



APPENDIX 4

DETAILED DRAINAGE PROPOSALS



APPENDIX 4-8

DRAINAGE DESIGN REPORT

MWP

SEVEN HILLS WIND FARM DYSART, COUNTY ROSCOMMON

Drainage Management Plan

Energia

April 2022

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1. Introduction

Energia is the developer for Seven Hills Wind Farm and Malachy Walsh and Partners (MWP) have been appointed to carry out the civil design for the project. Infrastructure for 20 no. wind turbine generators (WTGs) will be constructed as part of this project. The purpose of this document is to outline the design rationale for the drainage measures to be employed as part of the works.

2. Site description

The proposed site is split into two parts, with the Regional Road R363 separating 7 no. WTGs to north from the 13 no. WTGs to the south. The land is mostly agricultural on rolling hills. The geotechnical strata generally consist of clay, gravel or cobbles on rock. The ground is stable and suitable for access road and hardstand construction.

3. Drainage design

3.1 Design Principles

The drainage strategy for the wind farm site will ensure minimal impact on the existing flow regime, water quality, and run-off quantity.

The nature of the ground conditions dictates the drainage methodology that can be employed. On wet sites with soft ground, roads are dug down to a more solid bearing stratum and this results in a requirement for roadside drains where dirty water will accumulate. Where ground conditions are good, and the top surface is deemed suitable as a bearing stratum, roads can be constructed from that surface. This latter method does not result in a requirement for roadside drains.

Dirty water is generated on wind farm sites predominantly during construction. The dirty water is generated through movement of soil material around the site and breaking down of the road surface under sustained loading from construction traffic. Silt removal from dirty water runoff will be either by filtration or by means of settlement ponds as described below.

An important aspect of the treatment process is that clean water from outside the works area is not mixed with dirty water from within the works area. This minimises the quantity of water to be treated and consequently reduces the size and quantity of settlement ponds where they are used.

Clean water flows from the uphill side of catchments to the downhill side. Having this water pass through the works unimpeded reduces the risk of mixing with dirty water and ensures a smaller quantity of dirty water remains for treatment. Clean water will pass through roads of stone construction due to its porosity via overland flow. Separation of clean and dirty water drains is shown in Figure 2. Clean water cut-off drains will be provided on the uphill side of infrastructure where it is undesirable to have clean water enter the works. Such locations would be on the uphill side of material storage areas where overland flow is unlikely to pass through unimpeded and mixing with dirty water is likely to occur. These drains are routed through to the downhill side of the works and discharged through buffered outfalls.

Where drains are constructed they will incorporate a series of check dams that will attenuate the flow and provide storage for the increased runoff from exceptional rainfall events. Check dams will comprise a clean 100 mm to 150 mm crushed rock behind a Terram barrier that will be embedded into the base and sides of ditches by at least 100 mm.

3.1.1 Treatment by settlement ponds

A typical drainage design on a wind farm using settlement ponds is shown in Figure 1. The clean water interceptor drains are all positioned upslope to prevent any mixing of the clean and dirty water. The outflow from these drains is then piped under the road at suitable intervals and at low points depending on the site topography. In the illustration, dirty water drains collect all incident rainwater that falls on the infrastructure. This water then drains to settlement ponds for removal of sediment before it is discharged to the nearest watercourse.

Dewatering of turbine base excavations can result in significant flow rates to the drainage and settlement system if high-capacity pumps are used. Should pumping be required, temporary storage will be provided within the excavations and dewatering carried out at a flow rate that is within the capacity of the settlement ponds.

The outflow from the treatment system will be infiltrated into the ground via swales at the end of the settlement ponds.

The details of the water treatment process and calculations for the required size of the settlement ponds is included in Section 4 of this document.



Figure 1 – Typical drainage design



Figure 2 – Separation of clean and dirty water drainage on wind farm site

3.1.2 Treatment by filtration

A key mitigation available for the development of this wind farm is through the use of existing vegetation to filter and clean dirty water run-off. As ground conditions here are optimal roads can be constructed on a geotextile material laid out on the existing surface without the need to carry out any excavations. This approach is highly beneficial for a number of reasons:

- It reduces the amount of excavations and soil movement around the site;
- It allows clean water to pass from uphill to downhill unimpeded;
- It eliminates the requirement for settlement ponds;
- It eliminates the concentration of dirty water at discrete locations and ensures treatment at the point of dirty water generation.

The last point is a fundamental principle of the drainage management to be employed on this site. Dirty water drains convey large amounts of water to discrete points where settlement ponds treat this water prior to discharge. However, a more efficient and sustainable method for treatment of dirty water is to utilise the massive filtration capacity of the vegetation immediately adjacent to infrastructure to filter suspended material from water as it passes through. Some of this water infiltrates into the ground and the remainder, if any, runs off to the nearest watercourse downhill. This methodology has been used very successfully where it has been employed and it ensures no ponding of dirty water and efficient filtration of sediment. Examples of this are shown in Figure 3 and Figure 4.



Figure 3 – Road built on existing surface without dirty water drains (1)



Figure 4 – Road built on existing surface without dirty water drains (2)

3.2 Water quality management

Sediment such as clay, or silt could potentially cause significant pollution during the construction phase of the wind farm due to the erosion of exposed soil by surface water runoff. The water quality management system has been prepared in order to control erosion and prevent sediment runoff during the construction phase of the wind farm. The implementation of sediment and erosion control measures is essential in preventing sediment pollution. The system was designed having regard to:

- Knowledge of the site's environmental conditions
- Previous construction experience of wind farm developments in similar environments
- Previous experience of environmental constraints and issues from construction of wind farms in similar environmental conditions
- Technical guidance and best management practice manuals

The following site-specific information was used in the design of the drainage and treatment system:

- High resolution aerial photography and topographical surveys
- Wind farm infrastructure layout (turbines, service roads and ancillary development)
- Hydrology maps (watercourses and buffer zones)
- Soil and land use maps
- Met Éireann point rainfall frequency data

The settlement ponds and check dams described previously provide the essential mechanism for the removal of silt from construction-related runoff and the controlled return of the treated surface waters to infiltrate to the ground.

The drainage and treatment system will ensure that the construction and early post-construction phases of the wind farm will not create adverse effects on the aquatic environment that could compromise the ability to meet Water Framework Directive objectives or fulfil compliance with basic measures required including the Nitrates Directive, the Habitats and Birds Directives and the Drinking Water Directive.

3.3 Water quality control measures

Additional infrastructure and measures used to control water quality are described in the following sub-sections.

3.3.1 Minimise exposed areas

The area of exposed ground will be kept to a minimum by maintaining where possible existing vegetation that would otherwise be subject to erosion in the vicinity of the internal wind farm roads and other infrastructure. The clearing of topsoil will be delayed until just before construction begins rather than stripping the entire site months in advance particularly during road construction.

3.3.2 Exposed formation

Where formation level requires excavation to bedrock (such as at hardstands or WTG foundations) measures will be taken to limit vertical flow of water into the bedrock from the works. At WTG foundations sand blinding, DPM and concrete blinding will be provided at formation level to create a vertical cut-off barrier and to mitigate the risk of concrete leakage into the ground below. Hardstands will be underlain with a layer of Terram geotextile to act in the same fashion.

3.3.3 Establish vegetation

Exposed areas of the site will need to be re-vegetated either by natural regeneration or by reseeding. Natural regeneration relies on colonisation of bare ground by native species from adjacent habitats. For this method, a roughened surface will be provided that can trap seeds and soil to provide initial regeneration areas.

3.3.4 Road construction and maintenance

On-site experience in wind farm construction and forestry development across the country has shown that the single most effective method of reducing the volume of sediment created by construction is the immediate surfacing of all service roads with high quality, hard wearing crushed aggregate graded transversely to one or both sides. In this regard, 100mm of imported Cl.804 will be provided as a finished surface. This significantly reduces the level of suspended solids in the storm water runoff.

The road surface can become contaminated with clay or other silty material during construction. Road cleaning will, therefore, need to be undertaken regularly during wet weather to reduce the volume of sediment runoff to the treatment system. This is normally achieved by scraping the road surface with the front bucket of an excavator and disposing of the material at designated locations within the site.

3.3.5 Check dams

Check dams will be placed at regular intervals, based on gradient, along all drains to provide flow attenuation, slow down runoff to promote settlement and to reduce scour and ditch erosion. They will be placed at appropriate intervals and heights, depending on the drain gradient, to allow small pools to develop behind them. These will contain a clean 100 mm to 150 mm stone material.



Figure 5 – Example of check dams along roadside drainage channels

3.4 Inspection and maintenance

The drainage and treatment system for the proposed wind farm must be managed and monitored at all times and particularly after heavy rainfall events during the construction phase. The drainage and treatment system will be regularly inspected and maintained to ensure that any failures are quickly identified and repaired so as to prevent water pollution. A programme of inspection and maintenance should be designed by the contractor and dedicated construction personnel assigned to manage this programme. A checklist of the inspection and maintenance control measures should be developed by the contractor and records kept of inspections and maintenance works. These drainage controls should be kept in place during the operational phase of the wind farm until the vegetation is re-established.

This checklist would include the following :

- Condition of silt traps and settlement ponds
- Removal of silt from settlement ponds
- Erosion concerns
- Blockages of cross-drains

3.5 Weather monitoring

Weather monitoring is a key input to the successful management of the drainage and treatment system during the construction of the wind farm. This, at a minimum, will involve 24-hour advance meteorological forecasting (Met Éireann download) linked to a trigger-response system. When a pre-determined rainfall trigger level is exceeded (e.g. 1 in 5 year storm event), planned responses should be undertaken. These responses will involve control measures including the cessation of construction until the storm event has passed over and flood flows have subsided. Dedicated construction personnel should be assigned to monitor weather.

3.6 Water quality monitoring

A programme for water monitoring should be prepared in consultation with Inland Fisheries Ireland (IFI) prior to the commencement of the construction of the wind farm. The plan should include monitoring of water during the pre-, throughout and post construction phases. Further baseline water quality monitoring of all streams near the development site should be undertaken prior to construction. During the construction phase of the project, water quality in the turloughs and wells, and outflow from the drainage and attenuation system should be monitored, field-tested and laboratory tested on a regular basis during different weather conditions. This monitoring together with the visual monitoring will help to ensure that the mitigation measures that are in place to protect water quality are working effectively.

3.7 Operational phase

The measures for control of runoff and sediment relate to the construction phase of the project when there is a high volume of site vehicles and delivery vehicles moving around the wind farm site. Following construction, the amount of on-site traffic will be negligible and there will be no particular risk of sediment runoff. Runoff from the roads, hardstands, and other works areas will continue to be directed to the settlement ponds, which will be left in place. Check dams within the drainage channels will remain in place. The retention of this part of the drainage infrastructure will ensure that runoff continues to be attenuated and dispersed across existing vegetation before recharge into the ground.

4. Settlement ponds

4.1 Treatment process

The treatment process consists of primary, secondary and tertiary treatment as follows:

- The *primary treatment* consists of a two-chamber settlement pond. The adoption of a two-chambered settlement pond facilitates the regular maintenance of the ponds in a controlled manner preventing the release of sediment during cleaning, a commonly overlooked problem with single chamber designs.
- The water then passes through a *secondary treatment* system in the form of a graded stone filter bed.
- The outflow is then channelled into a swale where infiltration into the ground takes place. This is the final or *tertiary stage* of the treatment process.

Drains carrying construction site runoff will be diverted into settlement ponds that reduce flow velocities, allowing silt to settle and reducing the sediment loading. A modular approach has been adopted for the design of the settlement ponds which have been sized to cater for a 1,200 m² works area. This is equivalent to a road length of 250 metres or the area of a typical turbine base and crane hard standing.

The ponds will have a modular surface area of 30 m². Where larger areas have to be catered for, the pond area will increase pro-rata. The settlement capacity is independent of depth; however, a nominal depth of 1.00 metres will be used to allow for storage of settled material. The length to width ratio will be at least 5:1 to encourage uniform flow across the cross-section of the pond and to avoid short-circuiting of the flow.

The settlement ponds have two chambers arranged in series. The first chamber has a maximum length of three metres and allows rapid settlement of the heavier particles that make up most of the suspended solid mass. The second chamber is the main settlement areas where the smaller particles are allowed to settle. The chambers are separated by a mound of drainage stone through which the flow from the first chamber migrates. This allows the flow to enter the chambers across its full cross-section so that it can operate efficiently in accordance with its design principles.

- The settlement ponds have been designed with regard to the following:
 - Met Éireann Point Rainfall Frequency data (statistical rainfall intensity / duration table)
 - Runoff flow rate for the modular catchment area
 - Character of the impermeable areas (runoff coefficients)
 - Design particle size and density

Settlement ponds will require regular inspection and cleaning when necessary. This will be carried out under low or zero flow conditions so as not to contaminate the clean effluent from the pond. The water level will first be lowered to a minimum level by pumping without disturbing the settled sediment. The sediment will then be removed by mechanical excavator and disposed of in areas designated for deposition of spoil. Settlement ponds will require perimeter fencing and signage to ensure that there are no health and safety risks to workers or landowners.

4.2 Settlement pond calculations

Generally, high intensity rainfall events have a short duration and lower intensity rainfall events tend to have a longer duration. The Met Éireann Extreme Rainfall Data for the area demonstrates that the chance of occurrence of a storm event of a given duration decreases (higher return period) as intensity increases. For a given return period the total depth of rainfall increases with storm duration but the actual rainfall rate over that period of time decreases.

For the operation of the settlement ponds it is the rate of flow rather than the total rainfall that is relevant. The return period is a measure of the likelihood that a storm of a particular intensity will occur in a given year. However, it is important to note that the chances of occurrence of a storm event with a particular return period

are the same in each year but should on average occur once in that time-period. For instance, a storm event at the wind farm site with an intensity of 30.4 mm/hour and 60-minute duration would be expected to occur once in a 100-year period. This is more appropriately expressed as an annual exceedance probability (AEP) of 1%; that is, it has a 1% chance of being equalled or exceeded in any year.

The runoff control measures for the wind farm site have been designed in the context of storm events of varying duration and intensity. The settlement ponds have been designed to cater for a maximum continuous flow rate associated with a medium-intensity rainfall event. Higher intensity runoff will be attenuated by the open drain collection system which provides temporary storage and limits the rate at which it enters the settlement ponds. This is achieved by the use of check dams within the open drains as described elsewhere in this document. Longer duration storms of 24 hours or more generally have very low intensity and are not critical in terms of the runoff rates that they generate.

The temporary settlement ponds have been designed to ensure that the suspended solids concentration at the outlet will be less than 25 mg/l (Threshold Limit). The ponds are designed to operate effectively for the runoff rate associated with a continuous high rainfall rate of 28.4 mm/hour. This is equivalent to a 30-minute duration storm event with a 10-year return period (M10-30) taken from the Met Éireann Point Rainfall Frequency table for the site location. This is considered a statistically significant rainfall event in the context of the length of time it takes to construct a wind farm.

The design runoff rate is calculated using the equation:

$$Q = c i A$$

where c is the runoff coefficient

i is the rainfall intensity in m/sec and

A is the catchment surface area in m^2 .

A runoff coefficient of 0.70 is assumed for the hardcore surface. For a rainfall intensity of 28.4 mm/hour and a catchment area of 1,200 m^2 the runoff rate is:

$$\begin{aligned} Q &= 0.70 \times (0.0284/3600) \times 1,200 \text{ m}^3/\text{sec} \\ &= 0.0066 \text{ m}^3/\text{sec} \text{ (6.60 litres/sec)} \end{aligned}$$

The main design parameter for the settlement pond is the water surface area. The required surface area is the design flow rate in m^3/sec divided by the particle settlement velocity (V_s) in m/sec ($\text{Area} = Q/V_s \text{ m}^2$).

The particle settlement velocity is determined using the Stokes equation as follows:

$$V_s = \frac{2 r^2 (D_p - D_f)}{9 \eta}$$

where V_s is the particle settlement velocity (m/sec)

r is the radius of the particle (metres),

D_p is the density of the particles (kg/m^3);

D_f is the density of the fluid (kg/m^3),

η is the viscosity of the fluid ($0.000133 \text{ kg sec}/\text{m}^2 @ 10^\circ\text{C}$).

For a particle density of $2,400 \text{ kg}/\text{m}^3$, water density of $1,000 \text{ kg}/\text{m}^3$ and particle diameter of 20 microns (radius 10^{-5} metres) the settlement velocity, V_s , is:

$$\begin{aligned} V_s &= \frac{2 \times (10^{-5})^2 \times (2,400 - 1,000)}{9 \times 0.000133} \\ &= \frac{2 \times 10^{-10} \times 1,400}{0.001197} \\ &= 0.000234 \text{ m/sec.} \end{aligned}$$

The required settlement pond surface area is

$$\begin{aligned} A_p &= Q/V_s \\ &= 0.0066/0.000234 \\ &= 28.20 \text{ m}^2 \end{aligned}$$

Theoretically the pond depth is not relevant but in practice a minimum depth is required to ensure laminar flow and to allow temporary storage of settled silt. The modular settlement pond has been designed with a surface area of 30 m² and a depth of 1m. In practice it has been found that most of the settlement occurs in the first chamber with very low turbidity levels being achieved in the final effluent.

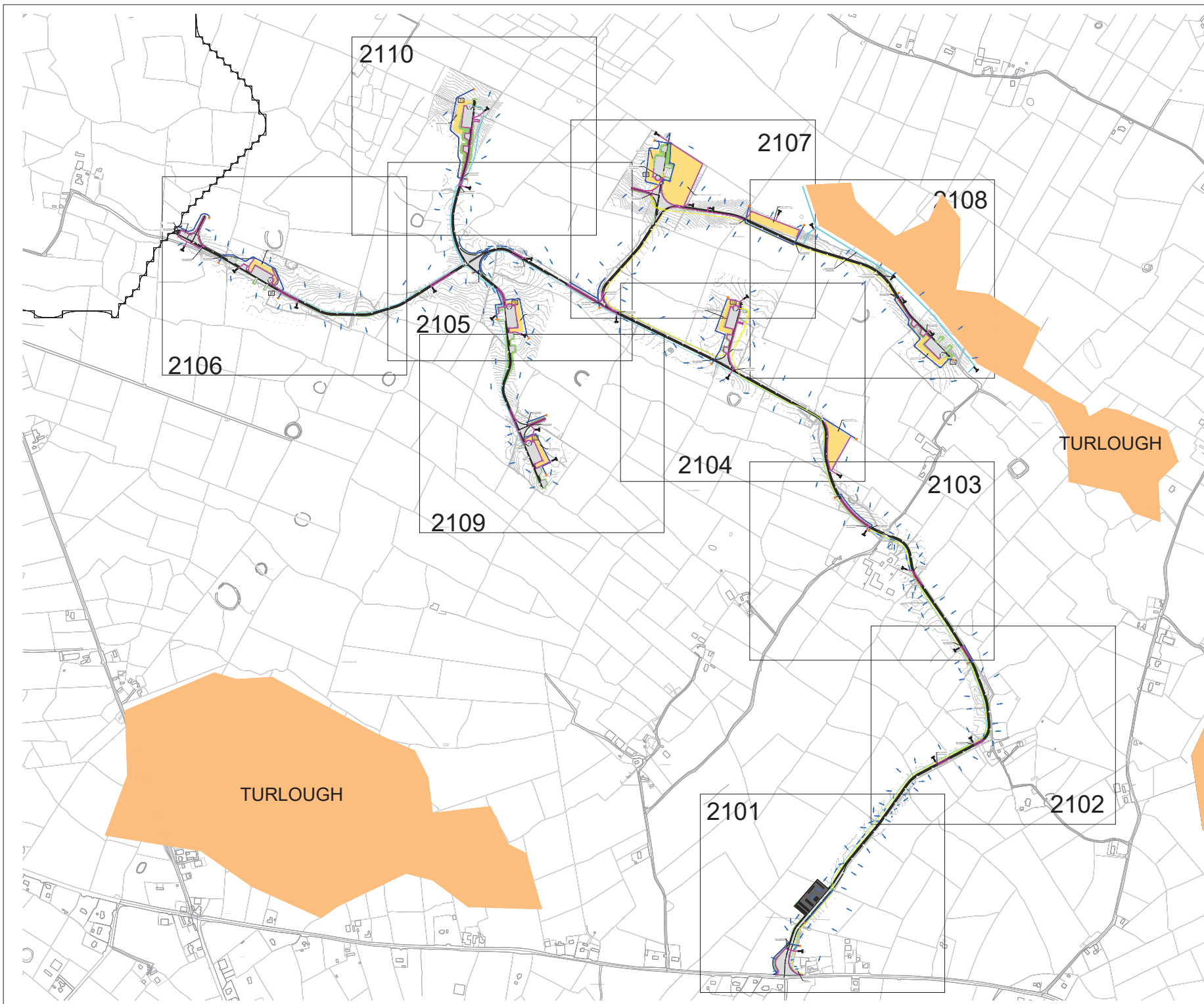
Where temporary settlement ponds are located next to turbine foundation excavations that are dewatered using a pump, the flow rate from the pumps will be limited to 6.60 litres/sec.

For practical reasons it may be necessary to increase the runoff area directed to a settlement pond in which case the pond surface area will be increased pro-rata.



APPENDIX 4-2

SITE DRAINAGE DRAWINGS



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LEGEND:

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

REV	DATE	DESCRIPTION	BY	APP
P0	10/10/22	REVISOR INFORMATION	PK	BS
P0	10/11/22	REVISOR INFORMATION	PK	BS

PROJECT:	SEVEN HILLS WIND FARM
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TITLE:	DRAINAGE & CABLE ROUTE LAYOUT - NORTH DRAWING LAYOUT PLAN
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CLIENT:	energia Switched on
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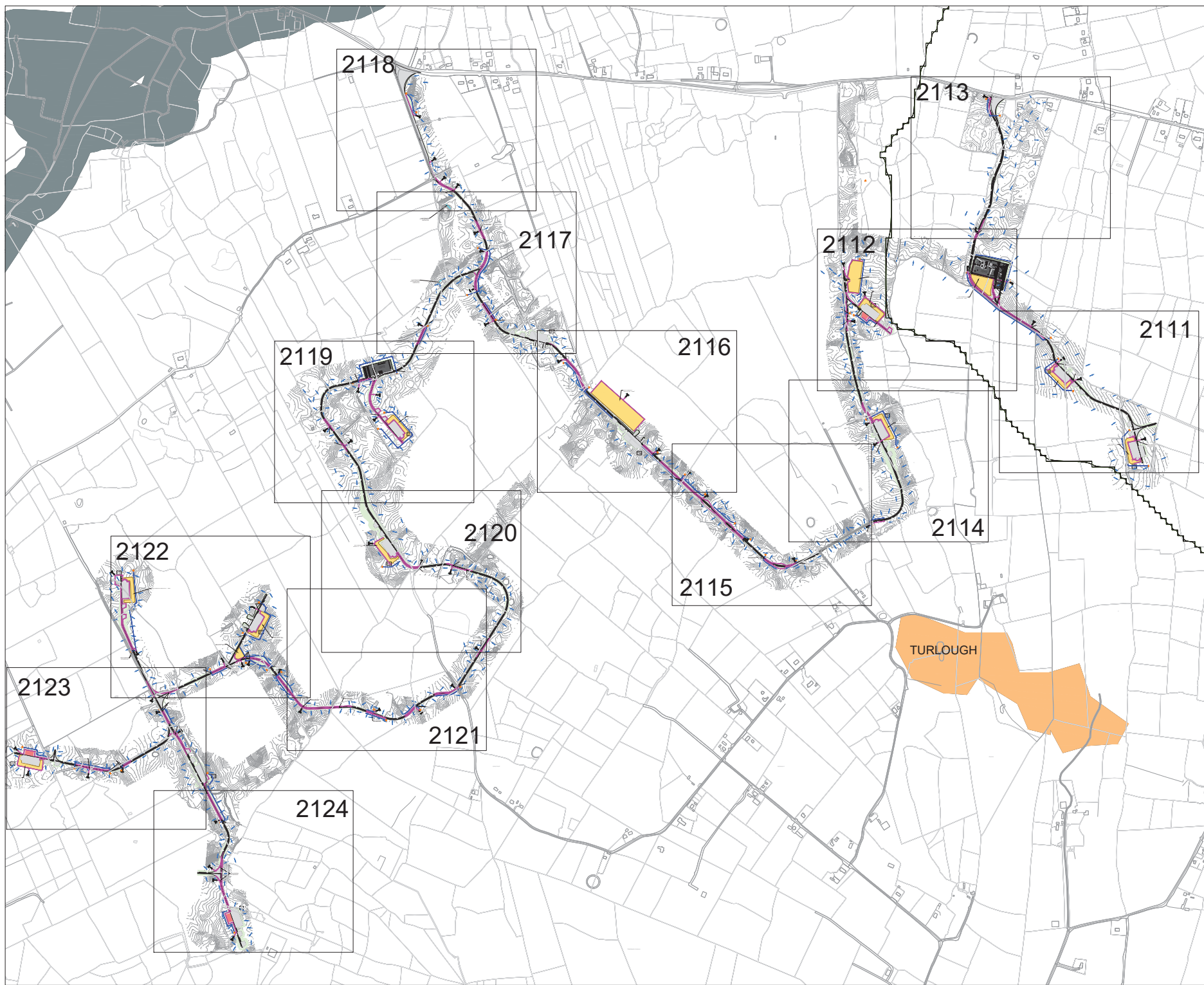
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Fax: +353 (0) 84 441 125
E-mail: info@malachywalsh.ie
Web: www.mw.ie

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- INTERNAL CABLE ROUTE (Circuit 4)
- INTERNAL CABLE ROUTE (Circuit 5)
- INTERNAL CABLE ROUTE (4 x circuits to Substation)

REV	DATE	SUB DESCRIPTION	BY	APP
01	10/06/22	SUB DESIGN/UPDATE	MB	BS
02	18/10/22	SUB DESIGN/UPDATE	MB	BS
03	10/11/22	REVISION FOR INFORMATION	MB	BS

PROJECT: SEVEN HILLS WF

TITLE: DRAINAGE & CABLE ROUTE LAYOUT - SOUTH DRAWING LOCATION PLAN

CLIENT: **enenergia**
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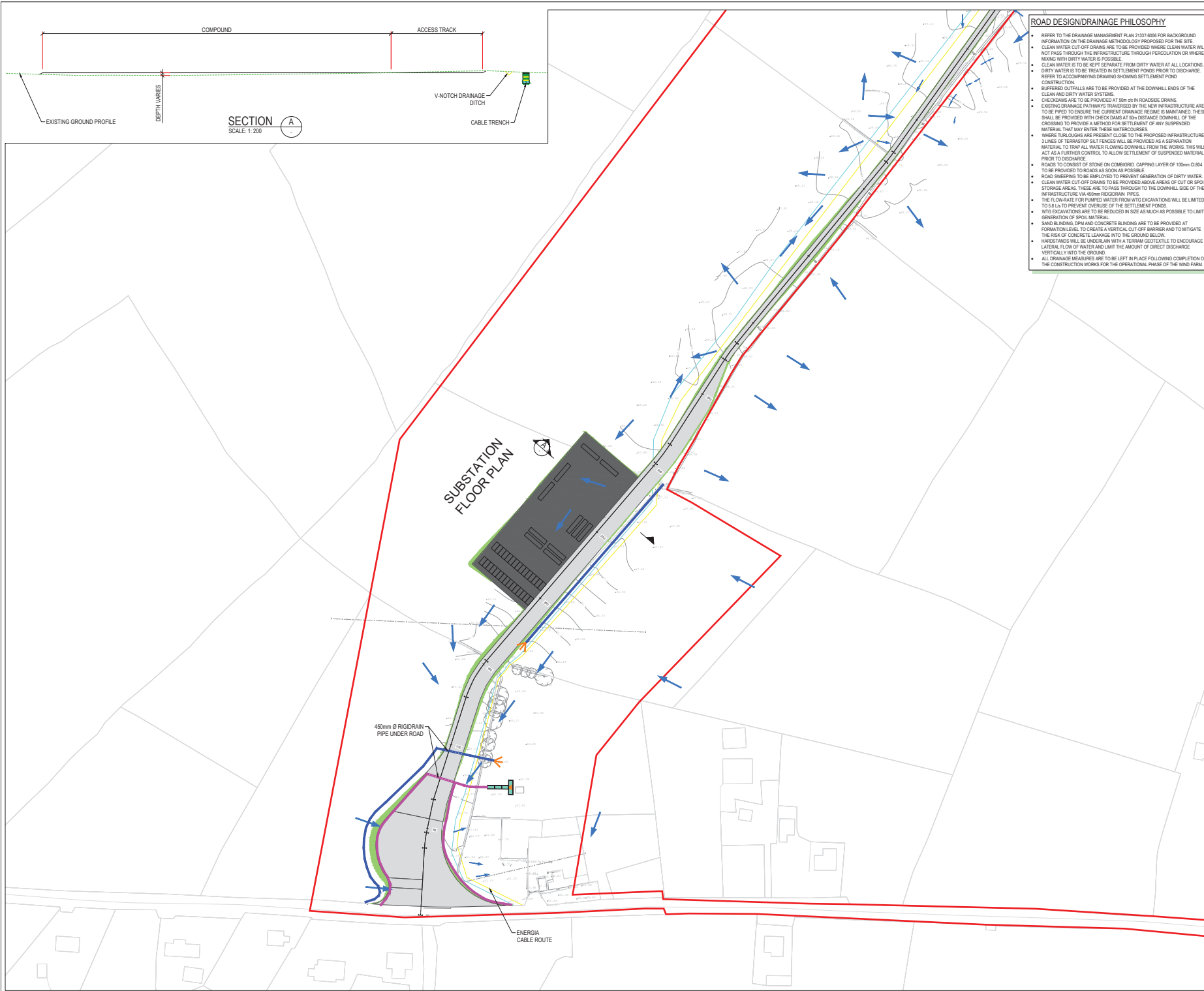
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DRAWN	PK	CHECKED	PB	APPROVED	BS
DATE:	01/06/22	SCALE @ A1:	1:1000		
PROJECT NUMBER:	21337	DRAWING STATUS:	S2		
DRAWING NUMBER:	21337-MWP-00-00-DR-C-2126	REV:	P03		

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ROAD DESIGN/ DRAINAGE PHILOSOPHY

- REFER TO THE DRAINAGE MANAGEMENT PLAN 21337-000 FOR BACKGROUND INFORMATION ON THE DRAINAGE METHODOLOGY PROPOSED FOR THE SITE.
- CLEAN WATER CUT-OFF DRAINS ARE TO BE PROVIDED WHERE CLEAN WATER WILL NOT PASS THROUGH THE INFRASTRUCTURE THROUGH PERCOLATION OR WHERE MIXING WITH DIRTY WATER IS POSSIBLE.
- CLEAN WATER IS TO BE KEPT SEPARATE FROM DIRTY WATER AT ALL LOCATIONS.
- DIRTY WATER IS TO BE TREATED IN SETTLEMENT PONDS PRIOR TO DISCHARGE. REFER TO ACCOMPANYING DRAWING SHOWING SETTLEMENT POND CONSTRUCTION.
- BUFFERED OUTFALLS ARE TO BE PROVIDED AT THE DOWNHILL ENDS OF THE CLEAN AND DIRTY WATER SYSTEMS.
- CHECKDAMS ARE TO BE PROVIDED AT 50m ON IN ROADSIDE DRAINS.
- EXISTING DRAINAGE PATHWAYS TRAVELLED BY THE NEW INFRASTRUCTURE ARE TO BE REPIED TO ENSURE THE CURRENT DRAINAGE REGIME IS MAINTAINED. THESE SHALL BE PROVIDED WITH CHECKDAMS AT 50m DISTANCE DOWNHILL OF THE CROSSING TO PROVIDE A METHOD FOR SETTLEMENT OF ANY SUSPENDED MATERIAL THAT MAY ENTER THESE WATERCOURSES.
- WHERE TROUSERS ARE PRESENT CLOSE TO THE PROPOSED INFRASTRUCTURE LINES OF TERRASTOP SILT FENCES WILL BE PROVIDED AS A SEPARATION MATERIAL TO TRAP ALL WATER FLOWING DOWNHILL FROM THE WORKS. THIS WILL ACT AS A FURTHER CONTROL TO ALLOW SETTLEMENT OF SUSPENDED MATERIAL PRIOR TO DISCHARGE.
- ROADS TO CONSIST OF STONE ON COMBIBO: CAPPING LAYER OF 100mm C18/4 TO BE PROVIDED TO ROADS AS SOON AS POSSIBLE.
- ROAD DRAINING TO BE EMPLOYED TO PREVENT GENERATION OF DIRTY WATER.
- CLEAN WATER CUT-OFF DRAINS TO BE PROVIDED ABOVE AREAS OF CUT OR SPILL STORAGE AREAS. THESE ARE TO PASS THROUGH TO THE DOWNHILL SIDE OF THE INFRASTRUCTURE VIA 400mm RIGID DRAIN PIPES.
- THE FLOW RATE FOR PUMPED WATER FROM WTD EXCAVATIONS WILL BE LIMITED TO 8 L/s TO PREVENT OVERBURD OF THE SETTLEMENT PONDS.
- WTD EXCAVATIONS ARE TO BE REDUCED IN SIZE AS MUCH AS POSSIBLE TO LIMIT GENERATION OF SPILL MATERIAL.
- SAND BLINDING, DPM AND CONCRETE BLINDING ARE TO BE PROVIDED AT FORMATION LEVEL TO CREATE A VERTICAL CUT-OFF BARRIER AND TO MITIGATE THE RISK OF CONCRETE LEAKAGE INTO THE GROUND BELOW.
- HARVESTERS WILL BE UNDERLAIN WITH A TERRAM GEOTEXTILE TO ENCOURAGE LATERAL FLOW OF WATER AND LIMIT THE AMOUNT OF DIRECT DISCHARGE VERTICALLY INTO THE GROUND.
- ALL DRAINAGE MEASURES ARE TO BE LEFT IN PLACE FOLLOWING COMPLETION OF THE CONSTRUCTION WORKS FOR THE OPERATIONAL PHASE OF THE WIND FARM.

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LEGEND:

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

REFERENCE DRAWINGS:

DRAWING No.	DRAWING TITLE
21337-MWP-WF-00-DR-C-2101	DRAINAGE LAYOUT SHEET 1
21337-MWP-WF-00-DR-C-2102	DRAINAGE LAYOUT SHEET 2
21337-MWP-WF-00-DR-C-2103	DRAINAGE LAYOUT SHEET 3
21337-MWP-WF-00-DR-C-2104	DRAINAGE LAYOUT SHEET 4
21337-MWP-WF-00-DR-C-2105	DRAINAGE LAYOUT SHEET 5
21337-MWP-WF-00-DR-C-2106	DRAINAGE LAYOUT SHEET 6
21337-MWP-WF-00-DR-C-2107	DRAINAGE LAYOUT SHEET 7
21337-MWP-WF-00-DR-C-2108	DRAINAGE LAYOUT SHEET 8
21337-MWP-WF-00-DR-C-2109	DRAINAGE LAYOUT SHEET 9
21337-MWP-WF-00-DR-C-2110	DRAINAGE LAYOUT SHEET 10
21337-MWP-WF-00-DR-C-2125	NORTH DRAINAGE KEYPLAN

REV	DATE	DESCRIPTION	BY	APP
R2	01/06/22	REVISION INFORMATION	JK	BS
R1	01/06/22	REVISION INFORMATION	JK	BS

PROJECT: SEVEN HILLS WIND FARM

TITLE: PROPOSED DRAINAGE LAYOUT SHEET 1

CLIENT: **enenergia** Switched on

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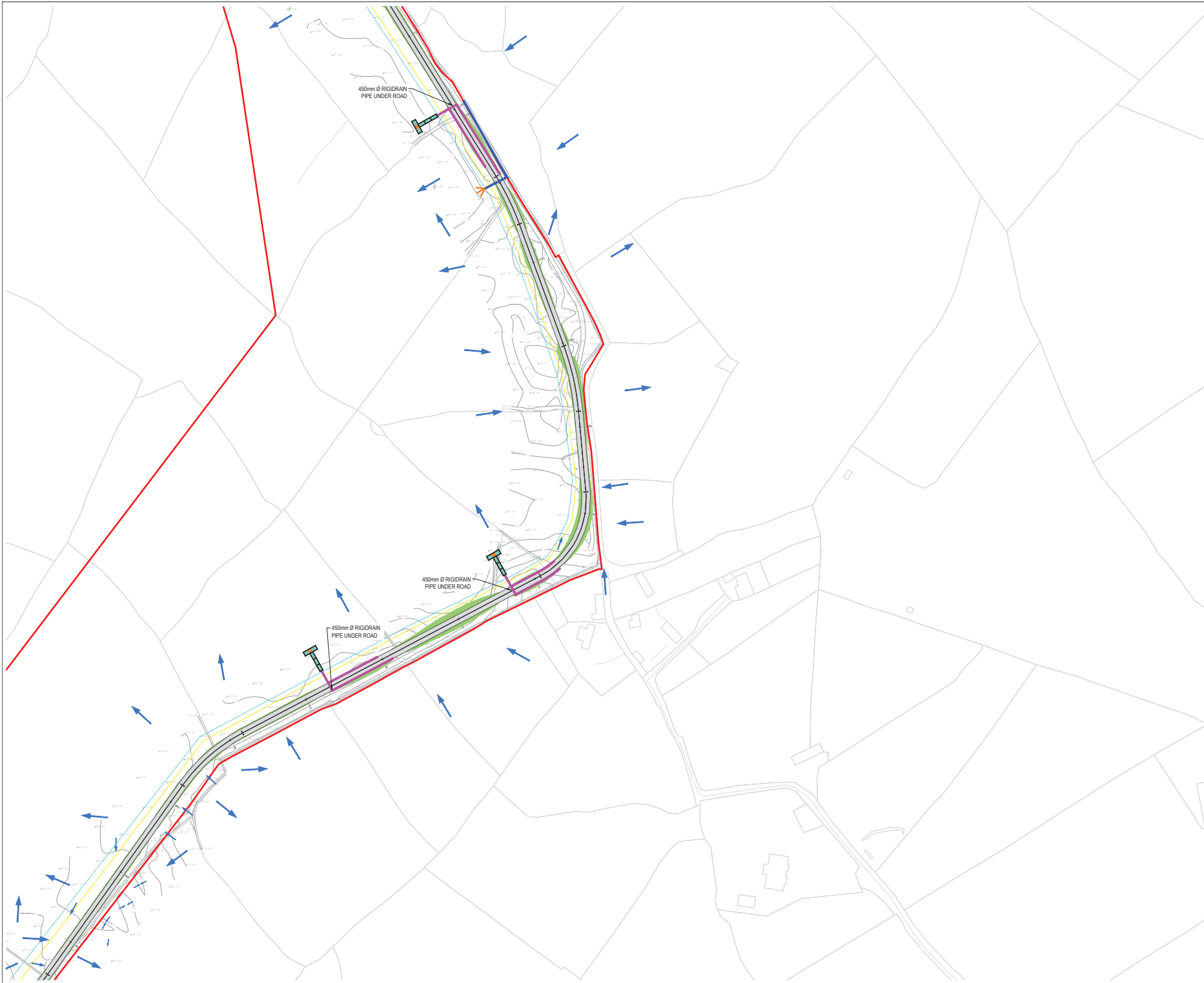
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DRAWN	CHECKED	APPROVED
MW	PB	BS

DATE: 01/06/22 SCALE @ A1: 1:1000

PROJECT NUMBER: 21337 PREPARED STATUS: S2

DESIGNED: 21337-MWP-WF-00-DR-C-2101



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LEGEND:

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

REV	DATE	DESCRIPTION	BY	APP
P0	10/06/22	REVISION INFORMATION	PK	BS
P1	01/07/22	REVISION INFORMATION	PK	BS

PROJECT:	SEVEN HILLS WIND FARM
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TITLE:	PROPOSED DRAINAGE LAYOUT SHEET 2
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CLIENT:	energia Switched on
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DRAWN:	PK	CHECKED:	PK	APPROVED:	BS
DATE:	01/06/22	SCALE @ A1:	1:1000	PROJECT NUMBER:	21337
PROJECT NUMBER:	21337	PROJECT STATUS:	S2	DRAWING NUMBER:	21337-MWP-ZZ-00-DR-C-2102
DRAWING NUMBER:	21337-MWP-ZZ-00-DR-C-2102	REV:	P02		

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LEGEND:

- SITE BOUNDARY
- OWNERSHIP BOUNDARY
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- ROAD/ STONE CAPPED SURFACES
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- INTERNAL CABLE ROUTE (Circuit 2)
- INTERNAL CABLE ROUTE (Circuit 3)
- INTERNAL CABLE ROUTE (Circuit 4)
- INTERNAL CABLE ROUTE (Circuit 5)
- INTERNAL CABLE ROUTE (4 x circuits to Substation)

REV	DATE	DESCRIPTION	BY	APP
P0	10/06/22	REVISOR INFORMATION	PK	BS
P1	01/07/22	REVISOR INFORMATION	PK	BS

PROJECT:
SEVEN HILLS WIND FARM

TITLE:
PROPOSED DRAINAGE LAYOUT
SHEET 3

CLIENT:
enenergia
Switched on

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DRAWN: PK
CHECKED: PB
APPROVED: BS

DATE: 01/06/22
SCALE @ A1: 1:1000

PROJECT NUMBER: 21337
DRAWING STATUS: S2

DESIGNED: 21337-MWP-ZZ-00-DR-C-2103
REV: P02



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- DIRECTION OF FLOW OF SURFACE WATER
- LAND & STRUCTURE BOUNDARY
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- INTERNAL CABLE ROUTE (Circuit 2)
- INTERNAL CABLE ROUTE (Circuit 3)
- INTERNAL CABLE ROUTE (Circuit 4)
- INTERNAL CABLE ROUTE (Circuit 5)
- INTERNAL CABLE ROUTE (4 x circuits to Substation)

REV	DATE	DESCRIPTION	BY	APP
R0	10/10/22	REVISION INFORMATION	MB	BS
R1	12/10/22	REVISION INFORMATION	MB	BS
R2	10/11/22	REVISION INFORMATION	MB	BS

PROJECT:

SEVEN HILLS WIND FARM

TITLE:

PROPOSED DRAINAGE LAYOUT

SHEET 4

CLIENT:

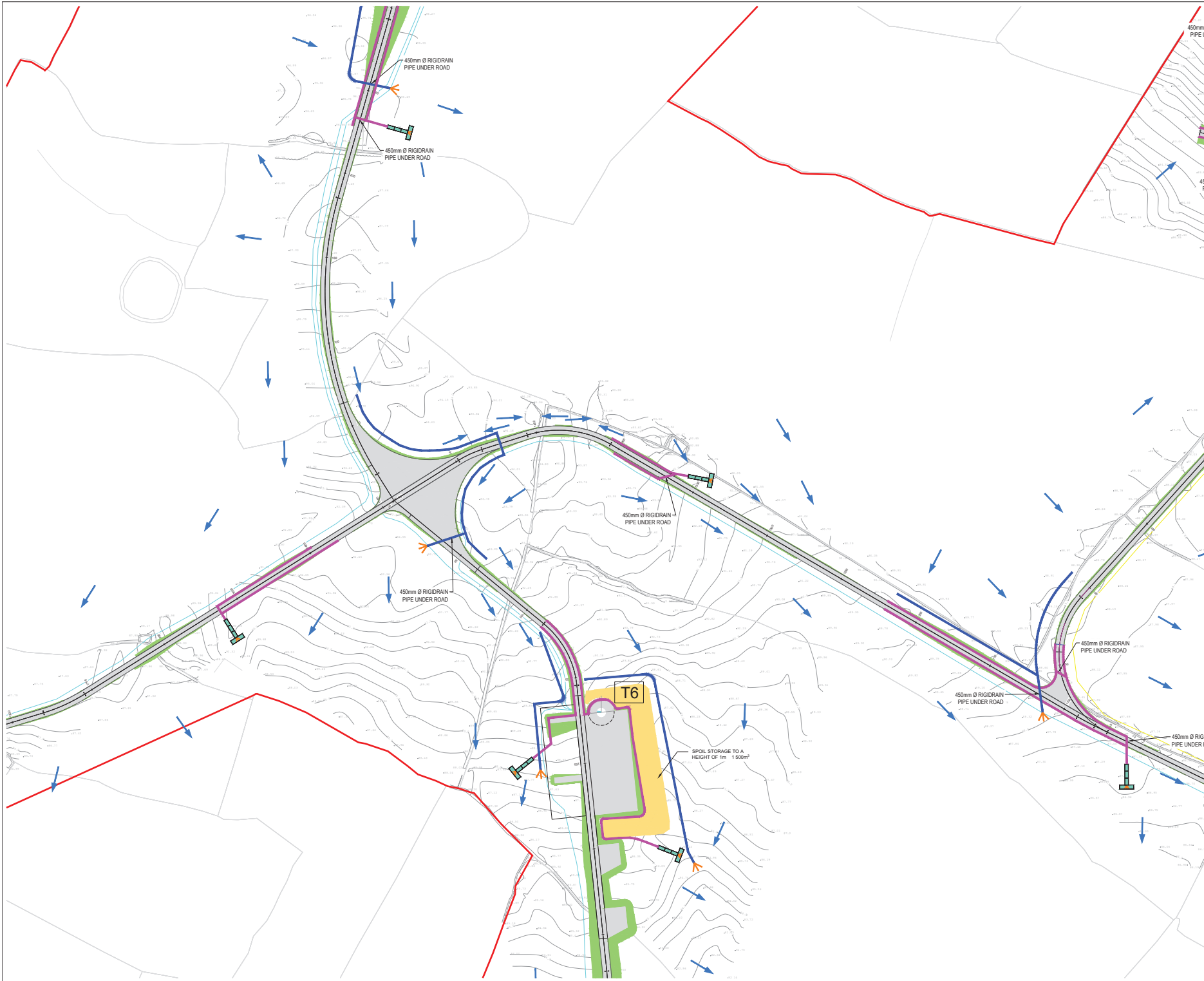
enenergia
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DRAWN: PX	CHECKED: PG	APPROVED: BS
DATE: 01/06/22	SCALE @ A1: 1:1000	
PROJECT NUMBER: 21337	DRAWING STATUS: S2	
DRAWING NUMBER: 21337-MWP-ZZ-00-DR-C-2104		REV: P03



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- EXTENT OF ROAD SIDE BERM
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- STONE BERM
- PEAT STORAGE
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- DIRECTION OF FLOW OF SURFACE WATER
- LAND & STRUCTURE BOUNDARY
- INTERNAL CABLE ROUTE (Circuit 1)
- INTERNAL CABLE ROUTE (Circuit 2)
- INTERNAL CABLE ROUTE (Circuit 3)
- INTERNAL CABLE ROUTE (Circuit 4)
- INTERNAL CABLE ROUTE (Circuit 5)
- INTERNAL CABLE ROUTE (4 x circuits to Substation)

REV	DATE	DESCRIPTION	BY	APP
P02	10/06/22	REVISION INFORMATION	PK	BS
REV	10/06/22	REVISION INFORMATION	PK	BS

PROJECT: SEVEN HILLS WIND FARM

TITLE: PROPOSED DRAINAGE LAYOUT SHEET 5

CLIENT: **energia** Switched on

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Web: www.mwp.ie

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PK	PK	BS

DATE: 01/06/22 SCALE @ A1: 1:1000

PROJECT NUMBER: 21337 DRAWING STATUS: S2

DRAWING NUMBER: 21337-MWP-ZZ-00-DR-C-2105 REV: P02



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LEGEND:

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- OWNERSHIP BOUNDARY
- WORKS CORRIDOR
- ROAD/STONE CAPPED SURFACES
- EXTENT OF ROAD SIDE BERM
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- FILL EMBANKMENT
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- STONE BERM
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- INTERNAL CABLE ROUTE (Circuit 1)
- INTERNAL CABLE ROUTE (Circuit 2)
- INTERNAL CABLE ROUTE (Circuit 3)
- INTERNAL CABLE ROUTE (Circuit 4)
- INTERNAL CABLE ROUTE (Circuit 5)
- INTERNAL CABLE ROUTE (4 x circuits to Substation)

REV	DATE	DESCRIPTION	BY	APP
P0	10/06/22	DESIGNER INFORMATION	JK	BS
P0	10/06/22	DESIGNER INFORMATION	JK	BS

PROJECT: SEVEN HILLS WIND FARM

TITLE: PROPOSED DRAINAGE LAYOUT SHEET 6

CLIENT: **enenergia**
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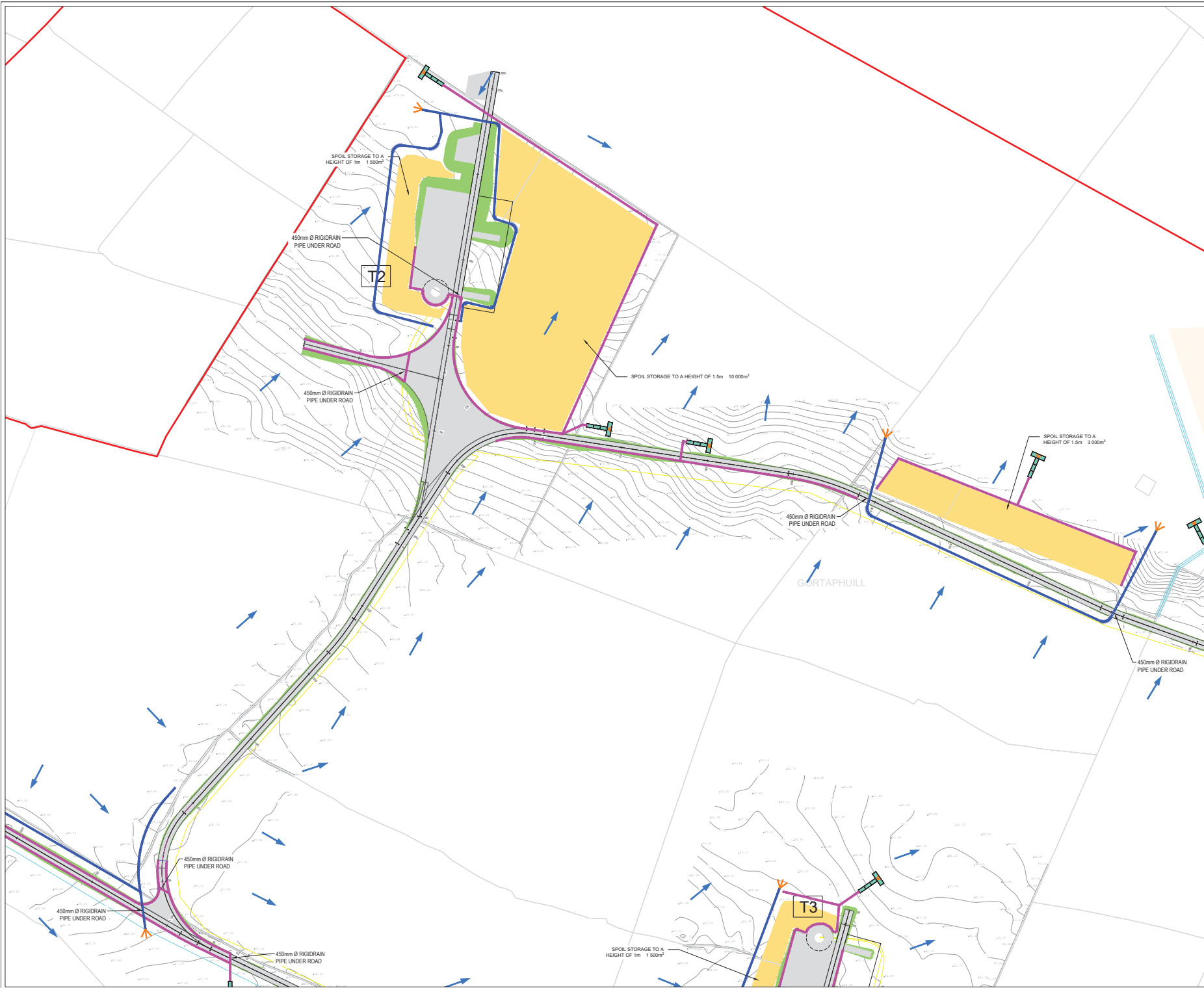
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E-mail: info@malachywalsh.ie
Web: www.malachywalsh.ie

DRAWN: PK CHECKED: PB APPROVED: BS

DATE: 01/06/22 SCALE @ A1: 1:1000

PROJECT NUMBER: 21337 DRAWING STATUS: S2

DRAWING NUMBER: 21337-MWP-ZZ-00-DR-C-2106 REV: P02



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LEGEND:

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

REV	DATE	DESCRIPTION	BY	APP
01	10/10/22	DESIGN INFORMATION	MB	BS
02	12/10/22	DESIGN INFORMATION	MB	BS
03	10/11/22	DESIGN INFORMATION	MB	BS

PROJECT: SEVEN HILLS WIND FARM

TITLE: PROPOSED DRAINAGE LAYOUT SHEET 7

CLIENT: **energia** Switched on

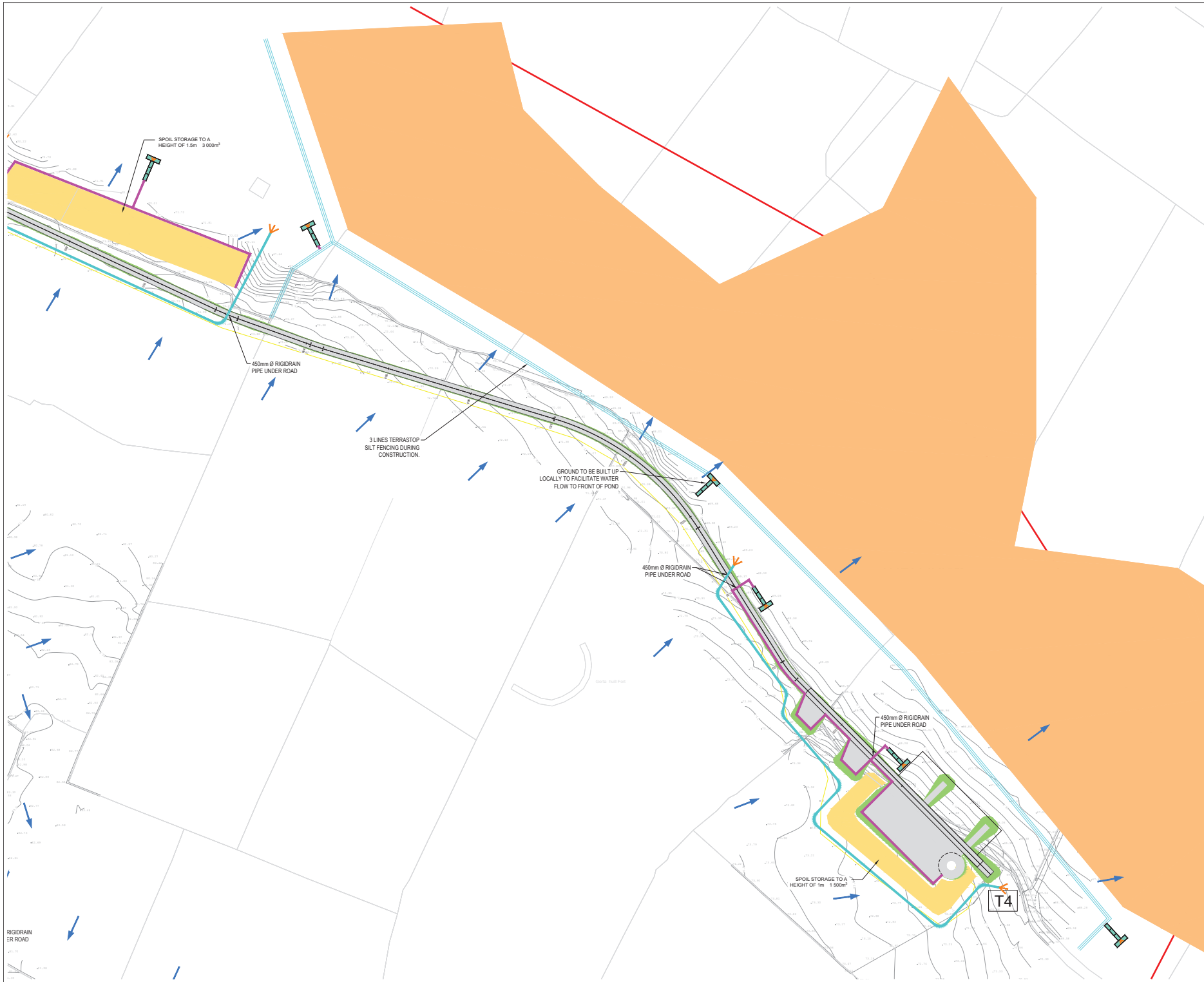
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Web: www.mwp.ie

DRAWN	PK	CHECKED	PB	APPROVED	BS
DATE:	01/06/22	SCALE @ A1:	1:1000	PROJECT NUMBER:	21337
PROJECT NUMBER:	21337	PROPOSED STATUS:	S2	DRAWING NUMBER:	21337-MWP-ZZ-00-DR-C-2107

PREP: P03



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LEGEND:

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- TURLOUGH
- PEAT STORAGE
- DIRTY WATER DRAIN
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- INTERNAL CABLE ROUTE (Circuit 1)
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- INTERNAL CABLE ROUTE (Circuit 3)
- INTERNAL CABLE ROUTE (Circuit 4)
- INTERNAL CABLE ROUTE (Circuit 5)
- INTERNAL CABLE ROUTE (4 x circuits to Substation)

REV	DATE	DESCRIPTION	BY	APP
01	01/06/22	REVISOR INFORMATION	PK	BS
02	01/06/22	REVISOR INFORMATION	PK	BS

PROJECT: SEVEN HILLS WIND FARM

TITLE: PROPOSED DRAINAGE LAYOUT SHEET 6

CLIENT: **enenergia**
Switched on

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Web: www.malachywalsh.ie

DRAWN: PK	CHECKED: PB	APPROVED: BS
DATE: 01/06/22	SCALE @ A1: 1:1000	
PROJECT NUMBER: 21337	DRAWING STATUS: S2	
DESIGNER NUMBER: 21337-MWP-ZZ-00-DR-C-2108		REV: P02

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- SETTLEMENT POND WITH BUFFERED OUTFALL
- DIRECTION OF FLOW OF SURFACE WATER
- LAND & STRUCTURE BOUNDARY
- INTERNAL CABLE ROUTE (Circuit 1)
- INTERNAL CABLE ROUTE (Circuit 2)
- INTERNAL CABLE ROUTE (Circuit 3)
- INTERNAL CABLE ROUTE (Circuit 4)
- INTERNAL CABLE ROUTE (Circuit 5)
- INTERNAL CABLE ROUTE (4 x circuits to Substation)

REV	DATE	DESCRIPTION	BY	APP
01	01/06/22	REVISOR INFORMATION	PK	BS
02	01/06/22	REVISOR INFORMATION	PK	BS

PROJECT: SEVEN HILLS WIND FARM

TITLE: PROPOSED DRAINAGE LAYOUT SHEET 9

CLIENT: **energia**
Switched on

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DRAWN: PK CHECKED: PB APPROVED: BS

DATE: 01/06/22 SCALE @ A1: 1:1000

PROJECT NUMBER: 21337 DRAWING STATUS: S2

DESIGNED: 21337-MWP-ZZ-00-DR-C-2109

REV: P02

GLENREVAGH



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LEGEND:

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

REV	DATE	DESCRIPTION	BY	APP
P02	10/06/22	REVISOR INFORMATION	PK	BS
P01	10/06/22	REVISOR INFORMATION	PK	BS

PROJECT: SEVEN HILLS WIND FARM

TITLE: PROPOSED DRAINAGE LAYOUT SHEET 10

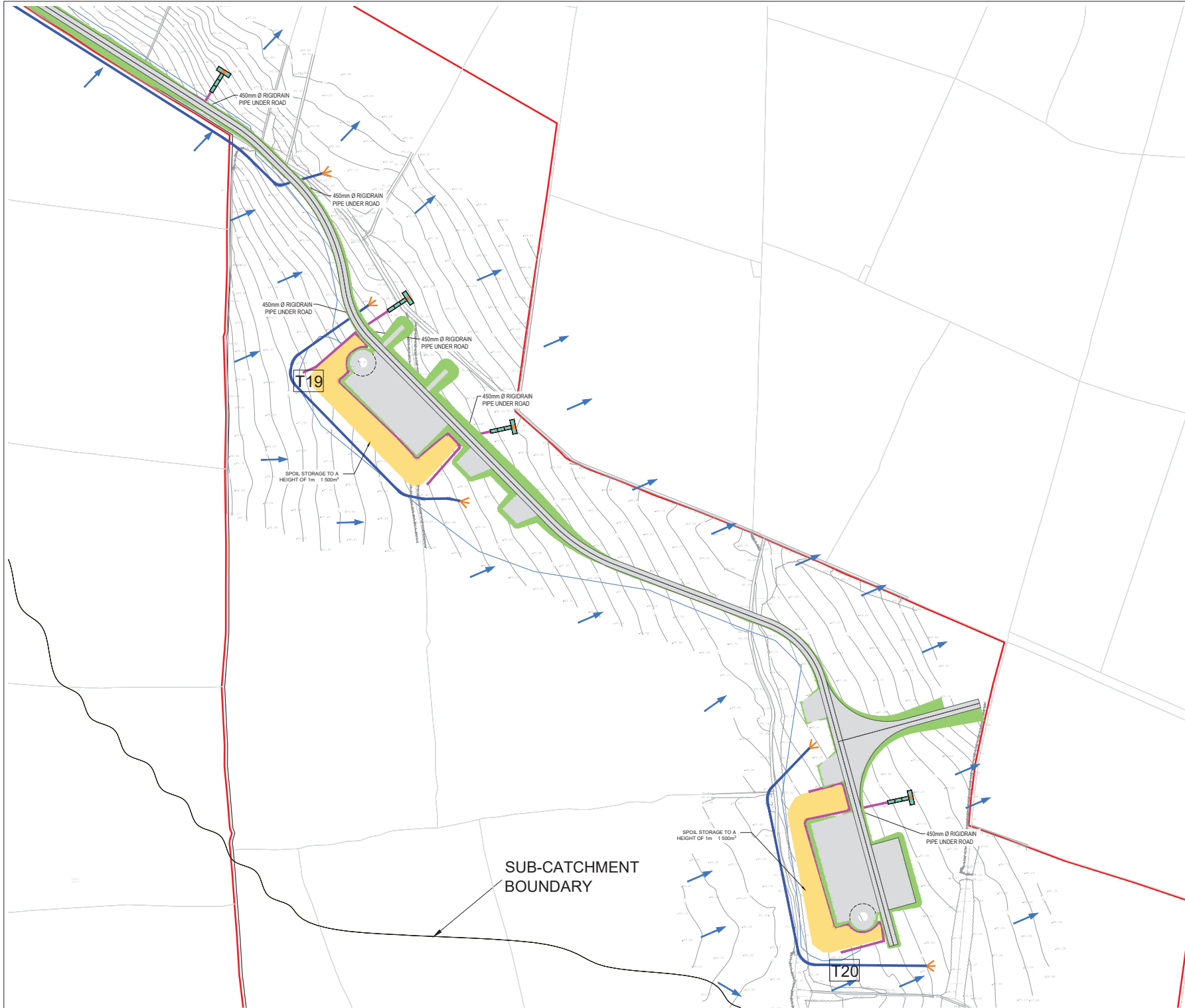
CLIENT: **energia**
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DRAWN: PK	CHECKED: PB	APPROVED: BS
DATE: 01/06/22	SCALE @ A1: 1:1000	
PROJECT NUMBER: 21337	DRAWING STATUS: S2	
DRAWING NUMBER: 21337-MWP-ZZ-00-DR-C-2110	REV: P02	



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LEGEND:

- SITE BOUNDARY
- OWNERSHIP BOUNDARY
- WORKS CORRIDOR
- ROAD STONE CAPPED SURFACES
- EXTENT OF ROAD SIDE BERM
- CUT EMBANKMENT
- FILL EMBANKMENT
- SUBSTATION FLOOR PLAN
- STONE BERM
- PEAT STORAGE
- DIRTY WATER DRAIN
- CLEAN WATER DRAIN
- EXISTING CUT-OFF DRAIN
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- INTERNAL CABLE ROUTE (Circuit 3)
- INTERNAL CABLE ROUTE (Circuit 4)
- INTERNAL CABLE ROUTE (Circuit 5)
- INTERNAL CABLE ROUTE (4 x circuits to Substation)

REFERENCE DRAWINGS:

DRAWING No.	DRAWING TITLE
21337-MWP-WF-00-DR-C-2111	DRAINAGE LAYOUT SHEET 11
21337MWP-WF-00-DR-C-2112	DRAINAGE LAYOUT SHEET 12
21337-MWP-WF-00-DR-C-2113	DRAINAGE LAYOUT SHEET 13
21337-MWP-WF-00-DR-C-2114	DRAINAGE LAYOUT SHEET 14
21337-MWP-WF-00-DR-C-2115	DRAINAGE LAYOUT SHEET 15
21337-MWP-WF-00-DR-C-2116	DRAINAGE LAYOUT SHEET 16
21337-MWP-WF-00-DR-C-2117	DRAINAGE LAYOUT SHEET 17
21337-MWP-WF-00-DR-C-2118	DRAINAGE LAYOUT SHEET 18
21337MWP-WF-00-DR-C-2119	DRAINAGE LAYOUT SHEET 19
21337MWP-WF-00-DR-C-2120	DRAINAGE LAYOUT SHEET 20
21337MWP-WF-00-DR-C-2121	DRAINAGE LAYOUT SHEET 21
21337MWP-WF-00-DR-C-2122	DRAINAGE LAYOUT SHEET 22
21337MWP-WF-00-DR-C-2123	DRAINAGE LAYOUT SHEET 23
21337MWP-WF-00-DR-C-2124	DRAINAGE LAYOUT SHEET 24
21337MWP-WF-00-DR-C-2126	SOUTH DRAINAGE LAYOUT

REV	DATE	DESCRIPTION	BY	APP
PK	01/06/22	ISSUED FOR INFORMATION	PK	BS
PK	01/06/22	ISSUED FOR WORKING	PK	BS

PROJECT: SEVEN HILLS WIND FARM

TITLE: PROPOSED DRAINAGE LAYOUT SHEET 11

CLIENT:

energia
Switched on

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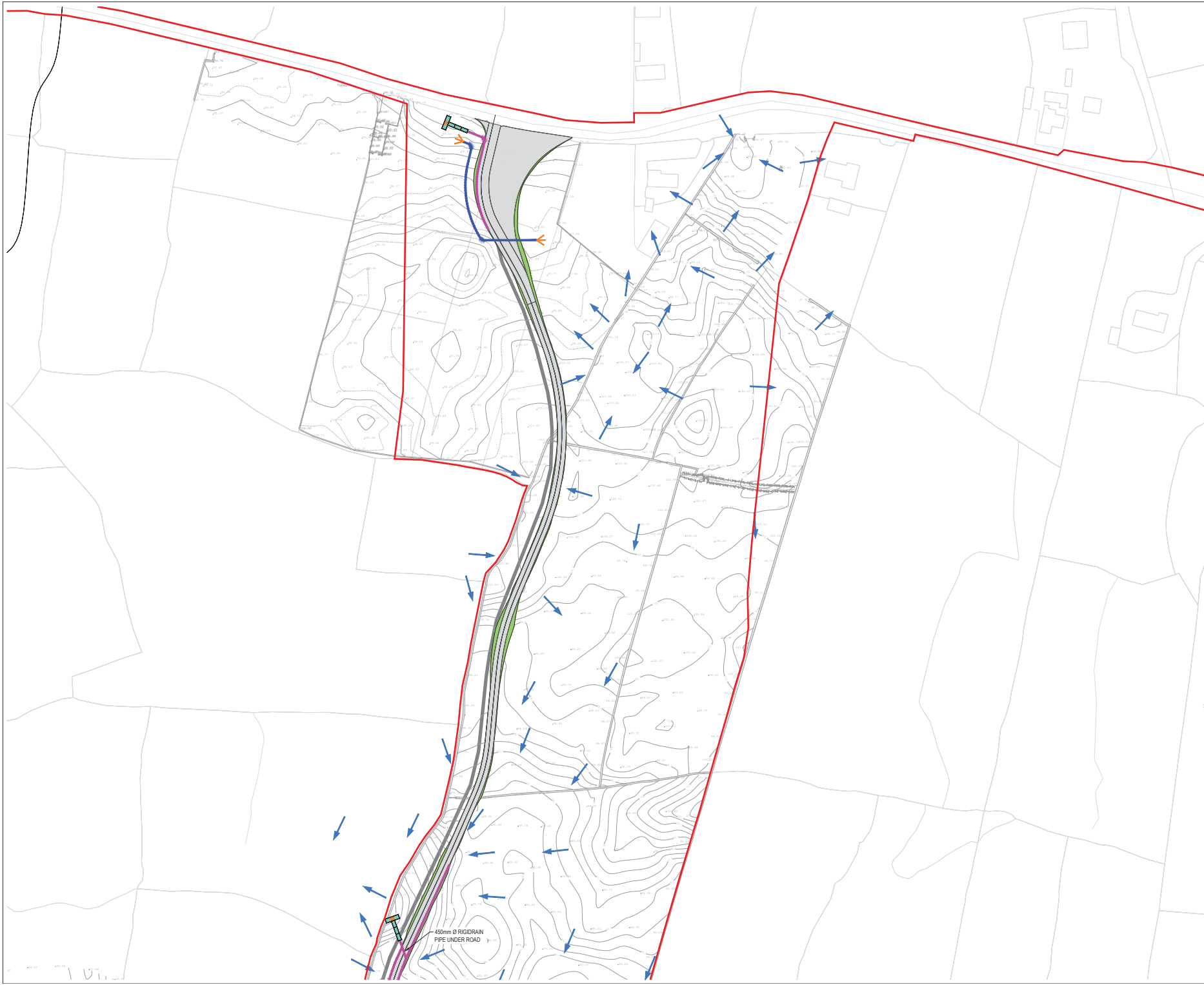
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DRAWN: PK CHECKED: PB APPROVED: BS

DATE: 01/06/22 SCALE @ A1: 1:1000

PROJECT NUMBER: 21337 DRAWING STATUS: S2

DRAWING NUMBER: 21337-MWP-00-00-DR-C-2111 REV: P02



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

REV	DATE	DESCRIPTION	BY	APP
01	01/08/22	DESIGN FOR CONSTRUCTION	PK	BS
02	01/08/22	DESIGN FOR CONSTRUCTION	PK	BS

PROJECT: SEVEN HILLS WIND FARM

TITLE: PROPOSED DRAINAGE LAYOUT
SHEET 13

CLIENT: **energia**
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DRAWN: PK	CHECKED: PB	APPROVED: BS
DATE: 01/08/22	SCALE @ A1: 1:1000	
PROJECT NUMBER: 21337	DRAWING STATUS: S2	
DRAWING NUMBER: 21337-MWP-00-00-DR-C-2113		P02



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- INTERNAL CABLE ROUTE (Circuit 4)
- INTERNAL CABLE ROUTE (Circuit 5)
- INTERNAL CABLE ROUTE (4 x circuits to Substation)

REV	07/08/22	DESCRIPTION	PK	BS
REV	01/07/22	DESCRIPTION	PK	BS
REV	DATE	DESCRIPTION	BY	APP

PROJECT: SEVEN HILLS WIND FARM

TITLE: PROPOSED DRAINAGE LAYOUT SHEET 14

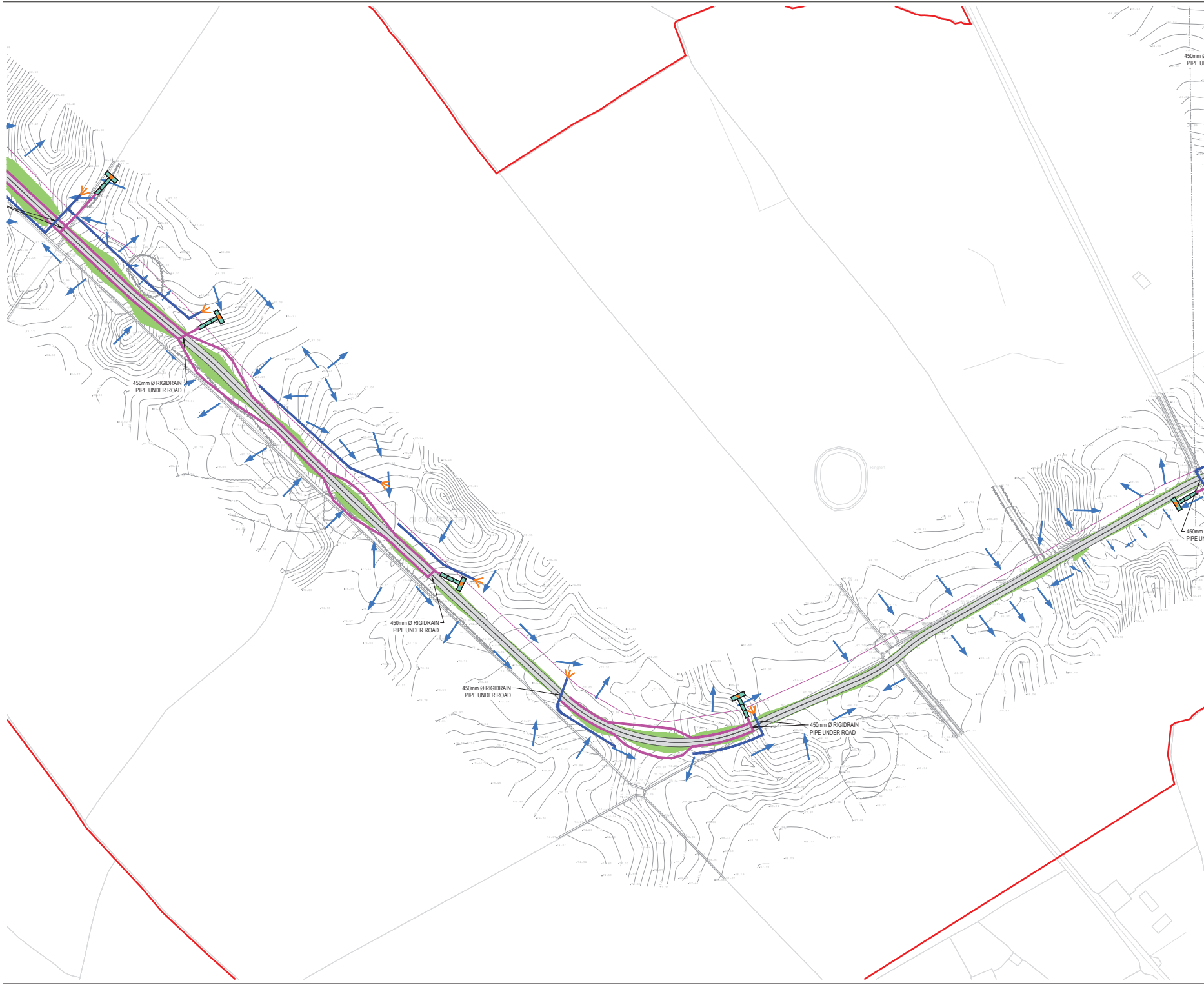
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DRAWN	PK	CHECKED	PB	APPROVED	BS
DATE	01/08/22	SCALE @ A1	1:1000		
PROJECT NUMBER	21337	DRAWING STATUS	S2		
DRAWING NUMBER	21337-MWP-00-00-DR-C-2114				P02



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- INTERNAL CABLE ROUTE (Circuit 4)
- INTERNAL CABLE ROUTE (Circuit 5)
- INTERNAL CABLE ROUTE (4 x circuits to Substation)

REV	01/08/22	DESCRIPTION FOR MODIFICATION	PK	BS	
REV	01/07/21	DESCRIPTION FOR MODIFICATION	PK	BS	
REV	1	DATE	DESCRIPTION	BY	APP

PROJECT:

SEVEN HILLS WIND FARM

TITLE:

PROPOSED DRAINAGE LAYOUT
SHEET 15

CLIENT:

energia
Switched on

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Engineering and Environmental Consultants
Cork | Tralee | Limerick

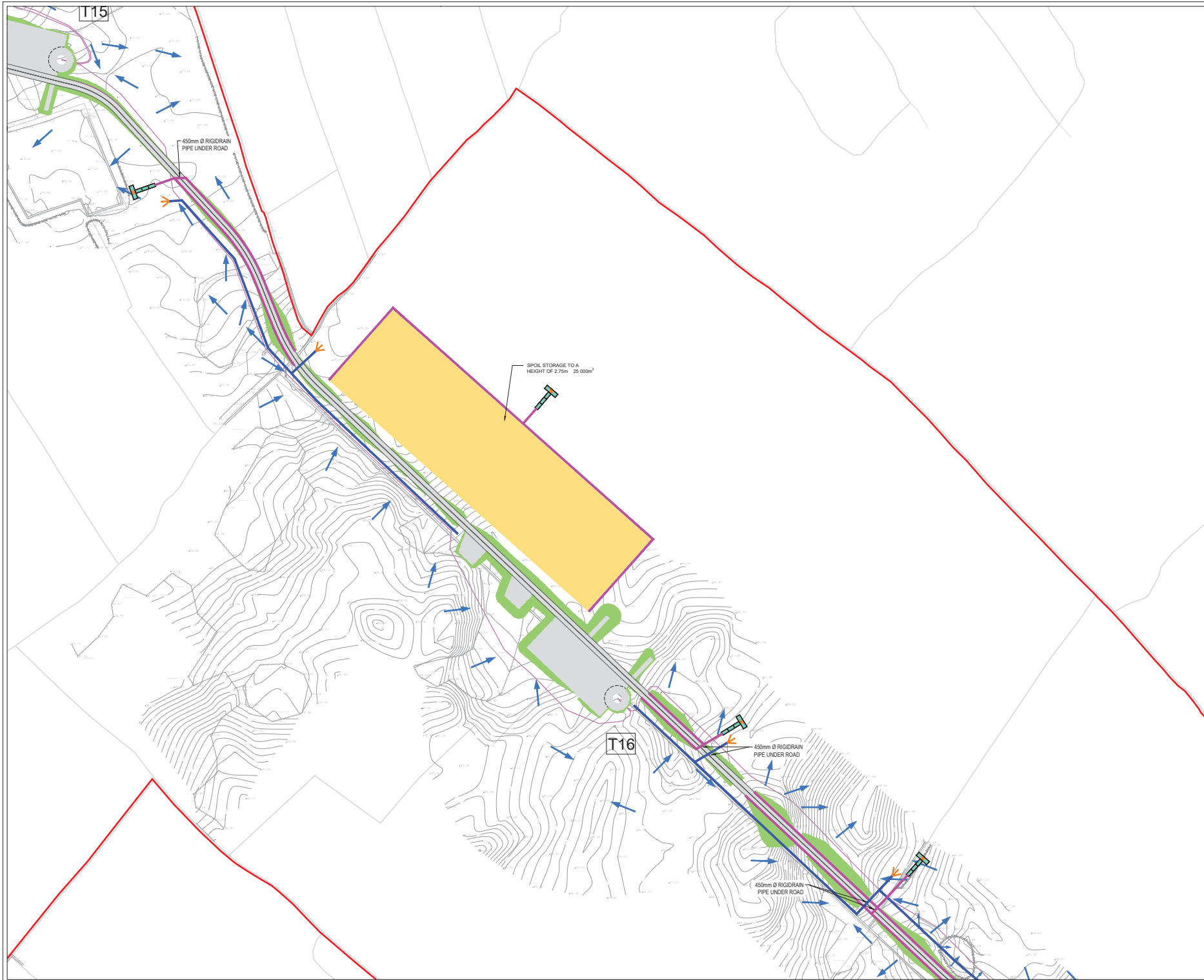
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DRAWN	PK	CHECKED	PB	APPROVED	BS
DATE:	01/08/22	SCALE @ A1:	1:1000		
PROJECT NUMBER:	21337	DRAWING STATUS:	S2		

DRAWING NUMBER: 21337-MWP-00-00-DR-C-2115

P02



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LEGEND:

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- FILL EMBANKMENT
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- STONE BERM
- PEAT STORAGE
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- CLEAN WATER DRAIN
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- INTERNAL CABLE ROUTE (Circuit 4)
- INTERNAL CABLE ROUTE (Circuit 5)
- INTERNAL CABLE ROUTE (4 x circuits to Substation)

REV	01/04/22	DESCRIPTION	BY	LS
REV	12/04/22	REVISION FOR OWNERS	BY	LS
REV	01/07/22	REVISION FOR OWNERS	BY	LS
REV	DATE	DESCRIPTION	BY	APP

PROJECT: SEVEN HILLS WIND FARM

TITLE: PROPOSED DRAINAGE LAYOUT SHEET 16

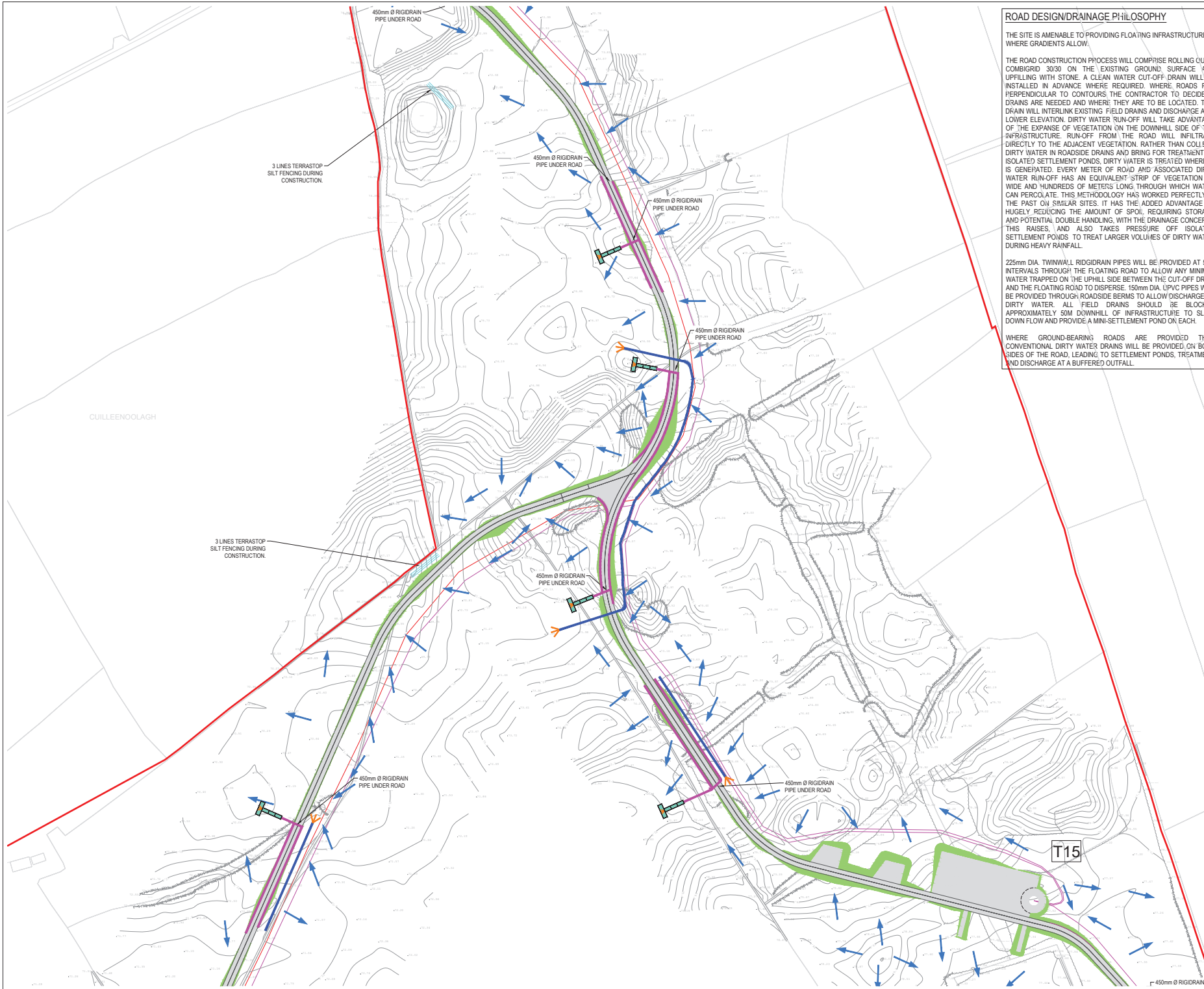
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DRAWN: PK	CHECKED: PB	APPROVED: SS
DATE: 01/08/22	SCALE @ A1: 1:1000	
PROJECT NUMBER: 21337	DRAWING STATUS: S2	
DRAWING NUMBER: 21337-MWP-00-00-DR-C-2116		P03



ROAD DESIGN/DRAINAGE PHILOSOPHY

THE SITE IS AMENABLE TO PROVIDING FLOATING INFRASTRUCTURE WHERE GRADIENTS ALLOW.

THE ROAD CONSTRUCTION PROCESS WILL COMPRISE ROLLING OUT A COMBIGRID 30/30 ON THE EXISTING GROUND SURFACE AND UPFILLING WITH STONE. A CLEAN WATER CUT-OFF DRAIN WILL BE INSTALLED IN ADVANCE WHERE REQUIRED. WHERE ROADS RUN PERPENDICULAR TO CONTOURS THE CONTRACTOR TO DECIDE IF DRAINS ARE NEEDED AND WHERE THEY ARE TO BE LOCATED. THIS DRAIN WILL INTERLINK EXISTING FIELD DRAINS AND DISCHARGE AT A LOWER ELEVATION. DIRTY WATER RUN-OFF WILL TAKE ADVANTAGE OF THE EXPANSE OF VEGETATION ON THE DOWNHILL SIDE OF THE INFRASTRUCTURE. RUN-OFF FROM THE ROAD WILL INFILTRATE DIRECTLY TO THE ADJACENT VEGETATION, RATHER THAN COLLECT DIRTY WATER IN ROADSIDE DRAINS AND BRING FOR TREATMENT TO ISOLATED SETTLEMENT PONDS. DIRTY WATER IS TREATED WHERE IT IS GENERATED. EVERY METER OF ROAD AND ASSOCIATED DIRTY WATER RUN-OFF HAS AN EQUIVALENT STRIP OF VEGETATION 1M WIDE AND HUNDREDS OF METERS LONG THROUGH WHICH WATER CAN PERCOLATE. THIS METHODOLOGY HAS WORKED PERFECTLY IN THE PAST ON SIMILAR SITES. IT HAS THE ADDED ADVANTAGE OF HUGELY REDUCING THE AMOUNT OF SPOIL, REQUIRING STORAGE AND POTENTIAL DOUBLE HANDLING, WITH THE DRAINAGE CONCERNS THIS RAISES, AND ALSO TAKES PRESSURE OFF ISOLATED SETTLEMENT PONDS TO TREAT LARGER VOLUMES OF DIRTY WATER DURING HEAVY RAINFALL.

225mm DIA. TWINWALL RIDGIDRAIN PIPES WILL BE PROVIDED AT 50m INTERVALS THROUGH THE FLOATING ROAD TO ALLOW ANY MINIMAL WATER TRAPPED ON THE UPHILL SIDE BETWEEN THE CUT-OFF DRAIN AND THE FLOATING ROAD TO DISPERSE. 150mm DIA. UPVC PIPES WILL BE PROVIDED THROUGH ROADSIDE BERMS TO ALLOW DISCHARGE OF DIRTY WATER. ALL FIELD DRAINS SHOULD BE BLOCKED APPROXIMATELY 50M DOWNHILL OF INFRASTRUCTURE TO SLOW DOWN FLOW AND PROVIDE A MINI-SETTLEMENT POND ON EACH.

WHERE GROUND-BEARING ROADS ARE PROVIDED THEN CONVENTIONAL DIRTY WATER DRAINS WILL BE PROVIDED ON BOTH SIDES OF THE ROAD, LEADING TO SETTLEMENT PONDS, TREATMENT AND DISCHARGE AT A BUFFERED OUTFALL.

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LEGEND:

- SITE BOUNDARY
- OWNERSHIP BOUNDARY
- WORKS CORRIDOR
- ROAD/STONE CAPPED SURFACES
- EXTENT OF ROAD SIDE BERM
- CUT EMBANKMENT
- FILL EMBANKMENT
- SUBSTATION FLOOR PLAN
- STONE BERM
- PEAT STORAGE
- DIRTY WATER DRAIN
- CLEAN WATER DRAIN
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- INTERNAL CABLE ROUTE (Circuit 3)
- INTERNAL CABLE ROUTE (Circuit 4)
- INTERNAL CABLE ROUTE (Circuit 5)
- INTERNAL CABLE ROUTE (4 x circuits to Substation)

REV	DATE	DESCRIPTION	BY	APP
01	01/01/21	DESIGN FOR CONSTRUCTION	PK	BS
02	01/01/21	DESIGN FOR CONSTRUCTION	PK	BS

PROJECT: SEVEN HILLS WF

TITLE: PROPOSED DRAINAGE LAYOUT SHEET 17

CLIENT: **energia** Switched on

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DRAWN: PK CHECKED: PB APPROVED: BS

DATE: 01/08/22 SCALE @ A1: 1:1000

PROJECT NUMBER: 21337 DRAWING STATUS: S2

DRAWING NUMBER: 21337-MWP-00-00-DR-C-2117 P02



E ISTING ROAD
BOUNDARY TO REMAIN

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 3. ANY DISCREPANCIES BETWEEN THESE DOCUMENTS SHALL BE BROUGHT TO THE ATTENTION OF THE ENGINEER.
 4. DRAWINGS ARE NOT TO BE SCALED.
 5. ALL DIMENSIONS ARE IN METERS, UNLESS NOTED OTHERWISE.

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

REV	DATE	DESCRIPTION	BY	APP
01	01/06/22	ISSUED FOR PERIOD 1	PK	BS
02	01/06/22	ISSUED FOR PERIOD 2	PK	BS

PROJECT: SEVEN HILLS WIND FARM

TITLE: PROPOSED DRAINAGE LAYOUT SHEET 18

CLIENT: **energia**
Switched on

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

The Elm Suite,
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V94 RS78

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Email: info@malachywalsh.ie
Web: www.mw.ie

DRAWN: PK	CHECKED: PB	APPROVED: BS
DATE: 01/06/22	SCALE @ A1: 1:1000	
PROJECT NUMBER: 21337	DRAWING STATUS: S2	
DRAWING NUMBER: 21337-MWP-00-00-DR-C-2118		P02



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

REV	01/06/22	ISSUED FOR INFORMATION	PK	BS
REV	20/01/22	ISSUED FOR INFORMATION	PK	BS
REV	DATE	DESCRIPTION	BY	APP

PROJECT: SEVEN HILLS WIND FARM

TITLE: PROPOSED DRAINAGE LAYOUT SHEET 19

CLIENT: **energia**
Switched on

Malachy Walsh and Partners
Engineering and Environmental Consultants
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DRAWN	PK	CHECKED	PB	APPROVED	BS
DATE:	01/08/22	SCALE @:	1:1000		
PROJECT NUMBER:	21337	DRAWING STATUS:	S2		

DRAWING NUMBER: 21337-MWP-00-00-DR-C-2119 P02

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LEGEND:

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

REV	DATE	DESCRIPTION	BY	APP
01	01/07/22	DESIGN FOR CONSTRUCTION	PK	BS
02	01/07/22	DESIGN FOR CONSTRUCTION	PK	BS

PROJECT:	SEVEN HILLS WIND FARM
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TITLE:	PROPOSED DRAINAGE LAYOUT SHEET 20
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CLIENT:	energia Switched on
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	Malachy Walsh and Partners Engineering and Environmental Consultants Cork Tralee Limerick Galway
---	---

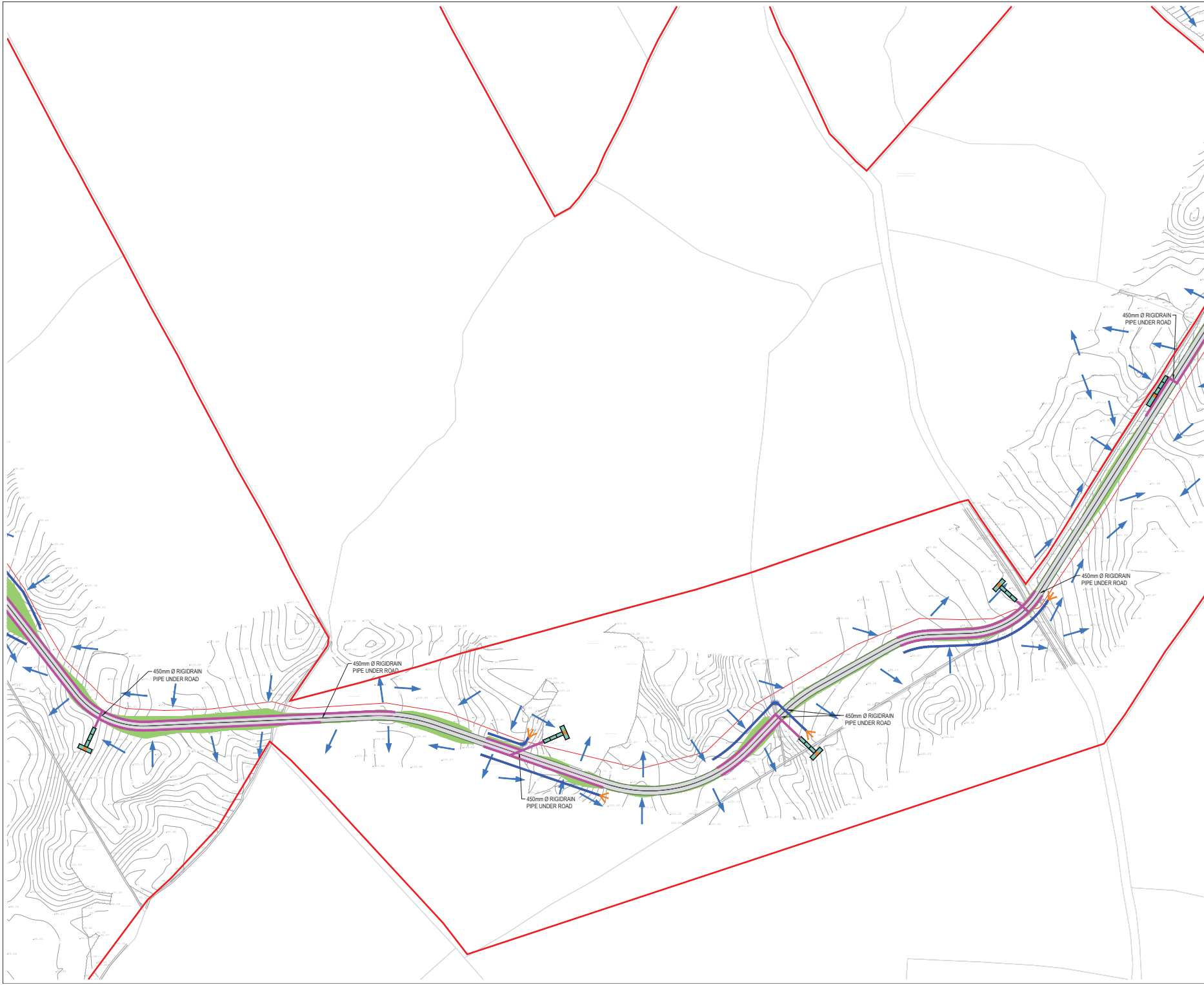
	The Elm Suite, Loughmore Centre, Rahreen Business Park, Limerick, V94 RS78	Tel: +353 (0) 87 480154 Fax: +353 (0) 87 481129 Email: energie@map.ie Web: www.map.ie
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DRAWN: PK	CHECKED: PB	APPROVED: BS
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DATE: 01/08/22	SCALE @ A1: 1:1000
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PROJECT NUMBER: 21337	DRAWING STATUS: S2
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DRAWING NUMBER: 21337-MWP-00-00-DR-C-2120	P02
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LEGEND:

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

REV	01/08/22	DESIGN FOR PROVISION	PK	BS	
REV	01/07/21	DESIGN FOR PROVISION	PK	BS	
REV	1	DATE	DESCRIPTION	BY	APP

PROJECT: SEVEN HILLS WIND FARM

TITLE: PROPOSED DRAINAGE LAYOUT SHEET 21

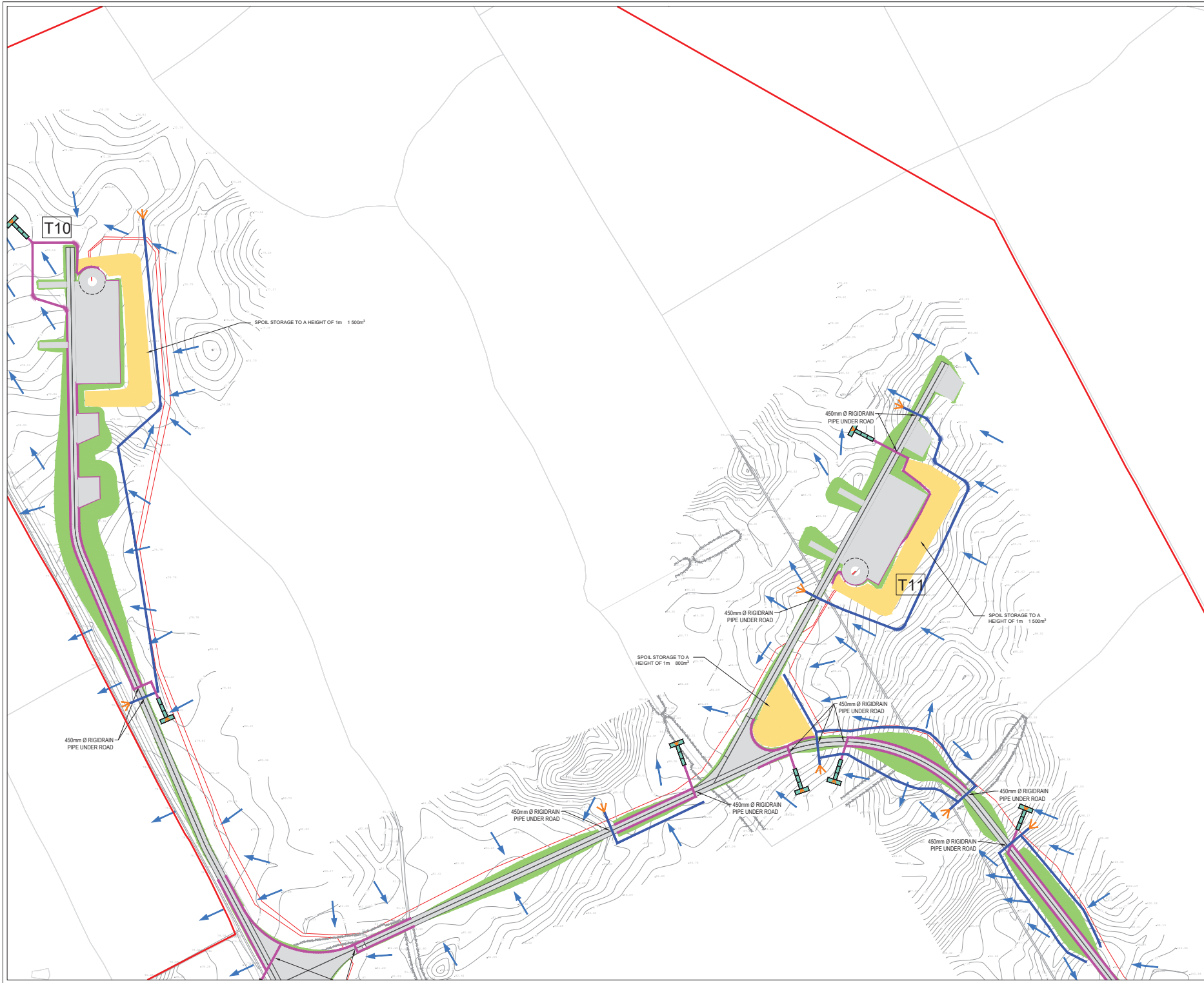
CLIENT: **energia** Switched on

Malachy Walsh and Partners
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DRAWN	PK	CHECKED	PB	APPROVED	BS
DATE:	01/08/22	SCALE @ A1:	1:1000		
PROJECT NUMBER:	21337	DRAWING STATUS:	S2		
DRAWING NUMBER:	21337-MWP-00-00-DR-C-2121				P02



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

REV	17/04/22	DESCRIPTION	BY	IS
REV	12/04/22	DESIGN FOR CONSTRUCTION	BY	IS
REV	10/01/21	DESIGN FOR CONSTRUCTION	BY	IS
REV	1 DATE	DESCRIPTION	BY	APP

PROJECT: SEVEN HILLS WIND FARM

TITLE: PROPOSED DRAINAGE LAYOUT SHEET 22

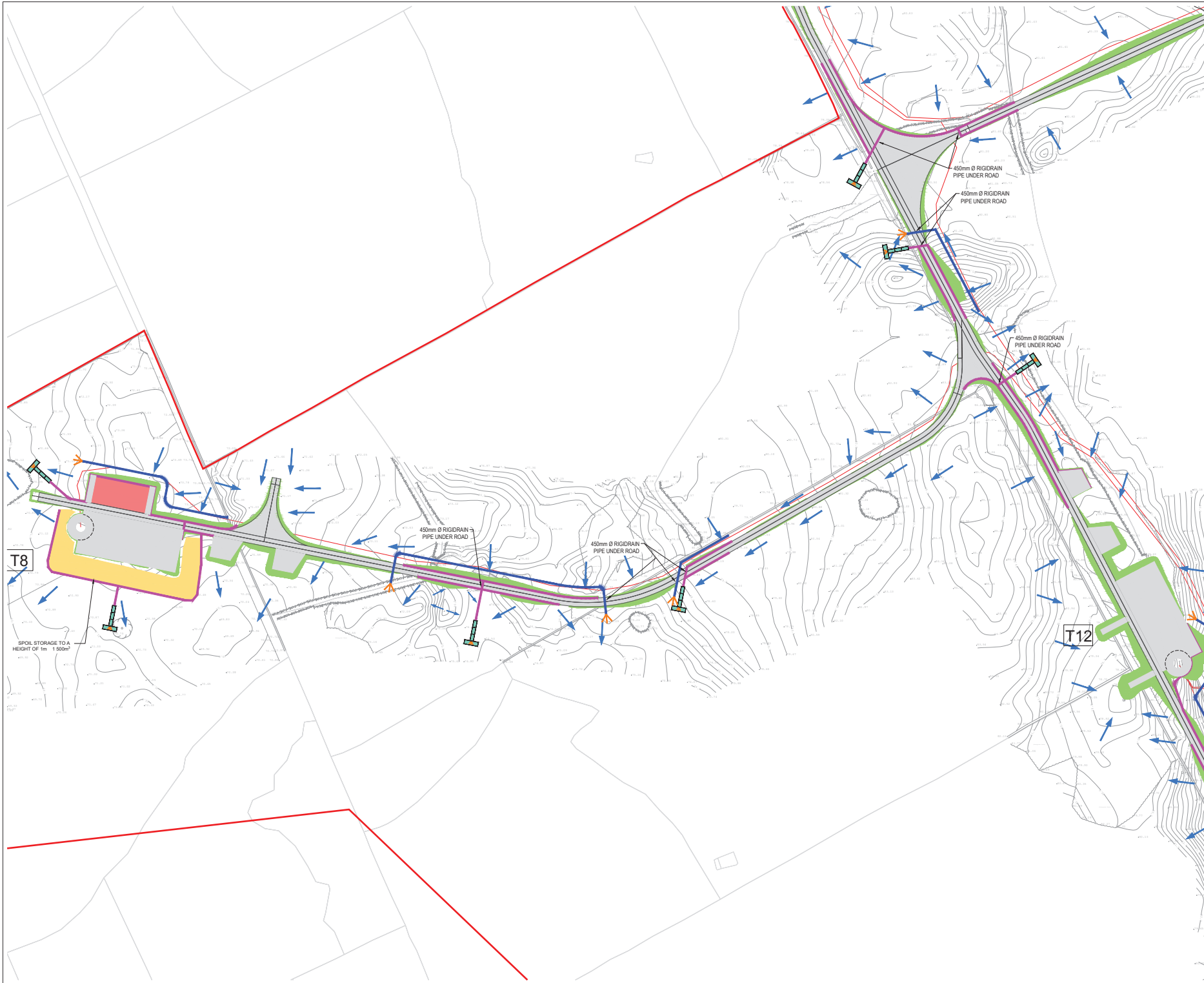
CLIENT: **energia**
Switched on

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

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Fax: +353 (0) 87 481128
Email: info@malachywalsh.ie
Web: www.mwp.ie

DRAWN: PK	CHECKED: PB	APPROVED: SS
DATE: 01/08/22	SCALE @ A1: 1:1000	
PROJECT NUMBER: 21337	DRAWING STATUS: S2	
DRAWING NUMBER: 21337-MWP-00-00-DR-C-2122		P03



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

REV	01/08/22	DESCRIPTION	PK	BS
REV	01/08/22	DESCRIPTION	PK	BS
REV	DATE	DESCRIPTION	PK	BS

PROJECT: SEVEN HILLS WIND FARM

TITLE: PROPOSED DRAINAGE LAYOUT SHEET 23

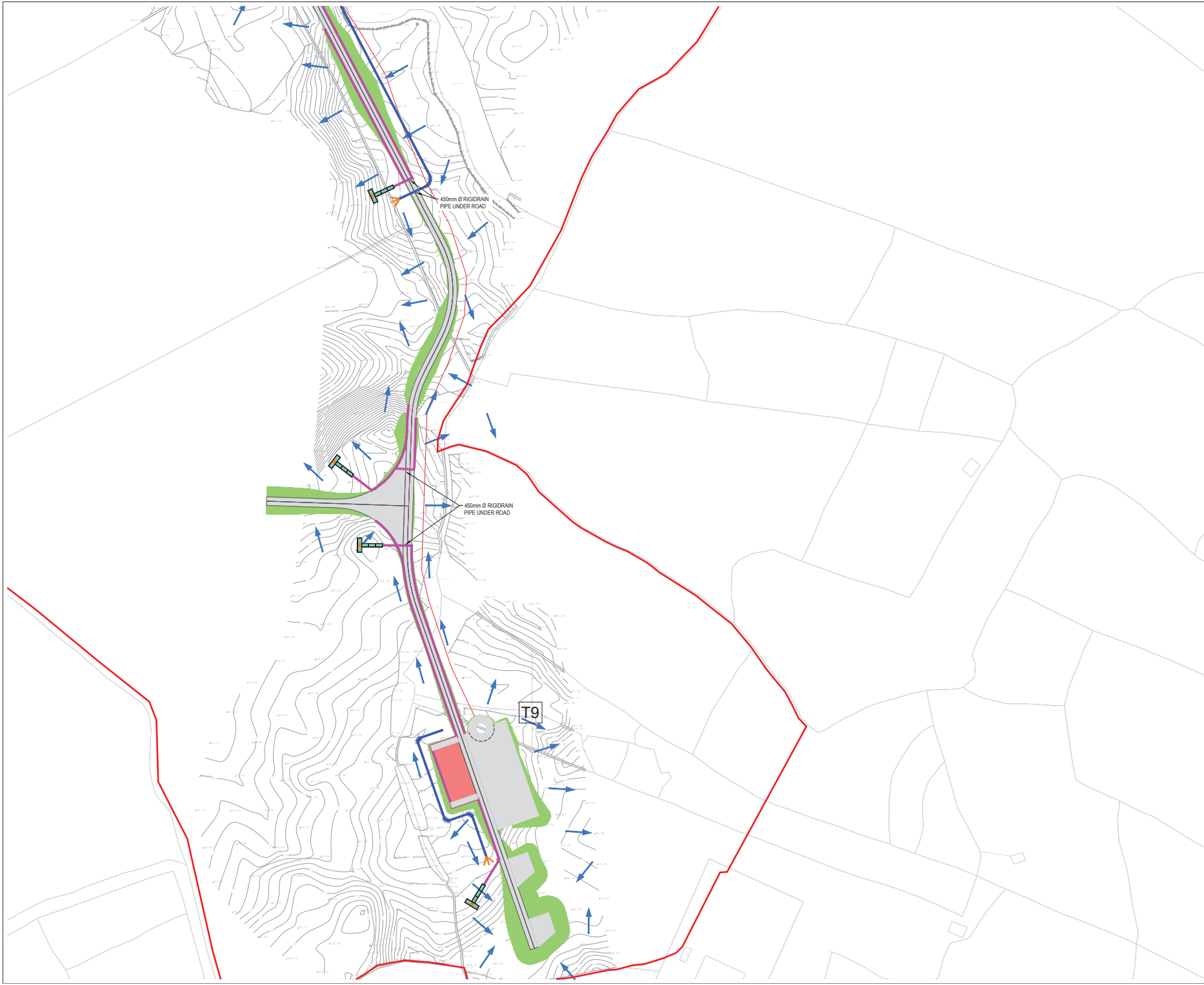
CLIENT: **energia**
Switched on

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E-mail: enquiries@malachy-walsh.com
Web: www.mwp.ie

DRAWN: PK	CHECKED: PB	APPROVED: BS
DATE: 01/08/22	SCALE @ A1: 1:1000	
PROJECT NUMBER: 21337	DRAWING STATUS: S2	
DRAWING NUMBER: 21337-MWP-00-00-DR-C-2133		P02



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LEGEND:

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

REV	01/08/22	DESIGN FOR CONSTRUCTION	PK	BS
REV	01/07/21	DESIGN FOR CONSTRUCTION	PK	BS
REV	DATE	DESCRIPTION	BY	APP

PROJECT: SEVEN HILLS WIND FARM

TITLE: PROPOSED DRAINAGE LAYOUT SHEET 24

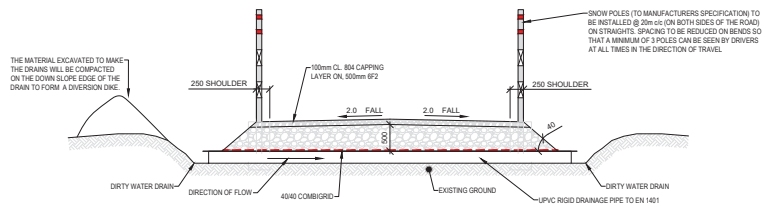
CLIENT: **energia** Switched on

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Cork | Tralee | Limerick | Enniscorthy

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Rahreen Business Park,
Limerick,
V94 RS78

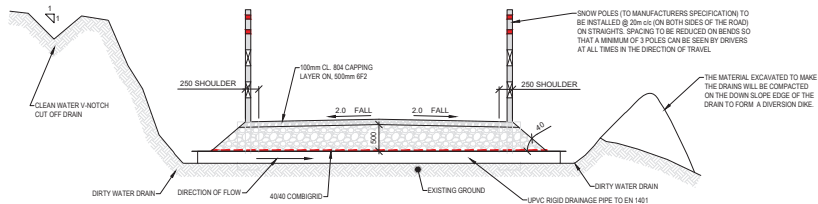
Tel: +353 (0) 61 480154
Fax: +353 (0) 61 481129
Email: info@mwep.ie
Web: www.mwep.ie

DRAWN	PK	CHECKED	PB	APPROVED	BS
DATE:	01/08/22	SCALE @ A1:	1:1000		
PROJECT NUMBER:	21337	DRAWING STATUS:	S2		
DRAWING NUMBER:	21337-MWP-00-00-DR-C-2124				P02



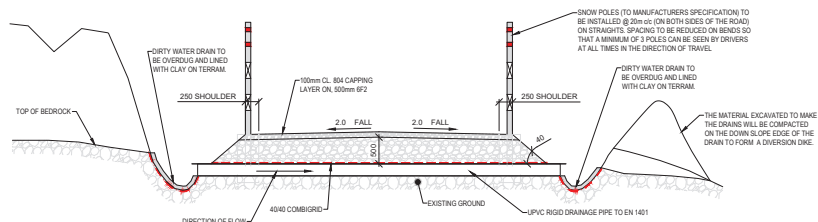
**GROUND BEARING ROAD DETAIL
(FLAT GROUND)**

SCALE 1:50



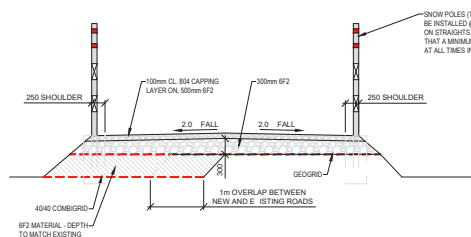
**GROUND BEARING ROAD DETAIL
(SLOPING GROUND NO BEDROCK
E POSED)**

SCALE 1:50



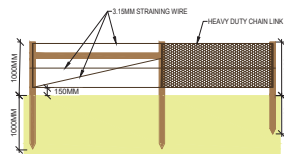
**GROUND BEARING ROAD DETAIL
(SLOPING GROUND BEDROCK
E POSED)**

SCALE 1:50



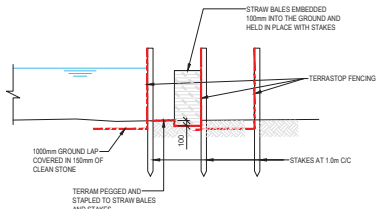
WIDENED ACCESS TRACK DETAIL

SCALE 1:50



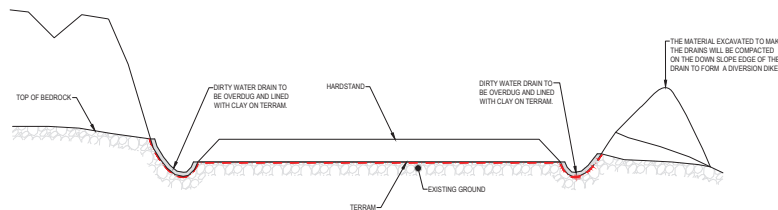
STOCK PROOF FENCING DETAILS

SCALE 1:50



TERRASTOP FENCING DETAILS

SCALE 1:50



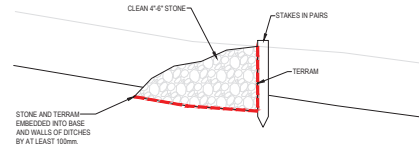
**GROUND BEARING HARDSTAND
DETAIL (SLOPING GROUND
BEDROCK E POSED)**

SCALE 1:50



**EROSION CONTROL ON STEEPER
LOCATIONS (GRADIENT IS
STEEPER THAN 10)**

SCALE NTS



CHECK DAM

SCALE 1:25

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- ALL DIMENSIONS ARE IN METERS, UNLESS NOTED OTHERWISE.
- THESE DETAILS ARE TYPICAL. THEY WILL BE ADJUSTED ACCORDING TO THE CONSTRUCTION REQUIREMENT.

REFERENCE DRAWINGS:

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

REV	DATE	DESCRIPTION	BY	APP
P01	10/06/22	ISSUED FOR INFORMATION	MM	BS
P02	28/03/22	REVISION FOR INFORMATION	MM	BS
P03	01/07/22	REVISION FOR INFORMATION	MM	BS

REV	DATE	DESCRIPTION	BY	APP
P01	10/06/22	ISSUED FOR INFORMATION	MM	BS
P02	28/03/22	REVISION FOR INFORMATION	MM	BS
P03	01/07/22	REVISION FOR INFORMATION	MM	BS

PROJECT: SEVEN HILLS WF

TITLE: TURBINE FOUNDATION, FENCING, ROAD AND DRAINAGE DETAILS

CLIENT: **enenergia**
Switched on

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Engineering and Environmental Consultants
Cork | Tralee | Limerick

The Elm Salls
Loughmore Centre,
Rahen Business Park,
Limerick,
V94 R578

DRAWN	PK	CHECKED	PG	APPROVED	BS
DATE:	01/06/22	SCALE @ A1:	1:50		

PROJECT NUMBER:	21337	DRAWING STATUS:	S2
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DRAWING NUMBER:	21337-MWP-ZZ-00-DR-C-2127	REV:	P03
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REFERENCE DRAWINGS:

DRAWING No.	DRAWING TITLE
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REV	DATE	DESCRIPTION	BY	APP
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REV	DATE	DESCRIPTION	BY	APP
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PROJECT:
SEVEN HILLS WF

TITLE:
GRASS LINED LINEAR SWALE INCLUDING SETTLEMENT POND

CLIENT:
enenergia
Switched on

Malachy Walsh and Partners
Engineering and Environmental Consultants
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DRAWN: px	CHECKED: pg	APPROVED: BS
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DATE: 01/06/22	SCALE @ A1: 1:50
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PROJECT NUMBER: 21337	DRAWING STATUS: S2
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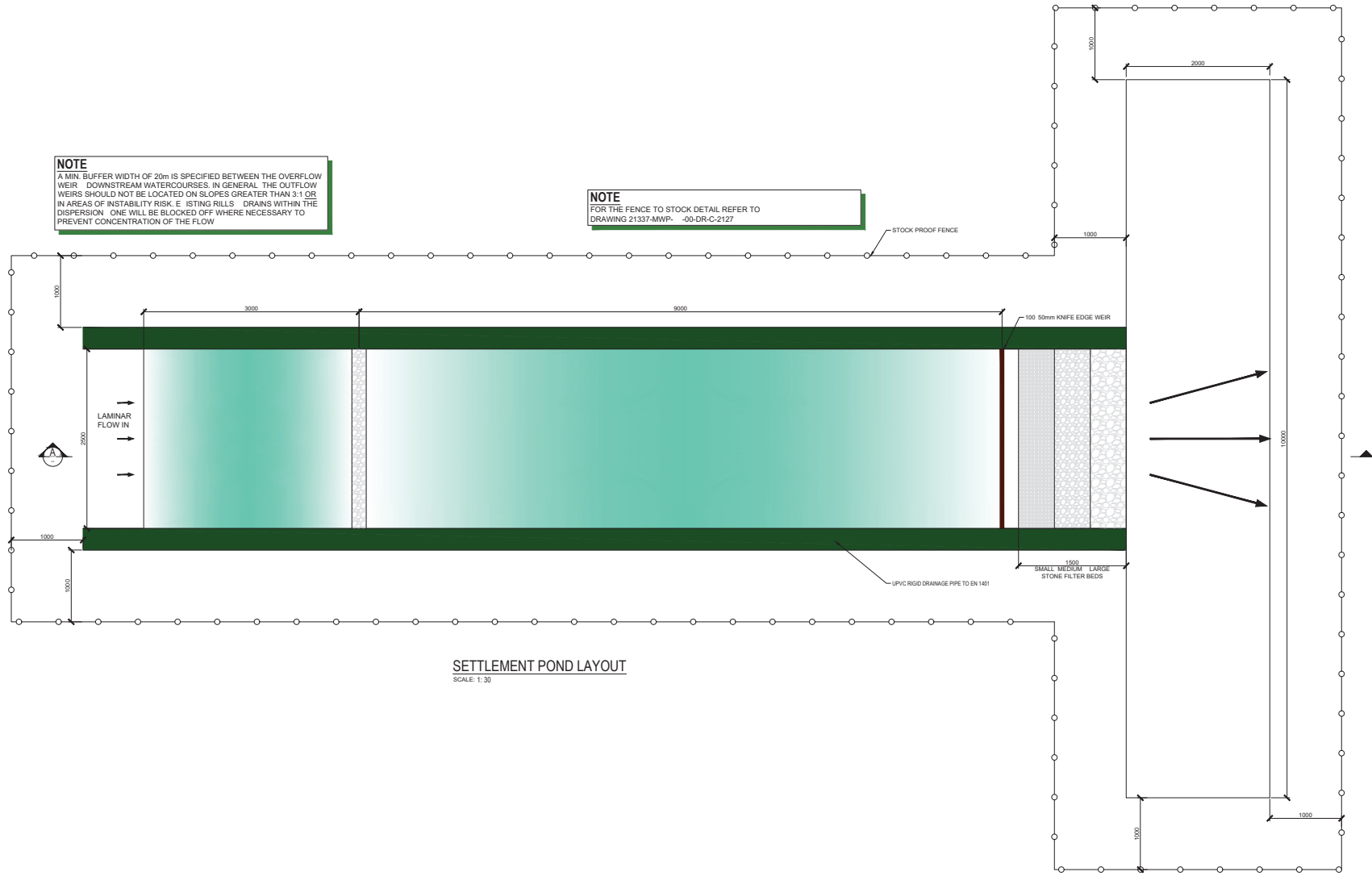
DRAWING NUMBER: 21337-MWP-ZZ-00-DR-C-2128	REV: P02
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NOTE

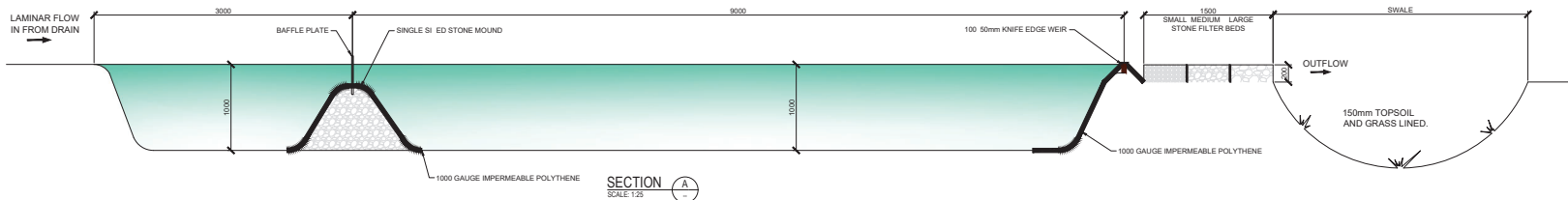
A MIN. BUFFER WIDTH OF 20m IS SPECIFIED BETWEEN THE OVERFLOW WEIR DOWNSTREAM WATERCOURSES. IN GENERAL THE OUTFLOW WEIRS SHOULD NOT BE LOCATED ON SLOPES GREATER THAN 3:1 OR IN AREAS OF INSTABILITY RISK. EXISTING RILLS DRAINS WITHIN THE DISPERSION ONE WILL BE BLOCKED OFF WHERE NECESSARY TO PREVENT CONCENTRATION OF THE FLOW

NOTE

FOR THE FENCE TO STOCK DETAIL REFER TO
DRAWING 21337-MWP- -00-DR-C-2127



SETTLEMENT POND LAYOUT
SCALE: 1:30



SECTION A-A
SCALE 1:25