Dinorwig to Pentir Heritage Railway Cable Replacement
Hydrogeological Impact Appraisal

Project:	Heritage Railway Permit Application		
Our reference:	16875-MMD-0608-G0-RP-Z-000066_P01	**Date:**	29/08/2024
Prepared by:	A Packman	**Approved by:**	C Williams
Subject:	Technical Note - Hydrogeological Impact Appraisal		

1.1 Background and Site Location

The purpose of this technical note is to provide Natural Resource Wales with a hydrogeological impact appraisal for the replacement of the buried electrical cable along the Heritage Railway located to the north of Llyn Padarn that National Grid Electricity Transmission ('National Grid') proposes to undertake. Morgan Sindall, the main contractor, have applied to Natural Resources Wales for abstraction permits to maintain excavations into the underlying aquifer during installation of the new cables.

Other potential environmental impacts from the works have been covered in the Environmental Risk Assessment and Non-Technical Summary which will be provided in support of the discharge and abstraction permit applications.

1.2 Dewatering Activities

The cable replacement scheme requires excavations to expose the existing cable which will be cut, drained of cooling liquid and removed with a new cable being immediately installed in its place within the existing trench which will be widened. The existing joint bays, constructed out of concrete during the installation of the original cable, will be retained and reused. The excavations must remain dry throughout the works in order to prevent the cables being compromised and potentially failing. It is anticipated that during dry periods the cable trench will be above groundwater level for much of the route; however, it is possible that during periods of rainfall the trench will become inundated with water flowing down the slope toward Llyn Padarn. Sectional drawings of the cable route[1] show the cable route elevation. Llyn Padarn is at an elevation of approximately 104mAOD with groundwater in close proximity to the lake expected to be at a similar elevation.

The trench crosses beneath the Afon Fachwen at chainage Ch2+240 within an existing pipe culvert. It is envisaged that this culvert will be used to carry the new cables beneath this stream with dewatering of the area required whilst cables are run through.

In order to facilitate efficient dewatering of the excavation a sump will be excavated at regular intervals along the route of the cables to collect any water that infiltrates through the ground into the excavation. It is proposed that cable laying will be undertaken with two teams working on different sections. This means that there will be a maximum of 2 abstraction points operating at any one time.

Experience on other sections of the cable route around Llyn Padarn suggests pumping rates of up to 500m^3/day would be expected to maintain excavations in a dry state.

The water will be discharged to ground some distance from the excavation following removal of any suspended solids. A number of locations are proposed along the route which will be used as the excavation work progresses.

[1] Drawings 16875-MMD-0608-C1-DR-C-01002 to 01008

1.3 Identification of Risks from Groundwater Abstraction

Due to the relative lack of historic development along the route the overall likelihood of contamination is considered to be low. There is however, the potential for contamination to be present within the ballast underlying the heritage railway. Suitable control measures including segregation during excavation will be employed to prevent these materials coming into the contact with the groundwater or otherwise migrating towards Llyn Padarn.

There are two SSSIs along the cable route as follows:

- Llyn Padarn; and
- Coed Dinorwig;

Mott MacDonald do not consider it likely that the cable replacement works including any dewatering will have any impact on the Coed Dinorwig SSSI which is designated as an oak woodland. The works will include the pruning and felling a small number of trees required to provide access for the plant and equipment required to complete the works. Although this will have an impact on the SSSI the impact on the groundwater is likely to be low.

Dewatering excavations will not affect the levels of water in Llyn Padarn or the underlying aquifer as the water abstracted will be low in volume and either be returned to the ground or discharged into the Llyn Padarn via the associated consented discharges. There is the potential that dewatering activities may mobilise low levels of suspended solids during the works due to the nature of groundwater ingress into excavations. This will be removed prior to discharge using on-site clarifiers.

The route passes through Secondary A and Secondary Undifferentiated aquifers. The entire route is classed as a low productivity aquifer, as such groundwater ingress into the excavation is likely to be limited.

The classification of groundwater vulnerability is classified as medium to high for the entire length of the route, there are no principal aquifers. The vulnerability classification is based on there being no significant attenuating sediments present. Investigations at the existing joint bays have shown only a thin, rocky soil comprising bedrock derived regolith present above bedrock.

There are no karst-prone rocks in the area which require special hydrogeological consideration.

The solid geology comprises the following lithologies from Llanberis northwards:

- Llanberis Slates Fm – mudstone, siltstone and sandstone;
- Fachwen Fm - sandstone and conglomerate, interbedded; and
- Padarn Tuff Fm - tuff, felsic.

Superficial deposits are generally absent along the route with the exception Alluvial Fan Deposits, Head Deposits and Devensian Till in the vicinity of the Afon Fachwen. These deposits are not extensive, the valley formed by this watercourse is limited in extent.

1.4 Summary

Risks to the environment from the abstraction of water containing sediment and its discharge have been covered within the Environmental Risk Assessment, mitigation measures have been put in place and the discharge permits have limits on pH and suspended solids.

There are no hydrogeological impacts arising from the proposed dewatering of the excavations. The water will be returned to the ground directly adjacent to the cable route and as such will not alter the hydrogeological mass balance.