4. DESCRIPTION OF THE PROPOSED DEVELOPMENT

4.1 Introduction

This section of the Environmental Impact Assessment Report (EIAR) describes the development and its component parts which is the subject of a proposed application for planning permission to An Bord Pleanála ('the Proposed Development').

The Proposed Development comprises:

i. *20 no. wind turbines with an overall ground to blade tip height of 180 metres, a rotor dimeter of 162m and a hub height of 99m, associated foundations, hard-standing areas*
ii. *15 no. spoil storage areas at hardstands of turbines no. 1, 2, 3, 4, 5, 6 and 7 (in the townlands of Turrock, Gortaphuill, Cronin, and Tullyneeny) and turbines no. 8, 10, 11, 13, 14, 17, 19 and 20 (in the townlands of Milltown, Cuilleenoolagh, Cloonacaltry, Feacle and Tawnagh)*
iii. *Provision of 1 no. permanent meteorological mast with a maximum height of 100 metres for a period of 30 years from the date of commissioning of the entire wind farm*
iv. *Provision of 1 no. 110kV onsite substation in the townland of Cam, along with associated control buildings, MV switchgear building, associated electrical plant, associated security fencing, and equipment and wastewater holding tank*
v. *All underground electrical and communication cabling connecting the proposed wind turbines to the proposed onsite substation and associated control buildings and plant*
vi. *All works associated with the connection of the proposed wind farm to the national electricity grid via underground 110kV cabling from the site to the existing Athlone 110kV substation located in the townland of Monksland. Cabling will be placed within the public road corridor of the R362, R363 and L2047, or on private land*
vii. *Upgrade works to the existing 110kV Athlone substation consisting of the construction of an additional dedicated bay to facilitate connection of the cable*
viii. *Provision of 2 no. new site accesses north and south from the R363 and upgrade of 1 no. junction south of the R363*
ix. *Provision of new access tracks/roads and upgrade of existing access tracks/roads*
x. *7 no. overburden storage areas*
xi. *2 no. temporary construction compounds*
xii. *Site drainage works*
xiii. *Operational stage site signage*
xiv. *All associated site development works, apparatus and signage*

This application seeks a ten-year planning permission and a 30-year operational life from the date of commissioning of the Proposed Development.

All elements of the Proposed Development in the list above together with the entire turbine delivery route as described in this chapter have been assessed as part of this EIAR.

4.2 Development Layout

The layout of the Proposed Development has been designed to minimise its potential environmental effects, while at the same time maximising the energy yield of the wind resource passing through the site. A constraints study, as described in Section 3.4 of this EIAR, has been carried out to ensure that the proposed turbines and ancillary infrastructure are located in the most appropriate areas of the site.

The overall layout of the Proposed Development is shown on Figure 4-1 and both the Northern and Southern Clusters are shown in more detail on Figures 4-2 and 4-3 respectively. The Grid Connection route is detailed in Section 4.3.7 and shown in detail on Figure 4-15. This drawing shows the proposed locations of the wind turbines and associated hardstands, electricity substation, temporary construction compounds, overburden storage areas, internal roads layout and site entrances. Detailed site layout drawings of the Proposed Development are included in Appendix 4-1 to this EIAR.

4.3 Development Components

This section of the EIAR describes the components of the Proposed Development. Further details regarding Site Drainage (Section 4.6), Construction Phasing (Section 4.7) and Construction Methodologies (Section 4.8) are provided subsequently in this chapter.

4.3.1 Wind Turbines

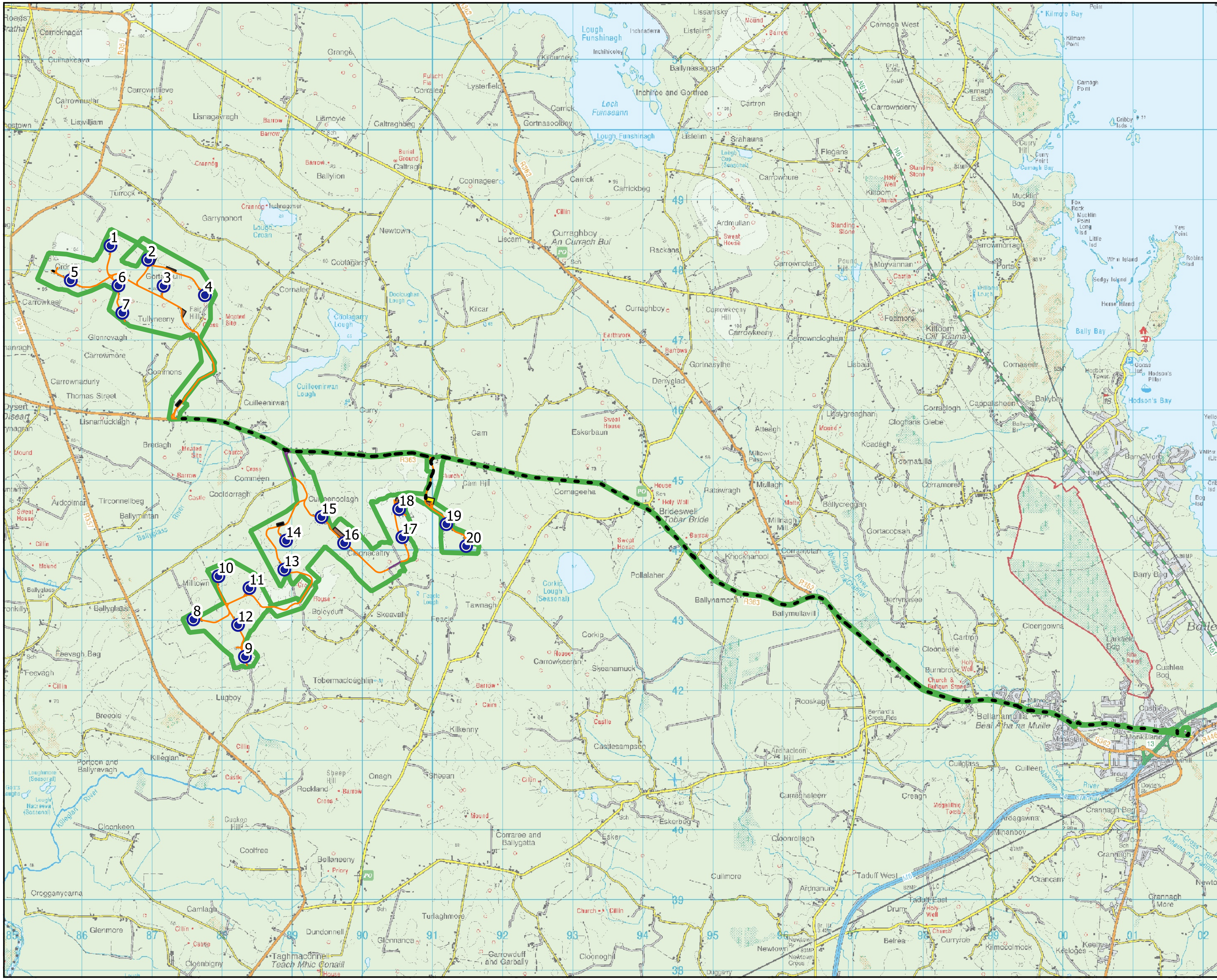
4.3.1.1 Turbine Locations

The proposed wind turbine layout has been optimised using industry standard wind farm design software to maximise the energy yield from the site, while maintaining sufficient distances between the proposed turbines to ensure turbulence and wake effects do not compromise turbine performance. The Grid Reference coordinates of the proposed turbine locations are listed in Table 4-1 below. As detailed in Chapter 1, the Proposed Development is separated into a Northern Cluster and Southern Cluster. Turbines associated with each cluster are identified below.

Table 4-1 Proposed Wind Turbine Locations and Elevations

Turbine No.	Irish Transverse Mercator Co-ordinates		Existing Elevation (m OD)
	Easting (m)	Northing (m)	
Northern Cluster			
1	586354	748365	90.82
2	586891	748163	77.09
3	587112	747791	83.56
4	587702	747658	71.63
5	585787	747871	90.07
6	586467	747796	88.86
7	586523	747407	73.30
Southern Cluster			
8	587538	743028	71.43
9	588273	742496	97.76
10	587895	743644	71.24
11	588338	743476	86.96
12	588175	742949	81.67
13	588836	743739	86.81
14	588861	744153	72.80
15	589367	744490	78.39

Turbine No.	Irish Transverse Mercator Co-ordinates		Existing Elevation (m OD)
	Easting (m)	Northing (m)	
16	589690	744119	88.05
17	590521	744202	90.81
18	590475	744603	109.11
19	591150	744389	95.87
20	591432	744076	89.95



Map Legend

- EIAR Site Boundary
- Proposed Turbine Layout
- Proposed Hardstands
- Proposed Access Roads
- Proposed Upgrades to Existing Access Roads
- Proposed 110kV Substation Location
- Proposed Construction Compounds
- Proposed Met Mast Location
- Proposed Overburden Storage Areas
- Infrastructure Overburden Storage Areas
- Proposed Connector Cabling and Grid Connection

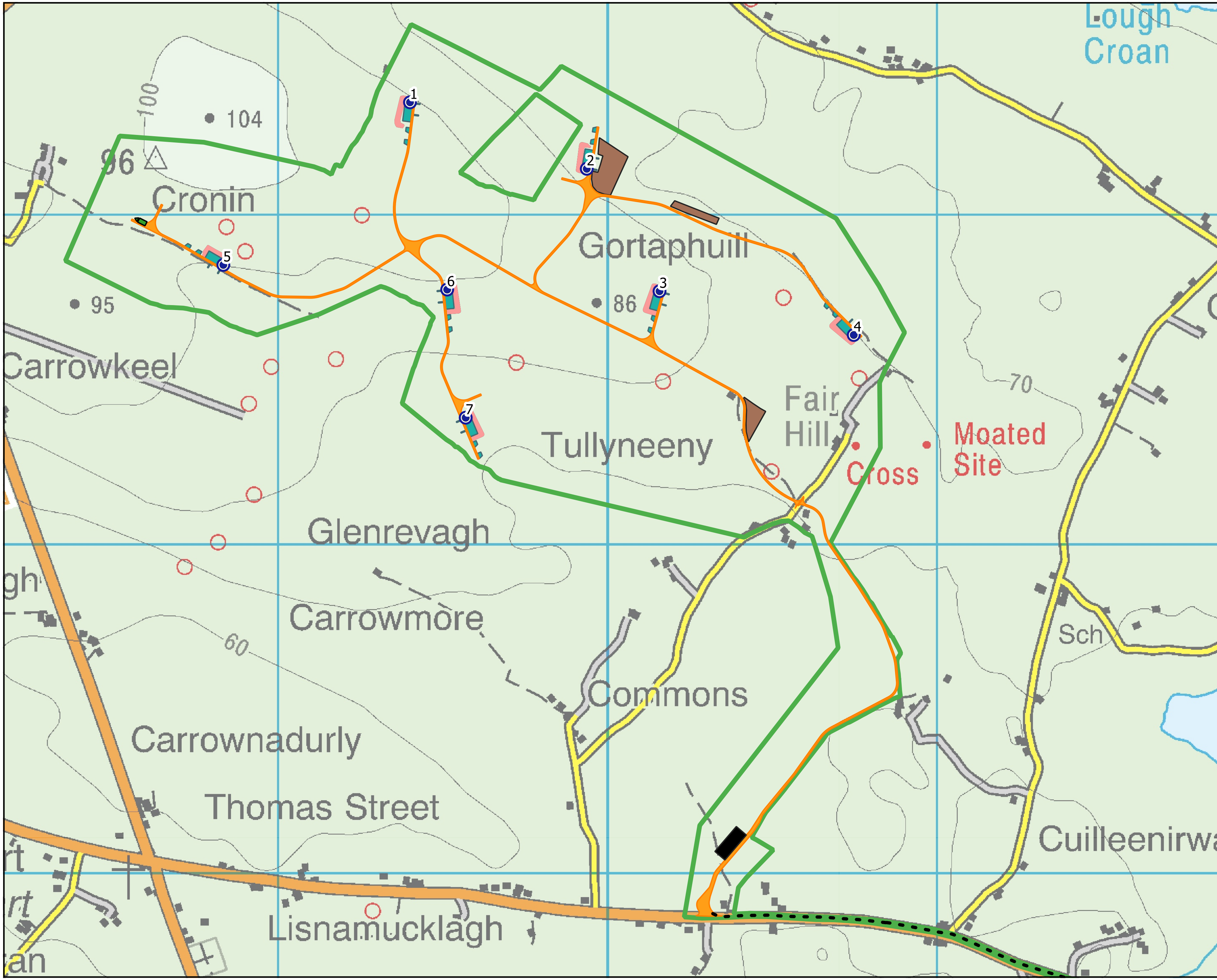
N

Drawing Title

Proposed Layout

Project Title: Seven Hills Wind Farm, Co. Roscommon	
Drawn By: DN	Checked By: ÓM
Project No.: 190907	Drawing No.: Figure 4-1
Scale: 1:70500	Date: 01.06.2021

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



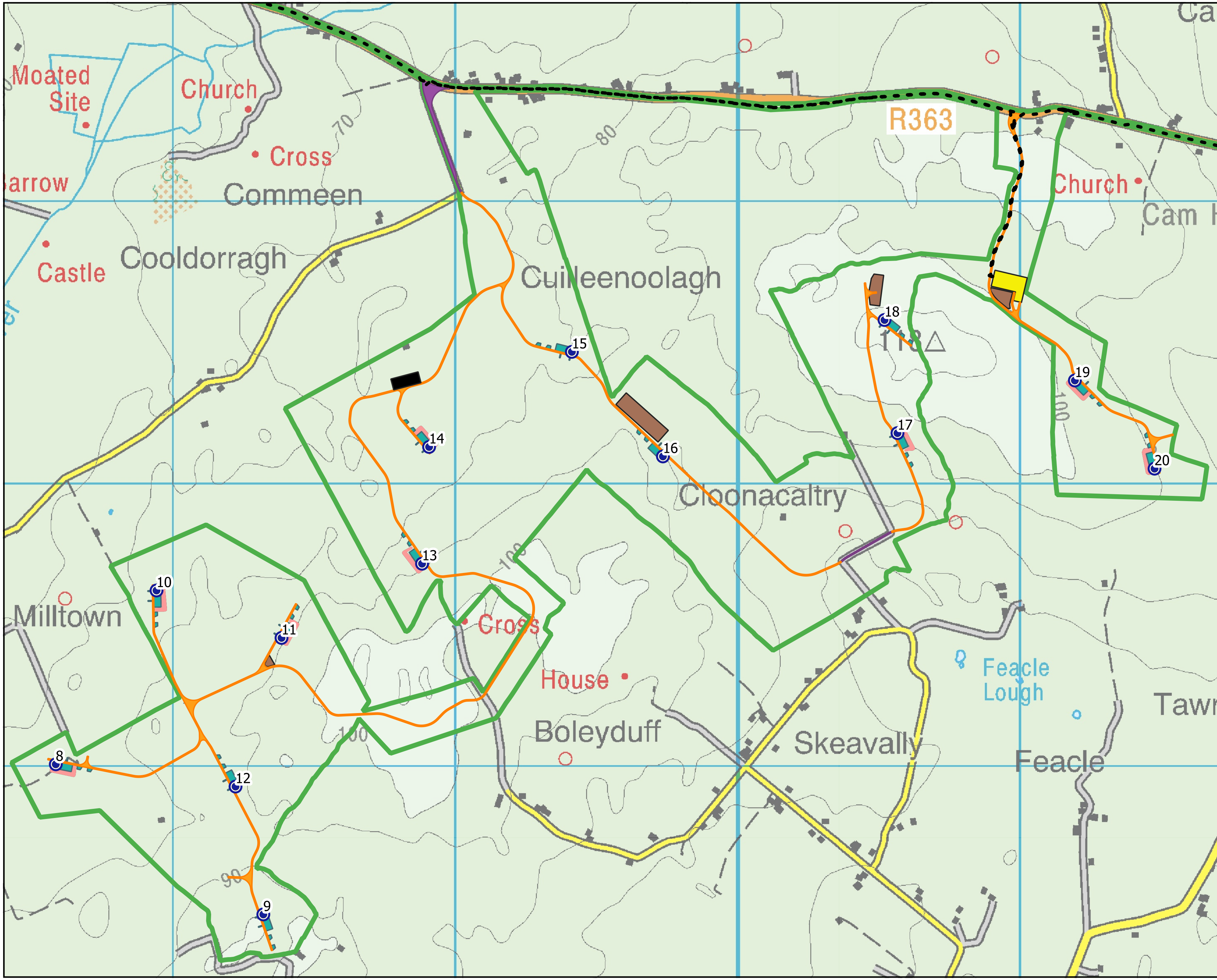
Map Legend

- EIAR Site Boundary
- Proposed Turbine Layout
- Proposed Access Roads
- Proposed Hardstands
- Proposed Construction Compounds
- Proposed Met Mast Location
- Proposed Overburden Storage Areas
- Infrastructure Overburden Storage Areas
- Proposed Connector Cabling and Grid Connection

N

Drawing Title: Proposed Layout - Northern Cluster	
Project Title: Seven Hills Wind Farm, Co. Roscommon	
Drawn By: DN	Checked By: ÓM
Project No.: 190907	Drawing No.: Figure 4-2
Scale: 1:15000	Date: 01.06.2021

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



Map Legend

- EIAR Site Boundary
- Proposed Turbine Layout
- Proposed Hardstands
- Proposed Access Roads
- Proposed Upgrades to Existing Access Roads
- Proposed 110kV Substation Location
- Proposed Construction Compounds
- Proposed Overburden Storage Areas
- Infrastructure Overburden Storage Areas
- Proposed Connector Cabling and Grid Connection

Drawing Title Proposed Layout - Southern Cluster	
Project Title Seven Hills Wind Farm, Co. Roscommon	
Drawn By DN	Checked By ÓM
Project No. 190907	Drawing No. Figure 4-3
Scale 1:17500	Date 01.06.2021

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

4.3.1.2 Turbine Location and Site Investigations

As part of the design process for the Proposed Development, numerous intrusive site investigations were undertaken across the Northern and Southern Clusters, to provide detail and clarity on the nature and extent of subsoils and bedrock as a means of characterising the site and providing evidence for potential karstification of the limestone bedrock. This assisted in providing additional information on the most suitable location for turbines and associated infrastructure.

IGSL Limited undertook a programme of geotechnical site investigation works between September and December 2020. The investigation comprised of rotary drilling, machine-dug trial pits and dynamic probing. The investigations were executed in accordance with BS 5930, Code of Practice for Site Investigations (2015) and EN 1997-2 Eurocode 7 Part 2 Ground Investigation & Testing and supervised by an IGSL Geotechnical Engineer.

APEX Geophysics conducted a non-intrusive investigation comprising 2D Electrical Resistivity Tomography, 2D P-wave Seismic Refraction profiles as well as a MASW [Multi-channel Analysis of Surface Waves] survey of each turbine location and at the proposed substation location.

Additional drillholes and excavations together with non-intrusive geophysical methods were scheduled by Malachy Walsh following a review of the initial survey at both Turbine 1 and Turbine 11.

A summary of the site investigation works is detailed below:

- Rotary Core Drillholes (43 No.)
- Trial Pits (45 No.)
- Dynamic Probing (67 No.)
- Geophysical Survey
- Groundwater Monitoring
- Surveying of Exploratory Hole Locations

Site investigations at the site were completed as a means to inform the final turbine layout. At the initial stages of the project, a 21-turbine layout was considered. Therefore, it should be noted that the naming of the site investigation works do not correspond with turbine numbering and are as detailed in the below Table 4-2. In addition, all the below locations are mapped within Figures 8-2 and 8-6 of Chapter 8 – Lands, Soils and Geology.

Table 4-2 - Site Investigation Numbering in regard to Wind Farm infrastructure

Turbine Numbers	IGSL Site Numbering to Match proposed Wind Farm Infrastructure
T01	T01-RC01, T01-RC02, T01-TP01 and T01-TP02
T02	T02-RC01, T02-RC02, T02-TP01 and T02-TP02
T03	T03-RC01, T03-RC02, T03-TP01 and T03-TP02
T04	T04-RC01, T04-RC02, T04-TP01 and T04-TP02
T05	T05-RC01, T05-RC02, T05-TP01 and T05-TP02
T06	T06-RC01, T06-RC02, T06-TP01 and T06-TP02
T07	T07-RC01, T07-TP01 and T07-TP02
T08	T08-RC01, T08-RC02, T8-TP01 and T08-TP02

T09	T10-RC01, T10-RC02, T10-TP01 and T10-TP02
T10	T11-RC01, T11-RC02, T11-TP01 and T11-TP02
T11	T12-RC01, T12-RC02, T12-TP01 and T12-TP02
T12	T13-RC01, T13-RC02, T13-TP01 and T13-TP02
T13	T14-RC01, T14-RC02, T14-TP01 and T14-TP02
T14	T15-RC01, T15-RC02, T15-TP01 and T15-TP02
T15	T16-RC01, T16-RC02, T16-TP01 and T16-TP02
T16	T17-RC01, T17-RC02, T17-TP01 and T17-TP02
T17	T18-RC01, T18-RC02, T18-TP01 and T18-TP01
T18	T19-RC01, T19-RC02, T19-TP01 and T19-TP02
T19	T20-RC01, T20-RC02, T20-TP01 and T20-TP02
T20	T21-RC01, T21-RC02, T21-TP01 and T21-TP02
Substation	Substation-TP01 and Substation-TP02
Met-Mast	Mast-RC01, Mast-RC02, Mast-TP01 and Mast-TP02

Full details and results from the site investigation works is detailed in Appendix 4-3 of this EIAR.

4.3.1.3 Turbine Type

Wind turbines use the energy from the wind to generate electricity. A wind turbine, as shown in Plate 4-1 below, consists of four main components:

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

Plate 4-1 Wind turbine components

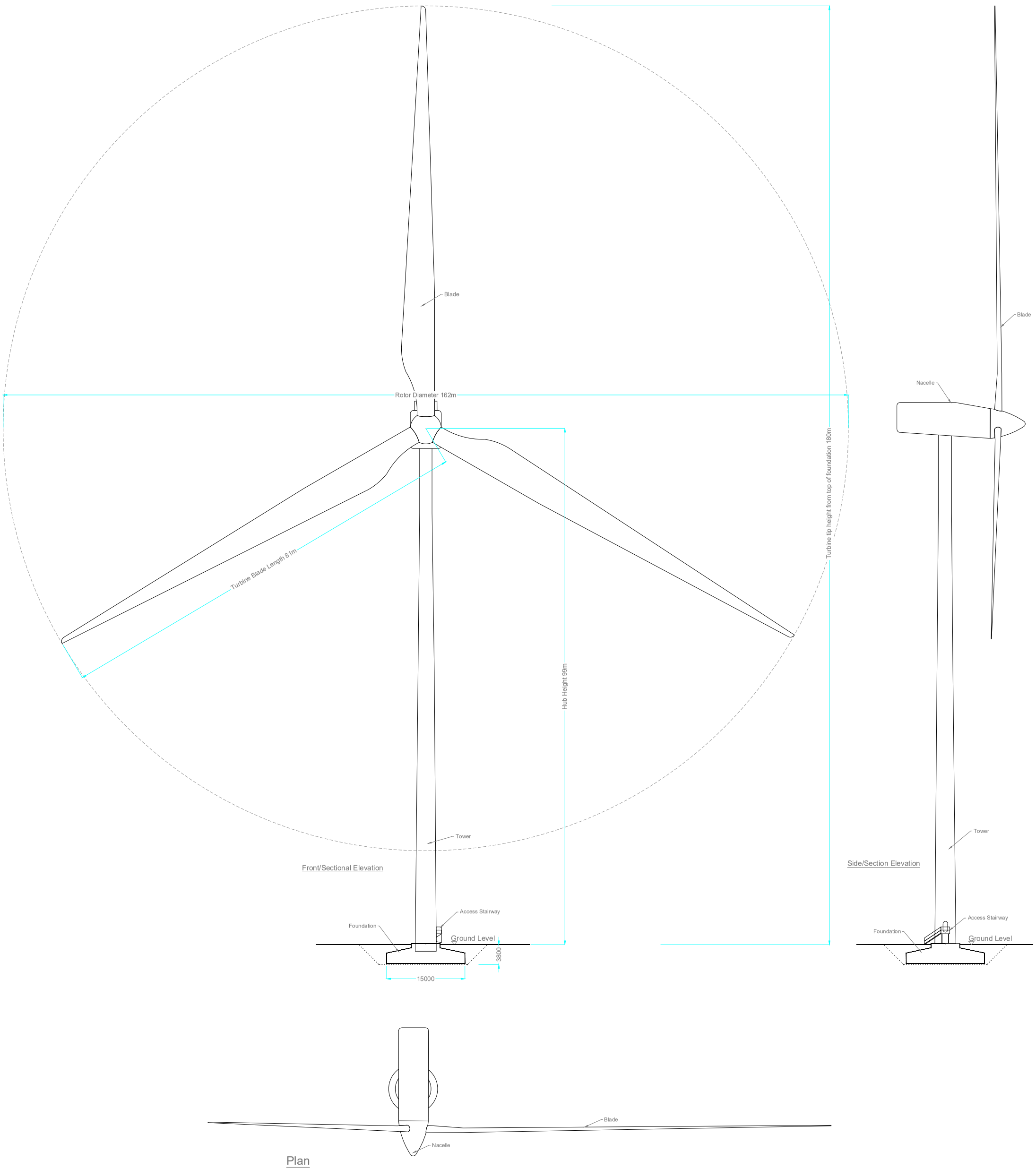
The proposed wind turbines will have a tip height of 180 metres, a rotor diameter of 162m and a hub height of 99m. The exact make and model of the turbine will be dictated by a competitive tender process, but it will not exceed a tip height of 180 metres. Modern wind turbines from the main turbine manufacturers have evolved to share a common appearance and other major characteristics, with only minor cosmetic differences differentiating one from another. The wind turbines that will be installed on the site will be conventional three-blade turbines, that will be geared to ensure the rotors of all turbines rotate in the same direction at all times. The turbines will be grey matte in colour.

For the purposes of this EIAR, the above turbine dimensions have been selected and considered in the relevant sections of the EIAR. Turbine design parameters have a bearing on the assessment of shadow flicker, noise, visual impact, traffic and transport and ecology (specifically birds), as addressed elsewhere in this EIAR.

A drawing of the proposed wind turbine is shown in Figure 4-4. All turbine hard standing area, assembly area and blade fingers are shown for each 20. turbines in Appendix 4-1.

Figure 4-5 shows the turbine foundation and base layout.

The individual components of a typical geared wind turbine nacelle and hub are shown in Figure 4-6.

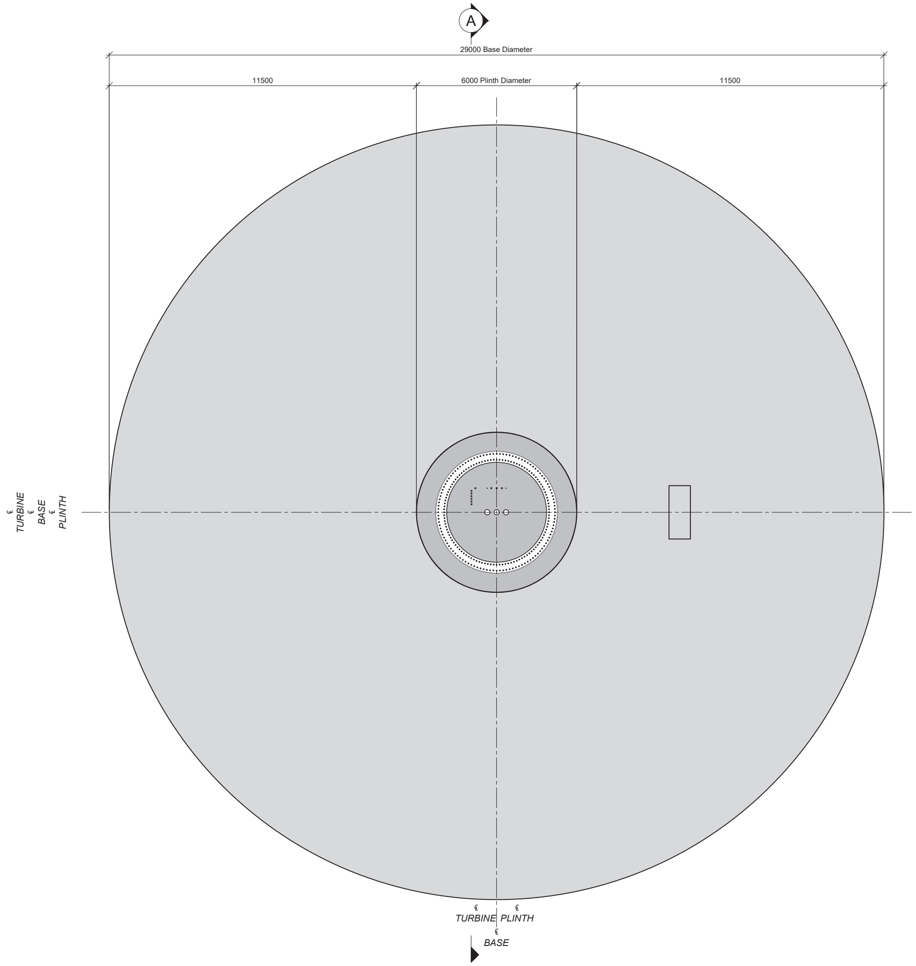


Drawing Notes

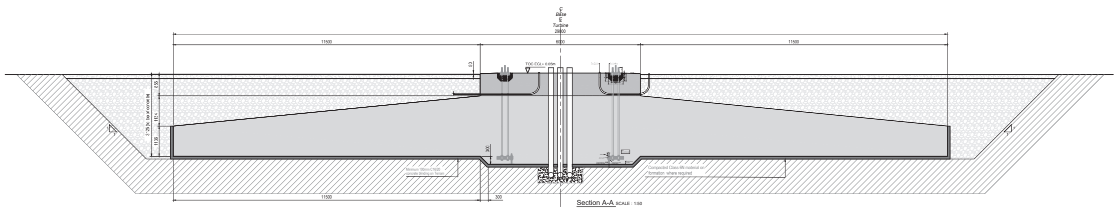
1. Proposed wind turbines to have a maximum ground to blade tip height of 180.
2. Exact make and model of the turbine to be dictated by a competitive tender process.
3. Installed wind turbine not to exceed maximum size envelope.
4. Turbine foundation diameter may vary.
5. Ground level represents the top of turbine foundation.

DRAWING TITLE: Proposed Turbine Size Envelope - Elevation View	
PROJECT TITLE: Seven Hills Wind Farm, Co. Roscommon	
DRAWING BY: Joseph O Brien	CHECKED BY: Meabhann Crowe
PROJECT No.: 190907	DRAWING No.: Fig 4-4
SCALE: 1:500 @A1	DATE: 03.06.2022

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



PROPOSED TURBINE FOUNDATION PLAN
SCALE 1:100



SECTION A
SCALE 1:100

DO NOT SCALE FROM THIS DRAWING. USE FIGURED DIMENSIONS IN ALL CASES. VERIFY DIMENSIONS ON SITE AND REPORT ANY DISCREPANCIES TO THE DESIGNERS IMMEDIATELY.
THIS DRAWING TO BE READ IN CONJUNCTION WITH THE DESIGNERS SPECIFICATION.

NOTES:
1. ALL DRAWINGS ARE TO BE READ IN CONJUNCTION WITH ALL RELEVANT SPECIFICATIONS, BILLS OF QUANTITIES, ARCHITECTURAL, SERVICES AND ENGINEERING DRAWINGS.
2. ALL LEVELS ARE IN METRES RELATED TO ORDNANCE DATUM MALIN HEAD.
3. ANY DISCREPANCIES BETWEEN THESE DOCUMENTS SHALL BE BROUGHT TO THE ATTENTION OF THE ENGINEER.
4. DRAWINGS ARE NOT TO BE SCALED.
5. ALL DIMENSIONS ARE IN MILLIMETRES, UNLESS NOTED OTHERWISE.

Fig 4-5

REV	DATE	DESCRIPTION	BY	APP
P01	30/03/22	FOR INFORMATION	MW	BS

PROJECT: SEVEN HILLS WIND FARM

TITLE: GROUND BEARING FOUNDATIONS

CLIENT: energia Switched on

Malachy Walsh and Partners
Engineering and Environmental Consultants
Cork | Tralee | London | Limerick

The Elm Suite,
Loughmore Centre,
Raheen Business Park,
Limerick,
V94 R578

Tel. : +353 (0) 61 480164
Fax : +353 (0) 61 441125
E-mail : limerick@mwp.ie
Web : www.mwp.ie

DRAWN: MW	CHECKED: BS	APPROVED: BS
DATE: 30/03/22	SCALE @ A1: 1:10, 25 & 100	
PROJECT NUMBER: 21337		DRAWING STATUS: S0

DRAWING NUMBER: 21337-MWP-ZZ-00-DR-C-0104 REV: P01

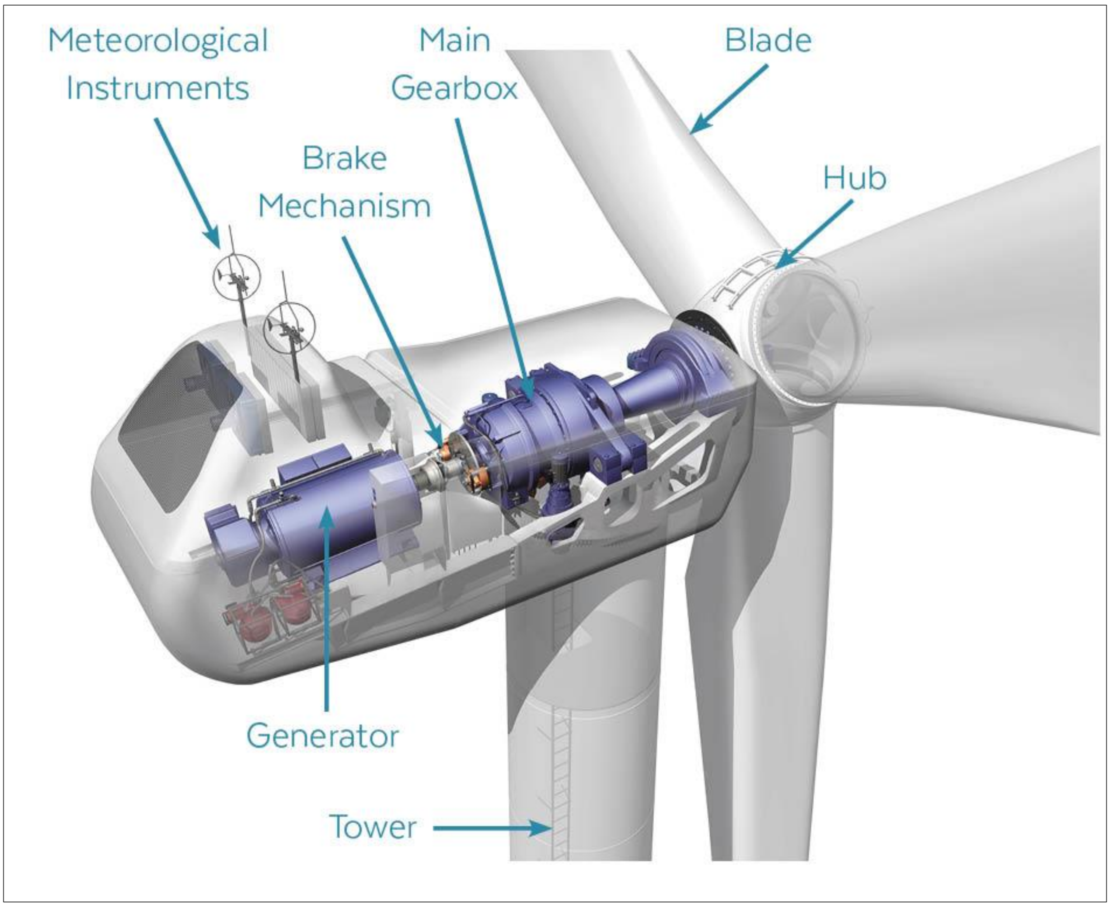


Figure 4-6 Turbine nacelle and hub components

4.3.1.4 Turbine Foundations

Each wind turbine is secured to a reinforced concrete foundation that is installed below the finished ground level. The foundation has been designed and dictated by expansive site investigation surveys (as detailed above and included in Appendix 4-3) that were undertaken at the site and are based on the site geotechnical characteristics. The turbine foundation transmits any load on the wind turbine into the ground. The horizontal and vertical extent of the turbine's foundation is shown above in Figure 4-5. The proposed turbine foundations measures 29m in diameter. The final turbine make and model selection will be the subject of a competitive tender process.

After the foundation level of each turbine has been formed, using piling methods or excavating to 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. The outside of the foundation is shuttered with demountable formwork to allow the pouring of concrete and is backfilled accordingly with appropriate granular fill or ballast to finished surface level (Plate 4-2 below). The reinstated ballast material can maintain a stoned running surface for maintenance vehicle access.

Plate 4-2 Turbine 'Anchor Cage' (left) and finished turbine base (right)

4.3.1.5 Hard Standing Areas

Hard standing areas consisting of levelled and compacted hardcore are required around each turbine base to facilitate access, turbine assembly and turbine erection. The hard-standing areas are typically used to accommodate cranes used in the assembly and erection of the turbine, offloading and storage of 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 the proposed hard standing areas have been designed and dictated by site investigation surveys that were undertaken at the site. The proposed hard standing areas measure 25m in width and 59m in length for the proposed turbines. The proposed hard standing areas for each individual turbine are shown on the detailed layout drawings included in Appendix 4-1 to this EIAR.

4.3.1.5.1 *Assembly Areas, Blade Fingers and Crane Assist Pads*

Levelled assembly areas are provided for the turbine erection. These are located on the hard-standing predominantly. In addition, 2 no. temporary blade fingers are provided for temporary storage of the turbine blades, which are located on the opposite side of the road from the hard-standing area as shown in Appendix 4-1. 2 temporary no. crane assist pads will also be provided in front of the hard-standing areas. These serve as set-up locations for the assist cranes to put the main crane together. These assembly areas are required for offloading turbine blades, tower sections and hub from trucks until such time as they are ready to be lifted into position by cranes. The assist crane pads measure approximately 12m in width by 17m in length. The exact arrangement of assembly area around the hardstands will be determined in consultation with the selected turbine manufacturer, however, the areas required will be assessed in this EIAR.

4.3.1.6 Power Output

The Proposed Development comprises a turbine with a tip height of 180m, a rotor dimeter of 162m and a hub height of 99m. It is anticipated that the proposed wind turbines will have a rated electrical power output of approximately 5 - 7 Megawatts (MW) per turbine. Turbines of the exact same make, model and dimensions can also have different power outputs depending on the capacity of the electrical generator installed in the turbine nacelle. Based on the above and for the purposes of this EIAR, a turbine model with a nominal rated output of 6 MW per turbine has been chosen to calculate the power output of the proposed 20-turbine Wind Farm, which would result in an estimated installed capacity of 120 MW.

Assuming an installed capacity of 120 MW, the Proposed Development therefore has the potential to produce approximately 367,920 MWh (megawatt hours) of electricity per year, based on the following calculation:

A x B x C = Megawatt Hours of electricity produced per year

where:

A = The number of hours in a year: 8,760 hours

B = The capacity factor, which takes into account the intermittent nature of the wind, the availability of wind turbines and array losses etc. A standard capacity factor of 35% is applied here

C = Rated output of the Wind Farm: 120 MW

The 367,920 MWh of electricity produced by the Proposed Development would be sufficient to supply approximately 87,600 Irish households with electricity per year, based on the average Irish household using 4.2 MWh[1] of electricity.

At present, there is a total of 112MW of renewable energy being generated in County Roscommon, with the potential for 262MW to be produced[2]. If the Proposed Development where to receive a grant of permission, the development would double the current capacity and contribute to County Roscommon's renewable energy targets.

4.3.2 Site Roads

4.3.2.1 Road Construction Types

To provide access within the site of the Proposed Development and to connect the wind turbines and associated infrastructure, existing tracks will need to be upgraded and new access roads will need to be constructed.

The Proposed Development makes use of the existing road network insofar as possible. It is proposed to upgrade approximately 635 metres of existing site roads and tracks, and to construct approximately 18.7km of new access road on the site. The construction of the Wind Farm will not require the crossing of any existing streams or watercourses. The Grid Connection will however require the crossing of 5 existing streams or watercourses. This is further detailed in Section 4.8.7 below.

1 March 2017 CER (CRU) Review of Typical Consumption Figures Decision https://www.cru.ie/document_group/review-of-typical-consumption-figures-decision-paper/
2 *Roscommon County Development Plan – 2022-2028 – Renewable Energy Strategy*

4.3.2.1.1 Upgrade to Existing Roads or Tracks

The existing tracks onsite were constructed using the excavate and replace construction technique. The general construction methodology for upgrading of existing sections of excavated roads or tracks is summarised below.

i. *The edge of existing tracks will be cut back by 1m. and a Combigrid placed over the proposed widened area. The cutting back of the existing track allows an anchorage of the Combigrid under the existing track.*
ii. *Granular fill to be placed in layers in accordance with the designer's specification and to match the depth of stone on the existing track. A geogrid will be applied at this level across the existing/widened road.*
iii. *The surface of the existing/widened access track will be overlaid with up to 300mm of selected granular fill.*
iv. *A layer of geogrid/geotextile may be required at the surface of the existing access road and in the widened section of road, where excessive rutting is anticipated (to be confirmed by onsite engineer).*
v. *Where excavations in spoil are required, side slopes shall be not greater than 1 (v): 2. This slope inclination will be reviewed during construction, as appropriate.*
vi. *The finished road width will be approximately 5m.*
vii. *If required, interceptor drains will be installed upslope of the access road alignment to divert any surface water away from the construction area. (Typically, interceptor drains preserve existing watercourses as a 'clean water drainage system / network'; see Section 4.6.4.1 of this chapter under Drainage Design for further details.)*
viii. *A final capping layer shall be placed over the existing access track, as per design requirements, to provide a suitable road profile and graded to accommodate wind turbine construction and delivery traffic.*
ix. *Drainage (as detailed below in Section 4.6.4).*

A section of existing excavated road for upgrade is shown in Figure 4-7.

4.3.2.1.2 Construction of New Excavated Roads

Due to the ground conditions, new access tracks proposed on site are proposed to be founded. The typical make-up of the founded access tracks is a minimum stone thickness of 600mm.

The general construction methodology for construction of excavated roads is summarised below:

i. *The appointed contractor will survey the area for any unforeseen hazards prior to the commencement of works and set up warning signage as appropriate.*
ii. *Excavators will first remove any topsoil / vegetative layer which may be present if deemed required. This is of relevance more for hardstands as roads will be constructed on grade where possible. This material will be transported to an agreed storage area and maintained for re-use during the restoration phase of the Wind Farm construction. Material to be reused will generally be kept adjacent to the location for reuse where possible. Topsoil / vegetation removal will be kept to a minimum in order to prevent any runoff of silt during heavy rainfall.*
iii. *Excavators will continue to strip and excavate the soft subsoil where required which will be temporarily stored adjacent to the works in accordance with approved methods with the use of an articulated dumper truck. Excavated material will only be temporarily stored on slopes under 10° and to a maximum height of under 1.0m at the required setback from streams until they are transported to the selected deposition areas where they will be permanently stored if not reused.*
iv. *All excavations to be carried out will be battered back to a safe angle of repose (maximum slope angle of 45°) and comply with the final Construction and Environmental Management Plan (CEMP) to be produced by the appointed contractor*

(and outline construction management plan considering all possible construction methodologies and all mitigation measures has been submitted with this application).

v. *Once a section of the excavated infrastructure is exposed to formation a layer of geogrid or geotextile material will be placed along its formation depending on ground conditions, which will be covered with imported aggregate stone as required.*

vi. *The stone will be delivered to the required work area and spread out locally with the use of excavators and compacted with the use of a roller which will roll the stone aggregate in maximum 250mm layers on top of the geogrid/geotextile material in order to achieve the required design strength.*

vii. *Drains as outlined in the relevant civil drawings will be constructed to manage clean and dirty water runoff in sensitive areas.*

viii. *The final running surface of the new excavated access roads will be capped with a layer of hard wearing Cl 804 stone or similar using a road grader.*

ix. *Any surplus spoil material generated from the excavated infrastructure will be transported back to the deposition areas. Excavated topsoil and subsoil will be kept separate at the excavation and storage areas.*

x. *The appointed contractor will ensure that on-site personnel are aware of environmental constraints/sensitive areas within the Wind Farm site in which works are to be avoided.*

xi. *Interceptor drains will be installed upslope of the access road alignment to divert any surface water away from the construction area. (Typically, interceptor drains preserve existing watercourses as a 'clean water drainage system/network'; see Section 4.6.4.1 of this chapter under Drainage Design for further details.)*

xii. *Excavation will take place to a competent stratum beneath the topsoil (as agreed with the site designer and resident engineer).*

xiii. *Road construction will be carried out in sections of approximately 50m lengths i.e. no more than 50m of access road to be excavated without re-placement with stone fill.*

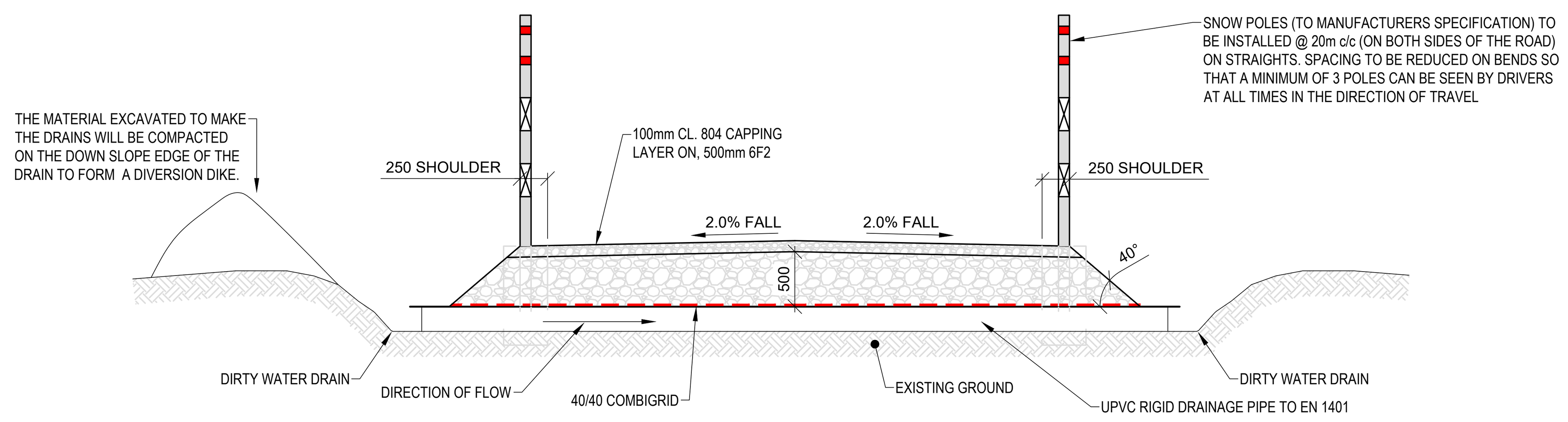
xiv. *The surface of the excavated access roads will be overlaid with minimum 250mm of selected granular fill. Granular fill to be placed in layers in accordance with the designer's specification.*

xv. *Access roads to be finished with a layer of capping across the full width of the road.*

xvi. *A final surface layer shall be placed over the excavated road, as per design requirements, to provide a suitable road profile and graded to accommodate wind turbine construction and delivery traffic.*

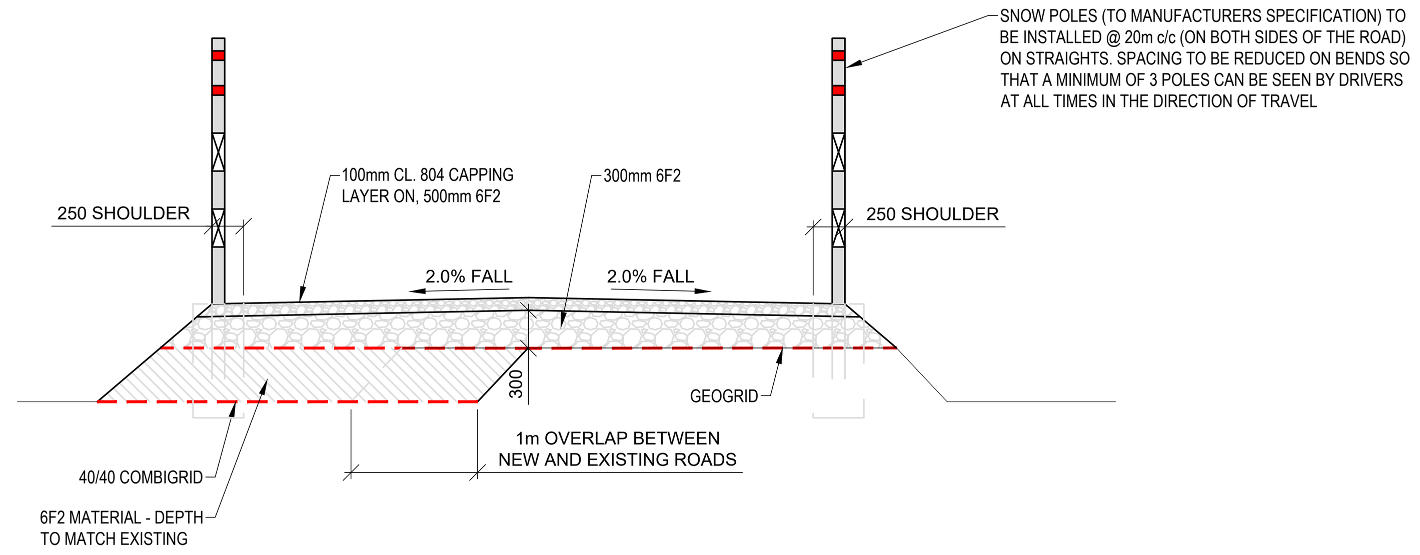
xvii. *Drainage (as detailed below in Section 4.6.4).*

A section of a new excavated road is also shown in Figure 4-7.



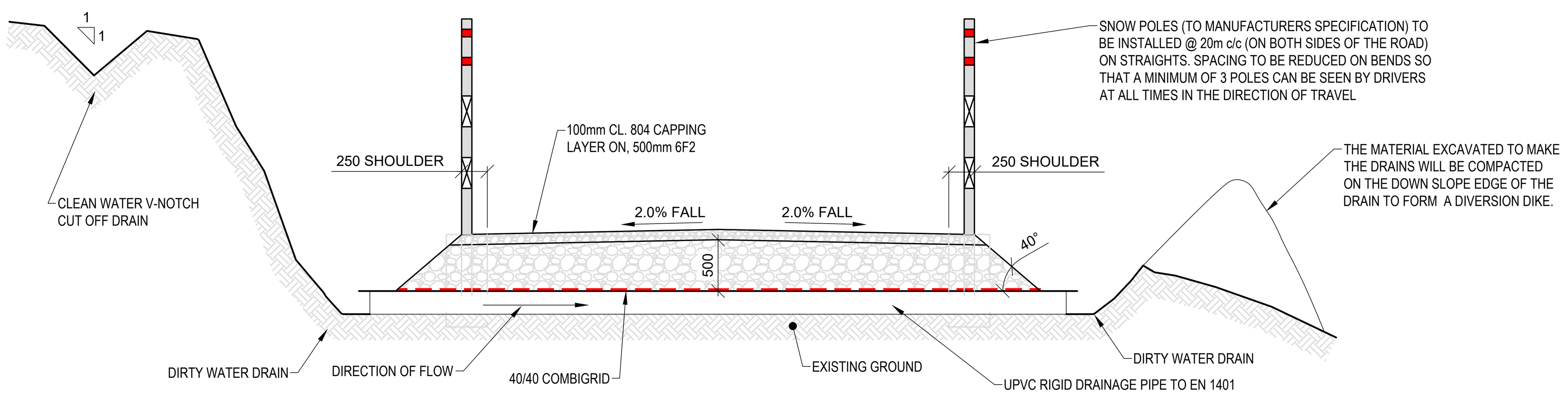
GROUND BEARING ROAD DETAIL (FLAT GROUND)

SCALE 1:50



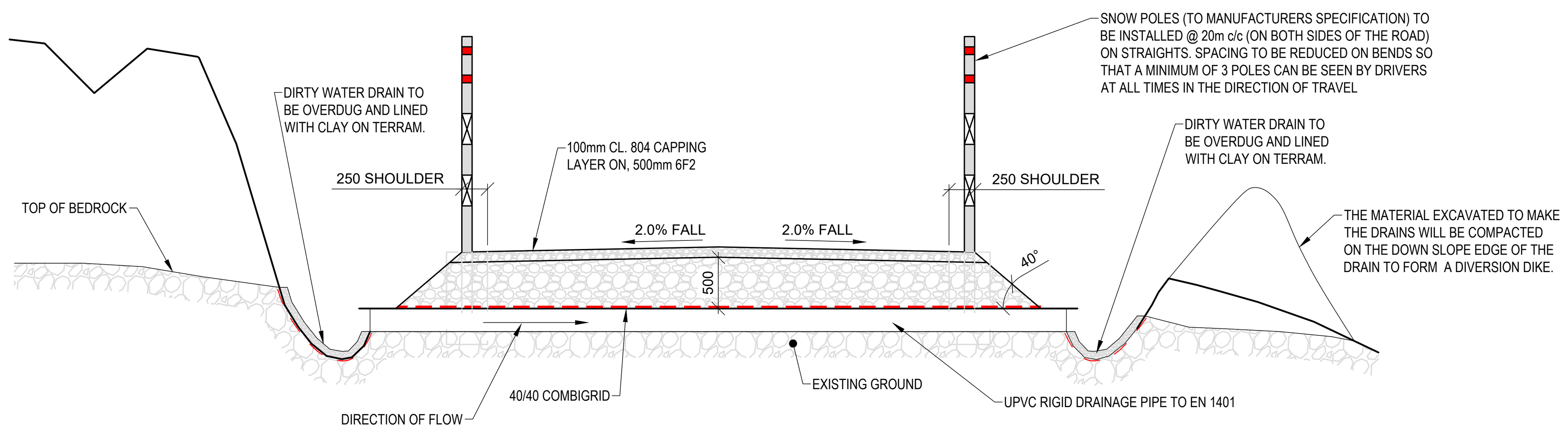
WIDENED ACCESS TRACK DETAIL

SCALE 1:50



GROUND BEARING ROAD DETAIL (SLOPING GROUND NO BEDROCK EXPOSED)

SCALE 1:50



GROUND BEARING ROAD DETAIL (SLOPING GROUND BEDROCK EXPOSED)

SCALE 1:50

NOTES:

1. ALL DRAWINGS ARE TO BE READ IN CONJUNCTION WITH ALL RELEVANT SPECIFICATIONS, BILLS OF QUANTITIES, ARCHITECTURAL, SERVICES AND ENGINEERING DRAWINGS.
2. ALL LEVELS ARE IN METRES RELATED TO ORDNANCE DATUM MALIN HEAD.
3. ANY DISCREPANCIES BETWEEN THESE DOCUMENTS SHALL BE BROUGHT TO THE ATTENTION OF THE ENGINEER.
4. DRAWINGS ARE NOT TO BE SCALED.
5. ALL DIMENSIONS ARE IN **METERS**, UNLESS NOTED OTHERWISE.
6. THESE DETAILS ARE **TYPICAL**, THEY WILL BE ADJUSTED ACCORDING TO THE CONSTRUCTION REQUIREMENT.

REFERENCE DRAWINGS:

DRAWING No.	DRAWING TITLE
21337-MWP-00-00-DR-C-xxxx	SITE LAYOUT MASTER SHEET

Figure 4-7

REV	DATE	DESCRIPTION	BY	APP
P03	01 / 06 / 22	ISSUED FOR INFORMATION	MW	BS
P02	28 / 03 / 22	ISSUED FOR INFORMATION	MW	BS
P01	20 / 01 / 22	ISSUED FOR INFORMATION	PK	BS

PROJECT: SEVEN HILLS WF

TITLE: Road Sections

CLIENT: energia Switched on

Malachy Walsh and Partners
Engineering and Environmental Consultants
Cork | Tralee | London | Limerick

The Elm Suite, Loughmore Centre, Raheen Business Park, Limerick, V94 R578
Tel. : +353 (0) 61 480164
Fax : +353 (0) 61 441125
E-mail : limerick@mwp.ie
Web : www.mwp.ie

DRAWN: PK	CHECKED: PB	APPROVED: BS
DATE: 01 / 06 / 22	SCALE @ A1: 1:50	
PROJECT NUMBER: 21337		DRAWING STATUS: S2

DRAWING NUMBER: 21337-MWP-ZZ-00-DR-C-2127 REV: P03

4.3.3 Deliveries of Stone and Ready-Mix Concrete from Quarries

In order to facilitate the construction of the Proposed Development, materials will need to be imported from nearby quarries. The quarries that could potentially provide stone and concrete for the Proposed Development are as follows;

1. *Roadstone, Cam – Stone,*
2. *Manninon Quarries, Bealnamulla – Stone,*
3. *Kildea Concrete, Bealnamulla – Concrete,*
4. *Spollen Concrete, Glasson – Concrete,*
5. *Ward Bros Quarry, Athleague – Stone,*
6. *Whelan's Limstone Quarries Ltd., Leccarow – Stone.*

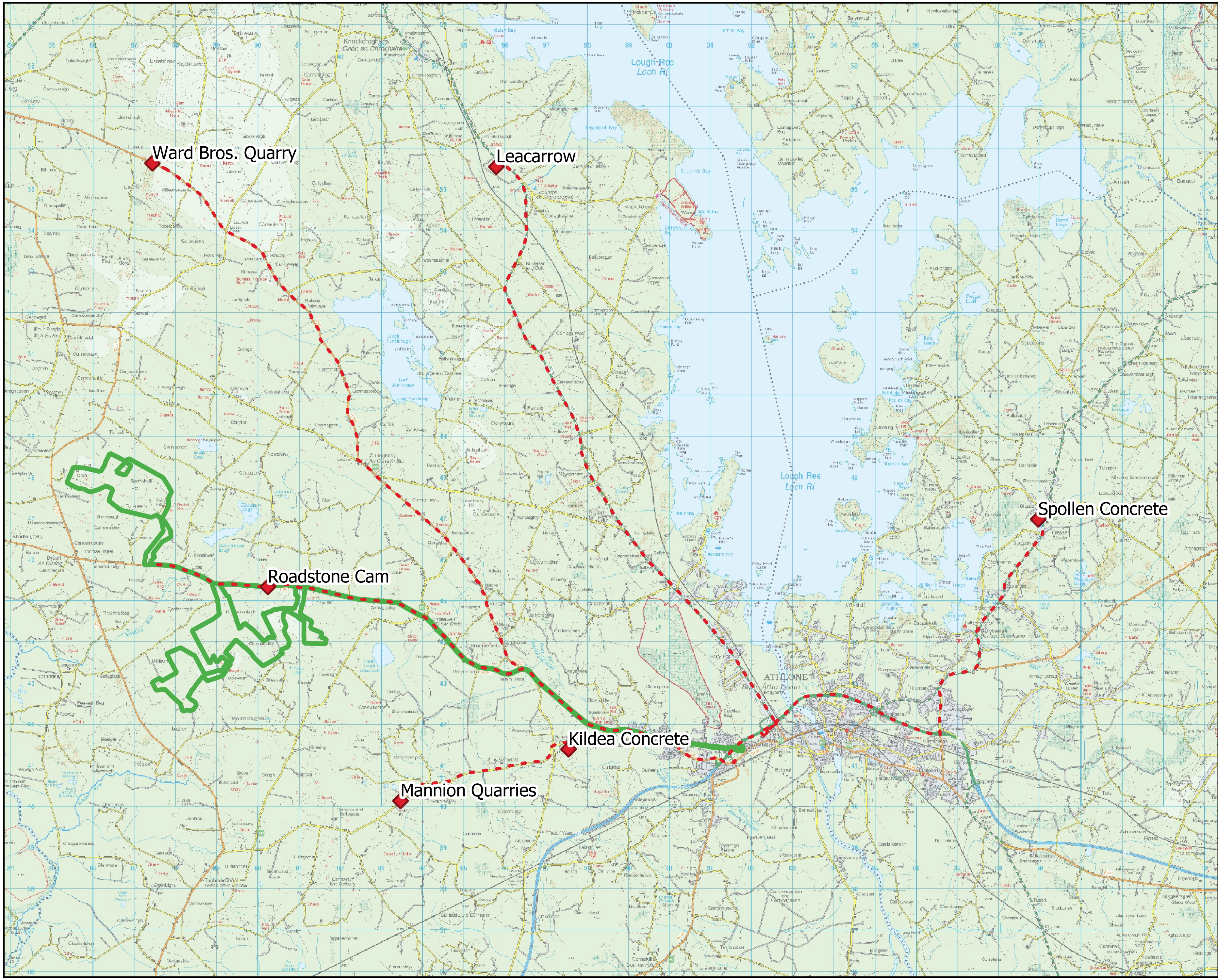
The locations of these quarries and ready-mixed concrete (RMC) batching plants together with the proposed routes to the Proposed Development site are shown in Figure 4-8. Deliveries of stone and ready-mix concrete for use in construction of the Proposed Development, are discussed in further detail in Chapter 14 of this EIAR.

4.3.3.1 Quantities of Aggregate Material Required

The quantity of aggregate material and concrete required for the Proposed Development has been calculated, as presented in Table 4-3 below.

Table 4-3 Seven Hills Wind Farm Predicted Required Volumes of Aggregate Material and Concrete

Infrastructure Item	Volume of Stone Won Onsite which can be reused during construction (m^3)	Volume of Material to be Imported (m^3)
Total for Northern Site only	3,900	26,500
Total for Southern Site only	4,200	132,850
Total Overall	8,100	159,350
Overall Total Volume of Stone Required for Construction	167,450	



Map Legend

- EIAR Site Boundary
- Location of Local Quarries
- Proposed Delivery Routes from Quarries

Drawing Title: Local Quarry Locations and Associated Delivery Routes	
Project Title: Seven Hills Wind Farm, Co. Roscommon	
Drawn By: DN	Checked By: ÓM
Project No.: 190907	Drawing No.: Figure 4-8
Scale: 1:120000	Date: 30.05.2021

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

4.3.4 Spoil and Overburden Management

The predicted overburden volumes generated during construction have been calculated and are outlined in Table 4-4 below. The quantity of overburden requiring management on the site of the Proposed Development has also been calculated, as presented in Table 4-5 below. These quantities were calculated as part of the Spoil Management Plan prepared by Malachy Walsh and Partners in Appendix 4-7 of this EIAR.

Table 4-4 Predicted Overburden Volumes Generated During Construction

Type of Overburden	Volume (m^3) (approx.)
Rock	8,100
Spoil (Clays/Gravels/Topsoil)	118,400
Total Spoil Generated	126,500

Of the **118,400m³** of spoil generated, approximately:

- **20,000 m³** of spoil generated as outlined in Table 4-4 above during foundation excavations will be reused as ballast for the backfilling on turbine foundations;
- 1,500 m³ of the spoil volume will be stored local to each turbine foundation and hardstand in allowable areas (16 of 20 turbines), totalling **24,000 m³**; and
- **7,500 m³** of the spoil volume will be used for miscellaneous landscaping.

The remainder of the surplus excavated spoil material, estimated at **66,900m³** will be stored within the overburden storage areas, as shown on in Figures 4-9 to 4-11 below. The 8,100m³ of rock generated will be reused on site.

The breakdown of the surplus spoil material that will be managed in the Northern and Southern Clusters of the site of the Proposed Development is 17,300 m³ and 49,600 m³ respectively. The overburden storage areas proposed can accommodate these volumes without the need to transport spoil from the Northern Cluster to the Southern Cluster, and vice versa.

Table 4-5 Overburden Volumes Requiring Management

Development Type	Approx. Volume (m^3) Northern Cluster	Approx. Volume (m^3) Southern Cluster
Approx. Total Volume (m^3) (Total Rock and Spoil as per Table 4-4)	+126,500	
Infrastructural Spoil Generation	**+ 40,700**	**+ 85,800**
Storage at hardstands and turbines	- 10,500	- 13,500
Reuse of material for ballast	- 7,000	- 13,000
Reuse of rock	- 3,900	- 4,200
Landscaping	- 2,000	- 5,500
Total Overburden to be managed	17,300	49,600

The total surplus spoil volume (**66,900m^3**) that is required to be stored within the proposed overburden storage areas will be done directly after excavation. A summary of the total overburden volumes for the Northern and Southern Clusters of the Proposed Development are provided in Table 4-6 below.

Table 4-6 Summary of Overburden Volumes Requiring Management (North and South)

Type of Overburden	Volume (m^3) (approx.)
Northern Site Spoil Storage Areas	17,300
Southern Site Spoil Storage Areas	49,600
Total Volume	66,900

4.3.4.1 Overburden Storage Areas

Spoil and overburden will be stored locally within the Proposed Development site, in dedicated overburden storage areas as shown on Figures 4-1 – 4-3 above. The Proposed Development includes for the provision of 6 no. overburden storage areas and storage around 15 turbines as shown in Figure 4-1. These areas have been selected based on the locations of spoil generation, areas suitable for spoil storage and environmentally constrained areas.

Prior to the use of areas for storage an interceptor drain will first be excavated upslope in order to intercept existing overland flow and divert it around the storage area prior to discharge via a buffer zone on the downslope side. A dirty water cut-off drain will be provided on the downhill side of the storage area to catch dirty water run-off and transfer it to a settlement pond prior to discharge via a buffered outfall.

Inspections of the storage areas will be made by a geotechnical engineer through regular monitoring of the works. The appointed contractor will review work practices at spoil deposition areas when periods of heavy rainfall are expected so as to prevent excessive dirty water runoff from being generated.

The surface of the deposited spoil will be profiled to a gradient to be agreed with the Geotechnical Engineer and vegetated or allowed to vegetate naturally as indicated by the project ecologist. Where there is a risk of inadvertent access into storage areas fencing will be provided. Further information on the overburden storage areas is detailed in the Spoil Management Plan prepared by Malachy Walsh and Partners in Appendix 4-7.

Plan and Sectional views of the overburden storage areas are seen in drawings in Appendix 4-1 and shown in Figures 4-9 to 4-11 below.

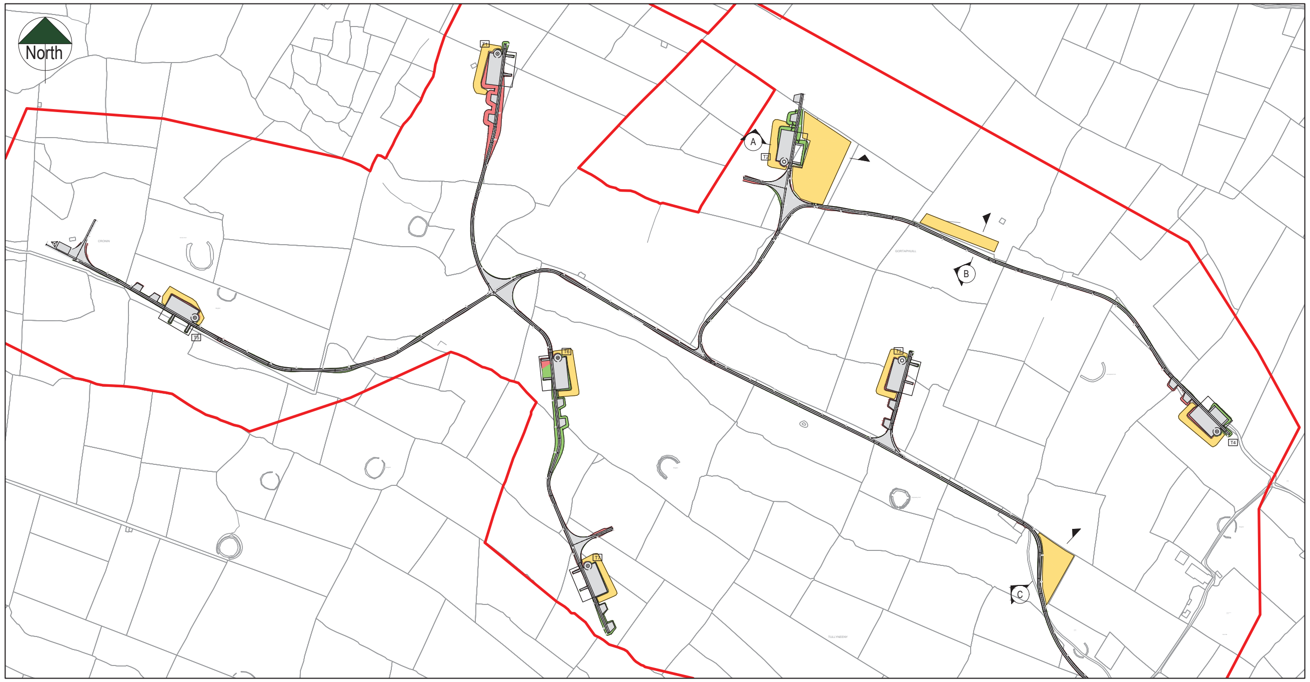
4.3.4.2 Placement of Spoil alongside Access Roads and Hardstands

In some areas of the site of the Proposed Development excavated materials will be placed temporarily alongside access roads or used for landscaping. The following best practice measures for the placement of spoil alongside the access road will be adhered to during the construction of the Proposed Development:

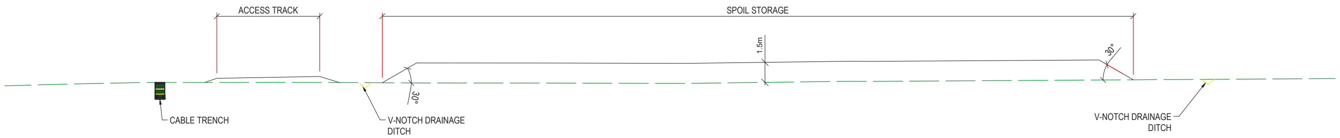
1. The potential spoil placement locations are alongside the existing excavated and proposed new access tracks with cross slopes of less than 10 degrees.
2. As a general guide, the spoil placed adjacent to the existing and proposed excavated access tracks will be restricted to a maximum height of 1.0m over a 3m wide corridor on both sides of the access tracks. It should be noted that the site engineer will define/confirm the maximum restricted height for the placed spoil.
3. The placement of excavated spoil will be avoided without first establishing the adequacy of the ground to support the load.

4. Where there is any doubt as to the stability of the ground then no material will be placed on to the surface.
5. Where practical, it will be ensured that the surface of the placed spoil is shaped to allow efficient run-off of surface water. Where possible, shaping of the surface of the spoil will be carried out as placement of spoil within the area progresses. This will reduce the likelihood of debris run-off and ensure stability of the placed spoil.
6. Finished/shaped side slopes in the placed spoil will be not greater than 1 (v): 2 or 3 (h).
7. Supervision by a geotechnical engineer or appropriately competent person will be carried out during this work.
8. All the above-mentioned general guidelines and requirements will be confirmed by the site engineer prior to construction.

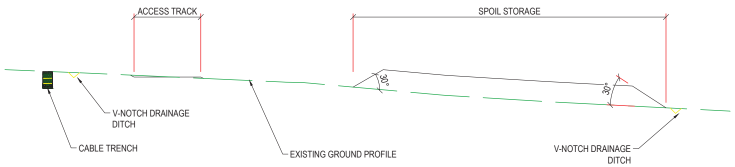
The management of excavated spoil and overburden and the methods of placement and/or reinstatement are described in detail in the Spoil Management Plan in Appendix 4-7 of this EIAR.



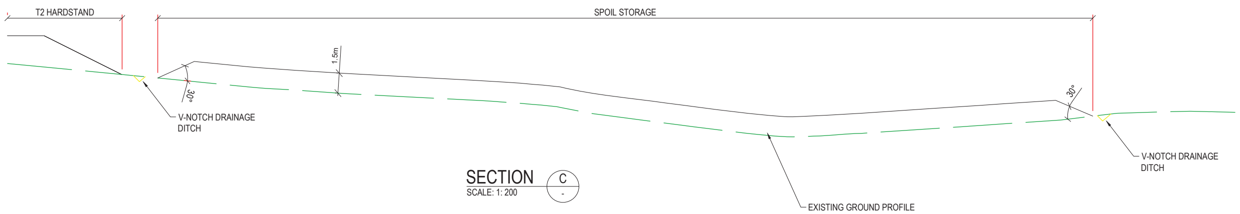
NORTH PLAN
SCALE 1:5000



SECTION A
SCALE: 1: 200



SECTION B
SCALE: 1: 200



SECTION C
SCALE: 1: 200

NOTES:

1. ALL DRAWINGS ARE TO BE READ IN CONJUNCTION WITH ALL RELEVANT SPECIFICATIONS, BILLS OF QUANTITIES, ARCHITECTURAL, SERVICES AND ENGINEERING DRAWINGS.
2. ALL LEVELS ARE IN **METRES** RELATED TO ORDNANCE DATUM MALIN HEAD OSGM15.
3. ALL CO-ORDINATES ARE TO IRISH TRANSVERSE MERCATOR **(ITM)** AND IN **METERS**.
4. ANY DISCREPANCIES BETWEEN THESE DOCUMENTS SHALL BE BROUGHT TO THE ATTENTION OF THE ENGINEER.
5. DRAWINGS ARE NOT TO BE SCALED.
6. ALL DIMENSIONS ARE IN **METERS**, UNLESS NOTED OTHERWISE.

LEGEND:

- SITE BOUNDARY
- EXISTING GROUND PROFILE
- PROPOSED SPOIL STORAGE PROFILE

Fig 4-9

REV	DATE	DESCRIPTION	BY	APP
P01	15 / 04 / 22	FOR INFORMATION	MW	BS

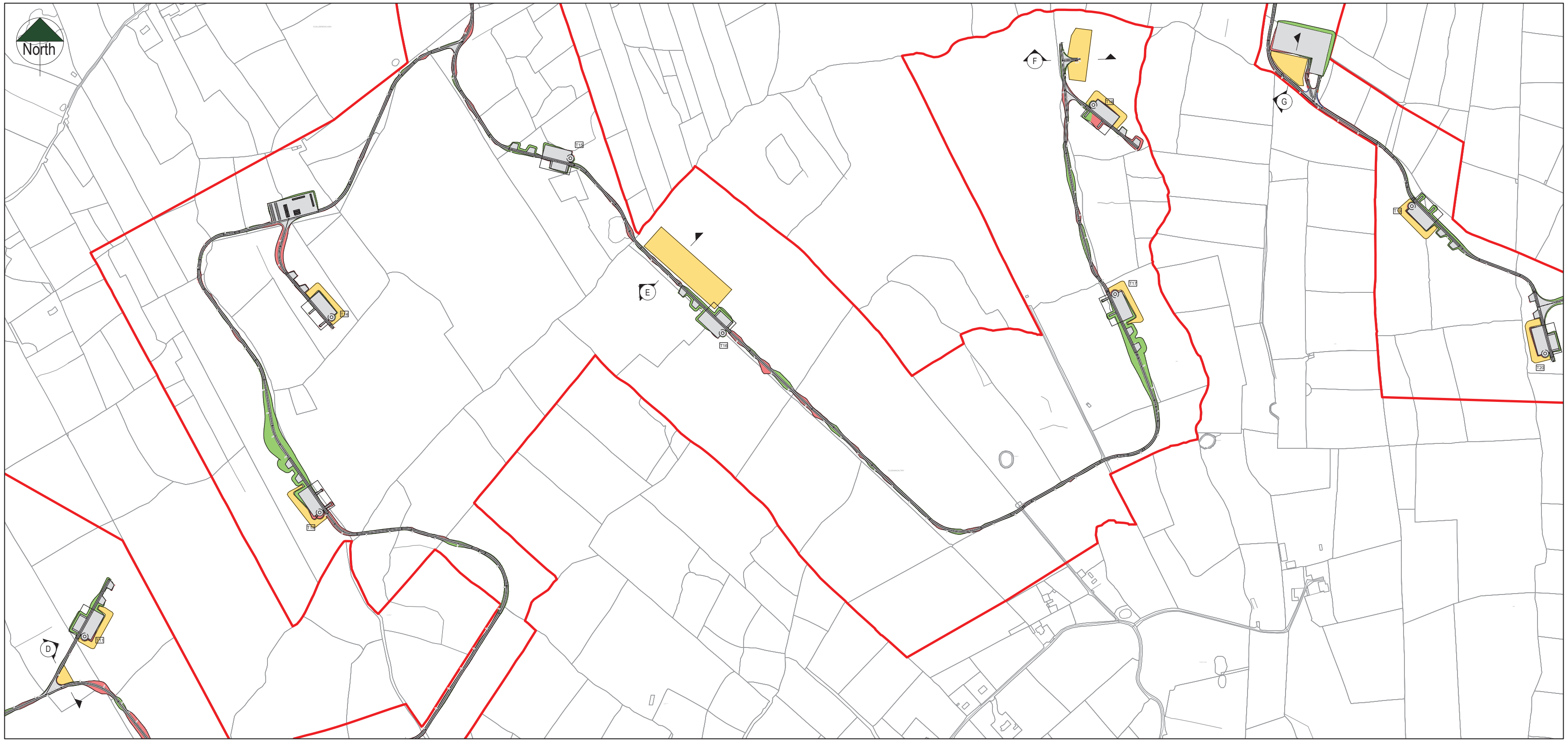
PROJECT: SEVEN HILLS WIND FARM

TITLE: SPOIL STORAGE SECTIONS - NORTH

CLIENT: energia Switched on

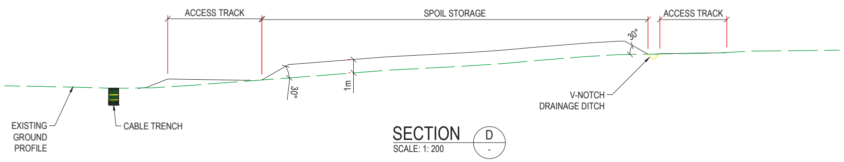
Malachy Walsh and Partners
Engineering and Environmental Consultants
Cork | Tralee | London | Limerick
The Elm Suite, Loughmore Centre, Raheen Business Park, Limerick, V94 R578
Tel : +353 (0) 61 480164
Fax : +353 (0) 61 441125
E-mail : limerick@mwp.ie
Web : www.mwp.ie

DRAWN: MW	CHECKED: BS	APPROVED: BS
DATE: 15/04/22	SCALE @ A1: AS NOTED	
PROJECT NUMBER: 21337		DRAWING STATUS: S0
DRAWING NUMBER: 21337-MWP-ZZ-00-DR-C-1400		REV: P01



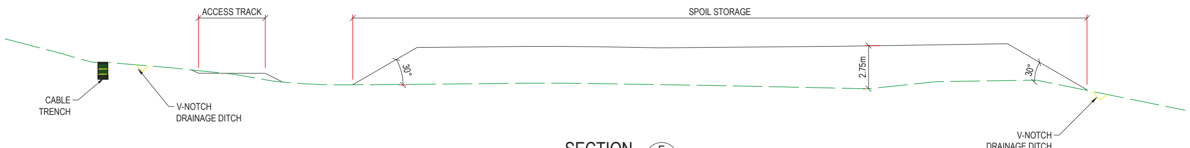
SOUTH PLAN

SCALE 1:5000



SECTION D

SCALE: 1: 200



SECTION E

SCALE: 1: 200

NOTES:

1. ALL DRAWINGS ARE TO BE READ IN CONJUNCTION WITH ALL RELEVANT SPECIFICATIONS, BILLS OF QUANTITIES, ARCHITECTURAL, SERVICES AND ENGINEERING DRAWINGS.
2. ALL LEVELS ARE IN **METRES** RELATED TO ORDNANCE DATUM MALIN HEAD OSGM15.
3. ALL CO-ORDINATES ARE TO IRISH TRANSVERSE MERCATOR **(ITM)** AND IN **METERS**.
4. ANY DISCREPANCIES BETWEEN THESE DOCUMENTS SHALL BE BROUGHT TO THE ATTENTION OF THE ENGINEER.
5. DRAWINGS ARE NOT TO BE SCALED.
6. ALL DIMENSIONS ARE IN **METERS**, UNLESS NOTED OTHERWISE.

LEGEND:

SITE BOUNDARY
EXISTING GROUND PROFILE
PROPOSED SPOIL STORAGE PROFILE

Fig 4-10

REV	DATE	DESCRIPTION	BY	APP
P01	15 / 04 / 22	FOR INFORMATION	MW	BS

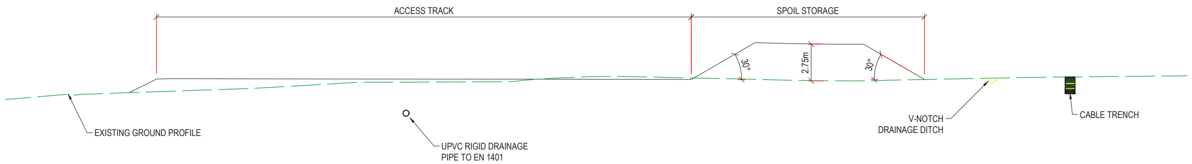
PROJECT: SEVEN HILLS WIND FARM

TITLE: SPOIL STORAGE SECTIONS - SOUTH
SHEET 1 of 2

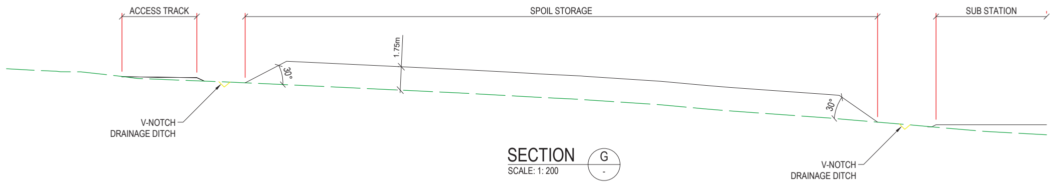
CLIENT: energia Switched on

Malachy Walsh and Partners
Engineering and Environmental Consultants
Cork | Tralee | London | Limerick
The Elm Suite, Loughmore Centre, Raheen Business Park, Limerick, V94 R578
Tel: +353 (0) 61 480164
Fax: +353 (0) 61 441125
E-mail: limerick@mwp.ie
Web: www.mwp.ie

DRAWN:	MW	CHECKED:	BS	APPROVED:	BS
DATE:	15/04/22	SCALE @ A1:	AS NOTED		
PROJECT NUMBER:	21337			DRAWING STATUS:	S0
DRAWING NUMBER:	21337-MWP-ZZ-00-DR-C-1401			REV:	P01



SECTION F
SCALE: 1: 200



SECTION G
SCALE: 1: 200

NOTES:

1. ALL DRAWINGS ARE TO BE READ IN CONJUNCTION WITH ALL RELEVANT SPECIFICATIONS, BILLS OF QUANTITIES, ARCHITECTURAL, SERVICES AND ENGINEERING DRAWINGS.
2. ALL LEVELS ARE IN **METRES** RELATED TO ORDNANCE DATUM MALIN HEAD OSGM15.
3. ALL CO-ORDINATES ARE TO IRISH TRANSVERSE MERCATOR **(ITM)** AND IN **METERS**.
4. ANY DISCREPANCIES BETWEEN THESE DOCUMENTS SHALL BE BROUGHT TO THE ATTENTION OF THE ENGINEER.
5. DRAWINGS ARE NOT TO BE SCALED.
6. ALL DIMENSIONS ARE IN **METERS**, UNLESS NOTED OTHERWISE.

LEGEND:

- SITE BOUNDARY
- EXISTING GROUND PROFILE
- PROPOSED SPOIL STORAGE PROFILE

Fig 4-11

REV	DATE	DESCRIPTION	BY	APP
P01	15 / 04 / 22	FOR INFORMATION	MW	BS

PROJECT: SEVEN HILLS WIND FARM

TITLE: SPOIL STORAGE SECTIONS - SOUTH
SHEET 2 of 2

CLIENT: energia Switched on

Malachy Walsh and Partners
Engineering and Environmental Consultants
Cork | Tralee | London | Limerick

The Elm Suite,
Loughmore Centre,
Raheen Business Park,
Limerick,
V94 R578

Tel. : +353 (0) 61 480164
Fax : +353 (0) 61 441125
E-mail : limerick@mwp.ie
Web : www.mwp.ie

DRAWN: MW	CHECKED: BS	APPROVED: BS
DATE: 15/04/22	SCALE @ A1: AS NOTED	
PROJECT NUMBER: 21337		DRAWING STATUS: S0

DRAWING NUMBER: 21337-MWP-ZZ-00-DR-C-1402 REV: P01

4.3.5 Onsite Electrical Substation

A 110 kV onsite electrical substation forms part of the Proposed Development as shown in Figure 4-1. The proposed onsite electrical substation is located within an area of improved agricultural grassland, approximately 465m south of the R363 Regional Road and approximately 400m northeast of the proposed Turbine No. 18. The proposed onsite electrical substation will be served by a separate access road to the Wind Farm from the R363 which will allow access for maintenance to the substation by ESB / EirGrid.

The footprint of the proposed onsite electrical substation covers an area of approximately 1.14 hectares and will include an Eirgrid Control Building, MV Switchgear Building and the electrical substation components necessary to consolidate the electrical energy generated by each wind turbine, and export the electricity from the Wind Farm substation to the national grid. The layouts and elevations of the proposed substation and its compound are shown on Figures 4-12 and 4-13. The construction and exact layout of electrical equipment in the onsite electrical substation will be to EirGrid / ESB Networks specifications.

Further details regarding the connection between the site substation and the national electricity grid are provided in Section 4.3.7 below.

The onsite electrical substation and its compound will be surrounded by an approximately 3.4 metre high steel palisade fence and internal fences will also segregate different areas within the main substation compound.

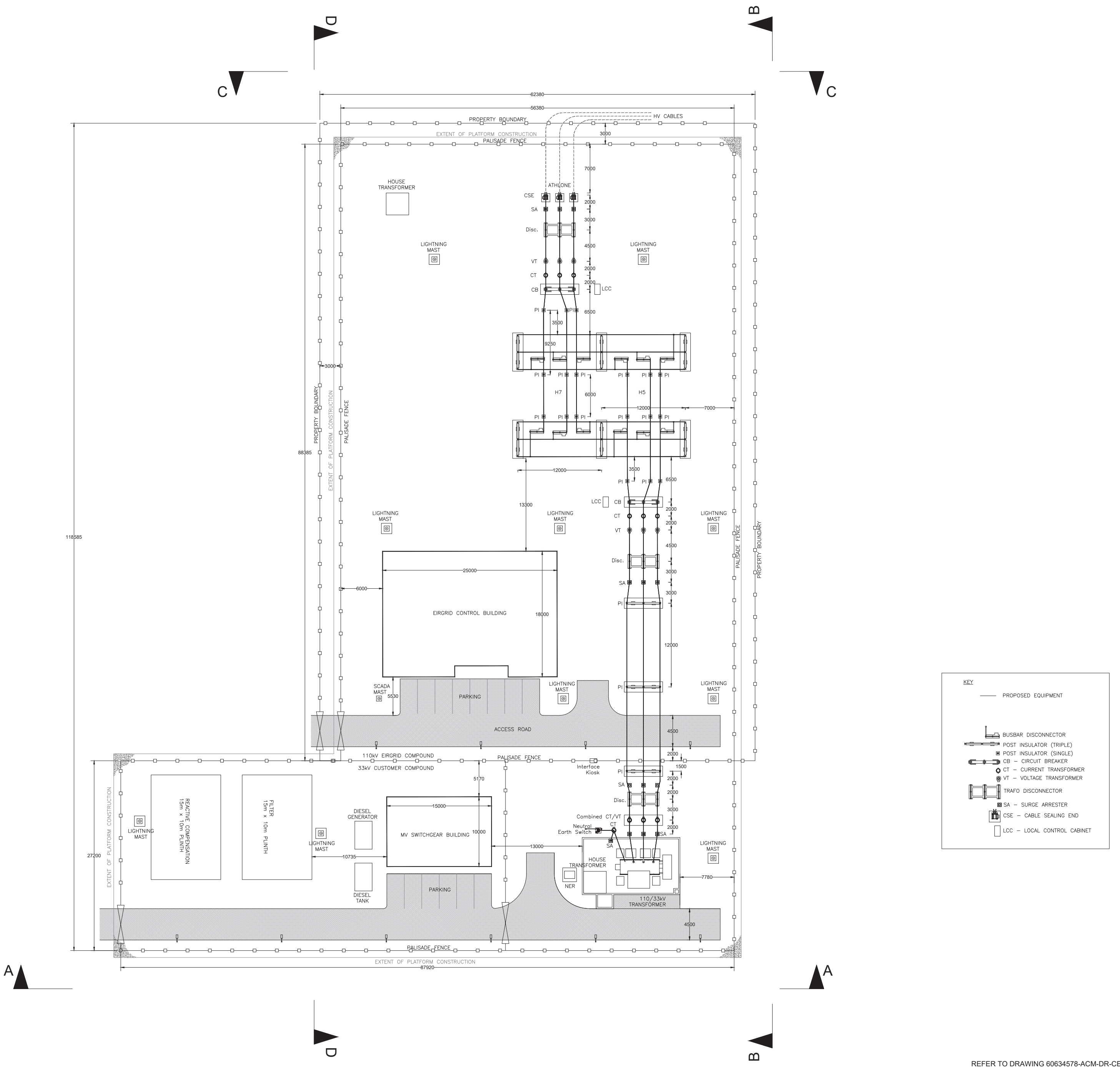
4.3.5.1 Electrical Substation Buildings

Two buildings will be located within the onsite electrical substation. Building 1 (Eirgrid control building) will measure approximately 450 square metres in area and 6 metres in height. Building 2 (MV Switchgear Building) will measure approximately 150 square metres in area and 6 metres in height. Layout and elevation drawings of the control buildings are included in Figures 4-12 and 4-13.

The onsite electrical substation buildings will include staff welfare facilities. Toilet facilities will be installed with a low-flush cistern and low-flow wash basin. Due to the specific nature of the Proposed Development, there will be a very small water requirement for occasional toilet flushing and hand washing and therefore the water requirement of the Proposed Development does not necessitate a potable source. It is proposed to either harvest rainwater from the roofs of the buildings. Bottled water will be supplied for drinking, if required.

It is not proposed to treat wastewater on site. Wastewater from the staff welfare facilities in the control buildings will be managed by means of a sealed storage tank. All wastewater will be removed from site by permitted waste collector to wastewater treatment plants. This is an accepted industry approach and has been adopted as a response to the specific site characteristics.

The proposed wastewater storage tank will be fitted with an automated alarm system that will provide sufficient notice that the tank requires emptying. The wastewater storage tank alarm will be part of a continuous stream of data from the site's turbines, wind measurement devices and electricity substation that will be monitored remotely 24 hours a day, 7 days per week. Only waste collectors holding valid waste collection permits under the Waste Management (Collection Permit) Regulations, 2007 (as amended), will be employed to transport wastewater away from the site to a licensed facility. There are licenced wastewater treatment facilities in Monksland and Roscommon town, located approximately 10 km southeast and 15.5 km north respectively from the Proposed Development site.



REFER TO DRAWING 60634578-ACM-DR-CE-002
FOR SITE ELEVATIONS.

AECOM

PROJECT

Seven Hills Windfarm

CLIENT

Seven Hills Wind Ltd.

CONSULTANT

AECOM
Adelphi Plaza
Georges Street Upper
Dun Laoghaire
County Dublin
Ireland
T +353 (0)1 2383100
www.aecom.com

LEGEND

Fig 4-12

NOTES

1. DRAWINGS ARE INDICATIVE ONLY AND SHOULD NOT BE USED AS DETAILED FOR DESIGN;

ISSUE/REVISION

I/R	DATE	DESCRIPTION
R9	24.01.22	REVISED TO SUIT EIRGRID SPEC
R8	09.12.21	FOR PLANNING
R7	08.12.21	REVISED FOLLOWING REVIEW
R6	06.12.21	REVISED FOLLOWING REVIEW
R5	19.07.21	REVISED FOLLOWING REVIEW
R4	23.06.21	REVISED FOLLOWING REVIEW
R3	16.04.21	REVISED FOLLOWING REVIEW
R2	30.03.21	REVISED FOLLOWING REVIEW
R1	17.03.21	REVISED FOLLOWING REVIEW
P0	24.09.20	First Issue

STATUS

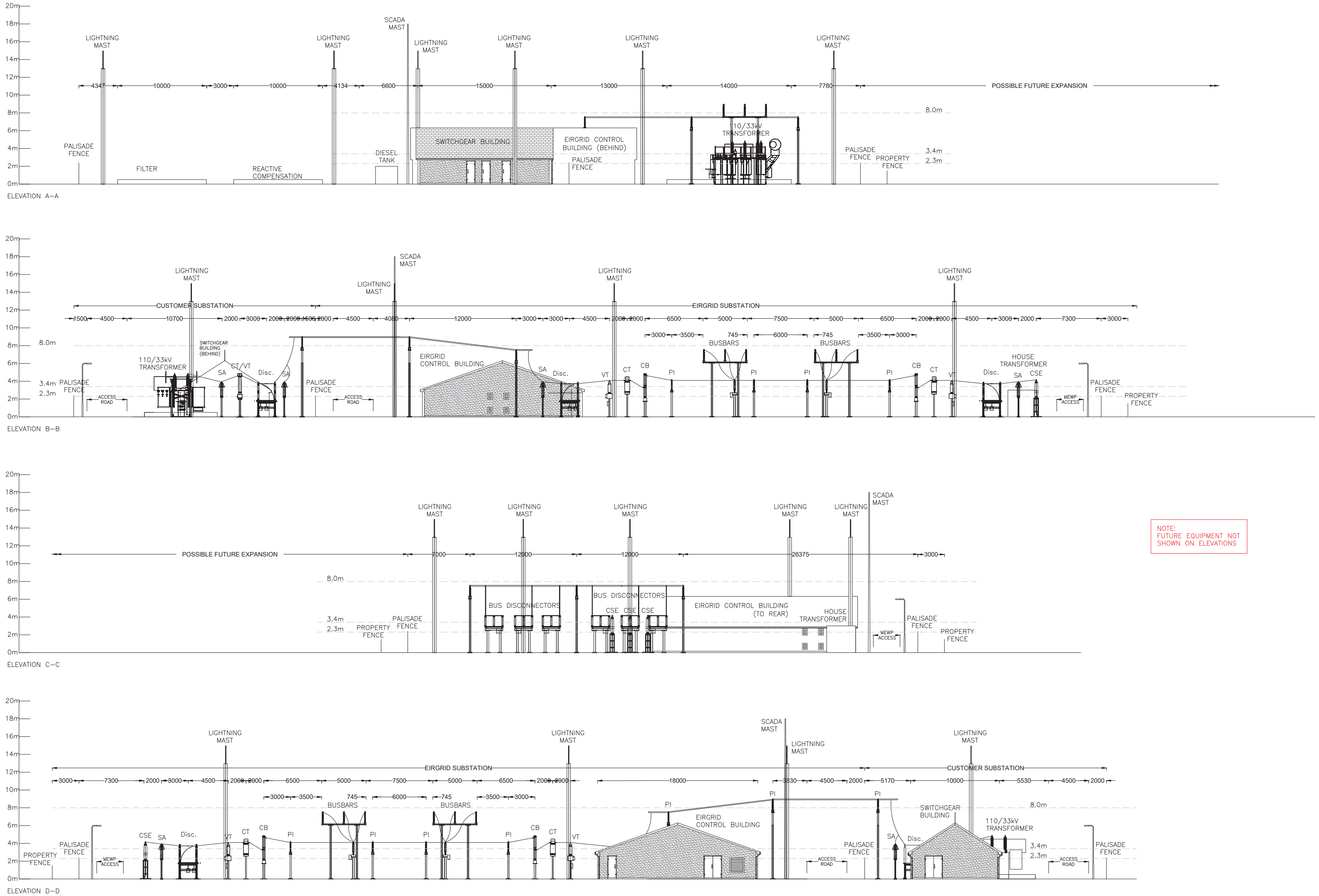
FOR PLANNING

PROJECT NUMBER	SCALE
60634578	NTS

SHEET TITLE

Seven Hills Windfarm
110 kV Substation
Proposed Layout

SHEET NUMBER	REV
60634578-ACM-DR-CE-001	R9



REFER TO DRAWING 60634578-ACM-DR-CE-001
FOR SITE LAYOUT, AND LOCATION OF ELEVATIONS.

AECOM

PROJECT

Seven Hills Windfarm

CLIENT

Seven Hills Wind Ltd.

CONSULTANT

AECOM
Adelphi Plaza
Georges Street Upper
Dun Laoghaire
County Dublin
Ireland
T +353 (0)1 2383100
www.aecom.com

LEGEND

Fig 4-13

NOTES

1. DRAWINGS ARE INDICATIVE ONLY AND SHOULD NOT BE USED AS DETAILED FOR DESIGN;

ISSUE/REVISION

I/R	DATE	DESCRIPTION
R8	24.01.22	REVISED TO SUIT EIRGRID SPEC
R7	08.12.21	REVISED FOLLOWING REVIEW
R6	06.12.21	REVISED FOLLOWING REVIEW
R5	19.07.21	REVISED FOLLOWING REVIEW
R4	23.06.21	REVISED FOLLOWING REVIEW
R3	16.04.21	REVISED FOLLOWING REVIEW
R2	30.03.21	REVISED FOLLOWING REVIEW
R1	17.03.21	REVISED FOLLOWING REVIEW
P0	24.09.20	First Issue

STATUS

FOR DISCUSSION

PROJECT NUMBER 60634578

SCALE NTS

SHEET TITLE

Seven Hills Windfarm
110 kV Substation
Site Elevations

SHEET NUMBER 60634578-ACM-DR-CE-002

REV R8

Project Management Initials : Designer : EP Checked : NC Approved : BC

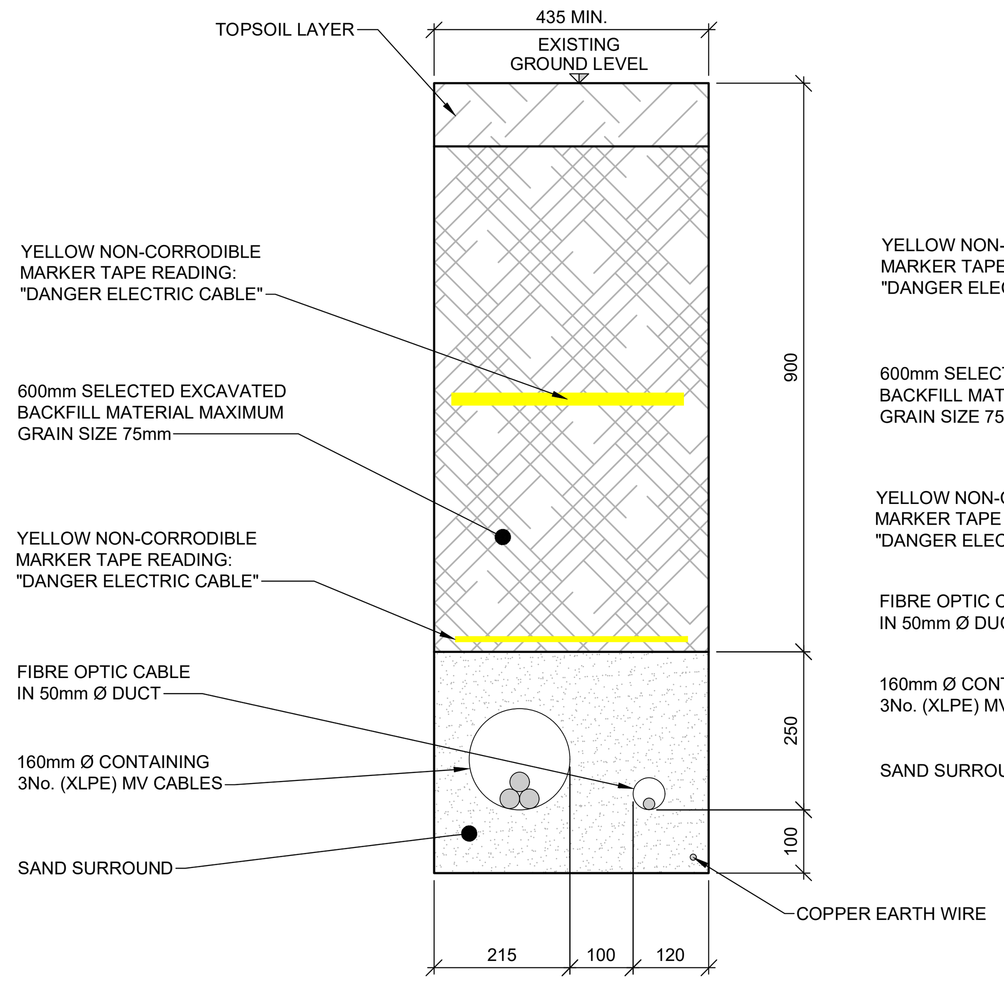
Last saved by: EUAN.PROUDFOOT(2022-01-25) Last Plotted: 2022-01-25
Filename: \\NA.AECOMNET.COM\LFS\EMEA\DUBLIN-IEDBL1\LEGACY\IEDBL1FP001\UFI\JOBS\PR-471040_MIDLANDS_110_KV_CABLE\900_CAD_GIS\910_CAD\910_2_CIVIL\S60634578-ACM-DR-CE-002.DWG

4.3.6 Site Underground Cabling

Each turbine will be connected to the on-site electrical substation via an underground 33 kV (kilovolt) electricity cable. Fibre-optic cables will also connect each wind turbine to the Wind Farm control building in the onsite electrical substation. The electricity and fibre-optic cables running from the turbines to the onsite electrical substation will be run in cable ducts approximately 1.2 metres below the ground surface, along the sides of roadways. The route of the cable ducts will follow the access track to each turbine location and are visible on the site layout drawings included as Appendix 4-1. Figure 4-14 below shows two variations of a typical cable trench, one for off-road trenches (to be installed on areas of soft ground that will not be trafficked) and one for on-road trenches (to be used where trenches run along or under a roadway). Please refer to Figure 4-14 below and Appendix 4-1 for location of cabling within the Wind Farm site. The exact configuration of the underground cabling will be set by the requirements of the electrical designers at detailed design stage.

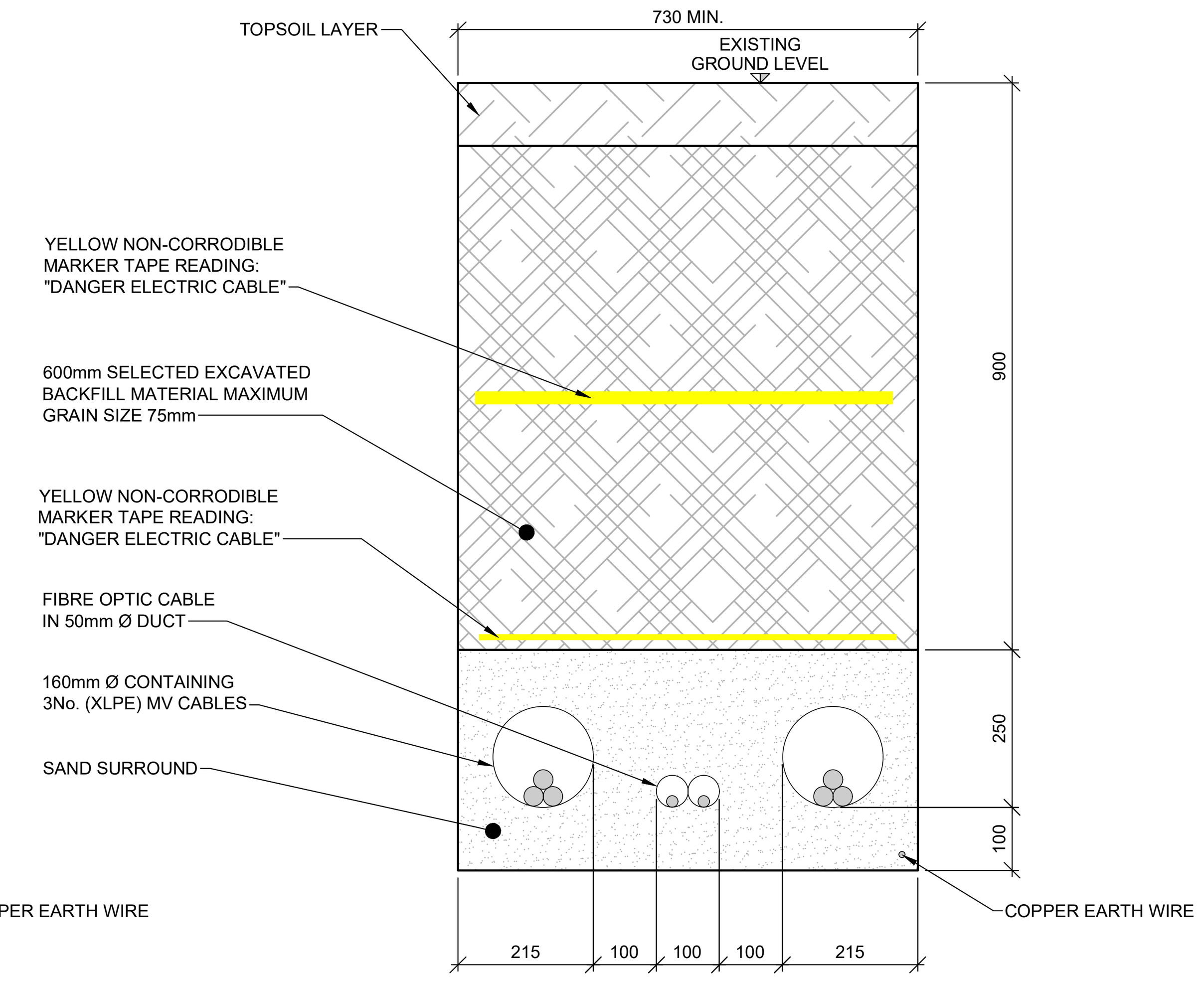
Clay plugs will be installed at regular intervals of not greater than 50 metres along the length of the trenches to prevent the trenches becoming conduits for runoff water. This material will be imported onto the site from local, authorised quarries. The majority of the cable trenches will be backfilled with locally sourced material. Backfill material will be compacted in layers with approved engineer's specified material, which may be imported onto the site should sufficient volumes of suitable material not be encountered during the excavation phase of the Proposed Development.

It is proposed to connect the two clusters of the site via underground cabling located within existing agricultural land and within the public road corridor. This IPP cabling route measures approximately 3.8km and is shown on Figure 4-15. The cable, ducting and trenching specifications provided within this application (see Section 4.8.5 below) are in accordance with standard ESB specifications. The final specification for the cable, ducting and trench to be lain within the proposed route as shown on Figure 4-14.



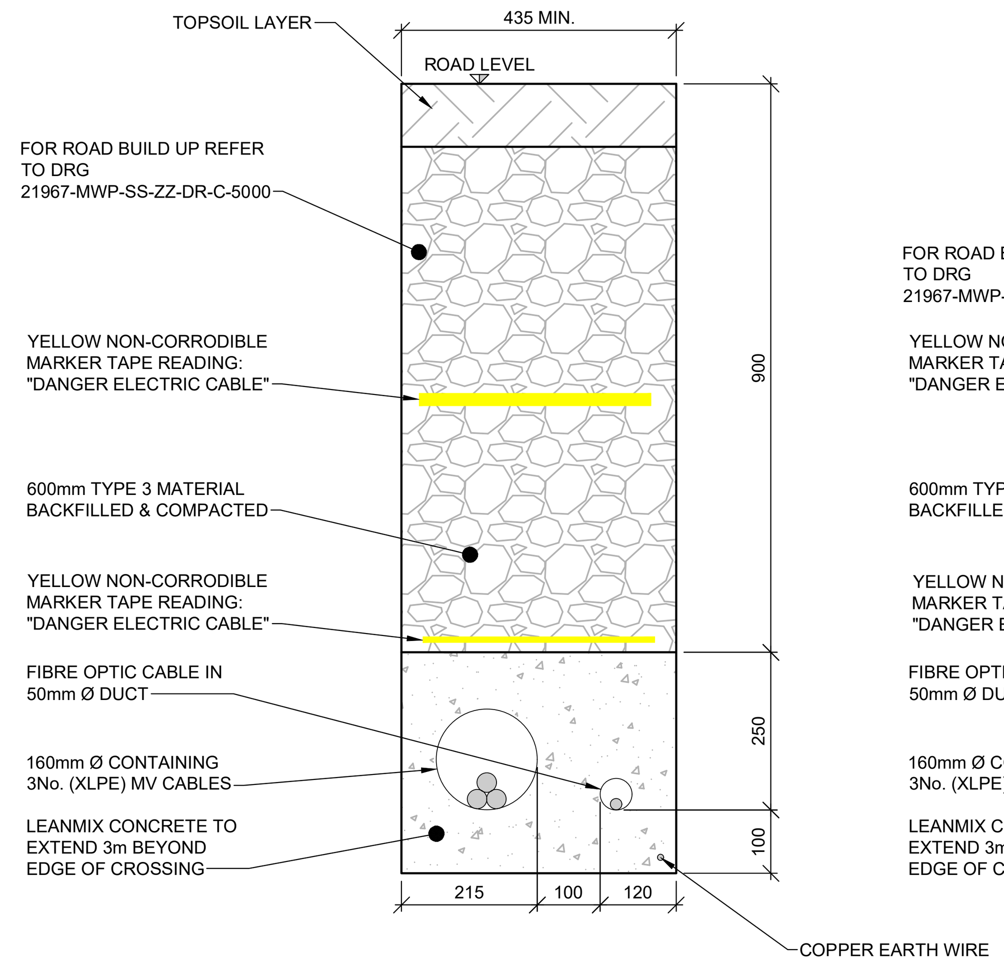
CABLE TRENCH IN OPEN GROUND
SINGLE CIRCUIT (INTERNAL WIND FARM)

SCALE: 1:10



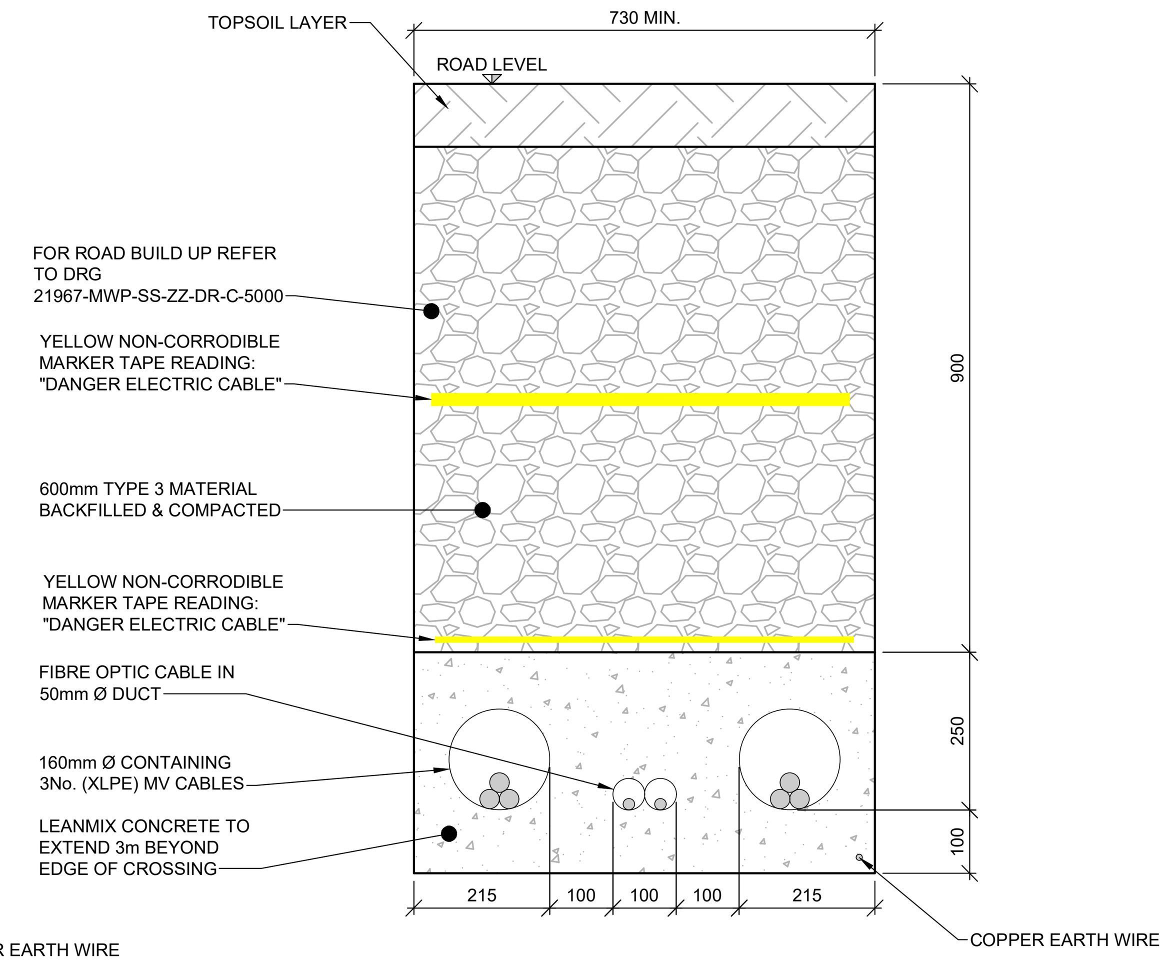
CABLE TRENCH IN OPEN GROUND
TWIN CIRCUIT (INTERNAL WIND FARM)

SCALE: 1:10



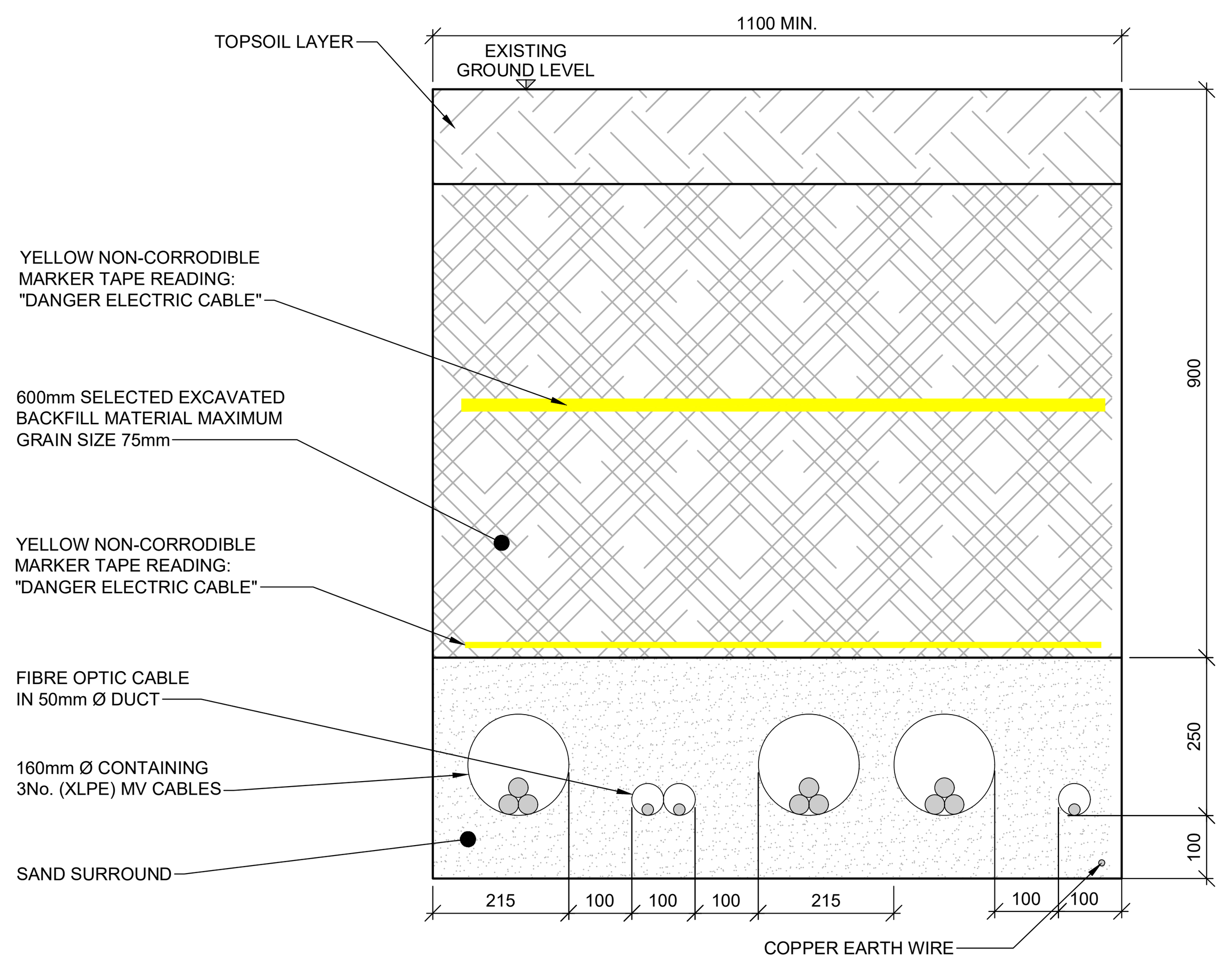
CABLE TRENCH IN SITE ROADWAY
SINGLE CIRCUIT (INTERNAL WIND FARM)

SCALE: 1:10



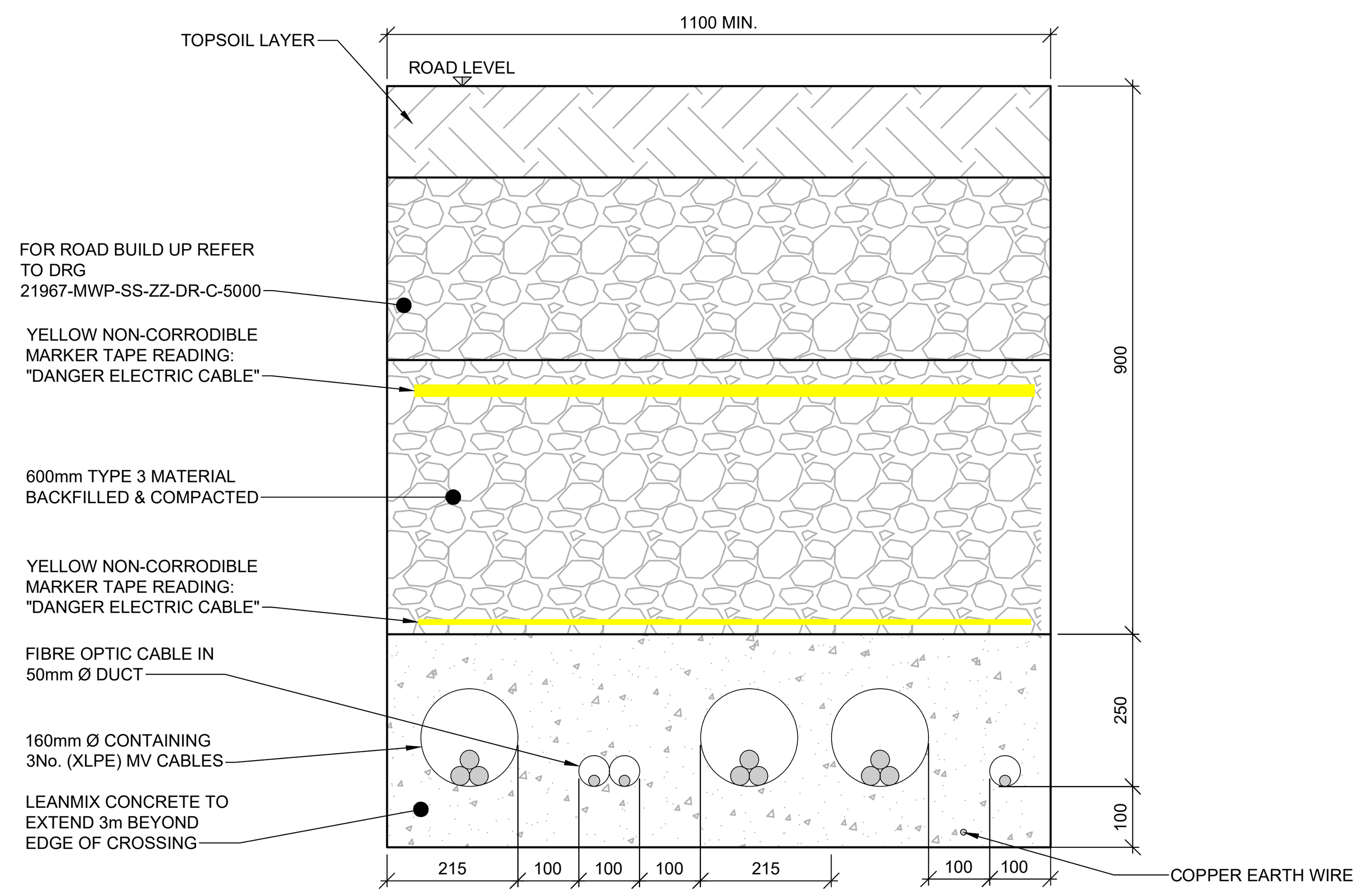
CABLE TRENCH IN SITE ROADWAY
TWIN CIRCUIT (INTERNAL WIND FARM)

SCALE: 1:10



CABLE TRENCH IN OPEN GROUND TWIN CIRCUIT
WITH MET MAST DUCT (INTERNAL WIND FARM)

SCALE: 1:10



CABLE TRENCH IN SITE ROADWAY TWIN CIRCUIT
WITH MET MAST DUCT (INTERNAL WIND FARM)

SCALE: 1:10

NOTES:

1. ALL DRAWINGS ARE TO BE READ IN CONJUNCTION WITH ALL RELEVANT SPECIFICATIONS, BILLS OF QUANTITIES, ARCHITECTURAL, SERVICES AND ENGINEERING DRAWINGS.
2. ALL LEVELS ARE IN METRES RELATED TO ORDNANCE DATUM MALIN HEAD.
3. ANY DISCREPANCIES BETWEEN THESE DOCUMENTS SHALL BE BROUGHT TO THE ATTENTION OF THE ENGINEER.
4. DRAWINGS ARE NOT TO BE SCALED.
5. ALL DIMENSIONS ARE IN **METERS**, UNLESS NOTED OTHERWISE.

REFERENCE DRAWINGS:

DRAWING No.	DRAWING TITLE
NORTH DRAINAGE	
21337-MWP-WF-00-DR-C-2101	DRAINAGE LAYOUT SHEET 1
21337-MWP-WF-00-DR-C-2102	DRAINAGE LAYOUT SHEET 2
21337-MWP-WF-00-DR-C-2103	DRAINAGE LAYOUT SHEET 3
21337-MWP-WF-00-DR-C-2104	DRAINAGE LAYOUT SHEET 4
21337-MWP-WF-00-DR-C-2105	DRAINAGE LAYOUT SHEET 5
21337-MWP-WF-00-DR-C-2106	DRAINAGE LAYOUT SHEET 6
21337-MWP-WF-00-DR-C-2107	DRAINAGE LAYOUT SHEET 7
21337-MWP-WF-00-DR-C-2108	DRAINAGE LAYOUT SHEET 8
21337-MWP-WF-00-DR-C-2109	DRAINAGE LAYOUT SHEET 9
21337MWP-WF-00-DR-C-2110	DRAINAGE LAYOUT SHEET 10
SOUTH DRAINAGE	
21337-MWP-WF-00-DR-C-2111	DRAINAGE LAYOUT SHEET 11
21337MWP-WF-00-DR-C-2112	DRAINAGE LAYOUT SHEET 12
21337-MWP-WF-00-DR-C-2113	DRAINAGE LAYOUT SHEET 13
21337MWP-WF-00-DR-C-2114	DRAINAGE LAYOUT SHEET 14
21337-MWP-WF-00-DR-C-2115	DRAINAGE LAYOUT SHEET 15
21337-MWP-WF-00-DR-C-2116	DRAINAGE LAYOUT SHEET 16
21337MWP-WF-00-DR-C-2117	DRAINAGE LAYOUT SHEET 17
21337-MWP-WF-00-DR-C-2118	DRAINAGE LAYOUT SHEET 18
21337-MWP-WF-00-DR-C-2119	DRAINAGE LAYOUT SHEET 19
21337MWP-WF-00-DR-C-2120	DRAINAGE LAYOUT SHEET 20
21337-MWP-WF-00-DR-C-2121	DRAINAGE LAYOUT SHEET 21
21337-MWP-WF-00-DR-C-2122	DRAINAGE LAYOUT SHEET 22
21337-MWP-WF-00-DR-C-2123	DRAINAGE LAYOUT SHEET 23
21337-MWP-WF-00-DR-C-2124	DRAINAGE LAYOUT SHEET 24
21337MWP-WF-00-DR-C-2125	NORTH DRAINAGE KEYPLAN
21337MWP-WF-00-DR-C-2126	SOUTH DRAINAGE LAYOUT

Figure 4-14

REV	DATE	DESCRIPTION	BY	APP
P02	09/05/22	ISSUED FOR INFORMATION	GC	BS
P01	20/01/22	ISSUED FOR COORDINATION	PK	BS

PROJECT: SEVEN HILLS WIND FARM

TITLE: SITE INTERNAL DUCTING
CABLE TRENCH AND CROSSING DETAILS

CLIENT: energia Switched on

Malachy Walsh and Partners
Engineering and Environmental Consultants
Cork | Tralee | London | Limerick

The Elm Suite,
Loughmore Centre,
Raheen Business Park,
Limerick,
V94 R578

Tel. : +353 (0) 61 480164
Fax. : +353 (0) 61 441125
E-mail : limerick@mwp.ie
Web : www.mwp.ie

DRAWN: GC	CHECKED: PB	APPROVED: BS
DATE: MAY 22	SCALE @ A1: 1:10	
PROJECT NUMBER: 21337		DRAWING STATUS: S2
DRAWING NUMBER: 21337-MWP-WF-00-DR-C-5001		REV: P02

4.3.7 Grid Connection

A connection between the onsite electrical substation and the national electricity grid will be necessary to export electricity from the Wind Farm site. It is proposed to construct a 110 kV substation within the site and to connect from here via a 110 kV underground cable connection to the existing Athlone 110 kV substation in Monksland, located approximately 11.3km to the east of the Southern Cluster, via underground cabling. The majority of the Grid Connection route is located within the public road and measures approximately 12km in total. This underground cable connection will originate at the proposed electrical onsite substation, continue along the R363, transitioning to the R362 near the townland of Ballymullavill, travelling north along the L2047 before reaching the Athlone 110 kV substation at Monksland. The methodology for construction of the Grid Connection component of the Proposed Development is presented in Section 4.8.5 below. The Grid Connection route is illustrated in Figure 4-15 and detailed drawings are included in Appendix 4-1 of this EIAR.

4.3.7.1 Grid Connection Design and Site Investigations

As part of the design process for the Proposed Development, site investigations were undertaken along a specific section of the Grid Connection route as detailed in Appendix 4-4 of this EIAR. The investigation comprised cable percussion boring, rotary drilling and slit trenching. The investigations were executed in accordance with BS 5930, Code of Practice for Site Investigations (2015) and EN 1997-2 Eurocode 7 Part 2 Ground Investigation & Testing and supervised by an IGSL geotechnical engineer.

The site investigation area occurred along a largely urban section of the R362 Regional Road from Bealnamulla through to Monksland. This route is situated primarily along an unclassified urban route (‘Old Tuam Road’) to the Athlone 110kV substation and is approximately 1.6 kilometres in length. The investigation works crossed a combination of roadways, footways and grass verges. In addition, an outlying borehole works were also located west of the village of Brideswell, County Roscommon. 8km northwest of Athlone Town. Refer to Figures 1 and 2 of Appendix 4-4 for location of site investigation works.

IGSL Limited undertook these geotechnical site investigation works between May and July 2021. The investigation comprised of the following:

- Cable Percussion Boreholes (3 No.)
- Rotary Open-Hole Drillholes (3 No.)
- Slit Trenches (10 No.)
- Groundwater Monitoring
- Surveying of Exploratory Hole Locations.

Full details and results from the site investigation works is detailed in Appendix 4-4 of this EIAR. A review of the above silt trenches by AECOM

4.3.7.2 Watercourse Crossings

The proposed Wind Farm component of the development will not require the crossing of any existing streams or watercourses. A total of 5 no. watercourse crossings have been identified along the proposed Grid Connection route and the underground cabling connecting the two clusters of the site.

The locations of the watercourse crossings are shown on Figure 4-15 and in the layout drawings in Appendix 4-1 of this EIAR. Section 4.8.7 below presents further details and options on the methodology that will be utilised for cable installation at existing watercourse crossings along the Grid Connection route. It should be noted that no option proposes in-stream works and all options are equal in terms of potential impacts across all environmental topics.

Table 4-7 below summaries the watercourse crossings that will be crossed as part of the development, as shown on Figure 4-15:

Table 4-7 Existing Watercourse Crossings

No.	Description	ITM Coordinates (m)	
		Easting	Northing
Collector Cabling Route Between Clusters			
WC 1	Existing crossing	588,454	745,655
Proposed Grid Connection			
WC 2	Existing crossing	594,318	744,329
WC 3	Existing crossing	596,453	743,348
WC 4	Existing crossing	598,085	741,970
WC 5	Existing crossing	599,342	741,770

4.3.7.3 N6 Crossing

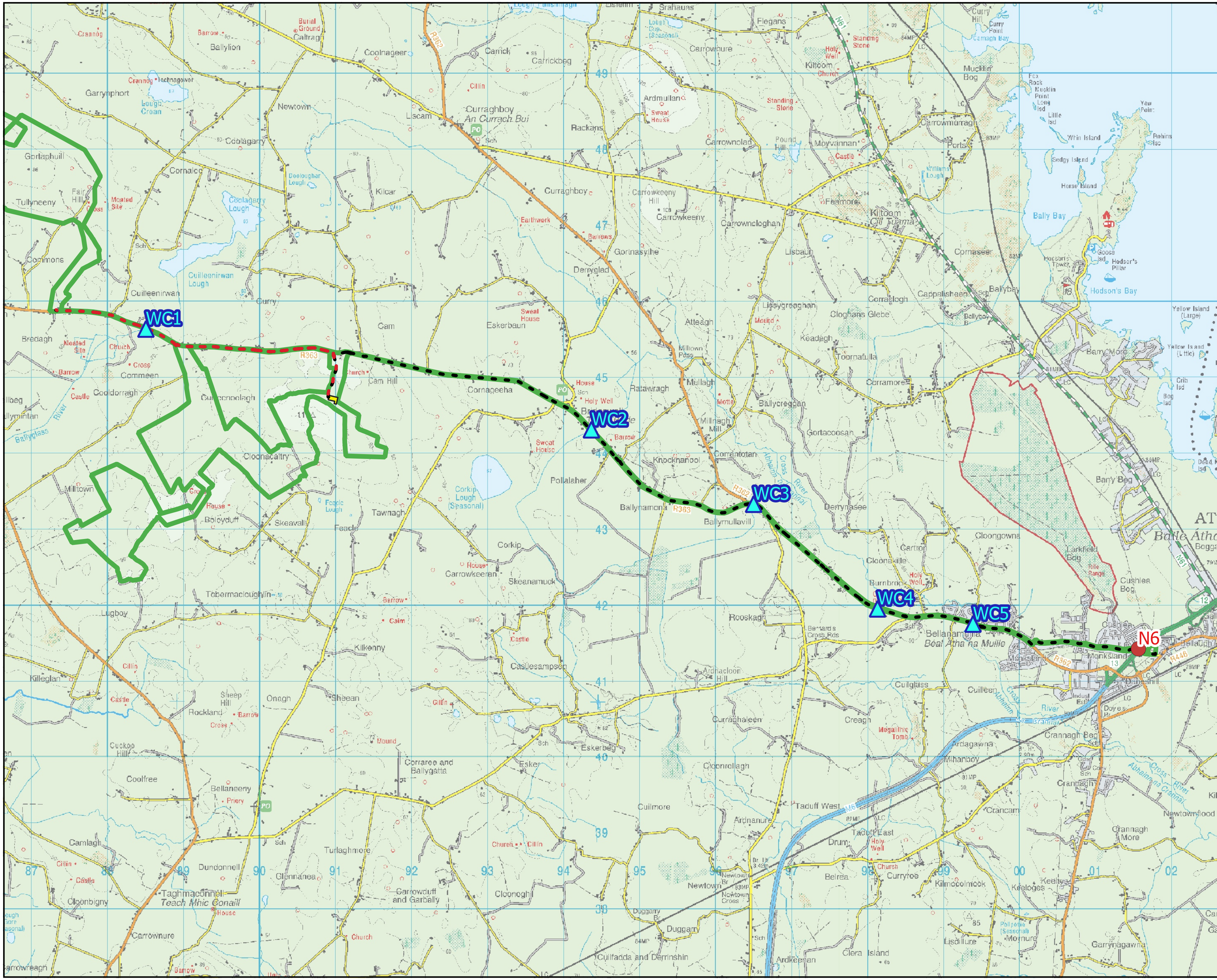
In addition to the above, a crossing is proposed beneath the N6 National Road to access the connection at the Athlone 110kV substation. This will involve horizontal directional drilling (HDD) as a means of cable installation. Section 4.8.7 below provides further details on the proposed HDD methodology.

The location of the crossing is shown on Figure 4-15 and in the layout drawings in Appendix 4-1 of this EIAR.

The below table details the crossing proposed and the location for the HDD installation as shown on Figure 4-15.

Table 4-8 Proposed HDD Crossing at N6 National Road

No.	Description	ITM Coordinates (m)	
		Easting	Northing
N6	Proposed HDD Crossing beneath the N6 National Road	601519	741444



Map Legend

- EIAR Site Boundary
- Proposed Grid Connection Route to Athlone 110kV Substation
- Internal Connector Cabling
- Proposed Substation Location
- Existing Watercourse Crossings
- Proposed N6 Crossing

Drawing Title	Proposed Grid Connection Route and Watercourse Crossings
Project Title	Seven Hills Wind Farm, Co. Roscommon
Drawn By: DN	Checked By: ÓM
Project No.: 190907	Drawing No.: Figure 4-15
Scale: 1:65000	Date: 01.06.2021

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

4.3.8 Proposed Upgrade works at Athlone 110kV Electricity Substation

To facilitate the HV cable connection from the Proposed Development to the transmission network, a new 110 kV Air Insulated Switchgear (AIS) bay will be required at the existing Athlone 110 kV substation in Monksland operated by EirGrid. The new AIS bay would be constructed in an area of the substation reserved for future bays and be located under the existing 110 kV busbar. It would comprise of the following equipment mounted on steel structures: busbar disconnects, circuit breaker, current transformers, voltage transformers, cable/earth disconnects, surge arrestors, and a cable sealing end. The proposed layout of the new bay is shown in Figure 14-16.

4.3.9 Meteorological Mast

One permanent meteorological (met) mast is proposed as part of the Proposed Development. The met mast will be equipped with wind monitoring equipment at various heights. The proposed met mast is located in the Norther Cluster of the site, approximately 200 meters northwest of the hard-standing area for Turbine No. 5, as shown on the site layout drawing in Figure 4-1

. There is currently an existing temporary met mast in the south of the Proposed Development which is located approximately 280 metres east of proposed Turbine No. 14.

The proposed met mast will be a self-supporting slender structure measuring 100 metres in height. The mast will be constructed on a hard-standing area sufficiently large enough to accommodate the crane that will be used to erect the mast, adjacent to the existing access road. An elevation drawing of the proposed met mast is shown on Figure 4-17.

In addition to the proposed permanent met mast as described above, there are two temporary met masts proposed within the site of the Proposed Development, both of which are 100m in height. These do not form part of the Proposed Development and are currently within the planning system. Energia Renewables Ltd. has applied to Roscommon County Council for planning permission for these met masts under the following planning reference numbers; Pl. Ref. 21274 and Pl. Ref. 21275. Should planning permission be granted, both met masts will be decommissioned and removed during the construction of the Proposed Development. The proposed met mast in the south (Pl. Ref. 21274) of the Proposed Development site is located approximately 280 metres east of proposed Turbine No. 14. The proposed met mast in the north (Pl. Ref. 21275) of the Proposed Development site is located approximately 10 metres north of proposed Turbine No. 6. Both masts will be assessed cumulatively within this EIAR where relevant.

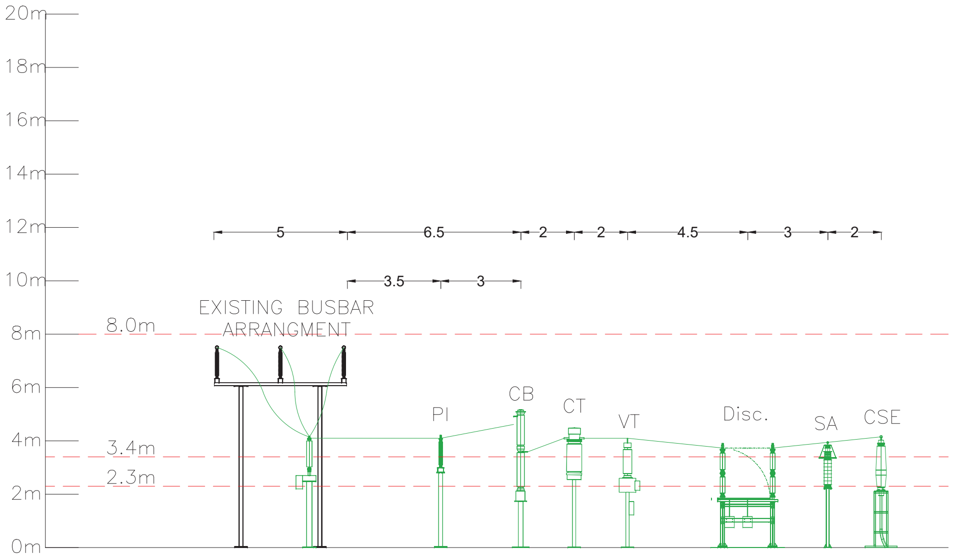
4.3.10 Temporary Construction Compounds

Two temporary construction compounds are proposed as part of the Proposed Development. Temporary construction compound No. 1 is located in the Northern Cluster, approximately 150m to the north of the northern site entrance. Temporary construction compound No. 2 is located in the Southern Cluster, approximately 200 meters north of Turbine no. 14. Both temporary construction compounds measure approximately 100 metres by 40 metres, with a footprint of 4,000 m^2 each, or a combined footprint of 8,000 m^2 for both compounds. The location of both proposed temporary construction compounds are shown on the site layout drawing in Figure 4-1. Spoil will be banked around the temporary construction compounds and stored for reinstatement after the works are completed.

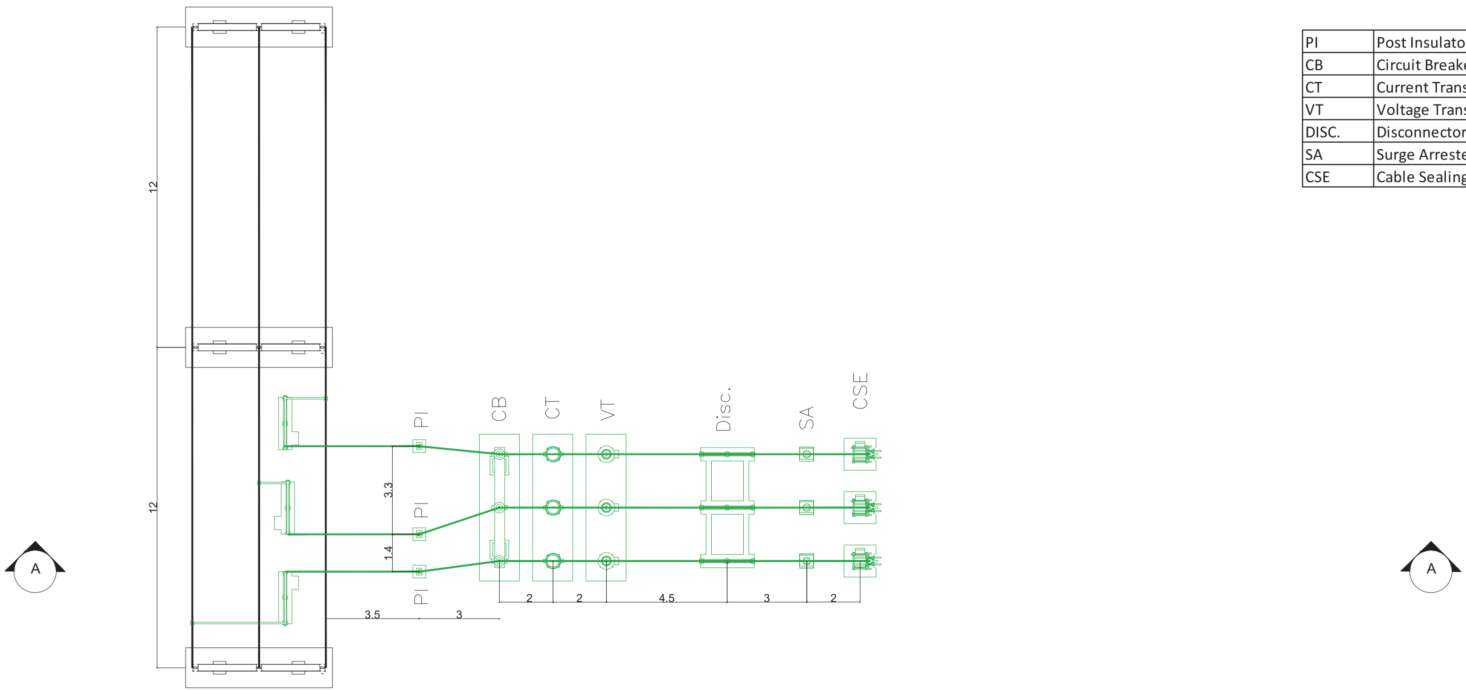
The temporary construction compounds will consist of temporary site offices, staff facilities and car-parking areas for staff and visitors. The layout of the temporary construction compounds is shown on Figure 4-18. No construction materials or turbine components will be stored in the temporary construction compound. These will be brought directly to the proposed turbine locations following their delivery to the site.

Temporary toilets located within a staff portacabin 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 an appropriately consented waste collector to wastewater treatment plants. There are licenced wastewater treatment facilities at Monksland and Roscommon town, as referred to in Section 4.3.5 above.

Once the Proposed Development has been commissioned, these temporary construction compounds will be removed. The areas will be reinstated with previously excavated spoil, and either be reseeded or left to revegetate naturally.



ELEVATION A—A



PI	Post Insulator
CB	Circuit Breaker
CT	Current Transformer
VT	Voltage Transformer
DISC.	Disconnector
SA	Surge Arrester
CSE	Cable Sealing End

AECOM

PROJECT

ATHLONE 110 kV SUBSTATION

CLIENT

ENERGIA

Fig 4-16

CONSULTANT

AECOM
Adelphi Plaza
Georges Street Upper
Dun Laoghaire
County Dublin
Ireland
T +353 (0)1 2383100
www.aecom.com

LEGEND

EXISTING EQUIPMENT
PROPOSED EQUIPMENT

NOTES

1. DRAWINGS ARE INDICATIVE ONLY AND SHOULD NOT BE USED FOR DETAILED DESIGN;
2. THE EQUIPMENT LAYOUTS ARE INDICATIVE AND DIMENSIONS MAY CHANGE ONCE THE EXACT SPECIFICATIONS ARE DETERMINED;
3. DRAWING REPRESENTS AN INDICATIVE 110 kV LINE BAY, HAS BEEN PRODUCED WITHOUT ANY DETAILED INFORMATION ON ATHLONE 110 kV STATION, AS SUCH A DETAILED SPACE PROVING EXERCISE HAS NOT BEEN CARRIED OUT.

ISSUE/REVISION

I/R	DATE	DESCRIPTION

STATUS

FOR DISCUSSION

PROJECT NUMBER

SCALE

1:100@ A1

SHEET TITLE

TYPICAL CABLE CONNECTION BAY

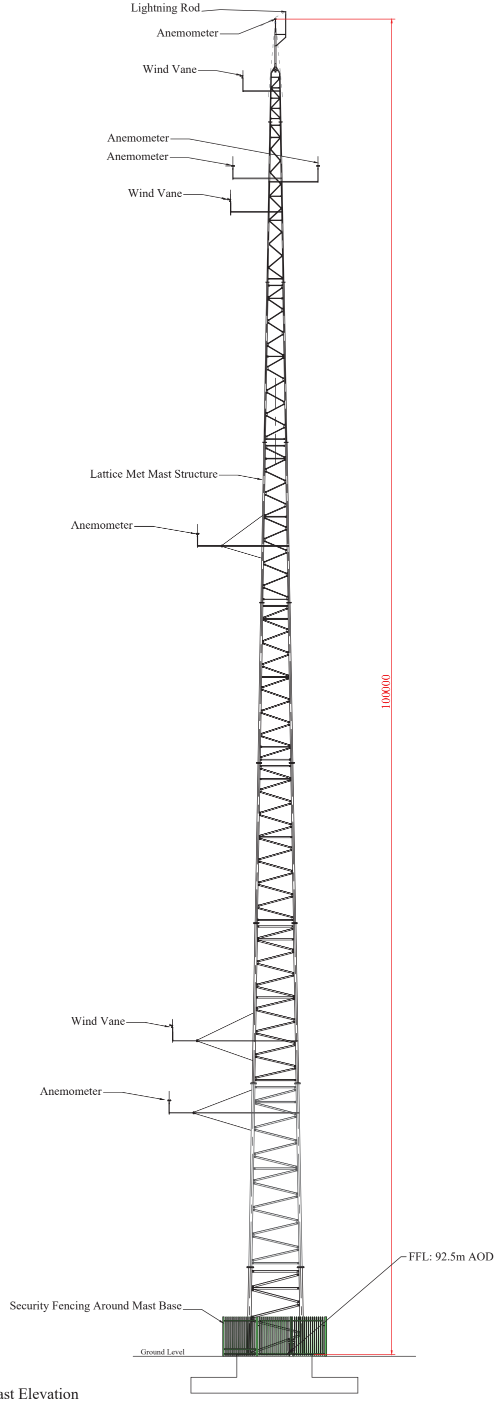
SHEET NUMBER

REV

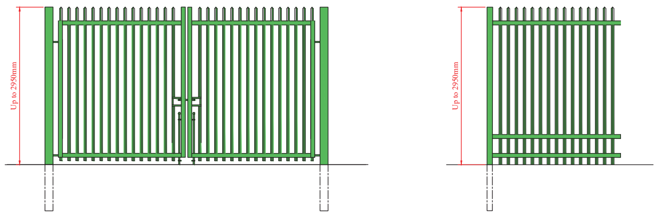
60634578-ACM-DR-CE-006

Project Management Initials : Designer : MB Checked : RB/OB Approved : BW

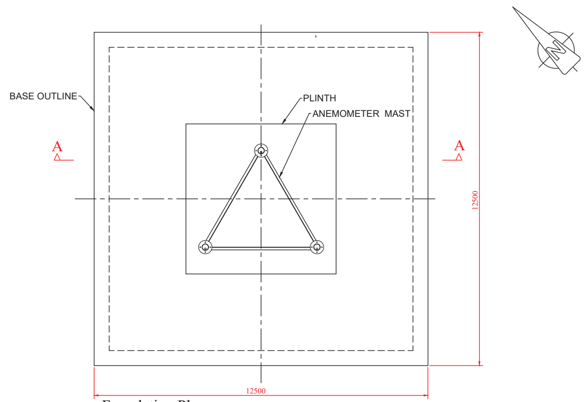
Last saved by: MARIA.BORRELLAGARRID(2022-04-13) Last Plotted: 2022-04-13
Filename: C:\USERS\MARIA.BORRELLAGARRID\DESKTOP\ATHLONE\DRAWING1.DWG



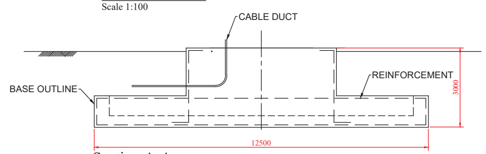
Overall Mast Elevation
Scale 1:200



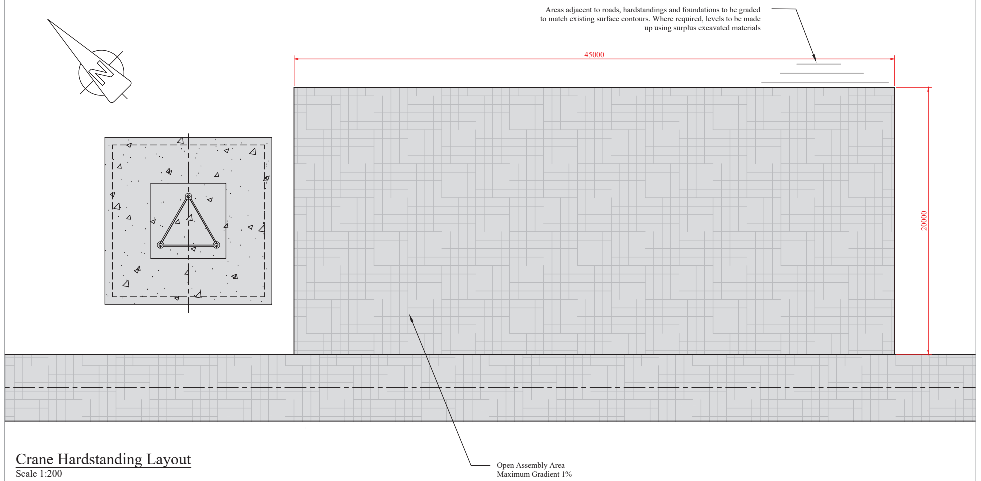
Security Fencing Detail
Scale 1:50



Foundation Plan
Scale 1:100



Section A-A
Scale 1:100



Crane Hardstanding Layout
Scale 1:200

Note:

1) All dimensions in millimeters unless otherwise stated and must be checked on site and not scaled from this drawing
2) The mast layout illustrated on this drawing is indicative only and may be subject to changes.
3) Foundation type may vary depending on met mast manufacturer and ground conditions
4) The instrument layout may vary depending on met mast manufacturer and Eirgrid requirements
5) Anticlimb security fencing to be fitted around the base of the mast
6) Ladder & fall arrest system to be fitted to the mast to allow for easy maintenance access

Fig 4-17

Date:	Rev:	Description:	Drawn By:

Prepared by:

GALETECH ENERGY SERVICES
Galetech Energy Services,
Clondargan,
Stradone,
Co. Cavan

Client:

Energia Renewables ROI Ltd

Job Title:

Seven Hills Wind Farm, Co. Roscommon

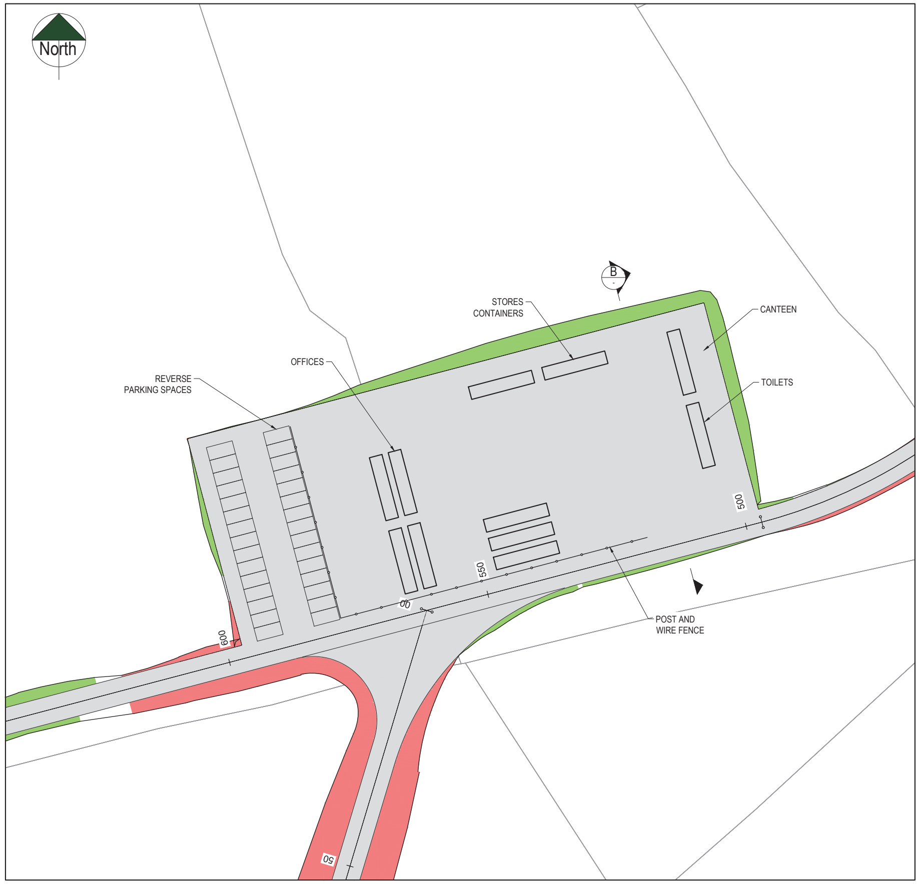
Drawing Title:

Anemometer Mast Elevations

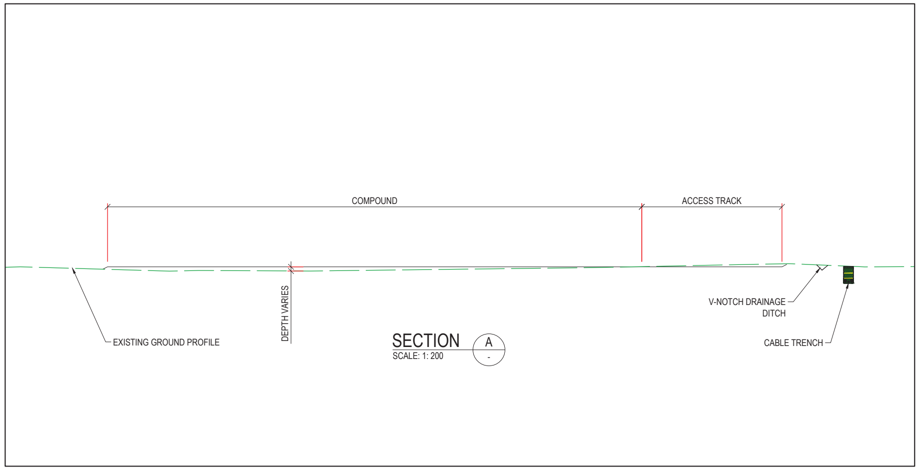
Drawing No.:	Revision No.:
SVH_PAS_ECS_001	0
Scale:	**Date:**
(A1) 1:200, 1:100, 1:50	22/04/2022

Drawn By:	Checked By:	Confirmed By:
C.M.P	J.B	S.C

NORTH COMPOUND
SCALE 1:500



SOUTH COMPOUND
SCALE 1:500



NOTES:

1. ALL DRAWINGS ARE TO BE READ IN CONJUNCTION WITH ALL RELEVANT SPECIFICATIONS, BILLS OF QUANTITIES, ARCHITECTURAL, SERVICES AND ENGINEERING DRAWINGS.
2. ALL LEVELS ARE IN **METRES** RELATED TO ORDNANCE DATUM MALIN HEAD OSGM15.
3. ALL CO-ORDINATES ARE TO IRISH TRANSVERSE MERCATOR **(ITM)** AND IN **METERS**.
4. ANY DISCREPANCIES BETWEEN THESE DOCUMENTS SHALL BE BROUGHT TO THE ATTENTION OF THE ENGINEER.
5. DRAWINGS ARE NOT TO BE SCALED.
6. ALL DIMENSIONS ARE IN **METERS**, UNLESS NOTED OTHERWISE.

Fig 4-18

REV	DATE	DESCRIPTION	BY	APP
P01	28 / 03 / 22	FOR INFORMATION	MW	BS

PROJECT: SEVEN HILLS

TITLE: TEMPORARY CONSTRUCTION COMPOUND GENERAL ARRANGEMENT

CLIENT:

Malachy Walsh and Partners
Engineering and Environmental Consultants
Cork | Tralee | London | Limerick

I.S. EN ISO 9001

The Elm Suite,
Loughmore Centre,
Raheen Business Park,
Limerick,
V94 RP26

Tel. : +353 (0) 61 480164
Fax. : +353 (0) 61 441125
E-mail : limerick@mwp.ie
Web : www.mwp.ie

DRAWN: MW	CHECKED: BS	APPROVED: BS
DATE: 28/03/22	SCALE @ A1: NTS	
PROJECT NUMBER: 21337		DRAWING STATUS: S0

DRAWING NUMBER: 21337-MWP-ZZ-00-DR-C0103 | REV: P01

C:\TDL\MWP (IE)\21337 - Seven Hills WF - General\Active\21337-MWP-ZZ-00-DR-C-0103.dwg

4.3.11 Site Activities

4.3.11.1 Environmental Management

All proposed activities associated with the Proposed Development will be provided for in an environmental management plan. A Construction and Environmental Management Plan (CEMP) has been prepared for the Proposed Development and is included in Appendix 4-9 of this EIAR. The CEMP sets out the key environmental considerations to be complied with by the contractor during construction of the Proposed Development. The CEMP also details the mitigation measures to be implemented in order to comply with the environmental commitments outlined in the EIAR. The contractor will be contractually obliged to comply with all such measures. The CEMP includes a Waste Management Plan and Emergency Response Plan. Further details on waste management are provided in Section 4.3.10.7 below.

Upon a grant of planning permission for the Proposed Development, the CEMP will be updated prior to the commencement of the development and will address the requirements of any relevant planning conditions, including any additional mitigation measures which are conditioned. The CEMP and will be submitted to the Planning Authority for written approval in advance of commencement of any construction works on site.

4.3.11.2 Refuelling

Wherever possible, vehicles will be refuelled off-site. This will be the case for regular, road-going vehicles. However, for construction machinery based on-site continuously, a limited amount of fuel will be stored on site in bunded areas.

On-site refuelling of machinery will be carried out at dedicated refuelling locations using a mobile double skinned fuel bowser. The fuel bowser, a double-axle custom-built refuelling trailer will be re-filled off site, and will be towed around the site by a 4x4 jeep or tractor 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 Development. 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, spill kits and fuel absorbent mats will be used during all refuelling operations.

4.3.11.3 Concrete Deliveries

Only ready-mixed concrete will be used during the construction phase, with all concrete being delivered from offsite batching plants in concrete delivery trucks. Existing concrete suppliers within 25 kilometres of the Proposed Development site are located at Kildea Concrete in Bealnamulla and Spollen Concrete in Glasson; final suppliers will be subject to procurement agreements ahead of construction.

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.

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 (https://www.siltbuster.co.uk/sb_prod/siltbuster-roadside-concrete-washout-rcw/) 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. Two examples are shown below in Plate 4-3 and 4-4.


Plate 4-3 Concrete washout area


Plate 4-4 Concrete washout area

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 will be 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.

Due to the volume of concrete required for each turbine foundation, 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 commuter traffic. Such activities are limited to the day of turbine foundation concrete pours, which are normally completed in a single day per turbine.

The risks of pollution arising from concrete deliveries will be further reduced by the following:

- Concrete trucks will not be washed out on the site (save for chute washout as described above) 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, confirming 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.

4.3.11.4 Concrete Pouring

Due to the scale of the main concrete pours that will be required to construct the Proposed Development, the main pours will be planned days or weeks in advance. Special procedures will be adopted in advance of and during all concrete pours to minimise the risk of pollution. These will include:

- 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 surface water bodies 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 suitable off-site locations away from any watercourse or sensitive habitats.

4.3.11.5 Dust Suppression

In periods of extended dry weather, dust suppression may be necessary along haul roads 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 the construction compound 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. A site speed limit will also be adhered to which will assist in suppressing dust on the Proposed Development site.

4.3.11.6 Vehicle Washing

Wheels or vehicle underbodies are often washed before leaving sites to prevent the build-up of mud on public (and site) roads. A vehicle or wheelwash facility will be provided at the Proposed Development site and will be used where required. The site roads will be well finished with non-friable, 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.

4.3.11.7 Waste Management

The outline CEMP, in Appendix 4-9 of this EIAR, provides a waste management plan (WMP) which describes the best practice procedures during the construction phase of the project. The WMP outlines the methods of waste prevention and minimisation by recycling, recovery and reuse at each stage of construction of the Proposed Development. Disposal of waste will be seen as a last resort.

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.

Prior to the commencement of the development, a Construction Waste Manager will be appointed by the Contractor. The Construction Waste Manager will be in charge of the implementation 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.

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.

4.4 Access and Transportation

4.4.1 Site Entrance

A total of three site entrances are proposed for the construction and operational stage of the Proposed Development in order to transport turbine components, materials and equipment to the site. The locations of the access junctions are shown in Figure 4-19 and are described as follows:

- Access A on the R363 Regional Road into Northern Cluster of turbines (T1 to T7),
- Access B on the L7535 Local Road at the junction with R363, into the southwest cluster of turbines within the Southern Cluster (T8 to T18), and
- Access C on the R363 Regional Road, into the southeast turbines (T19 and T20) and proposed onsite electrical substation within the Southern Cluster.

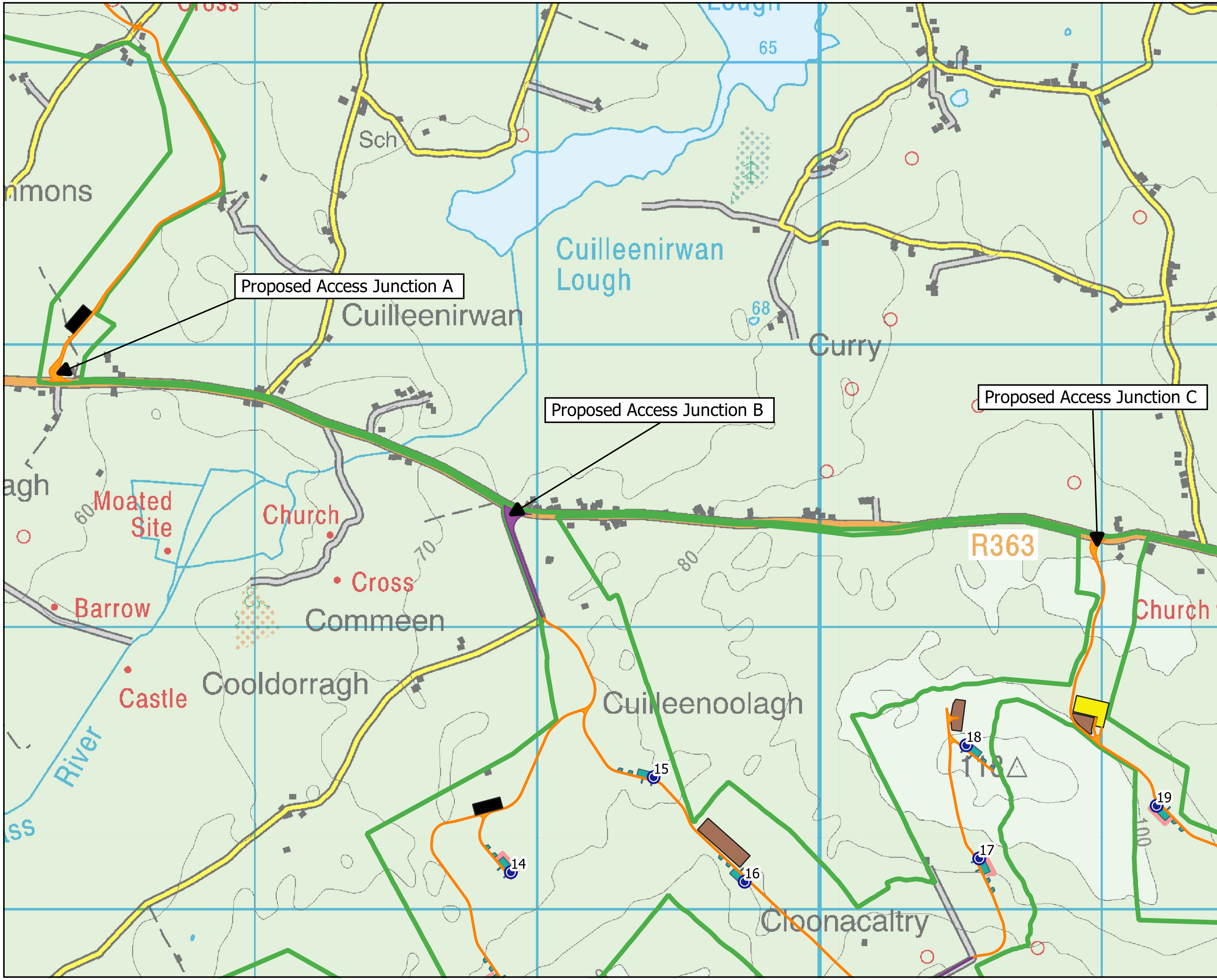
Access junction A (as shown on Figure 4-20) is on the northern side of the R363 Regional Road and will require a new road junction and access road. The site entrance was subject to autotrack assessment to identify the turning area required, as described in Section 14.1 of this EIAR. Appropriate sightlines will be established to the east and west of the proposed site entrance for the safe egress of traffic. It is proposed that this junction will provide access and egress to the Northern Cluster of turbines (T1 to T7) for abnormal loads as well as providing access for all general construction traffic (i.e., non-turbine components) to the Northern Cluster of the Proposed Development. It will also provide access for maintenance staff to the Northern Cluster when operational.

Access junction B (as shown on Figure 4-21) is located on the L7535 Local Road at the junction with R363 Regional Road and will require a widening of the existing entrance. This will be the primary access to the Southern Cluster of turbines (T8 to T18) and will provide for the delivery of abnormal loads, the delivery of general construction materials, and all construction traffic. Following the construction phase of the Proposed Development, the upgraded area of this entrance will be closed by erecting fencing, however this may be reopened during the operational phase of the development should replacement blades, abnormal loads or maintenance staff be required to access the site.

Access junction C (as shown on Figure 4-22) is on the southern side of the R363 Regional Road and will require a new road junction and access road. The site entrance was subject to autotrack assessment to identify the turning area required, as described in Section 14.1 of this EIAR. Appropriate sightlines will be established to the east and west of the proposed site entrance for the safe egress of traffic. It is proposed that this junction will provide access and egress to the southeast cluster of turbines in the Southern Cluster (T19 and T20) for abnormal loads as well as providing access to the proposed electrical substation location.

All turbine deliveries and abnormal loads will be made with the assistance of escort vehicles and traffic management staff. Access junctions will remain open throughout the duration of the proposed construction works and throughout the operation of the Proposed Development, to serve as a controlled access road to the onsite substation.

Further details are provided in Section 14.1 in Chapter 14 of this EIAR: Material Assets – Traffic and Transportation. A Traffic Management Plan is included in the CEMP in Appendix 4-9 of this EIAR. Upon grant of planning permission for the Proposed Development, the final Traffic Management Plan will address the requirements of any relevant planning conditions, including any additional mitigation measures which may be conditioned.



Map Legend

- EIAR Site Boundary
- Proposed Access Roads
- Proposed Upgrades to Existing Access Roads
- Proposed Turbine Layout
- Proposed Hardstands
- Proposed 110kV Substation Location
- Proposed Construction Compounds
- Proposed Overburden Storage Areas
- Infrastructure Overburden Storage Areas

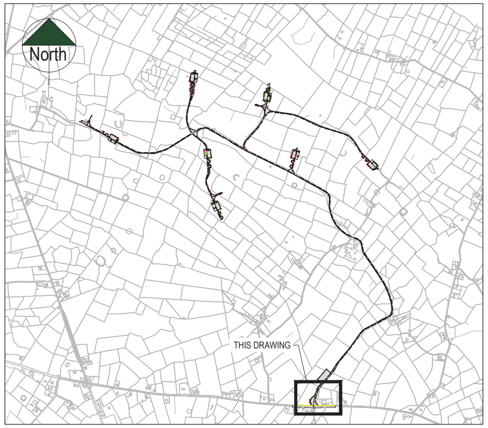
N

Drawing Title: Proposed Access Junction Locations

Project Title: Seven Hills Wind Farm, Co. Roscommon

Drawn By	Checked By
DN	ÓM
Project No. 190907	Drawing No. Figure 4-19
Scale 1:17500	Date 30.05.2021

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



LOCATION PLAN - NORTH

SCALE: 1: 20000

NORTH ENTRANCE

SCALE: 1: 1000

NOTES:

1. ALL DRAWINGS ARE TO BE READ IN CONJUNCTION WITH ALL RELEVANT SPECIFICATIONS, BILLS OF QUANTITIES, ARCHITECTURAL, SERVICES AND ENGINEERING DRAWINGS.
2. ALL LEVELS ARE IN METRES RELATED TO ORDNANCE DATUM MALIN HEAD.
3. ANY DISCREPANCIES BETWEEN THESE DOCUMENTS SHALL BE BROUGHT TO THE ATTENTION OF THE ENGINEER.
4. DRAWINGS ARE NOT TO BE SCALED.
5. ALL DIMENSIONS ARE IN **METERS**, UNLESS NOTED OTHERWISE.

LEGEND:

- SITE BOUNDARY
- OWNERSHIP BOUNDARY
- WORKS CORRIDOR
- ROAD/ STONE CAPPED SURFACES
- EXTENT OF ROAD SIDE BERM
- CUT EMBANKMENT
- FILL EMBANKMENT
- SUBSTATION FLOOR PLAN
- STONE BERM
- PEAT STORAGE
- DIRTY WATER DRAIN
- CLEAN WATER DRAIN
- EXISTING CUT-OFF DRAIN
- RUN OFF DRAIN WITH BUFFERED OUTFALL
- SETTLEMENT POND WITH BUFFERED OUTFALL
- DIRECTION OF FLOW OF SURFACE WATER
- LAND & STRUCTURE BOUNDARY
- INTERNAL CABLE ROUTE (Circuit 1)
- INTERNAL CABLE ROUTE (Circuit 2)
- INTERNAL CABLE ROUTE (Circuit 3)
- INTERNAL CABLE ROUTE (Circuit 4)
- INTERNAL CABLE ROUTE (Circuit 5)
- INTERNAL CABLE ROUTE (4 x circuits to Substation)

Fig4-20

REV	DATE	DESCRIPTION	BY	APP
P02	01 / 06 / 22	ISSUED FOR INFORMATION	CM	BS
P01	20 / 01 / 22	ISSUED FOR INFORMATION	CM	BS

PROJECT: SEVEN HILLS WIND FARM

TITLE: WINDFARM ENTRANCE SIGHTLINES SHEET 1

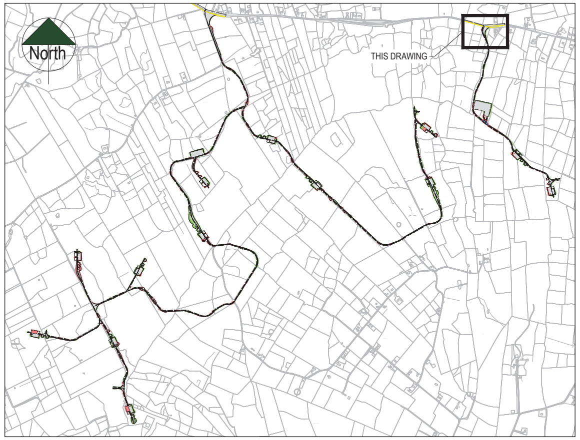
CLIENT: energia Switched on

Malachy Walsh and Partners
Engineering and Environmental Consultants
Cork | Tralee | London | Limerick

The Elm Suite, Loughmore Centre, Raheen Business Park, Limerick, V94 R578

Tel: +353 (0) 61 480164
Fax: +353 (0) 61 441125
E-mail: limerick@mwp.ie
Web: www.mwp.ie

DRAWN: CM	CHECKED: PB	APPROVED: BS
DATE: 01 / 06 / 22	SCALE @ A1: 1:1000	
PROJECT NUMBER: 21337		DRAWING STATUS: S2
DRAWING NUMBER: 21337-MWP-WF-00-DR-C-3000		REV: P02



LOCATION PLAN - SOUTH

SCALE: 1: 20000

SOUTH ENTRANCE - EAST

SCALE: 1: 1000

NOTES:

1. ALL DRAWINGS ARE TO BE READ IN CONJUNCTION WITH ALL RELEVANT SPECIFICATIONS, BILLS OF QUANTITIES, ARCHITECTURAL, SERVICES AND ENGINEERING DRAWINGS.
2. ALL LEVELS ARE IN METRES RELATED TO ORDNANCE DATUM MALIN HEAD.
3. ANY DISCREPANCIES BETWEEN THESE DOCUMENTS SHALL BE BROUGHT TO THE ATTENTION OF THE ENGINEER.
4. DRAWINGS ARE NOT TO BE SCALED.
5. ALL DIMENSIONS ARE IN **METERS**, UNLESS NOTED OTHERWISE.

LEGEND:

- SITE BOUNDARY
- OWNERSHIP BOUNDARY
- WORKS CORRIDOR
- ROAD/ STONE CAPPED SURFACES
- EXTENT OF ROAD SIDE BERM
- CUT EMBANKMENT
- FILL EMBANKMENT
- SUBSTATION FLOOR PLAN
- STONE BERM
- PEAT STORAGE
- DIRTY WATER DRAIN
- CLEAN WATER DRAIN
- EXISTING CUT-OFF DRAIN
- RUN OFF DRAIN WITH BUFFERED OUTFALL
- SETTLEMENT POND WITH BUFFERED OUTFALL
- DIRECTION OF FLOW OF SURFACE WATER
- LAND & STRUCTURE BOUNDARY
- INTERNAL CABLE ROUTE (Circuit 1)
- INTERNAL CABLE ROUTE (Circuit 2)
- INTERNAL CABLE ROUTE (Circuit 3)
- INTERNAL CABLE ROUTE (Circuit 4)
- INTERNAL CABLE ROUTE (Circuit 5)
- INTERNAL CABLE ROUTE (4 x circuits to Substation)

Fig 4-21

REV	DATE	DESCRIPTION	BY	APP
P02	01 / 06 / 22	ISSUED FOR INFORMATION	CM	BS
P01	20 / 01 / 22	ISSUED FOR INFORMATION	CM	BS

PROJECT: SEVEN HILLS WIND FARM

TITLE: WINDFARM ENTRANCE SIGHTLINES SHEET 2

CLIENT: energia Switched on

Malachy Walsh and Partners
Engineering and Environmental Consultants
Cork | Tralee | London | Limerick

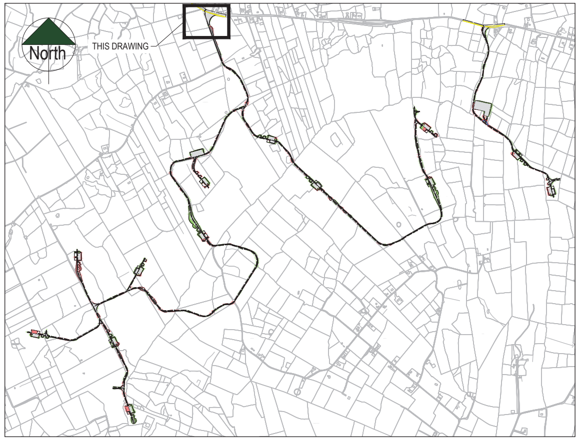
I.S. EN ISO 9001

The Elm Suite,
Loughmore Centre,
Raheen Business Park,
Limerick,
V94 R578

Tel. : +353 (0) 61 480164
Fax. : +353 (0) 61 441125
E-mail : limerick@mwp.ie
Web : www.mwp.ie

DRAWN: CM	CHECKED: PB	APPROVED: BS
DATE: 01 / 06 / 22	SCALE @ A1: 1:1000	
PROJECT NUMBER: 21337		DRAWING STATUS: S2

DRAWING NUMBER: 21337-MWP-WF-00-DR-C-3001 | REV: P02



LOCATION PLAN - SOUTH

SCALE: 1: 20000

SOUTH ENTRANCE - WEST

SCALE: 1: 1000

DO NOT SCALE FROM THIS DRAWING. USE FIGURED DIMENSIONS IN ALL CASES. VERIFY DIMENSIONS ON SITE AND REPORT ANY DISCREPANCIES TO THE DESIGNERS IMMEDIATELY.
THIS DRAWING TO BE READ IN CONJUNCTION WITH THE DESIGNERS SPECIFICATION.

NOTES:

1. ALL DRAWINGS ARE TO BE READ IN CONJUNCTION WITH ALL RELEVANT SPECIFICATIONS, BILLS OF QUANTITIES, ARCHITECTURAL, SERVICES AND ENGINEERING DRAWINGS.
2. ALL LEVELS ARE IN METRES RELATED TO ORDNANCE DATUM MALIN HEAD.
3. ANY DISCREPANCIES BETWEEN THESE DOCUMENTS SHALL BE BROUGHT TO THE ATTENTION OF THE ENGINEER.
4. DRAWINGS ARE NOT TO BE SCALED.
5. ALL DIMENSIONS ARE IN **METERS**, UNLESS NOTED OTHERWISE.

LEGEND:

- SITE BOUNDARY
- OWNERSHIP BOUNDARY
- WORKS CORRIDOR
- ROAD/ STONE CAPPED SURFACES
- EXTENT OF ROAD SIDE BERM
- CUT EMBANKMENT
- FILL EMBANKMENT
- SUBSTATION FLOOR PLAN
- STONE BERM
- PEAT STORAGE
- DIRTY WATER DRAIN
- CLEAN WATER DRAIN
- EXISTING CUT-OFF DRAIN
- RUN OFF DRAIN WITH BUFFERED OUTFALL
- SETTLEMENT POND WITH BUFFERED OUTFALL
- DIRECTION OF FLOW OF SURFACE WATER
- LAND & STRUCTURE BOUNDARY
- INTERNAL CABLE ROUTE (Circuit 1)
- INTERNAL CABLE ROUTE (Circuit 2)
- INTERNAL CABLE ROUTE (Circuit 3)
- INTERNAL CABLE ROUTE (Circuit 4)
- INTERNAL CABLE ROUTE (Circuit 5)
- INTERNAL CABLE ROUTE (4 x circuits to Substation)

Fig 4-22

REV	DATE	DESCRIPTION	BY	APP
P02	01 / 06 / 22	ISSUED FOR INFORMATION	CM	BS
P01	20 / 01 / 22	ISSUED FOR INFORMATION	CM	BS

PROJECT: SEVEN HILLS WIND FARM

TITLE: WINDFARM ENTRANCE SIGHTLINES SHEET 3

CLIENT: energia Switched on

Malachy Walsh and Partners
Engineering and Environmental Consultants
Cork | Tralee | London | Limerick

The Elm Suite, Loughmore Centre, Raheen Business Park, Limerick, V94 R578
Tel: +353 (0) 61 480164
Fax: +353 (0) 61 441125
E-mail: limerick@mwp.ie
Web: www.mwp.ie

DRAWN: CM	CHECKED: PB	APPROVED: BS
DATE: 01 / 06 / 22	SCALE @ A1: 1:1000	
PROJECT NUMBER: 21337		DRAWING STATUS: S2

DRAWING NUMBER: 21337-MWP-WF-00-DR-C-3002 REV: P02

4.4.2 Turbine and Construction Materials Transport Route

The proposed turbine transport route from the M6 Motorway to the Proposed Development site is shown Figure 4-23. Turbines will be transported along the M6 before exiting northwest at Monksland on to the R362 Regional Road. The route then travels northwest on the R362 Regional Road for approximately 5.5km, before merging left on to the R363 Regional Road. The turbine delivery route continues west along the R363 for approximately 6km before arriving at the first proposed primary access road, turning south to the Southern Cluster of the Proposed Development, while the second access road turning south is a further 2km west of the first junction. The access road junction to the northern part of the Proposed Development is located approximately 2km further west along the R363 towards Dysart village, before turning north at the proposed access junction.

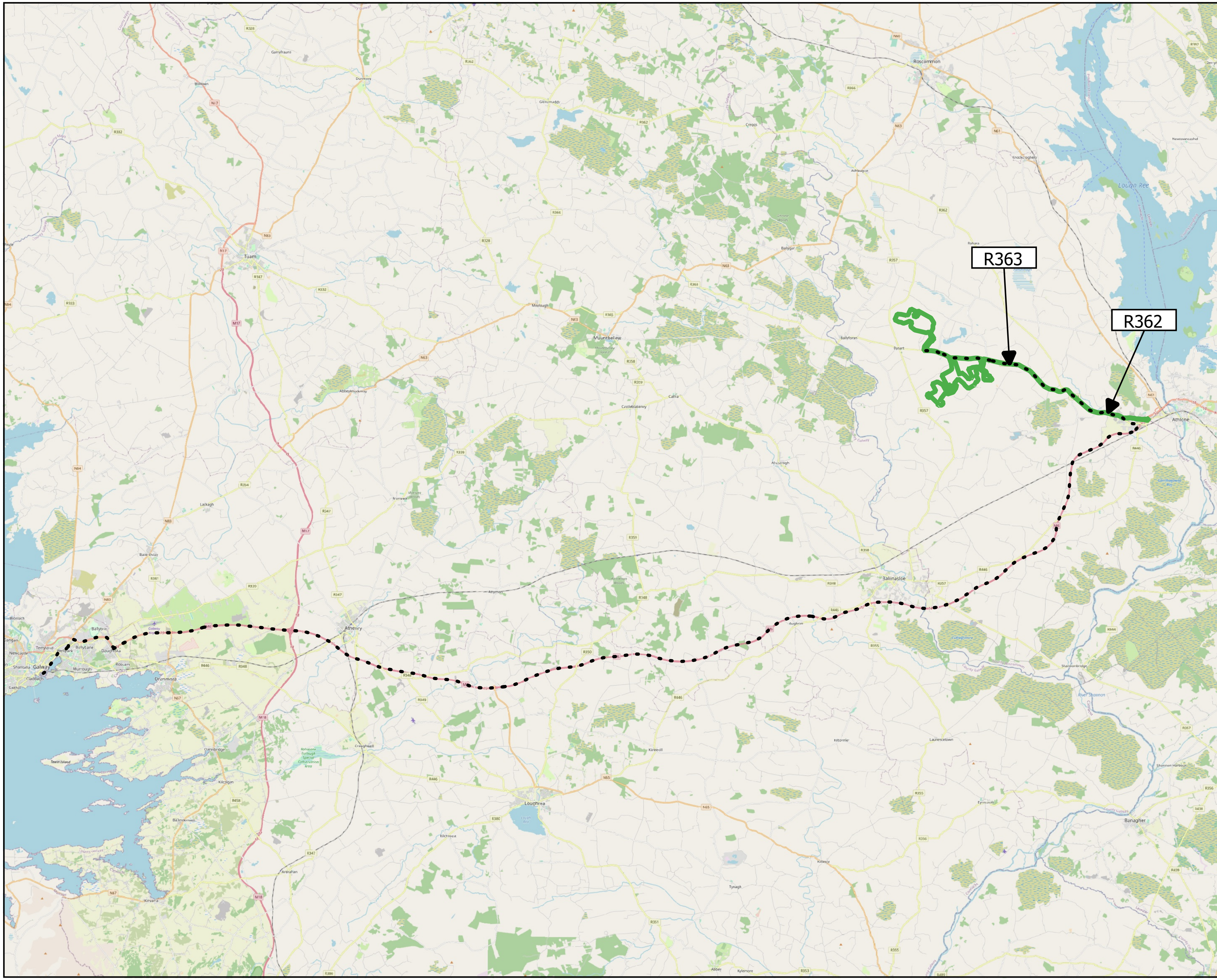
While the selection of a precise port of entry can only be determined following appointment of the chosen turbine manufacturer, for the purposes of the assessment, delivery from the Port of Galway is considered in this EIAR. Turbine components may also be imported through other ports including Dublin Port, Port of Waterford or Foynes/Shannon/Limerick Port. The Planning Authority will be advised of the selected port of entry as part of a final Transport/Traffic Management Plan, and that any specific traffic control measures arising from the selected route will be agreed with the Planning Authority prior to the commencement of development. Each of these ports are regularly used in the transportation of turbine components and are readily accessible without the need for significant road upgrade works between their location to the national road network.

The delivery route for general Heavy Goods Vehicles (HGV) construction traffic will be via the R363, with traffic either coming east or west of the site. For the purpose of this EIAR, it is assumed that deliveries of smaller component parts for the wind turbines will follow the same route towards the Proposed Development. In practice the delivery route for these component parts could change, but as the associated traffic volumes are low, as established in Section 14.1.4 of this EIAR, the impacts will be minimal regardless of the route selected.

The Traffic and Transport assessment is set out in Chapter 14: Section 14.1 of this EIAR.

4.4.3 Turbine Delivery Route Accommodation Works

Works such as road widening are sometimes required along proposed turbine delivery routes to accommodate the large vehicles used to transport turbine components to Wind Farm sites. The proposed transport delivery route for the Proposed Development has been the subject of a route assessment to determine if any widening works are required along its length; see Section 14.1 of this EIAR and Appendix 14-1 for the Route Access Survey. No permanent road widening or junction accommodation works are required along the turbine delivery route. Some temporary hardcore surfacing will be required at roundabouts or areas off oversail. Some minor modifications to street furniture will also be required along the turbine delivery route such as temporary removal of some street signs, traffic lights, etc.



Map Legend

EIAR Site Boundary

Proposed Turbine Delivery Route from Galway

Drawing Title: Proposed Turbine Delivery Route	
Project Title: Seven Hills Wind Farm, Co. Roscommon	
Drawn By: DN	Checked By: ÓM
Project No.: 190907	Drawing No.: Figure 4-23
Scale: 1:320000	Date: 30.05.2021

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

4.4.4 Traffic Management

A turbine with a blade length of 81 metres has been used in assessing the traffic impact of the Proposed Development. The blade transporter for such a turbine blade would have a total vehicle length of 94.2 metres, including the blade which overhangs the back of the vehicle. The total length of the tower transporter is 67.7 metres with the axles located at the front and rear of the load with no overhang. The vehicles used to transport the nacelles will be similar to the tower transporter. All other vehicles requiring access to the site of the Proposed Development will be smaller than the design test vehicles. The turbine delivery vehicles have been modelled in the autotrack assessments for the site access junctions, as detailed in Section 14.1 of this EIAR.

The need to transport turbine components on the public roads is not an everyday occurrence in the vicinity of the site of the Proposed Development. However, the procedures for transporting abnormal size loads on the country's roads are well established. Whilst every operation to transport abnormal loads is different and requires careful consideration and planning, escort vehicles, traffic management plans, drive tests, road marshals and convoy escorts from the Garda Traffic Corps are all measures that are regularly employed to get unusual loads from origin to destination.

An outline Traffic Management Plan has been prepared as set out in the CEMP in Appendix 4-9 of this EIAR. Upon grant of planning permission for the Proposed Development, the Traffic Management Plan will address the requirements of any relevant planning conditions, including any additional mitigation measures which are conditioned.

The plan will include:

- A delivery schedule.
- Details of works or any other minor alteration identified.
- A dry run of the route using vehicles with similar dimensions.

The deliveries of turbine components to the site may be made in convoys of three to five 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 public 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 where required will be made outside the normal peak traffic periods, at night, to avoid disruption to work and school-related traffic.

Prior to the Traffic Management Plan 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 the Transport Management Plan which will be finalised in advance of the construction stage, when the exact transport arrangements are known, delivery dates confirmed and escort proposals in place. The finalised Transport Management Plan will be 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.

4.5 Community Gain Proposal

The proposed Seven Hills Wind Farm has the potential to bring significant positive benefit to the local community. The project will create sustainable local employment, it will contribute annual rates to the local authority, and it will provide opportunity for local community investment. As with all wind farm projects the applicant develops, a community benefit fund will be put in place for the lifetime of the project to provide direct funding to those areas surrounding the project.

4.5.1 Community Benefit Fund

The Proposed Development has the potential to provide significant additional investment in community initiatives which will benefit local residents and businesses through an annual wind farm community benefit fund.

If this project is constructed as currently designed, the fund will invest in excess of €300,000 a year in local community projects, based on a minimum annual investment of €16,000 per turbine. This represents a dependable source of investment for the communities living in the vicinity of Proposed Development.

The fund will be administered by an independent charitable trust and will prioritise energy efficiency and sustainability goals. It will be designed and regularly reviewed in conjunction with local community groups to meet local needs. Any funds not spent within the corresponding twelve months will be rolled over to spend the following year. An annual record of all project funding, together with an impact assessment, will be made publicly accessible.

The fund will prioritise households within 1km of the wind turbines by offering electricity bill payers an annual contribution of €1,000 towards their electricity usage.

The Community Benefit Fund is detailed further, alongside all community engagement and stakeholder engagement, in Appendix 2-2 of this EIAR.

4.6 Site Drainage

4.6.1 Introduction

The drainage design for the Proposed Development has been prepared by Malachy Walsh and Partners (MWP). The drainage design is a bespoke design and has been prepared based on the extensive experience of the project team of wind farm sites, and a number of best practice guidance documents referred to in the References section of the EIAR.

Surface watercourses are absent within the Wind Farm site but are noted along the Grid Connection route as detailed above in Section 4.3.7. However, there are turloughs noted within the low-lying areas of the Wind Farm site, with a number of turloughs situated within localised depressions. Further information on the local and regional hydrology of the Proposed Development site is detailed in Chapter 9 of this EIAR.

There are 2 no. mapped Public Water Schemes (PWS) within 6km of the Proposed Development site (Mount Talbot PWS and Killeglan/Tobermore Spring PWS). The closest mapped domestic well by the GSI available through their public map viewer[3] is situated ~0.75km from the nearest turbine location. There are no other groundwater wells mapped by the GSI within the 50m accuracy threshold.

[3] https://dcenr.maps.arcgis.com/apps/MapSeries/index.html?appid=a30af518e87a4c0ab2fbde2aaac3c228

The protection of groundwater and surface water within and surrounding the site, and downstream catchments that they feed has been of utmost importance in considering the most appropriate drainage proposals for the site of the Proposed Development. The Proposed Development's drainage design has therefore been proposed specifically and ensures minimal impact with regards the existing flow regime across the site, in particular having no negative impact on the water quality of the site and consequently no impact on downstream catchments and ecological ecosystems. No routes of any natural drainage features will be altered as part of the Proposed Development. Watercourses are absent within the Wind Farm site, only occurring along the Grid Connection route, however potential impacts in relation to potential overland flow towards surface water bodies such as turloughs will nonetheless be mitigated against, as well as surface water runoff that will occur at site infrastructure that will need to be recharged locally into subsoils. This recharge water will occur close to source and can migrate vertically to groundwater below the site. There will be no direct discharges to any natural watercourses, with all drainage waters being dispersed as overland flow/recharge. All discharges (via groundwater recharge) from the proposed works areas will be made over vegetation filters at an appropriate distance from the works areas. Buffer zones around the existing natural drainage features (turloughs and karst features for the Wind Farm site) have been used to inform the layout of the Proposed Development.

Drainage controls at the Wind Farm site will be installed where significant cut and fill works are required. Elsewhere, the natural drainage/recharge regime will continue as that will cause the least disturbance and potential impacts to groundwater (note: this is how existing farm tracks within the Wind Farm site are drained currently).

Further details on the potential impact on the site drainage is detailed in Chapter 9 and in the Drainage Management Plan included as Appendix 4-8.

4.6.2 Existing Drainage Features

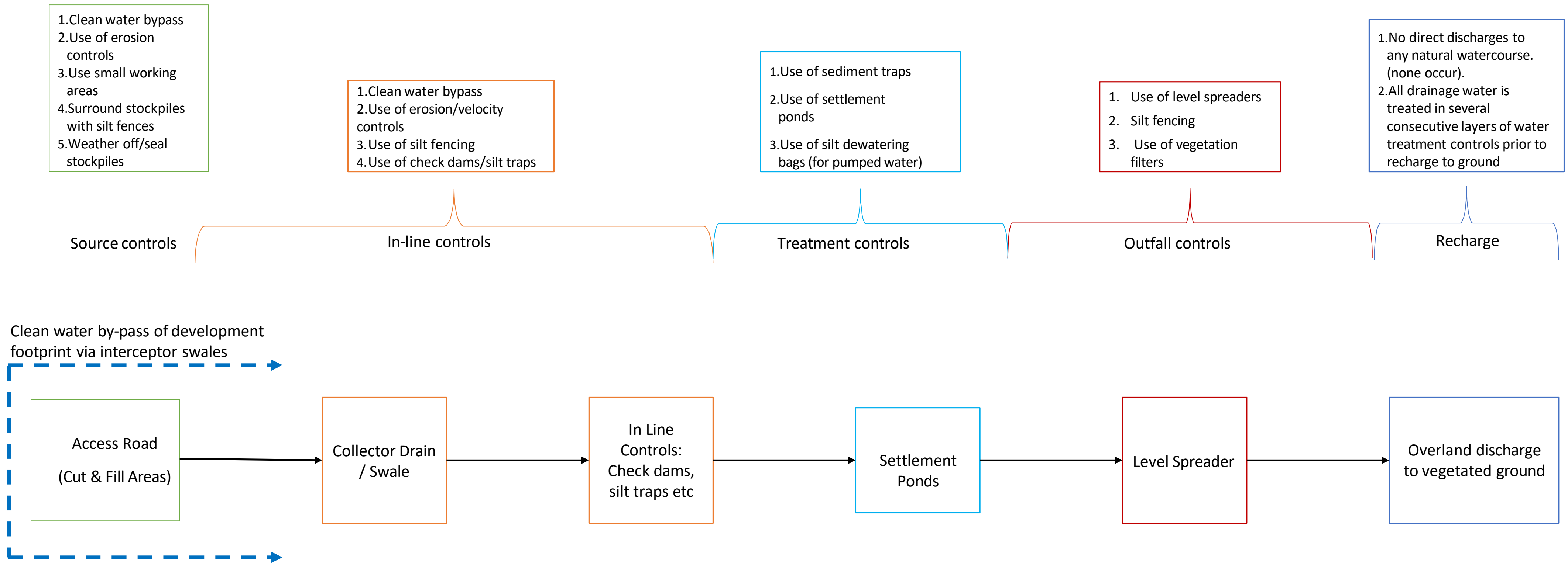
The routes of any natural drainage features will not be altered as part of the Proposed Development. Infrastructure locations have been selected to avoid turloughs across the Wind Farm site. There will be no direct discharges to turloughs. All discharges from the proposed works areas or from interceptor drains will be made over vegetated ground at an appropriate distance from turloughs. Where infrastructure is close to existing turlough 3 no. lines of Terrastop fencing shall be installed to provide additional settlement and filtration time to discharged water (such a scenario occurs at T4). This Terrastop fencing is shown on the relevant plan and detail drawings.

Where required, local overland drainage pathways in the vicinity of proposed works (including site roads and infrastructure locations) areas may have to be diverted around the proposed works areas to minimise the amount of water (after rainfall events) in the vicinity of works areas. These local drainage pathways will be blocked (using sandbags or silt fences) and overland flow water will be rerouted around works areas to downstream vegetation filters and designated recharge areas.

4.6.3 Drainage Design Principles

The drainage strategy for the Wind Farm site will ensure minimal impact on the existing flow regime, water quality, and run-off quantity. Drainage water from any works areas of the site of the Proposed Development will not be directed to any surface water features or turloughs within the site. Two distinct methods will be employed to manage drainage water within the site. The first method involves keeping clean overland flow water clean by routing around works 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 for local recharge to ground. Figure 4-24 below details the proposed drainage design.

Water Management at Proposed Access Roads / Hardstands / Turbine Bases



4.6.4 Drainage Design

A detailed drainage design for the Proposed Development, incorporating all principles and measures outlined in this drainage design description, has been prepared, and is included in Appendix 4-8 to this EIAR. The drainage design employs the various measures further described below.

4.6.4.1 Interceptor Drains (Clean Water Drain)

Interceptor drains will be installed upgradient of certain works areas to reroute overland flow 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 interceptor drains will be used to divert upslope overland flow around the works area to a location where it can be redistributed over the ground surface for recharge to local groundwater. 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 will remain in-situ. Any areas in which works were carried out to construct roads, turbine bases or hardstands, will have been built up with engineered fill, which even when compacted in place, will retain sufficient void space to allow water infiltrate the subsurface of these constructed areas. It is not anticipated that roadways or other installed site infrastructure will intercept overland flow to any significant extent that would result in scouring or over-topping or spill-over.

The velocity of flow in the interceptor will be controlled by check dams (see Section 4.6.4.3 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 predominantly installed horizontally across slopes to run in parallel with the natural contour line of the slope. Intercepted water will travel along the interceptor drains, pass through piped drains, and onto areas downgradient of works areas where the drain will terminate at a vegetation filter/level spreader (see Section 4.6.4.4 below).

4.6.4.2 Swales (Dirty Water Drain)

Drainage swales are drains that will be used to intercept and collect drainage water 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 Proposed 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. They are similar in design to interceptor drains described above.

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.

4.6.4.3 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 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.

The proposed check dams will be made up of stone. Clean 4-6 inch stone will be built up on a layer of Terram and secured in place with pairs of stakes. A detail for this is shown on the design drawings.

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.

Check dams will not be used in any natural watercourses (as none exist at the Wind Farm site), only artificial drainage channels, interceptor drains and swales. 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.

4.6.4.4 Level Spreaders and Vegetation Filters

A level spreader will be constructed at the end of each interceptor drain to convert concentrated flows in the drain, into diffuse flow over areas of vegetated ground (i.e. vegetation filters acting as recharge areas). The levels spreaders/vegetation filters will be located downgradient of any proposed works areas where possible 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 (clean overland flow water) 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 re-concentrated 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.

4.6.4.5 Piped Drains

Piped drains will be used to convey drainage water from swales and interceptor drains safely downslope of the infrastructure. From here, water is dispersed through the level spreaders or to settlement ponds.

The piped 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 swales/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.

Piped drains will be inspected weekly and following rainfall events. Inlet and outlets will be checked for sediment accumulation and blockage.

4.6.4.6 Settlement Ponds

Settlement ponds will be used to slow down and treat drainage water from works areas of the site of the Proposed Development 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 settlement ponds is to intercept drainage water 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 drainage water is redistributed as diffuse sheet flow downgradient of any works areas for recharge to ground.

Settlement ponds will be excavated/constructed at each required location as two separate ponds in sequence, a primary pond and a secondary pond as shown on the Drainage Drawing (see Appendix 4-2). The primary settlement pond will reduce the velocity of flows to allow settlement of silt to occur. Water will then pass from the primary pond to the secondary pond over a stone weir, where further settlement takes place. Water will flow out of the secondary pond over a knife-edge weir, partially wrapped in 1000-gauge impermeable polythene, which will control flow velocities and trap any sediment that has not settled out.

Water will flow by gravity through the settlement pond system. The ponds are 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 at a 10 year Return Period. Treated drainage water from settlement ponds will be routed via swales to levelspreaders/vegetation filters where treated water will recharge into the ground downstream of works areas.

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 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.

4.6.4.7 Silt Fences

Silt fencing will be used to manage drainage water. For example, they will be installed as a series of triple silt fences between works areas at T4 and Gortaphuill turlough.

Each fence will consist of a geotextile fabric such as Terrastop 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 the surface.

Site fences will be inspected regularly to ensure water is continuing to flow through the fabric, and the fence is not coming under strain from water backing up behind it.

4.6.5 Overburden Storage Area

The drainage strategy at overburden storage areas is similar to that elsewhere on site, and that is to intercept clean water overland flow on the uphill side of the storage areas and convey it to the downhill side below the storage area for recharge to ground. A dirty water cut-off drain is provided below the storage areas to intercept any dirty water run-off before it makes its way to the clean water drainage network. This dirty water will be treated as per the remainder of dirty water generated on the wind farm, i.e. via settlement ponds, swales, levelspreader/vegetation filter and recharge to ground.

4.6.6 Cable Trench Drainage

Cable trenches are 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 water 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 Proposed Development, would be transported to one of the on-site overburden storage areas or used for landscaping and reinstatements of other areas elsewhere on site, or disposed off-site at an appropriate licensed soil recovery facility.

On steeper slopes, silt fences, as detailed in Section 4.6.4.12, 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 drainage water.

4.6.7 Site and Drainage Management

4.6.7.1 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 amount of clean stone, terram, stakes, silt fencing, 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.

4.6.7.2 Pre-emptive Site Drainage Management

The works programme for the groundworks part of the construction phase of the Proposed Development 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.

4.6.7.3 Reactive Site Drainage Management

The final drainage design prepared for the Proposed Development prior to commencement of construction will provide for adaptive management of drainage measures. The effectiveness of drainage measures designed to minimise overland flow entering works areas and capture and treat silt-laden water from the works areas, will be monitored continuously by the Ecological Clerk of Works (ECoW) or supervising hydrologist 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/enhanced 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 the situation on the ground at a particular time.

In the event that works give rise to siltation of watercourses along the Grid Connection route, the ECoW or supervising hydrologist will immediately 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.

4.6.8 Drainage Maintenance

An inspection and maintenance plan for the drainage system onsite will be prepared in advance of commencement of any works on the Proposed Development. A Drainage Management Plan is included in Appendix 4-8 of the EIAR, and drainage inspection and maintenance are detailed in the outline CEMP included as Appendix 4-9 of this EIAR. Regular inspections of all installed drainage features will be necessary, especially after heavy rainfall, to check for blockages, and ensure there is no build-up of standing water at parts of the systems where it is not intended. The inspection of the drainage system will be the responsibility of the ECoW or the supervising hydrologist.

If necessary, any excess sediment build up behind check dams will be removed. For this reason, check dams will be inspected and maintained weekly during the construction phase of the project to ensure 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 Proposed Development 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 be 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 to a number of silt traps with marks to identify when sediment is at 50% of the trap's capacity. Sediment will be cleaned out of the silt trap when it exceeds 10% of trap capacity. Silt traps will be inspected weekly during the construction phase of the Proposed Development and following rainfall events. Inlet and outlets will be checked for sediment accumulation and anything else that might interfere with flows.

The frequency of drainage system inspections will be reduced following completion of the construction phase of the Proposed Development. Weekly inspections during the construction phase will be reduced to monthly, bi-monthly and eventually quarterly inspections during the operational phase up until the site has revegetated and the natural silt controls regenerate. The frequency will be increased or decreased depending on the effectiveness of the measures in place and the amount of remedial action required in any given period.

4.7 Construction Phasing and Timing

It is estimated that the construction phase of the Proposed Development will take approximately 18-24 months from commencement onsite to the commissioning of the electrical system.

In the interest of the protection of breeding birds, should the planned construction programme commencement coincide with the Breeding bird season (April to July inclusive), an early breeding season survey by a qualified ornithologist will be commissioned and, subject to confirmation of no nesting or breeding activity in any areas for works to be undertaken, works will proceed, with ongoing monitoring in parallel to ensure adherence of protection protocols throughout the season. Hedgerow cutting and disturbance of any other confirmed nesting habitat would be prohibited during the breeding season in line with legislation and best practice. The removal of woody vegetation will be undertaken in full compliance with Section 40 of the Wildlife Act 1976 – 2018. Any required removal of vegetation will be undertaken following inspection by a suitable qualify ornithologist to ensure no nesting birds are affected.

4.7.1 Construction Sequencing

The construction phase can be broken down into four main phases, which overlap partially and will take approximately 18-24 months to complete: 1) grid connection works – 3-6 months, 2) site preparation and civil engineering works - 10 months, 3) electrical works - 6 months, and 4) turbine erection and commissioning - 8 months. The main task items under each of the three phases are outlined below.

Grid Connection

- Establish traffic management
- Excavate and install pre-cast concrete joint bays
- Excavate trench for ducting & place ducting, backfill with graded granular fill material, reinstate temporary surface.
- Install cable, including jointing.
- Test installation and carry out permanent reinstatement of carriageway.

Civil Engineering Works:

- Erect all necessary safety signage
- Create new entrance(s) and hardcore existing entrances (where required).
- Clear and hardcore area for temporary site offices. Install same.
- Construct bunded area for oil tanks.
- Construct new site roads and hard-standings and crane pads.
- Construct drainage ditches, culverts etc. integral to road construction.
- Construct the substation, control buildings and groundworks for the substation compound.
- Excavate/pile for turbine bases where required. Place blinding concrete to turbine bases. Fix reinforcing steel and anchorage system for tower section. Construct shuttering. Fix any ducts etc. to be cast in. Pour concrete bases. Cure concrete. Remove shutters after 3-5 days.
- Backfill tower foundations and cover with previously stored granular material.
- Excavate trenches for site cables, lay cables and backfill. Provide ducts at road crossings.
- Complete site works, reinstate site.
- Remove temporary site offices. Provide any gates, landscaping, signs etc. which may be required.

Electrical Works:

- Construct bases/plinths for substation building.
- Install external electrical equipment at substation.
- Install transformer at compound.
- Erect stock proof and palisade fencing around substation area.
- Install internal collector network and communication cabling.

Turbine Erection and Commissioning:

- Erect towers, nacelles and blades.
- Complete electrical installation.
- Install meteorological mast.
- Commission and test turbines.
- Complete site works and reinstate site.
- Provide any gates, landscaping, signs etc. which may be required. Remove temporary site offices.

All relevant Site Health & Safety procedures, in accordance with the relevant Health and Safety Legislation and guidance (listed in Section 5.8.2.1 of this EIAR), including the preparation of the Health & Safety Plan, erection of the relevant and appropriate signage on site, inductions and toolbox talks will take place prior to and throughout the construction phase of the Proposed Development. Further details of on-site health, safety and welfare are included in Chapter 5 of this EIAR.

The phasing and scheduling of the main construction task items are outlined in Figure 4-25 below, where 1st January has been selected as an arbitrary start date for construction activities.

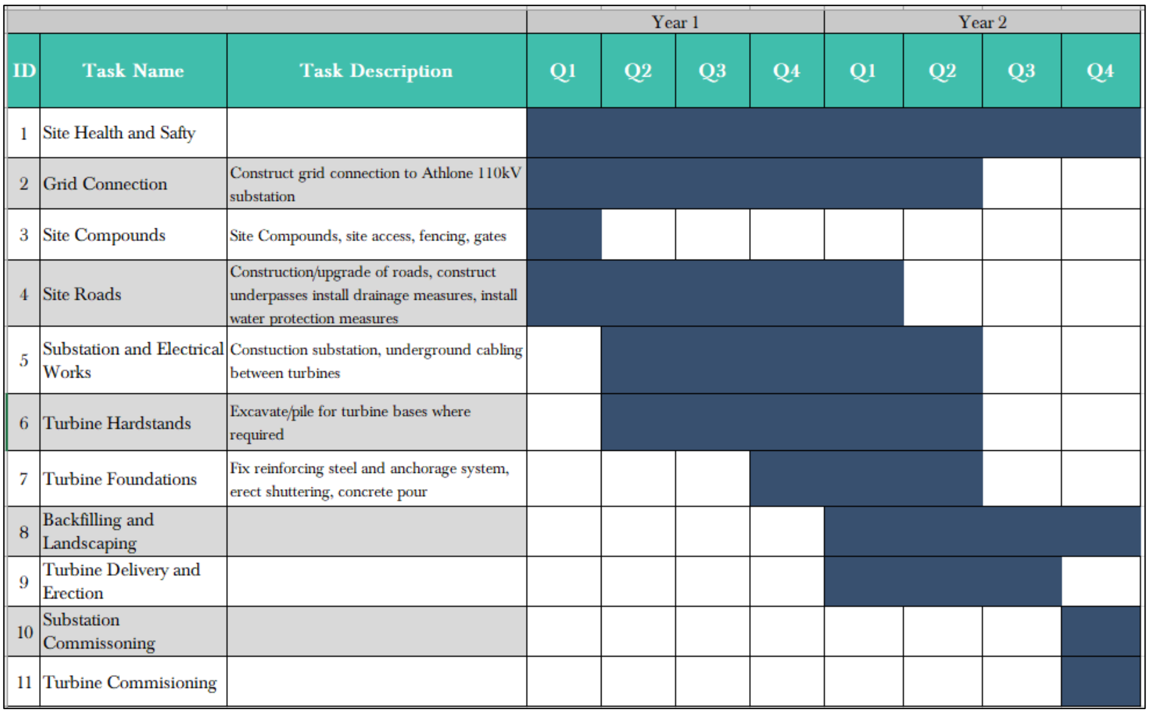


Figure 4-25 Indicative Construction Schedule

4.7.2 Construction Phase Monitoring and Oversight

The requirement for a final CEMP to be prepared in advance of any construction works commencing on any wind farm development site and submitted for agreement to the Planning Authority is now well-established. The procedures for the implementation of the mitigation measures outlined in the CEMP and their completion is audited by way of a CEMP Audit Report.

The CEMP Audit Report will list all mitigation measures prescribed in any of the planning documentation and all conditions attached to the grant of planning permission and allows them to be audited on a systematic and regular basis. The first assessment is a simply Yes/No question, has the mitigation measure been employed on-site or not? Following confirmation that the mitigation measure has been implemented, the adherence to mitigation measures must be the subject of regular review and audit during the full construction stage of the project. If remedial actions are needed to improve the effectiveness of the mitigation measure, then these are notified to the site staff immediately during the audit site visit, and in writing by way of the circulation of the audit report. Depending on the importance and urgency of rectifying the issue, the construction site manager is given a timeframe by when the remedial works need to be completed.

An outline CEMP has been prepared for the Proposed Development and is included in Appendix 4-9 of this EIAR. The CEMP includes details of drainage, overburden management, waste management etc, and describes how the above-mentioned Audit Report will function and be presented. In the event planning permission is granted for the Proposed Development, the CEMP will be updated prior to the commencement of the development, to address the requirements of any relevant planning conditions, including any additional mitigation measures which are conditioned and will be submitted to the Planning Authority for written approval.

The on-site construction staff will be responsible for implementing the mitigation measures specified in the EIAR and the CEMP and compiled in the Audit Report. Their implementation will be overseen by the ECoW or supervising hydrogeologists, environmental scientists, ecologists or geotechnical engineers, depending on who is best placed to advise on the implementation. The system of auditing referred to above ensures that the mitigation measures are maintained for the duration of the construction phase, and into the operational phase where necessary.

4.8 Construction Methodologies

4.8.1 Turbine Foundations

Foundations for wind turbines may be of the ground bearing gravity type. Each of the turbines to be erected on site will have a reinforced concrete base. As detailed above in Section 4.3.1.2, numerous intrusive site investigations were undertaken across the Northern and Southern Clusters, to provide detail and clarity on the nature and extent of subsoils and bedrock as a means of characterising the site and providing evidence for potential karstification of the limestone bedrock. This assisted in providing additional information on the most suitable location for turbines and associated infrastructure. Full details and results from the site investigation works is detailed in Appendix 4-3 of this EIAR.

Where the foundation of the turbine is founded on competent strata, overburden will be stripped off the foundation area to a suitable formation using a 360° excavator and will be placed across the site as close to the excavation as practical. A two-metre wide working area will be required around each turbine base, with the sides of the excavated areas sloped sufficiently to ensure that slippage does not occur. Material excavated to create the working area will be stored locally for later reuse in backfilling the working area around the turbine foundation. The excavated material will be sealed using the back of the excavator bucket and surrounded by silt fences to ensure sediment-laden run-off does not occur.

The formation material will have to be approved by an engineer as meeting the turbine manufacturer's requirements, although the proposed formation is already identified through the SI already completed. If the formation level is reached at a depth greater than the depth of the foundation, the ground level will be raised with Clause 6F2 or similar hardcore material, compacted in 250 millimetres (mm) layers, with sufficient compacted effort (i.e. compacted with seven passes using 12 tonne roller). Drainage measures will be installed to protect the formation by forming an interceptor drain around the perimeter of the base which will be pumped to an adjacent settlement pond.

A berm approximately 600 mm high will be constructed around the perimeter of each turbine base and a fence will be erected to prevent construction traffic from driving into the excavated hole and to demarcate the working area. All necessary health and safety signage will be erected to warn of deep excavations etc. Access to and from excavated bases will be formed by excavating a pedestrian walkway to 1:12 grade.

There will be a minimum of 100 mm of blinding concrete laid on the formation material positioned using concrete skip and 360° excavator to protect ground formation and to give a safe working platform.

The anchor cage is delivered to site in 2 or more parts depending on the turbine type. A 360° excavator or crane with suitable approved lifting equipment will be used to unload sections of the anchor cage and reinforcing steel. The anchor cage is positioned in the middle of the turbine base and is assembled accordingly. When the anchor cage is in final position it is checked and levelled by using an appropriate instrument. The anchor cage is positioned 250mm – 300mm from formation level by use of adjustable legs. Reinforcement bars are then placed around the anchor cage, first radial bars, then concentric bars, shear bars and finally the superior group of bars. Earthing material is attached during the steel foundation build up. The level of the anchor cage will be checked again prior to the concrete pour and during the concrete pour.

Formwork to concrete bases will be propped/supported sufficiently so as to prevent failure. Concrete for bases will be poured using a concrete pump. Each base will be poured in three stages. Stage 1 will see the concrete being poured and vibrated in the centre of the anchor cage to bring the concrete up to the required level inside the cage. Stage 2 will see the centre of the steel foundation being poured and vibrated to the required level. Stage 3 will see the remaining concrete being poured around the steel foundation to bring it up to the required finished level. After a period of time when the concrete has set sufficiently the top surface of the concrete surface is to be finished with a steel float.

Once the base has sufficient curing time it will be filled with suitable fill up to existing ground level. The working area around the perimeter of the foundation will be backfilled with the original material that was excavated.

4.8.2 Site Roads and Hardstand Areas

Site roads will be constructed to each turbine base and at each base hard standing will be constructed to the turbine manufacturer's specifications. Tracked excavators will carry out excavation for roads with appropriate equipment attached. The excavations shall follow a logical route working towards the proposed overburden storage areas. Excavated material will be contained within the site and transported to the designated overburden storage areas in haul trucks. A two- to three-metre-wide working area will be required around each hard standing area, with the sides of the excavated areas sloped sufficiently to ensure that slippage does not occur. Material excavated to create the working area will be stored locally for later reuse in backfilling the working area around the turbine foundation. The excavated material will be sealed using the back of the excavator bucket and surrounded by silt fences to ensure sediment-laden run-off does not occur.

Where it is deemed acceptable owing to good ground conditions road construction will consist of a geogrid being laid on the existing ground surface and the road build-up being placed on top. No stripping of the surface will take place. This approach reduces the amount of spoil generated on the project. It is anticipated that this form of construction will be used in the majority of areas. In areas where the top surface may be softer formation level will be arrived at through stripping the topsoil and upper layer of overburden. When the formation layer has been reached, stone shall be placed on a geogrid to form the road foundation. The sub grade will be compacted with the use of a roller. The final wearing course will not be provided until all bases have been poured. This prevents damage to the wearing course due to stone and concrete trucks movements. The road will be upgraded prior to the arrival of the first turbine. All roads will be maintained for the duration of the operation of the Proposed Development.

4.8.3 Onsite Electricity Substation and Buildings

The proposed electricity substation will be constructed by the following methodology:

- The dimensions of the onsite electrical substation have been designed to meet the requirements of the ESB and EirGrid;
- Two buildings, Eirgrid control building and MV Switchgear Building, will be built within the onsite electrical substation compound;
- The area of the onsite electrical substation will be marked out using ranging rods or wooden posts and the soil and overburden stripped and removed to nearby temporary storage area for later use in landscaping. Any excess material will be sent to one of the proposed onsite overburden storage areas.
- The foundations will be excavated down to the level indicated by the designer and appropriately shuttered reinforced concrete will be laid over it. An anti-bleeding admixture will be included in the concrete mix;
- The block work walls will be built up from the footings to damp proof course 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;

- 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.
- The electrical equipment will be installed and commissioned.
- Perimeter fencing will be erected.
- The construction and components of the substation have been designed to ESB/Eirgrid specifications.
- The substation and buildings will be accessible from a dedicated access road which will connect to the R363 Regional Road to the north.

4.8.4 Temporary Construction Compounds

The temporary construction compounds will be constructed as follows:

- The area to be used as the compounds 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 compounds platform will be established using a similar technique as the construction of the substation platform discussed above;
- A layer of geo-grid 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 compounds will be constructed as site roads and used as vehicle hardstandings during deliveries and for parking;
- The compounds will be fenced and secured with locked gates if necessary; and,
- Upon completion of the Proposed Development the temporary construction compounds will be decommissioned by backfilling the area with the material arising during excavation, landscaping with topsoil as required.

4.8.5 Site Underground Cabling

The transformer in each turbine is connected to the substation through a network of buried electrical cables. The ground is trenched typically using a mechanical excavator. 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 cables will be laid at a depth that meets relevant national and international requirements, and will generally be approximately 1.2m below ground level; a suitable marking tape is installed between the cables and the surface (see Plate 4-5 below). On completion, the ground will be reinstated as previously described above. The route of the cable ducts will follow the access track to each turbine location and are shown on the site layout drawings included as Appendix 4-1 of the EIAR.

Plate 4-5 Typical Cable Trench View

It is proposed to connect the Northern Cluster of turbines to the proposed onsite electrical substation within the Southern Cluster of turbines via a section of underground cabling measuring approximately 3.8km in length, as shown above in Figure 4-15 (IPP Cabling). Approximately 3.8km of the internal cabling is located on existing roads, with the remaining 635m to be installed within the internal site access track. The collector cabling to connect the two clusters of turbines will be laid beneath the surface of the site and public road using the following typical methodology:

- The area where excavations are planned will be surveyed, prior to the commencement of works to confirm the conditions predicted in this EIAR, with a cable-avoiding tool and all existing underground services will be confirmed.
- Two teams consisting of two tracked excavators, two dumpers and a tractor and stone cart with side-shoot will dig the trench for and lay approximately 300m of the underground cable ducting per day.
- The excavators will open a trench at the edge of the road surface or on agricultural land as appropriate, the trench will be a maximum of approximately 450mm wide and 1,300mm deep.
- Clay plugs will be installed at 50m intervals to prevent the trench becoming a conduit for surface water runoff.
- Cable joint bays will be located at approximately 600-800m intervals or as otherwise required by the Electrical Designer along the proposed cable route, each joint bay will be approximately 4m long x 2m wide x 2m deep in size and will be located in the road edge and accessible for cable pulling and future maintenance.
- The excavated material will be assessed for suitability and may be used as backfill material in the trench, if it is unsuitable for this use, it will be loaded into a dumper to be transported to a designated overburden storage area.
- Once the trench has been excavated, a layer of bedding material will be installed and compacted to the required specification.
- The ducting along with marker strips will then be placed in the trench as per relevant specifications.
- The specified ducting surround will be installed to approximately 75mm above the cable ducting and compacted.
- The remainder of the trench will be backfilled with the excavated material and compacted. Where ducting is located within the access track i.e. road crossings, it will be backfilled with stone material and capped with clause 804 material.

- Yellow marker warning tape will be installed across the width of the trench, at 300mm depth,
- Marker posts will then be placed at regular intervals (generally at joint bays and any change in direction) to denote the location of the underground power cables.

4.8.5.1 Existing Underground Services

Any underground services encountered along the cable routes will be surveyed for level and the ducting will pass over the service provided adequate cover is available. A minimum clearance of 300 mm will be required between the bottom of the ducts and the service in question. If a horizontal 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 duct and top-level yellow marker tape.

4.8.5.2 Joint Bays (Connection Chambers)

Joint bays are pre-cast concrete chambers where lengths of cable will be joined to form one continuous cable. They will be located at various points along the ducting route generally between 600 to 800 m intervals or as otherwise required by the Electrical Designer.

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 once they have been constructed, they will be backfilled until cables are being installed.

4.8.6 Grid Connection

The proposed Wind Farm will be connected to the National Grid via a 110 kV underground cable from the proposed onsite electrical substation to the existing Athlone 110kV substation in Monksland, with a total cable length of approximately 12km (as per Figure 4-15 above).

The underground cabling will be a single circuit 110 kV connection, in accordance with the requirements and specifications of ESB. A single circuit connection typically consists of 3 no. 160mm diameter HDPE power cable ducts and 2 no. 125mm diameter HDPE communications duct to be installed in an excavated trench, typically 600mm wide by 1,220mm deep. For trench designs there will be variations on the design to adapt to service crossings and watercourse crossings.

The power cable ducts will accommodate the power cables and the communications duct(s) will also accommodate a fibre cable(s) to allow communications between the Proposed Development substation and existing Athlone 110kV substation. The ducts will be installed, the trench reinstated in accordance with landowner or ESB specification, and then the electrical cabling/fibre cable is pulled through the installed ducts in approximately 600m to 800m sections. Construction methodologies to be implemented and materials to be used will ensure that the underground cabling is installed in accordance with the requirements and specifications of ESB.

A full construction methodology of the proposed external Grid Connection is detailed below.

4.8.6.1 HV Cable Overview

A combination of trefoil trench width 825mm and standard flat formation total trench width 930mm will be used for most of the cable route. A fully flat formation trench width of 1330mm may be utilised on sections of the route where standard vertical trench depths cannot be achieved. Trenchless installation in the form of horizontal directional drilling (HDD) will be used at the following locations:

- Cross River Bridge on the R363;
- Cross River Bridge on the R362; and
- Under N6 adjacent to R362 Traffic Bridge.

For proposed cable route, joint bays are required approximately every 600m to 800m where separate cable lengths can be joined together. The joint bays proposed along the cable route will be located either within the existing road or at suitable off-road locations which will be immediately adjacent to roadways to minimise traffic disruption. The selection of joint bay locations involved technical (including existing utilities, traffic management requirements and land ownership) and environmental evaluation of sites to ensure that the area is suitable for construction works and for safe access during any future maintenance. A working area is defined which provides adequate space for cable pulling and jointing around the joint bay. This working area will also provide space for movement of all construction vehicles. The working area will immediately adjoin the public road, as the cable will be diverted from the road to the joint bay.

All road works involving cable and pipe laying e.g., watermains, broadband, television etc., require traffic management procedures when installing within public roads. It may be a temporary requirement that some roads are closed along particular sections of the cable route. This can have a disruptive effect locally on residents over the period of the installation works. In the case of wider roads, one carriageway may be closed with use of the other carriageway restricted and controlled by temporary traffic lights or a "stop and go" traffic management system. The traffic management plan and corresponding works will be carried out with the agreement of the local authority.

4.8.6.2 Enabling Works

A preliminary site investigation has been completed to inform overall feasibility of the proposed route. The preliminary investigation included a series of slit trenches at potential conflict points and boreholes at proposed HDD locations. It is noted that further site investigations may be required to gather additional information on the road cover available over existing bridges and culverts with the relevant local authority approval.

4.8.6.3 Site Preparations

Prior to beginning construction work the contractor will scan the proposed route with a cable avoidance tool (CAT), carry out visual inspection of the area and may carryout out further below ground surveys if deemed necessary. If any previously unidentified services are discovered the site engineer will inform the design of the issues and possibly recommend a solution that works with the new constraints.

In some instances, it may be necessary to relocate existing underground services such as water mains or existing cables. In advance of any construction activity, the contractor will undertake additional surveys of the proposed route to confirm the presence or otherwise of any services. If found to be present, the relevant service provider will be consulted with in order to determine the requirement for specific excavation or relocation methods and to schedule a suitable time to carry out works.

If existing low voltage underground cables are found be present, a trench will be excavated, and new ducting and cabling will be installed along the new alignment and connected to the network on either end. The trench will be backfilled with suitable material to the required specification. Warning strip and marking tape will be laid at various depths over the cables as required. Marker posts and plates will be installed at surface level to identify the new alignment of the underground cable, the underground cables will then be re-energised.

In the event that water mains are encountered the water supply will be turned off by the utility so work can commence on diverting the service. The section of existing pipe will be removed and will be replaced with a new pipe along the new alignment of the service. The works will be carried out in accordance with the utility standards.

4.8.6.4 Trenching & Ducting

The proposed cable will be installed in a series of ducts in an excavated trench. Trenching will be achieved using a mechanical excavator. The top layer of soil or road surfacing will be removed and stockpiled separately for reuse. Material stockpiles should be stored at least 15 m back from drains and watercourses on level ground with a silt fence inserted at the base to prevent runoff.

The trench base will be graded and smoothed once the required depth and width is achieved. A layer of bedding material will be placed and compacted to the required specification on the trench floor prior to laying the ducts in trefoil formation.

The ducting surrounds will be carefully backfilled and compacted in accordance with the required specification. Cable protection strips will be placed on compacted material directly above the ducting. A secure cap will be placed at the end of each duct to prevent the ingress of dirt or water.

Ground water and surface water accumulating in the base of trenches will not be pumped directly to roadside drains or watercourses unless it is clean and free from solids. Contaminated water will be either treated onsite prior to discharge or tankered offsite to a suitably licensed disposal facility.

For concrete and asphalt/bitumen road sections, surfaces will be permanently reinstatement in accordance with the specification and to the approval of the local authority and/or private landowners, unless otherwise agreed with local authorities. All trench works carried out in public roadways will be carried out in accordance with *'Guidelines for Opening, Backfilling and Reinstatement of trenches in Public Roads'* and any other conditions imposed by the relevant road authority.

For unsurfaced/grass sections, trenches will be backfilled with suitable excavated material to ground level leaving at least 100 mm topsoil or match existing level at the top to allow for seeding or replace turves as per the specification of the local authority or landowner.

Ducting will be cleaned and tested in accordance with the specification by pulling through a brush and mandrel. A draw rope will be installed in each duct in preparation for cable installation at a later date.

4.8.6.5 Joint Bays

The location of joint bays have been selected to maximise each section length of cable and to satisfy electrical design requirements. The locations chosen by the designer are also determined by the density of existing services, likely disruption to traffic, requirements of utility specifications, space requirements for cable installation equipment.

For proposed cable route, joint bays are required approximately every 600m to 800m. The joint bay dimensions are approximately 6m long x 2.5m wide and 2m deep.

Where off-road joint bay locations are utilised, access tracks from the road to the joint bay locations will be constructed by stripping surface soils, placing geotextile reinforcement at subgrade level followed by a layer of granular material in accordance with the specification to form a working surface for vehicle. This surface will be regularly assessed for damage and additional aggregate added if required. Any roadside drains within the temporary works area will be culverted and check dams made from stone or sandbags covered with terram will be inserted upstream and downstream of these culverts to intercept any solids generated during the insertion or which wash out during the works. Any surplus materials will be stockpiled separately for reuse or appropriate disposal, subject to validation and waste classification sampling.

Joint bay locations will be excavated using conventional mechanical excavators. Joint bay excavations will be advanced to the required depth and width with the excavation floor graded and smoothed. A blinding layer will be placed at the base of the excavation to facilitate the construction of a concrete base and side walls (in-situ or precast).

Ground water and surface water accumulating in the base of excavations will not be pumped directly to roadside drains or watercourses unless it is clean and free from solids. Contaminated water will be either treated onsite prior to discharge or tankered offsite to a suitably licensed disposal facility.

Where joint bays are located under the road surface the joint bay will be backfilled with compacted in accordance with the specification. Road surfaces may be temporarily reinstated as specified by the local authority. Precast concrete covers may be used as temporary reinstatement of joint bays at off road locations. These covers are placed over the constructed joint bay and are then removed at the cable installation stage of the project.

4.8.6.6 Cable Installation

The installation of cabling normally involves pulling three individual conductors into three separate ducts. The cable pulling winch must be set at a predetermined cut off pulling tension as specified by the designer. The cable will be connected to the winch rope using approved suitably sized and rated cable pulling stocking and swivel or the pulling head fitted by the cable manufacturer. Once the “two sections” of cable are pulled into the joint bay, a jointing container will be positioned over the joint bay and the cable jointing procedure carried out in this controlled environment.

Following the completion of jointing and duct sealing works in the joint bay, place and thoroughly compact cement-bound sand in approximately 200 mm layers to 100mm above the top of the cable joint base to provide vertical support. A cable protection strip will be installed at this depth and the joint bay backfilled with cement-bound sand and reinstated to match surrounding areas.

4.8.6.7 Trenchless Installation

Trenchless installation in the form of HDD will be used at the following locations:

- Cross River Bridge on the R363;
- Cross River Bridge on the R362; and
- R362 Traffic Bridge over M6.

HDD uses a special design drilling rig which initially bores a pilot hole through the ground along a pre-determined route.

Once completed, this pilot bore is then expanded as necessary using various sizes and types of back-reamers to enlarge the pilot bore to the required final diameter into which the cable will be installed. Two temporary pits (entry and exit) are excavated at each side of the HDD route, locations are selected based on drilling requirements including angle, depth, diameter, curvature, vertical clearance underneath water courses and structures, etc.).

Access to the entry and exit pits will be via a newly constructed temporary access or existing access road/track. Silt fences will be erected around the entire work area at both entry and exit pits prior to the drilling contractor preparing a laydown area. The works area will be a minimum of 15 m back from the river and within this zone, the natural vegetative cover will not be altered. If areas are overgrown with thick vegetation, a section of it will be removed appropriately and disposed of via a licensed waste contractor. The area is then levelled where required, levelled areas will be overlain with geotextile reinforcement and granular material in accordance with the specification to form access roads and temporary work platform. No material will be stored or stockpiled within 15m of water courses.

A pilot hole will be drilled from the entry pit through the overburden into the bedrock and travel underneath the riverbed before emerging through the overburden in the exit pit. The depth of the drill below the riverbed will be determined from site investigations. The drilled cuttings will be flushed to the surface through a closed loop mud circulation system with recycling capability to minimise the volume of fluids required on site.

Once the pilot hole has been completed, a larger drill bit will be used to ream the pilot hole to the required diameter to facilitate ducting installation. The ducts will be laid out on the exit side in preparation for installation. When the ducts are ready and the drill hole diameter has been proven, a towing assembly will be used to pull the ducts into the bore. The HDD ducts will be connected to the ducts which will have been installed in trenches at the entry and exit pits.

All excess drilling fluids and cuttings will be transported offsite to a suitably licensed disposal facility.

On completion of the installation of the ducts, disposal of material and backfilling of trenches, the site will be restored as agreed with the landowners while silt fences remain in place. Geotextile reinforcement and granular material in accordance with the specification will be removed and disposed of to a licensed facility. Where necessary, topsoil will be imported and the area reseeded.

4.8.7 Watercourse Crossings on Grid Connection and Connector Cable Route

The Wind Farm component of the Proposed Development will not require the crossing of any existing streams or watercourses. However, a total of 5 no. existing crossings will be crossed along the R363 Regional Road to cater for the proposed collector cable and external Grid Connection towards the existing Athlone 110 kV substation. The locations of the watercourse crossings are shown on Figure 4-15 and details of each crossing are show in Figures 4-26 – 4-29 below. The watercourse crossing methodologies for the provision of the underground Grid Connection component of the Proposed Development at these locations is set out below with the most appropriated option being selected for each crossing. Instream works are not required at any watercourse crossing along the proposed IPP cable route or Grid Connection route.

Should an alternative methodology option listed below be required for individual crossings during the construction process this will be agreed with the relevant authorities including Roscommon County Council prior to works commencing.

4.8.7.1 Crossing Using Standard Trefoil Formation – Option 1

Watercourses will not be directly impacted upon since no instream works or bridge/culvert alterations are proposed. Where adequate cover exists above a bridge/culvert or where a new bottomless box culvert or clear-span structure has been installed, 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.

4.8.7.2 Flatbed Formation over Bridges/Culverts – Option 2

Where cable ducts are to be installed over an existing bridge/culvert crossing 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 or the depth of excavatable material over a bridge. The ducts will be laid in this trench in a flatbed formation over the existing culvert and will be encased in 6mm thick steel galvanized plate with a 35N concrete surround as per ESB Networks specification.

Where a bridge or culvert has insufficient cover depth to fully accommodate the required trench, 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 encased 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 raise the pavement level locally to fully cover the ducts. The increased 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.

4.8.7.3 Horizontal Directional Drilling – Option 3

The horizontal directional drilling method of duct installation is carried out using Vermeer D36 x 50 Directional Drill (approximately 22 tonnes), or similar plant. The launch and reception pits will be approximately 2.5mm wide, 2.5m long and 2.0m 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 will 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 will 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 in to void and enables the annulus which has been created to support the surrounding subsoil 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 a licensed recovery facility.

Backfilling of launch & reception pits will be conducted in accordance with the normal specification for backfilling excavated trenches. Sufficient controls and monitoring, as listed below, will be put in place during drilling to prevent frack-out, such as the installation of casing at entry points where reduced cover and bearing pressure exits.

- The area around the Clear Bore™ batching, pumping and recycling plants shall be bunded using terram and sandbags in order to contain any spillages;
- One or more lines of silt fences shall be placed between the works area and adjacent rivers and streams on both banks;
- Accidental spillage of fluids shall be cleaned up immediately and transported off site for disposal at a licensed facility; and,

Adequately sized skips will be used for temporary storage of drilling arisings during directional drilling works. This will ensure containment of drilling arisings and drilling flush.

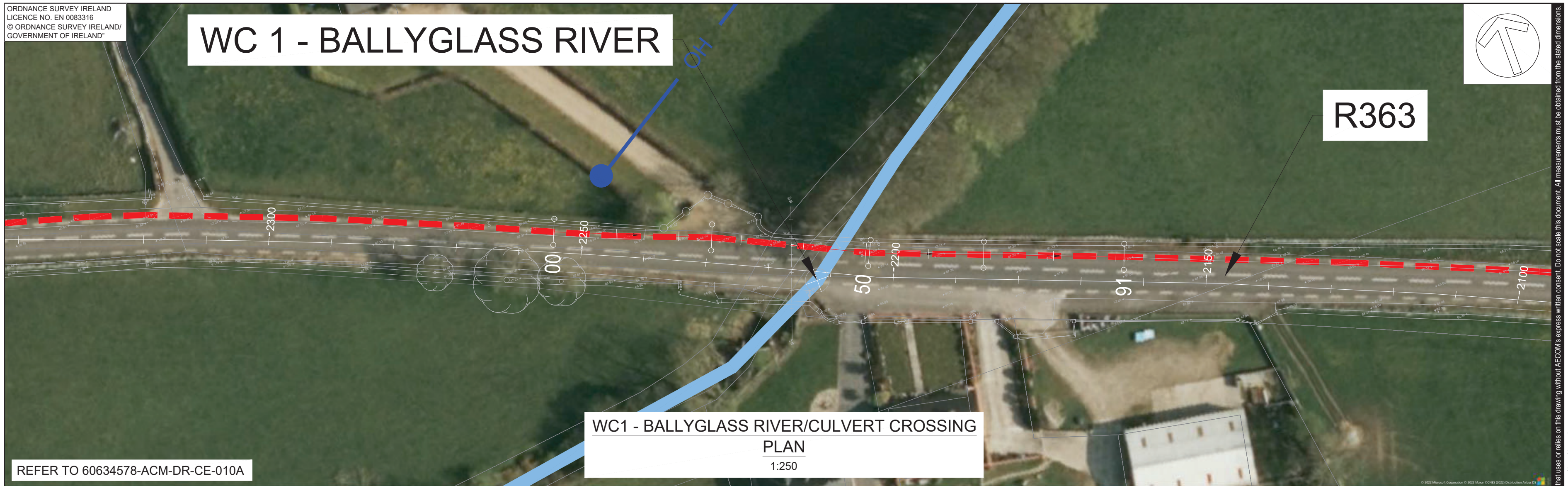
Table 4-9 Culvert Survey Summary and Crossing Methodology

Crossing No.	Type and size	Cover from road level to top of bridge/ culvert	Parapet Wall Height Above Road	Width, Height of Bridge	Description	Watercourse Crossing Option	Extent of In-stream Works
WC1	1,500mm Ø concrete pipe	2,000mm	720mm and 880mm	n/a	The culvert consists of a concrete pipe with large stone parapets above it on either side. Due to the existing cover over the pipe (c.2,000mm), there is sufficient separation distance to accommodate the standard trefoil cable passing over the watercourse crossing without any amendment to the trench or ducting profile. Alternatively, should sufficient cover between the culvert and existing road level not be achieved, the cable ducts will be laid in a flatbed formation.	Option 1 / Option 2	None. No in-stream works required.
WC2	1.5m stone arch bridge (Bridge considered of local cultural heritage merit).	2,000mm	1,000mm	3,000mm wide and 1,500mm tall	The existing cover over the stone arch bridge allows for the standard trefoil cable passing over the watercourse crossing to be laid without any amendment to the trench or ducting profile. Another option would allow for the laying of the ducts to be completed using directional drilling. This crossing methodology will ensure that no	Option 1 / Option 3	None. No in-stream works required.

Crossing No.	Type and size	Cover from road level to top of bridge/ culvert	Parapet Wall Height Above Road	Width, Height of Bridge	Description	Watercourse Crossing Option	Extent of In-stream Works
					contact will be made with the watercourse during the works.		
WC3	1,500mm Ø concrete pipe	5,000mm	500mm	n/a	The culvert consists of a concrete pipe with large stone parapets above it on either side. Due to the existing cover over the pipe (c.5,000mm), there is sufficient separation distance to accommodate the standard trefoil cable passing over the watercourse crossing without any amendment to the trench or ducting profile.	Option 1	None. No in-stream works required.
WC4	>500mm Ø concrete pipe	1,500mm	n/a	n/a	The culvert consists of a concrete pipe. Due to the lack of cover over the existing culvert, the cable ducts will be laid in a flatbed formation. Alternatively, the laying of the ducts can be carried out using a standard trefoil trench. To provide the required cover over the cabling ducts in this scenario, it may be necessary to raise the existing road level.	Option 1 / Option 2	None. No in-stream works required.
WC5	2.5m stone arch bridge	800mm		7.5m wide and 2.5m tall	Due to the lack of cover over the existing bridge, the cable ducts will be laid in a flatbed formation.	Option 2 / Option 3	None. No in-stream works required.

Crossing No.	Type and size	Cover from road level to top of bridge/ culvert	Parapet Wall Height Above Road	Width, Height of Bridge	Description	Watercourse Crossing Option	Extent of In-stream Works
					To provide the required cover over the cabling ducts, it may be necessary to raise the existing road level. Another option would allow for the laying of the ducts to be completed using directional drilling. This crossing methodology will ensure that no contact will be made with the watercourse during the works		

WC 1 - BALLYGLASS RIVER

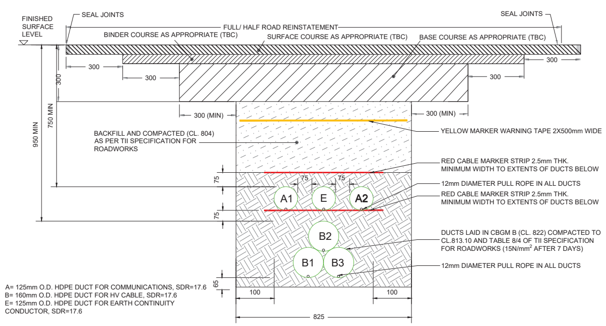


REFER TO 60634578-ACM-DR-CE-010A

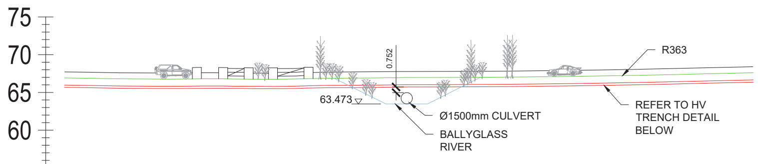
WC1 - BALLYGLASS RIVER/CULVERT CROSSING
PLAN
1:250

WC1 - SITE PHOTO
FACING WEST

WC1 - SITE PHOTO
FACING EAST



CROSS SECTION INDICATING TRENCH FOR
33KV CIRCUIT UNDER ROADS (TREFOIL)
NTS



CHAINAGE	00.000	10.000	20.000	30.000	40.000	50.000	60.000	70.000	80.000	90.000 / 91.293
EXISTING ROAD LEVELS	66.922	66.788	66.801	66.773	66.915	66.980	67.049	67.170	67.352	67.581 / 67.610
EXISTING WATERCOURSE LEVELS					66.881 / 64.768	64.420 / 67.013				
PROPOSED TREFOIL CROWN LEVELS	65.922	65.838	65.851	65.823	65.965	66.030	66.099	66.220	66.402	66.631 / 66.660

VERTICAL ALIGNMENT: G=-1.48% -1:67.6; G=-1.82% -1:54.9; G=-0.59% -1:169.7; G=-0.24% -1:411.0; G=2.39% 1:41.9; G=-1.02% -1:98.2; G=-0.63% -1:159.5; G=0.66% 1:152.0; G=0.93% 1:107.9; 1:47.7; G=-2.09%; G=0.74% 1:135.2; G=1.25% 1:79.7; G=0.11% 1:920.6; G=0.74% 1:135.9; G=1.36% 1:73.3; G=1.36% 1:73.3; G=2.14% 1:46.7; G=2.32% 1:43.1; G=2.27% 1:44.1

HORIZONTAL ALIGNMENT: L=25.262; L=25.338; L=18.257; L=22.437

WC1 - BALLYGLASS RIVER/CULVERT CROSSING
LONGSECTION
1:250

Fig 4-26

AECOM

PROJECT
SEVEN HILLS WINDFARM (PROPOSED 110KV CABLE ROUTE)

CLIENT
energia
Switched on

CONSULTANT
AECOM Limited
9th Floor
The Clarence West Building
2 Clarence Street West
Belfast
BT2 7GP
United Kingdom
+44-(0)28-90607200
aecom.com

NOTES

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVENT DOCUMENTATION.
2. DO NOT SCALE FROM THIS DRAWING, USE ONLY PRINTED DIMENSIONS.
3. ALL DIMENSIONS IN MILLIMETRES, ALL CHAINAGES, LEVELS AND COORDINATES ARE IN METRES UNLESS DEFINED OTHERWISE.
4. ALL LEVELS AND COVER DEPTHS ARE SUBJECT TO DETAILED PRE- WORKS TOPOGRAPHIC SURVEY AND CONSTRUCTION DRAWINGS IN ADVANCE OF ANY WORKS . NOTE ALL ESTIMATED TRENCH LEVELS ARE TO CROWN OF HV DUCT AND/OR HDD PIPE.
5. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH THE PROJECTS PLANNING DRAWINGS.
6. ALL PUBLIC ROAD WORKS AND OPENING AND REINSTATEMENTS OF PAVEMENTS TO BE UNDERTAKEN IN ACCORDANCE WITH PRE- APPROVED COUNCIL LICENCE AND A TEMPORARY TRAFFIC MANAGEMENT PLAN IN ACCORDANCE WITH CHAPTER 8 TSM.
7. PROPOSED SITE ACCESS TO CROSSINGS AND EXIT SITE COMPOUNDS TO BE AGREED WITH ALL RELEVANT PUBLIC AND PRIVATE PARTIES IN ADVANCE OF ANY WORKS.
8. PRIOR TO CONSTRUCTION, CONSULTATION WILL BE HELD WITH LOCAL COUNTY COUNCIL WITH RESPECT TO APPROVING THE FINAL DESIGN FOR CROSSINGS OVER THEIR RESPECTIVE ASSETS.
9. CONTRACTOR TO VERIFY GROUND CONDITIONS THROUGH ADDITIONAL GEOTECHNICAL INVESTIGATIONS AND BOREHOLES IN ADJOINING LANDS .
10. ALL WORKS TO CONFORM TO PLANNING CONDITION AND APPROVALS.
11. THESE WORKS TO BE UNDERTAKEN IN CONJUNCTION WITH THE PROJECTS APPROVED PRE CONSTRUCTION HEALTH AND SAFETY FILE AND ASSOCIATED RAMS AND RISK ASSESSMENTS.
12. CONTRACTOR TO UNDERTAKE APPROVED SITE INVESTIGATE FOR ALL ASSOCIATED UTILITIES AND STRUCTURAL REPORT FOR RELEVANT BUILDINGS AND STRUCTURES.
13. ALL LANDSCAPE AND ENVIRONMENTAL WORKS TO CONFORM TO THE EIAR.

ISSUE/REVISION

I/R	DATE	DESCRIPTION
P0	26/04/2022	FIRST ISSUE

KEY:
PROPOSED NORTHERN INTERNAL WF 33KV CABLE ROUTE
EXISTING WATERMAIN
EXISTING WATERCOURSE
EXISTING LV (400V/230V) OVERHEAD ROUTE

STATUS
FIRST ISSUE

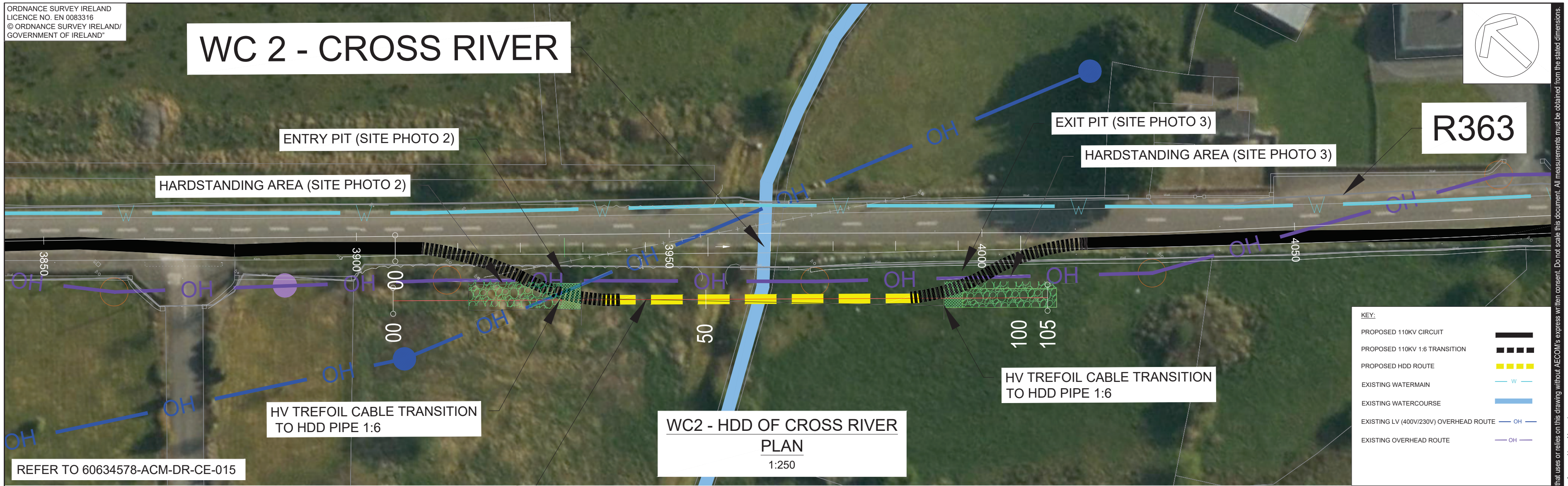
PROJECT NUMBER PR-471040
SCALE AS SHOWN @ A0

SHEET TITLE
SEVEN HILLS WINDFARM (PROPOSED 33KV CABLE ROUTE) WC1 - BALLYGLASS RIVER/CULVERT CROSSING

SHEET NUMBER 60634578-ACM-DR-CE-041
REV P0

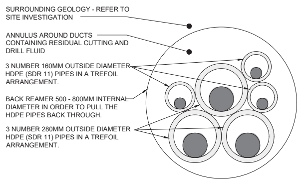
Designer : AF
Checked : RL
Approved : PA
Last saved by: PHILIP.STEWART(2022-04-27)
Last Plotted: 2022-04-27

WC 2 - CROSS RIVER



WC2 - HDD OF CROSS RIVER PLAN
1:250

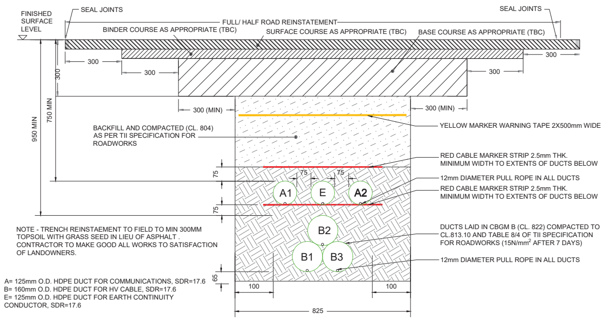
WC2 - SITE PHOTO 1
CROSS RIVER BRIDGE - FACING EAST



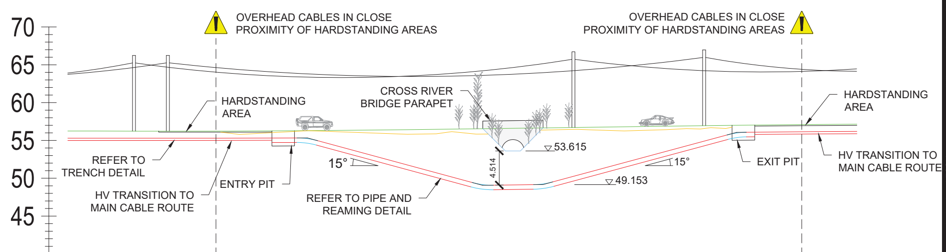
PIPE AND REAMING ARRANGEMENT CROSS SECTION
NTS

WC2 - SITE PHOTO 2
ENTRY PIT LOCATION - FACING EAST

WC2 - SITE PHOTO 3
EXIT PIT LOCATION - FACING WEST



CROSS SECTION INDICATING TRENCH FOR 110KV CIRCUIT UNDER ROADS (TREFOIL)
NTS



CHAINAGE	00.000	10.000	20.000	30.000	40.000	50.000	60.000	70.000	80.000	90.000	100.000	104.618
EXISTING ROAD / FIELD LEVELS	56.242	56.241	56.244	56.278 56.178	56.337 55.801	56.489 56.078	56.629	56.749 56.234	56.888 56.275	57.027	57.118	57.141
EXISTING WATERCOURSE LEVELS							56.561 53.615 56.676					
PROPOSED HDD / HV CABLE CROWN LEVELS	55.292	55.291	55.294	55.328	53.111	50.412	49.129	51.049	53.736	56.077	56.168	56.191
VERTICAL ALIGNMENT	G=-0.01% -1:11630.6	G=0.02% 1:4680.1	G=0.34% 1:291.0	L=2.75 K=0.10	G=-26.99% -1:3.7	L=2.837 K=0.10 G=1.39% 1:72.1 L=2.548 K=0.10		G=26.87% 1:3.7		L=2.57 K=0.10	G=0.91% 1:110.3	G=0.50% 1:198.4
HORIZONTAL ALIGNMENT	L=104.618											

WC2 - HDD OF CROSS RIVER LONGSECTION
1:250

AECOM

PROJECT
SEVEN HILLS WINDFARM (PROPOSED 110KV CABLE ROUTE)

CLIENT
energia Switched on

CONSULTANT
AECOM Limited
9th Floor
The Clarence West Building
2 Clarence Street West
Belfast
BT2 7GP
United Kingdom
+44-(0)28-90607200
aecom.com

NOTES

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVENT DOCUMENTATION.
2. DO NOT SCALE FROM THIS DRAWING, USE ONLY PRINTED DIMENSIONS.
3. ALL DIMENSIONS IN MILLIMETRES, ALL CHAINAGES, LEVELS AND COORDINATES ARE IN METRES UNLESS DEFINED OTHERWISE.
4. ALL LEVELS AND COVER DEPTHS ARE SUBJECT TO DETAILED PRE- WORKS TOPOGRAPHIC SURVEY AND CONSTRUCTION DRAWINGS IN ADVANCE OF ANY WORKS . NOTE ALL ESTIMATED TRENCH LEVELS ARE TO CROWN OF HV DUCT AND/OR HDD PIPE.
5. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH THE PROJECTS PLANNING DRAWINGS.
6. ALL PUBLIC ROAD WORKS AND OPENING AND REINSTATEMENTS OF PAVEMENTS TO BE UNDERTAKEN IN ACCORDANCE WITH PRE- APPROVED COUNCIL LICENCE AND A TEMPORARY TRAFFIC MANAGEMENT PLAN IN ACCORDANCE WITH CHAPTER 8 TSM.
7. PROPOSED SITE ACCESS TO DRILLING AND EXIT SITE COMPOUNDS TO BE AGREED WITH ALL RELEVANT PUBLIC AND PRIVATE PARTIES IN ADVANCE OF ANY WORKS.
8. PRIOR TO CONSTRUCTION , CONSULTATION WILL BE HELD WITH ROSCOMMON COUNTY COUNCIL WITH RESPECT TO APPROVING THE FINAL DESIGN FOR HDD UNDER THEIR RESPECTIVE ASSETS.
9. DRILLING TO BE LOCATED MIN 25M AWAY FROM ANY STRUCTURES / WATERCOURSES.
10. CONTRACTOR TO VERIFY GROUND CONDITIONS THROUGH ADDITIONAL GEOTECHNICAL INVESTIGATIONS AND BOREHOLES IN ADJOINING LANDS.
11. ALL WORKS TO CONFORM TO PLANNING CONDITION AND APPROVALS.
12. THESE WORKS TO BE UNDERTAKEN IN CONJUNCTION WITH THE PROJECTS APPROVED PRE CONSTRUCTION HEALTH AND SAFETY FILE AND ASSOCIATED RAMS AND RISK ASSESSMENTS.
13. CONTRACTOR TO UNDERTAKE APPROVED SITE INVESTIGATE FOR ALL ASSOCIATED UTILITIES AND STRUCTURAL REPORT FOR RELEVANT BUILDINGS AND STRUCTURES.
14. ALL LANDSCAPE AND ENVIRONMENTAL WORKS TO CONFORM TO THE EIAR.

ISSUE/REVISION

I/R	DATE	DESCRIPTION
1	28/04/2022	REVISION 1
P0	26/04/2022	FIRST ISSUE

Fig 4-27

STATUS
FIRST ISSUE

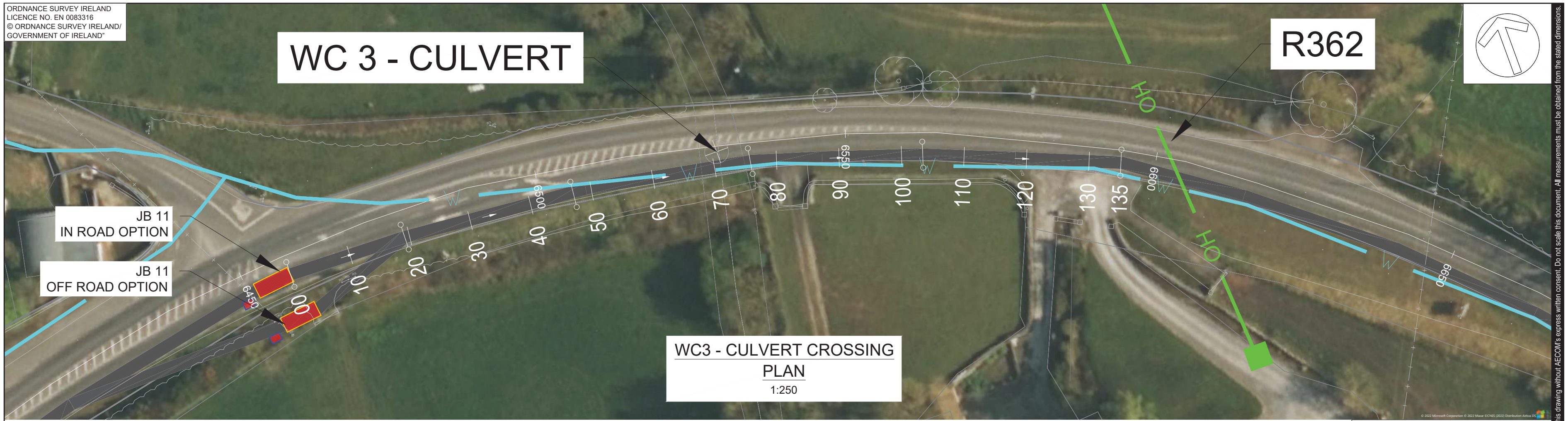
PROJECT NUMBER	SCALE
PR-471040	AS SHOWN @ A0

SHEET TITLE
SEVEN HILLS WINDFARM (PROPOSED 110kV CABLE ROUTE) WC2 - HDD OF CROSS RIVER

SHEET NUMBER	REV
60634578-ACM-DR-CE-042	P0

Designer : PS Checked : PA Approved : PA

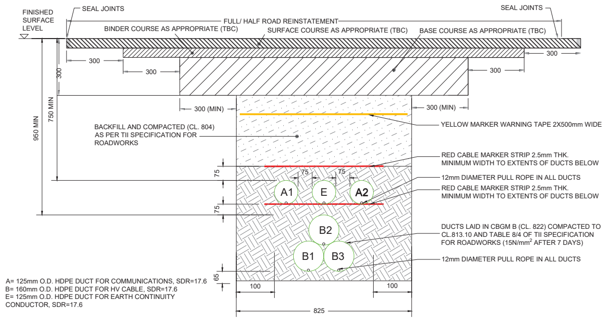
Last saved by: PHILLIP ADAMS1(2022-04-28) Last Plotted: 2022-04-28



WC3 - CULVERT CROSSING
PLAN
1:250

KEY:

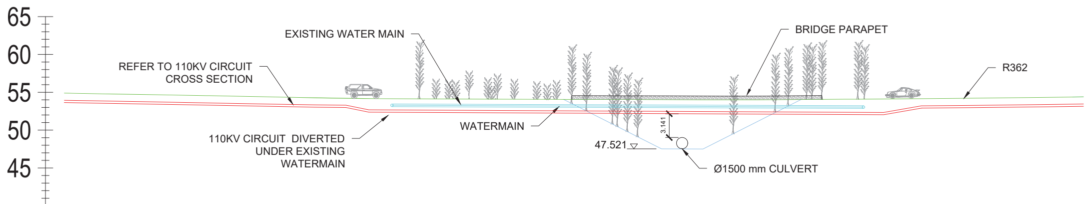
PROPOSED 110KV CONNECTION TO SUBSTATION	
EXISTING WATERMAIN	— W —
EXISTING WATERCOURSE	
EXISTING MV (10V/20V) OVERHEAD ROUTE	— OH —
PROPOSED JOINT BOX LOCATION	
PROPOSED COMMUNICATIONS CHAMBER LOCATION	



CROSS SECTION INDICATING TRENCH FOR
110KV CIRCUIT UNDER ROADS (TREFOIL)
NTS

WC3 - SITE PHOTO
FACING EAST

WC3 - SITE PHOTO
FACING WEST



CHAINAGE	00.000	10.000	20.000	30.000	40.000	50.000	60.000	70.000	80.000	90.000	100.000	110.000	120.000	130.000	135.097
EXISTING ROAD LEVELS	54.892	54.711	54.532	54.333	54.180	54.118	54.080	54.047	54.018	54.007	54.056	54.124	54.214	54.327	54.399
PROPOSED TREFOIL CROWN LEVELS	53.942	53.761	53.578	53.385	53.261	53.168	53.133	53.098	53.065	53.058	53.106	53.180	53.264	53.377	53.449

EXISTING WATERCOURSE LEVELS: 54.061, 52.132, 47.518, 50.184, 54.039

VERTICAL ALIGNMENT													
	G=-1.80% -1:55.5	G=-1.80% -1:55.6	G=-1.99% -1:50.4	G=-1.53% -1:65.2	G=-0.61% -1:163.7	G=-0.35% -1:282.2	G=-50.30% -1:2.0	G=-0.37% -1:268.1	G=50.30% 1:2.0	G=0.69% 1:145.1	G=0.90% 1:111.1	G=1.13% 1:88.6	G=1.40% 1:71.3

HORIZONTAL ALIGNMENT					
	L=19.228	L=27.839	L=28.738	L=27.587	L=31.706

WC3 - CULVERT CROSSING
LONGSECTION
1:250

AECOM

PROJECT

SEVEN HILLS WINDFARM (PROPOSED 110KV CABLE ROUTE)

CLIENT

energia Switched on

CONSULTANT

AECOM Limited
9th Floor
The Clarence West Building
2 Clarence Street West
Belfast
BT2 7GP
United Kingdom
+44-(0)28-90607200
aecom.com

NOTES

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVENT DOCUMENTATION.
2. DO NOT SCALE FROM THIS DRAWING, USE ONLY PRINTED DIMENSIONS.
3. ALL DIMENSIONS IN MILLIMETRES, ALL CHAINAGES, LEVELS AND COORDINATES ARE IN METRES UNLESS DEFINED OTHERWISE.
4. ALL LEVELS AND COVER DEPTHS ARE SUBJECT TO DETAILED PRE- WORKS TOPOGRAPHIC SURVEY AND CONSTRUCTION DRAWINGS IN ADVANCE OF ANY WORKS . NOTE ALL ESTIMATED TRENCH LEVELS ARE TO CROWN OF HV DUCT AND/OR HDD PIPE.
5. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH THE PROJECTS PLANNING DRAWINGS.
6. ALL PUBLIC ROAD WORKS AND OPENING AND REINSTATEMENTS OF PAVEMENTS TO BE UNDERTAKEN IN ACCORDANCE WITH PRE- APPROVED COUNCIL LICENCE AND A TEMPORARY TRAFFIC MANAGEMENT PLAN IN ACCORDANCE WITH CHAPTER 8 TSM.
7. PROPOSED SITE ACCESS TO CROSSINGS AND EXIT SITE COMPOUNDS TO BE AGREED WITH ALL RELEVANT PUBLIC AND PRIVATE PARTIES IN ADVANCE OF ANY WORKS.
8. PRIOR TO CONSTRUCTION, CONSULTATION WILL BE HELD WITH LOCAL COUNTY COUNCIL WITH RESPECT TO APPROVING THE FINAL DESIGN FOR CROSSINGS OVER THEIR RESPECTIVE ASSETS.
9. CONTRACTOR TO VERIFY GROUND CONDITIONS THROUGH ADDITIONAL GEOTECHNICAL INVESTIGATIONS AND BOREHOLES IN ADJOINING LANDS .
10. ALL WORKS TO CONFORM TO PLANNING CONDITION AND APPROVALS.
11. THESE WORKS TO BE UNDERTAKEN IN CONJUNCTION WITH THE PROJECTS APPROVED PRE CONSTRUCTION HEALTH AND SAFETY FILE AND ASSOCIATED RAMS AND RISK ASSESSMENTS.
12. CONTRACTOR TO UNDERTAKE APPROVED SITE INVESTIGATE FOR ALL ASSOCIATED UTILITIES AND STRUCTURAL REPORT FOR RELEVANT BUILDINGS AND STRUCTURES.
13. ALL LANDSCAPE AND ENVIRONMENTAL WORKS TO CONFORM TO THE EIAR.

ISSUE/REVISION

I/R	DATE	DESCRIPTION
P0	26/04/2022	FIRST ISSUE

Fig 4-28

STATUS
FIRST ISSUE

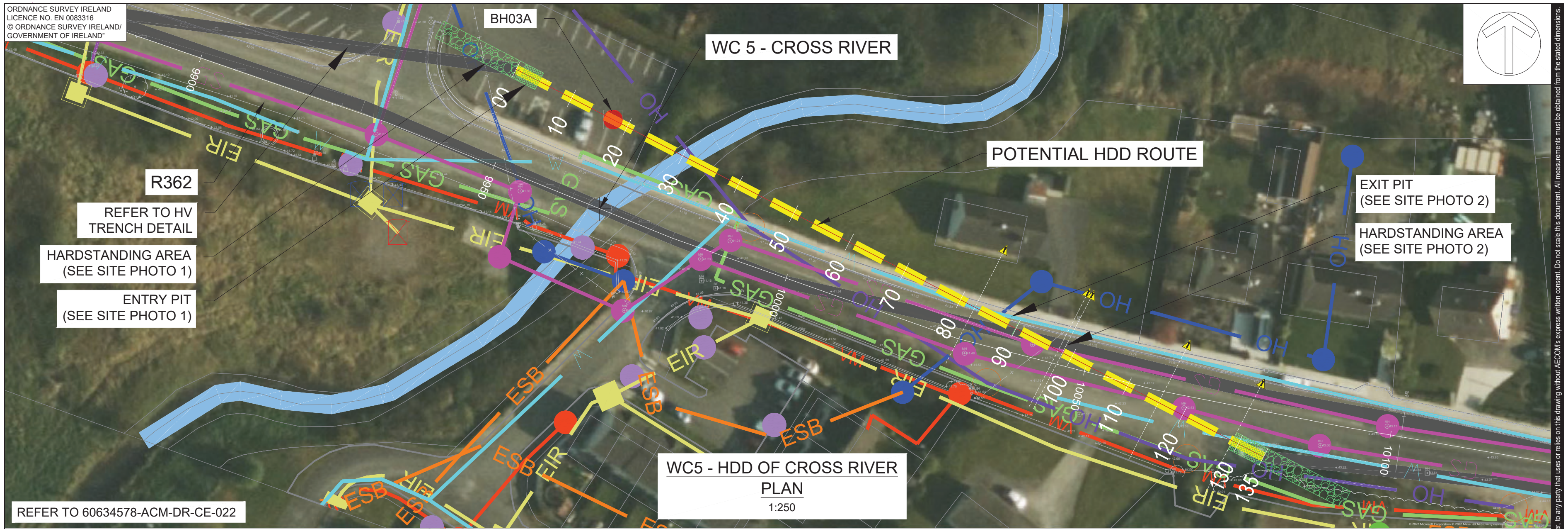
PROJECT NUMBER	SCALE
PR-471040	AS SHOWN @ A0

SHEET TITLE
SEVEN HILLS WINDFARM (PROPOSED 110KV CABLE ROUTE) WC3 - CULVERT CROSSING

SHEET NUMBER	REV
60634578-ACM-DR-CE-043	P0

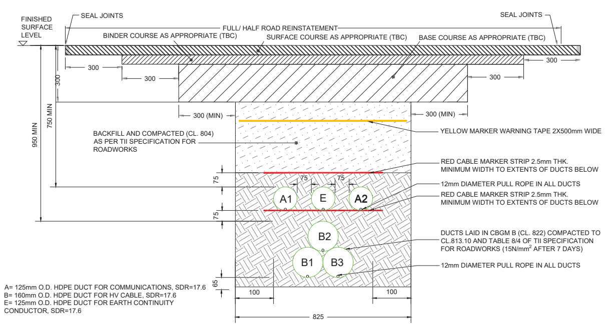
Designer : AF Checked : RL Approved : PA

Last saved by: PHILIP.STEWART(2022-04-27) Last Plotted: 2022-04-27



WC5 - HDD OF CROSS RIVER PLAN

1:250



CROSS SECTION INDICATING TRENCH FOR 110KV CIRCUIT UNDER ROADS (TREFOIL)

NTS

SITE PHOTO 1

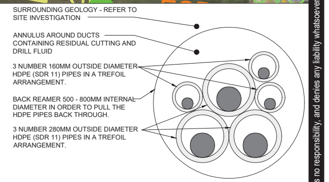
FACING EAST

SITE PHOTO 2

FACING WEST

SITE PHOTO 3

FACING EAST

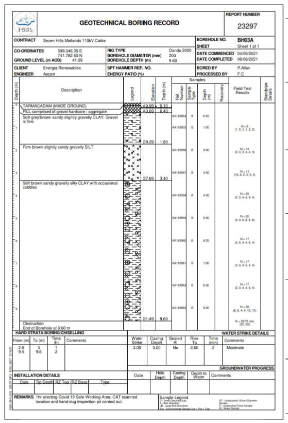


PIPE & REAMING ARRANGEMENT

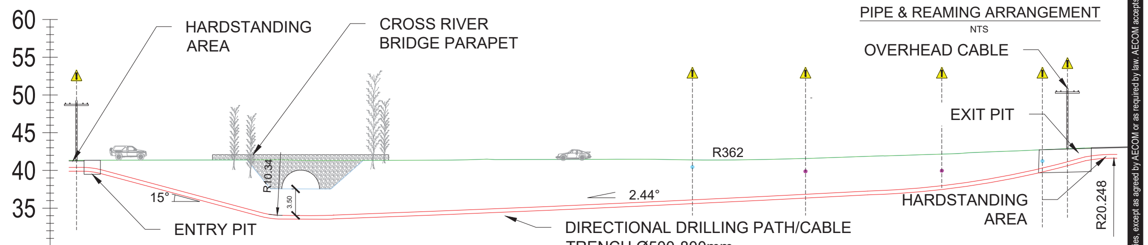
NTS

KEY

PROPOSED HDD ROUTE	
EIR OVERHEAD ROUTE	EIR
UNDERGROUND BT APPARATUS	BT
ESB MV (10KV/20KV) OVERHEAD	OH
ESB MV/LV (10KV/20KV/400V/230V) UNDERGROUND	ESB
ESB POLE	
WATERMAIN	W
GRAVITY SEWER	GS
GRAVITY SEWER MANHOLE	
VIRGIN MEDIA UNDERGROUND	VM
VIRGIN MEDIA UTILITY BOX	
ENET DUCT	ENET
ENET CHAMBER	
PROPOSED 110KV CONNECTION TO SUBSTATION	
INDICATIVE PROPOSED JOINT BOX LOCATION	
INDICATIVE PROPOSED COMMUNICATIONS CHAMBER LOCATION	
HAZARD WARNING	



BH03A - BOREHOLE DRILLING RECORD SHEET



CHAINAGE	00.000	10.000	20.000	30.000	40.000	50.000	60.000	70.000	80.000	90.000	100.000	110.000	120.000	130.000	134.564
EXISTING ROAD LEVELS	41.350	41.367	41.386	41.355	41.334	41.365	41.446	41.470	41.444	41.425	41.660	41.984	42.388	42.786	42.977
WATERCOURSE LEVELS				37.553											
HDD CROWN LEVELS	40.400	38.555	35.879	34.053	34.675	34.653	35.068	35.506	35.967	36.454	36.960	37.467	38.564	40.564	42.027

VERTICAL ALIGNMENT: G=-0.17% 1:-596.1; L=2.69 K=0.10; G=-26.76% -1:3.7; L=2.651 K=0.10; G=-0.26% 1:390.3; G=4.25% 1:23..52; L=29.174 K=1.16 R =116; R = 20 L=4.308 K=0.20

HORIZONTAL ALIGNMENT: L=134.564

WC5 - HDD OF CROSS RIVER LONGSECTION

1:250

AECOM

PROJECT

SEVEN HILLS WINDFARM (PROPOSED 110KV CABLE ROUTE)

CLIENT

energia Switched on

CONSULTANT

AECOM Limited
9th Floor
The Clarence West Building
2 Clarence Street West
Belfast
BT2 7GP
United Kingdom
+44-(0)28-90607200
aecom.com

NOTES

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVENT DOCUMENTATION.
2. DO NOT SCALE FROM THIS DRAWING, USE ONLY PRINTED DIMENSIONS.
3. ALL DIMENSIONS IN MILLIMETRES, ALL CHAINAGES, LEVELS AND COORDINATES ARE IN METRES UNLESS DEFINED OTHERWISE.
4. ALL LEVELS AND COVER DEPTHS ARE SUBJECT TO DETAILED PRE- WORKS TOPOGRAPHIC SURVEY AND CONSTRUCTION DRAWINGS IN ADVANCE OF ANY WORKS . NOTE ALL ESTIMATED TRENCH LEVELS ARE TO CROWN OF HV DUCT AND/OR HDD PIPE.
5. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH THE PROJECTS PLANNING DRAWINGS.
6. PROPOSED SITE ACCESS TO DRILLING AND EXIT SITE COMPOUNDS TO BE AGREED WITH ALL RELEVANT PUBLIC AND PRIVATE PARTIES IN ADVANCE OF ANY WORKS.
7. PRIOR TO CONSTRUCTION , CONSULTATION WILL BE HELD WITH ROSCOMMON COUNTY COUNCIL WITH RESPECT TO APPROVING THE FINAL DESIGN FOR HDD UNDER THEIR RESPECTIVE ASSETS.
8. DRILLING TO BE LOCATED MIN 25M AWAY FROM ANY STRUCTURES / WATERCOURSES.
9. CONTRACTOR TO VERIFY GROUND CONDITIONS THROUGH ADDITIONAL GEOTECHNICAL INVESTIGATIONS AND BOREHOLES IN ADJOINING LANDS.
10. ALL WORKS TO CONFORM TO PLANNING CONDITION AND APPROVALS.
11. THESE WORKS TO BE UNDERTAKEN IN CONJUNCTION WITH THE PROJECTS APPROVED PRE CONSTRUCTION HEALTH AND SAFETY FILE AND ASSOCIATED RAMS AND RISK ASSESSMENTS.
12. CONTRACTOR TO UNDERTAKE APPROVED SITE INVESTIGATE FOR ALL ASSOCIATED UTILITIES AND STRUCTURAL REPORT FOR RELEVANT BUILDINGS AND STRUCTURES.
13. ALL LANDSCAPE AND ENVIRONMENTAL WORKS TO CONFORM TO THE EIAR.
14. ALL PUBLIC ROAD WORKS AND OPENING AND REINSTATEMENTS OF PAVEMENTS TO BE UNDERTAKEN IN ACCORDANCE WITH PRE- APPROVED COUNCIL LICENCE AND A TEMPORARY TRAFFIC MANAGEMENT PLAN IN ACCORDANCE WITH CHAPTER 8. TSM

ISSUE/REVISION

I/R	DATE	DESCRIPTION
P0	27/04/2022	FIRST ISSUE

Fig 4-29

STATUS

FIRST ISSUE

PROJECT NUMBER	SCALE
PR-471040	AS SHOWN @ A0

SHEET TITLE

SEVEN HILLS WINDFARM (PROPOSED 110KV CABLE ROUTE) WC5 - HDD OF CROSS RIVER

SHEET NUMBER	REV
60634578-ACM-DR-CE-044	P0

Designer : AF Checked : RL Approved :PA

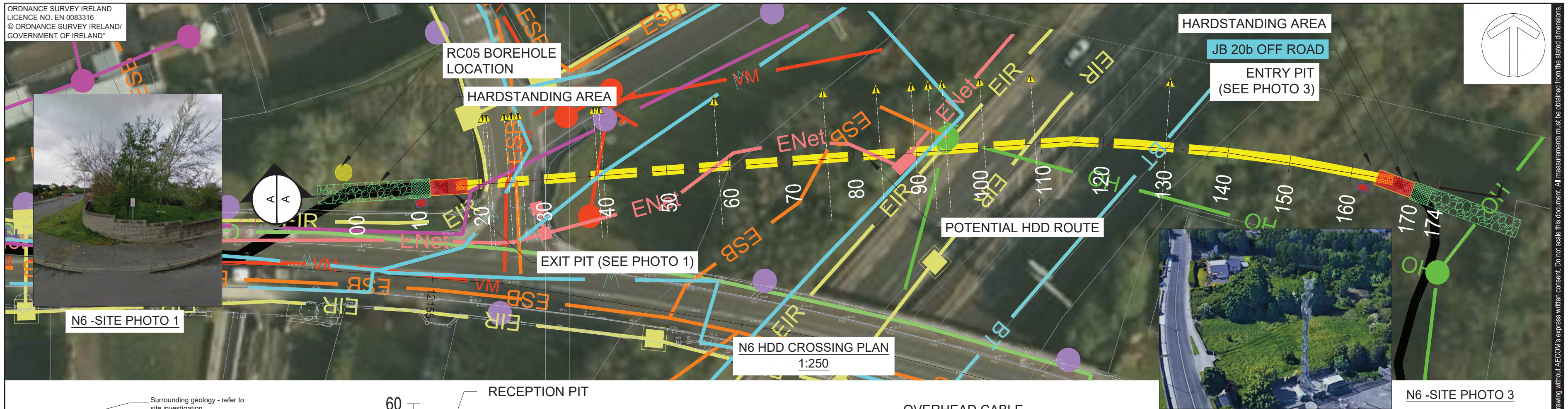
Last saved by: PHILLIP ADAMS1(2022-04-27) Last Plotted: 2022-04-28

4.8.8 N6 Crossing on Grid Connection Route

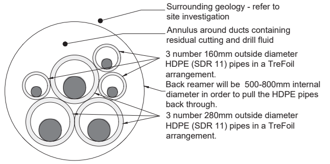
As detailed in Section 4.3.7.3, a crossing is proposed beneath the N6 National Road to access the connection at the Athlone 110kV substation. This will involve horizontal directional drilling (HDD) as a means of cable installation as detailed above.

The location of the crossing is shown on Figure 4-15 and detail of the HDD installation is shown in Figure 4-30 below.

ORDNANCE SURVEY IRELAND LICENCE NO. EN 0083316 © ORDNANCE SURVEY IRELAND/ GOVERNMENT OF IRELAND



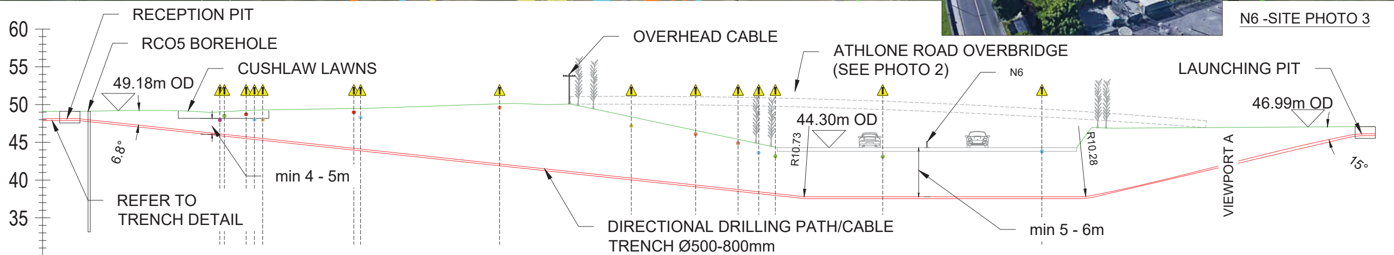
N6 HDD CROSSING PLAN
1:250



PIPE & REAMING ARRANGEMENT SECTION
B-B
NTS

KEY

EIR OVERHEAD ROUTE	EIR
UNDERGROUND BT APPARATUS	BT
ESB MV (10KV/20KV) OVERHEAD	OH
ESB MV/LV (10KV/20KV/400V/230V) UNDERGROUND	ESB
ESB POLE	
WATERMAIN	W
GRAVITY SEWER	GS
GRAVITY SEWER MANHOLE	
VIRGIN MEDIA UNDERGROUND	VM
VIRGIN MEDIA UTILITY BOX	
ENET DUCT	ENET
ENET CHAMBER	
110KV CONNECTION TO SUBSTATION	
INDICATIVE PROPOSED JOINT BOX LOCATION	
PROPOSED COMMUNICATIONS CHAMBER LOCATION	
PROPOSED HDD ROUTE	
HAZARD WARNING	

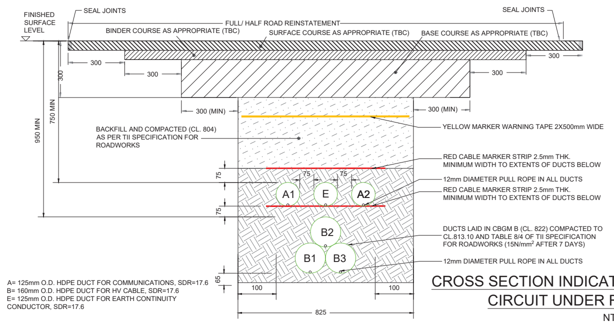


CHAINAGE	EXISTING ROAD LEVELS	HV TRENCH LEVELS
00.000		48.148
10.000	49.231	47.304
20.000	48.990	46.230
30.000	49.346	45.156
40.000	49.509	44.081
50.000	49.831	43.007
60.000	50.158	41.933
70.000	49.542	40.859
80.000	47.435	39.785
90.000	45.327	38.710
100.000	44.300	37.785
110.000	44.300	37.785
120.000	44.300	37.785
130.000	44.300	37.785
140.000	46.883	38.745
150.000	46.944	41.084
160.000	47.004	43.423
170.000	47.064	45.762
174.154	47.089	46.139

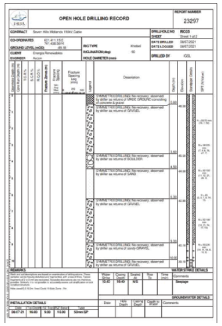
VERTICAL ALIGNMENT: G=0.50% K=0.10 L=1.12 1:199.5; G=-10.74% -1:9.3; L=1.074 K=0.10; G=0.00% Horizontal; L=2.339 K=0.10; G=23.39% 1:4.3; L=2.28 K=0.10 G=0.00% 1:165.8

HORIZONTAL ALIGNMENT: L=114.114; L=25.210; L=34.829

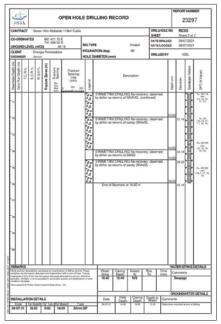
N6 SECTION A-A
SCALE: H 1:250,V 1:250



CROSS SECTION INDICATING TRENCH FOR 110KV CIRCUIT UNDER ROADS (TREFOIL)
NTS



N6 CROSSING - RCO5 BOREHOLE DRILLING RECORD SHEET 1 OF 2



N6 CROSSING - RCO5 BOREHOLE DRILLING RECORD SHEET 2 OF 2

N6 - SITE PHOTO 2

Fig 4-30

AECOM

PROJECT
SEVEN HILLS WINDFARM (PROPOSED 110KV CABLE ROUTE)

CLIENT
enérgia Switched on

CONSULTANT

AECOM Limited
9th Floor
The Clarence West Building
2 Clarence Street West
Belfast
BT2 7GP
United Kingdom
+44-(0)28-90607200
aecom.com

NOTES
1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVENT DOCUMENTATION.
2. DO NOT SCALE FROM THIS DRAWING, USE ONLY PRINTED DIMENSIONS.
3. ALL DIMENSIONS IN METRES, ALL CHAINAGES, LEVELS AND COORDINATES ARE IN METRES UNLESS DEFINED OTHERWISE.
4. ALL LEVELS AND COVER DEPTHS ARE SUBJECT TO DETAILED PRE-WORKS TOPOGRAPHIC SURVEY AND CONSTRUCTION DRAWINGS IN ADVANCE OF ANY WORKS.
5. ALL PUBLIC ROAD WORKS AND OPENING AND REINSTATEMENTS OF PAVEMENTS TO BE UNDERTAKEN IN ACCORDANCE WITH PRE-APPROVED COUNCIL LICENCE AND A TEMPORARY TRAFFIC MANAGEMENT PLAN IN ACCORDANCE WITH CHAPTER 8 TSM.
6. PROPOSED SITE ACCESS TO DRILLING AND EXIT SITE COMPOUNDS TO BE AGREED WITH ALL RELEVANT PUBLIC AND PRIVATE PARTIES IN ADVANCE OF ANY WORKS.
7. PRIOR TO CONSTRUCTION, CONSULTATION WILL BE HELD WITH ROSCOMMON COUNTY COUNCIL WITH RESPECT TO APPROVING THE FINAL DESIGN FOR HDD UNDER THEIR RESPECTIVE ASSETS.
8. DRILLING TO BE LOCATED MIN 25m AWAY FROM ANY STRUCTURES / WATERCOURSES.
9. CONTRACTORS TO VERIFY GROUND CONDITIONS THROUGH ADDITIONAL GEOTECHNICAL INVESTIGATIONS AND BOREHOLES IN ADJOINING LANDS.
10. ALL WORKS TO CONFORM TO PLANNING CONDITION AND APPROVALS.
11. THESE WORKS TO BE UNDERTAKEN IN CONJUNCTION WITH THE PROJECT APPROVED PRE CONSTRUCTION HEALTH AND SAFETY FILE AND ASSOCIATED RAMS AND RISK ASSESSMENTS.
12. CONTRACTOR TO UNDERTAKE APPROVED SITE INVESTIGATE FOR ALL ASSOCIATED UTILITIES AND STRUCTURAL REPORT FOR RELEVANT BUILDINGS AND STRUCTURES.
13. ALL LANDSCAPE AND ENVIRONMENTAL WORKS TO CONFORM TO THE EIAR

ISSUE/REVISION

I/R	DATE	DESCRIPTION
P0	27/04/2022	FIRST ISSUE

STATUS
FIRST ISSUE

PROJECT NUMBER: PR-471040
SCALE: AS SHOWN @ A0

SHEET TITLE
SEVEN HILLS WINDFARM (PROPOSED 110KV CABLE ROUTE) N6 - HDD

SHEET NUMBER: 60634578-ACM-DR-CE-045
REV: P0

Designer : AF   Checked : RL   Approved : PA

Last saved by: EUAN.PATTERSON(2022-04-27)   Last Plotted: 2022-04-27

4.9 Operation

The Proposed Development is expected to have a lifespan of approximately 30 years. Planning permission is being sought for a 30-year operation period commencing from the date of full operational commissioning of the Wind Farm. During the operational period, on a day-to-day basis the wind turbines will operate automatically, responding by means of anemometry equipment and control systems to changes in wind speed and direction.

The wind turbines will be connected, and data relayed to an off-site control centre. Each turbine will also be monitored off-site by the wind turbine supplier. The monitoring of turbine output, performance, wind speeds, and responses to any key alarms will be monitored at an off-site control centre 24-hours per day.

Each turbine will be subject to a routine maintenance programme involving visits to undertake a number of checks and changing of consumables, including oil changes.

In addition, there will be a requirement for unscheduled maintenance, which could vary between resetting alarms to major component changes requiring a crane. Typically, maintenance traffic will consist of four-wheel drive vehicles or vans. The electricity substation and site tracks will also require periodic maintenance.

4.10 Decommissioning

The wind turbines proposed as part of the Development are expected to have a lifespan of approximately 30 years and ongoing research shows that this is likely to increase with improvements in turbine technology, site design and maintenance measures. Following the end of their useful life, the wind turbines may be replaced with a new set of turbines, subject to fulfilment of planning requirements at that time, or the Proposed Development may be decommissioned fully. The onsite substation will remain in place as it will be under the ownership of the ESB and will form a permanent part of the electricity grid.

Upon decommissioning of the Proposed Development, the wind turbines will be disassembled in reverse order to how they were erected. The turbines will be disassembled with a similar model of crane that would be used for their erection. The turbine will most likely be removed from site using the same transport methodology adopted for delivery to site initially. The turbine materials will be transferred to a suitable recycling or recovery facility. All above ground turbine components would be separated and removed off-site for recycling. Turbine foundations would remain in place underground and would be covered with earth and reseeded as appropriate. 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 noise, dust and/or vibration.

Site roadways will be left in situ, as appropriate. If it were to be confirmed that the roads were not required in the future for any other useful purpose, they could be removed where required. Underground cables will be removed and the ducting left in place.

A Decommissioning Plan has been prepared (Appendix 4-10) the detail of which will be agreed with the local authority prior to any decommissioning. The plan provides details of the methodologies that will be adopted, throughout decommissioning, the environmental controls that will be implemented, the Emergency Response Procedure to be adopted, methods for reviewing compliance and an indicative programme of decommissioning works.

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. The potential for effects during the decommissioning phase of the Proposed Development has been fully assessed in the EIAR.

As noted in the Scottish Natural Heritage report (SNH) *Research and Guidance on Restoration and Decommissioning of Onshore Wind Farms* (SNH, 2013) reinstatement proposals for a Wind Farm are made approximately 30 years in advance, so within the lifespan of the Wind Farm, technological advances and preferred approaches to reinstatement are likely to change. According to the SNH guidance, it is therefore:

> *"best practice not to limit options too far in advance of actual decommissioning but to maintain informed flexibility until close to the end-of-life of the wind farm".*