

National Parks & Wildlife Service
Tóchar Midlands Wetland Restoration Scheme

Scragh Bog
PFS Site No. 1002
SAC (000692)

Fen Restoration Plan

April 2026



ARUP



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National Parks and Wildlife
Service

Fen Restoration Plan

Scragh Bog

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Executive Summary

Scragh Bog located 10km north-west of Mullingar, Co. Westmeath includes a Special Area of Conservation (SAC) for the presence of 7140 Transition mires and quaking bogs, 7230 Alkaline fens and Varnished hookmoss (*Hamatocaulis vernicosus*). The 7140 Transition mires habitat covers the majority of the northern part of the site with small areas of 7230 Alkaline fens and 7210 *Cladium* fens]. The southern part of the site is dominated by forestry (mixed and conifer) and does not contain fen habitats. The fen habitats (and species) are of significant ecological value, supporting biodiversity, improving water quality, storing carbon, and contributing to flood mitigation.

The ecological integrity of Scragh Bog has been impacted by several factors:

- Nutrient enrichment,
- Encroachment by scrub,
- Absence of appropriate grazing management,
- Intrusive research and monitoring activities.

These pressures have resulted in a decline in habitat quality and threaten the species and ecological functions the site supports.

Actions of the Fen Restoration Plan

The restoration plan for Scragh Bog sets out a coordinated series of measures to address the key pressures affecting the site and to support the recovery of its unique wetland habitats. The on-site restoration measures include scrub removal at the southeastern end of the transition mire and engagement with Coillte regarding the future management of the Coillte forestry area in the southern part of the site. Consistent monitoring of both vegetation and water levels is also proposed to provide a suitable baseline of information which can then inform if further measures are required.

To address nutrient pressures, the plan emphasises collaboration with local landowners and farmers through established programmes and incentives to reduce nutrient runoff from surrounding agricultural land. Regular water quality assessments will be conducted to monitor nutrient levels and inform adaptive management of the site.

Finally, the plan recognises the importance of stakeholder engagement and compliance. Active engagement with landowners, statutory bodies, and other local stakeholders will help ensure that restoration actions are practical, widely supported, and compliant with relevant legislation.

Benefits of the Fen Restoration Plan

The restoration plan is expected to deliver significant benefits for a range of habitats and species at Scragh Bog. For 7230 Alkaline *fens*, maintaining hydrological balance and controlling nutrient inputs will protect the fen's structure and function ensuring that 7230 Alkaline fen communities remain stable and resilient to pressures such as eutrophication.

The 7210 *Cladium* fens will benefit from measures to prevent nutrient enrichment, which threaten species composition and fen structure. Retaining boundary scrub will further help filter nutrient runoff into the fen from adjacent farmland. These actions will preserve the saturated conditions and species diversity that define 7210 *Cladium* fens habitats, preventing degradation and maintaining their Annex I quality.

The 7140 Transition mires will benefit from targeted manual scrub clearance, vegetation monitoring, and hydrological monitoring. These actions collectively support the persistence of characteristic species, including the QI Varnished hookmoss, maintain the open, wet conditions that are fundamental to this habitat's ecological integrity and reduce risks from nutrient enrichment, ensuring long-term habitat stability.

Restoration actions will respect the ecological role of wet woodland and bog woodland by retaining these communities while controlling scrub expansion elsewhere. This ensures these woodlands continue to provide filtration and hydrological buffering functions without compromising fen integrity as well as preserve their ecological function and maintain habitat diversity.

Engagement with Coillte to promote biodiversity management of the conifer plantation and the retention of treelines along the site boundary will reduce edge effects, provide filtration for nutrient runoff from adjacent farmland, and improve ecological resilience. Designating the conifer plantation area as a Biodiversity Area will support fen restoration objectives and enhance overall habitat connectivity.

Overall, these restoration actions will enhance habitat quality and resilience, supporting both biodiversity and the site's long-term conservation objectives.

Acknowledgements

This Restoration Action Plan was prepared following consultation with a broad range of groups and individuals involved in peatland restoration, local residents and stakeholders through several workshops.

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Tóchar Wetlands is a wetlands restoration project, co-funded by the Government of Ireland and the European Union through the EU Just Transition Fund Programme. It is managed by the National Parks and Wildlife Service, of the Department of Housing, Local Government and Heritage.

1 Introduction

1.1 Purpose of this Fen Restoration Plan

Scragh Bog is an oval depression containing wet transition fen with a floating root mat located approximately 10km north-west of Mullingar in Co. Westmeath. Much of the site is also part of the Scragh Bog Special Area of Conservation (SAC) (site code: 000692) which covers a total area of 22.77ha and is dominated by fen habitat although other associated wetland habitats are also present. The qualifying feature of the SAC includes 7140 Transition mires and quaking bogs (hereafter referred to as 7140 Transition mires), 7230 Alkaline fens and 1393 Varnished hookmoss *Hamatocaulis vernicosus*. Approximately 0.26h of Annex I¹ quality 7210 Calcareous fens with *Cladium Mariscus* and species of the *Caricion davallianae* fens (hereafter referred to as 7210 *Cladium* fens) are also present. According to the Pilot Fen Survey carried out between 2019-2020, the total extent of 7230 Alkaline fen was estimated at 1.50ha, 7140 Transition mires was estimated at 9.62ha, and 7210 *Cladium* fens was estimated at 0.26ha, respectively (O'Neill et al, 2023).

This Fen Restoration Plan (FRP) report has been developed by Arup on behalf of National Parks and Wildlife Service (NPWS) to set out proposals maintain or improve the quality of 7140 Transition mires, 7230 Alkaline fens and 7210 *Cladium* fens within the site which contributes to favourable conservation condition of the fen habitat and the achievement of SAC site-specific conservation objective (SSCO) targets. However, in some areas, it must be recognised that restoration to increase areas of existing 7140 Transition mires and/or 7230 Alkaline fen will not be possible due to unsuitable hydrological conditions, and the objective may simply be to ensure no further deterioration.

Although the focus of the restoration plan is on 7140 Transition mires, 7210 *Cladium* fens and 7230 Alkaline fens habitat, is it anticipated that restoration actions will also benefit other wetland habitats – as outlined in Section 4.

1.2 Wider Benefits of Fen Restoration

Fens are vital habitats due to their rich biodiversity, supporting a wide array of flora and fauna, many of which are rare or endangered. They act as natural water filters, purifying water by trapping pollutants and sediments, thus enhancing water quality downstream. Additionally, fens store significant amounts of carbon in their peat soils, contributing to climate change mitigation by reducing atmospheric carbon dioxide levels. Their ability to absorb and gradually release water helps regulate water flow and minimize flood risks. Beyond their ecological

¹ Each habitat and species type protected under the EU Habitats Directive (Council Directive 92/43/EEC of 21 May 1992) is given a unique numeric code so that all Member States use the same reference in legislation, reporting and monitoring. Each habitat and species code is an index in the Annex lists with codes grouped by habitat family.

importance, fens hold cultural, historical, and recreational value, offering opportunities for education, research, and outdoor activities. Although some fens in Ireland are not protected as SACs or Natural Heritage Areas (NHAs), they remain crucial for biodiversity and climate resilience.

The restoration measures at Scragh Bog may contribute to lead to improved water quality in downstream waterbodies. Well-functioning fen habitat reduces the risk of dissolved organic carbon passing into watercourses and has been shown to attenuate the speed at which water moves downstream, thereby reducing flood risk.

1.3 Key Pressures on Fens

The overarching (National) key pressures and threats to Annex I fen habitats have been identified in the latest Status of EU Protected Habitats and Species (Article 17 report) (NPWS 2025) in Table 1-1. The overall status is assigned as Bad for both 7140 Transition mires and 7230 Alkaline fens in the Article 17 report. The site is not designated for 7210 *Cladium* fens; however, Annex quality habitat has been recorded, and national pressures are also detailed. The overall status of this habitat is assigned as Bad.

Table 1-1: National pressures to fen habitats

Habitat	Importance	Pressure
7140 Transition mires	High	PA09 Burning for agriculture PA13 Application of natural or synthetic fertilisers on agricultural land PA22 Drainage for use as agricultural land PF02 Construction of modification (e.g. of housing and settlements) in existing built-up areas PL02 Drainage (mixed or unknown drivers)
	Medium	PA08 Extensive grazing or undergrazing by livestock PA17 Agricultural activities generating pollution to surface or ground waters (including marine) PB24 Drainage for forestry PE01 Roads, paths, railroads, and related infrastructure PI03 Problematic native species K01 Abstraction from groundwater, surface water, or mixed water L02 Natural succession resulting in species composition change C05 Peat extraction
	Low	PA01 Conversion into agricultural land (excluding drainage and burning) PA02 Conversion from one type of agricultural land use to another (excluding drainage and burning) PA05 Abandonment of management/use of grasslands and other agricultural and agroforestry systems (e.g. cessation of grazing, mowing or traditional farming) PA07 Intensive grazing or overgrazing by livestock PA21 Active abstraction of water for agriculture PB01 Conversion to forest from other land uses, or afforestation (excluding drainage) PB26 Other forestry activities, excluding those relating to agro-forestry

Habitat	Importance	Pressure
		PC05 Peat extraction PF06 Deposition and treatment of waste/rubbish from built-up areas PI02 Other invasive alien species (other than species of Union concern)
7230 Alkaline fens	High	PA07 Intensive grazing or overgrazing by livestock PA22 Drainage for use as agricultural land PA23 Physical alteration of water bodies (including dams, channels, etc.)
	Medium	PA01 Conversion into agricultural land (excluding drainage and burning) PA05 Abandonment of management/use of grasslands and other agricultural and agroforestry systems (e.g. cessation of grazing, mowing or traditional farming) PA08 Extensive grazing or undergrazing by livestock PB24 Drainage for forestry PC06 Dumping/depositing of inert and dredged materials from terrestrial and marine extraction PF06 Deposition and treatment of waste/rubbish from built-up areas PI02 Other invasive alien species (other than species of Union concern) PL02 Drainage (mixed or unknown drivers)
	Low	PF05 Sports, tourism, and leisure activities PI03 Problematic native species PE09 Land, water and air transport activities not referred to above PE01 Roads, paths, railroads, and related infrastructure
7210 <i>Cladium</i> fens	High	PA05 Abandonment of management/use of grasslands and other agricultural and agroforestry systems (e.g. cessation of grazing, mowing or traditional farming) PA17 Agricultural activities generating pollution to surface or ground waters (including marine) PL02 Drainage (mixed or unknown drivers)
	Medium	PA06 Mowing or cutting of grasslands PA08 Extensive grazing or undergrazing by livestock PB24 Drainage for forestry
	Low	PA01 Conversion into agricultural land (excluding drainage and burning) PA07 Intensive grazing or overgrazing by livestock PA22 Drainage for use as agricultural land PB19 Forestry activities generating pollution to surface or ground waters (including marine) PB26 Other forestry activities, excluding those relating to agro-forestry PF05 Sports, tourism, and leisure activities PI03 Problematic native species

1.4 Legislative Context

There is a comprehensive system of legislation, both domestic and international, which aims to protect biodiversity at a landscape, habitat, and species level in Ireland. This legislation exists within, and independently of, the planning process.

In Ireland, the most important pieces of legislation underpinning biodiversity and conservation are:

- Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora, hereafter referred to as the Habitats Directive.
- Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds, hereafter referred to as the Birds Directive.
- Regulation (EU) 2024/1991 of the European Parliament and of the Council of June 2024 on nature restoration and amending Regulation (EU) 2022/869.
- European Communities (Birds and Natural Habitats) Regulations, 2011 (S.I. No. 477 of 2011), as amended, hereafter referred to as the Birds and Habitats Regulations.
- Wildlife Acts 1976 to 2017, hereafter referred to as the Wildlife Acts; and
- Flora (Protection) Order, 2015 (S.I. No. 356 of 2015).

According to the EU Habitats Directive (92/43/EEC) and the EU Birds Directive (79/409/EEC), Member States are required to establish a Natura 2000 network of sites of highest biodiversity importance for rare and threatened habitats and species across the EU. In Ireland, the Natura 2000 network of European sites includes SACs and SPAs.

SACs are selected for the conservation of Annex I habitats (including priority types which are in danger of disappearance) and Annex II species (other than birds). SPAs are selected for the conservation of Annex I birds and all migratory birds and their habitats. The Annex habitats and species, for which each site is selected, are the qualifying interests (QI) of the SAC and special conservation interest (SCI) of the SPA. Conservation objectives for the site are defined for these qualifying interests.

The EU Nature Restoration Regulation aims to restore damaged ecosystems and improve biodiversity with particular focus on capturing and storing carbon and reducing the impact of natural disasters. Specific targets include improving and re-establishing biodiverse habitats on a large scale and increasing species populations by improving and enlarging their habitats. EU countries are required to submit National Restoration Plans to the European Commission showing how they will deliver on the targets and monitor their progress.

The Water Framework Directive (WFD, 2000/60/EC) aims to achieve good water quality and ecological status for all water bodies, which directly benefits fen habitats that rely on specific hydrological conditions. By regulating water quality and quantity, the WFD helps maintain the delicate balance of nutrients and water levels essential for fen ecosystems. The directive also promotes the restoration of degraded water bodies, ensuring the long-term conservation of these habitats. Implementing the WFD supports the achievement of site-specific conservation objectives for fen habitats, contributing to improving their conservation status.

1.4 Outline of this FRP document

- Section 2 of this FRP report outlines details of Scragh Bog and the conservation objectives for 7140 and 7230 fen habitat.
- Section 3 outlines the findings from the land and water desktop and site monitoring surveys that were carried out to inform the development of these FRP.
- Section 4 outlines the findings from the ecological desktop and site monitoring surveys that were carried out to inform the development of these FRP.
- Section 5 provides a summary of the key pressures identified by this FRP report that are impacting on fen.
- Section 6 outlines the key restoration measures proposed by this FRP.
- Section 7 outlines additional considerations to inform the development of the FRP.
- Section 8 outlines key players in the FRP, summarises restoration actions proposed, habitats that will benefit and further steps required to prepare for implementation.

Restoration actions proposed by this FRP assessment have been mapped in GIS format and delivered to NPWS in accordance with NPWS data standards (see Appendix D for details of GIS layers provided). This includes detailed mapping of the key pressures addressed by this assessment, detailed mapping of proposed restoration actions, ecological survey results, and referenced sensitivity areas. GIS Shapefiles which accompany this report include all relevant data on referenced species.

2 Site Overview

2.1 Scragh Bog

Scragh Bog is located 10km north-west of Mullingar (Figure 2-1) The site is bounded to the east and west by agricultural land. Lough Owel lies to the west of the site and is used for drinking water and recreational uses.

Historical maps show no record of drains within the site, but indicate the area is associated with wet vegetation. There is no evidence of a source of inflow to the site, however, the Ballynafid River acts as the outflow to the north of the site which ultimately discharges into Lough Owel.

Much of the site is designated as a SAC for the presence of 7140 Transition mires, 7230 Alkaline fen, and 1393 Varnished hookmoss, as listed on Annex I/II of the EU. Habitat Directive. These habitats are found in the northern part of the fen, except for the bog woodland, which is located in the southern area of the site.

The site sits in a depression at an elevation below 110mOD. A low ridge (120mOD) to the southwest separates the site from Lough Owel. To the northeast the land rises slightly and then slopes towards the River Gaine (70mOD).



Figure 2-1: Site location map

The SAC site synopsis (NPWS, 2015) for Scragh Bog notes that the site is comprised of a wet transition fen with a floating root mat which has developed in a small oval shape depression. The fen is fed by weak surface springs and drains by an artificially defined outlet. The fen becomes open carr in the central area and in places grades into ombrotrophic bog. The fen also contains nutrient rich non-peat forming marsh communities (Gill et al, 2022). The southeastern part of the site comprises a wooded area with fen carr and Annex habitat 91D0 Bog woodland.

2.2 Fen Condition Assessment

Scragh Bog was surveyed as part of the Scoping study and pilot survey of fens (PFS) (O'Neill et al, 2023) between 2nd, 4th and 6th of September 2019. During the PFS the following negative pressures were reported across the site:

- **7140 Transition mires**
 - A26 Agricultural activities generating diffuse pollution to surface or ground waters
 - H07 Intrusive research and monitoring activities
 - L02 Natural Succession resulting in species composition change
- **7210 *Cladium* fens**
 - L02 Natural succession resulting in species composition change (scrub encroachment)
- **7230 Alkaline fens**
 - No pressures

The results of field evaluation (2025) of the above pressures to inform the restoration planning process is detailed in Section 5.

The overall conservation status of 7140 Transition mires was assessed as Unfavourable – Inadequate and both 7210 *Cladium* fens and 7230 Alkaline fen were assessed as Favourable.

The results of the conservation status assessment of 7140 and 7230 carried out as part of the PFS surveys at Scragh Bog are summarised in Table 2-1.

Table 2-1: Conservation Status Assessment of 7140 Transition mires, 7210 *Cladium* fen, and 7230 Alkaline fen (O'Neill, et al. (2023).

Annex I habitat	Area	Overall Status	Rationale
7140	Favourable	Unfavourable Inadequate	Scrub encroachment should be monitored and scrub removed where it becomes excessive.
7230	Favourable	Favourable	Maintain or restore natural groundwater and surface water regimes. Maintain calcium-rich, low-nutrient water conditions.
7210	Favourable	Favourable	Scrub encroachment monitored and removed where it becomes excessive.

2.3 SAC Site-specific Conservation Objectives

Detailed SSCOs aim to define the conditions necessary to maintain or achieve the favourable conservation condition of a habitat or species at site level. The maintenance of habitats and species within sites at favourable condition will contribute to the maintenance of favourable conservation status of those habitats and species at a national level.

A conservation objective has been set for 7140 Transition mires and 7230 Alkaline Fen, using attributes and targets based on parameters set out in the Habitats Directive (NPWS, 2018).

The restoration actions outlined by this restoration plan aim to contribute towards achieving these targets.

This document does not present the full suite of attributes, targets, and measures for the Annex I habitats. The selection provided in Table 2-2 reflects a conscious decision to focus on those with clear, direct benefits from the FRP measures. While these are listed below, it is anticipated that the remaining attributes, targets, and measures will also experience positive outcomes as restoration measures are implemented.

Scragh Bog SAC is designated for 7140 Transition mires and 7230 Alkaline fens, which has the conservation objective '*To maintain/restore the favourable conservation condition of Alkaline fens in SAC*'. The attributes and targets for 7140 and 7230 fens, along with how the FRP will contribute to achieving set targets are set out in Table 2-2.

Table 2-2: Attributes and Targets for 7140 and 7230 Fen (NPWS, 2018)

Attribute	Measure	Target	Addressed by FRP?	Will restoration actions contribute to achieving target?
Transition mires 7140				
Habitat area	Hectares	Area stable or increasing subject to natural process	Yes	Yes. FRP actions are anticipated to sustain the current area of habitat designated within the SAC.
Habitat distribution	Occurrence	No decline, subject to natural processes	Yes	Yes. FRP actions will not result in a decline in distribution of fen habitat within the SAC. In fact, they should contribute to the increase of 7140 and 7230 distribution.
Ecosystem function: soil nutrients	Soil pH and appropriate nutrient levels at a representative number of monitoring stops	Maintain soil pH and nutrient status within natural ranges	Yes	Yes. FRP actions will alter hydrological conditions which in turn should assist in restoration of more natural soil pH and nutrient status.
Ecosystem function: peat formation	Percentage cover of peat-forming vegetation and water table levels	Maintain active peat formation, where appropriate	Yes	Yes. Improvement in the hydrology of fen habitat should improve conditions for peat formation.
Ecosystem function: hydrology - water levels	Centimetres; duration of water levels	Maintain appropriate water levels necessary to support the natural structure and functioning of the habitat	Yes	Yes FRP looks to monitor water levels and inform appropriate adaptive management if necessary

Attribute	Measure	Target	Addressed by FRP?	Will restoration actions contribute to achieving target?
Vegetation composition: native negative indicator species	Percentage cover at a representative number of 2m x 2m monitoring stops	Native negative indicator species at insignificant levels	Yes	Yes Removal of scrub encroachment in areas where growth was deemed to be significant
7230 Alkaline fens				
Ecosystem function: hydrology – groundwater levels	Water levels (centimeters); duration of levels; hydraulic gradients	Maintain, or where necessary restore, appropriate natural hydrological regimes necessary to support the natural structure and functioning of the habitat	Yes	Yes. FRP actions include water level monitoring to assess if drain blocking is required to improve or maintain the hydrology of fen habitat.
Ecosystem function: hydrology - surface water flow	Drain density and form	Maintain, or where necessary restore, as close as possible to natural or semi-natural drainage conditions	Yes	Yes. FRP actions include water level monitoring to assess if drain blocking is required to improve or maintain the hydrology of fen habitat

3 Land and Water

3.1 Desk Study

3.1.1 Meteorological Conditions

Understanding long-term meteorological patterns is key for informing effective fen restoration planning, particularly with respect to hydrological dynamics. To support this, historical precipitation data over the past 30 years from the closest weather station, Mullingar (Met Éireann - The Irish Meteorological Service), has been compiled to assess seasonal variability in rainfall at the site and surrounding areas.

Two datasets have been visualised: (1) average yearly precipitation (mm) to display long-term rainfall patterns over a 30-year period (Figure 3-1) and (2) average monthly precipitation to show seasonal distribution patterns over a 30-year period (Figure 3-2). This information is important to evaluate the feasibility and sustainability of restoration actions aimed at maintaining suitable the hydrological conditions.

The yearly maximum rainfall is highly variable compared to average and minimum rainfall (Figure 3-1). Around 2015, max precipitation notably increases to nearly 280 mm. Average and minimum rainfall show some fluctuations but remain relatively stable over the 30-year timeline.

The average monthly rainfall is highest in the winter months (October to January) and lowest in late spring (April and May) (Figure 3-2). Minimum rainfall follows a similar pattern, while the maximum monthly rainfall shows a notable increase in winter.

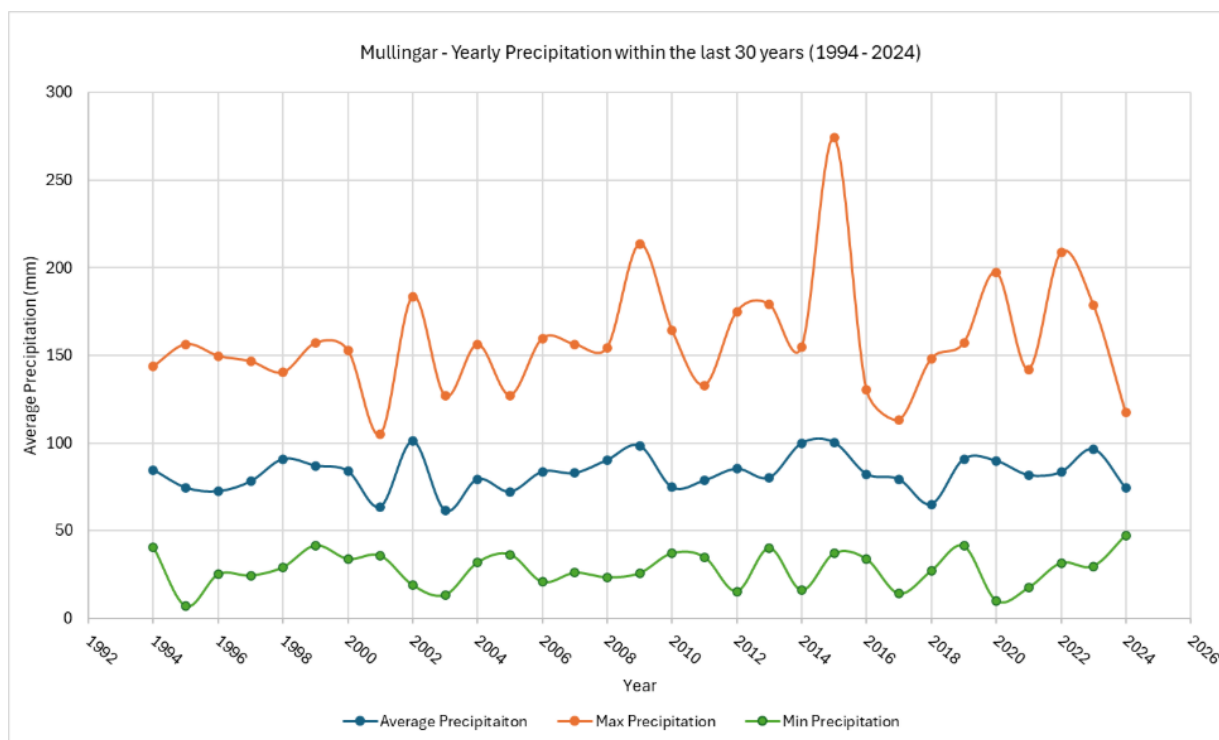


Figure 3-1: Mullingar weather station- average, maximum, and minimum yearly precipitation from 1994-2024

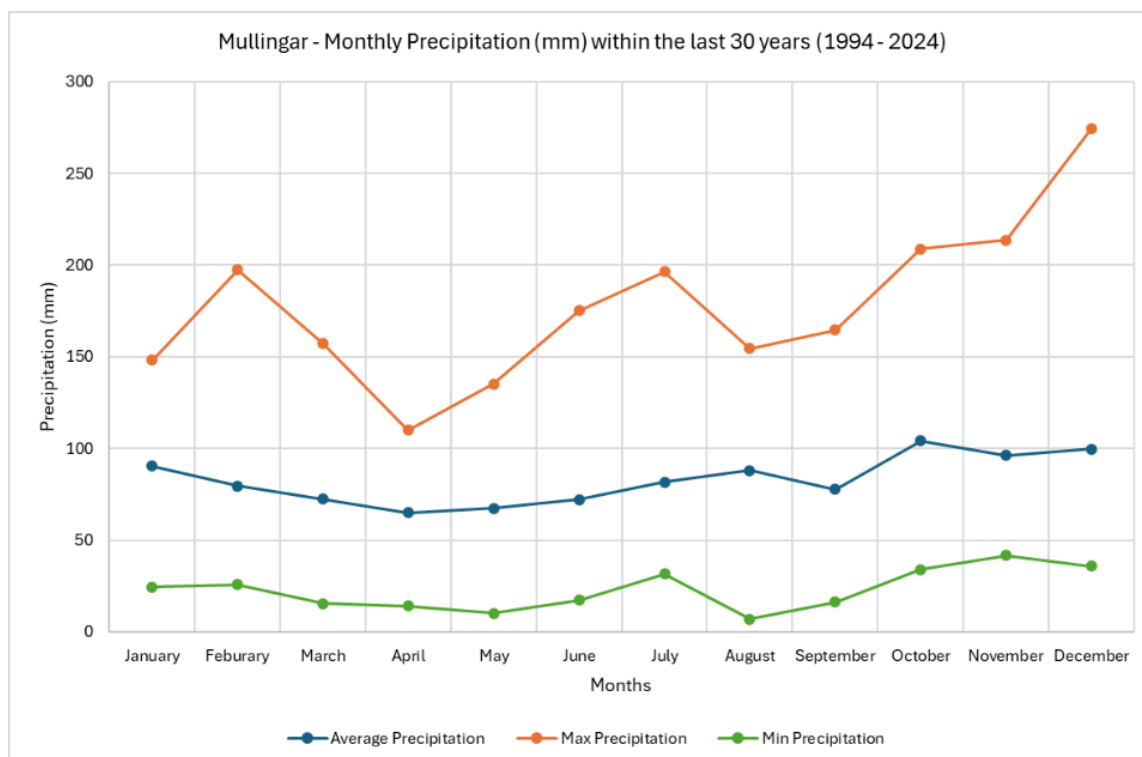


Figure 3-2: Mullingar weather station - average, maximum, and minimum monthly precipitation between 1994 and 2024

A water level gauge operated by the OPW is located in the surface water outflow channel (Ballynafid River) located to the north of Scragh Bog. Water level data indicates that Scragh Bog responds relatively quickly to rainfall events (Figure 3-3) shows water level trends rise relatively rapidly during periods of heavy rainfall, and then gradually drop during periods of little to no rainfall.

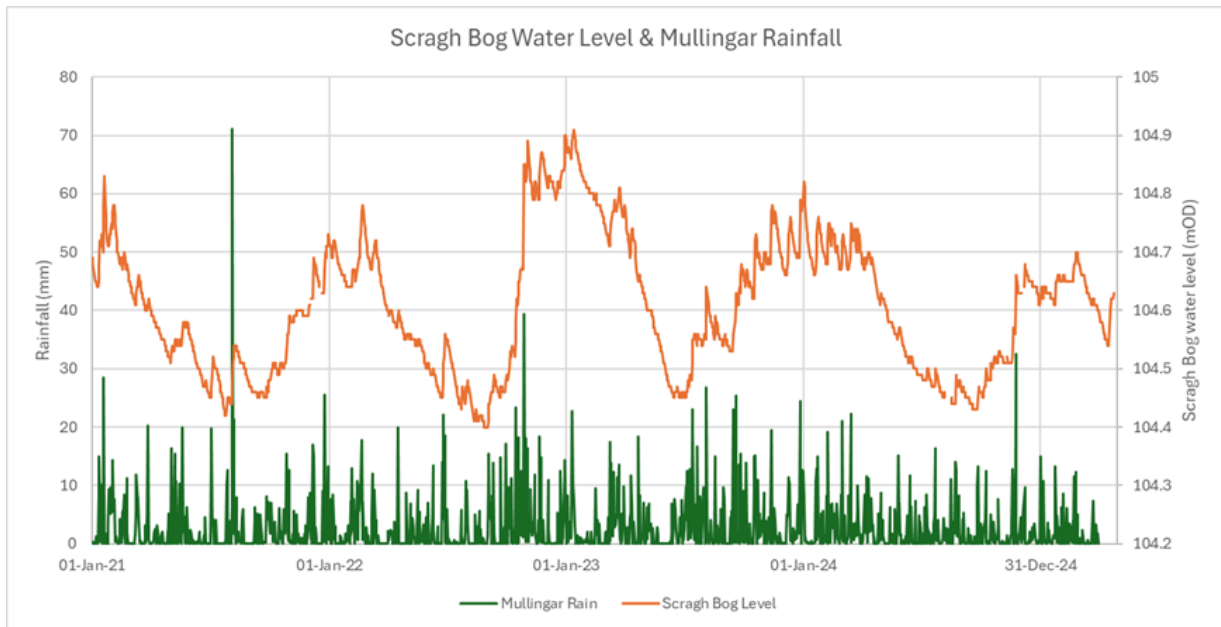


Figure 3-3: Water level at Scragh Bog outflow and Mullingar rainfall

3.1.2 Hydrogeological Setting

The area is underlain by Derravaragh Cherts characterized by cherty limestone, minor shale with some rock out cropping. The Lucan Formation (dark limestone & shale) is located to the south of the site. The bedrock geology of the site is presented in Figure 3-4.

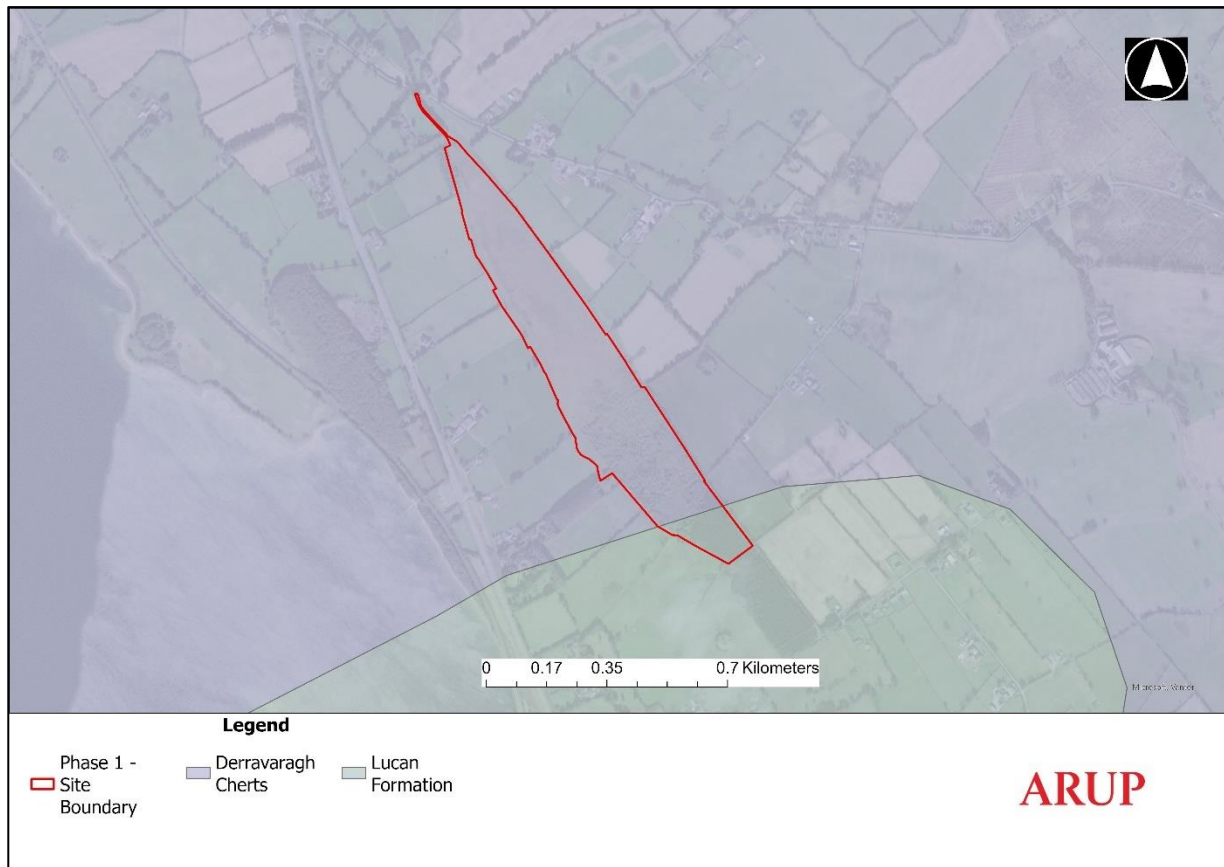


Figure 3-4: Bedrock geology underlying the site (GSI, 2025)

This area is underlain by a Locally Important bedrock aquifer which is Karstified to a limited degree or area (Lk). Karst features such as caves, swallow holes and springs are associated with this type of aquifer and are mapped in the wider regional area by Geological Survey Ireland (2025). A turlough is present on the southeastern boundary of the site (Bijkerk, 2023).

The area located to the south of the site is characterized by a Locally Important bedrock aquifer which is moderately productive only in local zones (LI). Groundwater flow is generally in the upper 30m of the bedrock in a highly weathered layer a couple of meters thick and the underlying zone of interconnected fissures. Deeper groundwater flow paths are possible in the Karstified bedrock. The aquifer classification underlying the site is presented in Figure 3-5.

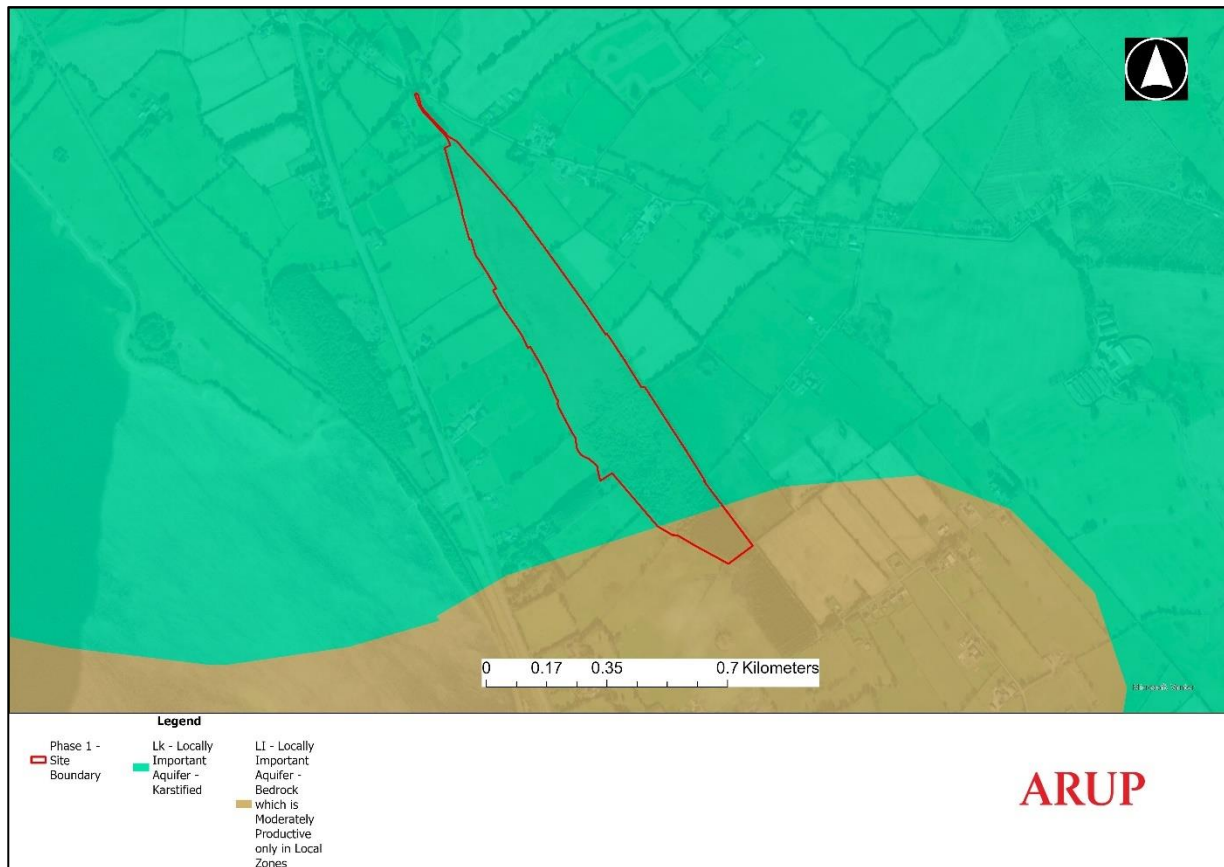


Figure 3-5: Aquifer underlying the site (GSI, 2025)

Quaternary sediments within the site comprise Fen Peat (FenPt). Till derived from cherts are present in the surrounding areas. Some bedrock outcrops/sub crops are also evident in the surrounding area. The subsoil type underlying the site is presented in Figure 3-6. The peat is up to 3m in depth at the centre of the site and thins towards the site boundary. The peat is underlain by lacustrine deposits (Livermud, marl and Gyttya) and boulder clay (O'Connell, 1980).

Groundwater vulnerability within the site is moderate. In the surrounding area the rock is exposed or near the surface. The groundwater vulnerability for the site is presented in Figure 3-7.

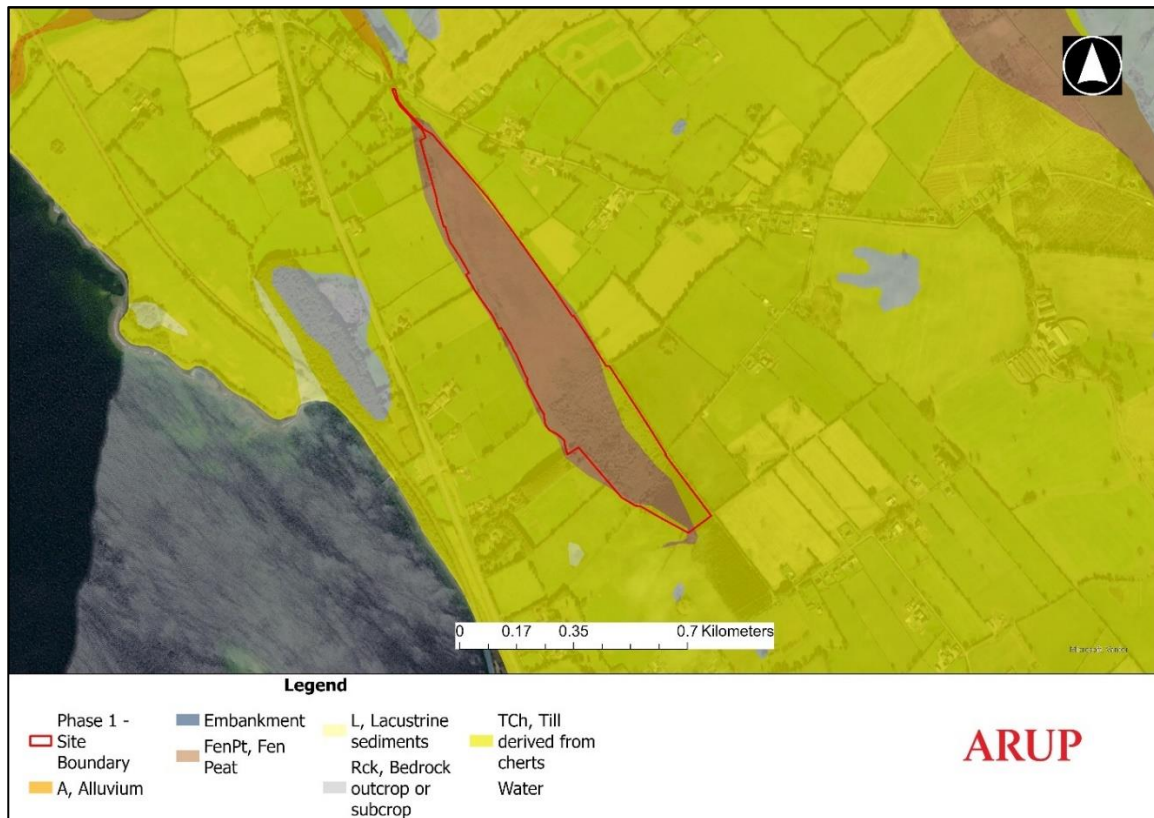


Figure 3-6: Quaternary sediments underlying and surrounding the site (GSI, 2025)

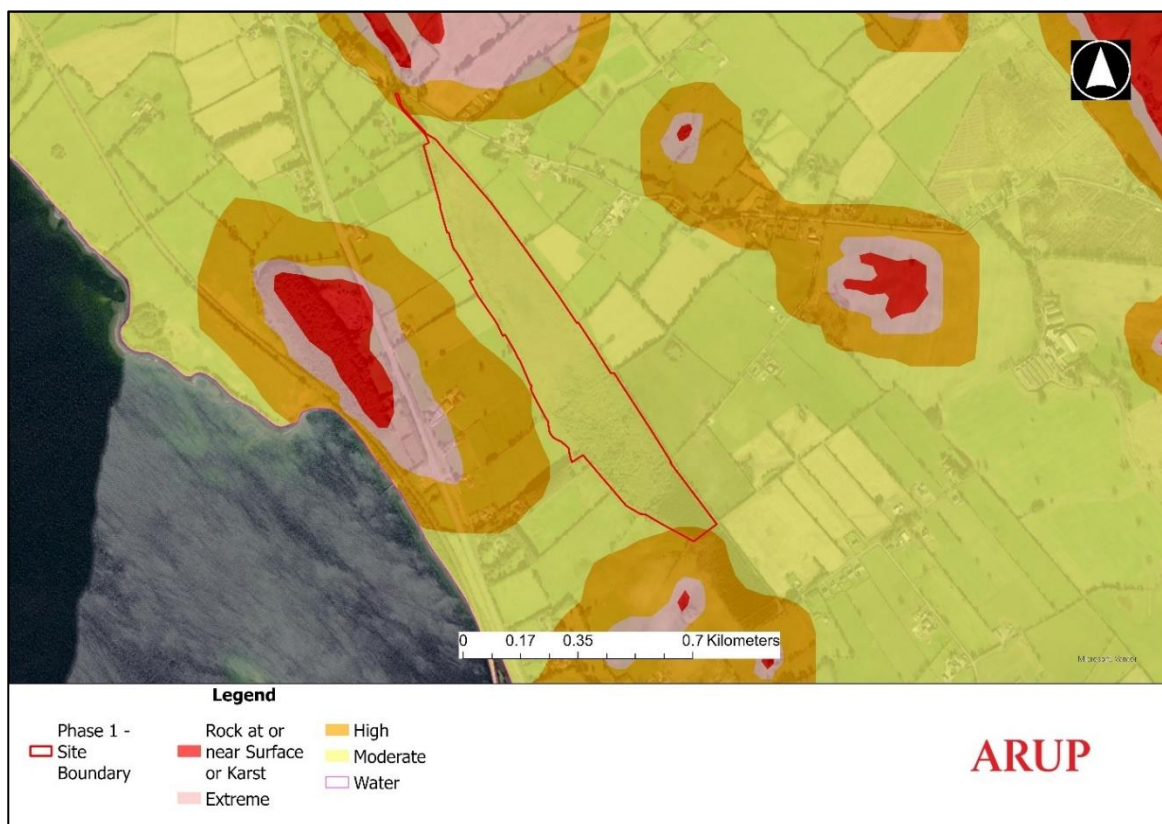


Figure 3-7: Groundwater vulnerability map (GSI, 2025)

3.1.3 Topography and Surface Water Drainage

The site is located within the Lower Shannon 25A WFD catchment and the Brosna sub catchment (WFD Code SC 010) (Figure 3-8). The Ballynafid River, which is part of the Brosna_010 WFD river sub-basin, discharges from the northern part of Scragh Bog into Ballynafid Lake and then to Lough Owel. The Brosna_010 is at 'Moderate' WFD Status and 'at risk' of failing to achieve its WFD objectives. The WFD lake waterbody Owel Main is in a 'Good' WFD Status and Owel Southeast Part is 'Under Review.'

The groundwater body underlying Scragh Bog is the GWDTE Lough Owel Fens & Mires (SAC000688 & SAC000692). The groundwater body is at 'good' status and 'not at risk' of failing to achieve its WFD objectives.

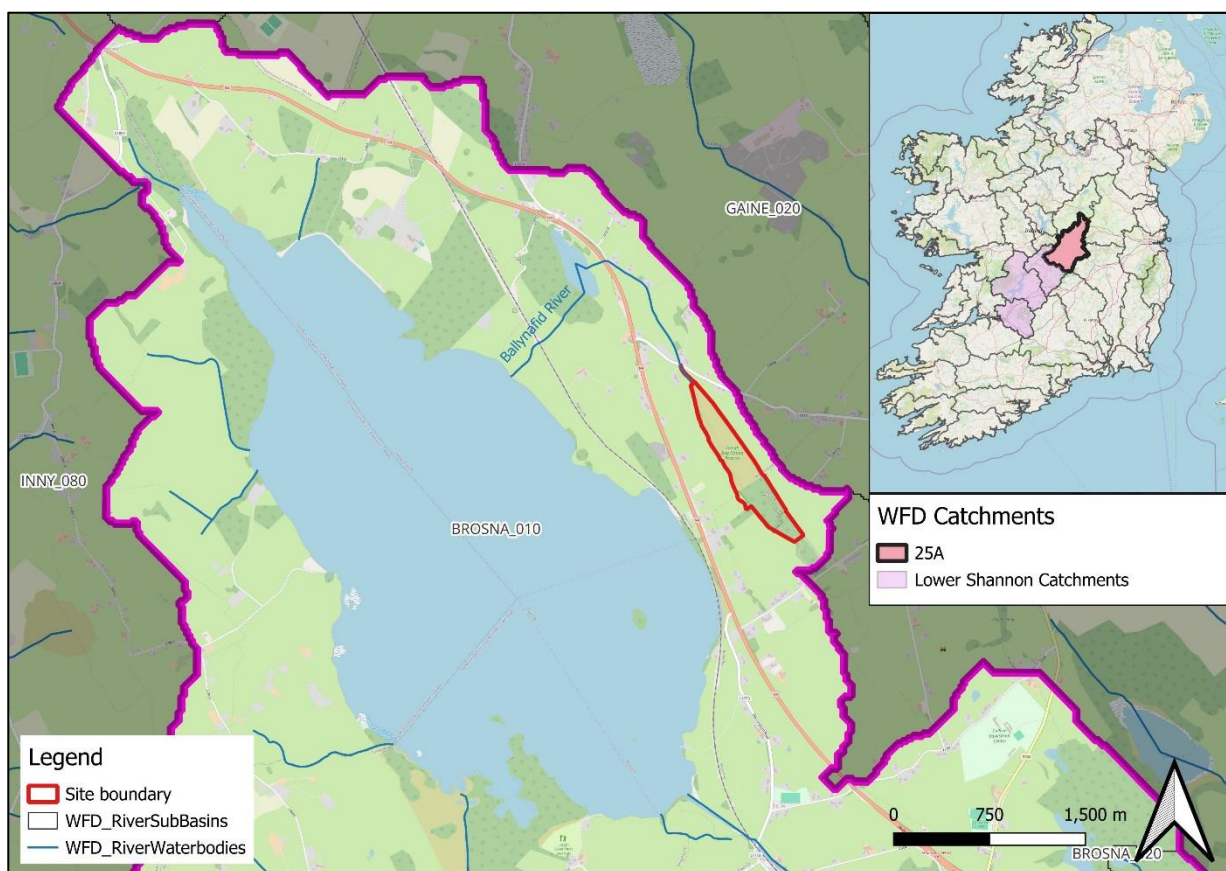


Figure 3-8: Surface water catchment for Scragh Bog (EPA, 2025)

The site sits at an elevation of approximately 110mOD. A low ridge (120mOD) to the southwest separates the site from Lough Owel (Figure 3-9). To the northeast the land rises slightly and then slopes towards the River Gaine (70mOD). Scragh Bog is relatively flat at an elevation of 105mOD throughout. Ballynafid Lake and Lough Owel lakeshores are at about 97mOD (Figure 3-9).

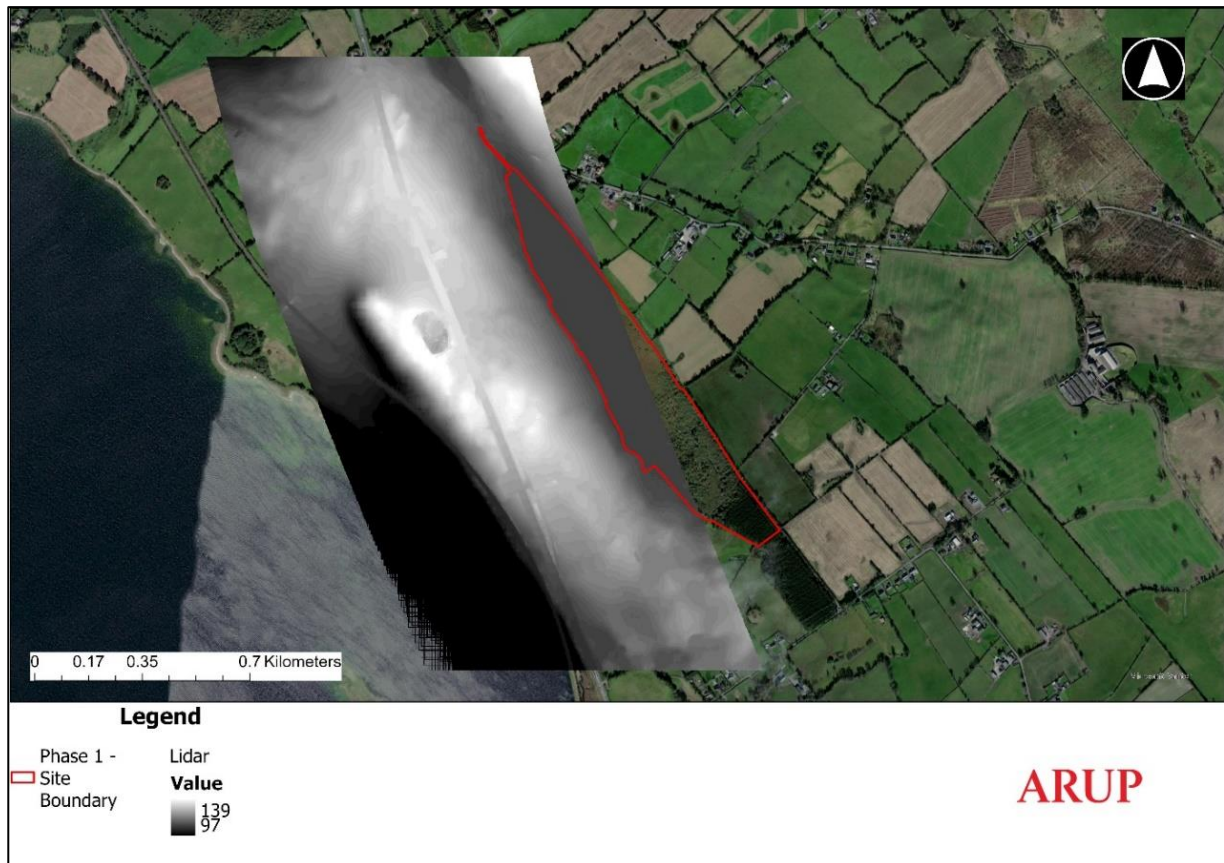


Figure 3-9: LiDAR of Scragh Bog (GSI, 2025)

Bijkerk (2023) estimated the surface water catchment area of Scragh Bog to be 1.1 km² with the fen area covering 0.24 km² (Figure 3-10). Groundwater contours developed by Bijkerk (2023) show that groundwater to the southeast of the site in the vicinity of the Coillte forestry area flows towards the fen and then to the southwest towards Lough Owel (Figure 3-10). The catchment area to the northeast boundary of the site is relatively limited in extent as the contours indicate that flow is directed towards the Ballynafid River to the north. Northwest of the site the contours indicate a flow direction towards the fen. Within the area of fen there is very little hydraulic gradient, and flow extends towards the outflow channel (Ballynafid River) in the northwest.

The regional groundwater flow is unlikely to be reflective of the local topography which likely flows towards Lough Owel. Due to the karstic nature of the bedrock, there is likely to be complex flow dynamics within the regional groundwater flow. However, the groundwater levels, evident from the work by Bijkerk (2023), also show that there is a shallow groundwater component which is influenced by the local topography in the vicinity of Scragh Bog. The combination of the deeper and shallower groundwater pathways likely combines at Scragh Bog to contribute to the upwelling of groundwater within the localised depression (indicated as the dotted circle in Figure 3-10).

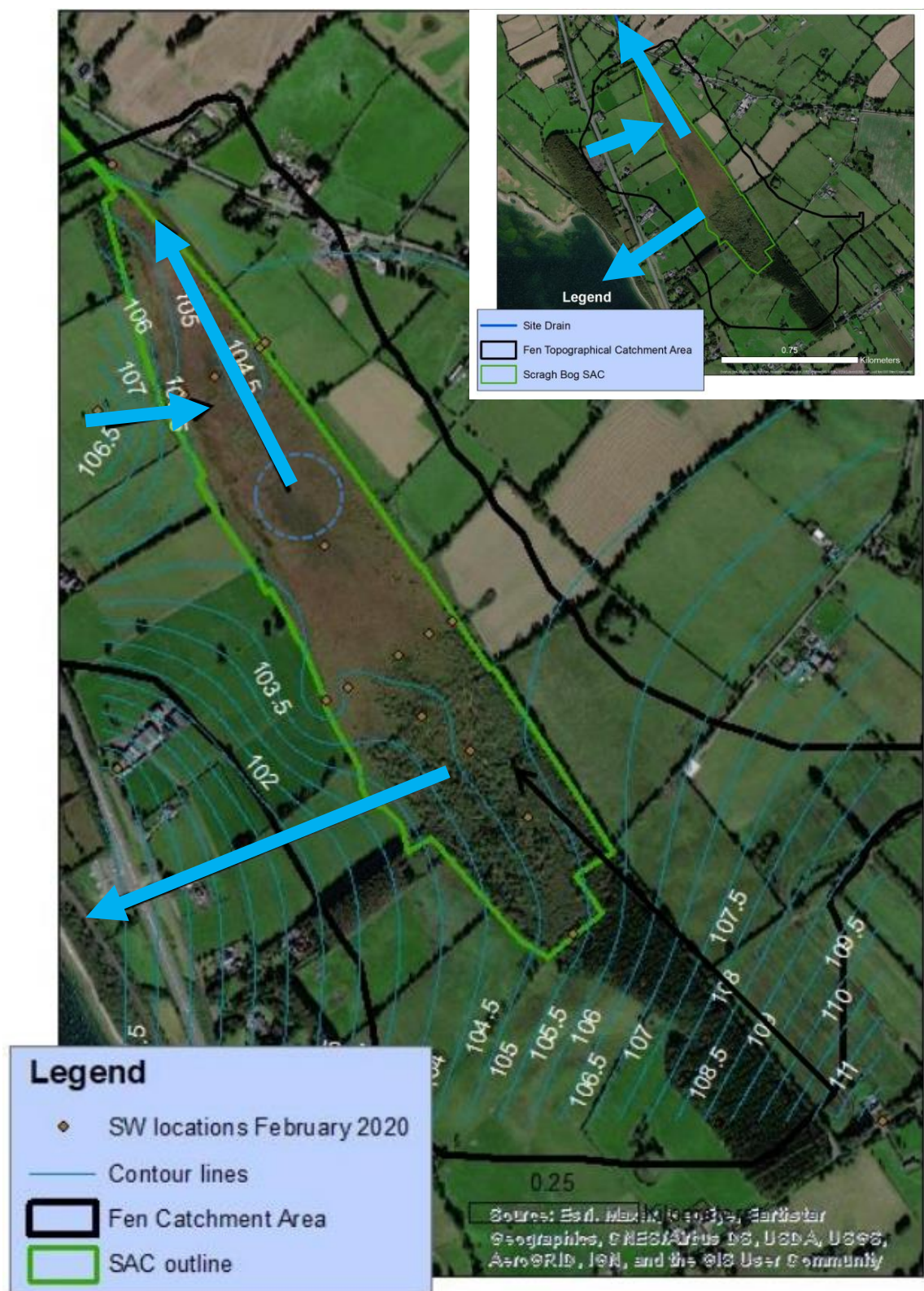


Figure 3-10: Surface water catchment area and contour lines of Scragh Bog. Flowlines are presented with blue arrows with groundwater monitoring locations identified as 'SW' (Bijkerk, 2023).

Assessment of historical photos indicates that the site has remained much the same since the 1800's (Figure 3-11). The Southern section has remained under forestry land use, with the northern section remaining wetland. The forested area had drainage modifications and the outflow from the site has historically been directed to Ballynafid Lake.

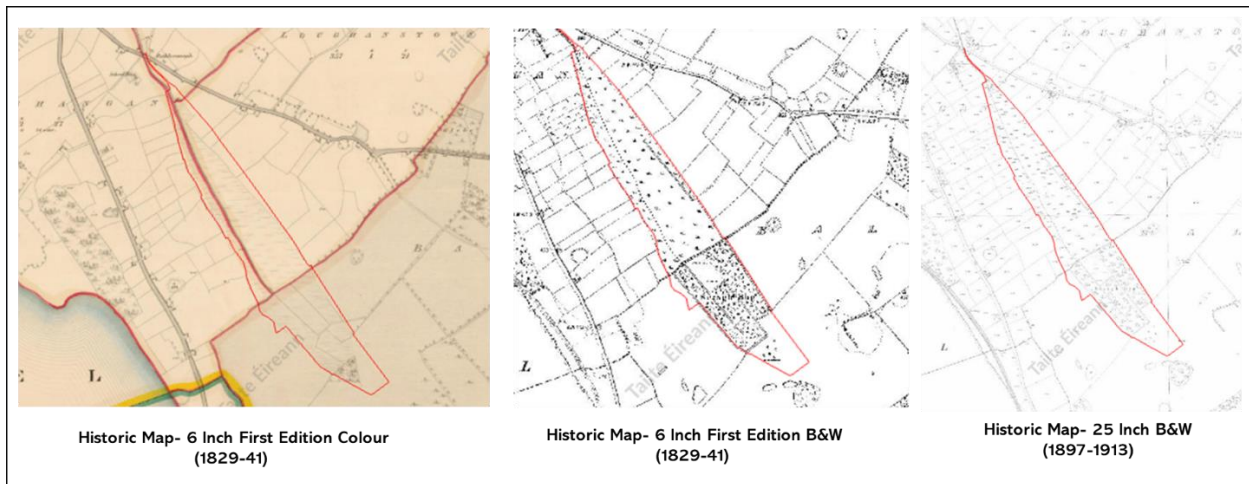


Figure 3-11: Historical water distribution and retention within wetland (Tailte Éireann Historical mapping)

The mapped Wetness Index classifies the northern part of the site as a temporarily wet, indicating alternating periods of saturation and dryness (Figure 3-12). This pattern suggests a mosaic of variable soil moisture conditions, supporting intermittent wetland characteristics across the site. The southern part of the site shows no wetness index; this could be a result of the bog woodland and forested areas.

Total productivity mapping of Scragh Bog further illustrates the sites hydrological variation (Figure 3-13). The Northern part of the site shows moderate to low productivity, which indicates stable productivity and is more typical of a functioning peatland. The southern part of the site shows high productivity, which indicates a drained or degraded peatland or an afforested peatland.

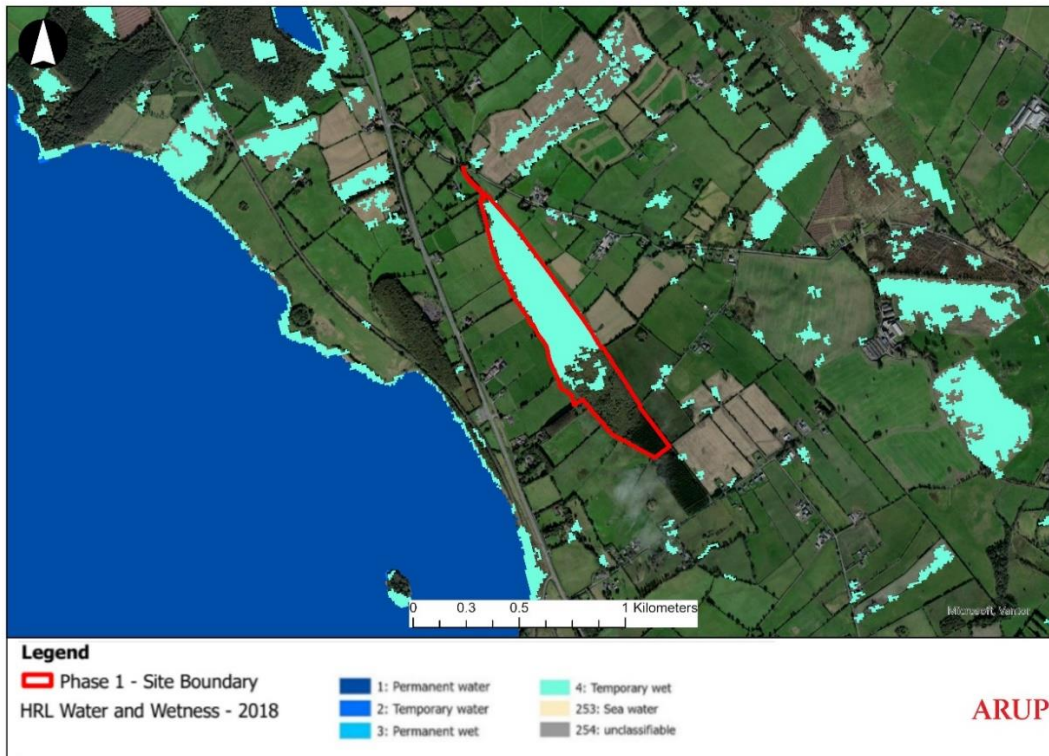


Figure 3-12: HRL Water and Wetness – 2018 (Copernicus, 2025)

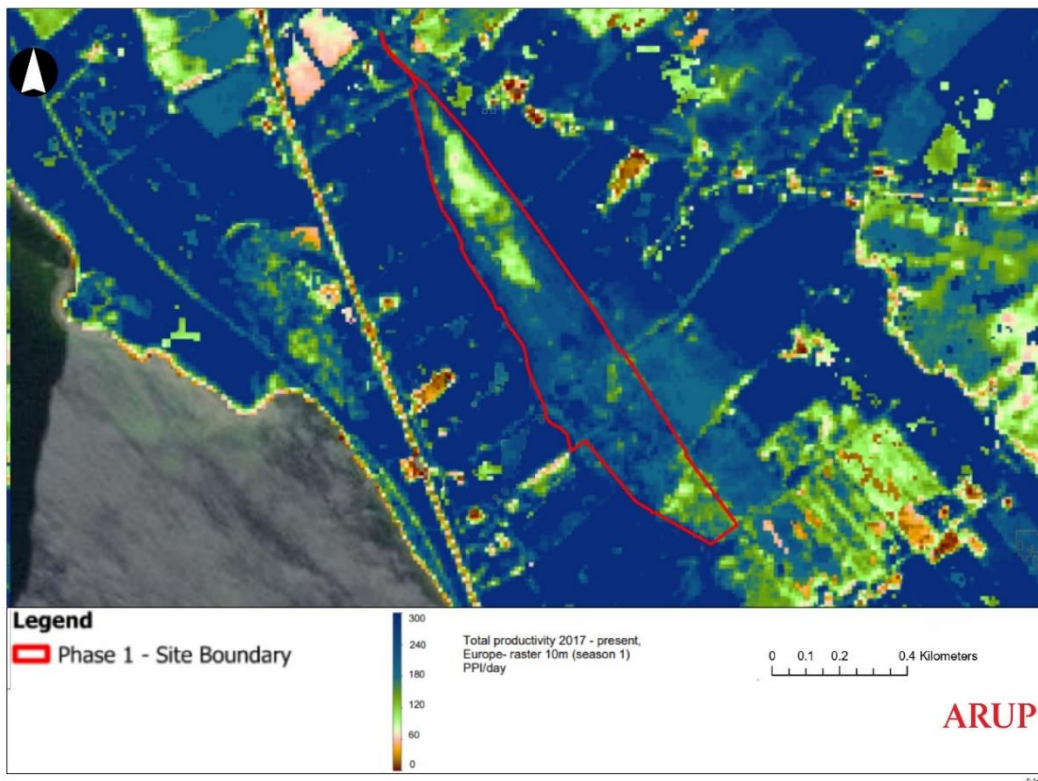


Figure 3-13: Total Productivity 2017 -present, Europe – raster 10m (season 1) (Copernicus, 2025)

Multiple drains are located in the southern part of the site in areas not classified as fen. These drains are not connected to the wider surface water network or the turlough located in the southeast of the site. It is unclear if these drains capture rising groundwater or surface water flow or a combination of both.

There are no mapped surface water inflows into Scragh Bog. Recharge to the site is therefore assumed to be primarily from groundwater, although during rainfall events it is likely that there is a proportion of water entering the fen via overland flow pathways. Publicly available LiDAR (GSI 2025) is currently available for much of the site and the area to the west. Drainage analysis of the LiDAR data (Figure 3-14) indicates that the upgradient drainage network is relatively diffuse indicated by the numerous flow pathways which don't all follow field boundaries. This analysis suggests that the agricultural fields do not contain modified drainage features which can act as point sources of flow and nutrients into the fen but the flow into the fen is diffuse.

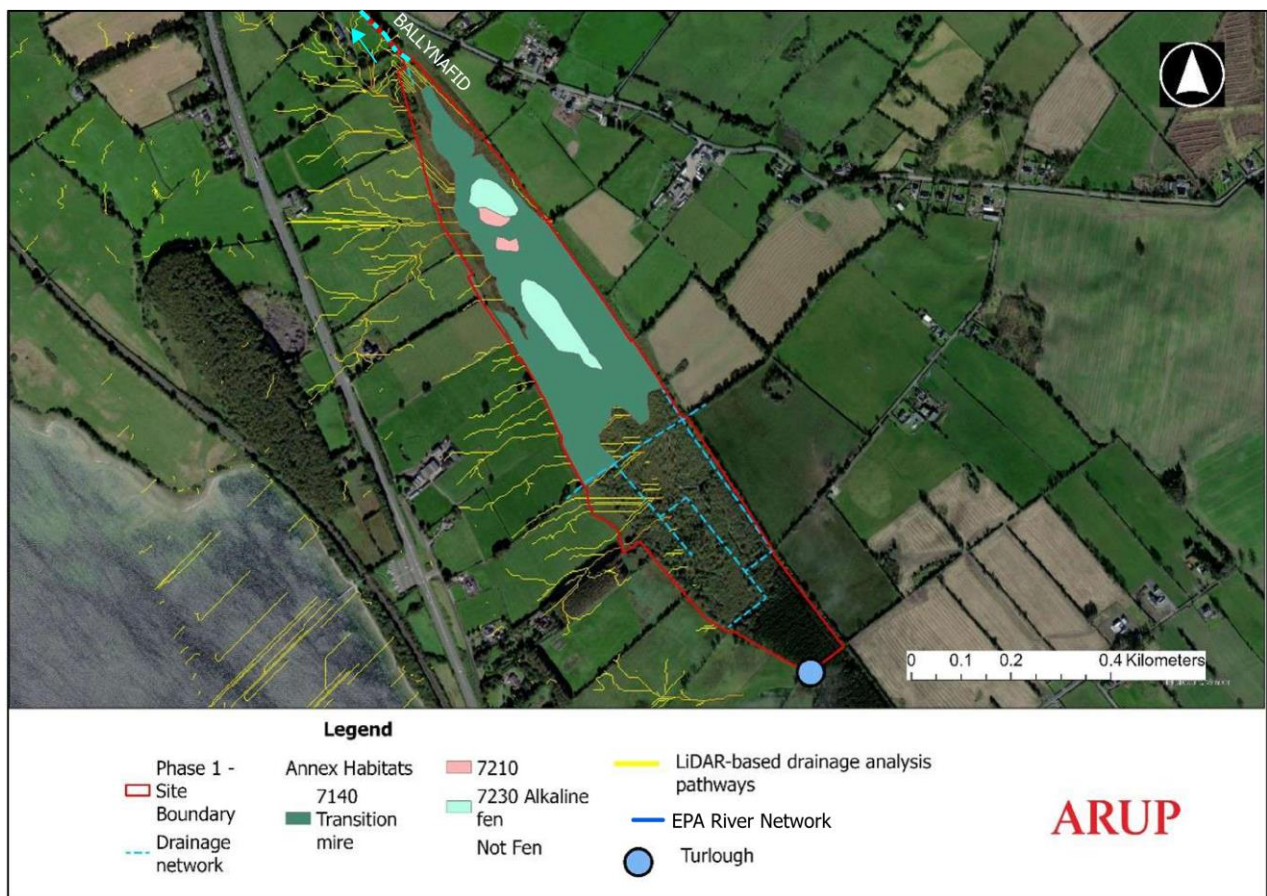


Figure 3-14: Drainage network and LiDAR-based drainage analysis in Scragh Bog

3.1.4 Land Use Pressures and Water Quality

Pollution Impact Potential (PIP) maps (EPA 2025) show the risk areas on the landscape for losses of nitrate and phosphorus to waterbodies. The PIP models estimate the annual nutrient losses from the agricultural land using spatial data on farm management, soils, and hydrogeology. PIP maps for Nitrogen and Phosphorus are presented in Figure 3-16 and Figure 3-17 respectively.

High risk areas for phosphorus loss typically have poorly draining soils and dominant overland flow pathways. The maps indicate that phosphorus delivery flow paths across the site range from medium to high risk in the northern area of the site. The land directly adjacent to the northeastern boundary of the site is classified as high risk from phosphorus runoff.

Freely draining soils and substantial groundwater pathways are high risk for nitrogen losses. Similar to phosphorus, the northeastern boundary of the site is classified as highest risk.



Figure 3-15: PIP- P - Flow delivery paths and points for Phosphorus for Scragh Bog (EPA, 2021)

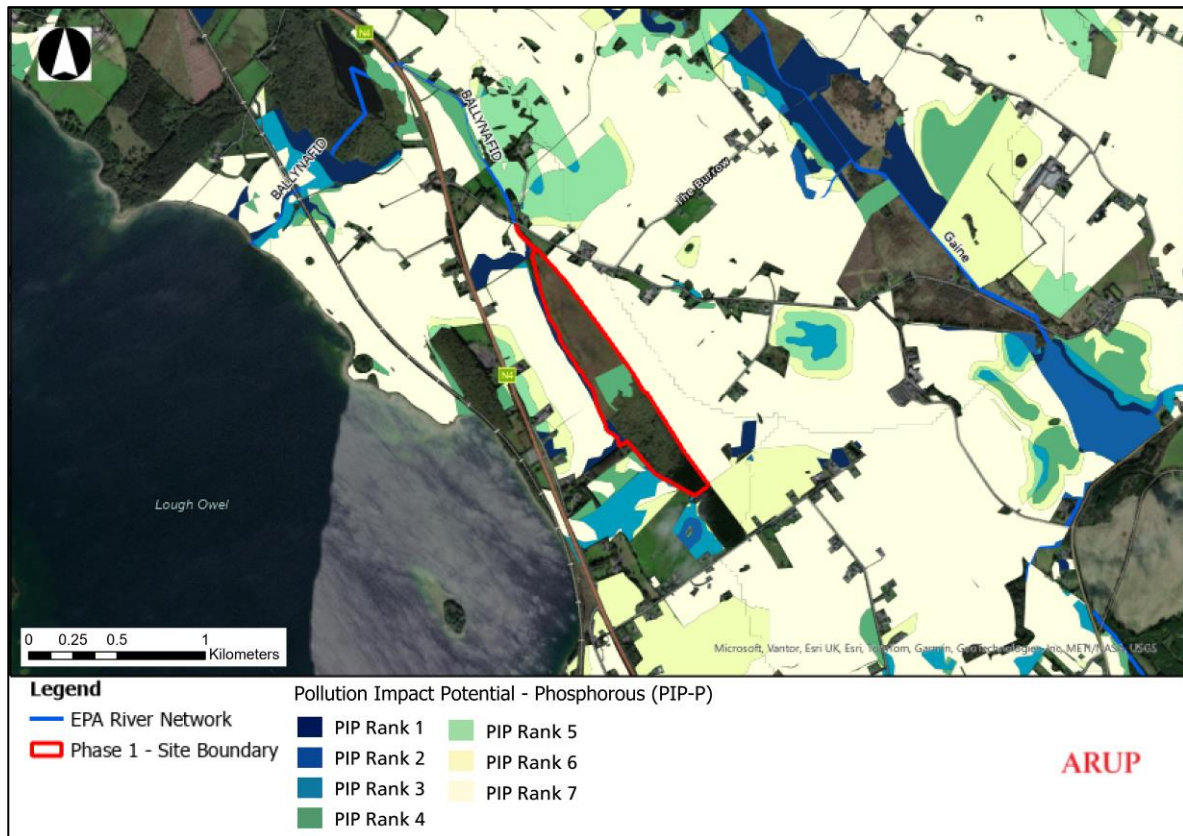


Figure 3-16: Pollution Impact Potential – Phosphorus (PIP-P) of Scragh Bog (EPA, 2025)

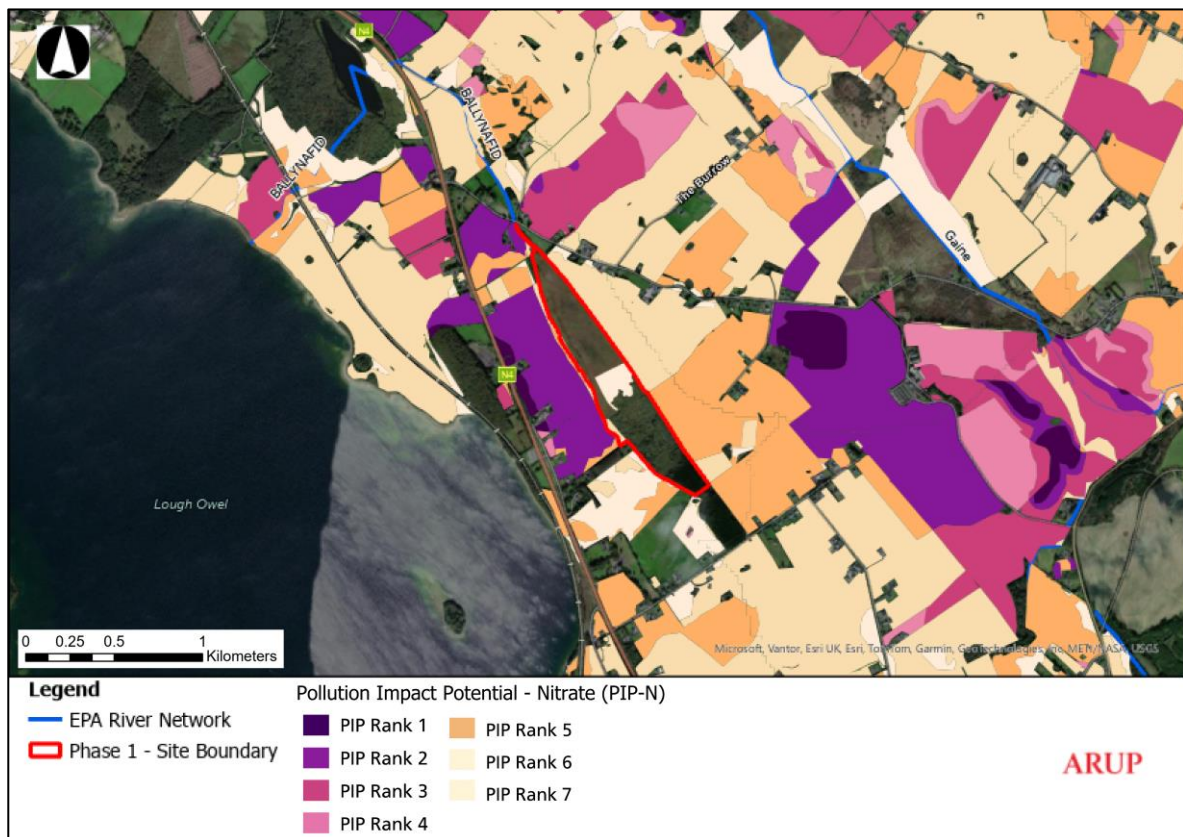


Figure 3-17: Pollution Impact Potential -Nitrate (PIP-N) of Scragh Bog (EPA, 2025)

Ammonium, nitrate, and phosphate analysis of water in Scragh Bog undertaken by Beltman et al (2002) shows decreasing concentrations from the site perimeter to the centre of the site. The eutrophic zone at the perimeter of the fen was estimated to be 5m in width and caused the rapid growth of grasses (Beltman et al., 2002).

Similar findings were concluded from more recent water quality analysis undertaken by Bijkerk (2023). The location for monitoring for this research is identified in Figure 3-18. This informed an analysis of the fen water balance and water chemistry. This research found that nutrient concentrations (ammonia and phosphorus) are higher at the site perimeter and in deeper strata suggesting that there is nutrient input from the surrounding land and the groundwater is upwelling within the fen (Figure 3-19). It also indicated that the fen does not have the capacity to attenuate all the incoming nutrient load and is acting as a “nutrient sink.”

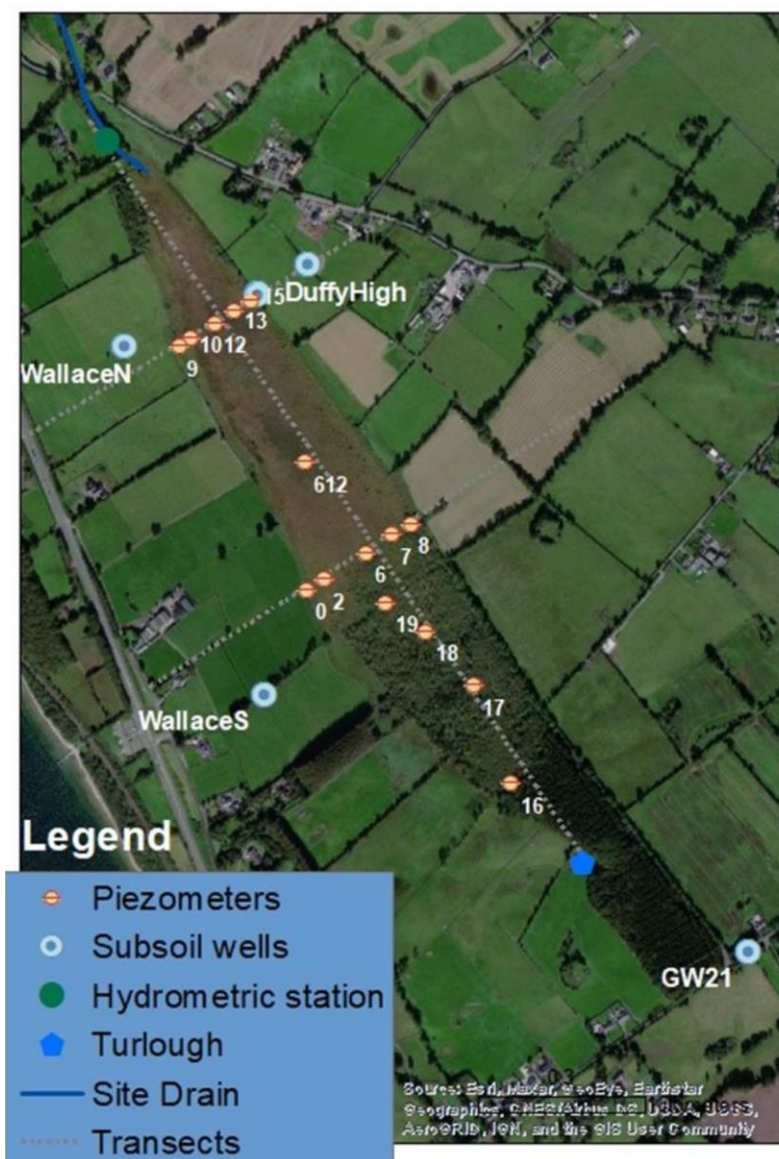


Figure 3-18: Scragh Bog instrumentation for fen piezometer and phreatic tube locations, subsoil well locations and the main site drains (Bijkerk, 2023)

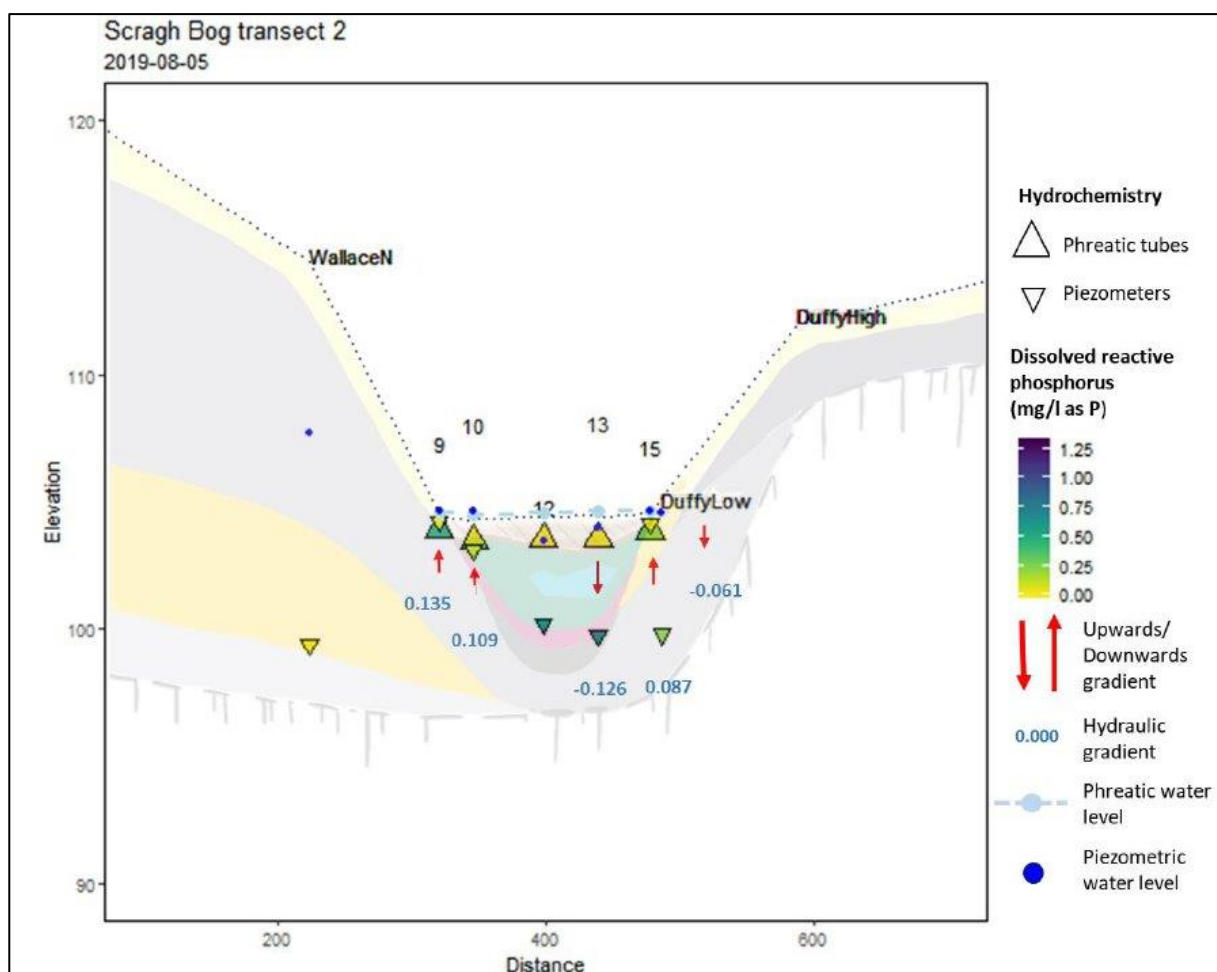


Figure 3-19: Hydrology and dissolved reactive phosphorus (mg/l as P) of Scragh Bog transect 2 in August 2019 (Bijkerk, 2023)²

3.2 Field Survey

Site monitoring was undertaken in August and September 2025, focusing on developing the understanding of the water regime, pressures, and implementation of restoration measures within the site. The site monitoring included peat depth probing, water quality monitoring, groundwater level monitoring in piezometers and observations of water flow in the drainage network (Figure 3-20). Water quality data was collected across multiple points within the site, including fens habitats and the outflow watercourse. The parameters recorded included pH, electrical conductivity (EC), temperature, dissolved oxygen (DO), nitrate (NO₃-N), and phosphate (PO₄). Groundwater levels were monitored in selected piezometers, and peat depths were probed to assess substrate characteristics.

² The phreatic water levels are displayed by a light blue line connected in places where water levels were measured and the piezometric water levels are displayed by dark blue points. The hydrochemistry data is placed at the height where the sample was taken from. The hydraulic gradients flows are shown by red arrows with the number of the vector reported below.



Figure 3-20: Baseline monitoring locations for Scragh Bog

3.2.1 Peat depth probing

Peat depth probing across the site showed spatial variability in peat accumulation (Figure 3-21). Peat depths ranged from 1.2 to 3m throughout the site and is consistent with previous studies.

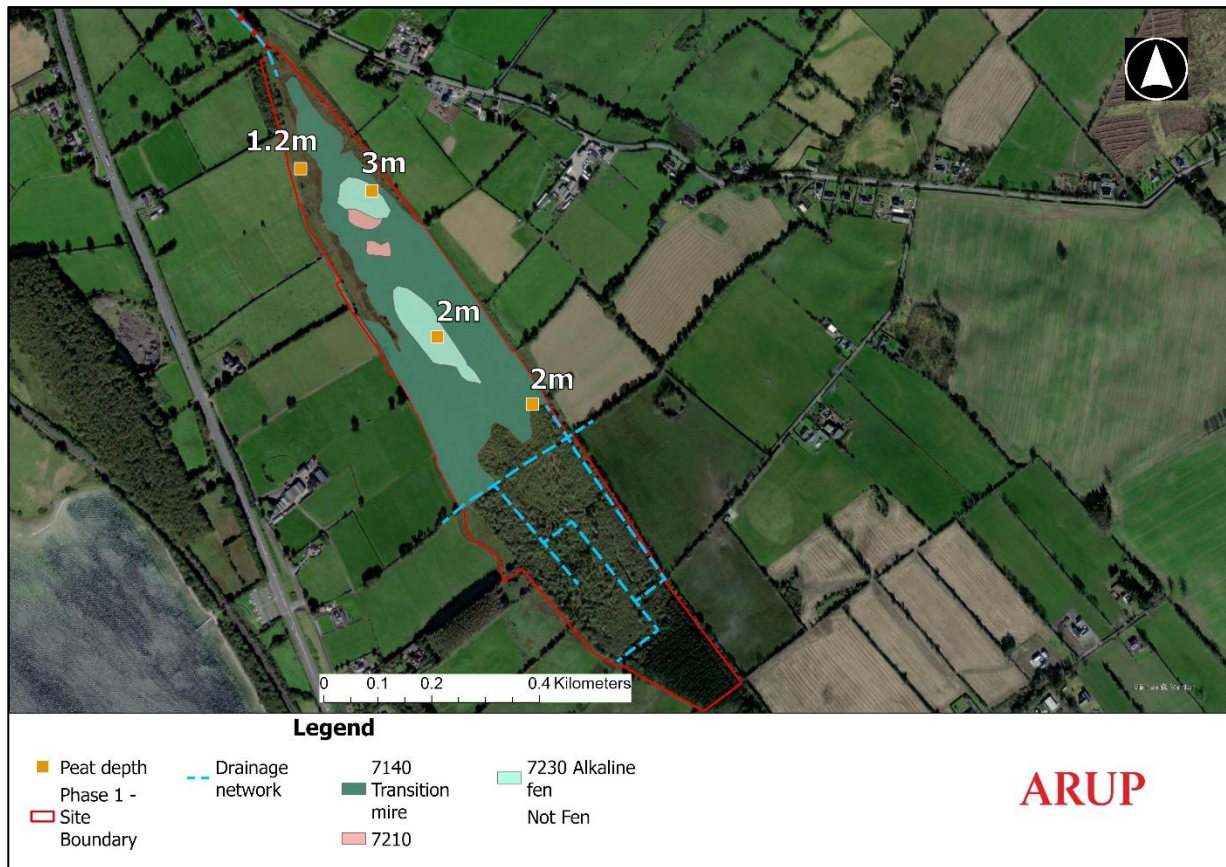


Figure 3-21: Peat depth measurements (m) at Scragh Bog

3.2.2 Groundwater Levels

Groundwater conditions were assessed in existing piezometers present on site (Figure 3-22). Groundwater levels ranged from 0.05 mbgl to 0.20 mbgl.



Figure 3-22: Water depth measurements (m) at Scragh Bog

3.2.3 Surface Water Drainage

Surface water conditions varied across the site during the site surveys. The drains in the southern part of the site were visited during the site surveys. These drains were dry, and flow was not evident. Access and visibility of some part of the drainage network, particularly close to the fen habitat was limited as the drain was heavily vegetated (Figure 3-23). The drain in the northern part of the fen is flowing out of Scragh Bog towards Lough Owel. Since the area was wet and heavily overgrown, it was difficult to determine how far the northern drain penetrated into the fen.

3.2.4 Water Quality

Water quality monitoring across the site was undertaken in drains and ponding fen waters.

The results indicate phosphate concentrations range from 0.3 to 2.3 mg/l PO_4 (Figure 3-23). Spatial trends in the distribution of phosphate concentrations are not evident from these results in relation to sources of phosphate and indicate that further long-term monitoring is required.

Nitrate concentrations were measured in the eastern perimeter of the site and range from 1.6 to 5.2 mg/l NO_3 (Figure 3-24).

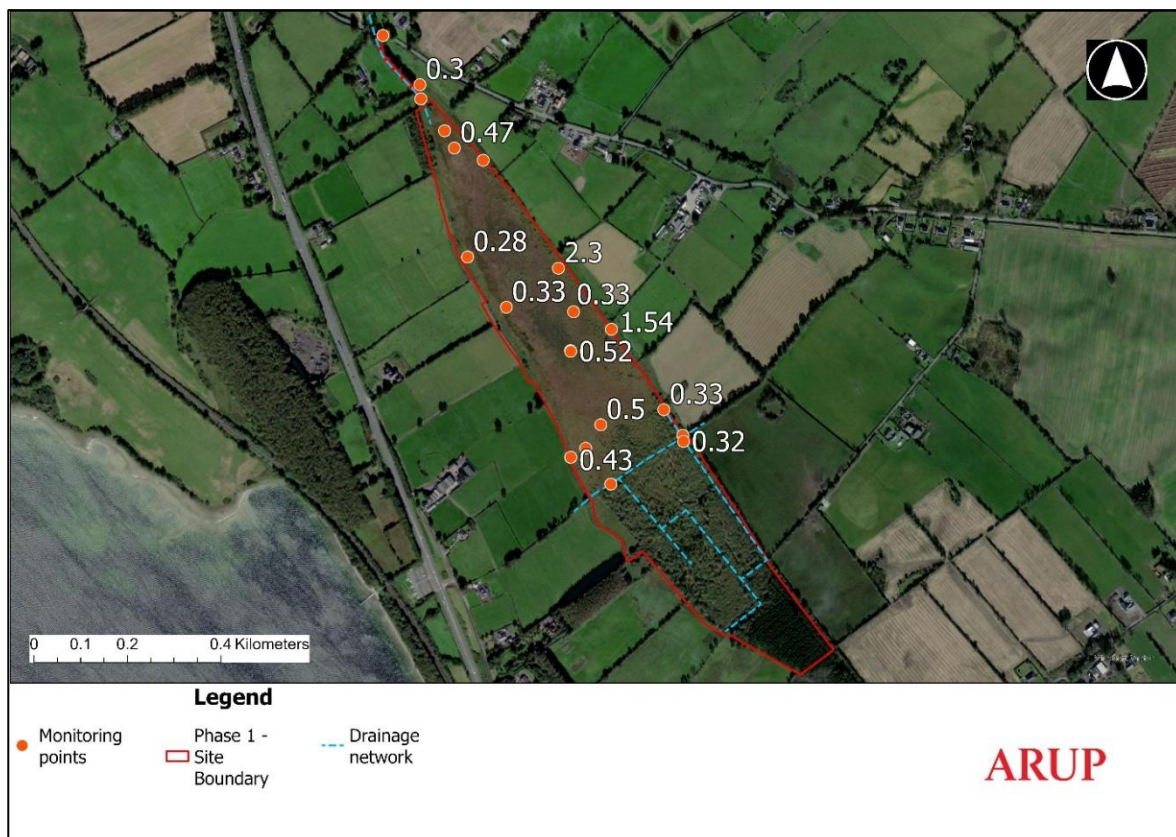


Figure 3-23: Phosphate (mg/l PO₄) results at survey points in Scragh Bog

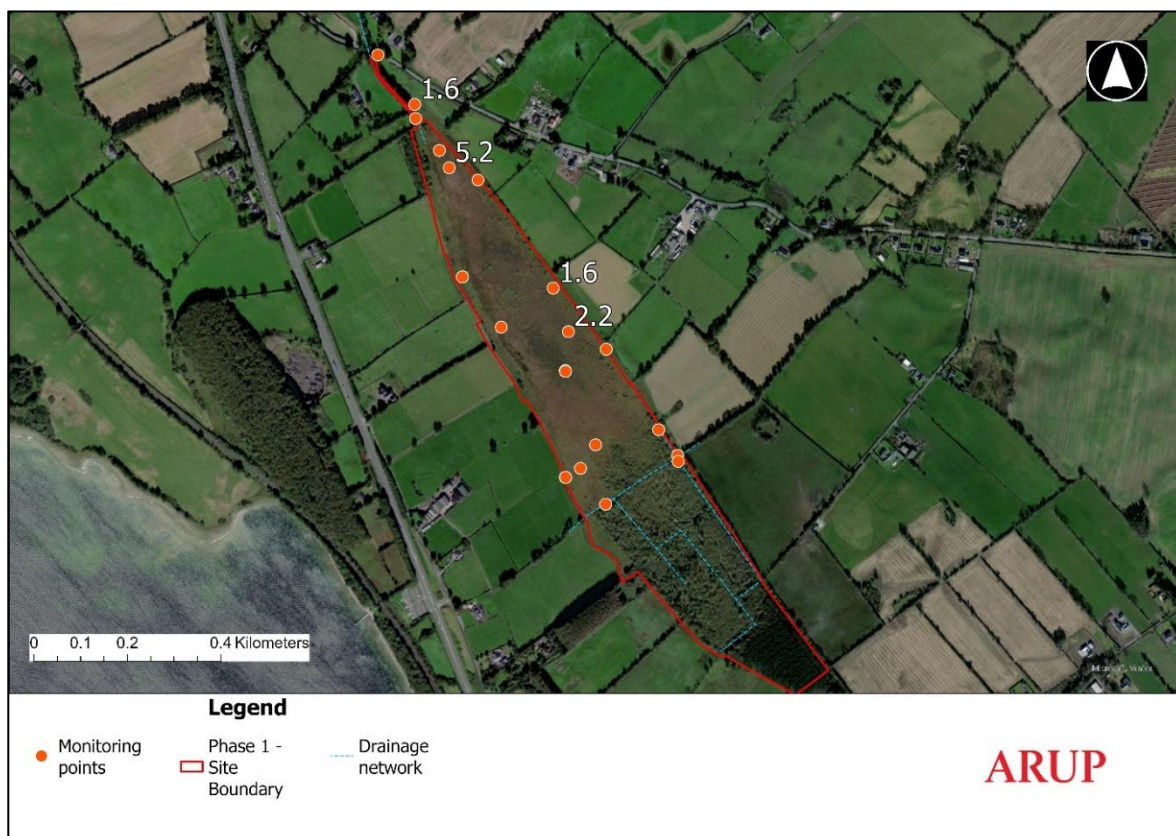


Figure 3-24: Nitrate (mg/l NO₃) results at survey points in Scragh Bog

3.3 Conceptual Site Model

Scragh Bog is classed as Ombrogenous bog (WETMEC 3b: Bog-Transition Quag (open basin)) with Seepage basin/bottom (WETMEC 13b: Seepage percolation quag) in the centre (O'Neill et al., 2023; Weeler et al., 2009). Key characteristics of the site are:

- While the area within Scragh Bog is relatively flat, the site is located within an elongated topographic depression with elevated ground to the southwest, separating it from Lough Owel, and a very slight incline to the northeast before the land slopes down towards the River Gaine.
- Geologically the majority of the site is underlain by the Derravaragh Cherts Formation, which comprises cherty limestone, minor shale with some rock outcropping. A small area to the south is underlain by the Lucan formation, which comprises of dark limestone and shale. Within the site boundary, quaternary sediments are primarily fen peat, whereas the surrounding landscape feature is till derived from limestone. Bedrock outcrops are evident to the west and northeast of the site.
- This site is underlain by a Locally Important bedrock aquifer which is Karstified (Lk). Although groundwater is predominantly in the upper 30m, deeper flow paths are possible. A small area in the southern area of the site is classified as a Locally Important bedrock aquifer which is moderately productive only in local zones (LI).
- Scragh Bog does not have any mapped surface water inputs. Therefore, it is assumed that groundwater is the main source of recharge to the site, however during rainfall events, some water may reach the fen through diffuse shallow and overland flow pathways. In the southeast of the site groundwater flow direction is toward the fen and then southwest toward Lough Owel. Within the area of fen there is very little hydraulic gradient, and flow extends towards the outflow channel (Ballynafid River) in the northwest.
- Hydrological modifications to the site occurred through the excavation of drainage features in the forested southern part of the site. However, the drains are dry and/or overgrown and there is little evidence of their impact on the fen habitats.
- Scragh Bog contains soligenous fen as water movements are predominantly lateral entering through groundwater and also discharging through the groundwater as well as the outflow to the north.

The CSM is presented in Figure 3-25.

Fin Lough
Offaly County
25A: Upper Shannon

WETMEC: 3: Buoyant Weakly Minerotrophic Surfaces (“Transition Bogs”)

Key:

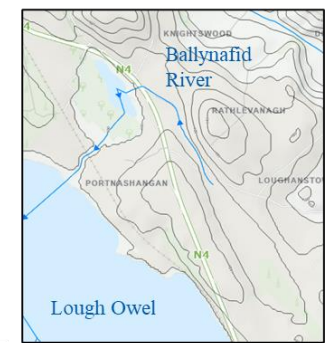
 3180 Turlough

 Wetland vegetation

Vegetation:



Location:



Conceptual site model:

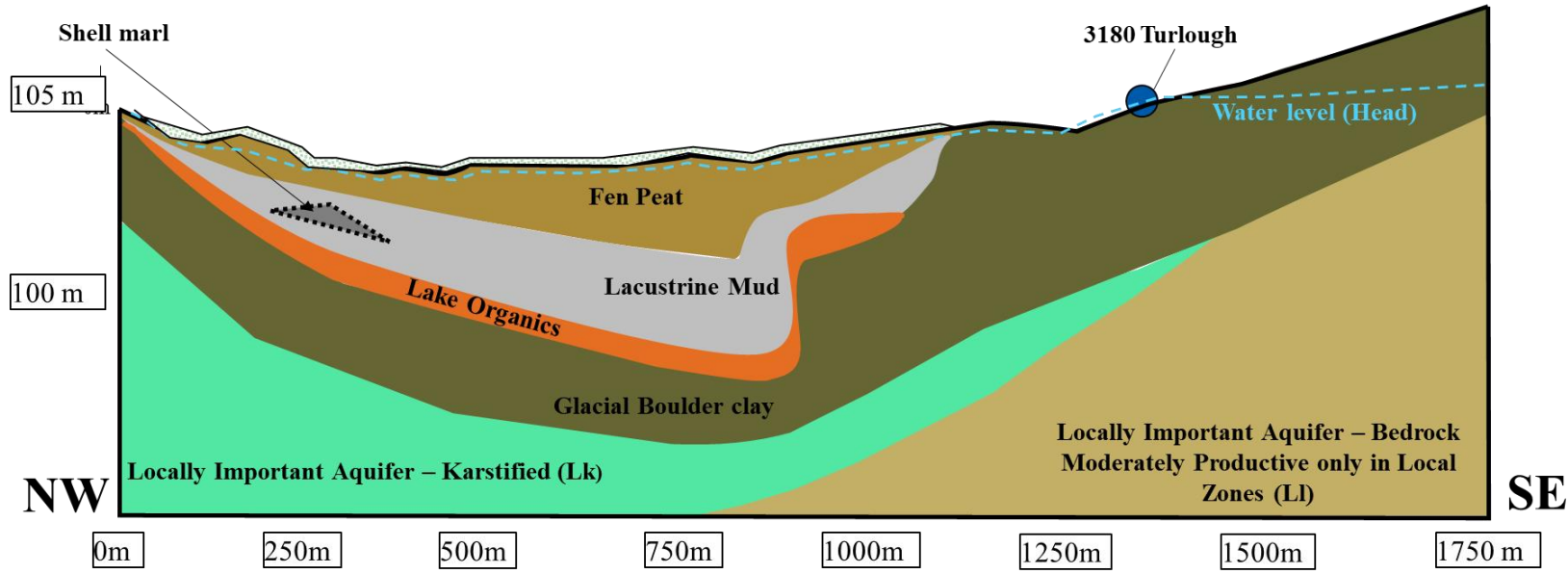


Figure 3-25: Conceptual Site Model of Scragh Bog (SAC)

4 Ecology

4.1 Desk Study

A review of available desktop information on the ecological baseline for Scragh Bog was reviewed from the below information sources:

- NPWS Protected Sites – Special Areas of Conservation –Scragh Bog SAC.
- NPWS Article 17 habitats distribution datasets.
- Scoping Study and Pilot Survey of Fens (O'Neill, 2023).
- Biodiversity Maps - National Biodiversity Data Centre (NBDC).
- Plant Atlas 2020 website - Botanical Society of Britain & Ireland (BSBI).

The PFS was commissioned to develop and test a standardised methodology for assessing the conservation status of fen habitats across Ireland. As part of this study, Scragh Bog in County Westmeath was selected as one of the pilot sites for field survey. The site was surveyed in September 2019, with a focus on Annex I fen habitats, specifically 7230 Alkaline fen and 7140 Transition mires. The survey methodology included:

- Detailed vegetation assessments using quadrats to record species composition and structure.
- Hydrological observations such as water levels and flow.
- Documentation of disturbance indicators including drainage, grazing, and invasive species.

GPS mapping and photographic records were also used to support habitat boundary delineation and condition assessment. While the primary emphasis was on habitat quality, vascular plants and bryophytes were recorded as part of the vegetation surveys, contributing to an understanding of species diversity and habitat integrity at the site.

4.1.1 Habitats

The PFS at Scragh Bog revealed that the site comprises a mosaic of fen, swamp, wet grassland, bog woodland, wet woodland, treeline, conifer plantation, and depositing/lowland river. Drains run through the south-eastern end of the site, but do not impact the areas of fen and 7140 Transition mires on-site. 42.4% of the site was found to be 7230 Alkaline fen.

4.1.1.1 Annex Habitats

The following Annex I habitats were identified and mapped:

- **7140 Transition mires and quaking bogs**– covering approximately 9.75 ha. Found predominantly in the centre of the site, surrounding patches of 7210 *Cladium* fen and]

7230 Alkaline fen Key species include *Carex rostrata*, *Carex diandra*, and *Epilobium palustre*. Other species recorded within this habitat on-site include *Caltha palustris*, *Galium palustre*, *Equisetum fluviatile*, *Menyanthes trifoliata*, *Potentilla palustris*, *Succisa pratensis*, *Valeriana officinalis*, *Salix cinerea*, *Filipendula ulmaria*, *Salix repens*, *Vaccinium oxycoccos*, *Angelica sylvestris*, *Dactylorhiza sp.*, *Juncus articulatus*, *Mentha aquatica*, *Silene flos-cuculis*, and *Scorpidium cossonii*. Despite its extent, the condition assessment indicates unfavourable-inadequate status for future prospects, and overall condition. This is likely due to ongoing scrub encroachment.

- **7210 *Cladium* fens** – FW3H *Cladium mariscus* – *Phragmites australis* swamp covering approximately 0.26 ha. Found in two isolated areas surrounded by 7140 Transition mires and 7230 Alkaline fens. The condition assessment for this habitat indicates favourable status for area, structure & functions, future prospects and overall status.
- **7230 Alkaline fens** – covering approximately 26.78 ha. Consists of *Schoenus nigricans* in mosaic with *Sphagnum subnitens*, *Hylocomium splendens* and *Aulacomnium palustre*. Other species present include *Angelica sylvestris*, *Galium palustre*, *Eriophorum angustifolium*, *Equisetum fluviatile*, *Epilobium palustre*, *Dactylorhiza sp.*, *Juncus articulatus*, *Mentha aquatica*, *Parnassia palustris*, *Potentilla palustris*, *Succisa pratensis*, *Vaccinium oxycoccos*, *Carex diandra*, *Menyanthes trifoliata*, *Hamatocaulis vernicosus*, *Calliergon giganteum*, *Scorpidium scorpioides*, *Campylium stellatum* and *Scorpidium cossonii* present. The condition assessment for this habitat indicates favourable status for area, structure & functions, future prospects and overall status.

4.1.1.2 Non-Annex I/Fossitt habitats

Non-Annex I fen and other habitats were also recorded, with mapping based on Fossitt³ (2000) classification. These include:

- GS4 – Wet grassland
- FS2 – Tall-herb swamps
- FW2 - Depositing/lowland rivers
- FW4 – Drainage ditches
- WL2 - Treelines
- WN6 –Wet willow-alder-ash woodland

³ Fossitt habitats refer to the classification system outlined in A Guide to Habitats in Ireland by J.A. Fossitt (2000). It provides a standardised framework for habitat identification and mapping in Ireland, grouping habitats into hierarchical levels based on vegetation, landform, and ecological characteristics.

- WN7 – Bog woodland
- WD4 – Conifer plantation
- PF1 – Rich fen and flush
- PF3 – Transition mires and quaking bogs
- FS1 – Reed and large sedge swamps

These habitats were distributed across the site (Appendix B), where most of the woodland habitat is concentrated in the south-eastern end of the site with the centre comprising largely of PF1 Rich fen and flush, PF3 Transition mires and quaking bogs and FS1 Reed and large sedge swamps.

- **GS4 - Wet grassland**
Small patches restricted to the western border of the site.
- **FS2 – Tall-herb swamps**
Area of habitat in the northern sector of the site. Borders the northern edge of PF3 habitat on-site.
- **FW2 – Depositing/lowland rivers**
A single stream in the northern area of the site into which the surrounding area drains, bordered by mature *Fagus sylvatica*-dominated WL2 – Treeline.
- **FW4- Drainage ditches**
Records exist of multiple drains on site, though only one has been classified as FW4.
- **WL2 – Treelines**
Mature *Fagus sylvatica*-dominated treeline bordering the stream within the northern area of the site.
- **WN6 – Wet willow-alder-ash woodland**
Fen carr limited to the southern end of the site. Bordered by WN7 – Bog woodland to the south, GS4 – Wet grassland to the west and PF3 – Transition mires and quaking bogs to the north.
- **WN7 – Bog woodland**
Limited to the southern end of the site. Bordered by WN6 – Wet willow-alder-ash woodland to the north and WD4 – Conifer plantation to the south.
- **WD4 – Conifer plantation**
A Sitka spruce plantation comprising the south-eastern end of the site. Bordered by WN7 – Bog woodland to the north-west.
- **PF1 – Rich fen and flush**

Two isolated patches of Annex I 7230 Alkaline fen as previously described. Largely bordered by 7140 Transition mires and quaking bogs with some adjacent areas of 7210 *Cladium* fen.

- **PF3 – Transition mires and quaking bogs**

A large swathe of transition mires across the centre of the site surrounding patches of 7230 Alkaline fen and 7210 *Cladium* fen.

- **FS1 – Reed and large sedge swamps**

Two isolated patches of 7210 *Cladium* fen.

4.1.2 Species

The following subsections outline the presence of species recorded at or within the zone of influence of the Scragh Bog site. This includes protected species listed under relevant legislation and conservation frameworks such as the EU Habitats and Birds Directives (Annex I, II, IV, and V), the Irish Red Lists, and the Wildlife Acts (including species protected under the Flora Protection Order). Where available, maps of recorded sightings will be provided to support spatial understanding of species distribution. Records are limited to those from the past ten years, reflecting the most plausible timeframe for continued presence and ecological relevance to the site - excepting where invasive species have been historically recorded and there has been no indication since of their elimination.

The site synopsis for Scragh Bog SAC (NPWS, 2015) for the following species on site: Varnished hookmoss, Arctic alpine-moss *Tomentypnum nitens*, Bog-sedge *Carex limosa*, Cross-leaved heath *Erica tetralix*, Round-leaved sundew *Drosera rotundifolia*, Black deerfly *Chrysops sepulchralis*, Frey's buff snailkiller *Tetanocera freyi*, Irish damselfly *Coenagrion lunulatum*, *Acrometopia wahlbergi* and the Scarce orange-legged boxer *Platycheirus perpallidus*.

Furthermore, Scragh Bog has been extensively surveyed by invertebrate zoologists regarding specific groups of invertebrates including spiders, dragonflies, molluscs, true flies, terrestrial and aquatic beetles, caddisflies, snails and slugs, and butterflies and moths. 114 species of spider have been recorded within the site.

4.1.2.1 Qualifying Interest of Scragh Bog SAC: Varnished hookmoss

Scragh Bog SAC is designated for the presence of Varnished hookmoss. This species of moss is protected through EU law as an Annex II species under the Habitats Directive. It is also designated as a near threatened species under the Irish Red List of Bryophytes (Hodgetts, N.G. & Lockhart, N. (2025)). This species typically occurs in transition mires and fen habitats which are influenced by mineral rich groundwater, favouring spring influenced sites in mildly basic small sedge fens. Activities such as drainage, afforestation and nutrient enrichment can threaten the species survival.

While the most recent record returned from the National Biodiversity Data Centre (NBDC) is from 2010, this species is a designated qualifying interest for the Scragh Bog SAC and as such these records are still relevant to inform historic distribution as shown in Appendix B.

4.1.2.2 Species within the site

The species listed within Table 4-1 below were identified using the NBDC interactive maps service, reviewing the PFS documentation and from the ecological walkover conducted in 2025. Appendix B provides the maps for the locations of each species.

Table 4-1: Species records within Scragh Bog SAC

Common Name	Latin name	Description	Most recent record
Common frog	<i>Rana temporaria</i>	Protected under Wildlife Acts and Annex V; breeds in wetland habitats including transition mires.	2015
Round-leaved wintergreen	<i>Pyrola rotundifolia</i>	Rare, Near Threatened; occurs in alkaline fens and transition mires with stable hydrology	2020
Dark tussock	<i>Dicallomera fascelina</i>	Native moth, Near Threatened; associated with open bog and fen habitats	2015
Fine bog-moss	<i>Sphagnum angustifolium</i>	Annex V species; key for peat formation and water retention in bog and fen systems.	2019
Rhododendron	<i>Rhododendron ponticum</i>	High-risk invasive; forms dense thickets, alters soil chemistry, threatens fen habitat integrity.	2025

4.1.2.3 Species within the Zone of Influence

Table 4-2 lists the functionally linked species recorded within the 2km distribution zone of influence around Scragh Bog SAC within the last ten years (from NBDC).

Table 4-2: Species records within the Zone of Influence of Scragh Bog SAC

Legislative Protection	Common name	Latin name
Birds Directive	Black-headed Gull	<i>Chroicocephalus ridibundus</i>
Birds Directive	Coot	<i>Fulica atra</i>

Legislative Protection	Common name	Latin name
Birds Directive	Goldcrest	<i>Regulus regulus</i>
Birds Directive	Goldeneye	<i>Bucephala clangula</i>
Birds Directive	Great Black-backed Gull	<i>Larus marinus</i>
Birds Directive	Great Northern Diver	<i>Gavia immer</i>
Birds Directive	Herring Gull	<i>Larus argentatus</i>
Birds Directive	Kestrel	<i>Falco tinnunculus</i>
Birds Directive	Mute Swan	<i>Cygnus olor</i>
Birds Directive	Pochard	<i>Aythya ferina</i>
Birds Directive	Robin	<i>Erithacus rubecula</i>
Birds Directive	Snipe	<i>Gallinago</i>
Birds Directive	White-tailed Eagle	<i>Haliaeetus albicilla</i>
Habitats Directive	Marsh fritillary	<i>Euphydryas aurinia</i>
Irish red list of macro-moths	Narrow-bordered Five-spot Burnet	<i>Zygaena lonicerae</i>
Wildlife Acts	Badger	<i>Meles meles</i>

4.2 Field Survey

Following a comprehensive review of available desktop data, a targeted follow-up ecological survey was undertaken on the site in August and September 2025. The field surveys concentrated on key areas highlighted during the desk-based assessment, specifically those with potential for restoration activities. These locations were investigated in detail to verify and further assess ecological conditions and parameters, ensuring that any recommended restoration measures would be both appropriate and effective in the identified zones.

Two survey forms were created to collect data relevant to:

- Monitoring data; and
- Pressures and threats.

4.2.1 Monitoring Points

To inform the restoration plan for Scragh Bog, a targeted walkover survey was undertaken. This was a focused assessment designed to gather site-specific data at pre-identified locations. The walkover was designed to assess ecological condition at nine pre-identified monitoring points (Monitoring Points 1–9), selected based on hydrological features, habitat potential, and restoration feasibility. The locations were determined through expert discussion and review of baseline data and will serve as fixed monitoring stations post-restoration. A map of survey points is provided in Appendix B.

These monitoring points now serve a dual purpose:

- Baseline characterisation of current site conditions.
- Long-term monitoring stations to assess ecological change following restoration.

The surveys focused on target notes, pressures, and threats:

- Target Notes: Qualitative observations at each monitoring point, capturing site condition, vegetation structure, hydrological features, and legacy management.
- Pressures and Threats Identification: Systematic recording of anthropogenic and natural pressures and threats affecting each location.

The surveys confirmed the presence of several fen habitat types, notably the Annex I habitat of:

- 7140 Transition mires: Detected at monitoring points One, Two, Three and Five.

4.2.2 Pressure & Threats

This section outlines the historical and current pressures and threats affecting fen habitats at Scragh Bog, with emphasis on Annex I habitats 7230 Alkaline fen, 7210 *Cladium* fens and 7140 Transition mires. The analysis draws on baseline data from the PFS and recent ecological walkovers.

4.2.2.1 Alkaline fens [7230]

Historical Pressures

The PFS determined that the overall status of Alkaline fen habitat at Scragh Bog was favourable, with no negative pressures noted.

Current Observations

Recent walkover surveys identified the following:

- **Scrub encroachment** in the form of scattered scrub was recorded across the site, which may increase in density over time without management. Whilst this is not an existing pressure upon the alkaline fen habitats, it may exist as a future threat.

- **Eutrophication** in the form of nutrient enrichment from outside Scragh Bog itself. Existing in marginal areas on the site, it may be necessary to address this threat via an offsite restoration measure.

4.2.2.2 7140 Transition mires

Historical Pressures

The Pilot Fen Survey identified one key pressure affecting transition mires:

- **Scrub encroachment** was recorded as a threat to the future prospects of transition mires at Scragh Bog. While considered a minor impact at the time, it was noted that there was potential for this issue to intensify in the future.

Current Observations

Recent walkover surveys confirm the continued pressure of scrub encroachment on transition mires, alongside the more recently recorded pressure of eutrophication:

- **Scrub encroachment** arising from ongoing natural succession which continues to occur on site, leading to shifts in species composition and a decline in characteristic mire vegetation. It is noted that scattered scrub is a natural feature of transition mire, but scrub management is recommended in the areas where it is denser and more vigorous. This exists within the southeastern section of the site, expanding from the adjacent wet woodland.
- **Eutrophication** arising from adjacent agricultural activities which generate diffuse pollution to surface and/or ground waters – evidence of this recorded along the edge of the site. This too leads to shifts in species composition and a decline in characteristic mire vegetation
- **Drainage** exists as a localised and minor threat at present, as evidence of localised drying linked to an infilling drain mapped by the PFS.

4.2.2.3 *Cladium* fen [7210]

Historical Pressures

The Pilot Fen Survey identified one key pressure affecting 7210 *Cladium* fens [7210] and swamps:

- **Lack of management** was recorded as a threat to the future prospects of 7210 *Cladium* fens [7210] and swamps at Scragh Bog as there was no management/grazing occurring on the site.

Current Observations

Recent walkover surveys confirm that the issue of a lack of management is still ongoing, with no grazing or other forms of disturbance taking place. This lack of disturbance has facilitated

the current issue of scrub encroachment facing the 7210 *Cladium* fens habitat at Scragh Bog. Lack of management continues to pose a threat to the future prospects of 7210 *Cladium* fens [7210] and swamps at Scragh Bog which has resulted in:

- **Scrub** encroachment, which continues to occur on site, is leading to shifts in species composition and a decline in characteristic *Cladium* fens [7210] vegetation.
- **Nutrient enrichment** present along the degraded margins, likely originating from run-off and infiltration from agricultural activities adjacent to the site.

4.2.2.4 General Site Observations

Scragh Bog is deemed to be in good ecological condition following the walkover and monitoring surveys. The site is very wet in places and whilst conservation grazing may reduce undesirable species, monitoring of vegetation and water levels for a consistent period of time will be beneficial ahead of implementing measures. The current pressures are not deemed to be significant, however proposed measures look to reduce the potential that these pressures become more severe or turn into threats. These pressures reflect both the historical land use and current ecological dynamics. The scrub encroachment and hydrological monitoring is specific to a certain area, but eutrophication is more broadly focused on adjacent land uses.

- **Scrub encroachment** is a continued historical pressure which continues to threaten fen habitat today. The cause of this continued encroachment is multifaceted in nature and can be attributed to the combined impact of other pressures including lack of management, hydrological modification, and eutrophication.
- **Water level monitoring** - Utilisation of existing piezometers and an OPW surface water gauging station and the installation of new piezometers in key locations to undertake continuous monitoring of the water levels is recommended within the site. This will help inform future management measures.
- **Lack of management** - Across the site, the absence of active grazing is a consistent theme. There is no evidence of current livestock activity. This lack of disturbance has contributed to the proliferation of scrub species, which are encroaching on open fen areas. Aside from the facilitation of scrub encroachment, the lack of active grazing itself poses a continued threat to the future prospect of the *Cladium* fens [7210] habitat recorded within Scragh Bog.

4.2.3 Additional Observations

A number of supplementary observations were recorded during the site walkovers that provide further ecological context and insight into site condition.

- **Vegetation structure and cover** - The monitoring points recorded exceptionally high cover (75–100%) for the herbs/grass/sedge's vegetation layer while the bryophyte, litter and scrub layers recorded <10% cover each. This suggests that while scrub

encroachment is a continued pressure, the majority of fen habitat on Scragh Bog is still unaffected.

4.3 *Site Conservation Priority Matrix for Scragh Bog*

The restoration actions proposed (Table 4-3) for the SAC habitats of Scragh Bog (7230 Alkaline fens] and 7140 Transition mires) are expected to deliver broader ecological benefits beyond their target habitat types. If these measures are successfully implemented and sustained, they may positively influence associated features such as European priority species, nationally important species, and locally significant habitats and species. In such cases, the additional restoration interventions outlined for these other features may become unnecessary or only partially required. However, to validate and understand the extent of these mutual benefits, ongoing post-restoration monitoring will be essential. This will ensure that improvements are not limited to SAC habitats alone but extend to the wider ecological network within and around the site.

Table 4-3: Site Conservation Priority Matrix for Scragh Bog

Level	Feature Type	Feature Name	Extent/ Population	Pressure/Threat	Restoration Measure On-Site	Restoration Measure Off-Site
1	SAC Habitat	7230 Alkaline fen	26.78 ha	Scrub encroachment, Eutrophication	Vegetation monitoring Scrub removal (where necessary) Monitoring of water table using piezometers	N/A
		7140 Transition mires	9.75	Scrub encroachment, Eutrophication	Vegetation monitoring Scrub removal (where necessary) Monitoring of water table using piezometers	Buffer zone management to reduce nutrient inputs
		7210 <i>Cladium</i> fen	0.26 ha	Lack grazing, Scrub encroachment	Vegetation monitoring Scrub removal (where necessary)	N/A
2	NHA Habitat	N/A	N/A	N/A	N/A	N/A
3	European priority species	Varnished hookmoss <i>Hamatocaulis vernicosus</i>	14 records (2010)	Habitat degradation via scrub encroachment	Vegetation monitoring Scrub removal (where necessary) in FS1 and PF3 habitat zones	Buffer zone management to control nutrient inputs
		Fine bog-moss <i>Sphagnum angustifolium</i>	1 record (2019)	Habitat degradation via scrub encroachment	Vegetation monitoring Scrub removal (where necessary) in FS1 and PF3 habitat zones	Control nutrient inputs Buffer zone management to control nutrient inputs

Level	Feature Type	Feature Name	Extent/ Population	Pressure/Threat	Restoration Measure On-Site	Restoration Measure Off-Site
4	Nationally important species	Species listed in Table 4-1 and Table 4-2	See Table 4-1 and Table 4-2	Habitat degradation via scrub encroachment, Eutrophication	Vegetation monitoring Scrub removal in FS1 and PF3 habitat zones	Buffer zone management to control nutrient inputs
5	Habitats and species of local interest	FS2 – Tall-herb swamps	See Appendix B	N/A	N/A	N/A
		WN6 –Wet willow-alder-ash woodland	See Appendix B	N/A	N/A	N/A
		WN7 – Bog woodland	See Appendix B	N/A	N/A	N/A
		PF1 – Rich fen and flush	See Appendix B	N/A	N/A	N/A
		PF3 – Transition mires and quaking bogs	See Appendix B	Scrub encroachment, Eutrophication	Vegetation monitoring Scrub removal (where necessary)	Buffer zone management to control nutrient inputs
		FS1 – Reed and large sedge swamps	See Appendix B	Lack of grazing, Scrub encroachment	Vegetation monitoring Scrub removal (where necessary)	N/A

4.4 Impact Assessment Notes

Restoration actions proposed for Scragh Bog aim to improve the ecological condition of sensitive fen habitats, particularly Annex I habitats 7140 Transition mires, 7210 *Cladium* fen and 7230 Alkaline fen as well as the Annex I 91D0 Bog Woodland habitat present on site. These actions are designed to support favourable conservation status and enhance habitat resilience. However, potential impacts—both direct and indirect—must be carefully assessed to ensure compliance with Article 6(3) of the Habitats Directive.

The restoration measures proposed for Scragh Bog are directly connected to the management of the SAC and inherently connected with maintaining the favourable conservation status of the site's qualifying interests: Varnished hookmoss, Alkaline fen, and Transition mires.

Potential Impacts

- **Habitat loss** – low risk - Restoration actions (i.e. scrub removal) are designed to enhance existing habitats rather than remove them. However, minor loss of degraded habitat may occur during scrub clearance.
- **Habitat degradation** – moderate risk - Potential degradation could occur if restoration measures are poorly implemented or monitored. This could occur where scrub removal without follow-up could lead to erosion or colonisation by invasive species or access to the site for continued ecological and hydrological monitoring is undertaken without due care.
- **Species disturbance** – very low risk – Scragh Bog SAC is located approximately 0.5km from Lough Owel SPA, which is designated for Coot *Fulica atra* and Shoveler *Spatula clypeatea*. Where proposed restoration works overlap with the overwintering period of these species, there is the potential that minor disturbance impacts could arise from the clearance operation and movement of personnel. However, given there are no species records for these species present on site at Scragh Bog SAC, this risk is considered very low.
- **Accidental pollution release** – very low risk - No chemical inputs are proposed. However, machinery use (if any) could pose a risk of fuel/oil leaks. This is mitigated by avoiding machinery in sensitive areas and using hand tools where possible.
- **Introduction and/or spread of invasive non-native species** – moderate risk - Restoration activities (e.g. soil disturbance, water movement) could facilitate dispersal of invasive species. Monitoring and biosecurity protocols will be embedded into the site plan to avoid such risks.

4.5 Good Practice Recommendations

Several good practice measures are recommended based on the requirement for compliance with legislation but also the occurrence of sensitive receptors and possible pathways for negative effects during preparation for or implementation of restoration actions. These are summarised in Table 4-4 below and should be taken as generally applicable in the planning of FRP.

Consultation with relevant NPWS staff should be undertaken prior to implementation to obtain more recent or up to date information on the locations of sensitive receptors, and buffers revised accordingly. Any further requirements outlined by NPWS at pre implementation stage should also be adhered to.

Table 4-4: Good Practice Recommendations

Receptor	Measure
Ground nesting birds	No vegetation clearance or activity which might contravene Section 40 of the Wildlife Act (consolidated) should be undertaken.
Invasive Alien Species	All vehicles should undergo stream cleaning before site entry. The appointed Ecological Clerk of Work will identify appropriate IAS buffers (where applicable), and these should be avoided during site preparation and restoration implementation. Consideration should be given to confirmatory survey to identify the latest <i>Rhododendron</i> infestation along with ecological oversight regarding works proximal to larger infestations.
Protection of European Sites	Any required mitigation measures to avoid potentially adverse effects on European Sites should be incorporated into an Environmental Management Plan or Checklist of Environmental Commitments. A suitably qualified ecologist should oversee implementation.
Protection of Sensitive Habitats	High sensitivity habitats should be protected from long term damage by the use of low-pressure vehicles. Extensive repeated tracking over fen habitat or any other identified priority habitat should be avoided. The storage locations of any materials should avoid high & medium sensitivity habitats.

5 Key Pressures – Field Validation and Evaluation

The FRP considers pressures on Scragh Bog through an initial desktop assessment of existing information on the site (including previous NPWS commissioned surveys), assessment of land, water and topographic data and aerial imagery, followed by field surveys to characterise and confirm key pressures mapped through desktop assessment. Consultation with NPWS Regional Staff was also undertaken, including a visit with the Conservation Ranger for the area to inform identification of pressures.

The PFS undertook a site evaluation and ranking which determined the conservation value of the site. This evaluation considered 15 criteria as outlined which included naturalness, non-recreatability, potential value, typicality, educational value, size, diversity, fen value, rarity of species, rarity of habitats, viability, recorded history, management needs, intrinsic appeal, and expert opinion. These criteria then informed the overall conservation status assessment.

The conservation status assessment results for Scragh Bog are summarised in Table 5-1.

Table 5-1: Conservation Status Assessment [based on PFS results for the site]

	OVERALL CONSERVATION STATUS ASSESSMENT				
Annex I habitat	Area (ha)	Structure & functions	Future prospects	Rationale	Overall Conservation Status
7140 (QI Feature)	9.62	Favourable	Unfavourable Inadequate	Scrub encroachment in the northern area of the site.	Unfavourable – Inadequate
7230 (QI Feature)	1.50	Favourable	Favourable	Maintain the favourable conservation condition for Alkaline fen.	Favourable
7210	0.26	Favourable	Favourable	Not considered a conservation objective because the area is too small to be considered an area of qualifying interest.	Favourable

5.1 Field surveys of key pressures

Following completion of desktop mapping of key pressure, field surveys were carried out to verify the findings of the desktop assessment and characterise conditions of the pressures to

inform selection of appropriate restoration actions required. The site surveys are discussed in Sections 3.2 and 4.2. These surveys aimed to capture information on the land and water environment such as drainage features, peat depth and water quality and the ecology.

As part of the ecology monitoring surveys, pressures and threats associated with the monitoring points were recorded. A summary is provided within Section 5.2.

5.2 Key Pressures

An overview of the key pressures identified on site, following desktop review and site visits are summarised in this section.

5.2.1 Hydrology Pressures

Modification of water levels has occurred in the area of commercial forestry in the south of the site through the installation of drains. However, the impact from the drains on the water levels within the fen habitat in the north of the site is perceived to be limited.

5.2.2 Nutrient Pressures

Diffuse pollution from agricultural activities presents nutrient pressures on the fen habitat. Land use in the surrounding catchment is contributing to nutrient enrichment primarily through groundwater pathways, although some overland flow pathways may also be contributing during times of heavy rainfall. The site exhibits evidence of nutrient enrichment with excess nitrogen and phosphate concentrations identified particularly along the site boundaries.

5.2.3 Flora and Fauna Pressures

The following pressures are listed in order of their intensity and impact on the ecological receptors of Scragh Bog. These were determined from the review of historical information (Scoping Study and Pilot Survey) and gathered from observations made along the monitoring points conducted as part of this project.

- Scrub encroachment – recorded at Scragh Bog as a threat to the future prospects of Annex I 7140 Transition mires and 7230 *Cladium* fen habitat as well as to the QI species Varnished hookmoss. Furthermore, scrub encroachment is considered a pressure on other protected species and non-Annex I habitats within the site. While currently considered a minor impact, there is potential for this issue to intensify in the future.
- Absence of appropriate grazing management – A lack of light grazing has facilitated scrub encroachment onto 7230 *Cladium* fen habitat. This ongoing pressure is leading to shifts in species composition and a decline in characteristic 7230 *Cladium* fen vegetation. The reintroduction of grazing is not currently proposed within the FRP; given the sensitive nature of the transition mire and quaking bog habitat and their dependent species, grazing could contribute to a degradation or fragmentation of the

habitat. Instead, the measures identified to remediate scrub encroachment and nutrient enrichment are anticipated to alleviate this issue.

- Nutrient enrichment – arising from adjacent agricultural activities which generate diffuse pollution to surface and/or ground waters – evidence of this recorded along the edge of the site. This too leads to shifts in species composition and a decline in characteristic mire vegetation. This pressure is currently impacting Annex I transition mire habitat, the QI species Varnished hook-moss and other protected species and non-Annex I habitats on site.
- Intrusive research and monitoring activities – the site is subject to various monitoring and research projects. Due to the sensitivity of the transition mire habitat, this can be subject to trampling from multiple (different) visits.

Historical pressures, which were not evidenced during site walkover in 2025 are outlined below. It is important to note that whilst these pressures were not observed during site walkover, it does not necessarily mean they are not present and as such should be considered as potentially current.

- Drainage – Historical maps show drains running through Coillte land in the southern area of the site, though these were shown not to be impacting the condition of fen habitat within the site during the 2025 walkover. The 2025 walkover did note that a drain southeast of the open transition mire was starting to infill with vegetation and could be a source of the scrub encroachment.

All identified pressures and threats, whether historical or currently observed, have been fully considered within the FRP to guide appropriate remediation. The proposed suite of restoration measures, encompassing both hydrological and vegetation interventions, is designed to maintain and improve the condition of Annex I habitats present within Scragh Bog, while delivering co-benefits to associated non-Annex habitats and protected species. The prioritisation of pressures (scrub encroachment and nutrient enrichment) was informed by a review of historical data (including the PFS) and detailed observations recorded at monitoring points during this project. These measures, supported by ongoing vegetation and hydrological monitoring, will contribute to the preservation of habitat structure and function, promptly address threats, and help to safeguard the ecological integrity of the site into the future.



Figure 5-1: Locations identified as exerting pressures upon the habitats of Scragh Bog

6 Restoration Measures

6.1 Introduction

The restoration actions proposed by the Fen Restoration Plan will help to maintain or improve the quality of existing areas of fens and improve the conditions that will allow an expansion of the area of fen. In some areas it must be recognised that restoration to fen habitat will not be possible, and the objective may simply be to improve the habitat condition.

Selection of the most appropriate restoration action depends on a range of factors including peat depth, hydrological conditions (flow rates, existing and expected flow paths after restoration), substrate type, existing ecological conditions, potential ecological constraints, and practicality of access for machinery.

Each of the factors was considered based on a combination of desktop analysis combined with site-specific field surveys to select the most appropriate restoration technique to address each pressure considered by the FRP.

The restoration measures proposed are outlined in Section 6.2 to Section 6.4, with detailed mapping of proposed measures illustrated in the maps provided in Appendix C.

6.2 Hydrology Measures

6.2.1 On-site Hydrology Measures

There is no clear evidence of negative influence on the site due to the modification of the drainage network. The hydrological regime within the fen is relatively stable and currently supportive of the fen habitats. Therefore, no on-site hydrology restoration measures are proposed. However, ongoing water level monitoring will indicate if hydrology measures such as drain blocking would provide a positive benefit to the fen habitats, particularly in relation to the drain to the southeast of the transition mire.

High resolution LiDAR data for the whole site is in the process of being obtained for Scragh Bog. If this data shows evidence of drainage pathways which may be impacting the site further restoration measures may be proposed.

Monitoring progress

A hydrological monitoring programme will be implemented, including the installation of piezometers and the use of existing piezometers (see Appendix B). A network of piezometers, monitored as part of a previous research study (Bijkerk, 2023) exists within the site including a transect of five piezometers located across the southern part of the transition mire. Two of these existing piezometers were located during the project site visits. It is proposed that these piezometers as well as new piezometers are included in a monitoring network for the site. Piezometers will be installed with level loggers to monitor changes in water levels and flow paths.

The piezometers will provide information on the water level dynamics in the transition mire and area of proposed scrub removal discussed in Section 6.4. This information will highlight if blocking of the drain to the south of these piezometers has the potential to make a positive impact on the habitat.

The water level monitoring in the Ballynafid River is operated by the OPW at an existing gauging station and the data is available publicly. This data can be compared to the piezometer water level data to gauge the direction of flow within the site and identify if blocking of the Ballynafid channel may be required for the maintenance of appropriate water levels within the site.

Rainfall and evaporation monitoring using site-specific or nearby stations, e.g. Mullingar rain gauge station, will be reviewed to assess meteorological changes in relation to water levels within the habitat.

6.2.2 Off-site Fen Hydrology Measures

6.2.2.1 Avoid creating new drainage channels adjacent to fen

Engagement is required with landowners (farmers and Coillte) around the site, particularly those whose lands are hydrologically connected to Scragh bog via drains or surface flow. Agreements should be made to ensure that no drainage takes place on adjacent lands that could interfere with the site's water balance.

6.3 Nutrient Measures

The primary aim of the nutrient measures is to maintain appropriate water quality, particularly nutrient levels, to support the natural structure and functioning of the habitats. For water quality the target is to maintain, or where necessary restore, appropriate water quality, particularly pH and nutrient levels, to support the natural structure and functioning of fen habitat.

6.3.1 On-site Nutrient Measures

6.3.1.1 Coir log riparian buffer

PIP maps and field water quality data suggest that the northeastern part of the site boundary may benefit from the implementation of a riparian buffer zone to reduce run off (risk of phosphorus losses), which help to intercept and retain nutrients transported from adjacent fields through surface and subsurface pathways.

A coir log buffer zone will act as a pathway interception measure for nutrients and sediments transferred from the western hill side (Figure 6-1). The effect of this zone will be through trapping sediments and runoff transported during rainfall events. In addition to the installation of the coir log there will also be inclusion of *Phragmites australis* (common reed) within the coir or adjacent to the coir log to allow for effective establishment of vegetation. The installation of vegetation will enhance sub-surface trapping of nutrients.

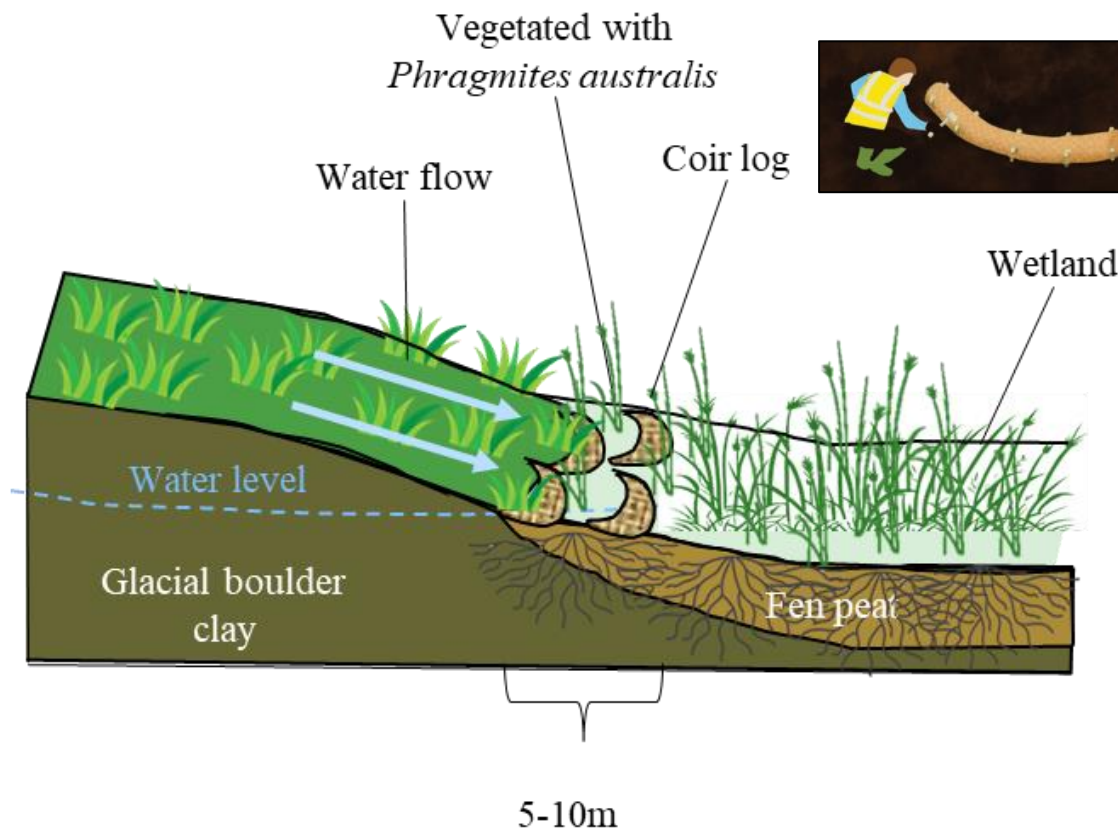


Figure 6-1 Conceptual diagram of installation of coir logs for Scragh Bog. Taking note of the position of the coir log in a 'U' shape against the flow of water and the installation of coir using wooden pegs

Site Preparation/Access

No excavation within the fen habitat will occur. The buffer zone footprint will be clearly marked prior to works, maintaining an agreed standoff distance from sensitive fen vegetation and qualifying features. Access routes will be predefined and kept to a minimum to avoid trampling and soil compaction. Access will seek to be undertaken from the adjacent landowner's land through existing agricultural land.

Coir Log Installation

The siting of the coir logs is defined in Appendix C.

Biodegradable coir logs will be installed along the interface between the nutrient source and the fen, positioned to intercept shallow surface flows from the hillslope to encourage sediment and nutrient deposition.

The buffer will extend over the 200m of land parcel 606. There will be two strips of coir logs, extending across the 200m length (i.e. 2 x 200m). As each coir log is 3m, this will require up to

120 coir logs. The width of the buffer will be between 5-10m, with the placement of the coir log streps following the contour of the land.

The coir log placement will need to be in a 'U' shape against the water flow from the hillslope. Up to 8 wooden stakes will be needed for each coir log. Logs will be placed directly onto the ground surface and secured using untreated wooden stakes driven by hand. The coir logs should be positioned and pegged in a long strip across the 200m to suit the terrain along the hillslope contour. There may be a need to construct a temporary fence to ensure livestock access is restricted during construction.

Common Reed Planting

Common reed will be planted within or immediately upslope of the coir logs to enhance nutrient uptake and promote long-term buffering.

Planting will use plug plants or rhizome sections of local provenance where possible. Reeds will be planted by hand at an appropriate spacing to allow establishment while avoiding excessive initial shading or competition. No fertilisers, soil ameliorants or herbicides will be used. Common reed is currently present within the fen and is deemed an appropriate species for the purpose of assimilating surface and sub-surface nutrients.

Protection of Fen Habitat and Species

All works will be undertaken from the buffer zone side only, with no entry into the fen habitat unless explicitly agreed. If protected species or nesting birds are encountered, works will cease and advice sought from an ecologist.

Monitoring and Aftercare

Planted areas will be monitored during the first growing season to ensure establishment. Any failed plants or displaced coir logs will be replaced or re-secured as needed. No routine maintenance within the fen will be required.

6.3.1.2 Water Quality Monitoring

On-site nutrient measures include the monitoring of water quality within the site to assess the effectiveness of proposed off-site nutrient measures and identify any changes in water quality within the site which may require a modification of measures.

Proposed water quality monitoring includes measuring nutrients (nitrate and phosphate), electrical conductivity, and pH. Locations are situated along the site boundary to limit trampling within the sensitive habitats. There are two sampling locations on the eastern boundary that will need to be sited, within the open water. Access to these locations will need to be assessed to avoid trampling vegetation. Other sampling locations include groundwater monitoring piezometers and the OPW gauging station on the Ballinayfid River channel. The locations are presented in Appendix C.

Monitoring of water quality should inform a response plan where nutrient levels are consistently inappropriate.

6.3.2 Off-site nutrient measures

6.3.2.1 Agricultural nutrient management

Targeted nutrient control measures should be implemented across the catchment to address both phosphate and nitrogen pathways.

Agricultural measures outlined under the Farming for Water EIP⁴ or novel approaches under NPWS Farm Plans⁵ are categorised depending on if they address the source, pathway, or receptor. Suitable measures for Scragh Bog may include:

- Source control measures:
 - **Farmer Training** Course for farmers in the fen catchment.
- **Nutrient Management Plan.** Such a plan will enable farmers in the catchment to achieve optimum slurry application and nutrient update and avoid overapplication of nutrients.
- **Nitrogen Surplus.** A nutrient accounting approach is applicable to dairy farms and may be appropriate to address excess nitrate in the habitat's groundwater catchment.
 - **Multi-species swards.** This measure reduces the need for fertiliser application and is recommended in areas classified as PIP N 1-4 such as the area to the northeast of the site boundary.
- Receptor measures:
- **Vegetated banded drain.** The measure may be applicable to the outflow which is currently highly vegetated with minimal flow during dry conditions. Implementing

⁴ The "[Farming for Water](#)" project provides funding to help farmers implement 43 measures designed to protect water quality by reducing pollution from nitrates, phosphorus, sediment, and pesticides. The project is a major initiative to reduce pollution from farming practices in Ireland and ensure that the country's rivers and other waterbodies are kept clean and healthy for the future and that we meet our obligations under the Water Framework Directive. Suggestion – make this smaller font so it can all fit on one page

⁵ The [NPWS Farm Plan Scheme](#) trials novel approaches to farming for the environment, to safeguard particular sites, habitats and species, and to work towards meeting conservation measures required under the EU Birds and Habitats Directives. Role players are the NPWS through the Agri-Ecology Unit, the regional staff of the NPWS and the farm participant.

the measure to slow the flow within the outflow stream during wet conditions may enhance the deposition of sediment and increase nutrient attenuation.

6.4 Vegetation Measures

6.4.1 On-site Vegetation Measures

Table 6-1: On Site Vegetation Measures proposed for Scragh Bog.

Priority	Measure	Description	Responsibility
1	Vegetation monitoring	Monitoring points have been proposed which overlap with (where suitable) the existing PFS points. The purpose of these points is to monitor species composition within the habitat. This serves to monitor the rate, if any, of succession and/or general scrub encroachment which in turn informs the need for further works outside the Tóchar fen restoration programme such as scrub removal and conservation grazing. Due to the nature of the site being so wet, it is recommended that consistent monitoring of both vegetation and hydrology (through piezometers) is undertaken to provide a suitable baseline of information which can then inform further measures.	Tóchar & NPWS (post-Tóchar)
2	Scrub removal	Scrub clearance at the southeastern end of the transition mire should focus on the area with vigorous young tree regeneration. Due to the sensitivity of the site, this should be manual clearance. Clearance should also aim to improve views from the platform at the end of the boardwalk. The area for clearance should be marked in the field by an ecologist prior to operations. It is important to note that small stands of willow forms part of the transition mire community and so the aim is to control this area of willow scrub rather than eliminate it. Furthermore, the areas of Annex I 91D0 bog woodland in the southern area of the site should be retained and not targeted for scrub/tree removal and trees and shrubs along the northwestern site boundary should be retained to provide filtration for nutrient runoff from uphill farms.	Tóchar & NPWS (post-Tóchar)

Priority	Measure	Description	Responsibility
		Any additional scrub clearance beyond that outlined will be reviewed following the ecological monitoring. Approximate area for scrub clearance is defined in Appendix B.	
3	Consultation with Coillte	Coillte own the woodland plantation at the south of Scragh Bog. It was noted from the site visits that there was a lot of windthrow in the area from the 2024/2025 storms. It is recommended that consultation with Coillte is undertaken to discuss the opportunity for this woodland to be designated as a Biodiversity Area and preparation of a Biodiversity Management Plan for the site is implemented which will be beneficial for the fen habitats.	NPWS

7 Additional Considerations

7.1 *Drainage Management Plan*

Drainage Districts were designated by the Commissioners of Public Works to improve land for agriculture and to mitigate flooding. Channels and lakes were deepened and widened, weirs removed, embankments constructed, bridges replaced or modified, and various other work was carried out. Local authorities are charged with responsibility to maintain Drainage Districts. The Arterial Drainage Act, 1945 contains a number of provisions for the management of Drainage Districts in Part III and Part VIII of the act.

The Ballynafid River is not part of a Drainage District.

The drainage management plan for Scragh Bog is presented in Appendix C

7.2 *Peat Stability Assessment*

Restoration activities have the potential to introduce additional risk of peat stability issues. The combination of additional loading (e.g. when excavators are used) and a higher water table has the potential to increase risk. At present, no specific guidance is available in Ireland detailing how peat stability risks should be managed in restoration projects.

Undertaking detailed geotechnical assessments is beyond the scope of the FRP. However, preliminary peat stability analysis was undertaken to inform the level of assessment required prior to the implementation of restoration actions. This includes a review of the landslide susceptibility map and historic landslide events produced by the Geological Survey of Ireland (GSI). The GSI landslide susceptibility map provides a preliminary indication of the susceptibility of a landslide based on several contributing factors, including where previous landslides have occurred and what caused them (slope, soil type, and the impact of the flow of water in an area).

The GSI landslide susceptibility map for Scragh Bog is presented in Figure 7-1. This highlights that there are no known historical landslides within the site, and the site is classified as at low risk of landslide susceptibility.

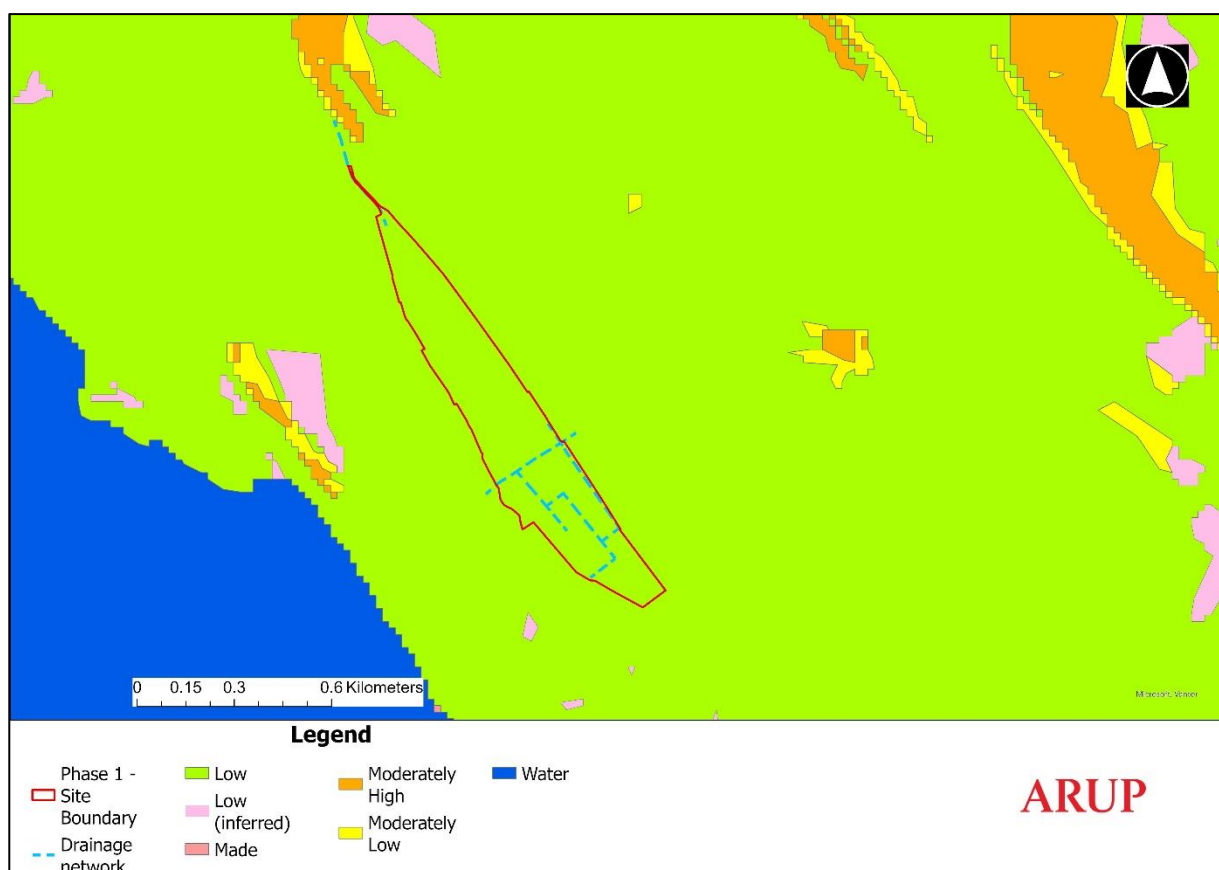


Figure 7-1: Geological Survey of Ireland Landslide Susceptibility mapping for Scragh Bog

7.3 Archaeology

There are no archaeological sites located within Scragh Bog recorded by the National Monument Service. There are numerous features in the surrounding area, most of which are ringforts (see Figure 7-2). Any works within the site boundary are unlikely to impact any of the mapped archaeological sites due to the distance and the minimal intrusive nature of the proposed works. Therefore, consultation with the Westmeath County Council archaeologist or National Monuments Service is not required prior to the commencement of the restoration measures. However, if a potential archaeological feature is identified during the course of the implementation of the restoration measure the work will cease and the appropriate organisations will be engaged.

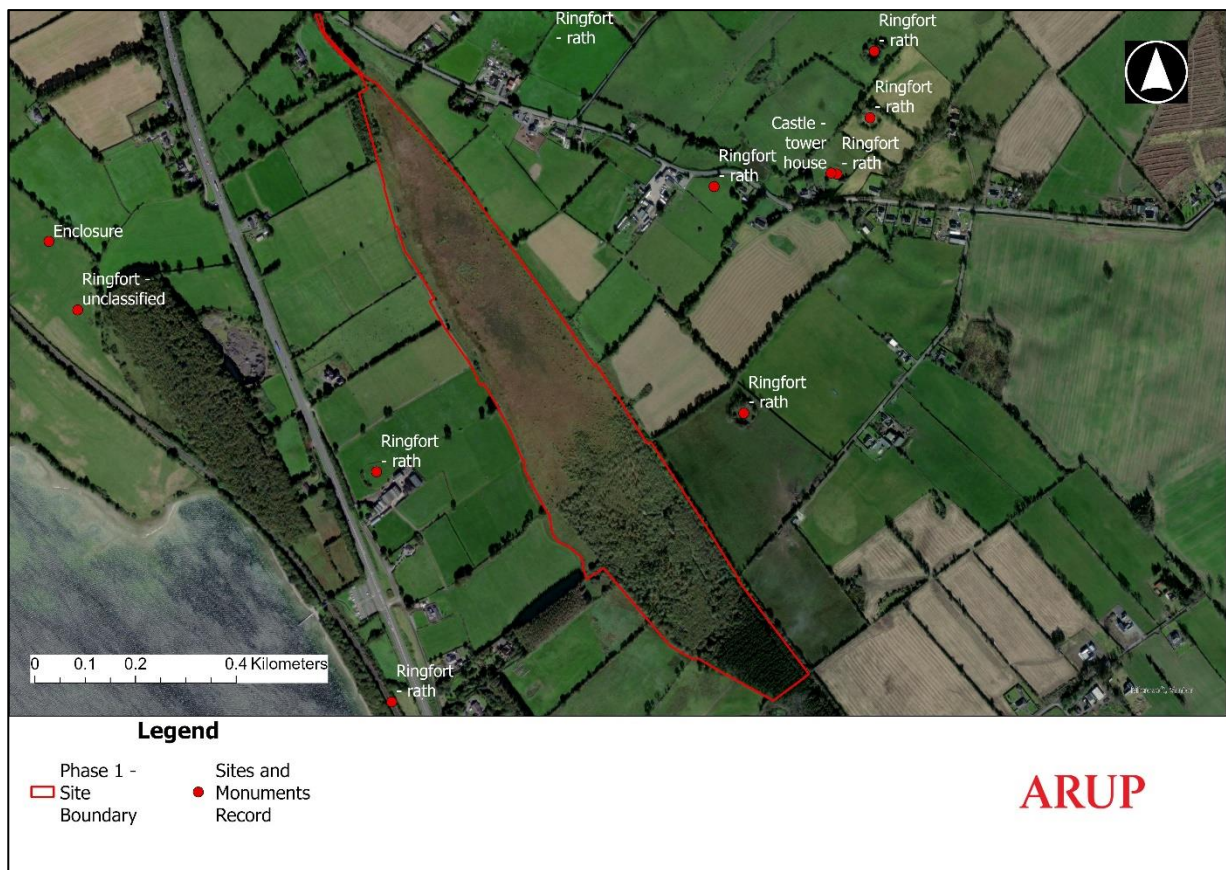


Figure 7-2: Archaeological Sites in the vicinity of Scragh Bog (NMS, 2025)

8 Summary of Fen Restoration Plan Actions

Prior to proceeding with the implementation of the restoration measures outlined in the FRP, consultation with landowners and key stakeholders with an interest in the site is essential (Table 8-1). While this FRP identifies key pressures and actions to be implemented, consultation with landowners and stakeholders may identify the need to amend or alter restoration actions. There may also be opportunities to provide additional benefits to the wider community. Consultation with local NPWS staff will be crucial to informing implementation planning.

Table 8-1: Role players in fen restoration plan

Measures	Stakeholder	Description
On-site	Coillte	Landowner of woodland plantation at southern boundary
	Landowners	Pockets of land within the Scragh Bog site boundary are under ownership by private individuals
	National Monument Services / County Council	No archaeological sites have been identified on the site from the desk study. However, archaeologists will need to be engaged if potential sites are identified during the work.
	FENCES (EPA, Trinity College Dublin, NPWS)	Interdisciplinary research is being conducted within Scragh Bog to understand fen ecohydrology, nutrient cycling, and carbon dynamics. Need to ensure long-term alignment and engagement with researchers.
Off-site	LAWPRO	Brosna_010 is within a LAWPRO Prioritised Areas for Action
	Landowners & farmers	Engagement for uptake of catchment measures.
Capacity building	NPWS	NPWS engagement in community education and events
	LAWPRO	LAWPRO team engagement with farmers through Farming for Water EIP.

This section provides the summary of the Fen Restoration Plan Actions for Scragh Bog (Table 8-2).

Table 8-2: Implementation plan for Scragh Bog Fen Restoration

	Activity	Location	Monitoring/ implementation indicator	Timeframe	Key role player			Possible funding source
					National	Regional/ Local	Other	
1	Required preliminary actions							
1.1	Screening for Appropriate Assessment report.							
	This report must outline all restoration measures that shall be undertaken as part of the project at Scragh Bog SAC. The Screening for AA must conclude whether a likely significant effect is anticipated to arise from the implementation of the project.	Sitewide	Screening report	Pre-restoration	NPWS			NPWS
2	Enabling Works							
2.1	Pre-restoration Works Surveys							
	Pre-site walkover with Ecologist/Ecological Clerk of Works (ECoW) to ensure proposed measures are appropriate and whether alterations are required. The ecologist will confirm/mark up the areas of scrub required for removal.	Southeastern area of transition mire	ECoW report	Pre-restoration			Arup	Within Tóchar project scope
2.2	Implementation of Mitigation Measures							
	Ecological Impact Assessment Considerations – identification of necessary mitigation measures. Such measures may include, but are not limited to, the utilisation of hand machinery to avoid impact on sensitive habitats.	Sitewide	ECoW report	Pre-restoration			Arup	Within Tóchar project scope

	Activity	Location	Monitoring/ implementation indicator	Timeframe	Key role player			Possible funding source
					National	Regional/ Local	Other	
2.3	Breeding Bird Considerations							
	Prior to restoration works, where any restoration measures are identified to have the potential to interfere with breeding birds e.g. scrub removal, these works shall occur outside the breeding bird season (1 March – 31 August inclusive).	Sitewide	ECoW report	Pre-restoration			Arup	Within Tóchar project scope
2.4	Good Practice Recommendations and CEMP							
	Good Practice Recommendations – Includes, but not limited to, avoidance of sensitive ecological receptors, pollution prevention procedures, biosecurity measures etc. The preparation and provision of a Construction Environmental Management Plan (CEMP).	Sitewide	ECoW report	Pre-restoration			Arup / Contractor	Within Tóchar project scope
3	On-Site Restoration measures							
3.1	Nutrient measures							
	Vegetated berm	North-east boundary at land parcel 606	Water quality	Restoration 2026	NPWS		Arup / Contractor	Within Tóchar project scope
	Engage Coillte regarding proposals for forestry management within the site and consider best practice regarding forestry land and water management.	Forestry in the south of the site	Water quality and level monitoring	Long term	Coillte		Arup	Within Tóchar project scope

	Activity	Location	Monitoring/ implementation indicator	Timeframe	Key role player			Possible funding source
					National	Regional/ Local	Other	
3.2	Vegetation measures							
	Proposed measures to address vegetation succession and scrub encroachment include: 1. Removal of scrub (young willow) via hand tools (chainsaw)	Sitewide	Site records / habitat surveys	Restoration 2026	NPWS		Arup / Contractor	Within Tóchar project scope
	Potential measures following hydrological and ecological monitoring: 1. Conservation grazing measures on site	Sitewide	Habitat and hydrological monitoring	Long-term	NPWS			Future appropriate funding opportunities
4	Off-Site Restoration measures							
4.1	Hydrology measures							
	Avoid creating new drainage channels adjacent to fen. The landowners should be made aware of the impact of drainage to the fen to ensure that no drainage measures take place on adjacent lands which could interfere with the site's water balance.	Surrounding farms	Landowner awareness	Long-term	NPWS		Surrounding landowners	Farming for Water EIP / other similar
4.2	Nutrient measures							

	Activity	Location	Monitoring/ implementation indicator	Timeframe	Key role player			Possible funding source
					National	Regional/ Local	Other	
	Agricultural nutrient management Targeted nutrient control measures should be implemented across the catchment to address both phosphate and nitrogen pathways. Measures may include source control measures (Farmer Training Course for farmers in the fen catchment; Nutrient Management Plan; Nitrogen Surplus; Multi-species swards); pathway interception measures (Linear Riparian Buffer Zones: Grassland) and receptor measures (Vegetated bunded drain).	Surrounding landowners	Uptake of measures by landowners / farmers	Long-term	NPWS, LAWPRO, Farming for Water EIP		Landowners	Catchment measures to be funded through Farming for Water EIP / other similar.
5	Monitoring progress							
5.1	Hydrology monitoring							
	No hydrology restoration measures proposed. Proposed monitoring will indicate if hydrology measures such as drain blocking is required. Existing and new groundwater and surface water level monitoring in a network of piezometers at key locations within the site to monitor changes to water levels. Level loggers will be used to monitor changes in water levels.	Various locations across site	Water level	Long-term	NPWS to facilitate site access		FENCES	NPWS
	Rainfall and evaporation monitoring using site-specific or nearby stations.	Mullingar	Rainfall and evaporation levels	Long-term	Met Eireann			n/a

	Activity	Location	Monitoring/ implementation indicator	Timeframe	Key role player			Possible funding source
					National	Regional/ Local	Other	
5.2	Nutrient monitoring							
	Ongoing monitoring along the site boundary and at the outflow for water quality parameters is proposed.	Various locations within the site	Nutrients (nitrate and phosphate), electrical conductivity, and pH	Long-term	NPWS to facilitate site access		FENCES	NPWS
5.3	Vegetation monitoring							
	Habitat condition assessments will be included to track restoration progress.	Sitewide	Habitat condition	Long-term	NPWS			NPWS
6	Capacity building and training							
	Public meeting: To engage stakeholders on developments and results from the restoration measures.			Long-term	NPWS			NPWS
	Farmer training: Training such as that provided by the Farming for Water EIP will provide farmers with knowledge of alternative and habitat sensitive measures			Long-term	NPWS/ Farming for Water EIP / LAWPRO / Teagasc			Farming for Water EIP / other similar

8.1 Habitats benefiting from implementation of restoration actions

- **7230 Alkaline fen / PF1 / FS3 / FS1**

The benefits of restoration actions lie in maintaining hydrological balance and controlling nutrient inputs. Regular monitoring of vegetation and water levels will ensure that alkaline fen communities remain stable and resilient to pressures such as eutrophication and atmospheric deposition. Retention of filtration scrub along site boundaries will reduce nutrient inflow, while engagement with landowners (outside the immediate remit) will further mitigate diffuse pollution risks. Together, these measures will protect the fen's structure and function, prevent succession, and support its long-term conservation value.

- **7210 *Cladium* fen with *Cladium mariscus* and species of the *Caricion davallianae* / PF1 / FS3 / FS1**

Restoration measures will address the pressures of scrub encroachment and nutrient enrichment, both of which threaten species composition and fen structure. Vegetation and hydrological monitoring will provide a baseline to track changes and inform timely interventions. Manual scrub clearance in sensitive areas will maintain the open fen character, while retaining boundary scrub will help filter nutrient runoff from adjacent farmland. These actions will preserve the saturated conditions and species diversity that define *Cladium* fen habitats, preventing degradation and maintaining their Annex I quality.

- **7140 Transition mires and quaking bogs / PF3 / FS3 / FS1**

The proposed restoration measures will maintain the open, wet conditions that are fundamental to this habitat's ecological integrity. Vegetation monitoring will allow early detection of scrub encroachment and species shifts, while hydrological monitoring ensures that water levels remain suitable for the delicate mire system. Targeted manual scrub clearance will prevent succession to woodland. These actions collectively support the persistence of characteristic species, including the QI Varnished hookmoss, and reduce risks from nutrient enrichment, ensuring long-term habitat stability.

- **WN6 Wet willow-alder-ash woodland**

Restoration actions will respect the ecological role of wet woodland by retaining these communities while controlling scrub expansion elsewhere. This ensures woodland continues to provide filtration and hydrological buffering functions without compromising fen integrity.

- **WN7 Bog woodland**

Bog woodland areas will be retained as part of the site's natural mosaic. Scrub clearance will avoid these zones, preserve their ecological function, and maintain habitat diversity within the SAC.

- **WD4 Conifer plantation**

Engagement with Coillte to promote biodiversity management will reduce edge effects from conifer plantations and improve ecological resilience. Designating the area as a Biodiversity Area will support fen restoration objectives and enhance overall habitat connectivity.

- **WL2 Treelines**

Retention of treelines along site boundaries will provide filtration for nutrient runoff from adjacent farmland, reducing eutrophication risks for fen and mire habitats. This also maintains structural diversity within the landscape.

8.2 *Species benefitting from implementation of restoration actions*

The proposed hydrological monitoring locations are within historically recorded habitat for Varnished hookmoss (throughout the fen habitat of Scragh Bog SAC (grid squares N4259 and N4258)). This monitoring will provide understanding of the site hydrology and therefore if any other measures such as drain blocking, would be appropriate for the site. By collecting and reviewing hydrological data for the site, the Tóchar project will contribute to the maintenance of suitable hydrological conditions. This aligns with the conservation objective to maintain suitable hydrological conditions.

Furthermore, outside the scope of the Tóchar programme, complementary measures such as light conservation grazing, buffer zone nutrient management, and scrub clearance can help to ensure quality habitat is available. These actions contribute to the species' conservation objectives regarding vegetation composition as well as vegetation structure and height, ensuring no decline in habitat quality and supporting the species' persistence through natural processes.

Together, these restoration efforts offer mutual benefits for broader fen ecosystem function and the long-term viability of Varnished hookmoss within Scragh Bog SAC.

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Appendix A – Non-Technical Summary

NPWS Tóchar Midlands Wetland Restoration Scheme Fen Restoration Plan Non-Technical Summary			
Site Name	Scragh Bog	NFS site no.	1002
County	Westmeath	Designation	SAC 000692
Fen habitats present (area)	7230 Alkaline fens (1.50 ha), 7140 Transition mires (9.62 ha) and 7210 <i>Cladium</i> fen (0.26)	Species of note	Varnished hookmoss <i>Hamatocaulis vernicosus</i>
Site Description			
Scragh Bog is an oval depression containing wet transition fen with a floating root mat located approximately 10km north-west of Mullingar in Co. Westmeath. Much of the site is also part of the Scragh Bog Special Area of Conservation (SAC) for the presence of 7140 Transition mires, 7230 Alkaline fens and 1393 Slender Green Feathermoss. Small pockets of 7210 <i>Cladium</i> fen are also present within the site. The fen habitats are found in the northern part of the fen and bog woodland is located in the southern area of the site. Figure 1 presents the habitats mapped within the site.			
Conceptual Site Model (CSM)			
While the area within Scragh Bog is relatively flat, the site is located within an elongated topographic depression with elevated ground to the southwest, separating it from Lough Owel, and a very slight incline to the northeast before the land slopes down towards the River Gaine. Scragh Bog does not have any mapped surface water inputs. Groundwater is the main source of recharge to the site, however during rainfall events, some water may reach the fen through diffuse shallow and overland flow pathways. In the southeast of the site groundwater flow direction is toward the fen and then southwest toward Lough Owel. Within the area of fen there is very little hydraulic gradient, and flow extends towards the outflow channel (Ballynafid River) in the northwest. The CSM is presented in Figure 2.			
Key Pressures			
Hydrology Pressures	Drainage – the impact from drains within the commercial forestry area on the water levels within the fen habitat in the north of the site is perceived to be limited.		
Nutrient Pressures	Diffuse pollution from agricultural activities presents nutrient pressure on the fen habitat. Land use in the surrounding catchment is contributing to nutrient enrichment primarily through groundwater pathways, although some overland flow pathways may also be contributing during times of heavy rainfall. The site exhibits evidence of nutrient enrichment with excess nitrogen and phosphate concentrations identified particularly along the site boundaries.		
Ecology Pressures	Scrub encroachment and nutrient enrichment (from agricultural runoff) present the greatest pressure to the fen habitats. Succession and vegetation changes are resulting in shifting fen vegetation communities and promoting growth of non-fen species.		

NPWS Tóchar Midlands Wetland Restoration Scheme Fen Restoration Plan Non-Technical Summary	
Objective of Restoration Plan	
The objective of the Scragh Bog Fen Restoration Plan is to maintain or improve the quality of existing areas of fens. In some areas it must be recognised that restoration to fen habitat will not be possible or preferable, such as in the area of bog woodland, and the objective is to maintain the habitat condition.	
Restoration Measures	
Hydrology Measures	Off-Site Measures: Avoid creating new drainage channels adjacent to fen
Nutrient Measures	On-Site Measures: Installation of a coir buffer strip on the north-eastern boundary to buffer surface and sub-surface nutrient and sediment flows. Off-Site Measures: Exploration of catchment nutrient management measures.
Ecology Measures	On-Site Measures: Scrub clearance using hand tools at the southeastern end of the transition mire which should focus on the area with vigorous young tree regeneration. Consultation with Coillte is proposed to discuss the opportunity for the Coillte woodland to be designated as a Biodiversity Area.
Monitoring	
Hydrology Monitoring	Groundwater and surface water monitoring within the fen as well as rainfall and evaporation monitoring.
Nutrient Monitoring	Ongoing monitoring of groundwater and surface water for water quality parameters within the fen
Ecology Monitoring	Habitat condition assessments to monitor the rate, if any, of succession and/or general scrub encroachment which in turn will inform the need for further works
More information	
Fen Restoration Plan Report (provide url)	
Tóchar website: https://www.tocharwetlands.ie/fen-restoration/	

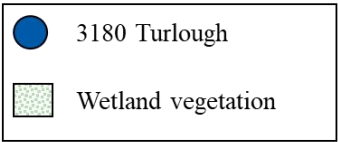


Figure 1: Site Habitat Map

Fin Lough
Offaly County
25A: Upper Shannon

WETMEC: 3: Buoyant Weakly Minerotrophic Surfaces (“Transition Bogs”)

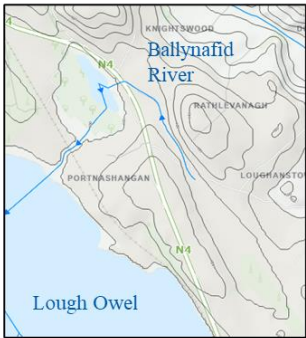
Key:



Vegetation:



Location:



Conceptual site model:

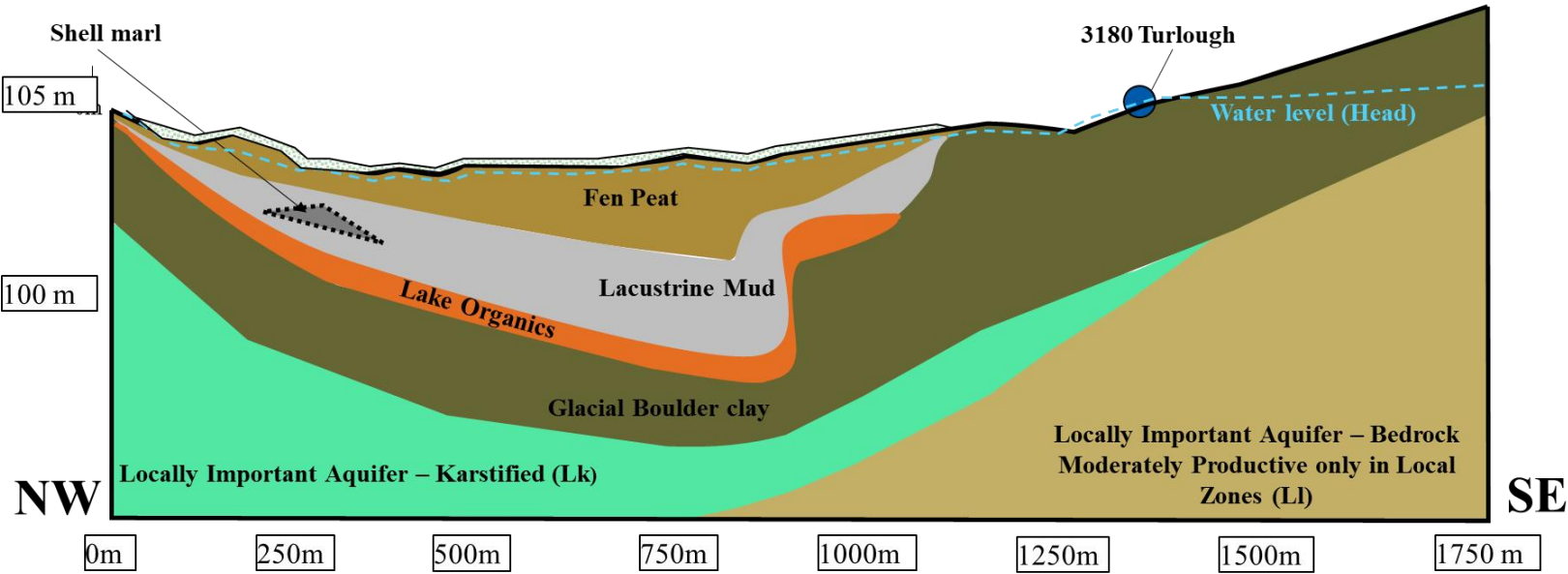


Figure 2: Conceptual Site Model

Appendix B – Ecological Survey Maps



Figure B.1: Annex habitats recorded during the PFS. Habitats mapped were noted to occur in mosaic with one another.

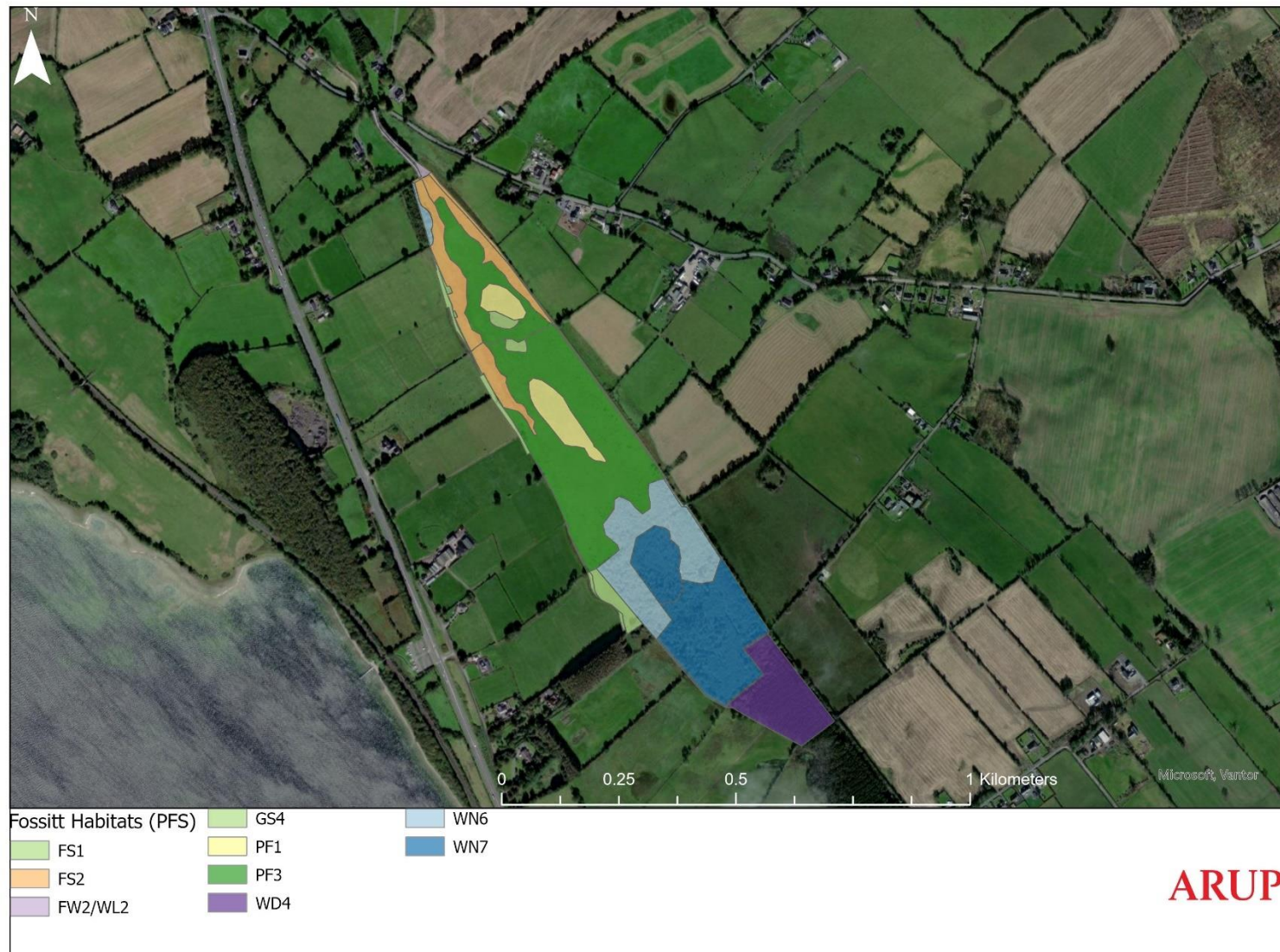


Figure B.2: Fossitt habitats recorded during the PFS. Habitats mapped were noted to occur in mosaic with one another.



Figure B.3: Pressures and Threats recorded on site at Scragh Bog (identified through desktop review and walkover visits)



Figure B.4: Restoration measures identified in respect of the habitats and species present at Scragh Bog



Figure B.5: Distribution of Varnished hookmoss within Scragh Bog SAC (source: NBDC)



Figure B.6: Distribution of Common frog within Scragh Bog SAC (Source NBDC)

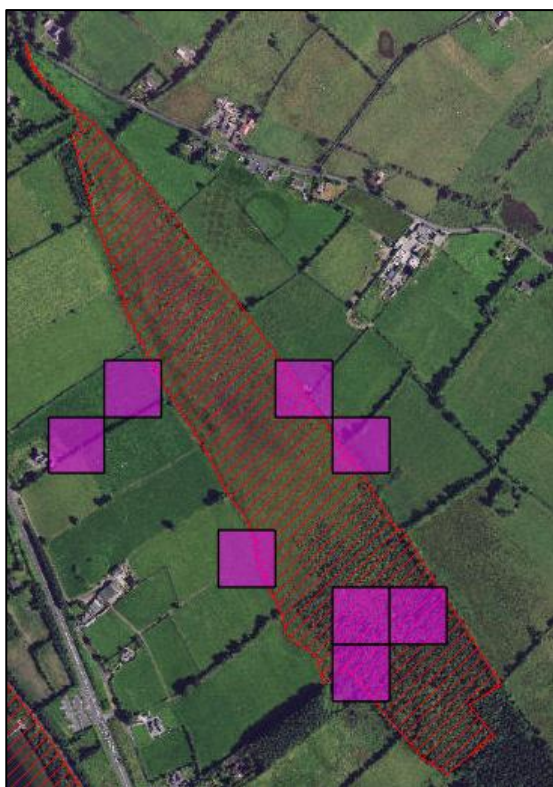


Figure B.7: Distribution of Round-leaved Wintergreen within and adjacent to Scragh Bog SAC (Source NBDC)

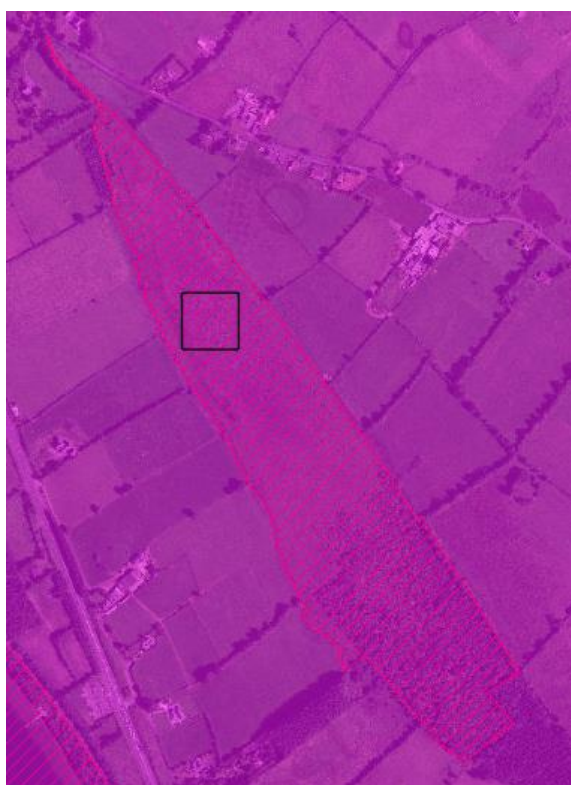


Figure B.8: Distribution of the Dark Tussock moth within Scragh Bog SAC (Source NBDC)



Figure B.9: Distribution of Fine Bog-moss within Scragh Bog SAC (Source NBDC)



Figure B.10: Distribution of Rhododendron within Scragh Bog SAC (Source: NBDC)

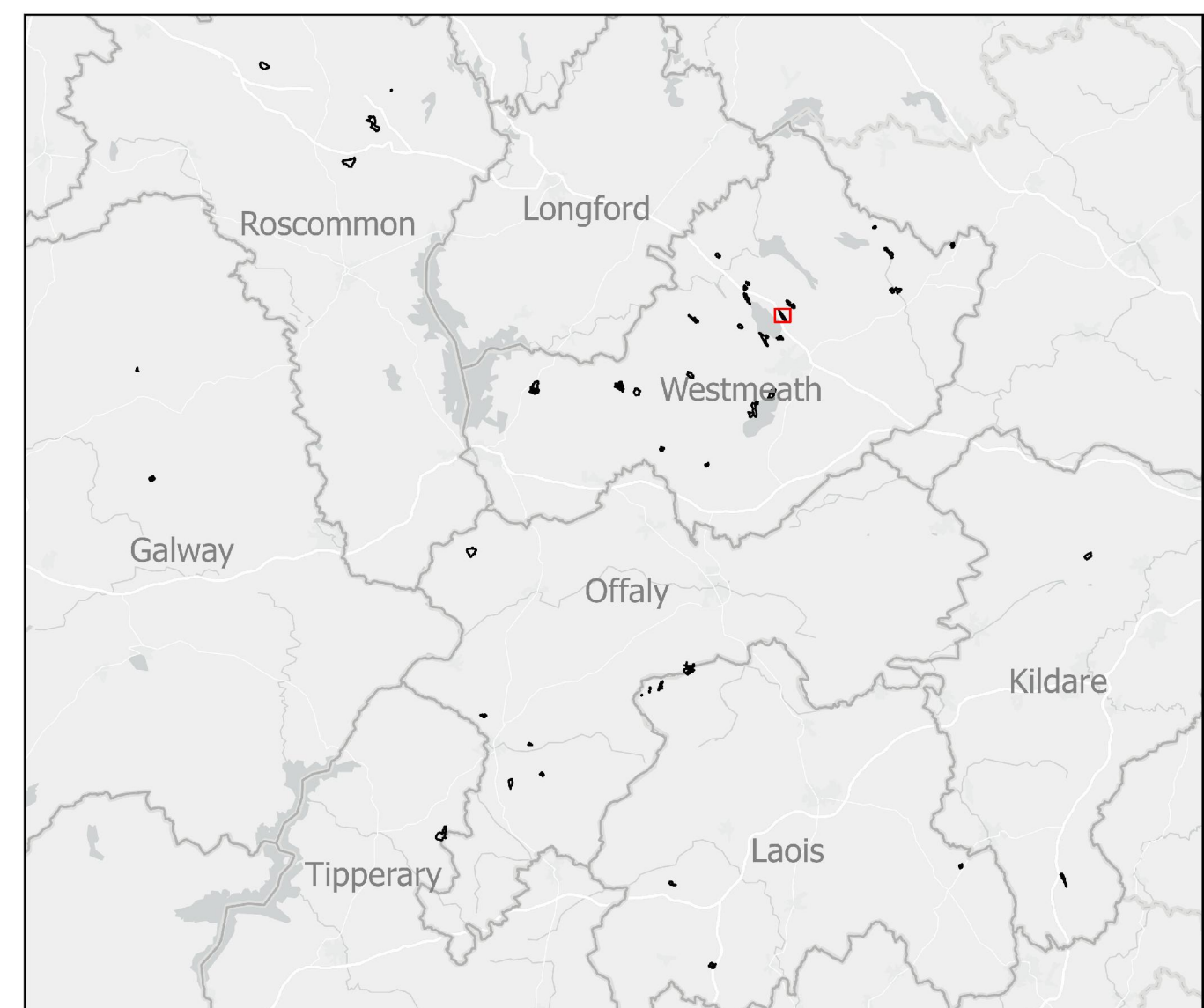
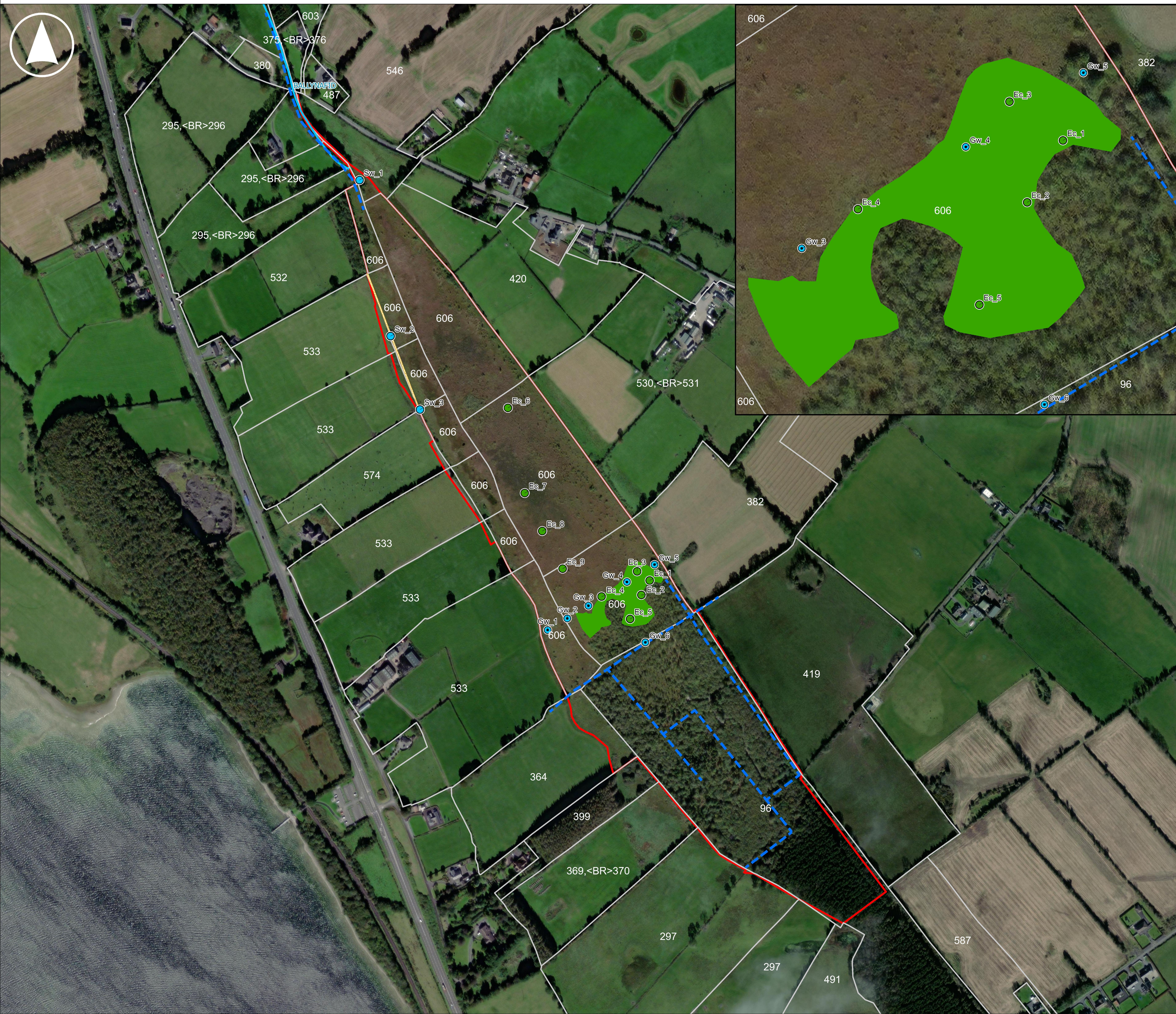
Appendix C – Restoration and Monitoring Map

Table C1: Long-term monitoring points for fen restoration at Scragh Bog

Point	Measure	Objective	Timeframe	Frequency of monitoring	Monitoring indicator
Gw_1	Hydrological	Monitoring groundwater levels and quality	Long-term	Data logger (x2) Quarterly ⁶ for year 1 Annual for year 2-5	Groundwater level across southern extent
Gw_2					
Gw_3					
Gw_4					
Gw_5					
Gw_6					Groundwater level at drain
Sw_1		Monitoring of surface water levels and quality	Long-term	Quarterly for year 1 Annual for year 2-5	Water level and quality at watercourse outlet
Sw_2					Water level and quality on western perimeter (at open water)
Sw_3					
Ec_1	Ecological	Monitoring along main hydrological measure near central drain	Long-term	First monitoring visit year 2-3 (after scrub removal). Subsequent visits should then be every 5-6 years if there is no additional active management	Ecological monitoring near southern extent
Ec_2					
Ec_3					
Ec_4					
Ec_5					Ecological monitoring
Ec_6					Ecological monitoring
Ec_7					Ecological monitoring

⁶ Seasonal: once in winter and once in summer to represent a hydrological year

Fen Restoration - Scragh Bog - Phase 1



Legend

- Site Boundary
- Drains
- Water River Network (OSI)
- Land Parcels

Monitoring

- Ecology monitoring
- Groundwater monitoring
- Surfacewater monitoring

Restoration

- Area for scrub encroachment management
- Coir Log

0 50 100 Meters

Scale: 1:3,000 | Page Size: A3
Date: 22/04/2026

Map Credits: Microsoft, Vantor, Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community

Appendix D – Drainage Management Plan

NPWS Tóchar Midlands Wetland Restoration Scheme			
Fen Restoration Plan: Drainage Management Plan			
Site name	Scragh Bog		
County	Westmeath	NFS site No.	1002
Catchment overview:			
The site is positioned at approximately 110 mOD and is relatively flat. Higher ground is located to the southwest (120mOD) along a low ridge, separating the site from Lough Owel. The northeast and slopes towards the River Gaine (70mOD).			
WFD catchment	25A- Lower Shannon	WFD Sub-catchment	Brosna_SC_010
Drainage Area	None	Drainage District	No
Responsible authority	None	Maintenance date	TBD
Surrounding landowners	Coillte, landowners		
Wetland drainage			
An assessment of historical and current hydrological data indicates that Scragh Bog was and is associated with wet vegetation. Scragh Bog does not have any mapped surface water inputs. Therefore, it is expected that groundwater provides the majority of the site's recharge, however some water may reach the fen through overland flow paths during rainfall events. In the southeast of the site in the vicinity of the Coillte forestry area groundwater flows towards the fen and then to the southwest towards Lough Owel. The catchment area to the northeast boundary of the site is relatively limited in extent as flow is directed towards the Rivier Gaine to the north. Northwest of the site the contours indicate a flow direction towards the fen. Within the area of fen there is very little hydraulic gradient, and flow extends towards the outflow channel (Ballynafid River) in the northwest. The southern portion of the site contains several drains. Neither the turlough in the southeast of the site nor the Ballynafid River are connected to these drains. It's unknown if these drains collect surface water flow, rising groundwater, or both.			
Surface water inflow	None	Surface water outflow	Ballynafid River
Groundwater inflow	Diffuse groundwater seepage		
Internal drains	Drains in the southern part of site	Perimeter drains	None
On site hydrology measures			

NPWS Tóchar Midlands Wetland Restoration Scheme

Fen Restoration Plan: Drainage Management Plan

Modification of water levels has occurred in the area of commercial forestry in the south of the site through the installation of drains. However, the impact from the drains on the water levels within the fen habitat in the north of the site is perceived to be limited. Therefore, no on-site hydrology measures have been proposed.

Off-site hydrology measures

Off-site measure 1	Avoid creating new drainage channels	Role player	NPWS/Surrounding landowners/Coillte
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It is necessary to interact with neighbouring landowners (farmers and Coillte), especially those whose properties are hydrologically linked to Scragh bog through surface flow or drainage. Agreements should be arranged to guarantee that no drainage occurs on nearby properties that can disrupt the water balance of the site.

On-site nutrient measures

On-site measure 1	Coir buffer strip	Role player	NPWS/Surrounding landowners
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It is likely that the installation of coir logs as a nutrient measure will impact local hydrology through slowing down surface runoff. Installation is proposed on the north-eastern border of Scragh bog.

Water Monitoring

Groundwater and surface water monitoring in a network of piezometers and standpipes at key locations within the site to monitor changes to water in order to establish if onsite measures area required such as drain blocking.

Indicator	Water level	Location	Various locations across site	Role players	NPWS
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A hydrological monitoring programme will be implemented, including the installation of piezometers and the use of existing piezometers. The network will include a transect of five piezometers located across the southern part of the transition mire as well as a piezometer located closer to the mapped drainage network. The water level dynamics in the transition mire and the scrub removal area will be monitored by level loggers installed in the piezometers.

The water level monitoring in the Ballynafid River is operated by the OPW at an existing gauging station and the data is available publicly. This data can be compared to the piezometer water level data to gauge the direction of flow within the site and identify if blocking of the Ballynafid channel may be required for the maintenance of appropriate water levels within the site.

Rainfall and evaporation monitoring is proposed using the nearby Met Eireann weather station at Mullingar.

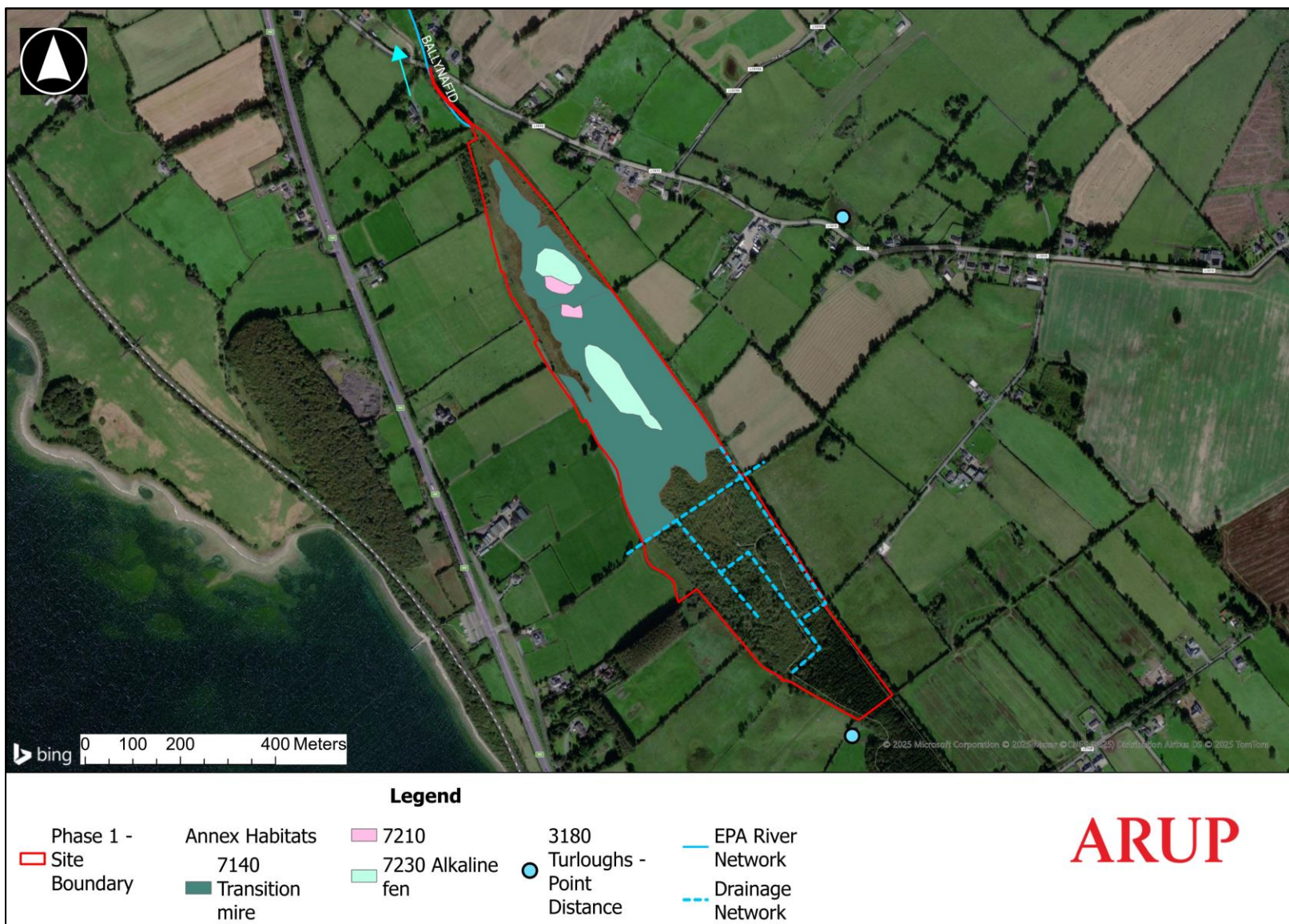


Figure 1: Mapped drainage network at Scragh Bog