Greenhills Solar Farm

Site Investigation Results

Civil & Structural Works

Report Ref: 300101185-CS-R-02-00

Date: August 2025

Client: RSK

Contents

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Revision:	Prepared:	Checked:	Approved:	Date:	Notes:
00	DM	DT	RG	01/08/2025	Issued to Client

1. Introduction

TLI Group were appointed by RSK, on behalf of Ørsted, to provide a preliminary design development of a loop-in style grid connection and associated planning design package. In addition to this, the Client requires design input into a Battery Energy Storage System (BESS) compound layout and the MV collector network for the proposed Greenhills Solar Farm. The proposed 220kV substation and BESS compound are located in the townland of Ballyneague on the outskirts of Inch village, approximately 5 kilometres north of Killeagh, County Cork (Figure 1).

Site investigation (SI) works were completed at the site on Tuesday 22nd July and Wednesday 23rd July 2025. The purpose of the SI works was to establish the ground conditions at the proposed locations of the substation and BESS compound. Percolation testing was also completed to determine the infiltration rate of the soil in order to complete the drainage design for the 220kV substation.

This document presents the findings of the SI works.

Figure 1: Proposed Site Location (Yellow Pins)

Additional information including scope of report, site description, site investigation details, trial pit and percolation test requirements and general notes can be found in the Site Investigation Specification report (300101185-CS-R-01).

2. Site Investigation Results

The following section of this report presents the results of the site investigation works for the proposed 220kV substation and BESS compound. 6 No. trial pits were completed during the site investigation works to establish the ground conditions. Percolation testing was also completed to determine the infiltration rate of the soil, which consisted of 3 No. P-Tests and 3 No. T-Tests.

The current use of the land is agricultural. From the surface, the land appeared to be excellent, well-drained and well-maintained. No rushes were present on site which is a good indication there won't be wet and/or poor ground conditions.

2.1 Trial Pits

The below table presents an overall summary of the findings from the trial pits. The trial pit photographs can be seen in section Appendix A – Site Investigation Photographs and the trial pit logs can be seen in Appendix B – Trial Pit Logs.

To summarise, no potential issues were discovered in any of the trial pits and the ground conditions are good. Groundwater was not found, and the sidewalls of the excavation were stable. The excavator (Komatsu PC138US) found it much more difficult to excavate as depth increased due to the high cobble and boulder content, likely sandstone, in many of the pits.

Trial Pit	Depth (m)	Groundwater (m)	Soil Description	Additional Comments
1	2.1	N/A	Silty Clay soil with high cobble content	Pit terminated due to presence of stone. Sidewalls stable.
2	2.1	N/A	Clayey soil with high cobble content and low boulder content	Pit terminated due to presence of stone. Sidewalls stable.
3	2.0	N/A	Clayey soil with high cobble and boulder content	Pit terminated due to presence of stone. Sidewalls stable.
4	2.3	N/A	Clayey soil with low cobble content	Pit terminated due to presence of stone. Sidewalls stable.
5	2.1	N/A	Silty Clay soil with high cobble content and low boulder content (shale)	Pit terminated due to presence of stone. Sidewalls stable.
6	2.2	N/A	Silty Clay soil with high cobble content and low boulder content (shale)	Pit terminated due to presence of stone. Sidewalls stable.

2.2 Percolation Test

The values recorded during the percolation test can be seen in the tables below. An infiltration rate has been calculated for the subsurface (T-Test) and surface (P-Test) excavations.

	Dimensions (mm)	Volume (m^3)	Time Filled	Time (¾ Full)	Time (¼ Full)	Time (¾ – ¼)
T-Test 1	400 x 350 x 300	0.042	09:46	10.21	11.27	66
T-Test 2	400 x 350 x 300	0.042	09:56	10.04	10.33	19
T-Test 3	400 x 400 x 300	0.048	09:50	10.35	12.04	89
Average	400 x 367 x 300	0.044	-	-	-	58

	Dimensions (mm)	Volume (m^3)	V_{p75-25} (m^3)	A_{p50} (m^2)	T_{p75-25} (minutes)	T_{p75-25} (seconds)
Average	400 x 367 x 300	0.044	0.022	0.377	58	3480

	Dimensions (mm)	Volume (m^3)	Time Filled	Time (¾ Full)	Time (¼ Full)	Time (¾ – ¼)
P-Test 1	350 x 350 x 300	0.037	09:32	09:42	11:44	122
P-Test 2	300 x 300 x 300	0.027	09:28	09:37	11:03	86
P-Test 3	350 x 350 x 300	0.037	09:38	09:49	10:30	41
Average	333 x 333 x 300	0.034	-	-	-	83

	Dimensions (mm)	Volume (m^3)	V_{p75-25} (m^3)	A_{p50} (m^2)	T_{p75-25} (minutes)	T_{p75-25} (seconds)
Average	333 x 333 x 300	0.034	0.017	0.311	83	4980

Soil infiltration rate, $f = \dfrac{V_{p75-25}}{a_{p50} \times t_{p75-25}}$

where:

V_{p75-25} = the effective storage volume of water in the trial pit between 75% and 25% effective depth;

a_{p50} = the internal surface area of the trial pit up to 50% effective depth and including the base area;

t_{p75-25} = the time for the water level to fall from 75% to 25% effective depth.

T-Test: $\boldsymbol{f = \dfrac{0.022}{0.377 \times 3480} = 1.677 \times 10^{-5}\ m/s = 0.00001677\ \text{m/s}}$

P-Test: $\boldsymbol{f = \dfrac{0.017}{0.311 \times 4980} = 1.098 \times 10^{-5}\ m/s = 0.00001098\ \text{m/s}}$

3. Conclusion

This report presents the results of the site investigation works completed as part of the proposed Greenhills Solar Farm 220kV Substation and BESS compound development which is located in the townland of Ballyneague on the outskirts of Inch village, 5 kilometres north of Killeagh, County Cork.

3.1 Trial Pits

Trial pit results indicate that the soil profile on site is suitable for the proposed cut and fill design required. Due to the depth of cut and fill required to form the substation platform, borehole site investigation will be required to confirm soil conditions at greater depths.

Due to the size of rock encountered on site, cut material will need to be graded before being re-used as fill. Further laboratory testing will be required of on-site material to ensure suitability for use. Based on initial trial hole evidence, strip foundations will be suitable for structures in the cut area and raft foundations are recommended in the fill area.

From Table 17 of BS 5975:2008 shown below, the average presumed allowable bearing pressure across the 6 No. trial pits is expected to be in the region of 150 – 300 kPa between 0.5 to 1.5m below ground level due to the presence of stiff clay and stone. The presumed bearing pressure is expected to be higher below 1.5m due to the high cobble and boulder content.

As these figures are estimates, laboratory testing and plate bearing tests are recommended to confirm the geotechnical design parameters and the presumed allowable bearing pressure.

BRITISH STANDARD BS 5975:2008

Table 17 **Presumed allowable bearing pressure under vertical static loading** *(continued)*

Group	Class	Types of rock and soil	Presumed bearing pressure kN/m²	Remarks
2 Non-cohesive soils	9	Compact gravel, or compact sand and gravel	⩾ 600	These values of bearing pressure are applicable to a width of foundation *B* not less than 1 m. Ground water level assumed to be a depth not less than *B* below the base of the foundation.
	10	Medium dense gravel, or medium dense sand and gravel	200 – 600	
	11	Loose gravel, or loose sand and gravel	< 200[c]	
	12	Compact sand	> 300	Where ground water level may rise to within *B* below the base, adopt 50% of the presumed bearing pressure.
	13	Medium dense sand	100 – 300	
	14	Loose sand	< 100[c]	
3 Cohesive soils	15	Very stiff boulder clays and hard clays	300 – 600	Group 3 is susceptible to long-term consolidation settlement as well as immediate settlement.
	16	Stiff clays	150 – 300	
	17	Firm clays	75 – 150	For foundations less than 1 m below the free surface of the ground, consideration should be given to the loss of strength resulting from softening.
	18	Soft clays and silts	< 75	
	19	Very soft clays and silts	Not applicable. Require special foundation attention.	
4	20	Peat and organic soils	Require special foundation attention.	Large settlement.
5	21	Made ground or fill	Suspect, unless controlled as to materials and placement (see **18.9**).	

3.2 Percolation Test

The typical soakaway dimensions based on the lower infiltration rate on site for a 25m x 18m substation building will be approximately 5m x 5m x 1.8m deep.

Once the platform has been constructed, it is recommended percolation testing should be completed to determine the actual infiltration rate of the soil at the correct level in the location of the soakaway to get an accurate infiltration rate for the soakaway design.

Appendix A – Site Investigation Photographs

Trial Pit 1

1		2	
3		4	

Trial Pit 2

1		2	
3		4	

Trial Pit 3

1		2	
3		4	

Trial Pit 4

1		2	
3		4	

Trial Pit 5

1		2	
3		4	

Trial Pit 6

1		2	
3		4	

T-Test 1

1		2	

T-Test 2

1		2	

T-Test 3

1		2	

P-Test 1

1		2	

P-Test 2

1		2	

P-Test 3

1		2	

Appendix B – Trial Pit Logs

TLI Group Unit 1, Borg Commercial Park Monavalley, Tralee, Co Kerry	Project Greenhills Solar Farm				Job no. 300-101185	
	Calcs for Trial Pit 1				Start page no./Revision 1 / 00	
	Calcs by DM	Calcs date 01/08/2025	Checked by DT	Checked date 01/08/2025	Approved by RG	Approved date 01/08/2025

TRIAL PIT LOG

Trial pit reference TP1 Sheet 1 of 1

Water	Reduced Level (m)	Legend	Depth (m)	Description
	0.00			
	-0.30	X X X X X X X X X X	(0.30) 0.30	Dark Brown TOP SOIL
	-0.80	- x - x - x - x - x - x - x - x - x - x - x - x - x - x - x - x - x -	(0.50) 0.80	Firm reddish brown slightly silty CLAY with high cobble content
	-2.10	- x - x - x - x - x - x - x - x - x - x - x - x - x - x - x - x - x - x - x - x - x - x - x - x - x - x - x - x - x - x - x - x - x - x - x - x - x -	(1.30) 2.10	Stiff brown slightly silty CLAY with high cobble content
				Trial pit ends

Not shown to scale

Additional notes: Trial pit terminated at 2.1m below ground level due to presence of stone. Ground water was not encountered. Sidewalls stable.

TLI Group Unit 1, Borg Commercial Park Monavalley, Tralee, Co Kerry	Project Greenhills Solar Farm				Job no. 300-101185	
	Calcs for Trial Pit 2				Start page no./Revision 1 / 00	
	Calcs by DM	Calcs date 01/08/2025	Checked by DT	Checked date 01/08/2025	Approved by RG	Approved date 01/08/2025

TRIAL PIT LOG

Trial pit reference TP2 Sheet 1 of 1

Water	Reduced Level (m)	Legend	Depth (m)	Description
	0.00			
	-0.30	X X X X X X X X X X	(0.30) 0.30	Dark Brown TOP SOIL
	-1.00	- -	(0.70) 1.00	Firm greyish brown CLAY with high cobble content
	-2.10	- -	(1.10) 2.10	Stiff brown CLAY with high cobble content and low boulder content
				Trial pit ends

Not shown to scale

Additional notes: Trial pit terminated at 2.1m below ground level due to presence of stone. Ground water was not encountered. Sidewalls stable.

TLI Group Unit 1, Borg Commercial Park Monavalley, Tralee, Co Kerry	Project Greenhills Solar Farm				Job no. 300-101185	
	Calcs for Trial Pit 3				Start page no./Revision 1 / 00	
	Calcs by DM	Calcs date 01/08/2025	Checked by DT	Checked date 01/08/2025	Approved by RG	Approved date 01/08/2025

TRIAL PIT LOG

Trial pit reference TP3 Sheet 1 of 1

Water	Reduced Level (m)	Legend	Depth (m)	Description
	0.00			
	-0.20	X X X X X X X X	(0.20) 0.20	Dark Brown TOP SOIL
	-1.20	- -	(1.00) 1.20	Firm light brown CLAY with high cobble content
	-2.00	- x - x - x - x - x - x - x - x - x - x - x - x - x - x - x - x - x - x - x - x - x - x - x - x - x	(0.80) 2.00	Stiff brown slightly silty CLAY with high cobble and boulder content
				Trial pit ends

Not shown to scale

Additional notes: Trial pit terminated at 2.0m below ground level due to presence of stone. Ground water was not encountered. Sidewalls stable.

TLI Group Unit 1, Borg Commercial Park Monavalley, Tralee, Co Kerry	Project Greenhills Solar Farm				Job no. 300-101185	
	Calcs for Trial Pit 4				Start page no./Revision 1 / 00	
	Calcs by DM	Calcs date 01/08/2025	Checked by DT	Checked date 01/08/2025	Approved by RG	Approved date 01/08/2025

TRIAL PIT LOG

Trial pit reference TP4 Sheet 1 of 1

Water	Reduced Level (m)	Legend	Depth (m)	Description
	0.00			
	-0.20	X X X X X X X X	(0.20) 0.20	Dark Brown TOP SOIL
	-1.00	- -	(0.80) 1.00	Firm light brown CLAY with low cobble content
	-2.30	- x - x - x - x - x - x - x - x - x - x - x - x - x - x - x - x - x - x - x - x - x - x -	(1.30) 2.30	Stiff brown slightly silty CLAY with low cobble content
				Trial pit ends

Not shown to scale

Additional notes: Trial pit terminated at 2.3m below ground level due to presence of stone. Ground water was not encountered. Sidewalls stable.

TLI Group Unit 1, Borg Commercial Park Monavalley, Tralee, Co Kerry	Project Greenhills Solar Farm				Job no. 300-101185	
	Calcs for Trial Pit 5				Start page no./Revision 1 / 00	
	Calcs by DM	Calcs date 01/08/2025	Checked by DT	Checked date 01/08/2025	Approved by RG	Approved date 01/08/2025

TRIAL PIT LOG

Trial pit reference TP5 Sheet 1 of 1

Water	Reduced Level (m)	Legend	Depth (m)	Description
	0.00			
	-0.30	X X X X X X X X X X	(0.30) 0.30	Dark Brown TOP SOIL
	-1.70	- x - x - x - x - x - x - x - x - x - x - x - x - x - x - x - x - x - x - x - x - x - x - x - x - x - x - x - x - x - x - x - x - x - x - x - x - x - x - x - x	(1.40) 1.70	Dense reddish brown slightly silty CLAY with high cobble content and low boulder content (shale)
	-2.10	- x - x - x - x - x - x - x - x - x - x - x - x -	(0.40) 2.10	Dense brown slightly silty CLAY with high cobble content and low boulder content (shale)
				Trial pit ends

Not shown to scale

Additional notes: Trial pit terminated at 2.1m below ground level due to presence of stone. Ground water was not encountered. Sidewalls stable.

TLI Group Unit 1, Borg Commercial Park Monavalley, Tralee, Co Kerry	Project Greenhills Solar Farm				Job no. 300-101185	
	Calcs for Trial Pit 6				Start page no./Revision 1 / 00	
	Calcs by DM	Calcs date 01/08/2025	Checked by DT	Checked date 01/08/2025	Approved by RG	Approved date 01/08/2025

TRIAL PIT LOG

Trial pit reference TP6 — Sheet 1 of 1

Water	Reduced Level (m)	Legend	Depth (m)	Description
	0.00			
	-0.30	X X X / X X	(0.30) 0.30	Dark Brown TOP SOIL
	-1.50	- x - x - / x - x - x	(1.20) 1.50	Dense reddish brown slightly silty CLAY with high cobble content (shale)
	-2.20	- x - x - / x - x - x	(0.70) 2.20	Dense brown slightly silty CLAY with high cobble content and low boulder content (shale)
				Trial pit ends

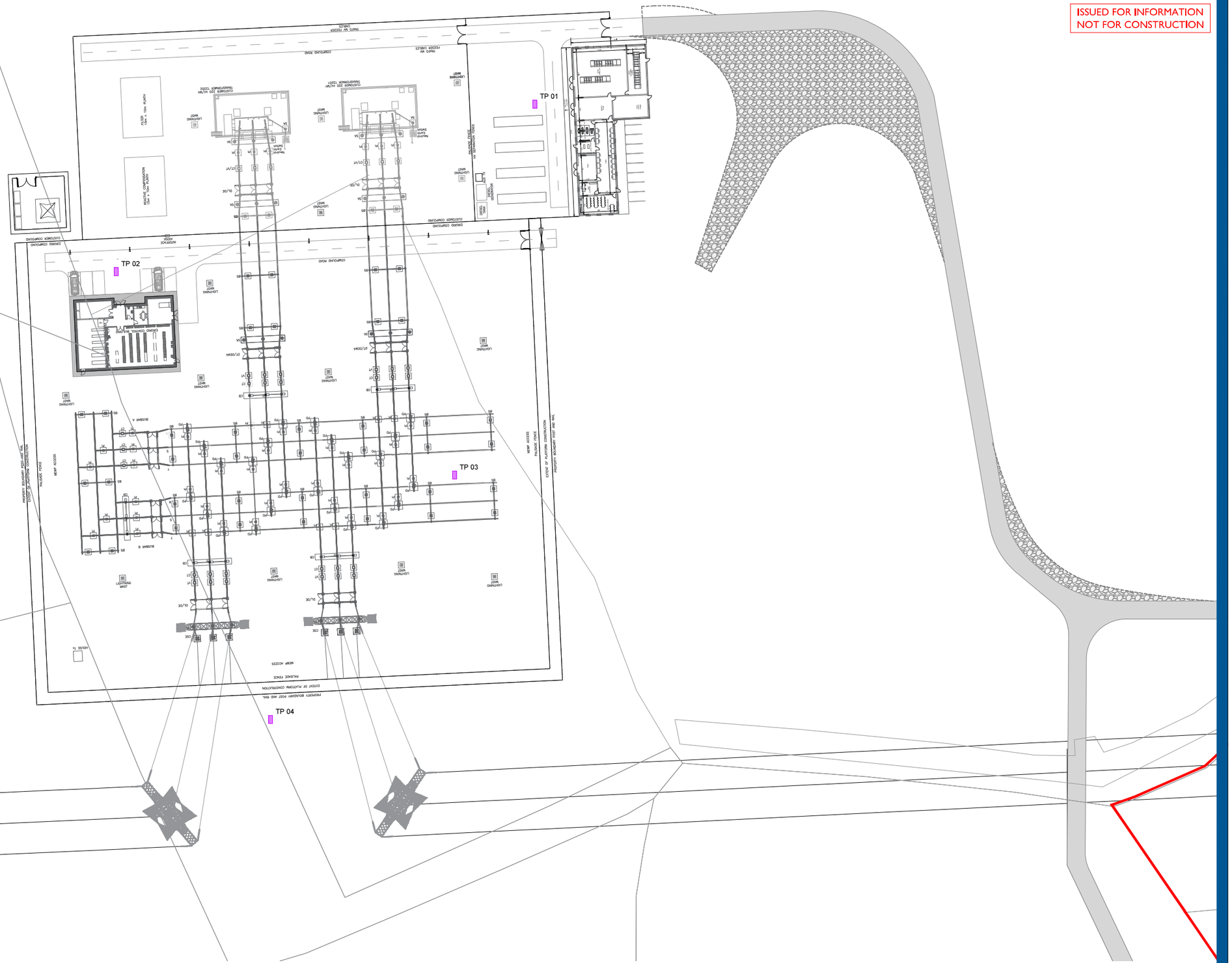
Not shown to scale

Additional notes: Trial pit terminated at 2.2m below ground level due to presence of stone. Ground water was not encountered. Sidewalls stable.

Appendix C – Site Investigation Site Location Map

ISO A1 594mm x 841mm

Test	Label	X Coordinates	Y Coordinates
Trial Pit	TP 01	602758.2100	582134.5794
Trial Pit	TP 02	602653.2436	582092.5794
Trial Pit	TP 03	602738.0948	582041.5762
Trial Pit	TP 04	602691.9454	602691.9454



Map Series:
Prime Data Vector

ITM Centre Point Co-ordinate:
X,Y = 602768,581965

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PROJECT

Greenhills Solar Farm

CLIENT

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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.
- Datum: Malin Head

LEGEND: -

Proposed Trial Pits

Planning Boundary

ISSUE/REVISION

N1	16.07.25	Issued for Information
I/R	DATE	DESCRIPTION

PROJECT NUMBER

300-101185

SHEET TITLE

Proposed Trial Pit Locations
Sheet 1 of 2

SHEET NUMBER

300101185-DR-150

Project Management Initials: Designer: DM Checked: DT Approved: RG

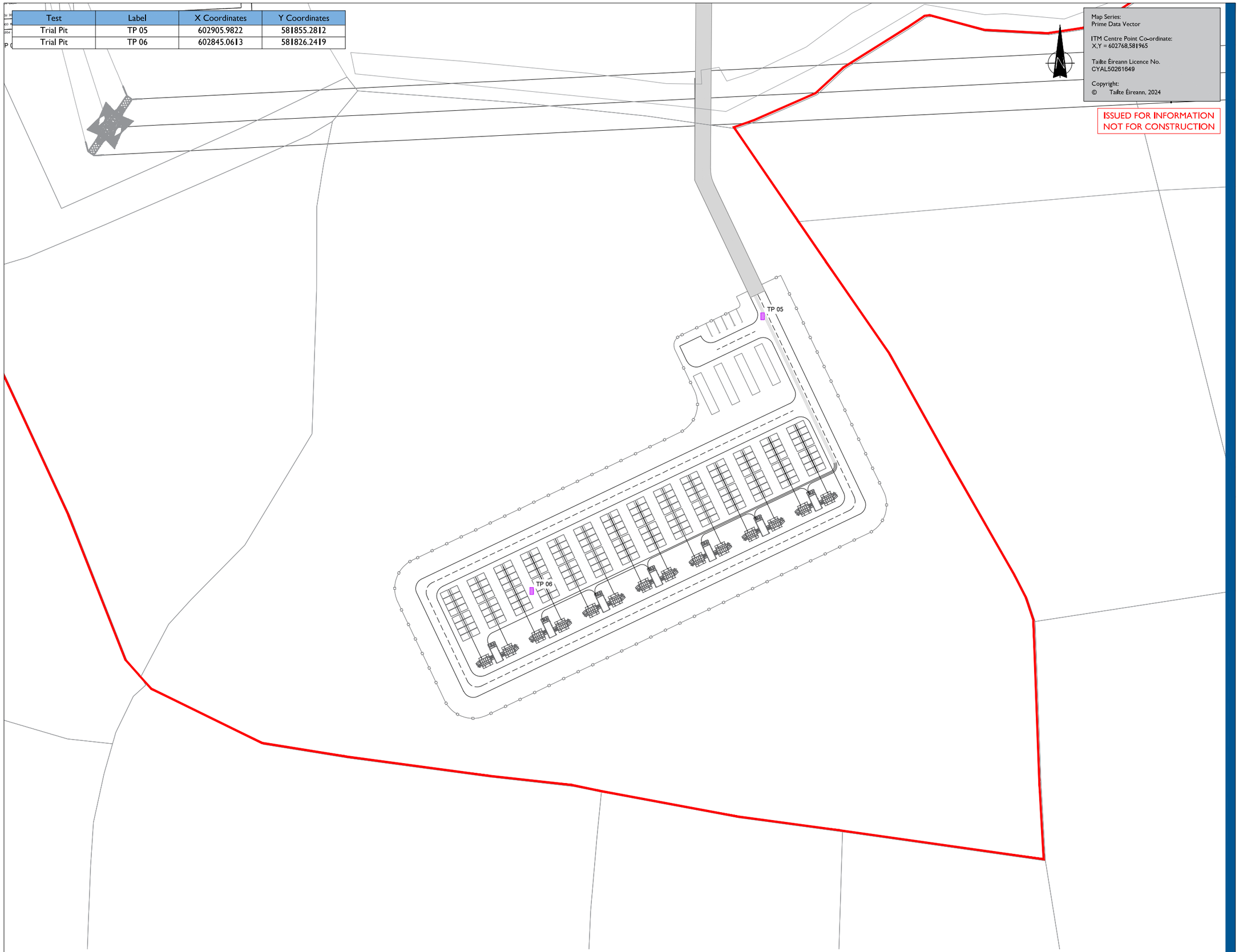
Proposed Site Investigation Locations

Scale: 1:500

1:500
10m 0 10m 20m 30m 40m 50m

ISO A1 594mm x 841mm

Test	Label	X Coordinates	Y Coordinates
Trial Pit	TP 05	602905.9822	581855.2812
Trial Pit	TP 06	602845.0613	581826.2419



Map Series:
Prime Data Vector

ITM Centre Point Co-ordinate:
X,Y = 602768,581965

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Proposed Site Investigation Locations

Scale: 1:500

1:500
10m 0 10m 20m 30m 40m 50m

Project Management Initials: Designer: DM Checked: DT Approved: RG

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PROJECT

Greenhills Solar Farm

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Proposed Trial Pits

Planning Boundary

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SHEET TITLE

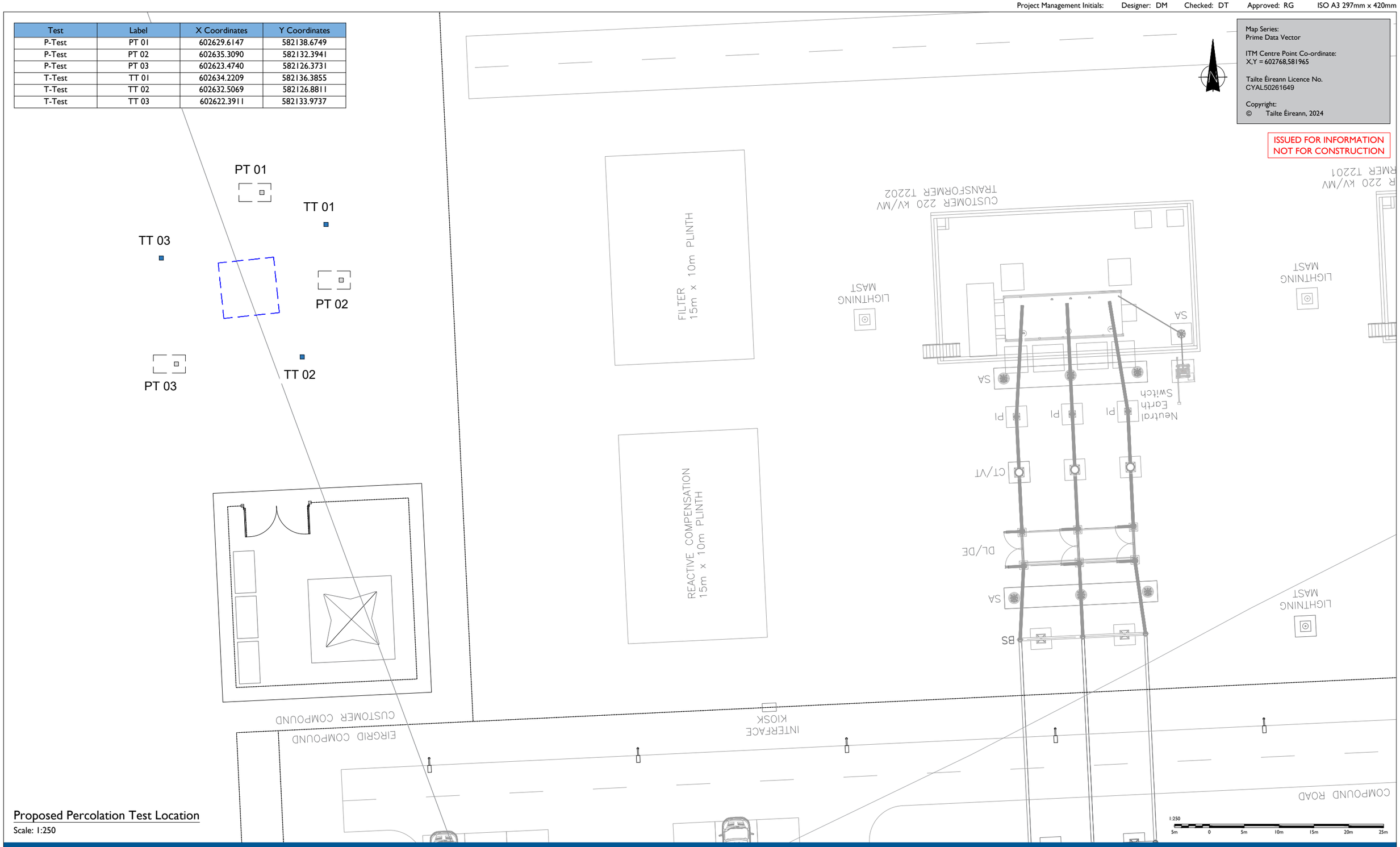
Proposed Trial Pit Locations
Sheet 2 of 2

SHEET NUMBER

300101185-DR-151

Project Management Initials: Designer: DM Checked: DT Approved: RG ISO A3 297mm x 420mm

Test	Label	X Coordinates	Y Coordinates
P-Test	PT 01	602629.6147	582138.6749
P-Test	PT 02	602635.3090	582132.3941
P-Test	PT 03	602623.4740	582126.3731
T-Test	TT 01	602634.2209	582136.3855
T-Test	TT 02	602632.5069	582126.8811
T-Test	TT 03	602622.3911	582133.9737



Map Series:
Prime Data Vector

ITM Centre Point Co-ordinate:
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Proposed Percolation Test Location
Scale: 1:250

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PROJECT
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SHEET TITLE
Proposed Percolation Test Location

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SHEET NUMBER
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