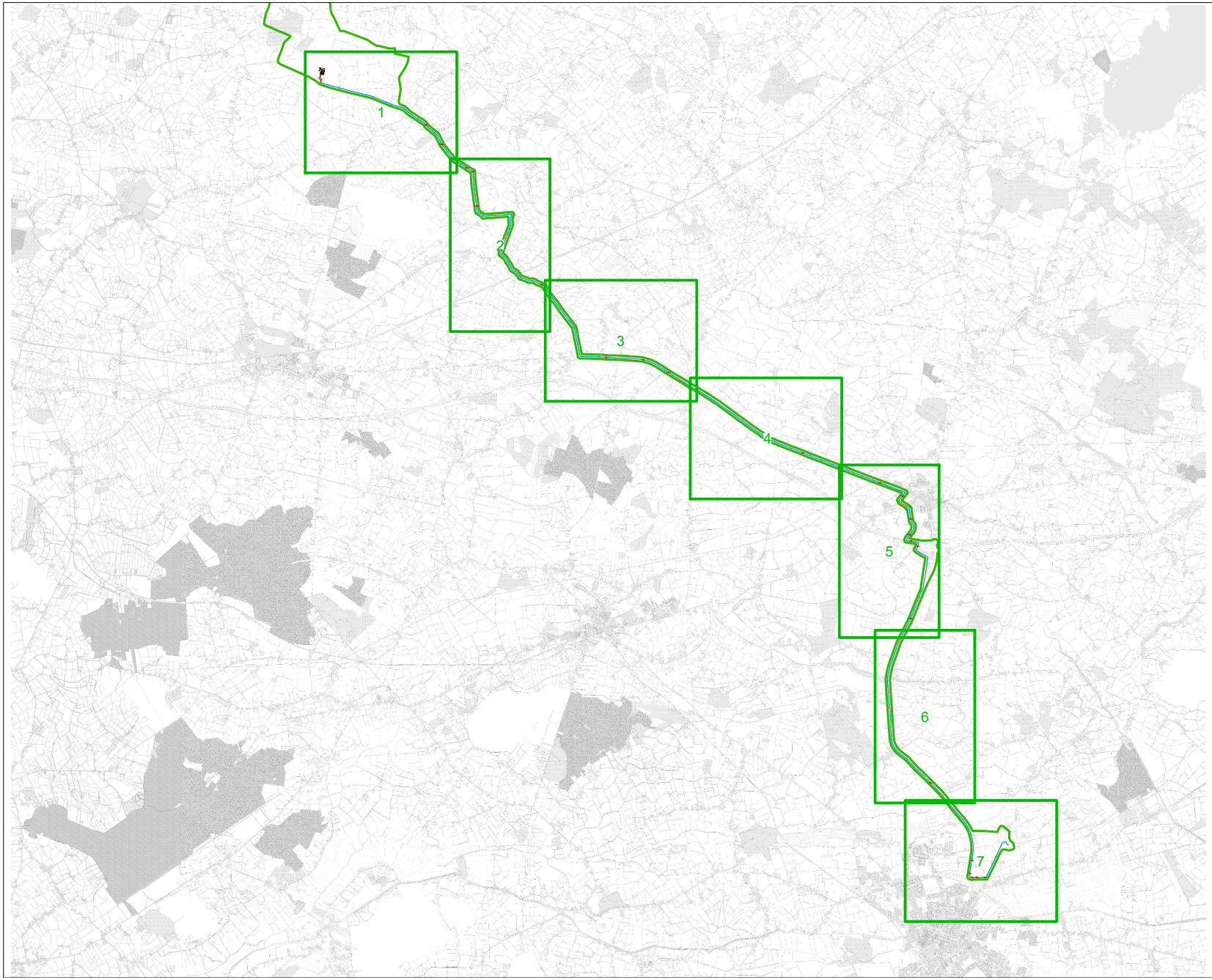
APPENDIX 7

GRID CONNECTION INFRASTRUTURE DESIGN DRAWINGS



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7. Exact location of cable/joint bay in the road curtilage to be subject to ESB specifications and agreement with Westmeath County Council.

Drawing Legend

- EIAR Site Boundary
- Underground Electrical Cabling Route
- Joint Bay
- Culvert Crossing
- Watercourse Crossing

N

DRAWING TITLE:
Site Layout Map Key Plan (1:5,000)

PROJECT TITLE:
Umma More Renewable Energy Development, Co. Westmeath

DRAWING BY: Joseph O Brien	CHECKED BY: Meabhann Crowe
PROJECT No.: 201050	DRAWING No.: 201050 - 01
SCALE: 1:40,000 @ A1	DATE: 02.03.2023

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Drawing Legend

- EIAR Site Boundary
- Underground Electrical Cabling Route
- Cabling Construction Track
- Joint Bay
- Culvert Crossing
- Watercourse Crossing

N

DRAWING TITLE:

Site Layout Map
Sheet 1 of 7

PROJECT TITLE:

Umma More Renewable Energy Development, Co. Westmeath

DRAWING BY:	CHECKED BY:
Joseph O Brien	Meabhann Crowe
PROJECT No.: 201050	DRAWING No.: 201050 - 02
SCALE: 1:5,000 @ A1	DATE: 02.03.2023

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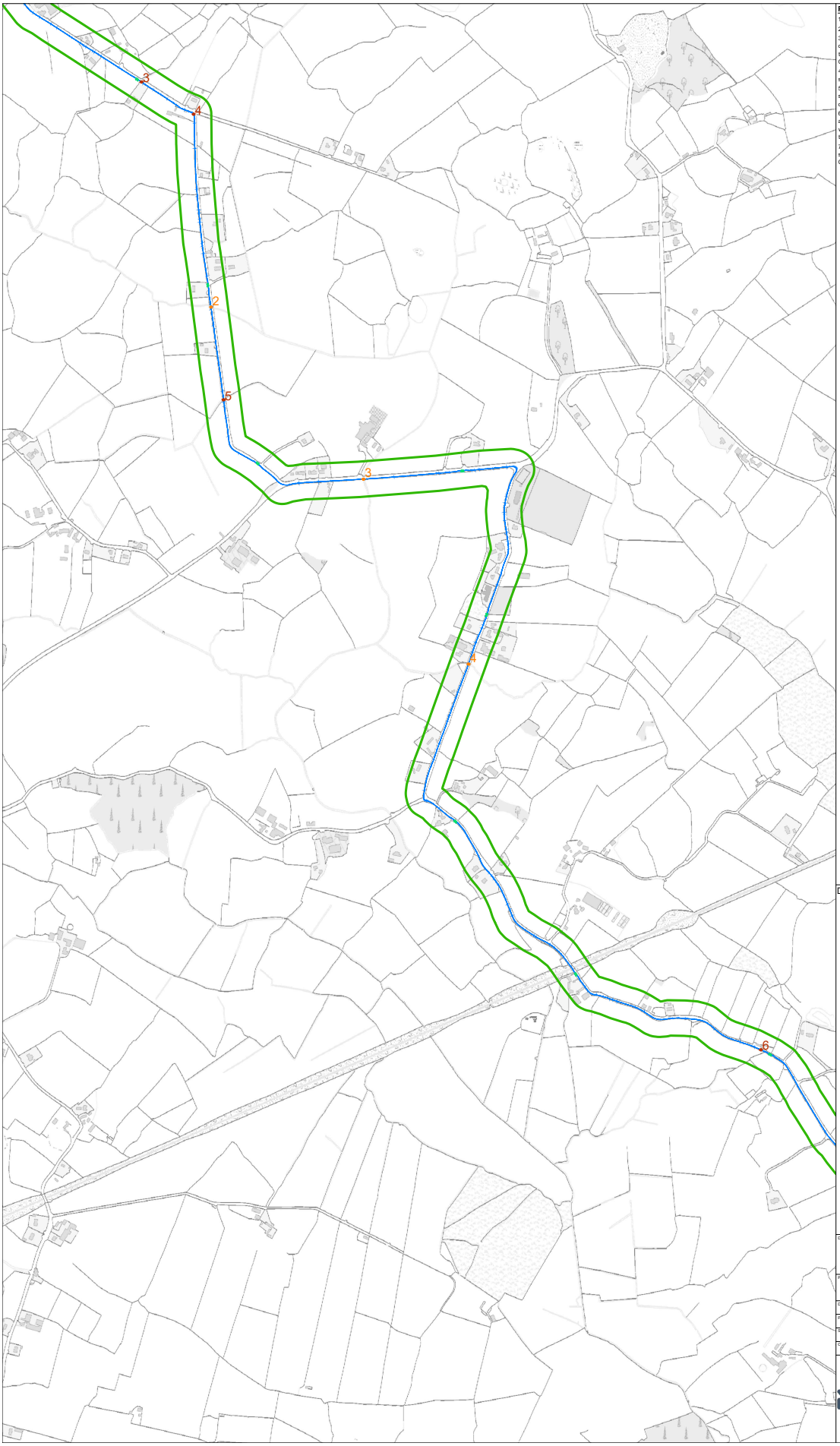

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Drawing Legend

- EIAR Site Boundary
- Underground Electrical Cabling Route
- Joint Bay
- Culvert Crossing
- Watercourse Crossing

N

DRAWING TITLE:

Site Layout Map
Sheet 2 of 7

PROJECT TITLE: Umma More Renewable Energy Development, Co. Westmeath

DRAWING BY:	CHECKED BY:
Joseph O Brien	Meabhann Crowe
PROJECT No: 201050	DRAWING No: 201050 - 03
SCALE: 1:5,000 @ A1	DATE: 02.03.2023

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Drawing Legend

- EIAR Site Boundary
- Underground Electrical Cabling Route
- Joint Bay
- Culvert Crossing
- Watercourse Crossing

N

DRAWING TITLE:

Site Layout Map
Sheet 3 of 7

PROJECT TITLE:

Umma More Renewable Energy Development, Co. Westmeath

DRAWING BY:	CHECKED BY:
Joseph O Brien	Meabhann Crowe
PROJECT No.: 201050	DRAWING No.: 201050 - 04
SCALE: 1:5,000 @ A1	DATE: 02.03.2023

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Drawing Legend

- EIAR Site Boundary
- Underground Electrical Cabling Route
- Joint Bay
- Culvert Crossing

N

DRAWING TITLE:

Site Layout Map
Sheet 4 of 7

PROJECT TITLE:

Umma More Renewable Energy Development, Co. Westmeath

DRAWING BY:	CHECKED BY:
Joseph O Brien	Meabhann Crowe
PROJECT No.: 201050	DRAWING No.: 201050 - 05
SCALE: 1:5,000 @ A1	DATE: 02.03.2023

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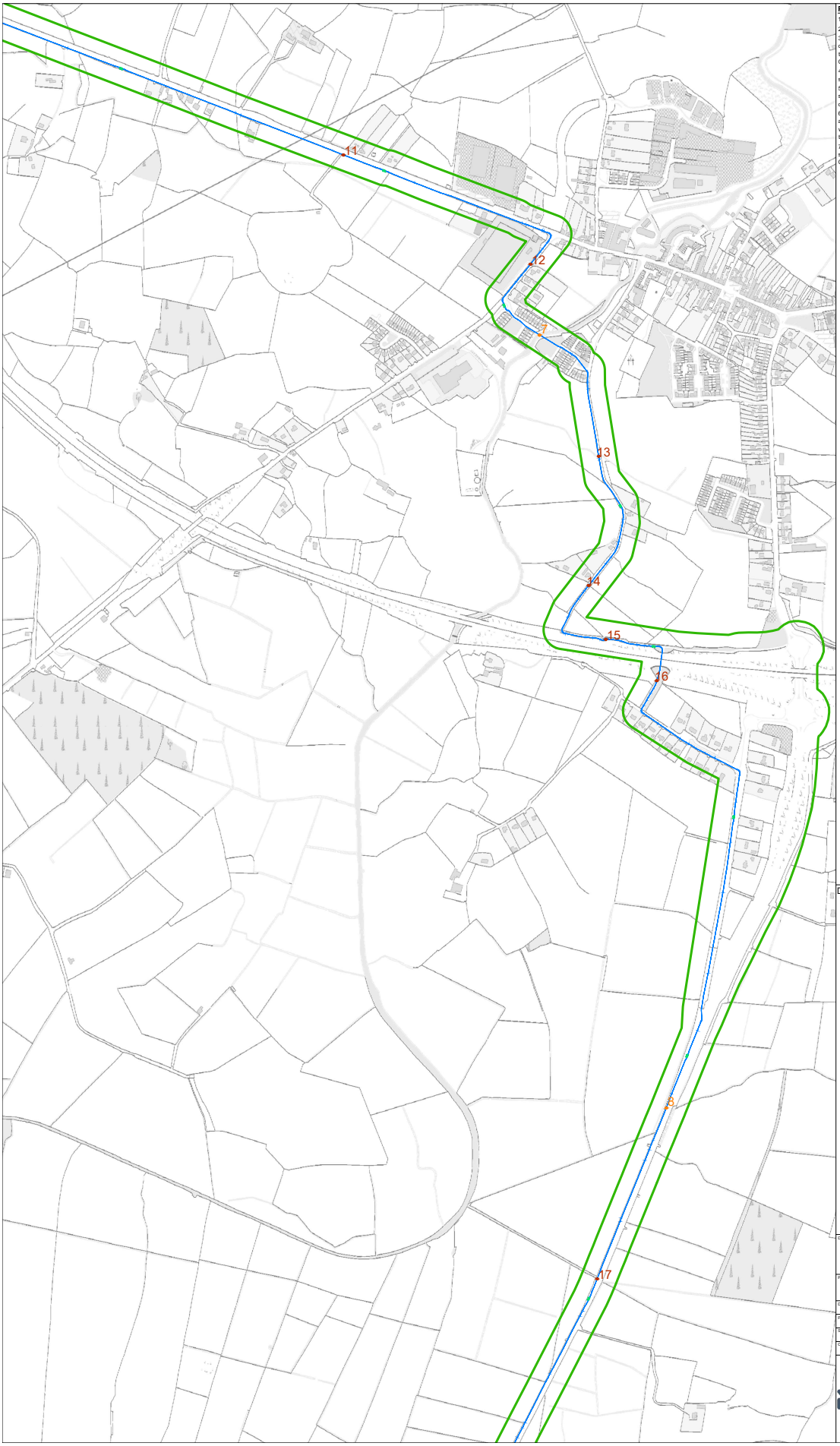

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Drawing Legend

- EIAR Site Boundary
- Underground Electrical Cabling Route
- Joint Bay
- Culvert Crossing
- Watercourse Crossing

N

DRAWING TITLE:

Site Layout Map
Sheet 5 of 7

PROJECT TITLE: Umma More Renewable Energy Development, Co. Westmeath

DRAWING BY: Joseph O Brien	CHECKED BY: Meabhann Crowe
PROJECT No: 201050	DRAWING No: 201050 - 06
SCALE: 1:5,000 @ A1	DATE: 02.03.2023

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Drawing Legend

- EIAR Site Boundary
- Underground Electrical Cabling Route
- Joint Bay
- Culvert Crossing
- Watercourse Crossing

N

DRAWING TITLE:

Site Layout Map
Sheet 6 of 7

PROJECT TITLE:

Umma More Renewable Energy Development, Co. Westmeath

DRAWING BY:	CHECKED BY:
Joseph O Brien	Meabhann Crowe
PROJECT No: 201050	DRAWING No: 201050 - 07
SCALE: 1:5,000 @ A1	DATE: 02.03.2023

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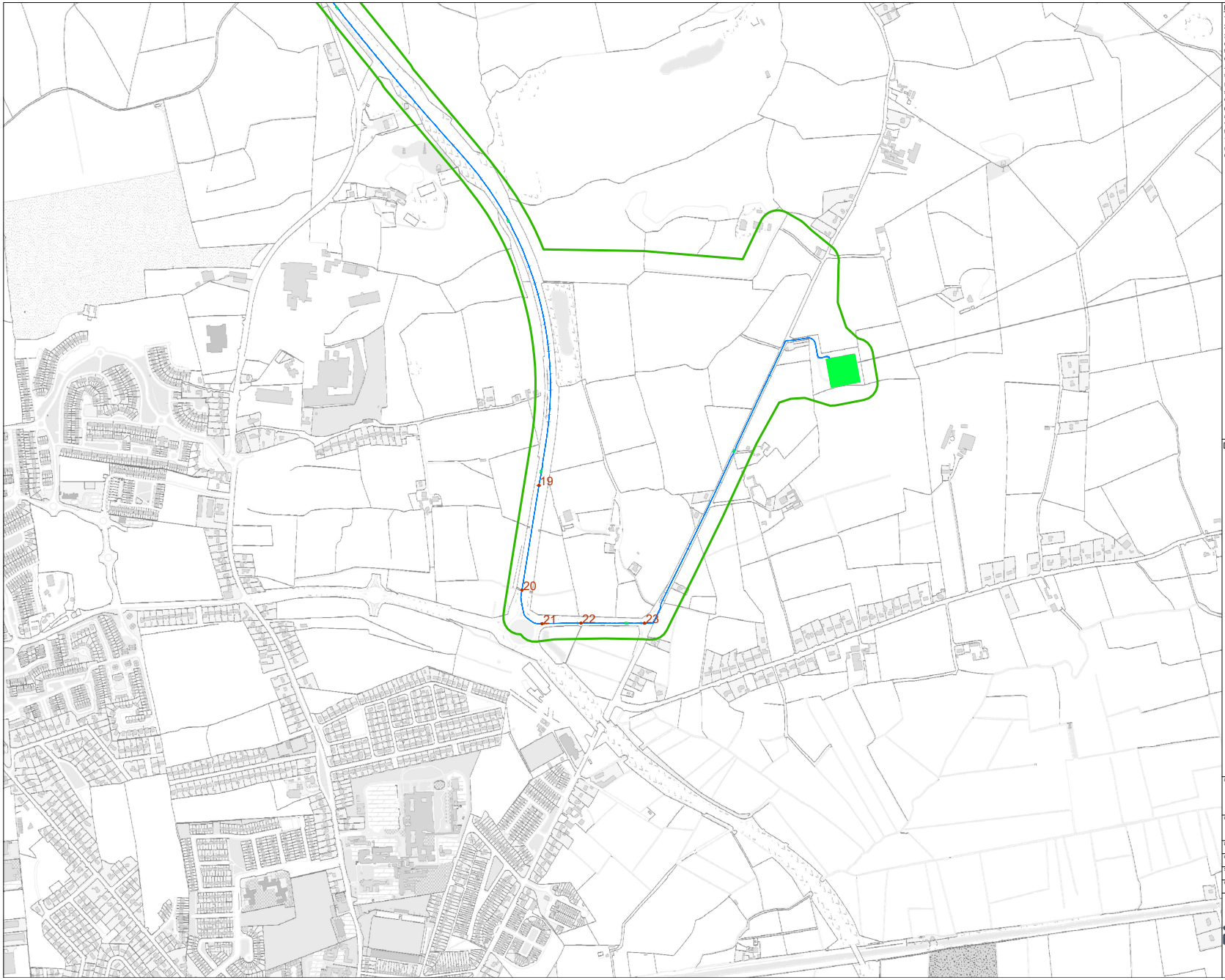

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Drawing Legend

- EIAR Site Boundary
- Underground Electrical Cabling Route
- Joint Bay
- Culvert Crossing
- Thornsberry 110kV Substation

N

DRAWING TITLE:

Site Layout Map
Sheet 7 of 7

PROJECT TITLE:

Umma More Renewable Energy Development, Co. Westmeath

DRAWING BY:	CHECKED BY:
Joseph O Brien	Meabhann Crowe
PROJECT No.: 201050	DRAWING No.: 201050 - 08
SCALE: 1:5,000 @ A1	DATE: 02.03.2023

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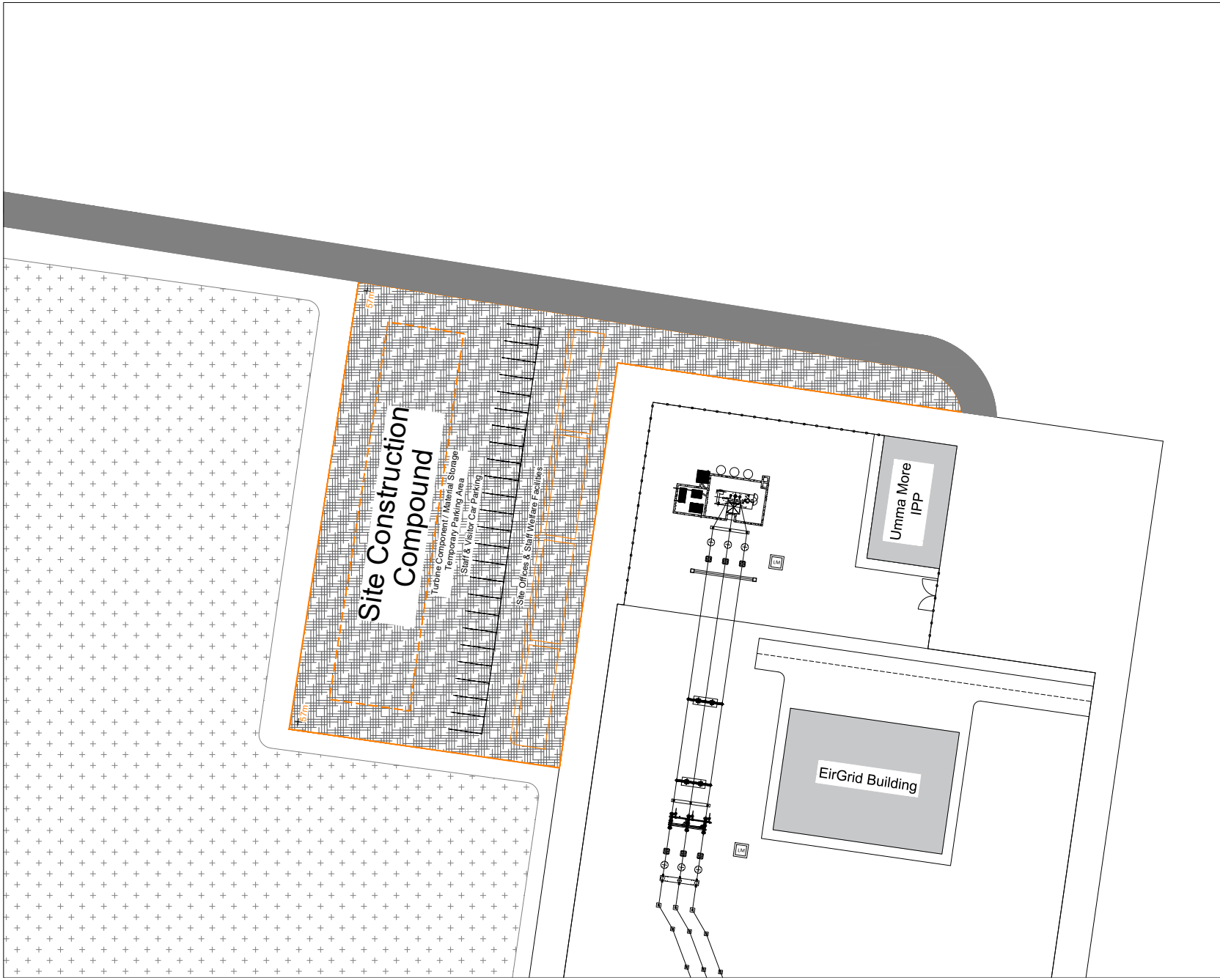

DRAWING TITLE:
Temporary Construction Compound for Grid Connection

PROJECT TITLE:
Umma More Renewable Energy Development, Co. Westmeath

DRAWING BY: Joseph O Brien	CHECKED BY: Meabhann Crowe
PROJECT No.: 201050	DRAWING No.: 201050 - 09
SCALE: 1:500 @ A3	DATE: 02.03.2023
OS SHEET No.: 2900, 2901, 2969, 2970	

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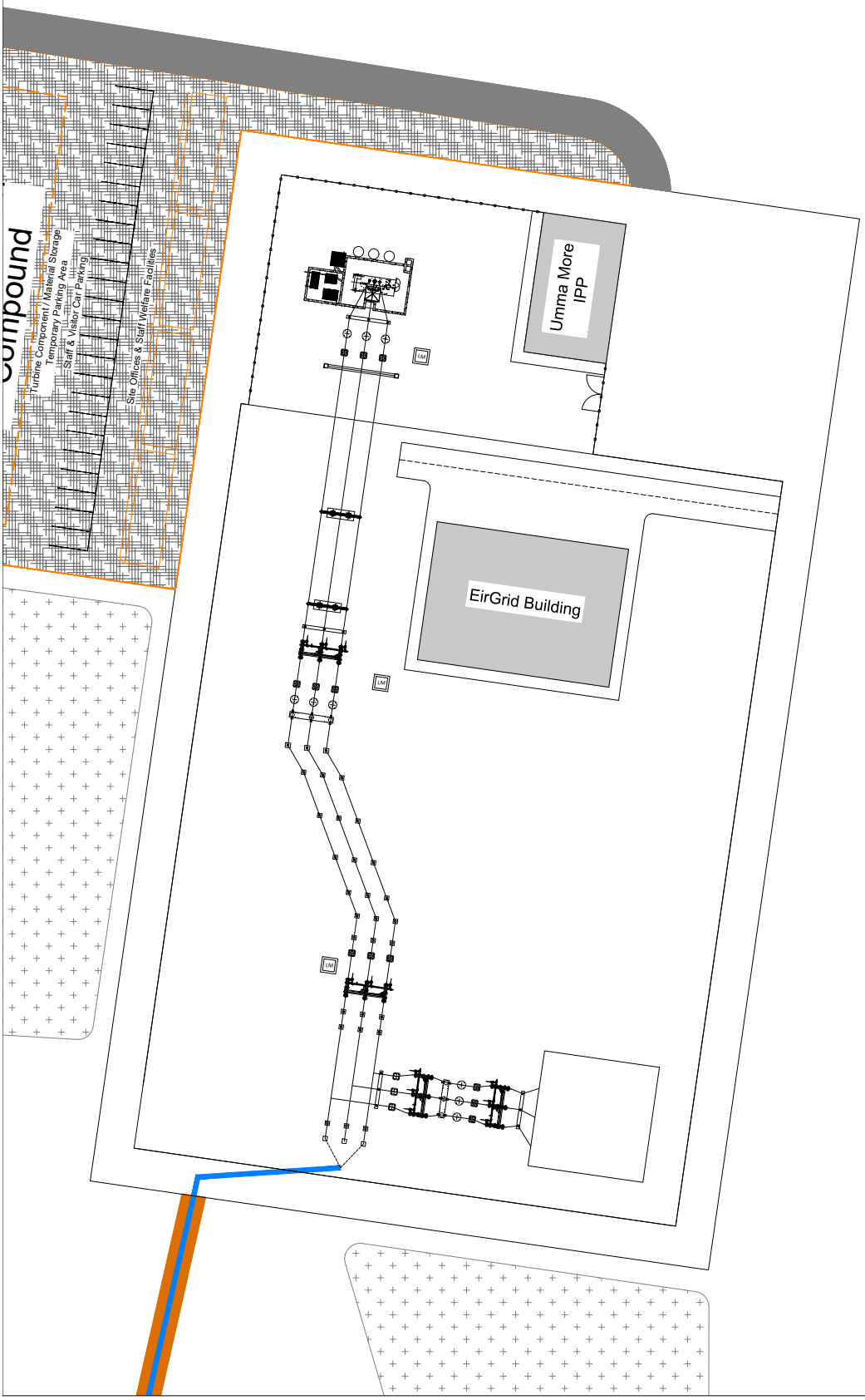

N

DRAWING TITLE:

Onsite 110kV Substation Drawing Layout

PROJECT TITLE:

Umma More Renewable Energy Development, Co. Westmeath

DRAWING BY:	CHECKED BY:
Joseph O Brien	Meabhann Crowe
PROJECT No:	DRAWING No:
201050	201050 - 10
SCALE:	DATE:
1:500 @ A3	06.03.2023

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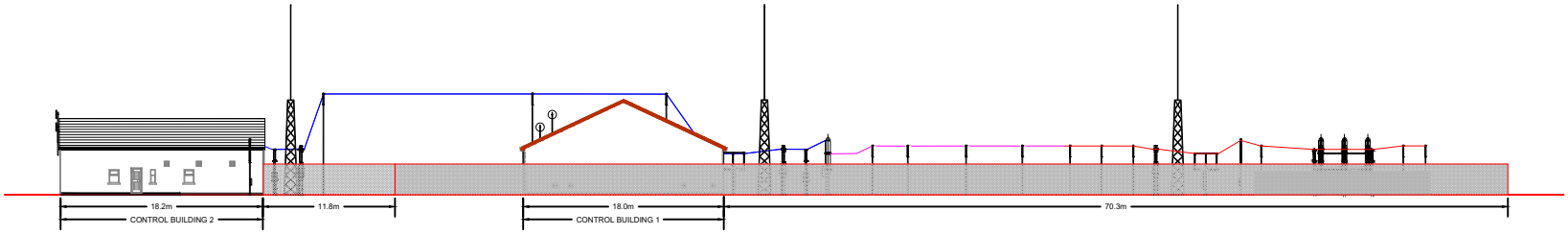
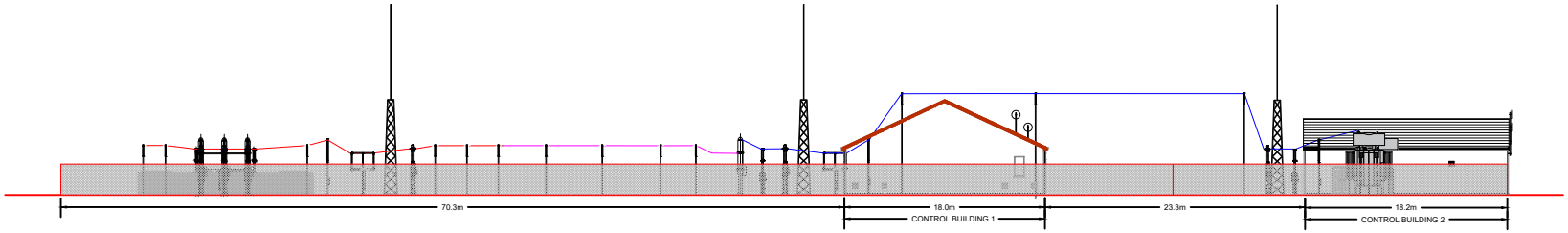
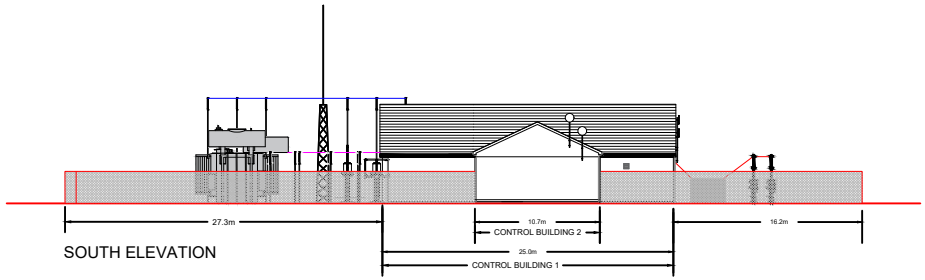


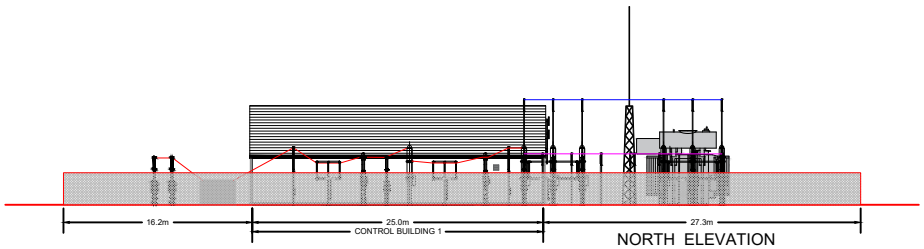
EAST ELEVATION



WEST ELEVATION



SOUTH ELEVATION



NORTH ELEVATION

DRAWING TITLE
Onsite 110kV Substation Drawing Elevations

PROJECT TITLE
Umma More Renewable Energy Development, Co. Westmeath

DRAWING BY: Joseph O Brien	CHECKED BY: Meabhann Crowe
PROJECT No.: 201050	DRAWING No.: 201050 - 11
SCALE: 1:200 @ A1	DATE: 02.03.2023

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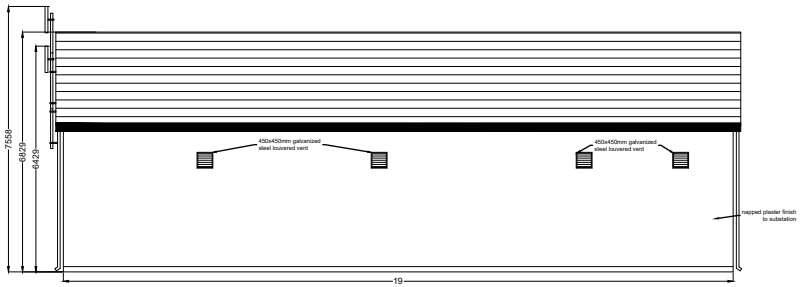

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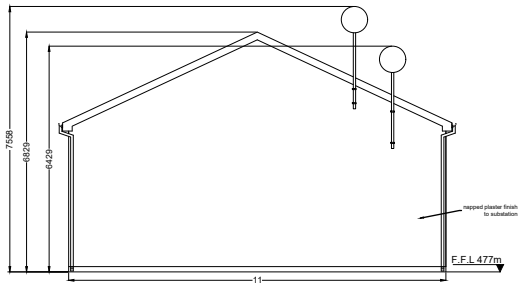
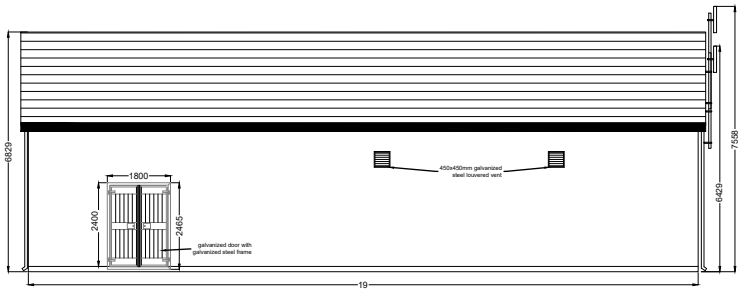
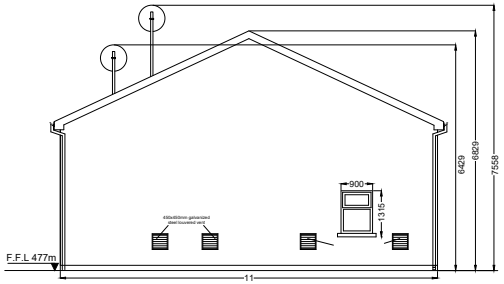


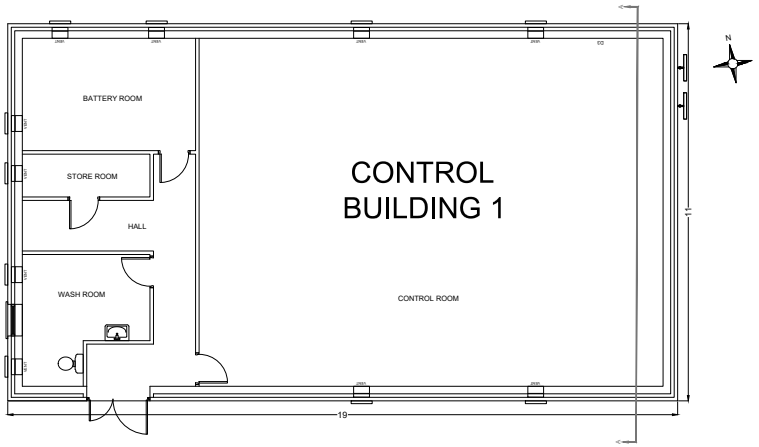
East Elevation

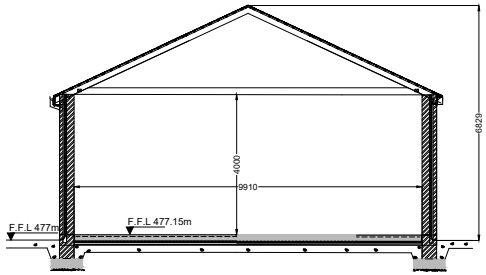


South Elevation



West Elevation





SECTION A-A

DRAWING TITLE:
Control Building 1 Elevations & Section

PROJECT TITLE:
Umma More Renewable Energy Development, Co. Westmeath

DRAWING BY: Joseph O Brien	CHECKED BY: Meabhann Crowe
PROJECT No: 201050	DRAWING No: Fig 4-15
SCALE: 1:100 @ A2	DATE: 08.03.2023

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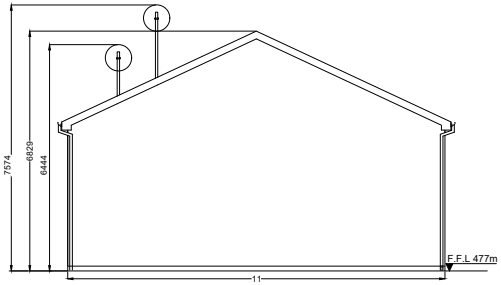
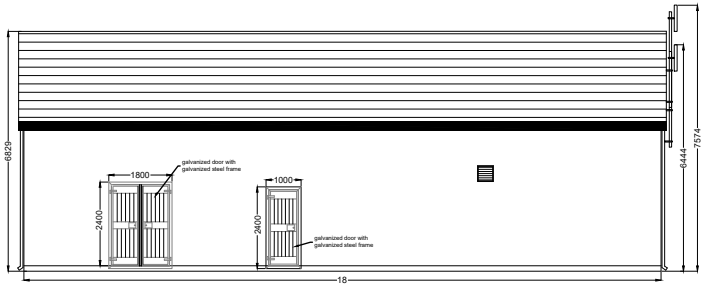
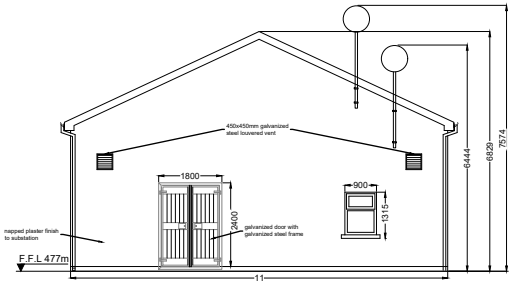


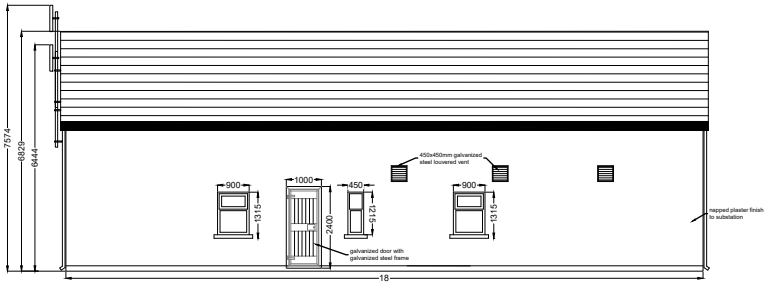
North Elevation



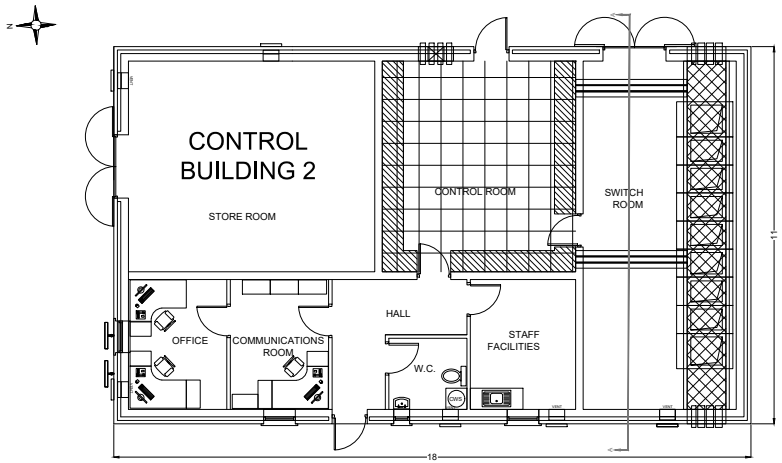
West Elevation

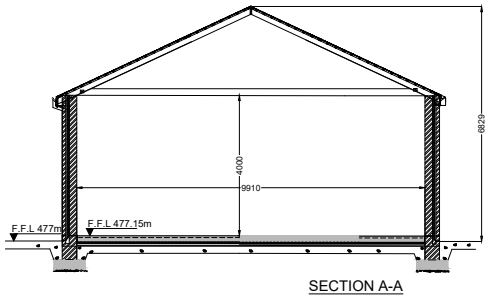


South Elevation



East Elevation





SECTION A-A

DRAWING TITLE:
Control Building 2 Elevations & Section

PROJECT TITLE:
Umma More Renewable Energy Development, Co. Westmeath

DRAWING BY: Joseph O Brien	CHECKED BY: Meabhann Crowe
PROJECT No: 201050	DRAWING No: Fig 4-16
SCALE: 1:100 @ A2	DATE: 08.03.2023

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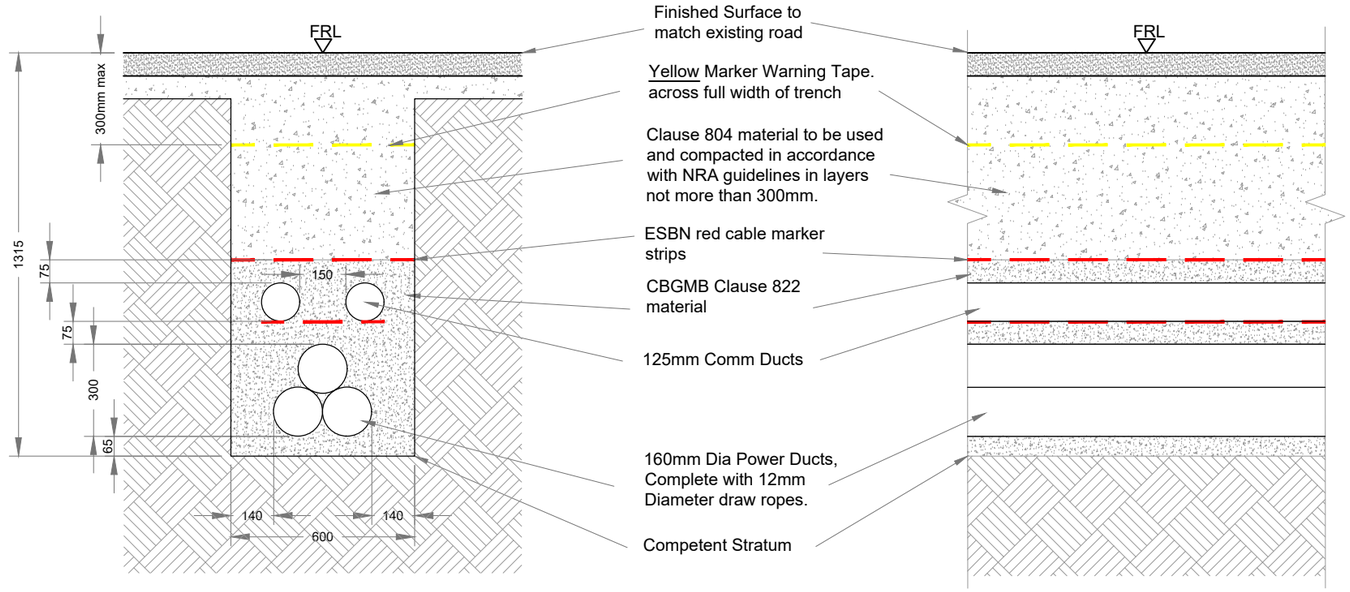


Standard 110kV Trench Detail

SCALE 1:20

Note:
ALL DIMENSIONS TO BE CHECKED ON SITE AND ANY DISCREPANCIES TO BE REPORTED TO THE ENGINEER.
FIGURED DIMENSIONS ONLY TO BE USED.
DRAWINGS NOT TO BE SCALED.

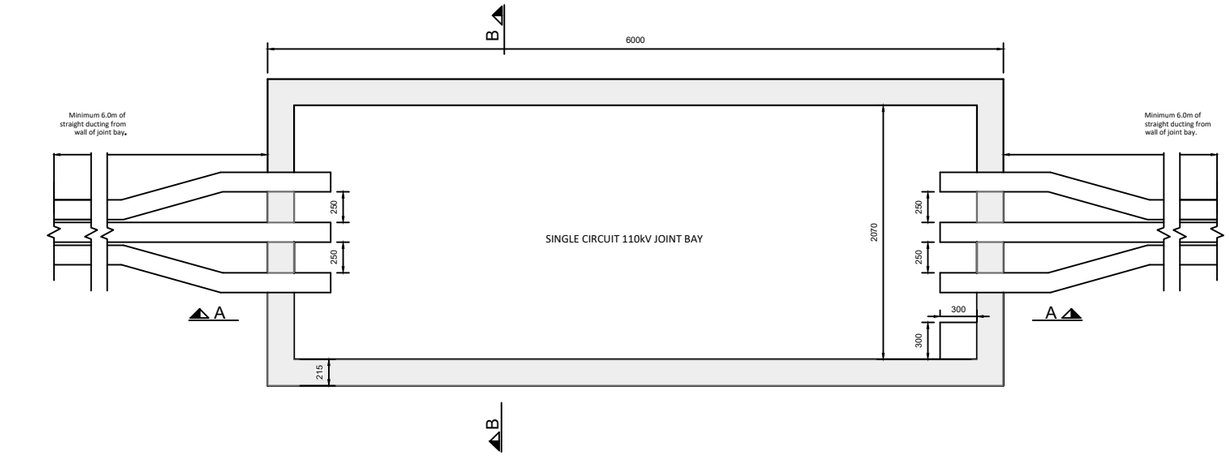
Enerco Energy

Project:
Umma More

Drawing:
110kV Trench Detail

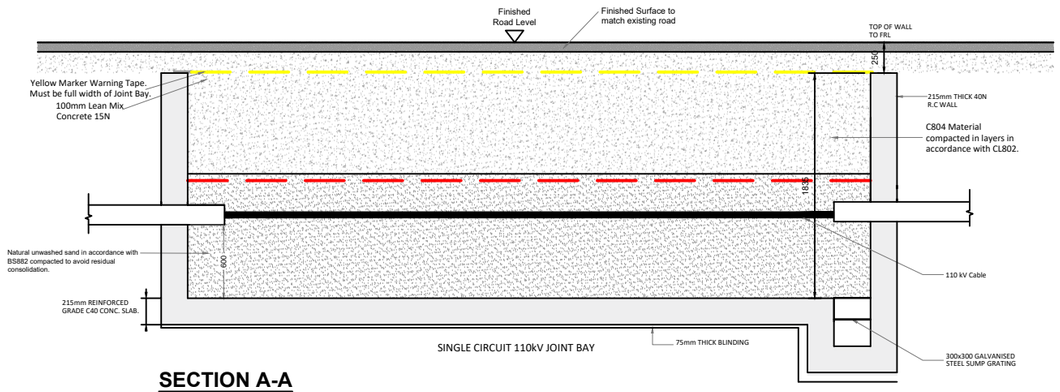
Drawn By:	Checked By:	Drawing No.
NG	WOC	0099 - 03 - G - 002 - R001

Scale: As Shown @ A3



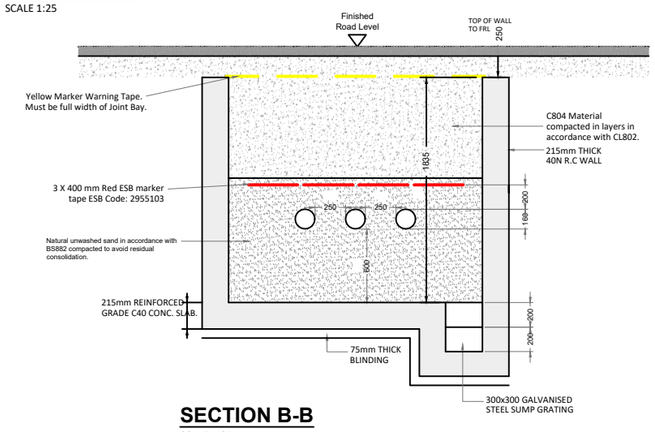
110kV JOINT BAY DETAIL

SCALE 1:25



SECTION A-A

SCALE 1:25



SECTION B-B

SCALE 1:25

Note:
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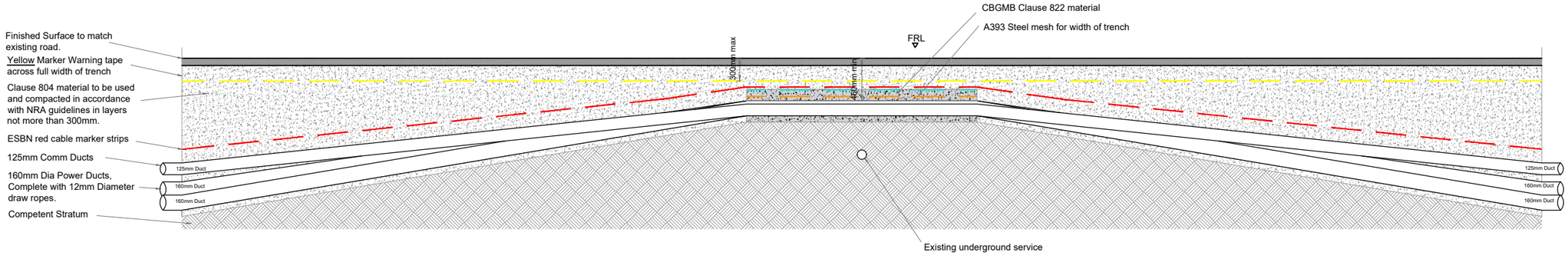
FIGURED DIMENSIONS ONLY TO BE USED.
DRAWINGS NOT TO BE SCALED.

Enerco Energy

Project:
Umma More

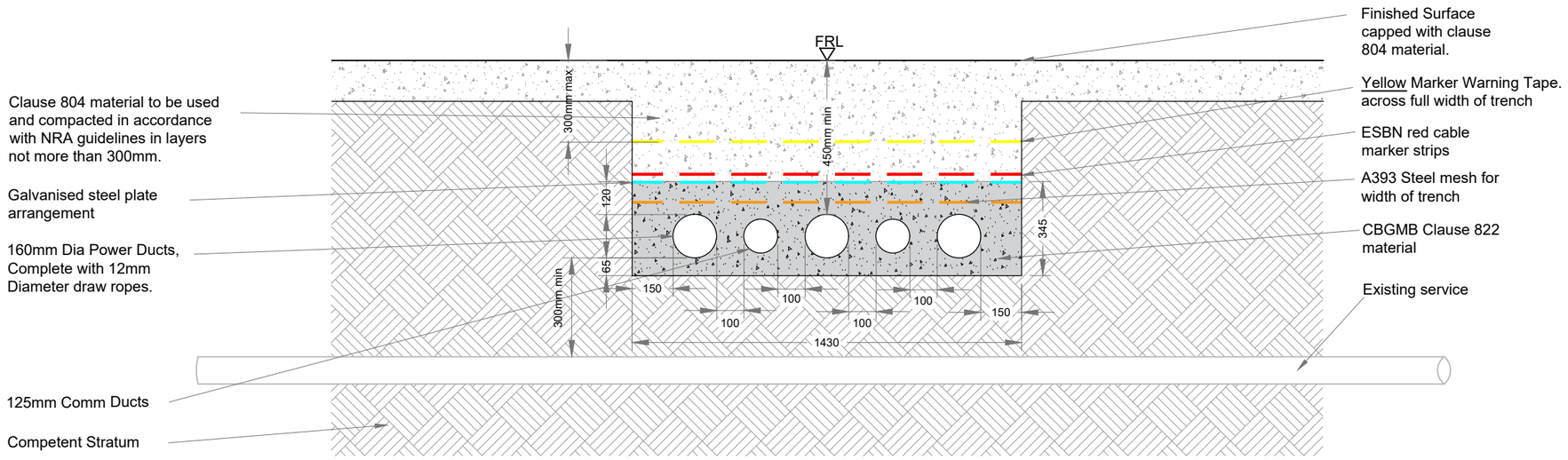
Drawing:
110kV Joint Bay Detail

Drawn By:	Checked By:	Drawing No.
MJM	T.Sca	0099 - 01 - E - 001 - R001
Scale: As Shown @ A3		



Option C - Flat bed over existing service - 110kV

SCALE 1:50



Option C - Flat bed over existing service - 110kV

SCALE 1:20

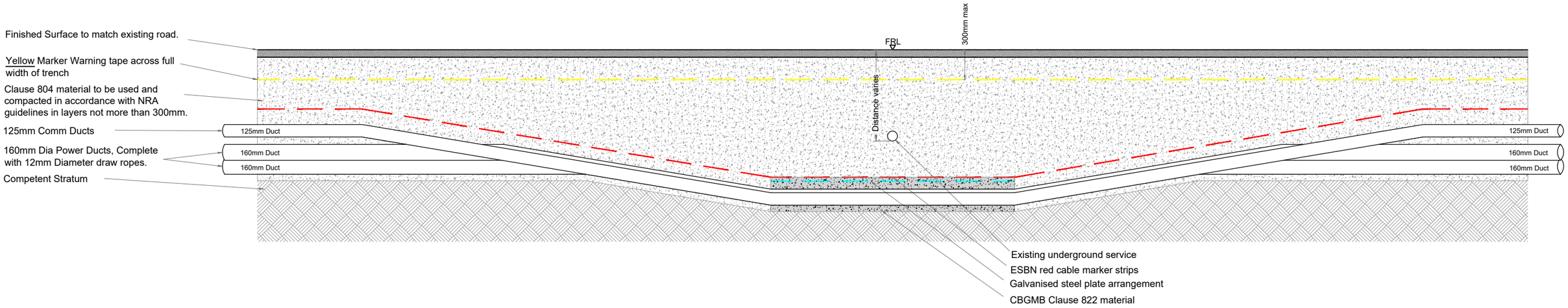
Note:
ALL DIMENSIONS TO BE CHECKED ON SITE AND ANY DISCREPANCIES TO BE REPORTED TO THE ENGINEER.
FIGURED DIMENSIONS ONLY TO BE USED.
DRAWINGS NOT TO BE SCALED.

Enerco Energy

Project:
Umma More

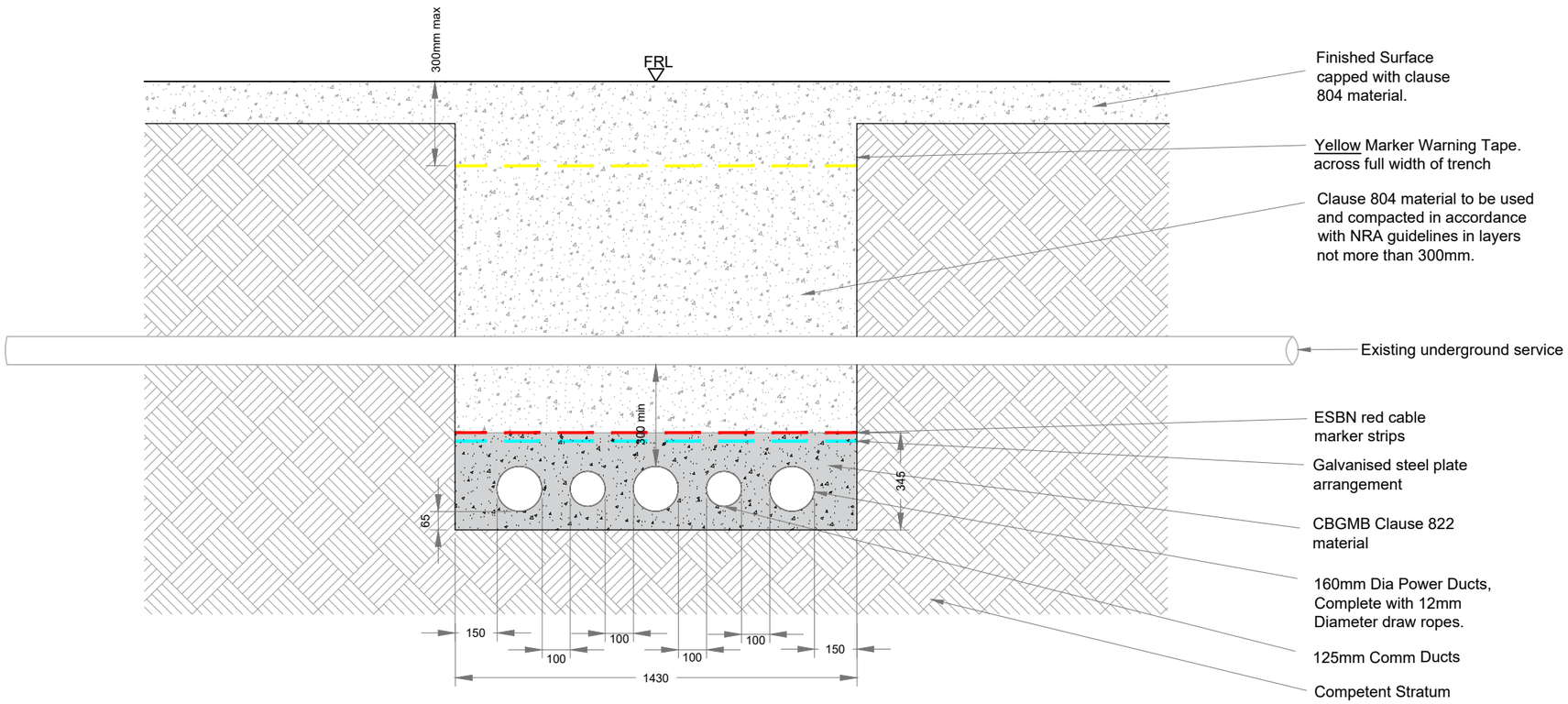
Drawing:
Flat Bed Over - Existing Service

Drawn By:	Checked By:	Drawing No.
MJM	T.Sca	0099 - 01 - E - 002 - R001
Scale: As Shown @ A3		



Option B - Flat bed under existing service - 110kV

SCALE 1:40



Option B - Flat bed under existing service - 110kV

SCALE 1:20

Note:
ALL DIMENSIONS TO BE CHECKED ON SITE AND ANY DISCREPANCIES TO BE REPORTED TO THE ENGINEER.
FIGURED DIMENSIONS ONLY TO BE USED.
DRAWINGS NOT TO BE SCALED.

Enerco Energy

Project:
Umma More

Drawing:
Flat Bed Under - Existing Service

Drawn By:	Checked By:	Drawing No.
MJM	T.Sca	0099 - 01 - E - 001 - R001

Scale: As Shown @ A3

1. WATERCOURSE CROSSINGS METHODOLOGY

Watercourse Crossing Reference No.	Watercourse Type	Width of Channel (m)	Cover from Road Level to Top of Culvert (m)	Crossing Option Description	Watercourse Crossing Option	Extent of In-Channel Works	Site Layout Drawing Reference (included as Appendix 4-5)
1	Stone Culvert	-	0.6	Where cable ducts are to be installed over an existing culvert and sufficient cover cannot be achieved, the ducts will be laid in a much shallower trench, the depth of which will be determined by the cover available at the culvert crossing location. The ducts within the shallow formation trench will be encased in 6mm thick steel galvanized plates and backfilled with 35N concrete.	Option C	None. No in-stream works required.	Appendix 4-5: Figure 1
2	Concrete Bridge	-	0.4	Where sufficient depth is not available over or under the crossing for a trench arrangement, the laying of cable ducts to be completed using directional drilling. This crossing methodology will ensure that no contact will be made with the watercourse during the works.	Option D	None. No in-stream works required.	Appendix 4-5: Figure 2
3	Stone Arch Bridge	-	0.4	Where sufficient depth is not available over or under the crossing for a trench arrangement, the laying of cable ducts to be completed using directional drilling. This crossing methodology will ensure that	Option D	None. No in-stream works required.	Appendix 4-5: Figure 3

Watercourse Crossing Reference No.	Watercourse Type	Width of Channel (m)	Cover from Road Level to Top of Culvert (m)	Crossing Option Description	Watercourse Crossing Option	Extent of In-Channel Works	Site Layout Drawing Reference (included as Appendix 4-5)
				no contact will be made with the watercourse during the works.			
4	Stone Arch Bridge	-	0.4	Where sufficient depth is not available over or under the crossing for a trench arrangement, the laying of cable ducts to be completed using directional drilling. This crossing methodology will ensure that no contact will be made with the watercourse during the works.	Option D	None. No in-stream works required.	Appendix 4-5: Figure 4
5	Concrete Bridge	-	0.4	Where sufficient depth is not available over or under the crossing for a trench arrangement, the laying of cable ducts to be completed using directional drilling. This crossing methodology will ensure that no contact will be made with the watercourse during the works.	Option D	None. No in-stream works required.	Appendix 4-5: Figure 5
6	Stone Arch Bridge	-	1.2	Where cable ducts are to be installed over an existing culvert and sufficient cover cannot be achieved, the ducts will be laid in a much shallower trench, the depth of which will be determined by the cover available at the culvert crossing location. The ducts within the shallow formation trench will be encased in 6mm thick steel galvanized plates and backfilled with 35N concrete.	Option C	None. No in-stream works required.	Appendix 4-5: Figure 6
7	Open channel	3.9	-	Where sufficient depth is not available over or under the crossing for a trench arrangement, the laying of cable ducts to be completed using directional drilling. This crossing methodology will ensure that	Option D	None. No in-stream works required.	Appendix 4-5: Figure 7

Watercourse Crossing Reference No.	Watercourse Type	Width of Channel (m)	Cover from Road Level to Top of Culvert (m)	Crossing Option Description	Watercourse Crossing Option	Extent of In-Channel Works	Site Layout Drawing Reference (included as Appendix 4-5)
				no contact will be made with the watercourse during the works.			
8	1500 mm Concrete Pipe	-	0.9	Where cable ducts are to be installed over an existing culvert and sufficient cover cannot be achieved, the ducts will be laid in a much shallower trench, the depth of which will be determined by the cover available at the culvert crossing location. The ducts within the shallow formation trench will be encased in 6mm thick steel galvanized plates and backfilled with 35N concrete.	Option C	None. No in-stream works required.	Appendix 4-5: Figure 8
9	600mm Concrete Pipe	-	0.9	Where cable ducts are to be installed over an existing culvert and sufficient cover cannot be achieved, the ducts will be laid in a much shallower trench, the depth of which will be determined by the cover available at the culvert crossing location. The ducts within the shallow formation trench will be encased in 6mm thick steel galvanized plates and backfilled with 35N concrete.	Option C	None. No in-stream works required.	Appendix 4-5: Figure 9
10	1200mm Concrete Pipe	-	1.6	Where adequate cover exists above a culvert, the standard aforementioned trench arrangement will be used where the cable ducts pass over a culvert without any contact with the existing culvert or watercourse.	Option A	None. No in-stream works required.	Appendix 4-5: Figure 10
11	Box Culvert Bridge	-	1	Where sufficient depth is not available over or under the crossing for a trench arrangement, the laying of cable ducts to	Option D	None. No in-stream works required.	Appendix 4-5: Figure 11

Watercourse Crossing Reference No.	Watercourse Type	Width of Channel (m)	Cover from Road Level to Top of Culvert (m)	Crossing Option Description	Watercourse Crossing Option	Extent of In-Channel Works	Site Layout Drawing Reference (included as Appendix 4-5)
				be completed using directional drilling. This crossing methodology will ensure that no contact will be made with the watercourse during the works.			

Map Legend

- EIAR Site Boundary
- Watercourse Crossings

Proposed Grid Development

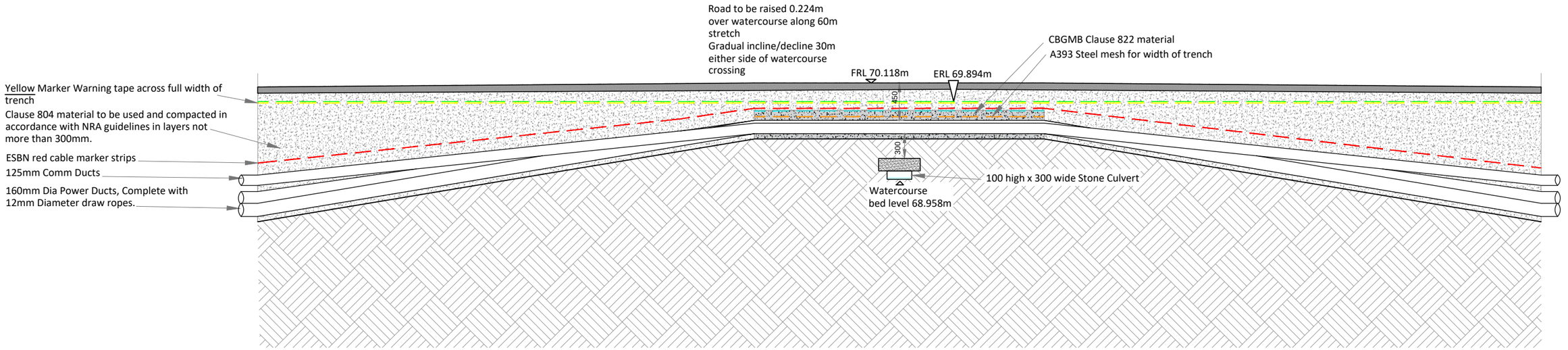
- Grid Connection
- Onsite Substation
- Temporary Construction Compound
- Thornsberry 110kV Substation

Drawing Title
Grid Connection Watercourse Crossing Locations

Project Title
Umma More Renewable Energy Development

Drawn By	Checked By
BT	EC
Project No.	Drawing No.
201050	Figure 4-29
Scale 1:85,000	Date 2023-02-02

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



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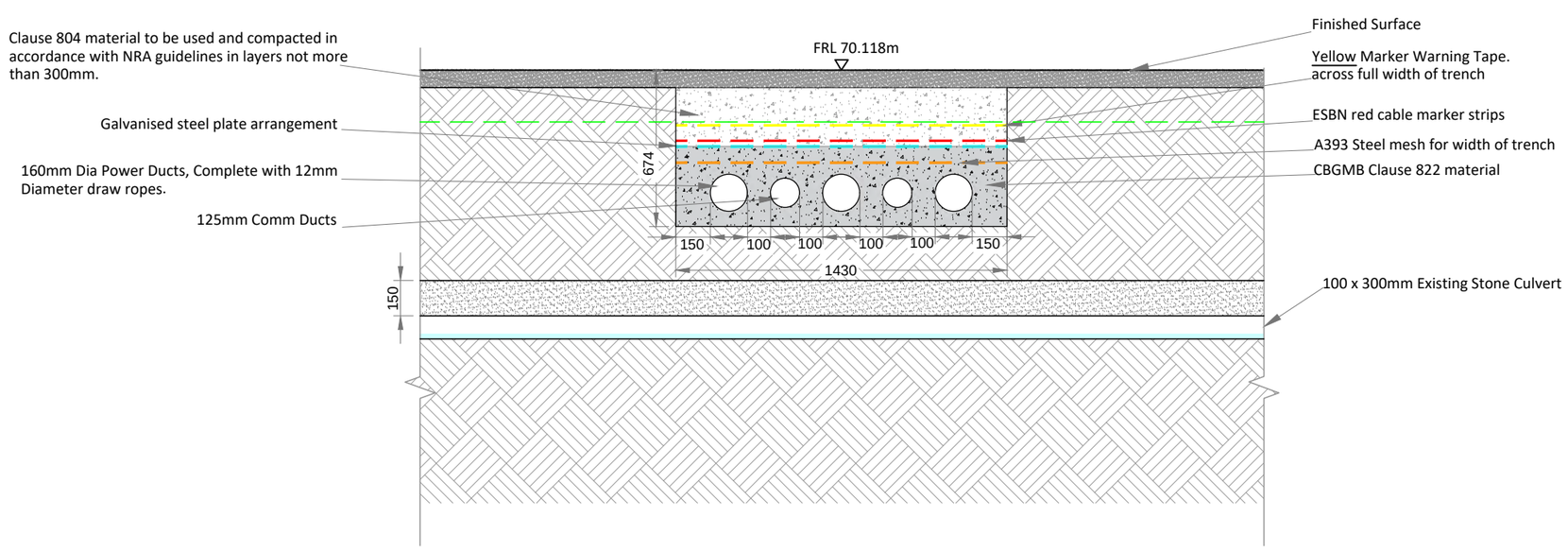

Section B-B
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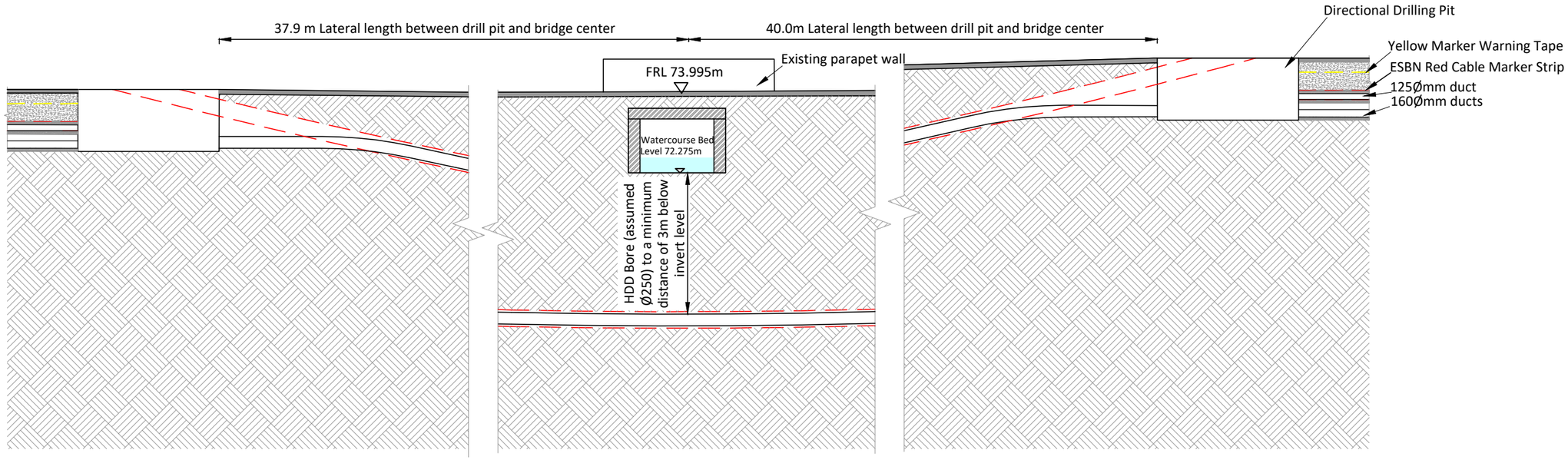
Note:
ALL DIMENSIONS TO BE CHECKED ON SITE AND ANY DISCREPANCIES TO BE REPORTED TO THE ENGINEER.
FIGURED DIMENSIONS ONLY TO BE USED.
DRAWINGS NOT TO BE SCALED.

Enerco Energy

Project:
Umma More

Drawing:
Figure 1: WC Crossing 1 - Flat Bed Over & Raise Road

Drawn By:	Checked By:	Drawing No.
MJM	T.Sca	0099 - 03 - I - 002K - R001
Scale: As Shown @ A3		



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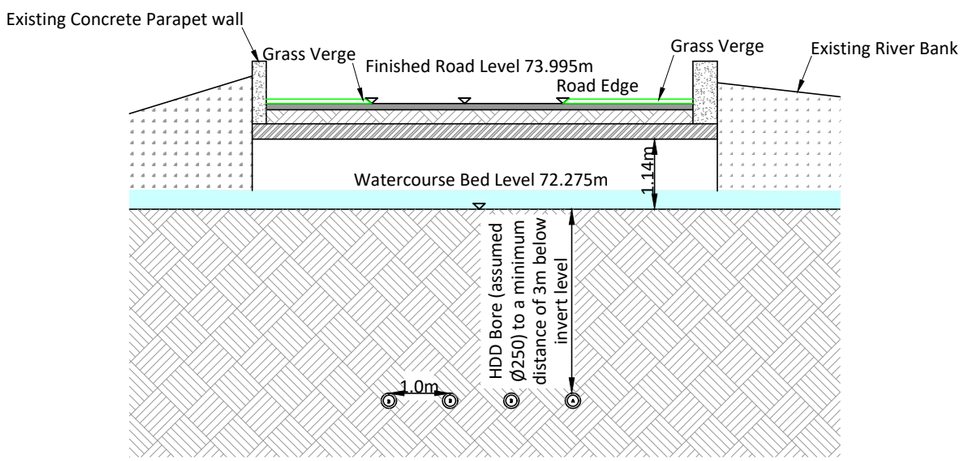

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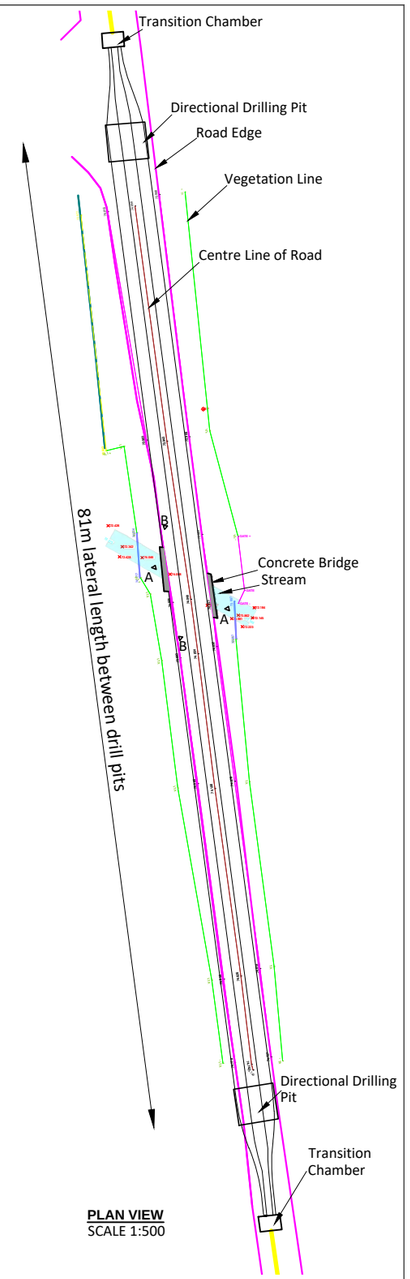

PLAN VIEW
SCALE 1:500

Note:
ALL DIMENSIONS TO BE CHECKED ON SITE AND ANY DISCREPANCIES TO BE REPORTED TO THE ENGINEER.
FIGURED DIMENSIONS ONLY TO BE USED.
DRAWINGS NOT TO BE SCALED.

Enerco Energy

Project:
Umma More

Drawing:
Figure 2: WC Crossing 2 - HDD - 81m

Drawn By:	Checked By:	Drawing No.
MJM	T.Sca	0099 - 03 - I - 002A - R001
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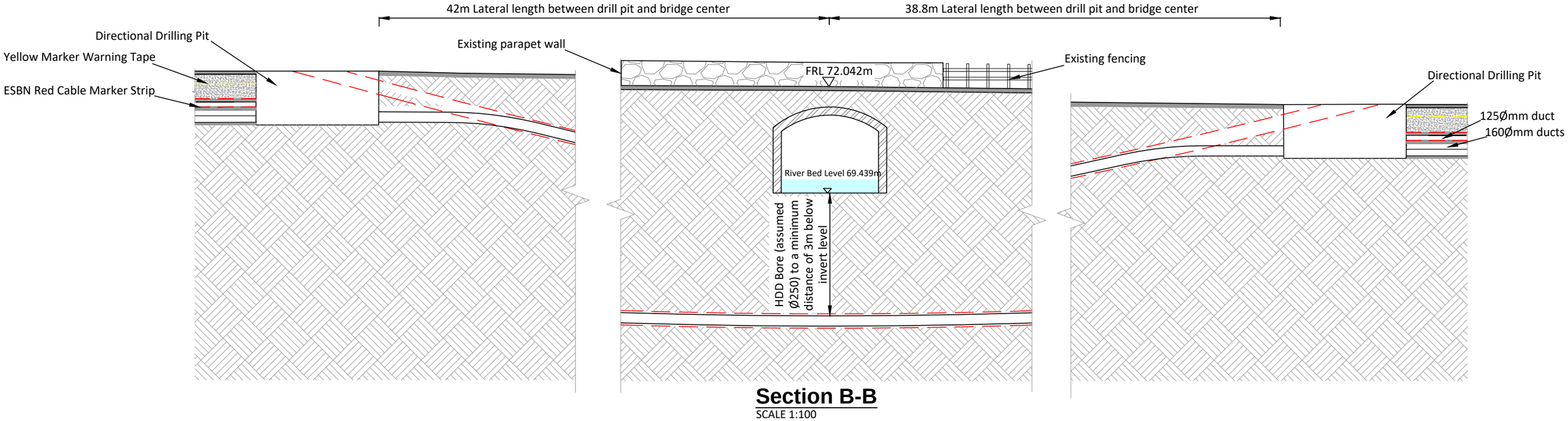

Section B-B
SCALE 1:100

Section A-A
SCALE 1:100

PLAN VIEW
SCALE 1:500

Note:
ALL DIMENSIONS TO BE CHECKED ON SITE AND ANY DISCREPANCIES TO BE REPORTED TO THE ENGINEER.
FIGURED DIMENSIONS ONLY TO BE USED.
DRAWINGS NOT TO BE SCALED.

Enerco Energy

Project:
Umma More

Drawing:
Figure 3: WC Crossing 3 - HDD - 84m

Drawn By:	Checked By:	Drawing No.
MJM	T.Sca	0099 - 03 - I - 002B - R001
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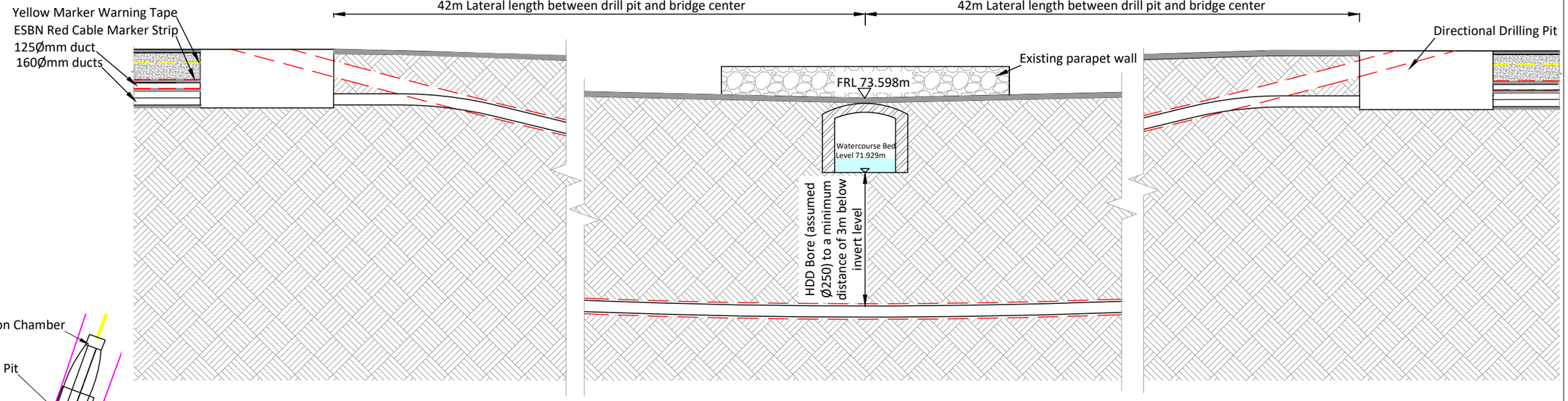

Section B-B

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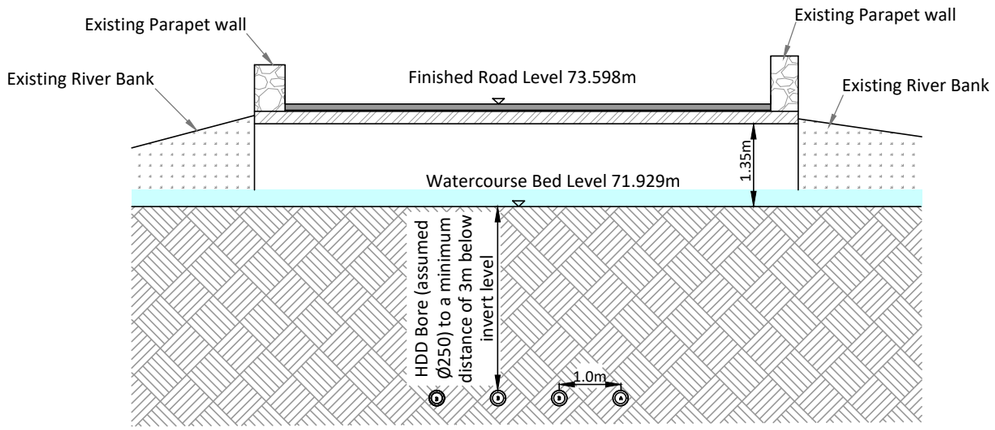
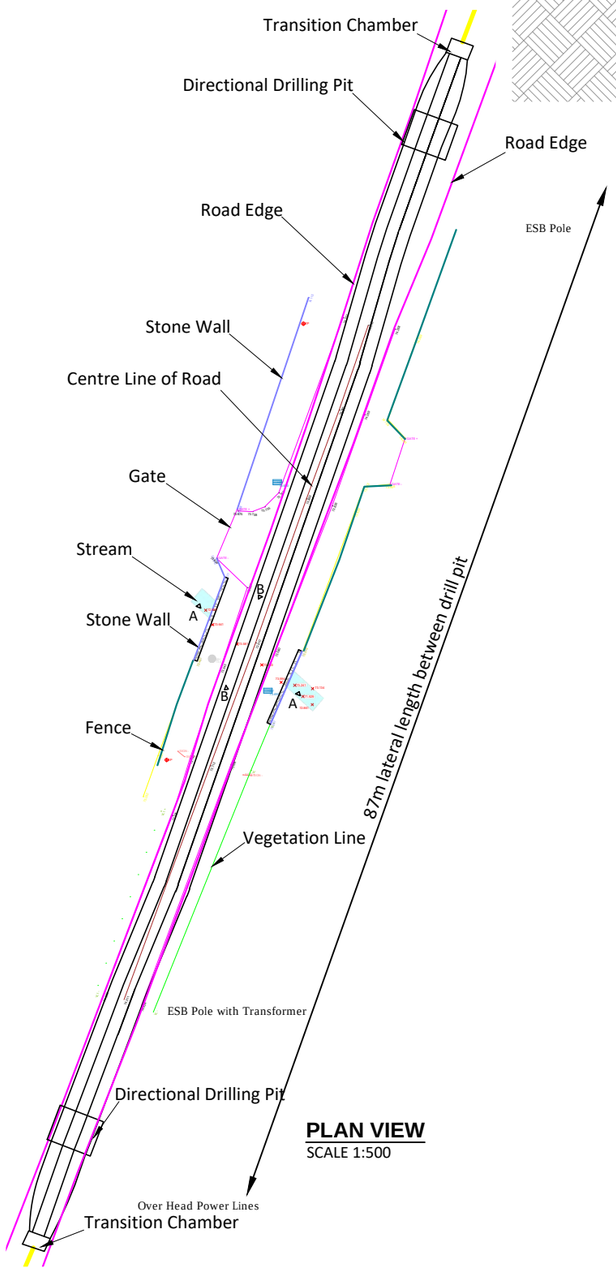


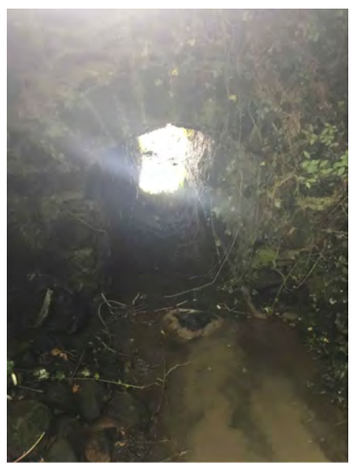


PLAN VIEW

SCALE 1:500

Section A-A

SCALE 1:100



Note:
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FIGURED DIMENSIONS ONLY TO BE USED.
DRAWINGS NOT TO BE SCALED.

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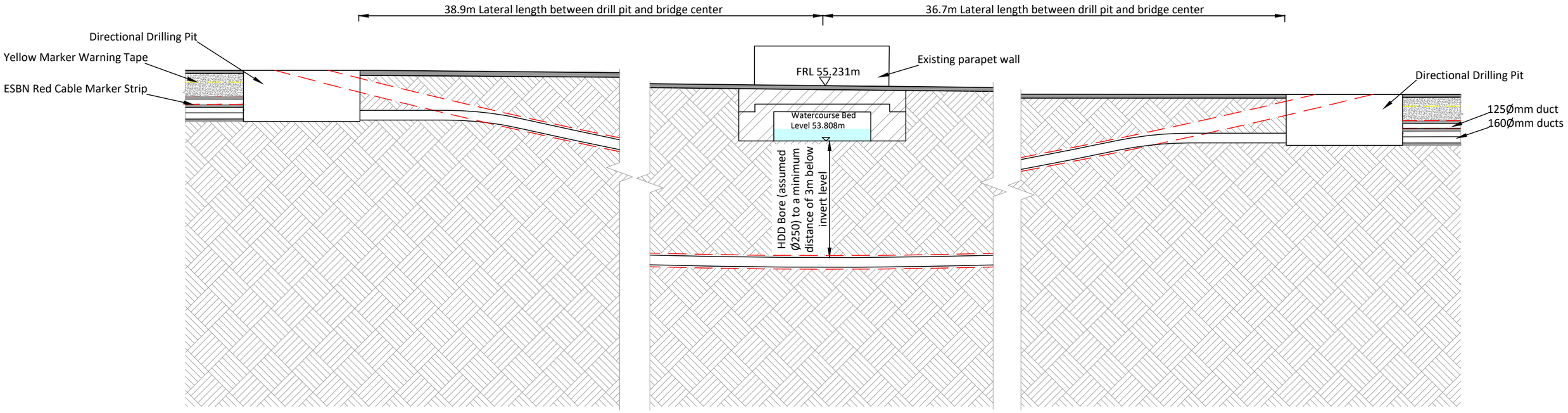
Project:
Umma More

Drawing:
Figure 4: WC Crossing 4 - HDD - 87m

Drawn By:	Checked By:	Drawing No.
MJM	T.Sca	0099 - 03 - I - 002C - R001

Scale: As Shown @ A3



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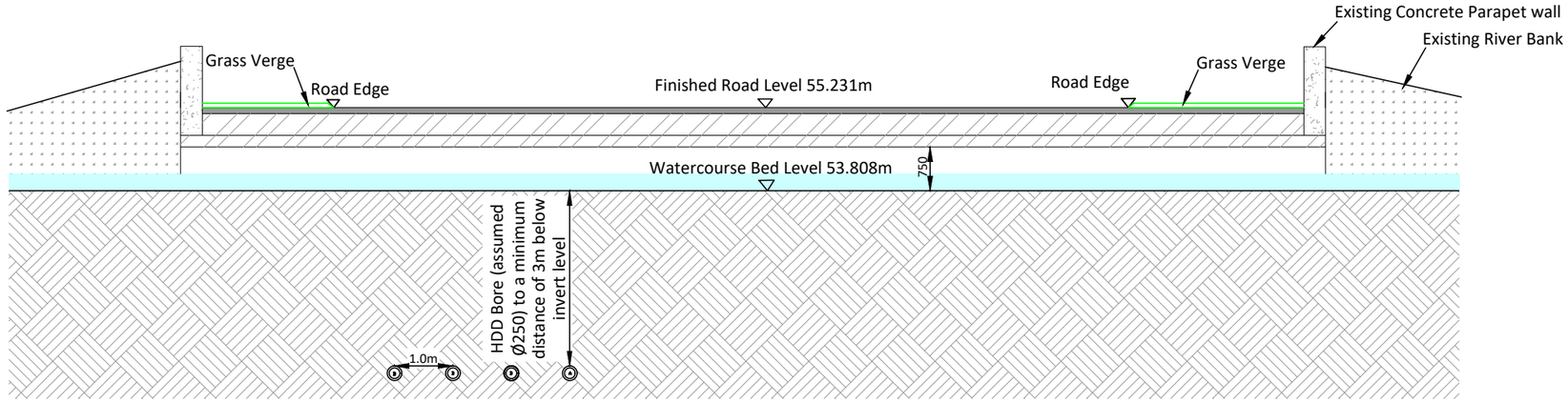

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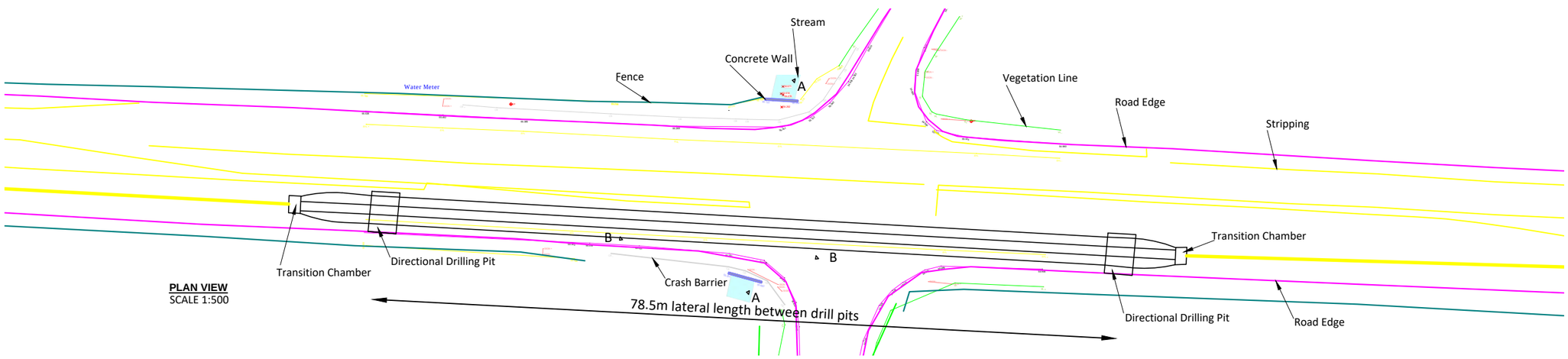

PLAN VIEW
SCALE 1:500

Note:
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FIGURED DIMENSIONS ONLY TO BE USED.
DRAWINGS NOT TO BE SCALED.

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Project:
Umma More

Drawing:
Figure 5: WC Crossing 5 - HDD - 78.5m

Drawn By:	Checked By:	Drawing No.
MJM	T.Sca	0099 - 03 - I - 002D - R001
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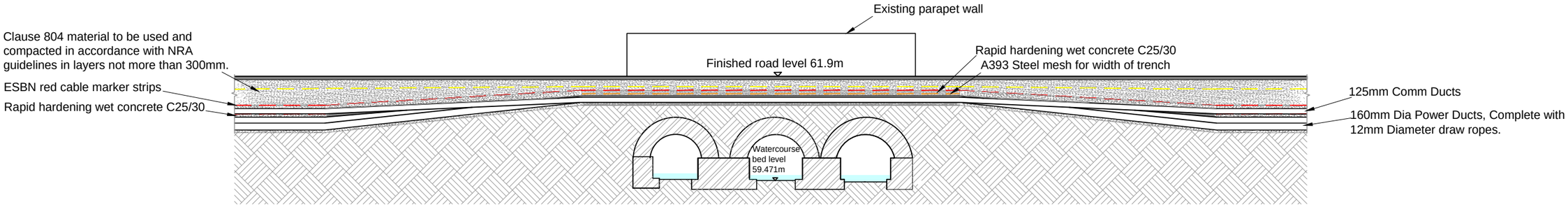

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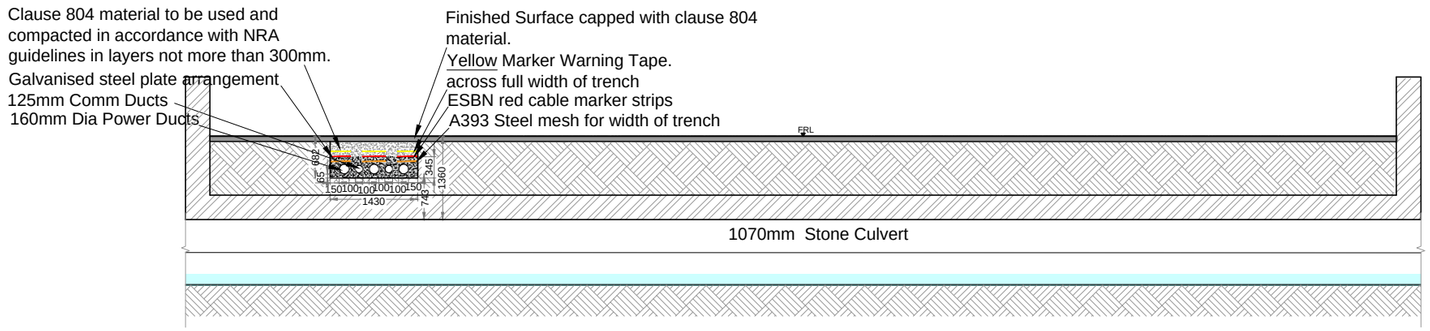

Section B-B
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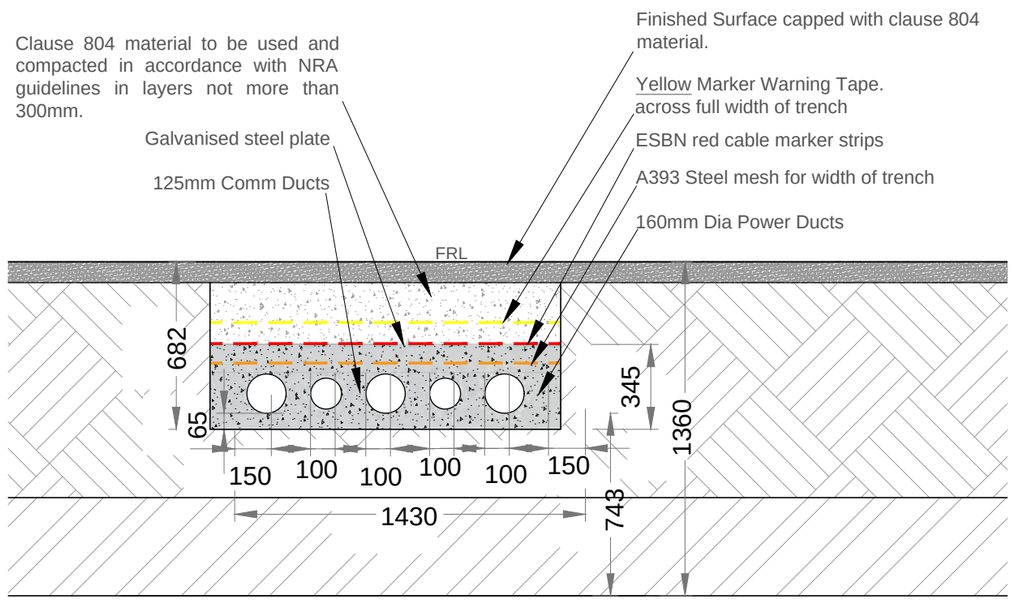

Note:
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FIGURED DIMENSIONS ONLY TO BE USED.
DRAWINGS NOT TO BE SCALED.

Enerco Energy

Project:
Umma More

Drawing:
Figure 6: WC Crossing 6 - Flat Bed Over

Drawn By:	Checked By:	Drawing No.
MJM	T.Sca	0099 - 03 - I - 002G - R001
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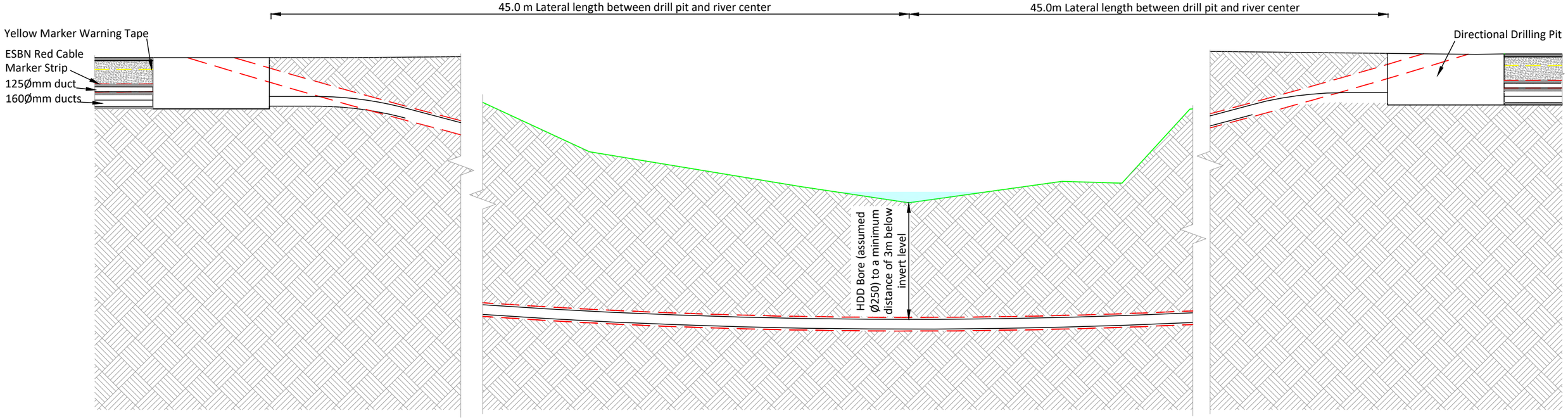

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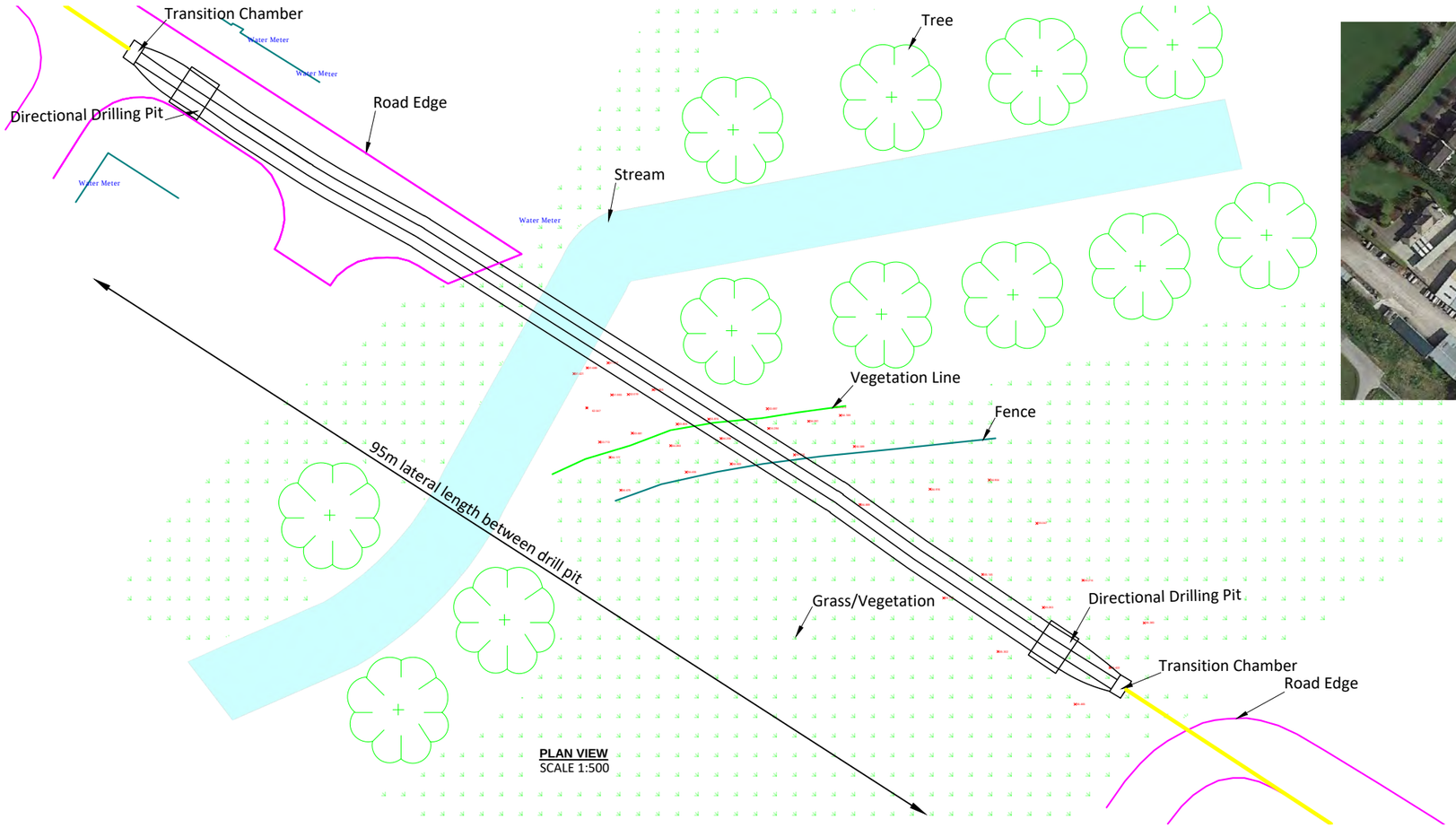

PLAN VIEW
SCALE 1:500

Note:
ALL DIMENSIONS TO BE CHECKED ON SITE AND ANY DISCREPANCIES TO BE REPORTED TO THE ENGINEER.
FIGURED DIMENSIONS ONLY TO BE USED.
DRAWINGS NOT TO BE SCALED.

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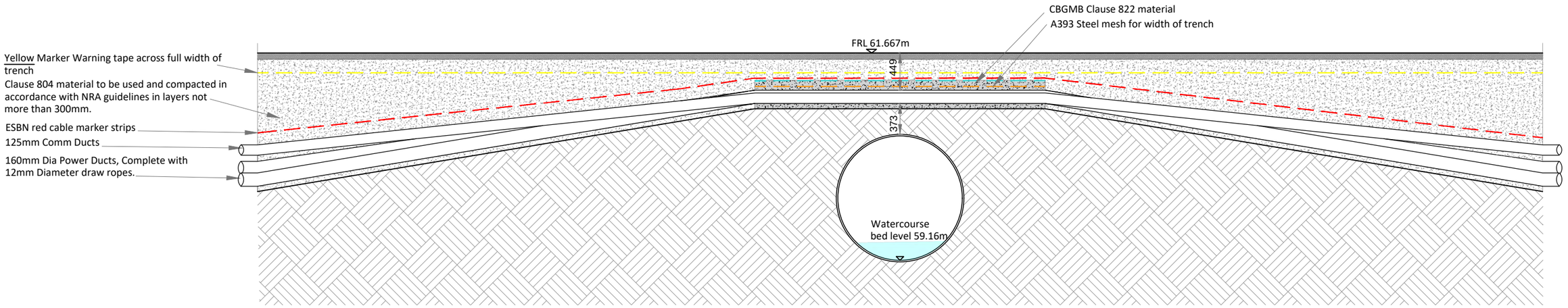
Project:
Umma More

Drawing:
Figure 7: WC Crossing 7 - HDD - 93m

Drawn By:	Checked By:	Drawing No.
MJM	T.Sca	0099 - 03 - I - 002E - R001
Scale: As Shown @ A3		



Section A-A
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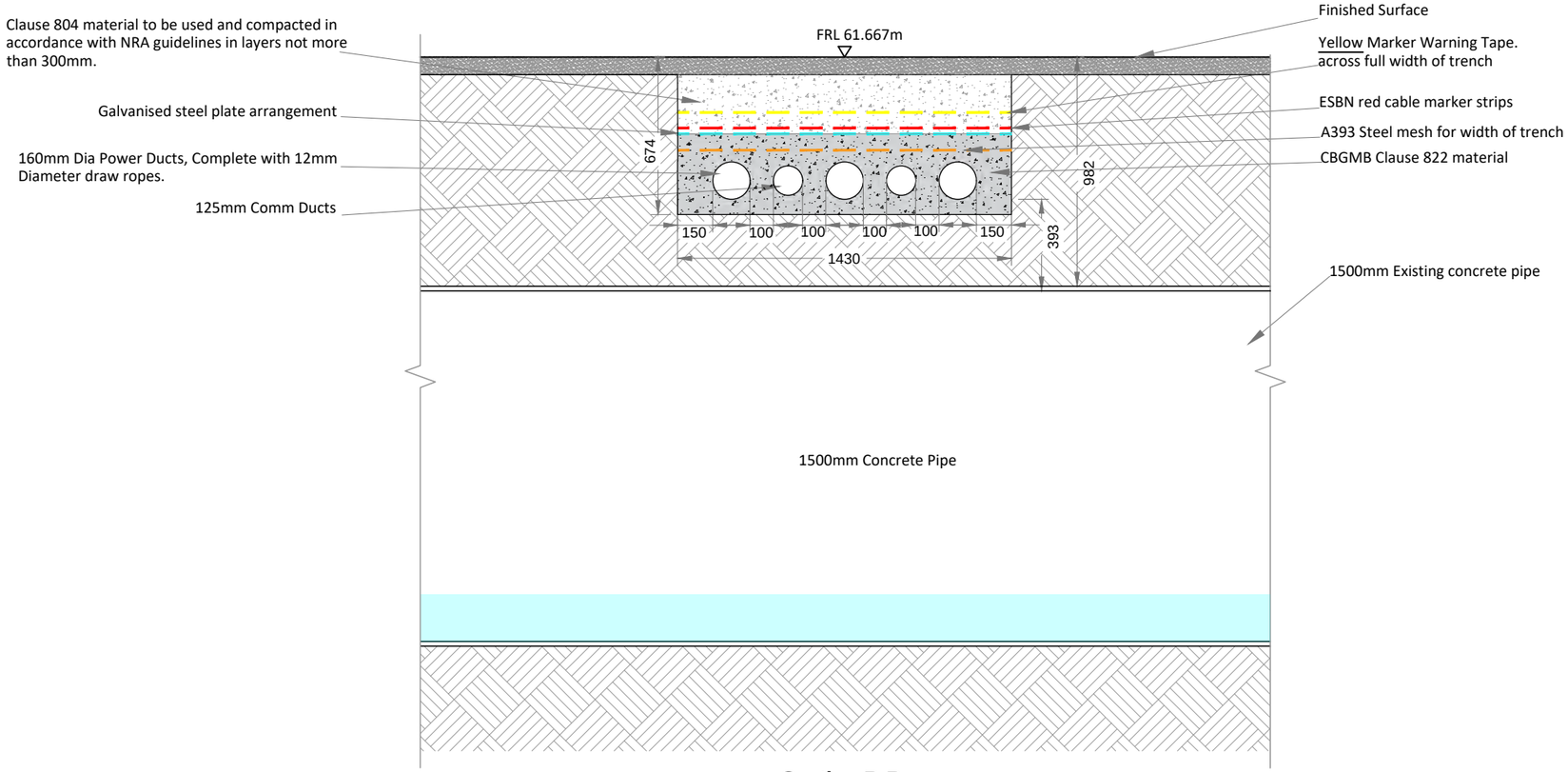


Section B-B
SCALE 1:25

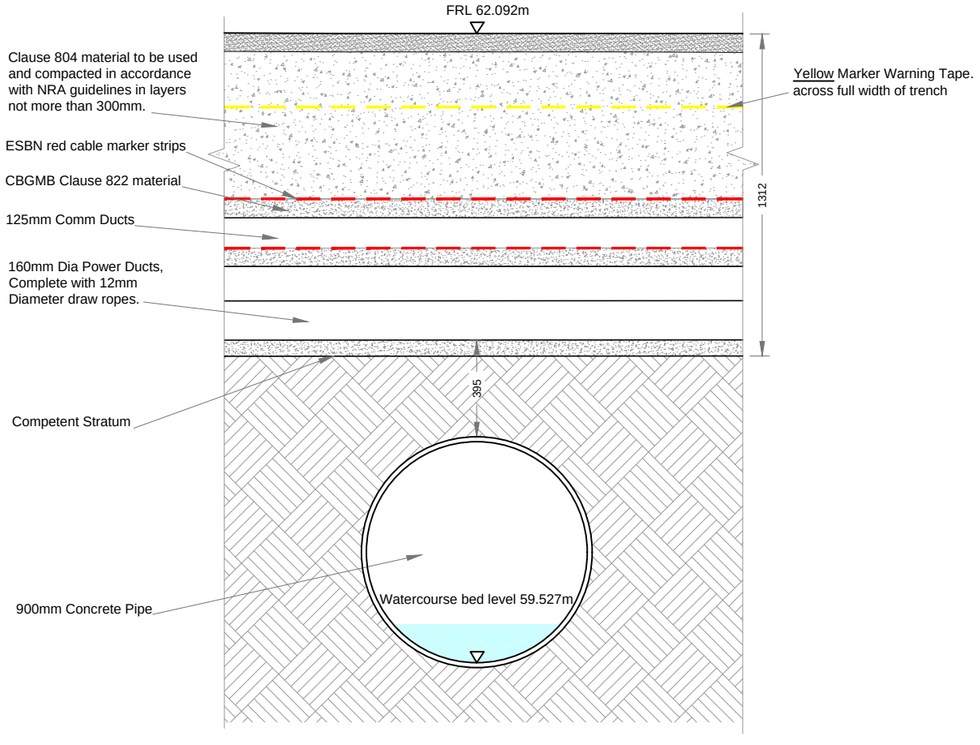
Note:
ALL DIMENSIONS TO BE CHECKED ON SITE AND ANY DISCREPANCIES TO BE REPORTED TO THE ENGINEER.
FIGURED DIMENSIONS ONLY TO BE USED.
DRAWINGS NOT TO BE SCALED.

Enerco Energy

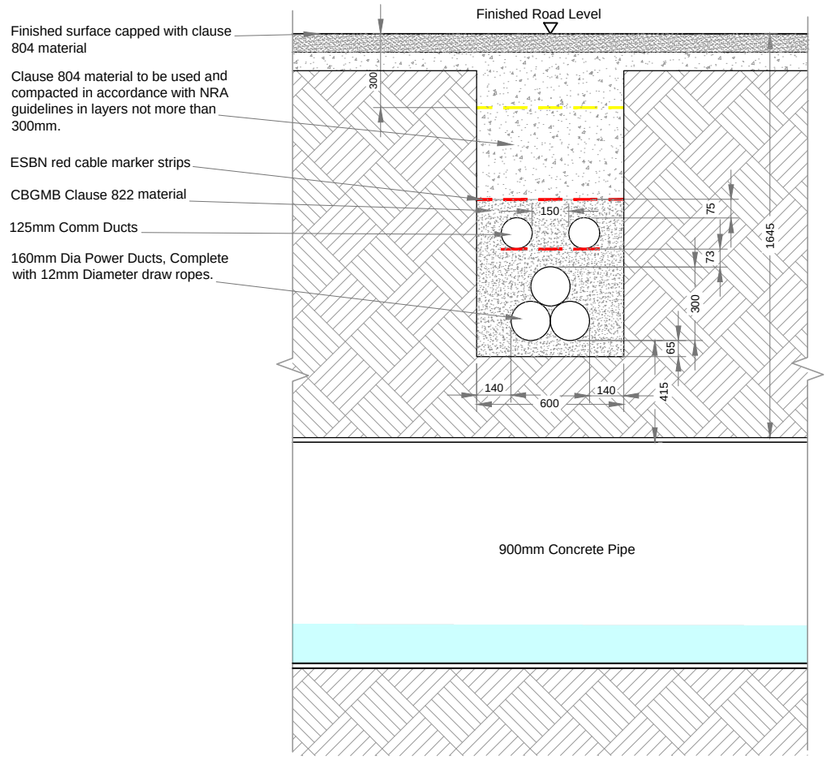
Project:
Umma More

Drawing:
Figure 8: WC Crossing 8 - Flat Bed Over

Drawn By:	Checked By:	Drawing No.
MJM	T.Sca	0099 - 03 - I - 002H - R001
Scale: As Shown @ A3		



Section A-A
SCALE 1:25



Section B-B
SCALE 1:25

Note:
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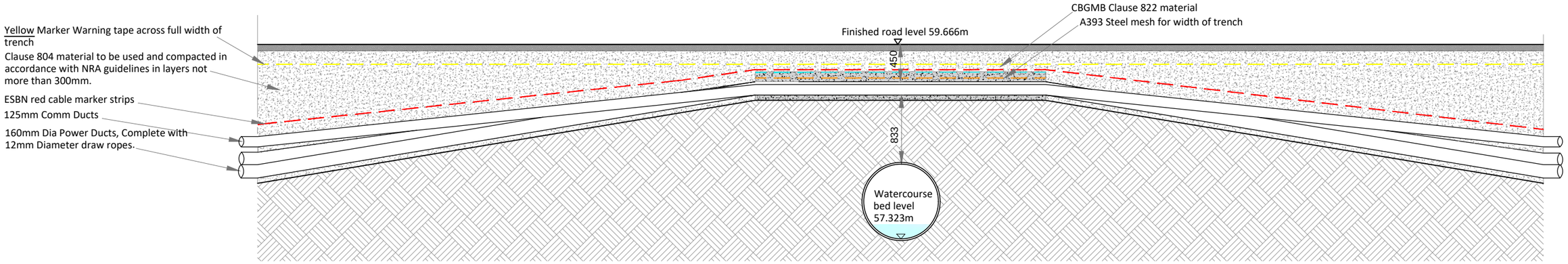
FIGURED DIMENSIONS ONLY TO BE USED.
DRAWINGS NOT TO BE SCALED.

Enerco Energy

Project:
Umma More

Drawing:
Figure 9: WC Crossing 9 - Standard Trench Detail

Drawn By:	Checked By:	Drawing No.
MJM	T.Sca	0099 - 03 - I - 002I - R001
Scale: As Shown @ A3		



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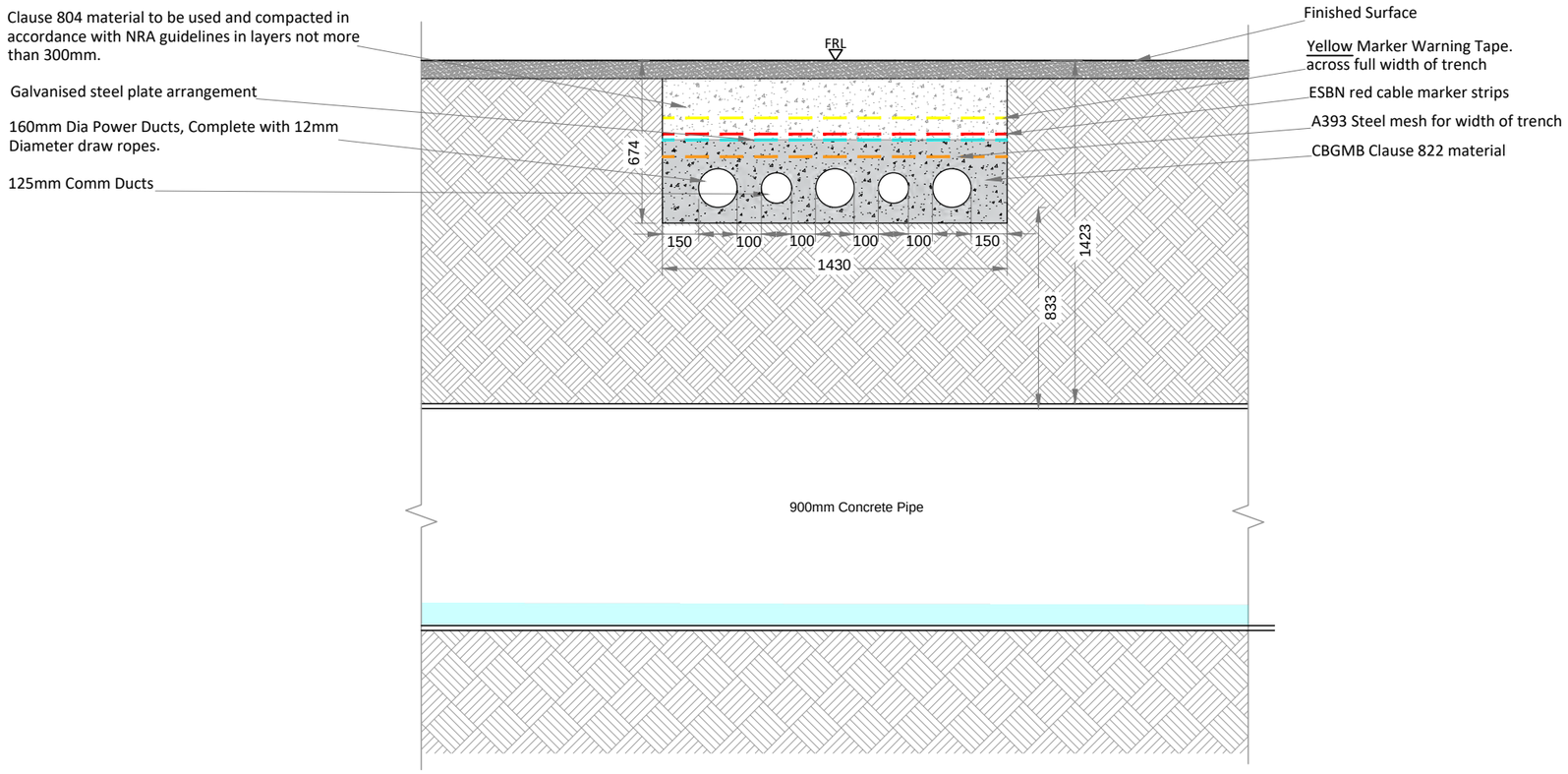
SCALE 1:50



Section B-B
SCALE 1:25

Note:
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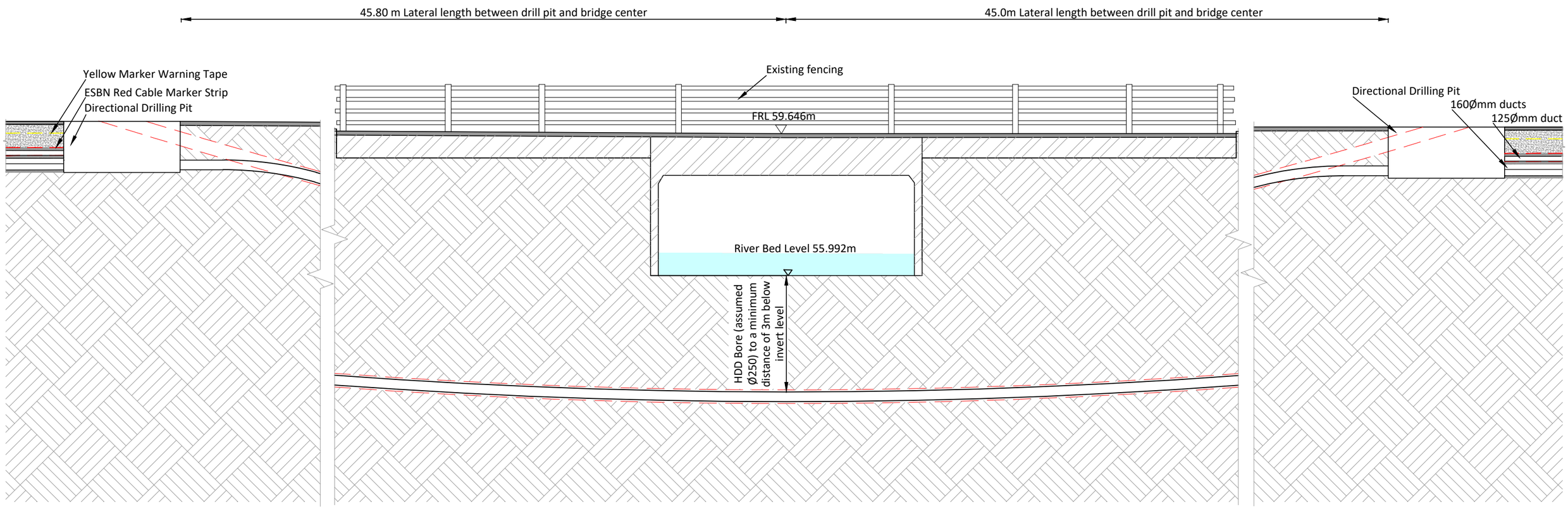
FIGURED DIMENSIONS ONLY TO BE USED.
DRAWINGS NOT TO BE SCALED.

Enerco Energy

Project:
Umma More

Drawing:
Figure 10: WC Crossing 10 - Flat Bed Over

Drawn By:	Checked By:	Drawing No.
MJM	T.Sca	0099 - 03 - I - 002J - R001
Scale: As Shown @ A3		



Section B-B

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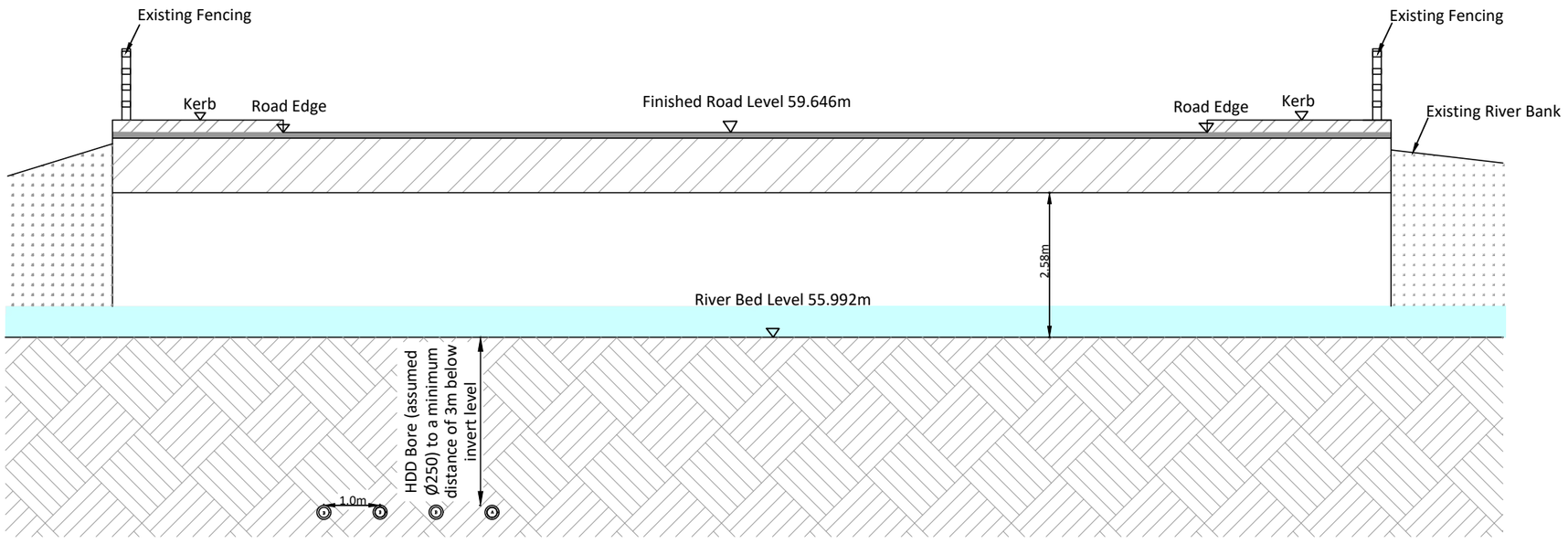


Section A-A

SCALE 1:100

Note:
ALL DIMENSIONS TO BE CHECKED ON SITE AND ANY DISCREPANCIES TO BE REPORTED TO THE ENGINEER.
FIGURED DIMENSIONS ONLY TO BE USED.
DRAWINGS NOT TO BE SCALED.

Enerco Energy

Project:
Umma More

Drawing:
Figure 11: WC Crossing 11 - HDD - 93.8m

Drawn By:	Checked By:	Drawing No.
MJM	T.Sca	0099 - 03 - I - 002F - R001
Scale: As Shown @ A3		

PLAN VIEW
SCALE 1:500

Note:
ALL DIMENSIONS TO BE CHECKED ON SITE AND ANY DISCREPANCIES TO BE REPORTED TO THE ENGINEER.
FIGURED DIMENSIONS ONLY TO BE USED.
DRAWINGS NOT TO BE SCALED.

Enerco Energy

Project:
Umma More

Drawing:
Figure 11: WC Crossing 11- Plan

Drawn By:	Checked By:	Drawing No.
MJM	T.Sca	0099-03-I-002F(1)-R001
Scale: NTS @ A3		

2.

CULVERT AND DRAIN CROSSINGS METHODOLOGY

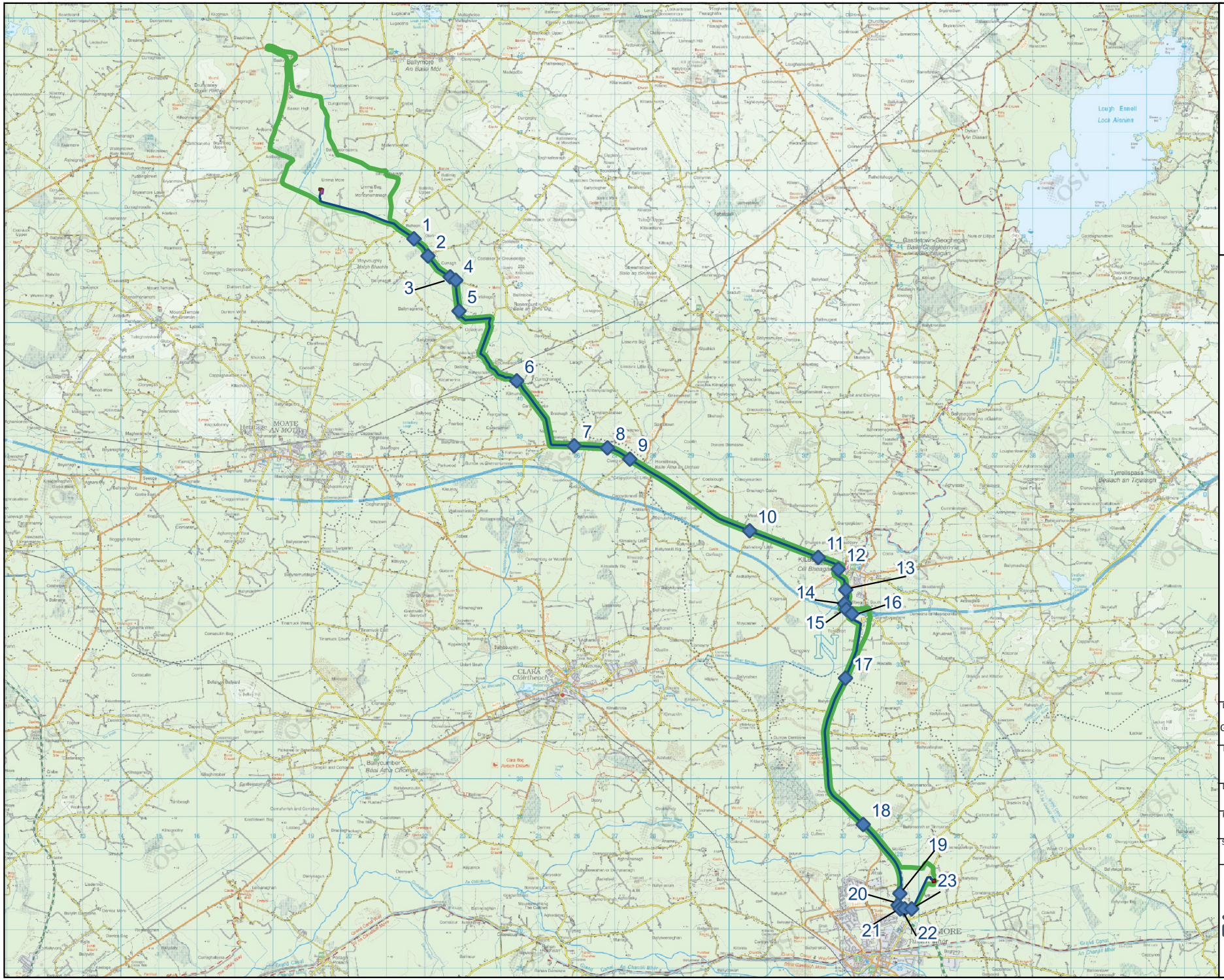
Culvert/Drain Crossing Reference No.	X (ITM)	Y (ITM)	Culvert/Drain Type	Width of Drain Channel (m)	Cover from Road Level to Top of Culvert (m)	Crossing Option Description	Watercourse Crossing Option	Extent of In-Channel Works
1	621671	744221	900mm Concrete Pipe	-	1.00 m	Where cable ducts are to be installed over an existing culvert and sufficient cover cannot be achieved, the ducts will be laid in a much shallower trench, the depth of which will be determined by the cover available at the culvert crossing location. The ducts within the shallow formation trench will be encased in 6mm thick steel galvanized plates and backfilled with 35N concrete.	Option C - Flat Bed Over	None. No in-stream works required.
2	622041	743768	600 mm Concrete Pipe	-	0.90 m	Where cable ducts are to be installed over an existing culvert and sufficient cover cannot be achieved, the ducts will be laid in a much shallower trench, the depth of which will be determined by the cover available at the culvert crossing location. The ducts within the shallow formation trench will be encased in 6mm thick steel galvanized plates and backfilled with 35N concrete.	Option C - Flat Bed Over	None. No in-stream works required.
3	622626	743218	450mm Concrete Pipe	-	0.90 m	Where cable ducts are to be installed over an existing culvert and sufficient cover cannot be achieved, the ducts will be laid in a much shallower trench, the depth of which will be determined by the cover available at the culvert crossing location. The ducts within the shallow formation trench will be encased in 6mm thick steel galvanized plates and backfilled with 35N concrete.	Option C - Flat Bed Over	None. No in-stream works required.
4	622773	743127	Blocked Concrete Pipe	-	-		Will be replaced with 450mm Pipe	None. No in-stream works required.

Culvert/Drain Crossing Reference No.	X (ITM)	Y (ITM)	Culvert/Drain Type	Width of Drain Channel (m)	Cover from Road Level to Top of Culvert (m)	Crossing Option Description	Watercourse Crossing Option	Extent of In-Channel Works
5	622858	742319	600 mm Concrete Pipe	-	1.10 m	Where cable ducts are to be installed over an existing culvert and sufficient cover cannot be achieved, the ducts will be laid in a much shallower trench, the depth of which will be determined by the cover available at the culvert crossing location. The ducts within the shallow formation trench will be encased in 6mm thick steel galvanized plates and backfilled with 35N concrete.	Option C - Flat Bed Over	None. No in-stream works required.
6	624378	740481	Blocked Stone Culvert	-	0.30 m		Will be repaced with 450mm Pipe	None. No in-stream works required.
7	625890	738770	900 mm Concrete Pipe	-	2.22 m	Where adequate cover exists above a culvert, the standard aforementioned trench arrangement will be used where the cable ducts pass over a culvert without any contact with the existing culvert or watercourse.	Option A - Standard Trench Detail	None. No in-stream works required.
8	626765	738714	600 Concrete Pipe	-	1.70 m	Where adequate cover exists above a culvert, the standard aforementioned trench arrangement will be used where the cable ducts pass over a culvert without any contact with the existing culvert or watercourse.	Option A - Standard Trench Detail	None. No in-stream works required.
9	627356	738418	Stone Culvert - 500mm x 800mm	-	1.70 m	Where adequate cover exists above a culvert, the standard aforementioned trench arrangement will be used where the cable ducts pass over a culvert without any contact with the existing culvert or watercourse.	Option A - Standard Trench Detail	None. No in-stream works required.
10	630508	736530	900 mm Concrete Pipe	-	1.45 m	Where adequate cover exists above a culvert, the standard aforementioned trench arrangement will be used where the cable ducts pass over a culvert without any contact with the existing culvert or watercourse.	Option A - Standard Trench Detail	None. No in-stream works required.

Culvert/Drain Crossing Reference No.	X (ITM)	Y (ITM)	Culvert/Drain Type	Width of Drain Channel (m)	Cover from Road Level to Top of Culvert (m)	Crossing Option Description	Watercourse Crossing Option	Extent of In-Channel Works
11	632314	735831	900 mm Concrete Pipe	-	1.22 m	Where cable ducts are to be installed over an existing culvert and sufficient cover cannot be achieved, the ducts will be laid in a much shallower trench, the depth of which will be determined by the cover available at the culvert crossing location. The ducts within the shallow formation trench will be encased in 6mm thick steel galvanized plates and backfilled with 35N concrete.	Option C - Flat Bed Over	None. No in-stream works required.
12	632844	735522	Box Culvert Bridge	-	0.40 m	Where sufficient depth is not available over or under the crossing for a trench arrangement, the laying of cable ducts to be completed using directional drilling. This crossing methodology will ensure that no contact will be made with the watercourse during the works.	Option D - HDD 46m	None. No in-stream works required.
13	633036	734978	900 mm Concrete Pipe	-	1.57 m	Where adequate cover exists above a culvert, the standard aforementioned trench arrangement will be used where the cable ducts pass over a culvert without any contact with the existing culvert or watercourse.	Option A - Standard Trench Detail	None. No in-stream works required.
14	633008	734613	300mm UPVC	-	0.70 m	Where the culvert consists of a socketed concrete or sealed plastic pipe and sufficient depth is notavailable over the crossing, a trench will be excavated beneath the culvert and cable ducts will be installed in the standard formation 300mm below the existing pipe.	Option B - Flat Bed Under	None. No in-stream works required.
15	633057	734460	1200 mm Concrete Pipe	-	0.35 m	Where the culvert consists of a socketed concrete or sealed plastic pipe and sufficient depth is notavailable over the crossing, a trench will be excavated beneath the culvert and cable ducts will be installed in the standard formation 300mm below the existing pipe.	Option B - Flat Bed Under	None. No in-stream works required.
16	633200	734344	900 mm Concrete Pipe	-	1.72 m	Where adequate cover exists above a culvert, the standard aforementioned trench arrangement will be used where the cable ducts pass over a culvert without any contact with the existing culvert or watercourse.	Option A - Standard Trench Detail	None. No in-stream works required.

Culvert/Drain Crossing Reference No.	X (ITM)	Y (ITM)	Culvert/Drain Type	Width of Drain Channel (m)	Cover from Road Level to Top of Culvert (m)	Crossing Option Description	Watercourse Crossing Option	Extent of In-Channel Works
17	633032	732652	Concrete Bridge 1200W	-	0.40 m	Where sufficient depth is not available over or under the crossing for a trench arrangement, the laying of cable ducts to be completed using directional drilling. This crossing methodology will ensure that no contact will be made with the watercourse during the works.	Option D - HDD 50m	None. No in-stream works required.
18	633498	728797	600 mm Concrete Pipe	-	1.67 m	Where adequate cover exists above a culvert, the standard aforementioned trench arrangement will be used where the cable ducts pass over a culvert without any contact with the existing culvert or watercourse.	Option A - Standard Trench Detail	None. No in-stream works required.
19	634465	726979	600 mm Concrete Pipe	-	0.30 m	Where the culvert consists of a socketed concrete or sealed plastic pipe and sufficient depth is notavailable over the crossing, a trench will be excavated beneath the culvert and cable ducts will be installed in the standard formation 300mm below the existing pipe.	Option B - Flat Bed Under	None. No in-stream works required.
20	634415	726673	600mm Concrete Pipe	-	0.97 m	Where cable ducts are to be installed over an existing culvert and sufficient cover cannot be achieved, the ducts will be laid in a much shallower trench, the depth of which will be determined by the cover available at the culvert crossing location. The ducts within the shallow formation trench will be encased in 6mm thick steel galvanized plates and backfilled with 35N concrete.	Option C - Flat Bed Over	None. No in-stream works required.
21	634474	726574	900 mm Concrete Pipe	-	2.10 m	Where adequate cover exists above a culvert, the standard aforementioned trench arrangement will be used where the cable ducts pass over a culvert without any contact with the existing culvert or watercourse.	Option A - Standard Trench Detail	None. No in-stream works required.
22	634588	726575	1200 mm Concrete Pipe	-	1.75 m	Where adequate cover exists above a culvert, the standard aforementioned trench arrangement will be used where the cable ducts pass over a culvert without any contact with the existing culvert or watercourse.	Option A - Standard Trench Detail	None. No in-stream works required.

Culvert/Drain Crossing Reference No.	X (ITM)	Y (ITM)	Culvert/Drain Type	Width of Drain Channel (m)	Cover from Road Level to Top of Culvert (m)	Crossing Option Description	Watercourse Crossing Option	Extent of In-Channel Works
23	634774	726575	900 mm Concrete Pipe	-	0.80 m	Where the culvert consists of a socketed concrete or sealed plastic pipe and sufficient depth is notavailable over the crossing, a trench will be excavated beneath the culvert and cable ducts will be installed in the standard formation 300mm below the existing pipe.	Option B - Flat Bed Under	None. No in-stream works required.



Map Legend

- EIAR Site Boundary
- Culvert and Drain Crossings
- Proposed 110 kV Onsite Substation
- Existing Thornsberry 110kV Substation
- Proposed Temporary Construction
- Proposed Underground Electrical Cabling Route

Drawing Title

Grid Connection Culvert and Drain Crossings

Project Title

Umma More Renewable Energy Development

Drawn By	Checked By
NMcH	EC
Project No.	Drawing No.
201050	
Scale	Date
1:130,000	2023-02-01

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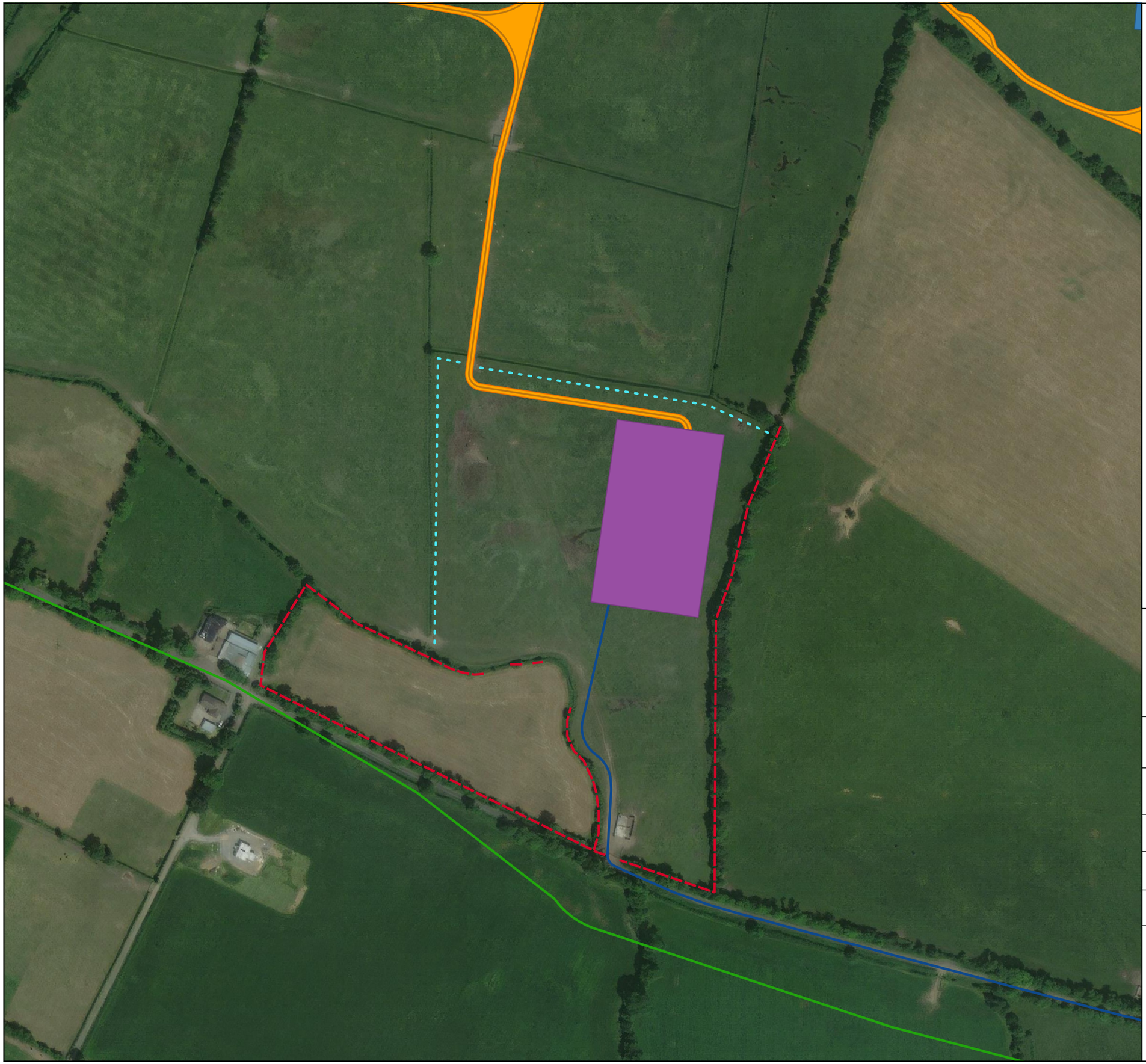

Map Legend

- EIAR Site Boundary
- Proposed New Roads
- Proposed Onsite Substation
- Proposed Grid Connection underground electrical cabling route
- Existing Treeline
- Proposed planting

Drawing Title

Substation Enchancement Planting

Project Title

Umma More Renewable Energy Development

Drawn By	Checked By
EC	MW
Project No.	**Drawing No.**
201050	1
Scale 1:2750	**Date** 2023-03-08

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