National Parks & Wildlife Service

Tóchar Midlands Wetland Restoration Scheme

Clonaslee Eskers and Derry bog SAC

NFS site No. 109002

SAC 000859

pNHA 000859

Fen Restoration Plan

July 2026

Tóchar
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Midlands Wetland Restoration

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Fen Restoration Plan

Clonaslee Eskers and Derry Bog SAC

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Arup

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Executive Summary

Clonaslee Eskers and Derry Bog (Laois) is located approximately 5 km west of Clonaslee, Co. Laois and is designated as a Special Area of Conservation for the presence of 7230 Alkaline fens, 7220 Petrifying springs with tufa formation (*Cratoneurion*) and 1013 Geyer's whorl snail *(Vertigo geyeri)* - all of which are listed under Annex I and II of the EU Habitats Directive (Figure 1-1). The site consists of a range of habitats, with Derry Bog itself consisting largely of PB4 cutover bog. However, areas of higher quality habitat exist in the eastern area of the site. The eastern area consists of Annex I 7230 Alkaline fens and 7220 Petrifying springs with tufa formation (*Cratoneurion*) habitats alongside Annex I quality 6410 Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*) and 91E0 Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae) (Figure 1-1).

This Fen Restoration Plan sets out proposals for the restoration of 7230 Alkaline fens and 7220 Petrifying springs with tufa formation (*Cratoneurion*) to contribute to the achievement of site-specific conservation objectives for the Special Area of Conservation and the favourable conservation condition of fen habitat.

This is a site-level plan that will be subject to refinement prior to implementation of restoration actions in each subsite. The assessment primarily considers the following pressures that may be impacting on the hydrological function and/or favourable condition of the fen habitat:

- Drainage
- Scrub encroachment
- Changes to water quality, e.g. nutrient enrichment
- Over or under grazing

Factors such as landownership and management will dictate the ability of addressing such pressures as part of this FRP.

Previous restoration planning undertaken through the NPWS Farm Plan identified many of these same pressures, including hydrological modification, scrub encroachment, insufficient grazing pressure, and the development of dense black bog-rush and purple moor-grass tussocks. A range of restoration measures has already been implemented across the site, including scrub clearance, water level management works, fencing and conservation grazing. The Farm Plan concluded that while these measures had improved site condition, further hydrological restoration and ongoing habitat management would be required to achieve favourable conservation condition. The recommendations presented in this FRP therefore build upon existing restoration efforts and seek to address the remaining hydrological, ecological and land management constraints affecting the site.

This assessment included a review of previous studies of Clonaslee Eskers and Derry Bog (Laois) commissioned by National Parks and Wildlife Services including the surveys carried out in 2022 as part of the National Fen Survey (Brophy et al., In prep.). Detailed aerial imagery and topographic datasets were then used to map all drainage features within the site. Hydrological and ecological field surveys were undertaken to collect additional information to validate the findings from desktop assessment and inform the selection of suitable restoration actions, considering the conditions found on site and possible constraints.

Drainage features, water quality and ecology were assessed, and a recommendation made for suitable restoration actions (Figure 1-2). A prioritisation exercise was completed to identify restoration measures that should be targeted first in progressing the implementation of these restoration requirements. Consultation with stakeholders, and further site investigations, will be the next key steps required to refine this assessment prior to proceeding to the implementation phase(s). The key measures proposed by this assessment are:

On-site Measures:

- Drain blocking: drain blocking will help raise the water levels in the fen.
- Conservation grazing: grazing at a suitable level will help maintain appropriate vegetation communities.
- Appropriate mowing: liaison with relevant landowners to implement appropriate mowing and aftermath management on 7230 Alkaline fen habitat.
- Monitoring scrub encroachment: targeted removal of younger willow scrub saplings to maintain the community and reduce scrub encroachment is possible if monitoring shows a need for this.

Off-site Measures:

- Management of nutrient enrichment: Participation in the NPWS Farm Plan Scheme is recommended for landowners within the wider hydrological contribution area (both surface water runoff and groundwater recharge areas associated with the surrounding esker aquifer) to support nutrient reduction and achievement of conservation objectives.



Figure 1-1: Annex I and Annex I quality habitats recorded and mapped as part of the 2022 NFS. Note the % value indicates the % cover of the dominant Annex I and Annex I quality habitat recorded in the polygon

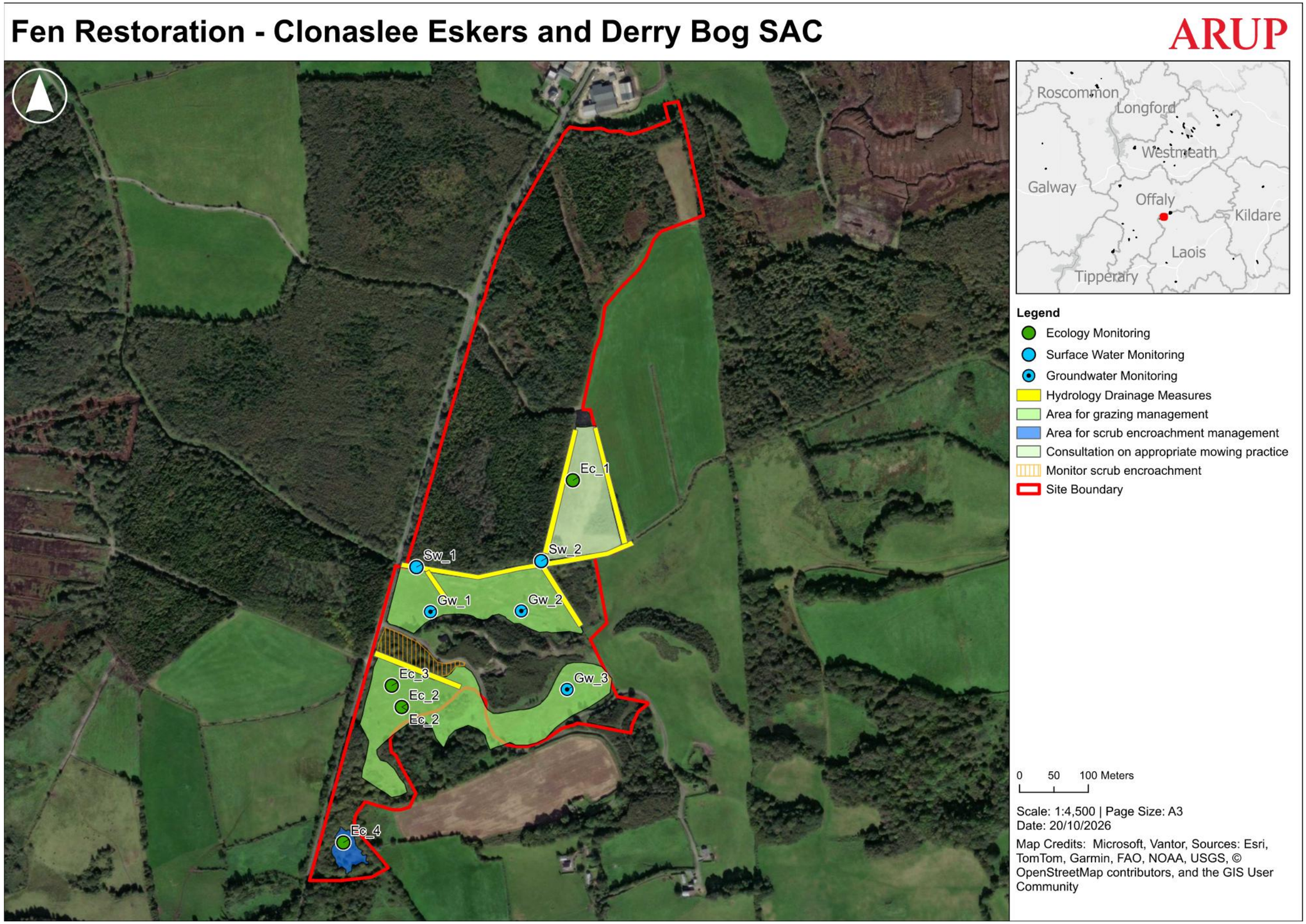


Figure 1-2: Restoration and monitoring map

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

This Fen Restoration Plan (FRP) report was developed by Arup on behalf of National Parks and Wildlife Service (NPWS) to set out proposals for the restoration of Annex I[1] 7230 Alkaline fens and 7220 Petrifying springs with tufa formation (*Cratoneurion*) (hereafter referred to as 7220 Petrifying springs) habitats within the site which contribute to the favourable conservation condition of the fen habitat and the achievement of the Special Area of Conservation (SAC) site-specific conservation objective (SSCO) targets.

Clonaslee Eskers and Derry Bog SAC (site code: 000859) is located approximately 5 km west of Clonaslee in county Laois. The site covers a total area of 277.15 ha and is dominated by peatland habitat (Brophy et al., In prep). The qualifying features of the SAC are 1013 Geyer's whorl snail *(Vertigo geyeri)* as well as 7230 Alkaline fens and 7220 Petrifying springs. The National Fen Surveys carried out in 2022 (Brophy et al., In prep), recorded the total extent of 7230 Alkaline fens habitat as 3.69 ha and the Monitoring and Assessment of EU Habitats Directive Annex I Priority Habitat Petrifying Springs 2025 Report (Denyer, 2025) recorded the total extent of 7220 Petrifying springs habitat as 0.036 ha.

The main aim of the restoration actions proposed as part of this assessment is to maintain or improve the quality of existing areas of 7230 Alkaline fen and 7220 Petrifying springs or improve the hydrological conditions that will allow an expansion of the measurable area of these habitats, thus positively contributing to the SSCOs/favourable condition of the fen. However, in some areas, it must be recognised that restoration to increase areas of existing 7230 Alkaline fen and/or 7220 Petrifying springs 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 7230 Alkaline fen and 7220 Petrifying springs and associated SSCOs/favourable conditions, it is anticipated that restoration actions will also benefit other wetland habitats, including Annex I quality 6410 *Molinia* meadows and 91E0 Alluvial forests, which were mapped during previous surveys (Brophy et al., In prep.). The implementation of the actions proposed within this FRP report may also provide wider improvements to biodiversity and potentially improve water quality all of which may be demonstrable under eventual post implementation monitoring.

1.2 Wider benefits of peatland restoration

[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.

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 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.

Peatland drainage and extraction transform a natural peatland which acts as a modest carbon sink into a carbon source (Waddington & McNeil, 2002; Alm *et al*. 2007; Wilson *et al*. 2015). The EPA- funded Carbon Restore Project (Wilson *et al*. 2012) found that rewetting of drained peatlands can lead to restoration of functional peatland, such as the return of typical plant and animal species, which in turn may lead to the restoration of peat-formation and the C-sink function.

It is expected that areas within Clonaslee Eskers and Derry Bog will become a reduced carbon source/part carbon sink following implementation of the FRP which will result in improvement in hydrology via drain blocking.

The restoration of fen habitat is likely to lead to improved water quality. Well- functioning fen habitat reduces the risk of dissolved organic carbon passing into water courses and was shown to attenuate the speed at which water moves downstream thereby reducing flood risk.

In addition to being designated as an SAC, Clonaslee Eskers and Derry Bog is also currently a proposed NHA (pNHA) (Site code 000859), though no site synopsis is available for this pNHA. Within 1 km of the Clonaslee Eskers and Derry Bog, there are three sites in the Sites and Monument Records (SMR): LA00022 (Standing stone), LA00024 (Enclosure), LA00023 (Ringfort - rath).

1.3 Key pressures on Fens

The overarching (National) key pressures and threats to Annex I fen habitats and Annex II species Geyer's whorl snail are identified in the latest Status of EU Protected Habitats and Species in Ireland (Article 17 report) (NPWS 2025) in Table 1-1. The overall conservation status is assigned as Bad for 7230 Alkaline fens, Bad for Geyer's whorl snail, and Inadequate for 7220 Petrifying springs in the Article 17 report.

Table 1-1: National pressures to fen habitats and QI species

Habitat	Importance	Pressure
7220 Petrifying springs	Medium	PK01 Mixed source pollution to surface and ground waters (limnic and terrestrial)

Habitat	Importance	Pressure
		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) PA07 Intensive grazing or overgrazing by livestock PL05 Modification of hydrological flow (mixed or unknown drivers) PF01 Conversion from other land uses to built-up areas PI03 Problematic native species PA25 Agriculture activities not referred to above PE05 Land, water and air transport activities generating pollution to surface or ground waters PL01 Abstraction from groundwater, surface water or mixed water (mixed or unknown drivers) PF07 Residential and commercial activities and structures generating pollution to surface or ground waters
	Low	PI02 Other invasive species (other than species of Union concern) PM05 Avalanches, landslides and collapse of terrain PF05 Sports, tourism and leisure activities PL02 Drainage (Mixed or unknown drivers) PF06 Deposition and treatment of waste/rubbish from built-up areas
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.) J01 Mixed source pollution to surface and ground waters
	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 under grazing 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

Habitat	Importance	Pressure
		PI02 Other invasive alien species (other than species of Union concern) PL02 Drainage (mixed or unknown drivers) to surface or ground waters
	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 PC05 Peat extraction PA17 Agricultural activities generating pollution to surface or ground waters (including marine) PA20 Livestock farming generating pollution PB19 Forestry activities generating pollution to surface or ground waters (including marine) PB26 Other forestry activities, excluding those relating to agroforestry
Geyer's whorl snail	High	PA08 Extensive grazing or under grazing by livestock PA22 Drainage for use as agricultural land PL05 Modification of hydrological flow (mixed or unknown drivers)

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.
- 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.
- Regulation (EU) 2024/1991 of the European Parliament and of the Council of June 2024 on nature restoration and amending Regulation (EU) 2022/869.
- 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.
- 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 Special Protection Areas (SPAs).

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 bringing back 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. Member States are required to implement restoration measures for specific habitats and species, including marine ecosystems, forests, wetlands, and pollinators.

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). Conservation objectives for the site are defined for these qualifying interests.

Ireland is required to manage water resources in an integrated way under the Water Framework Directive (WFD, 2000/60/EC) and the European Communities (Water Policy) Regulations 2003 (S.I. No. 722 of 2003). Member States are required to submit River Basin Management Plans to the European Commission showing how they will protect and improve the water environment. Restoring surface and groundwater bodies to the equivalent of 'good status' or better and to protect water from any further deterioration requires collaboration at a local and national level. Implementing the WFD supports the achievement of site-specific conservation objectives for fen habitats, contributing to their favourable conservation status.

1.5 Outline of this FRP document

- Section 2 of this FRP report outlines details of Clonaslee Eskers and Derry Bog SAC and the conservation objectives for 7230 Alkaline fens, 7220 Petrifying springs and Geyer's whorl snail.
- 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 are 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. Regarding maps presented, and following consultation with NPWS, due to the sensitivity of many of the species recorded or referenced, species names are omitted from Map legends. This is to ensure no confidential or highly sensitive locations are revealed which might result in negative impacts. GIS Shapefiles which accompany this report include all relevant data on referenced species.

2 Site Overview

2.1 Clonaslee Eskers and Derry Bog SAC

Clonaslee Eskers and Derry Bog SAC is located approximately 5 km west of the town of Clonaslee, in Co. Laois. The site is designated for 7230 Alkaline fens, 7220 Petrifying springs, and Geyer's whorl snail as listed on Annex I/II of the E.U Habitats Directive.

Adjacent habitats in the surrounding landscape include improved grassland, scrub, wet woodland, conifer forestry and cutover bog. The survey area comprises one main polygon containing an esker and surrounding slumping areas, as well as several smaller satellite polygons beside and around Derry Bog. The smaller satellite polygons were not found to contain any target habitat and are therefore not considered for restoration measures. Several fields surrounding the esker are likely seasonally flooded and contain 7230 Alkaline fens.

Drains run around many of the margins of the site, with River Silver (Kilcormac) running through the centre of the site from east to west. Conifer forestry with some wet heath dominates the north of the site. There are adjacent improved agricultural fields. Gorse scrub is a prominent feature on the esker itself, along with rank calcareous grassland (GS1). There is a small area of wet woodland in the south of the site, it is well drained and non-Annex I. The fields with the fen grade from wet grassland (GS4) into rank calcareous grassland (GS1) at their edges. There are signs of scrub removal in several of the fields within recent years and signs of scrub regrowth where it was removed. (Brophy et al., In prep).

Altitude at the site ranges from 82 m to 88 m, with further detailed topographical information found in Section 3.1.3. Figure 2-1 outlines the location and extent of Clonaslee Eskers and Derry Bog SAC.

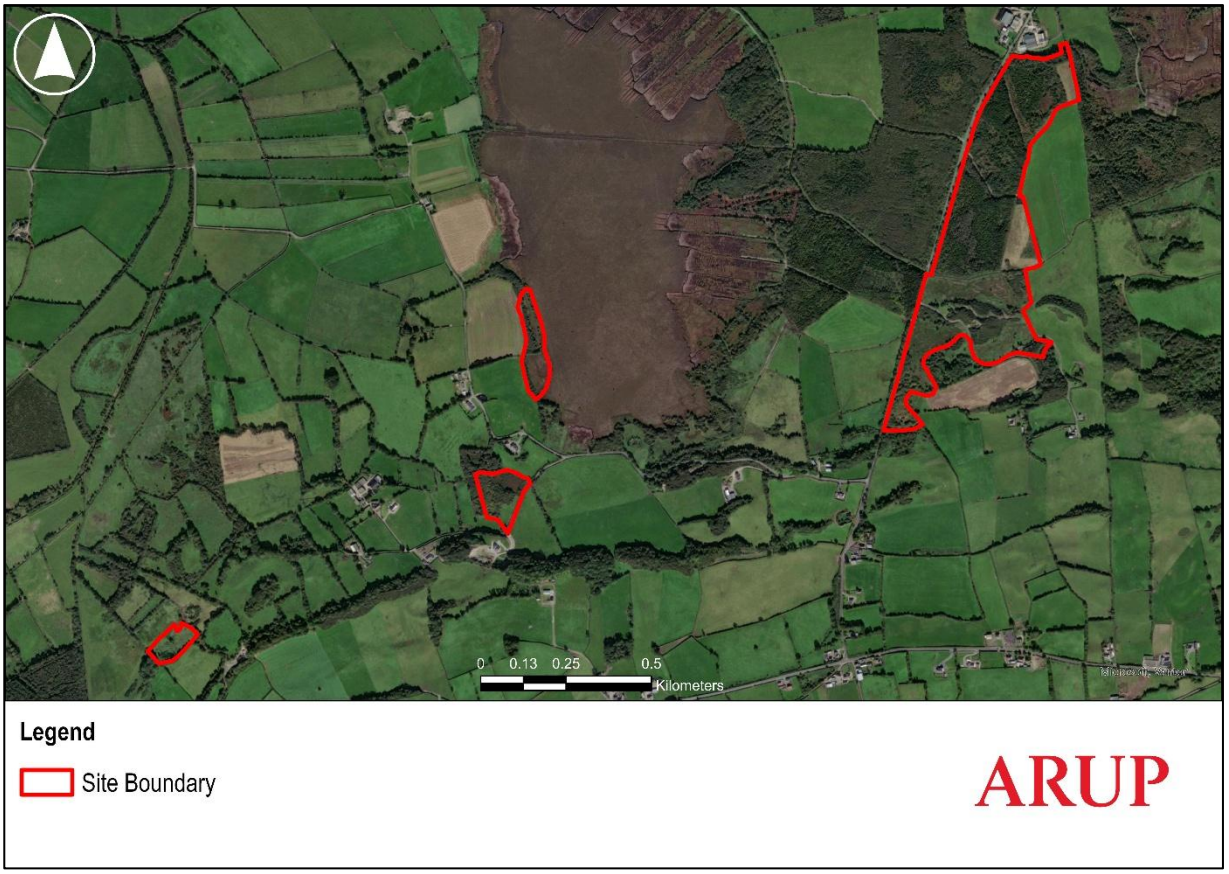


Figure 2-1: Site Location Map

The site synopsis (NPWS, 2021) notes that a significant land use practice within the site is the extraction of gravel. This activity leads directly to destruction of the esker and irreparable damage to the site. Some of the esker grasslands (mostly at the western end) were improved either for pasture or for arable farming.

The site is located within the 25A: Lower Shannon Catchment and is primarily drained by tributaries of the SILVER (KILCORMAC)_020 River. For the purposes of the Water Framework Directive most of the site is located within the 25A_12: Silver (Kilcormac)_SC_010 sub-catchment.

2.1.1 Fen Condition Assessment

Clonaslee Eskers and Derry Bog was surveyed as part of the NFS (Brophy et al, In prep) on the 9th and 10th August 2022 and again as part of the 2025 Petrifying springs monitoring report (Denyer, 2025) on the 13th September 2024. During these surveys, the negative pressures outlined in Table 2-1 were identified.

Table 2-1: Assessment of impacts of pressures on 7220 Petrifying springs and 7230 Alkaline fens at Clonaslee Eskers and Derry Bog

Pressure Code	Pressure [sub-category]	Influence
PA05	Abandonment of management/use of grasslands and other agricultural and agroforestry systems (e.g. cessation of grazing, mowing or traditional farming). This pressure was considered to be impacting 7220 Petrifying springs habitat.	Negative
L02	Natural succession to scrub. This pressure was considered to be impacting 7230 Alkaline fens and 7220 Petrifying springs habitats.	Negative
PL01	Abstraction from groundwater, surface water or mixed water.	Negative
PL05	Modification of hydrological flow. Newly dug ditch was noted with the potential to remove water from the site.	Negative

The results of a field evaluation (2026) of the above pressures to inform the restoration planning process is detailed in Section 5 of this report.

The overall conservation status of 7230 Alkaline fens was not assessed during the NFS, though the structure and functions of the habitat on-site was assessed as Unfavourable – Bad. The Monitoring and Assessment of EU Habitats Directive Annex I Priority Habitat Petrifying Springs 2025 Report determined that the overall status of 7220 Petrifying springs was Unfavourable – Bad, with both area and future prospects assessed as Unfavourable – Inadequate, while structure and functions were assessed as Unfavourable – Bad.

2.1.2 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.

The conservation objective set for 7230 Alkaline fens is 'to maintain the favourable conservation condition of Alkaline fens in Clonaslee Eskers and Derry Bog SAC', using attributes and targets based on parameters set out in the Habitats Directive. The attributes and targets for 7230 Alkaline fens, along with how the FRP will contribute to achieving set targets, are set out in Table 2-2.

This document does not present the full suite of attributes, targets, and measures for the Annex I habitats and QI species within Clonaslee Eskers and Derry Bog SAC. The selection provided below 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.

Table 2-2: Attributes and Targets for 7230 Alkaline Fens (NPWS, 2019)

Attribute	Measure	Target	Addressed by FRP?	Will restoration actions contribution to achieving target?
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 as actions are set to improve the condition.
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 address nutrient input from surrounding land which will assist in the restoration of more natural nutrient conditions.
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 will improve conditions for peat formation.
Ecosystem function: hydrology – groundwater levels	Water levels (centimetres); 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. Drain blocking seeks to improve the hydrology of the fen and raise the water table.
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. Drain blocking seeks to reduce surface water flow/run-off from the site.

Attribute	Measure	Target	Addressed by FRP?	Will restoration actions contribution to achieving target?
Ecosystem function: water quality	Water chemistry measures	Maintain appropriate water quality, particularly pH and nutrient levels, to support the natural structure and functioning of the habitats	Yes	Yes. FRP actions will include the engagement with landowners for best practice regarding land management to reduce nutrients entering the site from surrounding lands. Water quality monitoring will be carried out within the site.
Community diversity	Abundance of variety of vegetation communities	Maintain variety of vegetation communities, subject to natural processes	Yes	The restoration measures seek to have a positive impact on the vegetation structure and composition of 7230 Alkaline fens . Subsequently, all attributes should see a favourable shift towards their respective targets.
Vegetation composition: brown mosses	Percentage cover at a representative number of 2 m x 2 m monitoring	Maintain adequate cover of typical brown moss species	Yes	
Vegetation composition: typical vascular plants	Percentage cover at a representative number of 2 m x 2 m monitoring stops	Maintain adequate cover of typical vascular plant species	Yes	
Vegetation composition: native negative indicator species	Percentage cover at a representative number of 2 m x 2 m monitoring stops	Cover of native negative indicator species at insignificant levels	Yes	

Attribute	Measure	Target	Addressed by FRP?	Will restoration actions contribution to achieving target?
Vegetation composition: nonnative species	Percentage cover at, and in local vicinity of, a representative number of 2 m x 2 m monitoring stops	Cover of non-native species less than 1%	Yes	
Vegetation composition: native trees and shrubs	Percentage cover in local vicinity of a representative number of monitoring stops	Cover of scattered native trees and shrubs less than 10%	Yes	
Vegetation composition: soft rush and common reed cover	Percentage cover in local vicinity of a representative number of monitoring stops	Total cover of soft rush (Juncus effusus) and common reed (Phragmites australis) less than 10%	Yes	
Vegetation structure: litter	Percentage cover in local vicinity of a representative number of monitoring stops	Total cover of litter not more than 25%	Yes	
Physical structure: disturbed bare ground	Percentage cover at, and in local vicinity of, a representative number of 2 m x 2 m monitoring stops	Cover of disturbed bare ground not more than 10%	Yes	

Attribute	Measure	Target	Addressed by FRP?	Will restoration actions contribution to achieving target?
Physical structure: tufa formations	Percentage cover in local vicinity of a representative number of monitoring stops	Disturbed proportion of vegetation cover where tufa is present is less than 1%	Yes	Yes. Appropriate habitat management (grazing) is proposed in areas of 7230 Alkaline fens which overlap with areas of 7220 Petrifying springs. Hydrological monitoring will also be implemented in appropriate locations to monitor the hydrological conditions and inform any future adaptations to management of the site.
Indicators of local distinctiveness	Occurrence and population size	No decline in distribution or population sizes of rare, threatened or scarce species associated with the habitat; maintain features of local distinctiveness, subject to natural processes	Yes	Yes. FRP actions seek to improve the condition of 7230 Alkaline fens which support Geyer's whorl snail.

3 Land and Water

3.1 Desktop 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 40 years from the closest Met Éireann weather station, Clonaslee Waterworks II (approximately 5 km southeast of the site), was reviewed to assess seasonal variability in rainfall at the site and surrounding areas (Met Eireann, 2025).

At this station, monthly and daily rainfall data was available from 1985 to 2025. The minimum and maximum mean monthly rainfall collected in that station over the past 40 years were 18 mm in September and 283.1 mm in October respectively. Two datasets are presented: (1) average monthly precipitation (mm), incorporating a 40-year period to show seasonal distribution patterns (Figure 3-1) and (2) total annual precipitation (mm) for each year within the 40-year record (Figure 3-2), to identify longitudinal trends. This information is important to assess water availability and to evaluate the feasibility and sustainability of restoration actions aimed at restoring or maintaining suitable hydrological conditions.

The average monthly rainfall is highest in the winter months (October to January) and lowest in late spring to early summer (April to June). Minimum rainfall is lowest in late spring and early autumn, particularly in May and September, while the maximum monthly rainfall shows

considerable variability throughout the year, with notable peaks in February, June, October and December (Figure 3-1).

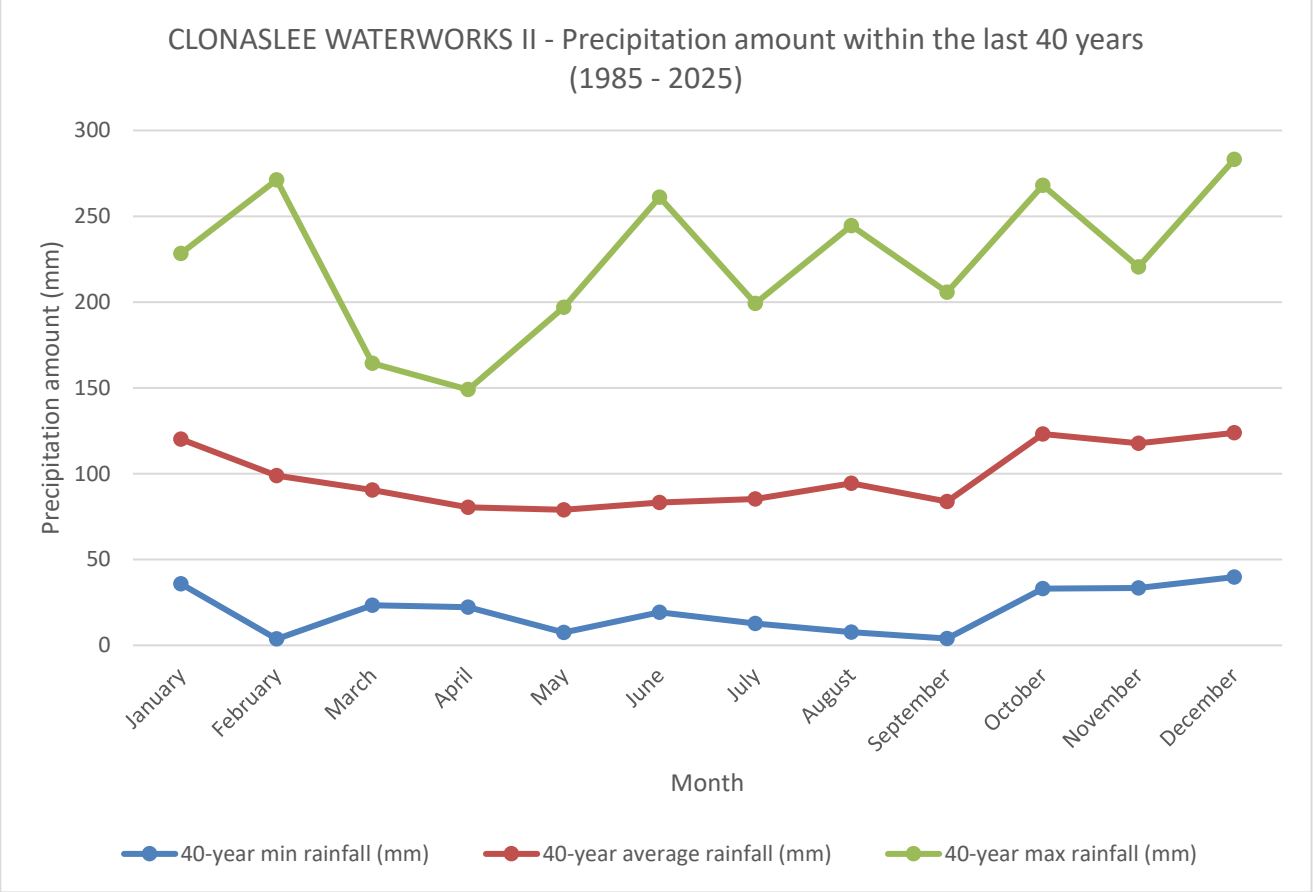


Figure 3-1: 40-year minimum, average and maximum monthly rainfall in Clonaslee Waterworks II (Met Éireann, 2026)

Total annual precipitation also varies between years, indicating inter-annual variability that is relevant when considering baseline hydrological conditions and the application of the restoration measures under both wetter and drier climate conditions (Figure 3-2). In particular, maximum precipitation surged to nearly 1451 mm in 2014 and minimum precipitation was circa 789 mm in 1985.

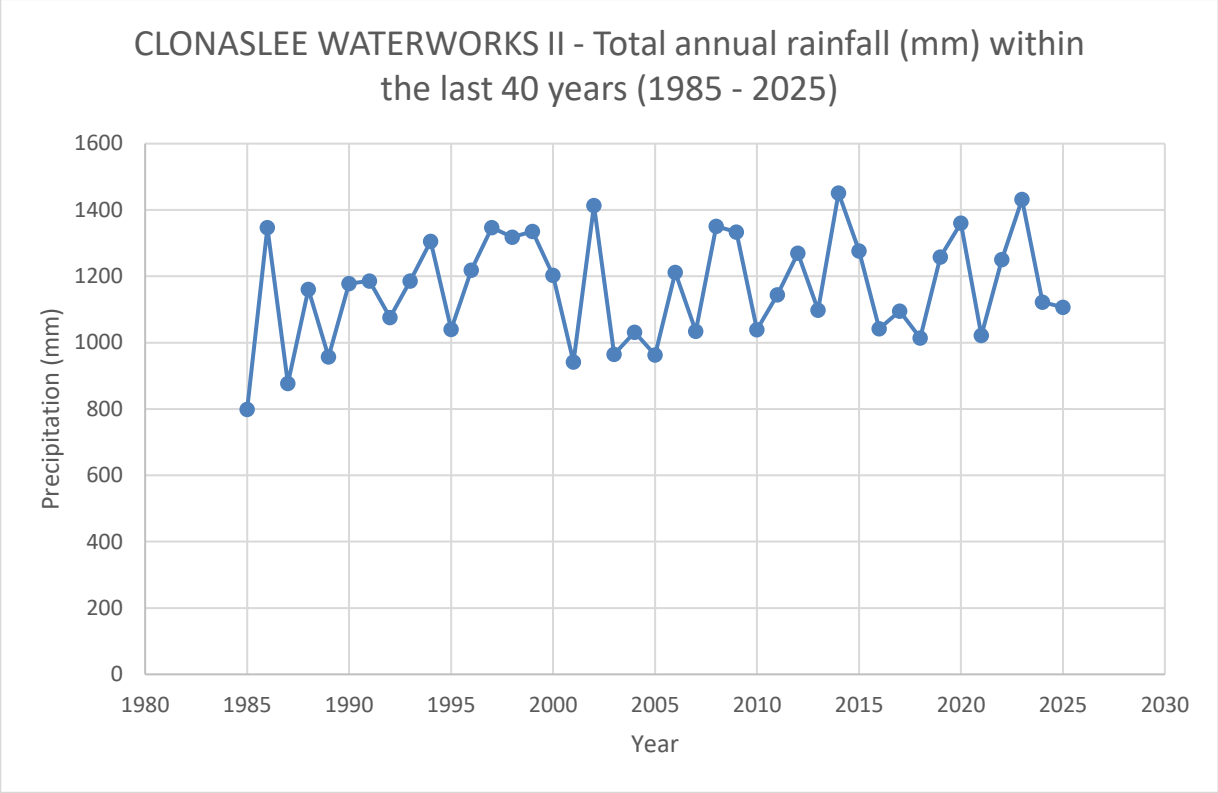


Figure 3-2: Clonaslee Waterworks II weather Station – Total annual precipitation within the last 40 years (1985-2025) (Met Éireann, 2026)

3.1.2 Hydrogeological Setting

The hydrogeological information gathered for the Clonaslee Eskers and Bog was extracted from the Geological Survey Ireland (GSI) website. Most of the site is underlain by the Ballysteen Formation, characterised by dark muddy limestone and shale. A small portion of the site in the south is underlain by Lower Limestone Shale, formed by sandstone, mudstone and thin limestone beds, and the southwestern limit of the site underlain by Clonaslee Member which is characterised by thick flaggy sandstone and thin siltstone. These formations are expected to permit groundwater movement primarily through fractures, bedding planes and weathered zones. The bedrock geology of the site is presented in Figure 3-3.

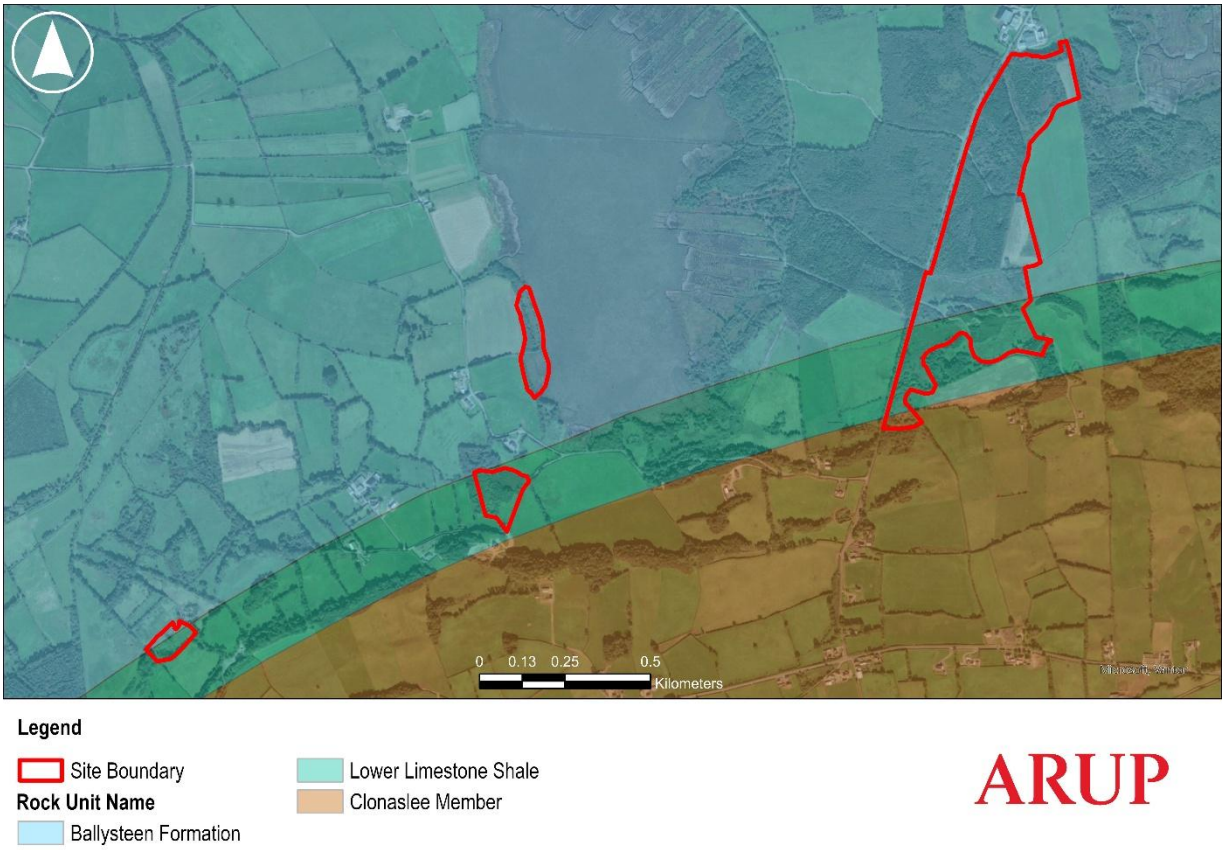


Figure 3-3: Bedrock Geology of Clonaslee Eskers and Derry Bog SAC (GSI, 2025)

Most of the area is underlain by a Locally Important bedrock aquifer which is moderately productive only in local zones (Ll). Most of the flow in this type of aquifer is in the upper 15 m, in the zone that consists of a weathered layer and connected fracture zone below. The southern portion of the site is underlain by a Poor Aquifer, which is generally unproductive except for local zones. Additionally, at the southwestern limit of the site, a Regionally Important Aquifer characterized by fissured bedrock is observed. The bedrock aquifer classification underlaying the site is presented in Figure 3-4.

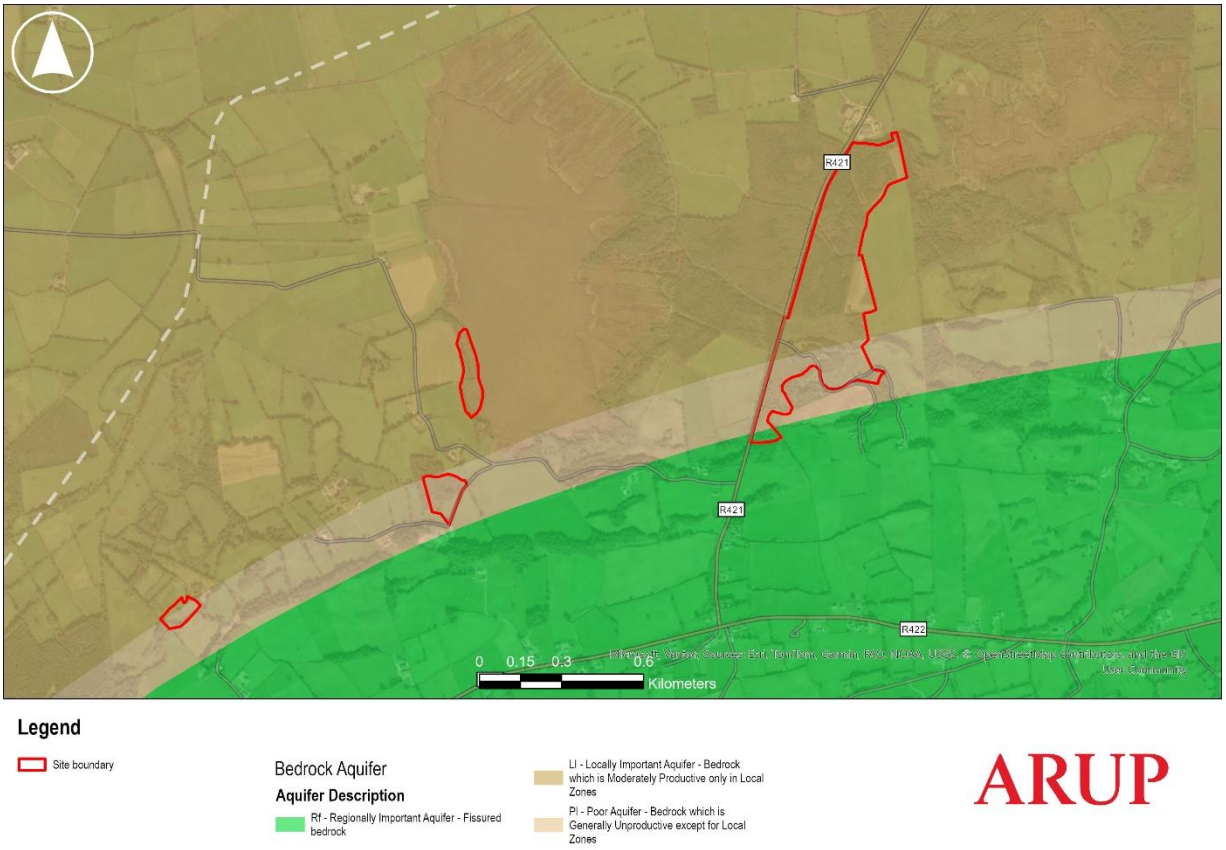


Figure 3-4: Bedrock aquifer classification underlying Clonaslee Eskers and Derry Bog SAC (GSI, 2025)

At Clonaslee Eskers and Derry Bog SAC, a Locally important gravel aquifer (Lg) is also present below the entire site. The esker-derived sand and gravel deposits have a greater capacity to store and transmit groundwater than the surrounding peat deposits and may therefore contribute to local groundwater flow pathways within the site and subsequently influence groundwater-dependent habitats within the SAC. The sand and gravel aquifer classification underlaying the site is presented in Figure 3-5.

The groundwater body which underlies Clonaslee Eskers and Derry Bog SAC is Geashill (IE_SH_G_103). This ground waterbody is at 'good' status and 'not at risk' of not achieving its WFD objectives.

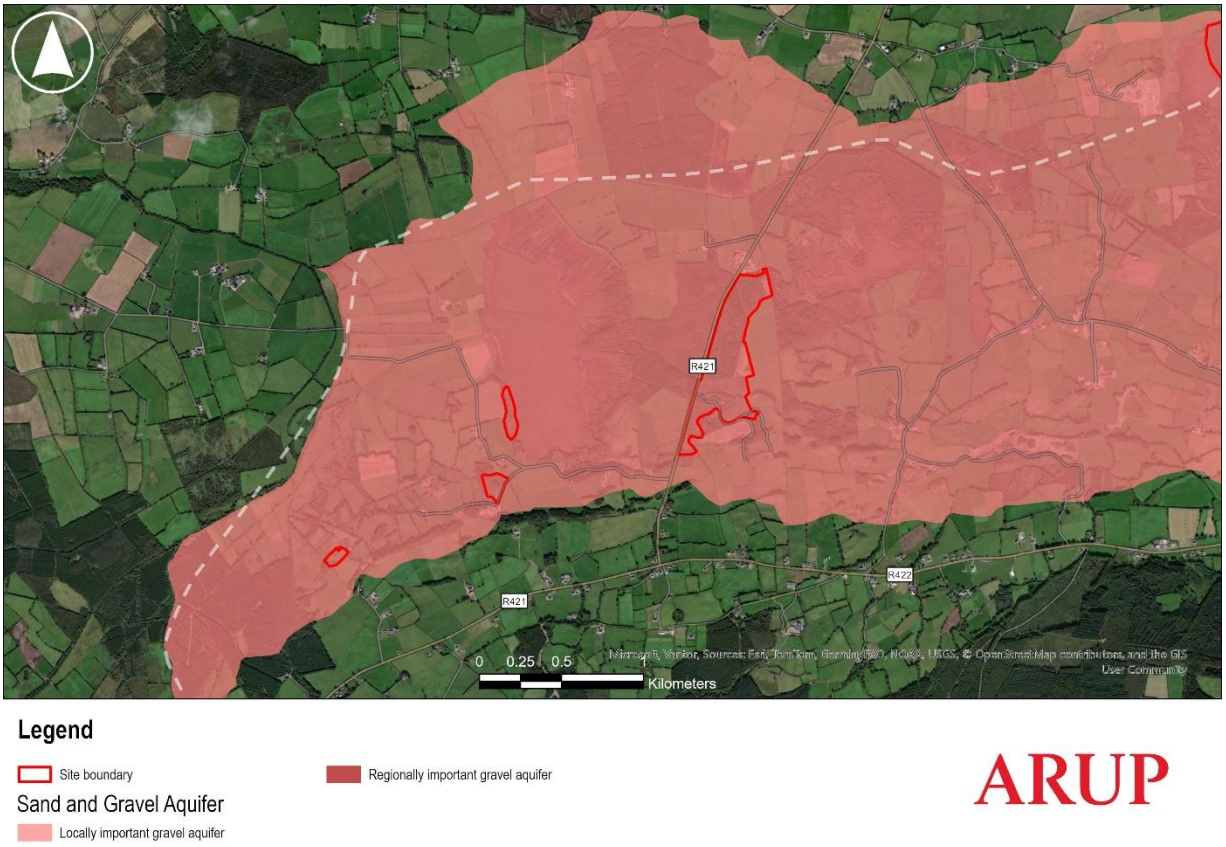


Figure 3-5: Sand and gravel aquifer classification underlying Clonaslee Eskers and Derry Bog SAC (GSI, 2025)

Quaternary sediments within the site boundary comprise mostly cut over raised peat. In the centre of the site, there are BasEsk deposits, comprising eskers of basic gravels. South of the eskers, there is a layer of lacustrine sediments. Esker gravels are highly permeable and facilitate groundwater storage and movement, while the peat and lacustrine sediments are of lower permeability. The variation in these subsoils is likely to influence the groundwater pathways and discharge within the site. The subsoil type underlaying the site is presented in Figure 3-6.

Soil type in Clonaslee Eskers and Derry Bog SAC observed during the Scoping Study and Pilot Survey of Fens included peat with depths ranging from 35 cm to greater than 98 cm (Brophy et al., In prep). The study notes that soil types within the site are mostly cut peat (82.1%) with smaller areas in the site of shallow well drained mineral (mainly basic) (14.4%); lacustrine-type soils (2.1%); shallow, rocky, peaty/non-peaty mineral complexes (mainly basic) (0.7%); and shallow poorly drained mineral (mainly basic) (0.6%).

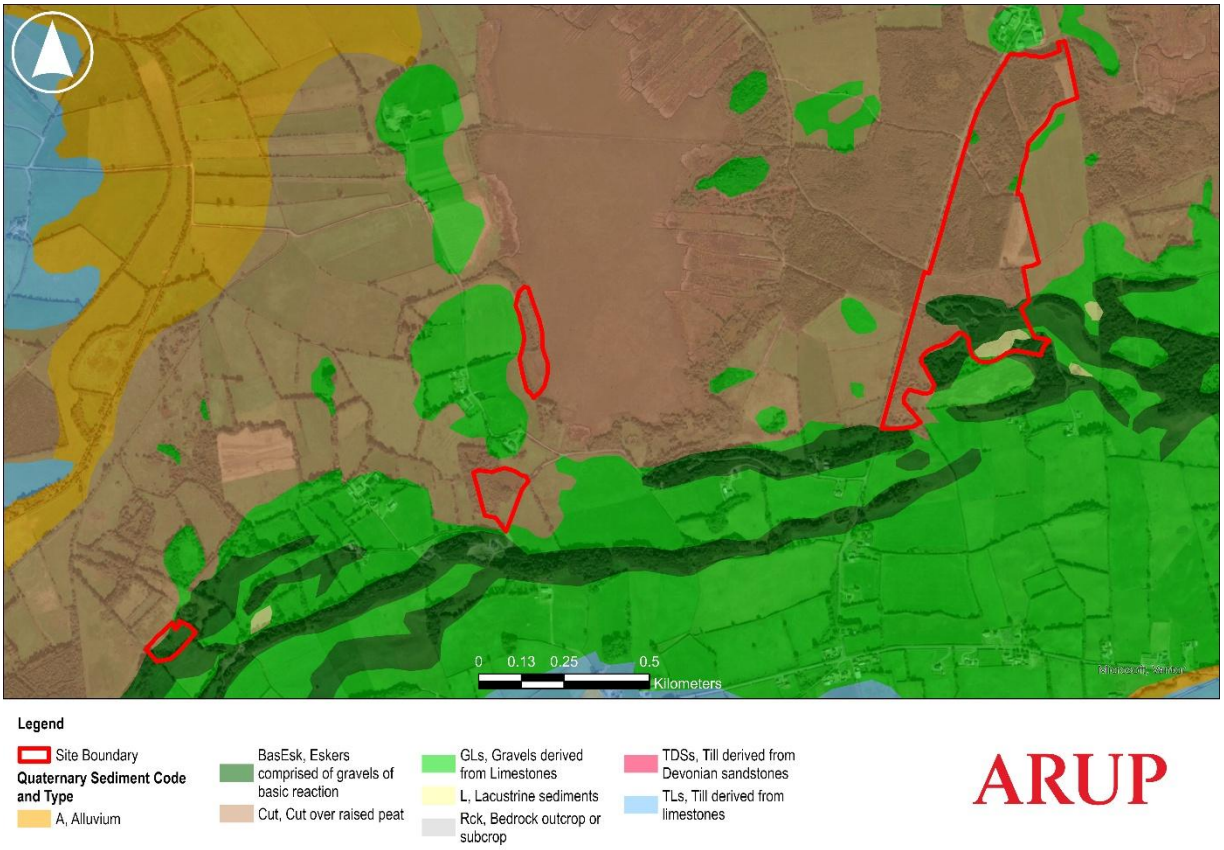


Figure 3-6: Sub-soil type underlying Clonaslee Eskers and Derry Bog SAC (GSI Quaternary map, 2025)

Groundwater vulnerability ranges from moderate in peat-covered areas to high in areas underlain by eskers. The groundwater vulnerability for the site is presented in Figure 3-7.

Recharge rates follow a similar pattern, reflecting the influence of subsoil type on the water infiltration. Where the site is covered by peat, recharge rates are lower, between 251 and 300 mm per year. In areas dominated by gravel and eskers, recharge rates raise to approximately 501 to 550 mm per year (Figure 3-8).

Previous hydrogeological investigations confirmed that groundwater discharge from the surrounding esker gravels contributes to the maintenance of groundwater-dependent fen habitat within the SAC. The study identified several spring discharge zones and highlighted the importance of the esker deposits as the principal groundwater recharge and flow pathway supporting fen hydrology (Ryan Hanley, 2021).

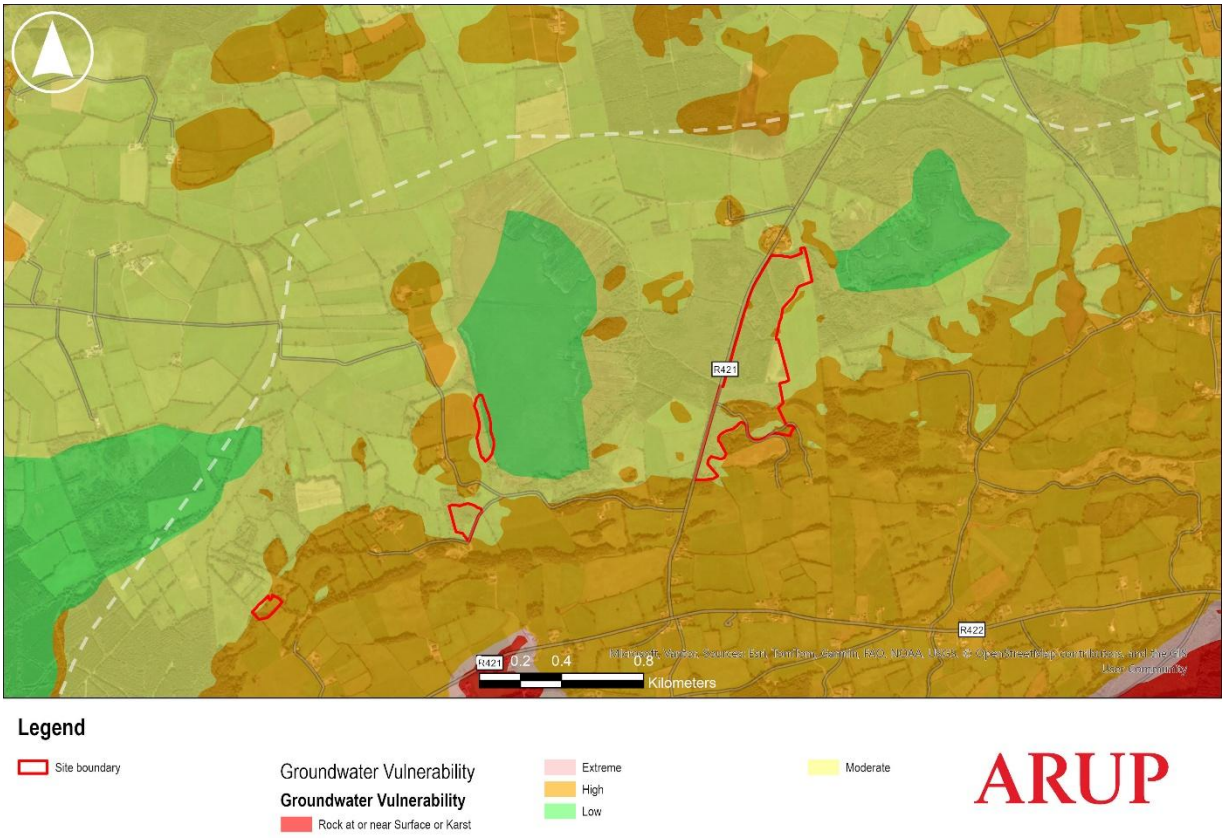


Figure 3-7: Groundwater vulnerability map for Clonaslee Eskers and Derry Bog SAC (GSI, 2025)

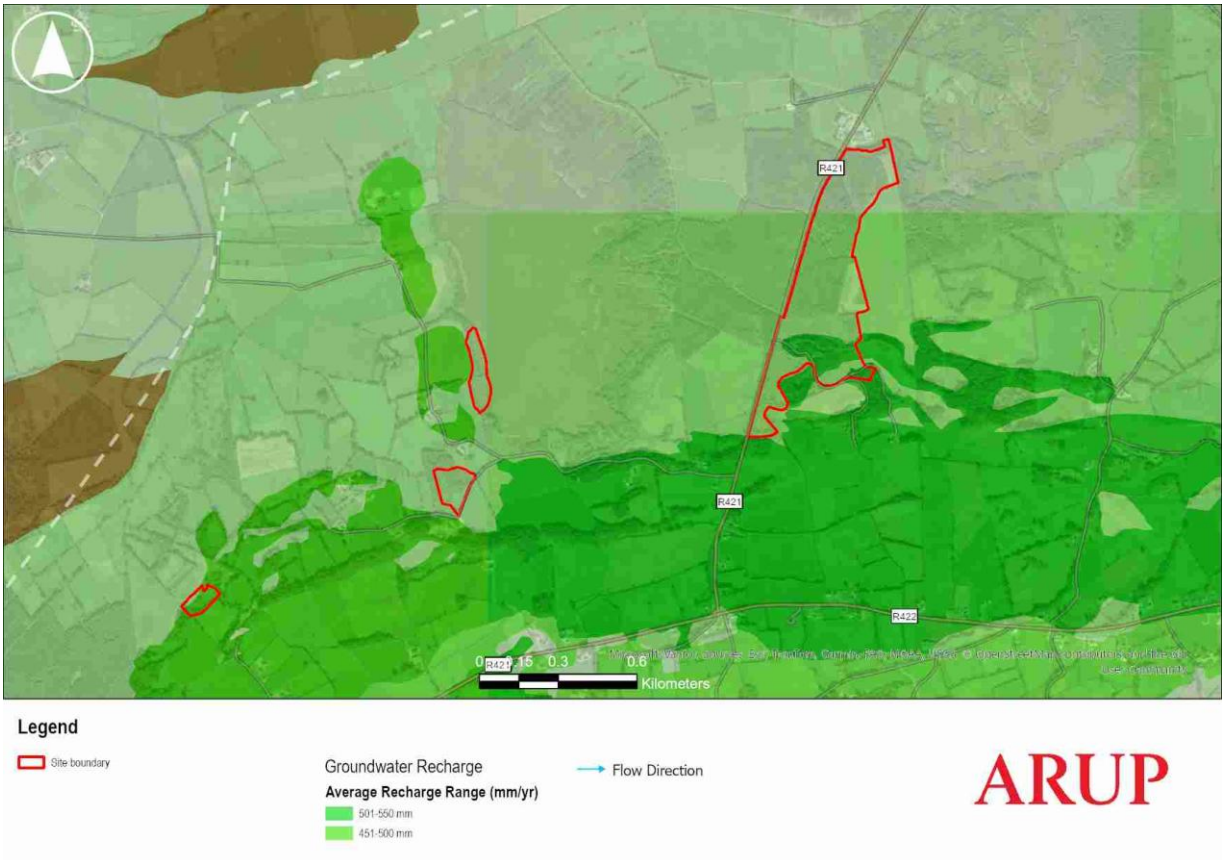


Figure 3-8: Groundwater recharge map for Clonaslee Eskers and Derry Bog SAC (GSI, 2025)

3.1.3 Topographic and Surface Water Drainage

The site is located within the 25A: Lower Shannon WFD Catchment and the 25A_12: Silver (Kilcormac)_SC_010 WFD sub catchment (Figure 3-9). The Silver (Kilcormac) River flows northeast to the Brosna River and, from there southwest towards the Lower Shannon River. The lower Shannon catchments drain towards the Shannon Estuary. The WFD River waterbody is classed at good WFD Status and at risk of not achieving its WFD objective established by WFD Cycle 3 (EPA, 2024).

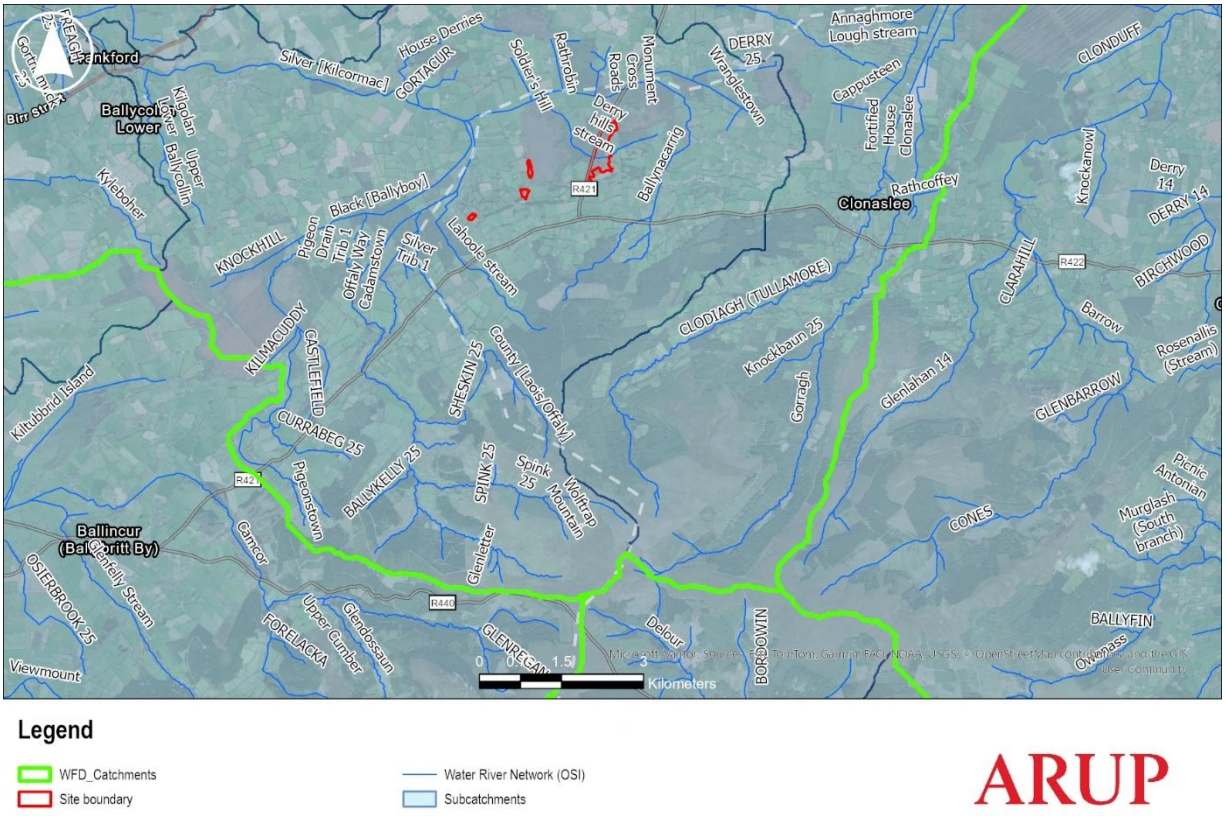


Figure 3-9: WFD Catchment and River sub-basin (EPA, 2025)

The site is positioned at approximately 84 mOD and is relatively flat. Higher ground is located at the northern boundary of the site (approximately 87 mOD) and at the southeastern portion of the site (up to 90 mOD). Water flows from both the northern and the southern portions of the site run towards the drain in the middle of the site.

An assessment of historical hydrological data indicates that wells, drains and springs are visible within the site. Historical mapping shows three springs located in the southeast corner of the site, a main drain crossing the centre of the site from the west to the east, and a secondary drain conveying water from the southeastern boundary westwards into a roadside drainage network before draining northwards, eventually leaving the site to the northwest. The location of the main drain was confirmed in site visits taken in 2026. The secondary drain was not identified in initial visits, with diffuse flow paths seen in the area. However, the drain was located during follow up visits, as discussed below in Section 3.2. Although mapped spring

emergence points were not observed during site visits, groundwater-fed conditions and widespread surface water were evident across the site, suggesting a continued groundwater influence in these areas. Denyer (2025) describes the site as comprising seasonal tufa-forming flushes at the base of an esker, consistent with the presence of seasonal petrifying spring habitat within the site. Historical water distribution and retention within the wetland is shown in Figure 3-10.

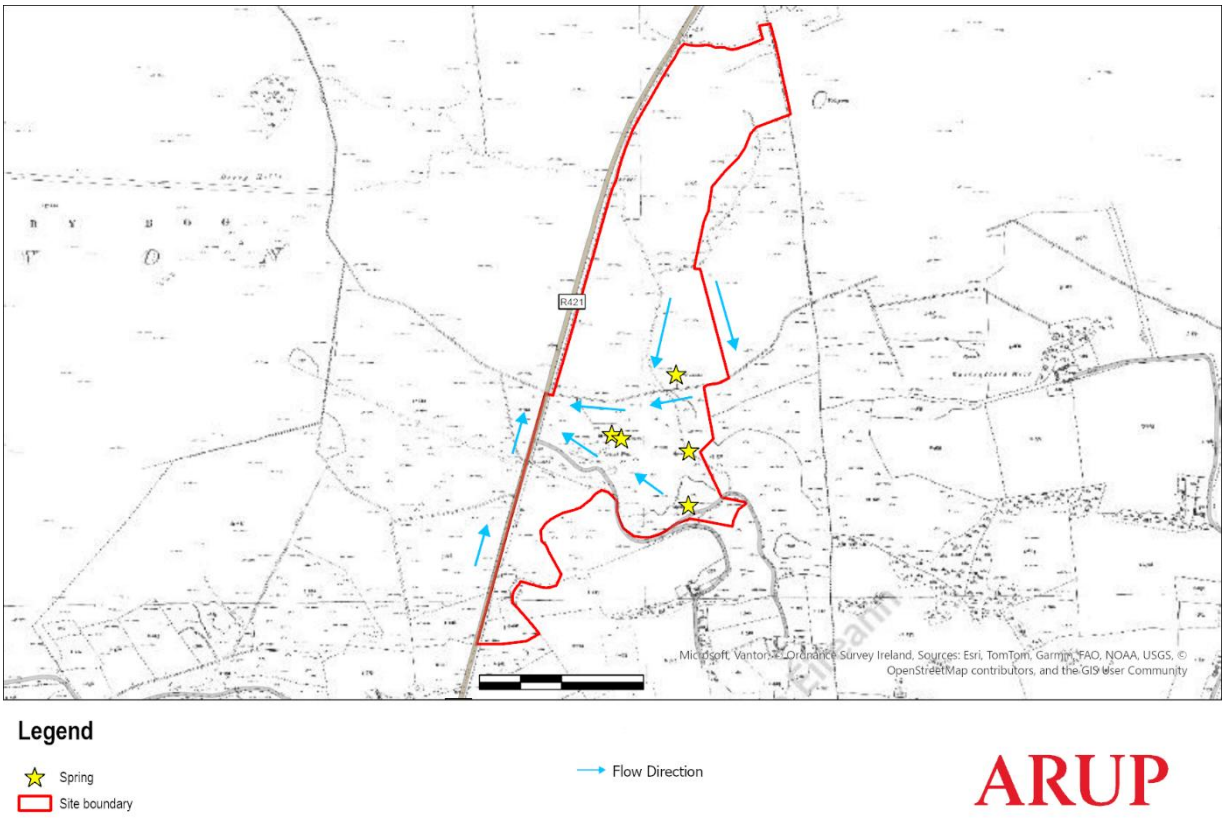


Figure 3-10: Historical water distribution and retention within wetland (Tailte Éireann Historical mapping, 2025)

The mapped Wetness Index[2] classifies most of the site area as dry and a few specific areas across the south of the site as temporarily wet, indicating alternating periods of saturation and dryness over the period of 2012 to 2018. This pattern suggests a mosaic of variable soil moisture conditions, supporting intermittent wetland characteristics across the site (Figure 3-11). However, the predominance of dry conditions across much of the site, particularly relative to the noticeably wetter bog habitat to the west, suggests that the fen may be drier than desirable for maintaining optimal fen hydrological conditions and associated ecological function.

[2] Dataset available at 10m resolution indicating the occurrence of water and wet surfaces over the period from 2012 to 2018.

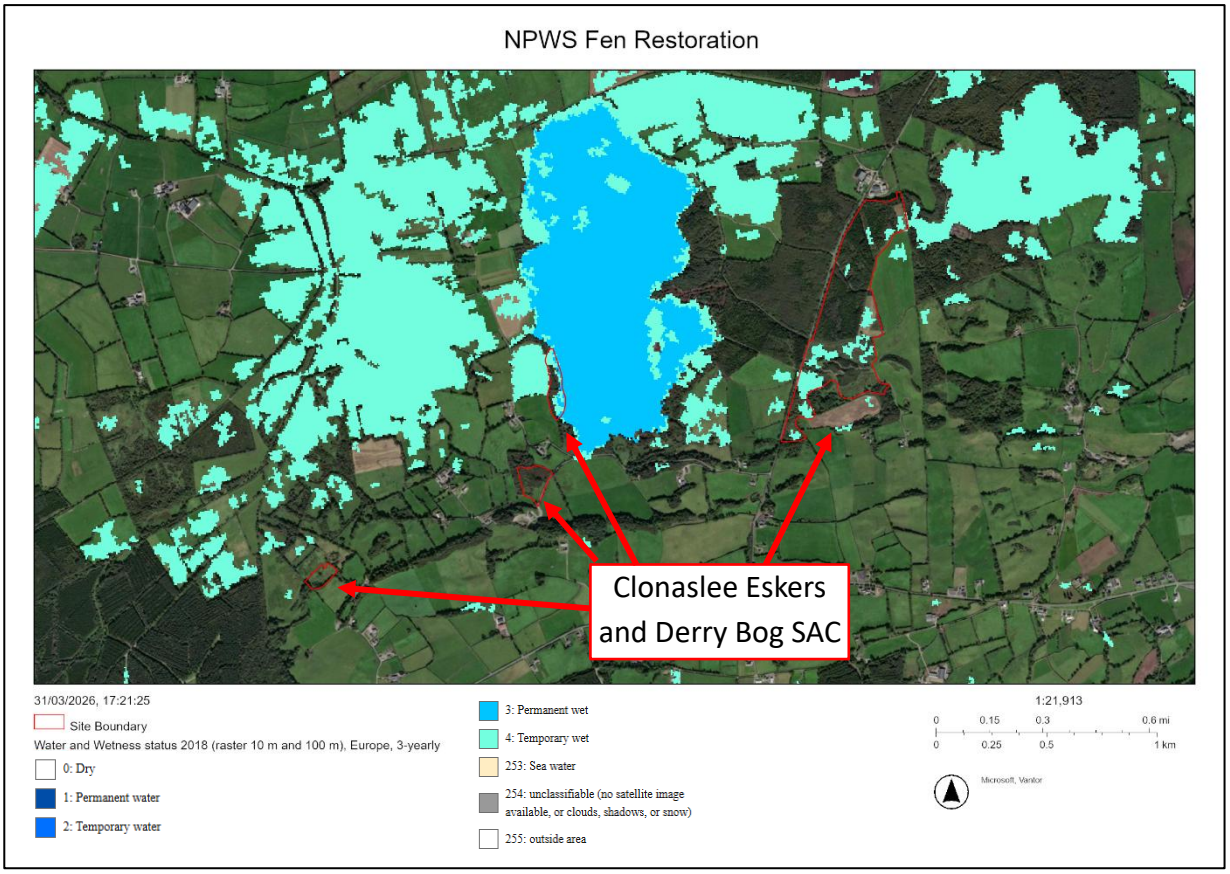


Figure 3-11: HRL Water and Wetness – 2018 of Clonaslee Eskers and Derry Bog SAC (Copernicus, 2025)

Total productivity mapping of Clonaslee Eskers and Derry Bog SAC further illustrates the site's hydrological variation. Most of the area north of Silver (Kilcormac) River is classified as having moderate productivity, typically associated with semi-degraded peatlands habitats impacted by drainage and vegetation encroachment, which is consistent with the forestry drainage present within this area. Areas south of the Silver (Kilcormac) River, show higher productivity, which presents the characteristics of artificial drainage, agricultural use or colonisation by grasses, shrubs, or trees in a more intense manner. In contrast, in the northern boundary of the site areas of low productivity, with nutrient-poor, water-saturated soils were observed, indicating a functioning peatland system (Figure 3-12).

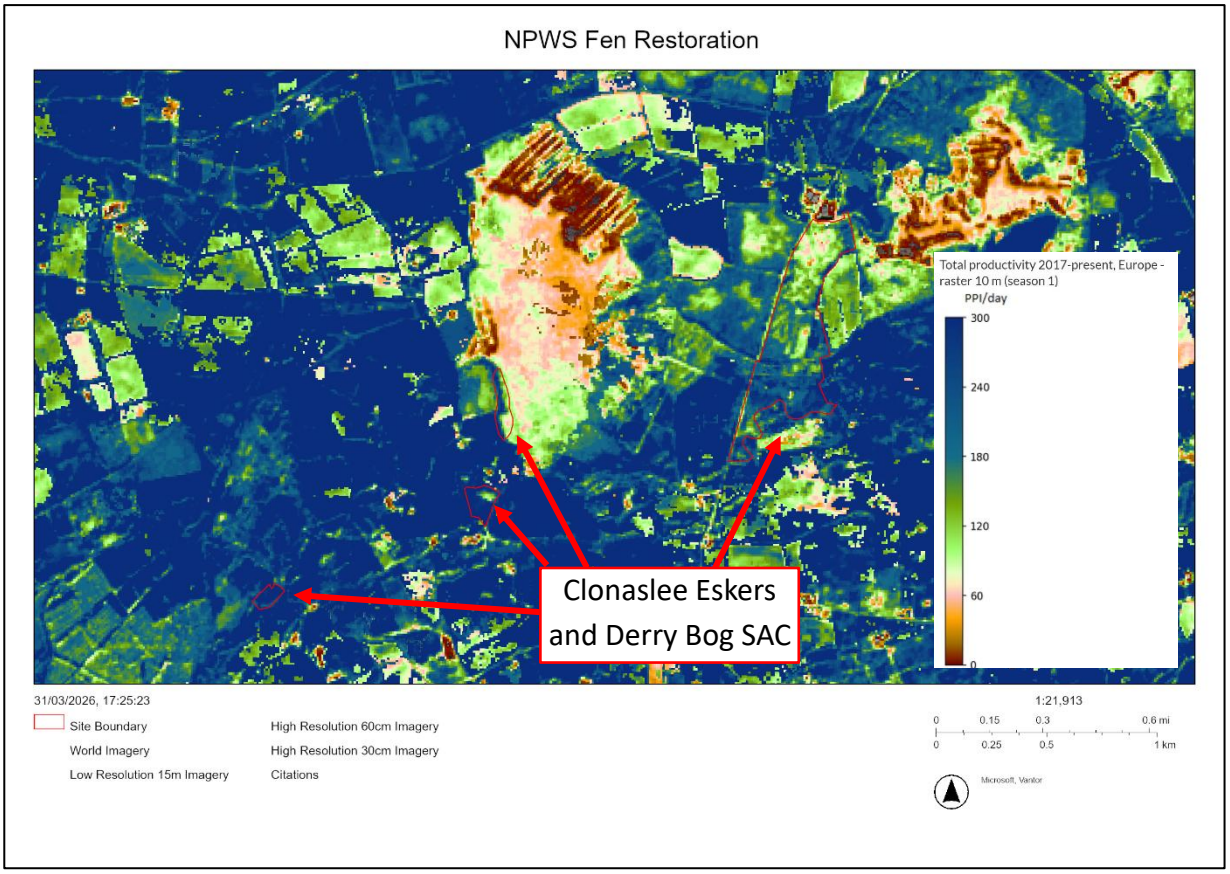


Figure 3-12: Total Productivity 2017 -present, Europe – raster 10m (season 1) of Clonaslee Eskers and Derry Bog SAC (Copernicus, 2025)

Figure 3-13 and Figure 3-14 show the site photogrammetry and the Digital Terrain Model (DTM) map of Clonaslee Eskers and Derry Bog SAC, both generated from LiDAR imagery. The images indicate a main drain flowing crossing the site from east to west, providing the principal outflow of the site, and smaller drains north of the main drain in the north-south direction which are consistent with forestry usage in this portion of the site. Smaller diagonal drains can be observed through the fields in the southern portion of the site, flowing from the southeast to the northwest and into the main drain. The main drain became less deep as it flows west out of the site. These drains can also be seen below in Figure 3-15.

Topographically, the site slopes generally towards the main drain located through the centre of the site. North of the drain, the ground falls at approximately 0.8% from north to south from the northern boundary. South of the drain, the site slopes northward at a gradient of approximately 2.25%. It should be noted that there is a high point at 93 mOD in the centre of the southern portion of the site, associated with the accumulation of gravel at the location of the former gravel pit.

In the east-west direction, the northern portion of the site is mostly flat, with an elevation of approximately 81.5 mOD and a few localised high points, with elevations of approximately 84.5 mOD. In the southern portion of the site, the site slopes towards the west with an average gradient of approximately 2.31%, with high points in the centre of the southern area.



Figure 3-13: Site Photogrammetry map of Clonaslee Eskers and Derry Bog SAC

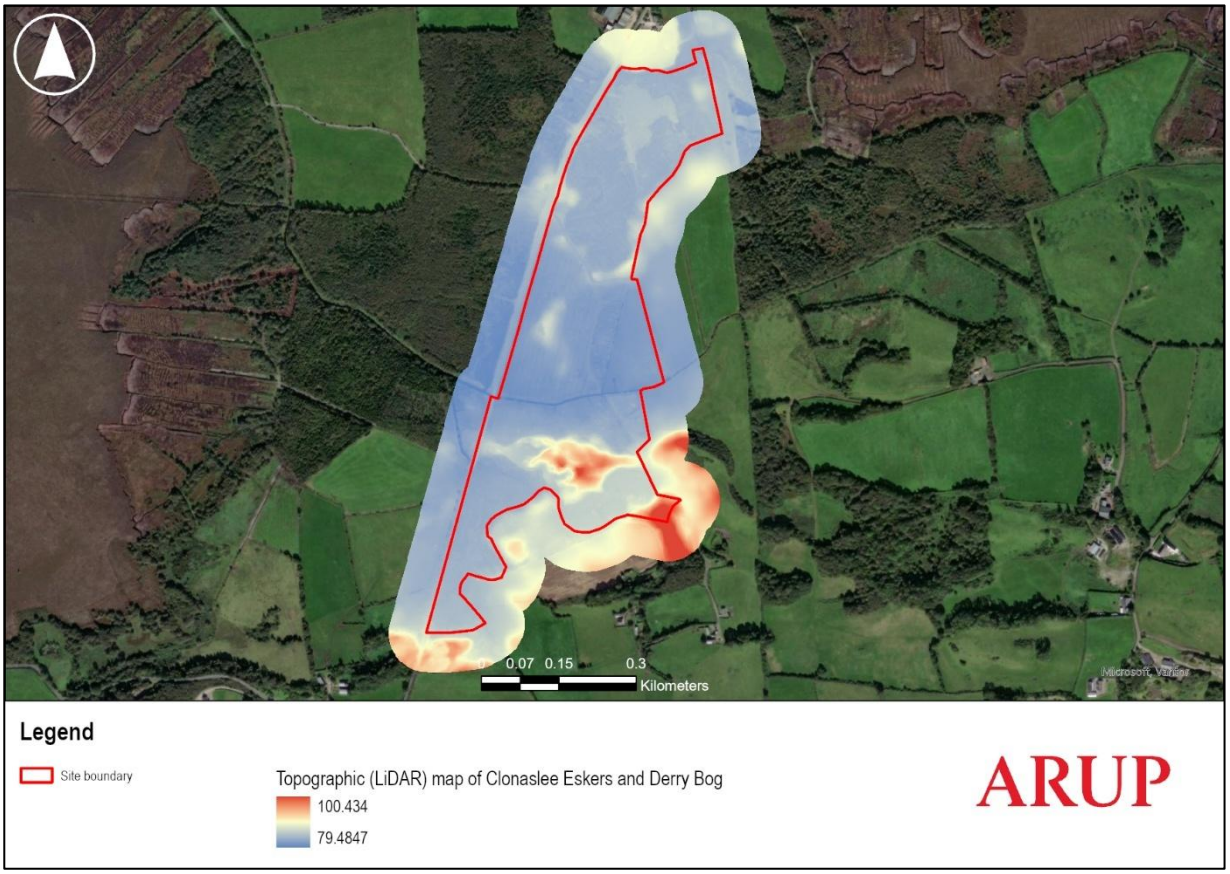


Figure 3-14: Topographic (LiDAR) map of Clonaslee Eskers and Derry Bog SAC

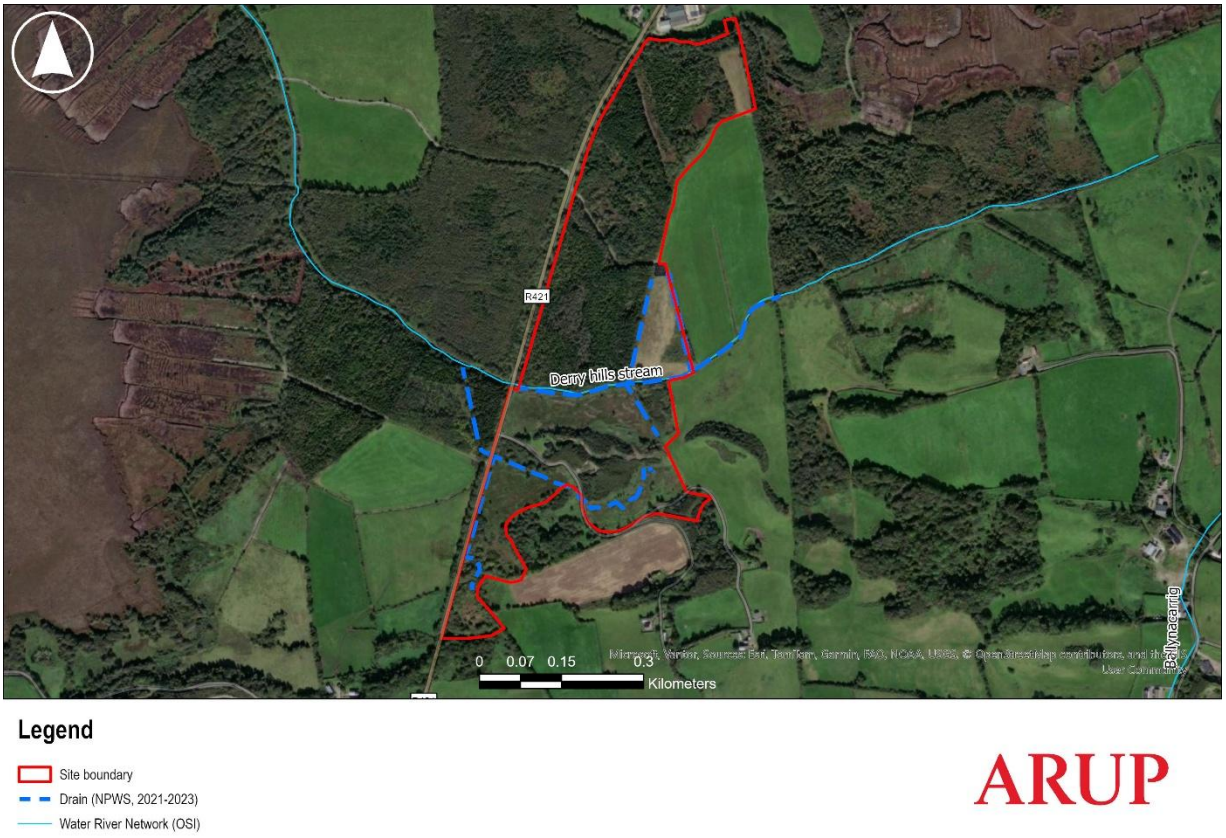


Figure 3-15: Mapped drainage network of Clonaslee Eskers and Derry Bog SAC

3.1.4 Land use Pressures and Water Quality

Pollution Impact Potential (PIP) maps (EPA 2025) show the highest risk areas in the landscape for losses of Nitrate and Phosphorus to waterbodies. The PIP models estimate the annual nutrient losses from agricultural land using spatial data on farm management, soil and hydrogeology. This information is relevant to the SSCO attribute "Water quality – Nutrients" and informs assessment against the SSCO target to maintain nutrient levels and support favourable conservation condition.

Freely draining soils and substantial groundwater pathways are high risk for nitrate losses. PIP mapping indicates that the risk of near surface nitrate loss is low within the northern portion of the site (north of Silver (Kilcormac) River) (Figure 3-16). The susceptibility of near surface nitrate loss increases progressively towards the southeast, going from low to high and very high susceptibility, indicating a greater potential for nitrate leaching in the soil layer within the immediate catchment of the site. The susceptibility of nitrate loss in the subsurface layer, representing potential transport via groundwater pathways, follows a similar spatial distribution, with susceptibility of nitrate loss increasing towards the southeast of the site (Figure 3-17). However, in that area, the susceptibility increases from very low to low.

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 very high risk, with areas of higher risk particularly noted in the northern portion of the site, north of Silver (Kilcormac) River. These flow paths indicate potential delivery pathways towards the fen and the Silver (Kilcormac) River. Additional areas of elevated surface runoff risk are also identified in the southwestern portion of the site, with water flow towards the northwest. Areas classified as PIP Rank 1, representing the highest phosphorus loss risk, are identified northeast of the site boundary. Additionally, a small portion of PIP Rank 3 areas are located southeast and southwest of the site boundary. Flow delivery paths and PIP Ranking for Phosphorus are presented in Figure 3-18. A close up of the flow delivery paths in the site area is presented in Figure 3-19.

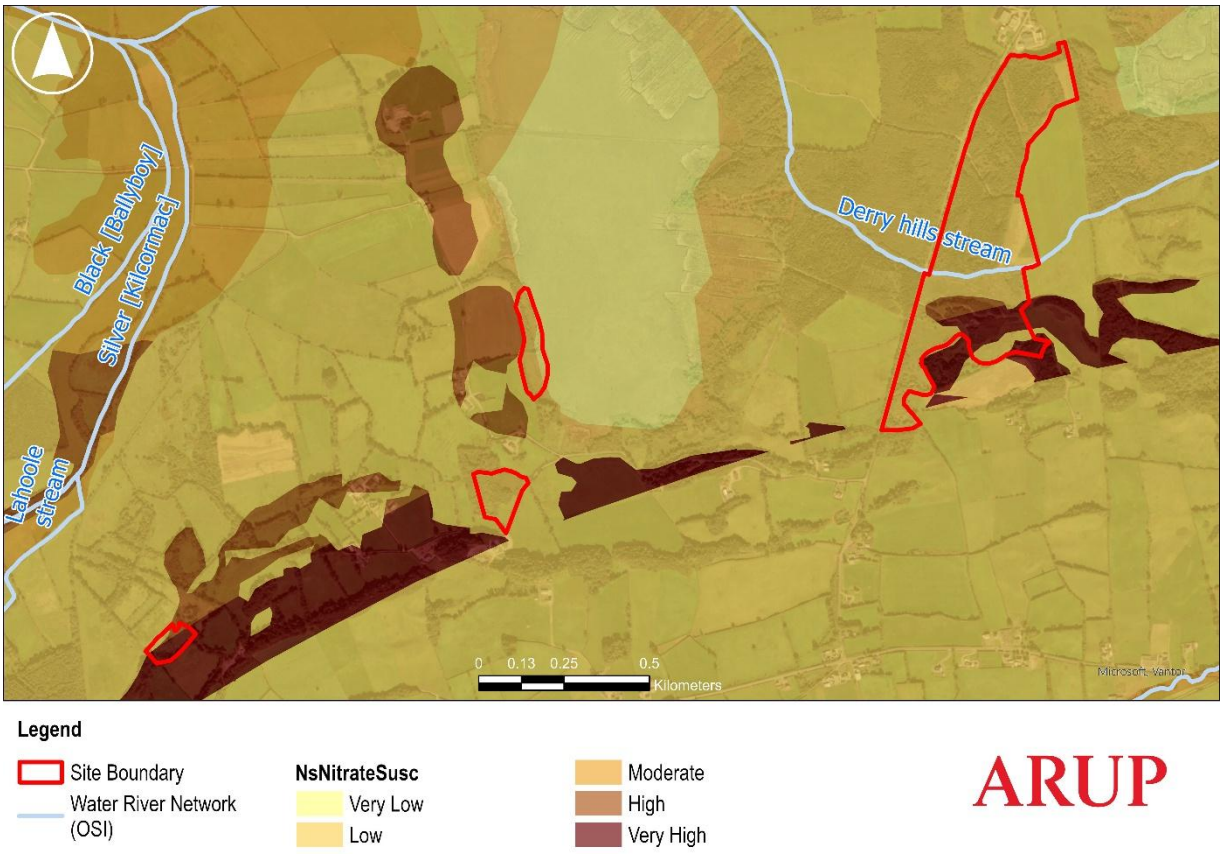


Figure 3-16: Susceptibility maps (Nitrate – near surface) of Clonaslee Eskers and Derry Bog SAC (EPA, 2021)

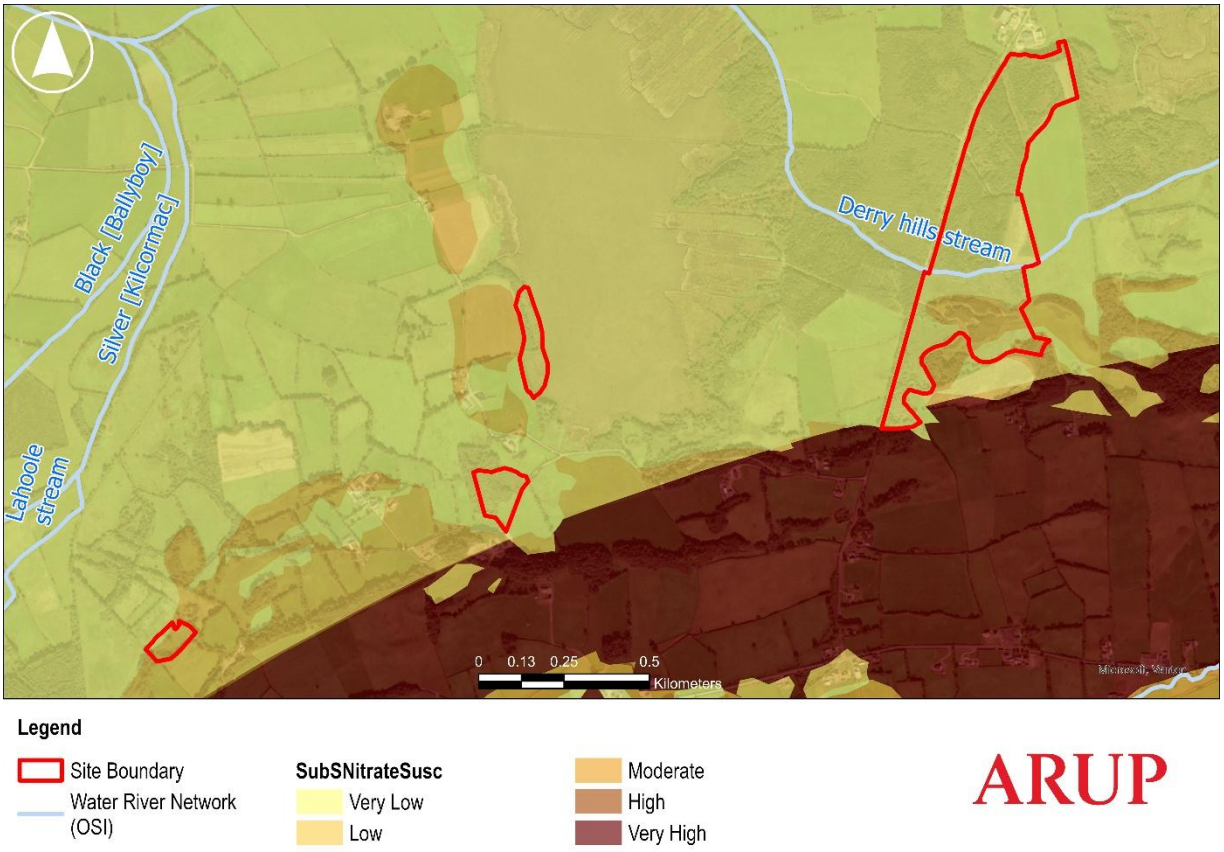


Figure 3-17: Susceptibility maps (Nitrate – sub surface) of Clonaslee Eskers and Derry Bog SAC (EPA, 2021)

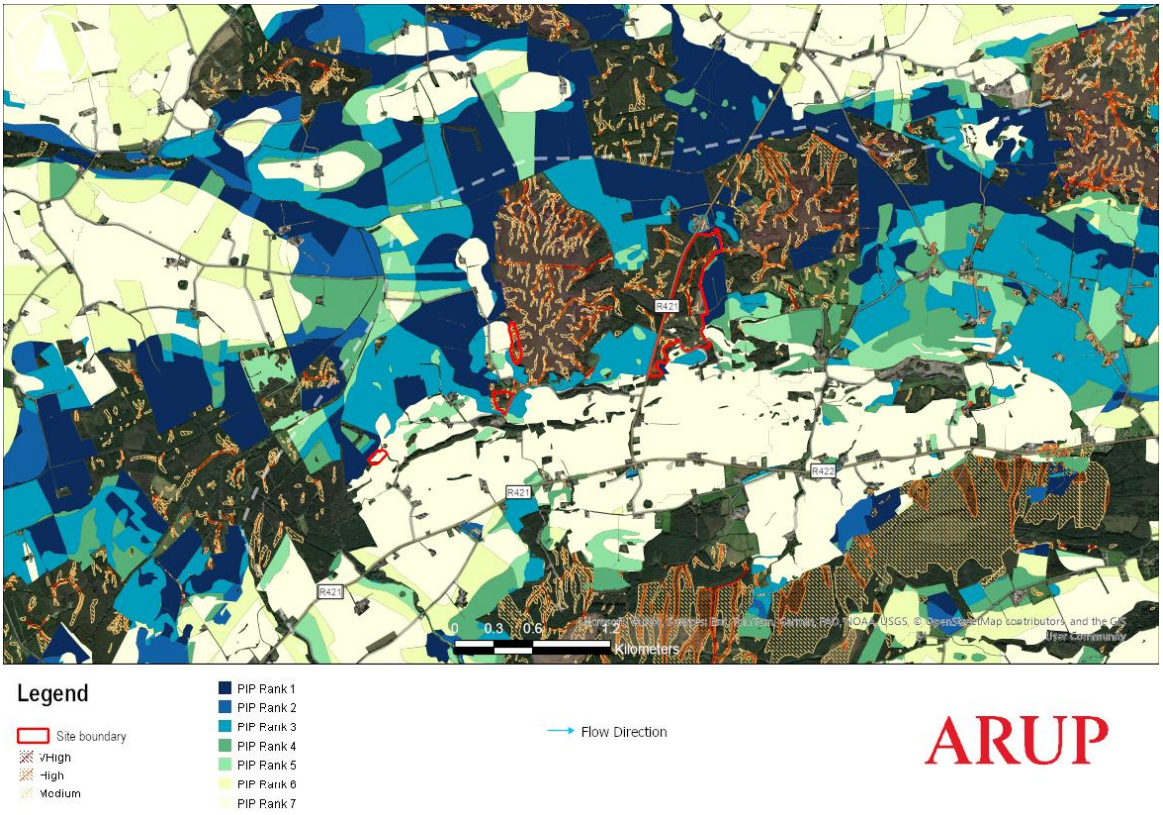


Figure 3-18: PIP maps + Flow delivery paths (Phosphorus) of Clonaslee Eskers and Derry Bog SAC (EPA, 2021)



Figure 3-19: Flow delivery paths (Phosphorus) of Clonaslee Eskers and Derry Bog SAC (EPA, 2021)

3.2 Field Survey

In the 2022 NFS, water sample data of electrical conductivity (EC), pH and peat depth was collected. EC values recorded ranged from 106 to 662 µS/cm, pH values ranged from 4.86 to 7.92 and peat depth ranged from 35 to 98cm (Brophy et al., In prep).

Site monitoring was undertaken in February, May and June 2026, focusing on developing the understanding of the water regime, pressures and implementation of restoration measures within the habitat. Monitoring comprised peat depth probing, water quality monitoring, identification of springs, and observations of water flow in the drainage network across 22 monitoring locations. Several locations were used for more than one monitoring purpose, including both water quality and peat depth measurements.

Water quality monitoring parameters included electrical conductivity, pH, temperature, phosphate and nitrate. The 12 surface and ground water monitoring locations for Clonaslee Eskers and Derry Bog SAC are shown in Figure 3-20, including areas within the fen habitat and along the main flow paths within the site. The 18 peat depth monitoring locations for Clonaslee Eskers and Derry Bog SAC are shown in Figure 3-21.

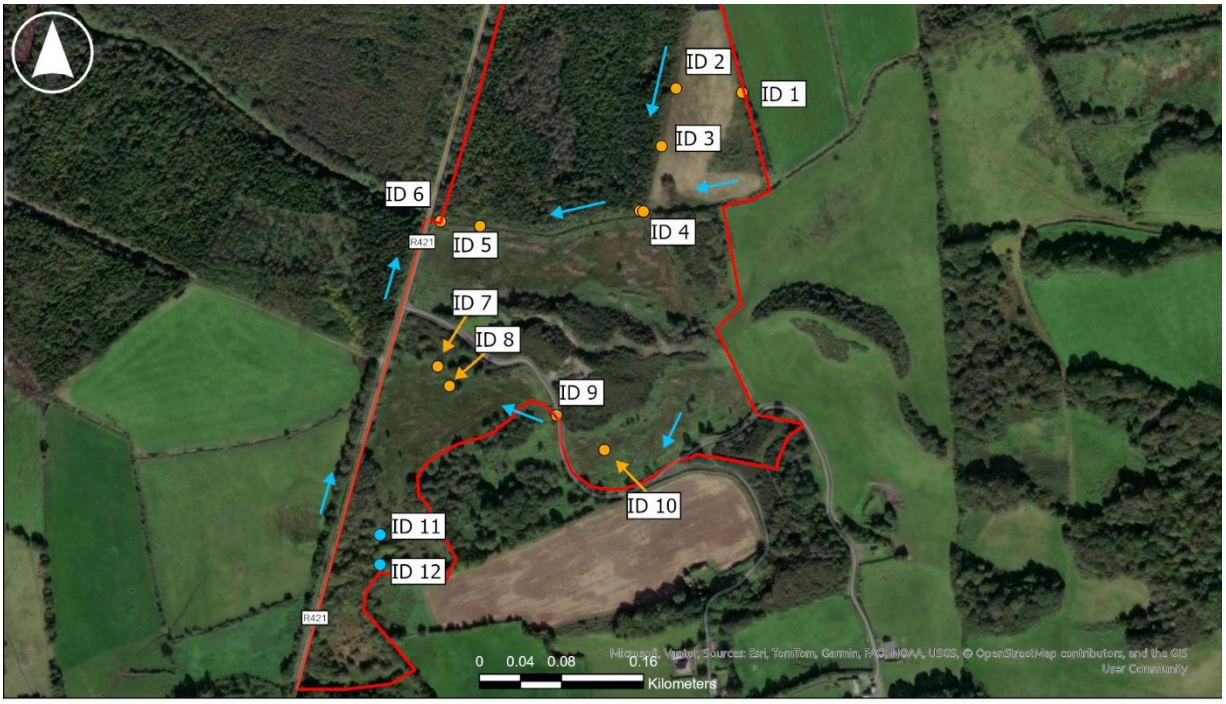


Figure 3-20: Baseline surface and groundwater monitoring locations of Clonaslee Eskers and Derry Bog SAC

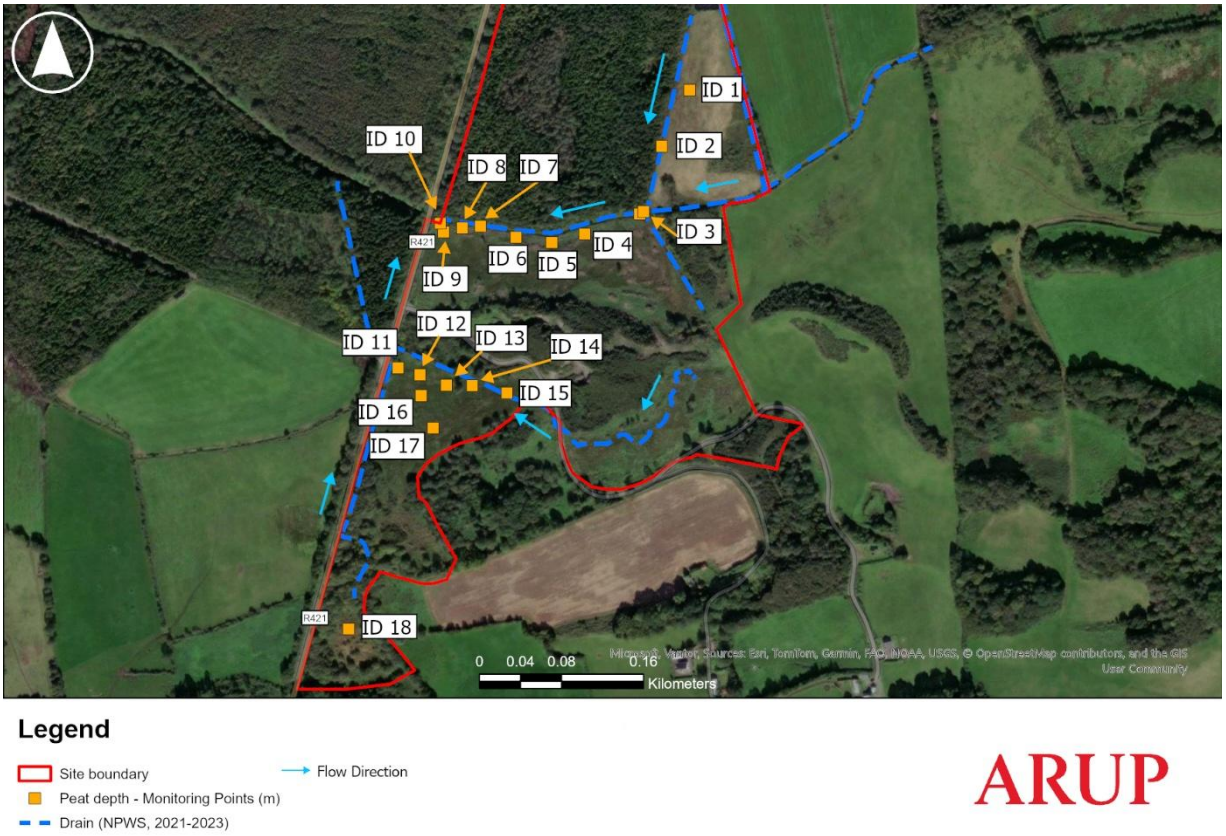


Figure 3-21: Baseline peat monitoring locations of Clonaslee Eskers and Derry Bog SAC

3.2.1 Peat Depth Probing and Ground Investigations

19 peat depth measurements were taken across 18 locations over three visits in the Clonaslee Eskers and Derry Bog SAC, as presented in Figure 3-22 and Table 3-1.

Peat depths were measured at two locations in February 2026 and indicated consistently deep peat, ranging from 0.9 m at Point 10, located on the western edge of the east–west drain within the site boundary, to 1.9 m at Point 3, located at the intersection of the north–south and east–west drains.

Four peat depth measurements were taken in May 2026 showing a variable depth across the site, but mostly deep peat. In the northern region, north of the east-west drain, a peat depth measurement of 1.96 m was taken (Point 1). In the southwestern portion of the site, south of the east-west drain, peat depths of 1.62 and 1.96 m were recorded (Points 16 and 17). The last measurement was taken near the southwestern edge of the site, of 1.59 m (Point 18).

Finally, thirteen peat depth measurements were taken in June 2026 showing a variable depth across the site. Mostly shallow peat depths were found in the field immediately south of the east-west drain, ranging from 0.04 to 0.1 m, except for Point 5, where 1.1 m of peat was recorded. Five of these thirteen peat measurements were taken in the southwest (south of the access road which passes through the site), with depths of approximately 1-1.1 m.

Table 3-1: Peat depth measurements at Clonaslee Eskers and Bog

Location	Date of measurement	Peat depth (m)
ID 1	May 2026	1.96
ID 2	June 2026	1
ID 3 – Sample 1	February 2026	1.9
ID 3 – Sample 2	June 2026	1
ID 4	June 2026	0.09
ID 5	June 2026	1.1
ID 6	June 2026	0.1
ID 7	June 2026	1
ID 8	June 2026	0.04
ID 9	June 2026	0.05
ID 10	February 2026	0.9
ID 11	June 2026	1
ID 12	June 2026	1
ID 13	June 2026	1.05
ID 14	June 2026	2
ID 15	June 2026	1
ID 16	May 2026	1.62
ID 17	May 2026	1.96
ID 18	May 2026	1.59

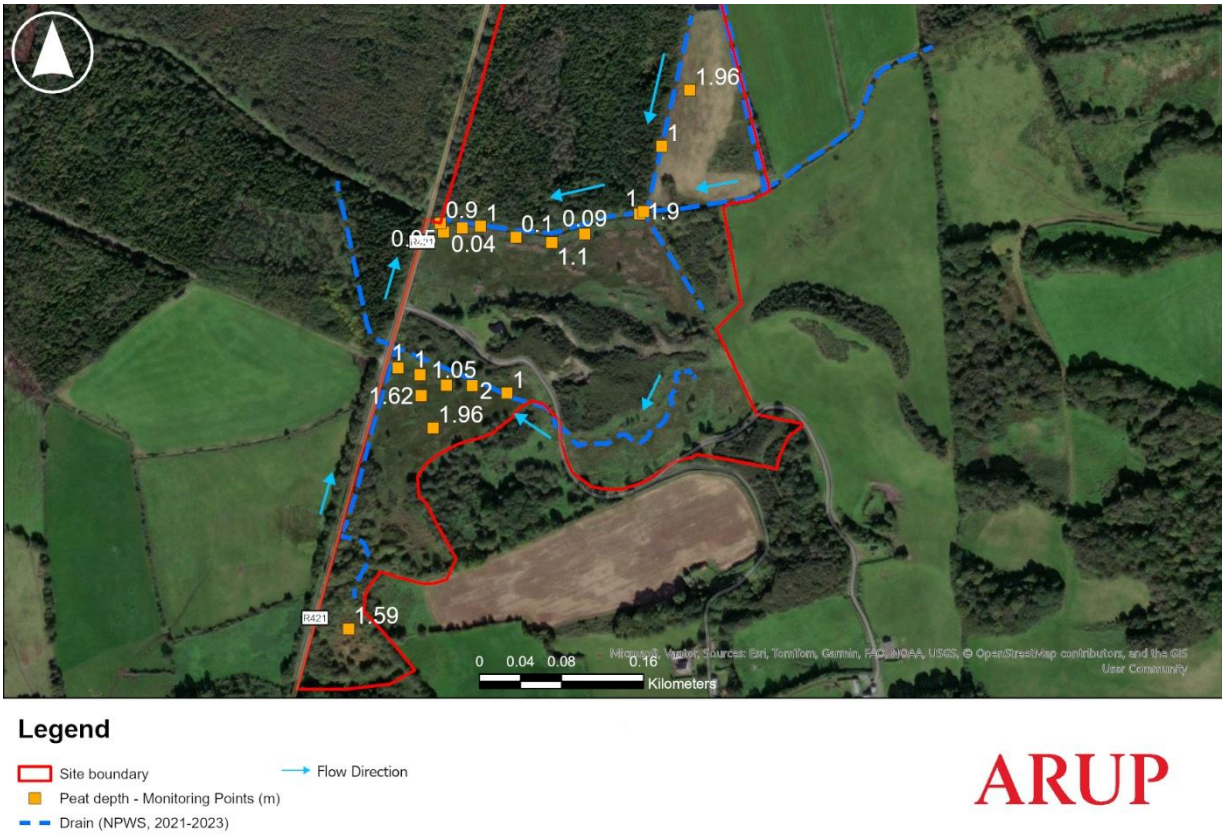


Figure 3-22: Baseline peat monitoring locations of Clonaslee Eskers and Derry Bog SAC

3.2.2 Groundwater Levels and Springs

Field surveys confirmed the groundwater-dependent nature of the site, with widespread wet ground conditions, areas of standing water and evidence of groundwater influence observed across the fen. In addition to the spring locations shown on historic mapping (Section 3.1.3), two previously unmapped spring features were identified in the southern portion of the site during site visits (Figure 3-23). At Point 11, paludal tufa and shallow water were identified, suggesting seepage and further supporting the presence of petrifying spring habitat. At Point 12, a springhead was identified in woodland. No water levels or water quality measurements were taken at these two points.

Previous piezometer monitoring undertaken within the site indicated a general groundwater flow direction from the southern recharge areas towards the northern fen and drainage network. While localised groundwater discharge was observed in spring-fed areas, groundwater monitoring suggested that drainage features may be intercepting groundwater flow and contributing to water table drawdown within parts of the fen (Ryan Hanley, 2021).



Figure 3-23: Baseline groundwater level monitoring locations of Clonaslee Eskers and Derry Bog SAC

3.2.3 Surface Water levels

The main flow paths are through the site from east to west and from the southeast to the west in the centre.

Surface water conditions varied across the site, particularly with respect to flow regimes and drainage features, with the southern section presenting more stagnant water and a shallower water table. Water measurements taken during the site visits are presented in Table 3-2 and these monitoring locations are presented in Figure 3-24.

The two north-south drains monitored at Points 1, 2 and 3 presented widths varying from 1.5 to 2.5 m, a depth of circa 1.5 m and very shallow water levels of approximately 0.05 m. Algae and pondweed in the drain bottom and patchy vegetation mainly of common reed was identified at Point 1. At Point 2, the drain was infilling with common reed and bottle sedge.

The east-west drain that bisects the two sections of the site varies in width from 2.5 to 4 m and from 1 to 3 m in depth (Points 4 and 5). A medium water flow was observed within this trapezoidal cross section, with clear water and a lot of vegetation in the riverbed. A lot of vegetation was present in the riverbed at the junction between the north-south and east-west at Point 4.

The southeast-northwest drain present in the southwest portion of the site was identified adjacent to the treeline. The drain is 0.3 m deep with a water level of 0.1 m on day of survey (May 2026) and was infilling with common reed. In the same area, disperse water flow was observed from southwest to northwest towards the main road. There was a distinct preferential flow path with a water level of approximately 0.3 m and 2 m width, with mostly clear water and some fine sediment. There was a lot of vegetation within this flow path, and the bottom could not be seen.

In the southeast portion of the site, the drain surveyed (Point 10) crossed the fields with water flowing from southeast to northwest towards the access road. The drain had a width of approximately 2 m width and 0.3 m depth. The drain had clear water with a lot of vegetation in the bottom. The width varied along the length of the drain.

Table 3-2: Drain dimension measurements at Clonaslee Eskers and Bog

Location	Date of measurement	Water Level (m)	Drain depth (m)	Drain width (m)
ID 1	May 2026	NI [3]	1.5	2.5
ID 2	May 2026	NI	1.5	2.5
ID 3	June 2026	0.02	1	1.5
ID 4 – Sample 1	February 2026	0.6	NI	2.5
ID 4 – Sample 2	June 2026	0.4	3	4
ID 5	February 2026	0.3	NI	2.5
ID 6	May 2026	0.1	0.3	1.5
ID 7	February 2026	0.3	NI	2
ID 8	February 2026	NI	NI	0.5
ID 9	February 2026	0.3	NI	2

[3] NI – Not Identified

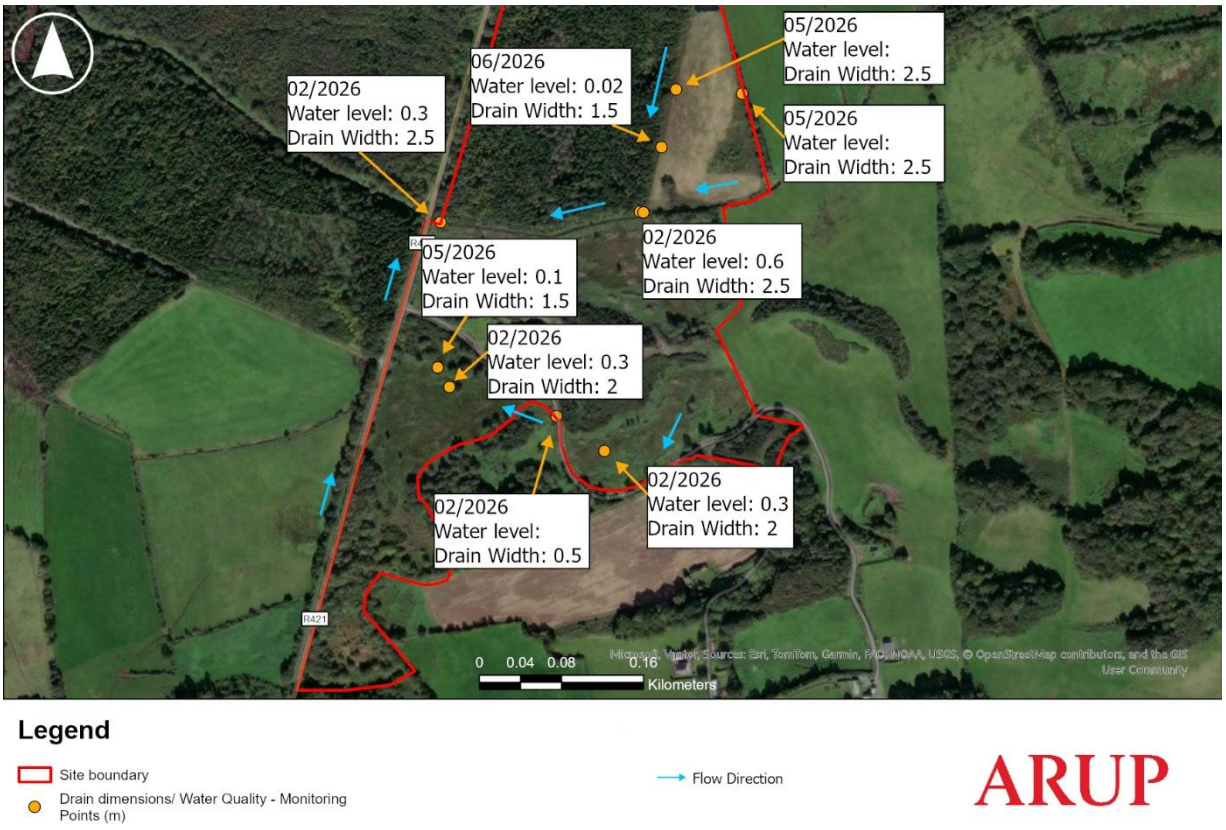


Figure 3-24: Baseline surface water monitoring locations of Clonaslee Eskers and Derry Bog SAC

3.2.4 Water Quality

Water quality monitoring shows spatial variation in nutrient concentrations across the site with potential sources of enrichment. Water quality measurements were taken in February and June 2026 and are summarised in Table 3-3.

Phosphate concentrations (PO_4^{3-}) varied across the site (Figure 3-25), with many measurements exceeding the WFD good status environmental quality standard of (0.035 mg/L PO_4^{3-}). Higher phosphate concentrations of 0.4 mg/L PO_4^{3-} were identified in the intersection between the north-south and east-west drains within the site at Point 4 (Sample 2 - taken in June), as well as 0.34 mg/L PO_4^{3-} in the western end of the east-west main drain at Point 6 and 0.33 mg/L PO_4^{3-} in the southwestern portion of the site at Point 8. The lowest concentration of 0 mg/L was registered along the north-south drain (Point 3) flowing towards the main drain in the centre of the site. This was the only measurement that complied with the WFD good status environmental quality standard of (0.035 mg/L PO_4^{3-}). Other concentrations at Clonaslee Eskers and Derry Bog SAC varied from 0.06 to 0.22 mg/L PO_4^{3-}.

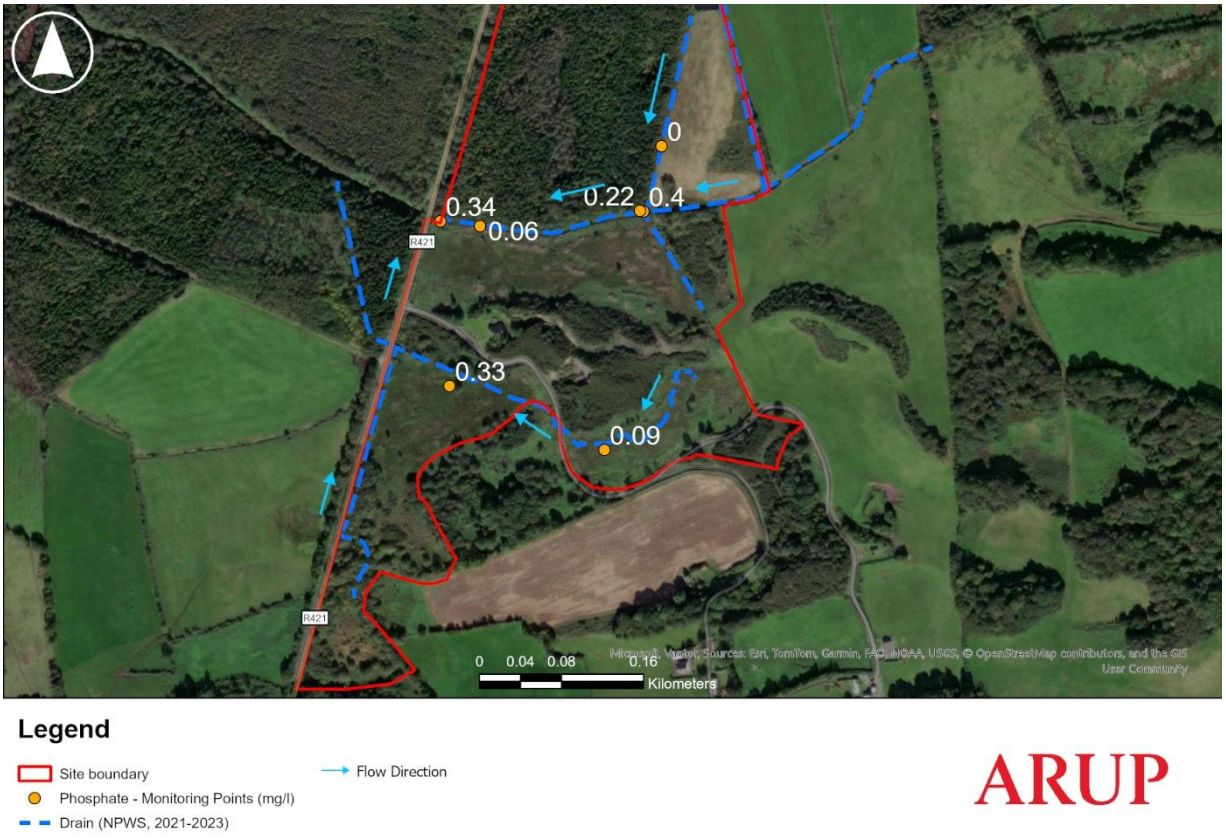


Figure 3-25 Phosphate monitoring locations of Clonaslee Eskers and Derry Bog SAC

Nitrate concentrations (NO_3^-) are also variable across the site (Figure 3-26). Although there is no regulatory surface water threshold for nitrate, nitrate concentrations of greater than 1.8 mg/L NO_3^- (which is the case for all measurements taken) may impact the ecological health of rivers (EPA, 2025b). Nitrate concentrations were generally higher in the east-west drain, increasing as the water flowed from east to west. Nitrate concentrations within this drain ranged from 12.6 (Point 4) to 24.2 mg/L NO_3^- (Point 6), the highest nitrate concentration recorded on the site. Nitrate concentrations also increased as the water flowed towards the northeast in the southeast-northeast drain in the southern portion of the site. In that drain, concentrations vary from 11.3 to 18.7 mg/L mg/L NO_3^-. The lowest concentration of 2.8 mg/L mg/L NO_3^- was measured at Point 3, along the north-south drain. Although the results relate to surface water bodies, the site is groundwater influenced. No recorded nitrate concentrations exceed the regulatory European groundwater threshold of 50 mg/L NO_3^- (Directive 2006/118/EC).

As fens are naturally nutrient-poor systems with respect to nitrogen and phosphorus, the recorded concentrations suggest potential nutrient enrichment, specifically in the western area, that may influence the achievement of the conservation targets. Additionally, several phosphate measurements exceeded the thresholds typically associated with Water Framework Directive (WFD) good or high ecological status.

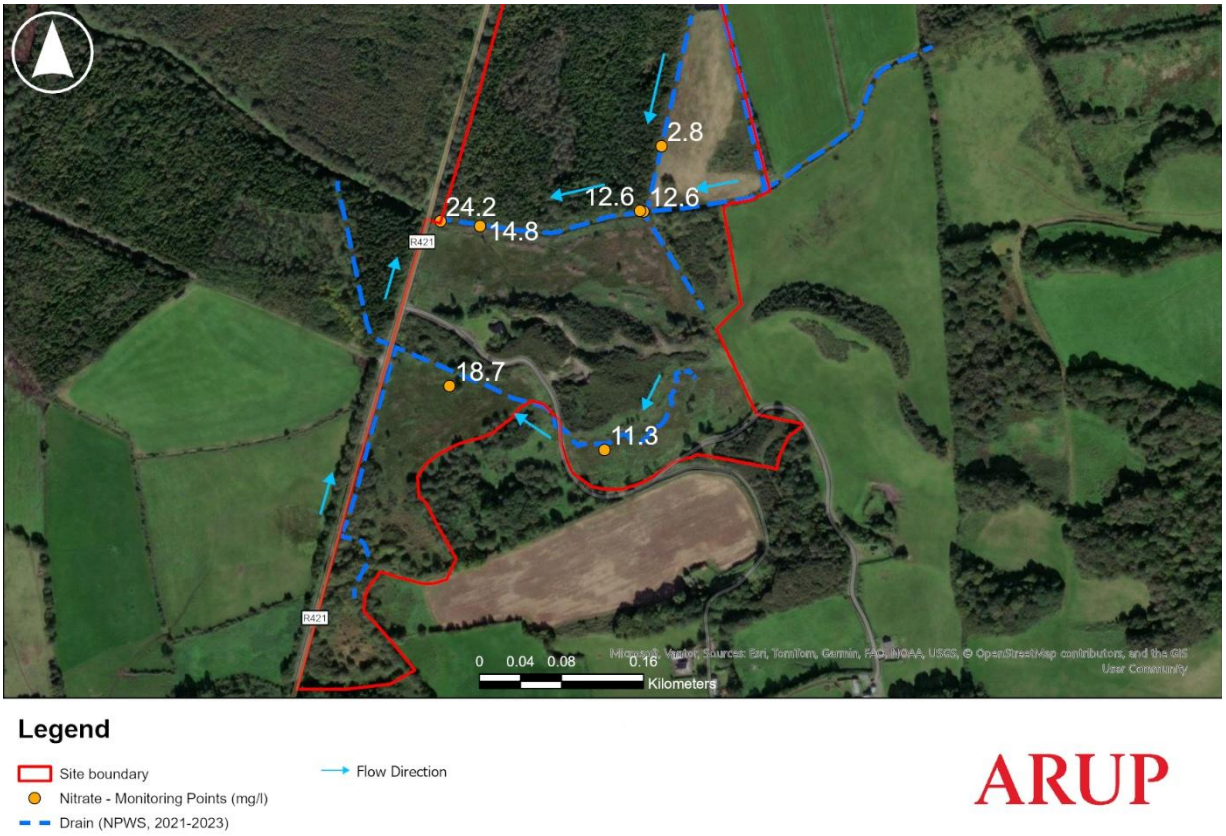


Figure 3-26 Nitrate monitoring locations of Clonaslee Eskers and Derry Bog SAC

In the north-south and southeast-northwest drains, conductivity values ranged from 632 (Point 8 - southeast-northwest drain) to 677µS/cm (Point 8 – north-south drain). In the central east-west drain, electrical conductivity values were slightly lower, ranging from 587 to 598 µS/cm (Figure 3-27), which may indicate a greater influence of surface water relative to the other drains.

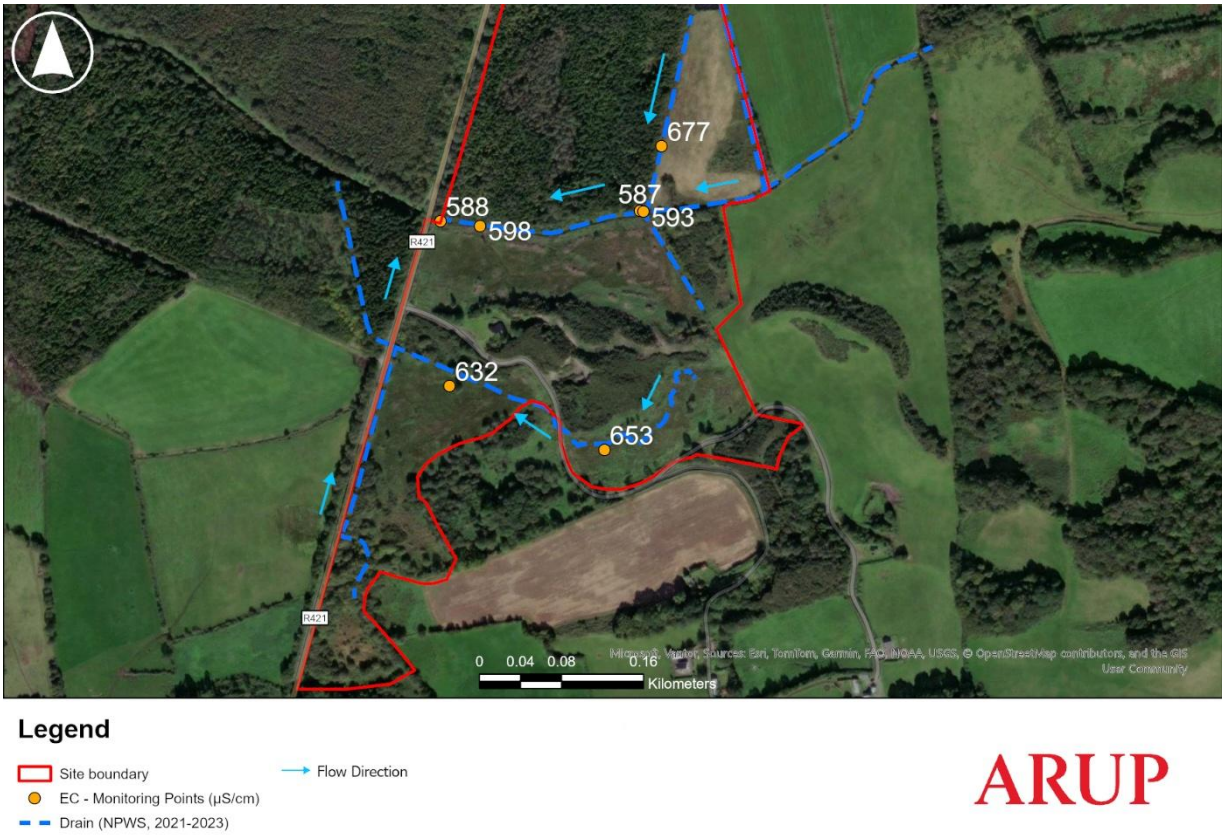


Figure 3-27 EC monitoring locations of Clonaslee Eskers and Derry Bog SAC

There was not a large variation in pH within the site (Figure 3-28), with values ranging from 7.22 to 7.95 (with lower pH values within the north-south drain, at Point 3 and more basic conditions in the southeast-northeast drain in the southern portion of the site (Points 8 and 10). The east-west drain that separates the northern and southern sections of the site presented slightly basic conditions.

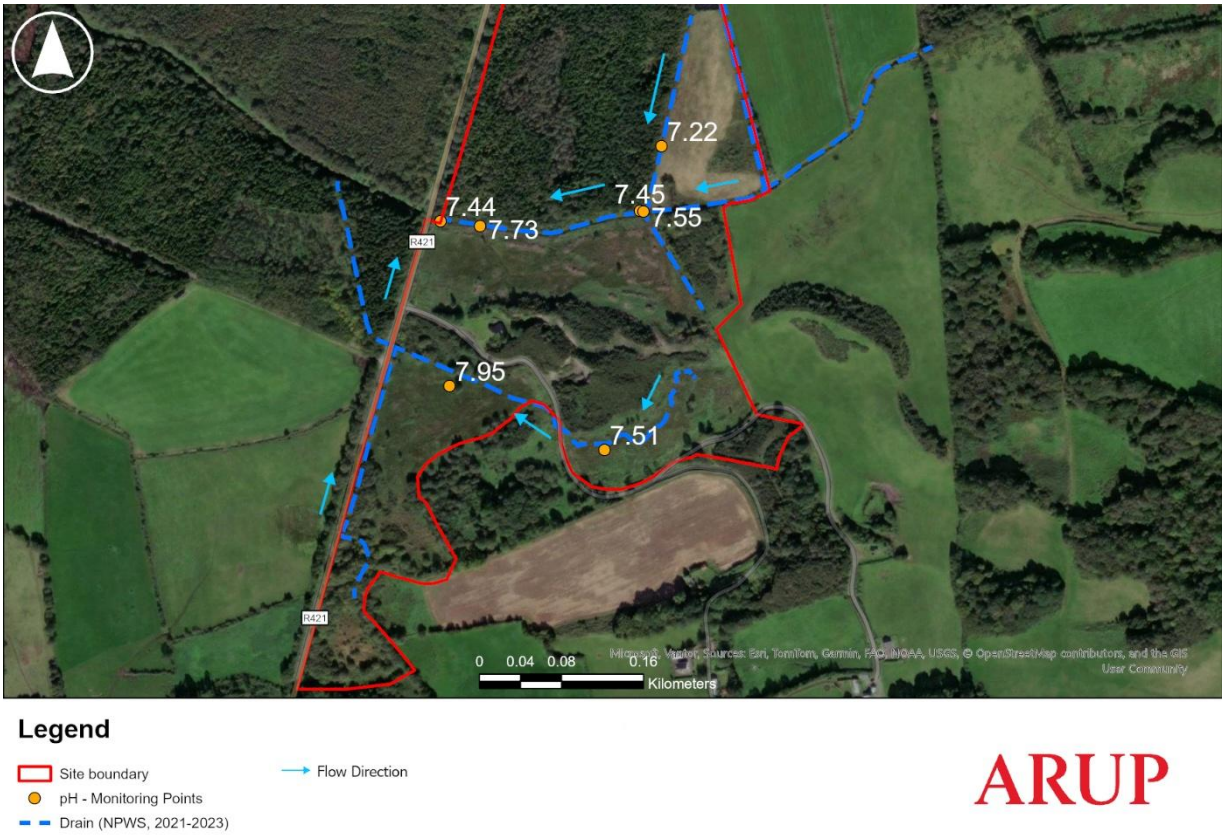


Figure 3-28 pH monitoring locations of Clonaslee Eskers and Derry Bog SAC

Temperature (Figure 3-29) was also higher within the north-south drain, with 16.5 °C recorded at Point 3 in June 2026. Temperature values of 14.2 and 13.7°C were recorded in the east-west drain, with the temperature decreasing as the water flowed west. In February 2026, the highest recorded temperature of 12 °C was measured in the southeast portion of the site.

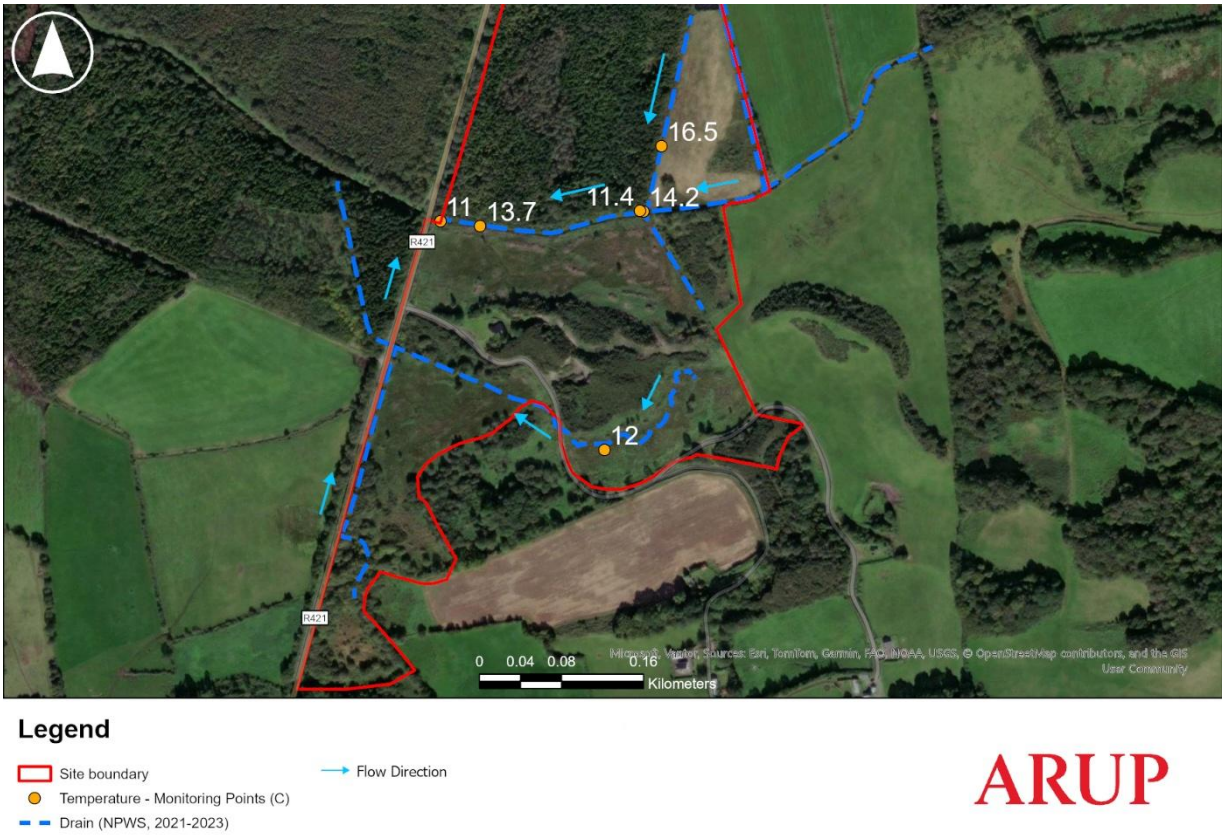


Figure 3-29 Temperature monitoring locations of Clonaslee Eskers and Derry Bog SAC

Table 3-3: Water quality measurements at Clonaslee Eskers and Derry Bog SAC

Location	Date of measurement	Phosphate (mg/L)	Nitrate (mg/L)	EC (µS/cm)	pH	Temperature (C)
ID 3	June 2026	0.00	2.8	677	7.22	16.5
ID 4 – Sample 1	February 2026	0.22	12.6	587	7.44	11
ID 4 – Sample 2	June 2026	0.40	12.6	593	7.55	14.2
ID 5	June 2026	0.06	14.8	598	7.73	13.7
ID 6	February 2026	0.34	24.2	588	7.44	11
ID 8	February 2026	0.33	18.7	632	7.95	NI
ID 10	February 2026	0.09	11.3	653	7.51	12

3.3 Conceptual Site Model

The site exhibits characteristics most consistent with a groundwater-fed bottom system (WETMEC 9), whereby groundwater discharged from the surrounding esker gravels and bedrock contributes to waterlogged conditions within the low-lying fen areas (Figure 3-30).

Evidence of drying within the fen indicates that the site is currently functioning more as a partially drained groundwater-fed bottom system (WETMEC 9b), with groundwater supply no longer sufficient to maintain the historically wetter conditions across all areas of the site. Localised seepage processes also occur around the margins of the esker deposits, particularly where springs associated with historical and recently identified spring features, which are considered representative of groundwater-flushed bottom systems (WETMEC 16). The restoration objective for the site is to restore and maintain a wet groundwater-fed bottom system (WETMEC 9a), through increasing water retention, reducing drainage-related water losses, and restoring wetter conditions across the fen. The characteristics of the site are:

- Site topography generally slopes towards the central east–west drain, with elevated ground occurring to the north and along an esker ridge that extends parallel to the drain on its southern side.
- Geologically, most of the site is underlain by the Ballysteen Formation, which comprises dark muddy limestone and shale. The southern area of the site is underlain by the Lower Limestone Shale, formed by sandstone, mudstone & thin limestone, and the southwestern limit of the site underlain by Clonaslee Member which is characterised by thick flaggy sandstone, thin siltstone.
- Within the site boundary, quaternary sediments are primarily cut-over raised peat. North of the Silver (Kilcormac) River, the cut-over raised peat is underlain by till derived from limestone and, below the till layer, gravels of basic reaction are present. Eskers gravel deposits are present underneath the entire site and ascend to the surface immediately south of the Silver (Kilcormac) River. Lacustrine sediments are present to the south of the eskers (GSI, 2025).
- Most of the area is underlain by a Locally Important bedrock aquifer which is moderately productive only in local zones (LI) The southern portion of the site is underlain by a Poor Aquifer, which is generally unproductive except for local zones. Additionally, at the southwestern limit of the site, a Regionally Important Aquifer characterized by fissured bedrock is observed (GSI, 2025).
- A Locally important gravel aquifer (Lg) is also present below the entire site, which provides groundwater storage (GSI, 2025).
- The Silver (Kilcormac) River flows from east to west through the centre of the site, that is the main surface water feature within the site and provides the main outflow from the site. A secondary surface water flow directing water from the southeastern boundary of the site to the northwest was identified. During winter, surface water flow was diffuse through the area, while a formal drain was identified during a second site visit.
- According to the historical maps, three springs are located in the southeast corner of the site. While these springs were not specifically identified during field visits,

groundwater-fed conditions and widespread surface water were evident across the site, suggesting a continued groundwater influence in these areas. During the Petrifying Springs Survey (Denyer, 2025), these southeastern springs were noted as series of seasonal tufa forming flushes at the base of an esker, which were dry at the time of survey. Two additional springs, not shown on historic mapping, were identified with the southernmost portion of the site, with paludal tufa present at one of these. These tufa springs across the site contribute to the site's hydrology and support Annex I habitats and species.

- Groundwater feeding the springs originates in the esker and deposits. Rainfall infiltrates these gravels, and as groundwater moves laterally through the permeable material, it emerges at the margins of the gravel deposits where it meets lower permeability peat. This contrast in permeability forces groundwater to surface, resulting in springs and seeps. Local variation in peat thickness may also influence spring location, with emergence more likely where the peat is thinner.
- Previous groundwater monitoring indicates that groundwater moving through the esker system may be intercepted by drainage channels before contributing to widespread groundwater discharge within the fen (Ryan Hanley, 2021).
- Hydrological modifications to the site occurred through the excavation of drainage features, such as forestry drainage in the north of the site which is likely contributing to overall drying trends. There is no sign of peat extraction occurring on the site.
- The site’s hydrological characteristics result from the combination of groundwater discharge, surface water flow and drainage modification. These elements have influenced habitat development and the spatial distribution of springs and seepages over recent decades. Clonaslee Eskers and Derry Bog SAC is best described as a soligenous fen, with groundwater moving predominantly as lateral throughflow. Groundwater discharge from the surrounding esker deposits, including historically mapped springs south of the Silver (Kilcormac) River, contributes to the maintenance of wet conditions within the fen and supports a continuous movement of water through the site. However, drainage and associated drying have altered the site's hydrological regime, reducing the extent and persistence of waterlogged conditions within parts of the fen.

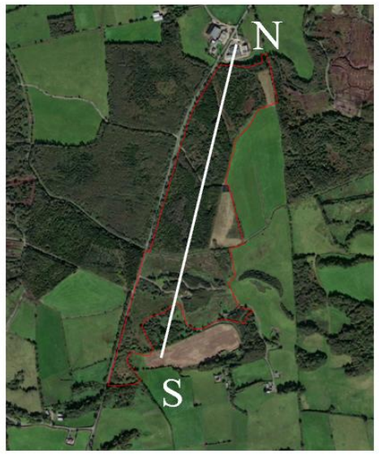
CLONASLEE ESKERS AND DERRY BOG SAC
Laois County
277.15 ha
WFD catchment: Lower Shannon (25A)

Water key:

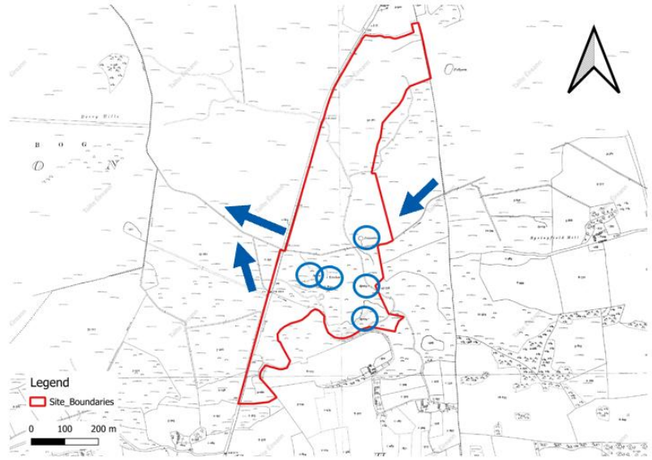
Drains

Springs

Vegetation:



Location:



Conceptual site model:

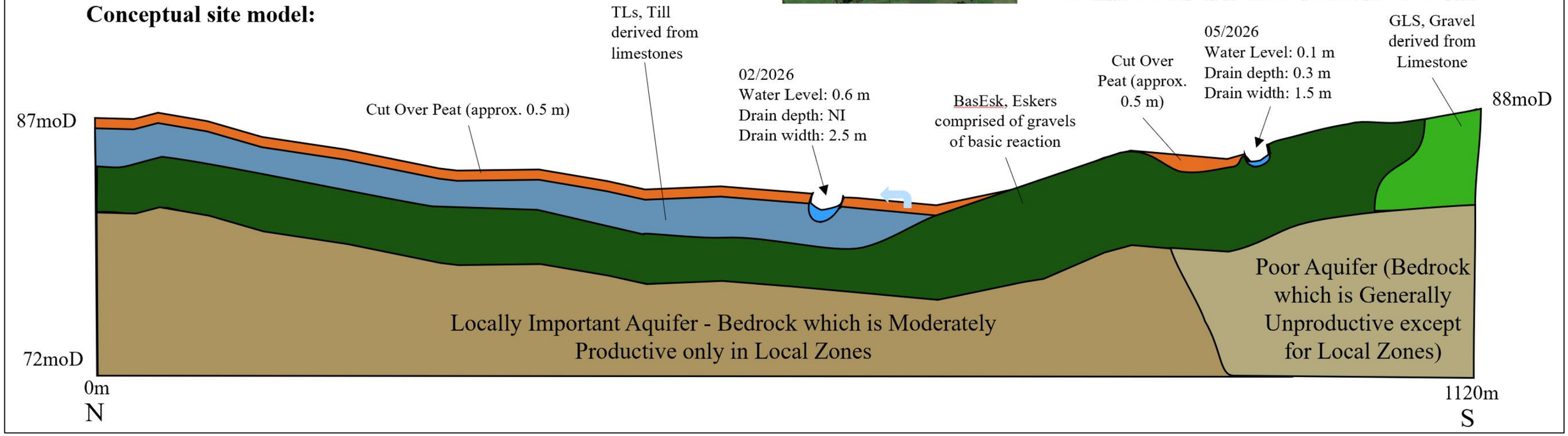


Figure 3-30: Conceptual Site Model of Clonaslee Eskers and Derry Bog

4 Ecology

4.1 Desk Study

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

- NPWS Protected Sites – SAC – Clonaslee Eskers and Derry Bog;
- NPWS Article 17 habitats distribution datasets;
- National Fen Survey (Brophy et al, In prep);
- Biodiversity Maps - National Biodiversity Data Centre (NBDC);
- World Imagery Wayback - ArcGIS;
- Plant Atlas 2020 website - Botanical Society of Britain & Ireland (BSBI);
- Long, M.P. & Brophy, J.T. (2019) Monitoring of sites and habitat for three Annex II Species of whorl snail *(Vertigo)* – Irish Wildlife Manuals 104.
- Brophy, J.T. et al (2025) Monitoring of three Annex II species of Vertigo snail on Irish sites (2022-2024). Appendices I & II – Irish Wildlife Manuals 159.
- Monitoring and Assessment of EU Habitats Directive Annex I Priority Habitat Petrifying Springs, 2025 – Irish Wildlife Manuals 160.

The NFS was commissioned to develop and test a standardised methodology for assessing the conservation status of fen habitats across Ireland. As part of this study, Clonaslee Eskers and Derry Bog was selected as one of the sites for field survey. The site was surveyed in August 2022, with a focus on Annex I and Annex I quality wetland and fen habitats. Four areas within the wider SAC were surveyed. 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 NFS and Monitoring and Assessment of EU Habitats Directive Annex I Priority Habitat Petrifying Springs 2025 reports confirmed the presence of Annex I 7230 Alkaline fens and 7220 Petrifying springs alongside Annex I quality 6410 *Molinia* meadows and 91E0 Alluvial forests as well as drains, improved agricultural grassland, dry meadows and grassy verges, wet heath, raised bog, wet willow-alder-ash woodland, and scrub. A directory of Annex I and Fossitt habitat codes is provided in Table B-1, Appendix B.

4.1.1.1 Annex I Habitats

The following Annex I and Annex I quality habitat was identified and mapped:

- **7230 Alkaline fens** covering approximately 3.69 ha. This habitat is spread across the eastern-most area surveyed and is absent from the three other survey areas to the west.
- **7220 Petrifying springs** covering approximately 0.036 ha with four springs present. This habitat is restricted to a central area within the eastern-most survey site.
- **6410 *Molinia* meadows** covering approximately 1 ha. This habitat was located within the eastern-most area surveyed and is absent from the three other survey areas to the west.
- **91E0 Alluvial forests** covering approximately 0.59 ha. This habitat was located within the eastern-most area surveyed and is absent from the three other survey areas to the west.

It should be noted that the resulting mapping of Annex I and Annex I quality habitats from the NFS survey requires suitable interrogation and interpretation as to the extent of these habitats within each polygon i.e. Annex I habitat mapping is represented by the habitat that has the highest percentage attributed to the polygon. Therefore, polygons could be a mosaic or only support a small percentage of Annex I habitat within the overall polygon area and thus must be interpreted appropriately. Figure B-1 (Appendix B) outlines the Annex I habitat mapping alongside respective percentage covers within each mapped polygon.

4.1.1.2 Non-Annex/Fossitt habitats

Non-Annex I fen and other habitats were also recorded, with mapping based on Fossitt classification (Fossitt, 2000). These include drains, improved agricultural grassland, dry meadows and grassy verges, wet heath, raised bog, wet willow-alder-ash woodland, and scrub. Habitats recorded are detailed in Table 4-1 and shown in Figure B-2, Appendix B.

Table 4-1: Habitat types and locations at Clonaslee Eskers and Derry Bog

Habitat Type	Location	Notes
FW4 – Drainage ditches	Spread across the survey area.	Predominately within the eastern-most survey area.
GA1 – Improved agricultural grassland	Located within the eastern and western-most survey areas.	N/A
GS2 – Dry meadows and grassy verges	Located in two patches within the eastern-most survey area.	Adjacent to scrub, 7230 Alkaline fens and non-Annex I rich fen and flush within this habitat area.
HH3 – Wet heath	Located in the northern area of the eastern-most survey area.	Bordered by non-Annex I rich fen and flush and improved agricultural grassland.
PB1 – Raised bog	Located in the central survey area.	Part of the main bog complex within the SAC.
PF1 – Rich fen and flush	Located largely in the eastern-most survey area with one of the western survey areas also containing this habitat.	Some areas contain Annex I 7230 Alkaline fens.
WN6 – Wet willow-alder-ash woodland	Located in the eastern-most survey area as a patch in the south of the site.	Adjacent to Annex I 7230 Alkaline fens.
WS1 - Scrub	Located in two patches within the eastern-most survey area	Adjacent to Annex I 7230 Alkaline fens.

4.1.2 Species

The following subsections outline the presence of species recorded at or within the zone of influence of Clonaslee Eskers and Derry Bog. 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 (Figure B-3 to Figure B-5, Appendix B). 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 were historically recorded and there was no indication since of their elimination.

4.1.2.1 Qualifying Interest Species: Geyer's whorl snail

Monitoring of Vertigo species across Irish SACs was undertaken by NPWS over three monitoring cycles: 2007-2012, 2013-2018 and 2019-2024 (Brophy et al. 2025 and Long & Brophy 2019). Results from these monitoring programmes were reviewed to inform this FRP, as Clonaslee Eskers was surveyed during each cycle – noting this included the eastern block of the SAC only, which this FRP relates to and is referred to as Clonaslee Eskers in the relevant Irish Wildlife Manuals. In addition to species presence data, observations on habitat condition and site management from these reports provide an important ecological baseline for this assessment.

The qualifying species Geyer's whorl snail is associated with base-rich, groundwater-fed fen habitats characterised by stable hydrological conditions and consistently high soil moisture. The species requires saturated, calcium-rich substrates and structurally open vegetation supporting a suitable microclimate.

At Clonaslee Eskers, the population, habitat and future prospects assessment all returned a result of Unfavourable-Bad across all three monitoring cycles. The overall conservation status is assessed as Favourable (Brophy et al. 2025 Appendices I & II) – however it is assumed that this is a typo in the Appendices based on all aspects being Unfavourable-Bad and no records of Geyer's whorl snail across the monitoring period and the last known record from 1998. Furthermore, the habitat suitability has gone from green in the 2007-2012 period to red in the following monitoring periods.

Whilst some management interventions were noted over the monitoring period, the decline in habitat suitability is attributed to the drying of habitat, likely in part due to climate change but also possibly drainage and development of unsuitable vegetation. It was noted in Long & Brophy (2019) that species may still occur in low numbers and therefore both management and survey efforts were to continue.

These pressures are acting cumulatively to reduce habitat suitability and, if unaddressed, may lead to the continued absence or potential loss of the species from the site.

Management requirements for Geyer's whorl snail are consistent with those identified for the fen habitats at Clonaslee Eskers & Derry Bog, in particular:

- A hydrological assessment to understand whether drainage is influencing the drying of habitats and subsequently appropriate restoration and maintenance of appropriate hydrological conditions to re-establishing the stable saturated microhabitats required by the species;
- Implementation of light, appropriate grazing regimes is required to maintain open vegetation structure and prevent succession, ensuring that grazing does not exacerbate poaching between black bog rush tussocks;
- Review dominance of black bog rush *Schoenus nigricans*.

These measures, if successfully implemented, are expected to restore suitable habitat conditions for Geyer's whorl snail and contribute to achieving favourable conservation status for this qualifying species in line with the SSCOs.

4.1.2.2 Species Within the Site

The species within Table 4-2 below were identified using the NBDC interactive maps service, reviewing the NFS documentation and from the ecological walkover conducted in 2026. Species that are considered notable or indicator species for fen habitat are included. It is important to note that while the site is designated for Geyer's whorl snail, this species has not been recorded within the site since 1998 despite monitoring attempts, though NBDC records show a more recent record in 2005 of the species within a 1 km grid square which overlaps with the SAC boundary.

Table 4-2: Species records within Clonaslee Eskers and Derry Bog

Common Name	Latin name	Description	Most recent record
Black bog-rush	*Schoenus nigricans*	A sedge species that grows in calcareous and base-rich fens, it is associated with 7230 Alkaline fens.	2026
Variegated horsetail	*Equisetum variegetum*	A scarce horsetail species which occurs in calcareous habitats	2022
Few-flowered spike-rush	*Eleocharis quinqueflora*	A species of rush often recorded in grazed wetlands.	2022
Meadow thistle	*Cirsium dissectum*	Species of thistle that grows in base-rich wetland habitats. Indicator species for 6410 *Molinia* meadows.	2022
Wood bitter-vetch	*Vicia orobus*	A protected plant species listed on the Flora Protection order (2022), Wildlife Acts.	2019
Yellow starry feathermoss	*Campylium stellatum*	A base-demanding species of moss typically found in rich fen and flush habitats.	2026
Small-fruited yellow-sedge	*Carex viridula*	A native Irish plant species associated with wetland habitats.	2026
Round-leaved sundew	*Drosera rotundiffolia*	A native Irish plant species associated with wetland habitats.	2026
Blunt-flowered rush	*Juncus subnodulosus*	A native Irish plant species associated with wetland habitats.	2026
Bog-myrtle	*Myrica gale*	A native Irish plant species associated with wetland habitats.	2026
Common butterwort	*Pinguicula vulgaris*	A native Irish carnivorous plant species associated with wetland habitats.	2026
Devil's bit scabious	*Succisa pratensis*	A native Irish plant species associated with wetland habitats. Food plan for the marsh fritillary butterfly.	2026

Common Name	Latin name	Description	Most recent record
Lustrous bogmoss	*Sphagnum subnitens*	A widespread wetland moss which is frequently found in base-rich flush edges, replacing the brown mosses that are found in the centre of the flush.	2026
Curlew	*Numenius arquata*	A species of wader. Breeds in wetlands. The Irish breeding population is critically endangered.	2018
Marsh Fritillary	*Euphydryas aurinia*	An Annex II species of butterfly/ Devil's-bit scabious is the species' primary food plant.	2018
Small Heath	*Coenonympha pamphilus*	A near threatened species of butterfly.	2021

4.1.2.3 Species within the Zone of Influence

Table 4-3 outlines notable records of species recorded within the 2 km distribution zone of influence around Clonaslee Eskers and Derry Bog within the last ten years from the NBDC, NFS, and from the ecological walkovers undertaken.

Table 4-3: Species records within the Zone of Influence of Clonaslee Eskers and Derry Bog

Legislative Protection	Common Name	Latin Name
EU Birds Directive	Curlew	*Numenius Arquata*
Wildlife Acts	Yellowhammer	*Emberiza citrinella*
EU Habitats Directive	White-clawed Crayfish	*Austropotamobius pallipes*
EU Habitats Directive	Marsh Fritillary	*Euphydryas aurinia*
No legislative protection	Small Heath	*Coenonympha pamphilus*
No legislative protection	Jenkins' Spire Snail	*Potamopyrgus antipodarum*

4.2 Field Survey

Following a comprehensive review of available desktop data, a targeted follow-up ecological survey was undertaken in May 202.6The 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

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 seven pre-identified monitoring points (Monitoring Points 1 to 7), 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 three key components:

- 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 affecting each location.

The surveys confirmed the presence of Annex I 7230 Alkaline fens which was recorded at points 1, 2, 4, 5, 6, 7.

4.2.2 Pressure & Threats

This section outlines the historical and current pressures and threats affecting fen and wetland habitats at Clonaslee Eskers and Derry Bog, with emphasis on the Annex I habitats of Alkaline fen 7230 and 7220 Petrifying springs 7220.

4.2.2.1 7230 Alkaline fens

4.2.2.1.1 Historical Pressures

The NFS determined that the structure and functions of 7230 Alkaline fens habitat was Unfavourable – Bad, with negative pressures likely relating to drainage, problematic native species (scrub encroachment) and eutrophication.

- **Scrub encroachment** was observed in areas of 7230 Alkaline fens habitat.
- **Drainage** has similarly been noted as an ongoing pressure in areas of 7230 Alkaline fens habitat.
- **Eutrophication** was noted on site within 7230 Alkaline fens habitat in the form of dried green algae.

4.2.2.1.2 Current Observations

Recent walkover surveys identified the following:

- **Scrub encroachment** historical scrub clearance has had a positive effect, but scrub is starting to recolonise.
- **Drainage** continues to negatively impact the site across the survey area, altering local hydrology and negatively impacting 7230 Alkaline fens community composition.
- **Mowing** is ongoing in one area, with the plant litter being left in place. This is smothering typical fen community species such as bryophytes and small vascular plants in this area.
- **Abandonment of pastoral systems** is contributing to scrub encroachment and rank vegetation in areas of 7230 Alkaline fens across the site.

4.2.2.2 7220 Petrifying springs

4.2.2.2.1 Historical Pressures

The Monitoring and Assessment of EU Habitats Directive Annex I Priority Habitat Petrifying Springs 2025 Report determined that the overall status of the Annex I 7220 Petrifying springs was Unfavourable – Bad, with negative pressures relating to problematic native species (rank vegetation and scrub encroachment), and drainage.

- **Scrub encroachment** is one of the contributing factors to the negative structure and functions assessment of unfavourable-bad for this habitat within the site.
- **Drainage** is also thought to be impacting the habitat, as changes to the site hydrology had rendered the springs dry at time of survey.
- **Rank vegetation** is the other contributing factor to the negative structure and functions assessment for this habitat within the site, with vegetation height exceeding favourable heights due to a lack of grazing/mowing/management.

4.2.3 Additional Observations

As detailed in Section 3.2.2 two springs were recorded during the 2026 walkover surveys.

4.3 Site Conservation Priority Matrix for Clonaslee Eskers and Derry Bog

The restoration actions proposed in Table 4-4 for 7230 Alkaline fens and 7220 Petrifying springs 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 Annex I habitat alone but will also extend to the wider ecological network within and around the site.

Table 4-4: Site Conservation Priority Matrix for Clonaslee Eskers and Derry Bog

Level	Feature Type	Feature Name	Extent/Population	Pressure/threat	Restoration Measure on-site	Restoration Measure off-site
1	SAC Habitat	7230 Alkaline fens	3.69 ha	Scrub Encroachment Drainage Mowing Abandonment of pastoral systems	Vegetation monitoring Scrub and vegetation removal (where necessary) Drain blocking and hydrological monitoring Conservation grazing and nutrient input management	Buffer zone management (Management of drainage and nutrient input)
		7220 Petrifying springs	0.036ha	Scrub Encroachment Drainage Rank vegetation	Conservation grazing Vegetation monitoring Scrub and vegetation removal (where necessary) Conservation grazing and nutrient input management Drain blocking and hydrological monitoring	Buffer zone management (Management of drainage and nutrient input)
		7110 Active raised bog	N/A	Scrub Encroachment Drainage	Vegetation monitoring Scrub and vegetation removal (where necessary) Drain blocking and hydrological monitoring	Buffer zone management (Management of drainage and nutrient input)
		6410 *Molinia* meadows	N/A	Scrub Encroachment Drainage	Vegetation monitoring Scrub and vegetation removal (where necessary) Drain blocking and hydrological monitoring	Buffer zone management (Management of drainage and nutrient input)

Level	Feature Type	Feature Name	Extent/Population	Pressure/threat	Restoration Measure on-site	Restoration Measure off-site
		91E0 Alluvial forests	N/A	Drainage	Drain blocking and hydrological monitoring	Buffer zone management (Management of drainage and nutrient input)
	SAC Species	Geyer's whorl snail	See Section 4.1.2.1	Habitat degradation via scrub encroachment and drainage	Vegetation monitoring Scrub and vegetation removal (where necessary) Drain blocking and hydrological monitoring Conservation grazing and nutrient input management	Buffer zone management (Management of drainage and nutrient input)
2	NHA Habitat	N/A	N/A	N/A	N/A	N/A
3	European priority species	N/A	N/A	N/A	N/A	N/A
4	Nationally important species	See Table 4-2 and Table 4-3	See Table 4-2 and Table 4-3	Habitat degradation via scrub encroachment and drainage	Vegetation monitoring Scrub and vegetation removal (where necessary) Drain blocking and hydrological monitoring	Buffer zone management (Management of drainage and nutrient input)
5	Habitats and species of local interest	PF1 – Rich fen and flush	See Appendix B	Habitat degradation via scrub encroachment and drainage	Vegetation monitoring Scrub and vegetation removal (where necessary) Drain blocking and hydrological monitoring	Buffer zone management (Management of drainage and nutrient input)

Level	Feature Type	Feature Name	Extent/Population	Pressure/threat	Restoration Measure on-site	Restoration Measure off-site
		WN6 – Wet willow-alder-ash woodland	See Appendix B	Drainage	Drain blocking and hydrological monitoring	Buffer zone management (Management of drainage and nutrient input)

4.4 Impact Assessment Notes

Restoration actions proposed for Clonaslee Eskers and Derry Bog aim to improve the ecological condition of sensitive fen habitats, particularly 7230 Alkaline fens and 7220 Petrifying springs habitats and Annex I quality 6410 *Molinia* meadows, and 91E0 Alluvial forests 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 are directly connected to the management of the Clonaslee Eskers and Derry Bog SAC and inherently connected with maintaining the favourable conservation status of the site's qualifying interests: 7230 Alkaline fens, 7220 Petrifying springs, and Geyer's whorl snail.

Potential Impacts

- **Habitat loss** – low risk - restoration actions (i.e. scrub removal) is 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.
- **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 4-5 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 4-5: 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 (IAS)	All vehicles should undergo steam cleaning before site entry.
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. Implementation should be overseen by a suitably qualified ecologist.
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 Clonaslee Eskers and Derry 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 NFS 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 which are detailed in Section 2.1.1.

5.1 Field surveys of key pressures

Following completion of desktop mapping of key pressure, field surveys were carried out by personnel 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 point 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 Flora and Fauna Pressures

The following pressures are listed in order of their intensity and impact on the ecological receptors of Clonaslee Eskers and Derry Bog. These were determined from the review of historical information and gathered from observations made along the monitoring points carried out as part of this project (Figure 5-1).

- Drainage – recorded as a threat to 7230 Alkaline fens and 7220 Petrifying springs, this pressure is leading to shifts in species composition and a decline in characteristic fen community vegetation across wetland habitats within the site. This pressure is currently impacting these Annex I habitats alongside the SAC's QI species, Geyer's whorl snail, and other protected species and wetland habitats including Annex I quality 91E0 Alluvial forests.

- Scrub encroachment – the spread of scrub into fen habitat threatens the future prospects of 7230 Alkaline fens and 7220 Petrifying springs habitats within the site. This encroachment is considered a pressure on Geyer's whorl snail, and other protected species and non-Annex I habitats within the site. It is expected that implementation of conservation grazing and appropriate management of the water levels within the site will remediate this issue alongside manual removal of scrub in designated areas within the site.
- Abandonment of pastoral systems – Insufficient levels of grazing in areas within the site is facilitating the spread of rank vegetation and contributing to ongoing scrub encroachment. This ongoing pressure is leading to shifts in species composition and a decline in characteristic 7230 Alkaline fens and 7220 Petrifying springs vegetation. Horses are grazing areas of the site though the current stocking level is insufficient to prevent the above impacts. The implementation of a conservation grazing regime is expected to remediate this issue.
- Mowing – The mowing of lands within an area of 7230 Alkaline fens habitat is negatively impacting the fen species community in this area due to the mown cuttings being left in situ. This is smothering bryophytes and smaller vascular plants which are characteristic of alkaline fen communities. Landowner liaison and the introduction of appropriate conservation-oriented management is expected to remediate this issue.

All identified pressures and threats are 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 and Annex I quality habitats present within Clonaslee Eskers and Derry Bog, while delivering co-benefits to associated non-Annex habitats and protected species. The prioritisation of pressures (drainage, scrub encroachment, abandonment of pastoral systems, and mowing) was informed by a review of historical data (including the NFS) and detailed observations recorded at monitoring points during this project. These measures, supported by ongoing vegetation and hydrological monitoring, will ensure that habitat structure and function are preserved, threats are addressed promptly, and the ecological integrity of the site is safeguarded into the future.



Figure 5-1: Pressures and threats recorded as present at Clonaslee Eskers and Derry Bog. Pressures and threats were compiled from desktop review and 2026 ecological walkover.

5.2.2 Fen Hydrology Pressures

Evidence of drying across the site indicates that the current hydrological regime is no longer maintaining historically wetter conditions throughout the fen. The principal hydrological pressure is artificial drainage, with a network of shallow field drains, deeper north-south drains and the main east-west arterial drain intercepting groundwater flow pathways and contributing to water table drawdown within adjacent fen habitats. Previous groundwater monitoring also identified groundwater interception by drainage channels and associated water table drawdown within the fen, supporting this interpretation (Ryan Hanley, 2021).

Several drains remain active pathways for water loss during wetter periods, even where little surface water was present during summer surveys. In particular, the east–west arterial drain may be contributing to groundwater and surface water drawdown within the fen, reducing the duration of waterlogged conditions required to support groundwater-dependent habitats. Roadside drains may also contribute to local water table drawdown; however, these features must remain operational to provide roadside drainage and therefore are not considered suitable for blocking.

5.2.3 Fen Nutrient Pressures

Water quality monitoring and Pollution Impact Potential (PIP) mapping indicate that nutrient enrichment represents an additional pressure on the ecological condition of the fen. Phosphate

concentrations exceeded the Water Framework Directive (WFD) good status threshold at nearly all monitoring locations, with the highest concentrations recorded within the main drainage network, particularly at the intersection of the north–south and east–west drains and within the western section of the site. Nitrate concentrations were also elevated throughout the site and generally increased along the main drainage pathways, indicating the transport of nutrients through the drainage network. As fens are naturally nutrient-poor systems, these elevated nutrient levels have the potential to alter vegetation composition and adversely affect the achievement of conservation objectives. PIP mapping further identifies hydrological pathways capable of delivering nutrient-rich runoff to the site, particularly from lands north of the Silver (Kilcormac) River.

6 Restoration Measures

6.1 Introduction

The restoration actions proposed by the FRP 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.

Previous restoration planning undertaken through the NPWS Farm Plan identified hydrological modification, scrub encroachment, insufficient grazing pressure and the development of dense black bog-rush and purple moor-grass tussocks as the principal pressures affecting fen condition. Measures including scrub clearance, water level management works and conservation grazing have already been implemented across parts of the site, with the Farm Plan concluding that further restoration and ongoing management would be required to achieve favourable conservation condition. The measures proposed in this FRP therefore build upon existing restoration efforts and are intended to address the remaining hydrological, ecological and land management constraints affecting the site.

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 Sections 6.2 to 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 Fen Hydrology Measures

On-site hydrology measures aim to rewet the site to support groundwater dependent fen habitats. Drain blocking across the site is proposed to increase water retention and promote re-wetting. Five drains across the site are identified for blocking, targeting shallow drains and preferential flow pathways that currently facilitate water loss and contribute to drawdown, as confirmed by previous groundwater monitoring (Ryan Hanley, 2021). As noted in section 5.2.2, additional roadside drainage features may contribute to drawdown across the site, but intervention opportunities are limited as these channels must remain operational to provide roadside drainage. The proposed measures therefore focus on drains where blocking can be undertaken without compromising existing drainage requirements.

Two of the proposed drains are located in the fields directly south of the east-west main drain, flowing from the gravel deposits towards this arterial channel. LiDAR imagery indicates these drains are shallow and wide, with depths of up to 0.3 m and widths of up to 10 m and are considered suitable locations for interventions to increase water retention due to their shallow depth and low flow volumes. Two additional north–south drains located along the eastern portion of the site are also proposed for blocking. While these drains were largely dry during the summer survey period, they are approximately 1.5 m wide and 1 m deep and may represent pathways for groundwater and surface water drawdown during wetter periods of the year. Blocking these drains could help retain water within the channels for longer into late spring, supporting higher local water tables and improving hydrological conditions for fen vegetation, even where water levels subsequently decline during the summer months. The vegetation currently present within the drains is not considered likely to provide an effective hydraulic barrier.

A further drain is located immediately downstream of the access road that passes through the site, following the tree line before discharging into a roadside drain. This feature is approximately 1.5 m wide and 0.3 m deep and conveys relatively low flows through an area of deep peat (>75 cm), making it a suitable location for water-retention measures.

The principal east–west drain that bisects the site has been identified as a key pathway for groundwater and surface water losses from the fen and may be contributing to water table drawdown within adjacent groundwater-dependent habitats. Subject to further assessment, partial blocking may help reduce drainage pressures and enhance water retention within the surrounding habitat. As this drain is managed by the OPW, any proposed intervention would be subject to their agreement. To better understand the hydrological influence of this drain, additional piezometers and surface water level monitoring points are recommended to assess whether the OPW drain is contributing to groundwater drawdown and drying within adjacent fen areas. In addition, data from the existing piezometers in the south-east of the site should be obtained and reviewed, and groundwater level loggers reinstated to continue monitoring groundwater levels associated with the spring system in this area. The installation of monitoring points across the site will be undertaken in a manner that avoids impacts on petrifying spring habitat, in accordance with the recommendations of Denyer (2025).

Monitoring progress

Annual groundwater and surface water level monitoring will be undertaken through a network of piezometers and standpipes at key locations within the site (as described above) to assess the effectiveness of the proposed drain blocking measures, track changes in site hydrology, and inform any follow-up maintenance or refinement of the restoration measures where required.

The locations for measures and monitoring are presented below in Figure 6-1 and in Appendix C.

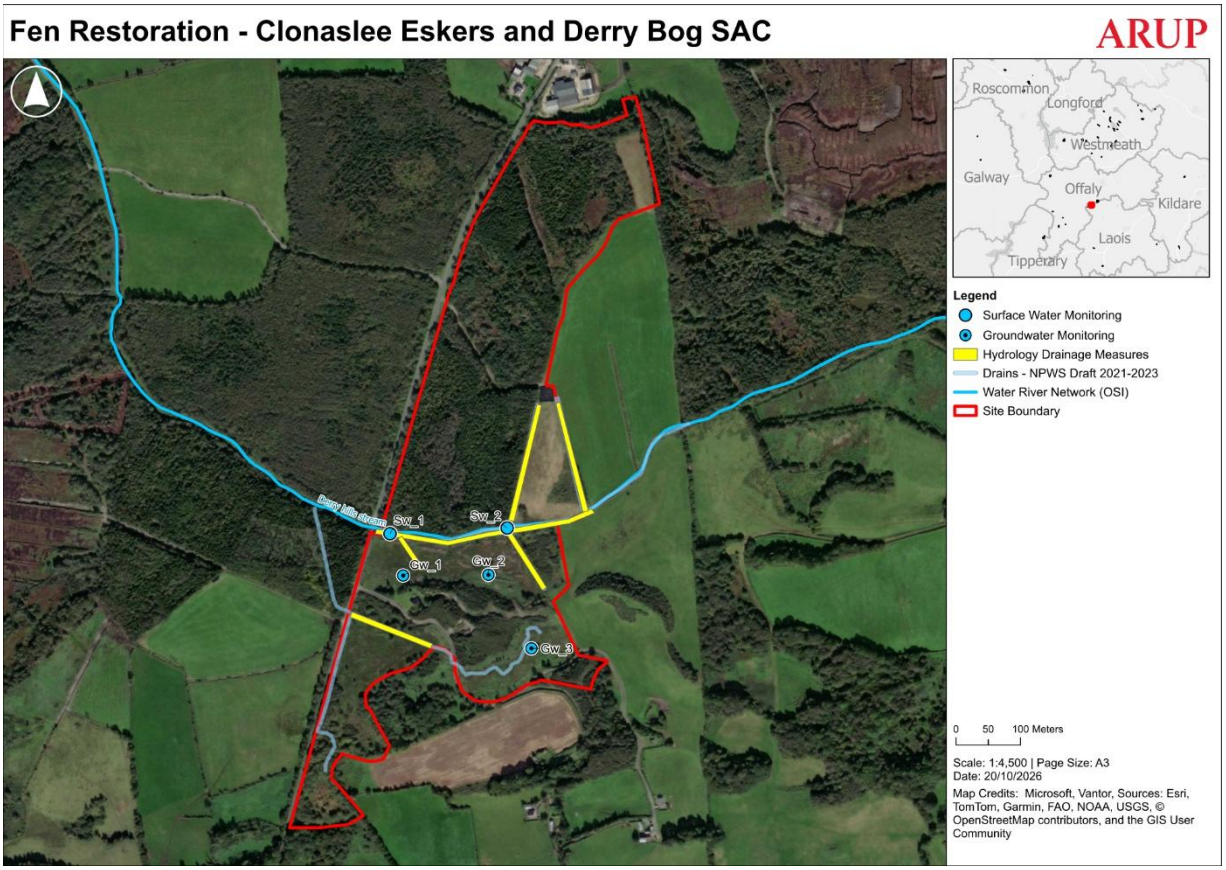


Figure 6-1: Proposed hydrological management measures and monitoring for Clonaslee Eskers and Derry Bog SAC

6.2.2 Off-site Hydrology Measures

No off-site hydrology measures are proposed as part of this FRP.

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

Continued water quality monitoring will be undertaken within the main east-west drainage channel (see Figure 6-1 above Appendix C for proposed locations). Water quality monitoring includes measuring nutrients (nitrate and phosphate), electrical conductivity and pH.

Drain blocking across the site will contribute to on-site nutrient management by spreading spring flows across fen habitats, encouraging nutrient uptake and reducing efficient drainage pathways that currently deliver nutrient-rich water directly to the east-west main drain and roadside drainage.

6.3.2 Off-site Nutrient Measures

Water quality monitoring and Pollution Impact Potential (PIP) mapping, nitrate susceptibility mapping and hydrogeological datasets indicate that nutrient enrichment poses a risk at Clonaslee Eskers and Derry Bog SAC. Nutrient enrichment pressures may originate from both surface water runoff pathways and groundwater recharge areas associated with the extensive sand and gravel aquifer system surrounding the site. While the installation of flow-blocking measures aims to reduce direct nutrient delivery to the fen, additional off-site measures may also be required to reduce the nutrient inputs at source and along hydrological pathways before they reach the SAC.

While a detailed hydrogeological investigation would be required to determine the precise groundwater catchment, the extent of the gravel aquifer, elevated nitrate susceptibility mapping and the presence of groundwater-fed habitats indicate that potential nutrient source areas extend beyond the immediate site boundary and surface water catchment. It is therefore recommended that agricultural landowners within areas hydrologically connected to the fen are prioritised for participation in the NPWS Farm Plan Scheme, particularly lands identified as elevated phosphorus delivery risk within the PIP mapping to the east and northeast of the site, as well as agricultural lands overlying the connected esker aquifer system to the south and east of the SAC where groundwater recharge may influence groundwater quality within the fen.

The NPWS Farm Plan Scheme provides a mechanism for identifying and implementing site-specific land management measures that reduce nutrient losses while supporting the conservation objectives of the SAC. It is noted that the principal landowner within the SAC is already participating in the NPWS Farm Plan Scheme, under which low-intensity grazing and scrub management measures are currently being implemented. Continued participation and alignment of future Farm Plan actions with the restoration objectives for the site are therefore recommended, alongside the identification and engagement of additional landowners within the wider hydrological contribution area surrounding the fen.

6.4 Vegetation Measures

6.4.1 On-site Vegetation Measures

Proposed measures to address vegetation succession and scrub encroachment include the following on-site measures which are described in order of priority in Table 6-1 and shown in Figure 6-2.

Table 6-1: On Site Vegetation Measures proposed for Clonaslee Eskers and Derry Bog

Priority	Measure	Description	Responsibility
1	Conservation grazing	Following discussions with relevant landowners, the implementation of a conservation grazing regime with appropriate stocking levels is recommended. The purpose of this is to control/reduce the pressures of scrub encroachment and rank vegetation with regard to 7230 Alkaline fens and 7220 Petrifying springs habitats. The reintroduction and assessment of appropriate grazing is the principal restoration measure for this site, addressing the pressure of rank vegetation. Grazing will aim to reduce sward dominance, particularly by black bog rush, improve structural diversity and maintain open fen conditions. Stocking levels and grazing timing should be carefully managed to avoid localised overgrazing, poaching between tussocks of black bog rush or damage to wetter zones. This improvement in habitat condition aligns with improving habitat for Geyer's whorls snail.	NPWS (post-Tóchar)
2	Scrub encroachment management	An area of gorse in the southern area should be removed to ensure this does not encroach into areas supporting 7230 Alkaline fens and petrifying springs habitats. It is important to note that areas of Annex I quality 91E0 Alluvial forests would not be targeted for scrub/tree removal. Based on the results of the vegetation monitoring, implementation of appropriate grazing regime and liaison with landowners, additional scrub removal may be required if scrub encroachment is still a pressure within areas of 7230 Alkaline fen.	Tóchar and NPWS (post-Tóchar)
3	Appropriate mowing practice	It is recommended to liaise with the relevant landowners regarding the mowing of areas containing 7230 Alkaline fens habitat in order to implement an appropriate mowing regime where the cuttings are removed. This ensures that arisings are not negatively impacting the	NPWS (post-Tóchar)

		vegetation community through smothering of suitable fen species.	
4	Vegetation monitoring	Monitoring points are proposed which overlap with (where suitable) the existing NFS points. The purpose of these points is to monitor species composition within the habitat. This serves to monitor any vegetation change and inform future restoration measures. Monitoring will be used to directly inform adaptive management, including the spatial targeting and intensity of grazing and scrub management, based on observed changes in sward structure, species composition and evidence of recovery or further degradation.	Tóchar & NPWS (post-Tóchar)

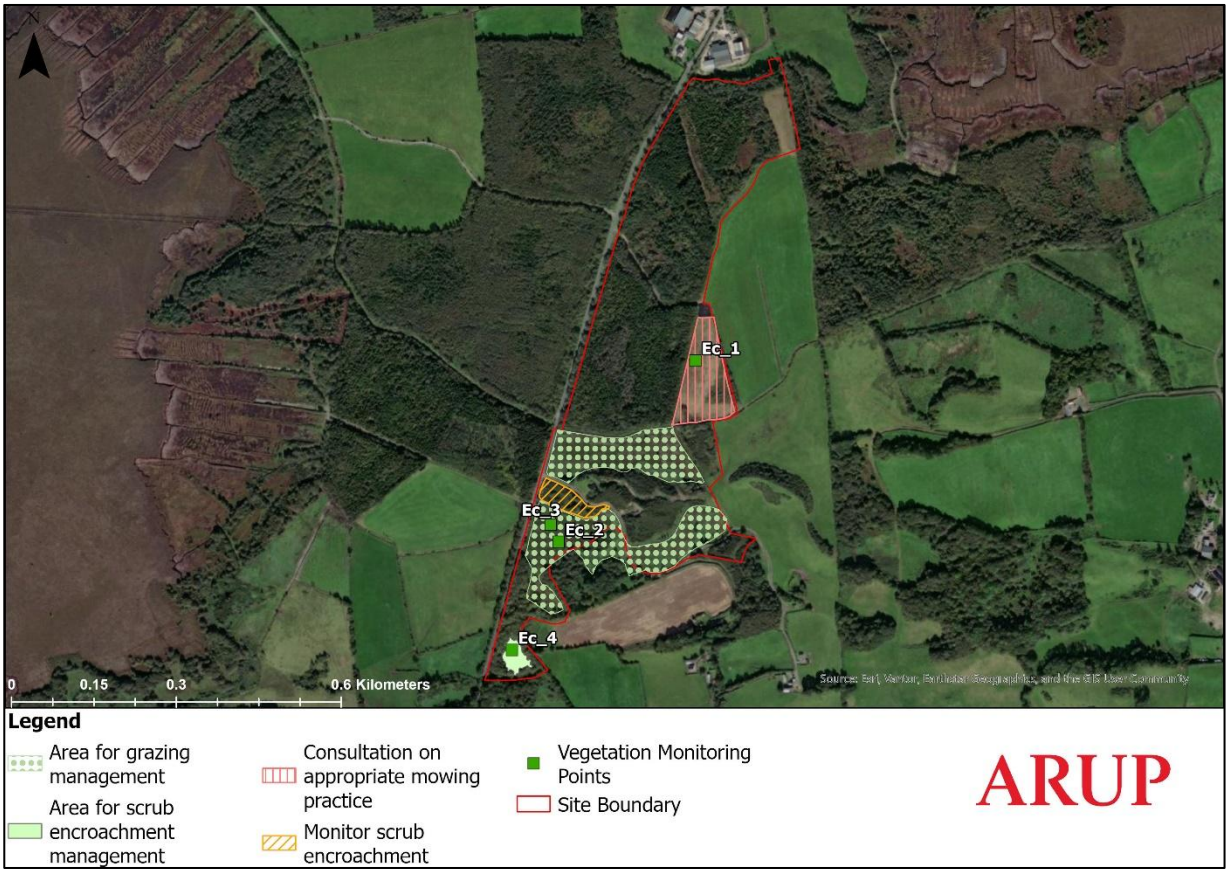


Figure 6-2: Proposed vegetation management measures and monitoring for Clonaslee Eskers and Derry Bog

7 Additional Considerations

7.1 Drainage Management Plan

Arterial Drainage Schemes were carried out under the Arterial Drainage Act, 1945 to improve land for agriculture and to mitigate flooding. Rivers, lakes weirs and bridges were modified to enhance conveyance, embankments were built to control the movement of flood water and various other work was carried out under Part II of the Arterial Drainage Act, 1945. The purpose of the schemes was to improve land for agriculture, to ensure that the 3 – year flood was retained in bank this was achieved by lowering water levels during the growing season to reduce waterlogging on the land beside watercourses known as callows. Flood protection in the benefiting lands was increased as a result of the Arterial Drainage Schemes.

The Brosna (Westmeath, Offaly and Laois) was the first scheme, which commenced in 1947. The last schemes were completed in the 1990s. Arterial Drainage schemes cover approximately 20% of the country, typically the flattest areas. The OPW is required to maintain Arterial Drainage schemes under sections 37 and 38 of the Arterial Drainage Act, 1945. The Act was amended on a number of occasions, e.g. to transpose EU Regulations and Directives such as the EIA, SEA, and Habitats Directives and the Aarhus Convention.

Clonaslee Eskers and Derry Bog SAC is part of an Arterial Drainage Area managed by OPW. The maintenance and function of the channel and the impact of future drainage plans on the fen and the impact of the proposed restoration measures on the objectives of the drainage district is OPW's responsibility.

The preliminary drainage management plan for Clonaslee Eskers and Derry Bog SAC is presented in Appendix D.

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 proposed approach to peat stability is a tiered approach that aims to filter out low risk sites that can proceed with limited ground investigation, followed by more complex sites that

require a more detailed quantitative assessment. Where risks cannot be excluded following these steps it may be necessary to progress to more detailed geotechnical studies.

The GSI landslide susceptibility map for Clonaslee Eskers and Derry Bog SAC is presented in Figure 7-1 and shows that most of the site is considered to have a low landslide susceptibility with a small area in the centre (0.28 ha) presenting moderately low landslide susceptibility. A small area to the southeast (0.51 ha) has an inferred low landslide susceptibility.



Figure 7-1: Geological Survey of Ireland Landslide Susceptibility mapping for Clonaslee Eskers and Derry Bog SAC (GSI, 2025)

7.3 Archaeology

A desktop constraint assessment was conducted using the National Monuments Service (NMS) Historic Environment Viewer to evaluate the site boundary and immediate surrounding buffer zones against the statutory Record of Monuments and Places (RMP) and the Sites and Monuments Record (SMR).

The assessment confirmed that there are no recorded archaeological monuments, protected heritage features, or statutory "zones of notification" overlapping with or situated within a relevant proximity to the proposed restoration footprint. Consequently, statutory requirements under the National Monuments Acts are determined to be not applicable to this project as follows:

- Section 12 Notification: Not required, as no works will take place at, or in the immediate vicinity of, an RMP-listed site.
- Section 14 Consent / Licensing: Not required, as the project does not impact any designated National Monument or site subject to a Preservation Order.

Proactive Risk Mitigation (Chance Finds Protocol)

While no recorded features exist, the waterlogged and anaerobic conditions of fen environments possess a high potential for preserving previously unrecorded organic archaeological materials (e.g., wooden trackways, ancient implements, or environmental deposits).

To ensure complete compliance with the spirit of the National Monuments Acts, a standard "Chance Finds" Protocol will be maintained throughout the duration of the restoration works. In the highly unlikely event that any sub-surface archaeological features or artefacts are exposed during ground disturbance or rewetting activities, works in the immediate area will cease immediately, and the National Monuments Service and the National Museum of Ireland will be notified within the statutory 72-hour window.

It should be noted that the site includes Clonaslee Eskers and Derry Bog pNHA (site code 000859). Within 1km of the Clonaslee Eskers and Derry Bog, there are 3 sites in the Sites and Monument Records (SMR): LA00022 (Standing stone), LA00024 (Enclosure), LA00023 (Ringfort - rath) (Figure 7-2and Figure 7-3).

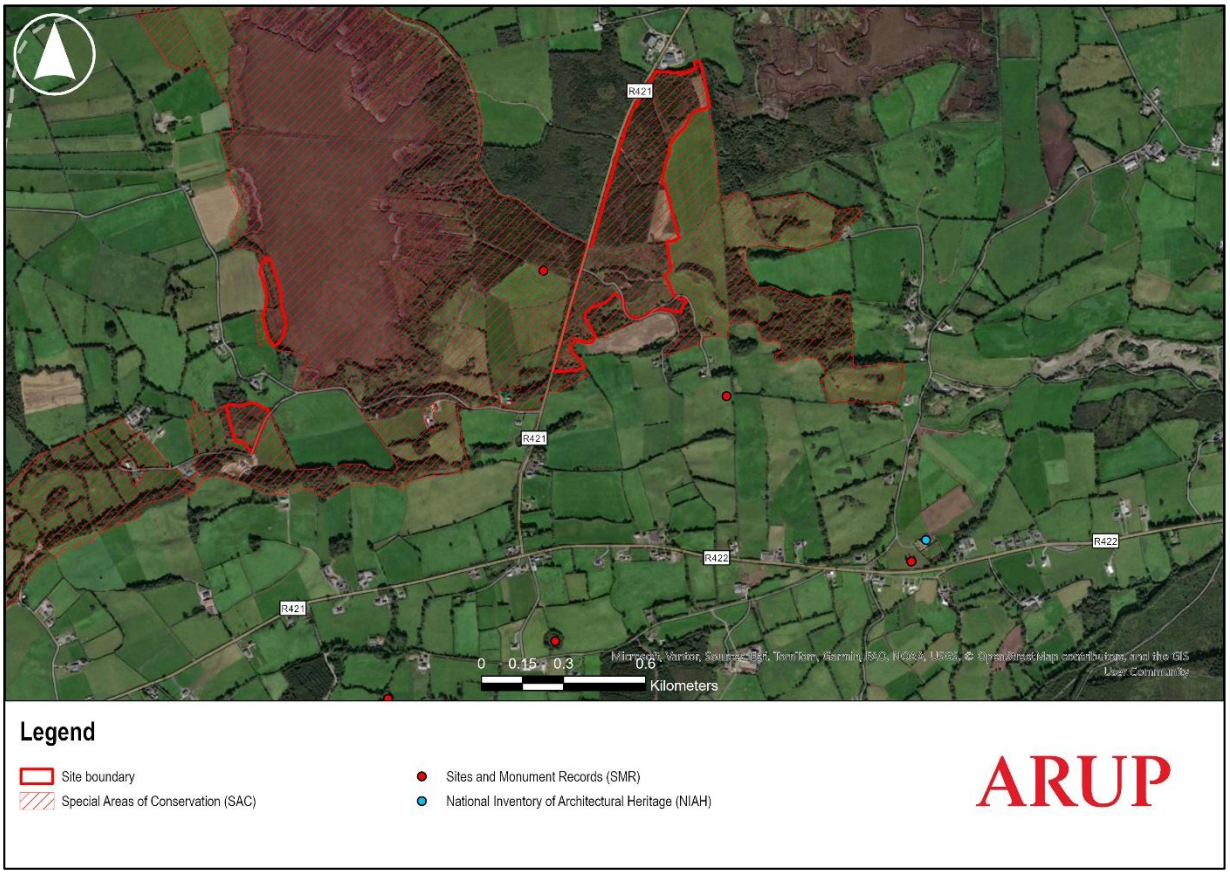


Figure 7-2: Archaeological Sites for Clonaslee Eskers and Derry Bog SAC (NMS, 2025)

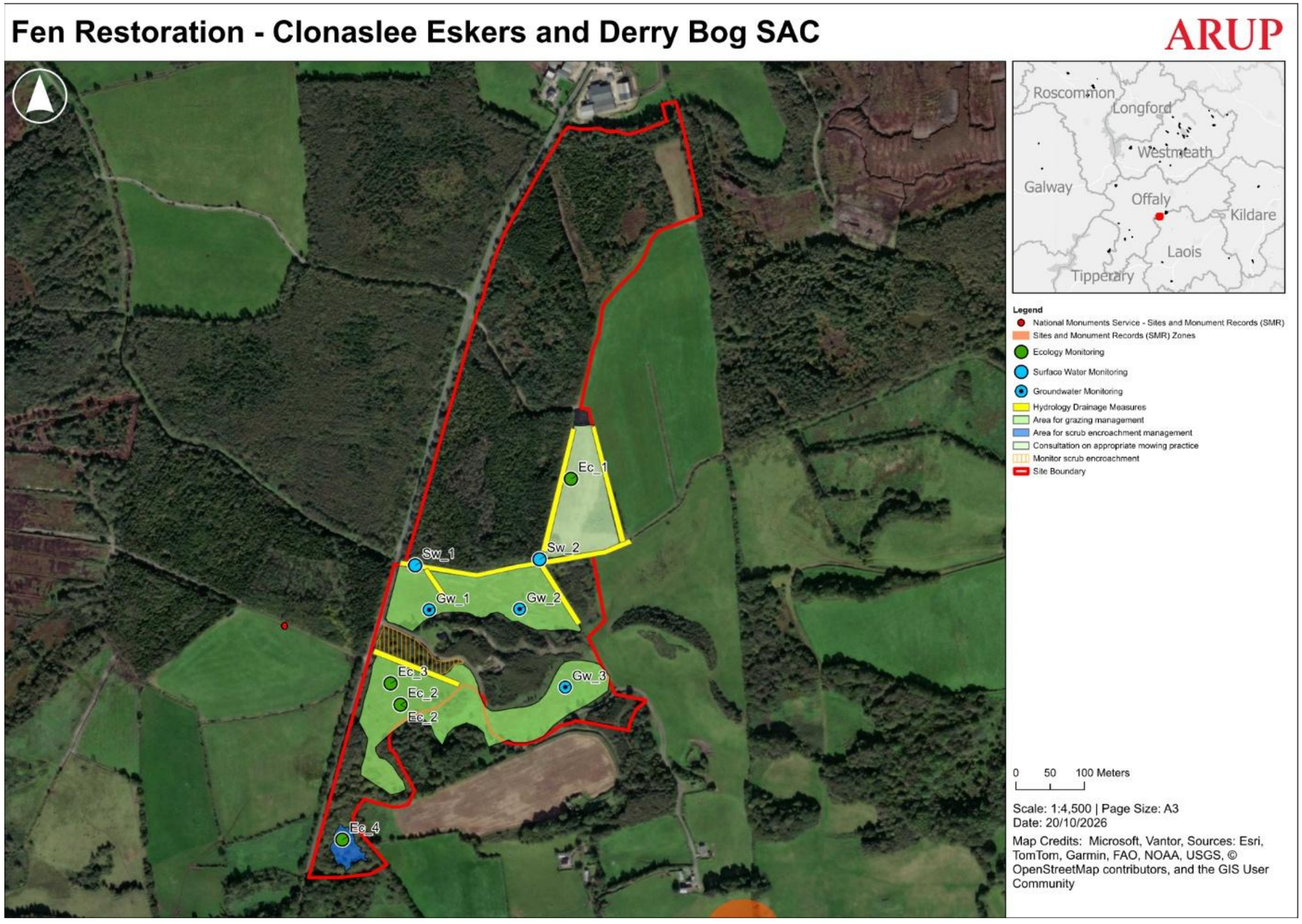


Figure 7-3: Restoration measures and archaeological sites for Clonaslee Eskers and Derry Bog SAC (NMS, 2025)

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 the 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	Landowners	Clonaslee Eskers and Derry Bog are under Commonage ownership by private individuals
	OPW	Management of Arterial Drainage
Off-site	OPW	Management of Arterial Drainage
	Landowners & farmers	Engagement for uptake of catchment measures.
	National Monuments Service	Management of archaeological sites
Capacity building	NPWS	NPWS engaging in community education and events

This section provides the summary of the Fen Restoration Plan Actions for Clonaslee Eskers and Derry Bog SAC (Table 8-2).

Table 8-2: Implementation plan for Clonaslee Eskers and Derry Bog SAC 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 Clonaslee Eskers and Derry 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			Within Tóchar project scope
1.2	**Drainage management plan**							
	Consultation with OPW on the drainage management plan is required to ensure compliance with legislation and local authority objectives.	Sitewide	Drainage management plan	Pre-restoration	NPWS OPW		Arup	Within Tóchar project scope
1.3	**Archaeological assessment**							
	Consultation with Laois County Council on archaeology is required to ensure compliance with legislation and local authority objectives.	Sitewide	Archaeological assessment report	Pre-restoration	NPWS	Laois Co. Co	Arup	Within Tóchar project scope
2	**Enabling Works**							
2.1	**Pre-restoration Works Surveys**							

	Activity	Location	Monitoring/ implementation indicator	Timeframe	Key role player			Possible funding source
					National	Regional/ Local	Other	
	Pre-site walkover with Ecologist/Ecological Clerk of Works (ECoW) to ensure proposed measures are appropriate and whether alterations are required. Surveys should also include identifying habitats for Geyer's whorl snail which were historically recorded within the areas for restoration measures. The purpose of the restoration measures is to improve habitat condition in the long-term. Their presence and consideration in the design of access routes will be included in a CEMP (discussed below) to ensure minimal disturbance during proposed works.	Sitewide	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
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**							

	Activity	Location	Monitoring/ implementation indicator	Timeframe	Key role player			Possible funding source
					National	Regional/ Local	Other	
	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	**Hydrology measures**							
	Installation of flow-blocking measures Block drains to increase water retention and promote re-wetting. Five drains across the site are identified for blocking, targeting shallow drains and preferential flow pathways that currently facilitate water loss and contribute to drawdown.	Multiple locations (northeast, centre and southwest of the site)	Dependent on the hydrological monitoring results and geotechnical investigations	Appropriate season following hydro monitoring	NPWS	Laois County Council	Arup / Contractor	Within Tóchar project scope
3.2	**Nutrient measures**							
	Installation of flow-blocking measures The flow-blocking measures that may implemented as part of the hydrological measures will contribute to on-site nutrient management by spreading spring flows across fen habitats, encouraging nutrient uptake and reducing efficient drainage pathways that currently deliver nutrient-rich water directly to the east-west main drain and roadside drainage.	Multiple locations (northeast, centre and southwest of the site)	Site installation records	Restoration in 2026	NPWS	Laois County Council	Arup / Contractor	Within Tóchar project scope

	Activity	Location	Monitoring/ implementation indicator	Timeframe	Key role player			Possible funding source
					National	Regional/ Local	Other	
3.3	**Vegetation measures**							
	Conservation grazing	7230 Alkaline fens	Regular monitoring of vegetation to review the stocking density and suitability of grazers	Seasonal grazing regime	NPWS working with landowner			NPWS Farm Plan Scheme
	Scrub encroachment management	Areas of gorse within 7230 Alkaline fens	Regular monitoring of vegetation to review scrub encroachment	Seasonal removal of vegetation to avoid bird nesting season	NPWS working with landowner		Arup / Contractor	Within Tóchar project scope
	Appropriate mowing practice	Field that is actively cut supporting 7230 Alkaline fen and 6410 Molinia meadows	Vegetation monitoring	Long-term	NPWS working with landowners			NPWS Farm Plan Scheme
4	**Off-Site Restoration measures**							
4.2	**Nutrient measures**							

	Activity	Location	Monitoring/ implementation indicator	Timeframe	Key role player			Possible funding source
					National	Regional/ Local	Other	
	Catchment nutrient management Prioritise participation in the NPWS Farm Plan Scheme for landowners in hydrologically connected lands surrounding the SAC, particularly high-risk phosphorus source areas to the east and northeast and recharge areas overlying the esker aquifer to the south and east.	Hydrologically connected lands surrounding the SAC	Uptake of measures by landowners / farmers	Long-term	NPWS, LAWPRO		Landowners	NPWS Farm Plan Scheme
5	**Monitoring progress**							
5.1	**Hydrology monitoring**							
	Groundwater and surface water monitoring will be undertaken through a network of piezometers and standpipes at key locations within the site (as described above) to assess the effectiveness of the proposed drain blocking measures, track changes in site hydrology, and inform any follow-up maintenance or refinement of the restoration measures where required.	Various locations across site	Water level	Long-term	NPWS	Laois County Council		Within Tóchar project scope
5.2	**Nutrient monitoring**							
	Ongoing monitoring of habitats, drainage channels and springs for water quality parameters is proposed within the fen.	Various locations within the site	Nutrients (Nitrate and phosphate), electrical conductivity and pH	Long-term	NPWS	Laois County Council		Within Tóchar project scope
5.3	**Vegetation monitoring**							

	Activity	Location	Monitoring/ implementation indicator	Timeframe	Key role player			Possible funding source
					National	Regional/ Local	Other	
	Habitat condition assessments will be included to track restoration progress.	Sitewide	Habitat condition	Long-term	NPWS	Laois County Council		Within Tóchar project scope
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 fens and 7220 Petrifying springs**

Restoration measures will focus on improving the hydrology of the fen habitat, scrub monitoring and potential removal, and conservation-oriented grazing and land management. Together, these measures will protect the fen's structure and function, preventing succession and supporting its long-term conservation value. Furthermore, these measures will also support an improved/favourable condition of 7220 Petrifying springs.

- **91E0 Alluvial forests**

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.

- **6410 *Molinia* meadows**

Restoration actions seek to improve the mowing practice in this area of the site, whereby cuttings are removed to reduce nutrient input and smothering of fen vegetation. Subsequently, the condition of this habitat will be improved.

- **Non-Annex Habitats/ Fossitt classified habitats**

A range of non-Annex habitats within the site, including PF1 Rich fen and flush, GS2 Dry meadow and grassy verges and WN6 Wet willow-alder-ash woodland, will also benefit from the implementation of the proposed restoration measures. These habitats are functionally connected to the Annex I fen system and form part of the wider ecological mosaic. Measures such as conservation grazing, vegetation management and hydrological restoration will improve habitat condition and structural diversity across these areas, while supporting habitat connectivity and overall ecological stability within the site.

8.2 Species Benefiting from Implementation of Restoration Actions

The proposed restoration measures will benefit the SAC's QI species, Geyer's whorl snail, by increasing both quality and quantity of available habitat within the SAC. With the snail having not been recorded within the site since 1998, the proposed restoration measures create the potential for a recovery of the site's population. Together, the proposed restoration efforts offer mutual benefits for broader fen ecosystem function and the long-term viability of Clonaslee Eskers and Derry Bog SAC's QI species alongside other wetland species that were recorded within the site, such as curlew and marsh fritillary.

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Appendix A – Non-Technical Summary

NPWS Tóchar Midlands Wetland Restoration Scheme Fen Restoration Plan Non-Technical Summary			
Site Name	Clonaslee Eskers and Derry Bog	**NFS site no.**	109002
County	Laois	**Designations**	SAC 000859
Fen habitats present (area)	7230 Alkaline fens (3.69 ha) and 7220 Petrifying springs (0.036 ha)	**Species of note**	Geyer's Whorl Snail (*Vertigo geyeri*)

Site Description

Clonaslee Eskers and Derry Bog is located approximately 5 km west of the town of Clonaslee, in Co. Laois and includes the Clonaslee Eskers and Derry Bog Special Area of Conservation (SAC) for the presence of 7230 Alkaline fens, 7220 Petrifying springs and *Vertigo geyeri* species (Geyer's Whorl Snail), listed under Annex I and II of the E.U. Habitats Directive.

The survey area comprises one main polygon containing an esker and surrounding slumping areas, as well as several smaller satellite polygons beside and around Derry Bog. The smaller satellite polygons were not found to contain any target habitat and are therefore not considered for restoration measures. Several fields surrounding the esker experience seasonal wetting due to groundwater conditions and contain 7230 Alkaline fens and 7220 Petrifying springs. Figure 1 presents the habitats mapped within the site.

Conceptual Site Model (CSM)

Clonaslee Eskers and Derry Bog SAC comprises a groundwater-dependent fen system influenced by both groundwater and surface water inputs. Site topography generally slopes towards a central east–west drain (Silver (Kilcormac) River), with elevated esker deposits located to the south and higher ground to the north. Groundwater recharge within the surrounding esker gravels and bedrock aquifers discharges at the margins of the deposits, resulting in seasonal tufa-forming flushes and petrifying spring habitat. Surface water flow is directed primarily towards the Silver (Kilcormac) River and the central drainage network, with additional flow paths identified in the southeastern portion of the site. Although groundwater discharge continues to support the fen, evidence of drying indicates that the site is experiencing hydrological drawdown, likely associated with the drainage network. The CSM is presented in Figure 2.

Key Pressures

Hydrology Pressures	Drainage – network of shallow field drains, deeper north–south drains and the main east–west arterial drain facilitating the removal of groundwater-derived inputs and potentially lowering water tables within adjacent fen habitats.
Nutrient Pressures	Diffuse pollution leading to nutrient enrichment. Phosphate concentrations exceeded the Water Framework Directive (WFD) good status threshold at nearly all monitoring locations, with the highest concentrations recorded within the main drainage network, particularly at the intersection of the north–south and east–west drains and within the western section of the site. Nitrate concentrations were also elevated throughout the site and generally increased along the main drainage pathways, indicating the transport of nutrients through the drainage network.

NPWS Tóchar Midlands Wetland Restoration Scheme Fen Restoration Plan Non-Technical Summary	
Ecology Pressures	Drainage modification, scrub encroachment, abandonment of pastoral systems and mowing are resulting in shifting fen vegetation patterns, a decline in characteristic fen community vegetation across wetland habitats within the site and pressure in protected species.
Objective of Restoration Plan	
The objective of the Clonaslee Eskers and Derry Bog Fen Restoration Plan is 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 or preferable, and the objective is to improve the habitat condition.	
Restoration Measures	
Hydrology Measures	**On-Site Measures:** Water level management through partial drain blocking of five drains across the site.
Nutrient Measures	**Off-Site Measures:** Employ catchment nutrient management measures through landowner engagement.
Ecology Measures	**On-Site Measures:** Conservation grazing, scrub encroachment management, appropriate mowing practice and vegetation monitoring**.**
Monitoring Progress	
Hydrology Monitoring	Groundwater and surface water monitoring within the fen
Nutrient Monitoring	Ongoing monitoring of habitats, drainage channels and springs for water quality parameters within the fen
Ecology Monitoring	Habitat condition assessments to track restoration progress.
More information	
Fen Restoration Plan Report (provide url) Tóchar website: https://www.tocharwetlands.ie/fen-restoration/	



Figure 1: Site Habitat Map

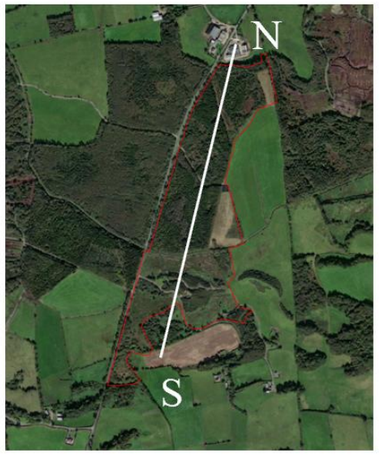
CLONASLEE ESKERS AND DERRY BOG SAC
Laois County
277.15 ha
WFD catchment: Lower Shannon (25A)

Water key:

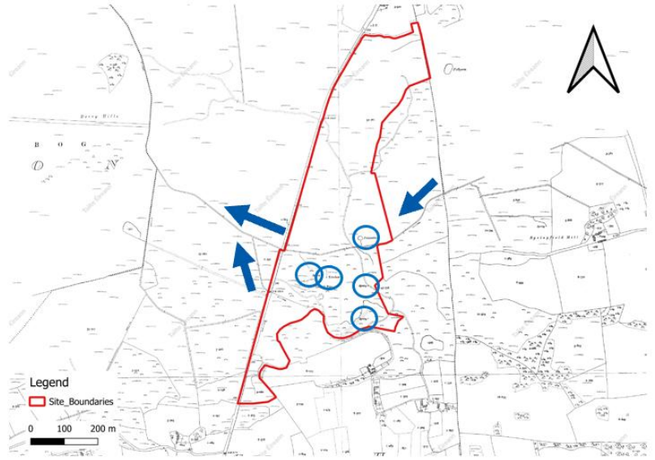
Drains

Springs

Vegetation:



Location:



Conceptual site model:

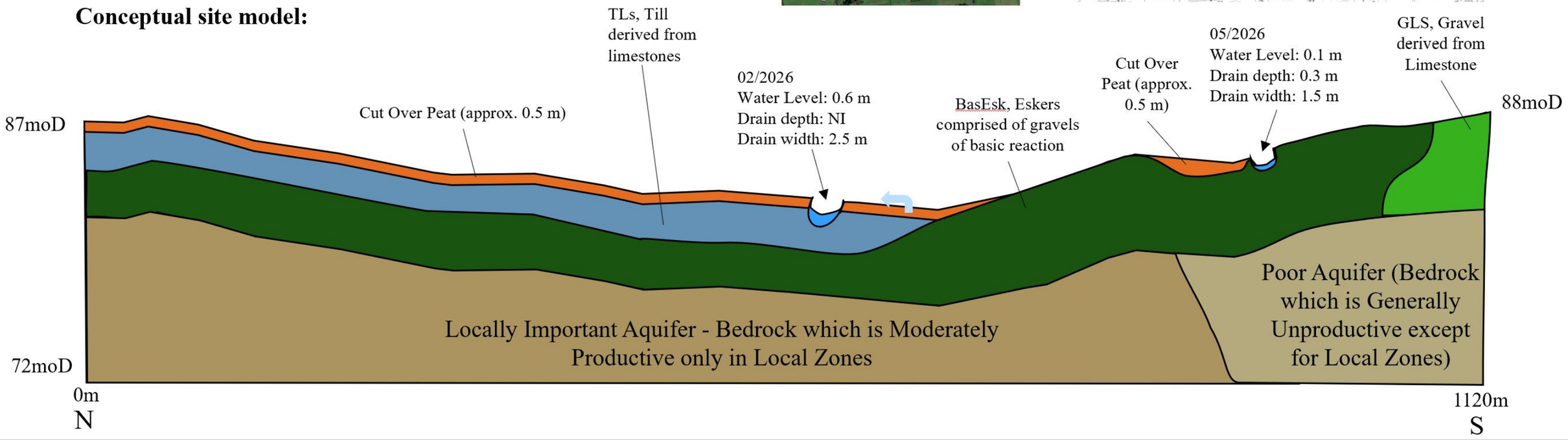


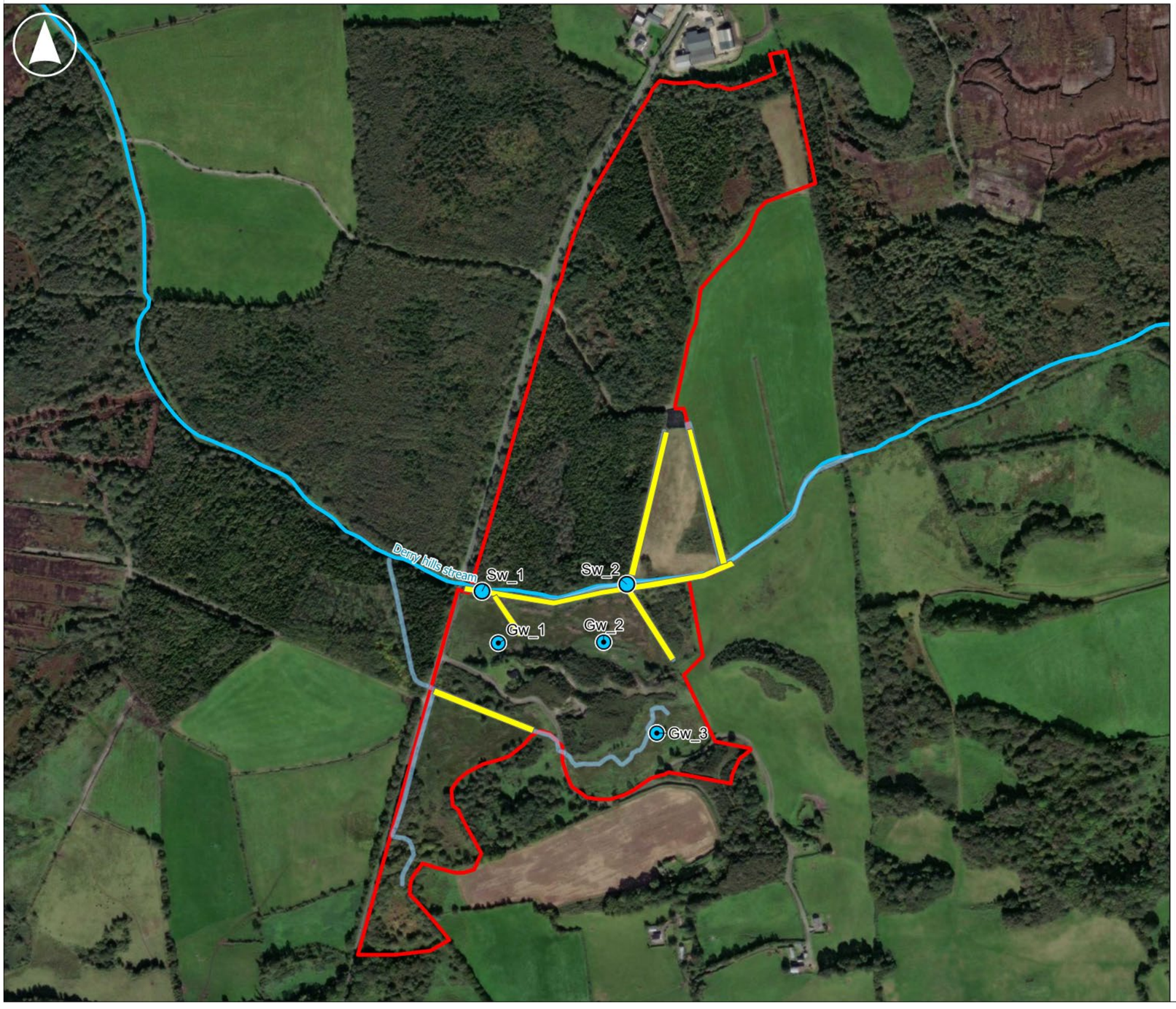
Figure 2: Conceptual Site Model

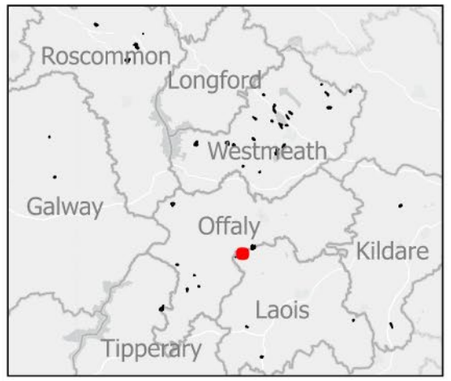
NPWS Tóchar Midlands Wetland Restoration Scheme Fen Restoration Plan: Drainage Management Plan			
Site name	Clonaslee Eskers and Derry bog		
County	Laois	NFS site No.	109002
Catchment overview:			
The site is positioned at approximately 84 mOD and is relatively flat. Higher ground is located at the northern boundary of the site (approximately 87 mOD) and at the southeastern portion of the site (up to 90mOD). Waterflows from both the northern and the southern portions of the site run towards the drain in the middle of the site.			
WFD catchment	25A- Lower Shannon	WFD Sub-catchment	25A_12: Silver (Kilcormac)_SC_010 WFD
Drainage Area	None	Drainage District	No
Responsible authority	OPW	Maintenance date	TBD
Surrounding landowners	Landowners		
Wetland drainage			
Historical and field evidence indicate that the hydrological regime of Clonaslee Eskers and Derry Bog SAC has been modified by drainage, contributing to drying within the groundwater-dependent fen habitats. The site remains strongly groundwater influenced, with groundwater recharge occurring within the surrounding esker gravels and bedrock aquifers before discharging within the fen through spring and seepages. Historical mapping identifies several spring locations within the site, while additional spring features were recorded during field surveys. Seasonal tufa-forming flushes associated with petrifying spring habitat have also been documented at the margins of the esker deposits. The Silver (Kilcormac) River flows from east to west through the centre of the site and provides the main outflow as the topography generally slopes towards this drainage corridor. A secondary surface water flow directing water from the southeastern boundary of the site to the northwest was identified. During winter, surface water flow was diffuse through the area, while a formal drain was identified during a second site visit.			
Surface water inflow	Silver (Kilcormac) River	Surface water outflow	Silver (Kilcormac) River
Groundwater inflow	Springs		
Internal drains	Five drains through site: main east–west drain, one north–south drain along the eastern portion of the site, two drains in the fields directly south of the east-west drain, and an additional east-west drain located immediately downstream of the access road that passes through the site. There are also internal forestry drains through the northern portion of the site.	Perimeter drains	One north–south drain along the eastern portion of the site, and roadside drainage to the west of the site.

NPWS Tóchar Midlands Wetland Restoration Scheme Fen Restoration Plan: Drainage Management Plan					
On site hydrology measures					
On-site measure 1	Drain blocking		Role player	NPWS to facilitate site access	
Five drains across the site have been identified for blocking, targeting shallow drains and preferential flow pathways that currently facilitate water loss and contribute to drawdown. The targeted area of inundation is primarily in the proximity of annex fen habitat providing more consistent wet conditions for these habitats. As the drains flowing out of the eskers in the centre of the site provides the greatest influence on water level within the fen habitat, they been targeted for this water level management measure. Following installation there will need to be follow up monitoring of performance of the measures after one month. Following this seasonal monitoring will be conducted by the NPWS.					
Off-site hydrology measures					
Off-site measure 1	No off-site hydrology measures		Role player		
Proposed 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 levels as a result of the installation of drain blocking measures.					
Indicator	Water level	Location	Various locations across site	Role players	NPWS
Rainfall and evaporation monitoring using site-specific or nearby stations.					

Fen Restoration - Clonaslee Eskers and Derry Bog SAC

ARUP





Legend

- Surface Water Monitoring
- Groundwater Monitoring
- Hydrology Drainage Measures
- Drains - NPWS Draft 2021-2023
- Water River Network (OSI)
- Site Boundary

0 50 100 Meters

Scale: 1:4,500 | Page Size: A3
Date: 20/10/2026

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

Figure 1: Mapped drainage network at Clonaslee Eskers and Derry bog

Appendix B – Ecological Survey Maps



Figure B-1: Annex I and Annex I quality habitats recorded and mapped as part of the 2022 NFS. Note the % value indicates the % cover of the dominant Annex I and Annex I quality habitat recorded in the polygon

Table B-1 Annex I habitat codes and Fossitt habitat code directory

Annex I habitat code	Annex I habitat name	Fossitt Habitat Code	Fossitt Habitat Name
3110	Oligotrophic Isoetid lake habitat	FL1	Dystrophic lakes
3130	Slender Naiad-type lakes	FL2	Acid oligotrophic lakes
3140	Hard-water lakes	FL3	Limestone/marl lakes
3150	Rich pondweed lake habitat	FL4	Mesotrophic lakes
3160	Acid oligotrophic lakes	FL5	Eutrophic lakes
3180	Turloughs	FL6	Turloughs
3260	Vegetation of flowing waters	FL7	Reservoirs
3270	Chenopodion rubri	FL8	Other artificial lakes and ponds
4010	Wet heaths	FW1	Eroding/upland rivers
4030	Dry heaths	FW2	Depositing/lowland rivers
4060	Alpine and subalpine heath	FW3	Canals

Annex I habitat code	Annex I habitat name	Fossitt Habitat Code	Fossitt Habitat Name
5130	Juniper scrub	FW4	Drainage ditches
6130	Calaminarian grasslands	FP1	Calcareous springs
6210	Orchid-rich calcareous grassland	FP2	Non-calcareous springs
6230	Species-rich Nardus grassland	FS1	Reed and large sedge swamps
6410	Molinia meadows	FS2	Tall-herb swamps
6430	Hydrophilous tall-herb swamp	GA1	Improved agricultural grassland
6510	Hay meadows	GA2	Amenity grassland (improved)
7110	Raised bog (active)	GS1	Dry calcareous and neutral grassland
7120	Degraded raised bogs	GS2	Dry meadows and grassy verges
7130	Blanket bog (active)	GS3	Dry-humid acid grassland
7140	Transition mires	GS4	Wet grassland
7150	Rhynchosporion depressions	GM1	Marsh
7210	Cladium fens	HH1	Dry siliceous heath
7220	Petrifying springs	HH2	Dry calcareous heath
7230	Alkaline fens	HH3	Wet heath
8110	Siliceous scree	HH4	Montane heath
8120	Calcareous scree	HD1	Dense bracken
8210	Calcareous rocky slopes	PB1	Raised bog
8220	Siliceous rocky slopes	PB2	Upland blanket bog
8240	Limestone pavement	PB3	Lowland blanket bog
8310	Caves	PB4	Cutover bog
8330	Sea caves	PB5	Eroding blanket bog
91A0	Old oak woodland	PF1	Rich fen and flush
91D0	Bog woodland	PF2	Poor fen and flush
91E0	Alluvial woodland	PF3	Transition mire and quaking bog
91J0	Yew woodland	WN1	Oak-birch-holly woodland
		WN2	Oak-ash-hazel woodland
		WN3	Yew woodland
		WN4	Wet pedunculate oak-ash woodland
		WN5	Riparian woodland
		WN6	Wet willow-alder-ash woodland
		WN7	Bog woodland

Annex I habitat code	Annex I habitat name	Fossitt Habitat Code	Fossitt Habitat Name
		WD1	(Mixed) broadleaved woodland
		WD2	Mixed broadleaved/conifer woodland
		WD3	(Mixed) conifer woodland
		WD4	Conifer plantation
		WD5	Scattered trees and parkland
		WS1	Scrub
		WS2	Immature woodland
		WS3	Ornamental/non-native shrub
		WS4	Short rotation coppice
		WS5	Recently-felled woodland
		WL1	Hedgerows
		WL2	Treelines
		ER1	Exposed siliceous rock
		ER2	Exposed calcareous rock
		ER3	Siliceous scree and loose rock
		ER4	Calcareous scree and loose rock
		EU1	Non-marine caves
		EU2	Artificial underground habitats
		ED1	Exposed sand, gravel or till
		ED2	Spoil and bare ground
		ED3	Recolonising bare ground
		ED4	Active quarries and mines
		ED5	Refuse and other waste
		BC1	Arable crops
		BC2	Horticultural land
		BC3	Tilled land
		BC4	Flower beds and borders
		BL1	Stone walls and other stonework
		BL2	Earth banks
		BL3	Buildings and artificial surfaces

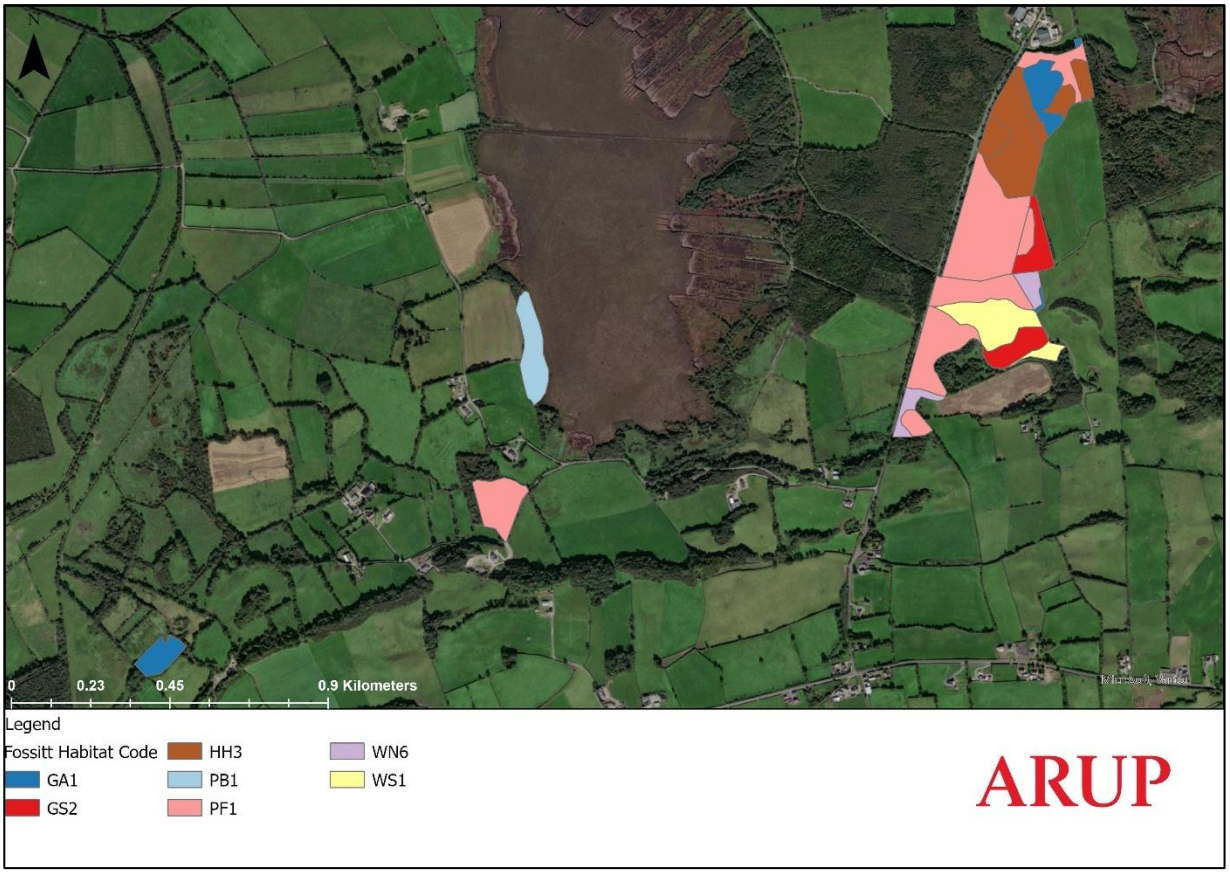


Figure B-2: Habitats recorded during the 2022 NFS and classified according to the Fossitt Habitat Classification System

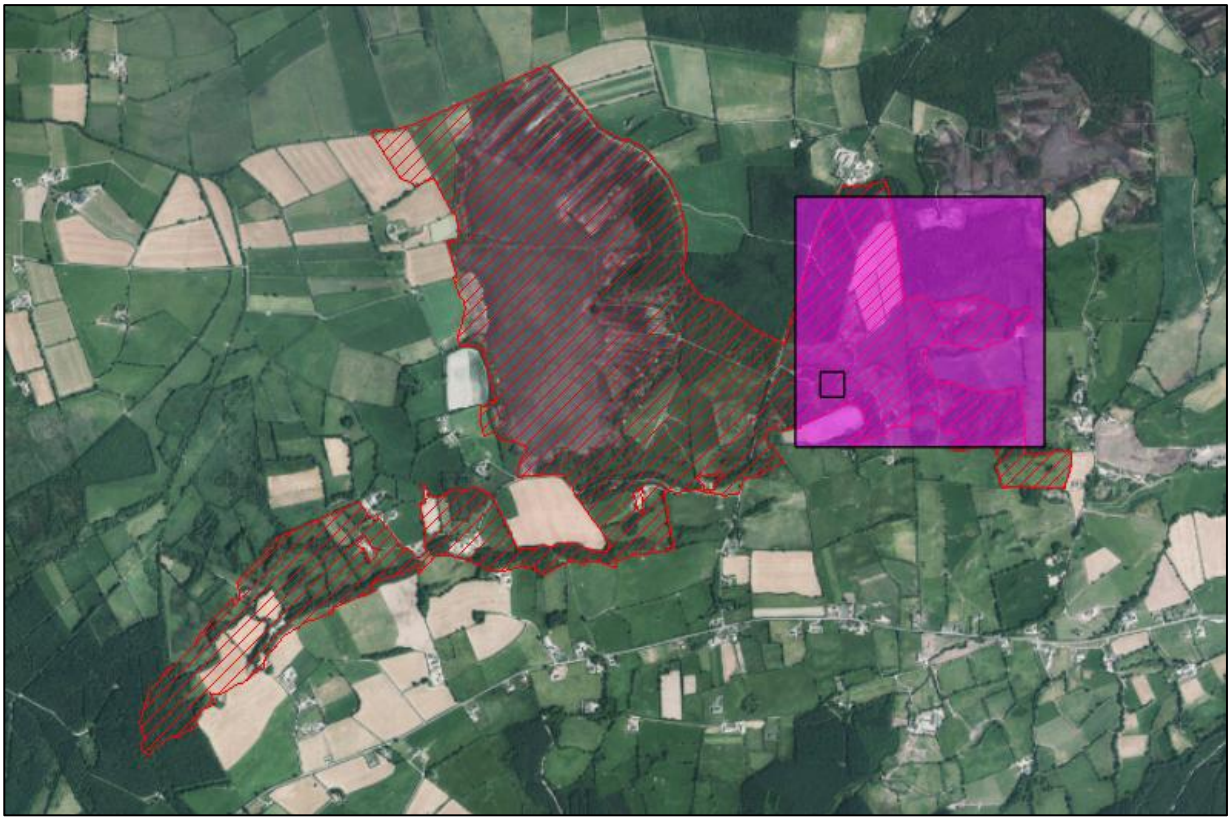


Figure B-3: Distribution of Geyer's whorl snail within and adjacent to Clonaslee Eskers and Derry Bog SAC using NBDC data viewer



Figure B-4: Distribution of marsh fritillary within and adjacent to Clonaslee Eskers and Derry Bog SAC using NBDC data viewer



Figure B-5: Distribution of curlew within and adjacent to Clonaslee Eskers and Derry Bog SAC using NBDC data viewer

Appendix C – Restoration and Monitoring Map

Table C-1: Long-term monitoring points for fen restoration at Clonaslee Eskers and Derry Bog SAC

Point	Measure	Objective	Timeframe	Frequency of monitoring	Monitoring indicator
Gw_1	Hydrological	Monitoring groundwater levels and quality	Long-term	One data logger Seasonal[4] for year 1 Annual for year 2-5	Groundwater level
Gw_2					Groundwater level
Gw_3					Groundwater level
Sw_1		Monitoring of surface water levels and quality	Long-term	Seasonal for year 1 Annual for year 2-5	Water level and quality in intersection between main drain, north-south and south-north drains
Sw_2					Water level and quality in intersection between main drain and south-north drain
Ec_1	Ecological	Monitoring within the 7230 Alkaline fens and 7220 Petrifying springs	Long-term	Seasonal for year 1 Every 3 years for year 2-5	Ecological monitoring
Ec_2					
Ec_3					
Ec_4					

[4] Seasonal: every quarter to represent a hydrological year

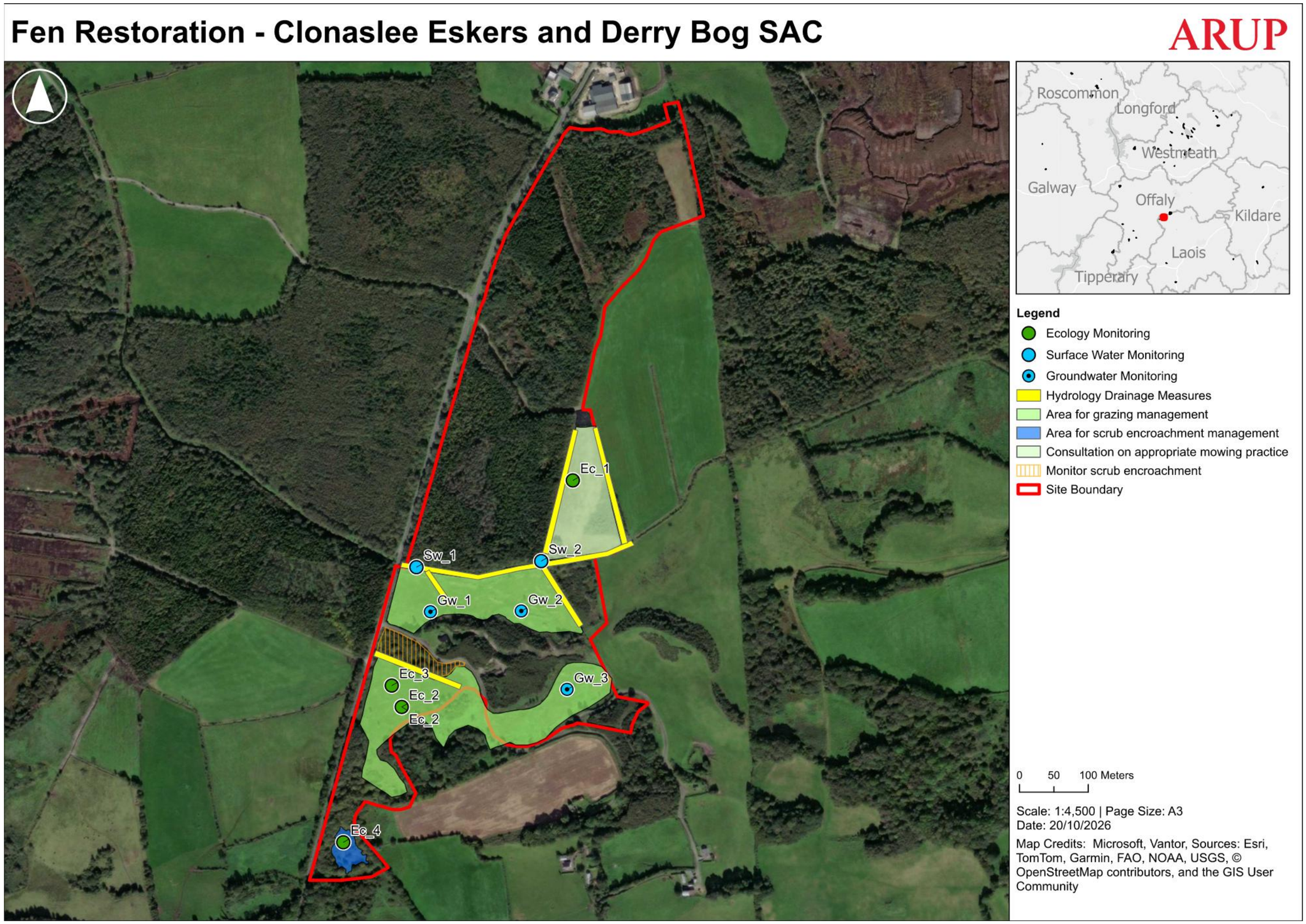


Figure C-1: Restoration and monitoring map

Appendix D – Drainage Management Plan

NPWS Tóchar Midlands Wetland Restoration Scheme Fen Restoration Plan Non-Technical Summary			
Site Name	Clonaslee Eskers and Derry Bog	**NFS site no.**	109002
County	Laois	**Designations**	SAC 000859
Fen habitats present (area)	7230 Alkaline fens (3.69 ha) and 7220 Petrifying springs (0.036 ha)	**Species of note**	Geyer's Whorl Snail (*Vertigo geyeri*)

Site Description

Clonaslee Eskers and Derry Bog is located approximately 5 km west of the town of Clonaslee, in Co. Laois and includes the Clonaslee Eskers and Derry Bog Special Area of Conservation (SAC) for the presence of 7230 Alkaline fens, 7220 Petrifying springs and *Vertigo geyeri* species (Geyer's Whorl Snail), listed under Annex I and II of the E.U. Habitats Directive.

The survey area comprises one main polygon containing an esker and surrounding slumping areas, as well as several smaller satellite polygons beside and around Derry Bog. The smaller satellite polygons were not found to contain any target habitat and are therefore not considered for restoration measures. Several fields surrounding the esker experience seasonal wetting due to groundwater conditions and contain 7230 Alkaline fens and 7220 Petrifying springs. Figure 1 presents the habitats mapped within the site.

Conceptual Site Model (CSM)

Clonaslee Eskers and Derry Bog SAC comprises a groundwater-dependent fen system influenced by both groundwater and surface water inputs. Site topography generally slopes towards a central east–west drain (Silver (Kilcormac) River), with elevated esker deposits located to the south and higher ground to the north. Groundwater recharge within the surrounding esker gravels and bedrock aquifers discharges at the margins of the deposits, resulting in seasonal tufa-forming flushes and petrifying spring habitat. Surface water flow is directed primarily towards the Silver (Kilcormac) River and the central drainage network, with additional flow paths identified in the southeastern portion of the site. Although groundwater discharge continues to support the fen, evidence of drying indicates that the site is experiencing hydrological drawdown, likely associated with the drainage network. The CSM is presented in Figure 2.

Key Pressures

Hydrology Pressures	Drainage – network of shallow field drains, deeper north–south drains and the main east–west arterial drain facilitating the removal of groundwater-derived inputs and potentially lowering water tables within adjacent fen habitats.
Nutrient Pressures	Diffuse pollution leading to nutrient enrichment. Phosphate concentrations exceeded the Water Framework Directive (WFD) good status threshold at nearly all monitoring locations, with the highest concentrations recorded within the main drainage network, particularly at the intersection of the north–south and east–west drains and within the western section of the site. Nitrate concentrations were also elevated throughout the site and generally increased along the main drainage pathways, indicating the transport of nutrients through the drainage network.

NPWS Tóchar Midlands Wetland Restoration Scheme Fen Restoration Plan Non-Technical Summary	
Ecology Pressures	Drainage modification, scrub encroachment, abandonment of pastoral systems and mowing are resulting in shifting fen vegetation patterns, a decline in characteristic fen community vegetation across wetland habitats within the site and pressure in protected species.
Objective of Restoration Plan	
The objective of the Clonaslee Eskers and Derry Bog Fen Restoration Plan is 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 or preferable, and the objective is to improve the habitat condition.	
Restoration Measures	
Hydrology Measures	**On-Site Measures:** Water level management through partial drain blocking of five drains across the site.
Nutrient Measures	**Off-Site Measures:** Employ catchment nutrient management measures through landowner engagement.
Ecology Measures	**On-Site Measures:** Conservation grazing, scrub encroachment management, appropriate mowing practice and vegetation monitoring**.**
Monitoring Progress	
Hydrology Monitoring	Groundwater and surface water monitoring within the fen
Nutrient Monitoring	Ongoing monitoring of habitats, drainage channels and springs for water quality parameters within the fen
Ecology Monitoring	Habitat condition assessments to track restoration progress.
More information	
Fen Restoration Plan Report (provide url) Tóchar website: https://www.tocharwetlands.ie/fen-restoration/	



Figure 1: Site Habitat Map

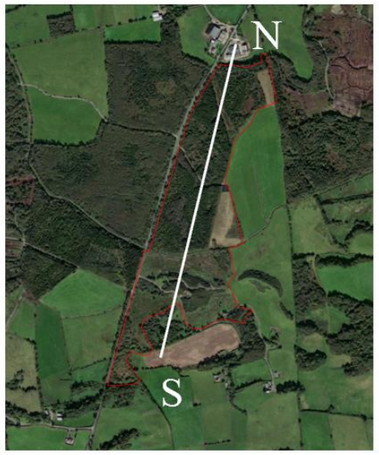
CLONASLEE ESKERS AND DERRY BOG SAC
Laois County
277.15 ha
WFD catchment: Lower Shannon (25A)

Water key:

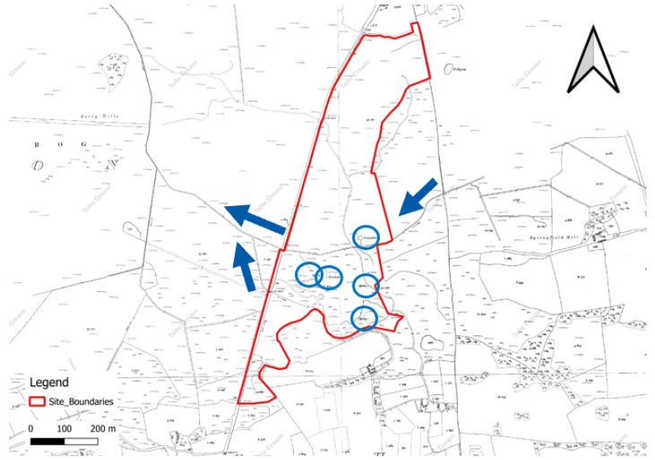
Drains

Springs

Vegetation:



Location:



Conceptual site model:

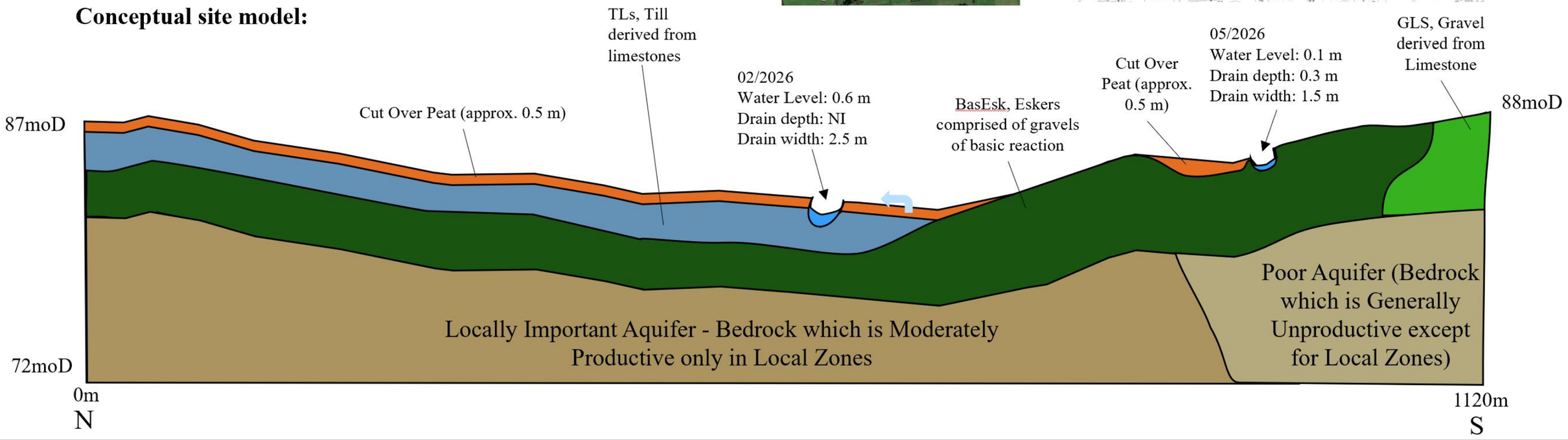


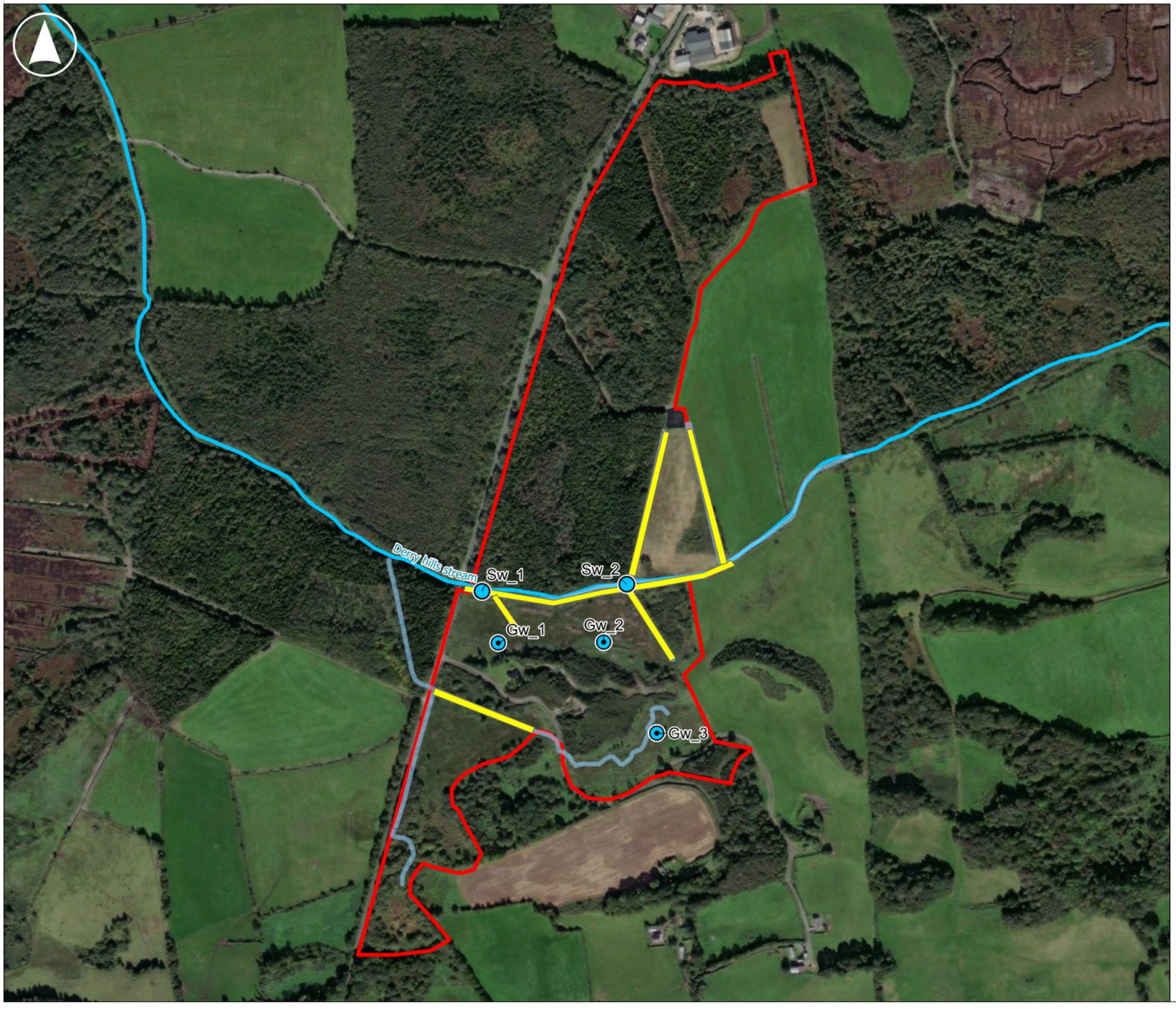
Figure 2: Conceptual Site Model

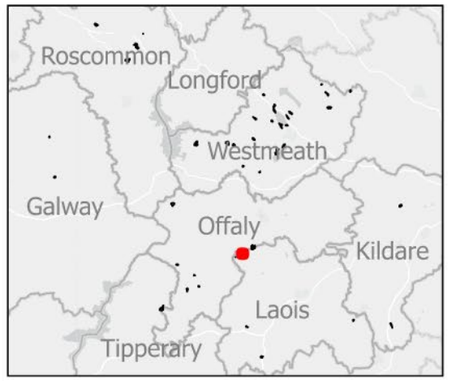
NPWS Tóchar Midlands Wetland Restoration Scheme Fen Restoration Plan: Drainage Management Plan			
Site name	Clonaslee Eskers and Derry bog		
County	Laois	NFS site No.	109002
Catchment overview:			
The site is positioned at approximately 84 mOD and is relatively flat. Higher ground is located at the northern boundary of the site (approximately 87 mOD) and at the southeastern portion of the site (up to 90mOD). Waterflows from both the northern and the southern portions of the site run towards the drain in the middle of the site.			
WFD catchment	25A- Lower Shannon	WFD Sub-catchment	25A_12: Silver (Kilcormac)_SC_010 WFD
Drainage Area	None	Drainage District	No
Responsible authority	OPW	Maintenance date	TBD
Surrounding landowners	Landowners		
Wetland drainage			
Historical and field evidence indicate that the hydrological regime of Clonaslee Eskers and Derry Bog SAC has been modified by drainage, contributing to drying within the groundwater-dependent fen habitats. The site remains strongly groundwater influenced, with groundwater recharge occurring within the surrounding esker gravels and bedrock aquifers before discharging within the fen through spring and seepages. Historical mapping identifies several spring locations within the site, while additional spring features were recorded during field surveys. Seasonal tufa-forming flushes associated with petrifying spring habitat have also been documented at the margins of the esker deposits. The Silver (Kilcormac) River flows from east to west through the centre of the site and provides the main outflow as the topography generally slopes towards this drainage corridor. A secondary surface water flow directing water from the southeastern boundary of the site to the northwest was identified. During winter, surface water flow was diffuse through the area, while a formal drain was identified during a second site visit.			
Surface water inflow	Silver (Kilcormac) River	Surface water outflow	Silver (Kilcormac) River
Groundwater inflow	Springs		
Internal drains	Five drains through site: main east–west drain, one north–south drain along the eastern portion of the site, two drains in the fields directly south of the east-west drain, and an additional east-west drain located immediately downstream of the access road that passes through the site. There are also internal forestry drains through the northern portion of the site.	Perimeter drains	One north–south drain along the eastern portion of the site, and roadside drainage to the west of the site.

NPWS Tóchar Midlands Wetland Restoration Scheme Fen Restoration Plan: Drainage Management Plan					
On site hydrology measures					
On-site measure 1	Drain blocking		Role player	NPWS to facilitate site access	
Five drains across the site have been identified for blocking, targeting shallow drains and preferential flow pathways that currently facilitate water loss and contribute to drawdown. The targeted area of inundation is primarily in the proximity of annex fen habitat providing more consistent wet conditions for these habitats. As the drains flowing out of the eskers in the centre of the site provides the greatest influence on water level within the fen habitat, they been targeted for this water level management measure. Following installation there will need to be follow up monitoring of performance of the measures after one month. Following this seasonal monitoring will be conducted by the NPWS.					
Off-site hydrology measures					
Off-site measure 1	No off-site hydrology measures		Role player		
Proposed 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 levels as a result of the installation of drain blocking measures.					
Indicator	Water level	Location	Various locations across site	Role players	NPWS
Rainfall and evaporation monitoring using site-specific or nearby stations.					

Fen Restoration - Clonaslee Eskers and Derry Bog SAC

ARUP





Legend

- Surface Water Monitoring
- Groundwater Monitoring
- Hydrology Drainage Measures
- Drains - NPWS Draft 2021-2023
- Water River Network (OSI)
- Site Boundary

0 50 100 Meters

Scale: 1:4,500 | Page Size: A3
Date: 20/10/2026

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

Figure 1: Mapped drainage network at Clonaslee Eskers and Derry bog