APPENDIX 4-5

KNOCKSHANVO GRID CONNECTION - TLI

ISO A1 594mm x 841mm

Map Series:
Prime Data Vector

Reference No.'s
4444, 4503, 4563, 4622

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CYAL50261649

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Tel: 00 44 1256406664

PROJECT

Knockshanvo Wind Farm
110kV Grid Connection

CLIENT

MKO

CONSULTANTS

NOTES: -

Path of cable route and location of associated Joint Bays, Link Boxes and Comms Chambers may vary depending on site conditions.

Other services may be encountered along the route.

This drawing is to be used only for the purpose of the planning application and is subject to detailed design.

LEGEND: -

- 110kV Underground Cable Design Route
- Planning Boundary shown thus
- Wind Farm Boundary shown thus. Details to be submitted under a separate planning application to An Board Pleanála
- Joint Bay Locations shown thus
- Knockshanvo WF Turbine Location. Details to be submitted under a separate planning application to An Board Pleanála
- Turbine Falling Distance shown thus. (2 x Rotor Diameter) Details to be submitted under a separate planning application to An Board Pleanála

ISSUE/REVISION

P6	19.08.24	Issued for Planning
P5	15.08.24	Issued for Planning
P4	01.08.24	Issued for Planning
P3	13.06.24	Issued for Planning
P2	05.06.24	Issued for Planning
P1	10.11.23	Issued for Planning
I/R	DATE	DESCRIPTION

PROJECT NUMBER

05-783

SHEET TITLE

Site Layout Keyplan

SHEET NUMBER

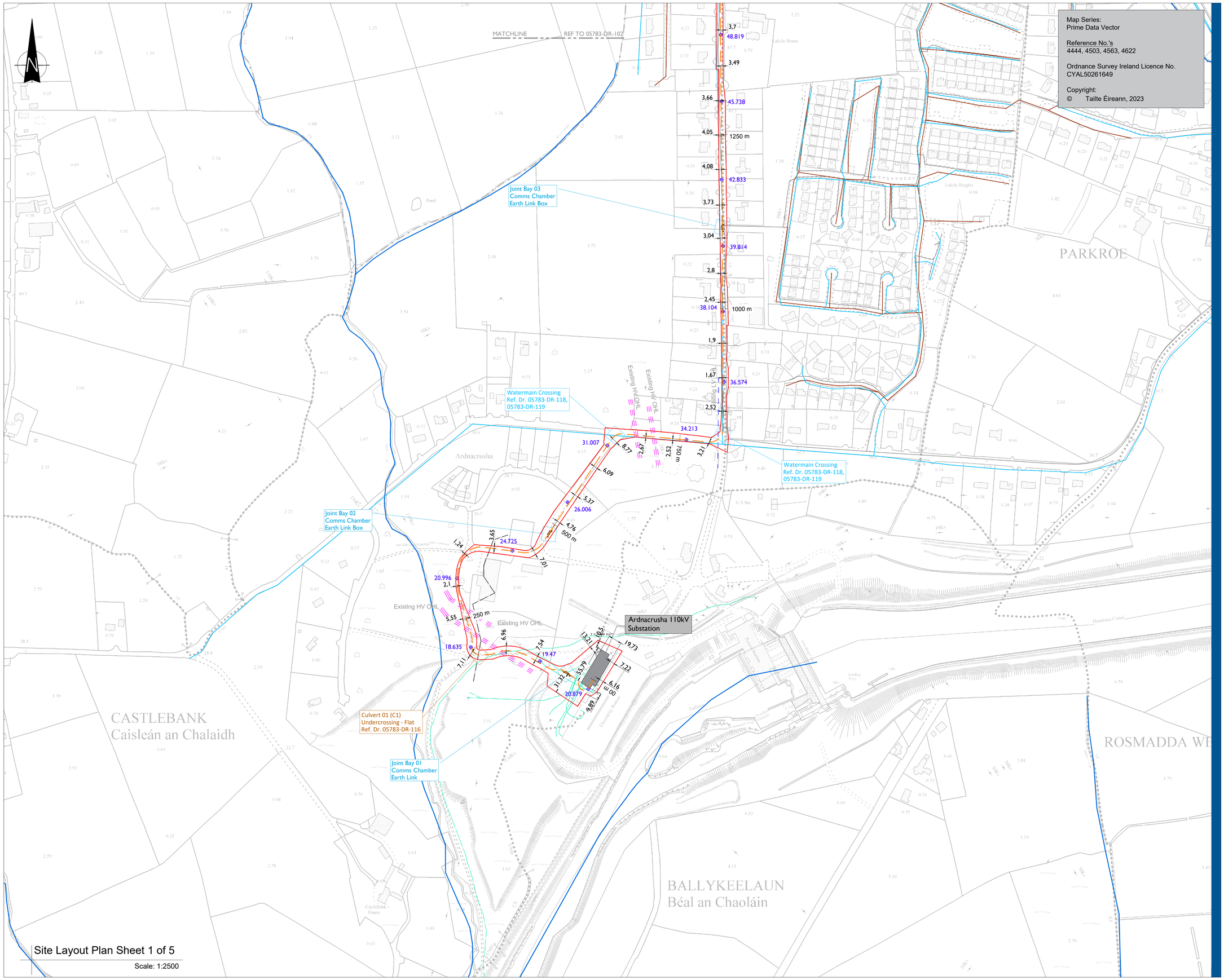
05783-DR-100

Project Management Initials:
Designer: JC
Checked: GC
Approved: DB

Overall Site Location Map

Scale: 1:20,000

ISO A1 594mm x 841mm



Project Management Initials: Designer: JC Checked: GC Approved: DB

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PROJECT

Knockshanvo Wind Farm
110kV Grid Connection

CLIENT

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CONSULTANTS

NOTES: -

Path of cable route and location of associated Joint Bays, Link Boxes and Comms Chambers may vary depending on site conditions.

Other services may be encountered along the route.

This drawing is to be used only for the purpose of the planning application and is subject to detailed design.

LEGEND: -

- 110kV Underground Cable Design Route
- Planning Boundary shown thus
- Joint Bay Locations shown thus
- Culvert Locations shown thus
- Existing levels shown thus ⊕ 79.617
- Existing ESB OHL MV/LV Networks shown thus
- Existing ESB OHL HV Networks shown thus
- Existing ESB UGC HV Networks shown thus
- Existing ESB UGC MV/LV Networks shown thus
- Existing Gas Network Ireland shown thus
- Existing Rivers & Streams
- Existing Irish Water Network

ISSUE/REVISION

I/R	DATE	DESCRIPTION
P2	05.06.24	Issued for Planning
P1	10.11.23	Issued for Planning

PROJECT NUMBER

05-783

SHEET TITLE

Site Layout Plan
Sheet 1 of 5

SHEET NUMBER

05783-DR-101

Project Management Initials: Designer: JC Checked: GC Approved: DB

MATCHLINE REF TO 05783-DR-103

Existing HV OHL

Map Series:
Prime Data Vector

Reference No.'s
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LEGEND: -

- 110kV Underground Cable Design Route
- Planning Boundary shown thus
- Joint Bay Locations shown thus
- Culvert Locations shown thus
- Existing levels shown thus 79.617
- Existing ESB OHL MV/LV Networks shown thus
- Existing ESB OHL MV/LV Networks shown thus
- Existing Gas Network Ireland shown thus
- Existing Rivers & Streams
- Existing Irish Water Network

Joint Bay 06
Comms Chamber
Earth Link Box

Existing MV OHL

Existing LV OHL

Existing MV OHL

Joint Bay 05
Comms Chamber
Earth Link Box

Watermain Crossing
Ref. Dr. 05783-DR-118,
05783-DR-119

Watermain Crossing
Ref. Dr. 05783-DR-118,
05783-DR-119

Culvert 02 (C2)
Undercrossing - Flat
Ref. Dr. 05783-DR-116

Watermain Crossing
Ref. Dr. 05783-DR-118,
05783-DR-119

Joint Bay 04
Comms Chamber
Earth Link Box

Existing MV OHL

GLENLON NORTH

ROO WEST

GLENLON SOUTH

LAKYLE

Glenlon House

Trough Castle (in ruins)

Pond

Lakyle House

Reservoir

85.785 1,88 4,06 3250 m 3,47 85.078 2,88 2,73 81.6 79.617 3,35 3,64 74.937 2,21 3000 m 2,45 72.544 2,21 2,82 72.5 3,53 72.129 4,16 2750 m 71.828 3,98 5,07 72.1 72.145 5,13 3,28 71.875 3,26 2500 m 7,1 69.228 7,16 3,96 68.060 3,36 2,62 2250 m 66.256 3,74 5,16 4,16 62.865 2,16 61.329 4,76 2000 m 4,38 4,18 61.856 5,5 5,56 59.640 5,29 1750 m 2,69 57.699 3,71 4,51 56.402 4,23 4,3 1500 m 53.211 4,02 3,7 48.819 3,49

NOTES: -

Path of cable route and location of associated Joint Bays, Link Boxes and Comms Chambers may vary depending on site conditions.

Other services may be encountered along the route.

This drawing is to be used only for the purpose of the planning application and is subject to detailed design.

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PROJECT

Knockshanvo Wind Farm 110kV Grid Connection

CLIENT

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CONSULTANTS

ISSUE/REVISION

I/R	DATE	DESCRIPTION
P2	05.06.24	Issued for Planning
P1	10.11.23	Issued for Planning

PROJECT NUMBER

05-783

SHEET TITLE

Site Layout Plan
Sheet 2 of 5

SHEET NUMBER

05783-DR-102

Site Layout Plan Sheet 2 of 5

Scale: 1:2500

ISO A1 594mm x 841mm

Project Management Initials: Designer: JC Checked: GC Approved: DB

MATCHLINE REF TO 05783-DR-104

Culvert 04 (C4)
Overcrossing - Flat
Ref. Dr. 05783-DR-117

Culvert 03 (C3)
Overcrossing - Flat
Ref. Dr. 05783-DR-117

Joint Bay 09
Comms Chamber
Earth Link Box

Joint Bay 08
Comms Chamber
Earth Link

HDD Crossing
Launch Pit within temporary works area = 20m²

HDD Crossing
Receptor Pit within temporary works area = 40m²

Bridge 1 (B1)
HDD Crossing Detail
Ref. Dr. 05783-DR-120

Joint Bay 07
Comms Chamber
Earth Link Box

MATCHLINE REF TO 05783-DR-102

Existing LV OHL
Existing HV OHL
Existing MV OHL

CLOGHERA
KNOCKDONAGH
Cnoc Dhonncha

Map Series:
Prime Data Vector

Reference No.'s
4444, 4503, 4563, 4622

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LEGEND: -

- 110kV Underground Cable Design Route
- Planning Boundary shown thus
- Joint Bay Locations shown thus
- Culvert Locations shown thus
- Existing levels shown thus 79.617
- Existing ESB OHL MV/LV Networks shown thus
- Existing ESB OHL MV/LV Networks shown thus
- Existing Rivers & Streams

NOTES: -

Path of cable route and location of associated Joint Bays, Link Boxes and Comms Chambers may vary depending on site conditions.

Other services may be encountered along the route.

This drawing is to be used only for the purpose of the planning application and is subject to detailed design.

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PROJECT

Knockshanvo Wind Farm
110kV Grid Connection

CLIENT

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ISSUE/REVISION

I/R	DATE	DESCRIPTION
P3	05.06.24	Issued for Planning
P2	26.03.24	Issued for Planning
P1	10.11.23	Issued for Planning

PROJECT NUMBER

05-783

SHEET TITLE

Site Layout Plan
Sheet 3 of 5

SHEET NUMBER

05783-DR-103

Site Layout Plan Sheet 3 of 5

Scale: 1:2500

ISO A1 594mm x 841mm

Project Management Initials: Designer: JC Checked: GC Approved: DB

MATCHLINE REF TO 05783-DR-105

Culvert 05 (C5)
Overcrossing - Flat
Ref. Dr. 05783-DR-117

Joint Bay 12
Comms Chamber
Earth Link Box

DRUMSILLAGH or
SALLYBANK (Merritt)

Joint Bay 11
Comms Chamber
Earth Link Box

HDD Crossing
Receptor Pit within
temporary works
area = 40m²

Bridge 2 (B2)
HDD Crossing Detail
Ref. Dr. 05783-DR-121

HDD Crossing
Launch Pit within temporary
works area = 20m²

Joint Bay 10
Comms Chamber
Earth Link Box

Culvert 04 (C4)
Overcrossing - Flat
Ref. Dr. 05783-DR-117

MATCHLINE REF TO 05783-DR-103

Existing MV OHL

Mountrice River

Map Series:
Prime Data Vector

Reference No.'s
4444, 4503, 4563, 4622

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LEGEND: -

- 110kV Underground Cable Design Route
- Planning Boundary shown thus
- Joint Bay Locations shown thus
- Culvert Locations shown thus
- Existing levels shown thus 79.617
- Existing ESB OHL MV/LV Networks shown thus
- Existing Rivers & Streams

NOTES: -

Path of cable route and location of associated Joint Bays, Link Boxes and Comms Chambers may vary depending on site conditions.

Other services may be encountered along the route.

This drawing is to be used only for the purpose of the planning application and is subject to detailed design.

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PROJECT

Knockshanvo Wind Farm 110kV Grid Connection

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ISSUE/REVISION

I/R	DATE	DESCRIPTION
P2	05.06.24	Issued for Planning
P1	10.11.23	Issued for Planning

PROJECT NUMBER

05-783

SHEET TITLE

Site Layout Plan
Sheet 4 of 5

SHEET NUMBER

05783-DR-104

Site Layout Plan Sheet 4 of 5

Scale: 1:2500

ISO A1 594mm x 841mm

Project Management Initials: Designer: JC Checked: GC Approved: DB

Map Series:
Prime Data Vector

Reference No.'s
4444, 4503, 4563, 4622

Ordnance Survey Ireland Licence No.
CYAL50261649

T8

Joint Bay 14 Comms Chamber Earth Link Box

Knockshanvo 110kV Substation

Details to be submitted under a separate planning application to An Board Pleanála

Joint Bay 13 Comms Chamber Earth Link Box

MATCHLINE REF TO 05783-DR-105

Site Layout Plan Sheet 5 of 5

Scale: 1:2500

LEGEND: -

- 110kV Underground Cable Design Route
- Planning Boundary shown thus
- Wind Farm Boundary shown thus. Details to be submitted under a separate planning application to An Board Pleanála
- Joint Bay Locations shown thus
- Culvert Locations shown thus
- Existing levels shown thus (79.617)
- Existing ESB OHL MV/LV Networks shown thus
- Existing Rivers & Streams
- Knockshanvo WF Turbine Location. Details to be submitted under a separate planning application to An Board Pleanála (T)
- Turbine Falling Distance shown thus (2 x Rotor Diameter). Details to be submitted under a separate planning application to An Board Pleanála
- Wind Farm Access Track. Details to be submitted under a separate planning application to An Board Pleanála
- Cut Volume. Details to be submitted under a separate planning application to An Board Pleanála
- Fill Volume. Details to be submitted under a separate planning application to An Board Pleanála
- Access track. Details to be submitted under a separate planning application to An Board Pleanála

NOTES: -

Path of cable route and location of associated Joint Bays, Link Boxes and Comms Chambers may vary depending on site conditions.

Other services may be encountered along the route.

This drawing is to be used only for the purpose of the planning application and is subject to detailed design.

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PROJECT

Knockshanvo Wind Farm 110kV Grid Connection

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I/R	DATE	DESCRIPTION
P6	19.08.24	Issued for Planning
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P4	01.08.24	Issued for Planning
P3	13.06.24	Issued for Planning
P2	05.06.24	Issued for Planning
P1	10.11.23	Issued for Planning

PROJECT NUMBER

05-783

SHEET TITLE

Site Layout Plan
Sheet 5 of 5

SHEET NUMBER

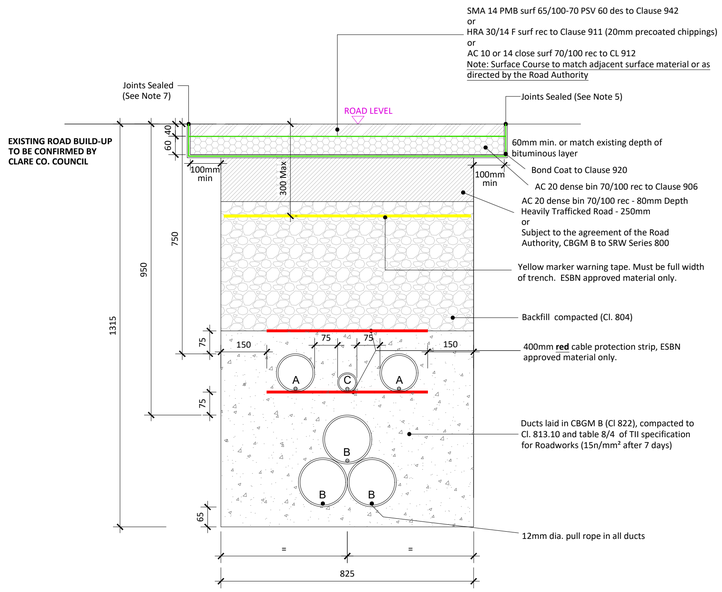
05783-DR-105

ISO A1 594mm x 841mm

ISO A1 594mm x 841mm

Permanent Reinstatement

Reinstatement details based on Guidelines for Managing Openings in Public Roads - SD4

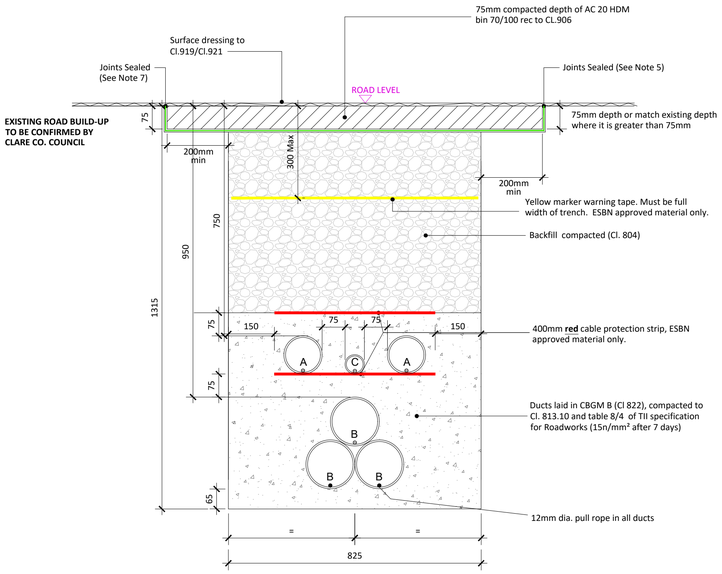


A = 125mm : Outer Diameter HDPE ESB Approved Duct, SDR=17.6
B = 160mm : Outer Diameter HDPE ESB Approved Duct, SDR= 21
C = 63mm : ECC Earth Continuity Conductor

Section Through Permanent Reinstatement of Longitudinal Opening in Roadway

SCALE 1:10

Reinstatement details based on Guidelines for Managing Openings in Public Roads - SD5



A = 125mm : Outer Diameter HDPE ESB Approved Duct, SDR=17.6
B = 160mm : Outer Diameter HDPE ESB Approved Duct, SDR= 21
C = 63mm : ECC Earth Continuity Conductor

Section Through Permanent Reinstatement of Longitudinal Opening in Dressed Rural Unbound Roadway

SCALE 1:10

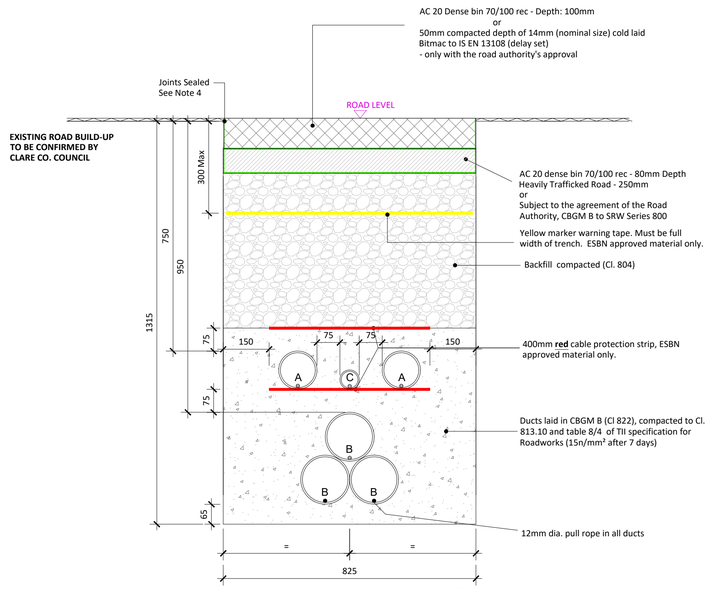
ALL REINSTATEMENT WORKS ARE TO BE IN ACCORDANCE WITH LOCAL AREA ENGINEERS REQUIREMENTS AND GUIDELINES FOR MANAGING OPENINGS IN PUBLIC ROADS

Note:

1. Refer to Guidelines for managing Openings in Public Roads (Purple Book - April 2017), Chapter 6 'Specifications' for guidance on Duct type / colour and Marker Tape type / colour.
2. All bound edges shall be saw cut to expose the full vertical thickness of each layer prior to excavation. All edges shall be essentially straight, smooth and vertical.
3. Where a temporary surface has been used, material shall be planed out to the depth specified in this drawing. The new permanent surface shall be machined laid and mechanically compacted with a vibrating roller.
4. Where the trimmed edge of excavation is within 400mm* of a joint / edge, ironwork or other reinstatement, this trimmed edge shall be extended to include same and the area of reinstatement shall be extended accordingly (* increase to 800mm where this is pre-existing practice).
5. Any damaged area adjacent to the opening and resulting from the excavation operation shall be included within the area to be reinstated.
6. Clause 808 or Cement Bound Granular Material surface to be sprayed per clause 920 prior to application of Asphalt Concrete Layer.
7. Joint sealer shall be a hot 50 pen bitumen binder or cold thixtropic bitumen 50 -70 pen to be applied to all vertical cuts in accordance with B.S.594987 prior to application of bituminous materials.
8. For roads without asphalt concrete surface (e.g. may be Cl.804 with double surface dressing), the road authority may as its discretion permit the temporary reinstatement surface of asphalt concrete to be regulated in lieu of excavation and reinstatement; and subsequently surface dressed.
9. On highly trafficked roads services must have a minimum cover of 750mm.
10. Where required by the Road authority the trench may be reinstated with a Cement Bound Granular Material.

Temporary Reinstatement

Reinstatement details based on Guidelines for Managing Openings in Public Roads - SD1

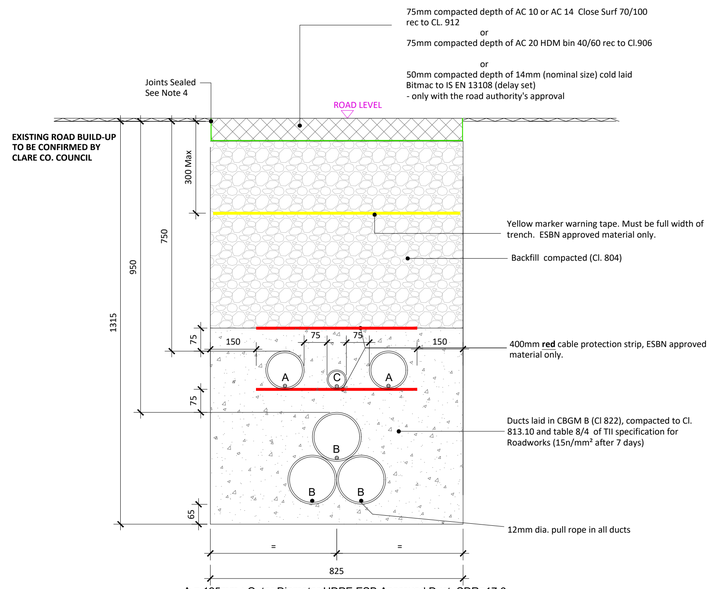


A = 125mm : Outer Diameter HDPE ESB Approved Duct, SDR=17.6
B = 160mm : Outer Diameter HDPE ESB Approved Duct, SDR= 21
C = 63mm : ECC Earth Continuity Conductor

Section Through Temporary Reinstatement of Longitudinal Opening in Roadway

SCALE 1:10

Reinstatement details based on Guidelines for Managing Openings in Public Roads - SD2



A = 125mm : Outer Diameter HDPE ESB Approved Duct, SDR=17.6
B = 160mm : Outer Diameter HDPE ESB Approved Duct, SDR= 21
C = 63mm : ECC Earth Continuity Conductor

Section Through Temporary Reinstatement of Longitudinal Opening in Dressed Rural Unbound Roadway

SCALE 1:10

ALL REINSTATEMENT WORKS ARE TO BE IN ACCORDANCE WITH LOCAL AREA ENGINEERS REQUIREMENTS AND GUIDELINES FOR MANAGING OPENINGS IN PUBLIC ROADS

Note:

1. Refer to 'Guidelines for managing Openings in Public Roads (Purple Book - April 2017)', Chapter 6 'Specifications' for guidance on Duct type / colour and Marker Tape type / colour.
2. All bound edges shall be saw cut to expose the full vertical thickness of each layer prior to excavation. All edges shall be essentially straight, smooth and vertical.
3. Clause 808 surface to be sprayed per clause 920 prior to application of Asphalt Concrete Layer.
4. Joint sealer shall be a hot 50 pen bitumen binder or cold thixotropic bitumen 50-70 pen to be applied to all vertical cuts in accordance with B.S. 594987 prior to application of bituminous materials.
5. Licence holder must maintain temporary reinstatement to a safe and acceptable standard.
6. Any damaged area adjacent to the opening and resulting from the excavation operation shall be included within the area to be reinstated.
7. Temporary Road Surface warning signs must be used in accordance with the Traffic Signs Manual (Chaper 8 - Temporary Traffic Measures and Signs for Roadworks).
8. Refer to detail Permanent Reinstatement of Road for advice on permanent reinstatement - all permanent reinstatement shall be carried out when adequate settlement has occurred as determined by the Road Authority.

Project Management Initials: Designer: JC Checked: GC Approved: DB

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PROJECT

Knockshanvo Wind Farm
110kV Grid Connection

CLIENT

MKO

CONSULTANTS

NOTES: -

- This drawing is to be read in conjunction with relevant drawings, specifications and reports
- Dimensions are in millimeters, unless noted otherwise
- Drawings are not to be scaled use figured dimensions only
- Geogrid may be implemented along the cable trench route where deemed necessary by the contractor or as required by CLARE County Council

LEGEND: -

ISSUE/REVISION

P1	10.11.23	Issued for Planning
I/R	DATE	DESCRIPTION

PROJECT NUMBER

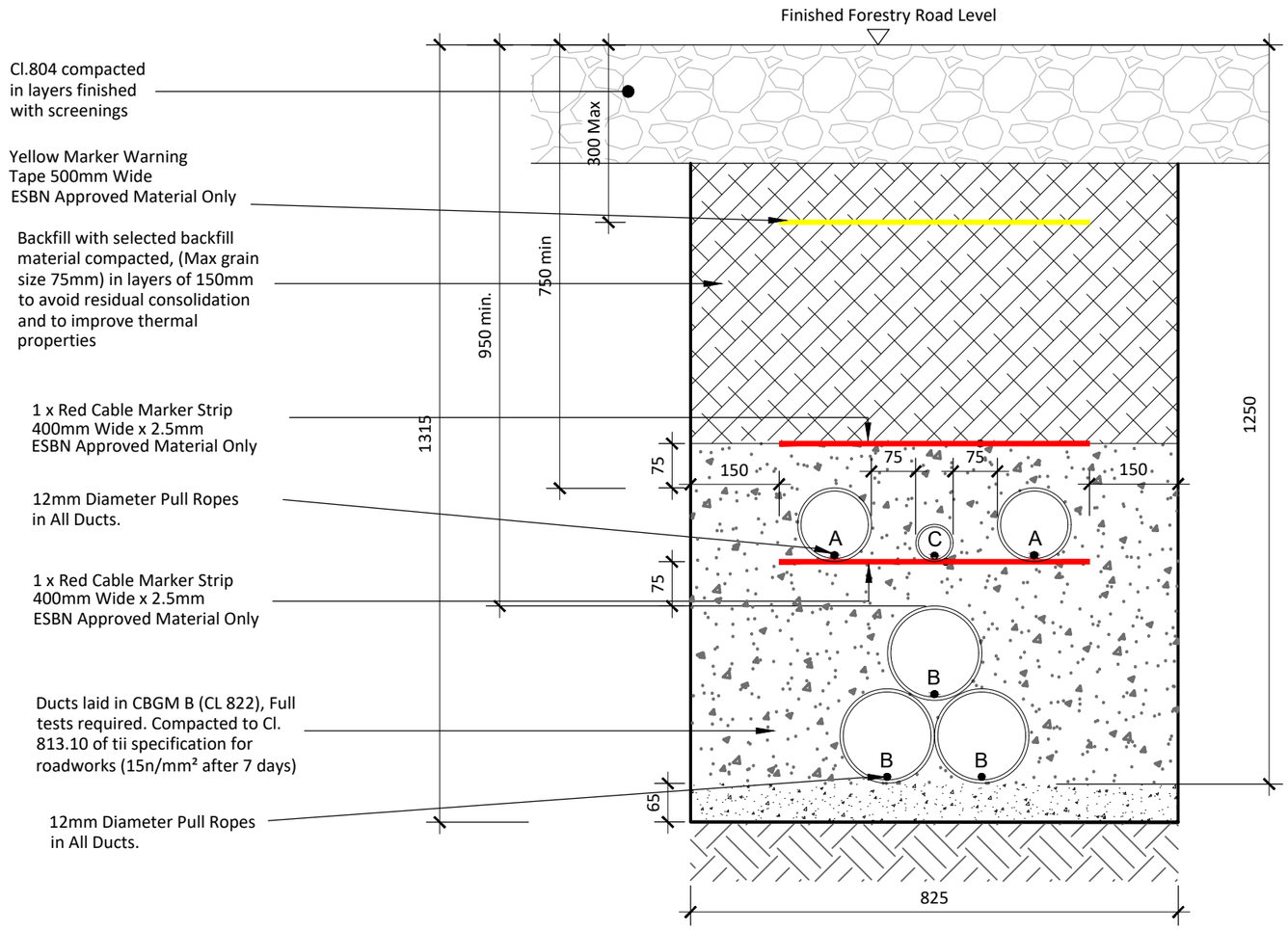
05-783

SHEET TITLE

Ducting Through
Regional / Local Roadways

SHEET NUMBER

05783-DR-110



A = 125mm : Outer Diameter HDPE ESB Approved Duct, SDR=17.6
B = 160mm : Outer Diameter HDPE ESB Approved Duct, SDR= 21
C = 63mm : ECC Earth Continuity Conductor

Section Through Forestry Road

SCALE 1:10

Note:
- This drawing is to be read in conjunction with relevant drawings, specifications and reports
- Dimensions are in millimeters, unless noted otherwise
- Drawings are not to be scaled use figured dimensions only

ALL REINSTATEMENT WORKS ARE TO BE IN ACCORDANCE WITH LANDOWNERS REQUIREMENTS

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PROJECT
Knockshanvo Wind Farm
110 kV Grid Connection

PROJECT NUMBER
05-783

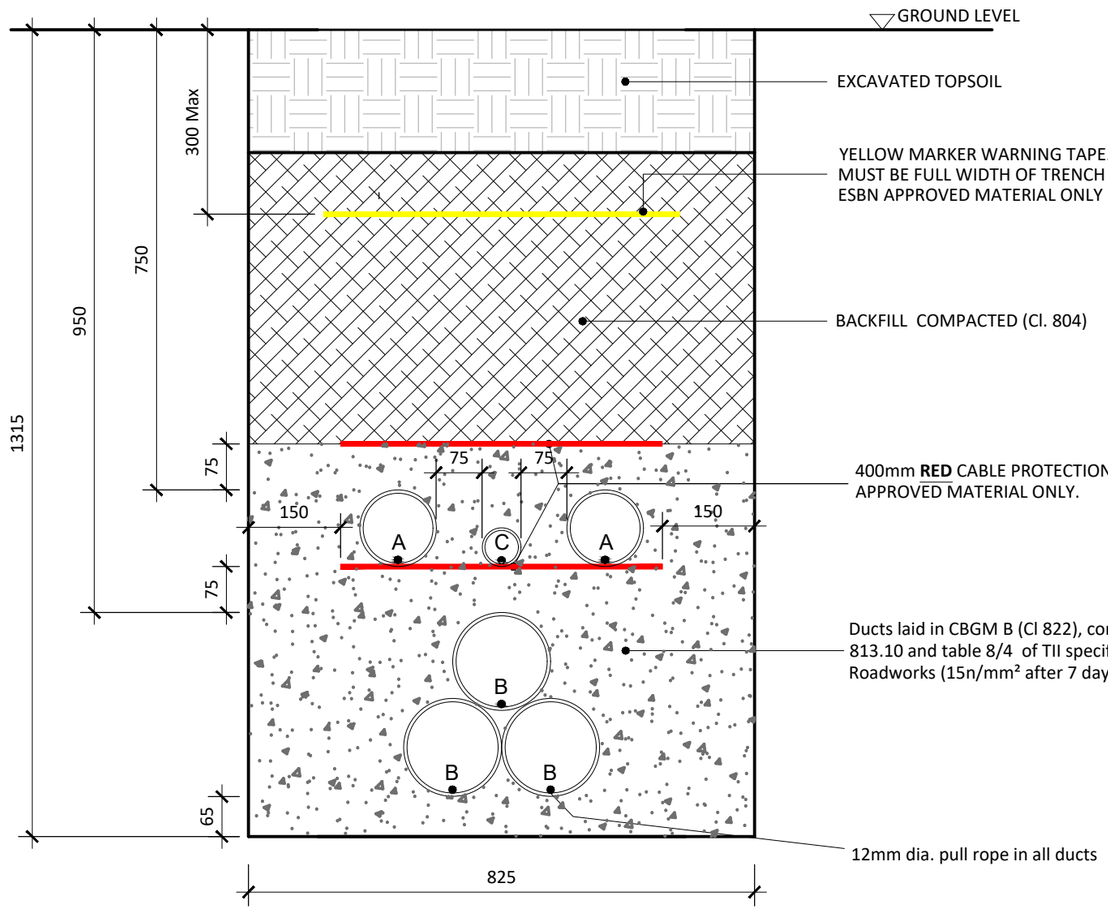
SHEET NUMBER
05783-DR-111

SHEET TITLE
Ducting through Forestry Road

DRAWING STATUS
For Planning

ISSUE/REVISION

I/R	DATE	DESCRIPTION
P1	10.11.23	Issued for Planning



A = 125mm : Outer Diameter HDPE ESB Approved Duct, SDR=17.6
B = 160mm : Outer Diameter HDPE ESB Approved Duct, SDR= 21
C = 63mm : ECC Earth Continuity Conductor

Section Through Private Lands

SCALE 1:10

Note:
- This drawing is to be read in conjunction with relevant drawings, specifications and reports
- Dimensions are in millimeters, unless noted otherwise
- Drawings are not to be scaled use figured dimensions only

ALL REINSTATEMENT WORKS ARE TO BE IN ACCORDANCE WITH LANDOWNER REQUIREMENTS

Reinstatement details based on Guidelines for Managing Openings in Public Roads - SD14

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PROJECT
Knockshanvo Wind Farm
110kV Grid Connection

PROJECT NUMBER
05-783

SHEET NUMBER
05783-DR-112

SHEET TITLE
Ducting through Off Road Sections

DRAWING STATUS
For Planning

ISSUE/REVISION

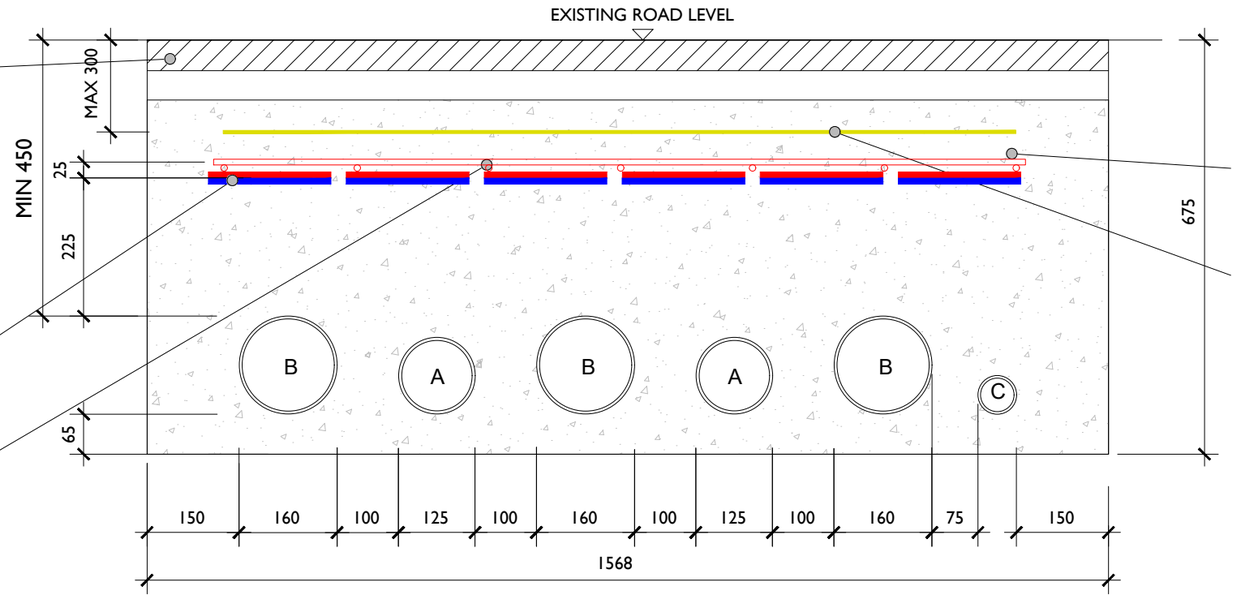
I/R	DATE	DESCRIPTION
P1	10.11.23	Issued for Planning

Road reinstatement to be in accordance with *Guidelines for Managing Openings in Public Roads* (Purple Book - April 2017).

450mm is the minimum acceptable clearance dimension from the road surface to the top of the highest cable duct where the cable trench is in the carriageway

Heavy duty 6x200mm wide galvanized steel plates with red marker strips fixed to the top surface and to be installed until standard cover is achieved over hv ducts and communication ducts

A393 mesh to be installed until standard cover is achieved over hv ducts and communication ducts



C25/30 concrete to be in accordance with specification for road works 1000. 20mm max : of aggregate, with minimum duct spacing of 75r Min. cover to steel - 50mm.

4 X 400mm ESBN yellow warning tape across full width of trench

A = 125mm : Outer Diameter HDPE ESB Approved Duct, SDR=17.6
B = 160mm : Outer Diameter HDPE ESB Approved Duct, SDR= 21
C = 63mm : ECC Earth Continuity Conductor

Section Through Ducting in Flat Formation

SCALE 1:10

Note:
- This drawing is to be read in conjunction with relevant drawings, specifications and reports
- Dimensions are in millimeters, unless noted otherwise
- Drawings are not to be scaled use figured dimensions only

ALL REINSTATEMENT WORKS ARE TO BE IN ACCORDANCE WITH LOCAL AREA ENGINEERS LANDOWNERS REQUIREMENTS AND GUIDELINES FOR MANAGING OPENINGS IN PUBLIC ROADS

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CLIENT
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PROJECT
Knockshanvo Wind Farm
110 kV Grid Connection

PROJECT NUMBER
05-783

SHEET NUMBER
05783-DR-113

SHEET TITLE
Section Through Ducting in Flat Formation

DRAWING STATUS
For Planning

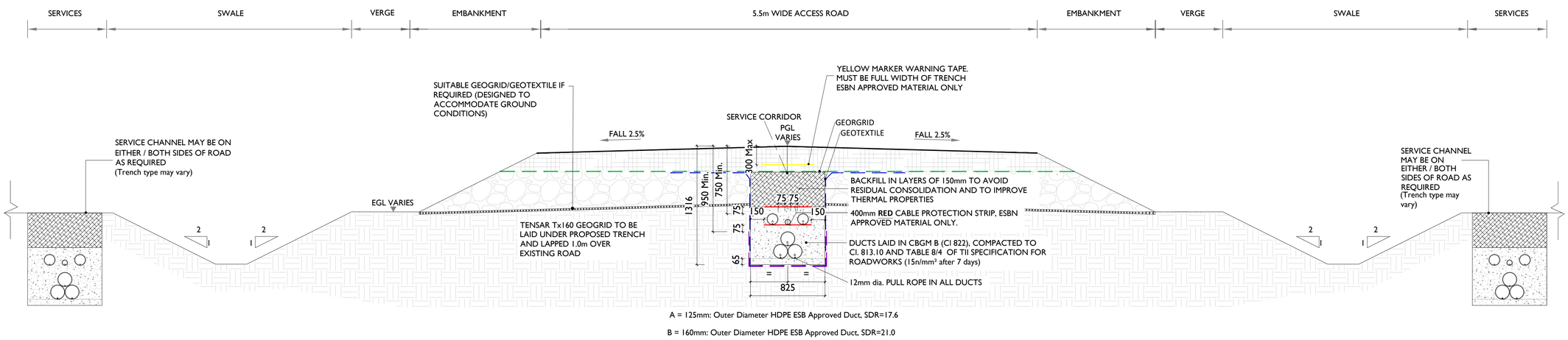
ISSUE/REVISION

I/R	DATE	DESCRIPTION
P1	10.11.23	Issued for Planning

ISO A1 594mm x 841mm

NOTES:
1. This drawing is to be used for EirGrid design approval only and is not to be used for construction.
2. For further information reference the latest versions of EirGrid Dr. No. XDC-CBL-STND-H-007 & Functional Specifications in addition to all other relevant documentation.
3. Dimensions are in millimeters, unless noted otherwise.
4. Drawings are not to be scaled, use figured dimensions only.
5. Road-markings to be agreed with the county council and reinstated.
6. Road surfacing build-up and tie in with non floating road sections to be agreed with the county council.

LEGEND:
- SECUGRID 40/40 GEOGRID
- TENSAR Tx160 GEOGRID
- GEOTEXTILE
- BASE WEARING COURSE
- PEAT COMPOSITION
- EXISTING MATERIAL
- NEW ROAD BUILD UP MATERIAL



A = 125mm: Outer Diameter HDPE ESB Approved Duct, SDR=17.6

B = 160mm: Outer Diameter HDPE ESB Approved Duct, SDR=21.0

CABLE TRENCH SECTION
Scale: 1:25

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PROJECT

Knockshanvo Wind Farm

110kV Grid Connection

CLIENT

MKO

CONSULTANTS

NOTES: -

Path of cable route and location of associated Joint Bays, Link Boxes and Comms Chambers may vary depending on site conditions.

Other services may be encountered along the route.

This drawing is to be used only for the purpose of the planning application and is subject to detailed design.

LEGEND: -

ISSUE/REVISION

I/R	DATE	DESCRIPTION
P1	10.11.23	Issued for Planning

PROJECT NUMBER

05-783

SHEET TITLE

110kV Ducting through
Existing Floating Road in Peat

SHEET NUMBER

05783-DR-114

Project Management Initials: Designer: JC Checked: GC Approved: DB

LEGEND:

SECUGRID 40/40 GEOGRID

TENSAR Tx160 GEOGRID

GEOTEXTILE

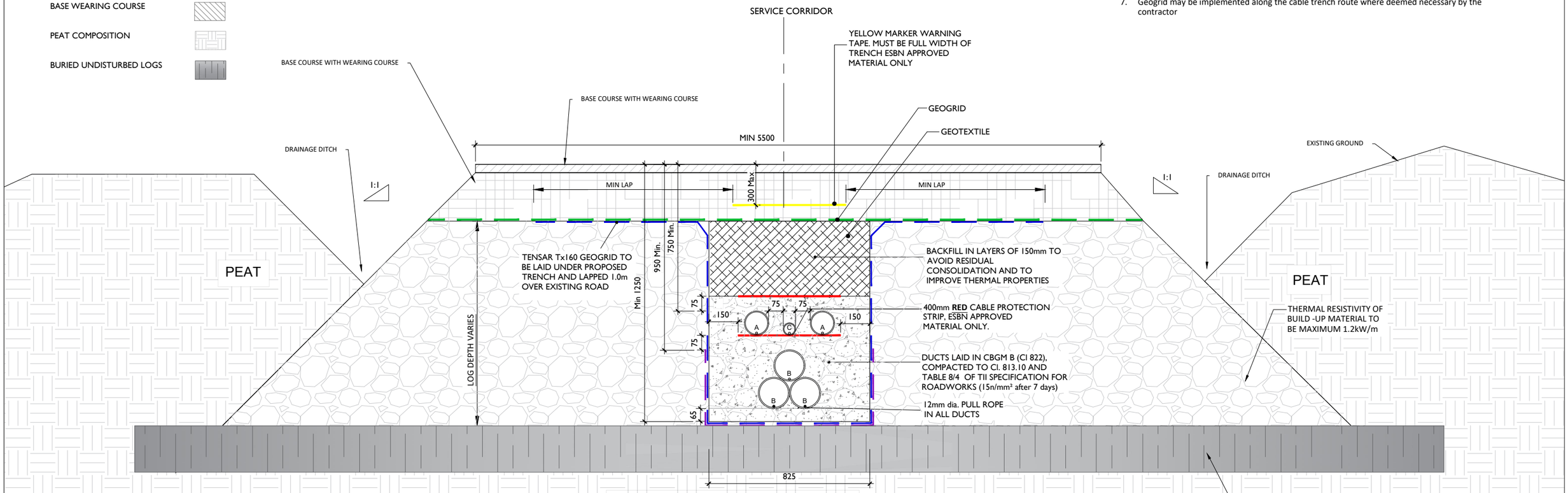
BASE WEARING COURSE

PEAT COMPOSITION

BURIED UNDISTURBED LOGS

NOTES:

1. This drawing is to be used for EirGrid design approval only and is not to be used for construction.
2. For further information reference the latest versions of EirGrid Dr. No. XDC-CBL-STND-H-007 & Functional Specifications in addition to all other relevant documentation.
3. Dimensions are in millimeters, unless noted otherwise.
4. Drawings are not to be scaled, use figured dimensions only.
5. Base course & wearing course to be in accordance with TII (NRA) specification for roadworks series 900
6. All products & materials to be utilised during construction to comply with EirGrid Functional specification. Deep peat installatin will need to comply with **CDS-HFS-01-001**
7. Geogrid may be implemented along the cable trench route where deemed necessary by the contractor



CABLE TRENCH SECTION

Scale: 1:20

A = 125mm: Outer Diameter HDPE ESB Approved Duct, SDR=17.6

B = 160mm: Outer Diameter HDPE ESB Approved Duct, SDR=21.0

PEAT

PEAT

SECTION THROUGH UPGRADED FLOATING ROAD PEAT DEPTH > 2.5m

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Tel: 00353 66 7135710

CLIENT

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PROJECT

Knockshanvo Wind Farm
110kV Grid Connection

PROJECT NUMBER
05-783

SHEET NUMBER
05783-DR-115

SHEET TITLE

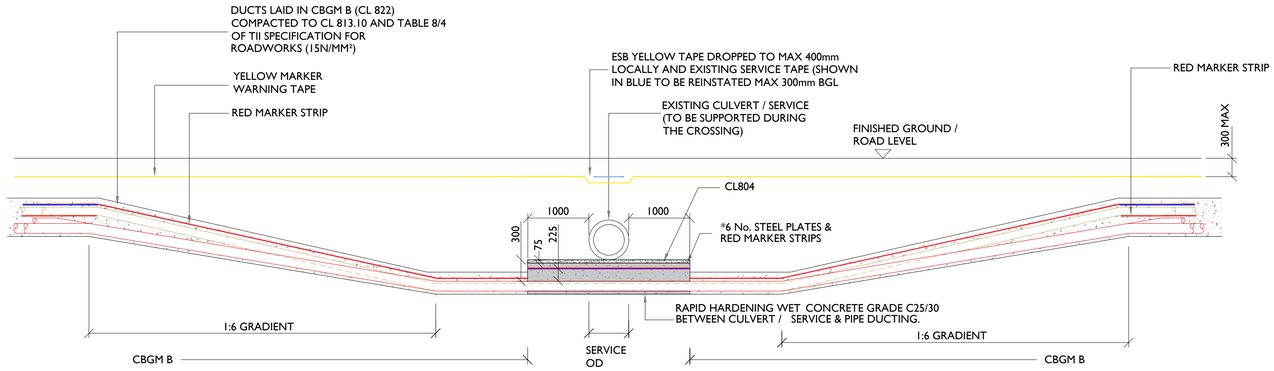
110kV Ducting through section
Upgraded Floating Road in Peat > 2.5m

DRAWING STATUS
for Planning

ISSUE/REVISION

I/R	DATE	DESCRIPTION
P1	10.11.23	Issued for Planning

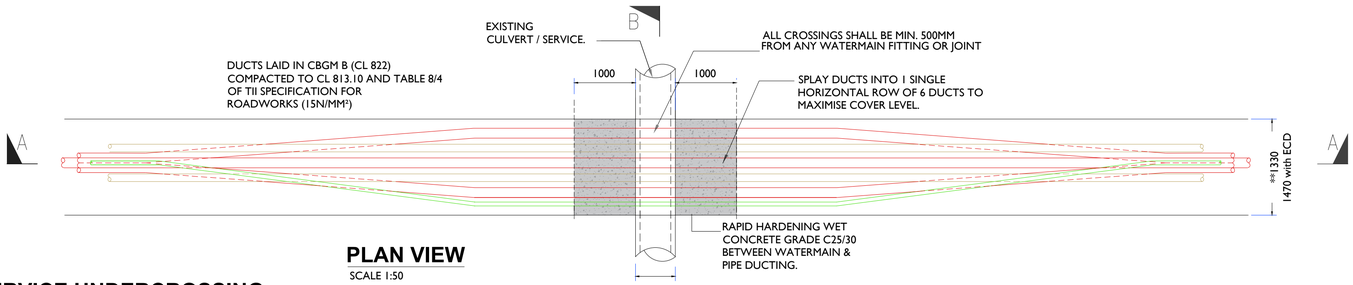
ISO A1 594mm x 841mm



SECTION A-A

SCALE 1:50

* 5X200mm STEEL PLATE & RED MARKER WHERE ECC ISN'T REQUIRED
** MIN 1330mm WHERE ECC ISN'T REQUIRED
*** SEE GENERAL NOTES, NO. 18



PLAN VIEW

SCALE 1:50

SERVICE UNDERCROSSING

GENERAL NOTES

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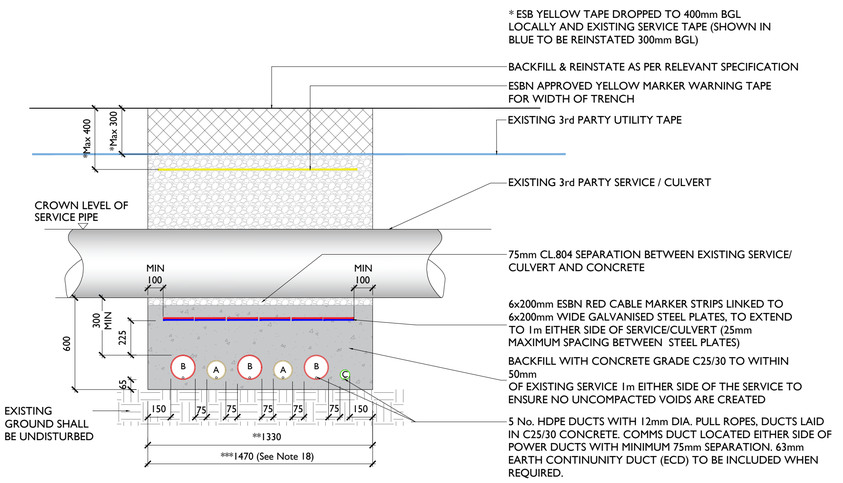
2. This drawing is to be read in conjunction with all other relevant documentation.
3. Do not scale from this drawing use only printed dimensions
4. All dimensions are in millimetres, all chainages, levels and co-ordinates are in metres unless defined otherwise.
5. No excavation shall commence until the Contractor has consulted up to date services drawings and carried out an Electromagnetic Locator (EML) Scan.
6. Hand dig only within 500mm of existing services.
7. If compacting CBGM B could cause damage to the culvert / service below, use rapid hardening cement grade C25/30 following engineers prior approval.
8. For standard trench cross section drawings and minimum horizontal separation to existing services, see 05783-DR-110 (TREFOIL) and 05783-DR-113 (FLAT).
9. Where depths exceed 2500mm to the top of duct the Contractor shall consult the cable system design engineer for phase spacing requirements.
10. Backfill as per guidelines for the opening, backfilling and reinstatement of openings in public roads (2015).
11. **ESB's preference is to cross under existing services where possible.**
12. Backfill as per guidelines for the opening, backfilling and reinstatement of openings in public roads (2015)
13. The Contractor is responsible for the design and construction of all temporary works. The Contractor shall appoint a temporary works designer, and submit temporary works design to PSDP for review.
14. 225mm minimum concrete over ducts where they transition from standard cross section and where they are at less than standard cover to ground level.
15. Replace existing service marker tape over ESB yellow marker tape.
16. The owner of the existing utility being crossed must be consulted in advance of works commencing as per their guidelines.
17. The Contractor shall record detailed as-built information as per the specification. At all crossing locations these records shall include photographic evidence clearly demonstrating that minimum service clearances and duct separations have been achieved.
18. Where duct for Earth Continuity Conductor (ECC) is required for single point bonded sections, attach the 63mm ECC duct to the A duct and update the trench width accordingly.



SECTION B-B

SCALE: 1:20

A = 125mm OUTER DIAMETER HDPE ESB APPROVED COMMS DUCT, SDR=17.6
B = 160mm OUTER DIAMETER HDPE ESB APPROVED POWER DUCT, SDR=21
C = 63mm OUTER DIAMETER HDPE FOR EARTH CONTINUITY CONDUCTOR

Project Management Initials: Designer: JC Checked: GC Approved: DB

tli GROUP

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PROJECT

Knockshanvo Wind Farm
110kV Grid Connection

CLIENT

MKO

CONSULTANTS

NOTES: -

LEGEND: -

- 160mm Ø HDPE POWER DUCT WITH 12mm DIAMTER PULL ROPE
- 125mm Ø HDPE COMMUNICATION DUCT WITH 12mm DIAMTER PULL ROPE
- 63mm Ø HDPE EARTH CONTINUITY CONDUCTOR WITH12mm DIAMTER PULL ROPE
- RED MARKER STRIP OR STEEL PLATES
- YELLOW MARKER WARNING TAPE
- 6mm GALVANISED STEEL PLATE
- EXISTING SERVICE TAPE

ISSUE/REVISION

I/R	DATE	DESCRIPTION
P1	10.11.23	Issued for Planning

PROJECT NUMBER

05-783

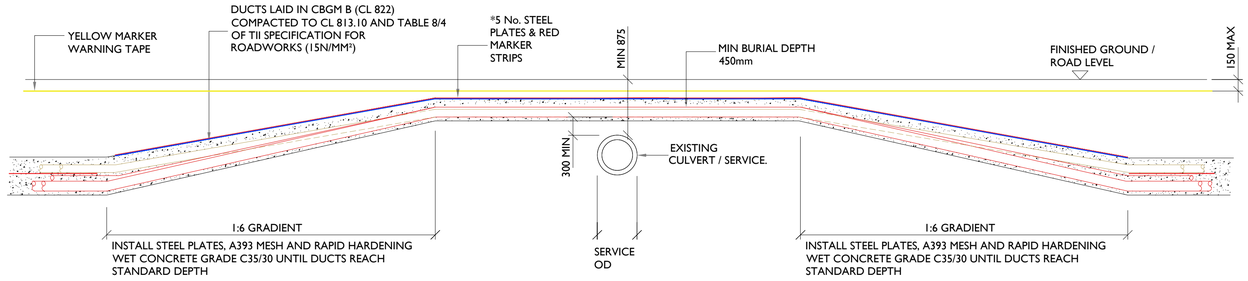
SHEET TITLE

Trench Sections For Undercrossing Existing Culverts / Services

SHEET NUMBER

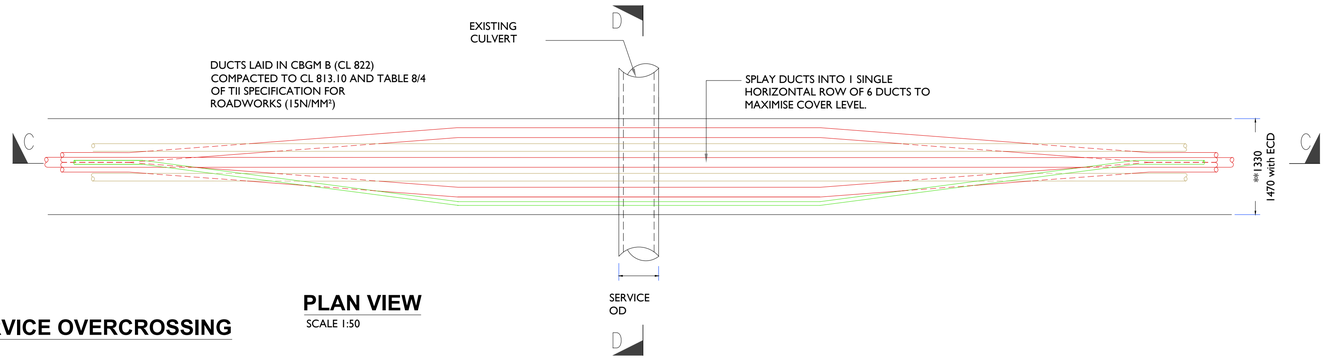
05783-DR-116

ISO A1 594mm x 841mm



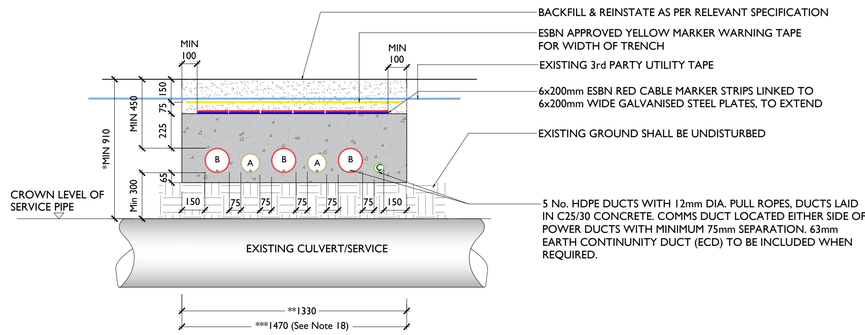
SECTION C-C
SCALE 1:50

* 5X200mm STEEL PLATE & RED MARKER WHERE ECC ISN'T REQUIRED
** MIN 1330mm WHERE ECC ISN'T REQUIRED
*** SEE GENERAL NOTES, NO. 18



PLAN VIEW
SCALE 1:50

SERVICE OVERCROSSING



* ALL EXISTING SERVICES WITH COVERS LESS THAN MIN. DIMENSIONS ABOVE SHALL BE CROSSED BY UNDERCROSSING METHOD

A = 125mm OUTER DIAMETER HDPE ESB APPROVED COMMS DUCT, SDR=17.6
B = 160mm OUTER DIAMETER HDPE ESB APPROVED POWER DUCT, SDR=21
C = 63mm OUTER DIAMETER HDPE FOR EARTH CONTINUITY CONDUCTOR

SECTION D-D
SCALE: 1:20

GENERAL NOTES

1. This drawing is subject to ESB design approval and is not to be used for construction.
2. This drawing is to be read in conjunction with all other relevant documentation.
3. Do not scale from this drawing use only printed dimensions
4. All dimensions are in millimetres, all chainages, levels and co-ordinates are in metres unless defined otherwise.
5. No excavation shall commence until the Contractor has consulted up to date services drawings and carried out an Electromagnetic Locator (EML) Scan.
6. Hand dig only within 500mm of existing services.
7. If compacting CBGM B could cause damage to the culvert / service below, use rapid hardening cement grade C25/30 following engineers prior approval.
8. For standard trench cross section drawings and minimum horizontal separation to existing services, see 05783-DR-110 (TREFOIL) and 05783-DR-113 (FLAT).
9. Where depths exceed 2500mm to the top of duct the Contractor shall consult the cable system design engineer for phase spacing requirements.
10. Backfill as per guidelines for the opening, backfilling and reinstatement of openings in public roads (2015).
11. **ESB's preference is to cross under existing services where possible.**
12. Backfill as per guidelines for the opening, backfilling and reinstatement of openings in public roads (2015)
13. The Contractor is responsible for the design and construction of all temporary works. The Contractor shall appoint a temporary works designer, and submit temporary works design to PSDP for review.
14. 225mm minimum concrete over ducts where they transition from standard cross section and where they are at less than standard cover to ground level.
15. Replace existing service marker tape over ESB yellow marker tape.
16. The owner of the existing utility being crossed must be consulted in advance of works commencing as per their guidelines.
17. The Contractor shall record detailed as-built information as per the specification. At all crossing locations these records shall include photographic evidence clearly demonstrating that minimum service clearances and duct separations have been achieved.
18. Where duct for Earth Continuity Conductor (ECC) is required for single point bonded sections, attach the 63mm ECC duct to the A duct and update the trench width accordingly.

Project Management Initials: Designer: JC Checked: GC Approved: DB

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Tel: 00 44 1256406664

PROJECT

Knockshanvo Wind Farm

110kV Grid Connection

CLIENT

MKO

CONSULTANTS

NOTES: -

LEGEND: -

- 160mm Ø HDPE POWER DUCT WITH 12mm DIAMTER PULL ROPE
- 125mm Ø HDPE COMMUNICATION DUCT WITH 12mm DIAMTER PULL ROPE
- 63mm Ø HDPE EARTH CONTINUITY CONDUCTOR WITH12mm DIAMTER PULL ROPE
- RED MARKER STRIP OR STEEL PLATES
- YELLOW MARKER WARNING TAPE
- 6mm GALVANISED STEEL PLATE
- EXISTING SERVICE TAPE

ISSUE/REVISION

I/R	DATE	DESCRIPTION
P1	10.11.23	Issued for Planning

PROJECT NUMBER

05-783

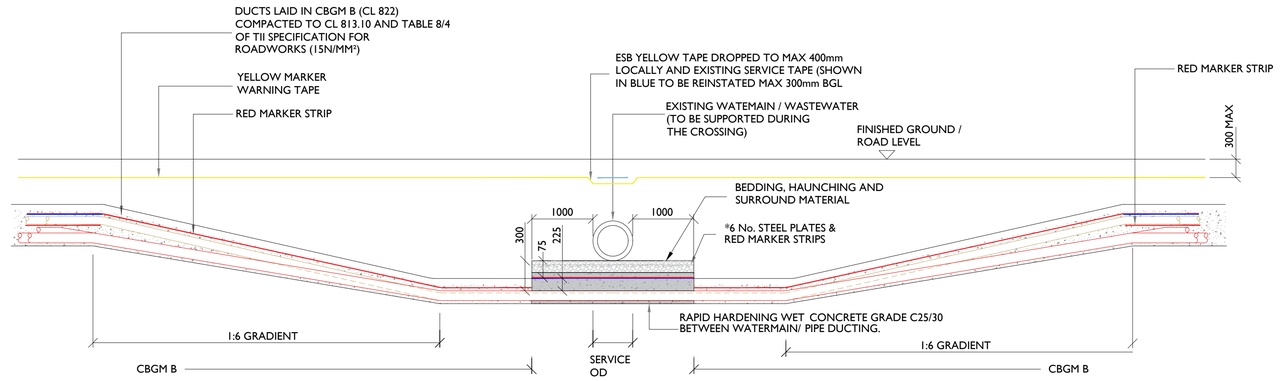
SHEET TITLE

Trench Sections For Overcrossing under Culverts/Services

SHEET NUMBER

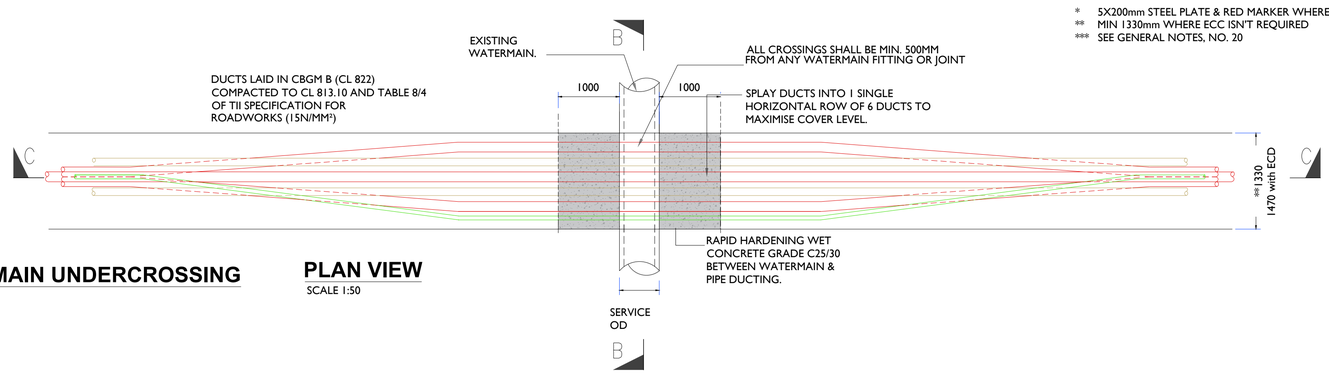
05783-DR-117

ISO A1 594mm x 841mm



SECTION A-A

SCALE 1:50



* 5X200mm STEEL PLATE & RED MARKER WHERE ECC ISN'T REQUIRED
** MIN 1330mm WHERE ECC ISN'T REQUIRED
*** SEE GENERAL NOTES, NO. 20

WATERMAIN UNDERCROSSING

PLAN VIEW

SCALE 1:50

GENERAL NOTES

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11. **ESB's preference is to cross under existing services where possible.**
12. Backfill as per guidelines for the opening, backfilling and reinstatement of openings in public roads (2015)
13. As per WIS 4-08-02 & IGN 4-08-01 granular material shall be 14mm to 5mm graded aggregate or 10mm single sized aggregate
14. If any Watermains are damaged during construction they will be replaced in full. camera scoping will be completed before and after the works.
15. The Contractor is responsible for the design and construction of all temporary works. The Contractor shall appoint a temporary works designer, and submit temporary works design to PSDP for review.
16. 225mm minimum concrete over ducts where they transition from standard cross section and where they are at less than standard cover to ground level.
17. Replace existing service marker tape over ESB yellow marker tape.
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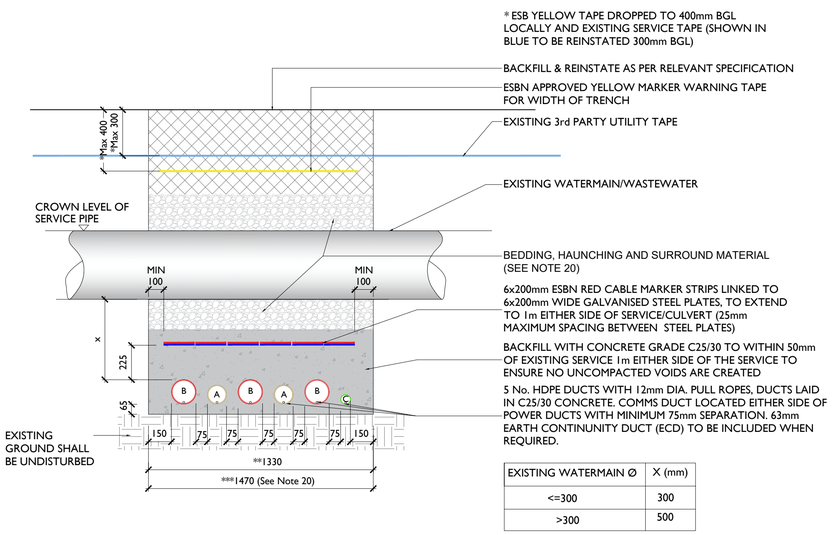
19. The Contractor shall record detailed as-built information as per the specification. At all crossing locations these records shall include photographic evidence clearly demonstrating that minimum service clearances and duct separations have been achieved.
20. Where duct for Earth Continuity Conductor (ECC) is required for single point bonded sections, attach the 63mm ECC duct to the A duct and update the trench width accordingly.



EXISTING WATERMAIN Ø	X (mm)
<=300	300
>300	500

SECTION B-B

SCALE: 1:20

A = 125mm OUTER DIAMETER HDPE ESB APPROVED COMMS DUCT, SDR=17.6
B = 160mm OUTER DIAMETER HDPE ESB APPROVED POWER DUCT, SDR=21
C = 63mm OUTER DIAMETER HDPE FOR EARTH CONTINUITY CONDUCTOR

Project Management Initials: Designer: JC Checked: GC Approved: DB

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PROJECT

Knockshanvo Wind Farm

110kV Grid Connection

CLIENT

MKO

CONSULTANTS

NOTES: -

LEGEND: -

- 160mm Ø HDPE POWER DUCT WITH 12mm DIAMTER PULL ROPE
- 125mm Ø HDPE COMMUNICATION DUCT WITH 12mm DIAMTER PULL ROPE
- 63mm Ø HDPE EARTH CONTINUITY CONDUCTOR WITH12mm DIAMTER PULL ROPE
- RED MARKER STRIP OR STEEL PLATES
- YELLOW MARKER WARNING TAPE
- 6mm GALVANISED STEEL PLATE
- EXISTING SERVICE TAPE

ISSUE/REVISION

I/R	DATE	DESCRIPTION
P1	10.11.23	Issued for Planning

PROJECT NUMBER

05-783

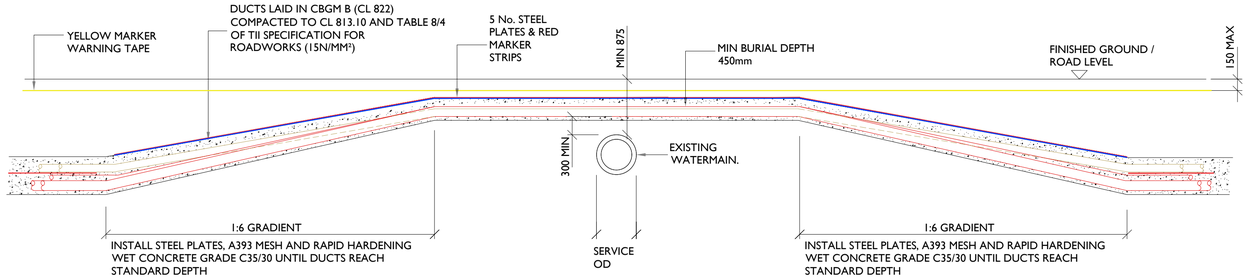
SHEET TITLE

Trench Sections For Undercrossing Existing Watermain/Wastewater

SHEET NUMBER

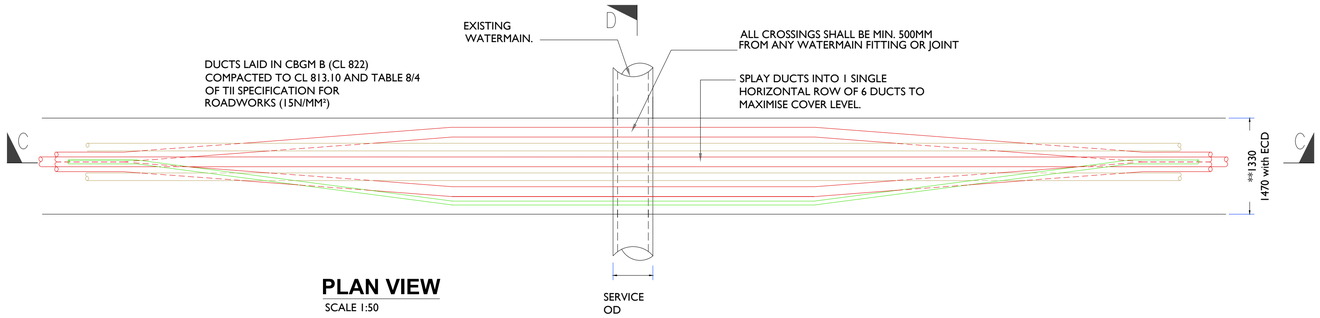
05783-DR-118

ISO A1 594mm x 841mm



SECTION C-C
SCALE 1:50

* 5X200mm STEEL PLATE & RED MARKER WHERE ECC ISN'T REQUIRED
** MIN 1330mm WHERE ECC ISN'T REQUIRED
*** SEE GENERAL NOTES, NO. 20



PLAN VIEW
SCALE 1:50

WATERMAIN OVERCROSSING

GENERAL NOTES

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2. This drawing is to be read in conjunction with all other relevant documentation.
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4. All dimensions are in millimetres, all chainages, levels and co-ordinates are in metres unless defined otherwise.
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6. Hand dig only within 500mm of existing services.
7. If compacting CBGM B could cause damage to the culvert / service below, use rapid hardening cement grade C25/30 following engineers prior approval.
8. For standard trench cross section drawings and minimum horizontal separation to existing services, see 05783-DR-110 (TREFOIL) and 05783-DR-113 (FLAT).
9. Where depths exceed 2500mm to the top of duct the Contractor shall consult the cable system design engineer for phase spacing requirements.
10. Backfill as per guidelines for the opening, backfilling and reinstatement of openings in public roads (2015).
11. **ESB's preference is to cross under existing services where possible.**
12. Backfill as per guidelines for the opening, backfilling and reinstatement of openings in public roads (2015)
13. As per WIS 4-08-02 & IGN 4-08-01 granular material shall be 14mm to 5mm graded aggregate or 10mm single sized aggregate
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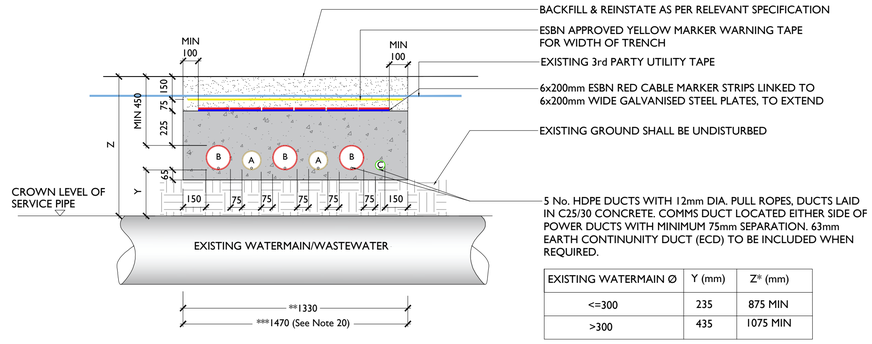

EXISTING WATERMAIN Ø	Y (mm)	Z* (mm)
<=300	235	875 MIN
>300	435	1075 MIN

* ALL EXISTING SERVICES WITH COVERS LESS THAN MIN. DIMENSIONS ABOVE SHALL BE CROSSED BY UNDERCROSSING METHOD

A = 125mm OUTER DIAMETER HDPE ESB APPROVED COMMS DUCT, SDR=17.6
B = 160mm OUTER DIAMETER HDPE ESB APPROVED POWER DUCT, SDR=21
C = 63mm OUTER DIAMETER HDPE FOR EARTH CONTINUITY CONDUCTOR

SECTION D-D
SCALE: 1:20

Project Management Initials: Designer: JC Checked: GC Approved: DB

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PROJECT

Knockshanvo Wind Farm
110kV Grid Connection

CLIENT

MKO

CONSULTANTS

NOTES: -

LEGEND: -

- 160mm Ø HDPE POWER DUCT WITH 12mm DIAMTER PULL ROPE
- 125mm Ø HDPE COMMUNICATION DUCT WITH 12mm DIAMTER PULL ROPE
- 63mm Ø HDPE EARTH CONTINUITY CONDUCTOR WITH12mm DIAMTER PULL ROPE
- RED MARKER STRIP OR STEEL PLATES
- YELLOW MARKER WARNING TAPE
- 6mm GALVANISED STEEL PLATE
- EXISTING SERVICE TAPE

ISSUE/REVISION

P1	10.11.23	Issued for Planning
I/R	DATE	DESCRIPTION

PROJECT NUMBER

05-783

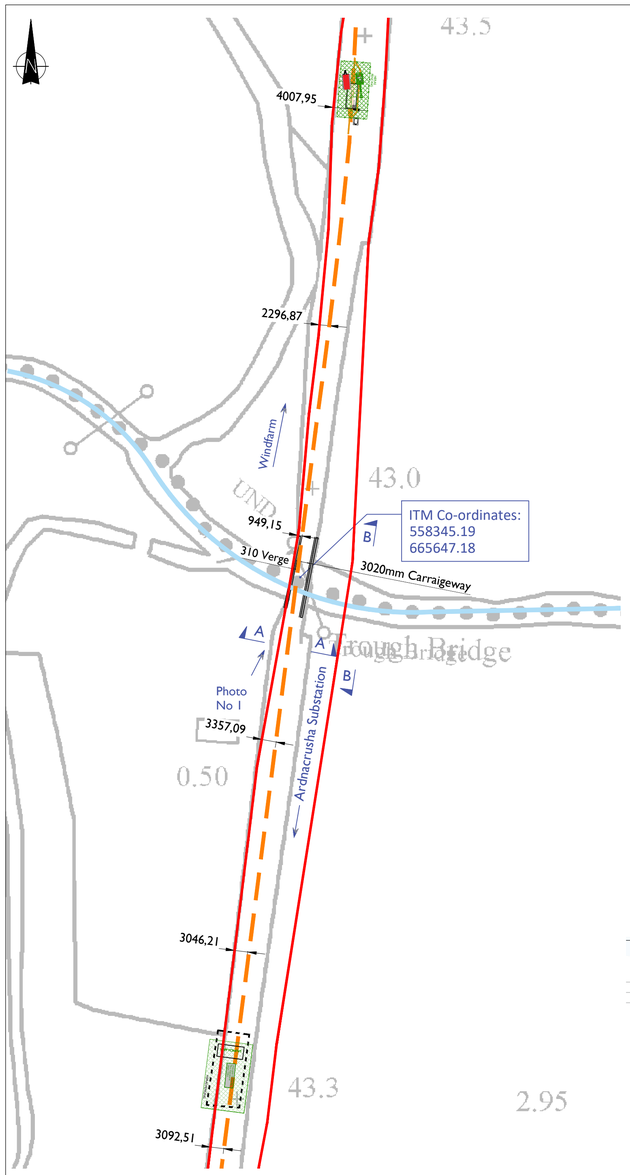
SHEET TITLE

Trench Sections For Undercrossing Existing Watermain/Wastewater

SHEET NUMBER

05783-DR-119

ISO A2 420mm x 594mm



Map Series:
Prime Data Vector

Reference No.'s
4444, 4503, 4563, 4622

Ordnance Survey Ireland Licence No.
CYAL50261649

Copyright:
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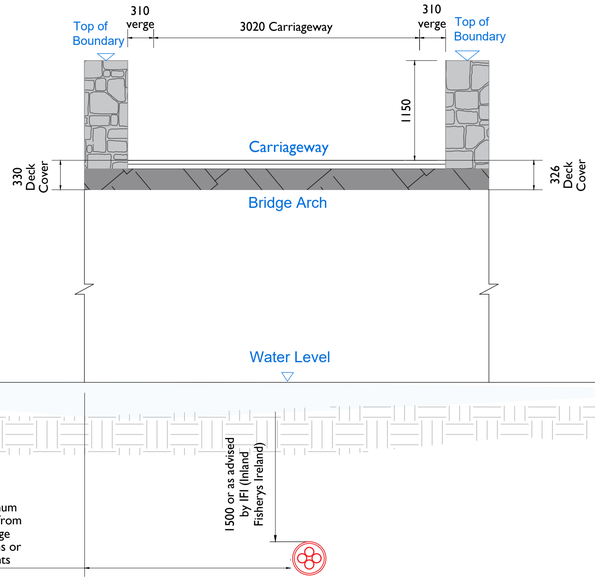
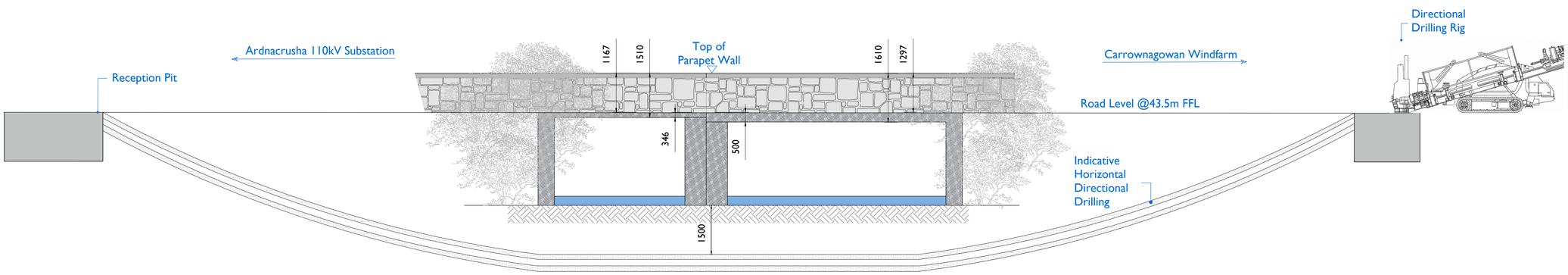
Photo No 1



Plan View Bridge No 1
Scale : 1:1000

Section A-A
Scale : 1:50



Section B-B
Scale : 1:100

tli GROUP

Head Office
Beenreigh, Abbeydorney,
Tralee, Co. Kerry, Ireland
Tel: 00353 66 7135710

PROJECT

Knockshanvo Wind Farm
110kV Grid Connection

CLIENT

MKO

CONSULTANTS

NOTES: -

- No structural bridge surveys have been carried out and the proposal s are subject to detailed design.
- Bridge crossing designs will be submitted to Clare Co. Council for review.
- Drawings are in compliance with ESBN specification requirements for shallow formation, bridge crossings, etc.
- HDD launch and reception pits locations to be determined following site investigations.

LEGEND: -

110kV Underground Cable Design Route

Planning Boundary shown thus

Existing River Network denoted as

Temporary Compound Drilling Area

ISSUE/REVISION

P2	05.06.24	Issued for Planning
P1	10.11.23	Issued for Planning
I/R	DATE	DESCRIPTION

PROJECT NUMBER

05-783

SHEET TITLE

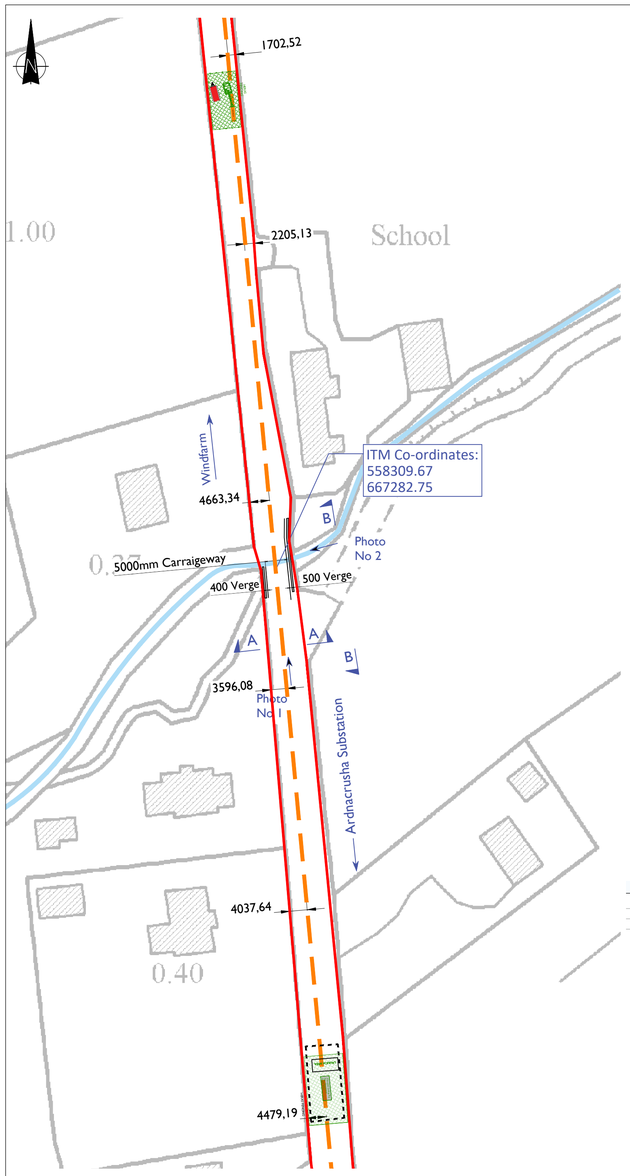
Bridge 1 - Proposed Crossing Details

SHEET NUMBER

05783-DR-120

Project Management Initials: Designer: JC Checked: GC Approved: DB

ISO A2 420mm x 594mm



Plan View Bridge No 2

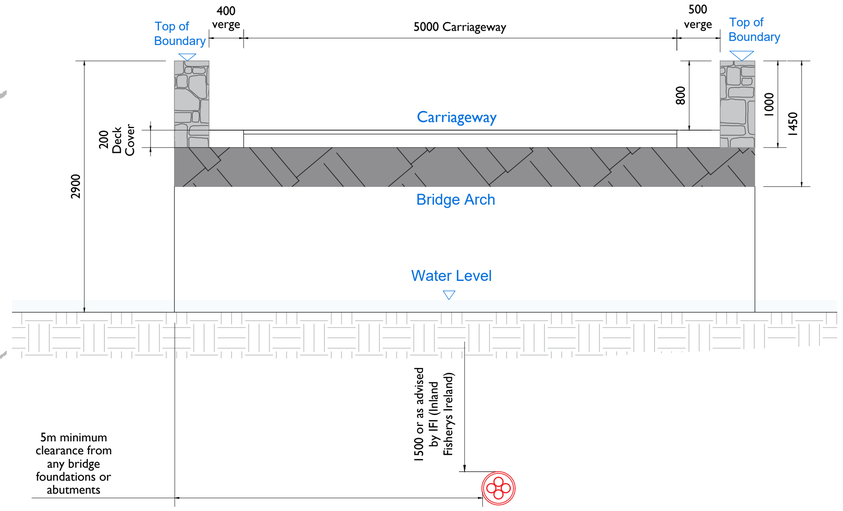
Scale : 1:1000

Map Series:
Prime Data Vector

Reference No.'s
4444, 4503, 4563, 4622

Ordnance Survey Ireland Licence No.
CYAL50261649

Copyright:
© Tailte Éireann, 2023

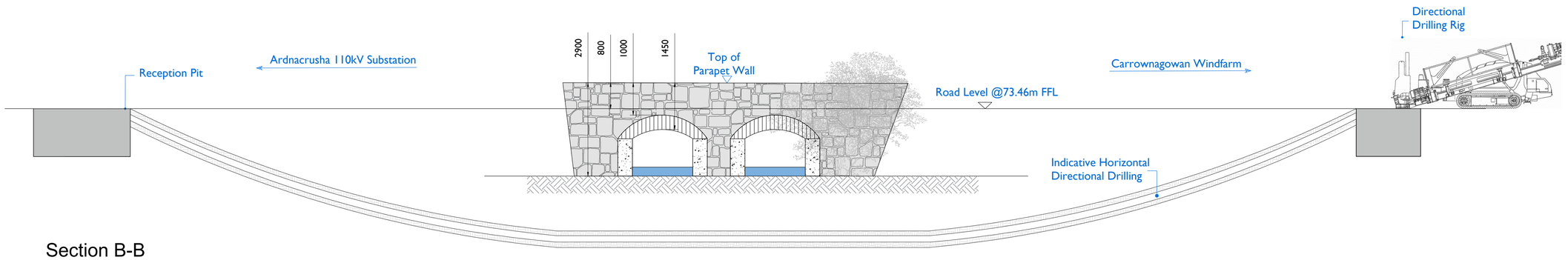


Section A-A

Scale : 1:50

Photo No 1

Photo No 2



Section B-B

Scale : 1:100

tli GROUP

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PROJECT

Knockshanvo Wind Farm

110kV Grid Connection

CLIENT

MKO

CONSULTANTS

NOTES: -

- No structural bridge surveys have been carried out and the proposal s are subject to detailed design.
- Bridge crossing designs will be submitted to Clare Co. Council for review.
- Drawings are in compliance with ESBN specification requirements for shallow formation, bridge crossings, etc.
- HDD launch and reception pits locations to be determined following site investigations.

LEGEND: -

110kV Underground Cable Design Route

Planning Boundary shown thus

Existing River Network denoted as

Temporary Compound Drilling Area

ISSUE/REVISION

P2	05.06.24	Issued for Planning
P1	10.11.23	Issued for Planning
I/R	DATE	DESCRIPTION

PROJECT NUMBER

05-783

SHEET TITLE

Bridge 2 - Proposed Crossing Details

SHEET NUMBER

05783-DR-121

Project Management Initials: Designer: JC Checked: GC Approved: DB

LEGEND:

SECUGRID 40/40 GEOGRID

TENSAR Tx160 GEOGRID

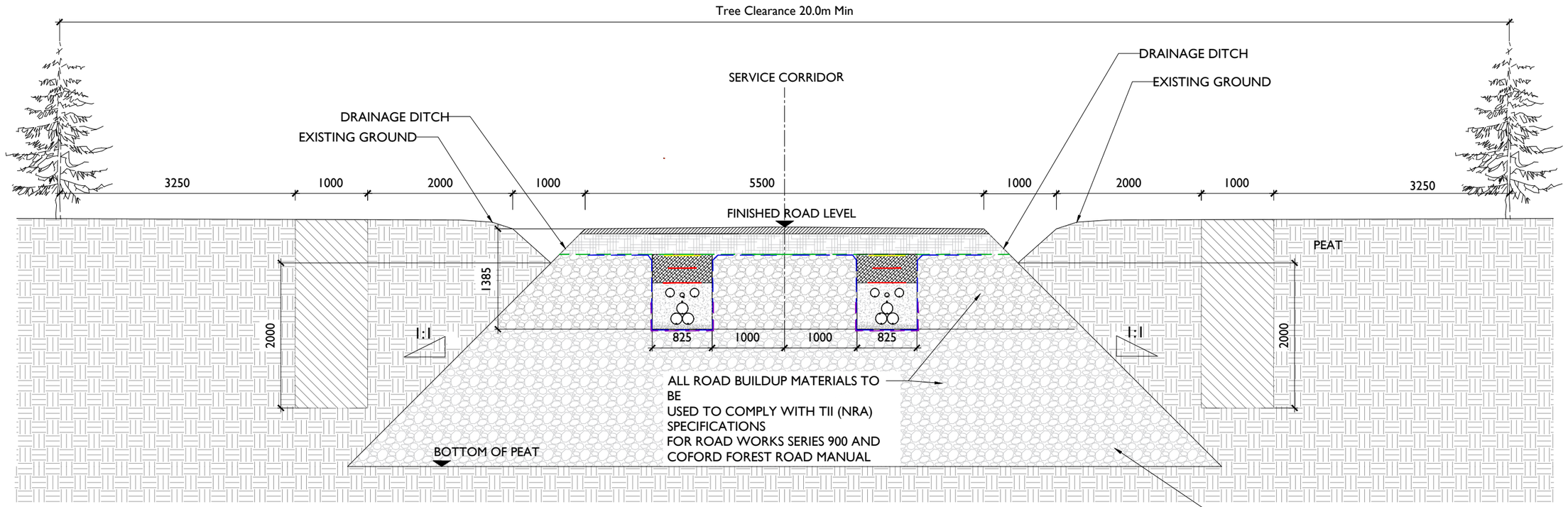
GEOTEXTILE

BASE WEARING COURSE

PEAT COMPOSITION

EXISTING MATERIAL

NEW ROAD BUILD UP MATERIAL



NOTE: THIS DRAWING IS FOR PEAT DEPTHS BELOW 2.5m
CABLE LOCATION SHOWN ARE INDICATIVE AND SUBJECT TO CHANGE DURING DETAIL DESIGN

Forestry Fire-Break Road Section

Scale : 1:30

Note:
1. This drawing is subject to planning approval and should not be used for construction.
2. This drawing is to be read in conjunction with relevant drawings, specifications and reports.
3. Dimensions are in millimeters, unless noted otherwise.
4. Drawings are not to be scaled use figured dimensions only.
5. Underground cable circuit spacing to be determined during detailed design, road layout may change during detailed design with site investigation results.

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PROJECT
Knockshanvo Wind Farm
110kV Grid Connection

PROJECT NUMBER
05-783

SHEET NUMBER
05783-DR-122

SHEET TITLE
Forestry Access Road with Service Corridor through existing Fire Break

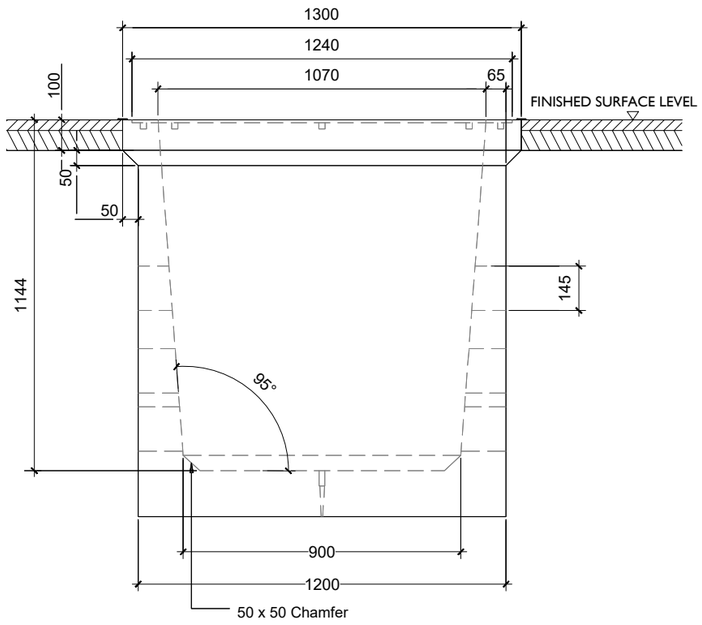
DRAWING STATUS
For Planning

ISSUE/REVISION

I/R	DATE	DESCRIPTION
P1	10.11.23	Issued for Planning

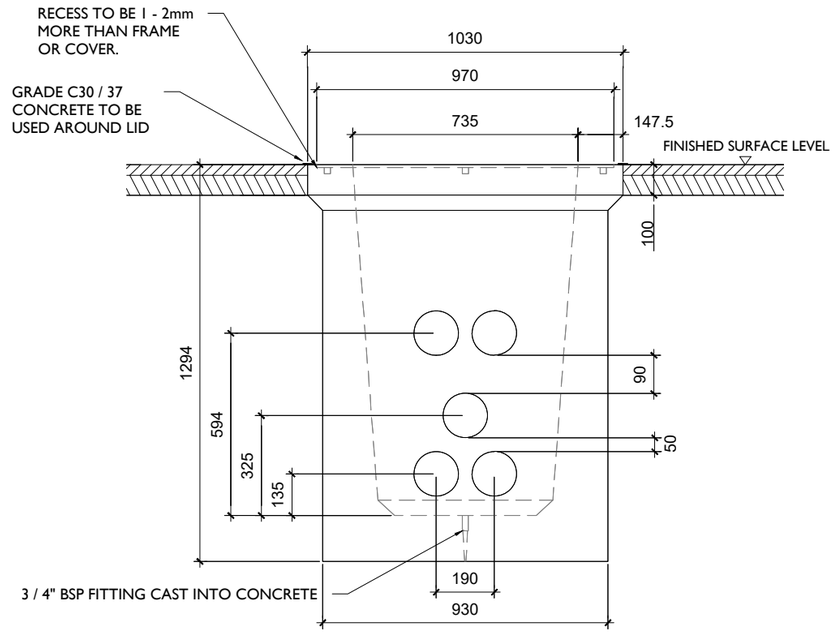
NOTES;

1. ALL DIMENSION IN MILLISMETERS UNLESS OTHERWISE STATED
2. REINSTATEMENTS TO COMPLY WITH REQUIREMENTS OF THE RELEVANT LOCAL AUTHORITY/ASSET OWNER
3. ENTRANCE AND EXIT DUCTS TO BE IN LINE
4. ALL MATERIALS AND WORKMANSHIP TO BE IN ACCORDANCE WITH NRA/T.I.I. SPECIFICATION FOR ROADWORKS, MAY 2005 & SUBSEQUENT REVISIONS
5. REINFORCED CONCRETE TO BE MINIMUM GRADE C32 / 40, SULPHATE RESISTING CEMENT TO BE USED WHERE AGGRESSIVE SOIL CONDITIONS APPLY, REFER TO TABLE 6.1 OF THE BRITISH STANDARD 8110.
6. CARRAIGEWAY COVERS AND FRAMES TO BE TO B.S EN 124.
7. ALL COVERS SHALL HAVE "ESB" LOGO INCORPORATED IN THEM TO THE APPROVAL OF EIRGRID
8. STEP IRONS TO BE GOT DIPPED GALVANISED TO B.S 729 AND POSITIONED AS SHOWN ON ANY CHAMBER DEEPER THAN 700mm ON THE END REMOTE FROM ANY SIDE ENTRY DUCT.
9. CONCRETE PRECAST CHAMBER AND COVER TO BE TESTED THROUGH 5 POINTS, 40 TONNES VERTICAL STATIC LOADING TEST BY AN INDEPENDENT TEST COMPANY. IF REQUIRED, FURTHER DETAILS WILL BE PROVIDED BY EIRGRID.
10. FINAL POSITION OF C2 CHAMBERS SHALL BE AGREED WITH EIRGRID
11. IN A FOREST ENVIROMENT, BACKFILL WITH LEAN MIX OUTSIDE THE COVER FRAME WHERE THE ASPHALT IS SHOWN



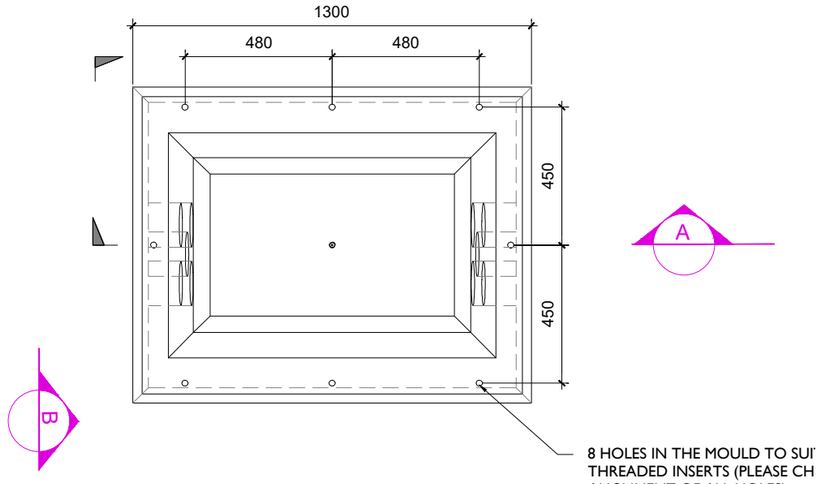
C2 Chamber Detail - Section A

SCALE 1:20



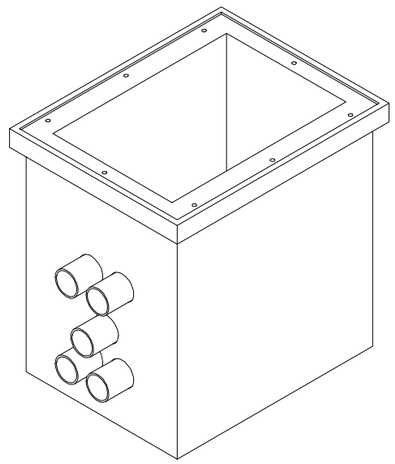
C2 Chamber Detail - Section B

SCALE 1:20



Plan of C2 Chamber

SCALE 1:20



Isometric : C2 Chamber Arrangement

SCALE 1:20

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PROJECT
Knockshanvo Wind Farm
110kV Grid Connection

PROJECT NUMBER
05-783

SHEET NUMBER
05783-DR-123

SHEET TITLE
Communications
Chamber Details

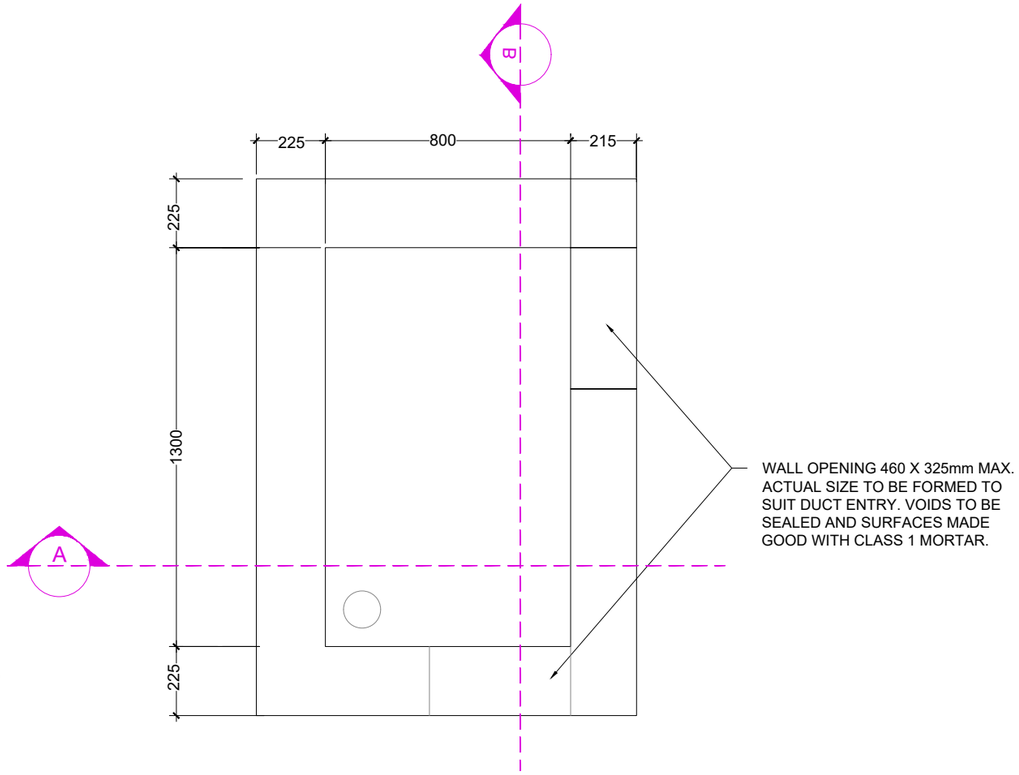
DRAWING STATUS
For Planning

ISSUE/REVISION

I/R	DATE	DESCRIPTION
P1	10.11.23	Issued for Planning

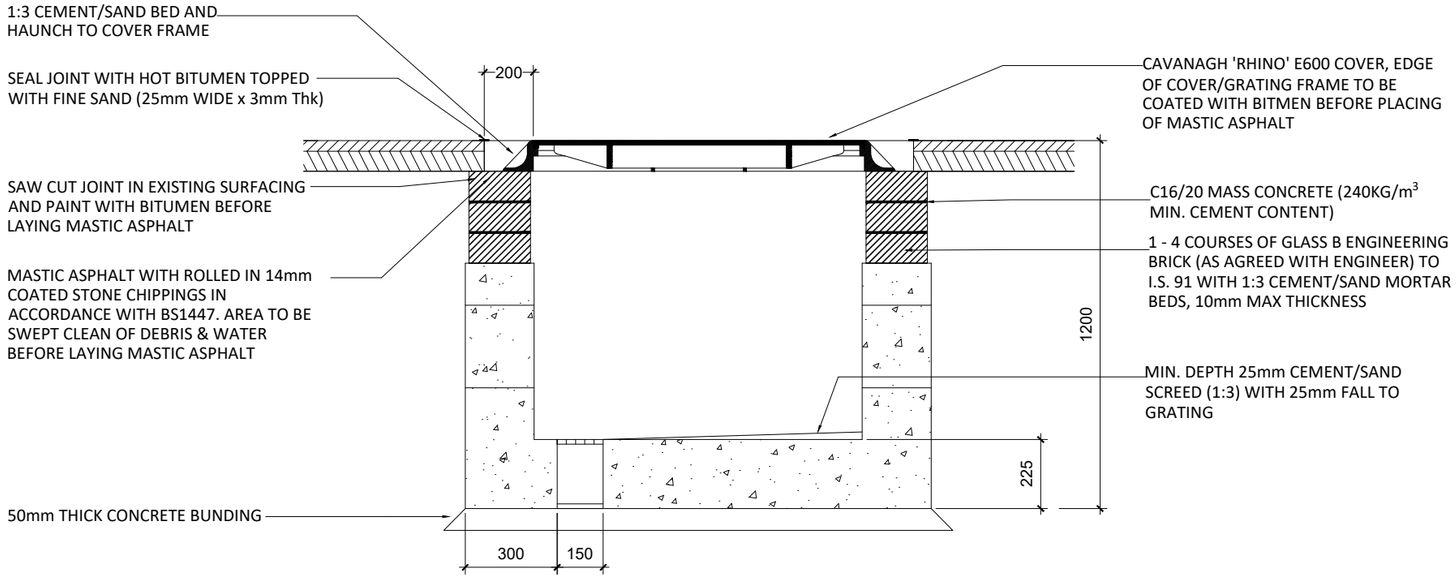
NOTES;

1. ALL DIMENSION IN MILLISMETERS UNLESS OTHERWISE STATED
2. REINSTATEMENTS TO COMPLY WITH REQUIREMENTS OF THE RELEVANT LOCAL AUTHORITY/ASSET OWNER
3. ALL MATERIALS AND WORKMANSHIP TO BE IN ACCORDANCE WITH NRA/T.I.I. SPECIFICATION FOR ROADWORKS, MAY 2005 & SUBSEQUENT REVISIONS
4. REINFORCED CONCRETE TO BE MINIMUM GRADE C32 / 40, SULPHATE RESISTING CEMENT TO BE USED WHERE AGGRESSIVE SOIL CONDITIONS APPLY, REFER TO TABLE 6.1 OF THE BRITISH STANDARD 8110.
5. CARRAIGEWAY COVERS AND FRAMES TO BE TO B.S EN 124.
6. ALL COVERS SHALL HAVE "ESB" LOGO INCORPORATED IN THEM TO THE APPROVAL OF EIRGRID
7. FURTHER DETAILS WILL BE PROVIDED BY EIRGRID.
8. FINAL POSITION OF EARTH LINK CHAMBERS SHALL BE AGREED WITH EIRGRID



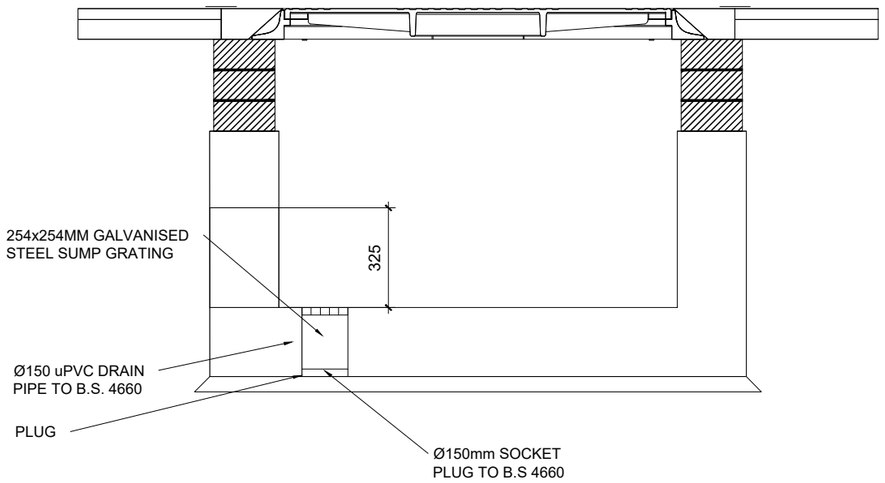
Plan of Earth Link Chamber

SCALE 1:20



Earth Link Chamber - Section A

SCALE 1:20



Earth Link Chamber - Section B

SCALE 1:20

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PROJECT
Knockshanvo Wind Farm
110kV Grid Connection

PROJECT NUMBER
05-783

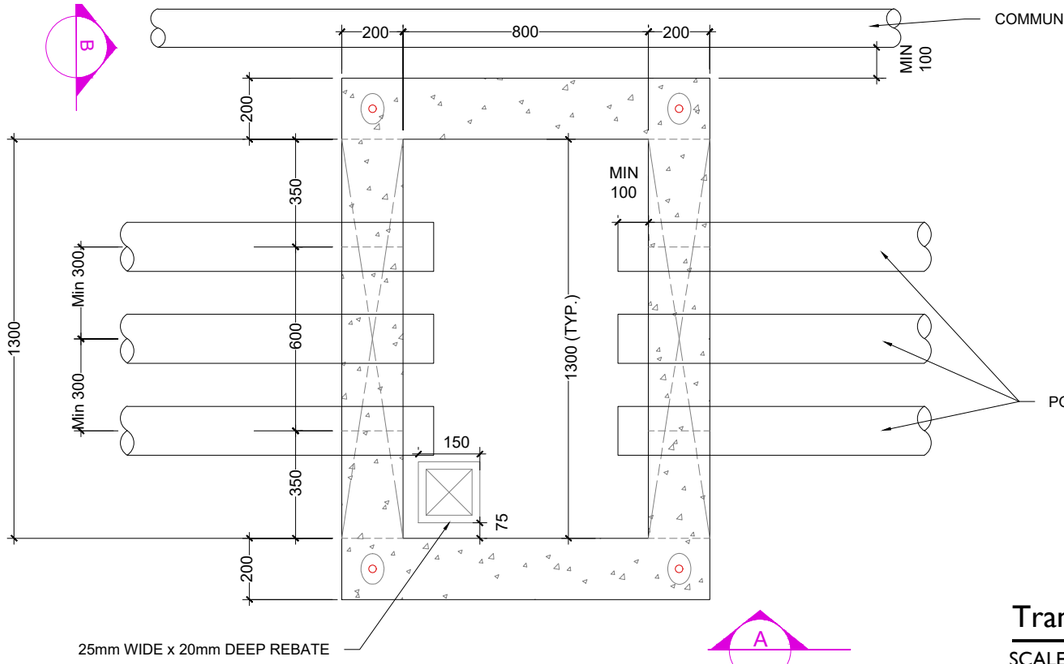
SHEET NUMBER
05783-DR-124

SHEET TITLE
Earth Link
Chamber Details

DRAWING STATUS
For Information

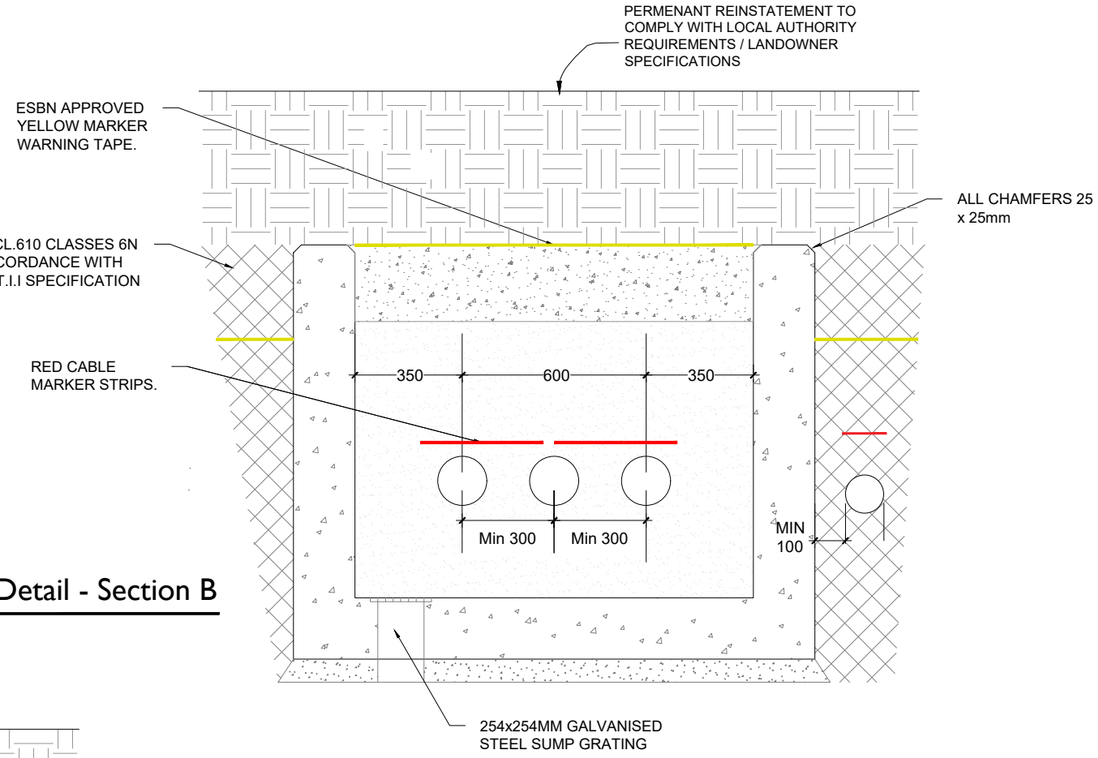
ISSUE/REVISION

I/R	DATE	DESCRIPTION
P1	10.11.23	Issued for Planning



Plan of Transition Chamber

SCALE 1:20

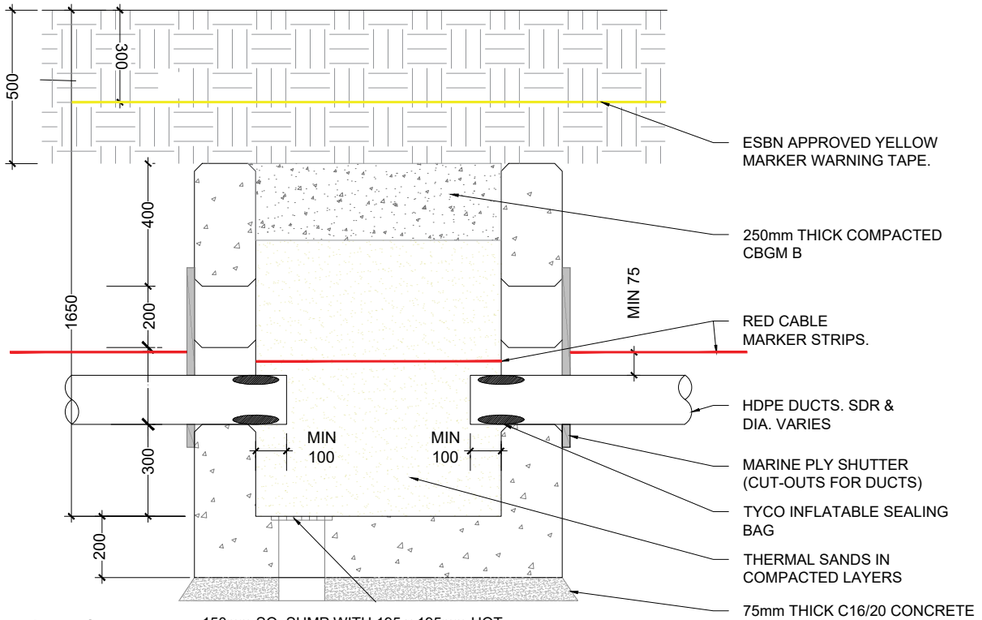


Transition Chamber Detail - Section B

SCALE 1:20

NOTES;

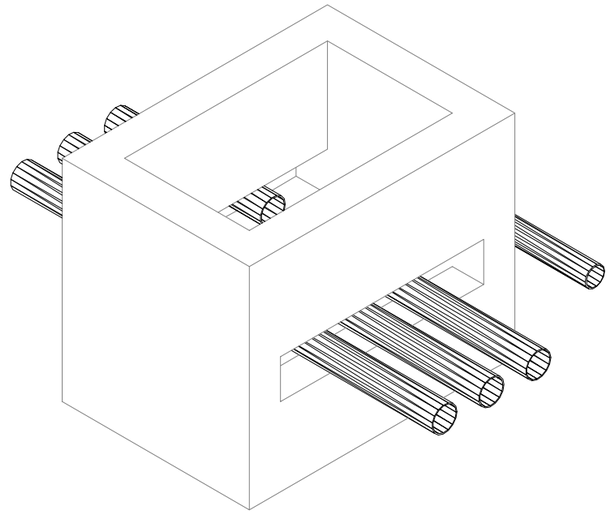
1. ALL DIMENSION IN MILLIMETERS UNLESS OTHERWISE STATED,
2. TELCOM DUCTS NOT TO BE ROUTED THROUGH TRANSITION CHAMBER
3. IF TRANSITION CHAMBER IS USED TO INTERFACE WITH HDD SECTION, THEN THE TELECOMS DUCT SDR 17.6 SHOULD BE CHAMFERED WHEN COUPLED WITH SDR 11 DUCTS
4. REINSTATEMENTS TO COMPLY WITH REQUIREMENTS OF THE RELEVANT LOCAL AUTHORITY/ASSET OWNER
5. TEMPORARY SUPPORTS TO THE SIDES OF THE EXCAVATION MAY BE REQUIRED DEPENDENT ON THE SUBSOIL,
6. THE CONSTRUCTION SHOWN, IS APPLICABLE ONLY WHERE THE THE SUBSOIL AT FORMATION LEVEL EXCEEDS 100kN/m BEARING CAPACITY
7. ALL MATERIALS AND WORKMANSHIP TO BE IN ACCORDANCE WITH NRA/T.I.I. SPECIFICATION FOR ROADWORKS, MAY 2005 & SUBSEQUENT REVISIONS
8. THE CENTRE LINE OF THE DUCTS ENTERING THE CHAMBER SHALL BE ALIGNED WITH THE DUCTS ON THE OPPOSITE SIDE, SO THAT THE CABLE IS PULLED IN A STRAIGHT LINE
9. DUCTS SHALL APPROACH THE CHAMBER IN A STRAIGHT ALIGNMENT (HORIZONTAL OR VERTICAL) FOR A MINIMUM OF 3 METERS BEFORE THE WALL OPENING
10. CARRAIGEWAY COVERS AND FRAMES TO BE TO B.S EN 124.
11. THE DEPTH FROM GROUND LEVEL TO THE TOP OF WALL CONSTRUCTION SHALL BE 500mm IN CULVATED FIELDS AND GRASSED LANDS.
12. FINAL POSITION OF TRANSITION CHAMBERS SHALL BE AGREED WITH EIRGRID



Transition Chamber Detail - Section A

SCALE 1:20

150mm SQ. SUMP WITH 195 x 195mm HOT DIPPED GALVINISED STEEL SUMP GRATING TO I.S. EN ISO 1461, FOLLOWING BLAST CLEANING TO Sa 2½ TO B.S. 7079 ½ TO B.S. 7079



Isometric : Chamber Arrangement

SCALE 1:20

tli GROUP
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PROJECT
Knockshanvo Wind Farm
110kV Grid Connection

PROJECT NUMBER
05-783

SHEET NUMBER
05783-DR-125

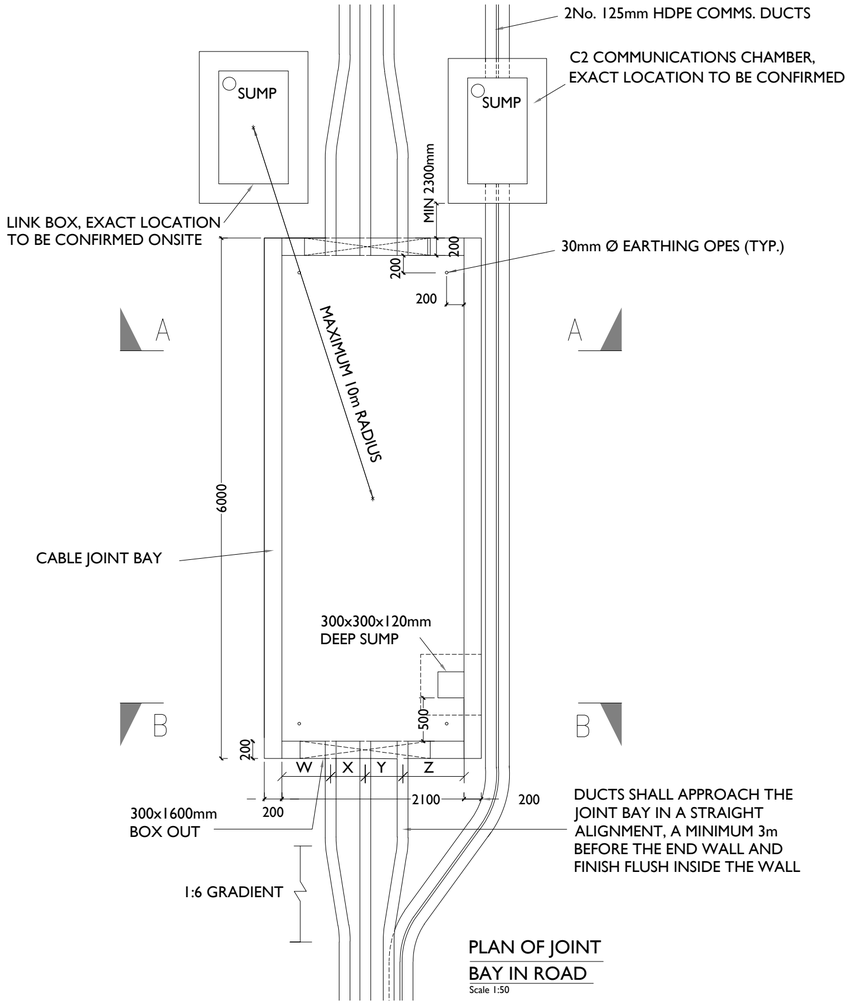
SHEET TITLE
Transition
Chamber Details

DRAWING STATUS
For Information

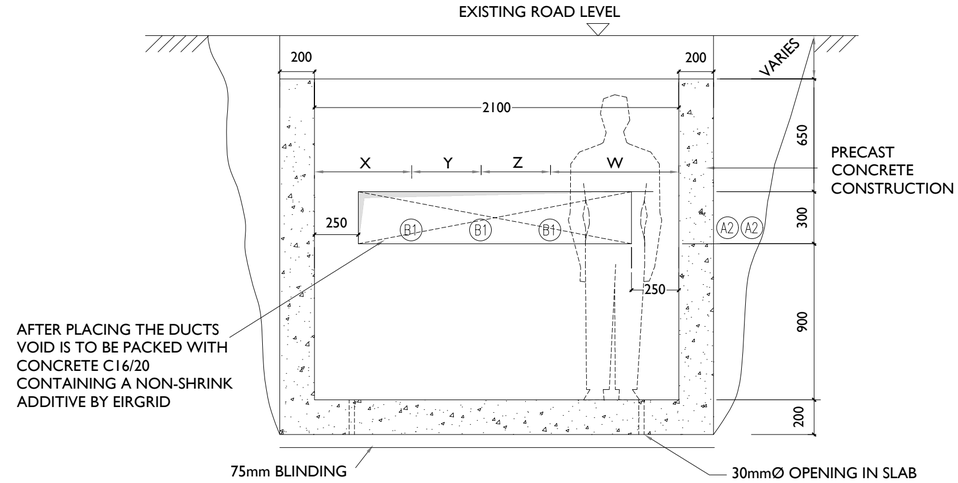
ISSUE/REVISION

I/R	DATE	DESCRIPTION
P1	10.11.23	Issued for Planning

ISO A2 420mm x 594mm



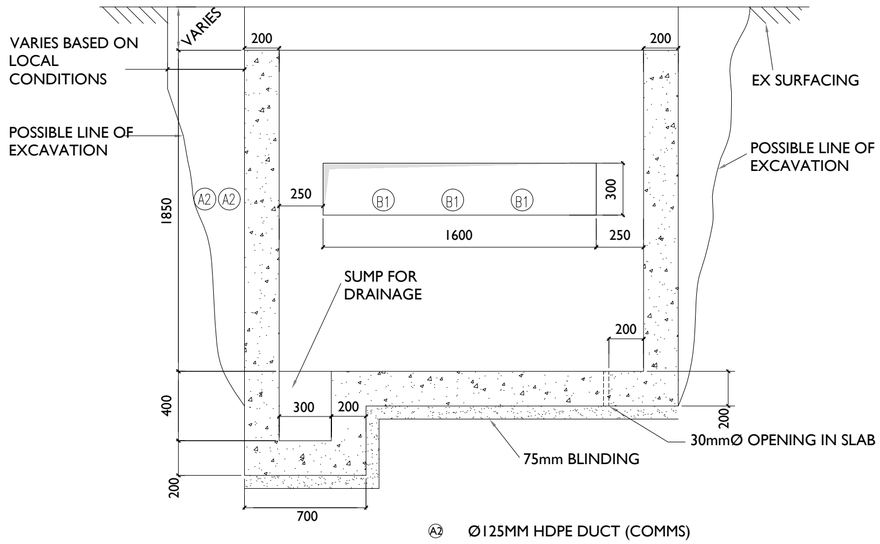
PLAN OF JOINT BAY IN ROAD
Scale 1:50



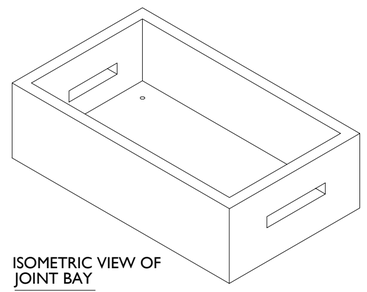
SECTION A-A
Scale 1:25

TABLE 1 - DUCT SEPERATION

	X	Y	Z	W
110kV	560	400	400	760
220kV	375	675	675	375



SECTION B-B
Scale 1:25



ISOMETRIC VIEW OF JOINT BAY
N.T.S.

GENERAL NOTES:

1. THIS DRAWING IS TO BE USED ONLY FOR THE PURPOSE OF ISSUE AND IS SUBJECT TO AMENDMENT.
2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT INFORMATION
3. DO NOT SCALE FROM THIS DRAWING, USE ONLY PRINTED DIMENSIONS.
4. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS DEFINED OTHERWISE.
5. STANDARD FOUNDATIONS ARE BASED ON THE FORMATION AT THE BASE OF THE EXCAVATION SHOWN BEING SUITABLE FOR A MINIMUM BEARING PRESSURE OF 100kN/m2. SUITABILITY OF STANDARD JOINT BAY FOUNDATIONS CAN ONLY BE CONFIRMED FOLLOWING GROUND INVESTIGATION. HAND VANE TESTS SHALL BE REQUIRED AS PER GI SPECIFICATION. WHERE SPECIFIED MINIMUM BEARING PRESSURE IS NOT ACHIEVABLE, AND WHERE PEAT IS ENCOUNTERED, THE CONTRACTOR SHALL REFER TO THE ENGINEER FOR GUIDANCE.
6. THE LENGTH OF BONDING LEAD LENGTH SHALL IN NO CASE EXCEED 10M. NO JOINTS IN BONDING CABLE ARE PERMITTED.
7. ALL EARTHING SHALL BE IN ACCORDANCE WITH ENA ER C55 AND EIRGRID/ESBN FUNCTIONAL SPECIFICATION
8. THE DEPTH FROM GROUND/ROAD LEVELTO THE TOP OF THE CONCRETE WALL SHALL BE
   A. 500MM - IN CULTIVATED FIELDS & GRASS LAND
   B. 300MM - IN PAVED ROADS AND GRASS VERGES
   C. 350MM - IN PAVED CITY ROADS AND GRASS VERGES
9. LINK BOX CHAMBERS TO BE POSITIONED AT THE EDGE OR OFF ROAD
10. LINK BOX CHAMBERS AND C2 COMM CHAMBERS FINAL POSITIONING TO BE AGREED WITH EIRGRID PRIOR TO INSTALLATION

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PROJECT

Knockshanvo Wind Farm
110kV Grid Connection

CLIENT

MKO

CONSULTANTS

NOTES: -

LEGEND: -

ISSUE/REVISION

I/R	DATE	DESCRIPTION
P1	10.11.23	Issued for Planning

PROJECT NUMBER

05-783

SHEET TITLE

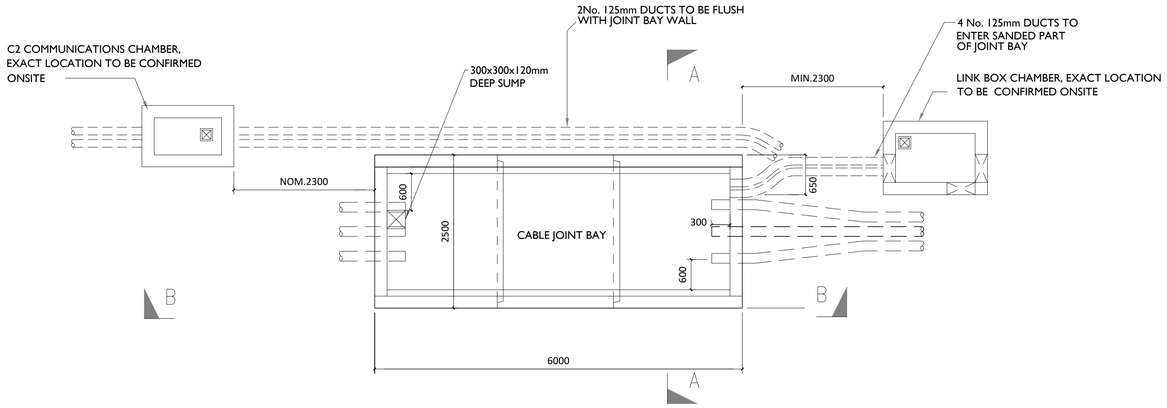
Joint Bay Section Detail

SHEET NUMBER

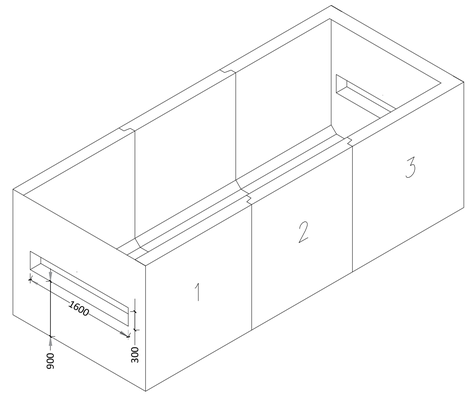
05783-DR-126

Project Management Initials: Designer: JC Checked: GC Approved: DB

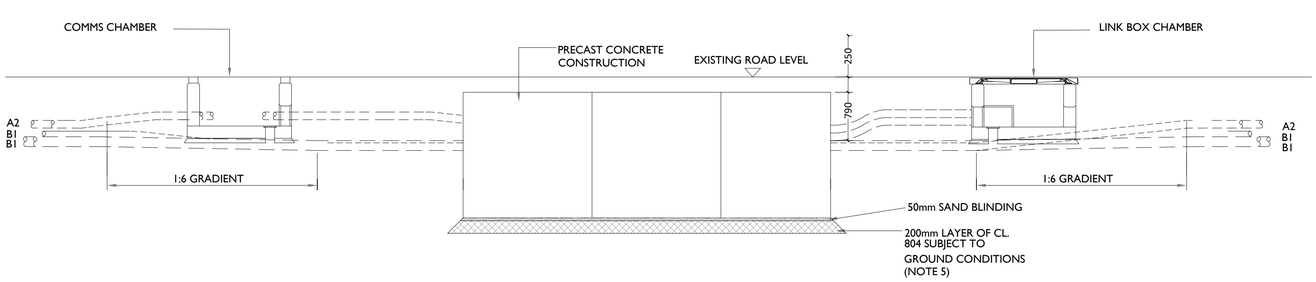
ISO A1 594mm x 841mm



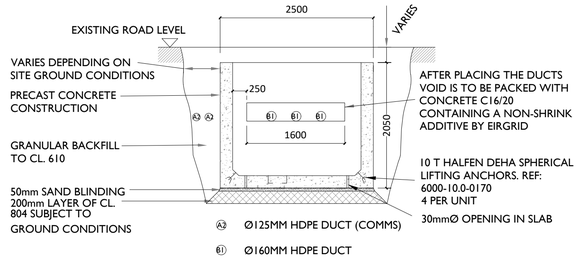
PLAN VIEW
SCALE 1:50



ISOMETRIC VIEW PRECAST CHAMBER
SCALE 1:50



SECTION B-B
SCALE 1:50



SECTION A-A
SCALE 1:50

GENERAL NOTES:
1. THIS DRAWING IS TO BE USED ONLY FOR THE PURPOSE OF ISSUE AND IS SUBJECT TO AMENDMENT.
2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT INFORMATION
3. DO NOT SCALE FROM THIS DRAWING, USE ONLY PRINTED DIMENSIONS.
4. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS DEFINED OTHERWISE.
5. STANDARD FOUNDATIONS ARE BASED ON THE FORMATION AT THE BASE OF THE EXCAVATION SHOWN BEING SUITABLE FOR A MINIMUM BEARING PRESSURE OF 100kN/m2. SUITABILITY OF STANDARD JOINT BAY FOUNDATIONS CAN ONLY BE CONFIRMED FOLLOWING GROUND INVESTIGATION. HAND VANE TESTS SHALL BE REQUIRED AS PER GI SPECIFICATION. WHERE SPECIFIED MINIMUM BEARING PRESSURE IS NOT ACHIEVABLE, AND WHERE PEAT IS ENCOUNTERED, THE CONTRACTOR SHALL REFER TO THE ENGINEER FOR GUIDANCE.
6. THE LENGTH OF BONDING LEAD LENGTH SHALL IN NO CASE EXCEED 10M. NO JOINTS IN BONDING CABLE ARE PERMITTED.
7. ALL EARTHING SHALL BE IN ACCORDANCE WITH ENA ER C55 AND EIRGRID/ESBN FUNCTIONAL SPECIFICATION
8. THE DEPTH FROM GROUND/ROAD LEVELTO THE TOP OF THE CONCRETE WALL SHALL BE
   - A. 500MM - IN CULTIVATED FIELDS & GRASS LAND
   - B. 300MM - IN PAVED ROADS AND GRASS VERGES
   - C. 350MM - IN PAVED CITY ROADS AND GRASS VERGES
9. LINK BOX CHAMBERS TO BE POSITIONED AT THE EDGE OR OFF ROAD
10. LINK BOX CHAMBERS AND C2 COMM CHAMBERS FINAL POSITIONING TO BE AGREED WITH EIRGRID PRIOR TO INSTALLATION

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PROJECT

Knockshanvo Wind Farm
110kV Grid Connection

CLIENT

MKO

CONSULTANTS

NOTES: -
See General Notes

LEGEND: -

ISSUE/REVISION

P1	10.11.23	Issued for Planning
I/R	DATE	DESCRIPTION

PROJECT NUMBER
05-783

SHEET TITLE
110kV Joint Bay General Arrangement and Details

SHEET NUMBER
05783-DR-127

Project Management Initials: Designer: JC Checked: GC Approved: DB

ISO A2 420mm x 594mm

Culvert Crossing Schedule

Culvert No.	Dimensions (mm)	Material	Approx. Cover (mm)	Proposed Crossing Methodology	Photo
1.	350 Ø	HDPE	250	UNDERCROSSING	
2.	300 Ø	HDPE	200	UNDERCROSSING	
3.	400mm Wide x 600mm Deep	Stone	500	UNDERCROSSING	
4.	300 Ø	HDPE	500	UNDERCROSSING	
5.	300 Ø	HDPE	200	UNDERCROSSING	

Project Management Initials: Designer: JC Checked: GC Approved: DB

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PROJECT

Knockshanvo Wind Farm
110kV Grid Connection

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CONSULTANTS

NOTES: -

- No structural surveys have been carried out and the proposals are subject to detailed design.
- Crossings are in compliance with ESBN & Eirgrid specification requirements for shallow formation, min depth, etc.
- Additional culverts may be encountered on the route.

LEGEND: -

ISSUE/REVISION

I/R	DATE	DESCRIPTION
P1	10.11.23	Issued for Planning

PROJECT NUMBER

05-783

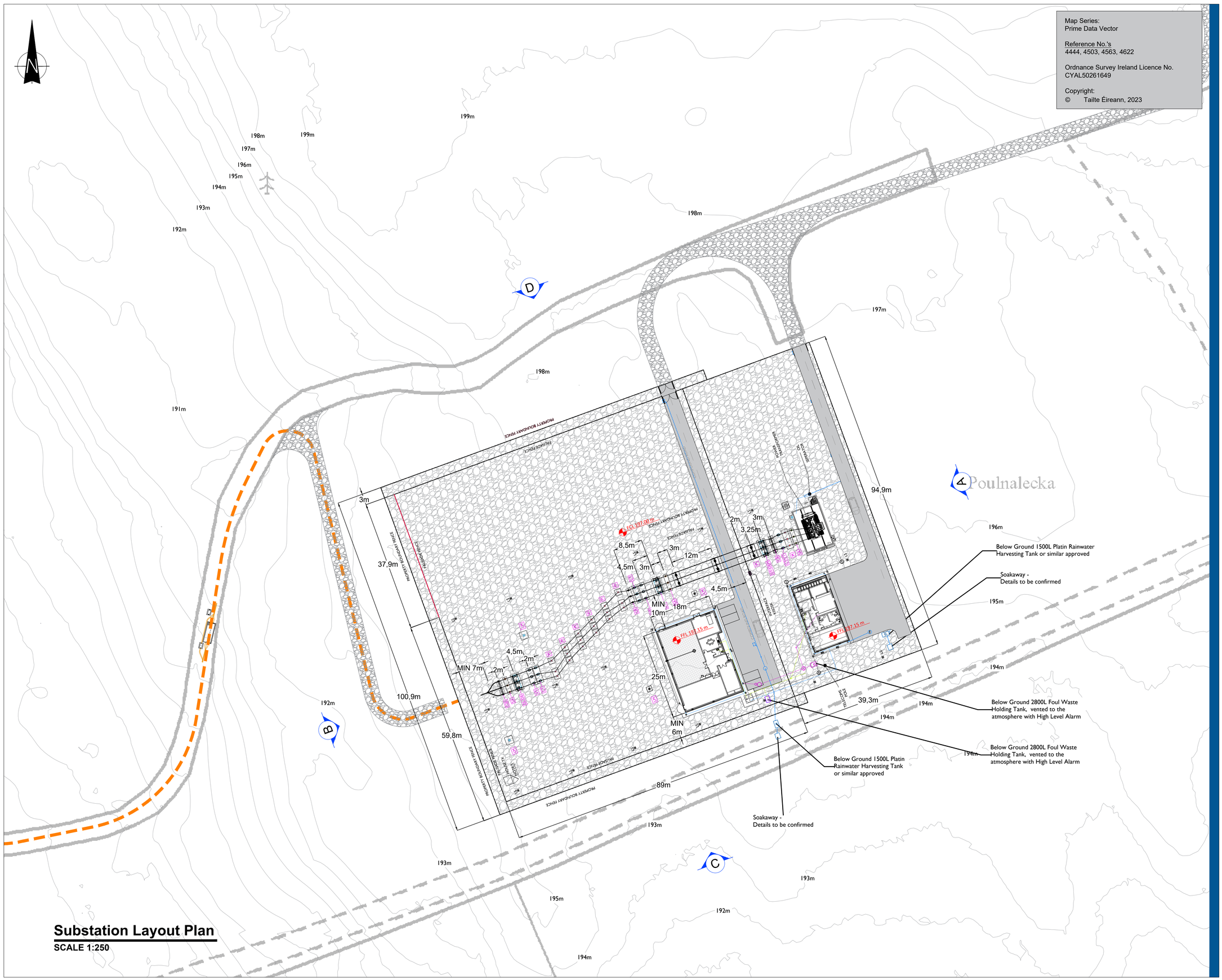
SHEET TITLE

Proposed Culvert Crossings

SHEET NUMBER

05783-DR-240

ISO A1 594mm x 841mm



Substation Layout Plan

SCALE 1:250

Project Management Initials: Designer: JC Checked: GC Approved: DB

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PROJECT

Knockshanvo Wind Farm
110kV Grid Connection

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CONSULTANTS

NOTES: -

- This drawing is to be read in conjunction with relevant drawings, specifications and reports.
- Drawings are not to be scaled use figured dimensions only.
- All levels shown are in m O.D unless noted otherwise.
- For Elevation Ref. to Drawing 05783-DR-151.

LEGEND: -

UG Cable Route shown thus (1.5 km)
Contours 14.0
Access track

ISSUE/REVISION

I/R	DATE	DESCRIPTION
P3	01.08.24	Issued for Planning
P2	05.06.24	Issued for Planning
P1	10.11.22	Issued for Planning

PROJECT NUMBER

05-783

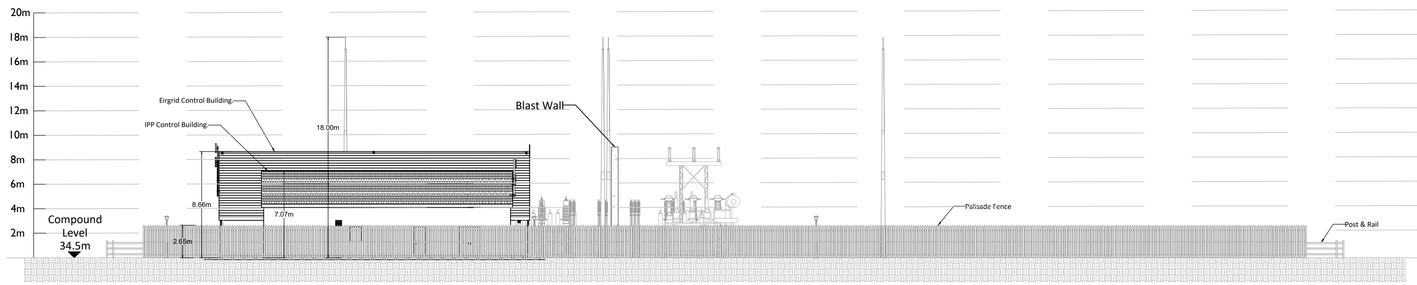
SHEET TITLE

Substation Layout Plan

SHEET NUMBER

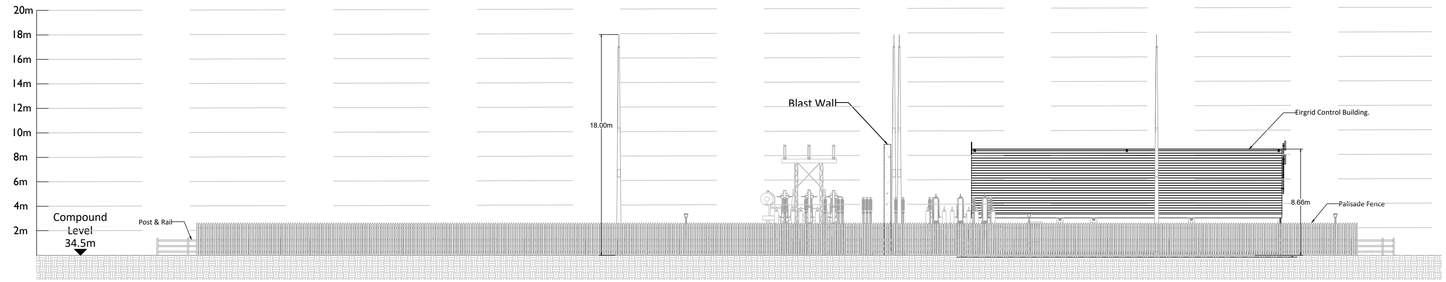
05783-DR-150

ISO A1 594mm x 841mm



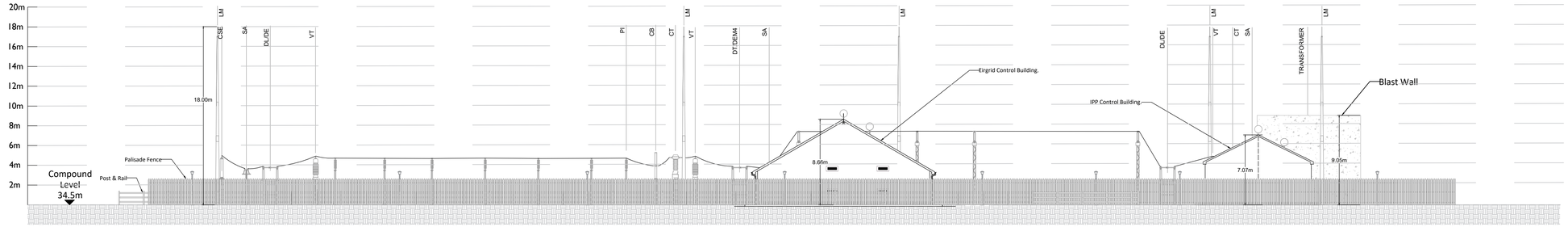
South-East Elevation

SCALE 1:250



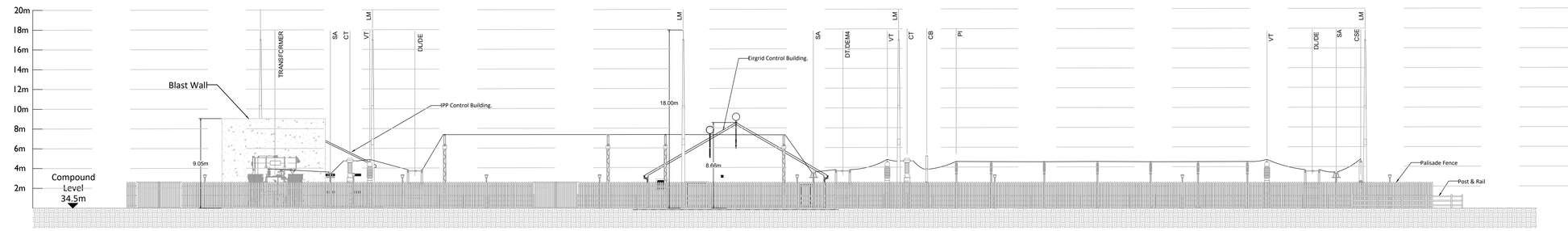
North-West Elevation

SCALE 1:250



North-East Elevation

SCALE 1:250



South-West Elevation

SCALE 1:250

Project Management Initials: Designer: JC Checked: GC Approved: DB

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PROJECT

Knockshanvo Wind Farm
110kV Grid Connection

CLIENT

MKO

CONSULTANTS

NOTES: -

1. Layout and Arrangements of Substation Building and Electrical Equipment is shown indicatively and for illustration purposes only.
2. Dimensions shown are as per current Eirgrid Specifications at the time of submission. Dimensions may vary at time of construction to reflect any revisions to EirGrid Specifications.
3. Final Specifications of Buildings and Electrical Equipment is to be as per EirGrid and ESB Specifications.
4. The Elevation of the Compound is indicative and will be finalised to project design to ensure Cut/Fill Earthworks associated with the construction of the Compound are balanced.

LEGEND: -

	Description
CSE	Cable Sealing End.
SA	Surge Arrester.
DL/DE	Line / Earth Disconnect.
VT	Voltage Transformer.
CT	Current Transformer.
CB	Circuit Breaker.
PI	Post Insulator.
LM	Lightning Mast.

ISSUE/REVISION

P2	05.06.24	Issued for Planning
P1	10.11.22	Issued for Planning
I/R	DATE	DESCRIPTION

PROJECT NUMBER

05-783

SHEET TITLE

Substation Elevations

SHEET NUMBER

05783-DR-151

ISO A1 594mm x 841mm

Finished Ground Level: 197m

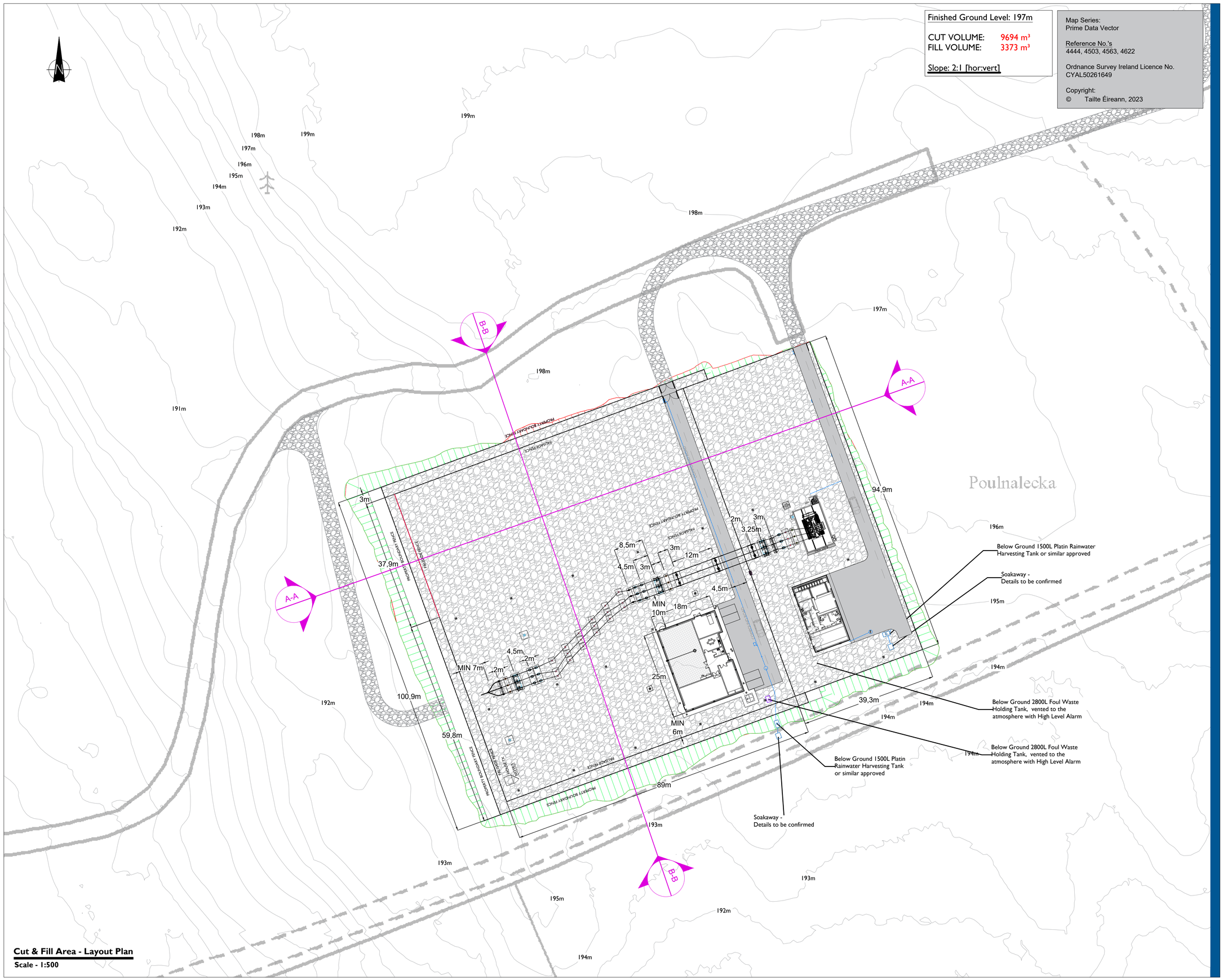
CUT VOLUME: 9694 m³
FILL VOLUME: 3373 m³

Slope: 2:1 [hor:vert]

Map Series:
Prime Data Vector

Reference No.'s
4444, 4503, 4563, 4622

Ordnance Survey Ireland Licence No.
CYAL50261649



Cut & Fill Area - Layout Plan
Scale - 1:500

Project Management Initials: Designer: JC Checked: GC Approved: DB

tli GROUP

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PROJECT

Knockshanvo Wind Farm
110kV Grid Connection

CLIENT

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CONSULTANTS

NOTES: -

- This drawing is to be read in conjuction with relevant drawings, specifications and reports.
- Dimensions are in millimetres, unless noted otherwise.
- Drawings are not to be scaled use figured dimensions only.
- All levels shown are in m O.D unless noted otherwise.

LEGEND: -

Cut Volume
Fill Volume
Access track

ISSUE/REVISION

I/R	DATE	DESCRIPTION
P3	01.08.24	Issued for Planning
P2	05.06.24	Issued for Planning
P1	10.11.22	Issued for Planning

PROJECT NUMBER

05-783

SHEET TITLE

Cut & Fill Area
Layout Plan

SHEET NUMBER

05783-DR-152

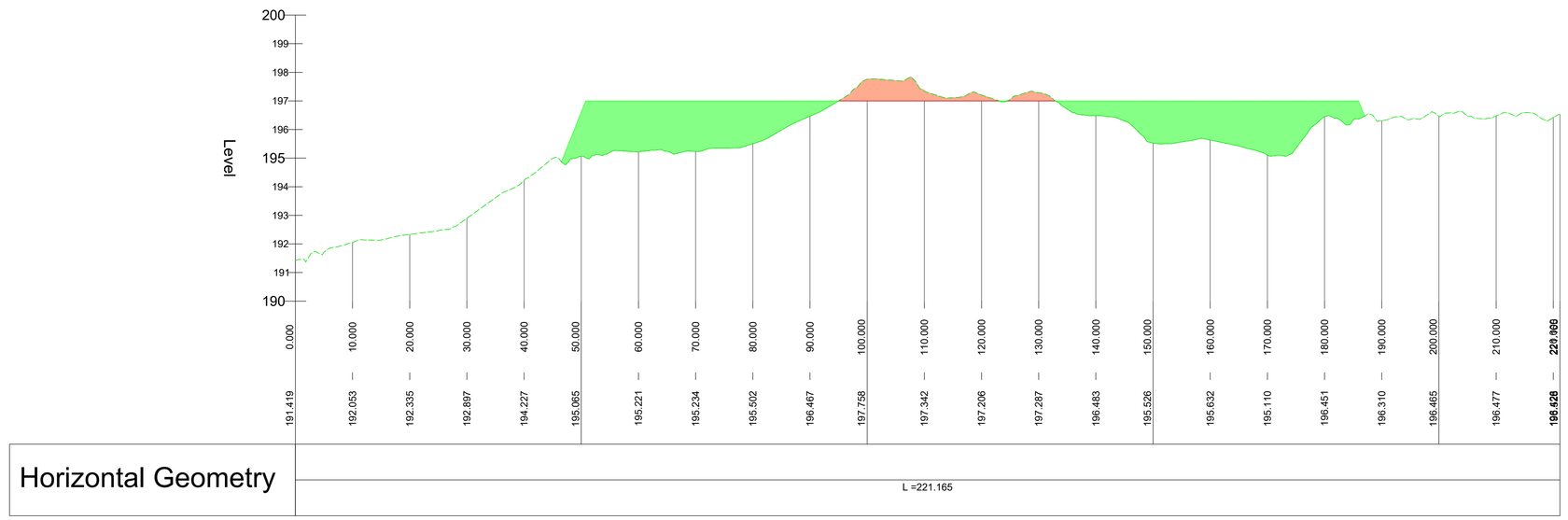
ISO A1 594mm x 841mm

Finished Ground Level: 197m

CUT VOLUME: 9694 m³
FILL VOLUME: 3373 m³

Slope: 2:1 [hor:vert]

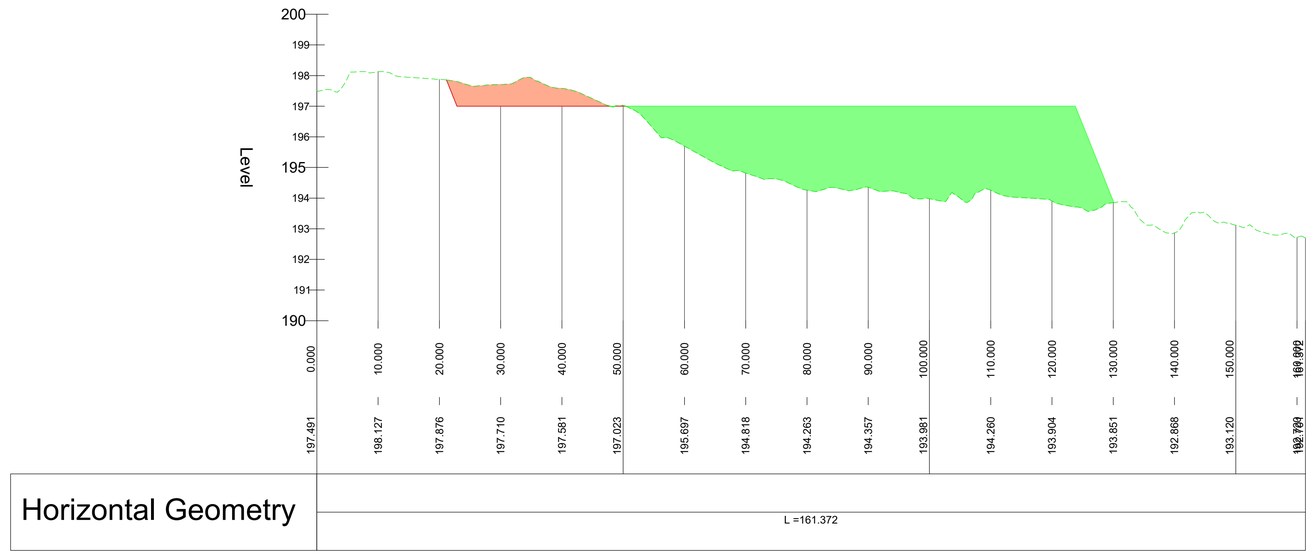
SECTION A-A - LONGSECTION
SCALE: H 1:500,V 1:100. DATUM: 190.000



Section A-A

Scale: - H 1:100 V 1:500

SECTION B-B - LONGSECTION
SCALE: H 1:500,V 1:100. DATUM: 190.000



Section B-B

Scale: - H 1:100 V 1:500

Project Management Initials: Designer: JC Checked: GC Approved: DB

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PROJECT

Knockshanvo Wind Farm
110kV Grid Connection

CLIENT

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CONSULTANTS

NOTES: -

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- Drawings are not to be scaled use figured dimensions only

LEGEND: -

Cut Volume
Fill Volume

ISSUE/REVISION

I/R	DATE	DESCRIPTION
P1	10.11.22	Issued for Planning

PROJECT NUMBER

05-783

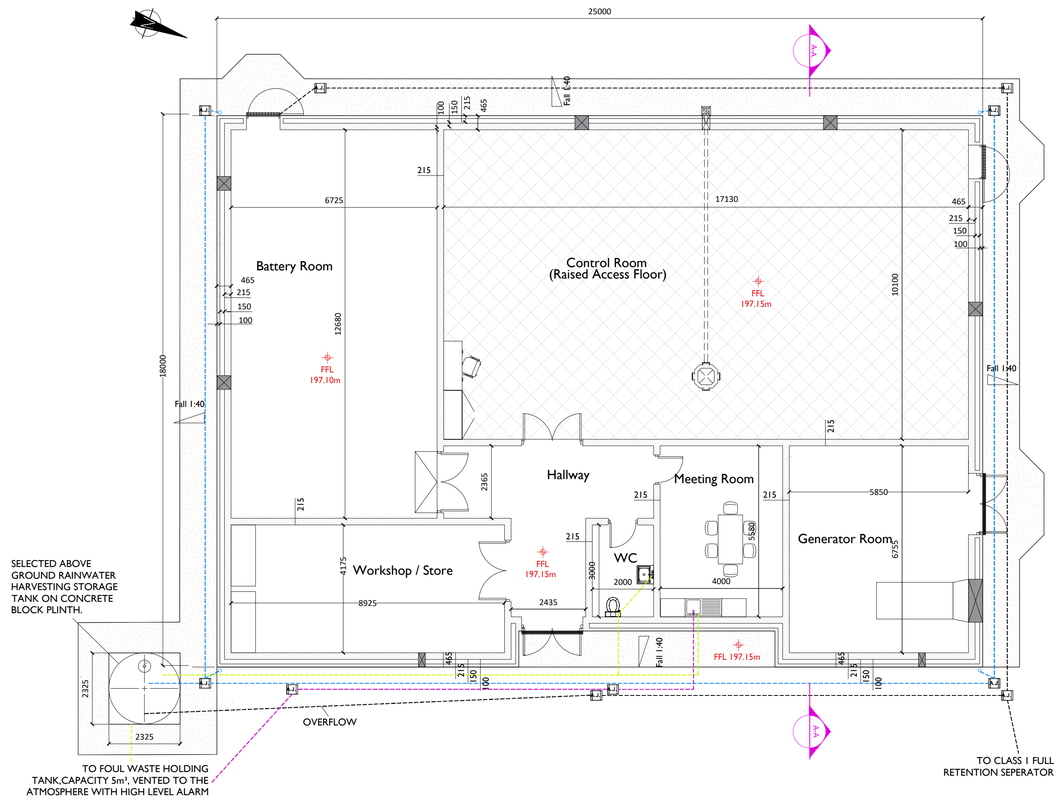
SHEET TITLE

Site Sections

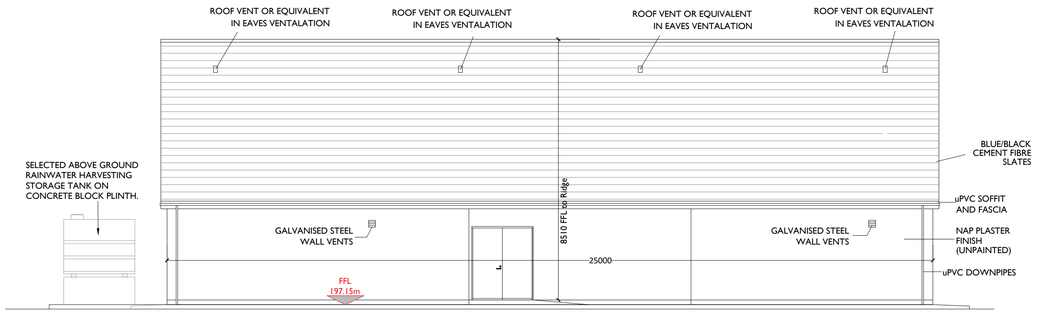
SHEET NUMBER

05783-DR-153

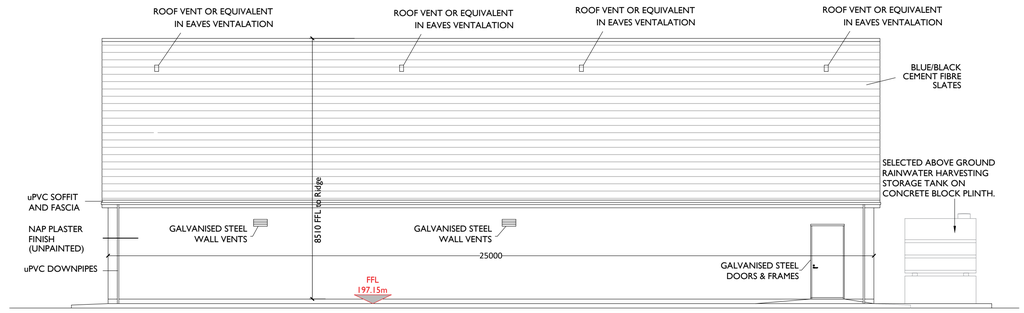
ISO A1 594mm x 841mm



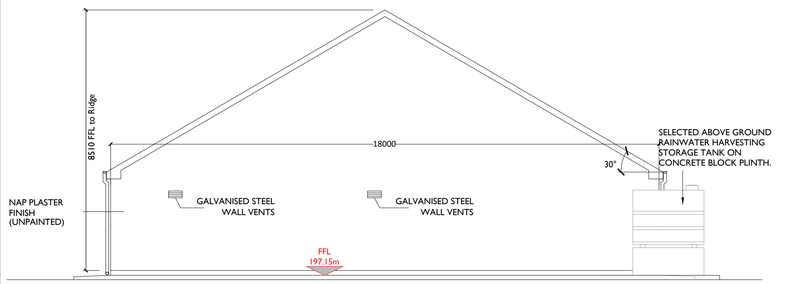
PLAN - CONTROL BUILDING
Scale : 1:100



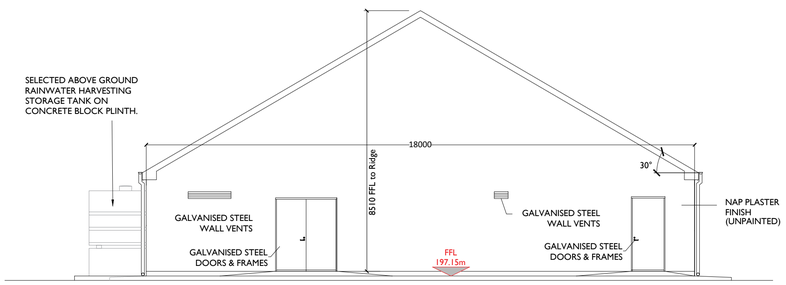
FRONT ELEVATION
Scale : 1:100



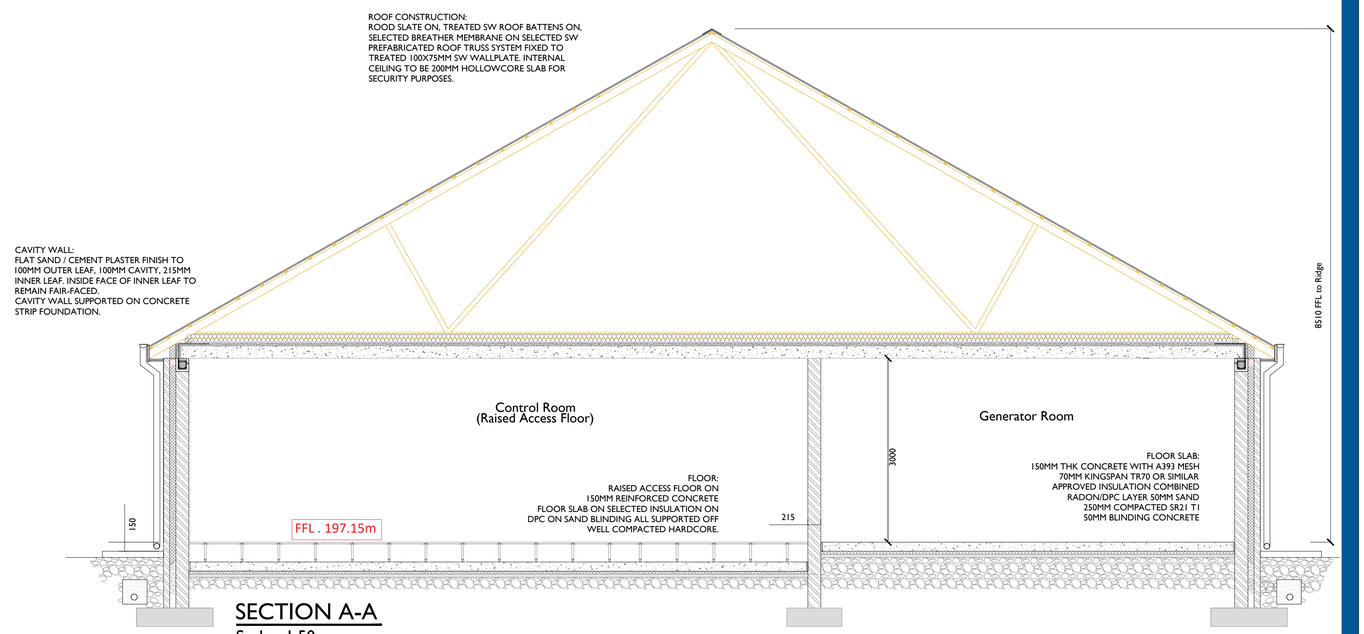
REAR ELEVATION
Scale : 1:100



RIGHT SIDE ELEVATION
Scale : 1:100



LEFT SIDE ELEVATION
Scale : 1:100



SECTION A-A
Scale : 1:50

Project Management Initials: Designer: JC Checked: GC Approved: DB

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PROJECT

Knockshanvo Wind Farm
110kV Grid Connection

CLIENT

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CONSULTANTS

NOTES: -

1. Layout and Arrangements of Substation Building and Electrical Equipment is shown indicatively and for illustration purposes only.
2. Dimensions shown are as per current EirGrid Specifications at the time of submission. Dimensions may vary at time of construction to reflect any revisions to EirGrid Specifications.
3. Final Specifications of Buildings and Electrical Equipment is to be as per Eirgrid and ESB Specifications.
4. The Elevation of the Compound will be depicted by localized Topography such that Cut/Fill Earthworks associated with the construction of the Compound are balanced.

LEGEND: -

Proposed Levels shown thus 379.10m
Concrete Footpath shown thus
Proposed Foul Sewer shown thus
Proposed Clean Storm Water shown thus
Proposed Dirty Storm Water shown thus
Water supply from Harvesting Tank shown thus

ISSUE/REVISION

P2	05.06.24	Issued for Planning
P1	10.11.23	Issued for Planning
I/R	DATE	DESCRIPTION

PROJECT NUMBER

05-783

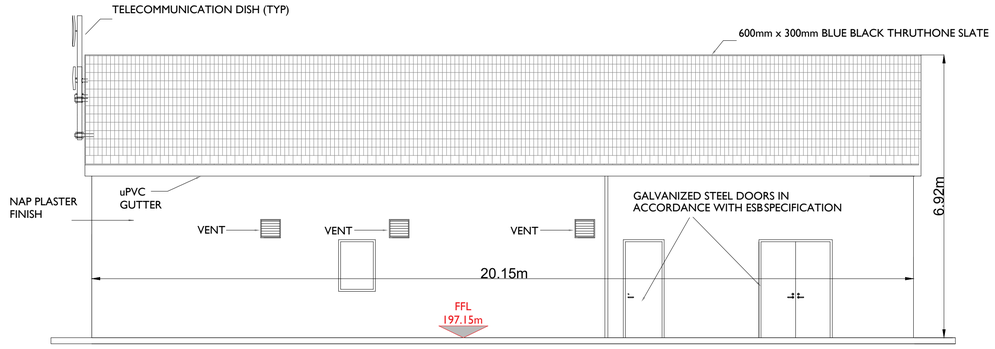
SHEET TITLE

Control Building - Plan & Elevations & Section

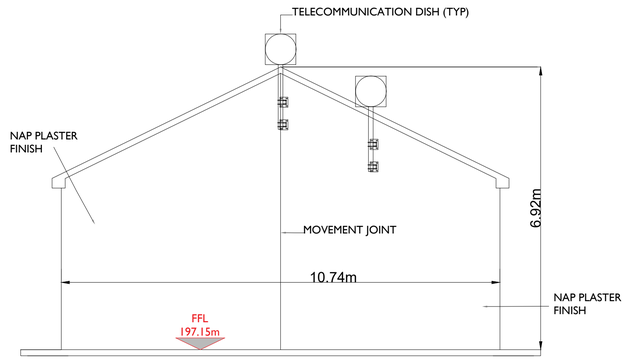
SHEET NUMBER

05783-DR-154

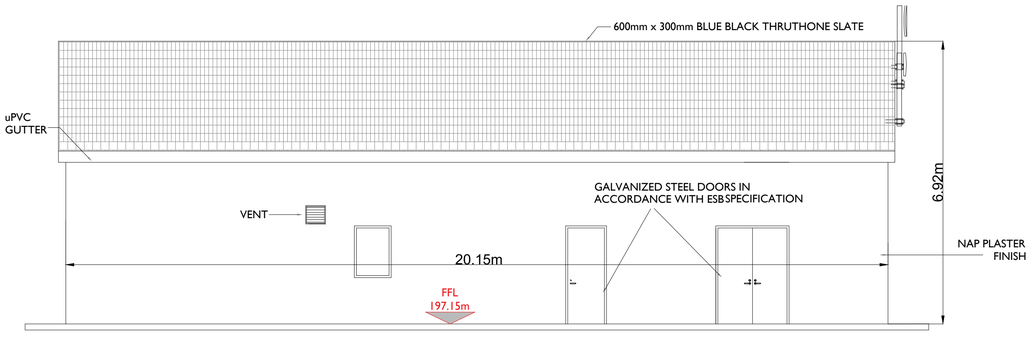
ISO A1 594mm x 841mm



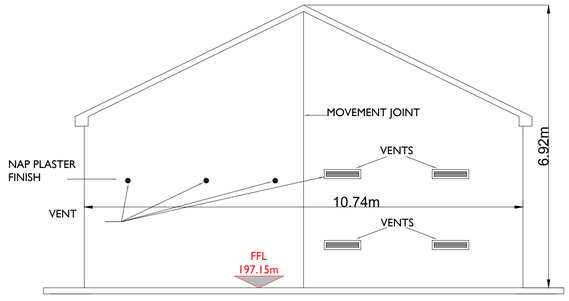
REAR ELEVATION
Scale : 1:75



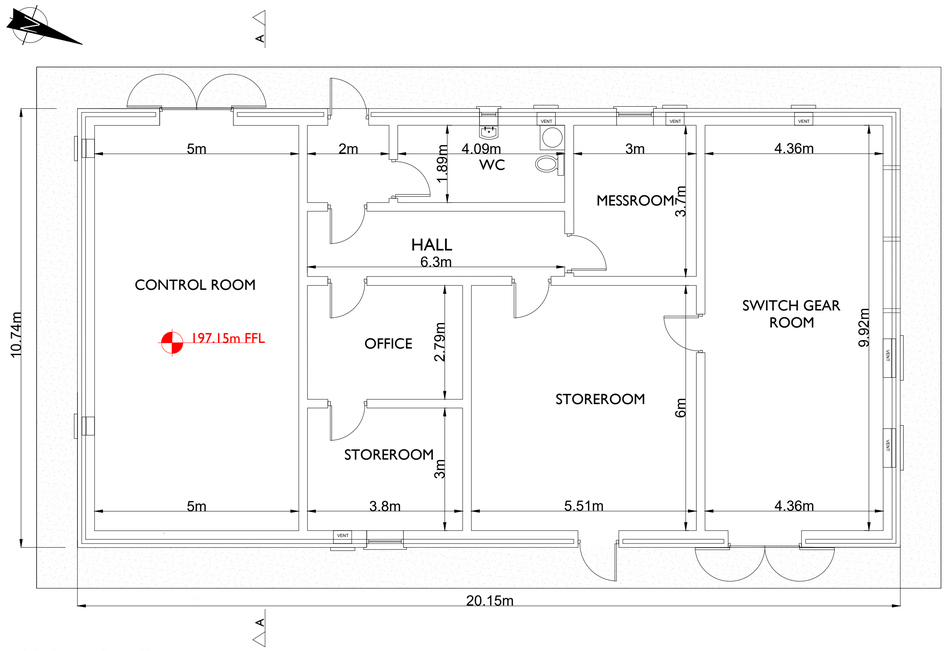
SIDE ELEVATION
Scale : 1:75



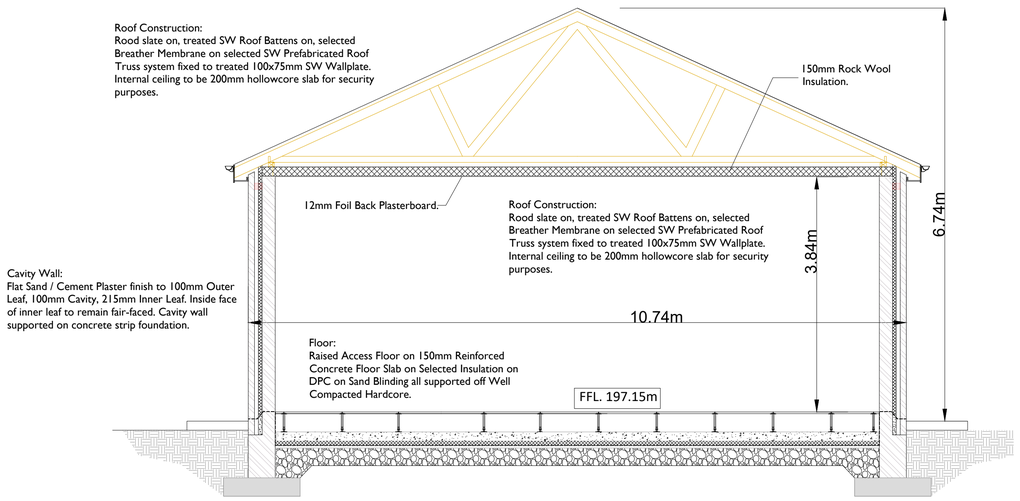
FRONT ELEVATION
Scale : 1:75



SIDE ELEVATION
Scale : 1:75



PLAN - IPP BUILDING
Scale : 1:100



SECTION A-A
Scale : 1:50

Project Management Initials: Designer: JC Checked: GC Approved: DB

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PROJECT

Knockshanvo Wind Farm
110kV Grid Connection

CLIENT

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CONSULTANTS

NOTES: -

1. Layout and Arrangements of Substation Building and Electrical Equipment is shown indicatively and for illustration purposes only.
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3. Final Specifications of Buildings and Electrical Equipment is to be as per Eirgrid and ESB Specifications.
4. The Elevation of the Compound will be depicted by localized Topography such that Cut/Fill Earthworks associated with the construction of the Compound are balanced.

LEGEND: -

Proposed Levels shown thus 279.10m

Concrete Footpath shown thus

ISSUE/REVISION

P2	05.06.24	Issued for Planning
P1	10.11.23	Issued for Planning
I/R	DATE	DESCRIPTION

PROJECT NUMBER

05-783

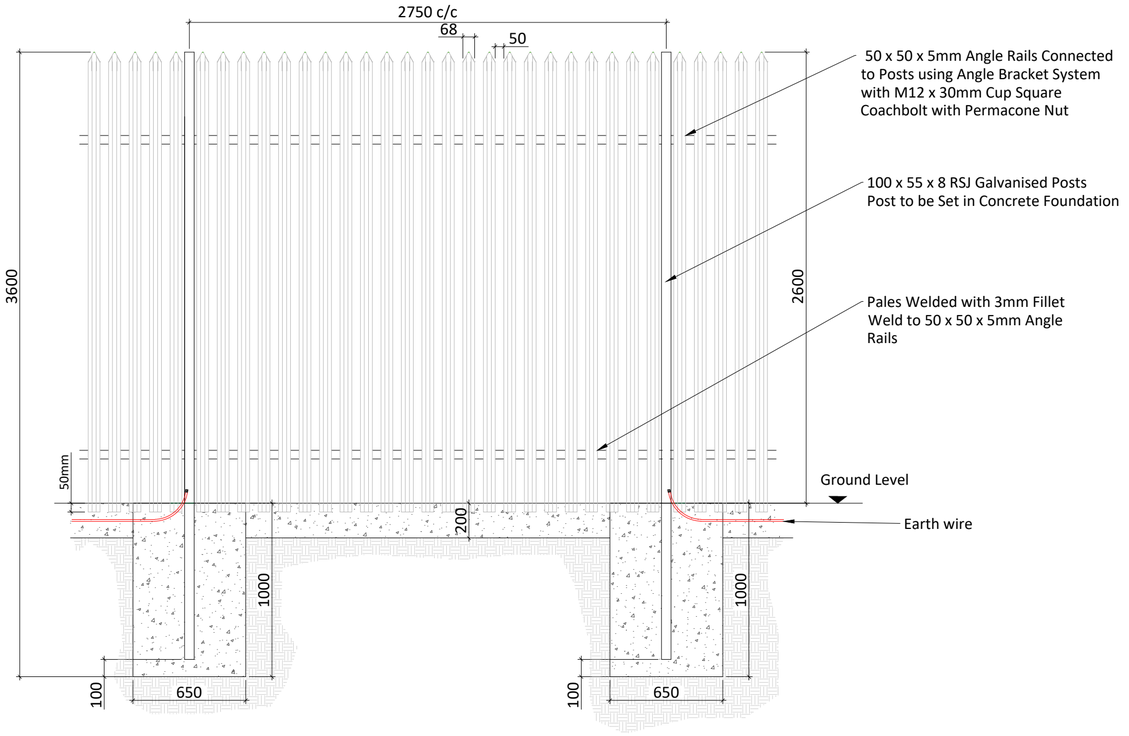
SHEET TITLE

IPP Building - Plan & Elevations & Section

SHEET NUMBER

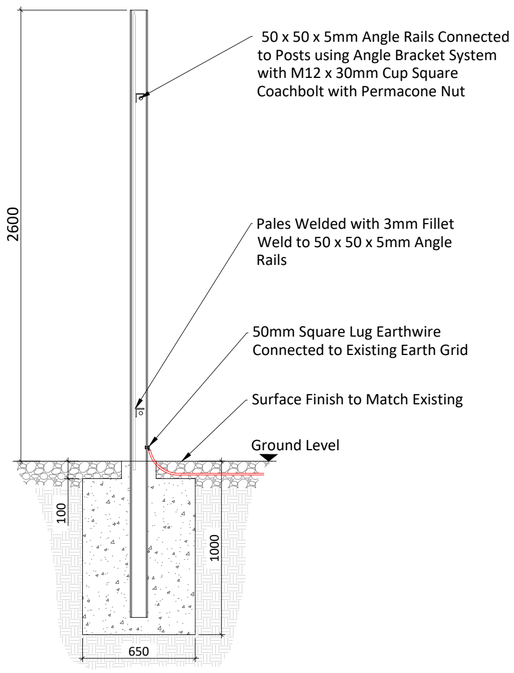
05783-DR-155

ISO A2 420mm x 594mm



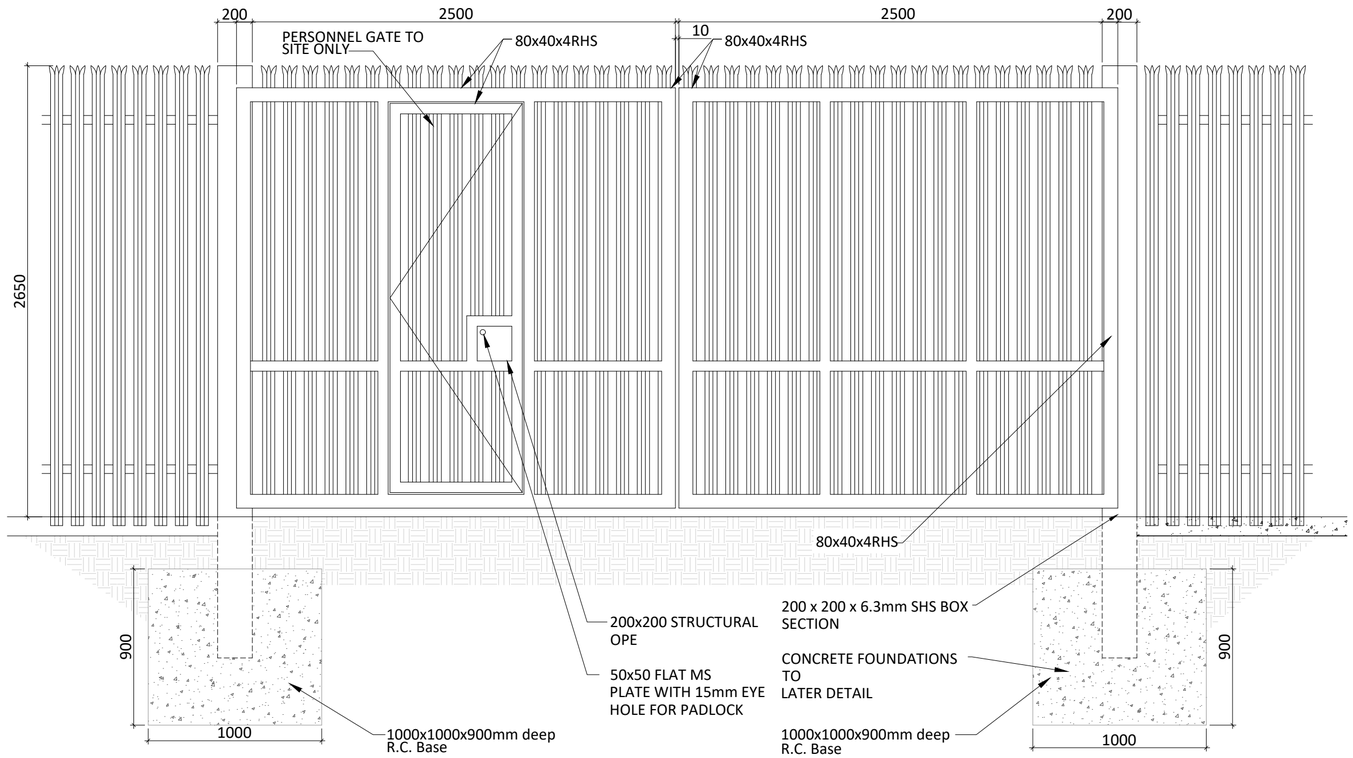
Palisade Fencing Details - Elevation

SCALE 1:25



Palisade Fencing Details - Section

SCALE 1:25



Gate Elevation

SCALE 1:25

Project Management Initials: Designer: JC Checked: GC Approved: DB

tli GROUP

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PROJECT

Knockshanvo Wind Farm
110kV Grid Connection

CLIENT

MKO

CONSULTANTS

NOTES: -

LEGEND: -

- This drawing is to be read in conjuction with relevant drawings, specifications and reports
- Dimensions are in millimetres, unless noted otherwise
- Drawings are not to be scaled use figured dimensions only

ISSUE/REVISION

P1	10.11.23	Issued for Information
I/R	DATE	DESCRIPTION

PROJECT NUMBER

05-783

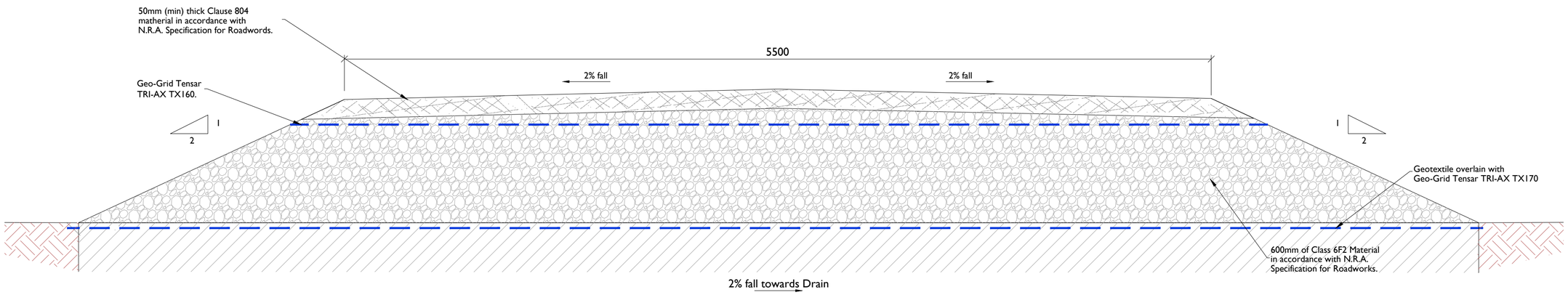
SHEET TITLE

Gate & Fence Details

SHEET NUMBER

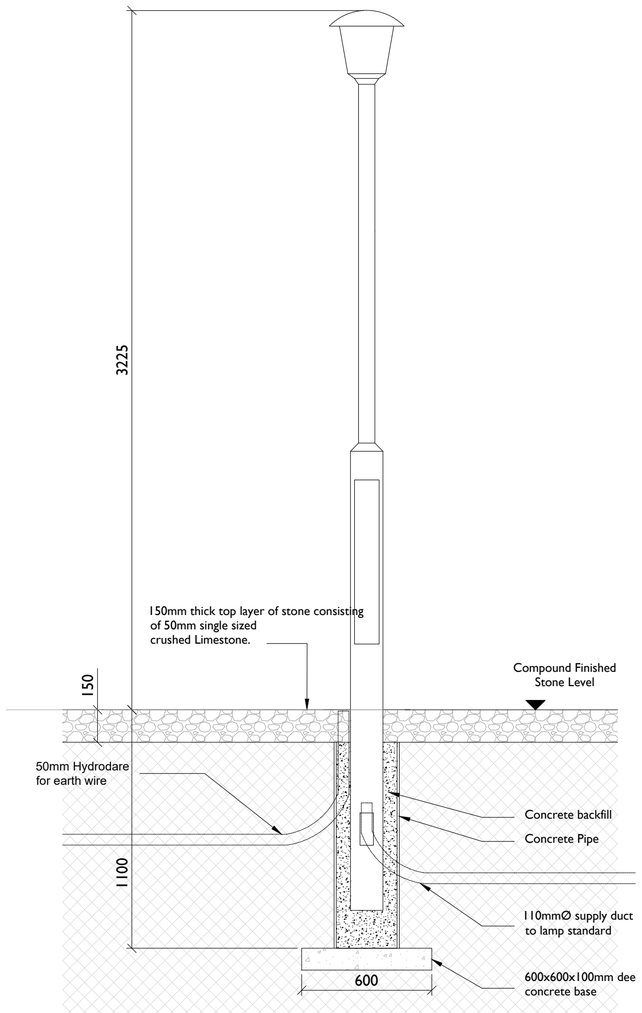
05783-DR-156

ISO A2 420mm x 594mm



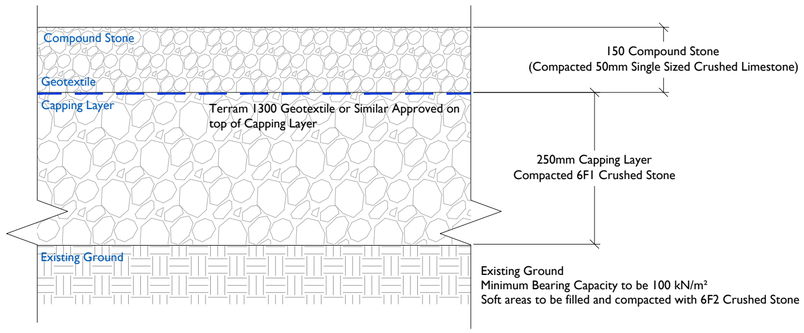
Section Through Access Road

SCALE 1:20



Lighting Column & Surround Detail

SCALE 1:20

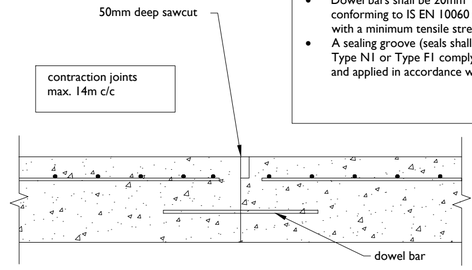


Compound Detail

SCALE 1:10

Contraction joints should comprise of the following:

- A sawn groove joint 10mm wide at least $\frac{1}{4}$ the slab depth
- Dowel bars shall be 20mm Ø at 300mm spacing conforming to IS EN 10060 and IS EN 13877-3 with a minimum tensile strength of 250 MPa
- A sealing groove (seals shall be hot applied sealants Type N1 or Type F1 complying with IS EN 14188-1 and applied in accordance with BS 2499-2)

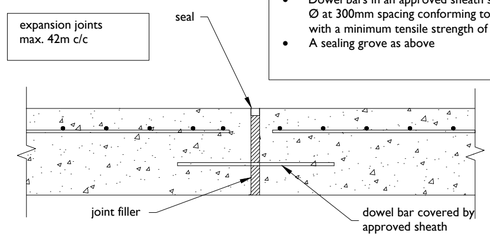


Concrete Access Road Contraction Joint

SCALE 1:10

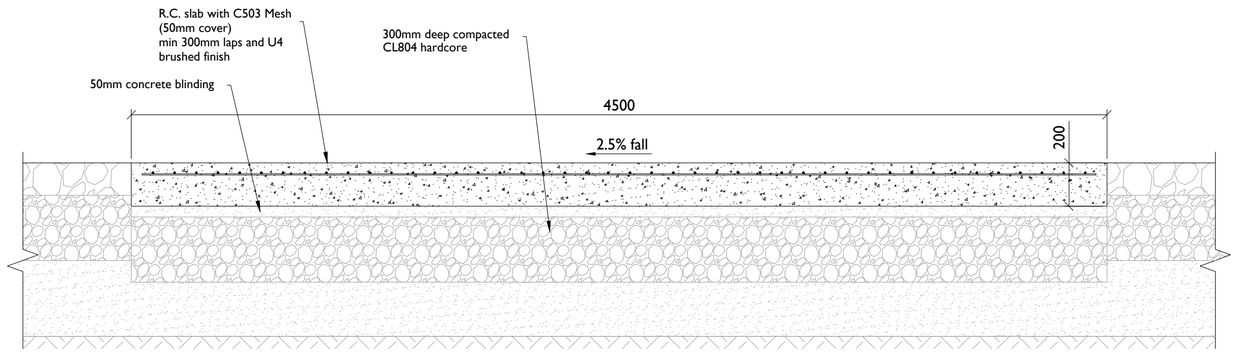
Expansion joints should comprise of the following:

- A joint filler board 25mm thick self expanding cork seal or from another approved compressible material
- Dowel bars in an approved sheath shall be 25mm Ø at 300mm spacing conforming to IS EN 13877-3 with a minimum tensile strength of 250MPa
- A sealing grove as above



Concrete Access Road Expansion Joint

SCALE 1:10



Section - Concrete Access Road

SCALE 1:20

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PROJECT

Knockshanvo Wind Farm

110kV Grid Connection

CLIENT

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CONSULTANTS

NOTES: -

- This drawing is to be read in conjunction with relevant engineering drawings, specifications and reports
- Dimensions are in millimeters, unless noted otherwise
- Drawings are not to be scaled use figured dimensions only

LEGEND: -

ISSUE/REVISION

P2	05.06.24	Issued for Planning
P1	10.11.23	Issued for Information
I/R	DATE	DESCRIPTION

PROJECT NUMBER

05-783

SHEET TITLE

Site Compound Details
& Access Road Details.

SHEET NUMBER

05783-DR-157

Project Management Initials: Designer: JC Checked: GC Approved: DB

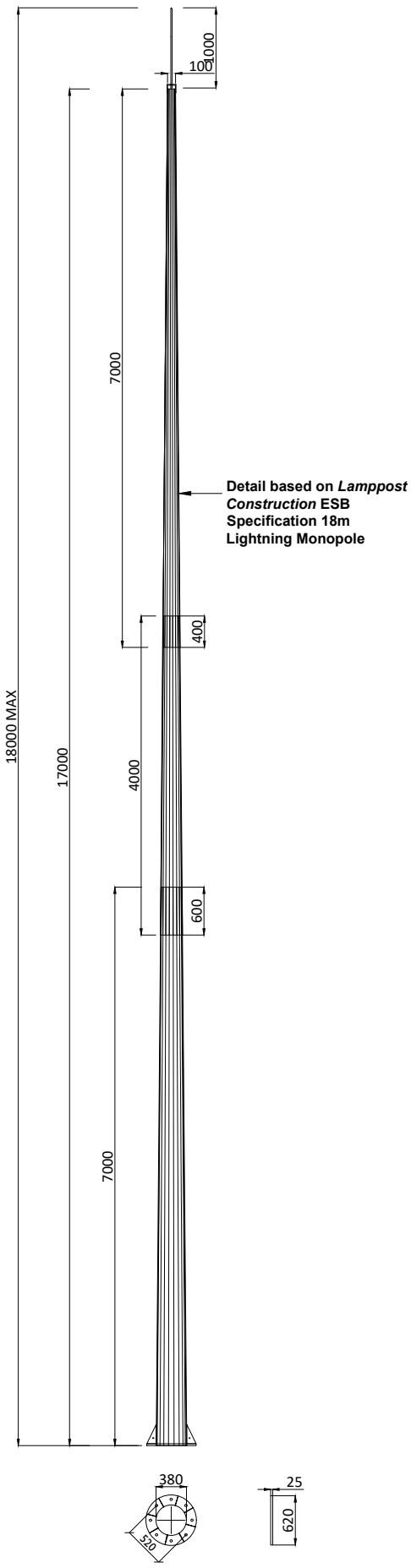
ISO A3 297mm x 420mm

GENERAL NOTES:

1. ALL DRAWINGS TO BE READ IN CONJUNCTION WITH THE SPECIFICATION AND ALL ENGINEERS AND ARCHITECTS DRAWINGS
2. ALL CONCRETE TO BE IN ACCORDANCE WITH I.S. EN 206-1:2002 WITH THE MIX DESIGNS SHOWN IN TABLE 1
3. CONCRETE FINISHES TO BE IN ACCORDANCE WITH TABLE 6.1 OF THE ESBI SPECIFICATION CS17-SO1-005.
4. ALL REINFORCEMENT SHALL BE IN ACCORDANCE WITH BS4449 AND SCHEDULED IN ACCORDANCE WITH BS.8666. 300MM LAPS FOR A142 MESH 600MM MIN LAPS FOR A393 MESH.
5. REFER ALWAYS TO RELEVANT EARTH GRID DRAWING PRIOR TO EXCAVATIONS & CONCRETE POURS
6. GEOMETRICAL TOLERANCES TO BE IN ACCORDANCE WITH TABLE 6.2 OF ESBI SPECIFICATION CS17-S01-005

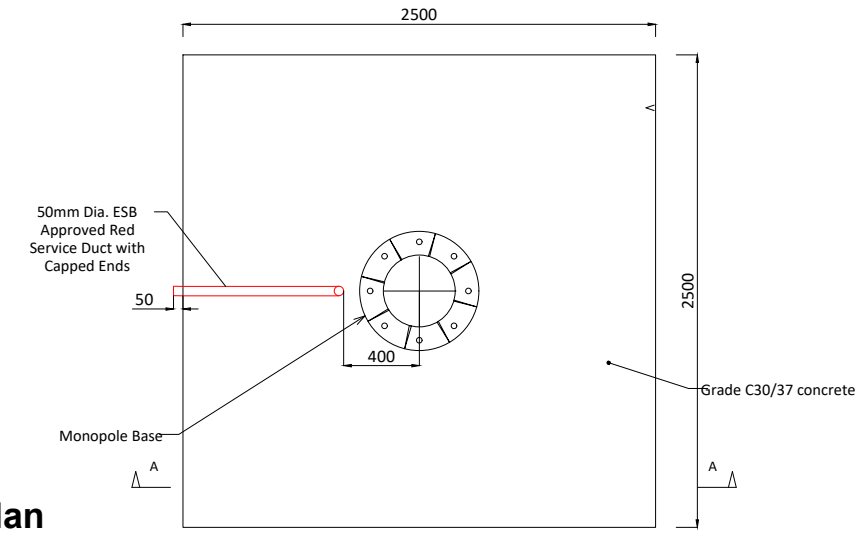
FOUNDATION NOTES:

7. GROUND TO HAVE A MINIMUM BEARING CAPACITY OF 100 kN/M².
8. FORMATION LEVEL AND FOUNDATIONS TO BE INSPECTED AND APPROVED BY THE ENGINEER PRIOR TO ANY CONCRETE BEING POURED.
9. ALL FOUNDATIONS ARE TO BE BLINDED IMMEDIATELY AFTER EXCAVATION WITH 50MM OF C16/20 CONCRETE BLINDING.
10. REFER ALWAYS TO THE RELEVANT EARTH WORK DRAWINGS PRIOR TO EXCAVATIONS & CONCRETE POURS.



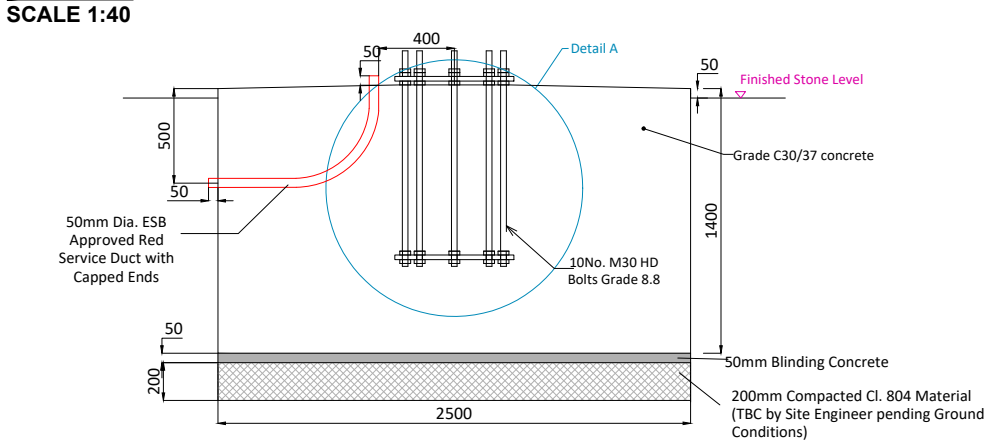
Monopole Details

SCALE 1:75



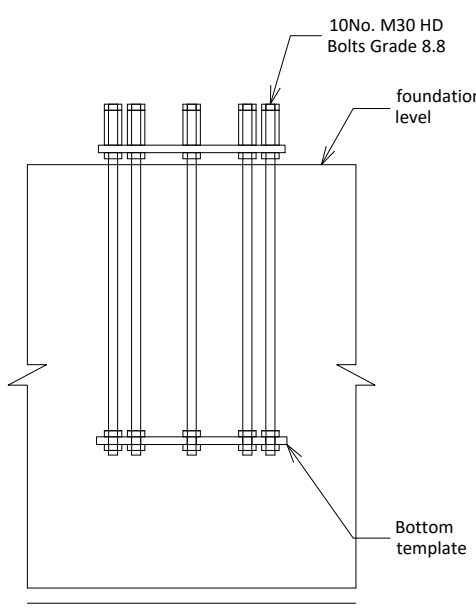
Plan

SCALE 1:40



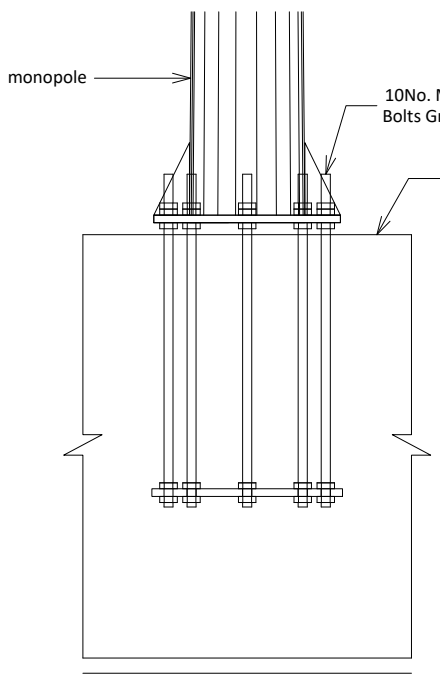
Section A-A: Foundation detail

SCALE 1:40



Detail A

Scale : 1:25



Monopole Base Plate to HDB Connection

Scale : 1:25

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ISSUE/REVISION

I/R	DATE	DESCRIPTION
P1	10.11.23	Issued for Information

CLIENT

PROJECT
Knockshanvo Wind Farm
110kV Grid Connection

SHEET TITLE
Lightning Monopole Foundation Details
18m Masts

DRAWING STATUS
For Information

PROJECT NUMBER
05-783

SHEET NUMBER
05783-DR-158

LEGEND/NOTES: -

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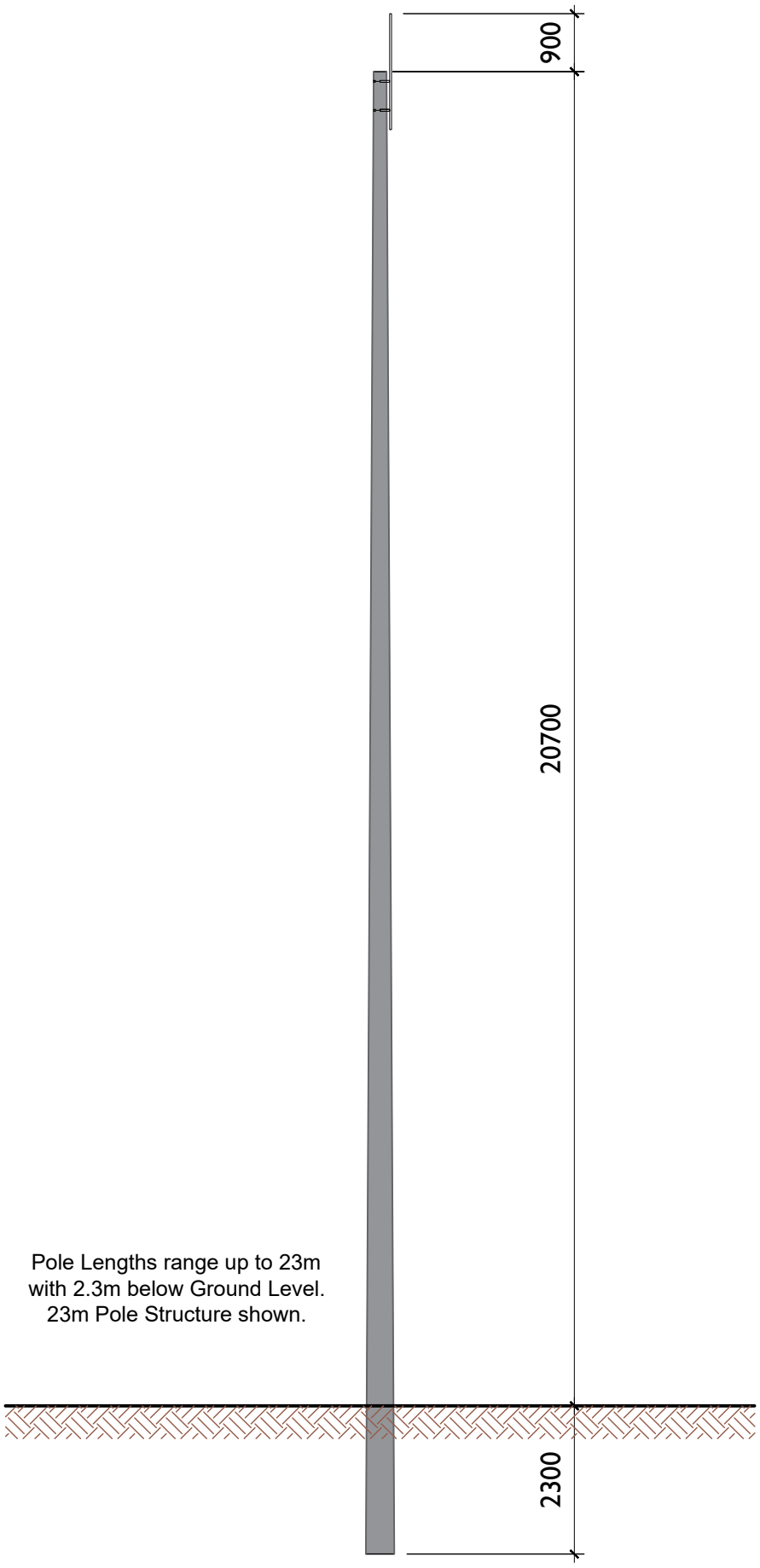
- Dimensions are in millimetres, unless noted otherwise
- Drawings are not to be scaled use figured dimensions only

ISO A3 297mm x 420mm



Pole Lengths range up to 23m
with 2.3m below Ground Level.
23m Pole Structure shown.

FRONT ELEVATION

Scale 1:100

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ISSUE/REVISION

I/R	DATE	DESCRIPTION
P1	10.11.23	Issued for Planning

CLIENT

MKO

PROJECT
Knockshanvo Wind Farm
110kV Grid Connection

SHEET TITLE
Telecoms Pole Elevation View

DRAWING STATUS
Issued for Information

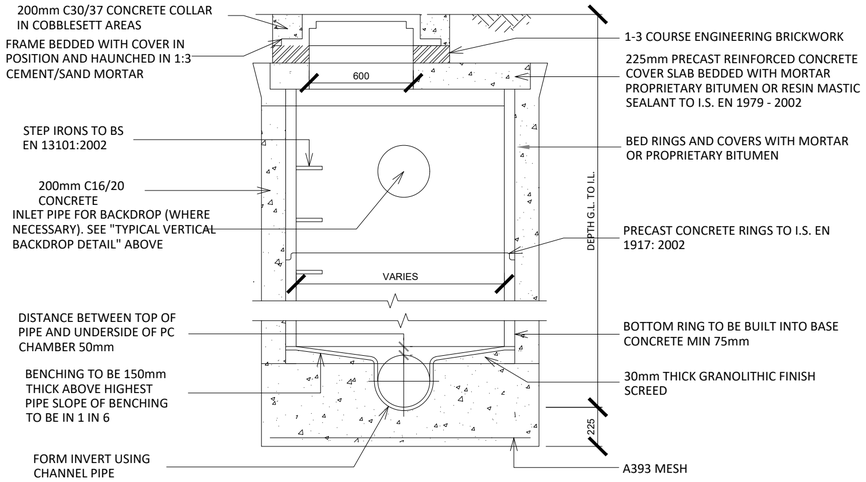
LEGEND/NOTES: -
All dimensions in mm unless noted otherwise

PROJECT NUMBER
05-783

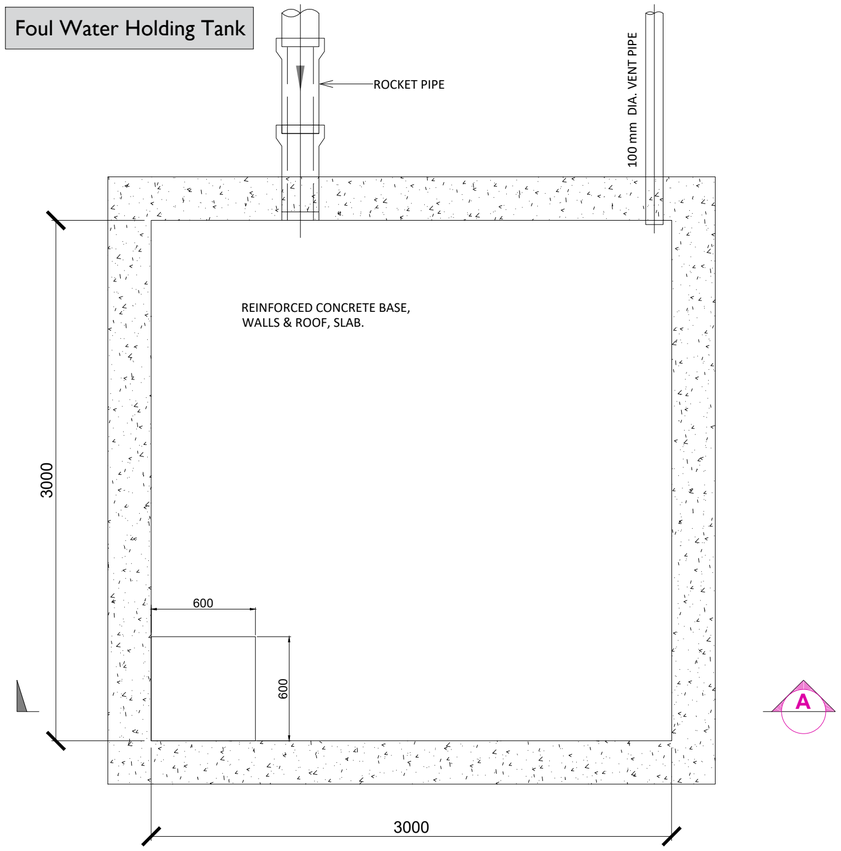
SHEET NUMBER
05783-DR-159

ISO A2 420mm x 594mm

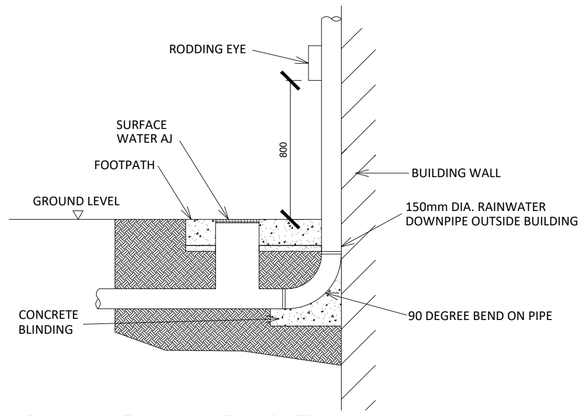
Manhole



Foul Water Holding Tank

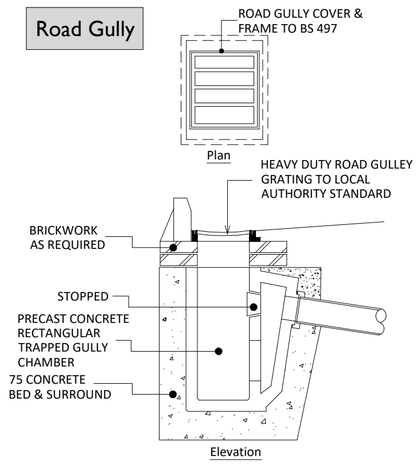


Foul Water Holding Tank - Plan
Scale : 1:25



Rainwater Downpipe Detail - Elevation
Scale : 1:25

Road Gully



Road Gully Detail
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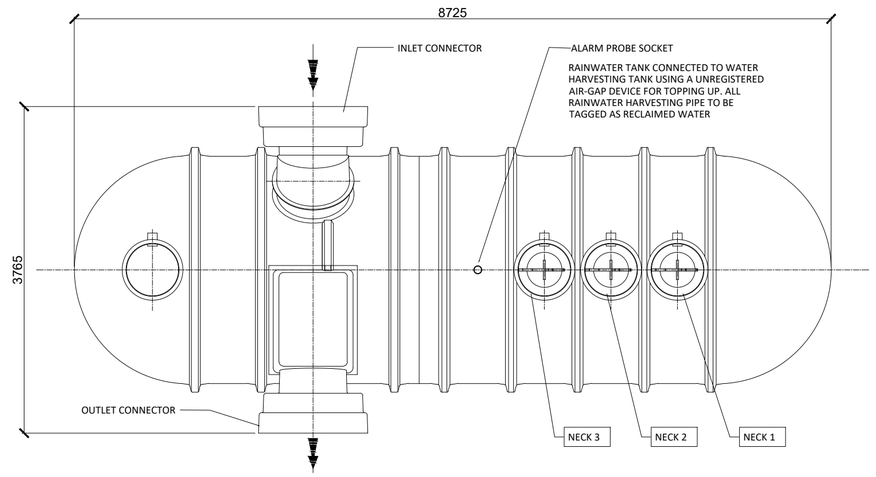
Retention Seperator Tank



Retention Separator Tank - Plan
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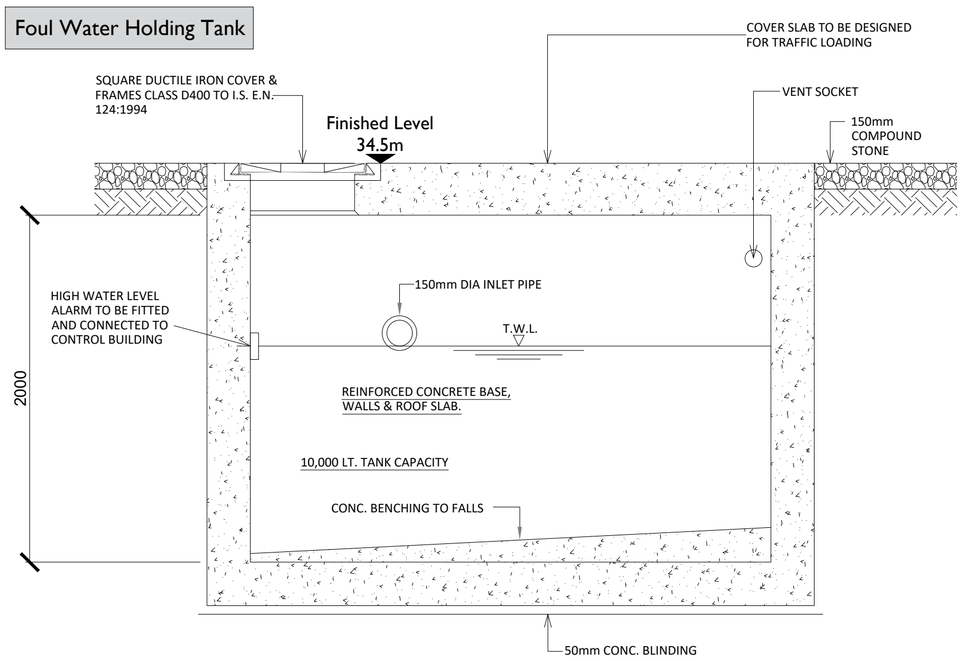
Foul Water Holding Tank



Foul Water Holding Tank - Elevation
Scale : 1:25

Project Management Initials: Designer: JC Checked: GC Approved: DB

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PROJECT

Knockshanvo Wind Farm
110kV Grid Connection

CLIENT

MKO

CONSULTANTS

NOTES: -

- This drawing is to be read in conjunction with relevant engineering drawings, specifications and reports
- Dimensions are in millimeters, unless noted otherwise
- Drawings are not to be scaled use figured dimensions only

LEGEND: -

ISSUE/REVISION

I/R	DATE	DESCRIPTION
P1	10.11.23	Issued for Planning

PROJECT NUMBER

05-783

SHEET TITLE

Substation Compound drainage, Rentention seperator tank, Foul water holding tank details

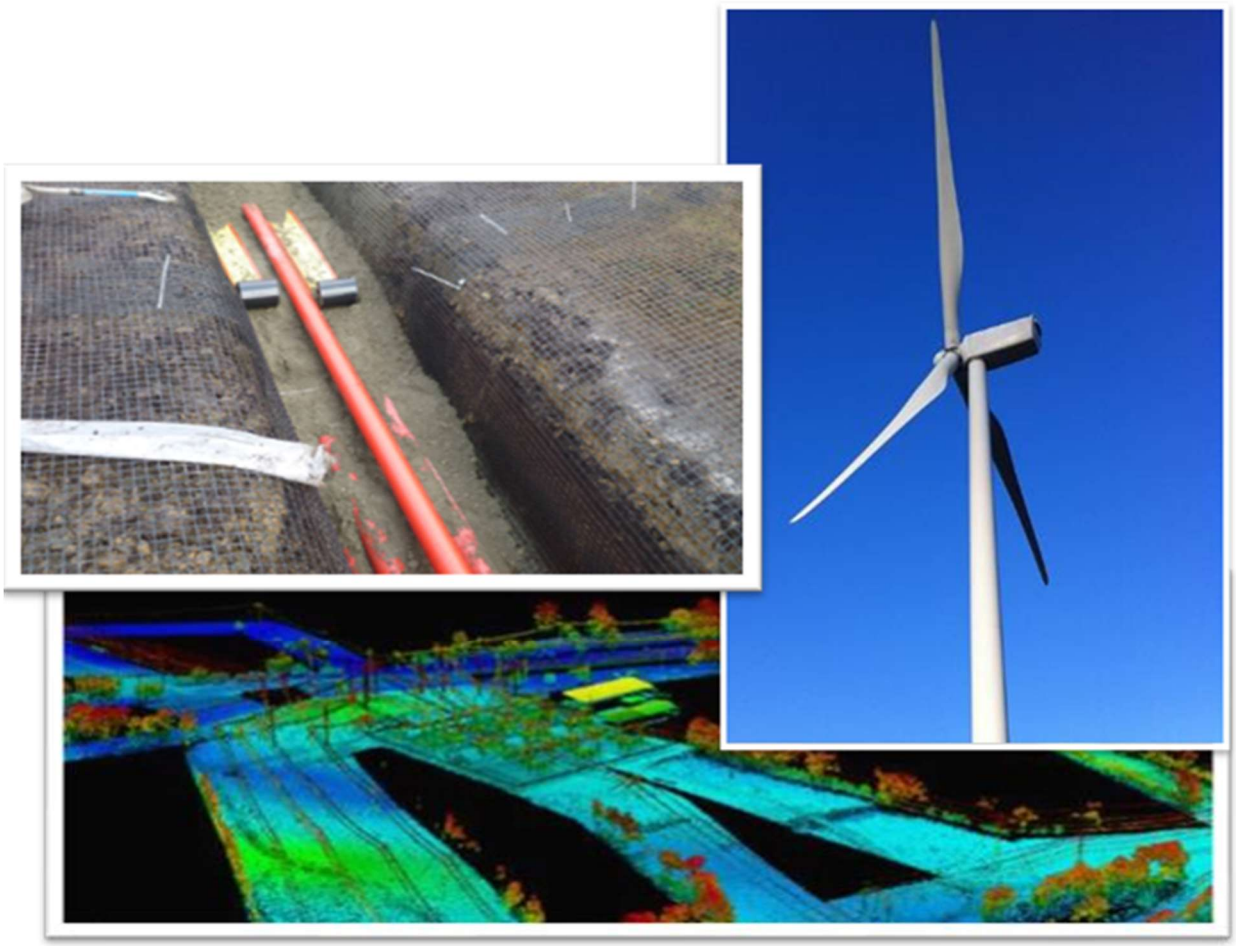
SHEET NUMBER

05783-DR-160

Construction Methodology

Knockshanvo Wind Farm 110kV

Underground Cable Connection



Report Ref: 05783-R03-01

Clients: MKO

Revision:	Author:	Checked:	Date:	Notes:
00	GC	DB	10.11.23	*Issued for Client Review*

Table of Contents

Table of Figures

1.0 Introduction

The purpose of this document is to outline and explain the construction techniques and methodologies which will be implemented during construction of the proposed Knockshanvo Wind Farm 110kV grid connection to the existing ESB Ardnacrusha 110kV substation. The grid connection will consist entirely of underground cabling (UGC) with the majority of the UGC to be installed within the public road network.

The UGC works will consist of the installation of 6 No. ducts in an excavated trench to accommodate 3 No. power cables, 1 No. fibre communications cable to allow communications between the Knockshanvo Wind Farm Substation and Ardnacrusha 110kV substation 1 No. spare fibre communications cable and 1 No. earth continuity duct.

This document is intended to be used as an aid to understand the methodologies to be employed during construction and should be read in conjunction with all other specialist reports which accompany the planning application. Detailed Method Statements will be prepared in respect of each aspect of the proposed development.

2.0 110kV Underground Cable Route

The proposed UGC route is approximately 9.2km in length and runs in a northerly direction from the existing ESB Ardnacrusha 110kV substation to the proposed Knockshanvo Wind Farm substation location utilizing public local road networks, existing access tracks, private forestry access tracks and private lands. Below (Figure 1) which outlines the proposed UGC route, with each section of the route being formulated in detail within Table 1.

This proposed grid connection option is shown as an Overall Site layout Plan in Drawing No. 05783-100.

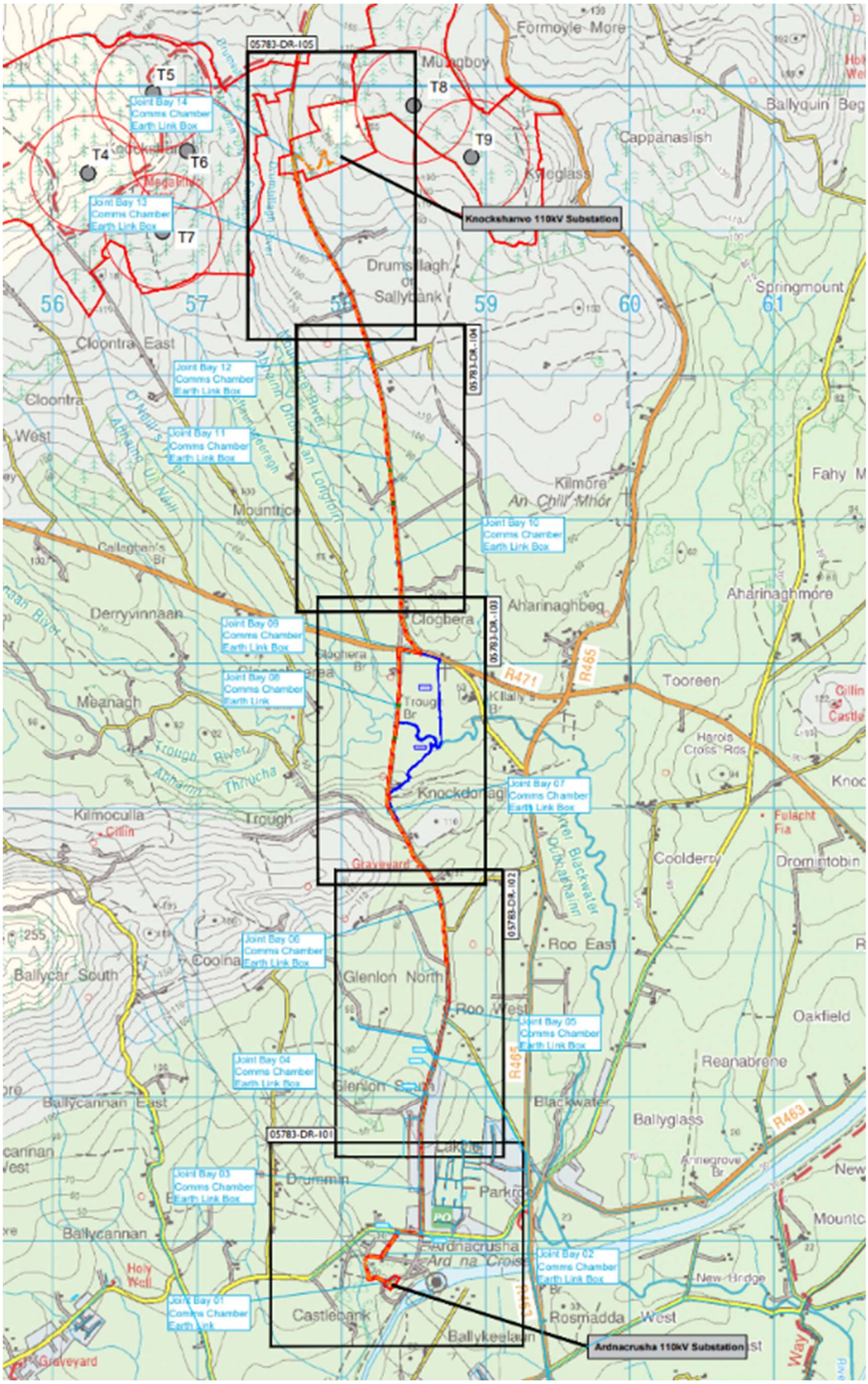


Figure 1 -Grid Connection Route Location

Table 1 of this report summaries the route location features of the underground cable connection and proposed route.

Table 1 – Approximate Route Location of Preliminary Design:		
Public Roads (UGC)	**Wind Farm Site/Forestry Roads (UGC)**	**Private/ Consenting Access Tracks (UGC)**
8077 m	460 m	650m

Table 1: Knockshanvo Wind Farm to Ardnacrusha 110kV Substation – UGC Route Location Summary

Table 2 below separates the UGC route into a number of sections and describes the specific construction requirements of each individual section with access routes to the work areas. All plant and equipment employed on the proposed works will be subject to good site organisation and hygiene, particularly during construction activities.

Table 2 - Summary of Grid Connection Design Route	
Section	**Description**
Section 1	**UGC from Ardnacrusha 110kV substation to R-471 Road *(Chainage 0 m to 5000 m)*** The underground cable route initially begins within the townland of Ballykeelaun, Co. Clare where from the Ardnacrusha 110kV substation GIS compound, the UGC departs the substation on the northwest boundary, converging onto an existing access track within folio No. CE51663F. The proposed UGC route then continues mainly north for a further approx. 650m where it converges onto the L-3056, leaving the Ardnacrusha complex. The underground cable route briefly travels along the L3056 for approximately 165m where it then approaches a crossroad junction, the UGC turns north opposite the main entrance of Ardnacrusha Power Station onto L-3054 (Lackyle Heights Road) and continuing along this route for approximately 2.8km. The UGC will predominantly be installed in the carriageway until encountering another road junction (L-7066) at which point the UGC will traverse to continue north bound. The UGC will carry within another section of localised secondary road carriageway (L7066-1), which in turn will inhibit the second proposed bridge crossing. The river Blackwater (Double Arch Bridge, denoted as Bridge 1) will be crossed using a horizontal directional drill method (HDD) before continuing within the L-7066-1. The mobilisation of a HDD will require temporary construction areas to be facilitated to complete the tranche of works involved in drilling beneath the riverine feature and bridge abutments. After navigating a path across the river Blackwater and the Double Arch Bridge, the underground cable infrastructure continues north until reaching the regional road, R471.

Features

Section 1 contains 8 no. joint bays. Joint bays will be located below ground and finished/reinstated to the required roads specification.

Joint bays will have associated communication chambers and link boxes which will have a surface access hatch which will match existing ground levels.

- Joint Bay 01 (JB01) will be located adjacent to the entry to Ardnacrusha 110kV Station. *Chainage – 60m*
- Joint Bay 02 (JB02) will be located north of JB01. The joint bay will be installed within a secondary access road into Ardnacrusha Power Station. *Chainage – 480m*
- Joint Bay 03 (JB03) will be located north of JB02 within the local road network situated within Lackyle Road network. *Chainage – 1125m*
- Joint Bay 04 (JB04) will be located north of JB03 positioning the joint bay within the Lackyle Road network. *Chainage – 1760m*
- Joint Bay 05 (JB05) will be located north of JB04 positioning the joint bay within the local road network. A temporary construction passing bay will be facilitated at this joint bay with consents in place with relevant landowner(s). *Chainage – 2350m*
- Joint Bay 06 (JB06) will be located north of JB05 within the local road carriageway. The joint bay will be positioning within the shoulder of the roadway. *Chainage – 3130m*
- Joint Bay 07 (JB07) is located northwest of JB06 within the shoulder of a section of public roadway. *Chainage – 3860m*
- Joint Bay 08 (JB08) will be located north of JB07 within the shoulder of an unpaved section of public roadway. JB08 is located immediately north of the first proposed Bridge crossing and located outside of the flood zone for the blackwater river. This joint bay will be situated at the proposed receptor area for the first proposed directional drill. *Chainage – 4610m*

Section 1 has 1 No. watercourse crossings:

Bridge 1 (Trough Bridge - *Chainage – 4475m*) has been surveyed with the result of insufficient clearance existing within this structure. To cross the Blackwater River, it will be required to utilise a Horizontal Directional Drill within the roadway to cross beneath with a satisfactory clearance to the waterway and bridge structure.

The HDD crossing will require a transition chamber to be installed at either side of the drill following the works, the location of these chambers is to be determined by the drilling contractor following site investigation. The launch and receptor pits will reside within the curtilage of the local roadway (L-7066-1).

Refer to Drawing 05783-DR-120-P0 for further Bridge 1 details.

Section 1 will encounter a multitude of service crossings:

Existing utility infrastructure (inclusive of ESB, Irish Water, Gas and Telecoms) will be encountered, and the crossing schedules will be prepared at detailed design to identify under or over methods to cross these existing buried services.

Section 1 has 2 No. culvert crossings:

	Refer to ***Appendix A***, appended to the end of this report and also refer to drawings 05783-DR-116-P0 & 05783-DR-117-P0 for crossing details.
Section 2	**UGC within R-471 and Northern Carriageway *(Chainage 5000 m to 9187 m)***

The UGC converges upon the regional road (R-471) with the underground cable infrastructure merging onto the new road and heading east, the UGC route traverses for 70m and crosses over a stone masonry culvert and continues eastward for another 70m. The UGC route then takes a turn to the north, encountering a sharp bend before the 'Mary, Mother of God Church'. The UGC sweeps around the bend and continues to traverse North. The UGC continues traversing North for another 440m North before encountering a culvert. The UGC will cross over the culvert and continue travelling North.

The UGC will carry within another section of localised secondary road carriageway, which in turn will inhibit the second proposed bridge crossing. The river Drumsillagh (Double Arch Bridge, denoted as Bridge 2) will be crossed using a horizontal directional drill method (HDD) before continuing within the secondary. The mobilisation of a HDD will require temporary construction areas to be facilitated to complete the tranche of works involved in drilling beneath the riverine feature and bridge abutments.

After navigating a path across the river Drumsillagh and the Double arch Bridge, the underground cable infrastructure continues north within the secondary road for one kilometre before encountering a culvert. The cable will cross under the culvert, within the road corridor and continue traversing north for 1450 m towards folio CE56390F. At folio CE56390F the cable will sweep to the east, entering the forestry access track via the bell mouth. The cable will continue to travel east within the forestry firebreak track until encountering the Knockshanvo windfarm boundary fence and will then terminate within the substation.

Features

Section 2 contains 6 no. joint bays. Joint bays will be located below ground and finished/reinstated to the required roads specification.

Joint bays will have associated communication chambers and link boxes which will have a surface access hatch which will match existing ground levels.

- Joint Bay 09 (JB09) will be located north of JB08 on the regional road (R-471) within the shoulder of this roadway. *Chainage – 5060m*
- Joint Bay 10 (JB10) will be located within the roadway, North of JB09. The Joint Bay will reside within a gated agricultural entrance. *Chainage – 5775m*
- Joint Bay 11 (JB11) will be located with the roadway, North of JB10. The Joint Bay will reside within a gated agricultural entrance. *Chainage – 6500m*
- Joint Bay 12 (JB12) will be located North of JB11. The Joint Bay will reside within a gated agricultural entrance. *Chainage – 7200m*
- Joint Bay 13 (JB13) will be located within the local roadway, north-west of JB12. A temporary construction passing bay will be facilitated at this joint bay with consents in place with relevant landowner(s). *Chainage – 8000m*

	• Joint Bay 14 (JB14) will be located within the bell mouth to the folio, north of JB13. *Chainage – 8760m* ***Section 2 has 3 No. watercourse crossings:*** Bridge 2 (*Chainage – 6315m)* has been surveyed with the result of insufficient clearance existing within this structure. To cross the Drumsillagh River, it will be required to utilise a Horizontal Directional Drill within the local roadway to cross beneath with a satisfactory clearance to the waterway and bridge structure. Refer to Drawing 05783-DR-121-P0 for further Bridge 2 details. Both HDD crossings will require a transition chamber to be installed at either side of the drill following the works, the location of these chambers is to be determined by the drilling contractor following site investigation but will be contained within the curtilage of the public road. ***Section 2 will encounter a multitude of service crossings:*** Existing utility infrastructure (incl. ESB, Irish Water, Gas and Telecoms) will be encountered, and the crossing schedules will be prepared at detailed design to identify under or over methods to cross these existing buried services. ***Section 2 has 3 No. culvert crossings:*** Refer to ***Appendix A***, appended to the end of this report and also refer to drawings 05783-DR-116-P0 & 05783-DR-117-P0 for crossing details.
Refer to Figure 1 and to the planning drawings submitted for location details.	

3.0 Access Routes to Work Area

The majority of the proposed underground cable will be installed within the public road network and therefore will be accessed via the existing road network. Where the cable route is located on private lands, such as the Ardnacrusha complex, and permitted wind farm roads, the contractor(s) will be required to access these from the local public road network in the vicinity of the work area and from there, traverse the consenting and permitted, predominantly within the permitted wind farm site.

A detailed Traffic Management Plan will accompany this planning application. In the event that planning consent is granted for the proposed development, the TMP will be updated prior to commencement of 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.

Careful and considered local consultation has been carried out, to minimise the amount of disturbance caused during works. Prior to the commencement of construction, the contractor will assess all access routes and determine any additional access requirements which will be incorporated as part of the method statement. All plant and equipment employed during the proposed works (e.g. diggers, tracked machines, footwear etc.) will

be inspected prior to arrival on site and on leaving site and cleaned where necessary to prevent the spread of invasive aquatic / riparian species.

4.0 Traffic Management

Traffic management and road signage will be in accordance with the Department of Transport: Traffic Signs Manual - Chapter 8: Temporary Traffic Measures and Signs for Road Works and in agreement with Clare County Council. All work on public roads will be subject to the approval of a road opening license application. The contractor will prepare detailed traffic management plans for inclusion as part of the road opening applications. Where road widths allow, the UGC installation works will allow for one side of the road to be open to traffic at all times by means of a 'Stop/Go' type traffic management system, where a minimum 2.5m roadway will be maintained at all times. Where it is not possible to implement a 'Stop/Go' system a full road closure will be required. Temporary traffic signals will be implemented to allow road users safely pass through the works area by channelling them onto the open side of the road. Typically, the UGC will be installed in 100m sections, and no more than 100m will be excavated without the majority of the previous section being reinstated. Where the construction requires the crossing of a road, works on one carriageway will be completed before the second carriageway is opened, to maintain traffic flows.

All construction vehicles will be parked within the works area so as not to cause additional obstruction or inconvenience to road users or residents. The traffic signals will be in place prior to the works commencing and will remain in place until after the works are completed. The public road will be checked regularly and maintained free of mud and debris. Road sweeping will be carried out as appropriate to ensure construction traffic does not adversely affect the local road condition.

In the event of emergency, steel plates, which will be available on site, can be put in place across the excavation to allow traffic to flow on both sides of the road.

All traffic management measures will comply with those outlined in the accompanying Traffic chapter of the EIAR and in the event that planning consent is granted for the proposed development, the TMP will be updated prior to commencement of 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.

5.0 Road Opening Licence

The proposed underground grid connection works will require a road opening licence under Section 254 of the Planning and Development Act 2000-2015 from Clare County Council. In the event that planning consent is granted for the proposed development, the TMP will be updated prior to commencement of 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 TMP will outline the location of traffic management signage, together with the location of any necessary road closures and the routing of appropriate diversions. Where diversions are required, these will be agreed with Clare County Council in advance of the preparation of the TMP.

6.0 Construction Hours

Standard working hours for construction will be 8.00am to 8.00pm Monday to Friday and 8.00am to 6.00pm on Saturday (if required), with no works on Sundays or Bank Holidays except in exceptional circumstances or in the event of an emergency. All site personnel will be required to wear project notification labelling on high visibility vests and head protection so that they can be easily identified by all workers on-site.

7.0 UGC Construction Methodology

The UGC will consist of 3 No. 160mm diameter HDPE power cable ducts, 2 No. 125mm diameter HDPE communications duct and 1 no. 63mm diameter earth continuity duct to be installed in an excavated trench, the maximum being 825mm wide and a depth of 1315mm, with lesser variations on this design to adapt to bridge crossings, service crossings and watercourse crossings, etc. Please refer to sections 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.

Relevant information will also be provided to the local authority and the employed crews to mitigate against any conflicts with existing buried services. It is an obligation of the developer/licence holder to install underground cable infrastructure in line with EirGrid functional specifications, for safety, constructability, and maintenance reasons. The new infrastructure shall be designed / installed as per these standards, to ascertain a separation from any existing 3rd party services (i.e. Water, Telecom, etc) and inclusive from any High Voltage /Medium Voltage or Low Voltage cables that may also be present. This minimum clearance requirement is incorporated into the H.S.A. Code of Practice on “Avoiding Danger from Buried Services”. Electricity cables/ducts must not be laid above other existing services except at crossing positions.

9.0 Service Culvert Crossings & 9.1 Major Watercourse Crossings of this report which alludes to the crossing procedures experienced by the grid infrastructure.

The power cable ducts will accommodate 1 No. power cables per duct. The communications duct will accommodate a fibre cable to allow communications between the Knockshanvo Wind Farm substation and Ardnacrusha 110kV substation. The inclusion 1 No. earth continuity conductor duct will also be required.

The ducts will be installed, the trench reinstated in accordance with with the local road’s authority within Clare County Council where installed on public roads, with the Forestry Road Manual (Guidelines for the design, construction and management of forest road) where installed with in forestry roads and reinstated in accordance with the landowner’s and with EirGrid functional specifications, where installed on private lands.

Once all are satisfied, then the electrical cabling/fibre cable is pulled through the installed ducts in approximately 700/850m sections at the joint bays. Construction method statements will be implemented to ensure that the UGC is installed in accordance with the correct requirements, materials, and specifications of ESBN and EirGrid functional specification[1].

[1] https://www.eirgridgroup.com/site-files/library/EirGrid/110kV-Underground-Cable-Functional-Specification-General-Requirements.pdf

7.1 Trenching Methodology

The following section outlines the methodology to be followed during trenching works:-

- The Contractor, and their appointed Site Manager, will prepare a targeted Method Statement concisely outlining the construction methodology and incorporating all mitigation and control measures included within the planning application and accompanying reports and as required by planning conditions where relevant;
- All existing underground services shall be identified on site prior to the commencement of construction works;
- At watercourse crossings, the contractor will be required to adhere to the environmental control measures outlined within the planning application and accompanying reports, the detailed Construction Environmental Management Plan (CEMP),
- Where the cable route intersects with culverts, the culvert will remain in place (where possible) and the ducting will be installed either above or below the culvert to provide minimum separation distances in accordance with ESB and Irish Water specifications;
- In the event that culverts require removal for ducting installation, it is proposed that a suitable method of damming the water source and pumping the water around the work area would be set out in a method statement and agreed with the relevant stakeholders. Once the ducts are installed the culvert will be reinstated to match existing levels and dimensions. If works of this nature are required, the contractor will liaise with Inland Fisheries Ireland in advance of works;
- Traffic management measures will be implemented in accordance with those included in the Traffic Management chapter, and detailed Traffic Management Plan
- Excavated material will be temporarily stockpiled onsite for re-use during reinstatement. Stockpiles will be restricted to less than 2m in height. Stockpiles will be located a minimum of 50m from surface water features and all stockpiling locations will be subject to approval by the Site Manager and Project Ecological Clerk of Works (ECoW);
- Excavated material shall be employed to backfill the trench where appropriate and any surplus material will be transported off site and disposed at a fully authorised soil recovery site, identified in chapter X of the EIAR;
- Any earthen (sod) banks to be excavated will be carefully opened with the surface sods being stored separately and maintained for use during reinstatement;
- The excavated trench will be dewatered if required, from a sump installed within the low section of the opened trench. Where dewatering is required, dirty water will be fully and appropriately attenuated, through silt bags, before being appropriately discharged to vegetation or surface water drainage feature;
- Where required, grass will be reinstated by either seeding or by replacing with grass turves;
- No more than a 100m section of trench will be opened at any one time. The second 100m will only be excavated once the majority of reinstatement has been completed on the first;
- The excavation, installation and reinstatement process will take on average of 1 no. day to complete a 100m section;
- Where the cable is being installed in a roadway, temporary reinstatement may be provided to allow larger sections of road to be permanently reinstated together;
- Following the installation of ducting, pulling the cable will take approximately 1 no. day between each joint bay, with the jointing of cables taking approximately 1 week per joint bay location.

Figure 2 - 110kV Underground Duct Installation

7.2 Ducting Installation Methodology

For the trenching and ducting works the following step by step methodology will apply:

1. Grade, smooth and trim trench floor when the required 1315mm depth and 825mm width have been obtained.
2. Place bedding layer of Cement Bound Granular Mixture B (CBGM B) material in accordance with the specification and compact it so that the compacted thickness is as per the drawings.
3. Lay the bottom row of ducts in trefoil formation as detailed on the design drawings. Use spacers as appropriate to establish horizontal duct spacing. Fit a secure cap / bung to the end of each duct run to prevent the ingress of dirt or water.
4. Carefully surround and cover ducts with CBGM B in accordance with the design drawings and specifications and thoroughly compact without damaging ducts.
5. Place cable protection strips on compacted CBGM B directly over the ducts.
6. Lay the top row of ducts onto the freshly compacted CBGM B including the cable protection strips above the bottom row of ducts. Place a secure cap at the end of each duct to prevent the ingress of dirt or water.
7. Carefully surround and cover ducts with CBGM B material in accordance with the drawings and thoroughly compact without damaging ducts.
8. Place red cable protection strip on top of compacted CBGM B over each set of ducts as shown on the drawings.
9. Place and thoroughly compact CBGM B material or Clause 804 backfill or soil backfill as specified and place warning tape at the depth shown on the drawings.
10. For concrete and asphalt/bitmac road sections, carry out immediate permanent reinstatement in accordance with the specification and to the approval of the local authority and/or private landowners, unless otherwise agreed with local authorities (Figure 3).
11. Clean and test the ducts in accordance with the specification by pulling through a brush and mandrel. Install 12 mm polypropylene draw rope in each duct and seal all ducts using robust duct

end seals fitted with rope attachment eyes in preparation for cable installation at a later date. All the works should be witnessed by ESBN Clerk of Works (CoW) as required.

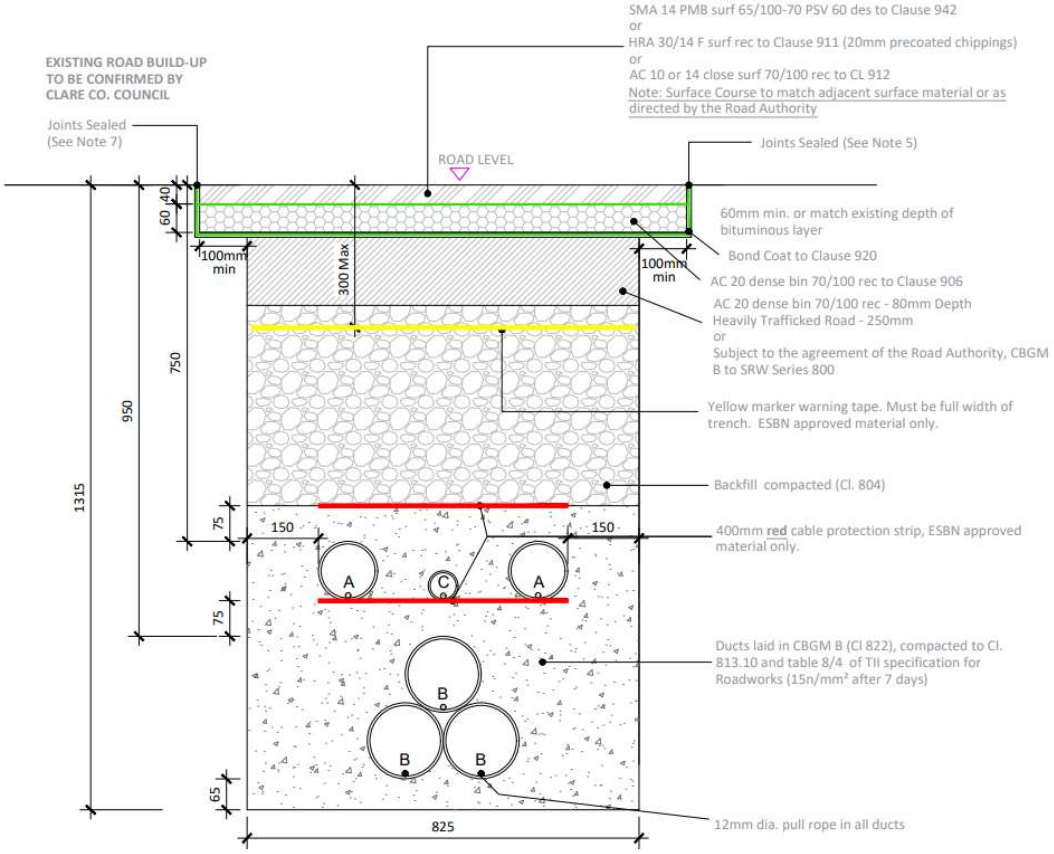


Figure 3 - Standard Trench in Roadway

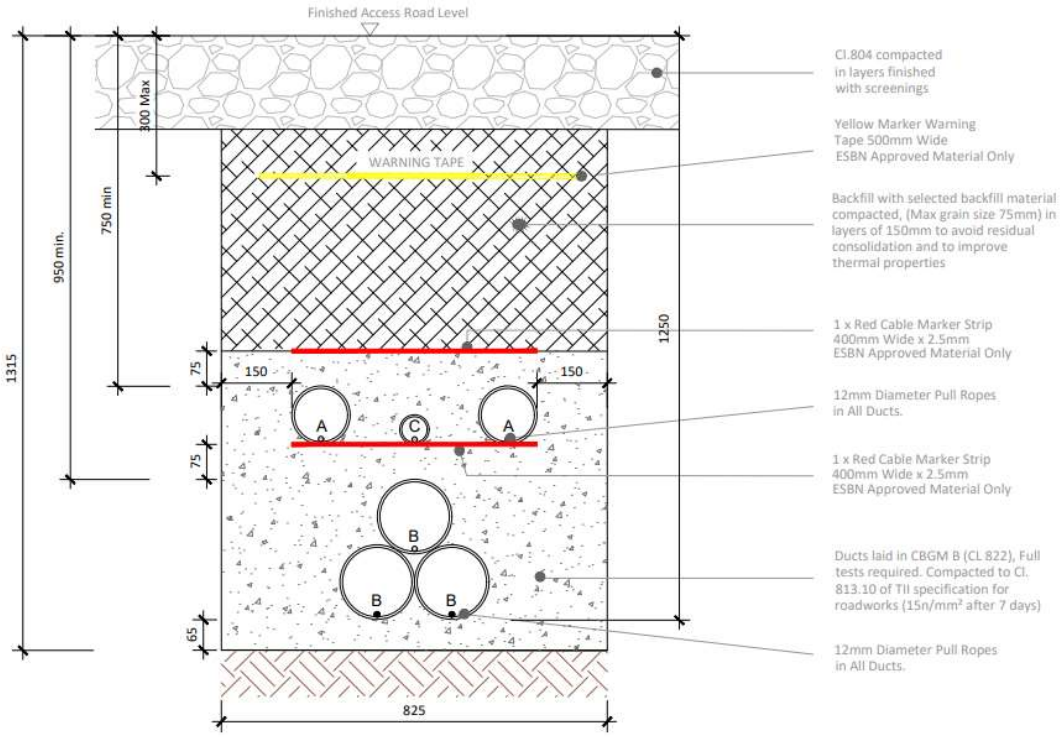


Figure 4 - Standard Trench through Access Road

Equipment:

- 2-3 General Operatives;
- 1 Excavator Operator;
- 1 no. tracked excavator (only rubber tracked machines will be allowed on public roads);
- 1 no. dumper or tractor and trailer.

Materials:

- Sand for pipe bedding;
- Ready-mix Concrete where necessary (delivered to site);
- Trench backfilling material (excavated material and aggregates) to relevant specifications;
- 160mm diameter HDPE ducting;
- 125mm diameter HDPE ducting;
- 63mm diameter HDPE ducting;
- Temporary Surface Reinstatement Materials

7.2.1 On Private Tracks (Chainage 0m – 650m)

Where the cable is installed in private tracks, predominantly within the Ardnacrusha complex, the location where the cable is laid will depend on several factors, width of track, bends along the track and crossings. Where the track needs to be widened stone will be brought in to build up the area to the same level of the track.

7.2.2 On Public Road (Chainage 650m – 8730m)

The majority of the 110kV UGC route is located within public road carriages and the trench will be in the non-trafficked strip between the wheel marks on the road, presence of exiting utilities and depending on the nature of the road and the adjoining terrain. It is preferable to excavate a trench within the middle of the lane, or the middle of the roadway to reduce load on the cable.

7.2.3 Through Internal Forestry Access roads (Chainage 8730m – 9187m)

Forest roads are necessary to provide access to the forestry for general management, maintenance, timber extraction and recreation. These roads have been constructed in line with the Coford Forestry roads manual[2]. The UG cable route will be required to traverse sections of existing forestry roads on approach to the permitted wind farm substation. The trench will be in the non-trafficked strip, within the middle of the existing forestry road, cognizant of any future haulage frequenting the plantation. Any excess material deposited from the open trenching from the road will be reused for surface reinstatement or spread locally.

7.3 Marker posts

Surface cable markers will be placed along the route where cable depth is unavoidably shallow, due to constraints such as existing services, to indicate the precise location of the UGC. These markers will be metallic plates in accordance with ESB standards.

Marker posts will be used on non-roadway routes to delineate the cable route and joint bay positions. Corrosion proof aluminium triangular danger sign, with 700mm base, and with centred lightning symbol, on engineering grade fluorescent yellow background shall be installed in adequately sized concrete foundations. Marker post shall also be placed in the event that burial depth is not to standard. Siting of marker posts to be dictated by ESBN as part of the detailed design process. (Figure 5) below

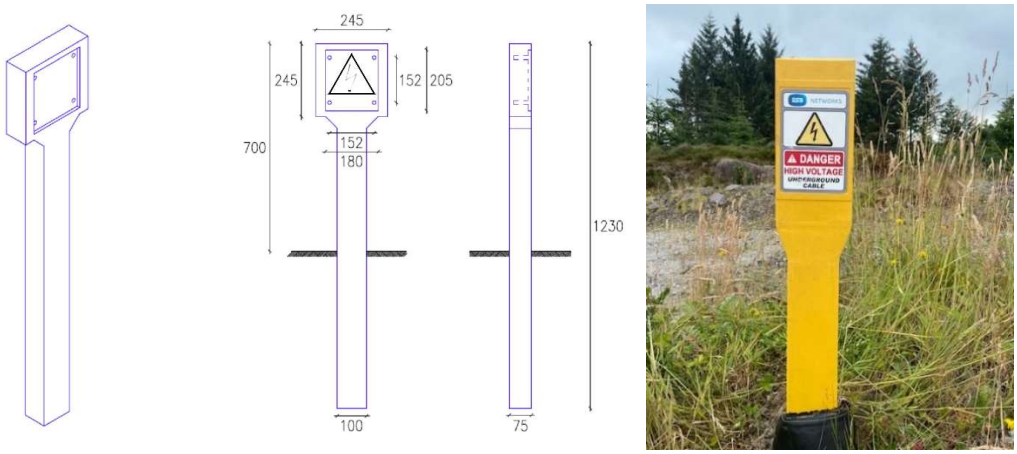


Figure 5 - Typical ESB Marker Posts Example

7.4 Horizontal Direction Drilling (HDD)

Horizontal Direction Drilling (HDD) is a method of drilling under obstacles such as bridges, railways, water courses, etc. in order to install cable ducts under the obstacle. This method is employed where installing the ducts using standard installation methods is not possible. There are a number of bridges on this UGC route which will require HDD due to there being insufficient cover and depth in the bridge to cross within the bridge deck. The proposed drilling methodology is as follows:

[2] http://www.coford.ie/media/coford/content/publications/projectreports/ForestRoadManual.pdf

1. A works area of circa 40m^2 will be fenced on both sides of the river crossing,
2. The drilling rig and fluid handling units will be located on one side of the bridge and will be stored on double bunded 0.5mm PVC bunds which will contain any fluid spills and storm water run-off.
3. Entry and exit pits (1m x 1m x 2m) will be excavated using an excavator, the excavated material will be temporarily stored within the works area and used for reinstatement or disposed of to a licensed facility.
4. A 1m x 1m x 2m steel box will be placed in each pit. This box will contain any drilling fluid returns from the borehole.
5. The drill bit will be set up by a surveyor, and the driller will push the drill string into the ground and will steer the bore path under the watercourse.
6. A surveyor will monitor drilling works to ensure that the modelled stresses and collapse pressures are not exceeded.
7. The drilled cuttings will be flushed back by drilling fluid to the steel box in the entry pit.
8. Once the first pilot hole has been completed a hole-opener or back reamer will be fitted in the exit pit and will pull a drill pipe back through the bore to the entry side.
9. Once all bore holes have been completed, a towing assembly will be set up on the drill and this will pull the ducting into the bore.
10. The steel boxes will be removed, with the drilling fluid disposed of to a licensed facility.
11. The ducts will be cleaned and proven, and their installed location surveyed.
12. The entry and exit pits will be reinstated to the specification of ESB Networks and Clare County Council.
13. A transition chamber will be installed at either side of the bridge/ following the horizontal directional drilling as per ESB/EirGrid requirements, this will join the HDD ducts to the standard ducts.

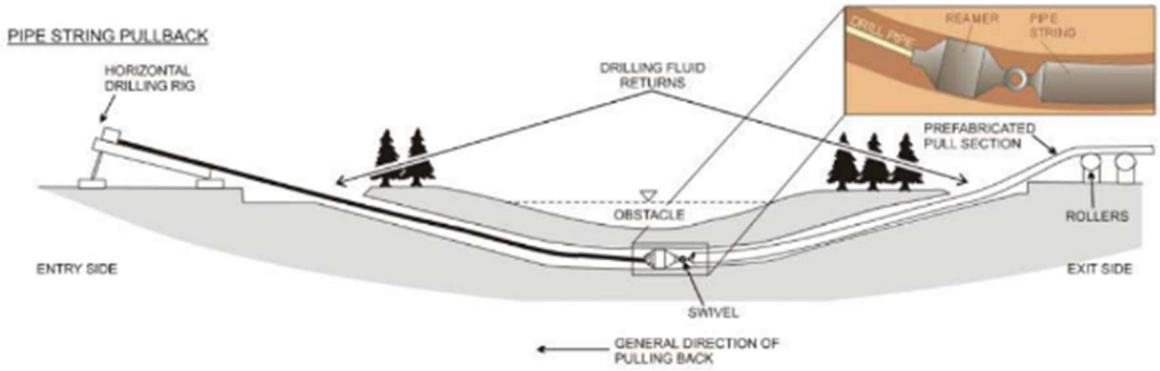


Figure 6 - Typical HDD Installation

7.5 Joint Bays and Associated Chambers

Joints Bays are to be installed as shown on drawings accompanying the planning application and approximately every 700m - 850m along the UGC route to facilitate the jointing of 2 No. lengths of UGC. Joint Bays are typically 6m x 2.5m x 2.05m pre-cast concrete structures installed below finished ground level. Joint Bays will be located in the non-wheel bearing strip of roadways, however given the narrow profile of local roads this may not always be possible. In the event of a joint bay and associated chambers being installed within narrow road profiles, there may be a requirement for a temporary construction passing bays to facilitate the works. Please refer to Drawings 05783-202, 05783-123, 05783-124, 05783-125, 05783-126, 05783-127.

In association with Joint Bays, Communication Chambers are required at every joint bay location to facilitate communication links between the Knockshanvo Wind Farm substation and the existing 110kV substation at Ardnacrusha. Earth Sheath Link Chambers are also required at every joint bay along the cable route. Earth Sheath Links are used for earthing and bonding cable sheaths of underground power cables, so that the circulating currents and induced voltages are eliminated or reduced. Earth Sheath Link Chambers and Communication Chambers are located in close proximity to Joint Bays. Earth Sheath Link Chambers and Communication Chambers will typically be pre-cast concrete structures with an access cover at finished surface level.

The precise siting of all Joint Bays, Earth Sheath Link Chambers and Communication Chambers is subject to approval by ESBN. Marker posts will be used on non-roadway routes to delineate the duct route and joint bay positions.

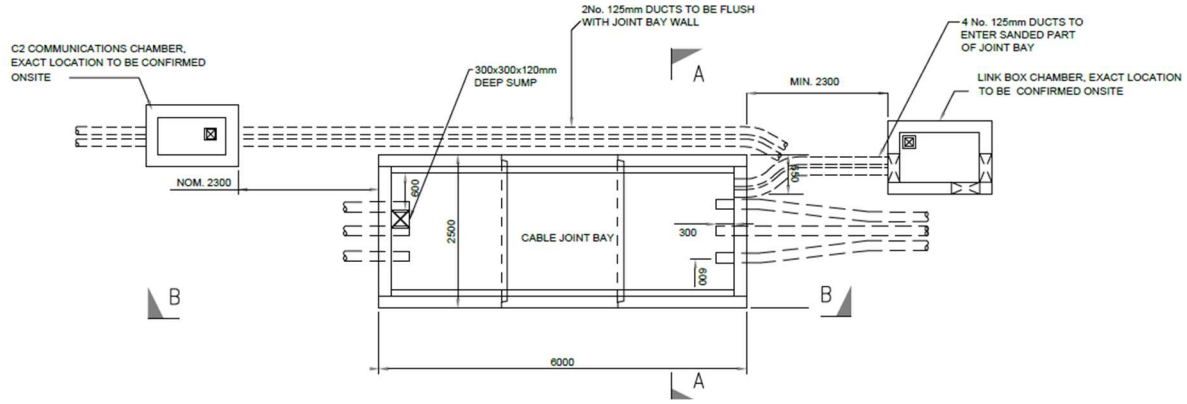


Figure 7 - 110kV Joint Bay Plan Layout

7.6 Joint Bay Construction and Cable Installation

Before starting to construct, the area around the edge of the proposed joint bay which will be used by heavy vehicles will be surfaced with a terram cover if required and stone aggregate to minimise ground damage. 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 excavated material that isn't removed off-site to a licenced facility will be stored near the excavations and reused for reinstatement works. Any soil required for reinstatement that will be temporarily stockpiled on site will be placed at least 15m back from the nearest watercourse on level ground and will be ringed at the base by silt fencing and be regularly monitored by a designated competent person for signs of solids escape. In which case an additional line of silt fencing with straw bales will be added in line with the relevant environmental control measures.

If the joint bay needs to be dewatered, this will be pumped to a percolation area if the soil is not saturated, otherwise a settlement tank will be used to remove any solids from the dewatering process to comply with the environmental control measures.

The risk of concrete reaching surface waters is considered very low given that all concrete will be poured into the pit excavated for the joint bay so that spills will be contained. The basic requirement therefore is that all pouring operations be constantly supervised to prevent accidental spillages occurring outside the pit.

Temporary storage of cement bound sand (if required) will be on hardstand areas only where there is no direct drainage to surface waters and where the area has been bunded e.g. using sand-bags and geotextile sheeting or silt fencing to contain any solids in run-off.

The following steps outline the methodology for joint bay construction and reinstatement:

1. The contractor will excavate a pit for joint bay construction, including for a sump in one corner.
2. Grade and smooth floor; then lay a 75 mm depth of blinding concrete (for in situ construction) or 50 mm thick sand (for pre-cast concrete construction) on 200 mm thick Clause 804 granular material.
3. In situ construction. Construct 200 mm thick reinforced concrete floor slab with sump and starter bars placed for walls as detailed on the drawings.
4. In situ construction. Construct 200 mm thick reinforced concrete sidewalls as detailed on the drawings. (Figure 8).

Figure 8 - Typical joint bay under construction (in-situ)

5. In situ construction. Remove formwork and backfill with suitable backfill material in grassed areas or Clause 804 material once ducting has been placed in the bay. Backfill externally with granular material to Co. Council/TII Specification for Roadworks. (Figure 9)

Figure 8 - Completed joint bay prior to cable installation (in-situ)

6. Pre-cast concrete construction. Place pre-cast concrete sections on sand bedding. (Figure 9)

Figure 9 - Joint bay under construction (pre-cast)

7. Where joint bays are located under the road surface the joint bay will be backfilled with compacted layers of Clause 804 and the road surface temporarily reinstated as specified by the local authority.
8. 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.
9. At a later date to facilitate cable installation and jointing, reinstate traffic management signage, secure individual sites, re-excavate three consecutive joint bays and store excavated material for reuse.
10. The cable is supplied in pre-ordered lengths on large cable drums (Figure 10). Installing "one section" of cable 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**.** A sponge may also be secured to the winch rope to disperse lubricant through the duct. Lubrication is also applied to the cable in the joint bay before it enters the duct.

Figure 10 - HV cable pulling procedure (Typical drum set-up)

11. Once the "two sections" of cable (total of 6 conductors) are pulled into the joint bay, a jointing container is positioned over the joint bay and the cable jointing procedure is carried out in this controlled environment. (Figure 11).

Figure 11 - HV cable jointing container

12. 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 the level of the cable joint base to provide vertical support. Install additional layers of cement-bound sand and compact each layer until the cement-bound sand is level with the top of the joint. Install an additional 100 mm cement-bound sand layer. Install cable protection strip. Backfill with cement-bound sand to a depth of 250 mm below surface and carry out permanent reinstatement including placement of warning tape at 400 mm depth below finished surface.

Equipment:

- 2-3 General Operatives
- 1 Excavator Operator
- 360˚ tracked excavator (13 ton normally, 22 ton for rock breaker)
- 1 no. tracked dumper or tractor and trailer.

Materials:

- Sand for pipe bedding
- Blinding Concrete where necessary
- Clause 804 Material
- 160mm diameter HDPE ducting
- 125mm diameter HDPE ducting
- 63mm diameter HDPE ducting
- Precast Chamber Units / Relevant construction materials for chambers
- Earth Sheath Link Box

8.0 Relocation of Existing Services

In order to facilitate the installation of the proposed underground cable, it may be necessary to relocate existing underground services such as water mains, gas networks, telecommunications, or existing cables.

Prior to work commencement of any excavation works, it is the responsibility of the developer to locate all existing services by undertaking detailed surveys and scans of the proposed route to confirm the presence or otherwise of any services and to safeguard same during construction. 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.

Relevant information will also be provided to the local authority and the employed crews to mitigate against any conflicts with existing buried services. It is an obligation of the developer/licence holder to install underground cable infrastructure in line with EirGrid functional specifications, for safety, constructability, and maintenance reasons. The new infrastructure shall be designed / installed as per these standards, to ascertain a separation from any existing 3rd party services (i.e. Water, Telecom, etc) and inclusive from any High Voltage /Medium Voltage or Low Voltage cables that may also be present. This minimum clearance requirement is incorporated into the H.S.A. Code of Practice on "Avoiding Danger from Buried Services". Electricity cables/ducts must not be laid above other existing services except at crossing positions.

9.0 Service Culvert Crossings

Numerous other minor watercourses crossing locations have been noted along the proposed cable route i.e. culverts, pipe drains. The majority of these minor watercourses have been identified as part of the survey works and a proposed crossing schedule has been included as part of this report, see ***Appendix A***.

Crossing existing culverts will be implemented using open trenching with either an undercrossing or an overcrossing, depending on the depth of the culvert. The cable route will involve 3 No. culvert crossings locations. The culvert crossing methods are detailed in *Figures 13* and *14* below, and more detailed culvert crossing drawings are available. Ref Drawings 05783-DR-116-P0 & 05783-DR-117-P0.

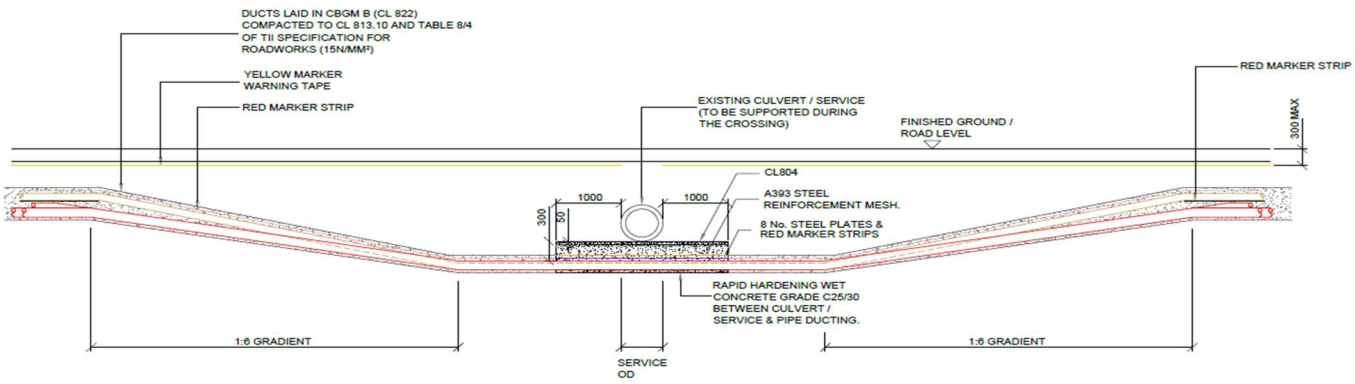


Figure 12 – 110kV UGC Culvert Undercrossing

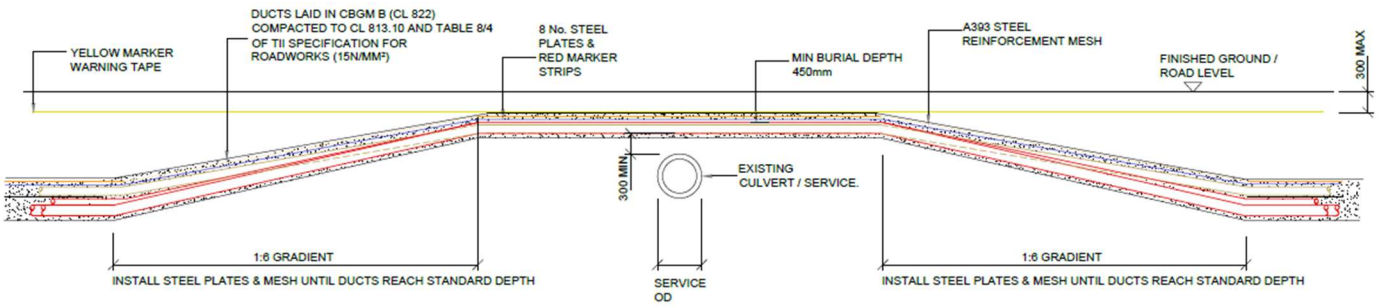


Figure 13 - 110kV UGC Culvert Overcrossing

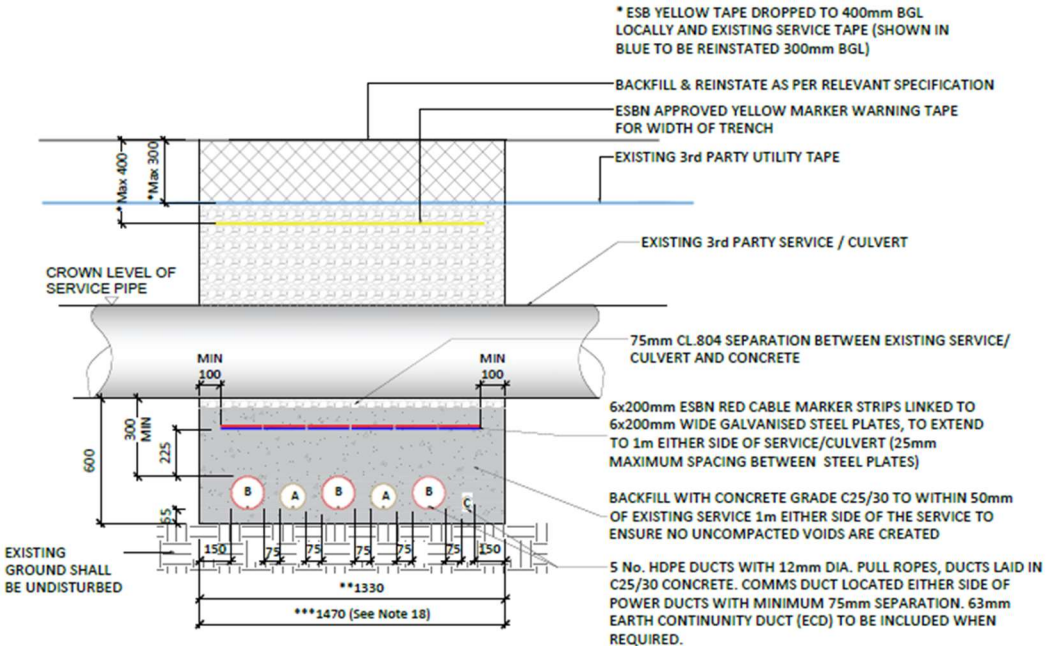


Figure 14 - Service undercrossing sectional view

9.1 Major Watercourse Crossings

The proposed cable route will involve 2 No. bridge crossings including 2 No. HDD crossings. Where the cable route intersects with existing watercourses, a detailed construction method statement will be prepared by the Contractor prior to the commencement of construction and is to be approved by the Local Authority and relevant environmental agencies. The cable will be located within the bridge deck where there is sufficient depth and width available on the bridge, where there is insufficient depth and width available horizontal directional drilling (HDD) is proposed.

Inland Fisheries Ireland have published guidelines relating to construction works along water bodies entitled ‘Requirements for the Protection of Fisheries Habitats during Construction and Development Works at River Sites”, and these guidelines will be adhered to during the construction of the proposed development.

9.1.1 Bridge 1 - Horizontal Directional Drilling

ITM Coordinates: 558345.19, 665647.18

Bridge 1 has insufficient room to install the cable to ESB/EirGrid specification (450mm cover to top of ducts) and the suitability of the bridge is inadequate to accommodate the proposed works. It is proposed to horizontal directional drill (HDD) approximately 1500mm beneath the waterway and bridge foundations. This depth is based on locating a suitable clay/silt formation for HDD and the required depth may increase subject to geotechnical investigations. Drilling will take place from the road carriageway**.**

See Drawing 05783-DR-120-P0 for further details.

Figure 15 - Bridge 1

Figure 16 - Bridge 1 on OSI Background

9.1.2 Bridge 2 - Horizontal Directional Drilling

ITM Coordinates: 558309.67, 667282.75

Bridge 2 has insufficient room to install the cable to ESB/EirGrid specification (450mm cover to top of ducts) and the suitability of the bridge is inadequate to accommodate the proposed works. It is proposed to horizontal directional drill (HDD) approximately 1500mm beneath the waterway and bridge foundations. This depth is based on locating a suitable clay/silt formation for HDD and the required depth may increase subject to geotechnical investigations. Drilling will take place from the road carriageway**.**

See Drawing 05783-DR-121-P0 for further details.

Figure 17 - Bridge 2

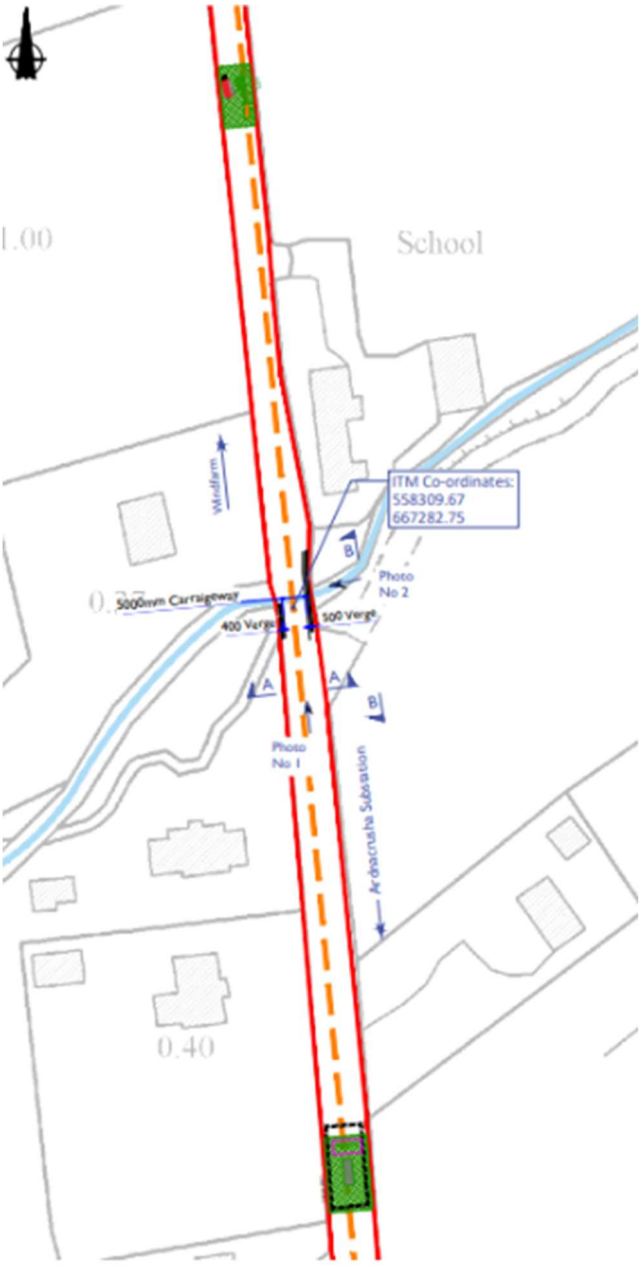


Figure 18 - Bridge 2 within R471 on OSI Background

10.0 Reinstatement of Private Land

Once all construction works are complete, the work areas will be reinstated with excavated soil and either seeded out with native species, allowed to vegetate naturally or reinstated with excavated grass turves and will be restored to their original condition. This work will be carried out in in consultation with the landowner and in line with any relevant measures outlined in the planning application, CEMP and planning conditions.

11.0 Best Practice Design and Construction & Environmental Management Methodology

Prior to commencement of construction works the contractor will draw up detailed Method Statements which will be informed by this Construction Methodology, environmental protection measures included within the planning application, measures proposed within the CEMP, and the guidance documents and best practice measures listed below. This method statement will be adhered to by the contractors and will be overseen by the Project Manager, Environmental Manager and ECoW where relevant.

The following documents will contribute to the preparation of the method statements in addition to those measures proposed in Sections 12 to 15 below:

- Inland Fisheries Ireland (2016) *Guidelines on Protection of Fisheries during Construction Works in and Adjacent to Waters*. Inland Fisheries Ireland*, Dublin,*
- *National Roads Authority (2008) Guidelines for the Crossing of Watercourses during the Construction of National Road Schemes*. National Roads Authority, Dublin;
- E. Murnane, A. Heap and A. Swain. (2006) *Control of water pollution from linear construction projects.* Technical guidance (C648). CIRIA;
- E. Murnane et al., (2006) *Control of water pollution from linear construction projects*. Site guide (C649). CIRIA.
- Murphy, D. (2004) Requirements for the Protection of Fisheries Habitat during Construction and Development Works at River Sites. Eastern Regional Fisheries Board, Dublin;
- H. Masters-Williams et al (2001) *Control of water pollution from construction sites. Guidance for consultants and contractors* (C532);
- Enterprise Ireland (unknown). *Best Practice Guide (BPGCS005) Oil storage guidelines;*
- Law, C. and D'Aleo, S. (2016) *Environmental good practice on site pocket book*. (C762) 4th edition. CIRIA;
- CIRIA *Environmental Good Practice on Site (fourth edition) (C741) 2015*.

The proposed works will be carried out by employing accepted good work practices during construction, and environmental management measures set out in the EIAR and NIS (Natura Impact Statement).

12.0 Invasive Species Best Practice Measures

Please refer the Biodiversity Chapter of the EIAR for details.

13.0 Waste Management

Please refer the Waste Management Chapter of the EIAR for details.

14.0 Implementation of Environmental Protection Measures

All environmental protection measures contained with the EIAR and NIS (Natura Impact Statement) which accompanies the planning application will be incorporated into the CEMP and construction method statements prior to the commencement of development and will be implemented in full during the construction phase. The Project Manager and Site Manager will be responsible for the implementation of measures following consultation with the Environmental Manager and ECoW where necessary.

Appendix A – Culvert Crossings

Culvert Crossing Schedule					
Culvert No.	Dimensions (mm)	Material	Approx. Cover (mm)	Proposed Crossing Methodology	Photo
1.	350 Ø	HDPE	250	UNDERCROSSING	
2.	300 Ø	HDPE	200	UNDERCROSSING	
3.	400mm Wide x 600mm Deep	Stone	500	UNDERCROSSING	
4.	300 Ø	HDPE	500	UNDERCROSSING	
5.	300 Ø	HDPE	200	UNDERCROSSING