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National Grid Electricity Transmission
PTNO - Trawsfynydd Construction

Water Discharge Activity Permit Application – Supporting Report

2026-09-11

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Prepared for

National Grid Electricity Transmission

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Submitted to

Natural Resources Wales (NRW) on behalf of National Grid Electricity Transmission

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Revisions

Rev	Date	Details
1	2026-09-11	Supporting Report for Issue

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1. Introduction

1.1 Non-technical Summary

WSP UK Ltd are providing technical support to National Grid Electricity Transmission (hereinafter 'NGET') in relation to environmental permitting and licensing requirements for the Pentir to Trawsfynydd (PTC1 and PTNO) reinforcement works (the 'scheme'), which form part of the overarching Great Grid Upgrade) (the 'project').

WSP have been commissioned to support, as one of the partners involved in the GGP, with the development of the necessary environmental permit applications that will be required for the project, including during the construction phase. More specifically, WSP are assisting with the identification and development of the necessary regulatory provisions associated with water discharge activities (WDA) that are proposed to be undertaken.

This supporting technical document has therefore been prepared as part of the bespoke WDA permit application process for the PTC1 and PTNO scheme and it has been submitted to the relevant regulator, Natural Resources Wales (NRW), to inform the decision-making for the permit. This scheme encompasses reinforcement of overhead lines and cables on the existing circuits between Pentir and Trawsfynydd substations in Northwest Wales. Specifically at Trawsfynydd, works will consist of:

- Installation of new 400 kW underground cables;
- Installation of a new shunt reactor and two new portable relay rooms;
- Installation of a new gantry; and
- Widening of part of the existing access road in fenced compound.

1.2 Purpose

As described above, WSP have been commissioned to support with the identification and development of the necessary environmental permit applications that will be required for the project, including those which will be required during the construction phases. With respect to the PTC1 and PTNO scheme, WSP have reviewed the regulatory provisions associated with the water discharge activities that are proposed to be undertaken during construction and the requirement for a bespoke WDA permit has been identified due to the fact there are no exemptions, Regulatory Position Statements (RPS') or Standard Rules permits which are applicable to the discharge of treated groundwater and rainfall-dependent surface water run-off.

This supporting document has therefore been prepared to support the WDA permit application, and it explains, in detail, the nature of the WDA and the treatment and management measures that are proposed to be implemented across the site to ensure the activity / resultant effluent does not result in harm to the receiving environment. A qualitative Environmental Risk Assessment (ERA), which considers management of the proposed activities on site has been prepared (refer to Appendix B –) in line with the relevant guidance, 'How to carry out a risk assessment for an Environmental Permit'[1]. A summary of the Environmental Management System (EMS) measures which will apply to the proposed discharge activity is also provided, as per the 'Develop a management system: environmental permits' guidance[2].

1.3 Location

The site of the PTC1 and PTNO scheme is located in northwest Wales, centred at approximately National Grid Reference SH 69188 38423, approximately 7.5 km south of Blaenau Ffestiniog and 12 km east of Porthmadog. The site comprises an existing substation owned by Magnox-Rozvodna, covering approximately 0.065 km^2, and forms part of the wider Magnox Trawsfynydd site, which extends to approximately 0.18 km^2. The former Trawsfynydd Nuclear Power Station, currently undergoing decommissioning, lies immediately adjacent to the southwestern boundary of the substation.

The site is accessed via the Magnox Trawsfynydd Nuclear Power Station access road, which connects to the A470 to the east. The surrounding area is comprised of woodland and shrubbery, with overhead electrical lines entering

[1] Natural Resources Wales / How to carry out a risk assessment for an Environmental Permit
[2] Develop a management system: environmental permits - GOV.UK

the site from the north, east and south. The site is located approximately 160 m north of the shoreline of Llyn Trawsfynydd and lies at an elevation of approximately 174 m to 185 m AoD. The site location and layout are shown below in Figure 1 and Figure 2 respectively.

Figure 1 - Site Location

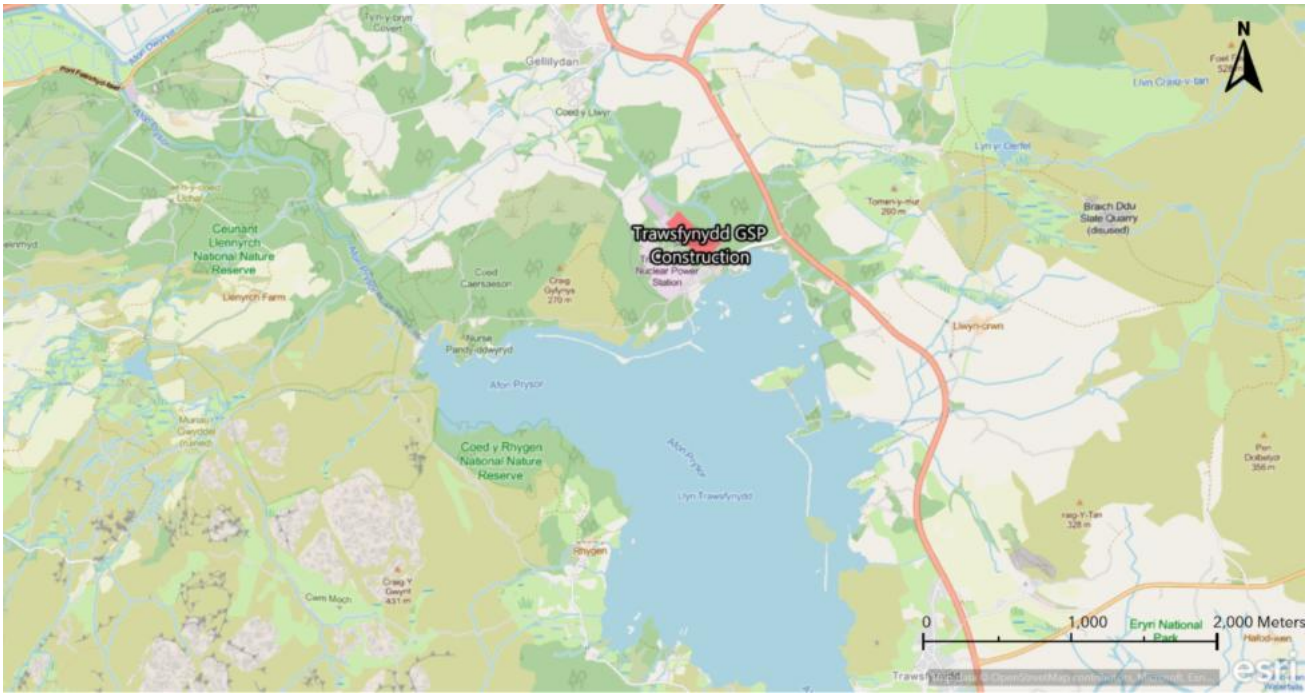
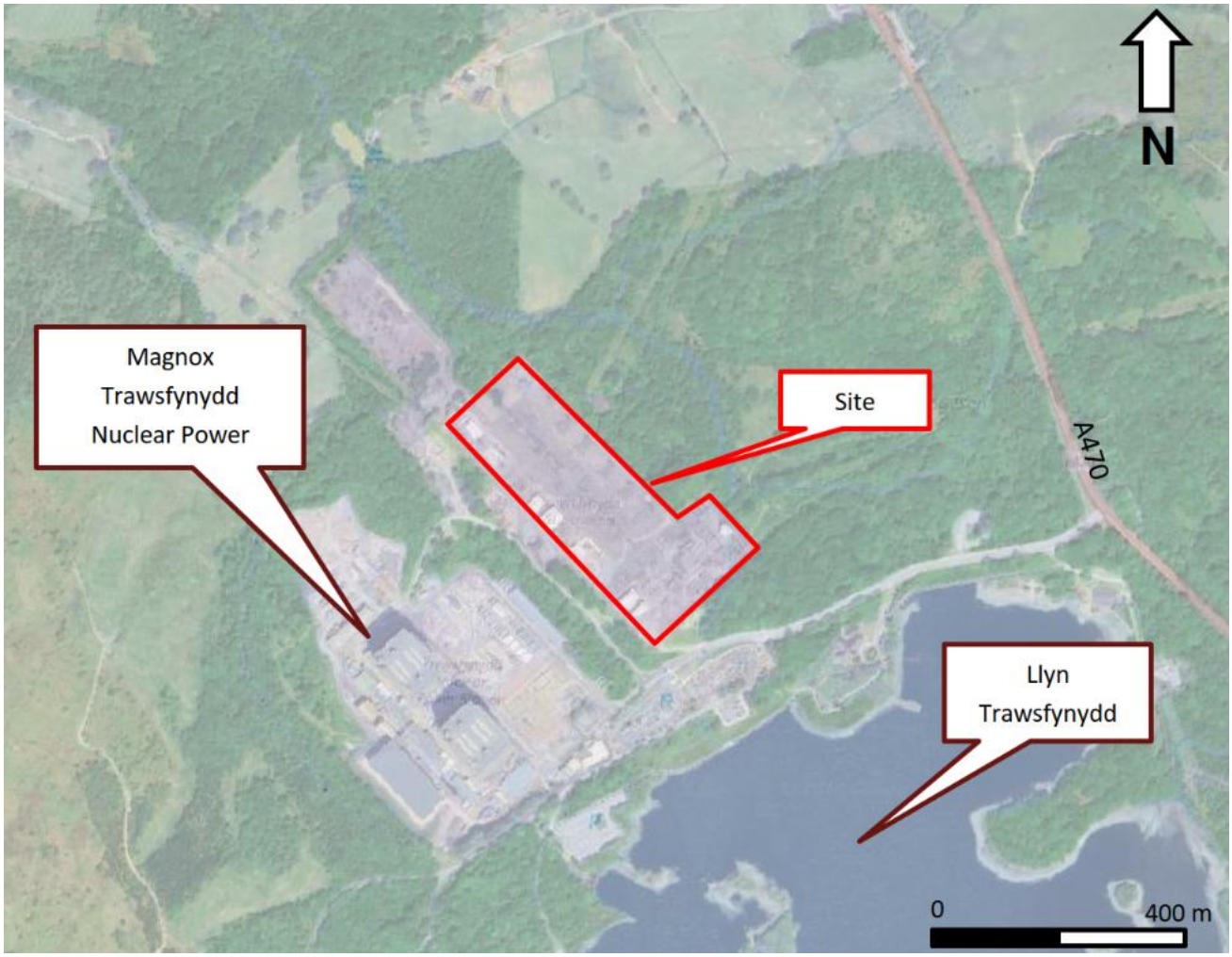


Figure 2 Site Layout Plan



1.4 Site Sensitivity

1.4.1 Ecology

A protected sites screening assessment was undertaken to clarify whether the site where the proposed discharge activities are going to take place is within or near to any protected areas. The search, performed on MAGIC.GOV[3] and DataMapWales[4], identified that there were ten statutory environmental designations within a 5 km buffer of the site, including 10 Sites of Special Scientific Interest (SSSI), 5 Special Areas of Conservation (SAC), 1 Special Protection Area (SPA) and 6 National Nature Reserves (NNR). These are shown below in Figure 3 and the designations found and their approximate distance away from the site is listed below in Table 1. There are no Ramsar sites or Areas of Outstanding Natural Beauty (AONB) found with 5 km of the site.

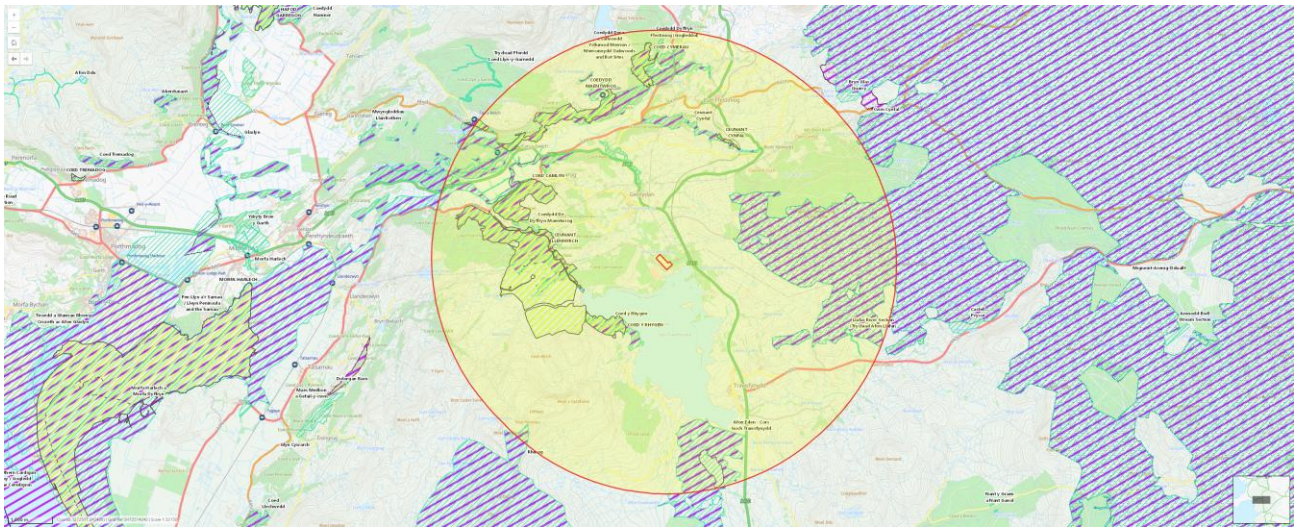
Table 1 - Distance to Environmental Designations found within 5 km from the site

Designation	Name of environmental designation	Direction	Distance away from site (km)
SSSI / NNR	COED Y RHYGEN	SW	1.47
SAC	Coedydd Derw a Safleoedd Ystlumod Meirion / Meirionnydd Oakwoods and Bat Sites	SW	1.47
SPA / SAC / SSSI	Migneint-Arenig-Ddu allt	E	1.48

[3] Magic Map Application
[4] Home | DataMapWales

Designation	Name of environmental designation	Direction	Distance away from site (km)
SSSI	Coedydd De Dyffryn Maentwrog	N	1.63
NNR	CEUNANT LLENNYRCH	W	1.72
NNR	COED CAMLYN	NW	2.62
SSSI / NNR	Ceunant Cynfal	N	2.83
SSSI	Coedydd Dyffryn Ffestiniog (Gogleddol)	N	3.22
NNR	COEDYDD MAENTWROG	N	3.33
SAC / SSSI	Afon Eden - Cors Goch Trawsfynydd	S	3.39
SSSI	Morfa Harlech	NW	3.39
SAC	Pen Llyn a'r Sarnau / Lleyn Peninsula and the Sarnau	NW	3.4
NNR	COED CYMERAU	N	3.74
SSSI	Llafar River Section (Trychiad Afon Llafar)	E	4.11
SAC / SSSI	Rhinog	SW	4.64
SSSI	Cwm Cynfal	NE	4.95

Figure 3 - Screenshot from MAGIC Map highlighting environmental statutory designations in proximity of the site

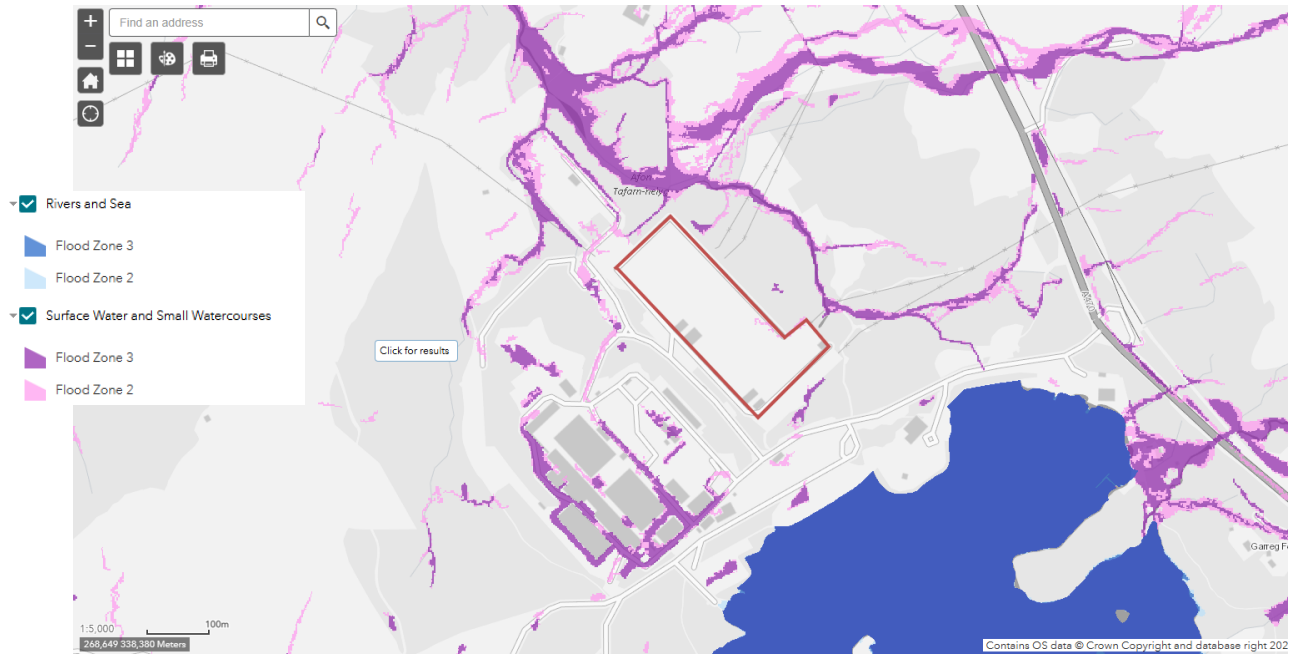


1.4.2 Flood Risk

According to a search performed using NRW's Flood Map for Planning[5], the site's location is not in a Flood Zone 2 or Flood Zone 3 and so is not considered at risk of flooding from rivers and the sea, as well as from surface water and small watercourses. This is highlighted in Figure 4 - Screenshot from NRW Flood Map for Planning.

[5] Flood Map for Planning

Figure 4 - Screenshot from NRW Flood Map for Planning



1.4.3 Nearby Licensed Water Discharges

According to the NRW Discharges to Water and Groundwater Public Register[6], within the nearby areas (Trawsfynydd, Gelilydan and Maentwrog) the following licensed discharges to water and groundwater have been identified:

Table 2 - Nearby Licences Water Discharges

Operator	Site	Permit Reference	Nature of Discharge	NGR of Point of Discharge (if known)	Distance from Site (if point of discharge known)	Direction from Site (if point of discharge known)
Nuclear Restoration Services Limited	Magnox, Trawsfynydd Site	CG0408701	Package treatment plant serving Trawsfynydd Decommissioning Site Secondary treated sewage effluent and trade effluent	SH 69224 37960	288 m	South
	Trawsfynydd Decommissioning Site	CG0409101	Diversion Culvert Storm Overflow serving Trawsfynydd Decommissioning Site Storm sewage	Unknown	Unknown	Unknown

[6] Public register - Customer Portal

Operator	Site	Permit Reference	Nature of Discharge	NGR of Point of Discharge (if known)	Distance from Site (if point of discharge known)	Direction from Site (if point of discharge known)
	Trawsfynydd Decommissioning Site	CG0087701	Site Drainage – Trade Effluent at Trawsfynydd Decommissioning Site	Unknown	Unknown	Unknown
	Trawsfynydd Decommissioning Site	CG0314901	Sewage Treatment Works serving Trawsfynydd Decommissioning Site	Unknown	Unknown	Unknown
	Trawsfynydd Decommissioning Site	CG0408801	Sewage Treatment Works serving Trawsfynydd Decommissioning Site	Unknown	Unknown	Unknown
	Magnox, Trawsfynydd Site	CG0409001	Site Drainage from the Northern Outlet Pipe at Trawsfynydd Decommissioning Site	Unknown	Unknown	Unknown
	Trawsfynydd Decommissioning Site	CG0088101	Active Effluent Treatment Plant serving Trawsfynydd Decommissioning Site	Unknown	Unknown	Unknown
	Magnox, Trawsfynydd Site	CG0409201	Turbine Hall Water Treatment Plant Neutralisation Sump serving Trawsfynydd Decommissioning Site	Unknown	Unknown	Unknown
Dŵr Cymru Cyfyngedig	Gellilydan STW	CG0369901	Gellilydan STW (Settled Storm) Settled storm sewage	SH 68731 40054	1.57 km	North
	Maentwrog CSO	CG0150101	Maentwrog CSO Storm sewage	SH 66334 40589	3.42 km	Northwest
	CSO at Trawsfynydd	CG0357501	CSO at Trawsfynydd,	SH 70890 35210	3.44 km	Southeast

Operator	Site	Permit Reference	Nature of Discharge	NGR of Point of Discharge (if known)	Distance from Site (if point of discharge known)	Direction from Site (if point of discharge known)
	Near Bron Gwyndy		Near Bron Gwyndy Storm sewage			
	Trawsfynydd Maes Gwyndy Estate CSO	CG0357401	Trawsfynydd Maes Gwyndy Estate CSO Storm sewage	SH 70997 35069	3.62 km	Southeast
	CSO at Trawsfynydd WwTW	CB3099ZG	Storm sewage	SH 71206 35109	3.68 km	Southeast
	Trawsfynydd Wastewater Treatment Works	CG0076001	Trawsfynydd Wastewater Treatment Works Secondary treated sewage effluent and settled storm sewage	SH 71206 35109	3.68 km	Southeast
Gellilydan Sewage Treatment Works	Gellilydan Wastewater Treatment Works	CG0060501	Biologically treated sewage effluent	SH 6871 4006	1.57 km	North
Mr Richard Kiy	The Byre	EPR/DB3193FS	Package treatment plant serving The Byre Secondary treated sewage effluent	SH 71029 29026	9.40 km	Southeast

2. Regulatory Context

In accordance with the Environmental Permitting (England and Wales) Regulations 2016[7], as amended, (the EPR), it is considered that a standalone WDA permit may be required for the proposed discharging activity as there are no Standard Rules permits, RPS' or exemptions that are applicable (refer to Table 3 below).

Under Schedule 22 of the EPR, the definition of a groundwater activity is 'the discharge of a pollutant in circumstances that might lead to a direct or indirect input of that pollutant to groundwater'. As the activity will comprise the discharge of dewatered groundwater encountered as part of excavations during construction to ground, alongside the discharge of small volumes of rainfall-dependent surface water from working areas (which together make up the effluent to be discharged), this could constitute an indirect input to the groundwater if the discharge were to percolate through the Made Ground to the soil / subsoil layers below.

Following a pre-application enquiry made to NRW (ref. WPCC16876), it has been confirmed that the groundwater abstraction activities are to be conducted under the civil engineering dewatering exemption[8], therefore no Water Resources Abstraction licence is required. NRW have also clarified that the associated discharge to ground is not incorporated into this exemption and a WDA permit is still required when discharging groundwater, hence the need for this application.

The abstracted groundwater (which will be encountered during excavation activities), and small volumes of rainwater which do not enter the site's existing permanent drainage system, will be discharged via multiple points to a soakaway-type arrangement, across the site, to reduce risks of any surface flooding / pooling of the water and to ensure infiltration through to the ground. It should be noted that there will not be an engineered soakaway at each point of discharge but instead will be an arrangement that allows percolation of effluent through the existing substation chippings to the ground below. The discharge points are to be used consecutively (not simultaneously); therefore, only one point of discharge will be in use at any one time across the site. This arrangement is discussed in further detail in Section **Error! Reference source not found.**.

Table 3 - WDA-related Regulatory Provisions

Title	Applicable to this WDA?	Justification
RPS261 – Temporary dewatering from excavations to surface water	No	This RPS is not applicable because it requires the effluent to be 'wholly or mainly rainwater'. As set out in this Supporting Report, the discharge will primarily comprise groundwater, so RPS261 cannot be relied upon. The proposed WDA is also expected to continue for more than three months, exceeding the time limit specified in RPS261.
RPS280 – Temporary discharge of water unfit for supply from water treatment and supply assets	No	This WDA does not involve water that is intended, but unsuitable, for supply.
SR2010 No 2: Discharge to surface water	No	This WDA will not be arising from a cooling circuit or heat exchanger.
SR2010 No 3: Discharge to surface water	No	This WDA will not consist of domestic sewage.

As part of this WDA permit application, the relevant NRW online application forms have therefore been completed:

- Form B6[9].

Within the application form, we have classified the activity being applied for asthe discharge of 'Trade – returned abstracted water' as the effluent is predominantly groundwater, though not related to ground source heating and

[7] The Environmental Permitting (England and Wales) Regulations 2016

[9] Natural Resources Wales / Apply for a permit to discharge trade or mixed effluent

cooling schemes. However, it should be acknowledged that, due to very small quantities of rainfall dependent surface water potentially being present in the effluent stream, the discharge activity could also be defined as 'Mixed effluent – containing rainfall dependent effluent – a mix of trade effluents (known volume) or domestic treated sewage (private ownership) with trade effluent (rainfall dependent) which share a treatment facility and common monitoring point'[9].

When determining this environmental permit application, the dates of the commencement of the WDA would need to reflect those of the commencement of the excavation as part of construction works (which are scheduled to begin at the earliest on 05/10/2026). The proposed permit start aligns to the current construction programme. Any deviations from this prospective date will be communicated to the Regulator, NRW.

3. Water Discharge Activities

3.1 Summary of Proposed Water Discharge Activities

Table 4 below sets out the current anticipated construction programme phases for the PTC1 and PTNO scheme and the associated proposed abstraction (dewatering) and WDA periods:

Table 4 - Dates of Proposed Abstraction and WDA

Phases (of construction activities and associated WDA's)	Proposed Dates / Durations	Proposed Construction Works	Quantity of Effluent to be Discharged
Phase 1	05/10/2026 – 15/01/2027	Excavation works to support underground cable ducting substation road, shunt reactor bund and skidway, 400kv equipment foundation, minor works including ducting, cabling, drainage and earth mat	<100 m^3 / day (comprising groundwater if encountered during excavations and minor, incidental volumes of surface water run-off (rainfall) which enters the excavations in the site working areas)
Phase 2	02/06/2028 – 30/06/2028	Civils works during outage including demolishing structures and building approx. 20 new foundations max. 1x1x1m	< 20 m^3 / day (as above)

Phase 1

Phase 1 of the construction programme comprises the initial civil engineering and enabling works required to establish the substation platform and prepare for installation of the 400 kV electrical infrastructure. Activities during this period include excavation and installation of underground cable ducting, construction of the substation access road, formation of the shunt reactor bund and skidway, and construction of the primary 400 kV equipment foundations. Minor supporting works will also be undertaken, including localised ducting and cabling runs, installation of the permanent drainage infrastructure, and placement of the substation earth mat.

A Dewatering Assessment (see Appendix C –) has been undertaken to estimate the quantity of groundwater that is anticipated to be encountered during the works required across Phase 1 and Phase 2 of the construction programme (detailed further below). The assessment concluded that a total of up to 35.6 m^3 / day could be encountered during excavations and require discharging, reflecting a conservative estimate.

The groundwater that is encountered is proposed to be pumped out of excavations for discharge to ground at various locations across the site, all within the substation site boundary. The discharge will be made via a soakaway-type arrangement, enabling the effluent to percolate through the ground (comprised of the existing substation chippings and underlying ground conditions, Made Ground), which will provide an element of filtration prior to the effluent soaking into the ground. Alongside the groundwater that is encountered during dewatering activities, there may be small amounts of surface water run-off which is also discharged (during times of rainfall only). Note that this will be minimal and limited to the rainfall that enters the working areas / excavations only (as there is no way to prevent this from occurring). The rest of rainfall across the site will pass through the existing substation permanent drainage system and is therefore outside the scope of this WDA permit application. Prior to the effluent being pumped out to the discharge points, it will pass through a pump fitted with a silt sock, to provide for silt-removal. As outlined in the Groundwater Risk Assessment (Appendix D –), the groundwater to be discharged is not anticipated to contain any harmful pollutants or contaminants – this is based on Ground Investigation reports undertaken by Bakerhicks in 2025 (refer to Appendix D –).

It should be noted that permanent drainage features are already established on site for uncontaminated surface water run-off and measures will be in place to ensure that works on site will not interfere with this arrangement.

Phase 2

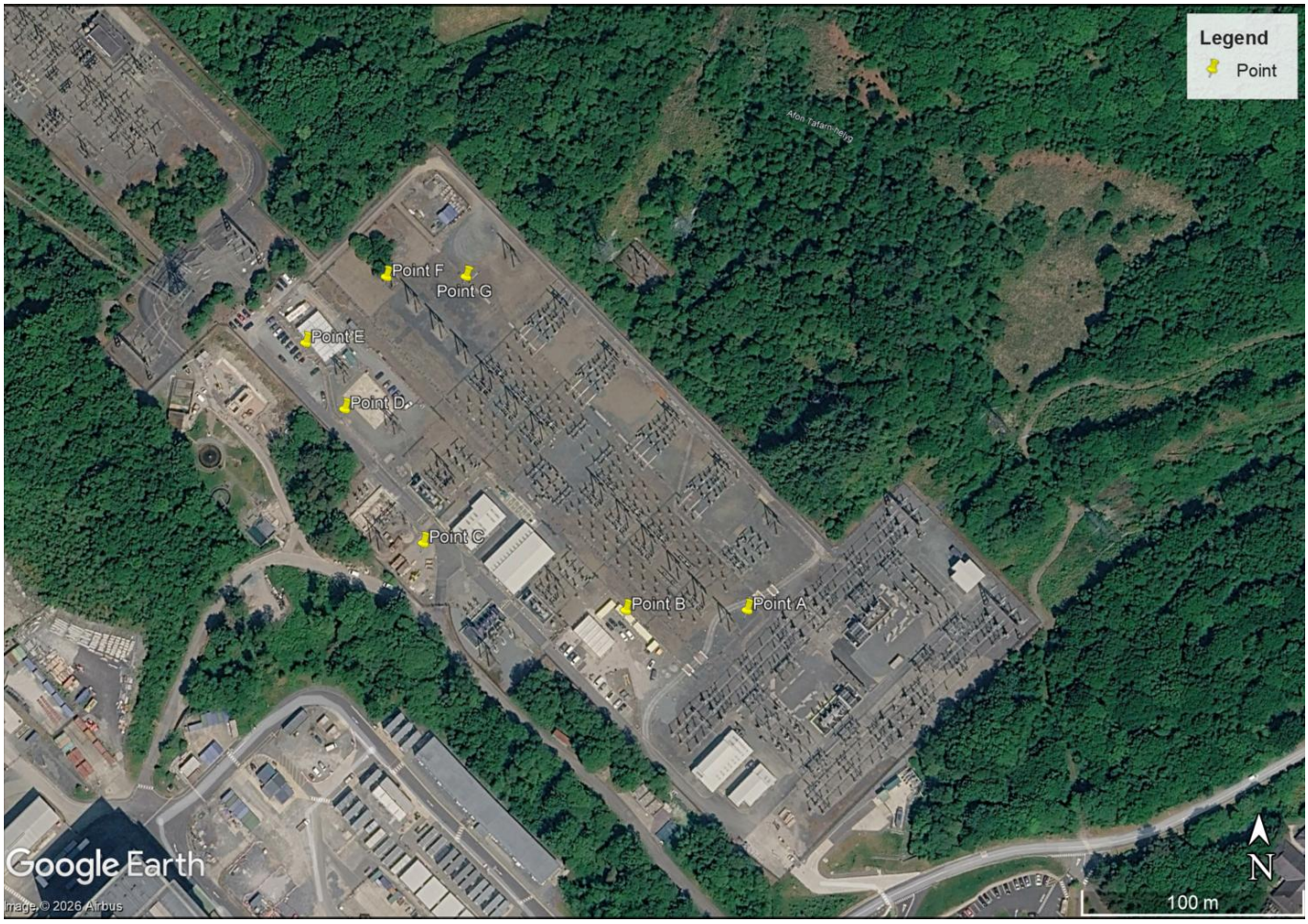
Phase 2 will be undertaken during a scheduled network outage and comprises the intrusive civil engineering works required to remove redundant substation infrastructure and install new foundation bases to support the upgraded 400 kV equipment. Activities include the controlled demolition and removal of existing structures and associated concrete foundations, followed by excavation and construction of up to twenty new reinforced concrete foundation blocks, each with an approximate footprint of 1 m^2. Works will be sequenced to maintain safe working areas within the outage window and to minimise disturbance to adjacent operational assets. During this phase, volumes of groundwater to be encountered are expected to be low, remaining below 20 m^3 / day. The same arrangements for managing the encountered groundwater described above for Phase 1 will also be adopted during Phase 2.

Throughout the construction works, the point at which the effluent will be discharged will be mobile (moved around the site). This will help to ensure suitable percolation / draining of the effluent through the existing ground conditions and alleviate any surface flood risks. Weather conditions will also be taken into account when dewatering to ensure that the discharge does not contribute to natural run-off rates across the site. However, it should be highlighted that the site is not expected to be at risk of flooding, as noted in Section 1.4.2. Table 4 identifies the potential discharge points which will be used on the site. The discharge locations have been selected on practical grounds, prioritising their proximity to active work areas and providing workable discharge points close to the areas of the site where activities will take place, while avoiding operational constraints for NGET. At each location, the effluent will be treated (via a silt sock) and pumped to percolate through the existing chippings on site to the underlying ground. Only one discharge point will be used at any one time and once the capacity of one soakaway is reached, the discharge activity will be transferred to another discharge point listed below. Regular visual monitoring of the discharge location in use will be undertaken during dewatering activities, to ensure that the ground is capable of absorbing the effluent being discharged.

Table 5 – Expected Grid References for Proposed Discharge Locations on site

Discharge Point	Grid Reference
A	SH 69275 38372
B	SH 69226 38351
C	SH 69119 38399
D	SH 69093 38461
E	SH 69081 38500
F	SH 69105 38519
G	SH 69142 38514

Figure 5 - Site Layout Plan indicating Proposed Discharge Points



3.2 Proposed Effluent Source and Volumes

As described above, a Dewatering Assessment has been conducted across the site which estimates that the volume of groundwater to be abstracted during both Phase 1 and Phase 2 of the construction works. This has been appended to this document in full (Appendix C –); however, in summary, the anticipated total volume of groundwater to be abstracted (and subsequently discharged) is estimated to be between 18.7 - 35.6 m^3/day across the site. The actual rate of discharge will be controlled by the design of the pump employed: it is intended that a 2-inch Bauer pump will be used, providing a maximum rate of discharge of 11 l / s at the discharge point.

The upper end of the estimated range reflects a conservative, short-term worst-case scenario based on literature hydraulic conductivity values and likely overestimates sustained inflows. The estimates of groundwater to be discharged are subject to the assumptions and limitations outlined in Appendix C – within the Dewatering Assessment. As outlined in the Dewatering Assessment, in the absence of on-site measurements, this assessment is supported by indirect values calculated using the Hazen method[10] and publicly available literature values. The values presented in the Dewatering Assessment are based on the total inflows from individual excavations.

The groundwater anticipated to be encountered as part of excavation activities will be pumped from the point at which it is identified to the relevant point of discharge. Effluent will pass through a silt sock on the end of the pipe, which will have hydrocarbon-detector capabilities. As per the qualitative risk screening undertaken within the Groundwater Risk Assessment (Appendix D –), no sources of pollution have been identified within the expected maximum radius of influence for the excavations and associated dewatering works and no exceedances of screening criteria were encountered during groundwater quality testing discussed in this assessment. The principle

[10] Hazen-Williams Water Flow Formula: Head Loss, Data, Charts & Calculator

foreseeable water quality risk is temporary deterioration in pumped water quality due to excavation-derived suspended solids / turbidity together with accidental releases of construction materials, fuels or soils (however, such risks are mitigated via storage best practice that will be implemented on site).

Alongside the Dewatering Assessment, a Ground Investigation has also been completed (GIR (2025) borehole data) (discussed in the Dewatering Assessment (Appendix C –) which determined:

- Laboratory testing did not identify any exceedance of concentrations within groundwater from the 5no. locations monitored (TBH02, TBH04, TBH05, TBH09, and TBH10) when compared against the adopted screening criteria.
- Leachate testing was completed on 4 no. samples across the development area to provide an assessment of risk associated with near surface concentrations. Leachate testing by this test method is considered to represent a worse case assessment of concentrations, such that screening of results to drinking water criteria can be deemed precautionary. Screening of leachate testing returned results at the limit of detection or below the adopted screening criteria for all determinants. As a result, concentrations within near surface soils are not deemed leachable.
- Based on the above testing, with both groundwater and leachate samples returning results below the adopted screening criteria or limit of detection it is considered that near surface concentrations within the development area do not represent a significant risk to Controlled Waters."

The Ground Investigation summarises the ground below the site as Artificial Made Ground relating to the construction of the Llyn Trawsfynydd reservoir and the existing GSP substation. It concludes that no superficial geology was recorded beneath the site and the solid geology below the site primarily consists of Greywacke sandstone of the Rhinog Formation.

Throughout the construction works and associated abstraction and WDA's, industry standard best-practice pollution prevention measures will be implemented to help mitigate any risks associated with the proposed activities. These are described in further detail within the Environmental Risk Assessment which is contained in Appendix B – .

3.3 Final Receiving Discharge Environment Considerations

NRW guidance for construction of electricity grid infrastructure [11] (which includes consideration of substations) has been taken into account in developing the proposed discharge arrangements. The site is underlain by Made Ground, which is typically heterogeneous in composition and permeability and may contain reworked soils, granular fill or construction materials. These conditions can result in variable infiltration behaviour and the potential for preferential flow paths. Therefore, to ensure that discharge is appropriately controlled, water from the works will be directed to designated soakaway-type areas, providing a route for infiltration to ground (via substation chippings), as a means of returning water to the same source of supply. Rates and volumes of discharge are presented in Section 3.2 above. The volume of any surface water run-off discharged alongside the abstracted groundwater will be small volumes of rainfall-dependent run-off only which directly enters open excavations and working areas; this is therefore not anticipated to significantly increase the volumes presented above or the quality of the overall effluent. Based on the expected discharge volumes, the controlled nature of the soakaway outflow and the mobile nature of the discharge point, the proposed activity is not considered likely to exceed the infiltration capacity of the receiving made ground or pose a pollution risk to the wider surrounding environment.

The final effluent quality will be in accordance with set permit conditions and limits. It is assumed based on previous experience limits, will be set for parameters including TSS, pH and no visible oil and grease. Proposed pollution prevention and treatment measures will be adjusted on site accordingly to ensure these are met.

3.3.1 Made Ground Area

As described in the Dewatering Assessment, the site is underlain by granular Made Ground of variable thickness, overlying reworked natural deposits comprising predominantly gravel, cobbles and boulders with only limited fine-grained material. Groundwater was encountered within these deposits during the ground investigation, with inflows recorded in a number of trial pits and boreholes. The Dewatering Assessment concludes that the proposed excavations are expected to intercept groundwater and generate inflows during construction, which may require temporary dewatering and subsequent discharge management, hence this application for a WDA permit is being made. This Made Ground is inferred to be associated with construction of the Llyn Trawsfynydd reservoir between 1901 and 1953.

[11] Natural Resources Wales / Advice for developers on planning electricity grid infrastructure

Within the table below, a high-level summary of the stratigraphy encountered across the site is provided and forms the basis of the conceptual ground model adopted within the Dewatering Assessment.

Table 6 – Summary of Ground Conditions Relevant to the Proposed Water Discharge Activity

Strata	Depth of top (m bgl)	Depth to base (m bgl)	Thickness range (m)
Made Ground	0.0	0.2-1.7	0.2-1.7
Reworked Natural Ground (cobbles & boulders)	0.25-1.7	1.5-9.8*	0.36* – 8.15 **
*Base not proven, and full extent of thickness not proven. **Maximum proven thickness, but full thickness may not have been proven.			

3.3.2 Designated Sites and Habitats

A review of the proposed discharge activity has been undertaken with reference to the on GOV.UK guidance on Habitats regulations assessment: protecting a European site[12]. The proposed discharge will be to Made Ground located within the existing substation footprint and is not proposed to be discharged directly to any European designated site. On this basis, a Habitats Regulation Assessment is not considered necessary for the proposed discharge activity

Given water is to be discharged via soakaway to an area of Made Ground within the site boundary, impacts from the proposed WDA are not expected to be significant. This conclusion is supported by the findings of the Environmental Risk Assessment, which determined that residual risks to the receiving environment remain Low or Very Low following implementation of the proposed mitigation measures, treatment controls and discharge management procedures.

3.4 Feasibility of Sewer Connection

Based on engagement (via email) with Dŵr Cymru Welsh Water (DCWW) on April 27th, 2026, discharge to sewer is not feasible. Surface water run-off and groundwater are not being accepted into foul or combined sewers due to network capacity constraints and current policy to prioritise higher-level drainage hierarchy options. Therefore, the effluent is proposed to be discharged to ground within the site boundary (as this reflects less of a risk from a pollution prevention perspective than discharging to surface water).

It is noted that DCWW's current policy actively discourages surface water and runoff discharges to sewer, in line with their prescribed discharge hierarchy. Under this hierarchy, discharge to a combined or surface water sewer represents the lowest priority (Levels 4 and 5)[13], and applicants are expected to maximise discharge via higher-priority routes before sewer discharge is considered. On this basis, an application for a new TEC is not considered a viable route for managing the abstracted groundwater during the proposed construction works.

Due to the temporary nature of the proposed WDA, it is also not considered appropriate to build a connection to nearby foul sewer, as costs would be disproportionate to the benefit. Furthermore, as the discharge will comprise abstracted groundwater; this type of discharge is not typically accepted by sewerage undertakers as it will lead to an increase in flows / effluent quality requiring treatment that most existing sewerage systems in Wales are not designed for.

3.5 Physical Pollution Prevention Measures

Throughout the construction works, physical pollution prevention measures will be implemented to underpin the WDA and provide suitable and effective management of the effluent to be discharged. Provisions for preventing contamination of permanent surface water run-off drainage features that are already established on site will also be implemented. Proposed measures to be implemented are as follows:

- All effluent to be discharged will pass through a silt sock at each discharge point to remove suspended solids prior to infiltration to the chippings and underlying Made Ground.
- The silt sock will have integrated hydrocarbon indicator capabilities to provide early visual warning of any hydrocarbon breakthrough. Any fuels and oil stored and used on site will be subject to management under

[12] Habitats regulations assessments: protecting a European site - GOV.UK
[13] Sustainable test Drainage (SuDS) Statutory Guidance

Oil Storage Regulations and spill equipment will be available should there be any incidents / accidents leading to potential hydrocarbon pollution. Any other hazardous substances will be stored in accordance with COSHH requirements and other legislation as applicable.

- Silt sock performance will be checked routinely during dewatering activities to ensure they remain effective in their operation and are suitably preventing any contaminated water entering the soakaway. They will be replaced as necessary.
- Effluent will be discharged to ground via the soakaway-type arrangements at each point consecutively rather that simultaneously, to ensure suitable infiltration and reduce risk of any surface flooding / pooling on site.
- Chemical treatment (i.e., through dosing of flocculants) is not considered to be required at this stage as the granular nature of the underlying ground conditions means clay-sized fines requiring chemical dosing are not anticipated in the abstracted groundwater. Furthermore, the construction activities are taking place on an existing site, therefore there is not anticipated to be significantly elevated levels of silt from earthworks activities (as there might be on undeveloped sites for instances).

4. Risk Assessment

4.1 Environmental Risk Assessment

A qualitative environmental risk assessment for the proposed WDA has been prepared in line with GOV.UK requirements for a bespoke standalone water discharging activity[1]. This considers the potential impacts of the proposed discharge activity on the surrounding environment.

In accordance with the guidance, the risk assessment has considered:

- Hazards;
- Receptors (people, animals, property and any others which could be affected by the hazard);
- Pathways (how the hazard could reach the receptor);
- Measures taken to reduce risks;
- Probability of exposure;
- Consequences (harm which could be caused); and
- Overall risk (based on control measures which will be implemented).

Refer to Appendix B – for the full Environmental Risk Assessment.

Overall, the qualitative Environmental Risk Assessment has concluded that there will be no significant adverse impacts to the environment once the proposed mitigation measures are implemented on site.

4.2 Groundwater Risk Assessment

Due to the nature of the WDA being classed as a discharge to ground (via a soakaway-type arrangement), a Groundwater Risk Assessment has been developed in line with relevant regulatory guidance**Error! Bookmark not defined.**. This Assessment adopts a worst-case approach as it considers the effluent arising from the groundwater abstraction and discharge activities only; it has not incorporated assessment of the minor, incidental volumes of surface water run-off as this will be small volumes and will not present any additional risk.

The findings of the Groundwater Risk Assessment (Appendix D –) are such that the planned temporary discharge associated with dewatering activities at Trawsfynydd is unlikely to cause significant hydrogeological effects, provided that the activities are underpinned by suitable construction pollution prevention controls, suitable discharge control measures are in place, and appropriate monitoring arrangements are implemented. Such details are discussed and outlined in Section 3 and Section 5 of this Supporting Report. Conclusions are based on a Tier 1 qualitative assessment, which is considered to be sufficient at this stage, given the low-risk nature of the proposed discharge activities. A more detailed assessment would only be necessary should design of the excavations requiring dewatering change significantly. Overall, with proper management of the effluent being discharged (refer specifically to the Environmental Risk Assessment in Appendix B –), any residual risks associated with accidental / unplanned events would have short-term impacts on water quality and would be minor and temporary. Therefore, the Assessment concludes that the overall WDA associated with the dewatering is of low risk. It is currently anticipated that dosing chemicals will not be required as part of the Total Suspended Solids (TSS) treatment at this stage, therefore have not been included in the Groundwater Risk Assessment undertaken

5. Management System

As the proposed permit holder, NGET have an ISO 14001 certified Environmental Management System (EMS), which will act as the overarching management system under which the WDA, and wider works, will be undertaken. However, this will be complemented by a Construction Environmental Management Plan (CEMP), which will set out Morgan Sindall Infrastructure's (MSI) (appointed contractor responsible for day-to-day operations under the permit) control measures, including those relevant to the WDA, as discussed further below. MSI are responsible for the day-to-day operations on the site of the proposed substation during construction, including the proposed WDA; however, because the works are being undertaken on behalf of NGET, NGET will remain the permit holder, with overall accountability.

The below paragraphs are aligned to the GOV.UK guidance for EMS[2], and they describe how each aspect will be met under the above-described EMS and permit holder arrangements.

5.1.1 Site Infrastructure plan

The site infrastructure plan has been included in Figure 5Error! Reference source not found. highlighting the proposed arrangements for discharge on site. The plan, in line with GOV.UK guidance, will also show:

- Monitoring / sampling locations
- Location of any emergency equipment
- Any other mitigation measures which are applicable to the WDA.

5.1.2 Site Operations

The activity being undertaken consists of a standalone water discharge activity: this has been described in detail in Section 3 of this document.

In addition, and as stated above, the contractor responsible for the proposed WDA operation will implement a site-specific CEMP. This will cover the proposed WDA and will be reviewed by NGET to confirm that it meets their own certified EMS (and wider contractor / contractual) requirement and is suitable for the proposed work for Trawsfynydd substation.

The CEMP is in development at the time of writing, however, as a minimum, will incorporate the following environmental management aspects:

- Ground and surface water management (including treatment arrangements for the proposed WDA subject to this permit application)
- Measures to minimise environmental nuisance (including noise, dust, light, odour);
- Waste and materials management measures;
- Measures to minimise visual impacts;
- Traffic management requirements;
- Measures to protect Public Highway;
- Location and design of site office and storage compounds; and
- Public consultation and liaison arrangements.

The CEMP will be intended to act as a 'live' document and will be updated periodically as conditions and activities on site change. It will also be reviewed should any near-misses or incidents occur which have the potential to impact the environment. It will also be updated, where necessary, in relation to the ground and surface water management elements, to reflect any specific requirements implemented as part of the environmental permit.

The qualitative Environmental Risk Assessment, which has been developed alongside this permit application will also be used to inform the CEMP, alongside other supporting documents as considered necessary.

5.1.3 Site and Equipment Maintenance Plan (including discharge monitoring arrangements)

All equipment will be operated and maintained in accordance with the manufacturer's recommendations. Physical silt (and other pollution) prevention measures will be implemented across the site. These will be subject to regular visual checks to ensure they remain intact and effective. If issues are identified, the measures will be replaced as necessary.

Storage, use and disposal of any chemicals required will be carried out safely and in accordance with relevant legislation (e.g. in accordance with Oil Storage Regulations and COSHH regulations). They will be stored away from any discharge points on site, as well as any drainage or discharge features. Chemical treatment is not required and so storage of chemicals for treatment is not anticipated to be required.

Monitoring and Sampling Arrangements

Flow monitoring will be carried out at the point of discharge, in line with requirements outlined in the permit. Monitoring of effluent quality, for pH and TSS will be undertaken on site, via a regularly conducted sampling regime which will be developed in line with monitoring and sampling frequency requirements as set out in the environmental permit. Visible oil and grease in the effluent will be monitored via regular site inspections. Such monitoring will ensure suitable quality of effluent being discharged. All staff responsible for equipment on site associated with the WDA will be adequately trained in operation and maintenance and instructions will be available on operation and maintenance recommendations.

Final monitoring and sampling arrangements will be captured either within the CEMP for the proposed works / site, or alternative documentation (subject to Contractor arrangements). These will not be known until a WDA permit has been granted as this will ultimately set out the required discharge monitoring and sampling arrangements which will apply.

5.1.4 Contingency Plans

With regards to contingency arrangements for the proposed WDA; should any issue be identified associated with the function of the equipment related to the WDA, including the pollution prevention measures, discharges would be stopped immediately via manual shutdown of pumps to halt dewatering. Groundwater and surface water run-off would be held in excavated areas until the measures can be repaired or replaced. In the event that the system cannot be repaired or replaced quickly, operation will be paused until the system becomes operational again.

A specialist engineer would be contacted via telephone to assist the project team in carrying out straightforward repairs. If the repair cannot be handled by the project team, a specialist engineer will be able to attend site within 48 hours of a call-out.

As described above, the arrangements for dewatering and discharge and wider pollution prevention measures will be subject to maintenance in accordance with manufacturer recommendations and based on visual site checks / inspections.

Any wider contingency arrangements will be detailed in the CEMP, as appropriate.

5.1.5 Accident Plan

A Site Environmental Emergency Response Plan will also be implemented by the Contractor which will incorporate consideration of any incidents that may impact the proposed WDA. Mitigation measures to prevent impacts from / to the proposed WDA from foreseeable accidents / incidents have been captured in the qualitative Environmental Risk Assessment (see Appendix B –). This will be used to inform on-site documentation as necessary including the CEMP. This will be reviewed and updated at regular intervals and / or following an environmental incident or near-miss.

5.1.6 Complaints Procedure

The site will keep a compliments, comments and complaints record, operated via a third-party organisation, which will be used to document any feedback on how issues or queries are resolved. As outlined in the CEMP, all complaints received will be recorded and communicated to NGET by MSI (appointed contractor for the proposed substation works). It will be the responsibility of NGET and MSI to jointly review / consider and take the necessary action to respond to and resolve any complaints which are received. The type of action undertaken will be dependent upon the nature of the complaint received.

5.1.7 A Changing Climate

Climate-related risks to the proposed WDA have been considered and captured / addressed in the supporting Environmental Risk Assessment (see Appendix B –). Additional mitigation measures with respect to climate related risks will be captured in the Contractor's CEMP as appropriate.

5.1.8 Staff Training and Training

Environmental management will ultimately be the responsibility of the Project Manager for the site. However, day-to-day activities including monitoring and maintenance will be coordinated and undertaken by other relevant people

on site. Therefore, it will be the responsibility of the Project Manager to ensure all staff are suitably qualified and competent to undertake their assigned roles and responsibilities. Site-specific training will be covered by a procedure that forms part of the site's EMS. Informal briefings will be regularly carried out on site, for example, when monitoring or maintenance arrangements are updated. Furthermore, discharge activities will be covered in the general site induction to ensure all new subcontractor staff have been briefed on site rules and management requirements.

5.1.9 Record Keeping

Environmental information relating to the site is to be stored on a site-specific online workspace and on a secure shared drive. The site-specific page will house all relevant construction documentation, including for example the CEMP. The shared drive will be used to store regular monitoring and maintenance records. Record keeping will be undertaken for records required under the WDA permit, in accordance with the permit conditions, which is expected to consider checks for flow, TSS levels, pH and visible oil and grease. Until a permit is issued; these cannot be determined, however it is anticipated that there will be requirements with regards to retaining monitoring and sampling results associated with the WDA to ensure compliance with the permit can be demonstrated. A programme of inspections and audits undertaken by MSI and NGET will ensure permit compliance and appropriate records will be kept (in line with permit requirements) to ensure evidence of compliance is maintained.

5.1.10 EMS Review

NGET's EMS is subject to regular review under their ISO 14001 certification requirements. MSI will also be responsible for ensuring that the CEMP that will apply to the proposed WDA is kept up-to-date and reviewed on a regular basis (every 6 months) (review basis will also be dependent on the duration of the works and change on site as works progress). Based on the relatively short-term nature of the proposed works and associated WDA, it is anticipated that the CEMP will predominantly be reviewed following a near-miss / incident / accident on site as opposed to more frequent updates; however, if on-site conditions / changes warrant more frequent updates, these will be undertaken as necessary by the Contractor.

5.1.11 Site Closure

Under completion of the proposed WDA, the permit will be surrendered in line with relevant regulatory guidance. This will be the responsibility of NGET as the applicant / permit holder.

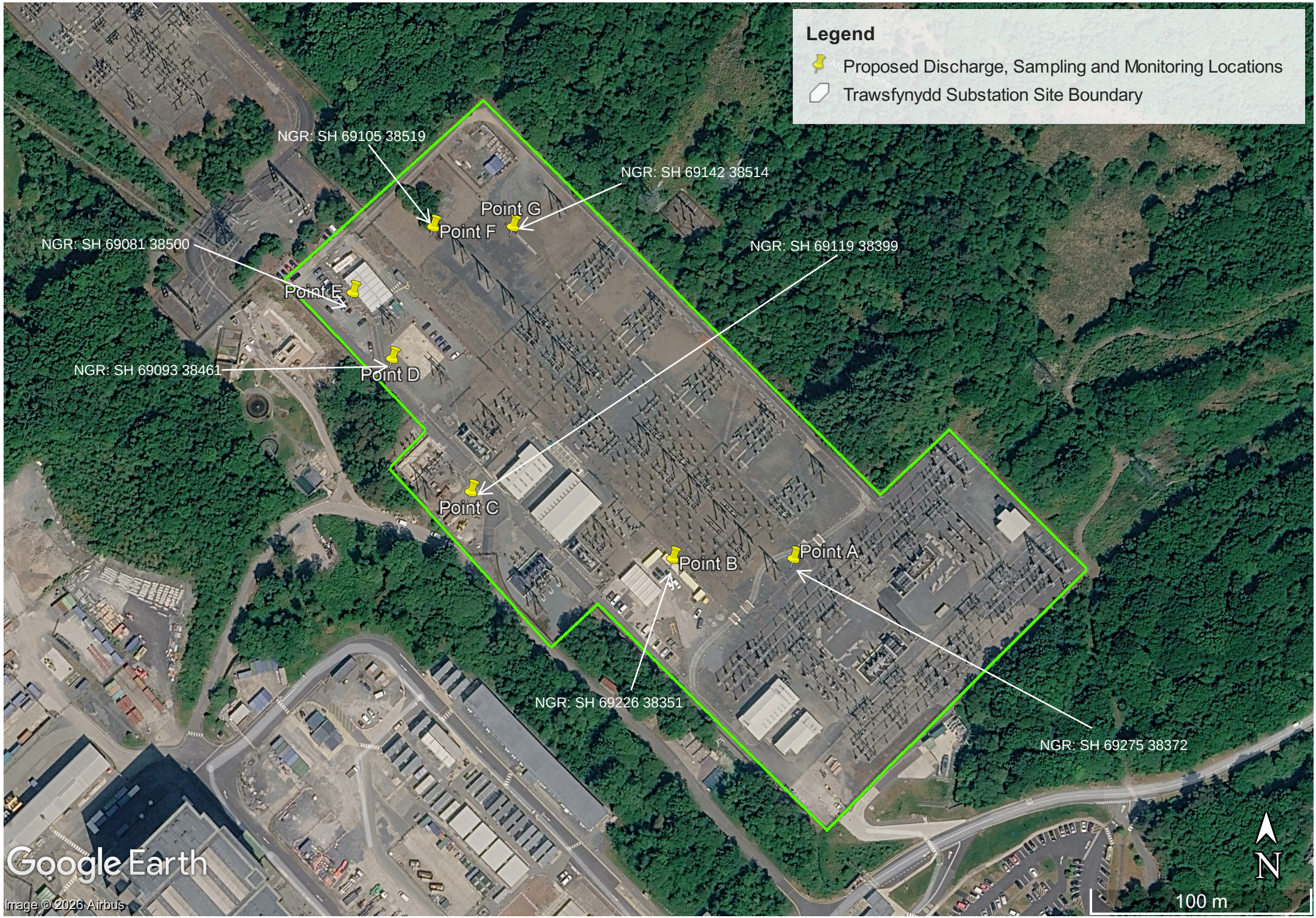
5.1.12 Make sure people understand what you do

All on-site personnel will be made aware of the CEMP and any permits, licences and / or consents which apply to the works being undertaken (including the proposed WDA). NGET will be responsible for communicating any additional EMS requirements expected to be adhered too by MSI to the Contractor outside of this permit application under their contractual obligations.

Appendix A

Site Infrastructure Plan

Appendix A – Site Infrastructure Plan


Legend
Proposed Discharge, Sampling and Monitoring Locations
Trawsfynydd Substation Site Boundary
NGR: SH 69105 38519
NGR: SH 69142 38514
Point G
Point F
NGR: SH 69081 38500
NGR: SH 69119 38399
Point E
NGR: SH 69093 38461
Point D
Point C
Point B
Point A
NGR: SH 69226 38351
NGR: SH 69275 38372
Google Earth
Image © 2026 Airbus
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100 m

Appendix B

Environmental Risk Assessment

Appendix B – Environmental Risk Assessment



National Grid Electricity Transmission
PTNO - Trawsfynydd GSP Construction

Water Discharge Activity Permit Application – Appendix B: Environmental Risk Assessment

September 2026

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National Grid Electricity Transmission

PTNO - Trawsfynydd GSP Construction

Water Discharge Activity Permit Application – Environmental Risk Assessment

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Prepared for

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Revisions

Rev	Date	Details
1	11/09/2026	Appendix B – For Issue

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1. Introduction

This Environmental Risk Assessment (ERA) has been completed to support an environmental permit application (to be submitted to Natural Resources Wales (NRW)) for a bespoke Water Discharge Activity (WDA) permit, required for construction activities associated with the Trawsfynydd Substation. This development is part of the Pentir to Trawsfynydd (PTC1 and PTNO) reinforcement works, which form part of the overarching Great Grid Partnership (GGP): a National Grid Electricity Transmission (NGET) project. The site area is centred on at grid references SH 6922 3840, with the closest postcode LL41 4DU.

The below ERA (developed in accordance with GOV.UK guidance on 'How to carry out a risk assessment for an Environmental Permit'[1]) identifies potential hazards and pathways in relation to the proposed WDA only, as well as potential sensitive receptors. It summarises the potential harm that could be instigated (without any control / mitigation measures being implemented), and the probability of this occurring. This is considered alongside the level of consequence that would be incurred if the harm was caused (to the receptors) to give an overall risk magnitude rating. See below criteria. The proposed control / mitigation measures to be implemented are then detailed to alleviate / eliminate the risk, alongside the residual risk rating.

The below ERA is based on information known at the time of writing, which is provided in the supporting application document. The ERA will be used to inform the development of the Contractor's Construction Environmental Management Plan (CEMP) which will be implemented on site to help manage any impacts from the proposed works, including the WDA.

The ERA applies to the proposed WDA described in the associated environmental permit application only. Wider environmental-related risks stemming from the overall construction scheme will be captured in the relevant on-site management system documentation.

1.1.1 Risk Assessment Criteria

The approach undertaken for the ERA comprised the following stages:

1. Identification of the hazards (defined as the activity or event with potential to cause environmental risk) which might be posed by the proposed discharge activity.
2. Identification of receptors (i.e., receiving environment, people, property, animals).
3. Identification of the pathways or routes by which the hazard might come into contact with the receptor(s).
4. Summary of the potential harm that could be caused should contact between the hazard(s) and receptor(s) occur.
5. Assess the potential impact through consideration of the probability of exposure (likelihood of the risk occurring / hazard coming into contact with the receptor), and the level of harm (consequence) that could occur (without mitigation measures). These combined (see below criteria rating) provide a subsequent magnitude of the risk (harm that could be caused).
6. Describe the anticipated control or mitigation measures that will be implemented to reduce the level of risk.
7. Assess the residual level of the risk (after mitigation measures have been implemented).

The criteria used for the assessment of the magnitude of risk within the ERA is defined in Table 1 below. The nature of these assessments, being qualitative, is that they are subjective, and the methodology and criteria used to complete the ERA can therefore vary. The criteria developed and applied to this ERA has been based on the professional judgement and expertise of the WSP permitting team responsible for developing this permit application on behalf of NGET.

[1] Natural Resources Wales / How to carry out a risk assessment for an Environmental Permit

Table 1 - Qualitative Environmental Risk Assessment Impact Assessment Criteria

Impact Assessment Rating	Criteria
Probability of Exposure	***Defined as the likelihood of the receptor(s) being exposed to the hazard(s)***
High	Exposure is probable. Direct exposure likely with no distance or barriers (e.g., physical features) between hazard and receptor.
Medium	Exposure is possible. Barriers to exposure are less controllable.
Low	Exposure is unlikely. Several barriers exist between hazard and receptor to mitigate against exposure.
Very Low	Exposure is very unlikely. There are effective, multiple barriers in place to mitigate against exposure.
Consequence	***Potential level of harm that could be caused to the receptor(s) if exposed to the hazard(s)***
High	Consequences are likely to be long-lasting and / or affect a large area or number of receptors. Effects require intervention to address and are difficult to reverse.
Medium	Consequences are likely to be medium-duration and / or affect a considerable sized area or number of receptors. Effects require intervention to address but are reversible.
Low	Consequences are short-term duration and unlikely to impact a considerable sized area or number of receptors. Requires some level of intervention to address.
Very Low	Consequences are minimal in terms of duration and have limited-no lasting effects. Requires little to no intervention to address.
Magnitude of Risk	***Determined by combining the Probability of Exposure by the level of Consequence*** *(refer the below Magnitude Rating Grid Box in* Table 2*)*
High	Identified risks will require stringent monitoring and formal methods of recording / reporting. Reportable to external stakeholders (e.g., regulators).
Medium	Identified risks require some level of regular monitoring and recording / reporting. Not necessarily reportable to external stakeholders.
Low	Identified risks require some level of monitoring / checking but this is not necessarily reportable / recorded.
Very Low	Identified risks require minimal monitoring / checking.

The below Grid Box summarises how the overall magnitude has been determined for each identified hazard and risk within the qualitative ERA. Note that the ERA methodology has been developed using a professional and subjective opinion; it is therefore open to some element of interpretation. However, the overall purpose of the ERA is to identify the key risks from the proposed WDA, in accordance with the recognised source-pathway-receptor methodology and outline what control measures will therefore be implemented to reduce the overall level of risk to demonstrate the likely impact of the WDA on the environment to support the permit application.

Table 2 - Qualitative Environmental Risk Assessment Magnitude Rating

Probability of Exposure (below) / Consequence (right)	High	Medium	Low	Very Low
High	High	High	Medium	Medium
Medium	High	Medium	Medium	Low
Low	Medium	Medium	Low	Low
Very Low	Medium	Low	Low	Very Low

2. Environmental Risk Assessment

Table 3 - Environmental Risk Assessment for Proposed WDA

Hazard	Receptor	Pathway	Potential Harm	Magnitude of Risk (based of Probability of Exposure and Consequence)	Control Measures	Residual Risk (after control measures implemented)
Uncontrolled discharge (e.g., no control of flow rate / volume) of abstracted groundwater and surface water runoff	Made Ground, underlying groundwater, Llyn Trawsfynydd.	Direct pathway via discharge to ground	Flooding	**Probability: High Consequence: Medium** **Magnitude of Risk: High**	Proposed discharge activity will be controlled, in that the flow rate (and therefore overall volume) will be managed by pump sizing restrictions and management of discharge locations and durations.	**Probability: Very Low Consequence: Low** **Overall Risk: Low**
Failure of pollution prevention / silt treatment measures resulting in silty discharge	Made Ground, groundwater, Llyn Trawsfynydd	Direct – through failure or degradation of silt socks, soakaways or other pollution prevention measures resulting in untreated discharge	Pollution of Made Ground and groundwater through elevated suspended solids. Potential indirect impacts on Llyn Trawsfynydd.	**Probability: Low Consequence: Medium Magnitude of Risk: Medium**	All discharge water will pass through silt socks prior to discharge to soakaway, providing suspended solids removal. These will be installed on the end of pipes will have hydrocarbon-detector capabilities. Silt socks to be inspected regularly and replaced when required. Monitoring and sampling will be undertaken in	**Probability: Low Consequence: Low** **Magnitude of Risk: Low**

Hazard	Receptor	Pathway	Potential Harm	Magnitude of Risk (based of Probability of Exposure and Consequence)	Control Measures	Residual Risk (after control measures implemented)
					accordance with permit requirements. These will be incorporated into the Contractors CEMP. Any other pollution prevention measures which are implemented (as outlined in Section 3.5 of the Supporting Report) will be routinely checked by site operatives.	
Presence of unexpected pollutants within effluent	Made Ground, groundwater, Llyn Trawsfynydd	Direct pathway via discharge of effluent to the ground	Deterioration of receiving ground / groundwater quality and potential indirect impacts on nearby receptors (such as flora / fauna in the immediate vicinity of the discharge)	**Probability: Low** **Consequence: Medium** **Magnitude Risk: Medium**	Based on ground investigations carried out previously (and summarised within the Supporting Report Section 3.2), contaminants are not expected to be present in groundwater / surface water run-off. The only anticipated pollutants are related to construction activities, in particular, silt, for which there will be suitable measures for removal (via silt socks as described above). The CEMP will set out specific measures to be implemented with regards to	**Probability: Very Low** **Consequence: Very low** **Magnitude of Risk: Very Low**

Hazard	Receptor	Pathway	Potential Harm	Magnitude of Risk (based of Probability of Exposure and Consequence)	Control Measures	Residual Risk (after control measures implemented)
					the use of chemicals / oil / fuel on site and waste management; to ensure that these do not result in impact to the environment (not considered further here as do not directly relate to proposed WDA).	
Monitoring failure leading to discharge of water with unknown composition or flow rate	Made Ground, groundwater, Llyn Trawsfynydd	Failure of monitoring equipment or incorrect interpretation of results	Potential discharge outside permit requirements. Potential pollution of groundwater.	**Probability: Low Exposure: High Risk: Medium**	Sampling and monitoring equipment will be operated and maintained in accordance with manufacturer / supplier recommendations and will be subject to regular checks by site operatives. Any issues identified with equipment will be reported to site management and faulty equipment either fixed or replaced. Final monitoring / sampling arrangements will be dependent upon requirements incorporated in the WDA permit. Personnel required to undertake sampling / monitoring checks will be competent to do so and specific requirements will be	**Probability: Very Low Consequence: Very low** **Magnitude of risk: Very Low**

Hazard	Receptor	Pathway	Potential Harm	Magnitude of Risk (based of Probability of Exposure and Consequence)	Control Measures	Residual Risk (after control measures implemented)
					taken from the WDA permit and incorporated into relevant site documentation / procedures.	
Overflow from the Made Ground area to surrounding habitats	Made Ground, groundwater, surrounding habitats	Ground saturation resulting in surface expression of discharge water or uncontrolled runoff.	Damage to surrounding habitats. Potential pollution of surrounding areas	**Probability of exposure: Low Consequence: High Risk: Medium**	Discharge volumes based on conservative estimates. Multiple discharge locations distribute infiltration across the site and alleviate any associated flood risk. Dewatering can be managed dynamically or paused where necessary. Contingency arrangements available for tankering water off-site if discharge capacity is exceeded. The local hydraulic gradient suggests that Llyn Trawsfynydd is unlikely to be affected by flooding associated with the site, as it lies hydraulically upgradient.	**Probability: Very Low Consequence: Very Low** **Risk: Very Low**
Climate change impacts including: ■ **Higher average temperatures;** ■ **More heat waves and hot days;**	Infrastructure on site Drainage arrangements Final receiving discharge environment,	Discharge of construction effluent not effectively managed due to damaged equipment or overwhelmed drainage systems.	Damage to drainage infrastructure on site Damage to treatment systems and other physical pollution prevention measures on site	**Probability: Medium Consequence: Medium** **Risk: Medium**	Local weather conditions will be monitored by on site operatives and a suitable flood response procedure will be initiated to prevent impacts. Existing substation chippings to be used for soakaway-	**Probability: Low Consequence: Low** **Risk: Low**

Hazard	Receptor	Pathway	Potential Harm	Magnitude of Risk (based of Probability of Exposure and Consequence)	Control Measures	Residual Risk (after control measures implemented)
▪ **Rising sea levels; and** ▪ **Changes in rainfall patterns and intensity resulting in increased flood risk**	Made Ground area.	During periods of heavy and / or prolonged rainfall, the site's drainage arrangements may become overwhelmed, resulting in flooding on site	Increased potential for uncontrolled discharge events.		type arrangement to mimic natural drainage routes to the Made Ground. Dewatering can be dynamically controlled and managed by site contractors to prevent flooding of the soakaway at each discharge location, including by pausing dewatering activities and associated discharges. Equipment will be operated and maintained in accordance with manufacturer / supplier recommendations and will be subject to regular checks by site operatives. Any issues identified with equipment will be reported to site management and faulty equipment either replaced or fixed. During periods of extreme heat and prolonged dry weather, a lower volume of rainfall would need to be managed, however this also poses the risk of lack of dilution of abstracted groundwater. Impacts will be managed via regular inspections and	

Hazard	Receptor	Pathway	Potential Harm	Magnitude of Risk (based of Probability of Exposure and Consequence)	Control Measures	Residual Risk (after control measures implemented)
					maintenance of the equipment in line with manufacturer recommendations, and contingencies can be initiated to tanker the effluent off site for disposal in accordance with the relevant waste regulatory requirements. Regular sampling and monitoring of effluent undertaken in line with permit requirements, to ensure effluent of a suitable quality is being discharged.	
Unauthorised access or vandalism affecting discharge infrastructure	Drainage / discharge-related infrastructure on site including pollution prevention measures and silt treatment; Made ground receptor	Direct pathway if targeted through acts of vandalism Direct pathway through discharges to ground using affected / ineffective equipment	Damage to drainage / discharge treatment infrastructure and equipment including pollution prevention measures	**Probability: Low** **Consequence: Medium** **Risk: Low**	Security measures will be established during site set-up and reflected in the CEMP. Police would be contacted in the event of a vandalism-related incident, alongside emergency clean-up contractors, where required. If a vandalism-related event results in impacts to the WDA and therefore the receiving environment (peatland area), NRW will be notified (in accordance with WDA permit conditions) and	**Probability: Very Low** **Consequence: Very Low** **Risk: Very Low**

Hazard	Receptor	Pathway	Potential Harm	Magnitude of Risk (based of Probability of Exposure and Consequence)	Control Measures	Residual Risk (after control measures implemented)
					further action undertaken as necessary.	
Fire and firewater runoff (in the event of fire occurring on site)	Infrastructure on site Final receiving discharge environment, peatland area	Direct pathway as firewater run-off will follow on-site drainage / natural site drainage	Contamination of Made Ground and groundwater. Damage to infrastructure. Damage to equipment managing the discharge of construction effluent	**Probability: Very Low** **Consequence: High** **Risk: Medium**	A Fire Risk Assessment will be carried out to understand the fire risk level associated with the site, alongside supporting fire drills and management for the prevention of a fire in the first instance and ensure suitable arrangements are available. In the event of a fire, the Fire and Rescue Service (FRS) will be contacted. Firewater run-off is expected to be collected in the permanent drainage surface water run-off system. All discharge activities would cease in the event of a fire occurring on site. Emergency Response Contractor may be contacted to support with clean-up following FRS attendance on site.	**Probability: Very Low** **Consequence: Very Low** **Risk: Very Low**

Hazard	Receptor	Pathway	Potential Harm	Magnitude of Risk (based of Probability of Exposure and Consequence)	Control Measures	Residual Risk (after control measures implemented)
Odour	N/A to standalone WDA					
Noise	N/A to standalone WDA					
Dust	N/A to standalone WDA					



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Appendix C

Dewatering Assessment

Appendix C – Dewatering Assessment

TECHNICAL NOTE

DATE:	30 March 2026	**CONFIDENTIALITY:**	Confidential
SUBJECT:	Dewatering Assessment - Trawsfynydd		
PROJECT:	National Grid, PTNO_PCN1	**AUTHOR:**	N. Boaglio
CHECKED:	Z. Krips	**APPROVED:**	M. Durham

INTRODUCTION

As part of the PTNO development, discharge assessments are required for cutting works, particularly excavation activities, associated with the substation upgrade at Trawsfynydd. This assessment estimates potential groundwater discharges in the excavations and determines the associated radius of influence (ROI). The report aims to provide a conservative estimate of groundwater discharge and outlines the calculation methods and conceptual approach, using Ground Investigation (GI) data and publicly available sources.

The following sections detail the local geology, groundwater levels, typical cross-sections, permeability, and available GI data relevant to the assessment.

Data Sources

Table 1 summarises the available information used in the dewatering assessment.

Table 1: Summary of available data

Data	Description	Source
Geology and public boreholes	Available information in GeoIndex	https://mapapps2.bgs.ac.uk/geoindex/home.html https://api.bgs.ac.uk/sobi-scans/v1/borehole/scans/items/135916
Geological map	Bedrock and Superficial Deposits - Snowdon (Sheet 119, 1997)	https://largeimages.bgs.ac.uk/iip/mapsportal.html?id=1001610
Ground Investigation (GI) and groundwater levels	Baseline information and groundwater monitoring data	Interpretative Ground Investigation Report – Trawsfynydd – Pentir 400kV Uprating FEED, National Grid - BakerHicks, 13 March 2025
LIDAR	Topographic data	https://datamap.gov.wales/maps/lidar-data-download/view#/
Hydraulic conductivity (k)	Magnitude of k for different materials	Kruseman, G.P. and de Ridder, N.A. (1994). Analysis and evaluation of pumping test data. 2nd ed. ILRI Publication 47, Wageningen.

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Site location and context

The site is located in northwest Wales, approximately 7.5 km south of Blaenau Ffestiniog and 12 km east of Porthmadog. The site comprises an existing substation owned by Magnox–Rozvodna, covering approximately 0.065 km^2, and forms part of the wider Magnox Trawsfynydd site, which extends to approximately 0.18 km^2. The former Trawsfynydd Nuclear Power Station, currently undergoing decommissioning, lies immediately adjacent to the southwestern boundary of the substation.

The site (Figure 1) is accessed via the Magnox Trawsfynydd Nuclear Power Station access road, which connects to the A470 to the east. The surrounding area is comprised of woodland and shrubbery, with overhead electrical lines entering the site from the north, east and south. The site is located approximately 160 m north of the northern shoreline of Llyn Trawsfynydd and lies at an elevation of approximately 174 m to 185 mAOD.

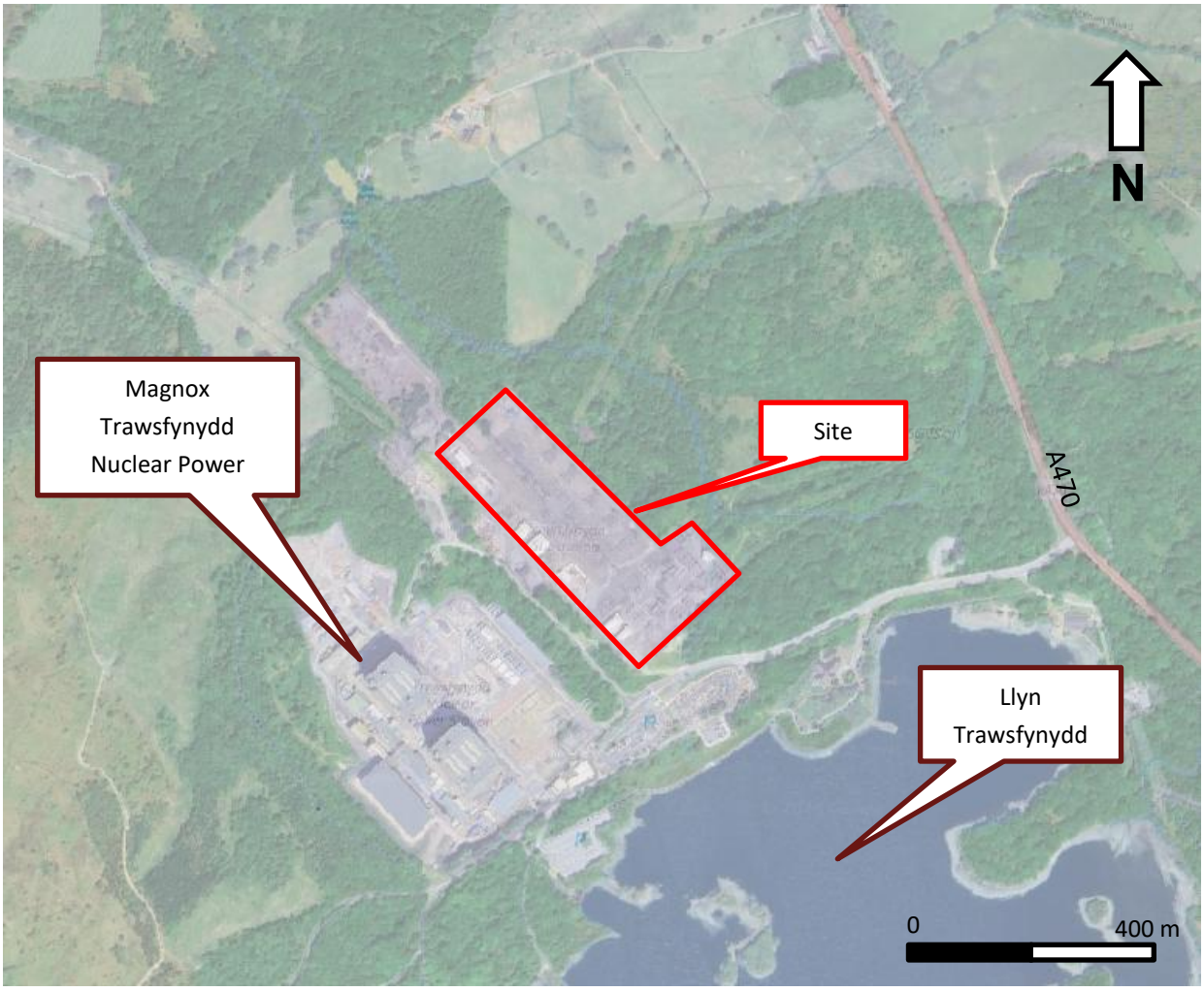


Figure 1 - Site location plan and approximate site extents

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Proposed Works

The proposed works at the site, as currently understood, include upgrades to Cable Sealing End foundations at various locations, installation of two new underground cables approximately 370 m and 340 m in length (with part of one route utilising an existing cable trough), construction of a new shunt reactor, and installation of a new gantry. A new access road was initially proposed prior to the ground investigation; however, this element was subsequently removed from the project scope. No ground investigation works were undertaken for the access road, and it has therefore been excluded from this report.

GEOLOGY AND HYDROGEOLOGY

Geology

BRITISH GEOLOGICAL SURVEY (BGS) RECORDS

Borehole records from the BGS indicate topsoil and peat up to 0.9 metre in depth and morainic deposits up to 5 metres deep across the site and in the southwestern area, as shown in Table 2.

Table 2: BGS – Borehole records

Borehole ID	Length (m)	Year	GL (mAOD)	GWL (mAOD)*	Description
SH63NE60[1]	10.97	1958	199.44	196.44	0.0 - 0.2 m Topsoil. 0.2 - 4.5 m Clayey sand and gravel with cobbles and large boulders (Moraine). 4.5 - 10.97 m Fractured. Massively bedded medium to coarse greywacke.
SH63NE62[2]	11.58	1958	195.52	191.02	0.0 - 0.2 m PEAT. 0.2 - 4.5 m Clayey sand gravel with cobbles and large boulders (Moraine). 4.5 - 11.6 m Fissured and strongly fractured. Massively bedded med to coarse greywacke.

[1] https://api.bgs.ac.uk/sobi-scans/v1/borehole/scans/items/137562
[2] https://api.bgs.ac.uk/sobi-scans/v1/borehole/scans/items/137564

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Borehole ID	Length (m)	Year	GL (mAOD)	GWL (mAOD)*	Description
SH63NE61[3]	9.44	1958	197.51	192.31	0 – 2.4 m Clayey sand gravel with cobbles and large boulders (Moraine). 2.4 – 9.4 m Medium to coarse grained greywacke with quartz veining and iron staining of the fracture planes.
SH63NE43[4]	14.63	1958	193.65	186.65	0.0 - 0.9 m PEAT. 0.9 - 7.0 m Clayey sand and gravel with cobbles large boulders (Moraine). 7.0 - 14.6 m Fissured and fractured. Massively bedded med to fine grained greywacke.
SH63NE68[5]	13.1	1958	184.27	173.57 **	0.0 - 0.4 m PEAT. 0.4 - 4.5 m Large boulders with clayey sand and gravel (Moraine). 4.5 - 13.1 m Badly fractured. Massively fine grained greywacke.
SH63NE39[6]	6.4	1958	200.07	197.37	0.0 - 0.3 m Topsoil. 0.3 - 3.6 m Large boulders with some clayey sand and gravel. 3.6 - 6.4 m Fractured massively bedded fine grained greywacke.

GL: ground level
GWL: groundwater level
*Ground Water level at construction (Water strike)
**Artesian ground water strike with flow to ground surface.

[3] https://api.bgs.ac.uk/sobi-scans/v1/borehole/scans/items/137563
[4] https://api.bgs.ac.uk/sobi-scans/v1/borehole/scans/items/137545
[5] https://api.bgs.ac.uk/sobi-scans/v1/borehole/scans/items/137570
[6] https://api.bgs.ac.uk/sobi-scans/v1/borehole/scans/items/137541

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PREVIOUS GROUND INVESTIGATION:

2025 Groundwater Investigation Report (GIR[7])

BakeHigks conducted a ground investigation in October and November 2024 (Figure 2), which included five trial pits (TTP01 to TTP05) and ten boreholes (designated TBH01 to TBH10).

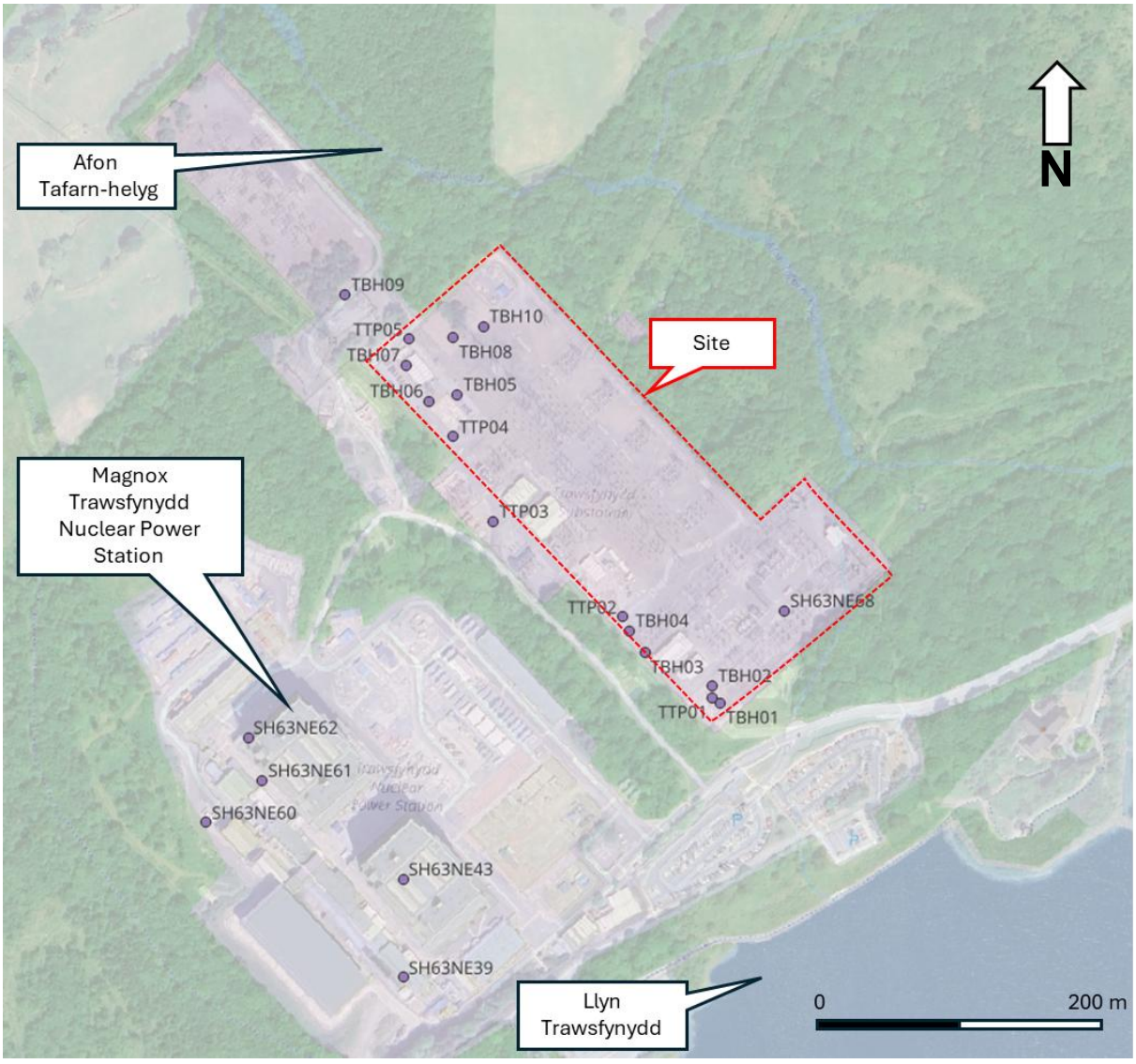


Figure 2: GI boreholes and trial pits location

[7] Interpretative Ground Investigation Report– Trawsfynydd – Pentir 400kV Uprating FEED, National Grid -BakerHicks, 13 March 2025

All boreholes were scheduled to reach 8 m below ground level (mbgl), based on an assumed 3 m of superficial deposits and 5 m of bedrock. Two holes reached the planned depth of 8 m. Five holes were terminated at shallower depths after obtaining 5 m of bedrock core. Three holes did not encounter bedrock and were drilled to at least 8 m, with final depths determined by the supervising engineer. All trial pits were scheduled to a depth of 2 m, but three could not reach this depth due to unstable granular material or obstructions such as boulders or potential bedrock.

MADE GROUND

The BGS Maps and Lexicon identify Made Ground (MG) in the site area. Based on GIR 2025, borehole and trial pit logs indicate MG thickness ranges from 0.07 m (TBH08) to 1.7 m (TBH09) in the northern part of the site, with an average of approximately 0.69 m. Made Ground forms a thin, variable superficial layer across the site.

SUPERFICIAL DEPOSITS

Although BGS Maps do not record any superficial deposits beneath the site, till deposits are mapped in the surrounding areas to the north and west of the site.

GIR (2025) borehole data consistently describe superficial deposits as granular and coarse clastic material, including gravel, cobbles, and boulders. Thickness varies from 0.40 (TBH02) m to 9.2 m (TBH07), with an average of 3.23 m across the site. These deposits mainly consist of coarse greywacke-derived gravel, subangular to angular cobbles, and occasional large boulders, sometimes interbedded with sandy or clayey matrices. In several trial pits, this unit forms a significant layer above the competent greywacke bedrock, indicating a heterogeneous colluvial or glacially reworked origin with localised pockets of very coarse material.

BEDROCK AND STRUCTURAL GEOLOGY

The BGS identifies the bedrock beneath the site as part of the Rhinog Formation, comprising grey to bluish grey, thick-bedded turbiditic sandstones, conglomerates, and laminated sandstones, with thin intercalations of siltstone and mudstone. The geological map sheet (Sheet 119, 1997[8]) indicates northwest–southeast trending inferred faults approximately 250 m west and 300 m east of the proposed site, with an unknown displacement. Mudstones from the Hafotty Formation may be present in the northern extent of the site located close to the northern site boundary.

GEOLOGICAL SEQUENCE

Table 3 summarises the geological units mapped within the site.

[8] https://largeimages.bgs.ac.uk/iip/mapsportal.html?id=1001610

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Table 3: Expected geological sequence within the site

Formation Name	Description	Thickness
Superficial Deposits	Morainic deposits (superficial deposits including granular and coarse clastic material, gravel, cobbles, and boulders).	Varies from 0.45 m to 9.0 m
Rhinog Formation (Bedrock)	Grey to bluish grey, thick-bedded turbiditic sandstones, conglomerates, and laminated sandstones, with thin intercalations of siltstone and mudstone	BGS indicates 400 to 780 m

Hydrogeology

AQUIFER DESIGNATION

According to the BGS, the superficial deposits on site are classified as a Secondary (undifferentiated) aquifer. These are aquifers that cannot be assigned to either category A or B. These units have been designated as minor or non-aquifers in various locations due to their variable characteristics.

The bedrock is classified as a Secondary A aquifer. This type of aquifer typically supports water supplies at a local rather than strategic scale and, in some cases, forms an essential source of baseflow to rivers.

GROUNDWATER LEVEL DATA

The groundwater assessment presented here is based solely on the monitoring undertaken by GIR November 2024 and February 2025. Table 4 summarises the pits where groundwater was encountered.

Table 4: Trial pits groundwater levels (water strike)

Pit ID	Depth (m)	Description	Water strike observed during construction
TTP02	2.0	Grey slightly sandy angular COBBLES and BOULDERS of greywacke. Grading to brown slightly gravelly clay in places.	Fast inflow. Groundwater encountered at 0.6 m depth.

Pit ID	Depth (m)	Description	Water strike observed during construction
TTP03	1.2	Greyish brown slightly sandy clayey angular to subrounded fine to coarse GRAVEL of greywacke. High angular cobble and boulder content of greywacke.	Medium inflow. Groundwater encountered at 0.6 m depth.
TTP04	1.6	Greyish brown sandy clayey angular fine to coarse GRAVEL of greywacke. High angular cobble content of greywacke.	Damp strata below 1.10 m depth. Standing water at 1.50 m depth.
TTP05	2.0	Brownish grey slightly sandy gravelly slightly clayey angular COBBLES and BOULDERS of greywacke. Grading to dark brown sandy clay in places.	Medium inflow. Groundwater encountered at 0.3 m depth.

Table 5 and Table 6 summarise the boreholes with installations and the groundwater observations and levels measured between November 2024 and February 2025.

Table 5: Borehole groundwater level monitoring records

BH ID	Slotted section (mbgl)	Description	Groundwater observation during construction
TBH02	2.7-5.2	Very strong grey fine to medium grained GREYWACKE. Discontinuities are horizontal to sub-horizontal, closely to medium spaced, undulating, rough with much orangish brown staining.	Slow flow

BH ID	Slotted section (mbgl)	Description	Groundwater observation during construction
TBH04	1.0-4.0	Between 1.00-2.00m, gravel includes quartz. Greyish brown very gravelly clayey fine, predominantly medium and coarse SAND of quartz, feldspar and mafic minerals. Occasional pockets (up to 60mm) of stiff brown very gravelly clay.	Minor inflows possibly masked by drilling flush.
TBH05	1.5-7.0	Grey subangular coarse GRAVEL, COBBLES and BOULDERS of greywacke. Between 3.0-4.5 m, occasional woody plant remains (root or branch).	Minor inflows possibly masked by drilling flush.
TBH09	6.0-8.0	Strong to very strong, occasionally extremely strong, very thickly bedded fine to coarse grained GREYWACKE.	Minor inflows possibly masked by drilling flush.
TBH10	4.8-6.2	Grey coarse GRAVEL and COBBLES of greywacke (Some plant soil material**).	Medium inflows.

Table 6: Summary of groundwater levels

BH ID	18/11/2024	29/11/2024	10/12/2024	07/01/2025	21/01/2025	04/02/2025
Groundwater level (m AOD)						
TBH02	184.99	184.78	184.86	184.92	184.72	184.81
TBH04	183.12	183.09	183.11	183.14	183.09	183.14
TBH05	177.87	177.86	177.89	177.91	177.85	177.89
TBH09	172.58	172.54	172.61	172.73	172.56	172.69

BH ID	18/11/2024	29/11/2024	10/12/2024	07/01/2025	21/01/2025	04/02/2025
TBH10	175.33	175.17	175.29	175.4	175.05	175.22

Monitoring boreholes TBH02 and TBH04 are located in the southern area of the site, boreholes TBH05, TBH09 and TBH10 are located in the northern area.

In the southern area, the highest groundwater levels were recorded in TBH02 at 184.99 mAOD (0.16 mbgl) in November 2024 and in TBH04 at 183.14 mAOD (0.83 mbgl) in both January and February 2025. The lowest groundwater level was 183.09 mAOD (0.88 mbgl) in TBH04, in November 2024 and also in January 2025. The average levels were 183.11 mAOD for TBH04 and 184.85 mAOD for TBH02.

In the northern area, groundwater levels also fluctuated. The highest level was 177.91 mAOD (1.96 mbgl) in TBH05 in January 2025, while the lowest was 172.54 mAOD (1.44 mbgl) in TBH09 in November 2024. Average values were 177.88 mAOD (TBH05), 172.60 mAOD (TBH09), and 175.25 mAOD (TBH10).

HYDRAULIC CONDUCTIVITY (K)

The superficial deposits consist of morainic sands and gravels, which generally have moderate to high hydraulic conductivity due to their coarse grain size and well-connected pore spaces.

The bedrock's hydraulic conductivity is expected to be variable and generally lower than that of the superficial deposits, reflecting differences in lithology, cementation, and the presence of finer-grained interbeds. Groundwater flow in the bedrock is likely controlled by secondary permeability, such as fissures and fractures. Based on current information, the superficial deposits are not expected to be hydraulically separated from the underlying bedrock. No in-situ or laboratory hydraulic conductivity (k) testing was conducted during the 2025 ground investigation; therefore, k-values from literature were considered for the dewatering assessment. Table 7 summarises hydraulic conductivity values for the superficial deposits and sedimentary rocks (Kruseman and de Ridder, 1994).

Table 7: K-values for different kinds of superficial deposits and rocks (from Bouwer, 1978, in Kruseman & De Ridder [9])

Permeabilities		Minimum k (m/s)	Maximum k (m/s)	Average k (m/s)
	Fine sand	$1.16x10^{-05}$	$5.79x10^{-05}$	$3.47x10^{-05}$

[9] Kruseman, G.P. and de Ridder, N.A. (1994). Analysis and evaluation of pumping test data. 2nd ed. ILRI Publication 47, Wageningen.

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Permeabilities		Minimum k (m/s)	Maximum k (m/s)	Average k (m/s)
Superficial Deposits	Medium sand	$5.79x10^{-05}$	$2.31x10^{-04}$	$1.45x10^{-04}$
	Coarse sand	$2.31x10^{-04}$	$2.31x10^{-03}$	$1.27x10^{-03}$
	Gravel	$2.31x10^{-03}$	$2.31x10^{-02}$	$1.27x10^{-02}$
	Sand and gravel mixes	$5.79x10^{-05}$	$2.31x10^{-03}$	$1.19x10^{-03}$
	Clay, sand and gravel mixes	$1.16x10^{-08}$	$1.16x10^{-06}$	$5.84x10^{-07}$
Rocks	Sandstone	$1.16x10^{-08}$	$1.16x10^{-05}$	$5.79x10^{-06}$

During the GI in 2025, Standard Penetration Test (SPT) were conducted in-situ, therefore the Hazen method is used to provide an empirical relationship between permeability and the effective grain size, derived from particle-size distribution data. This method applies the equation $K = A \times (D_{10})^2 \times 864$, where D_{10} represents the effective grain size in millimetres and A is a temperature-dependent coefficient, taken as 1.15 for groundwater at approximately 10°C. The Hazen method offers a rapid approximation of permeability (k) for clean, relatively uniform sands, and is used here to complement available ground investigation data and support the assessment of likely permeability behaviour within the excavated materials. Table 8 summarises the Hazen method results for the boreholes and trial pits for the southern and northern areas.

Table 8: Hazen method for estimate k-values

Name	Depth (m)	Geology on log	D10 (mm)	K (m/s)
TBH01	0.1-0.4	MADE GROUND: Dark brown sandy clayey gravel.	0.146	2.45×10^{-10}
TBH02	0.25-0.4	Greyish brown slightly sandy slightly clayey GRAVEL.	6.48	4.83×10^{-07}
TBH04	2.0-2.9	Greyish brown very gravelly clayey SAND.	0.248	7.07×10^{-10}
TBH06	1.2-1.5	Brown very sandy clayey GRAVEL.	0.121	1.68×10^{-10}
TBH07	0.1-0.3	MADE GROUND: Brown mottled dark grey very sandy clayey gravel.	1.81	3.77×10^{-08}
TBH09	1.2-2.5	MADE GROUND: Dark grey mottled black sandy slightly clayey gravel.	1	1.15×10^{-08}

Name	Depth (m)	Geology on log	D10 (mm)	K (m/s)
TTP02	0.25-0.45	MADE GROUND: Greyish brown slightly sandy slightly gravelly cobbles.	71.6	5.90×10^{-05}
TTP03	0.2-0.4	MADE GROUND: Grey mottled orange brown sandy slightly clayey gravel with a high cobble content.	7.74	6.89×10^{-07}
TTP04	1.1-1.6	Greyish brown sandy clayey GRAVEL with a high cobble content.	0.562	3.63×10^{-09}
TTP05	0.3-1.0	Brownish grey slightly sandy gravelly slightly clayey COBBLES.	15.7	2.83×10^{-06}

GROUNDWATER DISCHARGE ASSESSMENT

Excavation area/section

Based on information provided by the client, the required earthworks at the Trawsfynydd site are associated with foundation construction. No earthworks drawings have been produced at this stage, as these works are temporary in nature and are typically designed, detailed and managed by the Temporary Works designer. The estimated volume includes allowances for localised excavations for individual foundations; however, where foundations are closely spaced, full excavation of the area may be required, increasing the earthwork volume. The final extent of excavation will depend on the contractor's method statement and the presence and location of existing underground services within this operational site.

Assumptions:

- Discharge calculations are based on ground level, as groundwater in the unconfined aquifer is expected to align with the topography;
- Proposed excavation works are between 0.9 m and 1.2 m; and
- The Rhinog Formation is anticipated to occur below approximately 3 m depth, and no dewatering is expected from this unit, as it will not be intersected by the proposed excavations.

Table 9 summarises the proposed foundation excavations in the south and north areas, these areas are also shown on Figure 3 and in Appendix A.

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Table 9: Proposed excavations

Foundation Description	Code	Foundation size (mm)			Total Quantity South Area	Total Quantity North Area
		W	L	H		
EARTH SWITCH	ESW	2500	2500	900	3	12
CAPACITIVE VOLTAGE TRANSFORMER	CVT	2300	2300	900	5	3
DISCONNECTOR WITH 1 EARTH SWITCHES	DISC/1 ESW	2500	2500	900	N/A	6
DISCONNECTOR WITH 2 EARTH SWITCHES	DISC/2 ESW	2500	2500	900	N/A	6
CURRENT TRANSFORMER	CT	2300	2300	900	N/A	6
CIRCUIT BREAKER	CB	2700	2700	900	N/A	6
POST INSULTAOR	PI	2000	2000	900	N/A	9
PANTOGRAPH DISCONNECTOR	PANTO	2700	2700	900	N/A	3
SURGE ARRESTOR	SA	2000	2000	900	N/A	10
GANTRY FOUNDATION	N/A	4000	8000	900	N/A	2
CABLE SEALING END	CSE	1800	1800	1200	6	12

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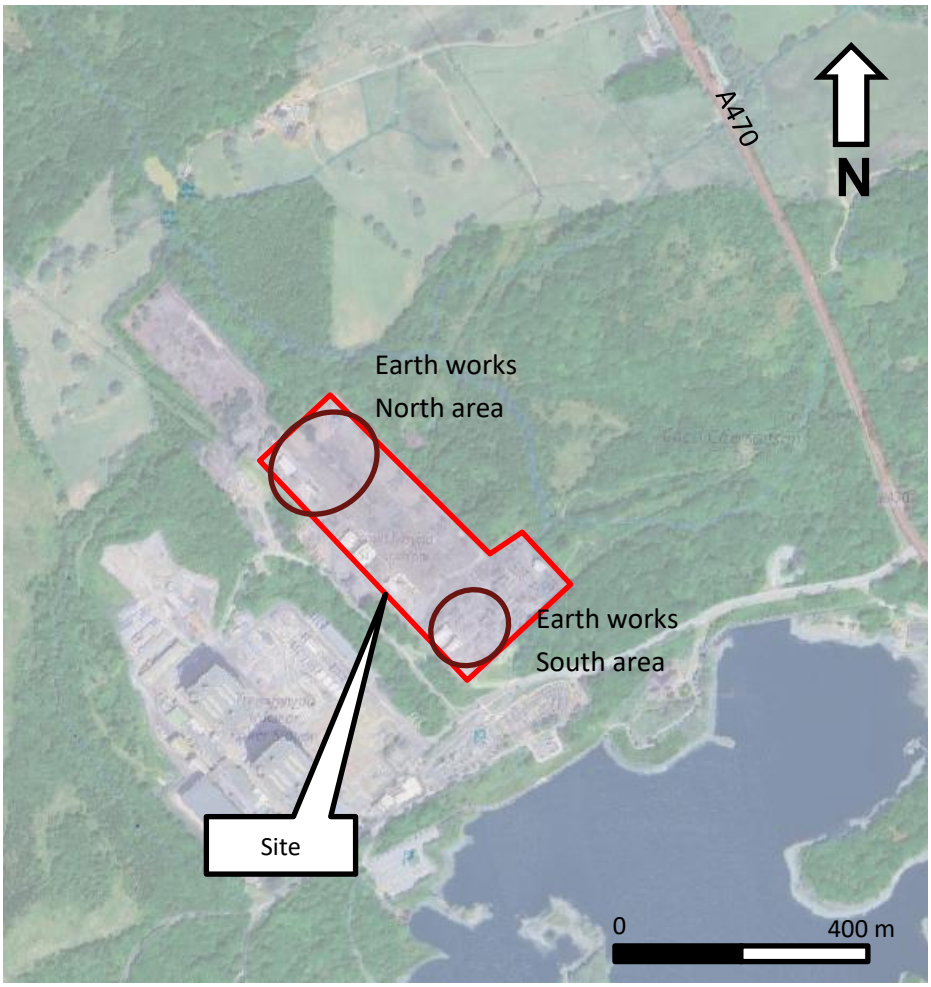


Figure 3 - Proposed earth work areas

Groundwater levels and hydraulic parameters

GROUNDWATER LEVELS

The available data indicate that groundwater levels were highest between November 2024 and January 2025. TBH04 and TBH05 show the least fluctuation during the monitoring period and are therefore representative of groundwater conditions associated with the superficial deposits. However, given that the proposed excavation depths range between approximately 0.9 m and 1.2 m bgl, it is considered more conservative to adopt water strike levels within the trial pits during construction. On this basis, groundwater levels recorded in TTP02 for the southern area and in TTP04 and TBH05 for the northern areas should be considered specifically for the dewatering assessment.

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HYDRAULIC CONDUCTIVITY (K)

In the absence of direct hydraulic conductivity measurements for the superficial deposits, a conservative range has been established by combining literature-based values (Kruseman and de Ridder, 1994) with Hazen method estimates from SPT particle size data (Table 7 and Table 8). The final k-value range incorporates both literature values for similar glaciofluvial materials and Hazen calculations, ensuring the dewatering assessment is both realistic and precautionary.

- North works

In the northern area, superficial deposits (to approximately 1 m depth) comprise brown mottled dark grey very sandy clayey gravel and brownish-grey slightly sandy, gravelly, slightly clayey cobbles (MG). SPT tests from borehole TBH07 and trial pit TTP05 were conducted within these units.

- South works

Ground investigation data indicate that the superficial deposits in the southern area (to approximately 1 m depth) consist of sandy clayey gravel and sandy gravelly cobbles (MG). SPT tests in boreholes TBH01 and TBH02, and trial pits TTP02 and TTP03, were conducted within these materials.

Table 10 summarises the hydraulic conductivity values adopted for the dewatering assessment, incorporating both Hazen-derived estimates (Table 8) and literature values (Table 7) for comparable superficial deposits. This approach provides a realistic yet precautionary range of k-values, reflecting the uncertainty in the available ground investigation data and avoiding reliance on potentially over-conservative single-value estimates.

Table 10: Range of k-values used for the dewatering assessment

Horizon	Description	Values for the dewatering calculation (m/s)	
		South works	North works
Superficial deposits	Permeability values assigned by Kruseman	1.16×10^{-06}	1.16×10^{-06}
Superficial deposits	Hazen Method	2.63×10^{-07}	3.27×10^{-07}

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CHECKED:	Z. Krips	**APPROVED:**	M. Durham

Dewatering calculation method and inputs

The location of the excavations are shown in Appendix A. The short-term average discharges were estimated using an analytical equation, given in Mansur and Kaufman (1962[10]) (Equation 1), driven by the hydraulic properties of the unconfined aquifer for a two-sided cutting.

Equation 1:

$$Discharge = \left[0.73 + \left(0.27\frac{P}{H}\right)\right]\frac{Kx(H^2 - h^2)}{L_0}$$

- P is the penetration below the original water table (m)
- H is the initial piezometric head (m)
- K is the assigned permeability based on Kruseman *et. al.* (1994) (m/s)
- x is the linear length of excavation (m)
- h is the lowered piezometric level (m)
- L_0 is the radius of influence (ROI) (m),

Derived using the Sichardt equation (Equation 2) with an empirical calibration factor, C = 2000.

Equation 2:

$$L_0 = C(H - h)\sqrt{K}$$

Table 11 and Table 12 summarise the calculation inputs, sources and results for the excavations in the substation for the North and South works.

Table 11: Calculation inputs, sources and results for the Trawsfynydd North works substation cutting

Description	Input	Source
Cutting Length (m)	180.6	Total length of the summatory of the individual excavations
Ground Level (mAOD)	179.0	Elevation taken from contour lines from LiDAR
Groundwater Level (mAOD)	178.70	GWL taken from TTP05 (water strike)

[10] Mansur, C.I., and Kaufman, R.I. 1962. Dewatering. In: Leonards G.A. editor, Foundation Engineering, McGraw-Hill Inc.

Description	Input	Source
Cutting base elevation (mAOD)	177.8	Cutting elevation considered from the design
Aquifer Base Elevation (mAOD)	176.0	Superficial Deposits average depth estimated in 3 m
Maximum Cutting Depth (m)	1.2	Maximum proposed cutting depth
Estimated drawdown (m)	0.72	Groundwater level minus cutting section base elevation.
Assigned permeability (m/s)	Table 10	A range of k values has been assigned to the dewatering calculations

Table 12: Calculation inputs, sources and results for the Trawsfynydd South works substation cutting

Description	Input	Source
Cutting Length (m)	29.8	Total length of the summatory of the individual excavations
Ground Level (mAOD)	185.0	Elevation taken from contour lines from LiDAR
Groundwater Level (mAOD)	184.4	GWL taken from TTP02 and TTP03 (water strikes)
Cutting base elevation (mAOD)	183.8	Cutting elevation considered from the design
Aquifer Base Elevation (mAOD)	182.0	Superficial Deposits average depth estimated in 3 m
Maximum Cutting Depth (m)	1.2	Maximum proposed cutting depth
Estimated drawdown (m)	0.6	Groundwater level minus cutting section base elevation.
Assigned permeability (m/s)	Table 10	A range of k values has been assigned to the dewatering calculations

Dewatering calculation results

Table 13 summarises the dewatering discharge at the site. Estimated dewatering rates in the superficial deposits differ significantly between the northern and southern works areas. The northern works are expected to have higher discharge rates, ranging from 15.9 to 30.4 m³/d depending on hydraulic conductivity, with a

radius of influence up to 1.0 m. The southern works show lower discharge rates, approximately 0.4 to 1.4 m³/d, but a wider radius of influence, extending up to 4.0 m under conservative assumptions.

Table 13: Dewatering assessment calculation results.

Horizon	Estimated discharge (m³/d)		ROI (m)	
	K (Kruseman)	**K (Hazen)**	**K (Kruseman)**	**K (Hazen)**
Superficial deposits North works	31.0	16.5	1.9	1.0
Superficial deposits South works	4.6	2.2	1.3	0.6

CONCLUSIONS

Excavations for the proposed substation foundation are expected to intercept groundwater and generate inflows during construction. Estimated groundwater discharge from superficial deposits ranges from 16.5 to 31 m³/d in the north area and 2.2 to 4.6 m³/d in the south.

The upper end of the estimated range reflects a conservative, short-term worst-case scenario based on literature hydraulic conductivity values and likely overestimates sustained inflows. In the absence of on-site measurements, this assessment is supported by indirect values calculated using the Hazen method and publicly available literature values. The reported discharge values are based on the total inflows from individual excavations. If the contractor chooses to conduct wider or combined excavations, the discharge estimates must be reviewed, and this report updated.

The discharge estimates presented are subject to the assumptions and limitations outlined in Appendix B and are considered to be conservative overall, notwithstanding the low likelihood of intercepting any regional groundwater flow systems. Should site-specific hydraulic property data become available during construction, it is recommended that this assessment be reviewed and updated to derive more representative and robust groundwater discharge estimates.

REFERENCES

BAKERHICKS, 2025 Interpretative Ground Investigation Report– Trawsfynydd – Pentir 400kV Uprating FEED, National Grid.

British Geological Survey (1997) Geological Survey of England and Wales Sheet 119 (Snowdon), Bedrock and Superficial Deposits, 1:50000.

Kruseman, G.P. and de Ridder, N.A. (1994). Analysis and evaluation of pumping test data. 2nd ed. ILRI Publication 47, Wageningen.

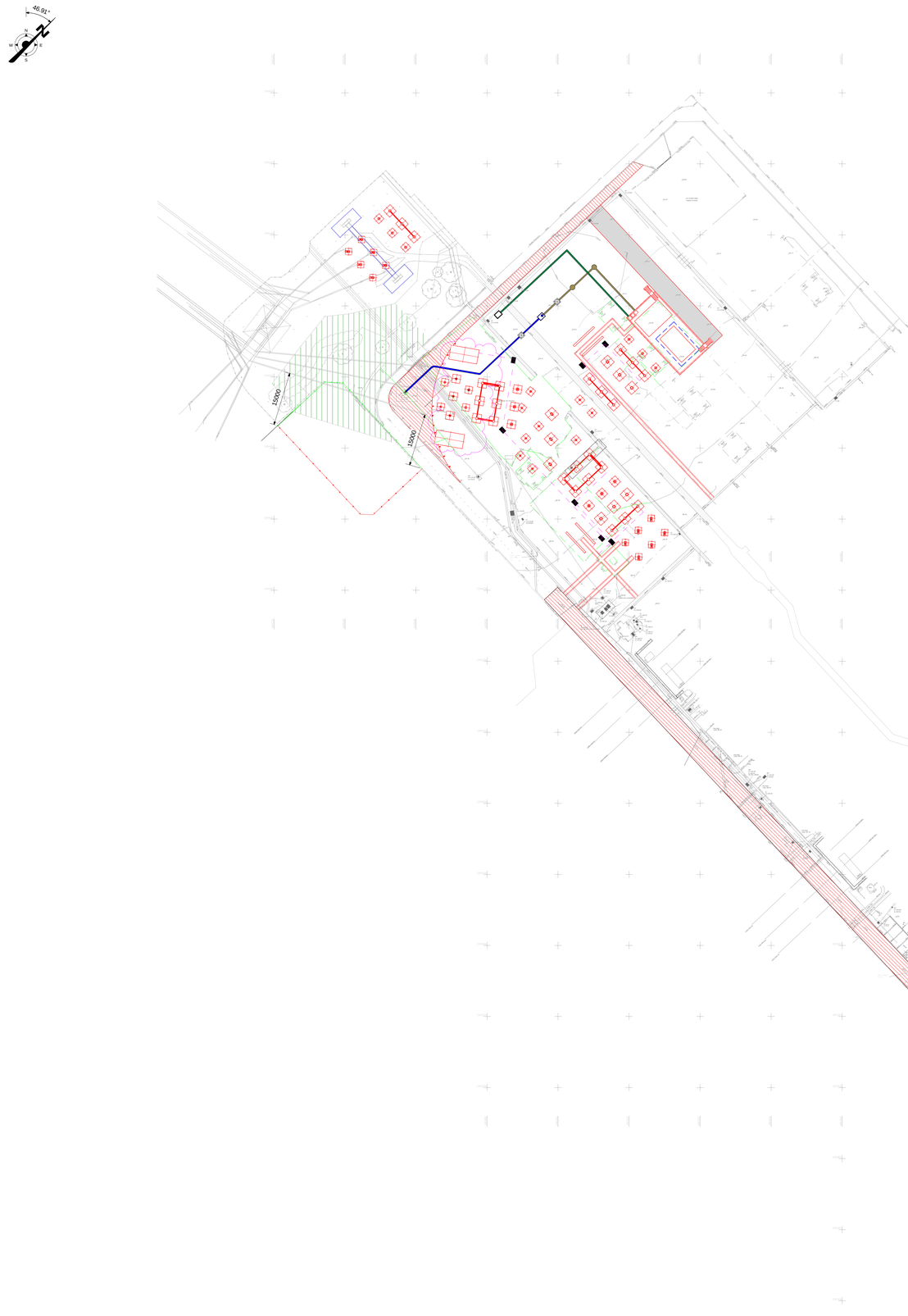
Mansur, C.I., and Kaufman, R.I. 1962. Dewatering. In: Leonards G.A. editor, Foundation Engineering, McGraw-Hill Inc.

Mapapps2.bgs.ac.uk, (2026). GeoIndex - British Geological Survey. [online] Available at: http://mapapps2.bgs.ac.uk/geoindex/home.html [Accessed March 2026].

TECHNICAL NOTE

DATE:	30 March 2026	**CONFIDENTIALITY:**	Confidential
SUBJECT:	Dewatering Assessment - Trawsfynydd		
PROJECT:	National Grid, PTNO_PCN1	**AUTHOR:**	N. Boaglio
CHECKED:	Z. Krips	**APPROVED:**	M. Durham

APPENDIX A: MAP



NOTES:

1. CONCEPT DESIGN ONLY. I.E.: FEED / NDP4.3. NOT FOR CONSTRUCTION.
2. DETAILED DESIGN AND CONSTRUCTION TO COMPLY WITH MOST RECENT NGTS.
3. ALL DIMENSIONS IN MILLIMETERS UNLESS STATED OTHERWISE.
   ALL LEVELS IN METERS ABOVE ORDNANCE DATUM (mAOD) UNLESS STATED OTHERWISE.
   DO NOT SCALE.
4. PERIMETER FENCE SHALL BE 'CATEGORY 2 - STANDARD' ELECTRIFIED PALISADE FENCE. INTERNAL FENCE SHALL BE 'CATEGORY 3 – REDUCED' PALISADE FENCE.
5. SITE LIGHTING NOT BEEN SHOWN BUT MUST INCLUDED IN DETAILED DESIGN AND CONSTRUCTION.
6. DUCTING FOR ELECTRIC FENCE AND LIGHTING NOT BEEN SHOWN BUT MUST BE INCLUDED IN DETAILED DESIGN AND CONSTRUCTION.
7. ASSUMED TELECOM AS FOLLOWS:
   FO1: BT / VODAFONE (VIA ACCESS ROAD)
   FO2: OPTEL / OPGW (VIA OHL)
   FO3: PROTECTION / DPS (VIA HV CABLE)
8. POTABLE WATER NOT SHOWN BUT MUST BE INCLUDED IN DETAILED DESIGN AND CONSTRUCTION
9. INCOMING DNO POWER ASSUMED TO BE BY OTHERS (ROUTE TO BE CONFIRMED)..
10. PIPES TO BE ENCASED IN CONCRETE WHEN THE MINIMUM COVER IS LESS THAN 0.9M BELOW THE ROADS.
11. THE EXPOSED TOPS OF FOUNDATION SHALL HAVE A NON-SLIP BRUSHED FINISH INCORPORATING
    SUFFICIENT CROSS FALL OR CAMBER PRE BENT PONDING OF WATER.
12. SUBSTATION FINISHES SHALL GENERALLY COMPRISE A 75MM THICK LAYER OF 'SUBSTATION
    SURFACING' AS DEFINED IN TS 3.10.02 OVER A MINIMUM THICKNESS OF 300MM UNBOUND FREE-
    DRAINING SUB-BASE (TYPE 3) IN ACCORDANCE WITH SERIES OF THE SPECIFICATION FOR HIGHWAY WORKS.
13. 0.9M WIDE CONCRETE FOOTPATHS SHALL BE PROVIDED BETWEEN ALL BUILDINGS PLUS RAMPED
    ACCESSES TO ALL DOORS TO FACILITATE EQUIPMENT INSTALLATION, TO ALL GAS FILLING POINTS TO FACILITATE MAINTENANCE ACTIVITIES, AND OUTSIDE THE PERIMETER FENCE.
14. EXISTING PIT AND TROUGH COVERS IN ROAD WIDENING TO BE ASSESSED FOR RE-USE. ASSUME ALL TO BE REPLACED WITH D400 COVERS AS PER TS 2.10.08.
15. EXISTING BELOW GROUND SERVICES IN ROAD WIDENING TO HAVE NEW PROTECTION SLABS (OR SIMILAR) INSTALLED ABOVE. EXISTING BELOW GROUND SERVICES EXPOSED DURING ROAD WIDENING EXCAVATION TO HAVE CONCRETE SURROUND ALSO.
16. FSL - TO MATCH WITH EXISTING SUBSTATION LEVEL

LEGEND:

- NEW PLANT
- PLANT TO BE REMOVED
- EXISTING PLANT
- PLANT TO BE REUSE
- FIRE DAMAGE ZONE
- NOISE ENCLOSURE
- PROPOSED OILY WATER CHAMBER
- PROPOSED OILY WATER DRAIN
- PROPOSED SURFACE WATER CHAMBER
- PROPOSED SURFACE WATER DRAIN
- PROPOSED OIL DRAW OFF POINT
- PROPOSED OIL / WATER INTERCEPTOR
- PENSTOCK VALVE CHAMBER
- OIL DRAW OFF CHAMBER
- PROPOSED SAMPLING CHAMBER WITH PENSTOCK
- DRAW PITS
- INDICATIVE TROUGHS
- INDICATIVE DUCTS

400kV EQUIPMENT FOUNDATIONS

DESCRIPTION	FOUNDATION SIZE (mm)	QUANTITY (Nos)
EARTH SWITCH (ESW)	2500x2500x900	15
CAPACITIVE VOLTAGE TRANSFORMER (CVT)	2300x2300x900	08
DISCONNECTOR WITH 1 EARTH SWITCHES (DISC/1 ESW)	2500x2500x900	06
DISCONNECTOR WITH 2 EARTH SWITCHES (DISC/2 ESW)	2500x2500x900	06
CURRENT TRANSFORMER (CT)	2300x2300x900	06
CIRCUIT BREAKER (CB)	2700x2700x900	06
POST INSULTAOR (PI)	2000x2000x900	12
PANTOGRAPH DISCONNECTOR (PANTO)	2700x2700x900	03
SURGE ARRESTOR (SA)	2000x2000x900	08
GANTRY FOUNDATION	4000x8000x900	02
CABLE SEALING END (CSE)	1800x1800x1200	18

ASSOCIATED DRAWINGS

DRAWING No.	DESCRIPTION
PDD-102185-CIV-302	SHUNT REACTOR BUND AND GA

Rev	Description	Cm'd	Chk'd	App'd	Date
P01	FOR REVIEW	CU	HD	KN	26.06.25

nationalgrid

Master Scheme No:	Sub-Scheme No:	Site:
10215	-	TRAWSFYNDD 400kV SUBSTATION

Scheme Name: PENTIR-TRAWSFYNDD NORTH WALES REINFORCEMENY

Document Title:

PROPOSED CIVIL LAYOUT TRAWSFYNDD 400kV SUBSTATION

Created by:	Date:	Checked by:	Date:	Approved by:	Date:
Author	27-06-2025	Checker	27-06-2025	Approver	27-06-2025

Development Eng:	Document Type:	Scale:	Format:	Sheet(s):	Rev:
Designer	LAY	1:500	A0	1 OF 3	P0

National Grid Document Number:

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FEED Document Number:

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TECHNICAL NOTE

DATE:	30 March 2026	**CONFIDENTIALITY:**	Confidential
SUBJECT:	Dewatering Assessment - Trawsfynydd		
PROJECT:	National Grid, PTNO_PCN1	**AUTHOR:**	N. Boaglio
CHECKED:	Z. Krips	**APPROVED:**	M. Durham

APPENDIX B: ASSUMPTIONS AND LIMITATIONS

The following assumptions apply to the Equation 1 (CIRIA 750):

- aquifer is unconfined
- aquifer has an infinite areal extent
- aquifer is homogenous, isotropic and of uniform thickness

Following assumptions/limitations apply to the equation used to determine dewatering volume (trench two-side (UC) CIRIA 750):

- aquifer is unconfined
- initial water table is horizontal
- aquifer is homogenous, isotropic and of uniform thickness
- L_0 is obtained using the Sichardt formula, taking C as between 1500 – 2000, the default value for C used in this spreadsheet is 2000. However, in high permeability soils where very large values of L_0 are calculated, caution is needed. Equation 1 was developed for ratios L_0/H of <5 and may not be suitable for application where L_0 is very large; flow rates may be significantly underestimated.
- excavations are penetrating the unconfined aquifer below the original water table
- calculation assumes the cut area is completely dewatered recorded groundwater level (for a GI location) is assumed to be the original water table

The equation assumes that the impact from dewatering affects the full aquifer thickness. In reality a minor cut is unlikely to impact the full aquifer depth beneath the base of the cut. In a deep or thick aquifer and for anisotropic conditions where Kv<Kh the influence of partial penetration on the yield of a well (or cut) is likely to be significantly diminished. This is not considered in the equation adopted.

Permeability may vary along the cut i.e. variable lithologies and variations in measured values may occur and there may not be fully represented by available GI data or the simplified approach to estimate discharge. This is overcome by comparing measured permeabilities or infiltration rates with approximate permeability values derived using the Hazen method based on PSD data. Where appropriate, discretised analyses could be performed to represent some variations along the length of the cut as applies here.

Appendix D

Groundwater Risk Assessment

Appendix D – Groundwater Risk Assessment

TECHNICAL NOTE

DATE:	17 July 2026	**CONFIDENTIALITY:**	Confidential
SUBJECT:	Trawsfynydd – Groundwater Risk Assessment		
PROJECT:	National Grid, PTNO_PCN1	**AUTHOR:**	Jamie Evans
CHECKED:	John Chapman	**APPROVED:**	Mark Durham

1. INTRODUCTION

This technical note has been prepared to support the hydrogeological appraisal of temporary dewatering associated with the proposed Trawsfynydd Grid Supply Point (GSP), part of the PTNO development, located approximately 7.5 km south of Blaenau Ffestiniog and 12 km east of Porthmadog at National Grid Reference SH 69207 38417, as shown in Figure 1.

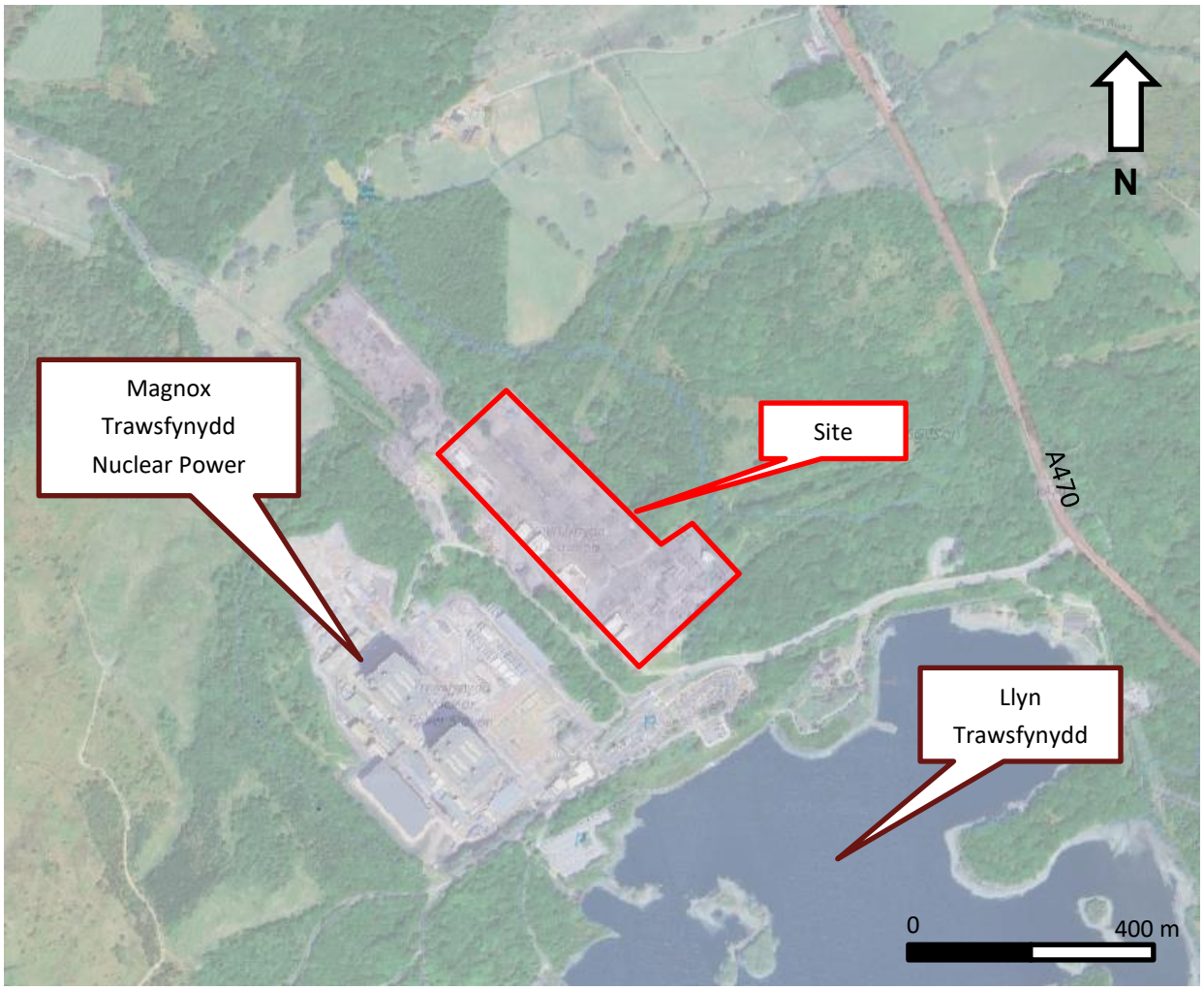


Figure 1 - Site location plan and approximate site extents

The appraisal is a desk-based screening assessment supported by publicly available environmental data, relevant groundwater protection guidance, and site-specific ground investigation and groundwater information, as summarised in Table 1.

Table 1 - Summary of the available data and information

Data/ Information	Description	Source
Geology and publicly available borehole logs	Available information in BGS GeoIndex	https://mapapps2.bgs.ac.uk/geoindex/home.html https://api.bgs.ac.uk/sobi-scans/v1/borehole/scans/items/135916
Geological map	Bedrock and Superficial Deposits - Snowdon (Sheet 119, 1997)	https://largeimages.bgs.ac.uk/iip/mapsportal.html?id=1001610
Ground Investigation (GI) and recorded groundwater levels	Baseline information and groundwater monitoring data	Interpretative Ground Investigation Report – Trawsfynydd – Pentir 400kV Uprating FEED, National Grid - BakerHicks, 13 March 2025
LIDAR	Topographic data	https://datamap.gov.wales/maps/lidar-data-download/view#/
Hydraulic conductivity (k)	Magnitude of k for different materials	Kruseman, G.P. and de Ridder, N.A. (1994). Analysis and evaluation of pumping test data. 2nd ed. ILRI Publication 47, Wageningen.
Rainfall	Monthly rainfall records between 1930 and 2026 from Valley Station (weather station) in Anglesey	metoffice.gov.uk/pub/data/weather/uk/climate/stationdata/valleydata.txt
Natural Resources Wales (NRW)	Data catalogue	https://datamap.gov.wales/search/?limit=20&offset=0

The scope of this technical note aligns with NRW[1] guidance, discharges to groundwater, including those through infiltration systems, may require an environmental permit and a supporting risk assessment. This assessment uses a source-pathway-receptor approach, in line with NRW guidance, to identify and evaluate potential risks to groundwater receptors. Particular attention was given to temporary construction activities, such as earthworks and dewatering, that could result in discharges to the ground.

2. BASELINE CONDITIONS

Topography and Land Use

The site is split into two levels, the upper level varying between approximately 180 – 185 m AOD and the lower section to the northwest varying between 174 – 176 m AOD. The site is located within a valley and, in the floor of the valley, the Llyn Trawsfynydd is located approximately 160 m south of the site. The site is surrounded by shrubbery and woodland to the north and the west which slope down towards the site. The Trawsfynydd Power Station is located directly to the southwest and is situated at a higher elevation than the site.

Rainfall Data

Historical rainfall data from the Valley[7] meteorological station in Anglesey, the nearest long-term dataset (54 km northwest of the site), indicates that 2024 was atypically low for rainfall compared to the ten-year monthly averages at the same station (986 mm), with an average monthly rainfall of around 888 mm.

Geology

SUPERFICIAL DEPOSITS

Although BGS maps do not record any superficial deposits beneath the site, till deposits are mapped in the surrounding areas to the north and west of the site. Superficial deposits were encountered at the site during the BakerHicks GI.

The BakerHicks GIR (2025) borehole data consistently describe superficial deposits as granular and coarse clastic material, including gravel, cobbles and boulders. Thickness varies from 0.40 m (TBH02) to 9.2 m (TBH07), with an average of 3.23 m across the site. These deposits mainly consist of coarse greywacke-derived gravel, subangular to angular cobbles and occasional large boulders, sometimes interbedded with sandy or clayey matrices. In several trial pits, this unit forms a significant layer above the competent greywacke bedrock, indicating a heterogenous colluvial or glacially reworked origin with localised pocked of very coarse material.

BEDROCK AND STRUCTURAL GEOLOGY

The BGS identifies the bedrock beneath the site as part of the Rhinog Formation, comprising grey to blueish grey, thick-bedded turbiditic sandstones, conglomerates and laminated sandstones, with thin intercalations of siltstone and mudstone. The geological map sheet (Sheet 119, 1997) indicates that northwest-southeast trending inferred faults approximately 250 m west and 300 m east of the proposed site, with an unknown displacement. Mudstones from the Hafotty Formation may be present in the northern extent of the site located close to the northern site boundary.

[1] https://naturalresources.wales/permits-and-permissions/installations/how-to-carry-out-a-risk-assessment-for-an-environmental-permit/?lang=en

Surface Water Features

The site is located within the Dwyryd-lower catchment and there are several surface water features identified within the vicinity of the study area. The Afon Tafarn-helyg is a river that is diverted around the site in the southeastern and northwestern corners. It is likely that the groundwater below the site is in hydraulic continuity with the river. Several other unnamed streams surround the site, with the river and streams flowing northwards.

According to BakerHicks (2025) there are six rivers situated within 20 m of the site, with the nearest being 1 m west of the site boundary. These rivers are understood to be referring to the Afon Tafarn-helyg and surrounding streams. There are also two unnamed inland surface water bodies situated within culverts on site. The length of these culverts are approximately 12m and 83m, respectively. One of the culverts is located along the southeastern boundary across which there are no current proposed works. The other culvert is located along the northwestern boundary. Given the current proposed works, the culverts are not likely to clash with the works (BakerHicks 2025).

The Llyn Trawsfynydd is located approximately 160 m south of the site.

Groundwater Dependent Terrestrial Ecosystems (GWDTEs)

There are no GWDTEs identified within the catchment.

There is one Site of Special Scientific Interest (SSSI) identified within the catchment (Coedydd de Dyffryn Maentwrog), however, this is located approximately 1.8 km from the site boundary and, despite being downgradient of the site, is not anticipated to be impacted by the proposed works.

Peatlands

Peatland mapping (NRW DataMapWales) indicates the closest identified peatlands 500 m northwest of the site boundary. These areas lie outside the proposed excavation footprint and predicted drawdown extent; however, they are located downstream of the site within the same groundwater catchment. These peatlands therefore remain potentially sensitive receptors in relation to uncontrolled discharge, runoff or sediment mobilisation.

Hydrogeology

According to the BGS, the superficial deposits on site are classified as a Secondary (undifferentiated) aquifer. These are aquifers that cannot be assigned to either category A or B. These units have been designated as minor or non-aquifers in various locations due to their variable characteristics. The bedrock is classified as Secondary A aquifer. This type of aquifer typically supports water supplies at a local rather than strategic scale and, in some case, forms an essential source of baseflow to rivers.

The superficial deposits consist of morainic sands and gravels, which generally have moderate to high hydraulic conductivity due to their coarse grain size and well-connected pore spaces. The bedrock hydraulic conductivity is expected to be variable and generally lower than that of the superficial deposits, reflecting differences in lithology, cementation, and the presence of finer-grained interbeds. Groundwater flow in the bedrock is likely controlled by secondary permeability, such as fissures and fractures. Based on current information, the superficial deposits are not expected to be hydraulically separated from the underlying bedrock.

Hydraulic conductivity within the superficial deposits is uncertain and likely to be spatially variable owing to the mixed granular and cohesive lithologies. No in-situ or laboratory hydraulic conductivity testing was conducted during the 2025 ground investigation. As a result, initial hydraulic conductivity values were sourced from literature (Kruseman and de Ridder, 1994) and a hydraulic conductivity of 1.16 x 10^{-6} m/s was adopted for the superficial deposits.

Groundwater level data was recorded from November 2024 to February 2025 at five groundwater monitoring locations as part of the BakerHicks 2025 GI. The summary of the groundwater level monitoring results is included in Table 2.

Table 2 - Groundwater Level Summary

Borehole ID	Highest recorded groundwater level (mbgl)	Lowest recorded groundwater level (mbgl)
Southern Area		
TBH02	0.16	0.43
TBH04	0.83	0.88
Northern Area		
TBH05	1.96	2.02
TBH09	1.25	1.44
TBH10	3.98	4.33

mbgl – metres below ground level

Recorded groundwater levels are shallow across the site, and as high as 0.16 mbgl. The current dataset is taken from November 2024 to February 2025; therefore, we do not have a complete seasonal dataset for groundwater levels at the site.

Groundwater quality samples were taken from five monitored locations (TBH02, TBH04, TBH05, TBH09, TBH10) as part of the 2015 GIR (BakerHicks, 2025) and analysed for:

- Dissolved metals (arsenic, boron, cadmium, chromium, copper, lead, mercury, nickel and zinc);
- Inorganics (pH, cyanide, monohydric phenol and sulphate);
- Petroleum Hydrocarbons;
- PAHs;
- PCBs (TBH02, TBH04 and TBH05 only); and
- VOCs.

Laboratory testing did not identify any exceedances of concentrations within groundwater when compared to the adopted screening criteria (UK Drinking Water Standards, WHO Guidelines for Drink Water Quality (4th Edition 2011) and Environmental Quality Standards). Therefore, the shallow groundwater within the development area does not represent a significant risk in relation to groundwater quality.

3. SITE SETTING

Site Proposed Layout

The proposed works at the Trawsfynydd site, as currently understood, includes upgrades to Cable Sealing End foundations, installation of two new underground cables approximately 370 and 340 m in length, construction of a new shunt reactor and installation of a new gantry.

The proposed layout is included in Appendix A.

Proposed Excavation

The Trawsfynydd Dewatering Assessment (WSP, 2026) presents more details related to the substation excavation areas. Excavations are expected to be shallow and are separated into northern and southern sections.

In the northern area, the largest individual excavation is related to the gantry foundation and is expected to be 8 m long, 4 m wide with a depth of 0.9 m. The deepest excavation in the north is expected to be 1.2 m. In the southern area, the largest individual foundation is 2.5 m long, 2.5 m wide with a depth of 0.9 m. The deepest excavation in the southern area is also expected to be 1.2 m. A total of 75 excavations are proposed in the northern area, whereas the southern area only consists of 14 proposed excavations.

The proposed excavations are presented in Appendix A.

Dewatering-derived Discharge Estimates

The dewatering assessment results below are provided solely to define the likely source term and magnitude of the proposed temporary discharge. They do not constitute a separate detailed dewatering impact assessment within this note.

Based on highest groundwater strikes encountered and assumed hydraulic conductivity, the Dewatering Assessment by WSP (2026) estimated that discharge from the superficial deposits was 31 m^3/d in the northern area and 4.6 m^3/d in the southern area. The maximum radius of influence was calculated as 1.9 m in the northern area excavations and 1.3 m in the southern area excavations. However, the aquifer is mapped to have a limited extent, variable lithology, anisotropic, and variable thickness. Therefore, the estimated discharge values represent conservative, short-term worst-case scenarios derived using literature-based hydraulic conductivity values for the superficial deposits and are therefore likely to overestimate sustained groundwater inflows.

Temporary Discharge Points

Water discharge is expected to be undertaken in two phases. A summary of the anticipated construction phases and associated proposed discharges are included in Table 3. The proposed temporary points for the discharge of groundwater (points A – G) are included in Figure 2.

Table 3 - Proposed Discharge Phases

Phase of Water Discharge Activity	Proposed Dates	Details of Proposed Construction Works	Quantity to be Discharged
Phase 1	September 2026 to Mid-April 2027	Underground cable ducting substation road, shunt reactor bund and skidway, 400kv equipment foundation, minor works including ducting, cabling, drainage and earth mat	<100 m^3/day (comprising groundwater if encountered during excavations and minor, incidental volumes of surface water run-off (rainfall) which enters the excavations)
Phase 2	March 2028	Civils works during the outage including demolishing structures and foundations. 20 new foundations with max. dimensions of 1x1x1m	<20 m^3/day (notes as above)



Figure 2 – Discharge Points (Soakaways)

The groundwater that is encountered is proposed to be pumped out of the excavations for discharge to ground at various locations across the site, all within the site boundary (refer to Figure 2). At each location the pumped groundwater will be treated (via a silt sock) and discharged to ground in areas of existing chippings on site. Alongside the groundwater that is encountered during the dewatering activities, there may be a small amount of surface water run-off (during times of rainfall only). This is anticipated to be minimal and limited to the rainfall that enters the excavations.

Only one discharge point will be used at any one time and once the capacity of one soakaway is reached (the discharge location will be visually monitored on a regular basis), the discharge activity will be transferred to another discharge point.

4. CONCEPTUAL SITE MODEL

The conceptual site model (CSM) describes the expected behaviour of groundwater and surface water in relation to the proposed temporary excavations and discharge activities. Developed using current desk-based and site-specific information, the CSM identifies the main hydrogeological sources, pathways, and receptors potentially affected by the works. There is limited site-specific data, and it is recommended that the CSM be refined further as more data become available. The model suggests that interactions will primarily involve shallow groundwater within the superficial deposits, with effects anticipated to be localised and temporary.

Sources

- The site has previously been used as an electrical substation. There is the possibility that the site itself could be a source of potentially contaminated groundwater;
- As noted in Section 1, the site neighbours the Trawsfynydd Nuclear Power Station. There is the possibility that this could be a source of potentially contaminated groundwater;
- Discharge of pumped groundwater, including the potential for suspended solids/ turbidity generated during excavation and pumping; and
- Accidental release associated with construction activities, for examples fuels, oils, coolants, lubricants, concrete washout or other construction materials.

Pathways

- Proposed discharge points (soakaways);
- Lateral groundwater flow within the superficial deposits;
- Surface runoff or drainage pathways from the dewatering discharge point to nearby drains or downstream surface water receptors, if discharge is not appropriately controlled; and
- Downward percolation to groundwater where construction-related pollutants are released at ground surface.

Receptors

- Groundwater within the Secondary Undifferentiated superficial deposit aquifer;
- Groundwater within the Secondary A bedrock aquifer;

- The wider groundwater resource within the relevant groundwater body;
- Peatlands identified 500m downstream of the site boundary;
- Nearby drains and more distantly, the Afon Tafarn-helyg and Llyn Trawsfynydd; and
- Any unidentified private groundwater supplies, although none are currently known within the study area.

5. QUALITATIVE RISK SCREENING

Hydrogeological context for discharge screening

Whilst this note focuses on the proposed discharge, it also briefly addresses groundwater levels and drawdown because the discharge results from temporary dewatering during excavations. The dewatering assessment estimated a maximum radius of influence of approximately 1.9 m and 1.3 m in the northern and southern areas, respectively. No licensed groundwater abstractions, no licensed surface water abstractions and no mapped surface water features were identified within this radial distance.

Due to the varied composition of the superficial deposits and the limited predicted drawdown, significant effects on neighbouring receptors are unlikely. The shallow excavations are expected to impact only the superficial Secondary undifferentiated aquifer, with significant hydraulic effects on the underlying Secondary A bedrock aquifer considered unlikely. Here, drawdown is addressed solely to provide a hydrogeological context for the discharge assessment, not as a separate detailed impact assessment.

Surface water interaction

The nearest named watercourse is the Afon Tafarn-helyg, located at the site boundary at its closest point. Therefore, the main surface water consideration for this screening is not flow depletion from drawdown, but the potential for uncontrolled temporary discharge to affect local drainage pathways through turbidity, siltation, or erosion.

Water quality effects

One potential contaminated land or groundwater pollution source (Trawfynydd Power Station) has been identified in the vicinity of the excavation area. However, there are no sources identified within the expected maximum radius of influence for the excavations and associated dewatering works (1.9 m). Groundwater quality results taken from five locations recorded no exceedances of screening criteria (analysed for metals, inorganics, TPH-CWG, PAHs, PCBs and VOCs). However, it must be noted that no radiological parameters were analysed during the groundwater quality sampling and should be incorporated into any future groundwater quality sampling at the site. The principal foreseeable water quality risk is temporary deterioration in pumped water quality due to excavation-derived suspended solids / turbidity, together with accidental release of construction materials, fuels or oils. Without mitigation, uncontrolled discharge of turbid or polluted water could affect downstream receptors. However, these risks are capable of being controlled through standard good-practice construction and discharge management measures.

Groundwater levels at the site are shallow leaving little hydraulic gradient for infiltration or zone of attenuation for pollutants. Infiltration capacity and protection from pollution of the aquifer may decrease further (or be removed entirely) during extended rainfall when the ground is saturated. In these conditions, limited hydraulic gradient and storage capacity can increase runoff to nearby drainage pathways. Discharge controls and

pollution prevention measures are necessary to manage local runoff, turbidity, and accidental spill risks during construction.

The principal foreseeable routine risks to groundwater include both direct and indirect risks relating to short-term drawdown, disturbance of shallow groundwater during excavation, and the discharge of turbid pumped water if it is not properly managed.

6. NRW / WALES PERMITTING CONSIDERATIONS

NRW requires permit risk assessments to identify sources of risk, receptors, possible pathways, whether the risks are acceptable, and the controls that will be implemented where necessary. Accordingly, the qualitative screening in Section 5 evaluates the proposed temporary discharge for potential water quality impacts, including from the neighbouring site, as well as turbidity, suspended solids, accidental construction-related releases, shallow groundwater conditions and possible runoff.

For discharges to surface water or groundwater, NRW guidance on applying for and complying with water discharge permits refers applicants to H1 Environmental Risks Assessment and sector guidance for water discharge and groundwater activity permits where a permit is required.

NRW states that, where applicable, it applies the England guidance for temporary water discharges from excavations in Wales. However, this should be considered only after the final discharge arrangement, discharge quality, treatment requirements, duration, flow rate, and receiving environment has been confirmed. Any use of low-risk temporary discharge approach must demonstrate that the discharge is controlled, contains no polluting substances other than minor suspended solids, and does not cause pollution, erosion, siltation, or harm to nearby receptors.

The final regulatory route for the Trawsfynydd dewatering discharge should therefore be confirmed with NRW, including whether the proposal can proceed under that approach or whether an environmental permit application is required. If the final discharge is to ground or relies on infiltration, the shallow groundwater levels and low infiltration capacity identified in Section 5 should be considered when confirming whether the discharge route is technically viable and acceptable to NRW.

The final permit position will need to be confirmed with NRW once the temporary discharge location, treatment system, monitoring schedule and receiving environment have been confirmed by the drainage and construction teams.

7. MITIGATION AND MONITORING

Mitigation Measures

- Manage temporary dewatering so that the associated discharge is limited to the minimum practicable duration and flow rate required for safe excavation.
- Discharge abstracted water in a controlled manner. Where turbidity is elevated, apply settlement, filtration or equivalent treatment to manage flow rate and reduce suspended solids risk.
- Select the discharge point to avoid erosion, direct pollution or drainage features or watercourses, and uncontrolled runoff towards sensitive receptors.
- Store and handle fuels, oils, concrete and other construction materials in accordance with the Construction Environmental Management Plan and standard pollution prevention controls.

- Maintain spill response materials on site and ensure staff are briefed in their use.
- Review the dewatering approach if unexpected groundwater conditions, excessive inflows or evidence of off-site effects are observed.

Monitoring

- Groundwater levels in a minimum of three suitable monitoring points, where available, to confirm baseline conditions, any localised drawdown and post-works recovery.
- Implement a groundwater quality monitoring schedule to establish any potential water quality changes associated with dewatering and temporary discharge. This should include the parameters previously monitored at the site, as well as a radiological parameter (tritium).
- Inspection of the discharge area and any nearby drainage features for evidence of siltation, erosion or pollution.

8. UNCERTAINTIES AND LIMITATIONS

- Hydraulic conductivity of the superficial deposits has not been confirmed by site-specific permeability or pumping tests;
- Radiological parameters have not been tested for in the current groundwater quality results;
- There is no full seasonal groundwater level dataset;
- The lateral continuity of permeable horizons within the superficial deposits remains uncertain; and
- The final temporary discharge locations, design, discharge duration, treatment method and monitoring requirements are not yet confirmed and may influence the applicable regulatory route and controls required.

9. CONCLUSIONS

This assessment finds that the planned temporary discharge associated with dewatering at Trawsfynydd is unlikely to cause significant hydrogeological effects, provided standard construction controls, controlled discharge, and appropriate groundwater and discharge monitoring are in place. Based on current information, a Tier 1 qualitative assessment is considered to be sufficient at this stage. A more detailed assessment would only be necessary if the excavation design changes significantly, dewatering rates exceed current predictions, a previously unrecorded sensitive receptor is identified nearby, or the final discharge route requires further water-quality or permitting review.

For discharge, the main risks are short term impacts on water quality, such as from turbid pumped water or accidental spills during construction. With proper management of discharge water, such as using settling, filtration, or controlled release, and with monitoring in place, these risks should be minor and temporary.

In summary, if the recommended mitigation and monitoring measures are followed, significant lasting hydrogeological effects are not anticipated.

REFERENCES

BakerHicks, 2025 Interpretative Ground Investigation Report - Trawsfynydd

British Geological Survey (1997) Geological Survey of England and Wales Sheet 119 (Snowdon), Bedrock and Superficial Deposits, 1:50000.

Kruseman, G.P. and de Ridder, N.A. (1994). Analysis and evaluation of pumping test data. 2nd ed. ILRI Publication 47, Wageningen.

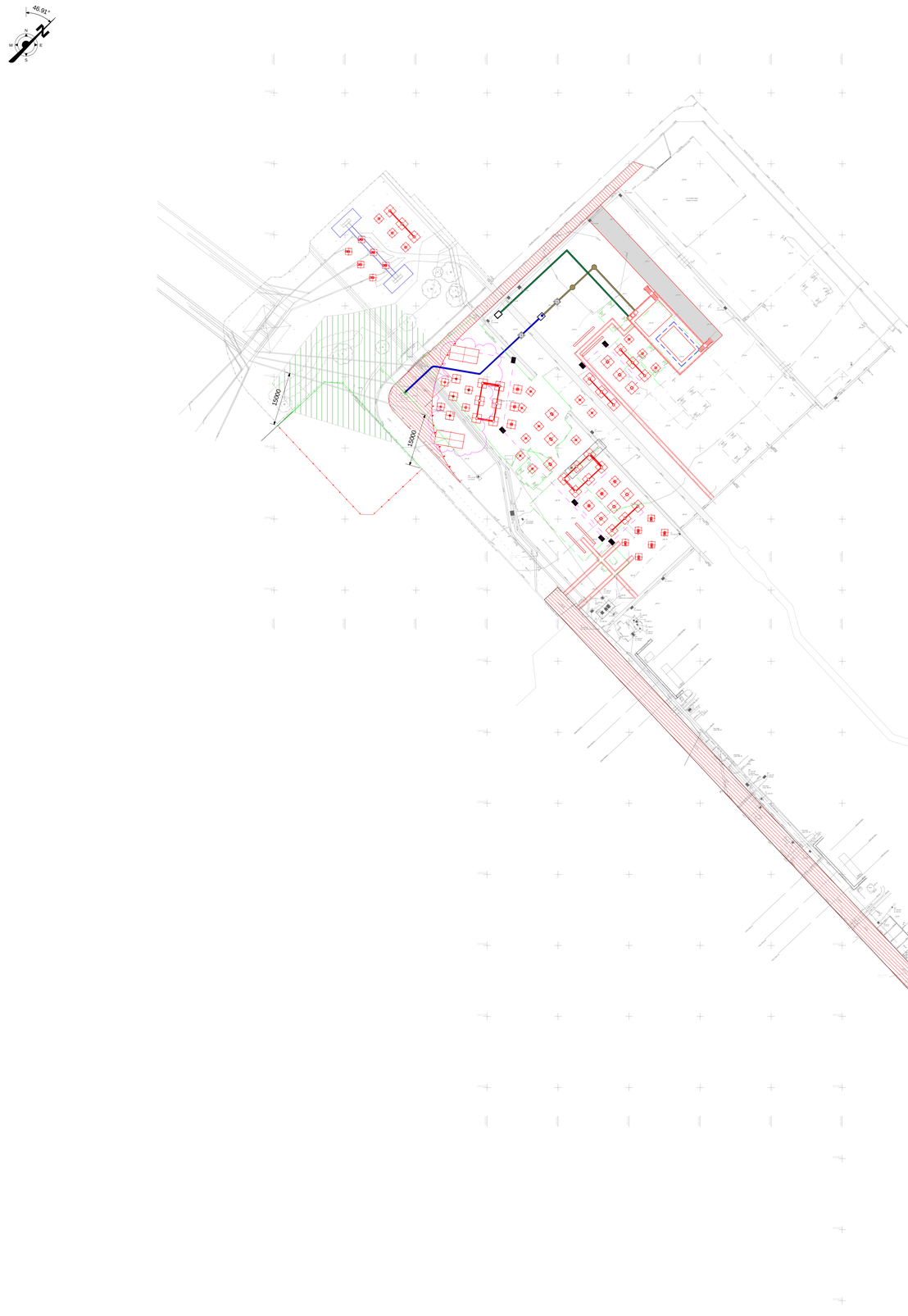
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Natural Resources Wales, Data catalogue | DataMapWales. Available at: https://datamap.gov.wales/search/?limit=20&offset=0&type__in=layer&type__in=layergroup&category__identifier__in=boundaries&category__identifier__in=elevation&category__identifier__in=environment&category__identifier__in=geoscientificInformation&category__identifier__in=inlandWaters&category__identifier__in=climatologyMeteorologyAtmosphere . [Accessed April 2026].

WSP, Trawsfynydd Dewatering Assessment Technical Note, March 2026.

APPENDIX A – PROPOSED LAYOUT PLAN



NOTES:

1. CONCEPT DESIGN ONLY. I.E.: FEED / NDP4.3. NOT FOR CONSTRUCTION.
2. DETAILED DESIGN AND CONSTRUCTION TO COMPLY WITH MOST RECENT NGTS.
3. ALL DIMENSIONS IN MILLIMETERS UNLESS STATED OTHERWISE.
   ALL LEVELS IN METERS ABOVE ORDNANCE DATUM (mAOD) UNLESS STATED OTHERWISE.
   DO NOT SCALE.
4. PERIMETER FENCE SHALL BE 'CATEGORY 2 - STANDARD' ELECTRIFIED PALISADE FENCE. INTERNAL FENCE SHALL BE 'CATEGORY 3 – REDUCED' PALISADE FENCE.
5. SITE LIGHTING NOT BEEN SHOWN BUT MUST INCLUDED IN DETAILED DESIGN AND CONSTRUCTION.
6. DUCTING FOR ELECTRIC FENCE AND LIGHTING NOT BEEN SHOWN BUT MUST BE INCLUDED IN DETAILED DESIGN AND CONSTRUCTION.
7. ASSUMED TELECOM AS FOLLOWS:
   FO1: BT / VODAFONE (VIA ACCESS ROAD)
   FO2: OPTEL / OPGW (VIA OHL)
   FO3: PROTECTION / DPS (VIA HV CABLE)
8. POTABLE WATER NOT SHOWN BUT MUST BE INCLUDED IN DETAILED DESIGN AND CONSTRUCTION
9. INCOMING DNO POWER ASSUMED TO BE BY OTHERS (ROUTE TO BE CONFIRMED)..
10. PIPES TO BE ENCASED IN CONCRETE WHEN THE MINIMUM COVER IS LESS THAN 0.9M BELOW THE ROADS.
11. THE EXPOSED TOPS OF FOUNDATION SHALL HAVE A NON-SLIP BRUSHED FINISH INCORPORATING
    SUFFICIENT CROSS FALL OR CAMBER PRE BENT PONDING OF WATER.
12. SUBSTATION FINISHES SHALL GENERALLY COMPRISE A 75MM THICK LAYER OF 'SUBSTATION
    SURFACING' AS DEFINED IN TS 3.10.02 OVER A MINIMUM THICKNESS OF 300MM UNBOUND FREE-
    DRAINING SUB-BASE (TYPE 3) IN ACCORDANCE WITH SERIES OF THE SPECIFICATION FOR HIGHWAY WORKS.
13. 0.9M WIDE CONCRETE FOOTPATHS SHALL BE PROVIDED BETWEEN ALL BUILDINGS PLUS RAMPED
    ACCESSES TO ALL DOORS TO FACILITATE EQUIPMENT INSTALLATION, TO ALL GAS FILLING POINTS TO FACILITATE MAINTENANCE ACTIVITIES, AND OUTSIDE THE PERIMETER FENCE.
14. EXISTING PIT AND TROUGH COVERS IN ROAD WIDENING TO BE ASSESSED FOR RE-USE. ASSUME ALL TO BE REPLACED WITH D400 COVERS AS PER TS 2.10.08.
15. EXISTING BELOW GROUND SERVICES IN ROAD WIDENING TO HAVE NEW PROTECTION SLABS (OR SIMILAR) INSTALLED ABOVE. EXISTING BELOW GROUND SERVICES EXPOSED DURING ROAD WIDENING EXCAVATION TO HAVE CONCRETE SURROUND ALSO.
16. FSL - TO MATCH WITH EXISTING SUBSTATION LEVEL

LEGEND:

- NEW PLANT
- PLANT TO BE REMOVED
- EXISTING PLANT
- PLANT TO BE REUSE
- FIRE DAMAGE ZONE
- NOISE ENCLOSURE
- PROPOSED OILY WATER CHAMBER
- PROPOSED OILY WATER DRAIN
- PROPOSED SURFACE WATER CHAMBER
- PROPOSED SURFACE WATER DRAIN
- PROPOSED OIL DRAW OFF POINT
- PROPOSED OIL / WATER INTERCEPTOR
- PENSTOCK VALVE CHAMBER
- OIL DRAW OFF CHAMBER
- PROPOSED SAMPLING CHAMBER WITH PENSTOCK
- DRAW PITS
- INDICATIVE TROUGHS
- INDICATIVE DUCTS

400kV EQUIPMENT FOUNDATIONS

DESCRIPTION	FOUNDATION SIZE (mm)	QUANTITY (Nos)
EARTH SWITCH (ESW)	2500x2500x900	15
CAPACITIVE VOLTAGE TRANSFORMER (CVT)	2300x2300x900	08
DISCONNECTOR WITH 1 EARTH SWITCHES (DISC/1 ESW)	2500x2500x900	06
DISCONNECTOR WITH 2 EARTH SWITCHES (DISC/2 ESW)	2500x2500x900	06
CURRENT TRANSFORMER (CT)	2300x2300x900	06
CIRCUIT BREAKER (CB)	2700x2700x900	06
POST INSULTAOR (PI)	2000x2000x900	12
PANTOGRAPH DISCONNECTOR (PANTO)	2700x2700x900	03
SURGE ARRESTOR (SA)	2000x2000x900	08
GANTRY FOUNDATION	4000x8000x900	02
CABLE SEALING END (CSE)	1800x1800x1200	18

ASSOCIATED DRAWINGS

DRAWING No.	DESCRIPTION
PDD-102185-CIV-302	SHUNT REACTOR BUND AND GA

Rev	Description	Cm'd	Chk'd	App'd	Date
P01	FOR REVIEW	CU	HD	KN	26.06.25

nationalgrid

Master Scheme No:	Sub-Scheme No:	Site:
10215	-	TRAWSFYNDD 400kV SUBSTATION

Scheme Name: PENTIR-TRAWSFYNDD NORTH WALES REINFORCEMENY

Document Title:

PROPOSED CIVIL LAYOUT TRAWSFYNDD 400kV SUBSTATION

Created by:	Date:	Checked by:	Date:	Approved by:	Date:
Author	27-06-2025	Checker	27-06-2025	Approver	27-06-2025

Development Eng:	Document Type:	Scale:	Format:	Sheet(s):	Rev:
Designer	LAY	1:500	A0	1 OF 3	P0

National Grid Document Number:

PDD-102185-CIV-301

FEED Document Number:

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APPENDIX B – TRAWSFYNYDD DEWATERING ASSESSMENT

TECHNICAL NOTE

DATE:	30 March 2026	**CONFIDENTIALITY:**	Confidential
SUBJECT:	Dewatering Assessment - Trawsfynydd		
PROJECT:	National Grid, PTNO_PCN1	**AUTHOR:**	N. Boaglio
CHECKED:	Z. Krips	**APPROVED:**	M. Durham

INTRODUCTION

As part of the PTNO development, discharge assessments are required for cutting works, particularly excavation activities, associated with the substation upgrade at Trawsfynydd. This assessment estimates potential groundwater discharges in the excavations and determines the associated radius of influence (ROI). The report aims to provide a conservative estimate of groundwater discharge and outlines the calculation methods and conceptual approach, using Ground Investigation (GI) data and publicly available sources.

The following sections detail the local geology, groundwater levels, typical cross-sections, permeability, and available GI data relevant to the assessment.

Data Sources

Table 1 summarises the available information used in the dewatering assessment.

Table 1: Summary of available data

Data	Description	Source
Geology and public boreholes	Available information in GeoIndex	https://mapapps2.bgs.ac.uk/geoindex/home.html https://api.bgs.ac.uk/sobi-scans/v1/borehole/scans/items/135916
Geological map	Bedrock and Superficial Deposits - Snowdon (Sheet 119, 1997)	https://largeimages.bgs.ac.uk/iip/mapsportal.html?id=1001610
Ground Investigation (GI) and groundwater levels	Baseline information and groundwater monitoring data	Interpretative Ground Investigation Report – Trawsfynydd – Pentir 400kV Uprating FEED, National Grid - BakerHicks, 13 March 2025
LIDAR	Topographic data	https://datamap.gov.wales/maps/lidar-data-download/view#/
Hydraulic conductivity (k)	Magnitude of k for different materials	Kruseman, G.P. and de Ridder, N.A. (1994). Analysis and evaluation of pumping test data. 2nd ed. ILRI Publication 47, Wageningen.

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Site location and context

The site is located in northwest Wales, approximately 7.5 km south of Blaenau Ffestiniog and 12 km east of Porthmadog. The site comprises an existing substation owned by Magnox–Rozvodna, covering approximately 0.065 km^2, and forms part of the wider Magnox Trawsfynydd site, which extends to approximately 0.18 km^2. The former Trawsfynydd Nuclear Power Station, currently undergoing decommissioning, lies immediately adjacent to the southwestern boundary of the substation.

The site (Figure 1) is accessed via the Magnox Trawsfynydd Nuclear Power Station access road, which connects to the A470 to the east. The surrounding area is comprised of woodland and shrubbery, with overhead electrical lines entering the site from the north, east and south. The site is located approximately 160 m north of the northern shoreline of Llyn Trawsfynydd and lies at an elevation of approximately 174 m to 185 mAOD.

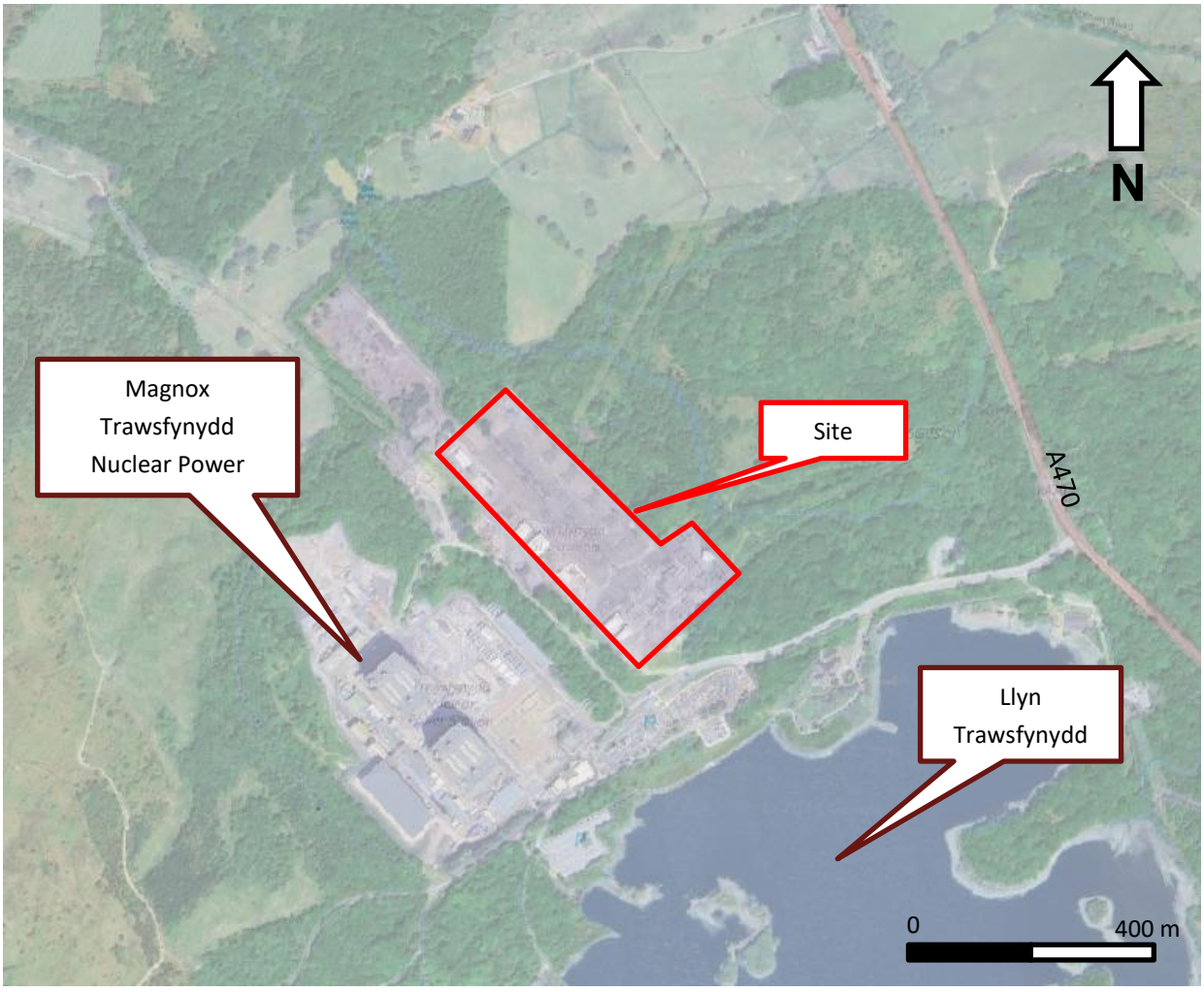


Figure 1 - Site location plan and approximate site extents

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Proposed Works

The proposed works at the site, as currently understood, include upgrades to Cable Sealing End foundations at various locations, installation of two new underground cables approximately 370 m and 340 m in length (with part of one route utilising an existing cable trough), construction of a new shunt reactor, and installation of a new gantry. A new access road was initially proposed prior to the ground investigation; however, this element was subsequently removed from the project scope. No ground investigation works were undertaken for the access road, and it has therefore been excluded from this report.

GEOLOGY AND HYDROGEOLOGY

Geology

BRITISH GEOLOGICAL SURVEY (BGS) RECORDS

Borehole records from the BGS indicate topsoil and peat up to 0.9 metre in depth and morainic deposits up to 5 metres deep across the site and in the southwestern area, as shown in Table 2.

Table 2: BGS – Borehole records

Borehole ID	Length (m)	Year	GL (mAOD)	GWL (mAOD)*	Description
SH63NE60[1]	10.97	1958	199.44	196.44	0.0 - 0.2 m Topsoil. 0.2 - 4.5 m Clayey sand and gravel with cobbles and large boulders (Moraine). 4.5 - 10.97 m Fractured. Massively bedded medium to coarse greywacke.
SH63NE62[2]	11.58	1958	195.52	191.02	0.0 - 0.2 m PEAT. 0.2 - 4.5 m Clayey sand gravel with cobbles and large boulders (Moraine). 4.5 - 11.6 m Fissured and strongly fractured. Massively bedded med to coarse greywacke.

[1] https://api.bgs.ac.uk/sobi-scans/v1/borehole/scans/items/137562
[2] https://api.bgs.ac.uk/sobi-scans/v1/borehole/scans/items/137564

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Borehole ID	Length (m)	Year	GL (mAOD)	GWL (mAOD)*	Description
SH63NE61[3]	9.44	1958	197.51	192.31	0 – 2.4 m Clayey sand gravel with cobbles and large boulders (Moraine). 2.4 – 9.4 m Medium to coarse grained greywacke with quartz veining and iron staining of the fracture planes.
SH63NE43[4]	14.63	1958	193.65	186.65	0.0 - 0.9 m PEAT. 0.9 - 7.0 m Clayey sand and gravel with cobbles large boulders (Moraine). 7.0 - 14.6 m Fissured and fractured. Massively bedded med to fine grained greywacke.
SH63NE68[5]	13.1	1958	184.27	173.57 **	0.0 - 0.4 m PEAT. 0.4 - 4.5 m Large boulders with clayey sand and gravel (Moraine). 4.5 - 13.1 m Badly fractured. Massively fine grained greywacke.
SH63NE39[6]	6.4	1958	200.07	197.37	0.0 - 0.3 m Topsoil. 0.3 - 3.6 m Large boulders with some clayey sand and gravel. 3.6 - 6.4 m Fractured massively bedded fine grained greywacke.

GL: ground level
GWL: groundwater level
*Ground Water level at construction (Water strike)
**Artesian ground water strike with flow to ground surface.

[3] https://api.bgs.ac.uk/sobi-scans/v1/borehole/scans/items/137563
[4] https://api.bgs.ac.uk/sobi-scans/v1/borehole/scans/items/137545
[5] https://api.bgs.ac.uk/sobi-scans/v1/borehole/scans/items/137570
[6] https://api.bgs.ac.uk/sobi-scans/v1/borehole/scans/items/137541

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PREVIOUS GROUND INVESTIGATION:

2025 Groundwater Investigation Report (GIR[7])

BakeHigks conducted a ground investigation in October and November 2024 (Figure 2), which included five trial pits (TTP01 to TTP05) and ten boreholes (designated TBH01 to TBH10).

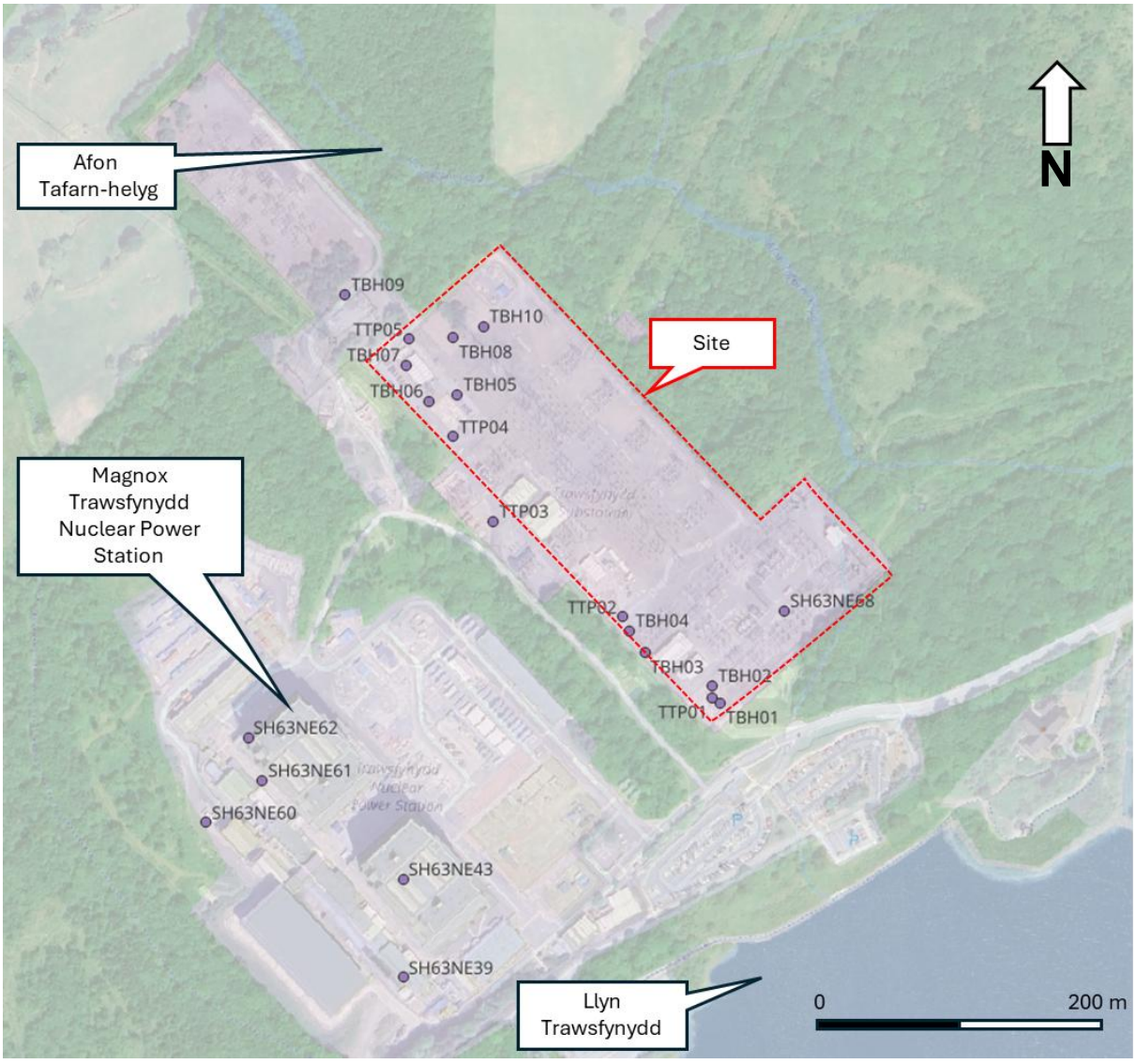


Figure 2: GI boreholes and trial pits location

[7] Interpretative Ground Investigation Report– Trawsfynydd – Pentir 400kV Uprating FEED, National Grid -BakerHicks, 13 March 2025

All boreholes were scheduled to reach 8 m below ground level (mbgl), based on an assumed 3 m of superficial deposits and 5 m of bedrock. Two holes reached the planned depth of 8 m. Five holes were terminated at shallower depths after obtaining 5 m of bedrock core. Three holes did not encounter bedrock and were drilled to at least 8 m, with final depths determined by the supervising engineer. All trial pits were scheduled to a depth of 2 m, but three could not reach this depth due to unstable granular material or obstructions such as boulders or potential bedrock.

MADE GROUND

The BGS Maps and Lexicon identify Made Ground (MG) in the site area. Based on GIR 2025, borehole and trial pit logs indicate MG thickness ranges from 0.07 m (TBH08) to 1.7 m (TBH09) in the northern part of the site, with an average of approximately 0.69 m. Made Ground forms a thin, variable superficial layer across the site.

SUPERFICIAL DEPOSITS

Although BGS Maps do not record any superficial deposits beneath the site, till deposits are mapped in the surrounding areas to the north and west of the site.

GIR (2025) borehole data consistently describe superficial deposits as granular and coarse clastic material, including gravel, cobbles, and boulders. Thickness varies from 0.40 (TBH02) m to 9.2 m (TBH07), with an average of 3.23 m across the site. These deposits mainly consist of coarse greywacke-derived gravel, subangular to angular cobbles, and occasional large boulders, sometimes interbedded with sandy or clayey matrices. In several trial pits, this unit forms a significant layer above the competent greywacke bedrock, indicating a heterogeneous colluvial or glacially reworked origin with localised pockets of very coarse material.

BEDROCK AND STRUCTURAL GEOLOGY

The BGS identifies the bedrock beneath the site as part of the Rhinog Formation, comprising grey to bluish grey, thick-bedded turbiditic sandstones, conglomerates, and laminated sandstones, with thin intercalations of siltstone and mudstone. The geological map sheet (Sheet 119, 1997[8]) indicates northwest–southeast trending inferred faults approximately 250 m west and 300 m east of the proposed site, with an unknown displacement. Mudstones from the Hafotty Formation may be present in the northern extent of the site located close to the northern site boundary.

GEOLOGICAL SEQUENCE

Table 3 summarises the geological units mapped within the site.

[8] https://largeimages.bgs.ac.uk/iip/mapsportal.html?id=1001610

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Table 3: Expected geological sequence within the site

Formation Name	Description	Thickness
Superficial Deposits	Morainic deposits (superficial deposits including granular and coarse clastic material, gravel, cobbles, and boulders).	Varies from 0.45 m to 9.0 m
Rhinog Formation (Bedrock)	Grey to bluish grey, thick-bedded turbiditic sandstones, conglomerates, and laminated sandstones, with thin intercalations of siltstone and mudstone	BGS indicates 400 to 780 m

Hydrogeology

AQUIFER DESIGNATION

According to the BGS, the superficial deposits on site are classified as a Secondary (undifferentiated) aquifer. These are aquifers that cannot be assigned to either category A or B. These units have been designated as minor or non-aquifers in various locations due to their variable characteristics.

The bedrock is classified as a Secondary A aquifer. This type of aquifer typically supports water supplies at a local rather than strategic scale and, in some cases, forms an essential source of baseflow to rivers.

GROUNDWATER LEVEL DATA

The groundwater assessment presented here is based solely on the monitoring undertaken by GIR November 2024 and February 2025. Table 4 summarises the pits where groundwater was encountered.

Table 4: Trial pits groundwater levels (water strike)

Pit ID	Depth (m)	Description	Water strike observed during construction
TTP02	2.0	Grey slightly sandy angular COBBLES and BOULDERS of greywacke. Grading to brown slightly gravelly clay in places.	Fast inflow. Groundwater encountered at 0.6 m depth.

Pit ID	Depth (m)	Description	Water strike observed during construction
TTP03	1.2	Greyish brown slightly sandy clayey angular to subrounded fine to coarse GRAVEL of greywacke. High angular cobble and boulder content of greywacke.	Medium inflow. Groundwater encountered at 0.6 m depth.
TTP04	1.6	Greyish brown sandy clayey angular fine to coarse GRAVEL of greywacke. High angular cobble content of greywacke.	Damp strata below 1.10 m depth. Standing water at 1.50 m depth.
TTP05	2.0	Brownish grey slightly sandy gravelly slightly clayey angular COBBLES and BOULDERS of greywacke. Grading to dark brown sandy clay in places.	Medium inflow. Groundwater encountered at 0.3 m depth.

Table 5 and Table 6 summarise the boreholes with installations and the groundwater observations and levels measured between November 2024 and February 2025.

Table 5: Borehole groundwater level monitoring records

BH ID	Slotted section (mbgl)	Description	Groundwater observation during construction
TBH02	2.7-5.2	Very strong grey fine to medium grained GREYWACKE. Discontinuities are horizontal to sub-horizontal, closely to medium spaced, undulating, rough with much orangish brown staining.	Slow flow

BH ID	Slotted section (mbgl)	Description	Groundwater observation during construction
TBH04	1.0-4.0	Between 1.00-2.00m, gravel includes quartz. Greyish brown very gravelly clayey fine, predominantly medium and coarse SAND of quartz, feldspar and mafic minerals. Occasional pockets (up to 60mm) of stiff brown very gravelly clay.	Minor inflows possibly masked by drilling flush.
TBH05	1.5-7.0	Grey subangular coarse GRAVEL, COBBLES and BOULDERS of greywacke. Between 3.0-4.5 m, occasional woody plant remains (root or branch).	Minor inflows possibly masked by drilling flush.
TBH09	6.0-8.0	Strong to very strong, occasionally extremely strong, very thickly bedded fine to coarse grained GREYWACKE.	Minor inflows possibly masked by drilling flush.
TBH10	4.8-6.2	Grey coarse GRAVEL and COBBLES of greywacke (Some plant soil material**).	Medium inflows.

Table 6: Summary of groundwater levels

BH ID	18/11/2024	29/11/2024	10/12/2024	07/01/2025	21/01/2025	04/02/2025
Groundwater level (m AOD)						
TBH02	184.99	184.78	184.86	184.92	184.72	184.81
TBH04	183.12	183.09	183.11	183.14	183.09	183.14
TBH05	177.87	177.86	177.89	177.91	177.85	177.89
TBH09	172.58	172.54	172.61	172.73	172.56	172.69

BH ID	18/11/2024	29/11/2024	10/12/2024	07/01/2025	21/01/2025	04/02/2025
TBH10	175.33	175.17	175.29	175.4	175.05	175.22

Monitoring boreholes TBH02 and TBH04 are located in the southern area of the site, boreholes TBH05, TBH09 and TBH10 are located in the northern area.

In the southern area, the highest groundwater levels were recorded in TBH02 at 184.99 mAOD (0.16 mbgl) in November 2024 and in TBH04 at 183.14 mAOD (0.83 mbgl) in both January and February 2025. The lowest groundwater level was 183.09 mAOD (0.88 mbgl) in TBH04, in November 2024 and also in January 2025. The average levels were 183.11 mAOD for TBH04 and 184.85 mAOD for TBH02.

In the northern area, groundwater levels also fluctuated. The highest level was 177.91 mAOD (1.96 mbgl) in TBH05 in January 2025, while the lowest was 172.54 mAOD (1.44 mbgl) in TBH09 in November 2024. Average values were 177.88 mAOD (TBH05), 172.60 mAOD (TBH09), and 175.25 mAOD (TBH10).

HYDRAULIC CONDUCTIVITY (K)

The superficial deposits consist of morainic sands and gravels, which generally have moderate to high hydraulic conductivity due to their coarse grain size and well-connected pore spaces.

The bedrock's hydraulic conductivity is expected to be variable and generally lower than that of the superficial deposits, reflecting differences in lithology, cementation, and the presence of finer-grained interbeds. Groundwater flow in the bedrock is likely controlled by secondary permeability, such as fissures and fractures. Based on current information, the superficial deposits are not expected to be hydraulically separated from the underlying bedrock. No in-situ or laboratory hydraulic conductivity (k) testing was conducted during the 2025 ground investigation; therefore, k-values from literature were considered for the dewatering assessment. Table 7 summarises hydraulic conductivity values for the superficial deposits and sedimentary rocks (Kruseman and de Ridder, 1994).

Table 7: K-values for different kinds of superficial deposits and rocks (from Bouwer, 1978, in Kruseman & De Ridder [9])

Permeabilities		Minimum k (m/s)	Maximum k (m/s)	Average k (m/s)
	Fine sand	$1.16x10^{-05}$	$5.79x10^{-05}$	$3.47x10^{-05}$

[9] Kruseman, G.P. and de Ridder, N.A. (1994). Analysis and evaluation of pumping test data. 2nd ed. ILRI Publication 47, Wageningen.

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Permeabilities		Minimum k (m/s)	Maximum k (m/s)	Average k (m/s)
Superficial Deposits	Medium sand	$5.79x10^{-05}$	$2.31x10^{-04}$	$1.45x10^{-04}$
	Coarse sand	$2.31x10^{-04}$	$2.31x10^{-03}$	$1.27x10^{-03}$
	Gravel	$2.31x10^{-03}$	$2.31x10^{-02}$	$1.27x10^{-02}$
	Sand and gravel mixes	$5.79x10^{-05}$	$2.31x10^{-03}$	$1.19x10^{-03}$
	Clay, sand and gravel mixes	$1.16x10^{-08}$	$1.16x10^{-06}$	$5.84x10^{-07}$
Rocks	Sandstone	$1.16x10^{-08}$	$1.16x10^{-05}$	$5.79x10^{-06}$

During the GI in 2025, Standard Penetration Test (SPT) were conducted in-situ, therefore the Hazen method is used to provide an empirical relationship between permeability and the effective grain size, derived from particle-size distribution data. This method applies the equation $K = A \times (D_{10})^2 \times 864$, where D_{10} represents the effective grain size in millimetres and A is a temperature-dependent coefficient, taken as 1.15 for groundwater at approximately 10°C. The Hazen method offers a rapid approximation of permeability (k) for clean, relatively uniform sands, and is used here to complement available ground investigation data and support the assessment of likely permeability behaviour within the excavated materials. Table 8 summarises the Hazen method results for the boreholes and trial pits for the southern and northern areas.

Table 8: Hazen method for estimate k-values

Name	Depth (m)	Geology on log	D10 (mm)	K (m/s)
TBH01	0.1-0.4	MADE GROUND: Dark brown sandy clayey gravel.	0.146	2.45×10^{-10}
TBH02	0.25-0.4	Greyish brown slightly sandy slightly clayey GRAVEL.	6.48	4.83×10^{-07}
TBH04	2.0-2.9	Greyish brown very gravelly clayey SAND.	0.248	7.07×10^{-10}
TBH06	1.2-1.5	Brown very sandy clayey GRAVEL.	0.121	1.68×10^{-10}
TBH07	0.1-0.3	MADE GROUND: Brown mottled dark grey very sandy clayey gravel.	1.81	3.77×10^{-08}
TBH09	1.2-2.5	MADE GROUND: Dark grey mottled black sandy slightly clayey gravel.	1	1.15×10^{-08}

Name	Depth (m)	Geology on log	D10 (mm)	K (m/s)
TTP02	0.25-0.45	MADE GROUND: Greyish brown slightly sandy slightly gravelly cobbles.	71.6	5.90×10^{-05}
TTP03	0.2-0.4	MADE GROUND: Grey mottled orange brown sandy slightly clayey gravel with a high cobble content.	7.74	6.89×10^{-07}
TTP04	1.1-1.6	Greyish brown sandy clayey GRAVEL with a high cobble content.	0.562	3.63×10^{-09}
TTP05	0.3-1.0	Brownish grey slightly sandy gravelly slightly clayey COBBLES.	15.7	2.83×10^{-06}

GROUNDWATER DISCHARGE ASSESSMENT

Excavation area/section

Based on information provided by the client, the required earthworks at the Trawsfynydd site are associated with foundation construction. No earthworks drawings have been produced at this stage, as these works are temporary in nature and are typically designed, detailed and managed by the Temporary Works designer. The estimated volume includes allowances for localised excavations for individual foundations; however, where foundations are closely spaced, full excavation of the area may be required, increasing the earthwork volume. The final extent of excavation will depend on the contractor's method statement and the presence and location of existing underground services within this operational site.

Assumptions:

- Discharge calculations are based on ground level, as groundwater in the unconfined aquifer is expected to align with the topography;
- Proposed excavation works are between 0.9 m and 1.2 m; and
- The Rhinog Formation is anticipated to occur below approximately 3 m depth, and no dewatering is expected from this unit, as it will not be intersected by the proposed excavations.

Table 9 summarises the proposed foundation excavations in the south and north areas, these areas are also shown on Figure 3 and in Appendix A.

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Table 9: Proposed excavations

Foundation Description	Code	Foundation size (mm)			Total Quantity South Area	Total Quantity North Area
		W	L	H		
EARTH SWITCH	ESW	2500	2500	900	3	12
CAPACITIVE VOLTAGE TRANSFORMER	CVT	2300	2300	900	5	3
DISCONNECTOR WITH 1 EARTH SWITCHES	DISC/1 ESW	2500	2500	900	N/A	6
DISCONNECTOR WITH 2 EARTH SWITCHES	DISC/2 ESW	2500	2500	900	N/A	6
CURRENT TRANSFORMER	CT	2300	2300	900	N/A	6
CIRCUIT BREAKER	CB	2700	2700	900	N/A	6
POST INSULTAOR	PI	2000	2000	900	N/A	9
PANTOGRAPH DISCONNECTOR	PANTO	2700	2700	900	N/A	3
SURGE ARRESTOR	SA	2000	2000	900	N/A	10
GANTRY FOUNDATION	N/A	4000	8000	900	N/A	2
CABLE SEALING END	CSE	1800	1800	1200	6	12

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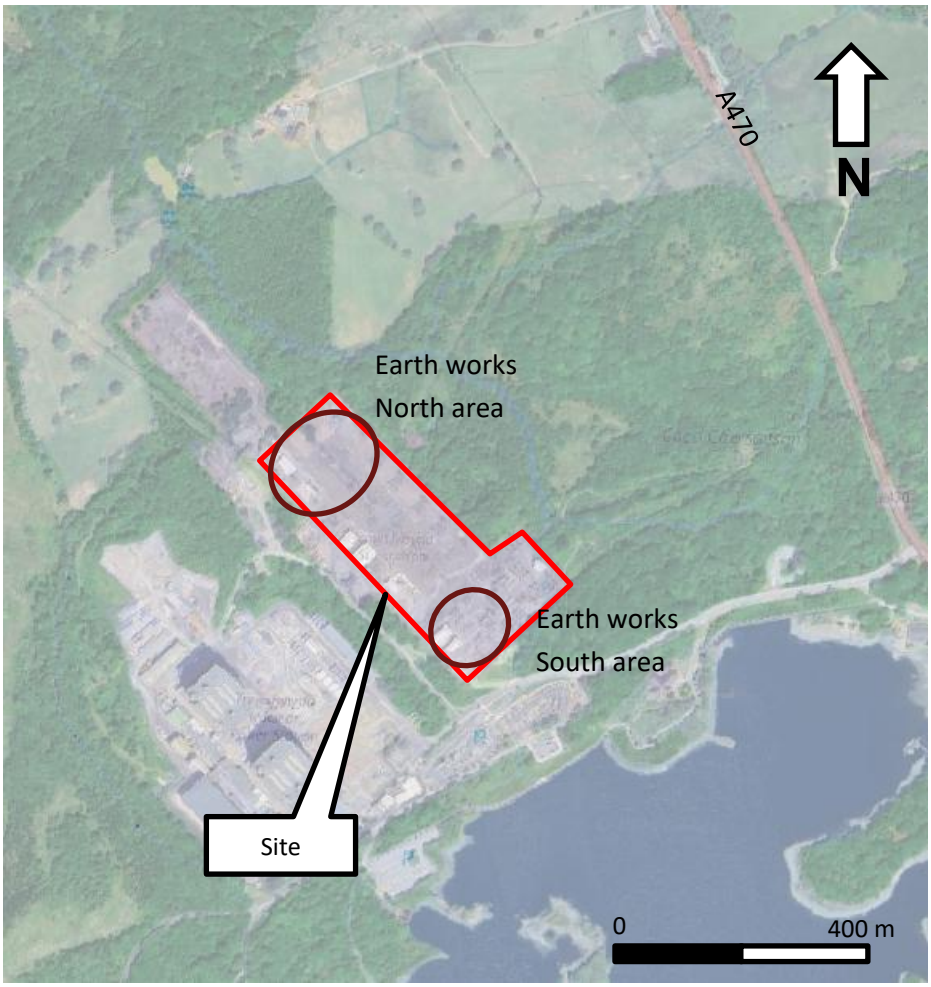


Figure 3 - Proposed earth work areas

Groundwater levels and hydraulic parameters

GROUNDWATER LEVELS

The available data indicate that groundwater levels were highest between November 2024 and January 2025. TBH04 and TBH05 show the least fluctuation during the monitoring period and are therefore representative of groundwater conditions associated with the superficial deposits. However, given that the proposed excavation depths range between approximately 0.9 m and 1.2 m bgl, it is considered more conservative to adopt water strike levels within the trial pits during construction. On this basis, groundwater levels recorded in TTP02 for the southern area and in TTP04 and TBH05 for the northern areas should be considered specifically for the dewatering assessment.

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HYDRAULIC CONDUCTIVITY (K)

In the absence of direct hydraulic conductivity measurements for the superficial deposits, a conservative range has been established by combining literature-based values (Kruseman and de Ridder, 1994) with Hazen method estimates from SPT particle size data (Table 7 and Table 8). The final k-value range incorporates both literature values for similar glaciofluvial materials and Hazen calculations, ensuring the dewatering assessment is both realistic and precautionary.

- North works

In the northern area, superficial deposits (to approximately 1 m depth) comprise brown mottled dark grey very sandy clayey gravel and brownish-grey slightly sandy, gravelly, slightly clayey cobbles (MG). SPT tests from borehole TBH07 and trial pit TTP05 were conducted within these units.

- South works

Ground investigation data indicate that the superficial deposits in the southern area (to approximately 1 m depth) consist of sandy clayey gravel and sandy gravelly cobbles (MG). SPT tests in boreholes TBH01 and TBH02, and trial pits TTP02 and TTP03, were conducted within these materials.

Table 10 summarises the hydraulic conductivity values adopted for the dewatering assessment, incorporating both Hazen-derived estimates (Table 8) and literature values (Table 7) for comparable superficial deposits. This approach provides a realistic yet precautionary range of k-values, reflecting the uncertainty in the available ground investigation data and avoiding reliance on potentially over-conservative single-value estimates.

Table 10: Range of k-values used for the dewatering assessment

Horizon	Description	Values for the dewatering calculation (m/s)	
		South works	North works
Superficial deposits	Permeability values assigned by Kruseman	1.16×10^{-06}	1.16×10^{-06}
Superficial deposits	Hazen Method	2.63×10^{-07}	3.27×10^{-07}

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Dewatering calculation method and inputs

The location of the excavations are shown in Appendix A. The short-term average discharges were estimated using an analytical equation, given in Mansur and Kaufman (1962[10]) (Equation 1), driven by the hydraulic properties of the unconfined aquifer for a two-sided cutting.

Equation 1:

$$Discharge = \left[0.73 + \left(0.27\frac{P}{H}\right)\right]\frac{Kx(H^2 - h^2)}{L_0}$$

- P is the penetration below the original water table (m)
- H is the initial piezometric head (m)
- K is the assigned permeability based on Kruseman *et. al.* (1994) (m/s)
- x is the linear length of excavation (m)
- h is the lowered piezometric level (m)
- L_0 is the radius of influence (ROI) (m),

Derived using the Sichardt equation (Equation 2) with an empirical calibration factor, C = 2000.

Equation 2:

$$L_0 = C(H - h)\sqrt{K}$$

Table 11 and Table 12 summarise the calculation inputs, sources and results for the excavations in the substation for the North and South works.

Table 11: Calculation inputs, sources and results for the Trawsfynydd North works substation cutting

Description	Input	Source
Cutting Length (m)	180.6	Total length of the summatory of the individual excavations
Ground Level (mAOD)	179.0	Elevation taken from contour lines from LiDAR
Groundwater Level (mAOD)	178.70	GWL taken from TTP05 (water strike)

[10] Mansur, C.I., and Kaufman, R.I. 1962. Dewatering. In: Leonards G.A. editor, Foundation Engineering, McGraw-Hill Inc.

Description	Input	Source
Cutting base elevation (mAOD)	177.8	Cutting elevation considered from the design
Aquifer Base Elevation (mAOD)	176.0	Superficial Deposits average depth estimated in 3 m
Maximum Cutting Depth (m)	1.2	Maximum proposed cutting depth
Estimated drawdown (m)	0.72	Groundwater level minus cutting section base elevation.
Assigned permeability (m/s)	Table 10	A range of k values has been assigned to the dewatering calculations

Table 12: Calculation inputs, sources and results for the Trawsfynydd South works substation cutting

Description	Input	Source
Cutting Length (m)	29.8	Total length of the summatory of the individual excavations
Ground Level (mAOD)	185.0	Elevation taken from contour lines from LiDAR
Groundwater Level (mAOD)	184.4	GWL taken from TTP02 and TTP03 (water strikes)
Cutting base elevation (mAOD)	183.8	Cutting elevation considered from the design
Aquifer Base Elevation (mAOD)	182.0	Superficial Deposits average depth estimated in 3 m
Maximum Cutting Depth (m)	1.2	Maximum proposed cutting depth
Estimated drawdown (m)	0.6	Groundwater level minus cutting section base elevation.
Assigned permeability (m/s)	Table 10	A range of k values has been assigned to the dewatering calculations

Dewatering calculation results

Table 13 summarises the dewatering discharge at the site. Estimated dewatering rates in the superficial deposits differ significantly between the northern and southern works areas. The northern works are expected to have higher discharge rates, ranging from 15.9 to 30.4 m³/d depending on hydraulic conductivity, with a

radius of influence up to 1.0 m. The southern works show lower discharge rates, approximately 0.4 to 1.4 m³/d, but a wider radius of influence, extending up to 4.0 m under conservative assumptions.

Table 13: Dewatering assessment calculation results.

Horizon	Estimated discharge (m³/d)		ROI (m)	
	K (Kruseman)	**K (Hazen)**	**K (Kruseman)**	**K (Hazen)**
Superficial deposits North works	31.0	16.5	1.9	1.0
Superficial deposits South works	4.6	2.2	1.3	0.6

CONCLUSIONS

Excavations for the proposed substation foundation are expected to intercept groundwater and generate inflows during construction. Estimated groundwater discharge from superficial deposits ranges from 16.5 to 31 m³/d in the north area and 2.2 to 4.6 m³/d in the south.

The upper end of the estimated range reflects a conservative, short-term worst-case scenario based on literature hydraulic conductivity values and likely overestimates sustained inflows. In the absence of on-site measurements, this assessment is supported by indirect values calculated using the Hazen method and publicly available literature values. The reported discharge values are based on the total inflows from individual excavations. If the contractor chooses to conduct wider or combined excavations, the discharge estimates must be reviewed, and this report updated.

The discharge estimates presented are subject to the assumptions and limitations outlined in Appendix B and are considered to be conservative overall, notwithstanding the low likelihood of intercepting any regional groundwater flow systems. Should site-specific hydraulic property data become available during construction, it is recommended that this assessment be reviewed and updated to derive more representative and robust groundwater discharge estimates.

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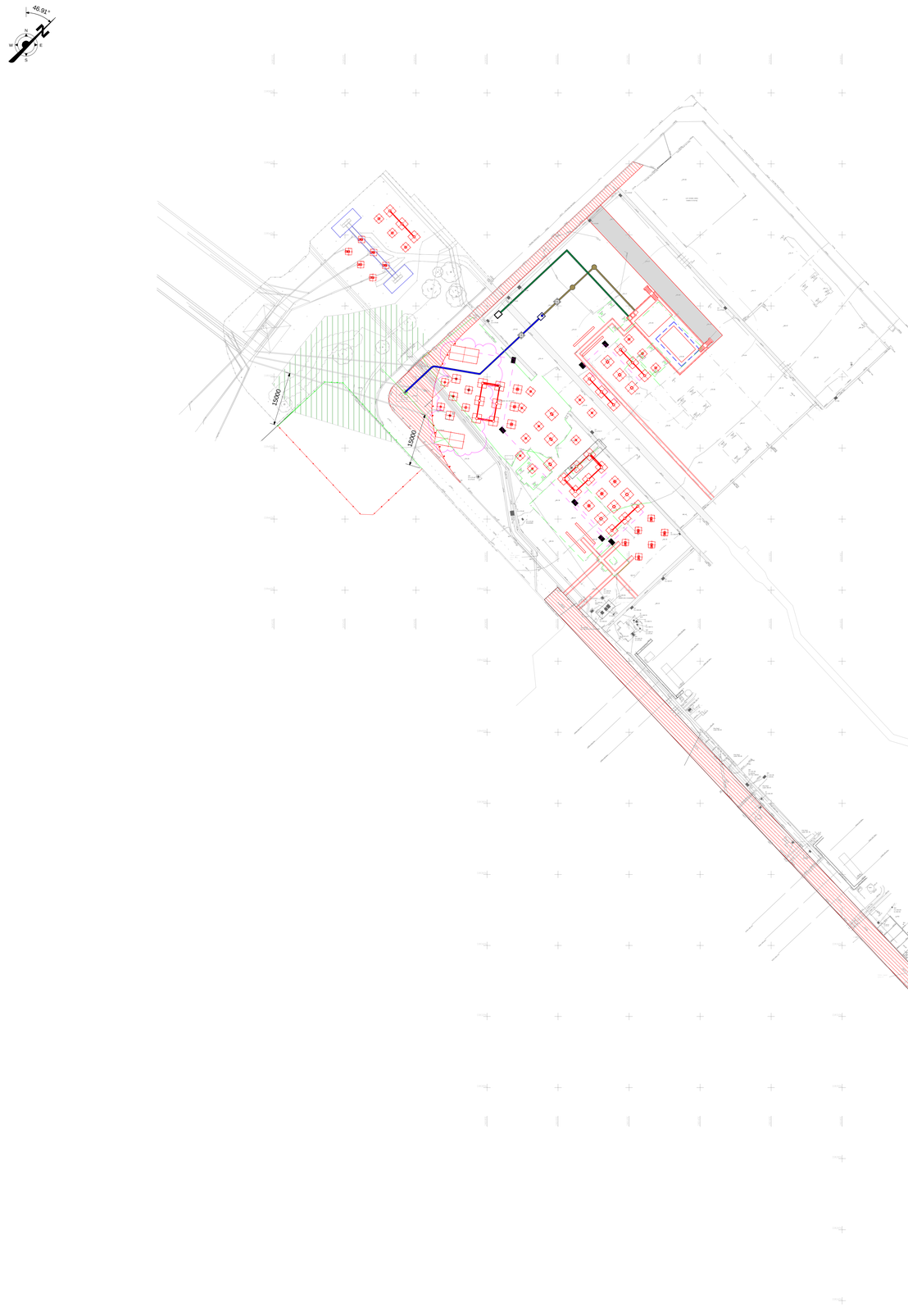
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APPENDIX A: MAP



NOTES:

1. CONCEPT DESIGN ONLY. I.E.: FEED / NDP4.3. NOT FOR CONSTRUCTION.
2. DETAILED DESIGN AND CONSTRUCTION TO COMPLY WITH MOST RECENT NGTS.
3. ALL DIMENSIONS IN MILLIMETERS UNLESS STATED OTHERWISE.
   ALL LEVELS IN METERS ABOVE ORDNANCE DATUM (mAOD) UNLESS STATED OTHERWISE.
   DO NOT SCALE.
4. PERIMETER FENCE SHALL BE 'CATEGORY 2 - STANDARD' ELECTRIFIED PALISADE FENCE. INTERNAL FENCE SHALL BE 'CATEGORY 3 – REDUCED' PALISADE FENCE.
5. SITE LIGHTING NOT BEEN SHOWN BUT MUST INCLUDED IN DETAILED DESIGN AND CONSTRUCTION.
6. DUCTING FOR ELECTRIC FENCE AND LIGHTING NOT BEEN SHOWN BUT MUST BE INCLUDED IN DETAILED DESIGN AND CONSTRUCTION.
7. ASSUMED TELECOM AS FOLLOWS:
   FO1: BT / VODAFONE (VIA ACCESS ROAD)
   FO2: OPTEL / OPGW (VIA OHL)
   FO3: PROTECTION / DPS (VIA HV CABLE)
8. POTABLE WATER NOT SHOWN BUT MUST BE INCLUDED IN DETAILED DESIGN AND CONSTRUCTION
9. INCOMING DNO POWER ASSUMED TO BE BY OTHERS (ROUTE TO BE CONFIRMED)..
10. PIPES TO BE ENCASED IN CONCRETE WHEN THE MINIMUM COVER IS LESS THAN 0.9M BELOW THE ROADS.
11. THE EXPOSED TOPS OF FOUNDATION SHALL HAVE A NON-SLIP BRUSHED FINISH INCORPORATING
    SUFFICIENT CROSS FALL OR CAMBER PRE BENT PONDING OF WATER.
12. SUBSTATION FINISHES SHALL GENERALLY COMPRISE A 75MM THICK LAYER OF 'SUBSTATION
    SURFACING' AS DEFINED IN TS 3.10.02 OVER A MINIMUM THICKNESS OF 300MM UNBOUND FREE-
    DRAINING SUB-BASE (TYPE 3) IN ACCORDANCE WITH SERIES OF THE SPECIFICATION FOR HIGHWAY WORKS.
13. 0.9M WIDE CONCRETE FOOTPATHS SHALL BE PROVIDED BETWEEN ALL BUILDINGS PLUS RAMPED
    ACCESSES TO ALL DOORS TO FACILITATE EQUIPMENT INSTALLATION, TO ALL GAS FILLING POINTS TO FACILITATE MAINTENANCE ACTIVITIES, AND OUTSIDE THE PERIMETER FENCE.
14. EXISTING PIT AND TROUGH COVERS IN ROAD WIDENING TO BE ASSESSED FOR RE-USE. ASSUME ALL TO BE REPLACED WITH D400 COVERS AS PER TS 2.10.08.
15. EXISTING BELOW GROUND SERVICES IN ROAD WIDENING TO HAVE NEW PROTECTION SLABS (OR SIMILAR) INSTALLED ABOVE. EXISTING BELOW GROUND SERVICES EXPOSED DURING ROAD WIDENING EXCAVATION TO HAVE CONCRETE SURROUND ALSO.
16. FSL - TO MATCH WITH EXISTING SUBSTATION LEVEL

LEGEND:

- NEW PLANT
- PLANT TO BE REMOVED
- EXISTING PLANT
- PLANT TO BE REUSE
- FIRE DAMAGE ZONE
- NOISE ENCLOSURE
- PROPOSED OILY WATER CHAMBER
- PROPOSED OILY WATER DRAIN
- PROPOSED SURFACE WATER CHAMBER
- PROPOSED SURFACE WATER DRAIN
- PROPOSED OIL DRAW OFF POINT
- PROPOSED OIL / WATER INTERCEPTOR
- PENSTOCK VALVE CHAMBER
- OIL DRAW OFF CHAMBER
- PROPOSED SAMPLING CHAMBER WITH PENSTOCK
- DRAW PITS
- INDICATIVE TROUGHS
- INDICATIVE DUCTS

400kV EQUIPMENT FOUNDATIONS

DESCRIPTION	FOUNDATION SIZE (mm)	QUANTITY (Nos)
EARTH SWITCH (ESW)	2500x2500x900	15
CAPACITIVE VOLTAGE TRANSFORMER (CVT)	2300x2300x900	08
DISCONNECTOR WITH 1 EARTH SWITCHES (DISC/1 ESW)	2500x2500x900	06
DISCONNECTOR WITH 2 EARTH SWITCHES (DISC/2 ESW)	2500x2500x900	06
CURRENT TRANSFORMER (CT)	2300x2300x900	06
CIRCUIT BREAKER (CB)	2700x2700x900	06
POST INSULTAOR (PI)	2000x2000x900	12
PANTOGRAPH DISCONNECTOR (PANTO)	2700x2700x900	03
SURGE ARRESTOR (SA)	2000x2000x900	08
GANTRY FOUNDATION	4000x8000x900	02
CABLE SEALING END (CSE)	1800x1800x1200	18

ASSOCIATED DRAWINGS

DRAWING No.	DESCRIPTION
PDD-102185-CIV-302	SHUNT REACTOR BUND AND GA

Rev	Description	Cm'd	Chk'd	App'd	Date
P01	FOR REVIEW	CU	HD	KN	26.06.25

nationalgrid

Master Scheme No:	Sub-Scheme No:	Site:
10215	-	TRAWSFYNDD 400kV SUBSTATION

Scheme Name: PENTIR-TRAWSFYNDD NORTH WALES REINFORCEMENY

Document Title:

PROPOSED CIVIL LAYOUT TRAWSFYNDD 400kV SUBSTATION

Created by:	Date:	Checked by:	Date:	Approved by:	Date:
Author	27-06-2025	Checker	27-06-2025	Approver	27-06-2025

Development Eng:	Document Type:	Scale:	Format:	Sheet(s):	Rev:
Designer	LAY	1:500	A0	1 OF 3	P0

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FEED Document Number:

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APPENDIX B: ASSUMPTIONS AND LIMITATIONS

The following assumptions apply to the Equation 1 (CIRIA 750):

- aquifer is unconfined
- aquifer has an infinite areal extent
- aquifer is homogenous, isotropic and of uniform thickness

Following assumptions/limitations apply to the equation used to determine dewatering volume (trench two-side (UC) CIRIA 750):

- aquifer is unconfined
- initial water table is horizontal
- aquifer is homogenous, isotropic and of uniform thickness
- L_0 is obtained using the Sichardt formula, taking C as between 1500 – 2000, the default value for C used in this spreadsheet is 2000. However, in high permeability soils where very large values of L_0 are calculated, caution is needed. Equation 1 was developed for ratios L_0/H of <5 and may not be suitable for application where L_0 is very large; flow rates may be significantly underestimated.
- excavations are penetrating the unconfined aquifer below the original water table
- calculation assumes the cut area is completely dewatered recorded groundwater level (for a GI location) is assumed to be the original water table

The equation assumes that the impact from dewatering affects the full aquifer thickness. In reality a minor cut is unlikely to impact the full aquifer depth beneath the base of the cut. In a deep or thick aquifer and for anisotropic conditions where Kv<Kh the influence of partial penetration on the yield of a well (or cut) is likely to be significantly diminished. This is not considered in the equation adopted.

Permeability may vary along the cut i.e. variable lithologies and variations in measured values may occur and there may not be fully represented by available GI data or the simplified approach to estimate discharge. This is overcome by comparing measured permeabilities or infiltration rates with approximate permeability values derived using the Hazen method based on PSD data. Where appropriate, discretised analyses could be performed to represent some variations along the length of the cut as applies here.

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