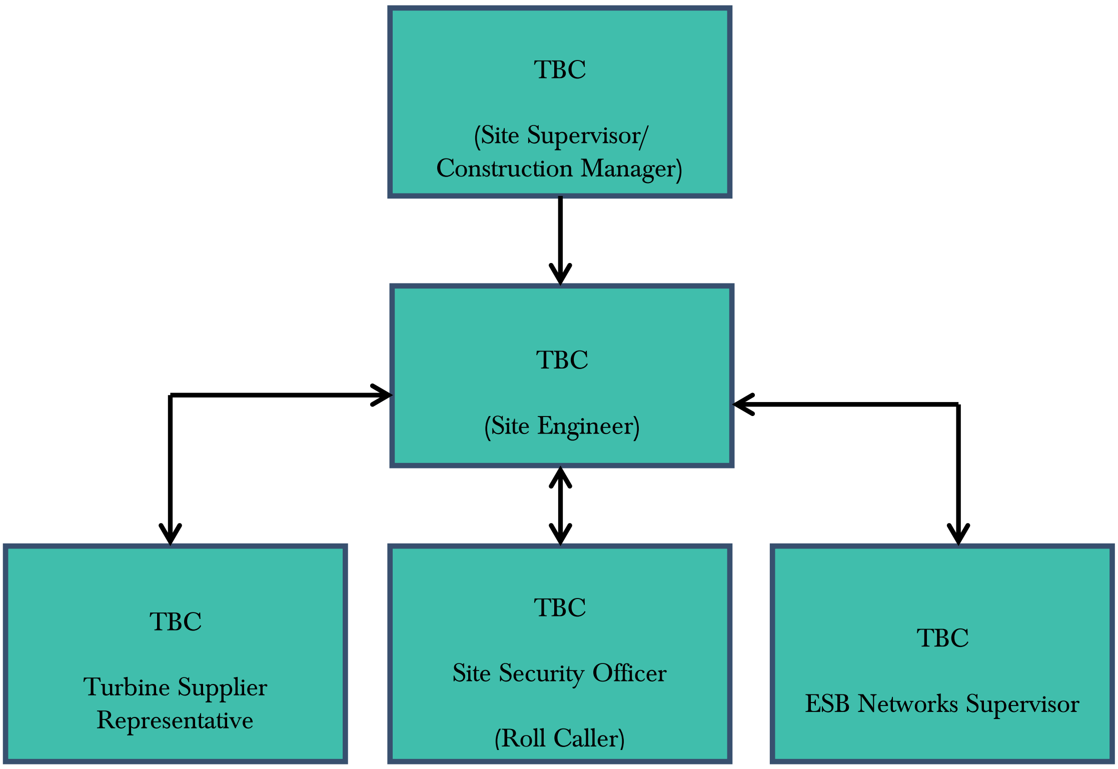


Figure 4-1 Emergency Response Procedure Chain of Command

4.1.2 Initial Steps

In order to establish the type and scale of potential emergencies that may occur, the following hazards have been identified as being potential situations that may require an emergency response in the event of an occurrence.

Table 4-1 Hazards associated with potential emergency situations

Hazard	Emergency Situation
Construction Vehicles: Dump trucks, tractors, excavators, cranes etc.	Collision or overturn which has resulted in operator or third-party injury.
Abrasive wheels/Portable Tools	Entanglement, amputation or electrical shock associated with portable tools
Contact with services	Electrical shock or gas leak associated with an accidental breach of underground services
Fire	Injury to operative through exposure to fire
Falls from heights including falls from scaffold towers, scissor lifts, ladders, roofs and turbines	Injury to operative after a fall from a height
Sickness	Illness unrelated to site activities of an operative e.g. heart attack, loss of consciousness, seizure
Turbine Specific Incident	This will be included the turbine manufacturers' emergency response plan.

In the event of an emergency situation associated with, but not restricted to, the hazards outlined in Table 4-1 the Site Supervisor/Construction Manager will carry out the following:

- Establish the scale of the emergency situation and identify the number of personnel, if any, have been injured or are at risk of injury.
- Where necessary, sound the emergency siren/fog-horn that activates an emergency evacuation on the site. The Site Supervisor/Construction Manager must proceed to the assembly point if the emergency poses any significant threat to their welfare **and if there are no injured personnel at the scene that require assistance**. The Site Supervisor/Construction Manager will be required to use their own discretion at that point. In the case of fire, the emergency evacuation of the site should proceed, without exception. The site evacuation procedure is outlined in Section 4.1.3.
- Make safe the area if possible and ensure that there is no identifiable risk exists with regard to dealing with the situation e.g. if a machine has turned over, ensure that it is in a safe position so as not to endanger others before assisting the injured.
- Contact the required emergency services or delegate the task to someone. If delegating the task, ensure that the procedures for contacting the emergency services as set out in Section 4.2 is followed.
- Take any further steps that are deemed necessary to make safe or contain the emergency incident e.g. cordon off an area where an incident associated with electrical issues has occurred.
- Contact any regulatory body or service provider as required e.g. ESB Networks the numbers for which as provided in Section 4.3.
- Contact the next of kin of any injured personnel where appropriate.

4.1.3 Site Evacuation/Fire Drill

A site evacuation/fire drill procedure will provide basis for carrying out the immediate evacuation of all site personnel in the event of an emergency. The following steps will be taken:

- Notification of the emergency situation. Provision of a siren or fog-horn to notify all personnel of an emergency situation.
- An assembly point will be designated in the construction compound area and will be marked with a sign. All site personnel will assemble at this point.
- A roll call will be carried out by the Site Security Officer to account for all personnel on site.
- The Site Security Officer will inform the Site Supervisor/Construction Manager when all personnel have been accounted for. The Site Supervisor/Construction Manager will decide the next course of action, which be determined by the situation that exists at that time and will advise all personnel accordingly.

All personnel will be made aware of the evacuation procedure during site induction. The Fire Services Acts of 1981 and 2003 require the holding of fire safety evacuation drills at specified intervals and the keeping of records of such drills.

4.1.4 Spill Control Measures

Every effort will be made to prevent an environmental incident during the decommissioning phase of the project. Oil/fuel spillages are one of the main environmental risks that will exist on the site which will require an emergency response procedure. The importance of a swift and effective response in the event of such an incident occurring cannot be over emphasised. The following steps provide the procedure to be followed in the event of such an incident:

- Stop the source of the spill and raise the alarm to alert people working in the vicinity of any potential dangers.
- If applicable, eliminate any sources of ignition in the immediate vicinity of the incident.
- Contain the spill using the spill control materials, track mats or other material as required. Do not spread or flush away the spill.
- If possible, cover or bund off any vulnerable areas where appropriate such as drains, watercourses or sensitive habitats.
- If possible, clean up as much as possible using the spill control materials.
- Contain any used spill control material and dispose of used materials appropriately using a fully licensed waste contractor with the appropriate permits so that further contamination is limited.
- Notify the ECoW immediately giving information on the location, type and extent of the spill so that they can take appropriate action.
- The ECoW will inspect the site and ensure the necessary measures are in place to contain and clean up the spill and prevent further spillage from occurring.
- The ECoW will notify the appropriate regulatory body such as Cork County Council, and the Environmental Protection Agency (EPA), if deemed necessary.

The importance of a swift and effective response in the event of such an incident occurring cannot be over emphasised. Environmental incidents are not limited to just fuel spillages. Therefore, any environmental incident must be investigated in accordance with the following steps.

- The ECoW must be immediately notified.
- If necessary, the ECoW will inform the appropriate regulatory authority. The appropriate regulatory authority will depend on the nature of the incident.

- The details of the incident will be recorded on an Environmental Incident Form which will provide information such as the cause, extent, actions and remedial measures used following the incident. The form will also include any recommendations made to avoid reoccurrence of the incident.
- If the incident has impacted on a sensitive receptor such as an archaeological feature the ECoW will liaise with the Project Archaeologist.
- A record of all environmental incidents will be kept on file by the ECoW and the Main Contractor. These records will be made available to the relevant authorities such as Cork County Council, EPA if required.

The ECoW will be responsible for any corrective actions required as a result of the incident e.g. an investigative report, formulation of alternative works methodologies or environmental sampling, and will advise the Main Contractor as appropriate.

4.2 Contact the Emergency services

In the event of requiring the assistance of the emergency services the following steps should be taken:

Stay calm. It is important to take a deep breath and not get excited. Any situation that requires 999/112 is, by definition, an emergency. The dispatcher or call-taker knows that and will try to move things along quickly, but under control.

Know the location of the emergency and the number you are calling from. This may be asked and answered a couple of times but do not get frustrated. Even though many emergency call centres have enhanced capabilities meaning they are able to see your location on the computer screen they are still required to confirm the information. If for some reason you are disconnected, at least emergency crews will know where to go and how to call you back.

Wait for the call-taker to ask questions, then answer clearly and calmly. If you are in danger of assault, the dispatcher or call-taker will still need you to answer quietly, mostly "yes" and "no" questions.

If you reach a recording, listen to what it says. If the recording says your call cannot be completed, hang up and try again. If the recording says all call takers are busy, WAIT. When the next call-taker or dispatcher is available to take the call, it will transfer you.

Let the call-taker guide the conversation. He or she is typing the information into a computer and may seem to be taking forever. There is a good chance, however, that emergency services are already being sent while you are still on the line.

Follow all directions. In some cases, the call-taker will give you directions. Listen carefully, follow each step exactly, and ask for clarification if you do not understand.

Keep your eyes open. You may be asked to describe victims, suspects, vehicles, or other parts of the scene.

Do not hang up the call until directed to do so by the call taker.

Due to the remoteness of the site it may be necessary to liaise with the emergency services on the ground in terms of locating the site. This may involve providing an escort from a designated meeting point that may be located more easily by the emergency services. This should form part of the site induction to make new personnel and sub-contractors aware of any such arrangement or requirement if applicable.

4.3 Contact Details

A list of emergency contacts is presented in Table 4-2. A copy of these contacts will be included in the Site Safety Manual and in the site offices and the various site welfare facilities.

Table 4-2 Emergency Contacts

Contact	Telephone no.
Emergency Services – Ambulance, Fire, Gardaí	999/112
Doctor – Macroom Health Centre	026 20650
Hospital – Cork University Hospital	021 492 2000
ESB Emergency Services	1850 372 999
Gas Networks Ireland Emergency	1850 20 50 50
Gardaí – Local Garda Station. Ballingeary	026 47002
Health and Safety Co-ordinator - Health & Safety Services	TBC
Health and Safety Authority	1890 289 389
Inland Fisheries Ireland (IFI)	1890 347 424
Project Supervisor Construction Stage (PSCS): TBC	TBC
Project Supervisor Design Stage (PSDS): TBC	TBC
Client: Cleanrath Windfarm Ltd.	021 7336034

4.3.1 Procedure for Personnel Tracking

All operatives on site without any exception will have to undergo a site induction where they will be required to provide personal contact details which will include contact information for the next of kin.

In the event of a site operative becoming in an emergency situation where serious injury has occurred and hospitalisation has taken place, it will be the responsibility of the Site Manager or next in command if unavailable to contact the next of kin to inform them of the situation that exists.

4.4 Induction Checklist

Table 4-3 provides a list of items highlighted in this ERP which must be included or obtained during the mandatory site induction of all personnel that will work on the site. This will be updated throughout the various stages of the project.

Table 4-3 Emergency Response Plan Items Applicable to the Site Induction Process

ERP Items to be included in Site Induction	Status
All personnel will be made aware of the evacuation procedure during site induction	
Due to the remoteness of the site it may be necessary to liaise with and assist the emergency services on the ground in terms of locating the site. This may involve providing an escort from a designated meeting point that may be located more easily by the emergency services. This should form part of the site induction to make new personnel and sub-contractors aware of any such arrangement or requirement if applicable.	
All operatives on site without any exception will have undergo a site induction where they will be required to provide personal contact details which will include contact information for the next of kin.	

5. PROGRAMME OF WORKS

5.1 Decommissioning Schedule

The decommissioning phase will take approximately 3 – 6 months to complete from commencing the removal of turbines to the final reinstatement of the site.

At this time, it is not possible to determine when decommissioning will take place.

The phasing and scheduling of the main decommissioning task items are outlined in Figure 5-1 below, where the 1st January has been shown as an indicative start date for decommissioning to commence.

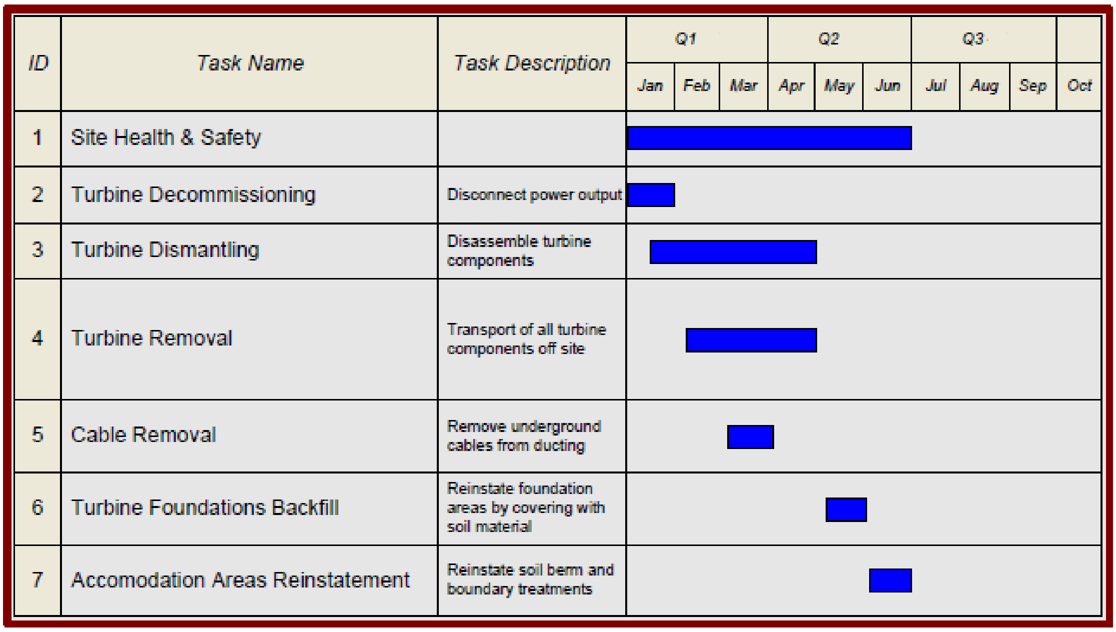


Figure 5-1 Indicative Decommissioning Schedule

6. MITIGATION PROPOSALS

All mitigation measures relating to the operational phases of the Cleanrath wind farm development were set out in the various sections of the Environmental Impact Assessment Report (EIAR) which accompanies this substitute consent application.

This section of the DP groups together all of the mitigation measures presented in the planning documentation. The mitigation measures are presented in the following pages.

By presenting the mitigation proposals in the below format, it is intended to provide an easy to audit list that can be reviewed and reported on during the operational phase of the project. The tabular format in which the below information is presented, can be further expanded upon during the course of operation and provides a reporting template for site compliance audits.

Table 6-1 Mitigation Measures

Ref. No.	Reference Location	Mitigation Measure	Audit Result	Action Required
		Operational Phase		
MM1	EIAR Chapter 6 OEMP Section 2	A habitat restoration and enhancement plan has been prepared to mitigate for peatland habitat loss		
MM2	EIAR Chapter 4 OEMP Section 2	An additional hectare of immature forestry will be removed to provide an area of enhanced peatland. Any further felling proposed for the site will be the subject of a Limited Felling Licence (LFL) application to the Forest Service. Replanting will be undertaken for any further felling		
MM3	EIAR Section 6,	The removal of woody vegetation will be undertaken in full compliance with Section 40 of the Wildlife Act 1976 – 2018.		
MM4	EIAR Chapter 8	As part of peatland restoration works, the following measures are proposed: - Brash removed during the restoration process should be stored up slope of the cleared area, to provide a buffer to surface water flows which may have the potential to erode, During tree felling brash mats will be used to support vehicles on soft ground, reducing peat and mineral soils erosion and avoiding the formation of rutted areas.		
MM5	EIAR Chapter 8, 9	Wherever possible, vehicles will be refuelled off-site, particularly for regular road-going vehicles. On-site refuelling of machinery will be carried out at designated refuelling areas at various locations throughout the site. Heavy Plant and		

Ref. No.	Reference Location	Mitigation Measure	Audit Result	Action Required
	OEMP Section 3	Machinery will be refuelled on site by a fuel truck. This will only take place for a short period during peatland habitat restoration works.		
MM6	REIAR Chapter 8	The electrical control building was bunded appropriately to the volume of oils likely to be stored, and to prevent leakage of any associated chemicals and to groundwater or surface water. The bunded area was fitted with a storm drainage system and an appropriate oil interceptor;		
MM7	EIAR Chapter 6 OEMP Section 3	The operational phase drainage of the development has been operated in full accordance with the design and mitigation measures that are fully described in Section 9.6 of Chapter 9: 'Water' and in the Operation and Environmental Management Plan. In addition, the same measures will be employed during any future operation. The Habitat Restoration Plan that is provided in Appendix 6.8 provides details of additional measures that will be implemented to protect water quality during the operation of the wind farm and the felling associated with the habitat restoration should it be granted permission.		
MM8	EIAR Chapter 9	Various combinations/adaptations of the runoff control and drainage management measures during the operational phase are employed at the site depending on the local conditions and topography: › Natural vegetation filters are used regularly across the site where the local drainage and topography allowed attenuation of surface water runoff. › Where possible, interceptor drains are installed up-gradient of infrastructure to collect clean surface runoff, in order to minimise the amount of runoff reaching areas where suspended sediment could become entrained. It is now directed to areas where it can be re-distributed onto natural vegetation.		

Ref. No.	Reference Location	Mitigation Measure	Audit Result	Action Required
		Swales/roadside drains are used to collect runoff from access roads and turbine hardstanding areas of the site, likely to have entrained suspended sediment, and channeled it onto natural vegetation.		
MM9	EIAR Chapter 9	As part of peatland restoration works, the following water protection measures are proposed: • Brash removed during the restoration process will be stored up slope of the cleared area, to provide a buffer to surface water flows which may have the potential to erode; • During tree felling brash mats will be used to support vehicles on soft ground, reducing peat and mineral soils erosion and avoiding the formation of rutted areas; and, • Drain blocking and use of silt fencing and check dams until stabilisation has taken place.		
MM 10	EIAR Chapter 7	Operational monitoring at the Cleanrath wind farm development commenced in January 2020 and continued into May 2020. Appendix 7-6 of this EIAR contains the Post-Construction Bird Monitoring Programme. Post construction monitoring included and will include the following surveys: • Flight activity surveys: Vantage Point Surveys • Breeding Bird Surveys: Adapted Brown & Shephard. • Winter Walkover Surveys • Breeding Raptor surveys • Hen Harrier Winter Roost Surveys		

Ref. No.	Reference Location	Mitigation Measure	Audit Result	Action Required
		- Targeted bird collision surveys (corpse searches) were/will be undertaken with training dogs. The surveys included detection and scavenger trials, to correct for these two biases and ensure the resulting data is robust.		
MM 11	EIAR Section 6	All mitigation measures as specified by the survey report and derogation licence was implemented by the client. Compensation habitat was provided to replace the relatively small area of habitat affected by the development and no significant impact on Kerry slug populations was predicted to occur as a result of this development.		
MM 12	EIAR Chapter 7	Following the precautionary principle and in accordance with the SNH (2019) guidelines, any future operation of the wind farm will be the subject of ongoing monitoring as described in Appendix 6-4. If, following monitoring, there is any uncertainty as to the impacts on bat species, mitigation will be implemented		
MM 13	EIAR Chapter 5 OEMP Section 3	During the operational phase there will be ongoing maintenance of the wind turbines and associated infrastructure. Access to the turbines is through a door at the base of the structure, which is locked at all times outside maintenance visits. An Operational and Maintenance Health and Safety Plan has been prepared for the wind farm and is included as Appendix A of the OEMP (Appendix 4-3).		
MM 14	EIAR Chapter 5, 11 OEMP Section 3	Best practice measures for noise control will be adhered to onsite during the operational phase of the Cleanrath wind farm development in order to mitigate the slight short-term negative impact associated with this phase of the development. These measures included: - No plant used on site will be permitted to cause an on-going public nuisance due to noise.		

Ref. No.	Reference Location	Mitigation Measure	Audit Result	Action Required
		- The best means practicable, including proper maintenance of plant, will be employed to minimise the noise produced by on site operations. - All vehicles and mechanical plant will be fitted with effective exhaust silencers and maintained in good working order for the duration of the contract. - Compressors will be attenuated models fitted with properly lined and sealed acoustic covers which will be kept closed whenever the machines are in use and all ancillary pneumatic tools were fitted with suitable silencers. - Machinery that will be used intermittently will be shut down or throttled back to a minimum during periods when not in use. - During the course of the construction programme, supervision of the works will be undertaken to ensure compliance with the limits detailed in Chapter 11 using methods outlined in British Standard BS 5228-1:2014+A1:2019 Code of practice for noise and vibration control on construction and open sites – Noise.		
MM 15	EIAR Chapter 5 OEMP Section 3	In periods of extended dry weather, dust suppression may be necessary along haul roads within the site to ensure dust does not cause a nuisance during use of plant or machinery. Where necessary, water will be spread with a bowser or water spreader to dampen down haul roads and the temporary site compound to prevent the generation of dust. Silty or oily water will not be used for dust suppression		
MM 16	EIAR Chapter 5 OEMP Section 2	All mitigation as outlined under noise and vibration, dust, traffic, visual amenity and shadow flicker in the EIAR, will be implemented in order to reduce insofar as possible impacts on residential amenity at properties located in the vicinity of the Cleanrath wind farm development works, including along the turbine and construction materials haul route.		

Ref. No.	Reference Location	Mitigation Measure	Audit Result	Action Required
		The installed wind turbines have been fitted with shadow flicker control units to allow the turbines to be controlled to prevent the occurrence of shadow flicker at properties surrounding the wind farm where necessary.		
MM 17	EIAR Chapter 10 OEMP Section 3	Any vehicles or plant brought onsite during the operational phase will be maintained in good operational order that comply with the Road Traffic Acts 1961 as amended, thereby minimising any emissions that arise.		
MM 18	EIAR Chapter 5, 11 OEMP Section 3	Best practice measures for noise control was adhered to onsite during the construction phase of the Cleanrath wind farm development in order to mitigate the slight short-term negative impact associated with this phase of the development. The measures include: › Sensitive location of equipment, taking account of local topography and natural screening. › Working methods: construction noise was controlled by prescribing that standard construction work was restricted to the specified working hours. Any construction work carried out outside of these hours shall be restricted to activities that did not generate noise of a level that may cause a nuisance. The phasing of works had also been designed with regard to avoidance of noise impacts. › Plant was selected taking account of the characteristics of noise emissions from each item. All plant and machinery used on the site shall comply with E.U. and Irish legislation in relation to noise emissions. The timing of on- and off-site movements of plant near occupied properties was controlled. › Operation of plant: all construction operations shall comply with guidelines set out in British Standard documents 'BS 5338: Code of Practice for Noise		

Ref. No.	Reference Location	Mitigation Measure	Audit Result	Action Required
		Control on Construction and Demolition Sites' and 'BS5228: Part 1: 1997: Noise & Vibration Control on Construction and Open Sites'. The correct fitting and proper maintenance of silencers and/or enclosures, the avoidance of excessive and unnecessary revving of vehicle engines, and the parking of equipment in locations that avoid possible effects on noise-sensitive locations were employed. › Training and supervision of operatives in proper techniques to reduce site noise, and self-monitoring of noise levels, if appropriate.		
MM 19	EIAR Chapter 14 OEMP Section 3	For a period of three weeks, a number of HGVs and excavator delivery vehicles will come to site as part of peatland habitat restoration works. These works will be undertaken in accordance with the Traffic Management Plan prepared for the construction phase which is included within Appendix 4-4 of the remedial EIAR		
MM 20	EIAR Chapter 14	In the event of further scoping responses being received from the EIA consultees, the comments of the consultees and any mitigation measures are considered during operation of the Cleanrath wind farm development, subject to the outcome of the Substitute Consent process. The terms of the signed 2RN Protocol Document for the Cleanrath wind farm development will be adhered to throughout operation		

Ref. No.	Reference Location	Mitigation Measure	Audit Result	Action Required
Decommissioning Phase				
MM 21	EIAR Chapter 4	Prior to the end of the operational period the Decommissioning Plan (Appendix 4-4) will be updated in line with decommissioning methodologies that may exist at the time and will agreed with the competent authority at that time.		
MM 22	DP Section 3	Prior to decommissioning, a suitably qualified ecologist will complete an invasive species survey of the berms that will be temporarily removed during decommissioning at the turbine delivery accommodation roadway and the junction upgrade adjacent to the sawmill in Cloontycarthy. The invasive species survey will also be undertaken along the cable route to identify invasive species at joint bay locations where excavation to expose the cabling for removal will be required.		
MM 23	EIAR Chapter 9	Best guidance in relation to protection of freshwater pear mussel (FPM) sites will be followed from guidance document Forestry and Freshwater Pearl Mussel Requirements – Site Assessment and Mitigation Measures (Draft).		
MM 24	EIAR Section 6	All mitigation measures as specified by the survey report and derogation licence or any revision or renewals of this licence was implemented by the client. Compensation habitat was provided to replace the relatively small area of habitat affected by the development and no significant impact on Kerry slug populations was predicted to occur as a result of this development.		
MM 25	EIAR Chapter 6	Trees did not be replanted in the future within the felled areas. In areas of felling close to turbine bases brash was removed from the site, where not required for the upgrade of existing roads and to prevent rutting of the ground surface during felling operations, and management was put in place to keep the growth of regenerating scrubby/bushy vegetation down.		

Ref. No.	Reference Location	Mitigation Measure	Audit Result	Action Required
MM 26	EIAR Chapter 4 DP Section 2	On removal of turbines, the covering of the foundation will be completed using material imported to site as the required quantity of material does not currently exist at the site. The imported soil will be spread and graded over the foundation using a tracked excavator and revegetation enhanced by spreading of an appropriate seed mix to assist in revegetation and accelerate the resumption of the natural drainage management that will have existed prior to any construction		
MM 27	EIAR Chapter 4 DP Section 3	The following mitigation measures are proposed to avoid release of hydrocarbons at the site: › Road-going vehicles will be refuelled off site wherever possible; › On-site refuelling will be carried out at designated refuelling areas at various locations throughout the site. Machinery will be refuelled directly by a fuel truck that will come to site as required › Only designated trained and competent operatives will be authorised to refuel plant on site. › Fuel volumes stored on site should be minimised. Any fuel storage areas will be bunded appropriately; › The plant used will be regularly inspected for leaks and fitness for purpose; and, › An emergency plan for the decommissioning phase to deal with accidental spillages will be developed (refer to Section 4) Spill kits will be available to deal with and accidental spillage in and outside the refuelling area. › A programme for the regular inspection of plant and equipment for leaks and fitness for purpose will be developed at the outset of the decommissioning phase.		

Ref. No.	Reference Location	Mitigation Measure	Audit Result	Action Required
MM 28	EIAR Section 7	A Decommissioning Plan has been prepared (see Appendix 4-4) The following measures are proposed for the decommissioning phase: - During the decommissioning phase, disturbance limitation measures will be as per the construction phase (see Chapter 7 of the rEIAR). - Plant machinery will be turned off when not in use. - All plant and equipment for use will comply with the Construction Plant and the European Communities (Noise Emission by Equipment for Use Outdoors) Regulations 2001 (S.I. No. 632 of 2001). - A project ecologist will be appointed to oversee the decommissioning phase, with similar duties to those outlined above during the construction phase.		
MM 29	EIAR Chapter 14 DP Section 3	The Traffic Management Plan has been prepared to consider the decommissioning as a standalone project. The removal of turbines from site will be undertaken for a specialist haulier. The traffic management arrangements although similar to that implement for turbine delivery as outlined in the rEIAR will be agreed in advance of decommissioning (early or after 25 years of operation) with the competent authority. A traffic management plan has been prepared for the removal of cabling from cable duct on the grid connection route		

7. MONITORING PROPOSALS

All monitoring proposals relating to the operational phases of the Cleanrath wind farm development were set out in the various sections of the Environmental Impact Assessment Report (EIAR) which accompanies this substitute consent application.

This section of the DP groups together all of the monitoring proposals presented in the planning documentation. The monitoring proposals are presented in the following pages.

By presenting the monitoring proposals in the below format, it is intended to provide an easy to audit list that can be reviewed and reported on during the operational phase of the project. The tabular format in which the below information is presented, can be further expanded upon during the course of operation to provide a reporting template for site compliance audits.

Table 7-1 Schedule of Monitoring Proposals

Ref. No.	Reference Location	Monitoring Measure	Frequency	Reporting Period	Responsibility
Operational Phase & Decommissioning Phases					
MX1	EIAR Chapter 4 OEMP Section 3	Monthly sampling for laboratory analysis for a range of parameters as adopted during pre-commencement and construction phases has continued for 6 months (although sample events were not completed in March and April 2020 due to the Covid-19 restrictions) after construction was completed Sampling will now continue quarterly into the operational phase for a period of one year	Quarterly	As Necessary	Site Manager
MX2	EIAR Chapter 4 OEMP Section 3	Turbidity monitors or sondes have been installed at locations surrounding the wind farm site as outlined in Figure 3-1. The sondes provide continuous readings for turbidity levels in the watercourse and are scheduled for removal at the next quarterly surface water sampling event	Ongoing	As Necessary	Site Manager
MX3	EIAR Chapter 7	Operational monitoring at the Cleanrath wind farm development commenced in January 2020 and continued into May 2020. The programme of works monitored and will continue to monitor parameters associated with collision, displacement/barrier effects and habituation during the lifetime of the project. Surveys commenced in January 2020 of Years 1. Thereafter surveys will be scheduled to coincide with Years 2, 3, 5, 10 and 15 of the lifetime of the wind farm. Monitoring measures were broadly based on guidelines issued by the Scottish Natural Heritage (SNH, 2009). Post construction monitoring included and will include the following surveys:			

Ref. No.	Reference Location	Monitoring Measure	Frequency	Reporting Period	Responsibility
		- Flight activity surveys: Vantage Point Surveys - Breeding Bird Surveys: Adapted Brown & Shephard. - Winter Walkover Surveys - Breeding Raptor surveys - Hen Harrier Winter Roost Surveys - Targeted bird collision surveys (corpse searches) were/will be undertaken with training dogs. The surveys included detection and scavenger trials, to correct for these two biases and ensure the resulting data is robust.			
MX4	EIAR Chapter 4, 6	Post-construction surveys for badger and otter will be completed on the site for five years. These surveys will be undertaken following the same scope and methodology as proposed for the pre-construction surveys. All results will be sent to the Planning Authority and to the NPWS.	Annually for 5 years	Annually	Project Ecologist
MX5	EIAR Chapter 4, 6	The Kerry Slug Management Plan will be implemented in full, as will the conditions of the derogation licence. This provides for post-construction surveys that cover a five year period	Annually for 5 years	Annually	Project Ecologist
MX6	EIAR Chapter 4, 6	Post-construction monitoring and reporting programmes for birds (particularly Hen Harrier and Merlin), otter, badger and Kerry slug shall be submitted to, and agreed in writing with, the planning authority prior to commencement of	As required	As required	Project Ornithologist

Ref. No.	Reference Location	Monitoring Measure	Frequency	Reporting Period	Responsibility
		development. The surveys shall be undertaken by suitably qualified and experienced specialists. Surveys shall be completed annually for a period of five years following commissioning of the wind farm and copies of the reports to the planning authority shall also be submitted to the National Parks and Wildlife Service.			
MX7	EIAR Chapter 5, 11	Post commissioning of the proposed turbine units it is recommended that the noise monitoring detailed in the relevant section of this report is repeated with a view to confirming that the operational units are compliant with the relevant day and night time noise criteria curves as presented in the body of this assessment. If this study work identifies any exceedances of the appropriate criteria relevant corrective actions will be taken/implemented.	Once	As required	Site Manager
MX8	DP Section 3	The Site Manager in consultation with the ECoW will be responsible for employing the services of a suitably qualified ecologist and any other suitably qualified professionals as required throughout the decommissioning works.	As required	As required	Site Manager
MX9	EAIR Chapter 6 DP Section 3	Prior to decommissioning, a suitably qualified ecologist will complete an invasive species survey of the berms that will be temporarily removed during decommissioning at the turbine delivery accommodation roadway and the junction upgrade adjacent to the sawmill in Cloontycarthy. The invasive species survey will also be undertaken along the cable route to identify invasive species at joint bay locations	As required	As required	Project Ecologist

Ref. No.	Reference Location	Monitoring Measure	Frequency	Reporting Period	Responsibility
		where excavation to expose the cabling for removal will be required.			
MX10	EAIR Chapter 6	Current and ongoing bat monitoring being conducted on site, where turbines are operating in sleep mode, will be utilised in conjunction with the 2015 bat survey findings. This will be used to assess bat activity patterns and to inform the design of any advanced site-specific mitigation requirements, including curtailment if deemed necessary, to ensure that there are no significant residual effects on bat species.	As required	As required	Project Ecologist

8. COMPLIANCE AND REVIEW

8.1 Site inspections and Environmental Audits

Routine inspections of decommissioning activities will be carried out on a daily and weekly basis by the ECoW and the Site Supervisor/Construction Manager to ensure all controls to prevent environmental impacts, relevant to the decommissioning activities taking place at the time, are in place.

Environmental inspections will ensure that the works are undertaken in compliance with this Decommissioning Plan and all other planning application documents. Only suitably trained staff will undertake environmental site inspections.

8.2 Auditing

An Environmental audit will first be carried out prior to the decommissioning phase of the Cleanrath wind farm development to ensure the construction and/or operational phase mitigation measures that are still in place as required are adequate. Further environmental audits will be carried out on a monthly basis during the decommissioning phase of the project and on completion of the decommissioning works.

In contrast to monitoring and inspection activities, audits are designed to shed light on the underlying causes of non-compliance, and not merely detect the non-compliance itself. In addition, audits are the main means by which system and performance improvement opportunities may be identified. Environmental audits will be carried out by the ECoW on behalf of the appointed contractor. It is important that an impartial and objective approach is adopted. Environmental audits will be conducted at planned intervals to determine whether the Decommissioning Plan is being properly implemented and maintained. The results of environmental audits will be provided to project management personnel.

8.3 Environmental Compliance

The following definitions shall apply in relation to the classification of Environmental Occurrences during the decommissioning of the wind farm:

Environmental Near Miss: An occurrence which if not controlled or due to its nature could lead to an Environmental Incident.

Environmental Incident: Any occurrence which has potential, due to its scale and nature, to migrate from source and have an environmental impact beyond the site boundary.

Environmental Exceedance Event: An environmental exceedance event occurs when monitoring results indicate that limits for a particular environmental parameter (as indicated in the Environmental Monitoring Programme) has been exceeded.

An exceedance will immediately trigger an investigation into the reason for the exceedance occurring and the application of suitable mitigation where necessary.

Exceedance events can be closed out on achieving a monitoring result below the assigned limit for a particular environmental parameter.

Environmental Non-Compliance: Non-fulfilment of a requirement and includes any deviations from established procedures, programs and other arrangements related to the Decommissioning Plan.

8.4 Corrective Action Procedure

A corrective action is implemented to rectify an environmental problem on-site. Corrective actions will be implemented by the Site Supervisor/Construction Manager, as advised by the Site Environmental Clerk of Works. Corrective actions may be required as a result of the following;

- Environmental Audits;
- Environmental Inspections and Reviews;
- Environmental Monitoring;
- Environmental Incidents; and,
- Environmental Complaints.

A Corrective Action Notice will be used to communicate the details of the action required to the main contractor. A Corrective Action Notice is a form that describes the cause and effect of an environmental problem on site and the recommended corrective action that is required. The Corrective Action Notice, when completed, will include details of close out and follow up actions.

If an environmental problem occurs on site that requires immediate attention direct communications between the Site supervisor/Construction Manager and the ECoW will be conducted. This in turn will be passed down to the site staff involved. A Corrective Action Notice will be completed at a later date.

8.5 Decommissioning Phase Plan Review

This Decommissioning Plan will be updated and reviewed prior to commencement of decommissioning.

APPENDIX 1

DECOMMISIONG PHASE TRAFFIC MANAGEMENT PLAN FOR THE CABLE ROUTE

Civil Engineering

Traffic Management Plan: Cleanrath WF Decommissioning 33kV & 38kV Cables Along Public Road

July 2020

Telephone: +353 (0) 21 733 6034, Fax: +353 (0) 21 733 6145
Web: www.mceengineering.ie, Email: office@mceengineering.ie
Lissarda Industrial Estate, Lissarda, Cork, Ireland.

Civil & Electrical Engineering Specialists

MCE – Cleanrath Windfarm Traffic Management Plan

Contractor: MCE ltd.

Project name: Cleanrath Windfarm

Address: Cleanrath, Co. Cork.

Name :James Crowley 086 3979248
Chris Murnane 086 7955083

Email: james.crowley@turnkeydev.com
chris.murnane@gmail.com

Site supervisor: TBC

Safety officer: TBC

Description of task: Traffic Management Plan for Cleanrath Windfarm cable decommissioning along public road

Key plant: 360 excavators
8 tonne dumper
Lorries
Roller
Submersible Pumps
Plate compactor
Generator
Spill Kit
Diesel Bowser
Drip Trays

Specific Training: FAS safe pass
CSCS plant ticket
Site induction

Civil & Electrical Engineering Specialists

MCE – Cleanrath WF Traffic Management Plan

Method of Access and Egress to the work Area	All operatives must complete pre works MCE Ltd. site induction before commencing work on the ducting route.
Fall Protection Measures: (Where work at height cannot be eliminated)	No persons are permitted within 2 meters of excavation. Trench support will be utilized if required. Open trenches will be fenced off or backfilled every evening to ensure the areas are safe for workers and local traffic. No persons allowed in trench when exclusion zone is not achievable for passing vehicles or when deemed unsafe.
Hazardous Substances: Applicable:	 **No** | **No** | **No** | **No** | **No** | **Yes** | **No**
Storage Arrangements:	No material will be used or generated during the course of this task
Mandatory and Additional PPE as Required:	
Emergency Procedures:	MCE Emergency Procedures (All employees informed at site inductions) All employees to be made aware of the nearest exit routes from site. All personnel to be in possession of the site coordinates at all times in case of need to contact emergency services for any reasons.
First Aid Facilities:	On-Site First Aider: Chris Murnane First Aid Box Location: MCE Site Vehicle & Site Office Nearest Hospital: Macroom Community Hospital – (026) 41002 Other Hospital: Cork University Hospital – (021) 4922000
Welfare Facilities:	Site office, canteen and toilet supplied by Mid Cork Electrical at site compound across from substation and assembly point.

MCE – Cleanrath WF Traffic Management Plan

Introduction:

This traffic management plan outlines the affected roadways for the 33kV & 38 kV cable decommissioning between Cleanrath WF and Coomataggart 110kV substation (Grousemount). This is to be read in conjunction with the works method statement in order to provide a safe system of work.

The total length of roadway affected is approximately 12.1km and can be seen in more detail in Fig. 1.0. It is proposed that a Stop/Go system will be put in place for the duration of the works as they progress along the route at each of the potential pull locations (see Fig. 1.1 for an overview and Fig.'s 2.0 – 14.0 for more detail). In the event that the road is too narrow for a Stop/Go to be feasible, an All-Stop system will be used. Access will be prioritised for emergency vehicles and local householders who are unable otherwise to access their homes. Traffic calming measures will be utilized to slow down vehicles and ensure the works can be carried out safely.

Prior to any works commencing a dilapidation survey will be completed of the entire route, photographing and noting any existing damage or defects to property or road surfaces. A copy of this will be submitted to Cork County Council prior to work commencing.

MCE – Cleanrath WF Traffic Management Plan

Local Access for Residents

As part of the traffic management plan local residents affected by the works will be alerted through the use of letter drops and prior consultation.

Every effort will be made to limit the effect on local residents and any residents who require special provisions to be made will be accommodated (i.e. Home carer, etc.). Traffic management plans will be reviewed on a daily basis and take into account all local parameter in the area where work is being carried out. All required traffic management calculation forms will be completed and kept on site.

Pedestrian & Cyclist Management

Pedestrians and cyclists will be accommodated along the routes. Operatives will be made aware to watch out for oncoming pedestrians / cyclists and to advise them accordingly.

Dealing With Emergency Services

Gardaí will be advised of the intended works to be carried out prior to commencement on the Gardaí Consultation form. Emergency services using the local roads will be prioritised and areas where the works are being carried out will be covered immediately with road plates so as to allow access.

Signage Plan

All works will be signed in accordance with the "Guidance for the Control and Management of Traffic at Road Works" (Second Edition 2010). The Routine Works Traffic Management Design, including the layout parameters is illustrated on attachment.

MCE – Cleanrath WF Traffic Management Plan

All traffic management will comply with guidance given in Chapter 8, Traffic Signs Manual, Department of Transport November 2010 and Control and management of Traffic at Road Work November 2007.

A fully certified and competent ‘Signing Lighting & Guarding ‘ officer will sign off on the works before commencement and carry out routine monitoring. A qualified supervisor will be onsite at all times.

✓See attached traffic management design sheet for signage etc.

✓The entire traffic management system will be set up prior to any works commencing.

✓Only approved signs will be used along the works area.

✓All signs will be clean and clearly visible.

✓Once signs are in place the route will be assessed to ensure adequate visibility for drivers and pedestrians.

✓All signs will be secured and weighted down where appropriate.

✓Traffic will be reduced to single flow during all excavations on the roadside along sections which do not require a closure.

✓ At the end of each day the excavation is back filled and all materials will be removed from the roadside.

✓Contractor vehicles will be parked with consideration given to traffic management plan.

✓Where flag men are required, both flag men, the foreman and guarding officer will all communicate via two-way radios.

MCE – Cleanrath WF Traffic Management Plan

Traffic Management Plan Drawings:

The following drawings are included at the end of this document:

- Fig. 1.0 – Route Overview – Sections
- Fig. 1.1 – Route Overview – Cable Pull Locations
- Fig. 2.0 – Section 2 Pull Location 1
- Fig. 3.0 – Section 2 Pull Location 2
- Fig. 4.0 – Section 3 Pull Location 3
- Fig. 5.0 – Section 4 Pull Location 4
- Fig. 6.0 – Section 4 Pull Location 5
- Fig. 7.0 – Section 5 Pull Location 6
- Fig. 8.0 – Section 6 Pull Location 7
- Fig. 9.0 – Section 6 Pull Location 8
- Fig. 10.0 – Section 6 Pull Location 9
- Fig. 11.0 – Section 7 Pull Location 10
- Fig. 12.0 – Section 8 Pull Location 11
- Fig. 13.0 – Section 9 Pull Location 12
- Fig. 14.0 – Section 9 Pull Location 13

MCE – Cleanrath WF Traffic Management Plan

Signage Layout

The following is the layout for signage that will be in place on the approach to the road works. See attached drawings showing signage layout for the road closure which will be occurring .

✓Sign no 1: WK 001 Man with Shovel.

✓Sign no 2: Do Not Pass/No Overtaking.

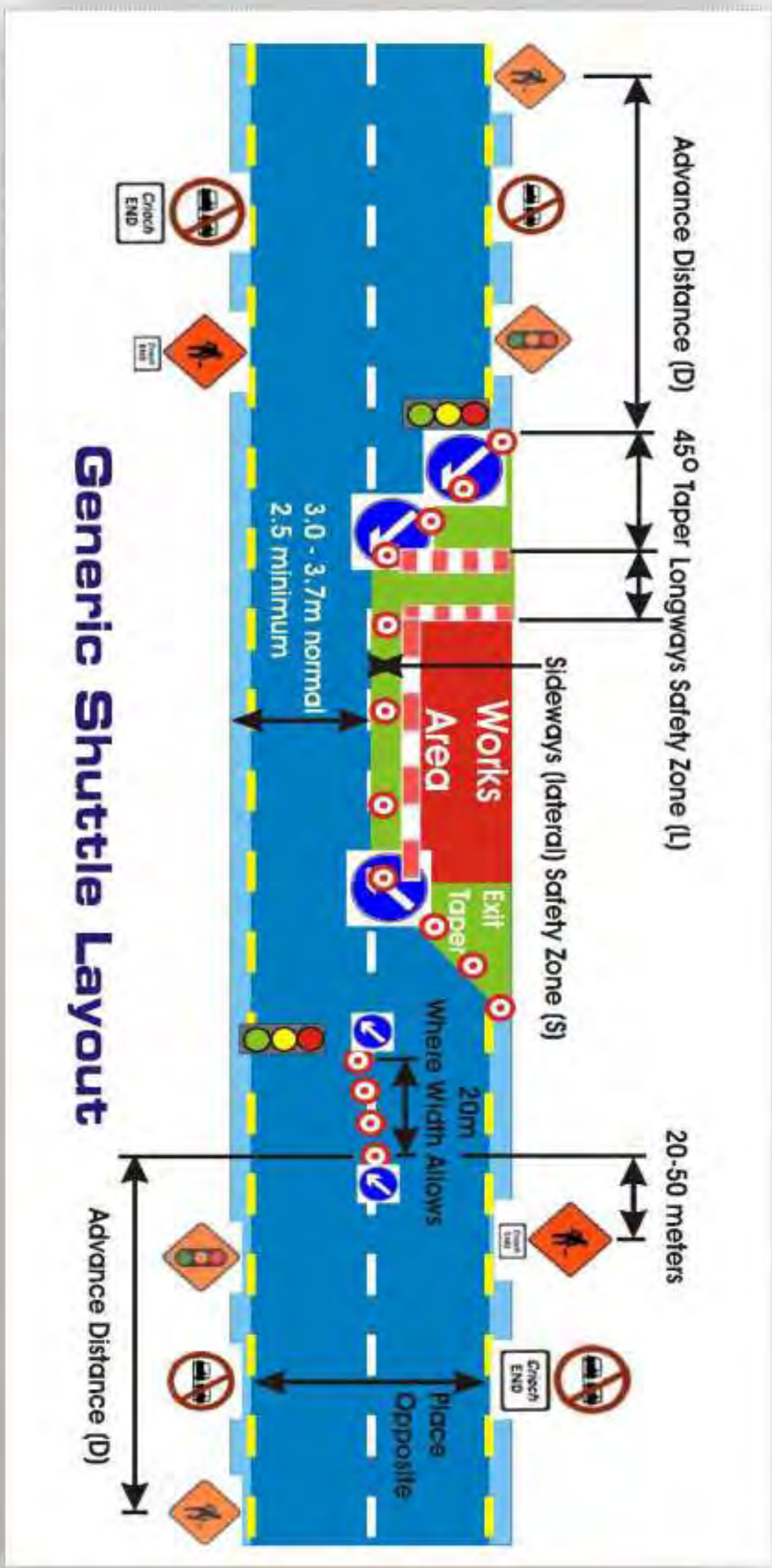
✓Sign no 3: Flagman or Traffic Light Ahead

✓Cones with reflectors start 50m before works location.

✓Signage after road words will indicate 'No Overtaking Ends' and ' End of Road Works'.

✓Traffic entering and exiting existing secondary road will continue as normal with construction traffic kept to a minimum.

✓See attached generic shuttle layout system for one-way stop and go. This shuttle layout will be set up onsite by the qualified signing lighting and guarding officer.

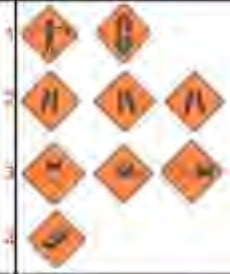

Advance Distance (D)
45° Taper
Longways Safety Zone (L)
Sideways (lateral) Safety Zone (S)
Works Area
Exit Taper
3.0 - 3.7m normal
2.5 minimum
20m
Where Width Allows
20-50 meters
Place Opposite
Advance Distance (D)
Críoch END
Generic Shuttle Layout

ROUTINE WORKS TRAFFIC MANAGEMENT DESIGN

SHUTTLE CONTROL SELECTION

Method	Max Speed Limit (km/h)	Length of Works (m)	Max Traffic (veh/hr)	3 Min Count	Notes	
All Stop	100	n/a	300	15	5-10 mins max.	
Give and Take	50	50	400	20	Clear Visibility required from both directions	
Priority	100	80	840	42	Speed Limit	Distance
	These Distances indicate the clear visibility distance from before an obstruction to a point an equal distance beyond the obstruction. If used at night, will require a warning beacon.				50 km/h	60m
					60 km/h	70m
					80 km/h	80m
					100 km/h	100m
Stop/Go	100	20	500	25	Can be Single Man/Single Sign	
	100	100	1400	70	Can be single Man-Auto Sign	
	100	200	1250	63	Can be single Man-Auto Sign	
	100	300	1050	53	Has to be Two Man-Two Sign	
	100	400	950	48	Has to be Two Man-Two Sign	
	100	500	850	43	Has to be Two Man-Two Sign	
Traffic Lights	100	500	n/a	n/a	Vehicle Actuated	

NOTE: WHEN USING SHUTTLE CONTROL, TAPERS ARE AT 45 DEGREES

Advance Signs	Warn	r.w.a.			road works ahead
	Inform	t.m.	Priority 1, 2, 3, 4		traffic management
	Direct	n.o.			no overtaking
For Advance Signs Space Signs evenly through the advance sign distance					
Works Signs	Direct	select appropriate			
End Signs	End				

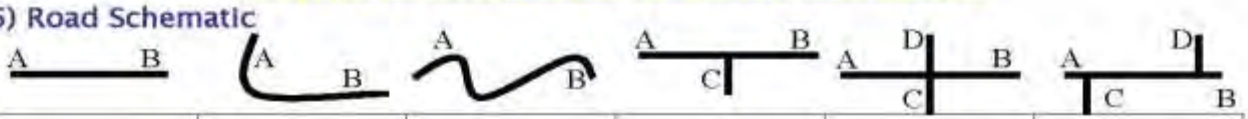
LAYOUT PARAMETER SELECTION SHEET

Type of Road	Advance Sign Distance (D) (m)	Min No. & Type Of Advance Signs In Sequence	Min clear visibility of Signs (m)	Min size of signs (mm)	Min height of cones (mm)	Long. Safety Zone (L) (m)	Side. Safety Zone (S) (m)	Long. Cone Space	Long. Lamp Space	Lane Taper Multiply factor	Taper Cone Spacing	Taper Lamp Spacing	Lead-in cone tapers (See Notes below) Recommended lengths	Width of hazard (including safety zone) NOTE: TAPERS ARE ONLY WHERE TWO WAY TRAFFIC MAINTAINED 1 m	2 m	3 m	4 m	Hard Shoulder Taper Multiply factor
Single carriageway road, 30km/h	50	1 (r.w.a.) 1 (t.m.)	50	600	450	5	0.5	6	12	8	3	9	Length of taper (T) in (m)	8	16	24	32	4
													Minimum No. of Cones	4	7	10	12	
													Minimum No. of Lamps	2	3	4	5	
Single carriageway 50km/h	50	1 (r.w.a.) 1 (t.m.)	50	600	450	5	0.5	6	12	8	3	9	Length of taper (T) in (m)	8	16	24	32	4
													Minimum No. of Cones	4	7	10	12	
													Minimum No. of Lamps	2	3	4	5	
Single Carriageway 80km/h	600	1 (r.w.a.) 1 (n.o.) 1 (t.m.)	90	750* 900*	750	45	1.2	12	24	35	2.5	9	Length of taper (T) in (m)	35	70	105	140	20
													Minimum No. of Cones	16	30	44	58	
													Minimum No. of Lamps	5	9	13	17	
Single Carriageway 100 km/h	800	1 (r.w.a.) 1 (n.o.) 2 (t.m.)	120	750* 900*	750	60	1.2	12	24	40	1	9	Length of taper (T) in (m)	40	80	120	160	20
													Minimum No. of Cones	42	82	122	162	
													Minimum No. of Lamps	6	10	15	19	
Dual Carriageway 60 km/h	600	1 (r.w.a.) 2 (t.m.) X 2	50	900	450	5	0.5	6	12	8	3	9	Length of taper (T) in (m)	8	16	24	32	4
													Minimum No. of Cones	4	7	10	12	
													Minimum No. of Lamps	2	3	4	5	
Dual Carriageway 80 km/h	600	1 (r.w.a.) 2 (t.m.) X 2	90	900	750	45	0.75	12	24	35	3	9	Length of taper (T) in (m)	35	70	105	140	10
													Minimum No. of Cones	13	25	37	48	
													Minimum No. of Lamps	5	9	13	17	
Dual Carriageway 100 km/h	1000	2 (r.w.a.) 3 (t.m.) X 2	120	1200	750	45	1.2	12	24	40	1	9	Length of taper (T) in (m)	40	80	120	160	20
													Minimum No. of Cones	42	82	122	162	
													Minimum No. of Lamps	6	10	15	19	

* Use 750mm signs where Vehicles Per Day < 5,000. Use 900mm signs where Vehicles Per Day > 5,000

TRAFFIC MANAGEMENT PLAN FOR ROUTINE WORKS

5) Road Schematic



6) Traffic Management Selection

6.1) Classification	Road Type	Road Width	Speed Limit	Urban/Rural	Traffic
					Heavy/ Light

6.2) Selection	All Stop	Give & Take	Priority	Stop/ Go	Lights	Tapers

6.3) Semi-Static	Will Semi-Static Management be used?	Yes		No	

7) Signage (Warn / Inform / Direct / End)

No	Sign	Dir	No	Sign	Dir	No	Sign	Dir	No	Sign	Dir
1	SELECT PLATE BELOW	A B C D	6		A B C D	11		A B C D	16	Pedestrian Barrier	A B C D
1 + 2 ARE SEMI-STATIC	Deisiú Bóthair ROAD REPAIRS Oibreacha Draenáil DRAINAGE WORKS Bearradh Fál HEDGE CUTTING		7		A B C D	12		A B C D	17		A B C D
2	2 km ar fad FOR 2 km	A B C D	8		A B C D	13		A B C D	18		A B C D
3		A B C D	9	YIELD (Priority)	A B C D	14	Barrier Board	A B C D	19		A B C D
5		A B C D	10		A B C D	15		A B C D	20	Críoch END	A B C D
If Using Traffic Lights/ Stop-Go, Have Gardai Been Notified?										YES	NO
Are All Required Cones /(Lamps & Beacons) In Place (and operating)?										YES	NO

8) Workforce Induction & Communication

8.1) Has this Plan been Communicated to the workforce and does everyone know their role? Operatives to Sign Below	Yes		No	

8.2) Supervisor	

NOTIFICATION OF POSITIVE TRAFFIC CONTROL

Under the following Road Traffic Acts/Regulations

- Section 37 of the Road Traffic Act, 1994
- Road Traffic (Signs) Regulations 2006 (S.I. No. 637 of 2006)
- Road Traffic (Control of Traffic) Regulations 2006 (S.I. No. 638 of 2006)

The Roads Authority of

Hereby notifies

Of the use of

TEMPORARY TRAFFIC LIGHTS ☐

STOP-GO BOARD(s) ☐

at the following location:

Road

From a point

To a point

ON/ BETWEEN (delete as appropriate) the following dates

and

Observations (if any) should be faxed to:

Signed: ______________________________

On behalf of the Roads Authority

PLANNED WORKS TRAFFIC MANAGEMENT SITE INSPECTION SHEET

PROJECT NAME:				Phase:	
Date:		Time:	1).		2).

1) TRAFFIC MANAGEMENT SET-UP/ MODIFICATION, INSPECTIONS

1-1) Installation Checks	
Does the Traffic Management conform to the Design Layout and Parameters?	
Have all hazards been addressed in the Traffic Management Plan?	
Has allowance been made for the delivery and removal of materials?	
Have Gardaí been informed of any Traffic Lights/ Stop-Go Boards in use?	
Have Gardaí been informed of Roadworks Speed limits being introduced?	

2) TRAFFIC MANAGEMENT OPERATION INSPECTIONS

2-1) Operation Checks	1	2
Are Safety Zones being kept clear of operatives, plant and materials?		
Are all the signs in good condition/ are all cones in good condition with sleeves?		
Are sign vision lines free from bends, hills/dips in the road, parked vehicles, hedges etc?		
Will the site be safe at night or in wind, fog, snow or rain? (delete as appropriate)		
Are all misleading permanent signs and road markings covered?		
Is the carriageway/footway being kept clear of mud and surplus equipment?		
Are materials/ plant that are left on verges or lay-bys being properly guarded and lit?		
2-2) Traffic Checks		
Is there safe access to adjacent premises?		
Does Signing and Guarding meet the (changing) conditions?		
Are traffic control arrangements working at the optimum level to reduce traffic delays?		
If present, are the needs of cyclists or horse riders incorporated into the layout?		
2-3) Pedestrian & Vulnerable Road User Checks		
Have the needs of pedestrians & vulnerable road users been addressed in the layout?		
If pedestrian route blocked, has a suitable alternative route been provided?		
Are pedestrian routes clearly evident/ indicated?		
If a footway in the road is to be used, are ramps to the kerb provided?		
Are pedestrian hazards sufficiently GUARDED at night?		

3) TRAFFIC MANAGEMENT CESSATION INPECTIONS

3-1) Works Complete Checks	
Have all signs, cones, barriers, and lamps been removed?	
Have any covered permanent signs been restored?	
Have Gardaí been informed that Speedlimits/ Traffic Signals/ Stop-Go removed?	

4) EXCEPTIONS REPORT
(Append attachments as necessary)

Check Completed By:	

PROJECT CLOSEOUT SHEET	
PROJECT NAME:	

1) Procedures	
The extents of construction have been completed per the plans	
Pavement Surface has been visually inspected and deemed satisfactory (incl. sweeping of surfaces that have been surface dressed)	
Temporary Traffic Management arrangements (incl. Orders) have been removed	
Any Permanent Road Markings, Road Studs, and Signs have been installed	
2) Works Extents	
The length of work completed was (m)	
The average width of work completed was (m)	
3) Appointments	
PSDP appointment terminated	
Designer appointment terminated	
PSCS appointment terminated	
Contractor given completion certificate	
4) Records	
The safety file is complete and will be stored	
5) Site Inspection	
The site has been inspected by (print name) and deemed to be satisfactory:	
Signature:	
Date of inspection:	

6) Procedure Monitoring (to be completed by supervisor of person listed in 5 above)	
I recommend that the Project be deemed complete (print name)	
Signature:	
Date:	

MCE Ltd.

Civil & Electrical Engineering Specialists

INCIDENT/ ACCIDENT REPORT FORM

1) Job Details

1.1) Job Name	
1.2) Job Location	

2) Incident

2.1) Date of Incident		2.2) Time of Incident	

2.3) Incident Involves	Public	Layout	Operatives	Plant	Materials	Hired	Contractor	Environment

2.4) Incident Classification	Class 1		Class 2		Class3	Class 4	
	Long Traffic Delays	Pedestrian Danger	Near Miss	Minor Injury	3 Day Injury	Road Traffic Accident	Serious Injury or Death

2.5) Weather Conditions						
Light:	Sunny	Cloudy	Fog	Dawn/Dusk	Night	Floodlit
Rain:	Dry	Light Rain	Heavy Rain	Hailstones	Snow	
Wind:	No Wind	Breeze	Windy	Gale		
Temperature:	Warm	Cold	Freezing			

2.6) Locus	Carriageway	Footpath	Safety Zone	Working Space

2.7) Pavement Condition	Clean	Dirty	Dry	Wet	Granular	Wearing	Base	Chips	Markings

2.8) Number involved (Class 2 or greater)	

3) Traffic Management

	N/A	Yes	No
3.1) Were the appropriate signs in their correct place?			
3.2) Were the signs in a good condition?			
3.3) Were all cones in place and in good condition?			
3.4) Were all TM Lamps in place and operating?			
3.5) Were all TM Beacons in place and operating?			
3.6) Were Plant Hazard Beacons operating?			

4) Site Health and Safety

	N/A	Yes	No
4.1) Had operative appropriate CSCS card?			
4.2) Had plant/ equipment been checked for suitability?			
4.3) Were Safety Guards in place and in good condition?			
4.4) Were correct operating procedures/ guidelines used?			
4.5) Were operatives wearing appropriate PPE?			
4.6) Was there good housekeeping on site?			

5) Emergency Procedure

5.1) Services	None	First Aid	Driven to Aid	Ambulance	Fire Brigade	Gardai

5.2) Procedure		Good	Bad	None
	Training			
	Equipment			

6) Operatives (List operatives on site at time of incident)

7) Incident Description

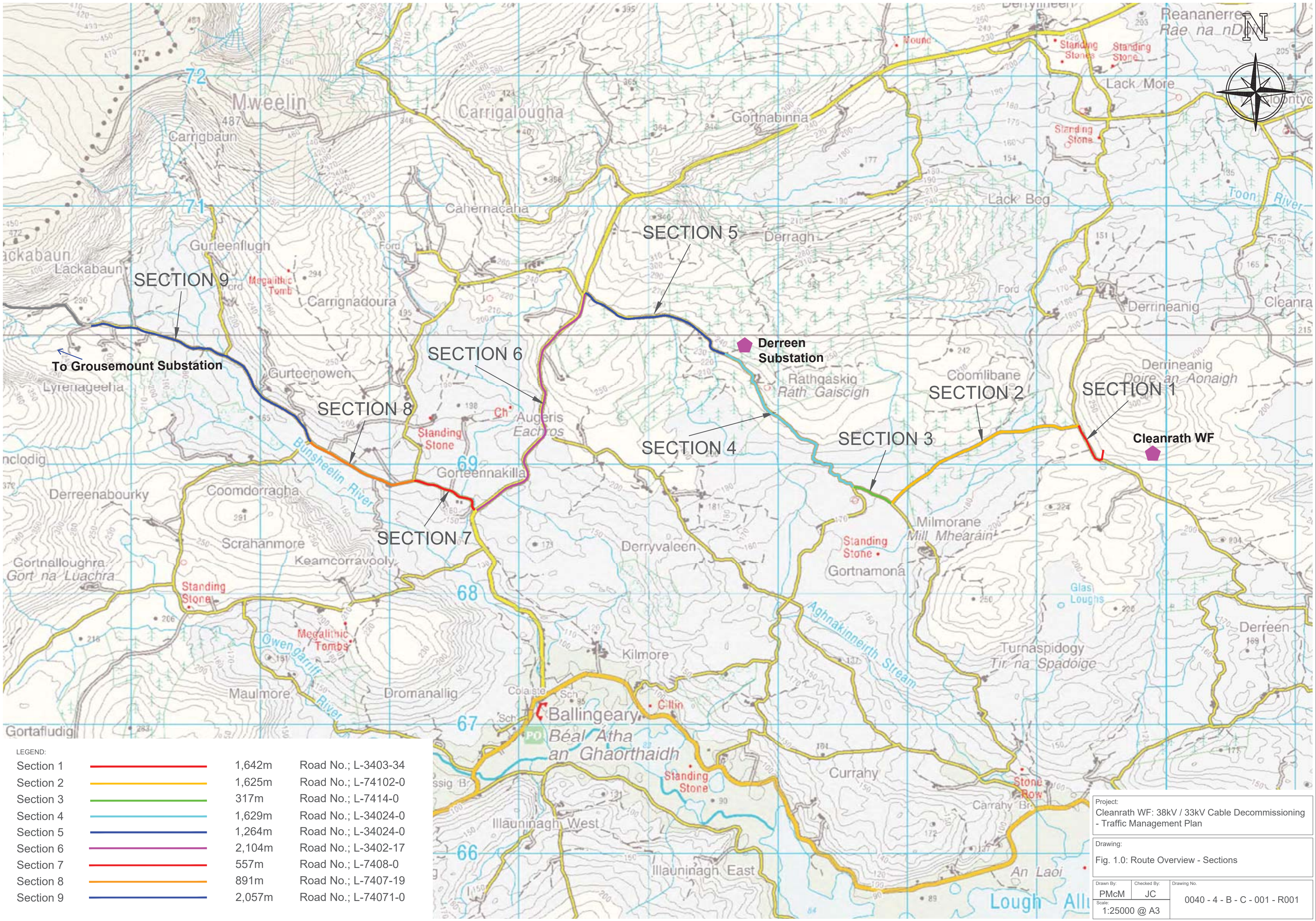
8) Suggested Control Measures to Prevent Re-Occurance

9) Incident Sketch

10) Report Completed By:		11) Report Noted By:	

MCE – Cleanrath WF Traffic Management Plan

	Name (Print)	Signature	I understand the details in the traffic management plan and agree to sign off (tick)	Date
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				



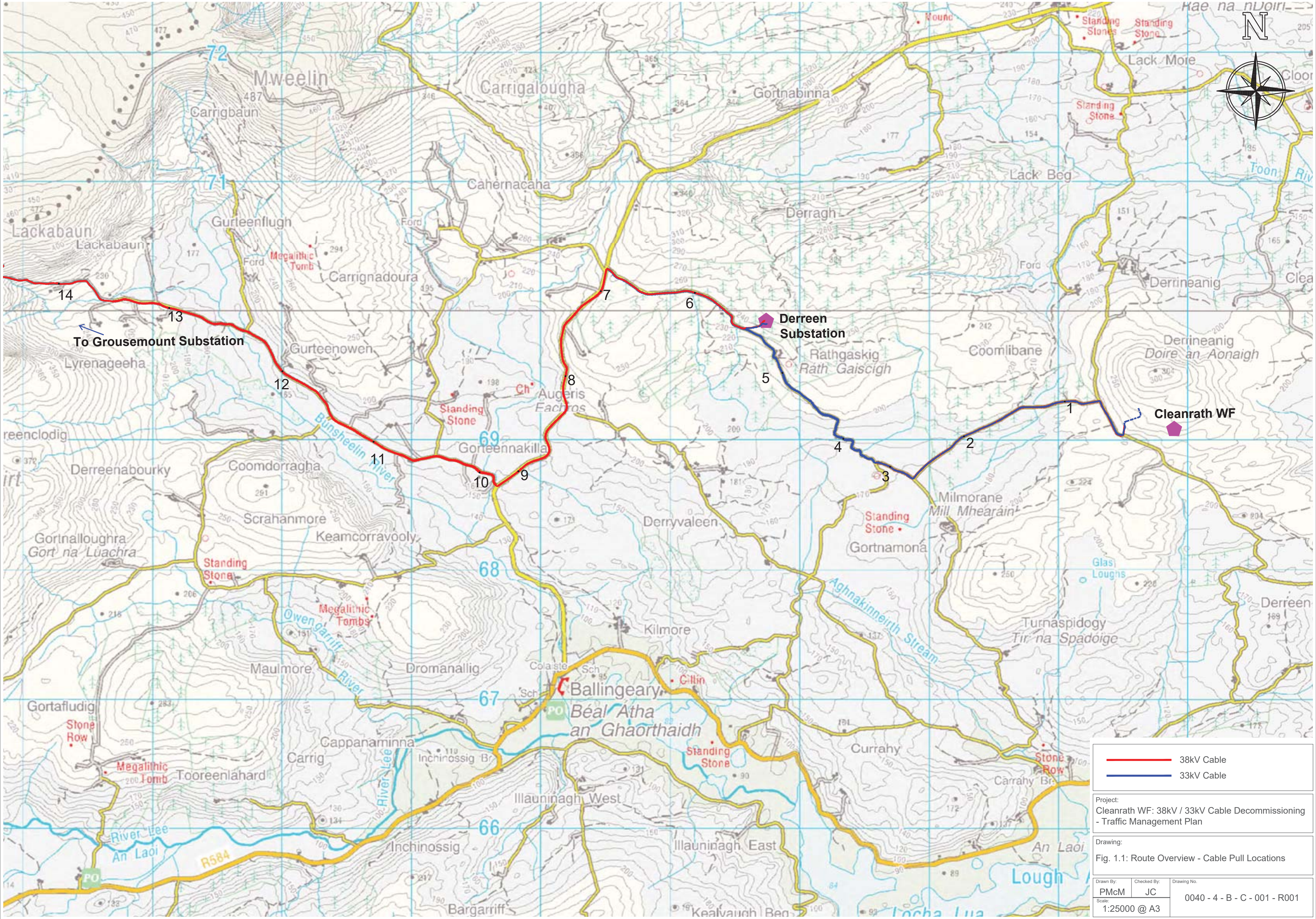
LEGEND:

Section 1		1,642m	Road No.; L-3403-34
Section 2		1,625m	Road No.; L-74102-0
Section 3		317m	Road No.; L-7414-0
Section 4		1,629m	Road No.; L-34024-0
Section 5		1,264m	Road No.; L-34024-0
Section 6		2,104m	Road No.; L-3402-17
Section 7		557m	Road No.; L-7408-0
Section 8		891m	Road No.; L-7407-19
Section 9		2,057m	Road No.; L-74071-0

Project:
Cleanrath WF: 38kV / 33kV Cable Decommissioning - Traffic Management Plan

Drawing:
Fig. 1.0: Route Overview - Sections

Drawn By:	Checked By:	Drawing No.
PMcM	JC	0040 - 4 - B - C - 001 - R001
Scale: 1:25000 @ A3		

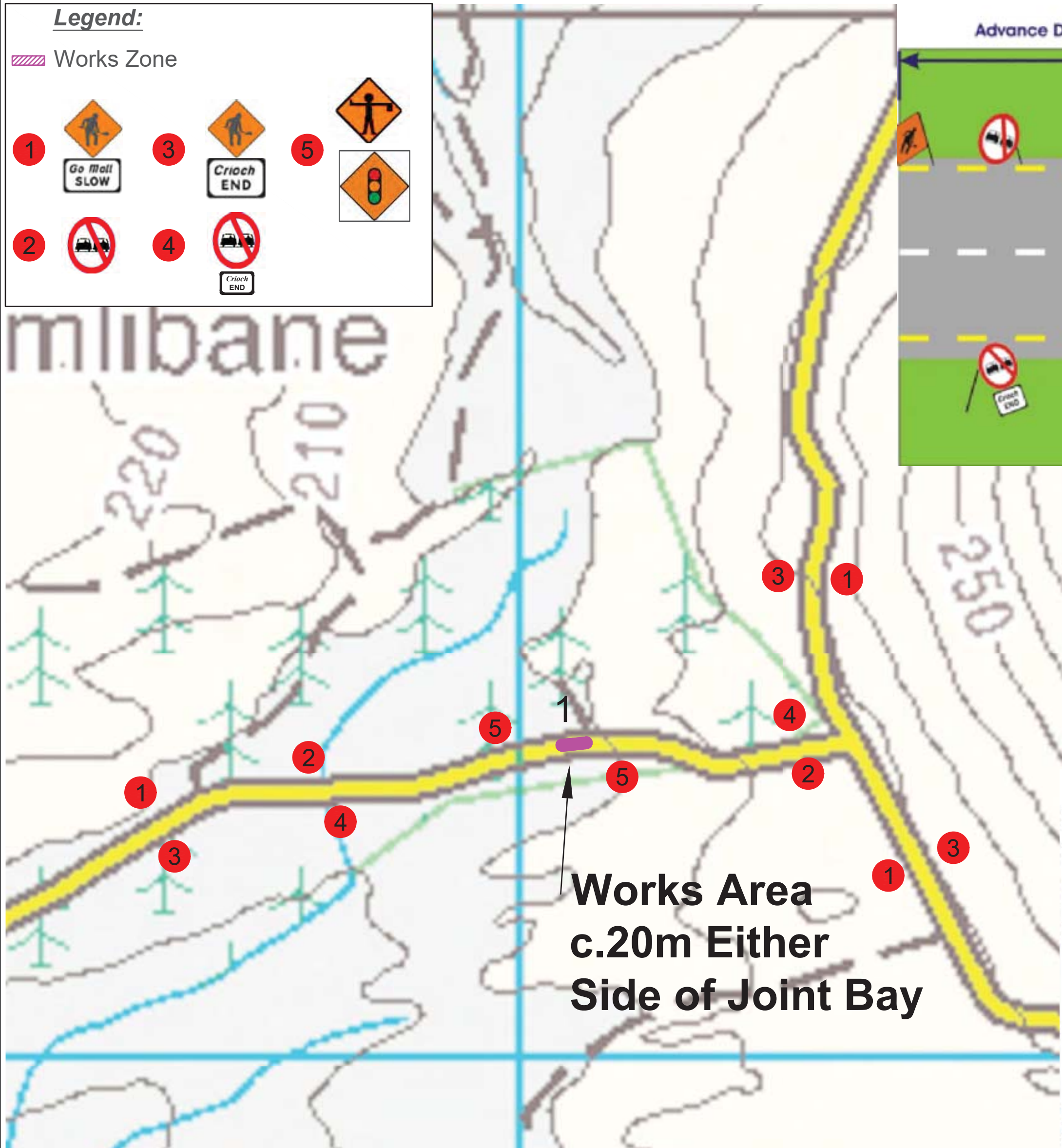


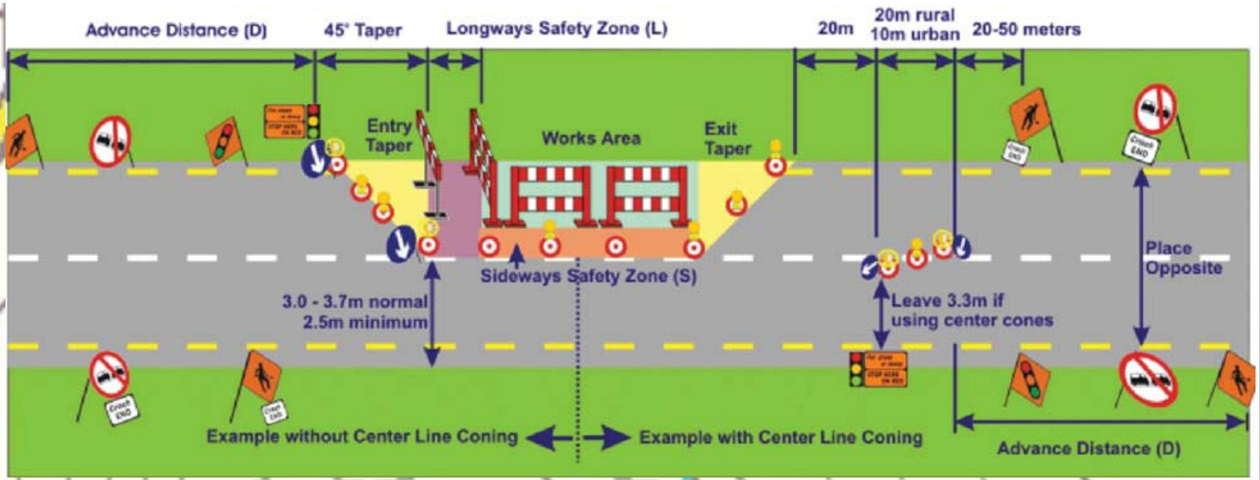
38kV Cable	
33kV Cable	

Project:
Cleanrath WF: 38kV / 33kV Cable Decommissioning - Traffic Management Plan

Drawing:
Fig. 1.1: Route Overview - Cable Pull Locations

Drawn By:	Checked By:	Drawing No.
PMcM	JC	0040 - 4 - B - C - 001 - R001
Scale: 1:25000 @ A3		





TM (A) Traffic Lights OR Flagman

Date: 23/07/2020 **Author:** PMcM **Scale:** 1:5000 @ A3

Project: Cleanrath Wind Farm 38kV / 33kV Cable Decommissioning

Example: Typical Scenario **Works Type:** Type A **Visibility:** 200m

Approach Sign: 3 **Sign Spacing:** 200m **Lane Taper:** 45-Degrees

Longitudinal Safety Zone: 45m **Side Safety Zone:** 1.2m @ Taper: 1-3m

Min Size of Cones & Signs: 750mm

Note: Sign No.5 will either be Flagman or Traffic Light.

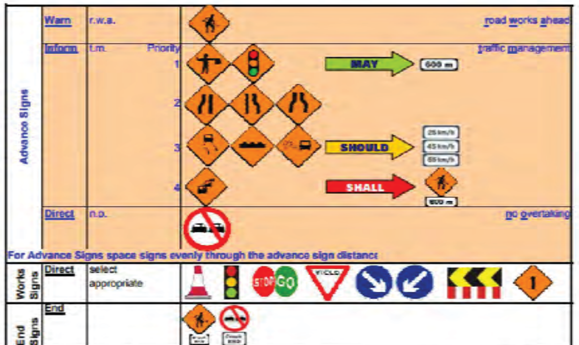
Figure 2.0 - Section 2 Pull Location 1 **Dwg:** 0040 - 4 - B - C - 001 - R001

Guidance for the Control and Management of Traffic at Roadworks. Second Edition - 2010

ROUTINE WORKS TRAFFIC MANAGEMENT DESIGN

SHUTTLE CONTROL SELECTION

Method	Max. Speed Limit	Length of Works (m)	Max. Traffic (veh/hr)	3 Minute Count	Notes	
All Stop	100	n/a	300	15	5-10 mins max.	
Give & Take	50	50	400	20	Clear Visibility required from both directions	
Priority	100	80	850	43	Speed Limit	Clear vis. Distance D
	clear visibility distance before and after works				50 km/h	60 m
	If used at night, will require flashing lamps				60 km/h	70 m
					80 km/h	80 m
					100 km/h	100 m
Stop/Go	100	20	500	25	Can be one person/Single Sign	
	100	100	1400	70	Can be one person-Auto Sign	
	100	200	1250	63	Can be one person-Auto Sign	
	100	300	1050	53	Has to be two people-Two Sign	
	100	400	950	48	Has to be two people-Two Sign	
	100	500	850	43	Has to be two people-Two Sign	
Traffic Lights	100	500	n/a	n/a	Vehicle Actuated preferred	

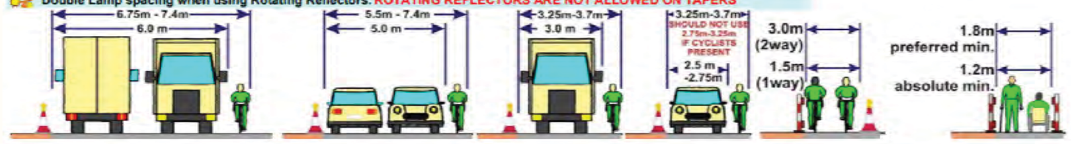


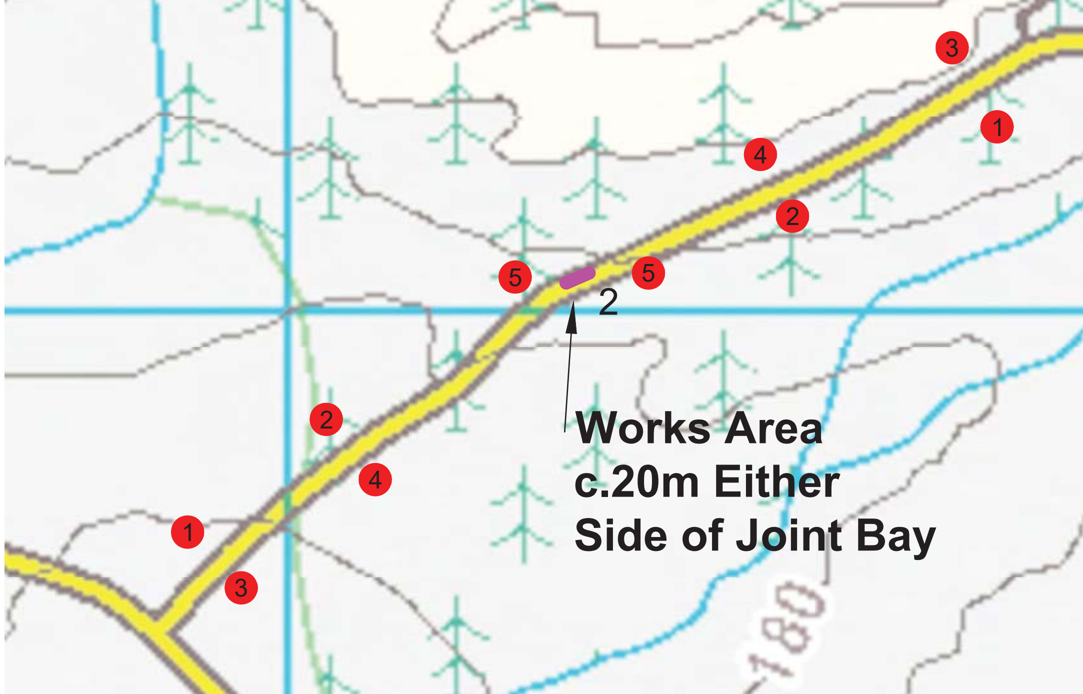
LAYOUT PARAMETER SELECTION SHEET

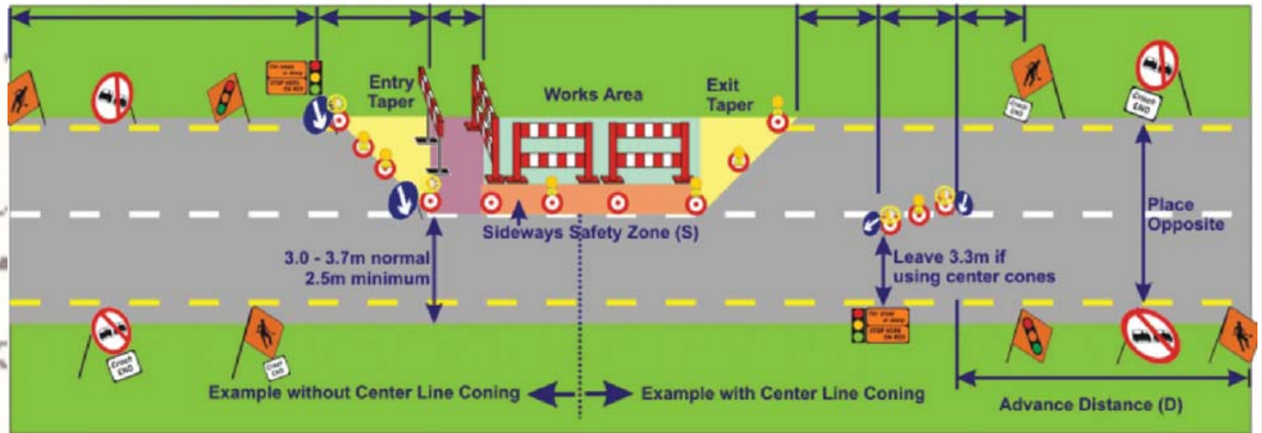
Type of Road	Advance sign distance (D) (m)	Min. no. & type of advance signs in sequence	Min. clear visibility of signs (m)	Min. size of signs (mm)	Min. height of cones (mm)	Long. safety zone (L) (m)	Side safety zone (S) (m)	Long. cone space (m)	Long. lamp space (m)	2-way taper multiply factor	Taper cone spacing (m)	Taper lamp spacing (m)	Lead-in cone tapers (See Notes below) Recommended lengths. SHUTTLE TAPERS = 45°	Width of hazard (including safety zone) NOTE: TAPERS ARE ONLY WHERE TWO WAY TRAFFIC MAINTAINED 1 m	2 m	3 m	4 m	Hard shoulder taper multiply factor
Single Carriageway, 60km/h	50	1 (r.w.a.) 1 (t.m.)	50	600	750	5	0.5	6	12	5	3 45°=1	6	Length of taper (T) in (m) Minimum No. of Cones Minimum No. of Lamps	5 3 2	10 5 3	15 7 4	20 8 5	5
Single Carriageway 100km/h	600	1 (r.w.a.) 1 (n.o.) 1 (t.m.)	120	600* 750*	750	45	1.2	12	12	40	3 45°=1	6	Length of taper (T) in (m) Minimum No. of Cones Minimum No. of Lamps	40 15 8	80 28 15	120 42 22	160 55 28	20

* Use 600mm signs where Vehicles Per Day < 5,000. Use 750mm signs where Vehicles Per Day > 5,000

Double Lamp spacing when using Rotating Reflectors. ROTATING REFLECTORS ARE NOT ALLOWED ON TAPERS





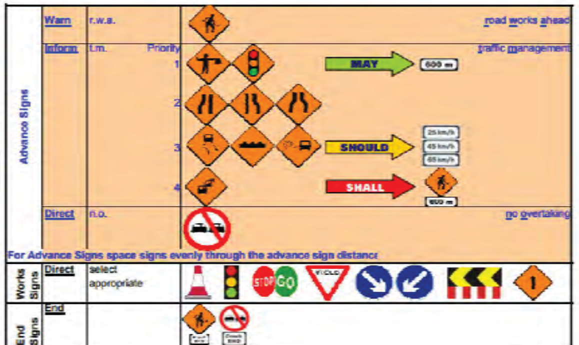


Guidance for the Control and Management of Traffic at Roadworks. Second Edition - 2010

ROUTINE WORKS TRAFFIC MANAGEMENT DESIGN

SHUTTLE CONTROL SELECTION

Method	Max. Speed Limit	Length of Works (m)	Max. Traffic (veh/hr)	3 Minute Count	Notes
All Stop	100	n/a	300	15	5-10 mins max.
Give & Take	50	50	400	20	Clear Visibility required from both directions
Priority	100	80	850	43	Speed Limit / Clear vis. Distance D: 50 km/h 60 m; 60 km/h 70 m; 80 km/h 80 m; 100 km/h 100 m
	clear visibility distance before and after works. If used at night, will require flashing lamps				
Stop/Go	100	20	500	25	Can be one person/Single Sign
	100	100	1400	70	Can be one person-Auto Sign
	100	200	1250	63	Can be one person-Auto Sign
	100	300	1050	53	Has to be two people-Two Sign
	100	400	950	48	Has to be two people-Two Sign
	100	500	850	43	Has to be two people-Two Sign
Traffic Lights	100	500	n/a	n/a	Vehicle Actuated preferred

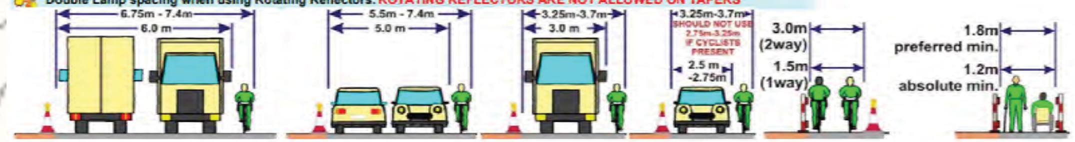


LAYOUT PARAMETER SELECTION SHEET

Type of Road	Advance sign distance (D) (m)	Min. no. & type of advance signs in sequence	Min. clear visibility of signs (m)	Min. size of signs (mm)	Min. height of cones (mm)	Long. safety zone (L) (m)	Side safety zone (S) (m)	Long. cone space (m)	Long. lamp space (m)	2-way taper multiply factor	Taper cone spacing (m)	Taper lamp spacing (m)	Lead-in cone tapers (See Notes below) Recommended lengths. SHUTTLE TAPERS = 45°	Width of hazard (including safety zone) NOTE: TAPERS ARE ONLY WHERE TWO WAY TRAFFIC MAINTAINED 1 m	2 m	3 m	4 m	Hard shoulder taper multiply factor
Single Carriageway, 60km/h	50	1 (r.w.a.) 1 (t.m.)	50	600	750	5	0.5	6	12	5	3 45°=1	6	Length of taper (T) in (m) Minimum No. of Cones Minimum No. of Lamps	5 3 2	10 5 3	15 7 4	20 8 5	5
Single Carriageway 100km/h	600	1 (r.w.a.) 1 (n.o.) 1 (t.m.)	120	600* 750*	750	45	1.2	12	12	40	3 45°=1	6	Length of taper (T) in (m) Minimum No. of Cones Minimum No. of Lamps	40 15 8	80 28 15	120 42 22	160 55 28	20

* Use 600mm signs where Vehicles Per Day < 5,000. Use 750mm signs where Vehicles Per Day > 5,000

Double Lamp spacing when using Rotating Reflectors. ROTATING REFLECTORS ARE NOT ALLOWED ON TAPERS



TM (A) Traffic Lights OR Flagman

Date: 23/07/2020 **Author:** PMcM **Scale:** 1:5000 @ A3

Project: Cleanrath Wind Farm 38kV / 33kV Cable Decommissioning

Example: Typical Scenario **Works Type:** Type A **Visibility:** 200m

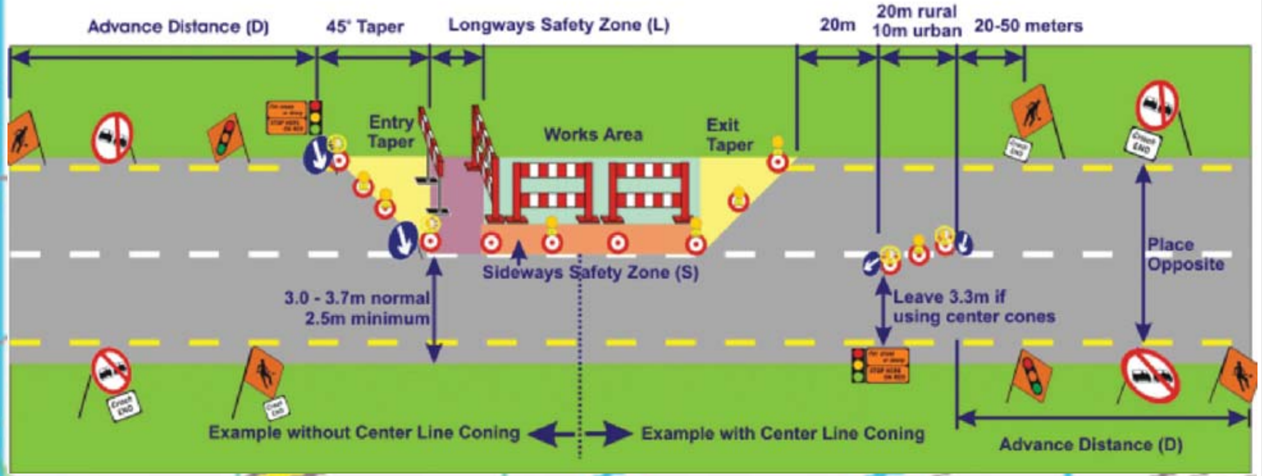
Approach Sign: 3 **Sign Spacing:** 200m **Lane Taper:** 45-Degrees

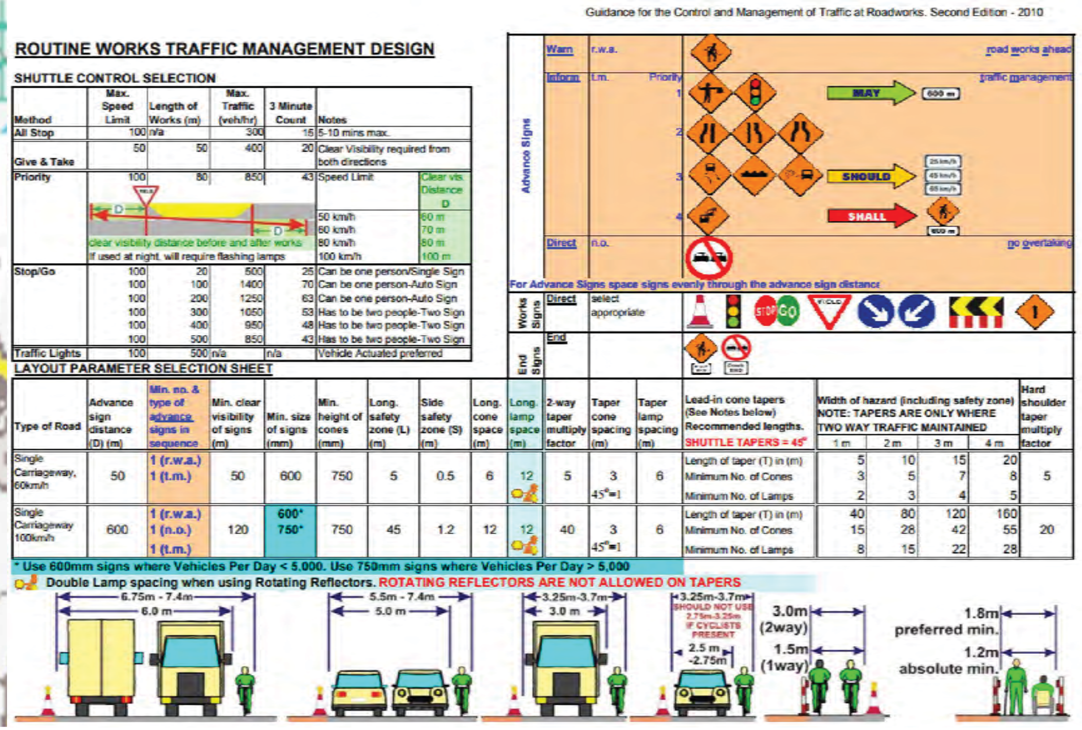
Longitudinal Safety Zone: 45m **Side Safety Zone:** 1.2m @ Taper: 1-3m

Min Size of Cones & Signs: 750mm

Note: Sign No.5 will either be Flagman or Traffic Light.

Figure 3.0 - Section 2 Pull Location 2 **Dwg:** 0040 - 4 - B - C - 001 - R001




Guidance for the Control and Management of Traffic at Roadworks. Second Edition - 2010

ROUTINE WORKS TRAFFIC MANAGEMENT DESIGN

SHUTTLE CONTROL SELECTION

Method	Max. Speed Limit	Length of Works (m)	Max. Traffic (veh/hr)	3 Minute Count	Notes
All Stop	100	n/a	300	15	5-10 mins max.
Give & Take	50	50	400	20	Clear Visibility required from both directions
Priority	100	80	850	43	Speed Limit / Clear vis. Distance D: 50 km/h 60 m; 60 km/h 70 m; 80 km/h 80 m; 100 km/h 100 m
	clear visibility distance before and after works. If used at night, will require flashing lamps				
Stop/Go	100	20	500	25	Can be one person/Single Sign
	100	100	1400	70	Can be one person-Auto Sign
	100	200	1250	63	Can be one person-Auto Sign
	100	300	1050	53	Has to be two people-Two Sign
	100	400	950	48	Has to be two people-Two Sign
	100	500	850	43	Has to be two people-Two Sign
Traffic Lights	100	500	n/a	n/a	Vehicle Actuated preferred

LAYOUT PARAMETER SELECTION SHEET

Type of Road	Advance sign distance (D) (m)	Min. no. & type of advance signs in sequence	Min. clear visibility of signs (m)	Min. size of signs (mm)	Min. height of cones (mm)	Long. safety zone (L) (m)	Side safety zone (S) (m)	Long. cone space (m)	Long. lamp space (m)	2-way taper multiply factor	Taper cone spacing (m)	Taper lamp spacing (m)
Single Carriageway, 60km/h	50	1 (r.w.a.) 1 (t.m.)	50	600	750	5	0.5	6	12	5	3 45°=1	6
Single Carriageway 100km/h	600	1 (r.w.a.) 1 (n.o.) 1 (t.m.)	120	600* 750*	750	45	1.2	12	12	40	3 45°=1	6

Lead-in cone tapers (See Notes below) Recommended lengths. SHUTTLE TAPERS = 45°	Width of hazard (including safety zone) NOTE: TAPERS ARE ONLY WHERE TWO WAY TRAFFIC MAINTAINED 1 m	2 m	3 m	4 m	Hard shoulder taper multiply factor
Length of taper (T) in (m)	5	10	15	20	5
Minimum No. of Cones	3	5	7	8	
Minimum No. of Lamps	2	3	4	5	
Length of taper (T) in (m)	40	80	120	160	20
Minimum No. of Cones	15	28	42	55	
Minimum No. of Lamps	8	15	22	28	

* Use 600mm signs where Vehicles Per Day < 5,000. Use 750mm signs where Vehicles Per Day > 5,000

Double Lamp spacing when using Rotating Reflectors. ROTATING REFLECTORS ARE NOT ALLOWED ON TAPERS

TM (A) Traffic Lights OR Flagman

Date: 23/07/2020 **Author:** PMcM **Scale:** 1:5000 @ A3

Project: Cleanrath Wind Farm 38kV / 33kV Cable Decommissioning

Example: Typical Scenario **Works Type:** Type A **Visibility:** 200m

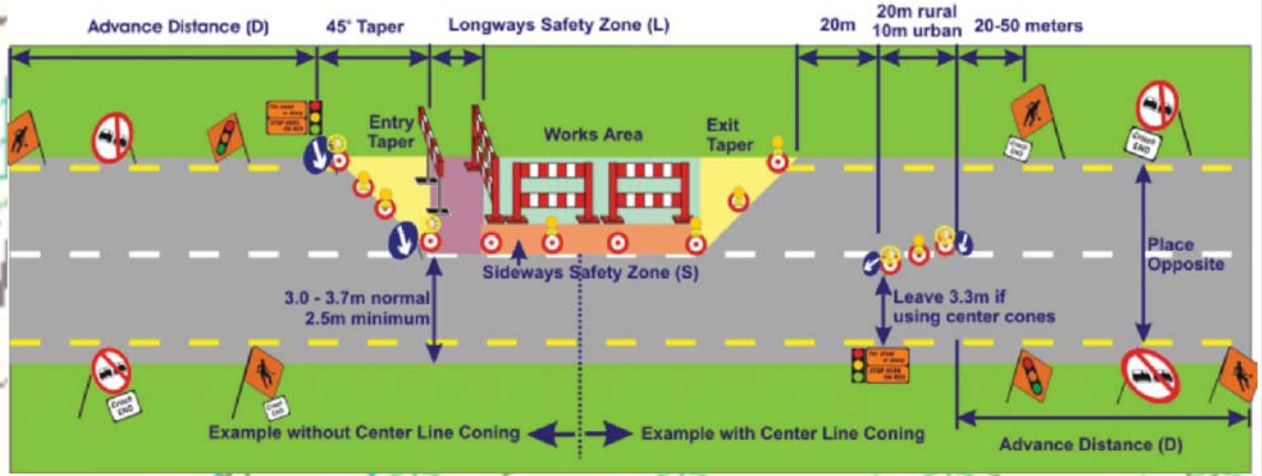
Approach Sign: 3 **Sign Spacing:** 200m **Lane Taper:** 45-Degrees

Longitudinal Safety Zone: 45m **Side Safety Zone:** 1.2m @ Taper: 1-3m

Min Size of Cones & Signs: 750mm

Note: Sign No.5 will either be Flagman or Traffic Light.

Figure 4.0 - Section 3 Pull Location 3 **Dwg:** 0040 - 4 - B - C - 001 - R001

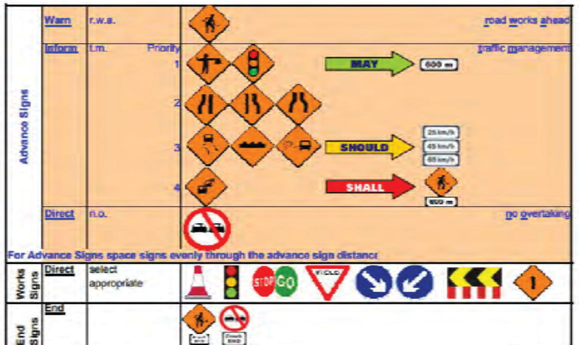


Guidance for the Control and Management of Traffic at Roadworks. Second Edition - 2010

ROUTINE WORKS TRAFFIC MANAGEMENT DESIGN

SHUTTLE CONTROL SELECTION

Method	Max. Speed Limit	Length of Works (m)	Max. Traffic (veh/hr)	3 Minute Count	Notes
All Stop	100	n/a	300	15	5-10 mins max.
Give & Take	50	50	400	20	Clear Visibility required from both directions
Priority	100	80	850	43	Speed Limit / Clear vis. Distance D: 50 km/h 60 m; 60 km/h 70 m; 80 km/h 80 m; 100 km/h 100 m. clear visibility distance before and after works. If used at night, will require flashing lamps
Stop/Go	100	20	500	25	Can be one person/Single Sign
	100	100	1400	70	Can be one person-Auto Sign
	100	200	1250	63	Can be one person-Auto Sign
	100	300	1050	53	Has to be two people-Two Sign
	100	400	950	48	Has to be two people-Two Sign
	100	500	850	43	Has to be two people-Two Sign
Traffic Lights	100	500	n/a	n/a	Vehicle Actuated preferred



LAYOUT PARAMETER SELECTION SHEET

Type of Road	Advance sign distance (D) (m)	Min. no. & type of advance signs in sequence	Min. clear visibility of signs (m)	Min. size of signs (mm)	Min. height of cones (mm)	Long. safety zone (L) (m)	Side safety zone (S) (m)	Long. cone space (m)	Long. lamp space (m)	2-way taper multiply factor	Taper cone spacing (m)	Taper lamp spacing (m)	Lead-in cone tapers (See Notes below) Recommended lengths. SHUTTLE TAPERS = 45°	Width of hazard (including safety zone) NOTE: TAPERS ARE ONLY WHERE TWO WAY TRAFFIC MAINTAINED 1 m	2 m	3 m	4 m	Hard shoulder taper multiply factor
Single Carriageway, 60km/h	50	1 (r.w.a.) 1 (t.m.)	50	600	750	5	0.5	6	12	5	3 45°=1	6	Length of taper (T) in (m)	5	10	15	20	5
													Minimum No. of Cones	3	5	7	8	
													Minimum No. of Lamps	2	3	4	5	
Single Carriageway 100km/h	600	1 (r.w.a.) 1 (n.o.) 1 (t.m.)	120	600* 750*	750	45	1.2	12	12	40	3 45°=1	6	Length of taper (T) in (m)	40	80	120	160	20
													Minimum No. of Cones	15	28	42	55	
													Minimum No. of Lamps	8	15	22	28	

* Use 600mm signs where Vehicles Per Day < 5,000. Use 750mm signs where Vehicles Per Day > 5,000

Double Lamp spacing when using Rotating Reflectors. ROTATING REFLECTORS ARE NOT ALLOWED ON TAPERS

TM (A) Traffic Lights OR Flagman

Date: 23/07/2020 **Author:** PMcM **Scale:** 1:5000 @ A3

Project: Cleanrath Wind Farm 38kV / 33kV Cable Decommissioning

Example: Typical Scenario **Works Type:** Type A **Visibility:** 200m

Approach Sign: 3 **Sign Spacing:** 200m **Lane Taper:** 45-Degrees

Longitudinal Safety Zone: 45m **Side Safety Zone:** 1.2m @ Taper: 1-3m

Min Size of Cones & Signs: 750mm

Note: Sign No.5 will either be Flagman or Traffic Light.

Figure 5.0 - Section 4 Pull Location 4 **Dwg:** 0040 - 4 - B - C - 001 - R001

Legend:

Works Zone

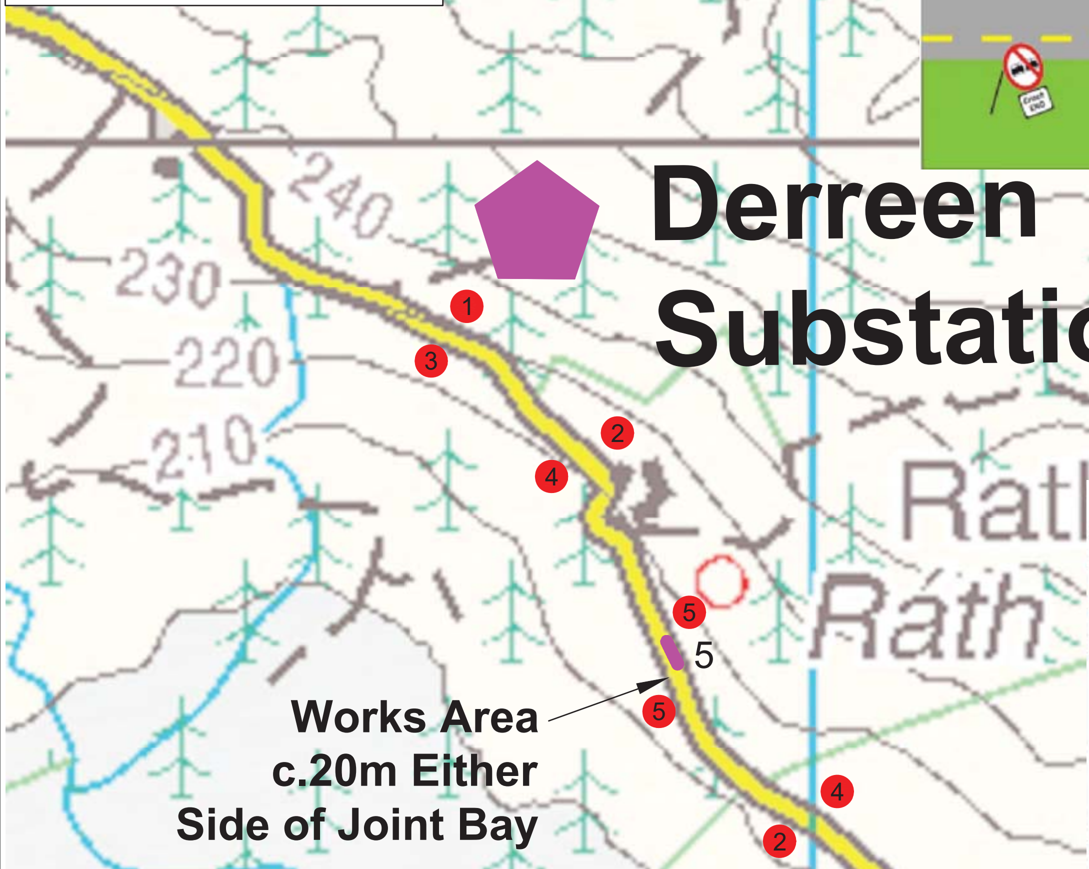
1 Go Mall SLOW

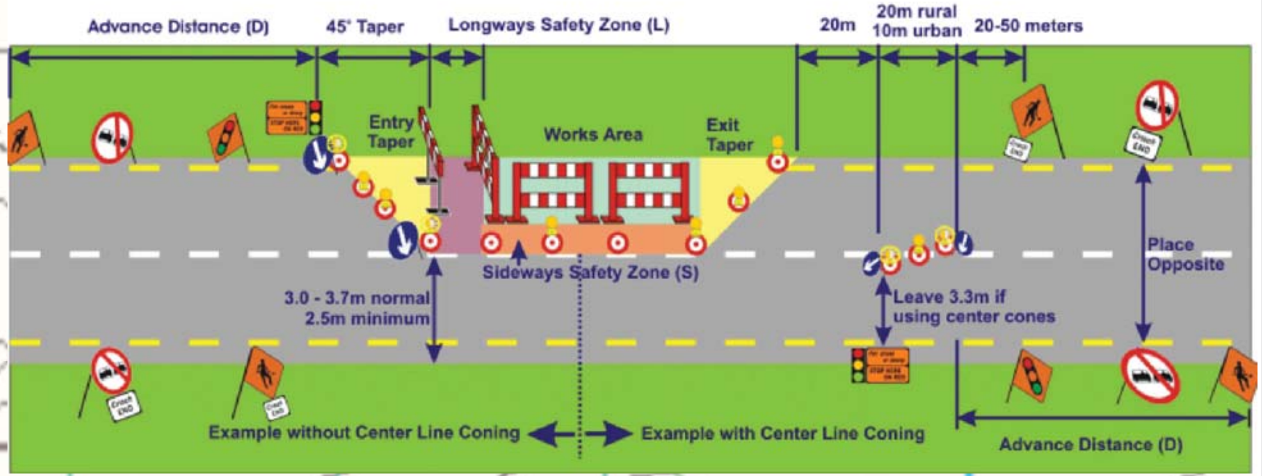
2

3 Críoch END

4 Críoch END

5





TM (A) Traffic Lights OR Flagman

Date: 23/07/2020 **Author:** PMcM **Scale:** 1:5000 @ A3

Project: Cleanrath Wind Farm 38kV / 33kV Cable Decommissioning

Example: Typical Scenario **Works Type:** Type A **Visibility:** 200m

Approach Sign: 3 **Sign Spacing:** 200m **Lane Taper:** 45-Degrees

Longitudinal Safety Zone: 45m **Side Safety Zone:** 1.2m @ Taper: 1-3m

Min Size of Cones & Signs: 750mm

Note: Sign No.5 will either be Flagman or Traffic Light.

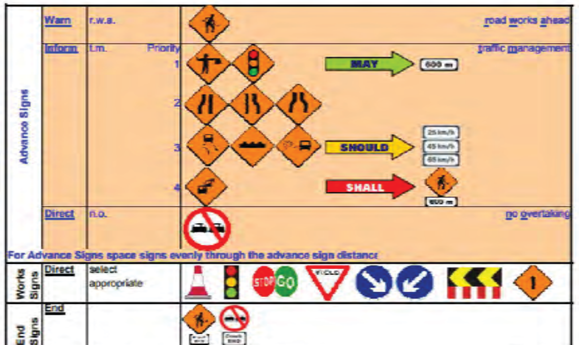
Figure 6.0 - Section 4 Pull Location 5 **Dwg:** 0040 - 4 - B - C - 001 - R001

Guidance for the Control and Management of Traffic at Roadworks. Second Edition - 2010

ROUTINE WORKS TRAFFIC MANAGEMENT DESIGN

SHUTTLE CONTROL SELECTION

Method	Max. Speed Limit	Length of Works (m)	Max. Traffic (veh/hr)	3 Minute Count	Notes	
All Stop	100	n/a	300	15	5-10 mins max.	
Give & Take	50	50	400	20	Clear Visibility required from both directions	
Priority	100	80	850	43	Speed Limit	Clear vis. Distance D
	clear visibility distance before and after works				50 km/h	60 m
	If used at night, will require flashing lamps				60 km/h	70 m
					80 km/h	80 m
					100 km/h	100 m
Stop/Go	100	20	500	25	Can be one person/Single Sign	
	100	100	1400	70	Can be one person-Auto Sign	
	100	200	1250	63	Can be one person-Auto Sign	
	100	300	1050	53	Has to be two people-Two Sign	
	100	400	950	48	Has to be two people-Two Sign	
	100	500	850	43	Has to be two people-Two Sign	
Traffic Lights	100	500	n/a	n/a	Vehicle Actuated preferred	

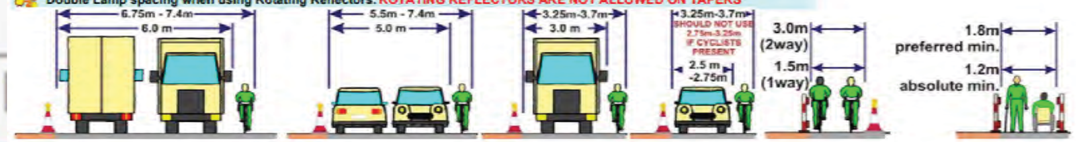


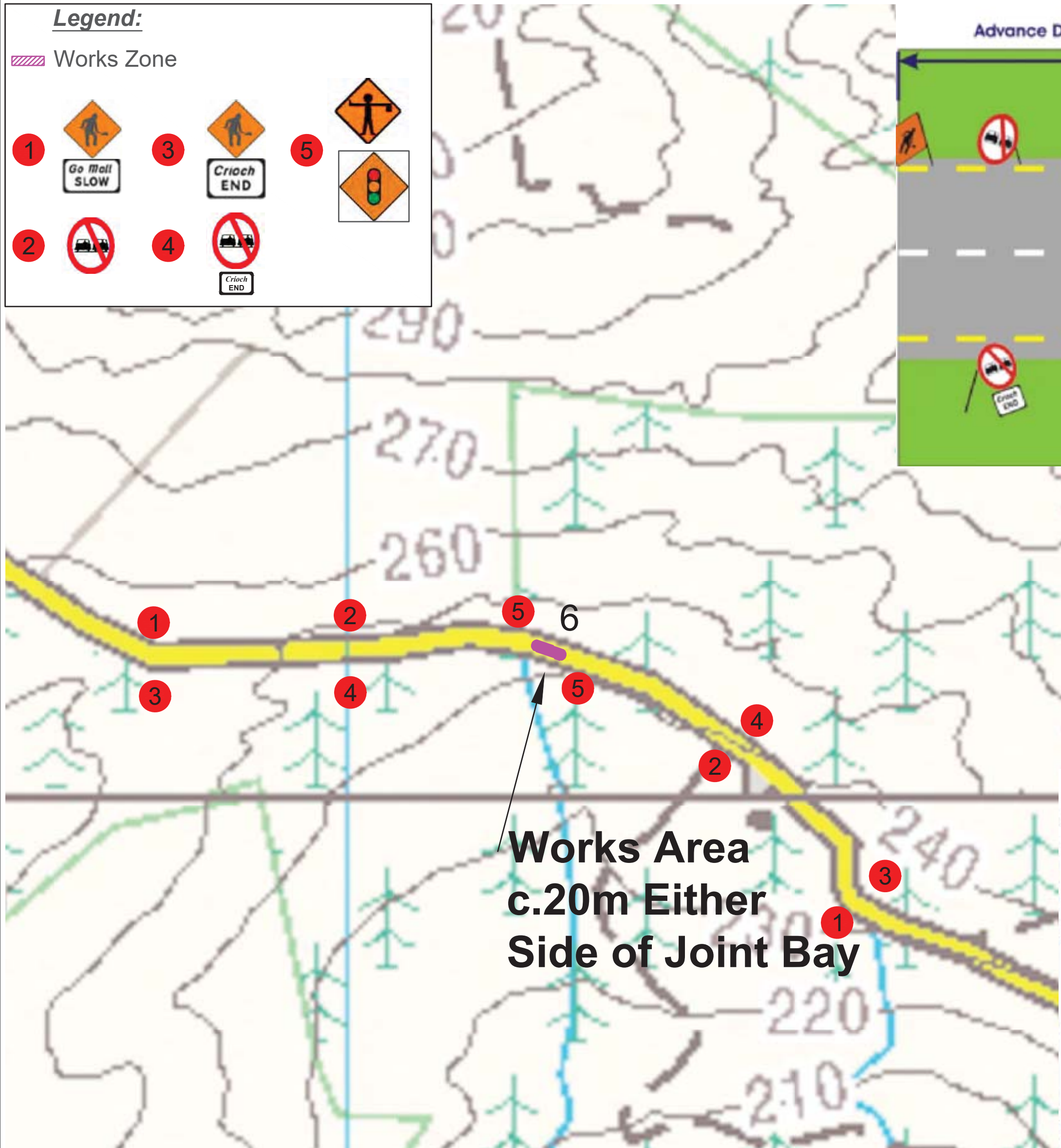
LAYOUT PARAMETER SELECTION SHEET

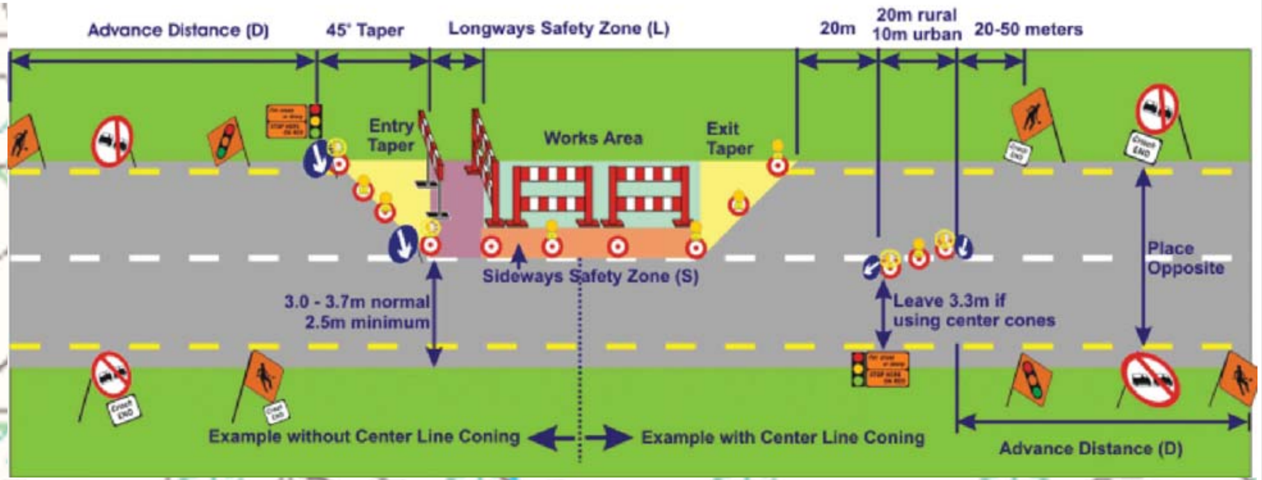
Type of Road	Advance sign distance (D) (m)	Min. no. & type of advance signs in sequence	Min. clear visibility of signs (m)	Min. size of signs (mm)	Min. height of cones (mm)	Long. safety zone (L) (m)	Side safety zone (S) (m)	Long. cone space (m)	Long. lamp space (m)	2-way taper multiply factor	Taper cone spacing (m)	Taper lamp spacing (m)	Lead-in cone tapers (See Notes below) Recommended lengths. SHUTTLE TAPERS = 45°	Width of hazard (including safety zone) NOTE: TAPERS ARE ONLY WHERE TWO WAY TRAFFIC MAINTAINED 1 m	2 m	3 m	4 m	Hard shoulder taper multiply factor
Single Carriageway, 60km/h	50	1 (r.w.a.) 1 (t.m.)	50	600	750	5	0.5	6	12	5	3 45°=1	6	Length of taper (T) in (m)	5	10	15	20	5
													Minimum No. of Cones	3	5	7	8	
													Minimum No. of Lamps	2	3	4	5	
Single Carriageway 100km/h	600	1 (r.w.a.) 1 (n.o.) 1 (t.m.)	120	600* 750*	750	45	1.2	12	12	40	3 45°=1	6	Length of taper (T) in (m)	40	80	120	160	20
													Minimum No. of Cones	15	28	42	55	
													Minimum No. of Lamps	8	15	22	28	

* Use 600mm signs where Vehicles Per Day < 5,000. Use 750mm signs where Vehicles Per Day > 5,000

Double Lamp spacing when using Rotating Reflectors. ROTATING REFLECTORS ARE NOT ALLOWED ON TAPERS







TM (A) Traffic Lights OR Flagman

Date: 23/07/2020 **Author:** PMcM **Scale:** 1:5000 @ A3

Project: Cleanrath Wind Farm 38kV / 33kV Cable Decommissioning

Example: Typical Scenario **Works Type:** Type A **Visibility:** 200m

Approach Sign: 3 **Sign Spacing:** 200m **Lane Taper:** 45-Degrees

Longitudinal Safety Zone: 45m **Side Safety Zone:** 1.2m @ Taper: 1-3m

Min Size of Cones & Signs: 750mm

Note: Sign No.5 will either be Flagman or Traffic Light.

Figure 7.0 - Section 5 Pull Location 6 **Dwg:** 0040 - 4 - B - C - 001 - R001

Guidance for the Control and Management of Traffic at Roadworks. Second Edition - 2010

ROUTINE WORKS TRAFFIC MANAGEMENT DESIGN

SHUTTLE CONTROL SELECTION

Method	Max. Speed Limit	Length of Works (m)	Max. Traffic (veh/hr)	3 Minute Count	Notes
All Stop	100	n/a	300	15	5-10 mins max.
Give & Take	50	50	400	20	Clear Visibility required from both directions
Priority	100	80	850	43	Speed Limit / Clear vis. Distance D: 50 km/h 60 m; 60 km/h 70 m; 80 km/h 80 m; 100 km/h 100 m
	D / D — clear visibility distance before and after works. If used at night, will require flashing lamps				
Stop/Go	100	20	500	25	Can be one person/Single Sign
	100	100	1400	70	Can be one person-Auto Sign
	100	200	1250	63	Can be one person-Auto Sign
	100	300	1050	53	Has to be two people-Two Sign
	100	400	950	48	Has to be two people-Two Sign
	100	500	850	43	Has to be two people-Two Sign
Traffic Lights	100	500	n/a	n/a	Vehicle Actuated preferred

Advance Signs			
Warn	r.w.a.		road works ahead
Inform	t.m.	Priority 1 — MAY (600 m)	traffic management
		2	
		3 — SHOULD (25 km/h, 45 km/h, 65 km/h)	
		4 — SHALL (600 m)	
Direct	n.o.		no overtaking

For Advance Signs space signs evenly through the advance sign distance

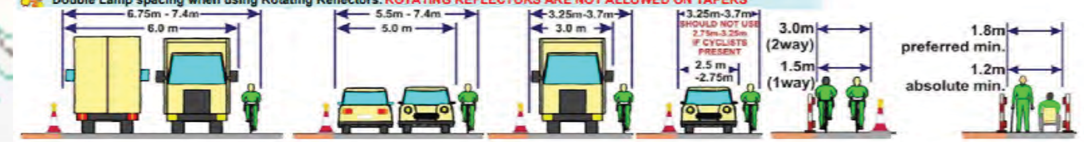
Works Signs	Direct	select appropriate	STOP GO, YIELD
End Signs	End		

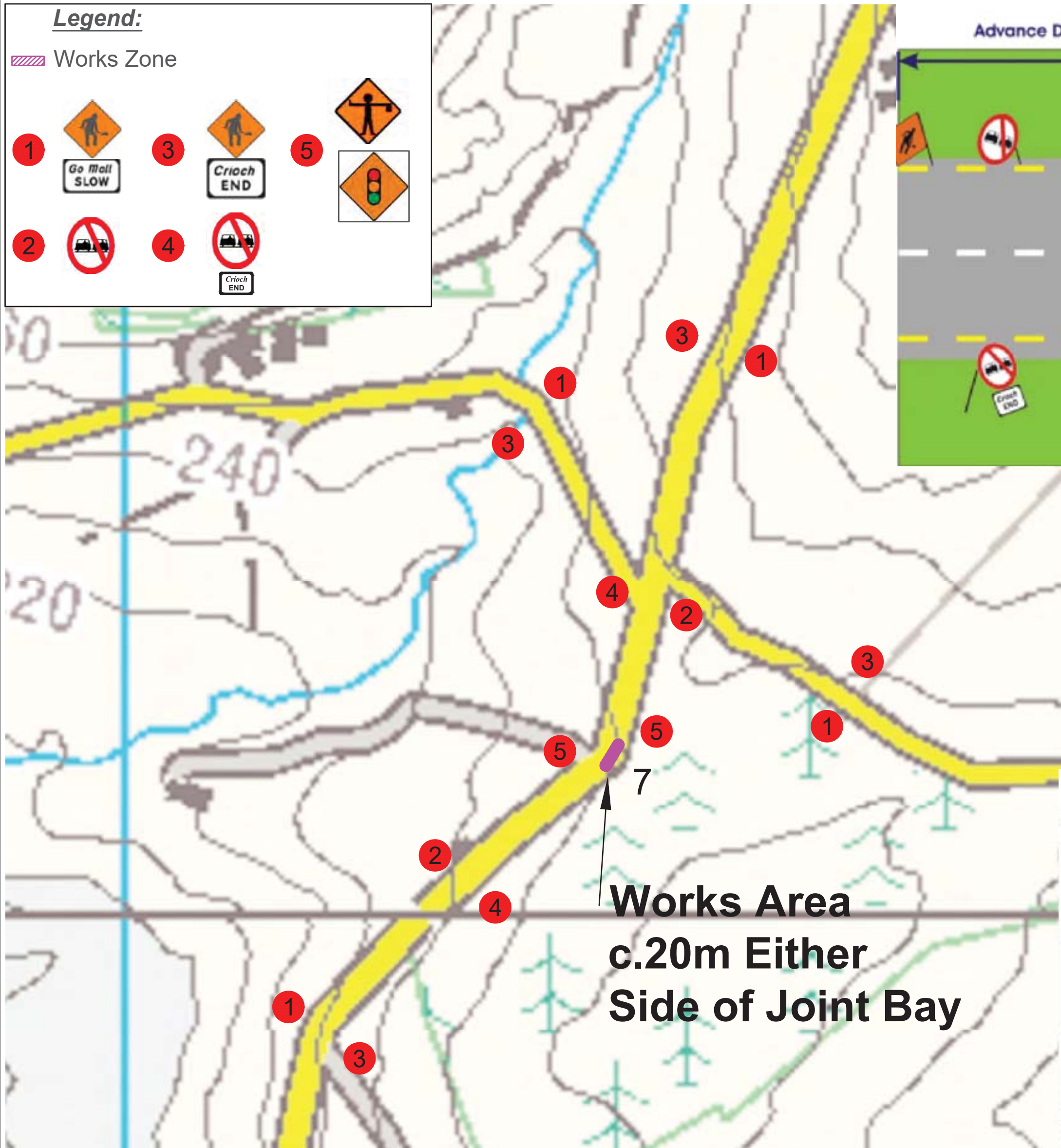
LAYOUT PARAMETER SELECTION SHEET

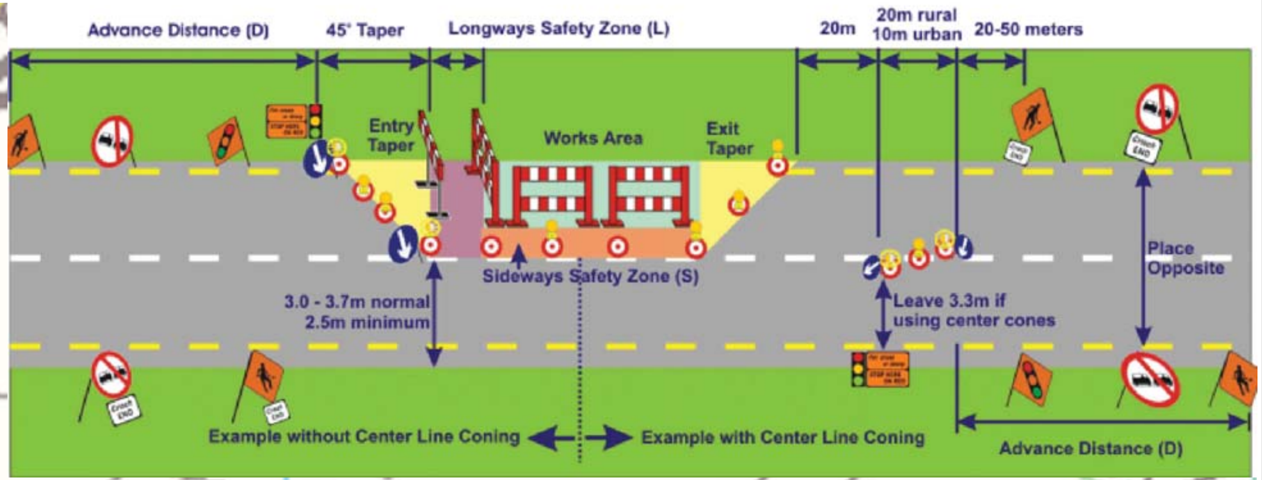
Type of Road	Advance sign distance (D) (m)	Min. no. & type of advance signs in sequence	Min. clear visibility of signs (m)	Min. size of signs (mm)	Min. height of cones (mm)	Long. safety zone (L) (m)	Side safety zone (S) (m)	Long. cone space (m)	Long. lamp space (m)	2-way taper multiply factor	Taper cone spacing (m)	Taper lamp spacing (m)	Lead-in cone tapers (See Notes below) Recommended lengths. SHUTTLE TAPERS = 45°	Width of hazard (including safety zone) NOTE: TAPERS ARE ONLY WHERE TWO WAY TRAFFIC MAINTAINED 1 m	2 m	3 m	4 m	Hard shoulder taper multiply factor
Single Carriageway, 60km/h	50	1 (r.w.a.) 1 (t.m.)	50	600	750	5	0.5	6	12	5	3 45°=1	6	Length of taper (T) in (m) Minimum No. of Cones Minimum No. of Lamps	5 3 2	10 5 3	15 7 4	20 8 5	5
Single Carriageway 100km/h	600	1 (r.w.a.) 1 (n.o.) 1 (t.m.)	120	600* 750*	750	45	1.2	12	12	40	3 45°=1	6	Length of taper (T) in (m) Minimum No. of Cones Minimum No. of Lamps	40 15 8	80 28 15	120 42 22	160 55 28	20

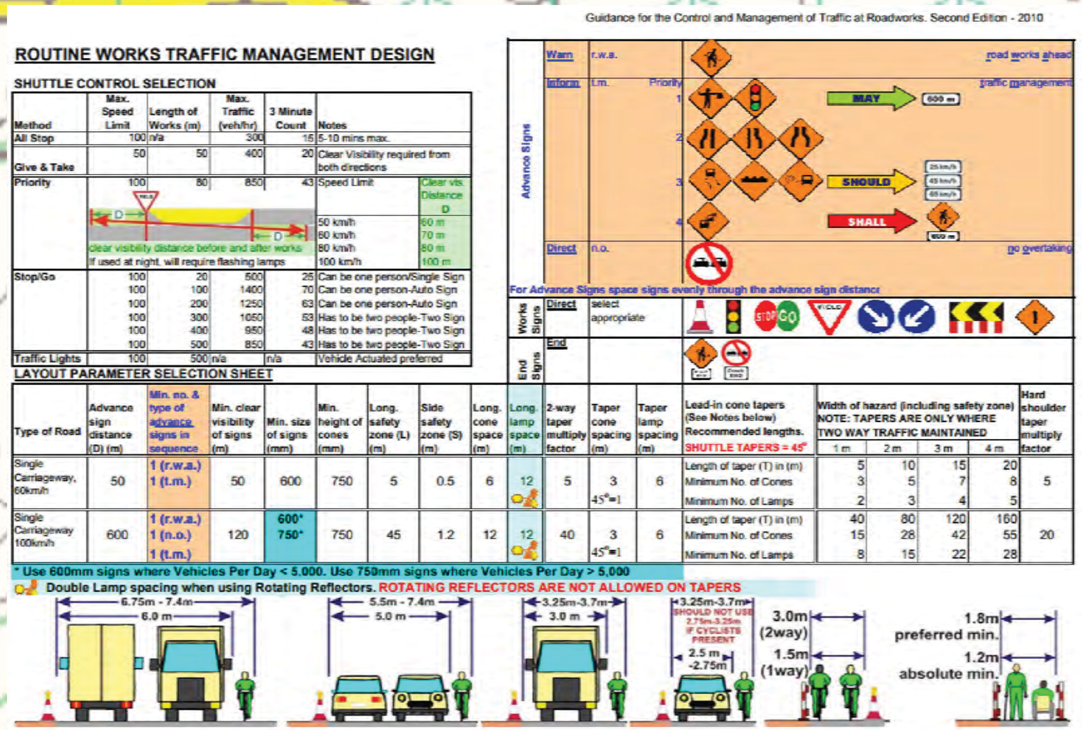
* Use 600mm signs where Vehicles Per Day < 5,000. Use 750mm signs where Vehicles Per Day > 5,000

Double Lamp spacing when using Rotating Reflectors. ROTATING REFLECTORS ARE NOT ALLOWED ON TAPERS









Guidance for the Control and Management of Traffic at Roadworks. Second Edition - 2010

ROUTINE WORKS TRAFFIC MANAGEMENT DESIGN

SHUTTLE CONTROL SELECTION

Method	Max. Speed Limit	Length of Works (m)	Max. Traffic (veh/hr)	3 Minute Count	Notes
All Stop	100	n/a	300	15	5-10 mins max.
Give & Take	50	50	400	20	Clear Visibility required from both directions
Priority	100	80	850	43	Speed Limit / Clear vis. Distance D: 50 km/h 60 m; 60 km/h 70 m; 80 km/h 80 m; 100 km/h 100 m
	clear visibility distance before and after works. If used at night, will require flashing lamps				
Stop/Go	100	20	500	25	Can be one person/Single Sign
	100	100	1400	70	Can be one person-Auto Sign
	100	200	1250	63	Can be one person-Auto Sign
	100	300	1050	53	Has to be two people-Two Sign
	100	400	950	48	Has to be two people-Two Sign
	100	500	850	43	Has to be two people-Two Sign
Traffic Lights	100	500	n/a	n/a	Vehicle Actuated preferred

Advance Signs: Warn — r.w.a. — road works ahead; Inform — t.m. — Priority — traffic management; MAY 600 m; SHOULD; SHALL; Direct — n.o. — no overtaking

For Advance Signs space signs evenly through the advance sign distance

Works Signs: Direct — select appropriate

End Signs: End

LAYOUT PARAMETER SELECTION SHEET

Type of Road	Advance sign distance (D) (m)	Min. no. & type of advance signs in sequence	Min. clear visibility of signs (m)	Min. size of signs (mm)	Min. height of cones (mm)	Long. safety zone (L) (m)	Side safety zone (S) (m)	Long. cone space (m)	Long. lamp space (m)	2-way taper multiply factor	Taper cone spacing (m)	Taper lamp spacing (m)	Lead-in cone tapers (See Notes below) Recommended lengths. SHUTTLE TAPERS = 45°	1 m	2 m	3 m	4 m	Hard shoulder taper multiply factor
Single Carriageway, 60km/h	50	1 (r.w.a.) 1 (t.m.)	50	600	750	5	0.5	6	12	5	3 45°=1	6	Length of taper (T) in (m)	5	10	15	20	5
													Minimum No. of Cones	3	5	7	8	
													Minimum No. of Lamps	2	3	4	5	
Single Carriageway 100km/h	600	1 (r.w.a.) 1 (n.o.) 1 (t.m.)	120	600* 750*	750	45	1.2	12	12	40	3 45°=1	6	Length of taper (T) in (m)	40	80	120	160	20
													Minimum No. of Cones	15	28	42	55	
													Minimum No. of Lamps	8	15	22	28	

Width of hazard (including safety zone) NOTE: TAPERS ARE ONLY WHERE TWO WAY TRAFFIC MAINTAINED

* Use 600mm signs where Vehicles Per Day < 5,000. Use 750mm signs where Vehicles Per Day > 5,000

Double Lamp spacing when using Rotating Reflectors. ROTATING REFLECTORS ARE NOT ALLOWED ON TAPERS

6.75m - 7.4m; 6.0 m; 5.5m - 7.4m; 5.0 m; 3.25m-3.7m; 3.0 m; 3.25m-3.7m SHOULD NOT USE 2.75m-3.25m IF CYCLISTS PRESENT; 2.5 m -2.75m; 3.0m (2way); 1.5m (1way); 1.8m preferred min.; 1.2m absolute min.

TM (A) Traffic Lights OR Flagman

Date: 23/07/2020 **Author:** PMcM **Scale:** 1:5000 @ A3

Project: Cleanrath Wind Farm 38kV / 33kV Cable Decommissioning

Example: Typical Scenario **Works Type:** Type A **Visibility:** 200m

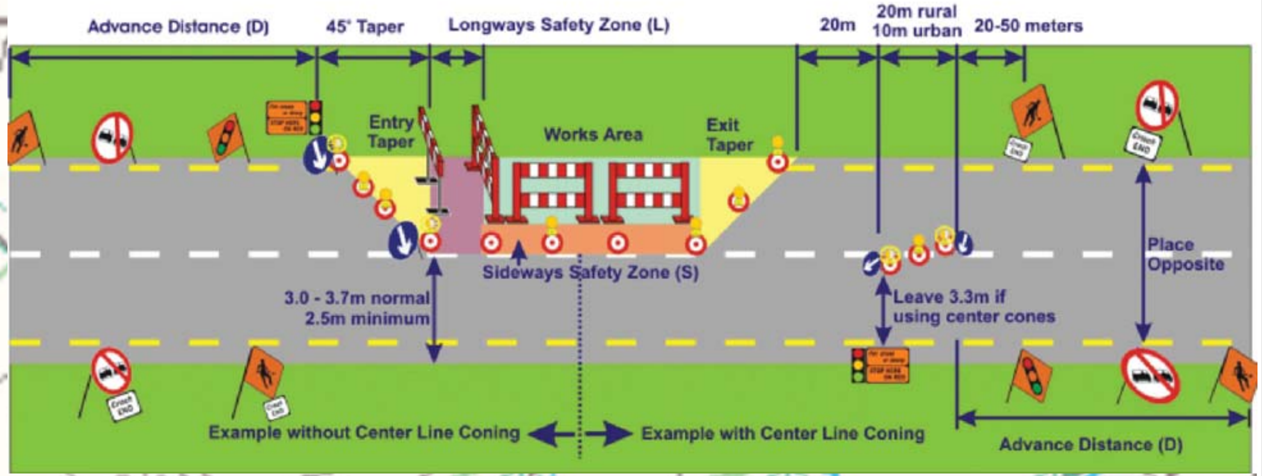
Approach Sign: 3 **Sign Spacing:** 200m **Lane Taper:** 45-Degrees

Longitudinal Safety Zone: 45m **Side Safety Zone:** 1.2m @ Taper: 1-3m

Min Size of Cones & Signs: 750mm

Note: Sign No.5 will either be Flagman or Traffic Light.

Figure 8.0 - Section 6 Pull Location 7 **Dwg:** 0040 - 4 - B - C - 001 - R001



Guidance for the Control and Management of Traffic at Roadworks. Second Edition - 2010

ROUTINE WORKS TRAFFIC MANAGEMENT DESIGN

SHUTTLE CONTROL SELECTION

Method	Max. Speed Limit	Length of Works (m)	Max. Traffic (veh/hr)	3 Minute Count	Notes
All Stop	100	n/a	300	15	5-10 mins max.
Give & Take	50	50	400	20	Clear Visibility required from both directions
Priority	100	80	850	43	Speed Limit / Clear vis. Distance D: 50 km/h 60 m; 60 km/h 70 m; 80 km/h 80 m; 100 km/h 100 m
	clear visibility distance before and after works. If used at night, will require flashing lamps				
Stop/Go	100	20	500	25	Can be one person/Single Sign
	100	100	1400	70	Can be one person-Auto Sign
	100	200	1250	63	Can be one person-Auto Sign
	100	300	1050	53	Has to be two people-Two Sign
	100	400	950	48	Has to be two people-Two Sign
	100	500	850	43	Has to be two people-Two Sign
Traffic Lights	100	500	n/a	n/a	Vehicle Actuated preferred

Advance Signs	Warn	r.w.a.	road works ahead
	Inform	t.m.	traffic management
		Priority 1–4	MAY 600 m; SHOULD; SHALL
	Direct	n.o.	no overtaking
For Advance Signs space signs evenly through the advance sign distance			
Works Signs	Direct	select appropriate	
End Signs	End		

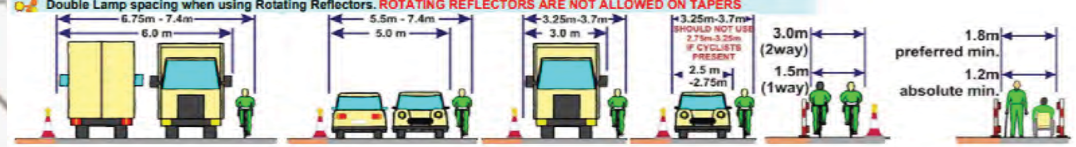
LAYOUT PARAMETER SELECTION SHEET

Type of Road	Advance sign distance (D) (m)	Min. no. & type of advance signs in sequence	Min. clear visibility of signs (m)	Min. size of signs (mm)	Min. height of cones (mm)	Long. safety zone (L) (m)	Side safety zone (S) (m)	Long. cone space (m)	Long. lamp space (m)	2-way taper multiply factor	Taper cone spacing (m)	Taper lamp spacing (m)
Single Carriageway, 60km/h	50	1 (r.w.a.) 1 (t.m.)	50	600	750	5	0.5	6	12	5	3 45°=1	6
Single Carriageway 100km/h	600	1 (r.w.a.) 1 (n.o.) 1 (t.m.)	120	600* 750*	750	45	1.2	12	12	40	3 45°=1	6

Type of Road	Lead-in cone tapers (See Notes below) Recommended lengths. SHUTTLE TAPERS = 45°	Width of hazard (including safety zone) NOTE: TAPERS ARE ONLY WHERE TWO WAY TRAFFIC MAINTAINED 1 m	2 m	3 m	4 m	Hard shoulder taper multiply factor
Single Carriageway, 60km/h	Length of taper (T) in (m)	5	10	15	20	5
	Minimum No. of Cones	3	5	7	8	
	Minimum No. of Lamps	2	3	4	5	
Single Carriageway 100km/h	Length of taper (T) in (m)	40	80	120	160	20
	Minimum No. of Cones	15	28	42	55	
	Minimum No. of Lamps	8	15	22	28	

* Use 600mm signs where Vehicles Per Day < 5,000. Use 750mm signs where Vehicles Per Day > 5,000

Double Lamp spacing when using Rotating Reflectors. ROTATING REFLECTORS ARE NOT ALLOWED ON TAPERS



TM (A) Traffic Lights OR Flagman

Date: 23/07/2020 **Author:** PMcM **Scale:** 1:5000 @ A3

Project: Cleanrath Wind Farm 38kV / 33kV Cable Decommissioning

Example: Typical Scenario **Works Type:** Type A **Visibility:** 200m

Approach Sign: 3 **Sign Spacing:** 200m **Lane Taper:** 45-Degrees

Longitudinal Safety Zone: 45m **Side Safety Zone:** 1.2m @ Taper: 1-3m

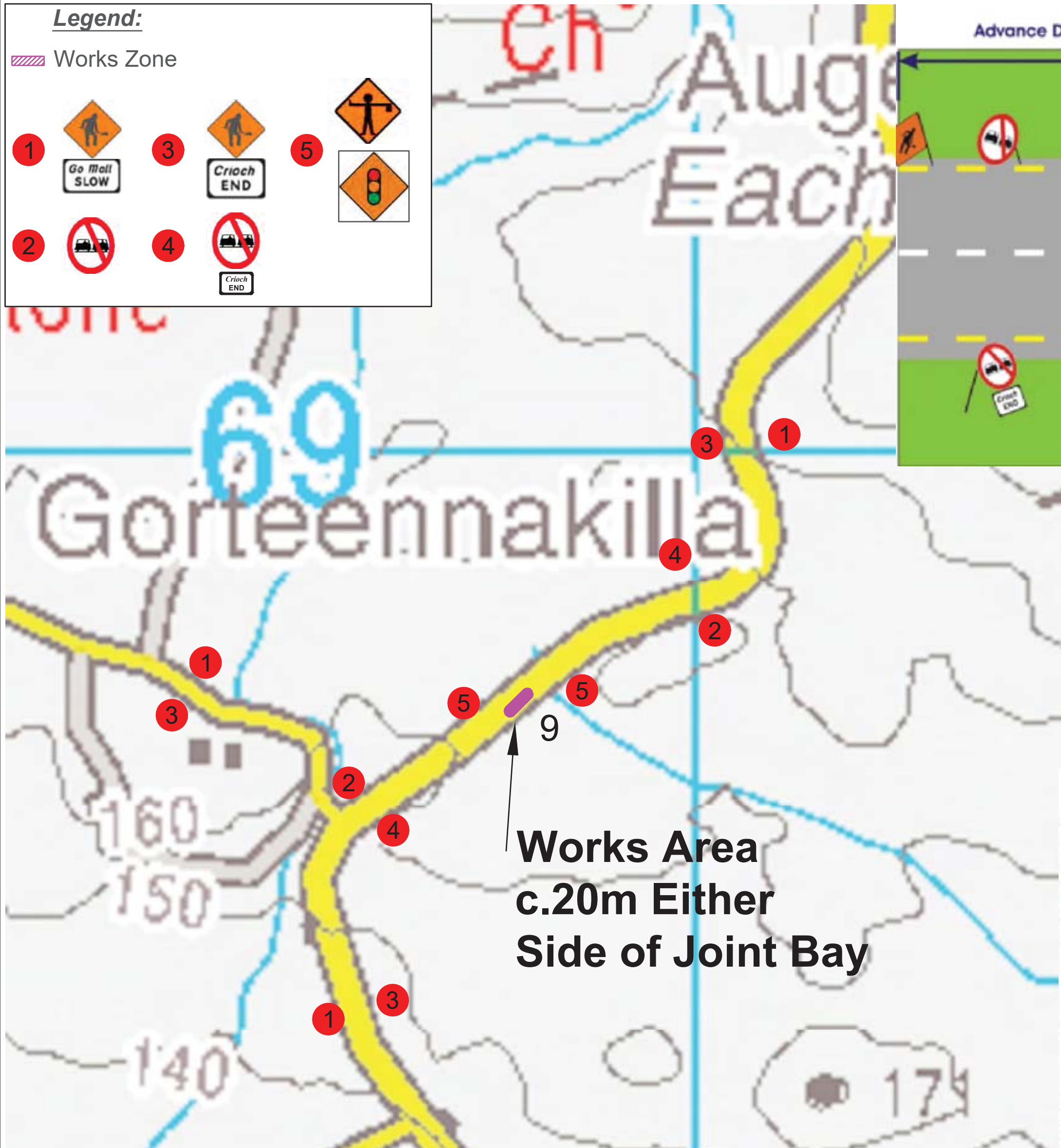
Min Size of Cones & Signs: 750mm

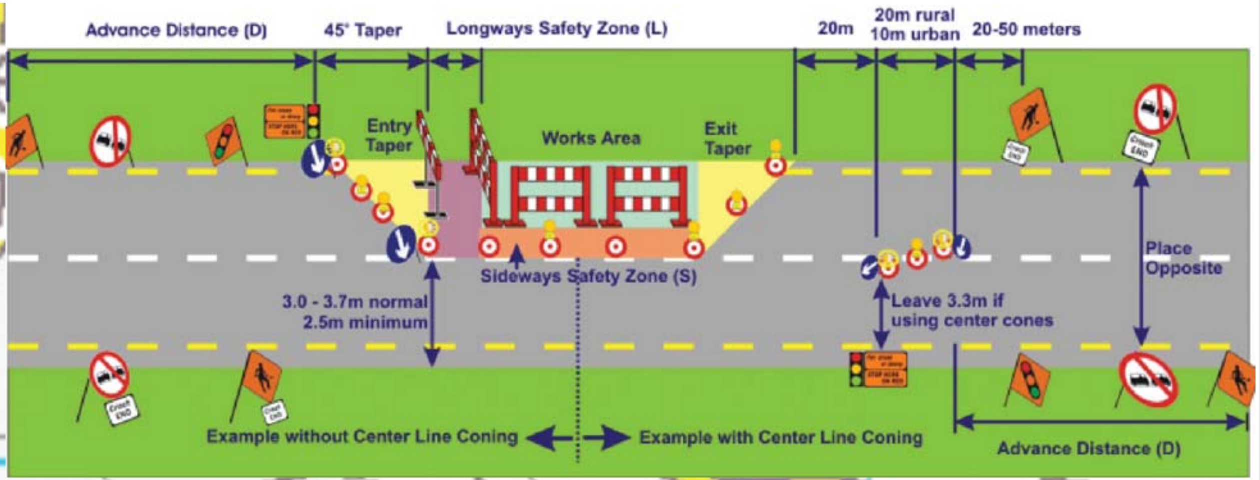
Note: Sign No.5 will either be Flagman or Traffic Light.

Figure 9.0 - Section 6 Pull Location 8 **Dwg:** 0040 - 4 - B - C - 001 - R001

Legend:

Works Zone



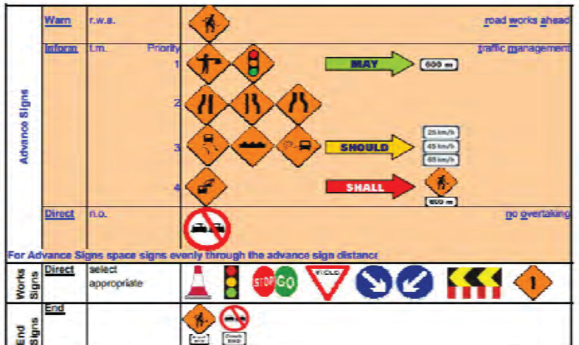


Guidance for the Control and Management of Traffic at Roadworks. Second Edition - 2010

ROUTINE WORKS TRAFFIC MANAGEMENT DESIGN

SHUTTLE CONTROL SELECTION

Method	Max. Speed Limit	Length of Works (m)	Max. Traffic (veh/hr)	3 Minute Count	Notes
All Stop	100	n/a	300	15	5-10 mins max.
Give & Take	50	50	400	20	Clear Visibility required from both directions
Priority	100	80	850	43	Speed Limit / Clear vis. Distance D: 50 km/h 60 m; 60 km/h 70 m; 80 km/h 80 m; 100 km/h 100 m
	clear visibility distance before and after works. If used at night, will require flashing lamps				
Stop/Go	100	20	500	25	Can be one person/Single Sign
	100	100	1400	70	Can be one person-Auto Sign
	100	200	1250	63	Can be one person-Auto Sign
	100	300	1050	53	Has to be two people-Two Sign
	100	400	950	48	Has to be two people-Two Sign
	100	500	850	43	Has to be two people-Two Sign
Traffic Lights	100	500	n/a	n/a	Vehicle Actuated preferred



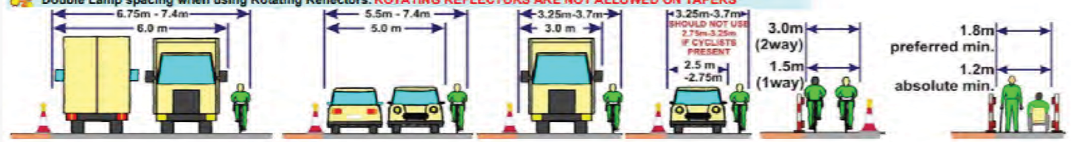
LAYOUT PARAMETER SELECTION SHEET

Type of Road	Advance sign distance (D) (m)	Min. no. & type of advance signs in sequence	Min. clear visibility of signs (m)	Min. size of signs (mm)	Min. height of cones (mm)	Long. safety zone (L) (m)	Side safety zone (S) (m)	Long. cone space (m)	Long. lamp space (m)	2-way taper multiply factor	Taper cone spacing (m)	Taper lamp spacing (m)
Single Carriageway, 60km/h	50	1 (r.w.a.) 1 (t.m.)	50	600	750	5	0.5	6	12	5	3 45°=1	6
Single Carriageway 100km/h	600	1 (r.w.a.) 1 (n.o.) 1 (t.m.)	120	600* 750*	750	45	1.2	12	12	40	3 45°=1	6

Type of Road	Lead-in cone tapers (See Notes below) Recommended lengths. SHUTTLE TAPERS = 45°	Width of hazard (including safety zone) NOTE: TAPERS ARE ONLY WHERE TWO WAY TRAFFIC MAINTAINED: 1 m	2 m	3 m	4 m	Hard shoulder taper multiply factor
Single Carriageway, 60km/h	Length of taper (T) in (m)	5	10	15	20	5
	Minimum No. of Cones	3	5	7	8	
	Minimum No. of Lamps	2	3	4	5	
Single Carriageway 100km/h	Length of taper (T) in (m)	40	80	120	160	20
	Minimum No. of Cones	15	28	42	55	
	Minimum No. of Lamps	8	15	22	28	

* Use 600mm signs where Vehicles Per Day < 5,000. Use 750mm signs where Vehicles Per Day > 5,000

Double Lamp spacing when using Rotating Reflectors. ROTATING REFLECTORS ARE NOT ALLOWED ON TAPERS



TM (A) Traffic Lights OR Flagman

Date: 23/07/2020 **Author:** PMcM **Scale:** 1:5000 @ A3

Project: Cleanrath Wind Farm 38kV / 33kV Cable Decommissioning

Example: Typical Scenario **Works Type:** Type A **Visibility:** 200m

Approach Sign: 3 **Sign Spacing:** 200m **Lane Taper:** 45-Degrees

Longitudinal Safety Zone: 45m **Side Safety Zone:** 1.2m @ Taper: 1-3m

Min Size of Cones & Signs: 750mm

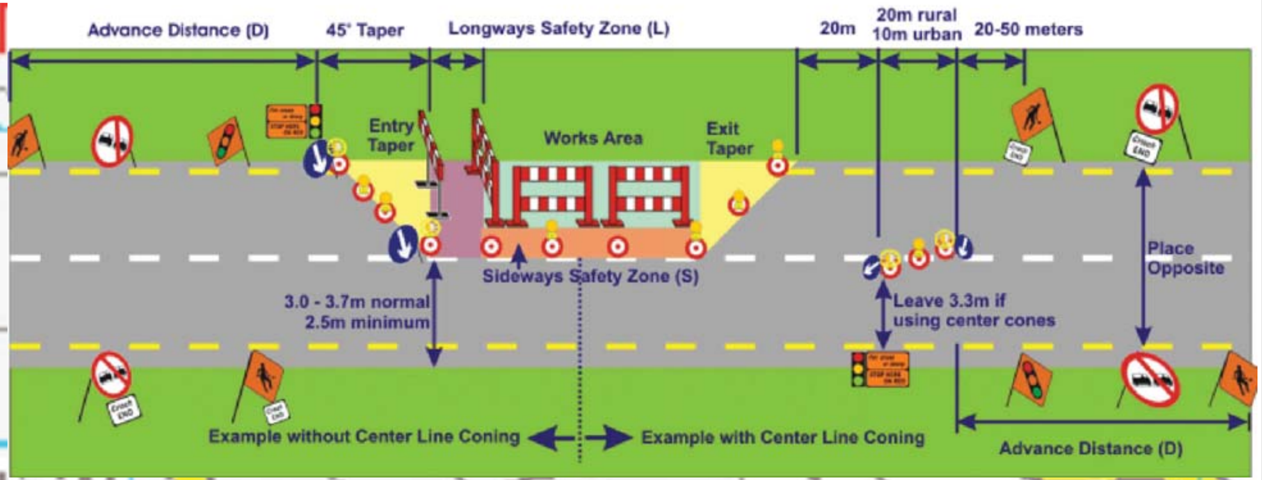
Note: Sign No.5 will either be Flagman or Traffic Light.

Figure 10.0 - Section 6 Pull Location 9 **Dwg:** 0040 - 4 - B - C - 001 - R001

Legend:

Works Zone

Works Area c.20m Either Side of Joint Bay

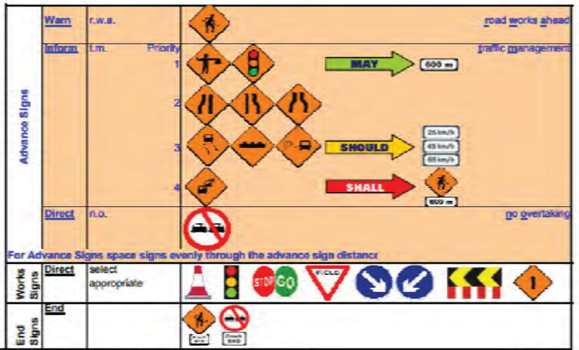


Guidance for the Control and Management of Traffic at Roadworks. Second Edition - 2010

ROUTINE WORKS TRAFFIC MANAGEMENT DESIGN

SHUTTLE CONTROL SELECTION

Method	Max. Speed Limit	Length of Works (m)	Max. Traffic (veh/hr)	3 Minute Count	Notes	
All Stop	100	n/a	300	15	5-10 mins max.	
Give & Take	50	50	400	20	Clear Visibility required from both directions	
Priority	100	80	850	43	Speed Limit	Clear vis. Distance D
clear visibility distance before and after works. If used at night, will require flashing lamps					50 km/h	60 m
					60 km/h	70 m
					80 km/h	80 m
					100 km/h	100 m
Stop/Go	100	20	500	25	Can be one person/Single Sign	
	100	100	1400	70	Can be one person-Auto Sign	
	100	200	1250	63	Can be one person-Auto Sign	
	100	300	1050	53	Has to be two people-Two Sign	
	100	400	950	48	Has to be two people-Two Sign	
	100	500	850	43	Has to be two people-Two Sign	
Traffic Lights	100	500	n/a	n/a	Vehicle Actuated preferred	

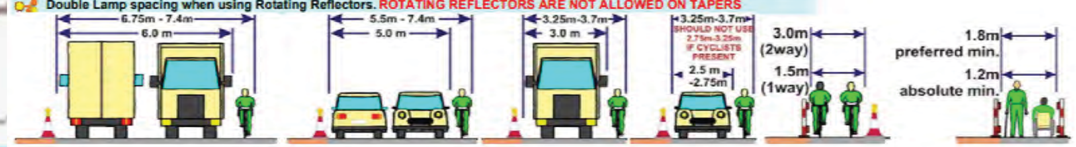


LAYOUT PARAMETER SELECTION SHEET

Type of Road	Advance sign distance (D) (m)	Min. no. & type of advance signs in sequence	Min. clear visibility of signs (m)	Min. size of signs (mm)	Min. height of cones (mm)	Long. safety zone (L) (m)	Side safety zone (S) (m)	Long. cone space (m)	Long. lamp space (m)	2-way taper multiply factor	Taper cone spacing (m)	Taper lamp spacing (m)	Lead-in cone tapers (See Notes below) Recommended lengths. SHUTTLE TAPERS = 45°	Width of hazard (including safety zone) NOTE: TAPERS ARE ONLY WHERE TWO WAY TRAFFIC MAINTAINED 1 m	2 m	3 m	4 m	Hard shoulder taper multiply factor
Single Carriageway, 60km/h	50	1 (r.w.a.) 1 (t.m.)	50	600	750	5	0.5	6	12	5	3 45°=1	6	Length of taper (T) in (m)	5	10	15	20	5
													Minimum No. of Cones	3	5	7	8	
													Minimum No. of Lamps	2	3	4	5	
Single Carriageway 100km/h	600	1 (r.w.a.) 1 (n.o.) 1 (t.m.)	120	600* 750*	750	45	1.2	12	12	40	3 45°=1	6	Length of taper (T) in (m)	40	80	120	160	20
													Minimum No. of Cones	15	28	42	55	
													Minimum No. of Lamps	8	15	22	28	

* Use 600mm signs where Vehicles Per Day < 5,000. Use 750mm signs where Vehicles Per Day > 5,000

Double Lamp spacing when using Rotating Reflectors. ROTATING REFLECTORS ARE NOT ALLOWED ON TAPERS



TM (A) Traffic Lights OR Flagman

Date: 23/07/2020 **Author:** PMcM **Scale:** 1:5000 @ A3

Project: Cleanrath Wind Farm 38kV / 33kV Cable Decommissioning

Example: Typical Scenario **Works Type:** Type A **Visibility:** 200m

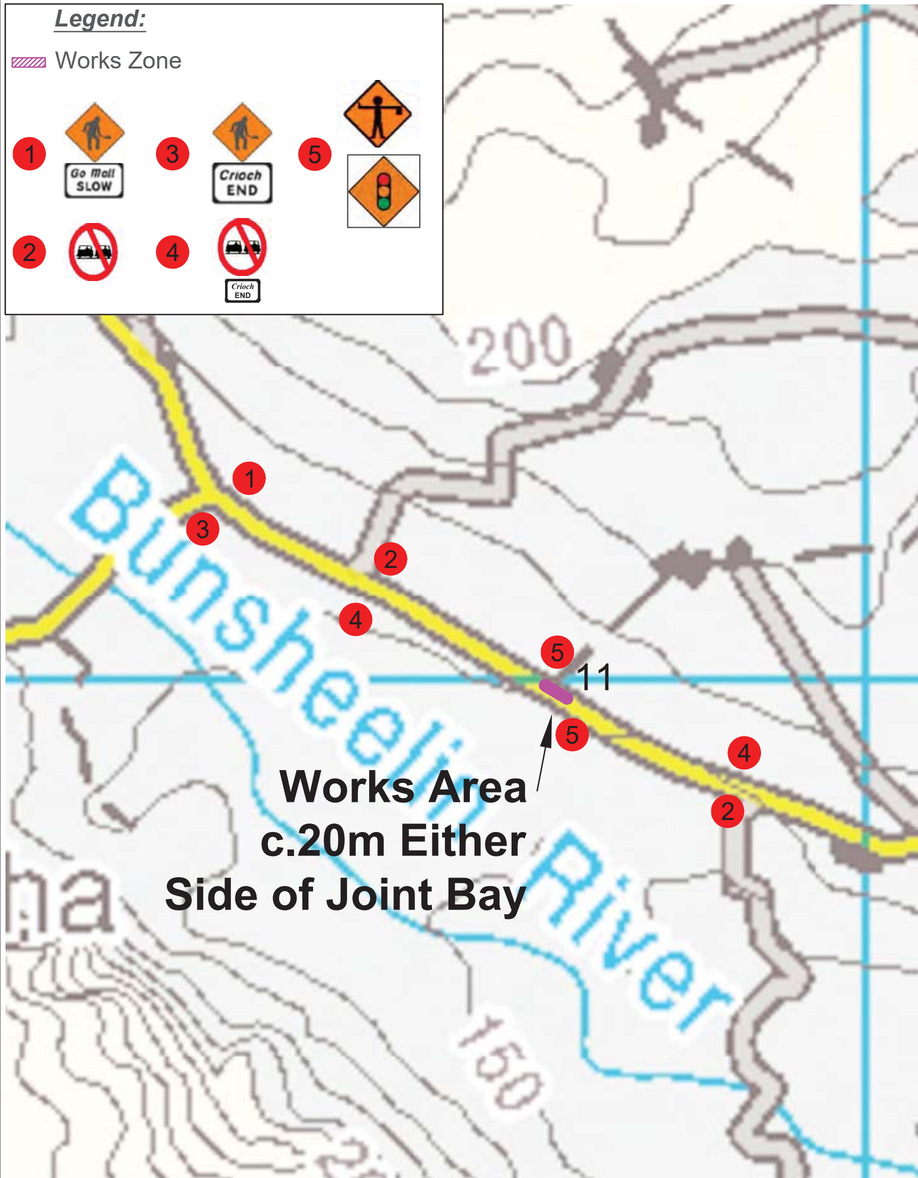
Approach Sign: 3 **Sign Spacing:** 200m **Lane Taper:** 45-Degrees

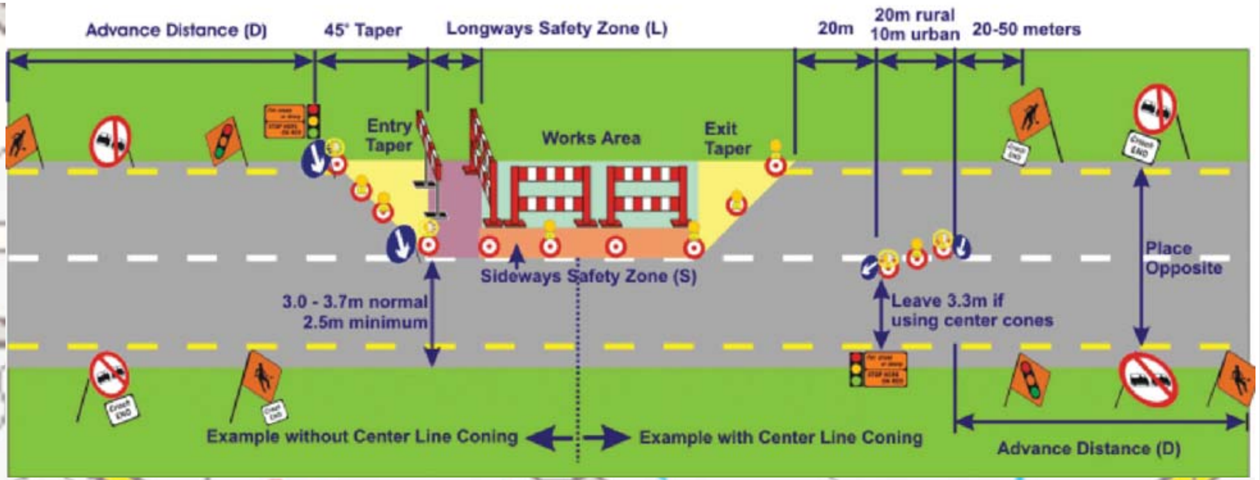
Longitudinal Safety Zone: 45m **Side Safety Zone:** 1.2m @ Taper: 1-3m

Min Size of Cones & Signs: 750mm

Note: Sign No.5 will either be Flagman or Traffic Light.

Figure 11.0 - Section 7 Pull Location 10 **Dwg:** 0040 - 4 - B - C - 001 - R001



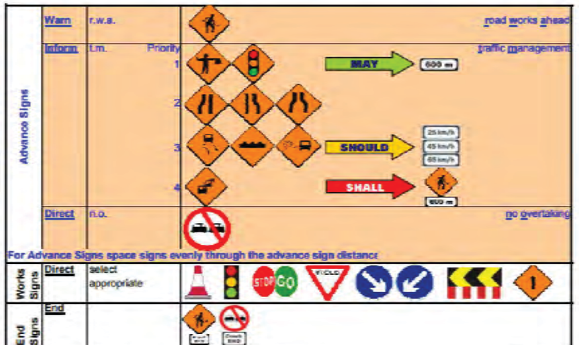


Guidance for the Control and Management of Traffic at Roadworks. Second Edition - 2010

ROUTINE WORKS TRAFFIC MANAGEMENT DESIGN

SHUTTLE CONTROL SELECTION

Method	Max. Speed Limit	Length of Works (m)	Max. Traffic (veh/hr)	3 Minute Count	Notes
All Stop	100	n/a	300	15	5-10 mins max.
Give & Take	50	50	400	20	Clear Visibility required from both directions
Priority	100	80	850	43	Speed Limit / Clear vis. Distance D: 50 km/h 60 m; 60 km/h 70 m; 80 km/h 80 m; 100 km/h 100 m
	clear visibility distance before and after works. If used at night, will require flashing lamps				
Stop/Go	100	20	500	25	Can be one person/Single Sign
	100	100	1400	70	Can be one person-Auto Sign
	100	200	1250	63	Can be one person-Auto Sign
	100	300	1050	53	Has to be two people-Two Sign
	100	400	950	48	Has to be two people-Two Sign
	100	500	850	43	Has to be two people-Two Sign
Traffic Lights	100	500	n/a	n/a	Vehicle Actuated preferred



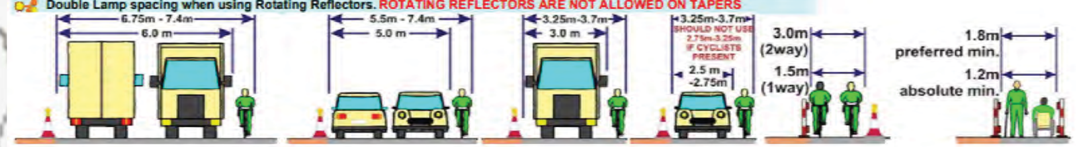
LAYOUT PARAMETER SELECTION SHEET

Type of Road	Advance sign distance (D) (m)	Min. no. & type of advance signs in sequence	Min. clear visibility of signs (m)	Min. size of signs (mm)	Min. height of cones (mm)	Long. safety zone (L) (m)	Side safety zone (S) (m)	Long. cone space (m)	Long. lamp space (m)	2-way taper multiply factor	Taper cone spacing (m)	Taper lamp spacing (m)
Single Carriageway, 60km/h	50	1 (r.w.a.) 1 (t.m.)	50	600	750	5	0.5	6	12	5	3 45°=1	6
Single Carriageway 100km/h	600	1 (r.w.a.) 1 (n.o.) 1 (t.m.)	120	600* 750*	750	45	1.2	12	12	40	3 45°=1	6

Type of Road	Lead-in cone tapers (See Notes below) Recommended lengths. SHUTTLE TAPERS = 45°	Width of hazard (including safety zone) NOTE: TAPERS ARE ONLY WHERE TWO WAY TRAFFIC MAINTAINED 1 m	2 m	3 m	4 m	Hard shoulder taper multiply factor
Single Carriageway, 60km/h	Length of taper (T) in (m)	5	10	15	20	5
	Minimum No. of Cones	3	5	7	8	
	Minimum No. of Lamps	2	3	4	5	
Single Carriageway 100km/h	Length of taper (T) in (m)	40	80	120	160	20
	Minimum No. of Cones	15	28	42	55	
	Minimum No. of Lamps	8	15	22	28	

* Use 600mm signs where Vehicles Per Day < 5,000. Use 750mm signs where Vehicles Per Day > 5,000

Double Lamp spacing when using Rotating Reflectors. ROTATING REFLECTORS ARE NOT ALLOWED ON TAPERS



TM (A) Traffic Lights OR Flagman

Date: 23/07/2020 **Author:** PMcM **Scale:** 1:5000 @ A3

Project: Cleanrath Wind Farm 38kV / 33kV Cable Decommissioning

Example: Typical Scenario **Works Type:** Type A **Visibility:** 200m

Approach Sign: 3 **Sign Spacing:** 200m **Lane Taper:** 45-Degrees

Longitudinal Safety Zone: 45m **Side Safety Zone:** 1.2m @ Taper: 1-3m

Min Size of Cones & Signs: 750mm

Note: Sign No.5 will either be Flagman or Traffic Light.

Figure 12.0 - Section 8 Pull Location 11 **Dwg:** 0040 - 4 - B - C - 001 - R001

Legend:

Works Zone

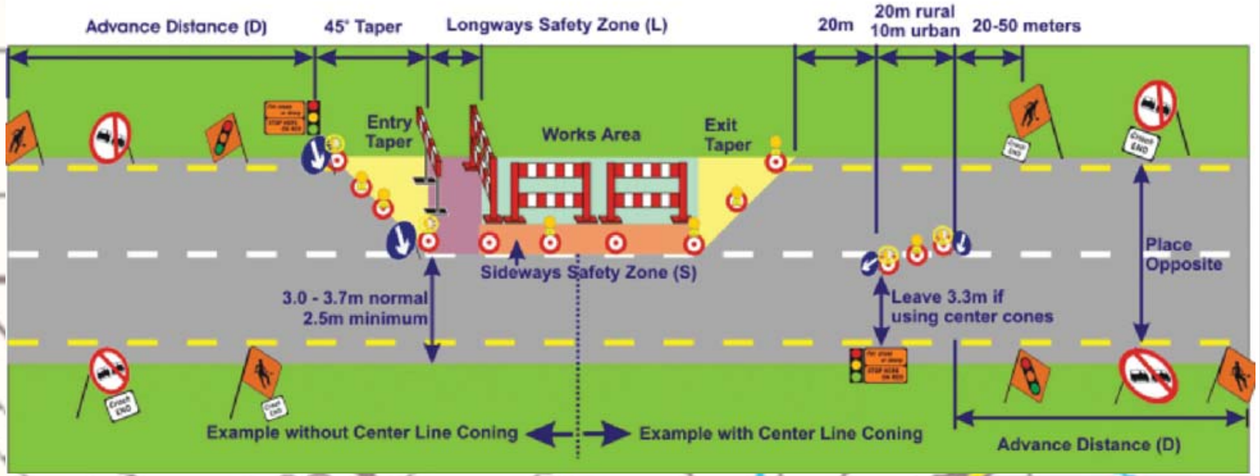
1 Go Mall SLOW

2

3 Críoch END

4 Críoch END

5



Guidance for the Control and Management of Traffic at Roadworks. Second Edition - 2010

ROUTINE WORKS TRAFFIC MANAGEMENT DESIGN

SHUTTLE CONTROL SELECTION

Method	Max. Speed Limit	Length of Works (m)	Max. Traffic (veh/hr)	3 Minute Count	Notes	
All Stop	100	n/a	300	15	5-10 mins max.	
Give & Take	50	50	400	20	Clear Visibility required from both directions	
Priority	100	80	850	43	Speed Limit	Clear vis. Distance D
	clear visibility distance before and after works				50 km/h	60 m
	If used at night, will require flashing lamps				60 km/h	70 m
					80 km/h	80 m
					100 km/h	100 m
Stop/Go	100	20	500	25	Can be one person/Single Sign	
	100	100	1400	70	Can be one person-Auto Sign	
	100	200	1250	63	Can be one person-Auto Sign	
	100	300	1050	53	Has to be two people-Two Sign	
	100	400	950	48	Has to be two people-Two Sign	
	100	500	850	43	Has to be two people-Two Sign	
Traffic Lights	100	500	n/a	n/a	Vehicle Actuated preferred	

Advance Signs	Warn	r.w.a.		road works ahead
	Inform	t.m.	Priority 1	traffic management
			2	
			3	
			4	
	Direct	n.o.		no overtaking
For Advance Signs space signs evenly through the advance sign distance				
Works Signs	Direct	select appropriate		
End Signs	End			

MAY 600 m

SHOULD 25 km/h 45 km/h 65 km/h

SHALL 600 m

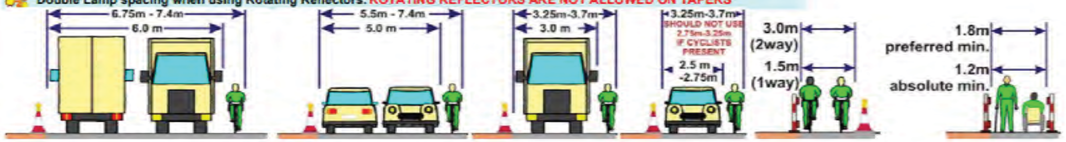
LAYOUT PARAMETER SELECTION SHEET

Type of Road	Advance sign distance (D) (m)	Min. no. & type of advance signs in sequence	Min. clear visibility of signs (m)	Min. size of signs (mm)	Min. height of cones (mm)	Long. safety zone (L) (m)	Side safety zone (S) (m)	Long. cone space (m)	Long. lamp space (m)	2-way taper multiply factor	Taper cone spacing (m)	Taper lamp spacing (m)
Single Carriageway, 60km/h	50	1 (r.w.a.) 1 (t.m.)	50	600	750	5	0.5	6	12	5	3 45°=1	6
Single Carriageway 100km/h	600	1 (r.w.a.) 1 (n.o.) 1 (t.m.)	120	600* 750*	750	45	1.2	12	12	40	3 45°=1	6

Type of Road	Lead-in cone tapers (See Notes below) Recommended lengths. SHUTTLE TAPERS = 45°	Width of hazard (including safety zone) NOTE: TAPERS ARE ONLY WHERE TWO WAY TRAFFIC MAINTAINED 1 m	2 m	3 m	4 m	Hard shoulder taper multiply factor
Single Carriageway, 60km/h	Length of taper (T) in (m)	5	10	15	20	5
	Minimum No. of Cones	3	5	7	8	
	Minimum No. of Lamps	2	3	4	5	
Single Carriageway 100km/h	Length of taper (T) in (m)	40	80	120	160	20
	Minimum No. of Cones	15	28	42	55	
	Minimum No. of Lamps	8	15	22	28	

* Use 600mm signs where Vehicles Per Day < 5,000. Use 750mm signs where Vehicles Per Day > 5,000

Double Lamp spacing when using Rotating Reflectors. ROTATING REFLECTORS ARE NOT ALLOWED ON TAPERS



TM (A) Traffic Lights OR Flagman

Date: 23/07/2020 **Author:** PMcM **Scale:** 1:5000 @ A3

Project: Cleanrath Wind Farm 38kV / 33kV Cable Decommissioning

Example: Typical Scenario **Works Type:** Type A **Visibility:** 200m

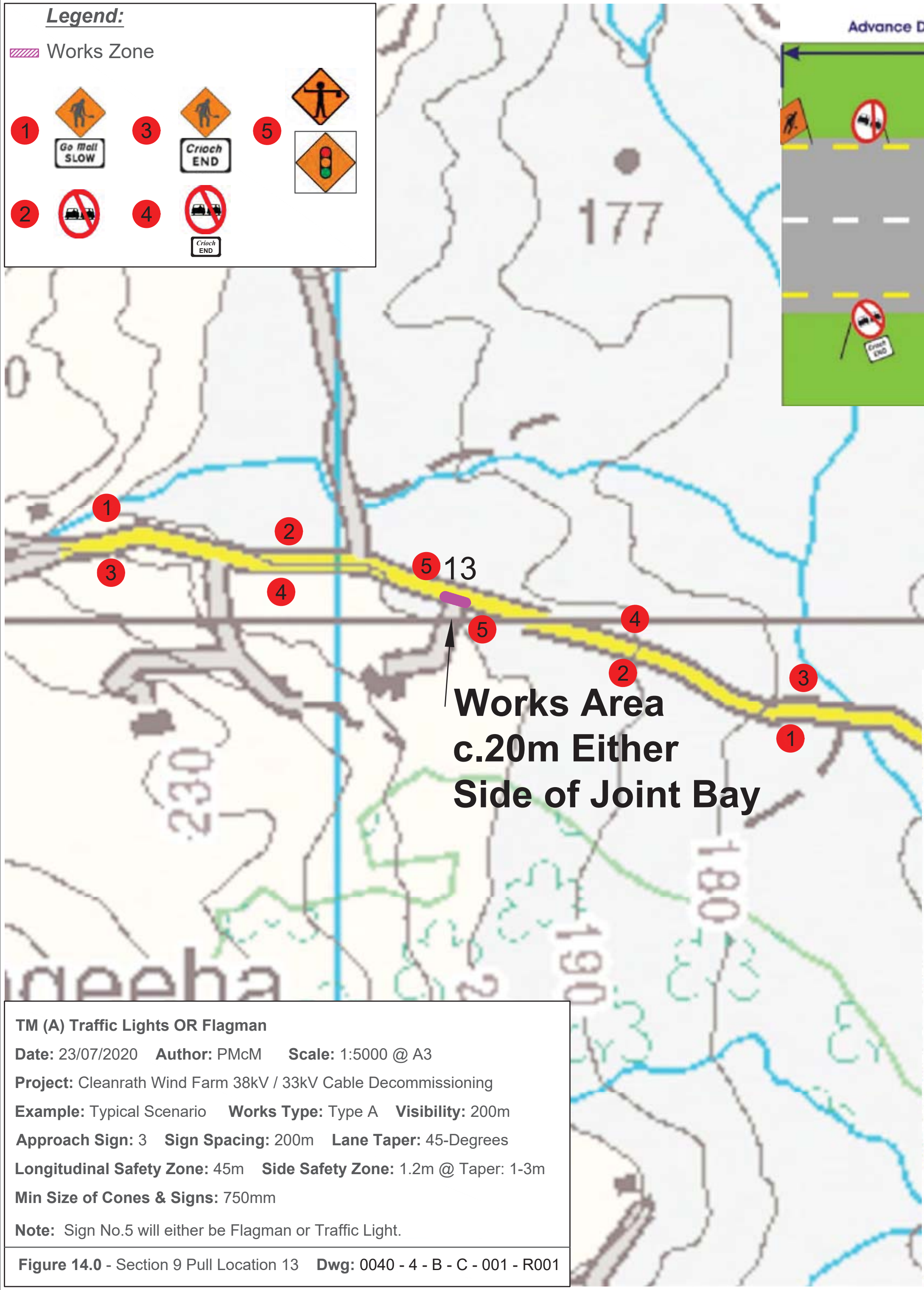
Approach Sign: 3 **Sign Spacing:** 200m **Lane Taper:** 45-Degrees

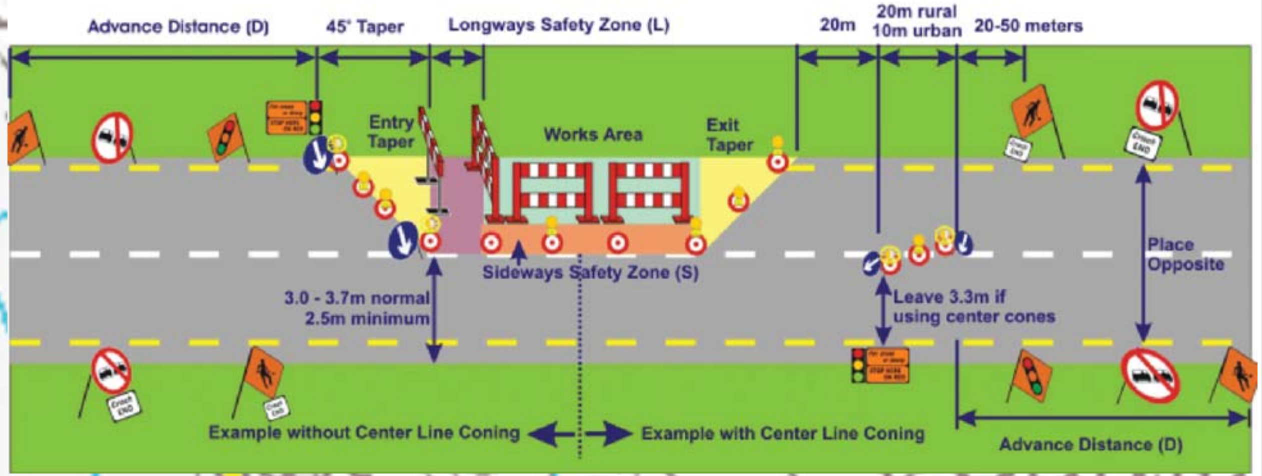
Longitudinal Safety Zone: 45m **Side Safety Zone:** 1.2m @ Taper: 1-3m

Min Size of Cones & Signs: 750mm

Note: Sign No.5 will either be Flagman or Traffic Light.

Figure 13.0 - Section 9 Pull Location 12 **Dwg:** 0040 - 4 - B - C - 001 - R001





TM (A) Traffic Lights OR Flagman

Date: 23/07/2020 **Author:** PMcM **Scale:** 1:5000 @ A3

Project: Cleanrath Wind Farm 38kV / 33kV Cable Decommissioning

Example: Typical Scenario **Works Type:** Type A **Visibility:** 200m

Approach Sign: 3 **Sign Spacing:** 200m **Lane Taper:** 45-Degrees

Longitudinal Safety Zone: 45m **Side Safety Zone:** 1.2m @ Taper: 1-3m

Min Size of Cones & Signs: 750mm

Note: Sign No.5 will either be Flagman or Traffic Light.

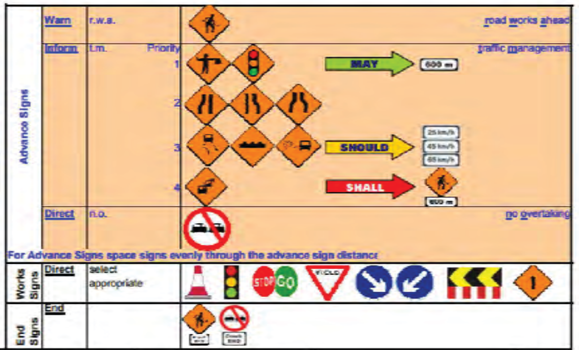
Figure 14.0 - Section 9 Pull Location 13 **Dwg:** 0040 - 4 - B - C - 001 - R001

Guidance for the Control and Management of Traffic at Roadworks. Second Edition - 2010

ROUTINE WORKS TRAFFIC MANAGEMENT DESIGN

SHUTTLE CONTROL SELECTION

Method	Max. Speed Limit	Length of Works (m)	Max. Traffic (veh/hr)	3 Minute Count	Notes	
All Stop	100	n/a	300	15	5-10 mins max.	
Give & Take	50	50	400	20	Clear Visibility required from both directions	
Priority	100	80	850	43	Speed Limit	Clear vis. Distance D
	clear visibility distance before and after works				50 km/h	60 m
	If used at night, will require flashing lamps				60 km/h	70 m
					80 km/h	80 m
					100 km/h	100 m
Stop/Go	100	20	500	25	Can be one person/Single Sign	
	100	100	1400	70	Can be one person-Auto Sign	
	100	200	1250	63	Can be one person-Auto Sign	
	100	300	1050	53	Has to be two people-Two Sign	
	100	400	950	48	Has to be two people-Two Sign	
	100	500	850	43	Has to be two people-Two Sign	
Traffic Lights	100	500	n/a	n/a	Vehicle Actuated preferred	



LAYOUT PARAMETER SELECTION SHEET

Type of Road	Advance sign distance (D) (m)	Min. no. & type of advance signs in sequence	Min. clear visibility of signs (m)	Min. size of signs (mm)	Min. height of cones (mm)	Long. safety zone (L) (m)	Side safety zone (S) (m)	Long. cone space (m)	Long. lamp space (m)	2-way taper multiply factor	Taper cone spacing (m)	Taper lamp spacing (m)	Lead-in cone tapers (See Notes below) Recommended lengths. SHUTTLE TAPERS = 45°	Width of hazard (including safety zone) NOTE: TAPERS ARE ONLY WHERE TWO WAY TRAFFIC MAINTAINED 1 m	2 m	3 m	4 m	Hard shoulder taper multiply factor
Single Carriageway, 60km/h	50	1 (r.w.a.) 1 (t.m.)	50	600	750	5	0.5	6	12	5	3 45°=1	6	Length of taper (T) in (m)	5	10	15	20	5
													Minimum No. of Cones	3	5	7	8	
													Minimum No. of Lamps	2	3	4	5	
Single Carriageway 100km/h	600	1 (r.w.a.) 1 (n.o.) 1 (t.m.)	120	600* 750*	750	45	1.2	12	12	40	3 45°=1	6	Length of taper (T) in (m)	40	80	120	160	20
													Minimum No. of Cones	15	28	42	55	
													Minimum No. of Lamps	8	15	22	28	

* Use 600mm signs where Vehicles Per Day < 5,000. Use 750mm signs where Vehicles Per Day > 5,000

Double Lamp spacing when using Rotating Reflectors. ROTATING REFLECTORS ARE NOT ALLOWED ON TAPERS