National Parks & Wildlife Service

Tóchar Midlands Wetland Restoration Scheme

Lough Ennell

NFS site No.

104015

&104016

SAC 000685

Fen Restoration Plan

July 2026

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Midlands Wetland Restoration

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National Parks and Wildlife Service

Fen Restoration Plan

Lough Ennell SAC (Site Code: 104015 and 104016)

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Executive Summary

Lough Ennell (SAC 000685) (Westmeath) is located 9km north-east of Mullingar, Co. Westmeath. The site is designated as a Special Area of Conservation (SAC) for qualifying interests 7230 Alkaline fen and 3140 Hard oligo-mesotrophic waters with benthic vegetation of Chara spp.; however, habitat 3140 is not relevant to this Fen Restoration Plan. Lough Ennell is composed of two sites surveyed as part of the National Fen Survey: Ladestown (104016) and Dysart (104015). Ladestown is located along the north-west shoreline of Lough Ennell, while Dysart is located to the west of the lake, south of Ladestown.

The NFS identified that 7230 Alkaline fen is present both at Ladestown and Dysart. Other Annex I quality habitats recorded within the site include 6410 Molinia meadows and 91E0 Alluvial woodland. These habitats are not qualifying interests of the SAC. Habitat 6410 Molinia meadow is restricted to the Ladestown site, while 91E0 Alluvial woodland occurs locally within the wider site area.

This Fen Restoration Plan has been developed to set out proposals for the restoration of 7230 Alkaline fen to contribute to the achievement of favourable conservation condition of this habitat within Lough Ennell (SAC 000685).

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
- Invasive species e.g. scattered self-seeding conifers

Other pressures (e.g., burning, turf cutting, damage by recreational vehicles) may be present within the site. Factors such as landownership and management will dictate the ability of addressing such pressures as part of this FRP.

This assessment was developed using a desktop assessment of previous studies of Lough Ennell (SAC 000685) commissioned by NPWS including the surveys carried out in 2023 as part of the National Fen Survey (ref). 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. A prioritisation exercise has been 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: partial drain blocking will help raise the water levels in the fen.
    - Water quality monitoring: to maintain low nutrient, calcium-rich conditions in the fen.
    - Removal or cut scrub and saplings: target removal of younger willow scrub saplings to maintain the community and reduce scrub encroachment.
- Off-site Measures:
    - Restoration of groundwater hydrology: engagement with landowners for the best practice regarding land management to reduce fertilizer use and improve nutrients entering the site from surrounding lands. Regularly test pH, calcium and nutrient levels in the surface and groundwater. Engage with partners of the Lough Ennell Catchment Management Plan for best practice regarding catchment management. Water quality monitoring done along with observing the catchment measures such as nutrients entering the fen from surrounding land.

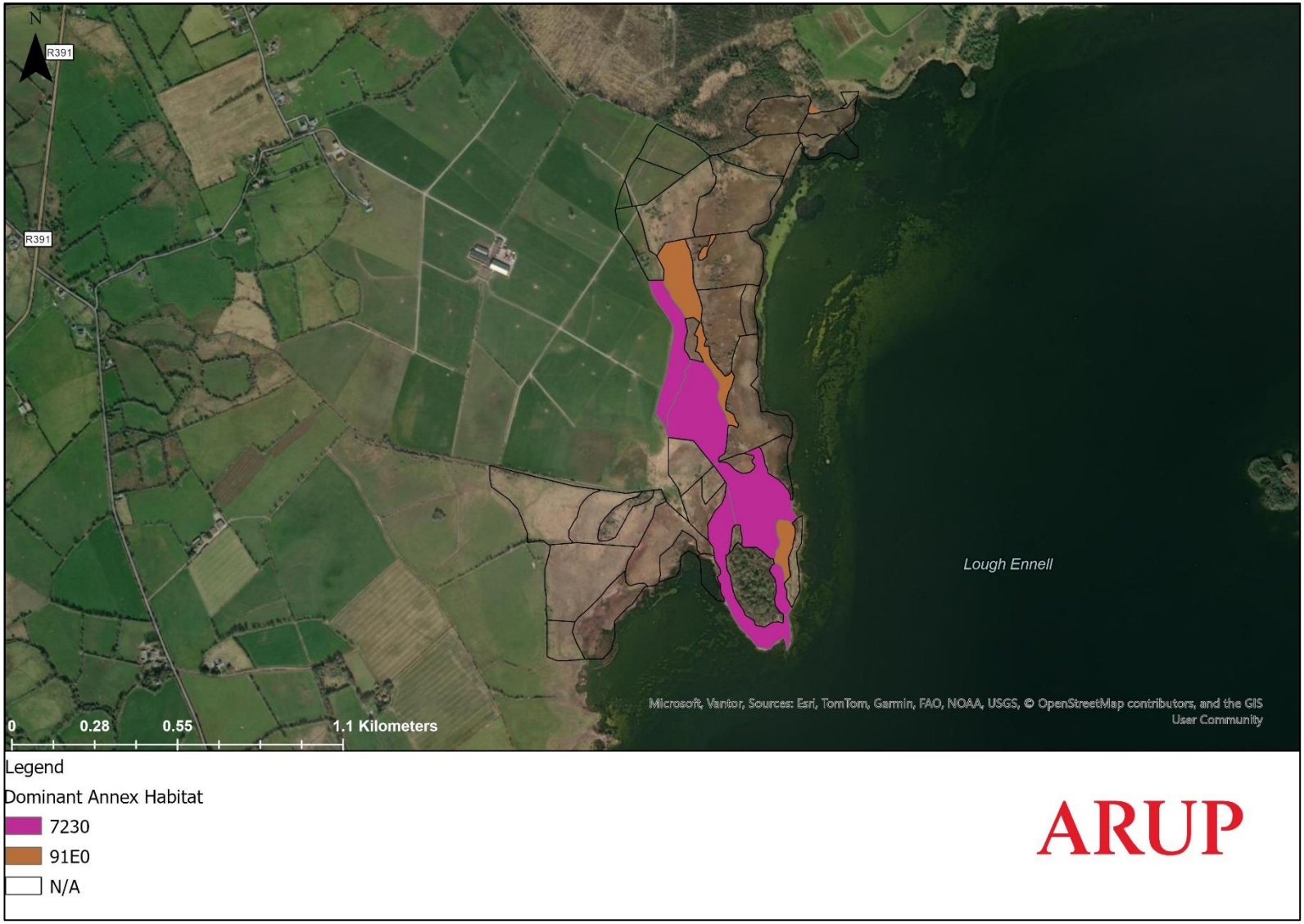


Figure 1-1: Annex I habitats identified during the 2022 NFS at Dysart. See Table 9-1 for the full list of habitat names.

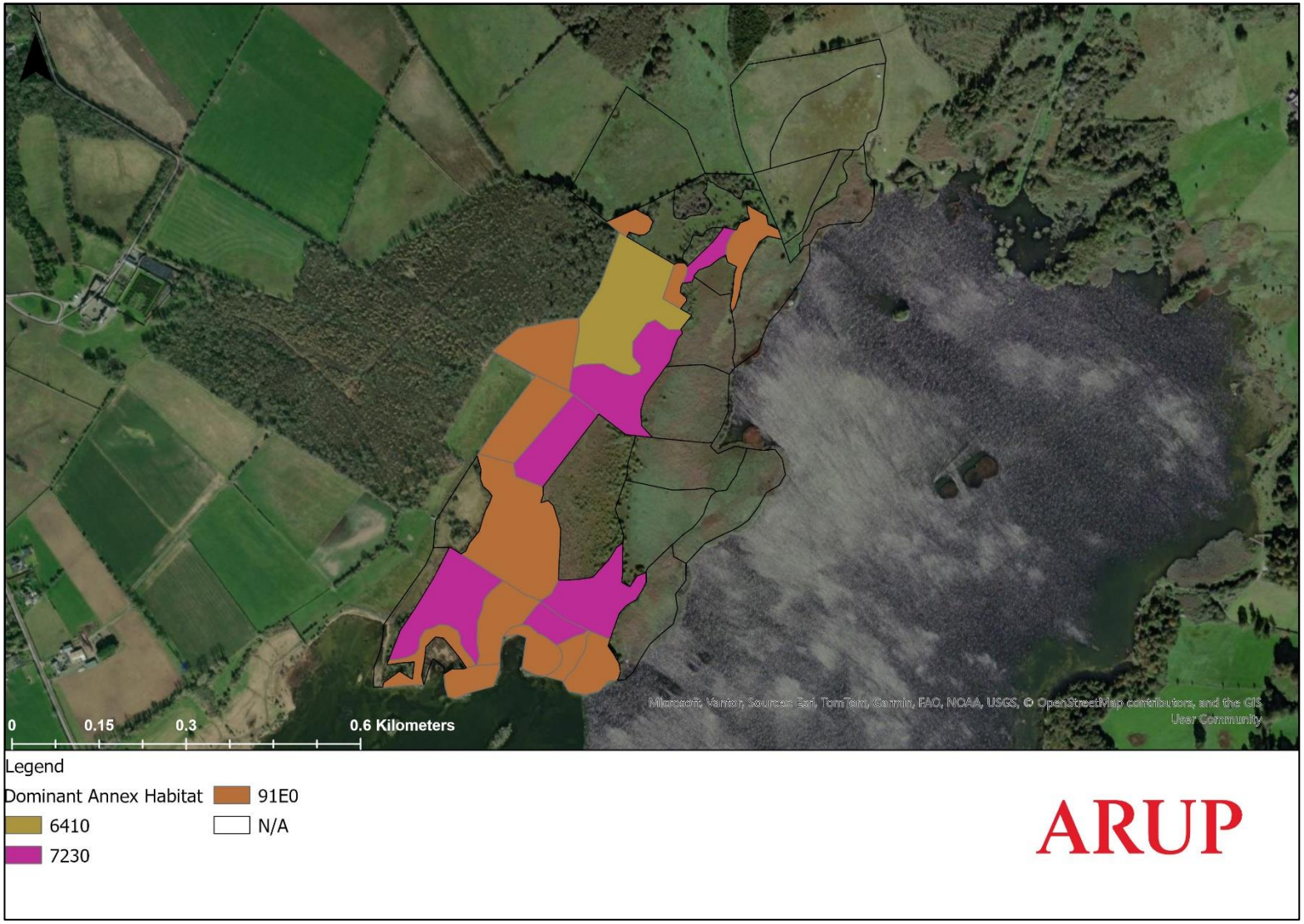


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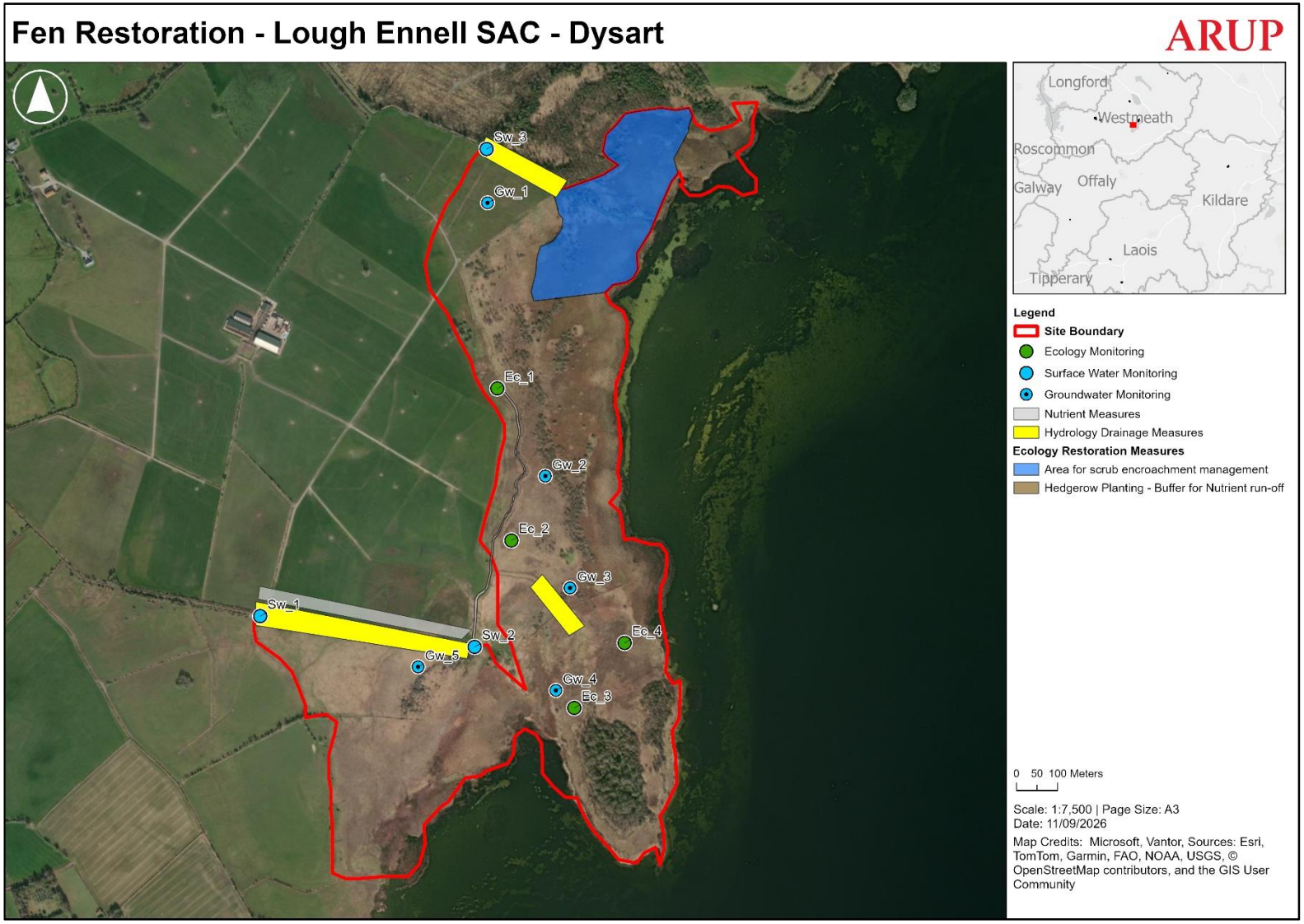


Figure 1-3: Restoration measures for Dysart - Lough Ennell SAC

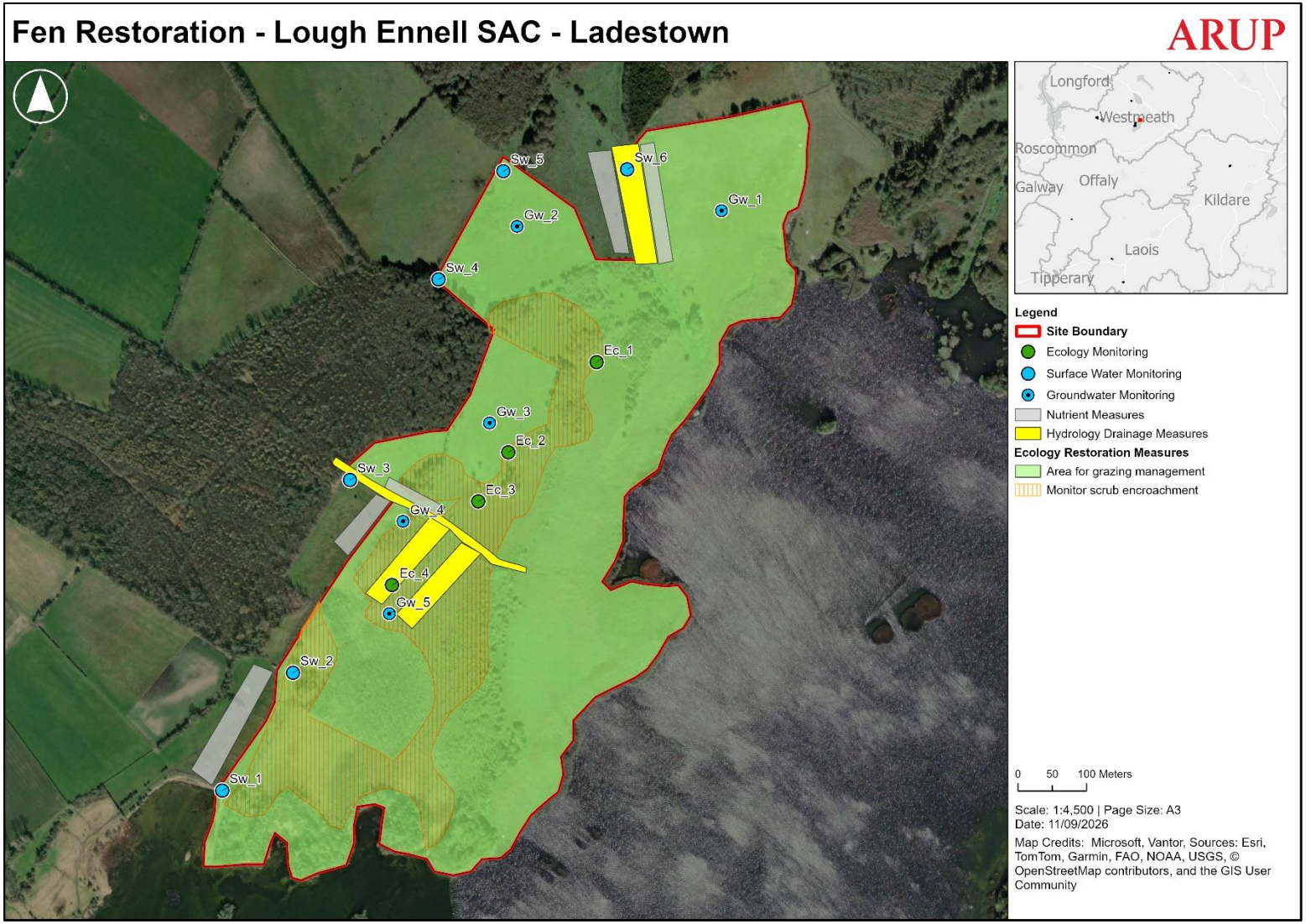


Figure 1-4: Restoration measures for Ladestown - Lough Ennell SAC

Acknowledgements

The Fen Restoration Plan was developed in collaboration with various organizations and individuals engaged in peatland restoration, along with local residents and stakeholders, through multiple workshops.

Thanks to the members of the SAR Directorate, NPWS Regional Staff, Ecological Assessment Unit (EAU), Ecological Guidance and Advisory Unit (EGAU), Local Authority Waters Programme (LAWPRO), Wildlife Enforcement and Nature Protection Directorate, Conservations Measures Unit, Conservation Planning Unit and the Tóchar Wetlands Project Team.

Tóchar Midlands Wetland Restoration is a restoration project managed by Ireland's National Parks and Wildlife Service and funded by the Government of Ireland and the EU Just Transition Fund Programme.

1 Introduction

1.1 Purpose of this Fen Restoration Plan

The Lough Ennell (SAC 000685) site comprises two National Fen Survey (NFS) locations, as documented by NPWS in 2023 (Brophy et al., in prep.). However, this Fen Restoration Plan (FRP) specifically focuses on: Dysart (NFS Site Code: 104015) and Ladestown (NFS Code: 104016). These two sites collectively form the Lough Ennell site, which lies within Lough Ennell Special Area of Conservation (SAC). In this FRP report, the term 'Lough Ennell SAC ' refers to the combined area of the Dysart and Ladestown NFS sites. Only where relevant will they be referred to on a site-by-site basis (i.e. Dysart and Ladestown).

Dysart and Ladestown sit within the Lough Ennell (SAC) (Site Code: 000685) which covers a total area of approximately 1,724 ha[1] and is dominated by fen habitat, although other associated wetland habitats are also present. The qualifying feature of the SAC includes 7230 Alkaline fen and 3140 Hard oligo-mesotrophic waters with benthic vegetation of Chara spp. The NFS (Brophy et al., in prep.), determined the total extent of 7230 Alkaline fen was estimated at 8.08 ha at Dysart and 3.18 ha at Ladestown with 0.03 ha of Annex I quality 6410 Molinia meadow.

This Fen Restoration Plan (FRP) report has been developed by Arup on behalf of National Parks and Wildlife Service (NPWS) to set out proposals for restoration of Annex I[2] habitat, namely 7230 Alkaline fen within the site which contributes to favourable conservation condition of the fen habitat and the achievement of SAC site-specific conservation objective (SSCO) targets.

The primary aim of the restoration actions proposed as part of this FRP is to maintain and improve the quality of existing areas of 7230 Alkaline fen. Where feasible, restoration measures will seek to improve the hydrological conditions in order to support the expansion of the 7230 Alkaline fen extent, thereby contributing to the achievement of SSCO targets related to habitat area, structure, and function. In some areas, restoration opportunities may be constrained by existing hydrological or land use conditions; in such cases, the objective will be to prevent further deterioration.

Although the focus of the restoration plan is on 7230 Alkaline fen habitat and associated SSCOs, it is anticipated that the implementation of restoration actions will also benefit other wetland habitats within the area. Wider benefits may include improvements to biodiversity, reductions

[1] NPWS (2023) Statutory Instrument Maps. Available on https://www.npws.ie/sites/default/files/protected-sites/statutory_instrument_maps/MAP000685.pdf

[2] 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.

in carbon emissions through rewetting of peat-based soils, and potentially improving water quality, all of which may be demonstrable under eventual post implementation monitoring.

1.2 Wider benefits of fen restoration

Fens are vital habitats due to their rich biodiversity, supporting a wide array of flora and fauna, many of which are rare or endangered. They act as natural water filters, purifying water by trapping pollutants and sediments, thereby 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 minimise 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 transforms 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 carbon sink function.

It is expected that areas within Lough Ennell SAC will become a reduced carbon source/part carbon sink following implementation of the FRP will result in revegetation of bare peat areas and improvement in hydrology via drain blocking.

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

The restoration of fen habitat is likely to have beneficial effects for bird species also. The Lough Ennell Special Protection Areas (SPA) (Site Code 004044) overlaps Lough Ennell SAC and is designated for pochard (*Aythya ferina*), tufted duck (*Aythya fuligula*), A125 Coot *(Fulica atra*) and A999 Wetlands and waterbirds. These species are associated with wetlands which provides important foraging and nesting habitat. A key target listed in the SSCO document for the Lough Ennell SPA for wetland is no significant loss to wetland habitat in order to ensure regularly occurring migratory waterbirds (NPWS, 2024). A key target in the conservation objective for the likes of pochard, tufted duck and coot is sufficient availability of suitable roost spatial distribution, extent and abundance throughout the SPA to maintain the population, along with sufficient availability of suitable foraging habitat across the SPA to support targets relating to population size, productivity rate and range. Restoration actions at Lough Ennell SAC

are likely to benefit such birds by improving foraging/nesting habitat for both and/or their prey species (in turn resulting in positive quality cascade effects).

1.3 Key pressures on Fens

The overarching (National) key pressures and threats to Annex I fen habitats have been identified in the latest Status of EU Protected Habitats and Species in Ireland (Article 17 report) (NPWS 2025) in Table 1-1. The overall conservation status is assigned as Unfavourable-Bad for 7230 Alkaline fen in the Article 17 report.

Table 1-1: National pressures to fen habitats

Habitat	Importance	Pressure
7230 Alkaline fen	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	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 PI02 Other invasive alien species (other than species of Union concern) PL02 Drainage (mixed or unknown drivers) to surface or ground waters
	Low	PA17 Agricultural activities generating pollution to surface or ground waters (including marine) PA20 Livestock farming generating pollution

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 SPAs.

SACs are selected for the conservation of Annex I habitats (including priority types which are in danger of disappearance) and Annex II species (other than birds). SPAs are selected for the conservation of Annex I birds and all migratory birds and their habitats. The Annex I 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.

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.

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

1.5 Outline of this FRP document

- Section 2 of this FRP report outlines details of Lough Ennell SAC and the conservation objectives for 7230 Alkaline fen habitat.
- Section 3 outlines the findings from the land and water desktop and site monitoring surveys that were carried out to inform the development of this FRP.

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

Restoration actions proposed by this FRP assessment have been mapped in GIS format and delivered to NPWS in accordance with NPWS data standards. 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 have been 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 Lough Ennell

As outlined in Section 1.1, the assessment area for this FRP comprises of Dysart (104015) and Ladestown (104016) NFS sites within Lough Ennell SAC (000685), County Westmeath. Lough Ennell is located approximately 9 km north-east of Mullingar. Ladestown is situated along the north-west shoreline of Lough Ennell, while Dysart is located to the west of the lake, south of Ladestown. The map below illustrates the location of Lough Ennell SAC and the position of the Dysart and Ladestown NFS sites within the wider designated area (Figure 2-1).

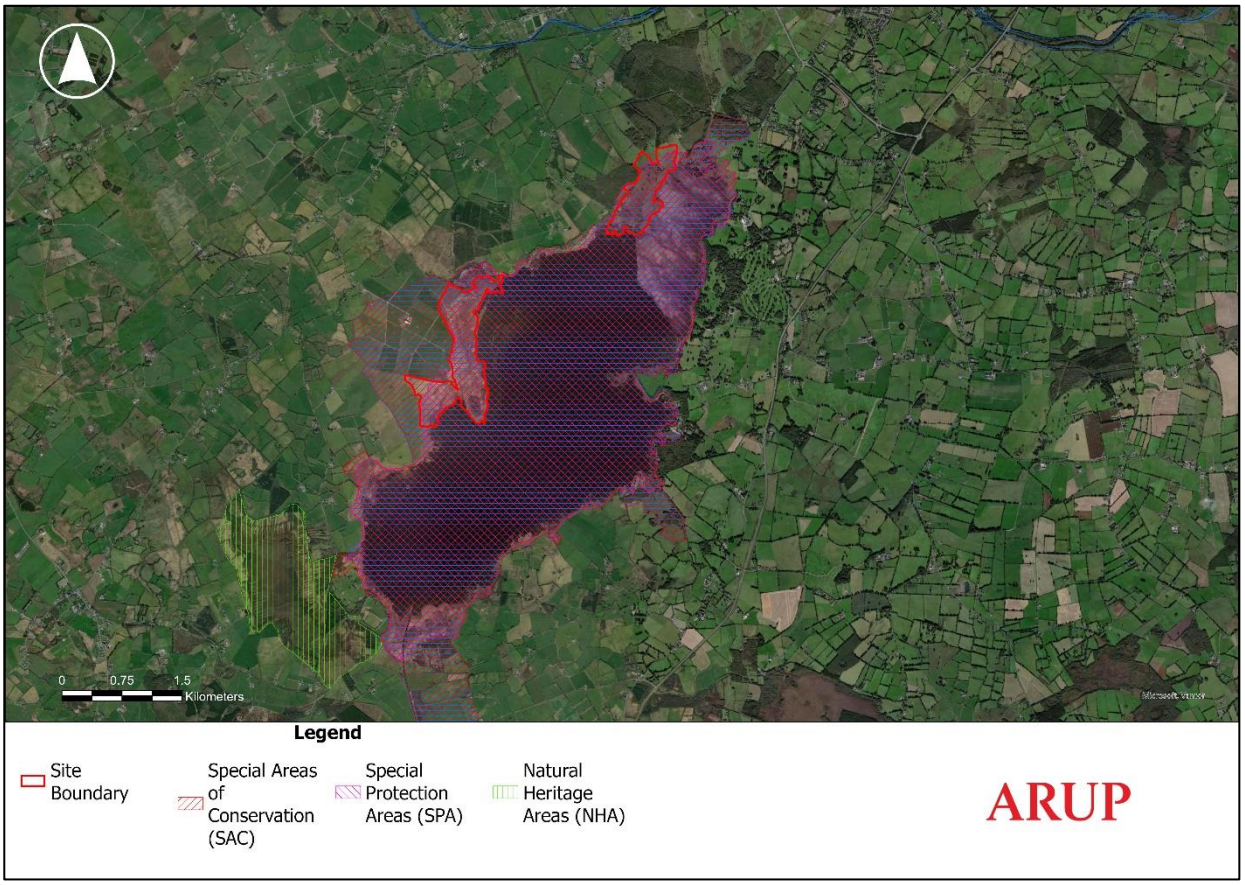


Figure 2-1: Site Location of Dysart and Ladestown within Lough Ennell SAC

Both Dysart and Ladestown occupy low lying, gently sloping lakeside terrain. At Dysart, elevations range from approximately 86 mOD at the western edge of the site, falling eastwards towards the lake margin at approximately 77 mOD. Ladestown similarly comprises gently sloping ground, with elevations decreasing from approximately 85 mOD towards the open water of Lough Ennell at approximately 77 mOD.

The catchment of Lough Ennell includes the main inflow to the north and outflow to the south, as well as surrounding smaller tributaries (Figure 2-2). The main inflow comes from the canal downstream of Mullingar, which derives from the spring fed Lough Owel. Surrounding tributaries to the east and west are also spring fed and highly alkaline.

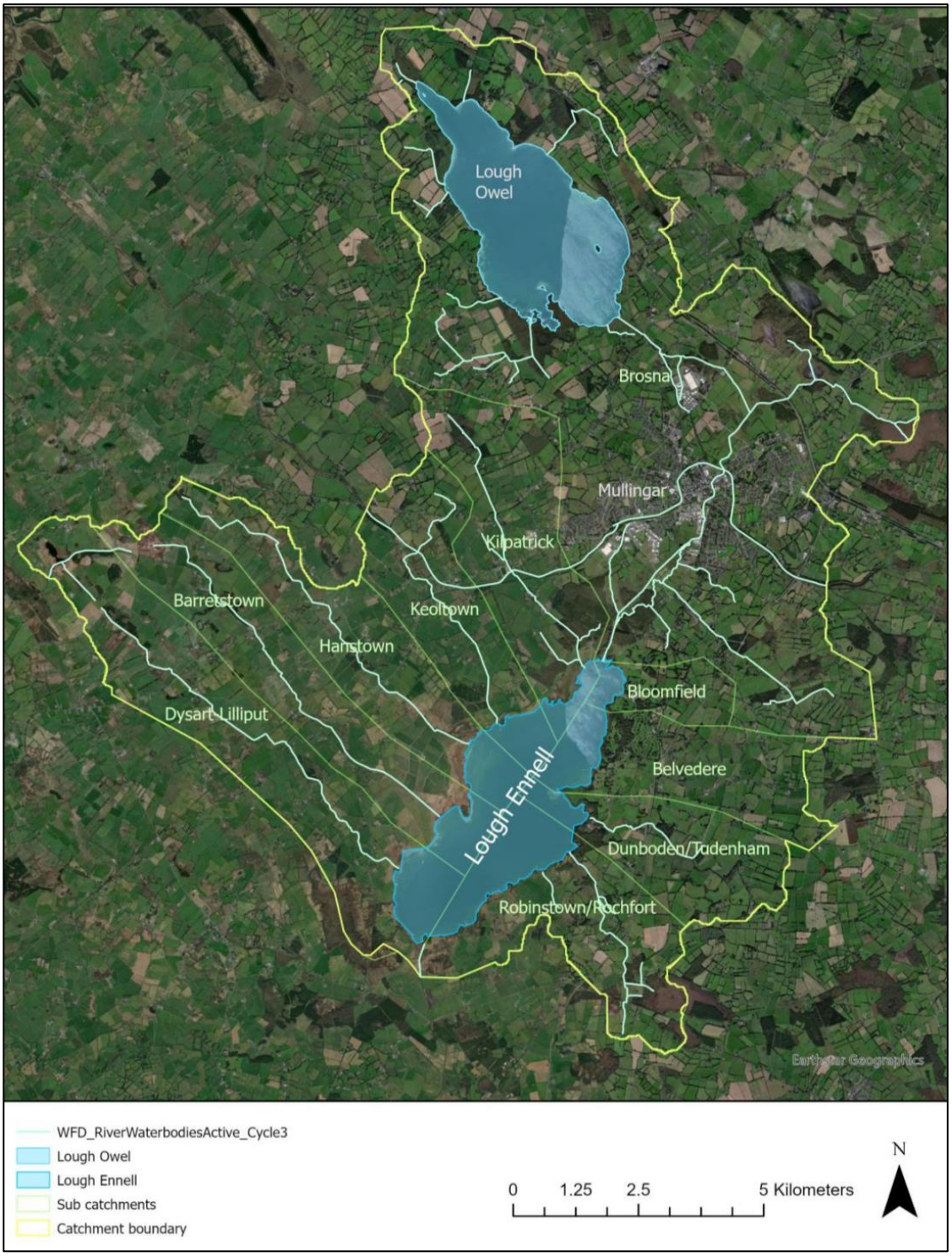


Figure 2-2: Lough Ennell catchment area (Source: Lauder and LECMP partners, 2025)

According to the site synopsis (NPWS, 2024), Lough Ennell supports a diverse aquatic flora, including extensive stonewort communities in the shallow waters. Historic eutrophication during the 1970s and 1980s resulted in ecological degradation; however, water quality and aquatic communities have improved following wastewater treatment upgrades. Lakeshore habitats include calcareous grassland, marsh, swamp, reedbed and fen vegetation. Reedbeds and species-poor swamp vegetation occur locally, particularly around inflow and outflow points,

while mixed deciduous woodland fringes parts of the shoreline. The catchment plan outlines that the pollution was from farming activities and agricultural use.

Lough Ennell SAC is also designated as a Ramsar wetland site, reflecting the importance of the lake and its associated wetlands at an international level. The lake plays a key role in seasonal water storage and exerts a strong hydrological influence on adjacent wetland systems, including shoreline fen habitats. The lake itself is a well-established brown trout (Salmo trutta) fishery, and the lake is widely used for recreational activities including bathing, fishing, boating and camping. Sections of the shoreline are managed to facilitate visitor access and amenity use, with Lough Ennell being designated as an Area of High Amenity by Westmeath County Council.

Lilliput is the designated bathing water on Lough Ennell under the Bathing Water Quality Regulations 2008 (S.I. no. 79 of 200811). In 2018, there was a marked deterioration from generally “Good” to “Poor” status of the Lilliput bathing water. During the 2021 bathing season, when a bathing prohibition was in place, water quality was nevertheless classified as ‘Excellent’. This high standard has broadly been maintained in subsequent years, with favourable reports recorded in 2022 and 2023.

The main water use in the catchment includes the upstream abstractions from Lough Owel for Mullingar drinking water and the supply of surface water to the Royal Canal. There are contributions of urban stormwater from the surrounding roads and urban areas upstream of Lough Ennell. The lake is also the receiving water body for treated wastewater from Mullingar.

Following key issues and opportunities being highlighted by Westmeath County Council in 2021 (Lauder, 2020) and 2022 (Lauder and Cussen, 2021), a catchment management plan was developed for Lough Ennell (Lauder and LECMP partners, 2025). The Lough Ennell Trout Preservation Association (LETPA) and partners such as LAWPRO and Inland Fisheries Ireland were involved in the development of the plan to investigate and tackle catchment issues related to water quality (particularly bathing water), and to trout stocks and spawning habitats. Several actions were identified as high priority, the most significant of which was the need for an overarching, integrated, catchment management plan with multiple stakeholders.

2.2 Fen Condition Assessment

As detailed in Table 2-1 and Table 2-2 the following seven pressures have been reported across the site in the reference:

- PA05 Abandonment of management/use of grasslands;
- PA22 Drainage for use as agricultural land;
- PF05 Sports, tourism and leisure activities; and
- PM02 Flooding;
- P0I Problematic native species;

- PA08: Extensive grazing or under grazing by livestock; and
- PI02: other invasive alien species.

Table 2-1: Assessment of Impacts of Pressures on Fen Habitats at Dysart

Pressure Code	Pressure [sub-category]	Influence
PA05	Abandonment of grazing at fen around Dysart Island.	Negative
PA22	Several deep drains across the site with the potential to remove water from the site.	Negative
PF05	Leisure activities include fishing/camping spot along the Lough shore in the southern extent. Signs included some cut branches, fire pit, trampled area.	Negative (low)
PM02	Flooding from the lake shores impacts the site on the eastern extent.	Negative

Table 2-2: Assessment of Impacts of Pressures on Fen Habitats at Ladestown

Pressure Code	Pressure [sub-category]	Influence
P0I	Problematic native species such as alder in the south-west of the site (potentially planted here). Scrub encroachment noted in the centre of the site from native species.	Negative
PA22	The site has a number of drains present, particularly near the boundaries with the forestry and fields present (west) impacting hydrology of the site in the areas furthest from the lough.	Negative
PA08	Most of the site is extensively grazed by cattle with the grazing pressure noted as low.	Positive
PI02	No species provided or location in NFS.	Negative

The results of this FRPs field evaluation (2025) to assess the above pressures and to inform the restoration planning process is detailed in Section 4.2.

Lough Ennell SAC was surveyed as part of the NFS (Brophy et al., in prep.) between June and July 2023. The overall conservation status of 7230 Alkaline fen were assessed as Unfavourable-Bad in both Dysart and Ladestown. The results of the conservation status assessment of 7230 carried out as part of the NFS surveys at Dysart and Ladestown in Lough Ennell SAC are summarised in Table 2-3.

Table 2-3: Conservation Status Assessment of 7230 Fen (Brophy et al., in prep.)

Annex I habitat	Area	Overall Status	Rationale
7230	Favourable	Unfavourable-Bad	Dysart: Cover of positive indicator species, cover of scattered native trees/shrubs Ladestown: Cover of negative indicator species, area showing signs of drainage, cover of scattered native trees/shrubs

2.3 Site-specific conservation objectives

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

A conservation objective has been set for Lough Ennell SAC for 7230 Alkaline fen, using attributes and targets based on parameters set out in the Habitats Directive. The restoration actions outlined by this restoration plan aim to contribute towards achieving these targets.

The conservation objective for 7230 Alkaline fen at Lough Ennell SAC is '*to maintain the favourable conservation condition of Alkaline fen in Lough Ennell SAC*'. The attributes and targets for 7230 Alkaline fen, along with how the FRP will contribute to achieving set targets, are set out in Table 2-4.

Table 2-4: Attributes and Targets for 7230 Alkaline fen 7230 (NPWS, 2024)

Attribute	Measure	Target	Addressed by FRP	Will restoration actions contribute to achieving targets?
Habitat area	Hectares	Area stable or increasing, subject to natural processes	Yes	Yes. FRP actions are anticipated to sustain the current area of habitat designated within the SAC.
Habitat distribution	Occurrence	No decline, subject to natural processes	Yes	Yes. FRP actions will not result in a decline in distribution of fen habitat within the SAC. In fact, it will contribute to the increase of 7230 distribution.
Ecosystem function: soil nutrients	Soil pH and appropriate nutrient levels at a representative number of monitoring stops	Maintain soil pH and nutrient status within natural ranges	Yes	Yes. FRP actions will 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. FRP actions include water level monitoring to assess if drain blocking is required to improve or maintain the hydrology of fen habitat
Ecosystem function: hydrology - surface water flow	Flow direction	Maintain, or where necessary restore, as close as possible to natural or semi- natural drainage conditions	Yes	Yes. FRP actions include weir installation which will improve hydrology of fen habitat

Attribute	Measure	Target	Addressed by FRP	Will restoration actions contribute to achieving targets?
Ecosystem function: water quality	Water chemistry measures	Maintain appropriate water quality, to support the natural structure and functioning of the habitats	Yes	Yes The restoration measures seek to have a positive impact on the vegetation structure and composition of Alkaline fens 7230. Subsequently, all attributes should see a favourable shift towards their respective targets.
Community diversity	Abundance of variety of vegetation communities	Maintain variety of vegetation communities, subject to natural processes	Yes	
Vegetation composition: typical vascular plants	Percentage cover at a representative number of 2m x 2m monitoring stops	Maintain adequate cover of typical vascular plant species	Yes	
Vegetation composition: native negative indicator species	Percentage cover at a representative number of 2m x 2m monitoring stops	Cover of native negative indicator species at insignificant levels	Yes	
Vegetation composition: nonnative species	Percentage cover at, and in local vicinity of, a representative number of 2m x 2m monitoring stops	Cover of non-native species at insignificant levels	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 at insignificant levels	Yes	
Vegetation composition: soft rush and common reed cover	Percentage cover in local vicinity of a representative number of monitoring stops	Total cover of common reed (Phragmites australis) at insignificant levels	Yes	

Attribute	Measure	Target	Addressed by FRP	Will restoration actions contribute to achieving targets?
Physical structure: drainage	Percentage cover at, and in local vicinity of, a representative number of 2m x 2m monitoring stops	Area showing signs of drainage from heavy trampling, tracking or ditches at insignificant levels	Yes	
Physical structure: disturbed bare ground	Percentage cover in local vicinity of a representative number of monitoring stops	Cover of disturbed bare ground not more than 10%	Indirectly	

3 Land and Water

3.1 Desktop Study

3.1.1 Meteorological Conditions

Comprehending long-term meteorological trends is essential for guiding effective fen restoration strategies, especially regarding hydrological processes. In support of this objective, historical precipitation data over the past 30 years from the closest weather station, Mullingar, has been compiled to assess long-term rainfall patterns and seasonal variability in rainfall at the site and surrounding areas (Met Eireann, 2025).

Two datasets were visualised: (1) average annual precipitation (mm), illustrating long-term rainfall trends across a 30-year period (Figure 3-1), and (2) average monthly precipitation, highlighting seasonal distribution patterns over a 30-year-period (Figure 3-2). These data are essential for assessing water availability and evaluating the feasibility and sustainability of restoration initiatives designed to establish or maintain appropriate hydrological conditions.

Over the past 30 years, average annual precipitation has fallen, ranging from 101 mm in 2002 to 61mm in 2003 (Figure 3-1). Maximum yearly rainfall shows a general upward trend and greater variability since 1994, indicating more unpredictable weather. Minimum yearly precipitation also increased modestly since 1994 with higher variability in the last decade, though less so than maximum values.

The average monthly rainfall is highest in the winter months (October to January) and lowest in late spring (April and May) (Figure 3-2). Minimum rainfall follows the same pattern, but maximum monthly rainfall rises significantly in winter.

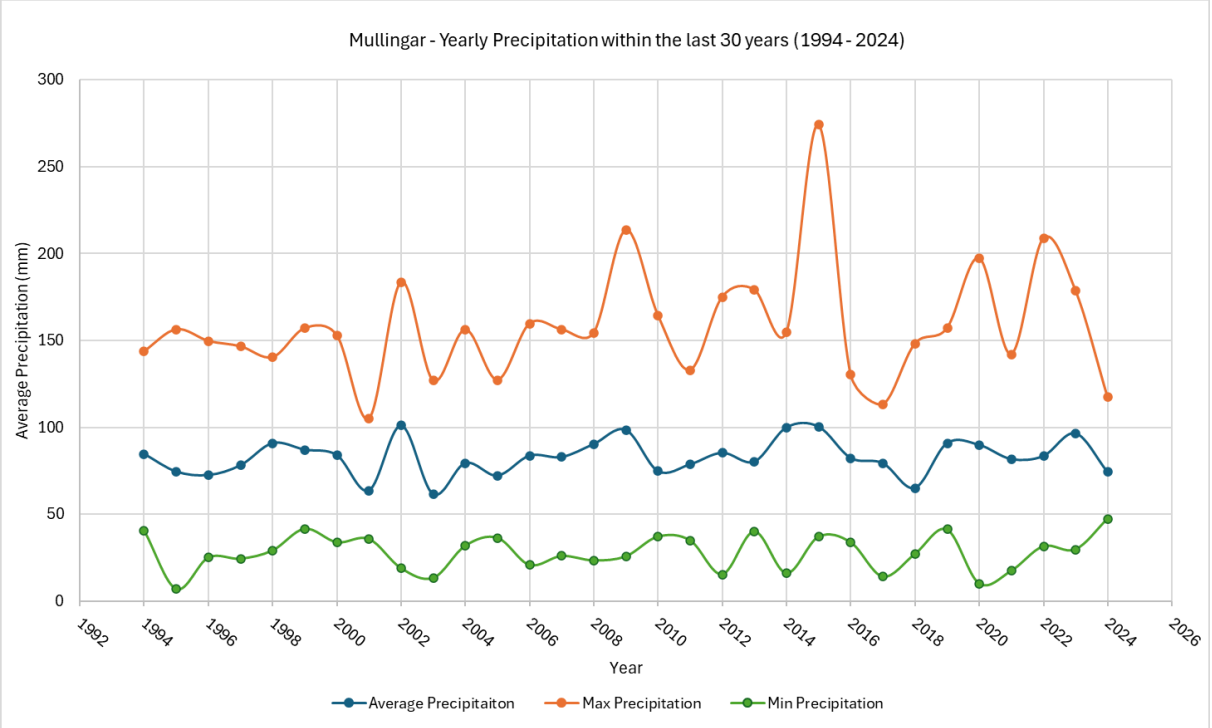


Figure 3-1: Mullingar weather station – (1) average, (2) maximum, and (3) minimum yearly precipitation from 1994 to 2024

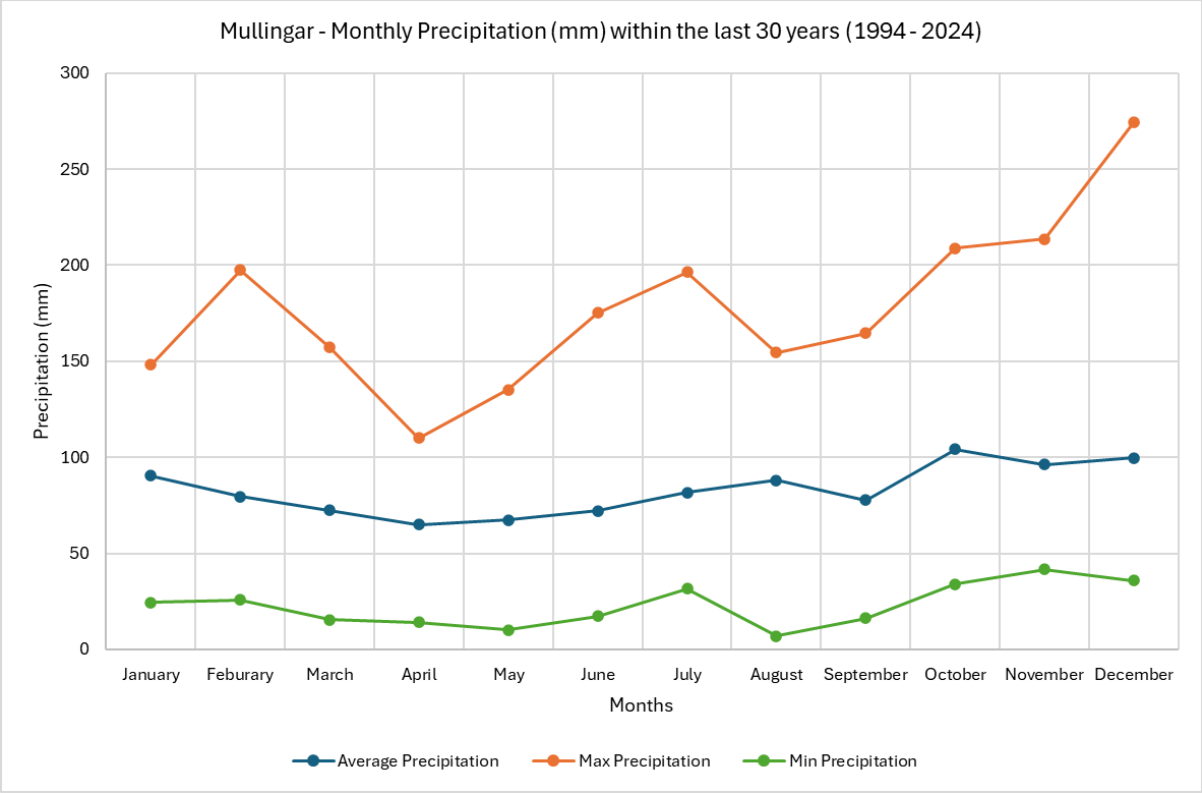


Figure 3-2: Mullingar weather station - (1) average, (2) maximum, and (3) minimum monthly precipitation from 1994 to 2024

3.1.2 Hydrogeological Setting

The GSI's Bedrock Geology mapping indicates that the two sites within the Lough Ennell SAC are underlain by the Lucan Formation, described as a dark limestone and shale. The two site areas belong to the Dinantian Upper Impure Limestones rock unit group (Figure 3-3).

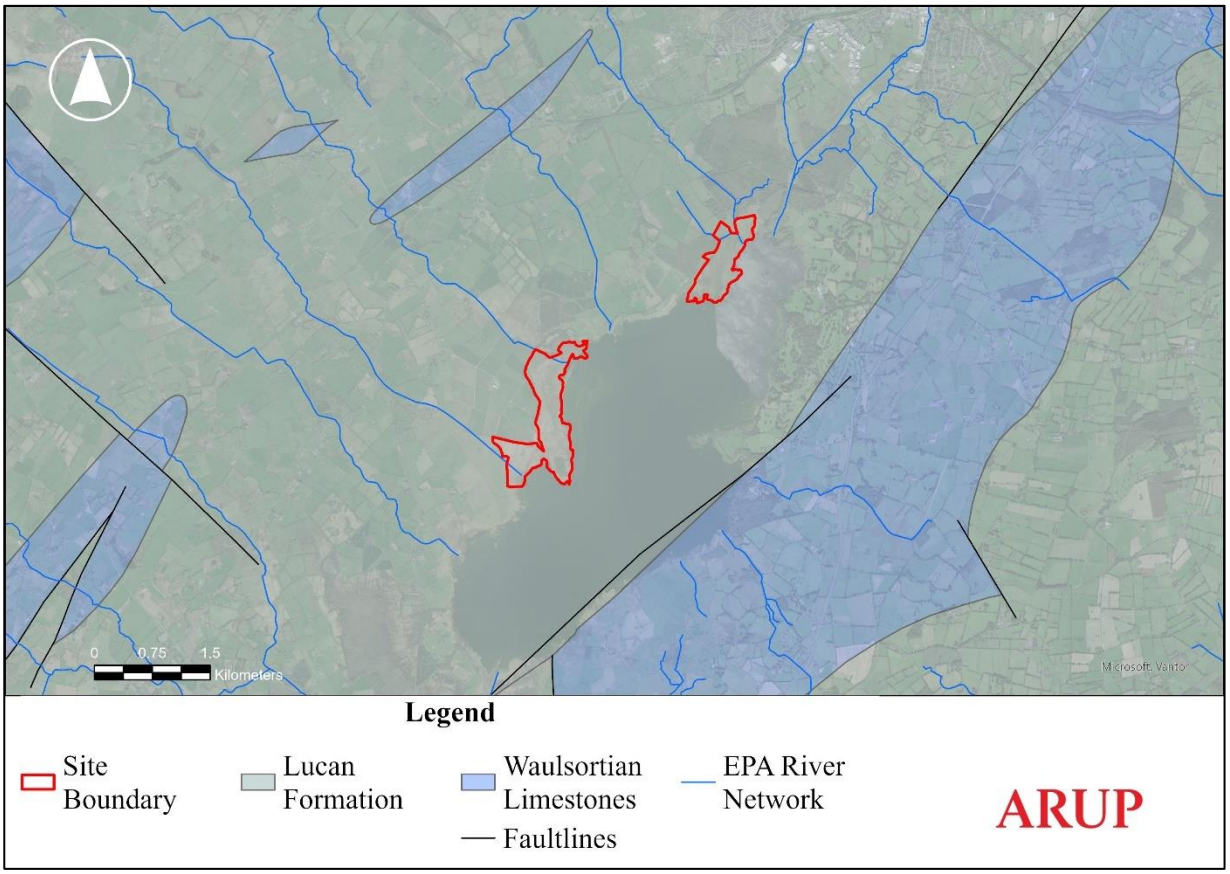


Figure 3-3: Bedrock Geology of Lough Ennell SAC- Dysart and Ladestown

The GSI Bedrock Aquifer mapping shows the area is underlain by a Locally Important Aquifer, which is moderately productive only in local zones. There are no gravel or karst aquifers adjacent or surrounding the site (Figure 3-4). The GSI Quaternary mapping shows Dysart is underlain by Lacustrine sediments and Ladestown is underlain by Fen Peat (FenPt). A small area of gravel sits within and to the south of Ladestown boundary, while Till derived from limestones surrounds both Ladestown and Dysart (Figure 3-5).

The GSI Groundwater Vulnerability mapping shows the two sites are classified as Low Vulnerability, with some small areas of High Vulnerability in Ladestown, and some areas of Moderate vulnerability in Dysart and Ladestown (Figure 3-6 and Figure 3-7).

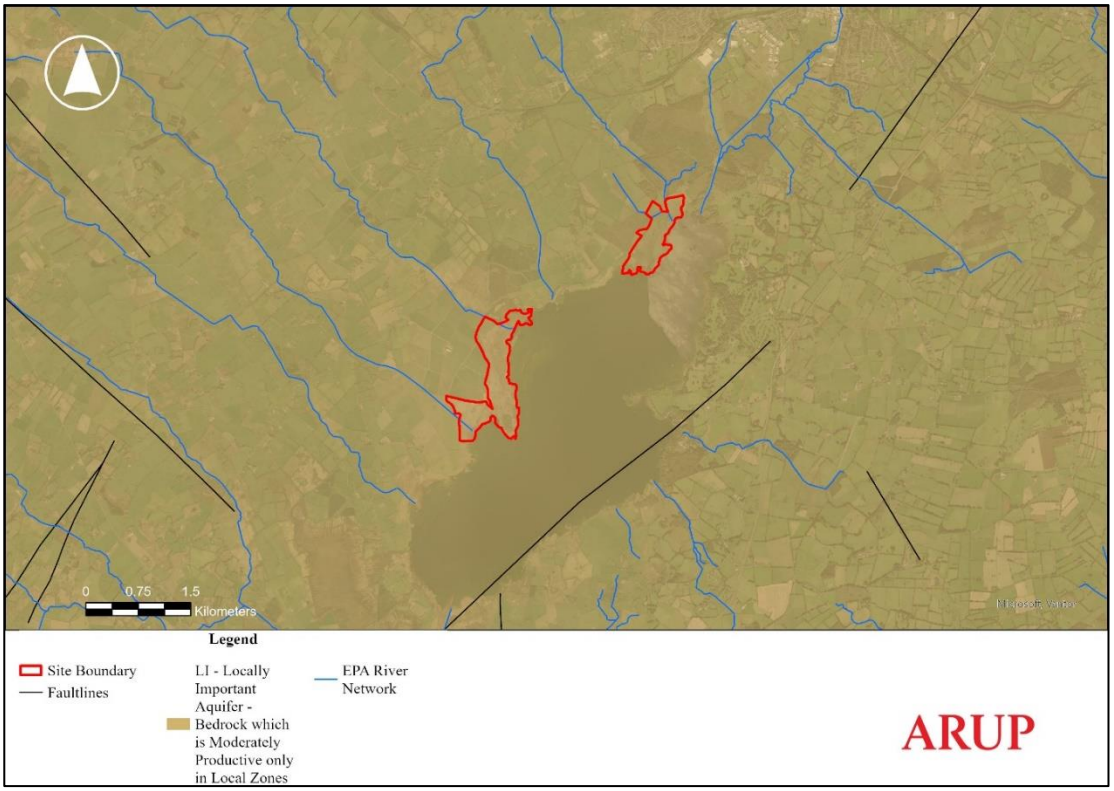


Figure 3-4: Aquifer classification and karst underlying Lough Ennell SAC – Dysart and Ladestown

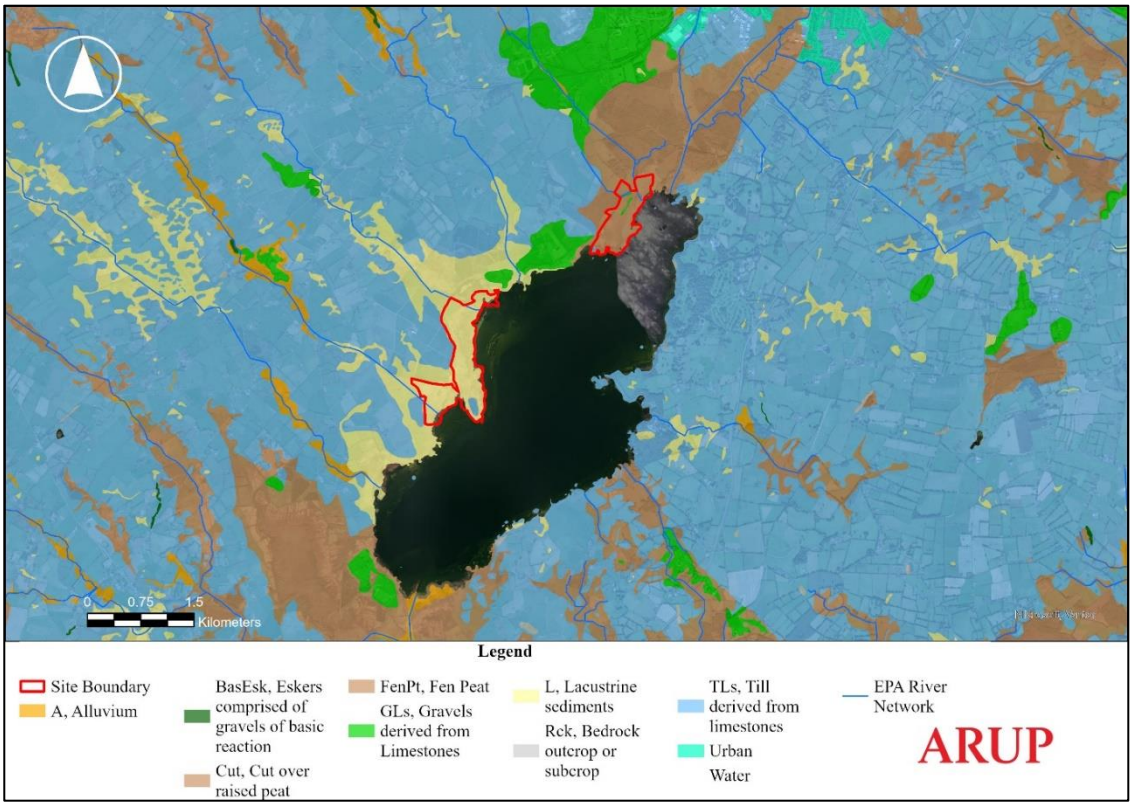


Figure 3-5: Sub-soil type underlying Lough Ennell SAC – Dysart and Ladestown (Source: GSI Quaternary map)

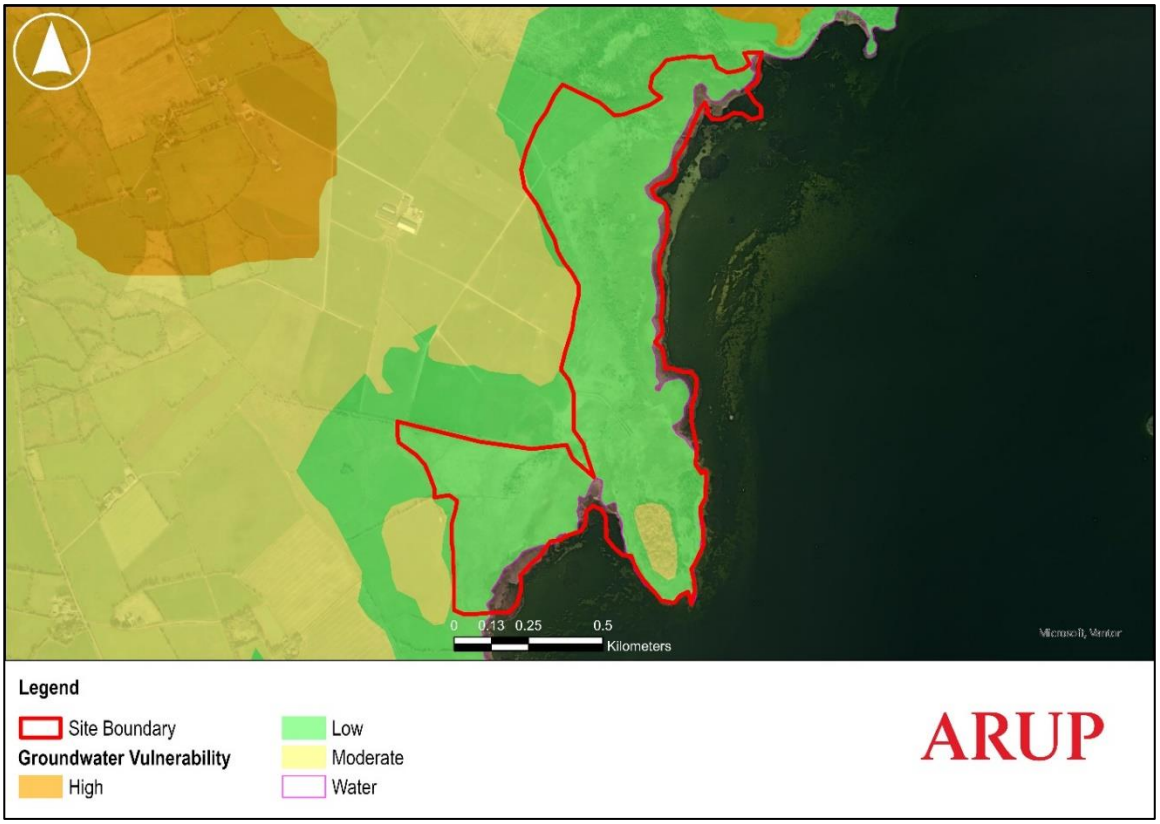


Figure 3-6: Groundwater vulnerability map for Lough Ennell SAC – Dysart (Source: GSI)

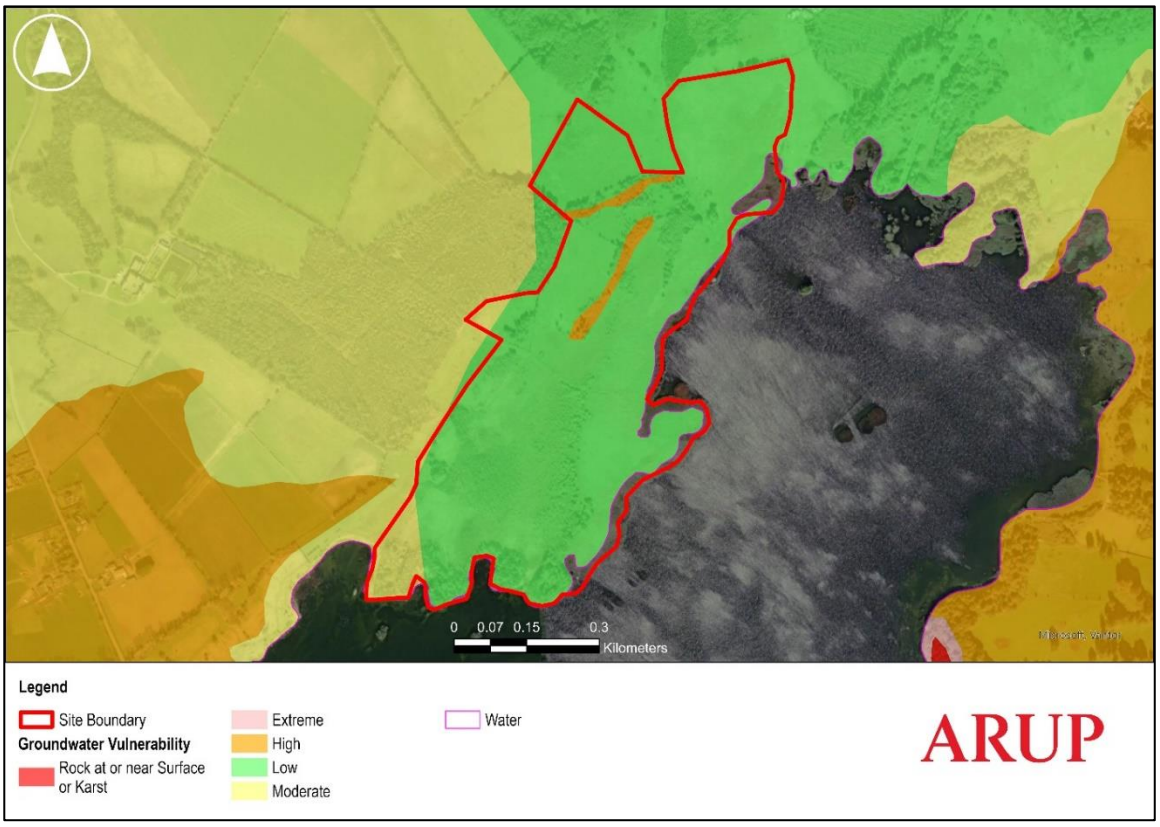


Figure 3-7: Groundwater vulnerability map for Lough Ennell SAC – Ladestown (Source: GSI)

3.1.3 Topographic and Surface Water Drainage

The sites are located within the 25A Lower Shannon WFD Catchment, Brosna_SC_010 WFD sub catchment and WFD sub-basin: Brosna_SC_040 (Figure 3-8) . Brosna_010 sub catchment area is 41.78 km^2 with the main lake being 12.5 km^2. Barrettstown stream flows through Dysart towards Lough Ennell and Brosna Branch West and Kilpatrcik_25 streams flow through Ladestown towards Lough Ennell. The River Brosna flows into the lake from the north at Butler's Bridge, and out from the south. The River Brosna continues flowing south connecting with the Shannon river which flows into Lough Derg.

The Brosna_SC_040 WFD River waterbody is classed at 'moderate' status and 'at risk' of not achieving its WFD objective. The Ennell WFD lake waterbody is classed at 'good' and is achieving its WFD objective. Both the river and lake waterbodies are targeted for restoration under LAWPRO. This has been addressed through the development of the Lough Ennell catchment management plan (Lauder and LECMP partners, 2025).

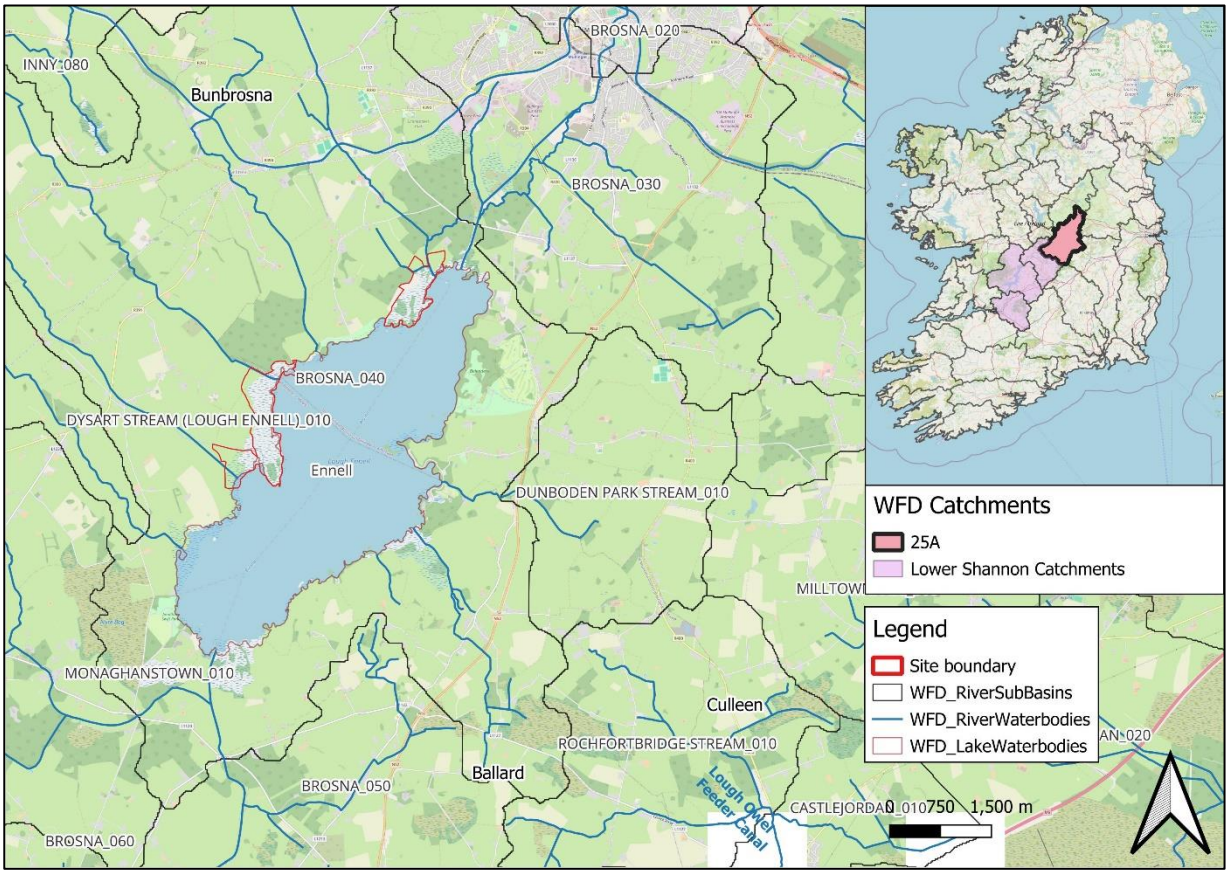


Figure 3-8: WFD Catchment and River sub-basin (EPA, 2025)

3.1.3.1 Dysart

Analysis of historical maps reveals that between 1829 and 1913, the lake level was higher than it is today, with open water depicted within the site boundaries. An arterial drain exists in the northern (Canal C39 (1)) and southern (Canal C38 (1)) areas of the site, directing water towards

the lake and flowing from the northwest. These arterial drains are part of the East Region Brosna Scheme. No springs were observed in the historical maps discharging into Canal 38; however, a spring was located west of site and discharges into canal 39. Dysart Island, now no longer an island, is situated in the southern part of the site. Also, according to the historical map the site is liable to flooding. This is mapped in Figure 3-9. These drains were further identified using Lidar data (Figure 3-10).

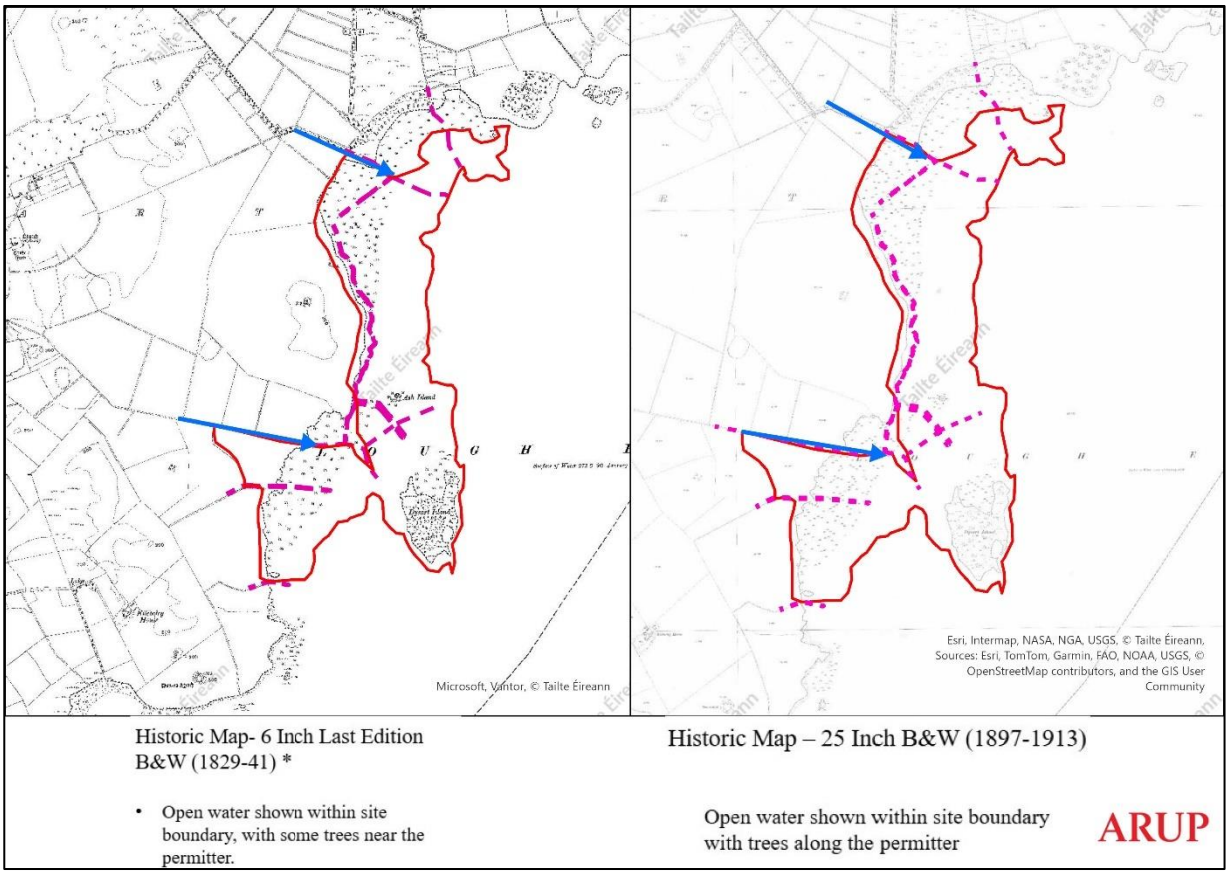


Figure 3-9: Historical water distribution and retention within Dysart wetland (Tailte Éireann Historical mapping)

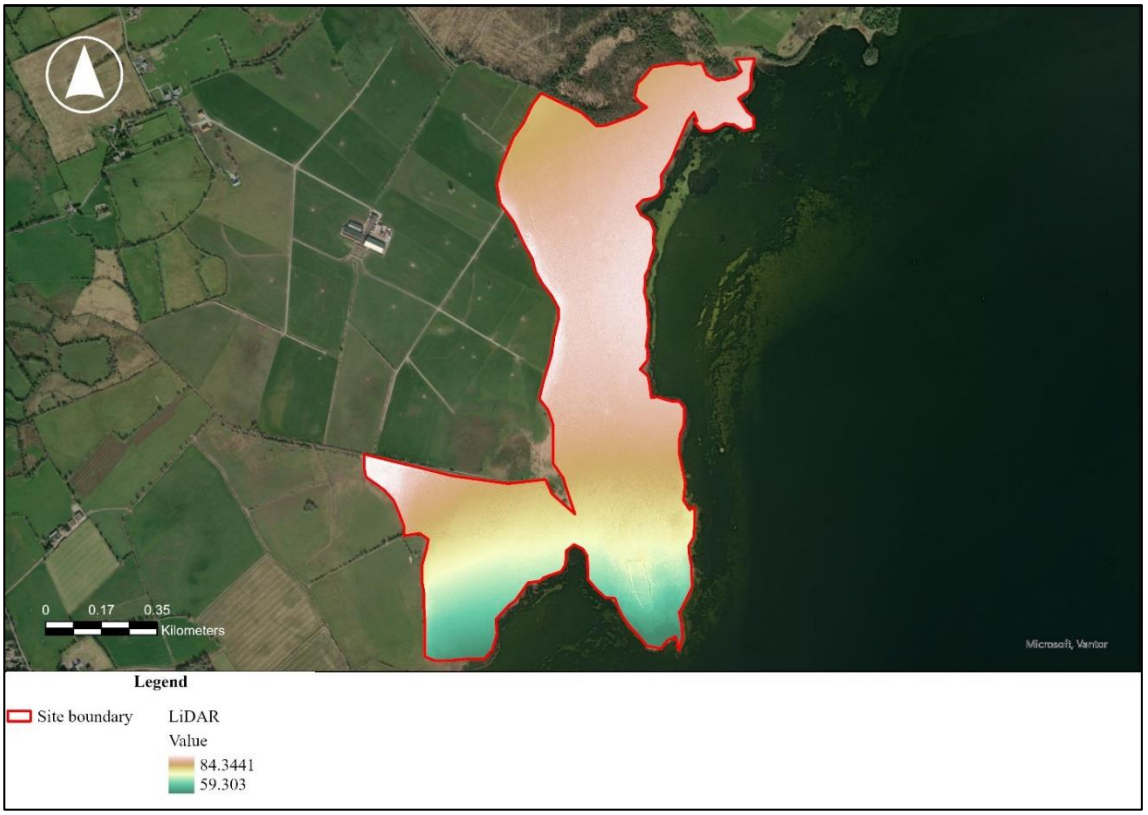


Figure 3-10: Topographic (LiDAR) map of Dysart – Lough Ennell SAC



Figure 3-11: Orthophoto of Dysart - Lough Ennell SAC

The mapped Wetness Index classifies majority of Dysart near the lake as permanently wet, and some areas, close to the western and northwestern perimeter of the site, as temporarily wet. This indicates the fen is hydraulically connected to the lake and groundwater system, with some areas receiving constant groundwater inflow (permanently wet), while others are only seasonally saturated due to fluctuations in the water table or lake levels (temporarily wet). This map is shown in Figure 3-12.

The mapped Total Productivity of the Dysart site indicates that majority of the site is highly productive, with small areas of low productive close to the site boundary. This further illustrates the site's hydrological variation. This is mapped in Figure 3-13.

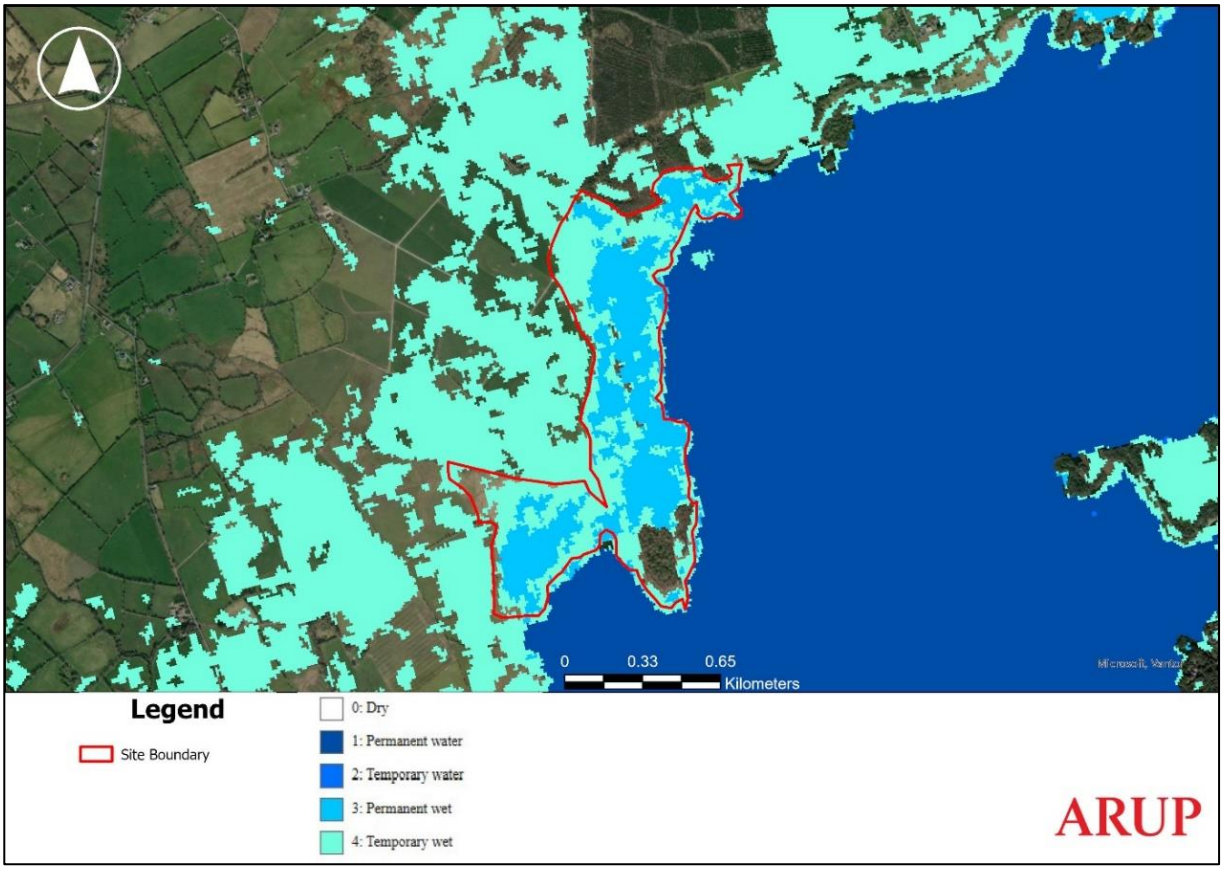


Figure 3-12: HRL Water and Wetness 2018 – Dysart (Copernicus, 2025)

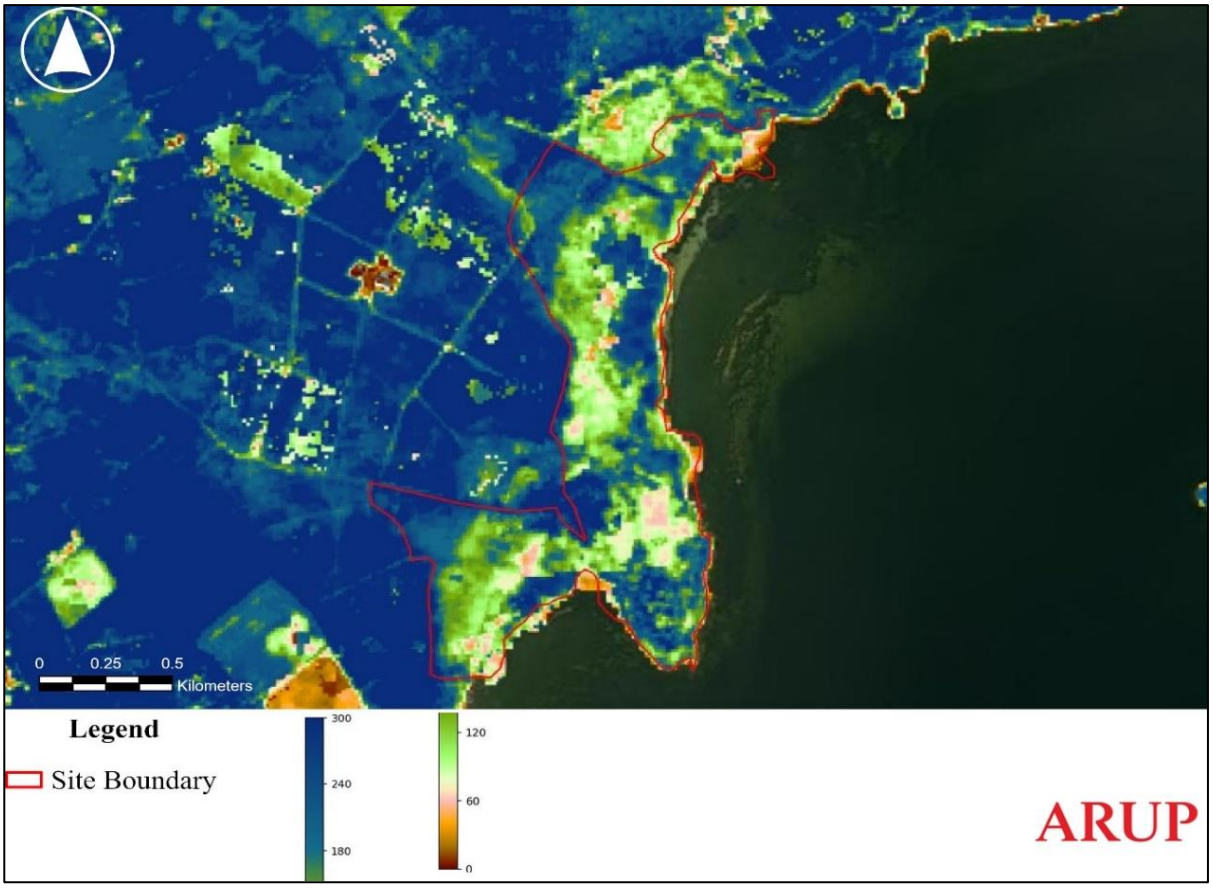


Figure 3-13: Total Productivity 2017 -present, Europe – Dysart (Copernicus, 2025)

The main drainage feature of Dysart is the arterial drainage channel to the northwest, and the arterial drainage to the southwest. Both of these drains are flowing into the site, towards Lough Ennell (Figure 3-14).

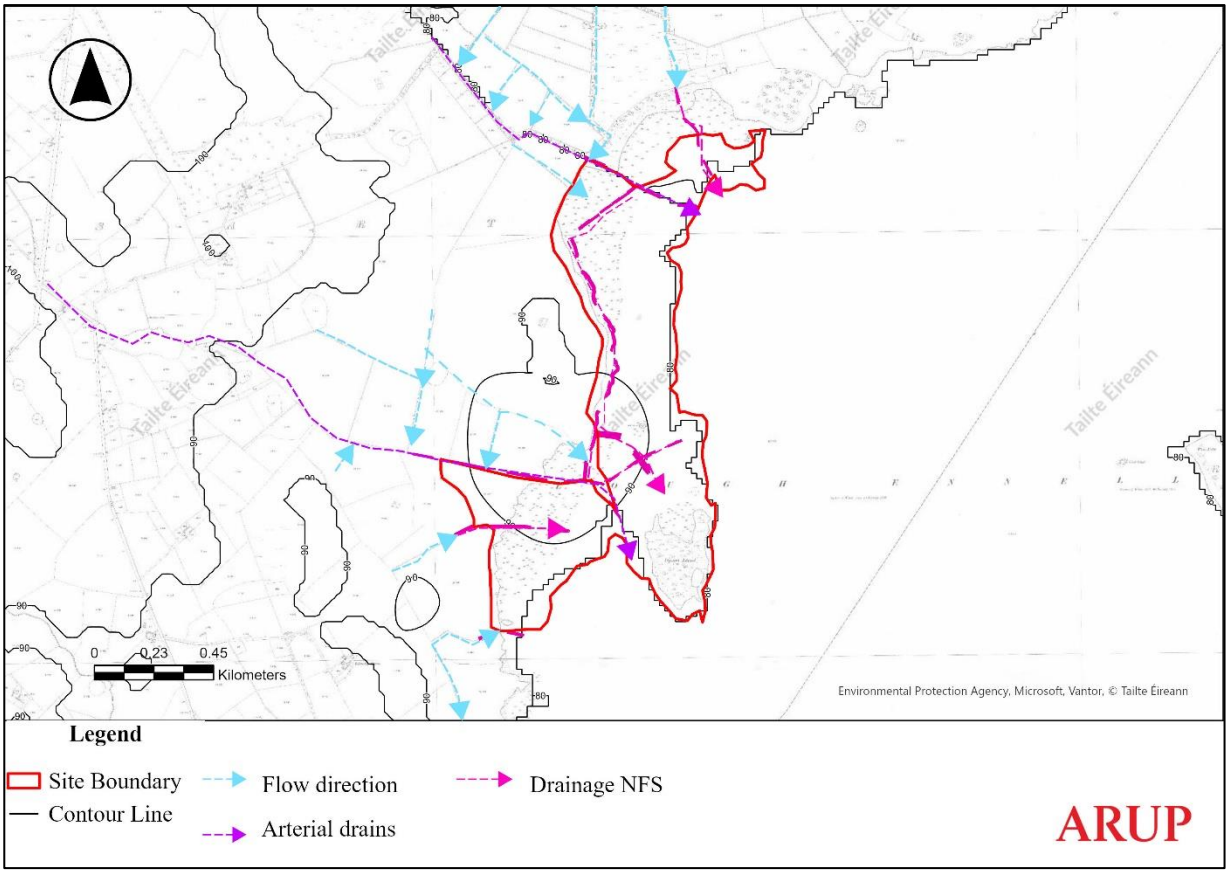


Figure 3-14: Mapped drainage network of Dysart

3.1.3.2 Ladestown

Historical maps show that the lake level was higher between 1829-1913, with open water within the site boundary. The River Brosna flows north to Lough Ennell, connecting with arterial drain C41(1) from the northwest—part of the East Region Brosna Scheme. Perimeter drains along the western boundary are visible on maps from both periods. The 1897-1913 map indicates a small area near Ladestown prone to flooding. A spring is located to the west of the site and discharges into Canal 41. A forest is located west of the site. Also, according to the historical map the site is liable to flooding (Figure 3-15). These drains were further confirmed using Lidar data (Figure 3-16).

The topography within the Ladestown site ranges from approximately 85 mOD to the open water of Lough Ennell at about 77 mOD.

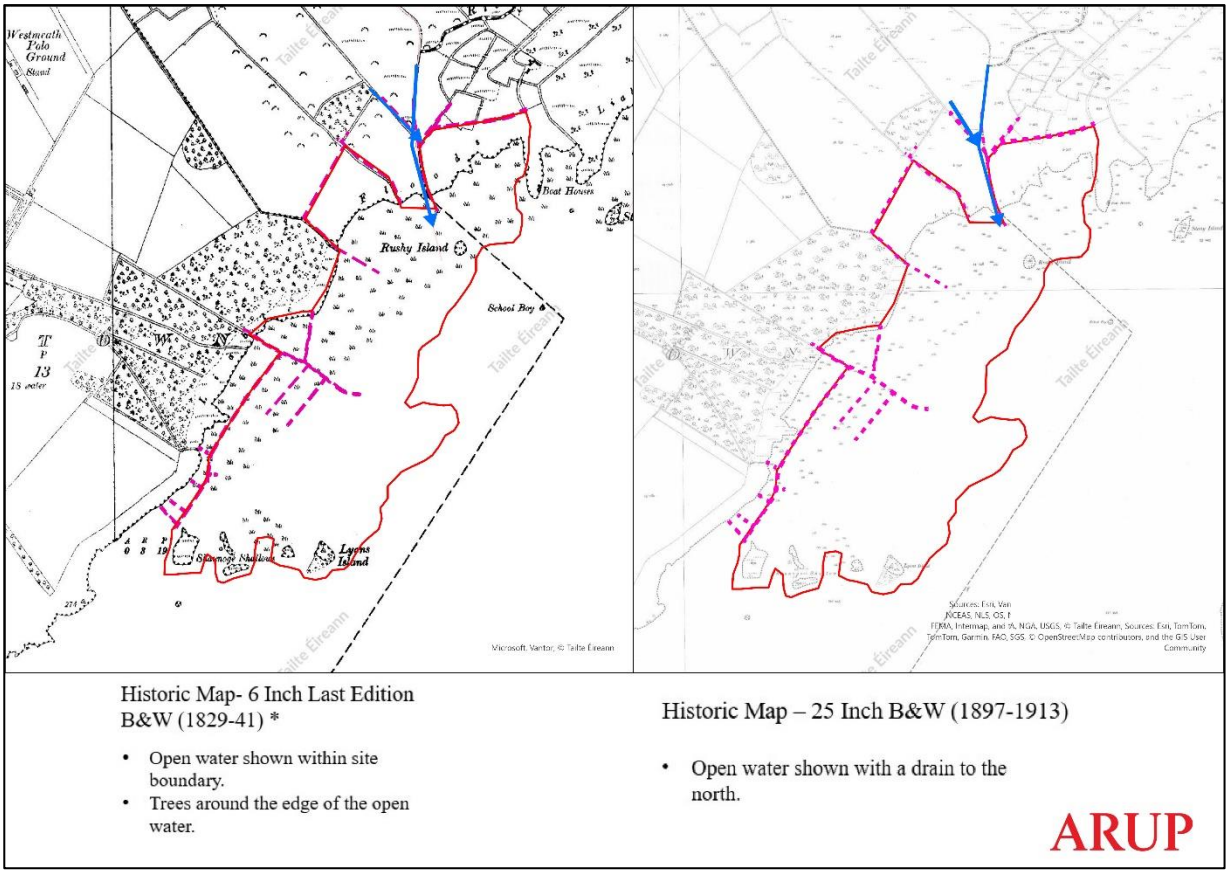


Figure 3-15: Historical water distribution and retention within Ladestown wetland (Tailte Éireann Historical mapping)



Figure 3-16: Topographic (LiDAR) map of Ladestown – Lough Ennell SAC



Figure 3-17: Orthophoto of Ladestown - Lough Ennell SAC

The mapped Wetness Index classifies majority of the Ladestown site near the lake as temporarily wet and some areas, in the northern and central areas of the site, as permanently wet. This indicates that flooding still occurs on site, which was highlighted on the historical maps. This map is shown in Figure 3-18.

The mapped Total Productivity of Ladestown site indicates that majority of the site is highly productive, with small areas of low productive close to the site boundary. This further illustrates the site's hydrological variation. This is mapped in Figure 3-19.

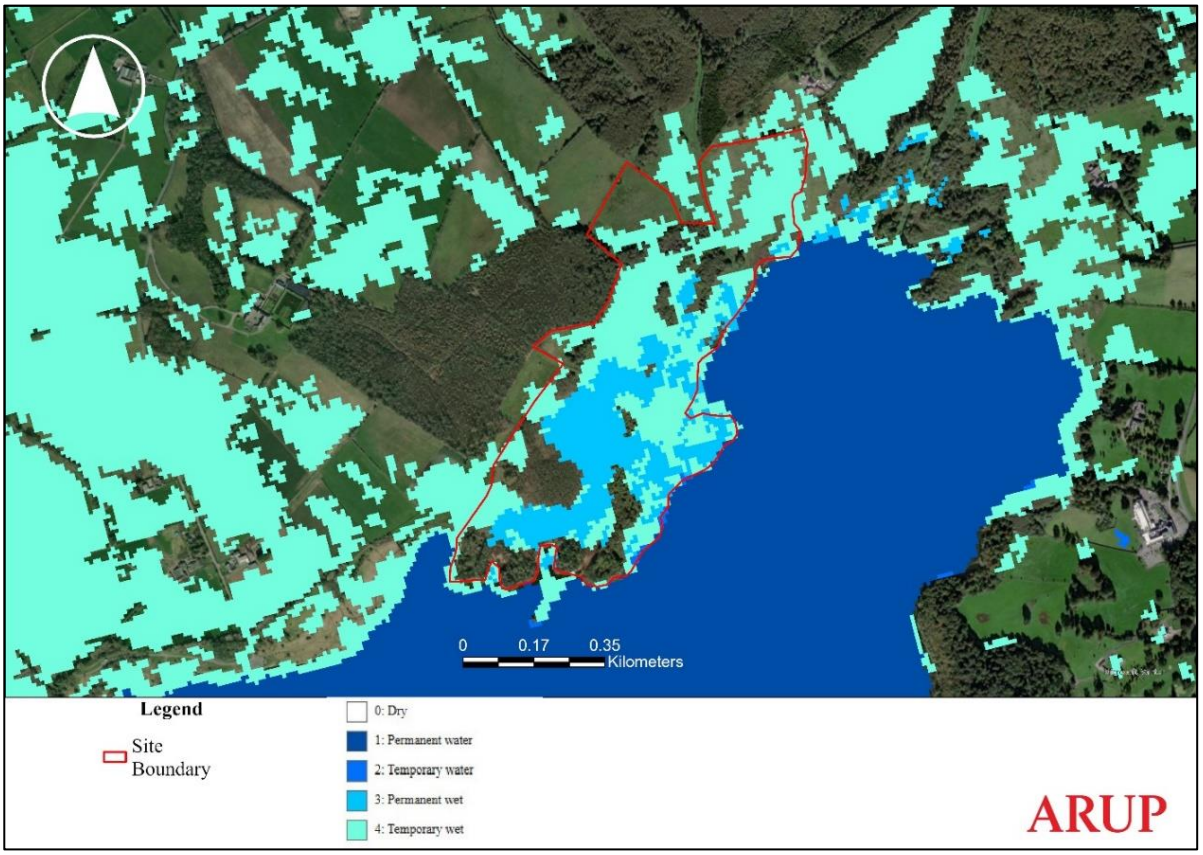


Figure 3-18: HRL Water and Wetness 2018 of Ladestown (Copernicus, 2025)

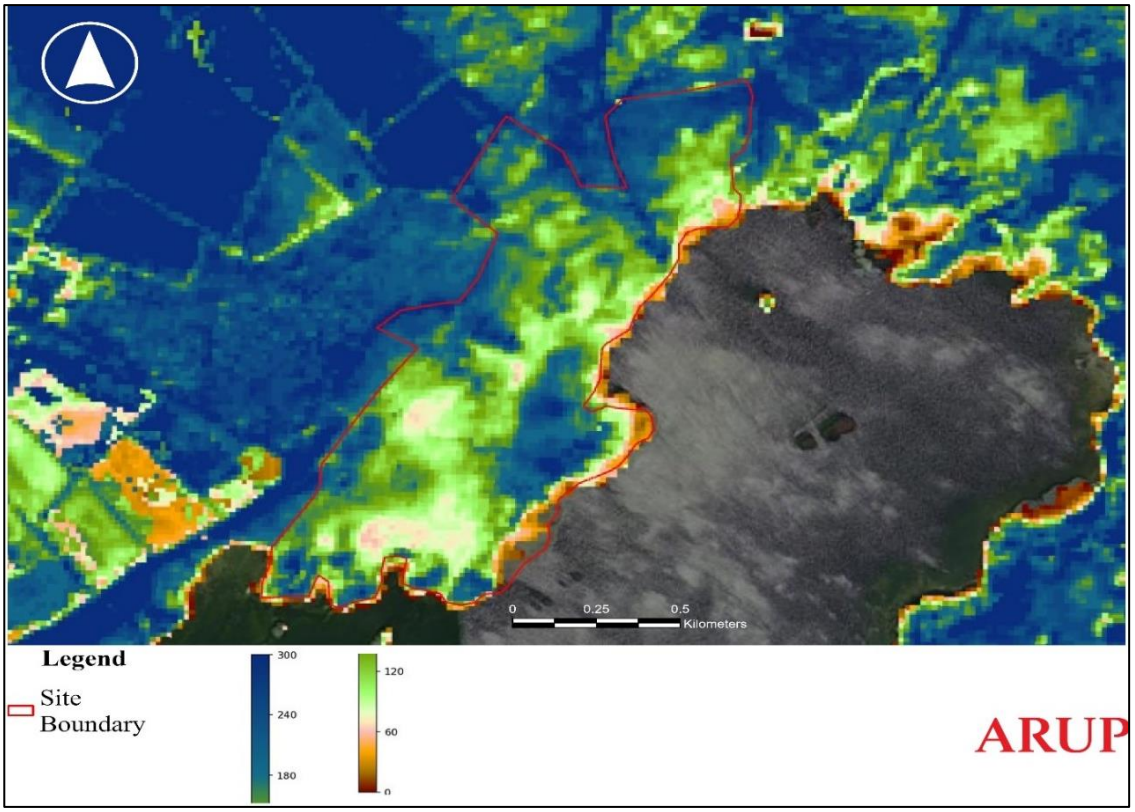


Figure 3-19: Total Productivity 2017 -present, Europe – Ladestown (Copernicus, 2025)

The main drainage feature of Ladestown is the arterial drainage channel to the northwest. This drain connects with the River Brosna and flows into the site, towards Lough Ennell (Figure 3-20).

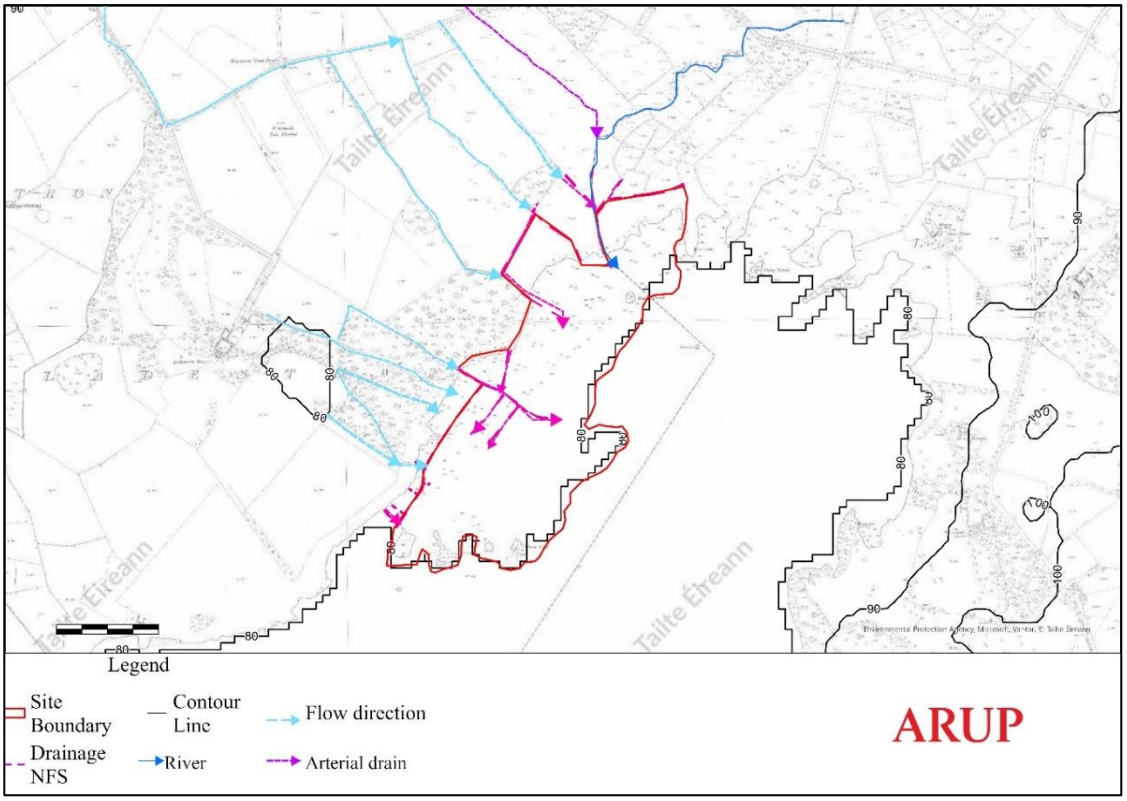


Figure 3-20: Mapped drainage network of the Ladestown site

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.

3.1.4.1 Dysart

High risk areas for phosphorus loss typically have poorly draining soils and dominant overland flow pathways. The PIP map indicates that phosphorus delivery flow paths across the site range from medium to very high throughout the site. The PIP-Phosphorus map shows that the site is classified as high risk, with surrounding areas also classifying at high risk (Figure 3-21). There are potential preferential pathways identified with in the site which may provide a pathway towards the fen.

Freely draining soils and subsurface groundwater pathways are high risk for nitrate losses. Dysart is classified as very low risk for nitrate in near surface pathways (Figure 3-22) and sub-surface pathways (Figure 3-23) in the southern area of the site. A small area of low risk for nitrate near surface pathways is also in the southern area of the site.

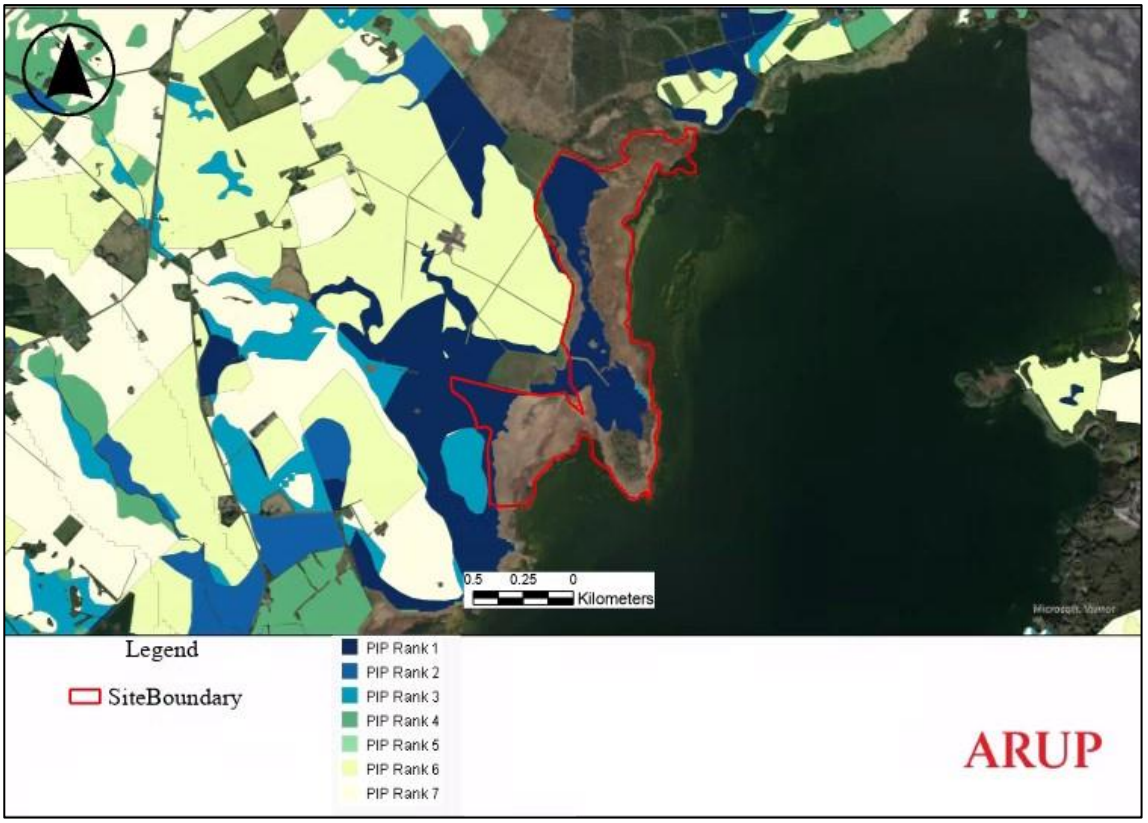


Figure 3-21: Pollution Impact Potential – Phosphorous for Dysart

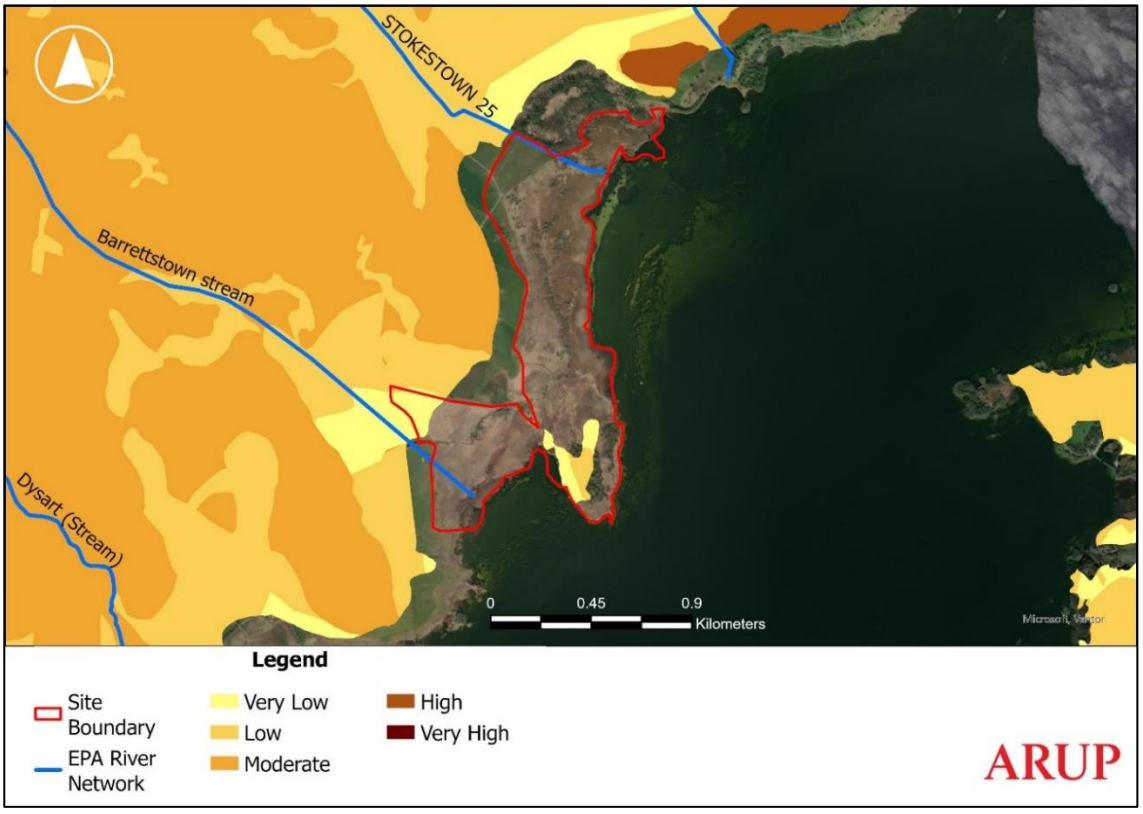


Figure 3-22: Pollution Impact Potential – Near surface Nitrate (PIP- N) at Dysart (EPA, 2025)



Figure 3-23: Pollution Impact Potential – Sub-surface Nitrate (PIP- N) at Dysart (EPA, 2025)

3.1.4.2 Ladestown

High risk areas for phosphorus loss typically have poorly draining soils and dominant overland flow pathways. The PIP map indicates that phosphorus delivery flow paths across the site range from medium to high risk, throughout the site. The PIP-Phosphorus map shows that the site is classified as low risk, with surrounding areas also classifying at low risk (Figure 3-24).

Freely draining soils and subsurface groundwater pathways are high risk for nitrate losses. Within the site boundary there is very low risk for nitrate in near surface pathways (Figure 3-25) and sub-surface pathways (Figure 3-26).. Surrounding the site the near surface pathways range from very low to moderate, while the sub surface pathways surrounding the site range from very low to low.

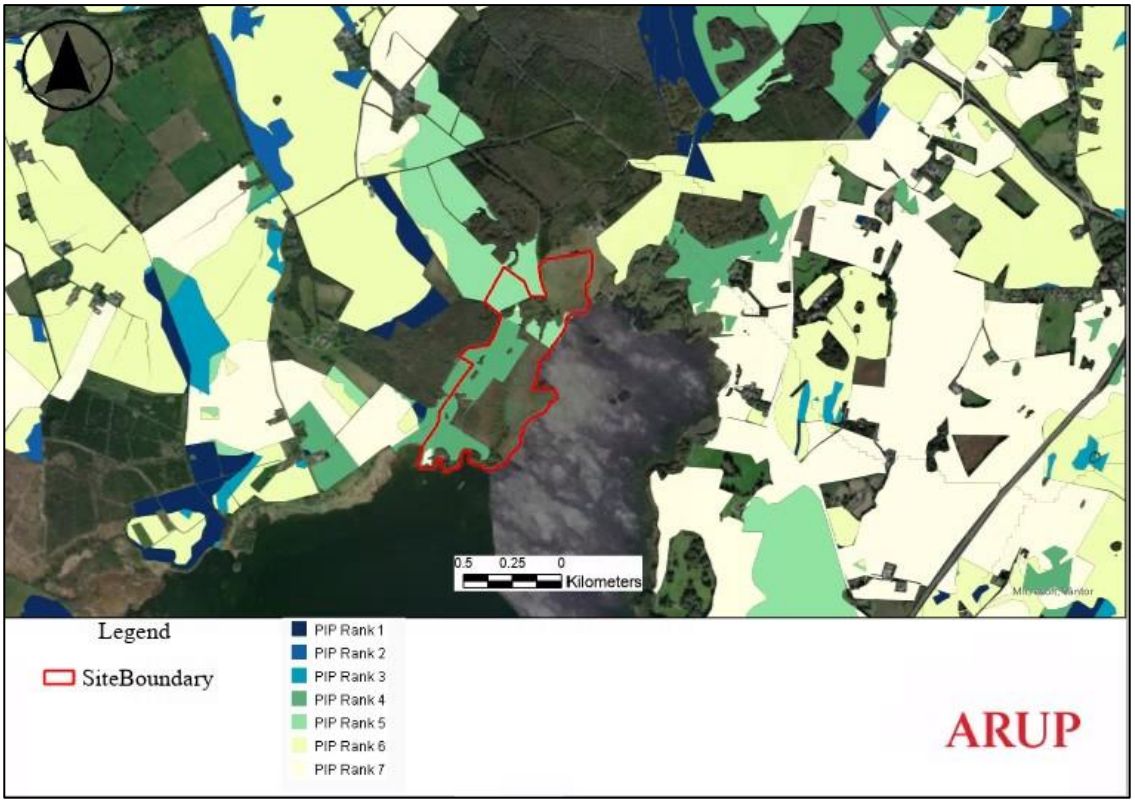


Figure 3-24: Pollution Impact Potential – Phosphorous for Ladestown

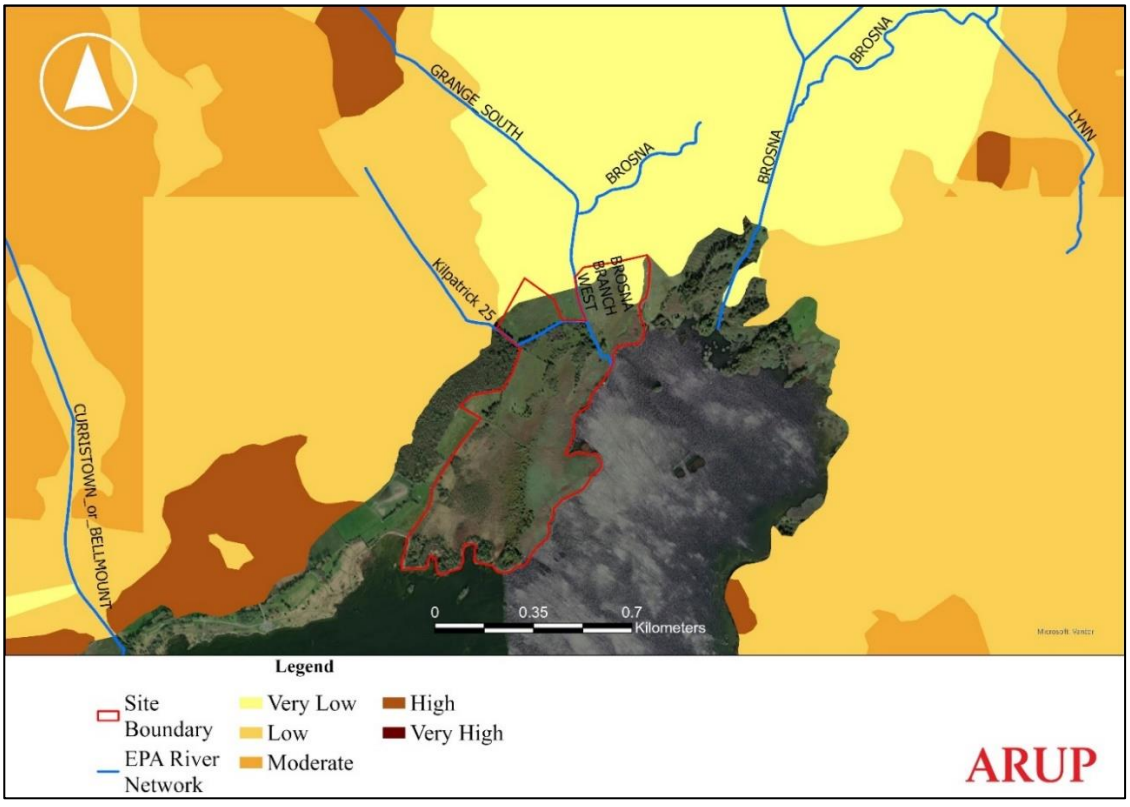


Figure 3-25: Pollution Impact Potential – Near surface Nitrate (PIP- N) at Ladestown (EPA, 2025

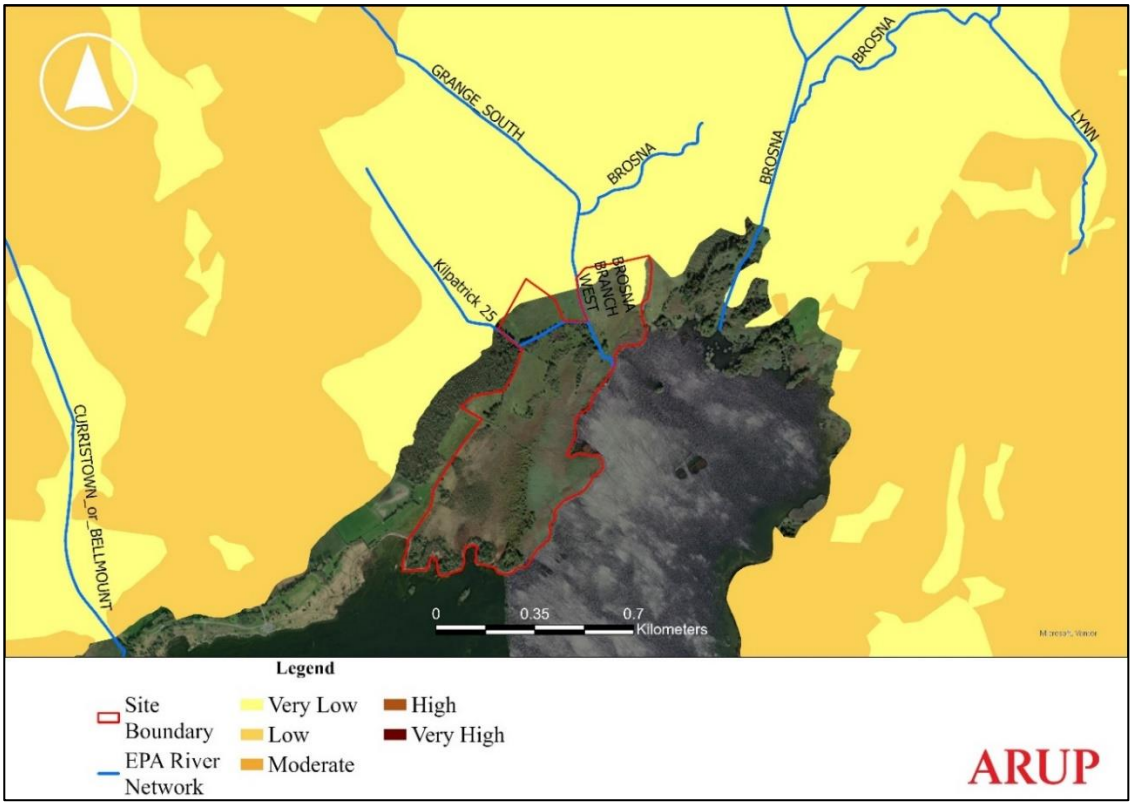


Figure 3-26: Pollution Impact Potential – Sub-surface Nitrate (PIP- N) at Ladestown (EPA, 2025)

3.2 Field Survey

Site monitoring was undertaken in February 2026, focusing on developing the understanding of the water regime, pressures and implementation of restoration measures within the habitat. The site monitoring included peat depth probing, water quality monitoring, and observations of water flow in the drainage network.

Water quality data were collected across multiple areas within and around the site, including fens, transition mires, wet grasslands, and associated watercourses. The parameters recorded included pH, electrical conductivity (EC), temperature, dissolved oxygen (DO), nitrate, and phosphate. Peat depths were probed to assess substrate characteristics.

Monitoring locations for the 2026 site surveys for Dysart and Ladestown are shown in Figure 3-27 and Figure 3-28.



Figure 3-27: Monitoring locations (1-10) at Dysart

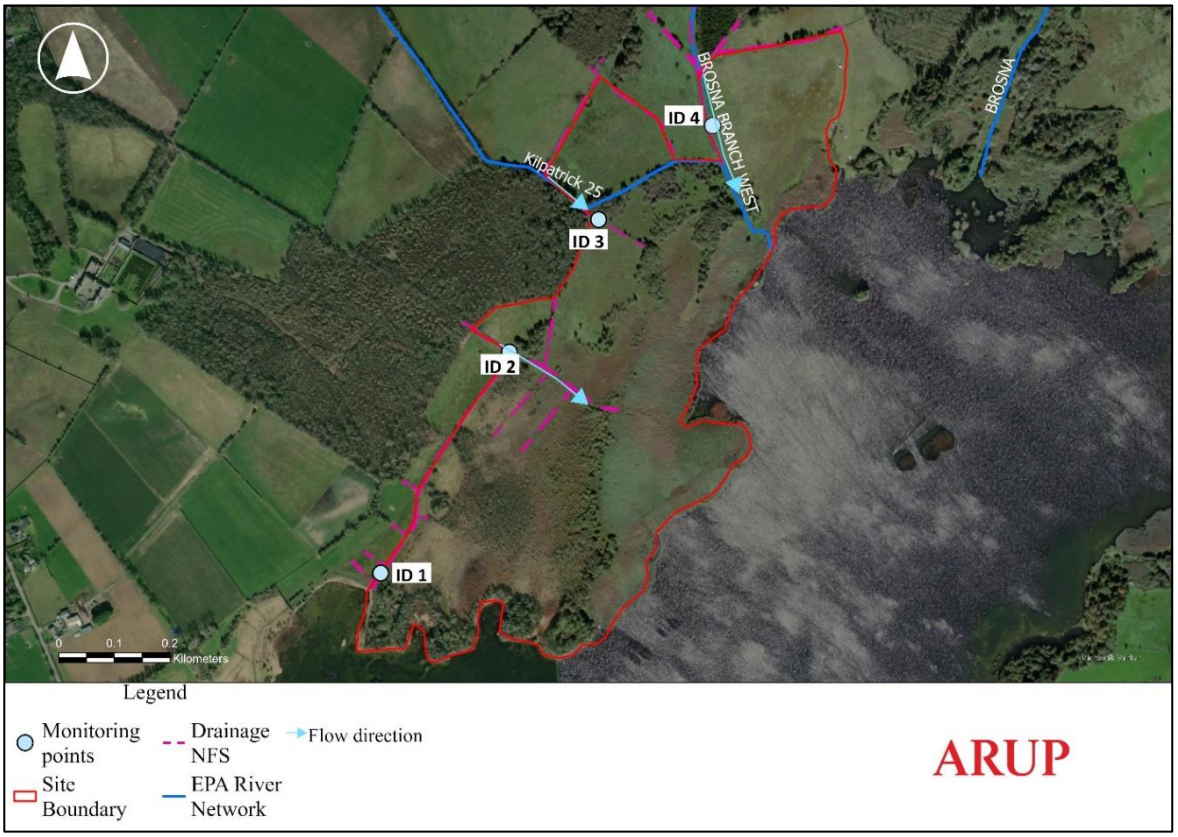


Figure 3-28: Monitoring locations (1-4) at Ladestown

3.2.1 Peat Depth Probing and Ground Investigations

3.2.1.1 Dysart

Peat depth was recorded as part of the Scoping Study and Pilot Survey of fens undertaken on the 19th and 20th of June 2023 (Brophy et al., In prep). Peat depth across the site ranged from 5cm to 100cm, however the spatial locations of the peat depth measurements were not provided.

During the 2026 site survey the peat depth near the arterial drain (i.e. Barrettstown stream) located in the southern section was measured as 4.2m. This depth of peat is reflective of the depositional history of the area. Peat depth was measured around a road that the local farmer uses to access Dysart Island. Historically this area would have been lakebed and therefore have a lower elevation than surrounding land. The road has two drains either side. The peat depth surrounding these drains were shallow at 0.75m with areas of rock at the surface. The historical lakeshore from the north to the south of the site is currently presenting as a shallow drain. The peat depth ranges from 0.3-0.5m. Peat depth was deeper in the northern area of the fen, measuring 2m near the northern arterial drain (i.e. Strokestown 25).

Peat depth locations at Dysart are mapped in Figure 3-29.

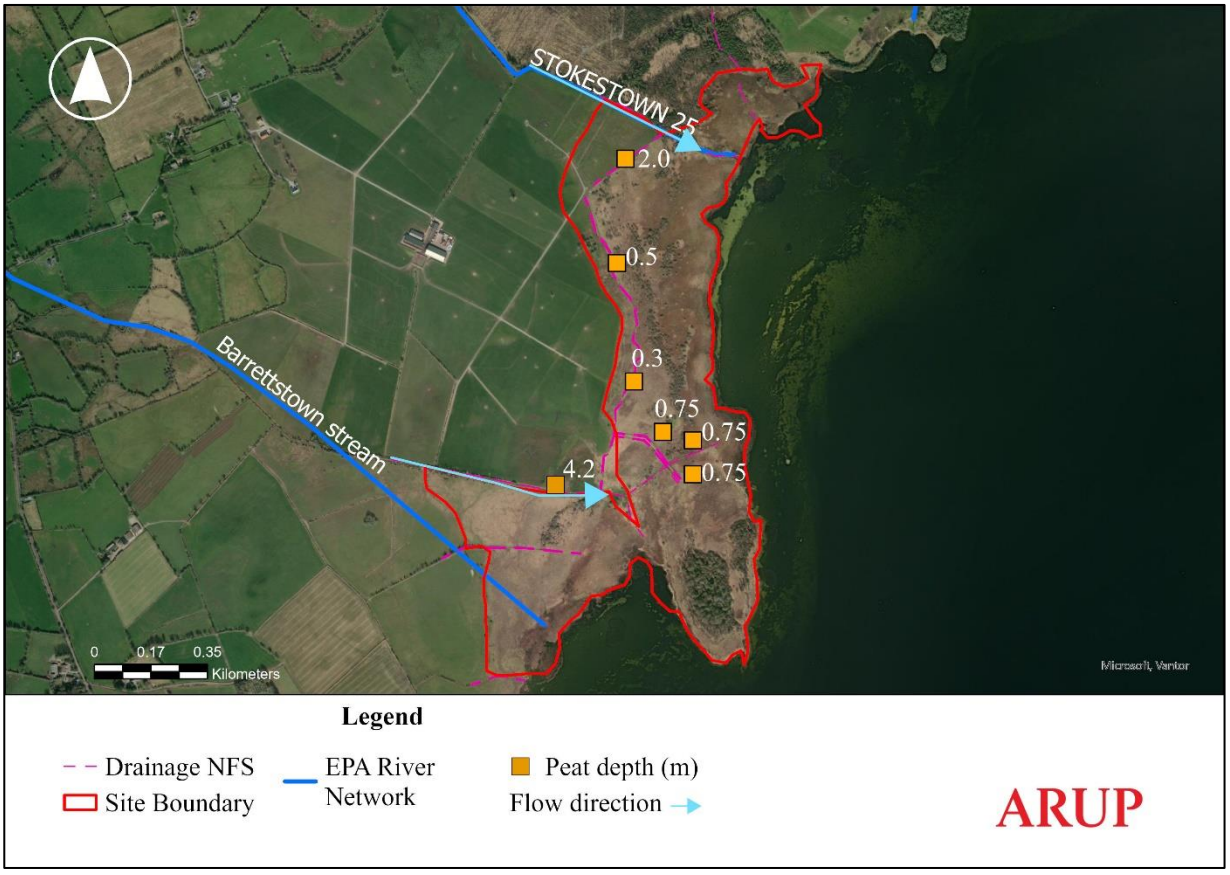


Figure 3-29: Peat depth (m) at Dysart

3.2.1.2 Ladestown

Peat depth was recorded as part of the Scoping Study and Pilot Survey of fens undertaken on the 5th and 6th of July 2023 (Brophy et al., In prep). Peat depth across the site ranged from 0.12m to 0.52m, however the spatial locations of the peat depth measurements were not provided.

During the 2026 site survey peat depth was measured along a drain in the west (0.9m) (i.e. Kilpatrick 25) and a forestry drain in the northwest (0.95m). Peat depth was observed as shallow in the centre of the site, ranging from at 0.05m – 0.15m. Limestone boulders were observed at the surface, indicative that the bedrock may be shallow. A drain was observed in the southern area where a culvert was located. The depth was shallow at 0.3m. Peat depth was taken around the arterial drain located in the north (i.e. Brosna Branch West) which was 1m deep.

Peat depth locations for Ladestown are mapped in Figure 3-30.

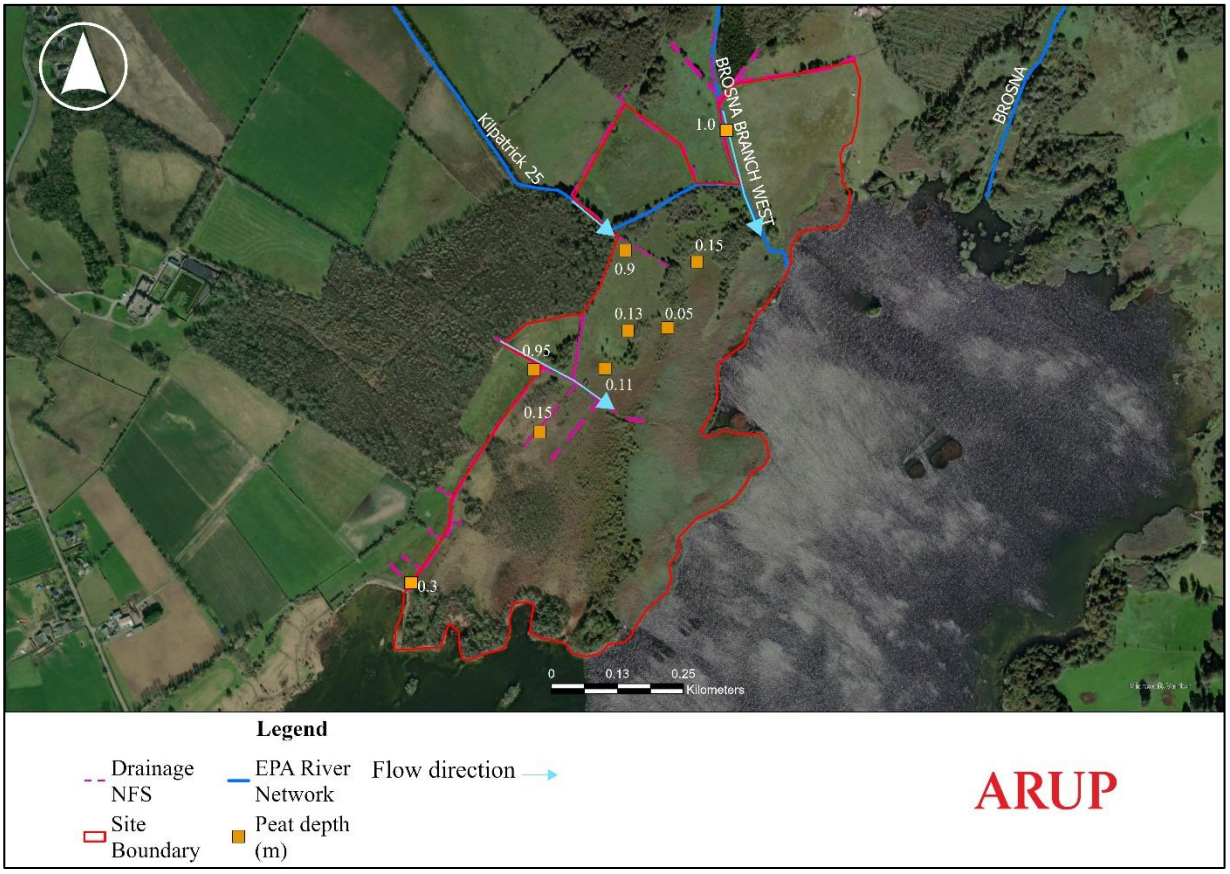


Figure 3-30: Peat depth (m) at Ladestown

3.2.2 Groundwater Levels and Springs

No springs or surface flushes were observed within the Dysart or Ladestown sites during the site walkovers.

3.2.3 Water Quality

Water quality monitoring indicates spatial variability and identifies potential sources of nutrient enrichment throughout the site, with elevated concentrations particularly noted in areas adjacent to agricultural activities and livestock.

3.2.3.1 Dysart

Phosphate concentrations (PO_4) vary across the site, with some measurements exceeding the 'good' status environmental quality standard for rivers of 0.107 mg/l PO_4 (0.035 mg/l PO_4-P) and others falling below this threshold Figure 3-31.

During the first visit the drain in the southwest recorded a concentration of 0.35 mg/l, which exceeds the standard. Similarly, the drain running adjacent to the site boundary in the western part of the site, parallel to the lake, recorded 0.17 mg/l, also above the threshold. In contrast, another drain in the southwest recorded a lower concentration of 0.07 mg/l, which meets the environmental quality standard.

Measurements were taken along a drain located in the southwestern part of the site in February 2026, which showed a concentration of 0.89 mg/l; this drain was adjacent to farmland. Measurements were taken along the drain perpendicular to the arterial drain, phosphate concentrations showed 0 mg/l.

Phosphate monitoring locations for Dysart are mapped in Figure 3-31

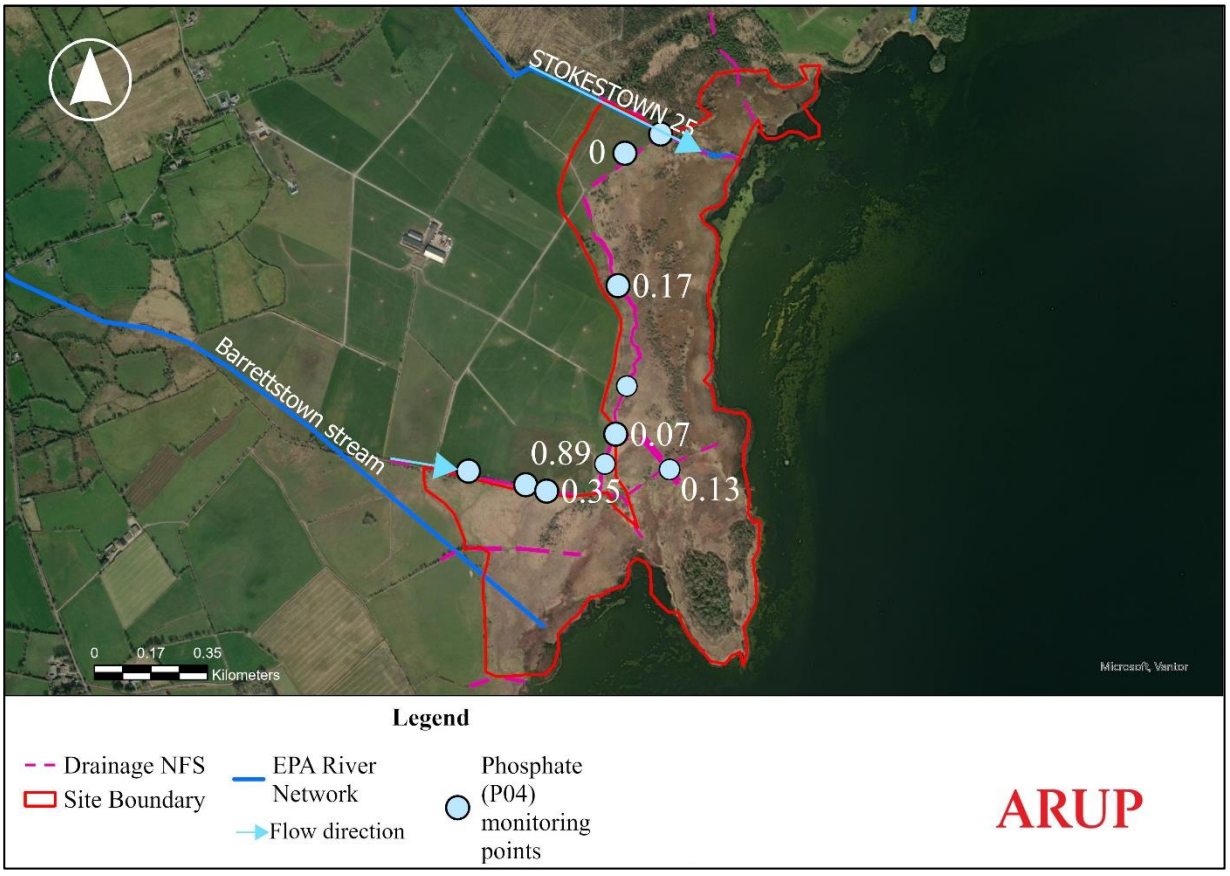


Figure 3-31: Phosphate (mg/l PO4) at survey points at Dysart

Nitrate ($N0_3$) across the site has areas above and below the regulatory groundwater threshold of 37.5 mg/l NO_3. Although there is no regulatory surface water threshold for nitrate, mean nitrate concentrations of greater than 8 mg/l NO_3 may impact the ecological health of rivers (EPA, 2025b).

The drain in the southwest had a measurement of 10.8 $N0_3$ mg/l in February 2026. The drain in the southwest area, adjacent to the road, had a measurement of 9.8 $N0_3$ mg/l. To the western side the drain running adjacent to the site boundary had a concentration of 31.0 mg/l.

IIn June 2026 many of the same drains and additional drains were sampled. Measurements were taken along the drain that was the old lakeshore, which showed concentrations of 110.0 mg/l, which is much higher than the measurement taken in the initial site visits. This sampling location is situated adjacent to agricultural land. Slurry spreading was observed in the vicinity during the site visit, which may have contributed to the elevated concentration recorded.

A water sample was taken in a northern drain perpendicular to the arterial drain, with a concentration of 6.1 mg/l.

Nitrate monitoring locations for Dysart are mapped in Figure 3-32.

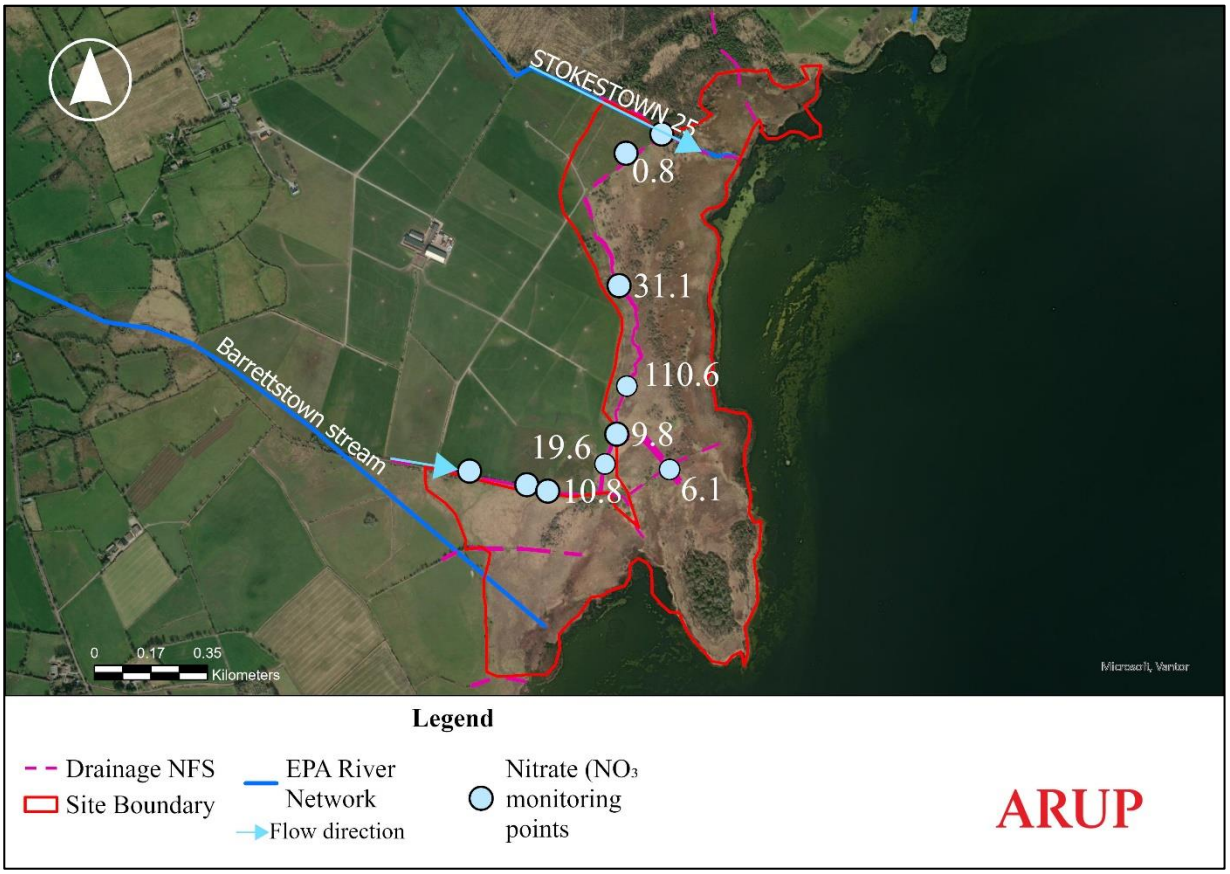


Figure 3-32: Nitrate (mg/l NO3) at survey points at Dysart

pH throughout Dysart ranged from 6.4 to 8.13, with the highest value being in a drain located in the southern part of the site. EC ranged from 554 – 850 µS/cm, with the highest value located in the arterial drain in the southern part of the site.

pH and EC locations for Dysart are mapped in Figure 3-33 and Figure 3-34.



Figure 3-33: pH at survey points at Dysart

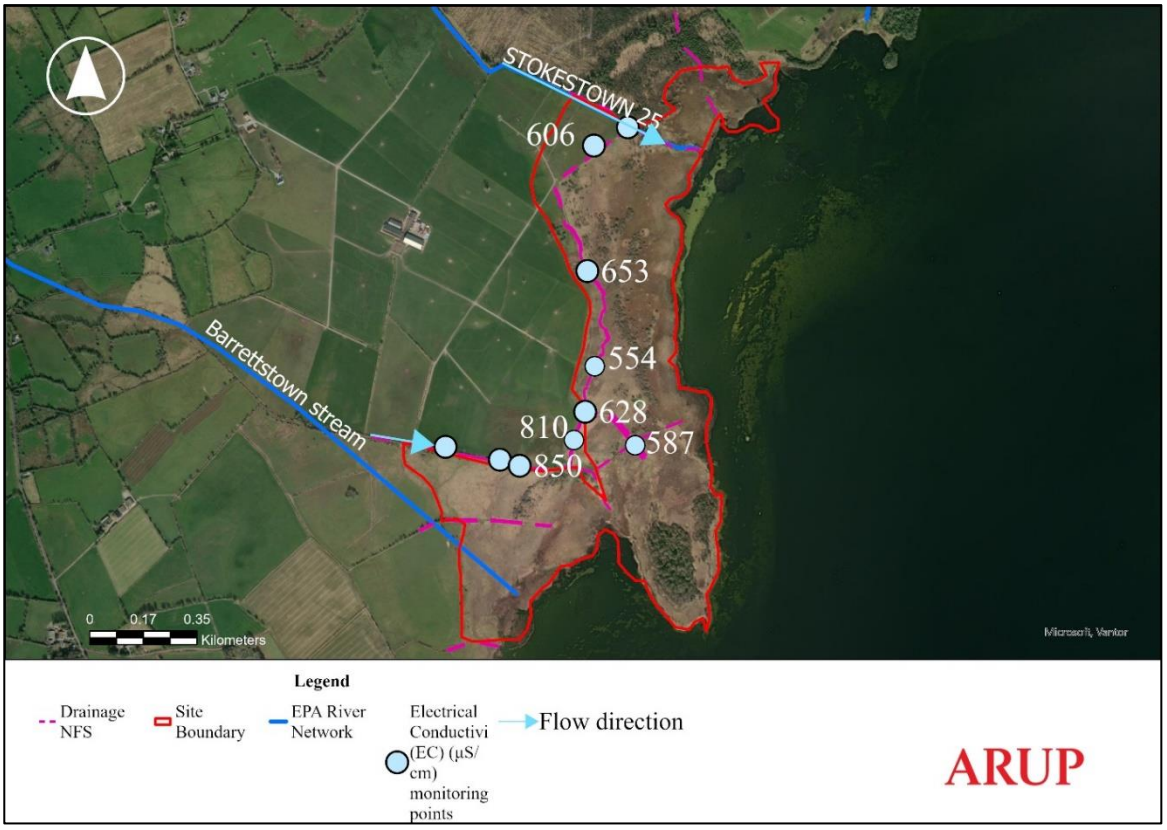


Figure 3-34: EC at survey points at Dysart

3.2.3.2 Ladestown

Phosphate concentrations were measured throughout the site. The first site visit showed a drain in southwest part of the site had a measurement of 0.4 mg/l. During the second site visit the same drain in the southwest was observed and showed a lower concentration of 0.14 mg/l. The water level was below ground surface which could be an indication of the lower result.

A drain in the western part of the site showed a concentration of 0.37 mg/l.

Phosphate was measured in the arterial drain in the northern area and showed a concentration of 1.3 mg/l, which exceeds the environmental quality standard for rivers.

Phosphate monitoring locations for Ladestown are mapped in Figure 3-35.

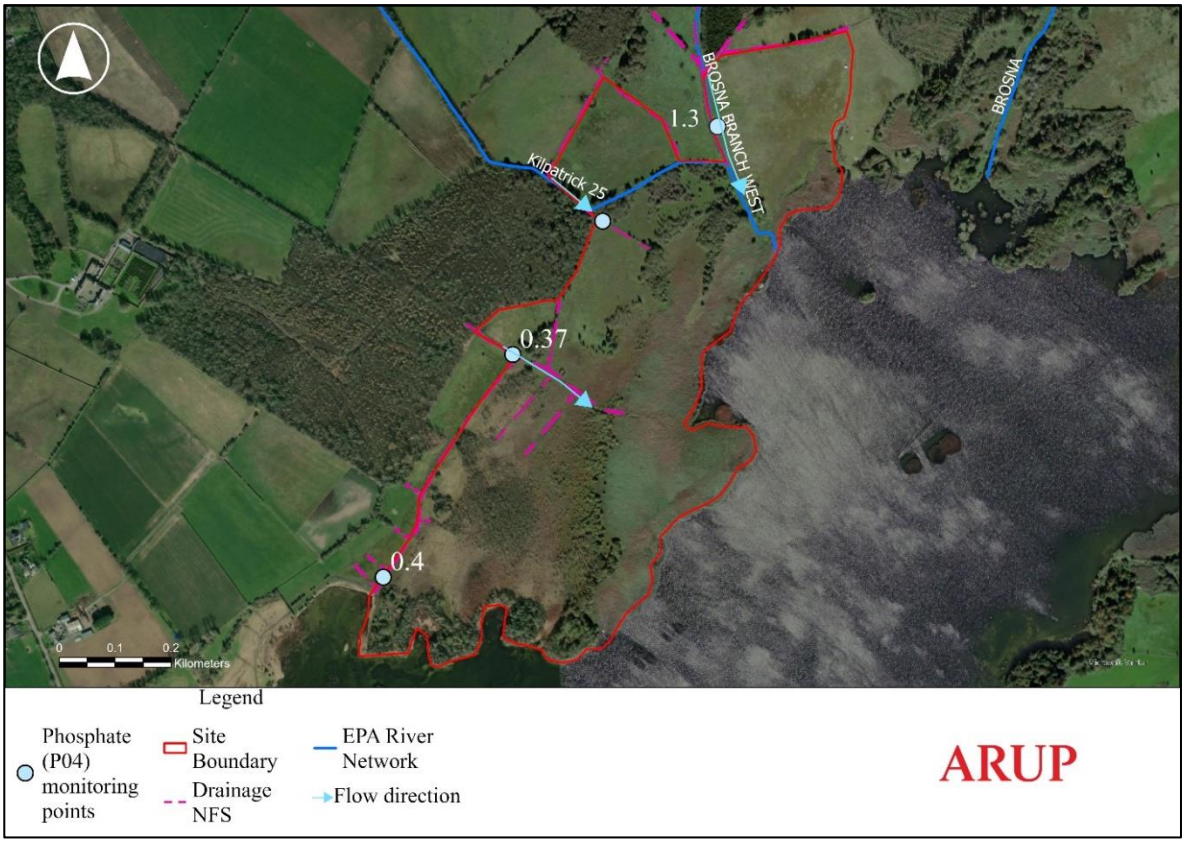


Figure 3-35: Phosphate (mg/l PO4) at survey points at Ladestown

Nitrate concentrations were measured in the drain in the southern part of the site showed a concentration of 8.0 NO_3-N mg/l which is the threshold for impacting ecological health in rivers. The drain in the western part of the site showed concentrations of 25.4 NO_3-N mg/l which exceeds the EPA's threshold.

The second site visit showed southwest drain had a concentration of 5.4 NO_3-N mg/l. Nitrate levels were low in the arterial drain in the northern area, at 1.8 NO_3-N mg/l.

Nitrate monitoring locations for Ladestown are mapped in Figure 3-36.

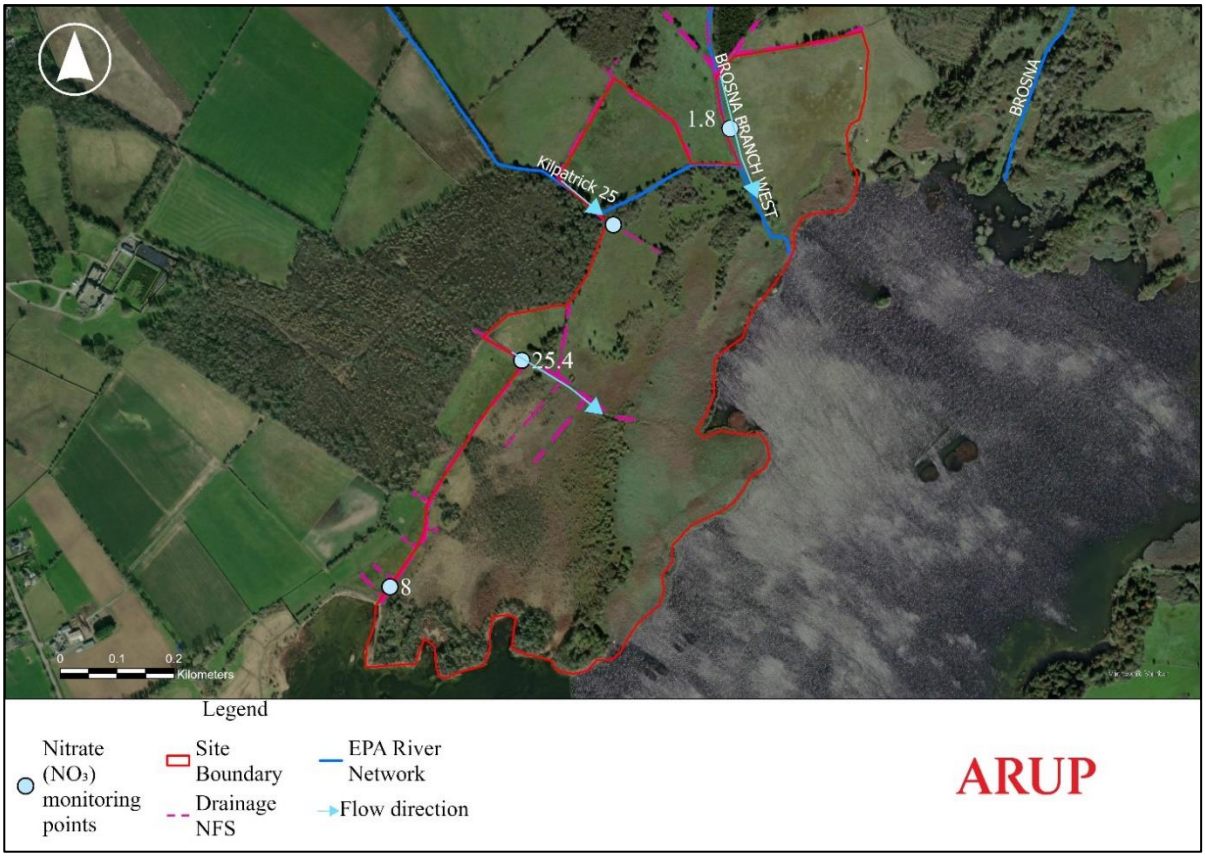


Figure 3-36: Nitrate (mg/l NO3) at survey points at Ladestown

pH ranged from 7.69 – 7.55 throughout Ladestown. EC throughout the site ranged from 598 – 818 µS/cm, with the highest value being in the northern section. High levels of conductivity indicate groundwater contribution within the drains.

pH and EC monitoring locations for Ladestown are mapped Figure 3-37 and Figure 3-38.

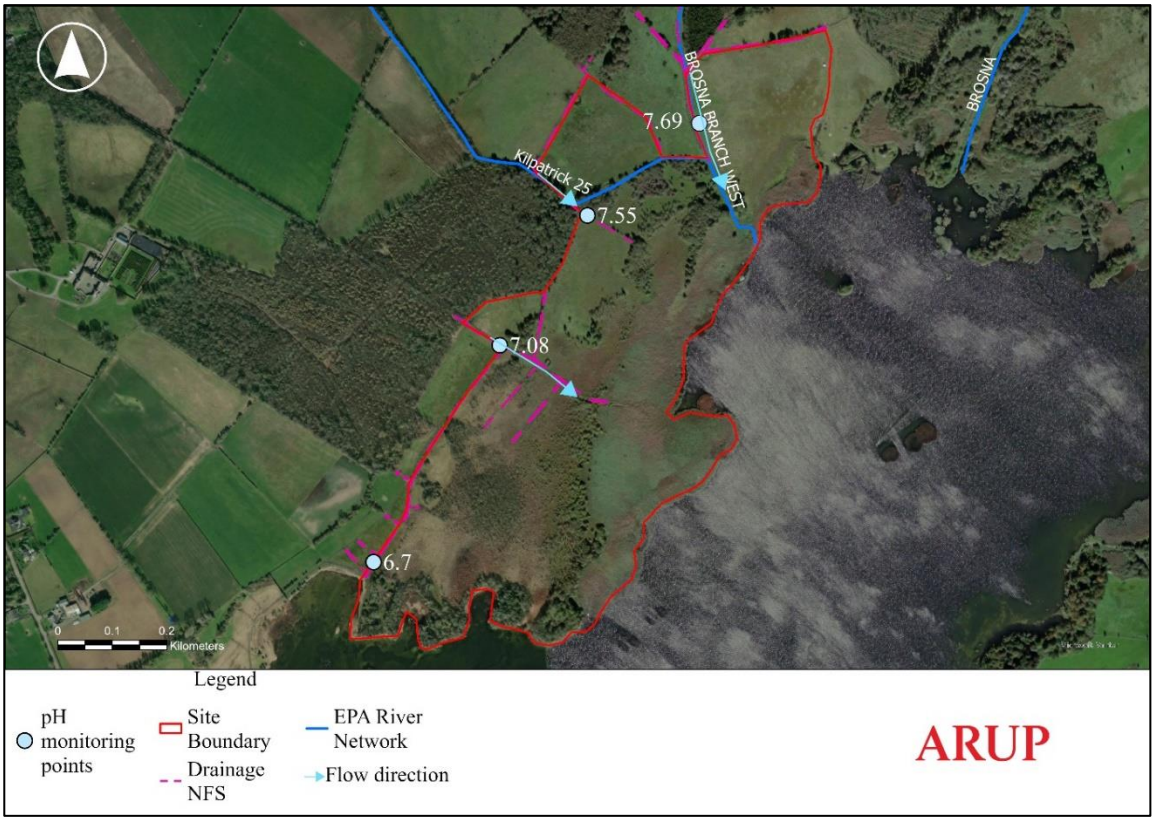


Figure 3-37: pH survey points at Ladestown

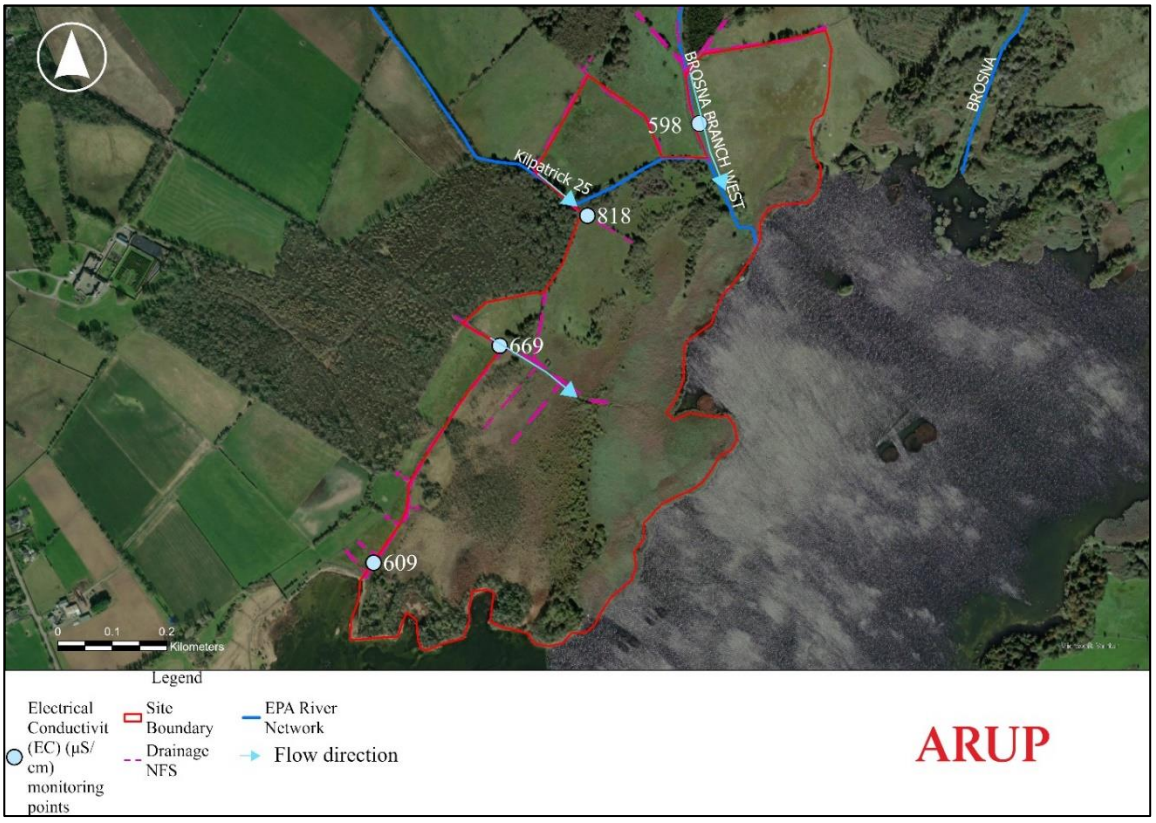


Figure 3-38: EC survey points at Ladestown

3.3 Conceptual Site Model

Lough Ennell is a large, shallow, limestone lake with hard water of low colour and alkaline pH. The lake is underlain by limestone and marl deposit. The lake is hydrologically connected to the spring fed Lough Owel and shares a similar geological history and more recent drainage history which has altered the hydrological regime. During the 1840's the hydrological regime of the lake was modified. This lowered the lake level, permanently exposing former lake substratum and impacting the characteristic zonation of charophyte and cyanobacterial crust (NPWS, n.d). The characteristic substratum of marl lakes is calcareous silt/sand and loose stones, but increased siltation and inorganic sediments can accumulate phosphorus and release it into the water column (Roden et al., 2020). The characteristic zonation for summer is more than 90% of the crust zone should be covered and water levels should never be lower than the top of the *Chara* curta zone; in winter, all zones should be submerged (Roden et al., 2020).

Dysart and Ladestown occur on the exposed lakeshore of Lough Ennell, with the shoreline being near the shallower parts of the lake (Figure 3-39). Both sites have relatively thin fen peat deposits, which have likely been forming since the 1840s. Although the fen habitat is in transition from lake habitat, the sites are within the depositional zone of potentially spring fed streams. This is evident by the sub-soil map indicating upstream peat in Ladestown. Dysart lakeshore may have extended further upstream to the west. In their natural condition these streams would have likely deposited sediment further upstream, in response to a change in gradient as well as other factors. In more recent times the streams have been straightened and deepened to reduce the deposition of sediment into surrounding lands. This has concentrated flows towards the lake and reduced natural sediment deposition upstream. Surface water, groundwater, marl and sediment all interact to create conditions for unique peatland habitats within the Lough Ennell catchment, streams and lake.

The distribution of habitat types at Dysart and Ladestown is strongly influenced by hydrology and nutrient pressures. At Dysart, 7230 Alkaline Fen occurs mainly in the western and central areas where calcareous groundwater discharges from underlying lacustrine sediments, while the eastern lakeshore margin is more influenced by lake water, supporting rich fen (PF1) and reed swamp (FS1) habitats. At Ladestown, site hydrology is influenced primarily by seasonal flooding and the arterial drainage network. Water quality monitoring identified elevated phosphate and nitrate concentrations within arterial drains, indicating that they are the main pathway for nutrient transfer from surrounding agricultural land to fen habitats. Therefore, nutrient enrichment via the drainage network represents a key pressure on habitat condition and should be considered alongside hydrological restoration measures.

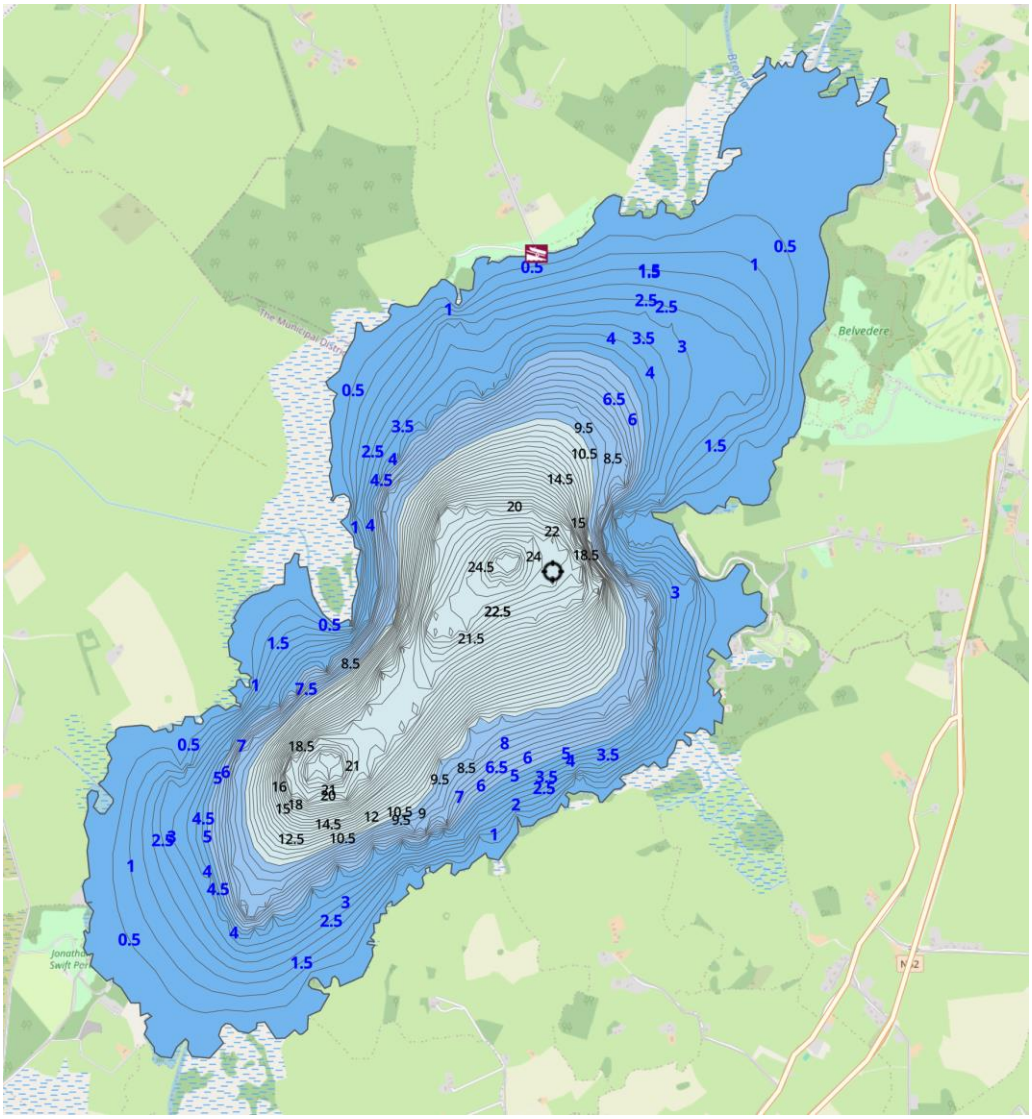


Figure 3-39: Bathymetry of Lough Ennell (Source: i-boating)[3]

A conceptual site model has been developed for each site based on the NFS 2022 (Brophy et al., In prep) results and the desktop study. Both sites are classed as **WETMEC 7b: Groundwater Floodplains** (O'Neil et al., 2023; Wheeler, 2009). These types of wetlands occur on floodplain surfaces and are often underlain by permeable deposits, receiving up flow through these permeable deposits. The surrounding surface water inputs from the arterial drains in the upstream catchment have relatively high EC values, indicative of groundwater contribution. Although the water quality of these drains is variable, it is likely that in their natural condition these would have been important water inputs to lakeshore wetlands, bringing sediments and nutrients from the upper catchment.

[3] i-Boating : Free Marine Navigation Charts & Fishing Maps

Dysart (Figure 3-40):

Dysart consists of Lacustrine sediments underlain by glacial till. A small area of gravels sits to the north of the site. The desk study and field survey results indicate that the bedrock is a karstified limestone (Ll aquifer) that provides a direct hydraulic connection to the fen through permeable lacustrine sediments. The peat depth is thin where the lakebed has been exposed, but there is an upstream area with very deep peat. This is reflective of the historical sediment dynamics of the lake and catchment.

There are two streams which have been modified under arterial drainage. These are located in the southwest and north of the site. Both are flowing towards the lake, with the southern drain discharging nutrients and sediments directly into the fen. The historical lakeshore near the western site boundary does not seem to be significantly deepened or modified and is acting as a nutrient and sediment trap for hillslope sheet flow off the dairy farm.

There are two Annex 1 habitats mapped within the Dysart site, 7230 Alkaline fen and 91E0 Alluvial Woodland The rest of the site comprises neutral non-Annex fen and grassland. The former Dysart Island is a mature beech dominated woodland with some adjacent alluvial forest.

Ladestown (Figure 3-41):

Ladestown consists of peat subsoils underlain by glacial till. A small area of gravels sits to the north of the site. The peat depth is thin, with outcrops of mineral soils. The bedrock is characterised by a Locally Important Aquifer – Bedrock which is Moderately Productive only in Local Zones (LI). There were no springs or wells identified on site. It is likely that the site receives water through the permeable sediments. The site is located on a floodplain and is prone to seasonal flooding.

Surface water discharges towards Lough Ennell but is constrained by the local topography to the south-west. Arterial drains are present on the northern edges of the site, with forestry drainage being directed to the central fen and western border. An arterial drain separates the northeastern part of the site from the rest of the site.

Multiple Annex habitats are mapped within the Ladestown site, - 6410 Molina meadows, 91E0 Alluvial Woodland and 7230 Alkaline fen are present in the western and central areas of the site. The rest of the site constitutes of neutral non-Annex fen and grassland.

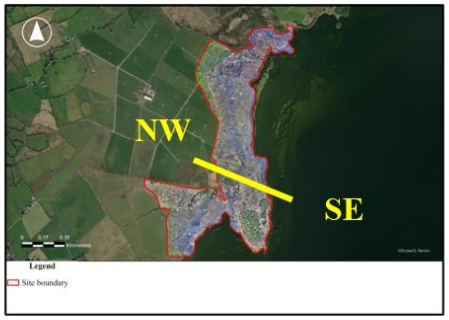
Lough Ennell: Dysart
Westmeath County
WFD catchment: Lower Shannon (25A): Brosna_SC_010
WETMEC 7 & 16

Water key:

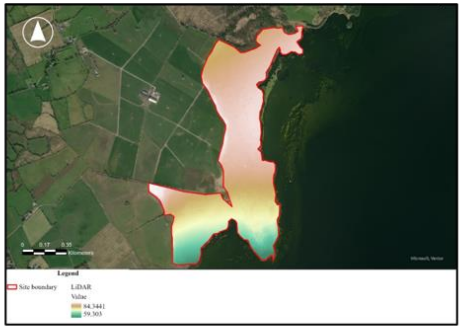
Drains

Wetland vegetation

Cross section:



Location:



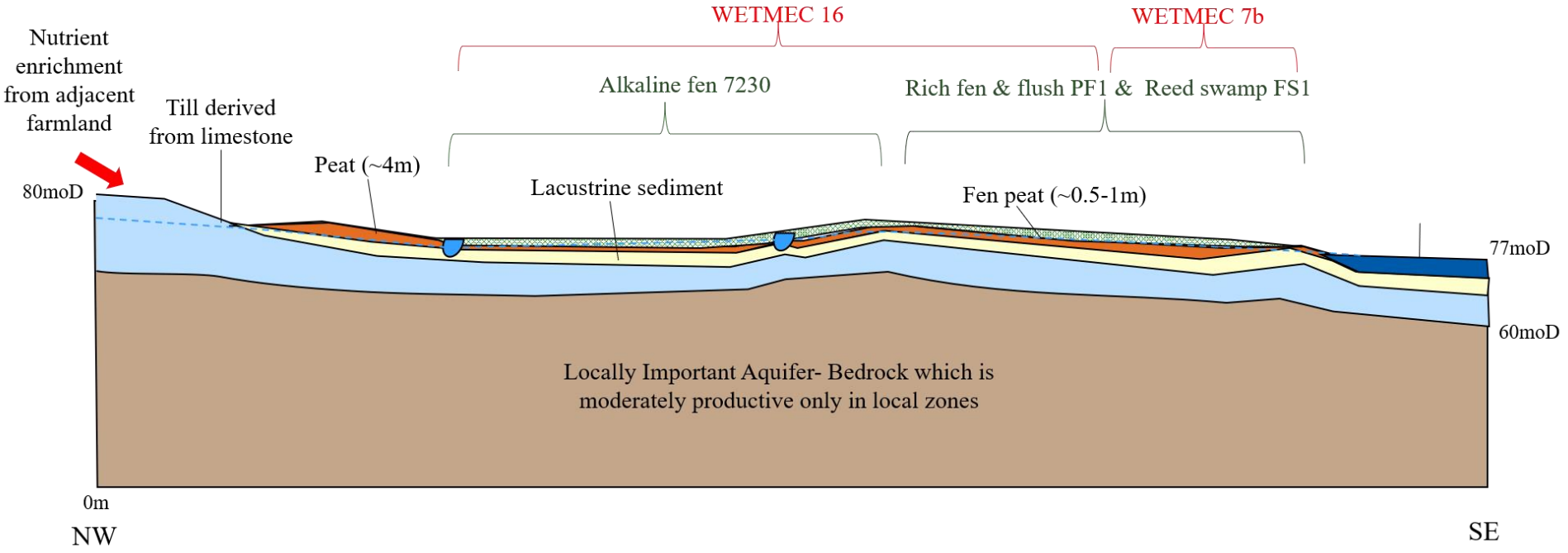


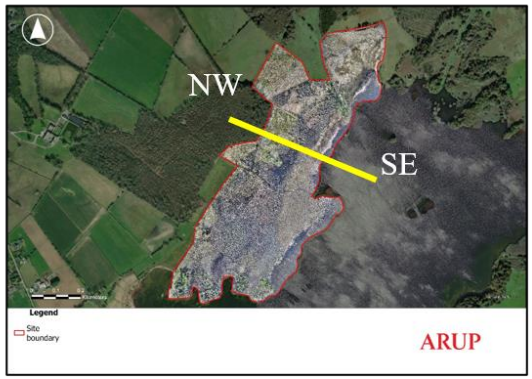
Figure 3-40: Conceptual Site Model for Dysart within the Lough Ennell SAC

Lough Ennell: Ladestown
Westmeath County
WFD catchment: Lower Shannon (25A): Brosna_SC_010
WETMEC 7 & 16

Water key:

Wetland vegetation

Cross section:



Location:



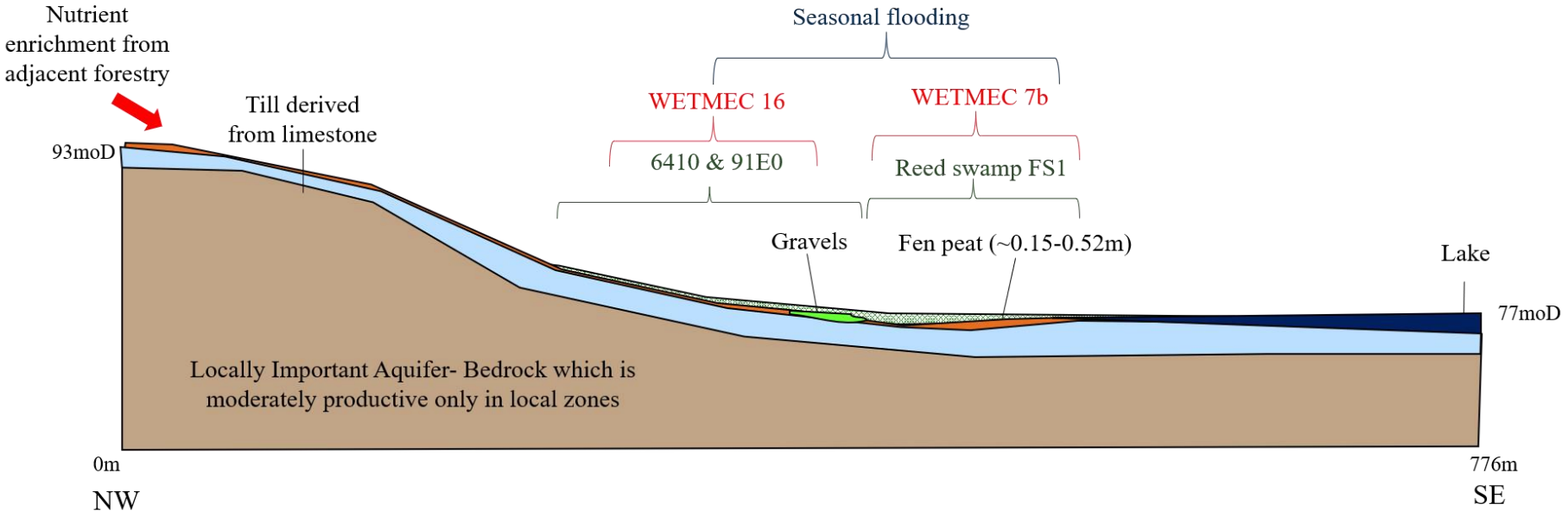


Figure 3-41: Conceptual Site Model for Ladestown within the Lough Ennell SAC

4 Ecology

4.1 Desk Study

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

- NPWS Protected Sites – Special Areas of Conservation – Lough Ennell SAC;
- NPWS Protected Sites – Special Protection Area – Lough Ennell SPA;
- NPWS Article 17 habitats distribution datasets;
- NFS (Brophy et al., in prep.);
- Biodiversity Maps - National Biodiversity Data Centre (NBDC);
- Field notes from NFS surveyor (George Smith, 2023);
- Plant Atlas 2020 website - Botanical Society of Britain & Ireland (BSBI);

The NFS (Brophy et al., in prep.) was commissioned to address significant knowledge gaps about fen habitats. As part of this study, two sites within Lough Ennell SAC, Co. Westmeath was selected for field survey. Both Dysart and Ladestown were surveyed in June and July 2023, with a focus on Annex I fen habitats, specifically 7230 Alkaline fen. 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 at Ladestown revealed that the site comprises a mosaic of fen, scrub, wet grassland, semi-neutral grassland, and wet woodland. The site is located on the northern shore of Lough Ennell, bordered by forestry plantations to the west and small agricultural fields to the north and southwest. A network of drains is present, particularly along the northern boundary and within the site, including an OPW arterial drainage channel that separates the northeast section from the remainder. The site drains into Lough Ennell via a central stream running north–south, and large areas are likely to experience seasonal flooding during winter. Overall, 43% of the site

was found to support Annex I 7230 Alkaline fen, with a small portion (0.4%) of Annex I quality 6410 Molinia meadow and 19% of the site found to support of Annex I quality 91E0 Alluvial Woodland.

The NFS at Dysart revealed that the site comprises a complex mosaic of fen, reed swamp, and woodland adjacent to Lough Ennell. Most habitats have developed on land exposed by historic lowering of lake levels. The site includes extensive areas of neutral fen interspersed with 7230 Alkaline fens, wet woodland, and scrub, with former Dysart Island supporting mature beech-dominated woodland. Several deep drainage channels are present across the site, including arterial drains located in both the southern (C38(1)) and northern sections (C39(1).

4.1.1.1 Annex I Habitats

The following Annex I and Annex I quality habitats were identified and mapped for Lough Ennell SAC from the NFS (Brophy et al., in prep.):

- **7230 Alkaline fen (Dysart)** – covering approximately 8.08 ha. This habitat occurs mainly on areas of rocky peat within the site, forming blocks of fen interspersed with neutral fen and reed swamp. The vegetation includes typical alkaline fen species such as *Schoenus nigricans* and sedge-dominated communities, along with frequent *Phragmites australis*. Other species recorded include *Succisa pratensis*, *Galium palustre*, *Filipendula ulmaria*, *Eupatorium cannabinum*, and orchids such as *Dactylorhiza incarnata*. These indicate a base-rich environment with good hydrological conditions, although some areas show signs of rank growth where grazing is absent. The condition assessment for this habitat indicates favourable status for area, but unfavourable-bad for structure & functions, future prospects, and overall status. Medium to high negative impacts from the cessation of traditional grazing, combined with artificial drainage and eutrophication, pose a risk to long-term habitat quality if unmanaged.
- **7230 Alkaline fen (Ladestown)** – covering approximately 3.18 ha. This habitat occurs as a block of habitat mainly in the northern part of the site however in the south there are portions which exist as mosaics with PF1 and FS1. This habitat is represented by both the typical *Schoenus nigricans* community and a small sedge community. Fen-associated species recorded include *Carex appropinquata, Epipactis palustris, Parnassia palustris, Samolus valerandi, Sagina nodosa, Gymnadenia conopsea, Utricularia vulgaris,* and *Potamogeton coloratus*, indicating a base-rich, calcareous fen environment with good hydrological conditions. The condition assessment for this habitat indicates favourable status for area with unfavourable structure & functions, future prospects, and overall status. Medium negative impacts from scrub encroachment and artificial drainage, combined with low-level invasive species pressure, pose a risk to long-term habitat quality if unmanaged.

The following Annex I quality habitats were identified and mapped for Lough Ennell SAC:

- **Annex I quality 91E0 Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae) (Dysart)** – This habitat occurs mainly in the centre of the site and on the former Dysart Island. It forms mature woodland dominated by beech (*Fagus sylvatica*) on the island, with adjacent patches of wet woodland dominated by alder (*Alnus glutinosa*), willow (*Salix* spp.), and ash (*Fraxinus excelsior*). The ground layer supports species such as *Iris pseudacorus*, *Filipendula ulmaria*, and *Eupatorium cannabinum*, with occasional shallow standing water. These woodland areas occur both as discrete blocks and in mosaic with fen and scrub habitats. Pressures include scrub encroachment and artificial drainage, which may alter hydrology and reduce habitat quality over time.
- **Annex I quality 91E0 Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae) (Ladestown)** – This habitat occurs mainly along the southern section and western boundary of the site. The approximate area mapped for this habitat is 7.94 ha. It forms wet woodland dominated by alder, willow and occasional birch. The ground layer supports a tall wetland flora, including *Iris pseudacorus, Filipendula ulmaria, Carex cf. acutiformis,* and *Eupatorium cannabinum*, with shallow standing water frequently present. The northern blocks of this habitat comprise a relatively young stand with an average canopy height of approximately 8 m. This habitat occurs both in mosaic with Fossitt classified habitat of GS4 Wet grassland (along west boundary) and as discrete woodland blocks (WN6/91E0 Annex I quality) in the south and north. Woodland patches dominated by willow, alder, and ash are also present on former lake island.
- **6410 Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae)(*Ladestown)** – covering approximately 0.03 ha. This very small area of fen meadow vegetation occurs within the centre of the site, with abundant *Cirsium dissectum* recorded.

4.1.1.2 Non-Annex/Fossitt habitats

Non-Annex fen and other habitats were also recorded within the Dysart and Ladestown sites, with classification using Fossitt (2000) classification. Table 4-1 and Table 4-2 below details these habitats and context to the site.

Table 4-1: Dysart Fossitt Habitats

Fossitt Habitat	Details and Location
PF1 – Rich fen and flush	Most fen within Dysart is neutral non-Annex fen (PF1), which is wetter and more diverse than the Alkaline fens, supporting a range of sedges, forbs, and orchids. It predominantly located to on the western extent of site.
FS1 – Reed and large sedge swamps	Reed swamp (FS1) occurs along fen margins, often dominated by *Phragmites australis.*
FW4 – Drainage ditches	Several deep drains traverse the site.
GA1– Improved grassland	A small portion of improved grassland (GA1) intersects the western boundary.

Fossitt Habitat	Details and Location
WD1 - Mixed broadleaved woodland	Woodland habitats include mature beech-dominated stands on former Dysart Island
WN6 - Wet willow–alder–ash woodland	Wet woodland habitats also are present on former Dysart Island
WS1 – Scrub	A small portion of scrub is located to the south, while scattered scrub is present in the centre of the site, though not cohesive enough to form a mapped.

Table 4-2: Ladestown Fossitt Habitats

Fossitt Habitat	Details and Location
FS1 – Reed and large sedge swamps	Fen transitions to reed swamp (FS1) nearing the lakeshore.
FS2 – Tall-herb swamps	A small portion (0.4 ha) of tall herb swamp (FS2) is located on the northern section of the site. It exists between the reed swamp (FS1) and Rich Fen and Flush (PF1).
FW4 – Drainage ditches	Drainage ditches are located on the northern edges of the site, bordering the forestry and fields, and into the centre of the site. An OPW arterial drainage channel separates the NE part of the site from the remainder. Additional drains were mapped during the survey, particularly along the northern boundary and within the site.
GS4 – Wet grassland	Wet grassland borders the site to the west then transitions into fen moving east.
PF1 – Rich fen and flush	The majority of the fen within the site is a less-strongly calcareous, sedge-dominated type that is probably influenced by seasonal flooding. It is predominantly located in the southern half of the site with a small section to the north. Typical species include *Carex elata, C. diandra, C. lepidocarpa, C. Nigra, C. panicea, Hydrocotyle vulgaris, Valeriana officinalis* and *Calliergonella cuspidata. Carex appropinquata* is locally frequent in this fen community, which was classified as non-Annex rich fen (PF1).
WN2 - Oak–ash–hazel woodland	Woodland patches on former lake islands in the southern.
WN6 - Wet willow–alder–ash woodland	Wet woodland is located adjacent wet grassland to the western extent of site.
WS1- Scrub	Scrub is recorded in the north while scattered scrub is present in the centre of the site, though not cohesive enough to form a mapped.

4.1.2 Surface Water levels

4.1.2.1 Dysart

Initial site visits taken place in February 2026 identified an arterial drain located in the southwestern area of the site, along the site boundary. This drain is flowing into Lough Ennell SAC. Three monitoring locations were observed along this drain. The first location (ID1) along the drain was 1.5m wide and the water level was shallow, at approximately 0.3m. The second location (ID2) along the drain had trapezoidal sides and was 2.3m wide with water level approximately 1m deep. The third location (ID3) along the drain had trapezoidal form with water flowing towards Lough Ennell SAC. The drain was 2m wide with the water level at approximately 0.4m deep. There were reeds growing in the drain towards the lake.

Two smaller drains were located and observed in the southwestern area of the site. The water was flowing towards Lough Ennell SAC, and a berm is present on either side of the drain. Tall reeds are growing within the drain. The drain is 2.5m wide with the water level at 0.3m deep. The water contained a lot of sediment.

In the western region of the site a monitoring location was taken along a drain near the perimeter of the site. The drain was overgrown with tall reeds. It had low flow towards Lough Ennell SAC. The drain was 1.5m wide with a water level of 0.2m. The water was mostly clear with some sediment. Several deer were seen grazing in this area.

Two drains were observed in the northwestern rea of the site. One drain was a very shallow natural drain through a field. The drain was 1m wide with a water level of 0.1m, but no flow was observed. The second drain was considered an arterial drain. This drain was flowing slowly for the northwest to the southeast, towards Lough Ennell SAC. The drain was 2m wide with a water level of 1.0m deep. It is joined by a drain, which is more overgrown and shallower, from the southwest to northeast.

Surface water monitoring locations for Dysart are mapped in Figure 4-1.

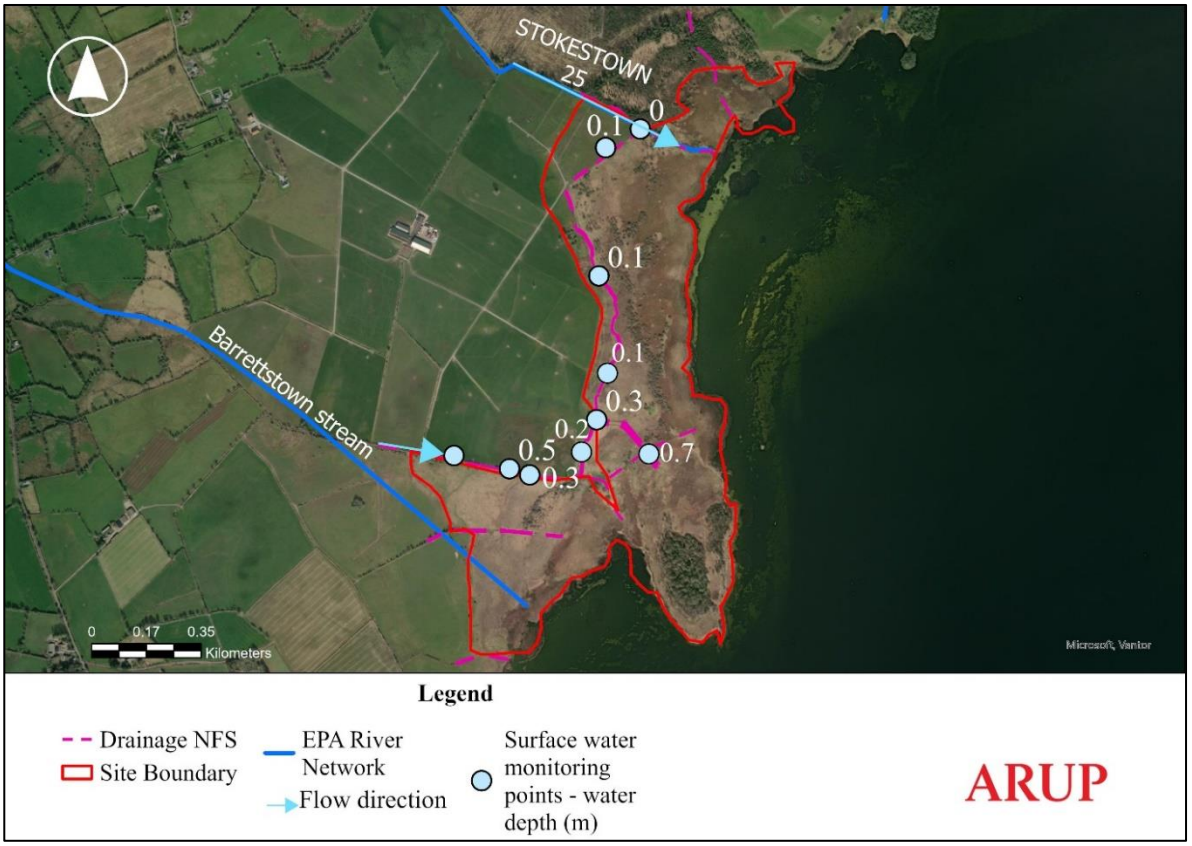


Figure 4-1: Surface water levels (m) at Dysart

4.1.2.2 Ladestown

A drain was observed in the southwest area of the site, along the site boundary. The drain has steep sides, and water level was at ground level. The drain is 2.3m wide with a water level of 0.8m deep. This drain is flowing into Lough Ennell SAC. Perpendicular drains feed into this drain, which then flows into Lough Ennell SAC. This same drain was visited in June 2026 where the water level was lower than ground level at 0.5m below ground level.

A drain was located in the western area of the site, along the site boundary. This drain is perpendicular to the drain in the southern area. This drain is 1m deep and 2.2m wide. The water level is at ground level and is flowing towards Lough Ennell SAC.

A drain was observed in the northwest area of the site, along the site boundary. This drain is 0.4m deep and 2.1m wide. The drain's water is clear, revealing a bed of sand and gravel. Water flows slightly south, with its level at the drain's surface.

An arterial drain was located in the northern section of the site which is 2.5m wide and flowing towards Lough Ennell. Water depth was 1m.

Surface water monitoring locations for Ladestown are mapped in Figure 4-2.

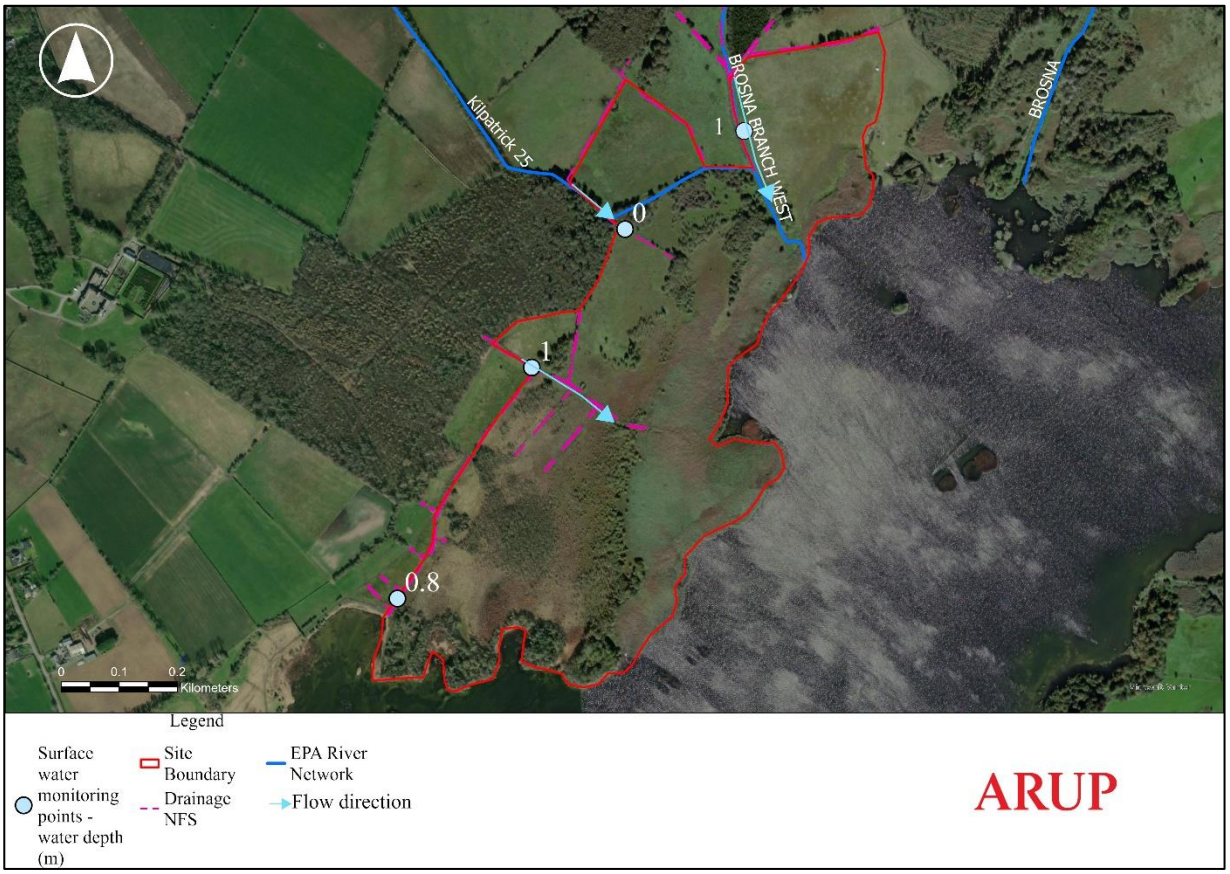


Figure 4-2: Surface water levels (m) at Ladestown

4.1.3 Species

This section summarises species recorded at or within the zone of influence of the Lough Ennell SAC. 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 areprovided to support spatial understanding of species distribution. Records are limited to those from the past ten years, reflecting the most plausible timeframe for continued presence and ecological relevance to the site - excepting

where invasive species have been historically recorded and there has been no indication since of their elimination.

Information sources include the National Biodiversity Data Centre (NBDC), the NFS documentation and site walkover observations in 2026. Where relevant, spatial patterns of records are illustrated in figures provided elsewhere in the report (Appendix C). The Lough Ennell SPA site synopsis (NPWS, 2014) identifies the site as supporting nationally and internationally important waterbird populations and forming part of a Ramsar wetland of international importance. The Lough Ennell SAC synopsis also highlights the exceptional stonewort (*Chara*) flora of the lake, including Irish Red Data Book taxa (refer to Section 4.1.1 for habitat context).

4.1.3.1 Qualifying interest species of Lough Ennell SPA

Lough Ennell SPA (Site Code 004044) is designated for three wintering waterbird species: pochard (*Aythya ferina*), tufted duck (*Aythya fuligula*), and coot (*Fulica atra*), together with the wetland and waterbirds assemblage. These species are protected under the EU Birds Directive and the Irish Wildlife Acts. The SPA conservation objectives seek to maintain the population size, distribution within the site, and the quality of supporting habitats for these species.

The open marl lake, shallow margins, and associated aquatic vegetation of Lough Ennell provide suitable feeding and roosting habitat for these waterbirds. Historic eutrophication previously affected lake condition; however, improvements in wastewater treatment have led to recovery of water clarity and macrophyte communities, supporting the continued suitability of the site for wintering waterfowl.

Recent NBDC records confirm the continued presence of pochard, tufted duck, and coot within the zone of influence up to 2024–2025. While records within the Ladestown and Dysart fen polygons themselves are limited, both subsites lie within the SPA boundary and contribute to the ecological functioning of the wider lake system. Lough Ennell is recognised as one of the most important midland lakes for wintering waterbirds, with historically high peak counts, underlining its ongoing national and international importance.

4.1.3.2 Species Within the Site

Both Ladestown and Dysart lie within the boundaries of Lough Ennell SAC and Lough Ennell SPA and support habitats relevant to both designations. A review of NBDC records for the past ten years returned no protected species records from within the Ladestown site. At Dysart, the only protected species record within this period was snipe (*Gallinago gallinago*), a species protected under the Irish Wildlife Acts.

During the 2023 NFS surveys, a potential otter (*Lutra lutra*) holt was identified to the north of the Dysart site. Otter is listed on Annexes II and IV of the EU Habitats Directive and is protected under the Wildlife Acts; this record represents a key consideration for works planning and the application of appropriate avoidance and timing measures.

An Irish hare (*Lepus timidus hibernicus*) was also recorded during the NFS. Although not an Annex II species, the Irish hare is protected under the Wildlife Acts and therefore represents a statutory protection consideration in relation to disturbance and timing of works.

4.1.3.3 Species within the Zone of Influence

Table 4-3 outlines the functionally linked species recorded within the 2km distribution zone of influence around Lough Ennell within the last ten years from NBDC.

Table 4-3: Species records within the Zone of Influence of Lough Ennell SPA and SAC

Legislative Protection	Common Name	Latin Name	Date of Latest Record
Habitats Directive & Wildlife Acts	Common Frog	*Rana temporaria*	*08/09/2019*
Birds Directive & Wildlife Acts	Black-headed Gull	*Chroicocephalus ridibundus*	*03/09/2025*
Birds Directive & Wildlife Acts	Common Gull	*Larus canus*	*18/01/2024*
Birds Directive & Wildlife Acts	Common Tern	*Sterna hirundo*	*17/05/2024*
Birds Directive & Wildlife Acts	Coot	*Fulica atra*	*22/02/2025*
Birds Directive & Wildlife Acts	Cormorant	*Phalacrocorax carbo*	*10/12/2024*
Birds Directive & Wildlife Acts	Curlew	*Numenius arquata*	*27/03/2023*
Birds Directive & Wildlife Acts	Gadwall	*Mareca strepera*	*04/09/2025*
Birds Directive & Wildlife Acts	Goldcrest	*Regulus regulus*	*02/09/2025*
Birds Directive & Wildlife Acts	Goldeneye	*Bucephala clangula*	*09/12/2024*
Birds Directive & Wildlife Acts	Great Crested Grebe	*Podiceps cristatus*	*06/10/2024*
Birds Directive & Wildlife Acts	Great Northern Diver	*Gavia immer*	*16/02/2024*
Birds Directive & Wildlife Acts	Great Spotted Woodpecker	*Dendrocopos major*	*29/08/2025*
Birds Directive & Wildlife Acts	Greenfinch	*Chloris chloris*	*30/05/2023*
Birds Directive & Wildlife Acts	Grey Wagtail	*Motacilla cinerea*	*10/12/2024*
Birds Directive & Wildlife Acts	Greylag Goose	*Anser anser*	*22/03/2024*
Birds Directive & Wildlife Acts	Herring Gull	*Larus argentatus*	*21/09/2024*
Birds Directive & Wildlife Acts	House Martin	*Delichon urbicum*	*20/06/2023*
Birds Directive & Wildlife Acts	House Sparrow	*Passer domesticus*	*13/05/2024*
Birds Directive & Wildlife Acts	Kestrel	*Falco tinnunculus*	*12/10/2024*
Birds Directive & Wildlife Acts	Kingfisher	*Alcedo atthis*	*10/02/2024*
Birds Directive & Wildlife Acts	Lapwing	*Vanellus vanellus*	*30/12/2023*
Birds Directive & Wildlife Acts	Lesser Black-backed Gull	*Larus fuscus*	*17/05/2024*
Wildlife Acts	Lesser Whitethroat	*Curruca curruca*	*03/07/2021*
Birds Directive & Wildlife Acts	Little Egret	*Egretta garzetta*	*03/09/2025*
Birds Directive & Wildlife Acts	Little Grebe	*Tachybaptus ruficollis*	*20/03/2024*
Birds Directive & Wildlife Acts	Little Owl	*Athene noctua*	*07/06/2021*
Birds Directive & Wildlife Acts	Swallow	*Hirundo rustica*	*07/06/2021*
Birds Directive & Wildlife Acts	Mallard	*Anas platyrhynchos*	*25/10/2025*
Birds Directive & Wildlife Acts	Meadow Pipit	*Anthus pratensis*	*24/10/2024*
Birds Directive & Wildlife Acts	Mistle Thrush	*Turdus viscivorus*	*04/05/2025*
Birds Directive & Wildlife Acts	Mute Swan	*Cygnus olor*	*25/10/2025*
Birds Directive & Wildlife Acts	Peregrine	*Falco peregrinus*	*30/12/2024*
Birds Directive & Wildlife Acts	Pheasant	*Phasianus colchicus*	*03/03/2024*
Birds Directive & Wildlife Acts	Pintail	*Anas acuta*	*22/02/2019*
Birds Directive & Wildlife Acts	Pochard	*Aythya ferina*	*09/12/2024*

Legislative Protection	Common Name	Latin Name	Date of Latest Record
Birds Directive & Wildlife Acts	Red-breasted Merganser	*Mergus serrator*	*13/03/2024*
Birds Directive & Wildlife Acts	Redshank	*Tringa totanus*	*26/01/2023*
Birds Directive & Wildlife Acts	Redwing	*Turdus iliacus*	*26/12/2024*
Birds Directive & Wildlife Acts	Robin	*Erithacus rubecula*	*02/09/2025*
Birds Directive & Wildlife Acts	Sand Martin	*Riparia riparia*	*12/09/2024*
Birds Directive & Wildlife Acts	Scaup	*Aythya marila*	*08/01/2024*
Birds Directive & Wildlife Acts	Shelduck	*Tadorna tadorna*	*26/01/2023*
Birds Directive & Wildlife Acts	Shoveler	*Spatula clypeata*	*22/02/2019*
Birds Directive & Wildlife Acts	Skylark	*Alauda arvensis*	*04/05/2020*
Birds Directive & Wildlife Acts	Snipe	*Gallinago gallinago*	*19/05/2024*
Birds Directive & Wildlife Acts	Sparrowhawk	*Accipiter nisus*	*18/03/2024*
Birds Directive & Wildlife Acts	Spotted Flycatcher	*Muscicapa striata*	*13/05/2024*
Birds Directive & Wildlife Acts	Starling	*Sturnus vulgaris*	*22/02/2025*
Birds Directive & Wildlife Acts	Stonechat	*Saxicola rubicola*	*26/01/2023*
Birds Directive & Wildlife Acts	Swallow	*Hirundo rustica*	*17/05/2024*
Birds Directive & Wildlife Acts	Swift	*Apus apus*	*22/06/2024*
Birds Directive & Wildlife Acts	Teal	*Anas crecca*	*18/01/2024*
Birds Directive & Wildlife Acts	Tufted Duck	*Aythya fuligula*	*09/12/2024*
Birds Directive & Wildlife Acts	White-fronted Goose	*Anser albifrons*	*02/04/2018*
Birds Directive & Wildlife Acts	White-tailed Eagle	*Haliaeetus albicilla*	*10/02/2024*
Birds Directive & Wildlife Acts	Whooper Swan	*Cygnus cygnus*	*20/03/2024*
Birds Directive & Wildlife Acts	Wigeon	*Mareca penelope*	*09/12/2024*
Birds Directive & Wildlife Acts	Willow Warbler	*Phylloscopus trochilus*	*11/06/2025*
Birds Directive & Wildlife Acts	Woodcock	*Scolopax rusticola*	*07/02/2022*
Birds Directive & Wildlife Acts	Yellowhammer	*Emberiza citrinella*	*19/05/2024*
EU Invasive Alien Species Regulation No. 1143/2014 || Invasive Species: Regulation S.I. 477/2011 (Ireland)	American Skunk-cabbage	*Lysichiton americanus*	*31/12/2017*
Invasive Species: Regulation S.I. 477/2011 (Ireland)	Canadian Waterweed	*Elodea canadensis*	*03/08/2019*
EU Invasive Alien Species Regulation No. 1143/2014 || Invasive Species: Regulation S.I. 477/2011 (Ireland)	Japanese Knotweed	*Fallopia japonica*	*15/07/2024*
Habitats Directive & Wildlife Acts	Marsh Fritillary	*Euphydryas aurinia*	*13/09/2023*
Wildlife Acts	Badger	*Meles meles*	*27/01/2023*
Invasive Species: Regulation S.I. 477/2011 (Ireland)	Fallow Deer	*Dama dama*	*23/10/2016*
Wildlife Acts	Hedgehog	*Erinaceus europaeus*	*20/06/2021*
Habitats Directive & Wildlife Acts	Pine Marten	*Martes martes*	*11/12/2022*

Historic records indicate the presence of legally protected species within the wider Lough Ennell SAC context, even though these records fall outside the current ten-year reporting window. Otter was last recorded by the NBDC in 2014, while white-clawed crayfish (Austropotamobius pallipes), listed under Annex II and V of the Habitats Directive and protected by the Wildlife Acts, was last recorded in 2008. Although these records are older,

both species remain ecologically relevant due to their role in aquatic connectivity within the SAC.

In addition, reedbeds along Lough Ennell provide important habitat for wintering waterbirds and support reed-specialist invertebrates, further emphasizing the ecological complexity and conservation value of the site.

4.2 Field Survey

Following a comprehensive review of available desktop data, a targeted ecological survey was undertaken at both Ladestown and Dysart subsites within Lough Ennell SAC in May 2026 to collect site-specific baseline data to inform the FRP. The 2026 ecological walkover was undertaken to collect updated site-specific baseline data, verify habitat condition at fixed monitoring points, and record current pressures and threats relevant to restoration planning. The survey focused on monitoring points selected to represent areas of habitat interest, hydrological influence and restoration feasibility. The data collected will also provide a baseline for future post-restoration monitoring.

Two survey forms were created to collect data relevant to:

- Monitoring data; and
- Pressures and threats .

4.2.1 Monitoring Points

To inform the FRP, 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 Dysart and Ladestown pre-identified monitoring points (Monitoring Points 1-9), selected based on hydrological features, habitat potential, and restoration feasibility. The locations were determined through expert discussion and review of baseline data and will serve as fixed monitoring stations post-restoration. A map of survey points is provided in Appendix B.

These monitoring points now serve a dual purpose:

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

The survey focused on these key components:

- Monitoring points: Presence and absence of positive and negative indicators of fen habitat;
- Target notes: Any qualitative observations capturing for example site condition, vegetation structure, hydrological features, and legacy management; and

- Pressures and Threats Identification: Systematic recording of anthropogenic and natural pressures affecting each location.

At Ladestown, 7230 Alkaline fen was recorded at Monitoring Points 1, 3 and 4. Monitoring Point 2 did not record 7230 Alkaline fen but included 6410 Molinia meadow as a mosaic element. PF1 Rich fen and flush was recorded at all four Ladestown monitoring points, reflecting the transitional and mosaic nature of the fen vegetation across the subsite. No 7210 Cladium fen, 7140 Transition mire or 7220 Petrifying springs were recorded at the Ladestown monitoring points. Vegetation cover was high at all monitoring points, while shrub cover was low (< 10% coverage).

At Dysart, 7230 Alkaline fen was recorded at Monitoring Points 6, 8 and 9. Monitoring Points 5 and 7 did not record 7230 Alkaline fen, although PF1 Rich fen and flush was recorded across the Dysart monitoring points. No 7210 Cladium fen, 7140 Transition mire or 7220 Petrifying springs were recorded at the Dysart monitoring points. Shrub cover was higher at some Dysart monitoring points than at Ladestown, recorded at Monitoring Points 5 and 7 while cover was lower (<10% cover) recorded at Monitoring Points 6, 8 and 9. Total vegetation cover was consistently high across all Dysart monitoring points.

The 2026 ecological walkover confirmed that both Ladestown and Dysart continue to support base-rich fen vegetation, with 7230 Alkaline fen recorded at monitoring points within both subsites. The monitoring data also indicate local variation in habitat condition, with some areas supporting characteristic alkaline fen vegetation and others showing greater influence from drainage, undergrazing, scrub encroachment or nutrient-related pressures.

4.2.2 Pressure & Threats

This section summarises the current pressures and threats recorded during the 2026 ecological walkover at Ladestown and Dysart, with emphasis on pressures affecting 7230 Alkaline fen and associated fen habitats.

Ladestown

Field surveys were used to validate and spatially refine the pressures and threats previously identified through the desk study and the NFS for the Ladestown subsite. Observations focused on how these pressures manifest on the ground and their distribution in relation to Annex I habitats and associated habitats recorded within Ladestown.

4.2.2.1 7230 Alkaline fen

Historical Pressures

The NFS condition assessment for 7230 Alkaline fens at Ladestown identified medium negative impacts associated with the following pressures

- **Scrub encroachment -** expansion of scrub into fen vegetation, with potential to alter fen structure and reduce habitat quality over time.
- **Artificial Drainage -** hydrological modification affecting fen water levels and contributing to unfavourable structure and functions
- **Invasive species** - noted historically as a potential pressure requiring management awareness.

Current Pressures

The 2026 ecological walkover recorded the following current pressures at monitoring points supporting 7230 Alkaline fens:

- **Drainage** – local and arterial drainage schemes were recorded at Monitoring Points 1, 3 and 4. Historical drainage influence was assessed as low at Monitoring Points 1 and 3 and medium at Monitoring Point 4.
- **Grazing management**: livestock grazing was recorded at Monitoring Point 3. Grazing absence was recorded at Monitoring Points 1 and 4. While currently assessed as a low influence pressure, prolonged grazing absence may result in increased rank vegetation, litter accumulation and succession towards less favourable fen communities.
- **Scrub encroachment**: frequent but low scrub regeneration (notably *Salix* and *Betula* regeneration typically <1 m in height) and recommend scrub control through hydrological restoration and/or management (e.g. grazing or scrub clearance) where feasible.

4.2.2.2 91E0 Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)*

Historical Pressures

The NFS mapping and associated habitat descriptions indicate that 91E0 alluvial woodland occurs within Ladestown. The principal pressures described historically for woodland within the site context include:

- **Drainage** – the potential alteration of wet woodland hydrology and associated ground flora conditions
- **Scrub/woodland succession dynamics** – potential for changes in habitat structure overtime where management is absent or hydrological conditions shift.

Current Pressures

91E0 Alluvial woodland was not recorded at the 2026 monitoring points within Ladestown.

4.2.2.3 6410 Molinia meadows

Historical Pressures

The NFS identified a very small extent of 6410 Molinia meadows at Ladestown (reported previously as a small, localised patch). No pressures or threats were recorded for the habitat during the NFS.

Current Pressures

The monitoring dataset indicates 6410 recorded as a mosaic element at Monitoring Point 2. While the overall condition of the mosaic habitat was recorded as good, the following pressures were noted:

- **Grazing** – the habitat mosaic has been noted as extensively grazed and in good condition. However, the threat of future abandonment exists given the marginal nature of the farmland.

Dysart

The NFS data for Dysart were used to identify the historical pressures affecting Annex I and Annex I quality habitats within the subsite. These pressures reflect the condition of the site at the time of survey (2023) and provide the baseline for understanding current and future restoration requirements

4.2.2.4 7230 Alkaline Fen

Historical Pressures

The NFS condition assessment for 7230 Alkaline fen at Dysart identified medium to high negative impacts associated with the following pressures:

- **Grazing abandonment**: Large areas of fen, particularly around Dysart Island, were noted as no longer grazed. This has resulted in the development of rank, species-poor vegetation and reduced structural diversity within the habitat. Monitoring notes indicate ungrazed areas becoming increasingly dominated by tall vegetation and losing typical fen character.
- **Scrub encroachment / problematic native species**: Scrub expansion, particularly involving willow and birch was recorded across the site. This encroachment is associated with grazing cessation and contributes to shading, increased evapotranspiration, and shifts in vegetation composition away from characteristic fen communities.
- **Drainage:** Several deep artificial drains were recorded within the site. While the influence was assessed as low, these features represent a continuing pressure by

modifying local hydrology, potentially lowering water tables and contributing to drier conditions in some areas of fen.

- **Hydrological instability (flooding**): Seasonal flooding from Lough Ennell was identified as a natural but influential process affecting much of the site. While part of the natural hydrological regime, changes to lake level management have altered flooding dynamics, influencing fen condition and spatial extent.
- **Localised disturbance:** Low-level disturbance associated with recreational activity (e.g. fishing and access tracks) was noted, including trampling and minor vegetation disturbance. This pressure was assessed as low impact.

Current Pressures

The 2026 ecological walkover recorded the following current pressures at monitoring points supporting 7230 Alkaline fen:

- **Drainage** - local and arterial drainage schemes were recorded across all Dysart monitoring points. Historical drainage influence was assessed as low at Monitoring Point 5 and medium at Monitoring Points 6, 7, 8 and 9.
- **Grazing management** - grazing absence was recorded at Monitoring Points 5, 7, 8 and 9, while livestock grazing was recorded at Monitoring Point 6. Areas subject to limited or no grazing generally exhibited rank vegetation and increased scrub encroachment.
- **Scrub encroachment** - willow encroachment was recorded at several monitoring points, with unmanaged areas also supporting *Phragmites australis* expansion. These pressures were particularly evident where grazing was absent and drainage features were present.
- **Nutrient enrichment** - low levels of nutrient enrichment were recorded at Monitoring Points 6 and 9. Survey notes indicate potential nutrient inputs from adjacent agricultural land and upslope runoff; however, impacts on fen vegetation were considered limited at the time of survey.

4.2.2.5 91E0 Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)

Historical Pressures

The NFS mapping confirms the presence of 91E0 alluvial woodland within Dysart. The principal pressures identified in the site context include:

- **Scrub/woodland succession dynamics:** Woodland expansion and natural succession processes are evident, with young stands of willow, birch and alder developing across former fen areas. This reflects reduced grazing pressure and contributes to progressive habitat change from open fen to woodland.

- **Drainage:** Artificial drainage within the wider site may influence local hydrological conditions within alluvial woodland areas, with potential impacts on water-dependent ground flora and woodland structure.
- 91E0 Alluvial woodland was not recorded at the 2026 monitoring points within Dysart.

Current Pressures

91E0 Alluvial woodland was not recorded at the 2026 monitoring points within Dysart.

4.2.3 Additional Observations

The 2026 ecological walkover indicates that both Ladestown and Dysart continue to support vegetation characteristic of base-rich fen systems, with a range of positive indicator vascular plants and bryophytes recorded across the monitoring network. The continued presence of these species suggests that the fundamental ecological conditions required to support alkaline fen habitat persist within both subsites, despite the influence of historical and contemporary pressures.

The monitoring data suggest that habitat condition is primarily influenced by variations in hydrological integrity and land management rather than by an absence of characteristic fen flora. Across both subsites, species indicative of calcareous, groundwater-fed conditions remain well represented, indicating that the ecological function of the fen system has not been fundamentally lost.

Differences between the subsites appear to be largely related to vegetation structure and successional processes. Ladestown generally supports a more open fen structure, with current grazing activity contributing to the maintenance of vegetation condition in some areas. In contrast, Dysart exhibits stronger signs of vegetation succession, with localised willow and *Phragmites* encroachment and more extensive areas of rank vegetation. This pattern suggests that the interaction between drainage effects and reduced grazing pressure is exerting a greater influence on habitat structure at Dysart than at Ladestown.

The ecological walkover also indicates that, while current pressures are evident, many of the observed changes remain reversible. The generally low levels of scrub development recorded at Ladestown and the continuing presence of characteristic fen species at both subsites suggest that habitat condition remains sufficiently intact to respond positively to targeted restoration measures. Consequently, hydrological restoration, coupled with the maintenance or reinstatement of appropriate low-intensity grazing management where feasible, is likely to deliver the greatest ecological benefit by addressing the underlying drivers of habitat change and maintaining the open, species-rich conditions required to support favourable conservation status.

4.3 Site Conservation Priority Matrix for Lough Ennell

The restoration actions proposed for the fen habitats of Lough Ennell 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 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 fen habitats alone but extend to the wider ecological network within and around the site.

Table 4-4: Site Priority Conservation Matrix for Lough Ennell

Level	Feature Type	Feature Name	Extent/ Population	Pressure/Threat affecting it	Restoration Measure On-Site	Restoration Measure Off- Site
1	SAC Habitat	7230 Alkaline fens	11.26 ha	Under grazing Drainage Scrub encroachment Nutrient enrichment	Grazing management where required Buffer planting to manage nutrient enrichment Drain blocking Hydrology monitoring Vegetation monitoring	N/A
	Annex quality habitat (Non-QI)	6410 Molinia meadows	0.03 ha	Undergrazing Drainage	Grazing management where required	N/A
		91E0 Alluvial woodland	7.94 ha	Scrub/woodland succession dynamics	Hydrology monitoring Vegetation monitoring	N/A
2	NHA Habitat	N/A	N/A	N/A	N/A	N/A
3	European Priority Species	Otter	A single holt identified within Dysart	Drainage	Drain blocking Hydrology monitoring	N/A
		White-clawed crayfish	N/A	Drainage	Drain blocking Hydrology monitoring	N/A
4	Nationally important species	Table 4-3	Table 4-3	Drainage Over grazing Scrub encroachment	Drain blocking Hydrology monitoring Grazing management where required Vegetation monitoring	N/A
5	Habitats and species of local interest	Table 4-1, Table 4-2 and Table 4-3	Table 4-1, Table 4-2 and Table 4-3	Drainage Over grazing Scrub encroachment	Drain blocking Hydrology monitoring Grazing management where required Vegetation monitoring	N/A

4.4 Impact Assessment Notes

Restoration actions proposed for Lough Ennell SAC aim to improve the ecological condition of the fen habitats, particularly the Annex I habitat 7230 Alkaline fen, and to support the achievement of the site-specific conservation objective for this qualifying interest. The proposed measures are intended to improve hydrological functioning, reduce the influence of nutrient enrichment, and maintain suitable vegetation structure and composition across Dysart and Ladestown. These actions are designed to support favourable conservation condition of the habitat and enhance habitat resilience. However, potential impacts, both direct and indirect, must be carefully considered to ensure that implementation of the restoration plan does not result in adverse effects on sensitive habitats, protected species, or the qualifying interests and special conservation interests of nearby European sites.

Potential impacts:

- **Habitat loss** – low risk – The restoration actions proposed within this FRP, including drain blocking, scrub management and hydrology monitoring are intended to restore and enhance fen habitat rather than remove it. Temporary, highly localised disturbance to vegetation may occur during implementation of measures such as drain blocking or scrub removal, but no permanent loss of Annex I fen habitat is anticipated where measures are appropriately designed and controlled.
- **Habitat degradation** – moderate risk – There is potential for habitat degradation if restoration measures are not appropriately designed, phased, or monitored. In particular, poorly located or poorly designed hydrological interventions could alter water levels in unintended ways, affecting the structure and function of 7230 Alkaline fen or associated wetland habitats such as 91E0 alluvial woodland and 6410 Molinia meadow. Similarly, inappropriate scrub removal or poorly managed grazing could damage sensitive vegetation structure. Monitoring protocols will therefore be embedded within the site plan to inform adaptive management following implementation.
- **Species disturbance** – low risk – There is potential for disturbance to protected and notable fauna during restoration works, particularly breeding birds, wintering waterbirds associated with Lough Ennell SPA, and protected mammals such as otter and Irish hare. Disturbance may arise through vegetation clearance, drain blocking works, or increased contractor activity near watercourses and fen margins. Works with potential to disturb breeding birds will be undertaken outside the breeding bird season (March to August inclusive) where practicable. Where this is not possible, pre-construction checks by a suitably qualified ecologist will be required. Any works in proximity to potential otter resting places or along watercourses should also be subject to pre-works ecological checks and appropriate buffers.

- **Introduction and/or spread of invasive non-native species** – moderate risk – Restoration activities involving vegetation clearance, soil disturbance, movement of machinery, or changes in site hydrology may increase the risk of introducing or spreading invasive non-native species. This includes the possible spread of existing invasive species populations in the wider zone of influence through contaminated machinery, disturbed ground, or altered water movement. Monitoring and biosecurity protocols will be embedded into the site plan to minimise these risks, and invasive species management will need to be considered as part of implementation planning.
- **Water quality effects** – moderate risk – Works at Lough Ennell SAC could affect water levels, flow pathways, or water quality if not carefully designed. This is particularly relevant given the influence of arterial drainage, field drains, surrounding land use, and the hydrological connection with Lough Ennell. Measures should therefore be informed by baseline monitoring and implemented with controls to avoid sediment release, nutrient mobilisation, and unintended effects on adjacent receptors.

Ecological Impact Assessment Considerations

- Vegetation Measures
    - Monitoring of Vegetation: Fixed-point quadrat monitoring to assess effectiveness and inform adaptive management.
    - Conservation Grazing: Appropriate stocking density, animal type and timing to ensure suitable levels of grazing on the 7230 Alkaline fens.
- Hydrology Measures
    - Drain blocking: Prioritised based on baseline hydrological data.
    - Livestock crossing: Construction of a stable crossing to aid livestock access across existing watercourses
- Nutrient Measures
    - Hydrochemistry Monitoring: Testing of nutrients in surface and groundwater.
    - Buffer strips: Creation of buffer strips at suitable locations to reduce the input of nutrients into the site.
- Species Protection Measures
    - Protected species checks: Pre-works checks should be undertaken where restoration actions may affect breeding birds, otter, or other protected fauna.
    - Timing of works: Works should be scheduled to avoid sensitive periods for breeding birds and other ecological receptors wherever practicable.

- Biosecurity: Biosecurity measures should be applied throughout implementation to reduce the risk of introducing or spreading invasive non-native species.

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 4-1 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	All vehicles should undergo stream cleaning before site entry. Identified buffers on IAS should be avoided during site preparation and restoration implementation. Consideration should be given to confirmatory survey to identify the latest *Rhododendron* infestation extent along with ecological oversight regarding works proximal to larger infestations.
Protection of European Sites	Any required mitigation measures to avoid potentially adverse effects on European Sites should be incorporated into an Environmental Management Plan or Checklist of Environmental Commitments. 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 Lough Ennell SAC 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 was applied based.

The conservation status assessment results for Lough Ennell SAC is summarised in Table 5-1.

Table 5-1: Conservation Status Assessment as per NFS 2022 (Brophy et al, In prep)

OVERALL CONSERVATION STATUS ASSESSMENT				
Annex I habitat	**Area**	**Structure & functions**	**Future prospects**	**Overall Conservation Status**
7140	N/A	N/A	N/A	N/A
7210	N/A	N/A	N/A	N/A
7230	Favourable	Unfavourable – Bad	Unfavourable – Bad	Unfavourable – Bad

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 at Lough Ennell SAC, following desktop review and the 2026 ecological walkover, is summarised below. The principal pressures affecting 7230

Alkaline fen and associated fen habitats are drainage and hydrological modification, grazing management, scrub encroachment and localised nutrient enrichment. These pressures vary between Ladestown and Dysart but interact through similar ecological mechanisms: altered water levels reduce soil saturation, reduced or inappropriate grazing promotes rank vegetation and woody regeneration, and nutrient inputs may favour competitive species at the expense of characteristic fen vegetation.

5.2.1 Hydrology Pressures

The following hydrological pressures were identified within Dysart and Ladestown for Lough Ennell sites (Table 5-2). Table 5-2: Hydrology pressures for Lough Ennell

Table 5-2: Hydrology pressures for Lough Ennell

Site	Hydrology pressure
Dysart	Drainage has been identified as a key pressure across the site. Historical drainage and arterial drainage schemes were recorded as affecting all Dysart monitoring points. Drainage influence was recorded as low at Ecological monitoring Point 5 and medium at Ecological Monitoring Points 6, 7, 8 and 9. Drainage may lower water levels, reduce soil saturation and facilitate willow and Phragmites encroachment in areas where grazing is absent or low. Parts of the site are likely to flood regularly in winter.
Ladestown	Drainage has been identified as a key pressure across the site. Drainage continues to be a relevant pressure where it affects water levels and contributes to drying or local vegetation change within fen habitats. Drainage pressure was recorded low influence at Ecological Monitoring Points 1 and 3 and medium influence at Ecological Monitoring Point 4. Large parts of the site are likely to flood regularly in winter.

5.2.2 Fen Nutrient Pressures

The following nutrient pressures were identified within Dysart and Ladestown in Lough Ennell (Table 5-3).

Table 5-3: Nutrient pressures for Lough Ennell

Site	Nutrient pressure
Dysart	High nutrients present in arterial drains, and field drains during 2026 site survey.
Ladestown	High nutrients present in field drains during 2026 site survey.

5.2.3 Flora and Fauna Pressures

The following pressures are presented in order of their relative intensity and potential impact on the ecological receptors of the Lough Ennell SAC. These have been identified through a review of historical information (PFS) and informed by observations recorded at the monitoring points established as part of this project.

- Drainage – Evident by historical and current drains that actively manage both sites. Drainage features can lower water tables and disrupt natural flow patterns, leading to shifts in fen vegetation and encouraging the dominance of grasses. Although some drains have become partially infilled with vegetation, they continue to influence the hydrological regime of both subsites.
- Scrub encroachment – evident from the presence of willow, alder, ash and beech woodland throughout both sites. Willow and birch regeneration were also recorded during the 2026 monitoring surveys. A forestry plantation located immediately west of Ladestown may contribute to scrub expansion along the site margin.
- Grazing Management – Grazing absence was recorded at a number of monitoring points within both Ladestown and Dysart, while active grazing was observed at others. Reduced grazing pressure can result in litter accumulation, increased vegetation height, scrub establishment and habitat succession, leading to changes in habitat structure and species composition. Conversely, excessive grazing may result in localised damage to fen vegetation and soils..
- Nutrient enrichment – Localised evidence of nutrient enrichment was recorded within Dysart, including algal growth along the fen margin. In addition, the 2026 water-quality monitoring identified elevated nutrient concentrations at a number of drainage locations, indicating potential nutrient inputs from adjacent land use which may influence fen habitat condition.



Figure 5-1: Flora & Fauna Pressures mapped within Ladestown



Figure 5-2: Flora & Fauna Pressures mapped within Dysart

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.

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

Each of the factors was considered based on a combination of desktop analysis combined with site-specific field surveys to select the most appropriate restoration technique to address each pressure considered by the FRP. The restoration measures proposed are outlined in Section 6.2 to Section 6.3, with detailed mapping of proposed measures illustrated in the maps provided in Appendix B.

6.2 Hydrology Measures

6.2.1 On-site Fen Hydrology Measures

The primary aim of the hydrology restoration measures is to modify water levels closer to the surface and increase the duration and frequency of saturation across the wetland, without causing inundation. Dysart and Ladestown occur on the exposed lakeshore of Lough Ennell, with both sites having relatively thin fen peat deposits. The CMS and desktop study indicated that both sites are classed as **WETMEC 7b: Groundwater Floodplains,** indicating that they are receiving up flow through these permeable deposits. Hydrological measures will focus on local water table improvements in support of fen habitat.

In the southwestern area of Dysart there is a road and drainage that has been constructed over the historical lakebed which is in transition to fen habitat. Drainage blockage is recommended along the two drains which run parallel to each other in this area. This will raise the water level to rewet that section of the site but may have implications for the use of the road. Further analysis into appropriate road infrastructure should be investigated. The peat in this area is shallow at 0.75m with some exposed rock at the surface. Peat dams are proposed, but peat depths will need to be confirmed on site prior to implementation of peat dams.

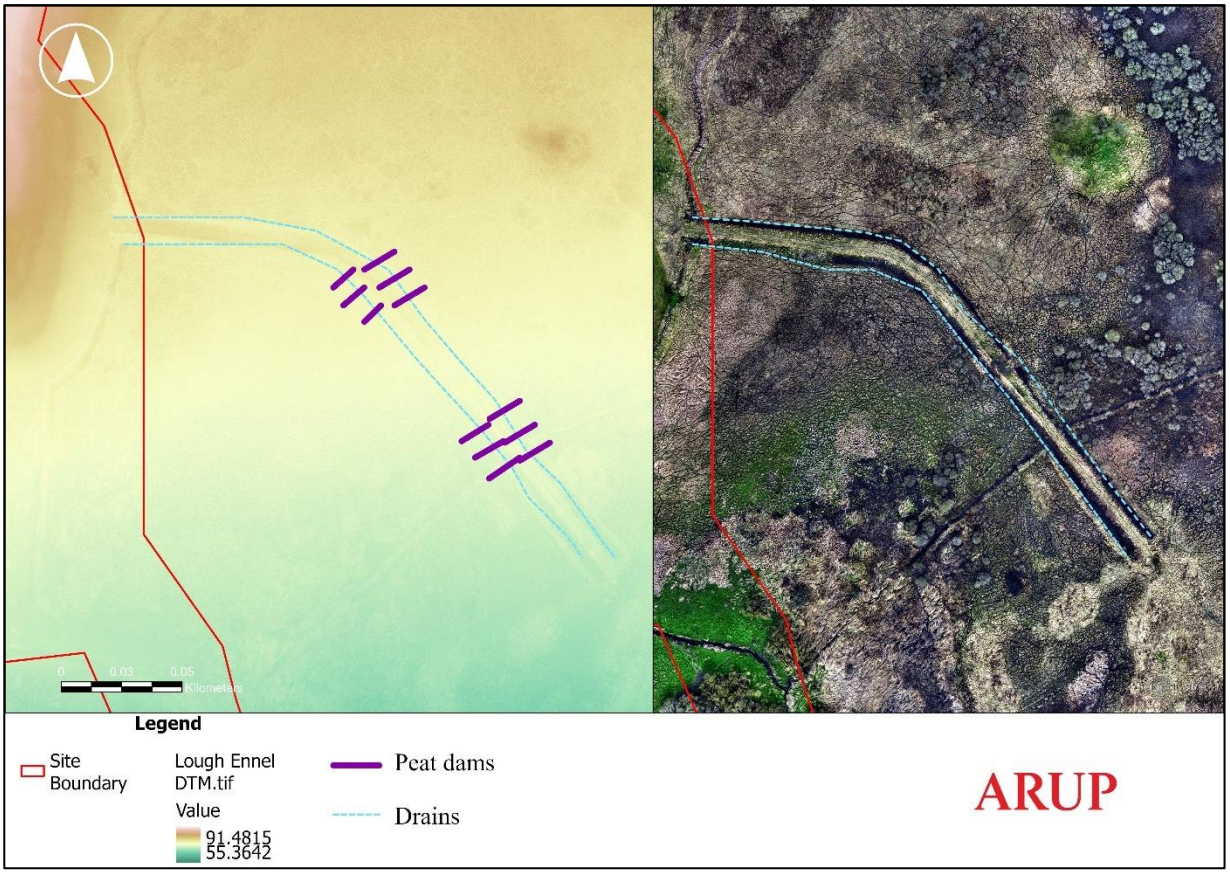


Figure 6-1: Locations for drain blocking at Dysart identified on the DTM and Orthophoto

Drain blocking is proposed in Ladestown along two drains perpendicular to the larger forestry drain in the western area of the site. However, engagement with the landowner will be required as he uses this area recreationally. The peat here is shallow at 0.15m, therefore peat dams are being proposed.

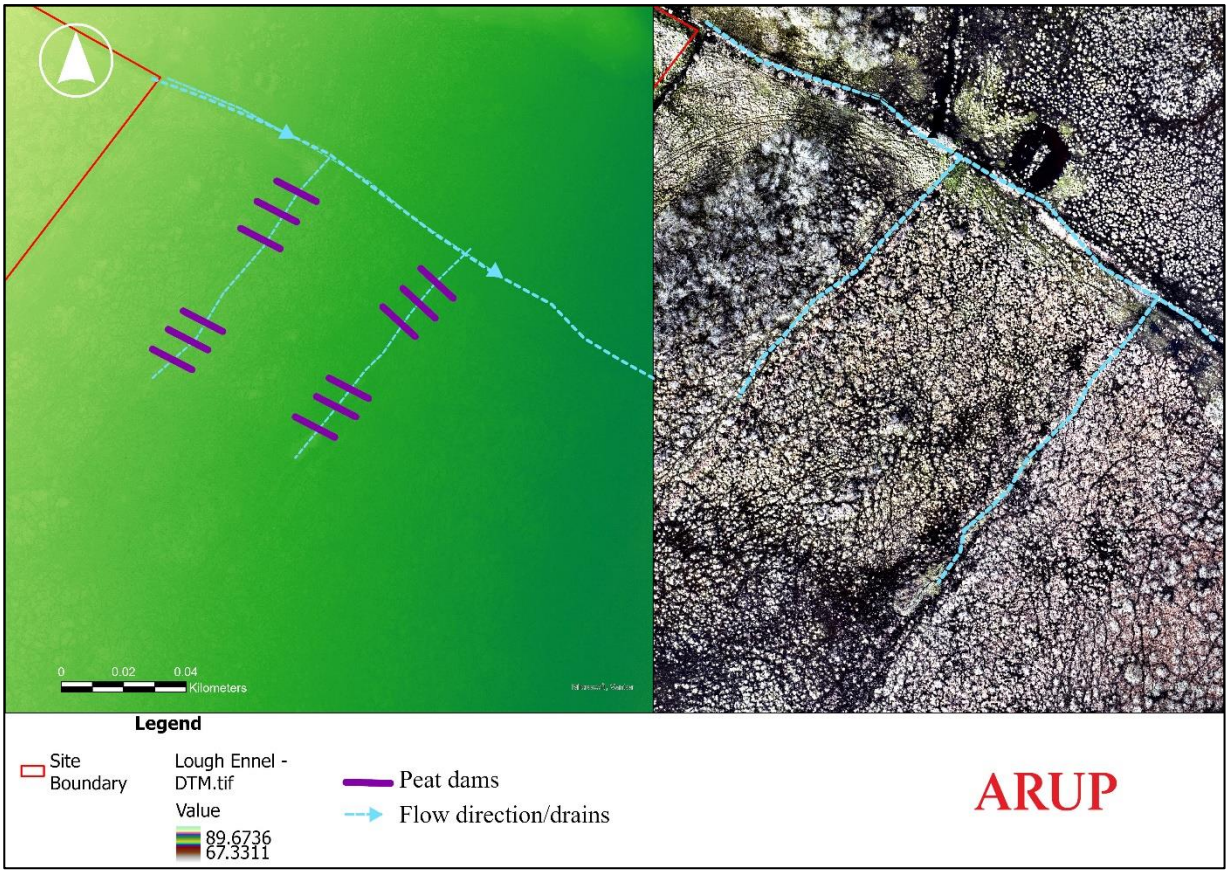


Figure 6-2: Locations for drain blocking at Ladestown identified on the DTM and Orthophoto

Equipment

In accordance with NatureScot Peatland Action guidance (NatureScot, 2019), peat dams will be constructed using small, low ground pressure excavators where ground conditions allow, to minimise disturbance and compaction of the peat surface. Excavators will be appropriately sized for access constraints and peat bearing capacity and may be used in conjunction with bog mats where required to reduce surface damage and improve machine stability.

Where access is constrained or machinery use would risk damage to sensitive vegetation or unstable peat, hand tools i.e. spades, may be used to construct or refine dams at selected locations. The excavator will be used to profile dam crests and adjacent ditch edges to avoid creating deep pools and to ensure controlled overtopping during high flows, in line with Peatland Action best practice (NatureScot, 2019.)

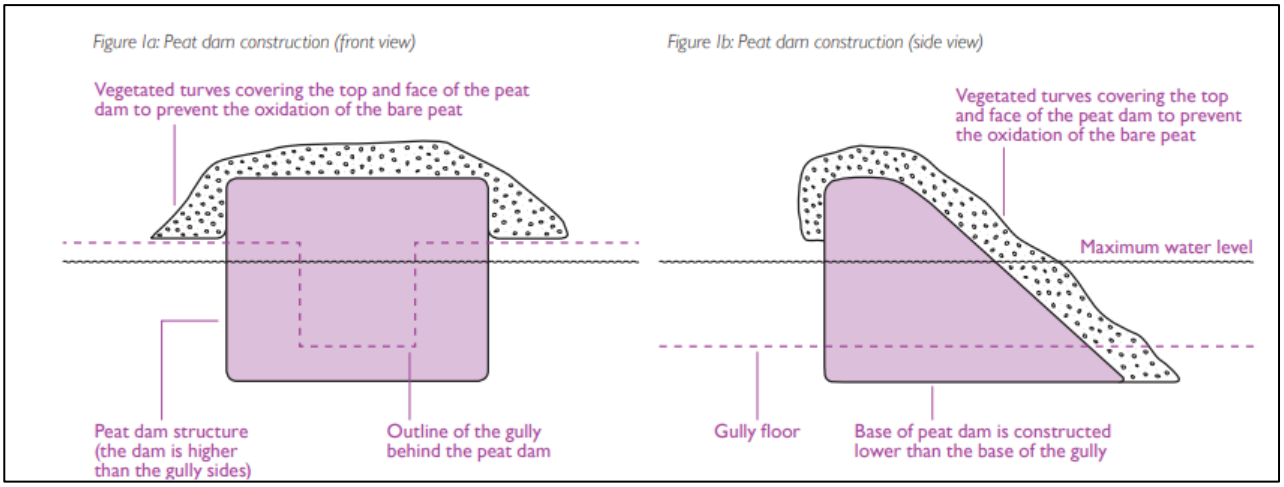


Figure 6-3: Peat dam construction (Moore for the Future Partnership, 2019)

Maintenance

An initial check should be undertaken approximately one month after installation to confirm the peat dams are functioning as intended (i.e. water is being held back) and to identify any early defects requiring repair. Checks should include confirmation that water is not bypassing around the sides or leaking underneath the dam, and that there are no major leaks or evidence of erosion/scour at the overflow point. Ongoing maintenance checks should continue on a seasonal basis, with particular attention to ensuring the overflow is not blocked by floating material and that dams continue to hold water effectively. Any defects identified should be repaired promptly to maintain hydrological performance and prevent progressive failure.

Monitoring progress

Surface water flow within Dysart and Ladestown, discharging to Lough Ennell, will be monitored at selected drains. Groundwater levels will be monitored using piezometers, installed at targeted locations within the wetland to support habitat restoration.

6.2.2 Off-site Hydrology Measures

6.2.2.1 Input to catchment management plan

The Lough Ennell Catchment Management Plan (Lauder and LECMP partners, 2025) is a plan to protect water quality and ecological health while supporting recreation and tourism. The aims are to reduce pathogen loading, restore habitats and maintain conservation status. Arterial drains in the Dysart catchment such as Barrettstown and Hanstown have been prioritised for interventions due to proximity to the bathing water area. It will be important to also consider the arterial drains upstream of the Dysart and Ladestown sites in this plan.

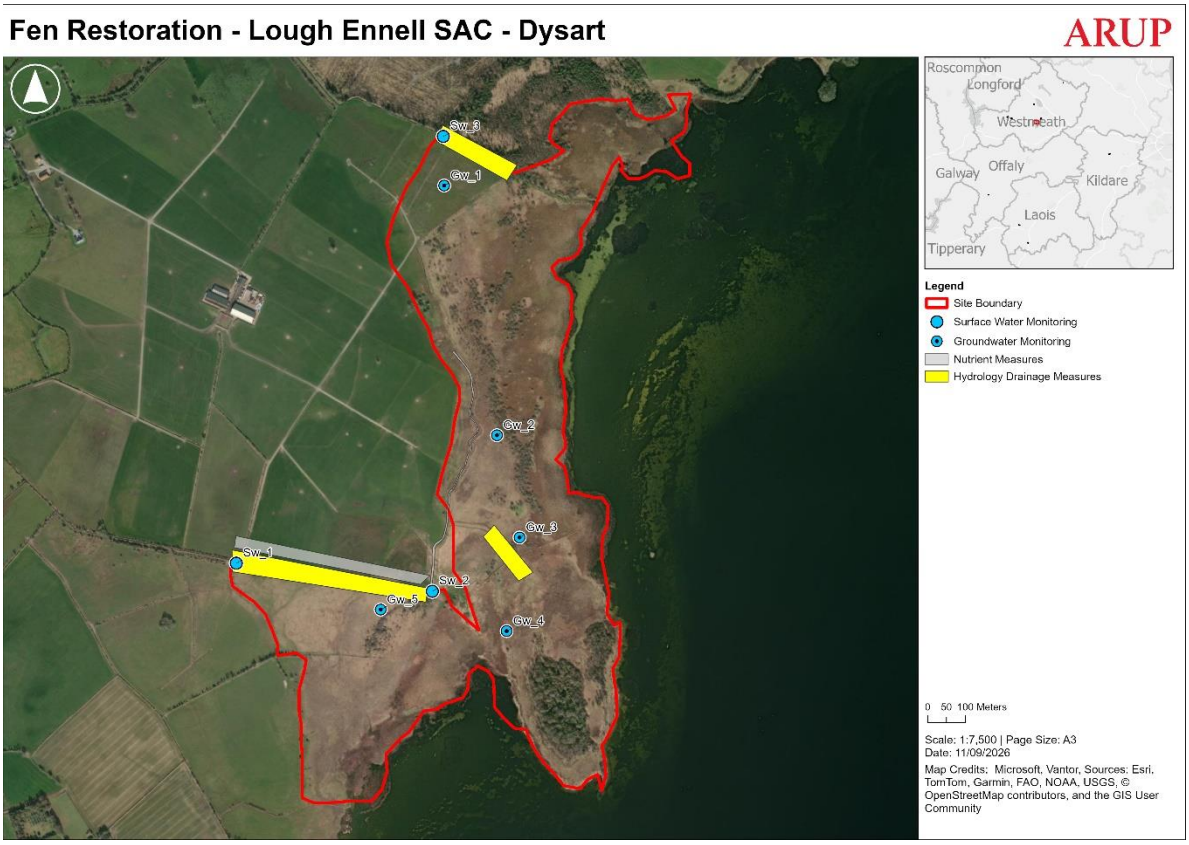


Figure 6-4: Proposed hydrology measures for Dysart

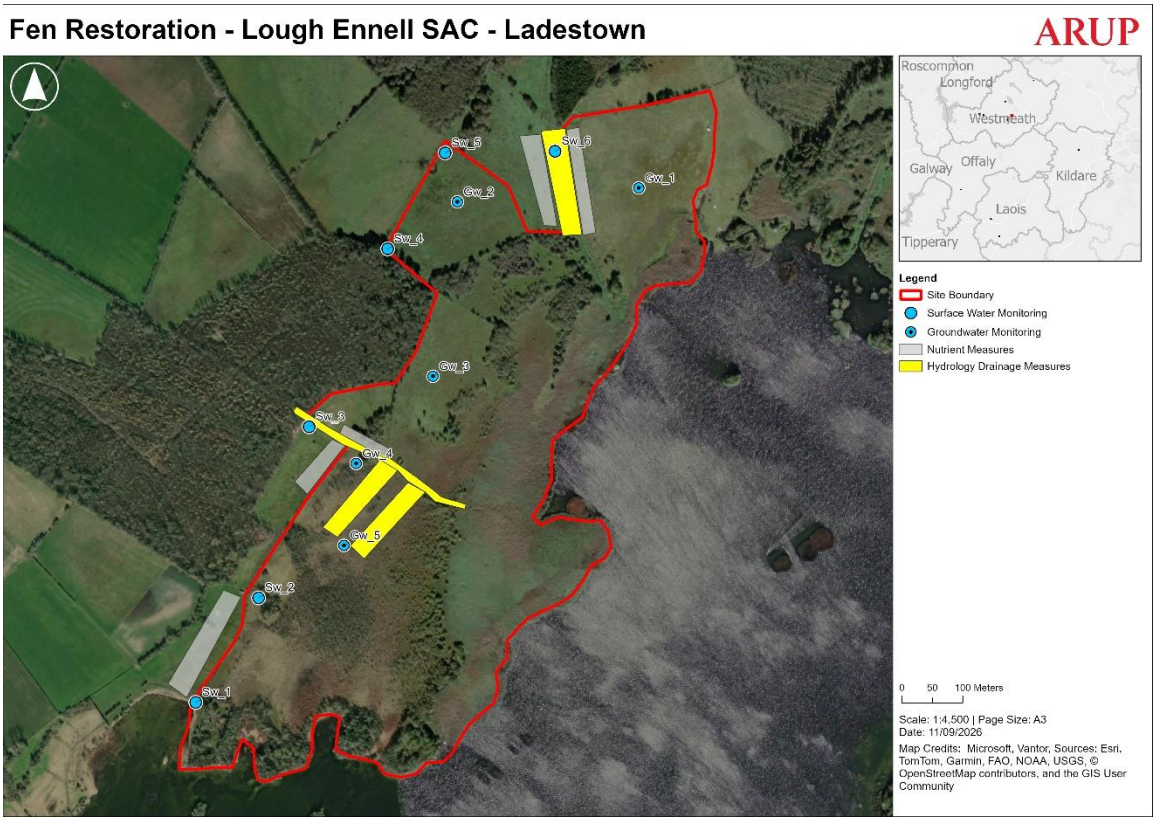


Figure 6-5: Proposed hydrology measures for Ladestown

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.

6.3.1 On-site Nutrient Measures

Within SACs landowners must get consent from NPWS to undertake certain actions. The "activities requiring consent" related to nutrient measures include:

- Reclamation, including infilling.
- Cutting, uprooting or otherwise removing plants[4].
- Introduction, or re-introduction, of plants or animals not found in the area[6].
- Digging, ploughing, harrowing or otherwise disturbing soil or substrate[5].
- Applying inorganic or organic fertiliser, including slurry and farmyard manure[6].
- Application of pesticides, including herbicides[6].

Nutrient measures such as hedgerows will intercept the pathway of sediment and nutrients and will also act as a visual delineation of farmland vs wetland. Existing agri-environment frameworks such as Farming for Water EIP[6] or novel approaches under NPWS Farm Plans[7] can provide support to landowners in reducing nutrient loads to reduce the mobilisation and transport of nitrogen(N) and phosphorus (P) from agricultural land to the fen habitat.

Source control within site boundary

[4] Consent is not required for harvesting of cultivated crops, or for grazing or mowing.

[5] Consent is not required for these activities on established reseeded grassland or cultivated land provided it is greater than 20m from a river, stream or floodplain; or greater than 50m from a wetland, lake, turlough or pond.

[6] The "Farming for Water" project provides funding to help farmers implement 43 measures designed to protect water quality by reducing pollution from nitrates, phosphorus, sediment, and pesticides. The project is a major initiative to reduce pollution from farming practices in Ireland and ensure that the country's rivers and other waterbodies are kept clean and healthy for the future and that we meet our obligations under the Water Framework Directive.

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

Suitable measures for Dysart and Ladestown may include (Farming for Water EIP, 2023):

- Farmer Training Course for farmers within the fen site boundary. Training will create awareness of the benefits of improved land practices upstream of a fen.
- Nutrient Management Plan. Such a plan will enable farmers in the site boundary to consider alternative nutrient application.

Pathway interception within site boundary

- Buffer along the farm side of western drain at Dysart. A spatially targeted buffer to intercept and retain pollutants and sediments transferred from adjacent fields by surface and subsurface pathways. Recommendations are to:
    - Maintain a minimum buffer width (typically 5–10 m), subject to site constraints.
    - Restricting fertiliser application, grazing, and any soil disturbance within the buffer zone.
    - Promoting natural regeneration of vegetation.
    - Preventing access by machinery within the buffer during maintenance operations.

Receptor measures:

- Bovine, Ovine Exclusion from water bodies is important due to nutrient impacts in both sites. Water bodies (including rivers, streams, drains, ponds, and lakes) should be fenced to restrict access by cattle and sheep. This measure helps minimise nutrient and sediment inputs and reduces the risk of bank erosion and destabilisation.

Monitoring is proposed for habitats and drainage channels, including key water quality parameters such as nutrients (nitrate and phosphate), electrical conductivity, and pH. Monitoring locations will encompass the main surface water inputs, both upstream and downstream of the sites.

6.3.2 Off-site Nutrient Measures

6.3.2.1 Catchment nutrient management

Targeted nutrient control measures should be implemented across the catchment to address both phosphate and nitrogen pathways. PIP maps and field water quality data suggest that Phosphorus runoff may be an issue in Dysart, in the OPW arterial drain in the southwestern section. Phosphorus runoff is also an issue in Ladestown according to the field survey data.

Nitrate levels are high in Dysart within the old lakeshore boundary drain and within the southwestern arterial drain. Nitrate is high on one drain in Ladestown adjacent to the site boundary.

All restoration maps are presented in Appendix C.

6.4 Vegetation Measures

6.4.1 On-site Vegetation Measures

On-site vegetation measures are detailed in Table 6-1.

Table 6-1: Recommended on-site vegetation measures

Priority	Measure	Description	Responsibility
1	Grazing management	Site-wide grazing management is required at Ladestown and Dysart to maintain open fen and limit scrub and tall-herb encroachment. Grazing absence was recorded at several monitoring points across both subsites during the 2026 surveys. Stocking density and seasonal timing should be controlled to avoid localised poaching, particularly in wetter areas near the lake edge and drainage features.	Landowner, Tóchar & NPWS (post-Tóchar)
2	Vegetation monitoring	Vegetation monitoring should be established across representative habitats and management zones at Ladestown, including scrub-affected areas, drainage-influenced zones and open fen. Monitoring should focus on the central fen corridor and areas vulnerable to encroachment by birch, willow and alder (Figure 5-1). Fixed-point quadrats should be used to track species composition, vegetation structure, and responses to grazing and scrub management, and to inform adaptive management. Monitoring results should inform adaptive management and future restoration requirements.	Tóchar & NPWS (post-Tóchar)
3	Scrub removal	Targeted scrub removal is required at Dysart to manage encroachment adjacent to forest and drainage features (Figure 5-2). At Ladestown, scrub removal should only be undertaken if monitoring identifies a need, in which case it should focus on the central fen corridor and localised areas shown on (Figure 5-1) where scrub is shading and suppressing fen vegetation. Works should use low-impact methods, arisings should be removed to avoid nutrient enrichment, and follow-up monitoring will be required to manage regrowth.	Tóchar & NPWS (post-Tóchar)



Figure 6-6: Recommended vegetation restoration measures at Ladestown



Figure 6-7: Recommended vegetation restoration measures at Dysart

7 Additional Considerations

7.1 Drainage Management Plan

Lough Ennell is part of the Brosna Arterial Drainage Scheme managed by OPW. Consultation is required with OPW on the maintenance and function of the C41(1), C38(1) and C39(1) of the East Region Brosna Scheme.

Only preliminary consultation with OPW has been completed to date. In the absence of information regarding consent requirements within Appendix D, additional consultation should be undertaken prior to the implementation of any drain-blocking measures to establish whether formal consent is required.

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.

Fen sites are typically located on relatively flat slopes at the base of catchments, which are lower risk than blanket bogs which occur at higher elevations including steep slopes and higher rainfall

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 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.

7.2.1 GSI Landslide Susceptibility Mapping

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 results from the landslide susceptibility maps for Lough Ennell SAC are presented in Figure 7-1 and Figure 7-2 . This highlights that there are no known historical landslides within of surrounding the SAC.

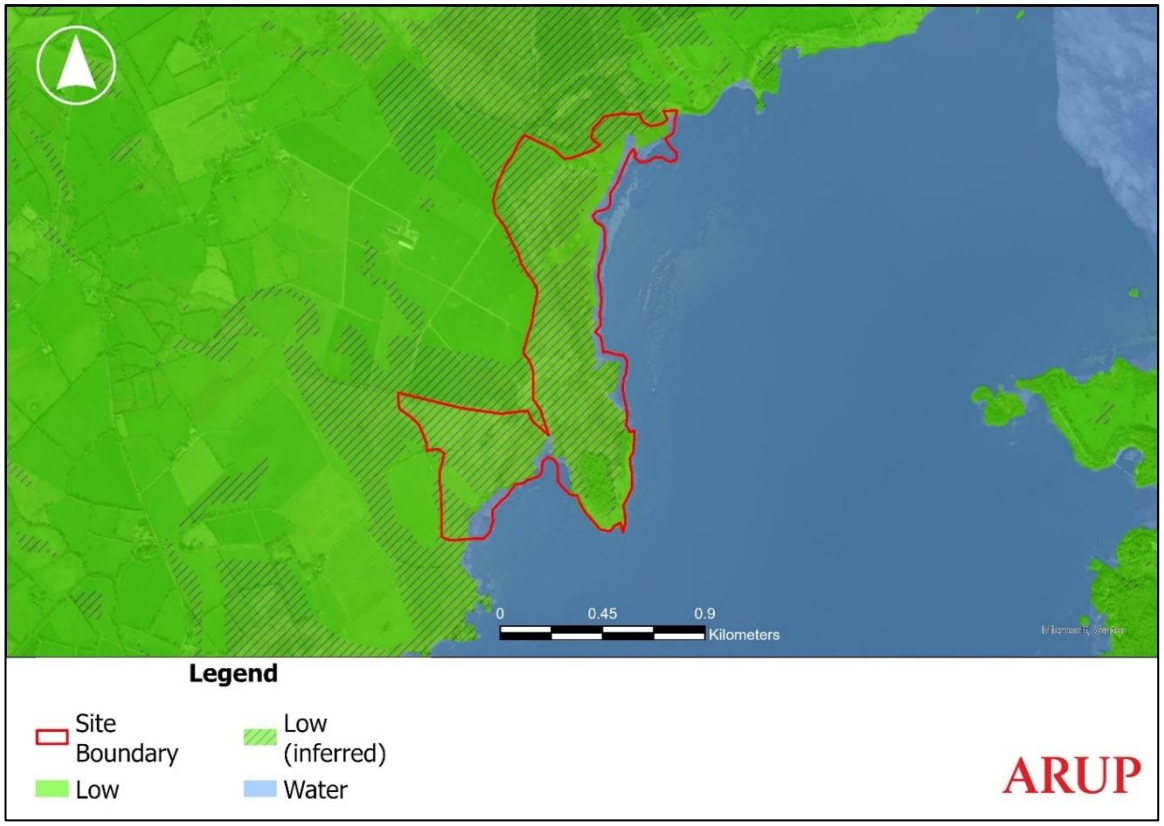


Figure 7-1: Geological Survey of Ireland Landslide Susceptibility mapping for Dysart.



Figure 7-2: Geological Survey of Ireland Landslide Susceptibility mapping for Ladestown.

7.3 Archaeology

There are several archaeological monuments surrounding and within both sites including Ringforts, Moates and Crannóg's. At Dysart there is a Bastioned fort (WM02089) located in the southeastern area of the site while a Crannóg (WM04111) is located in the central southern area of the site. In Ladestown there is a Crannóg (WM02236) located within the northeastern area of the site. The archaeological maps are shown in Figure 7-3 and Figure 7-4.

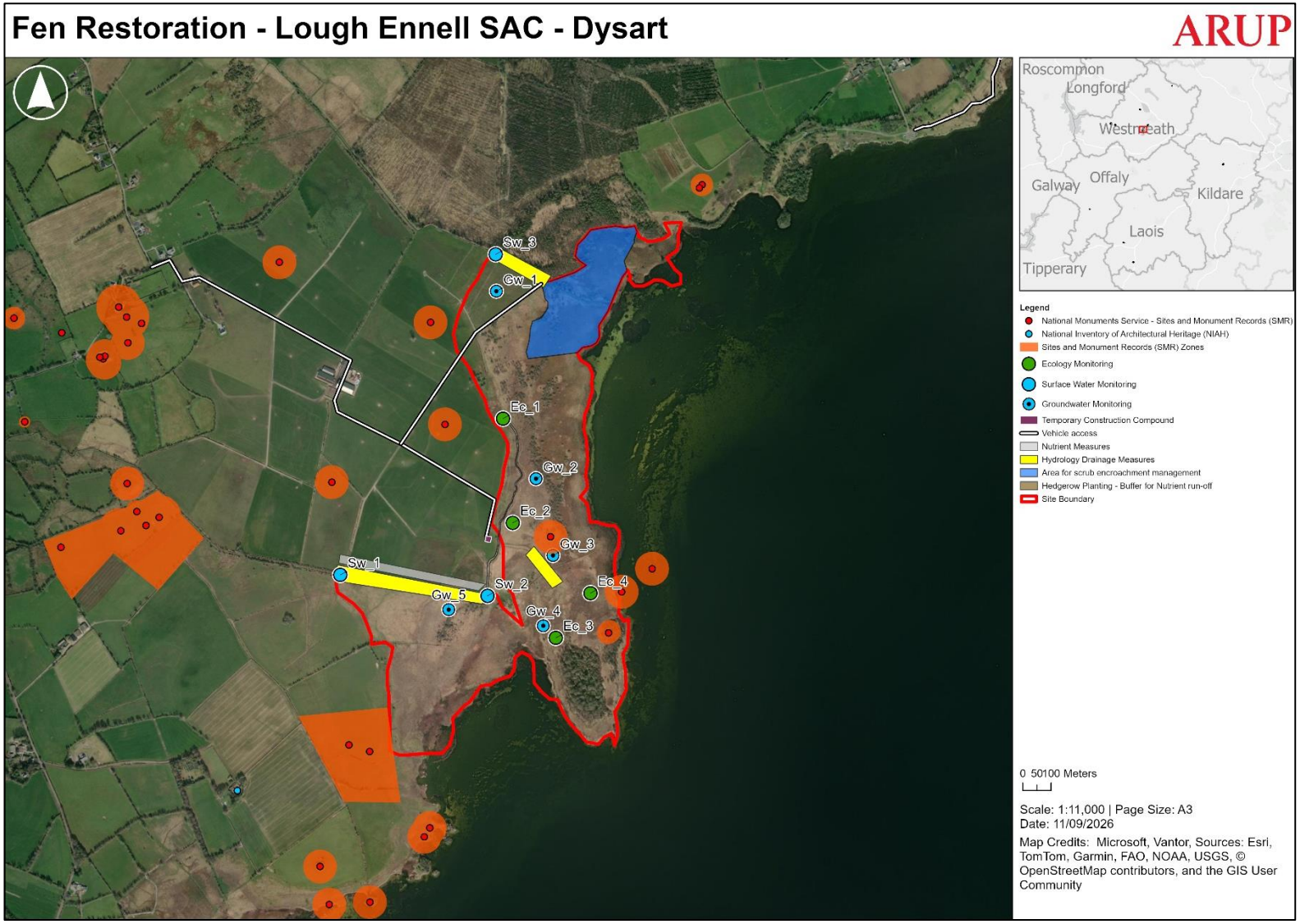


Figure 7-3: Archaeological monuments within Dysart (NMS, 2025)

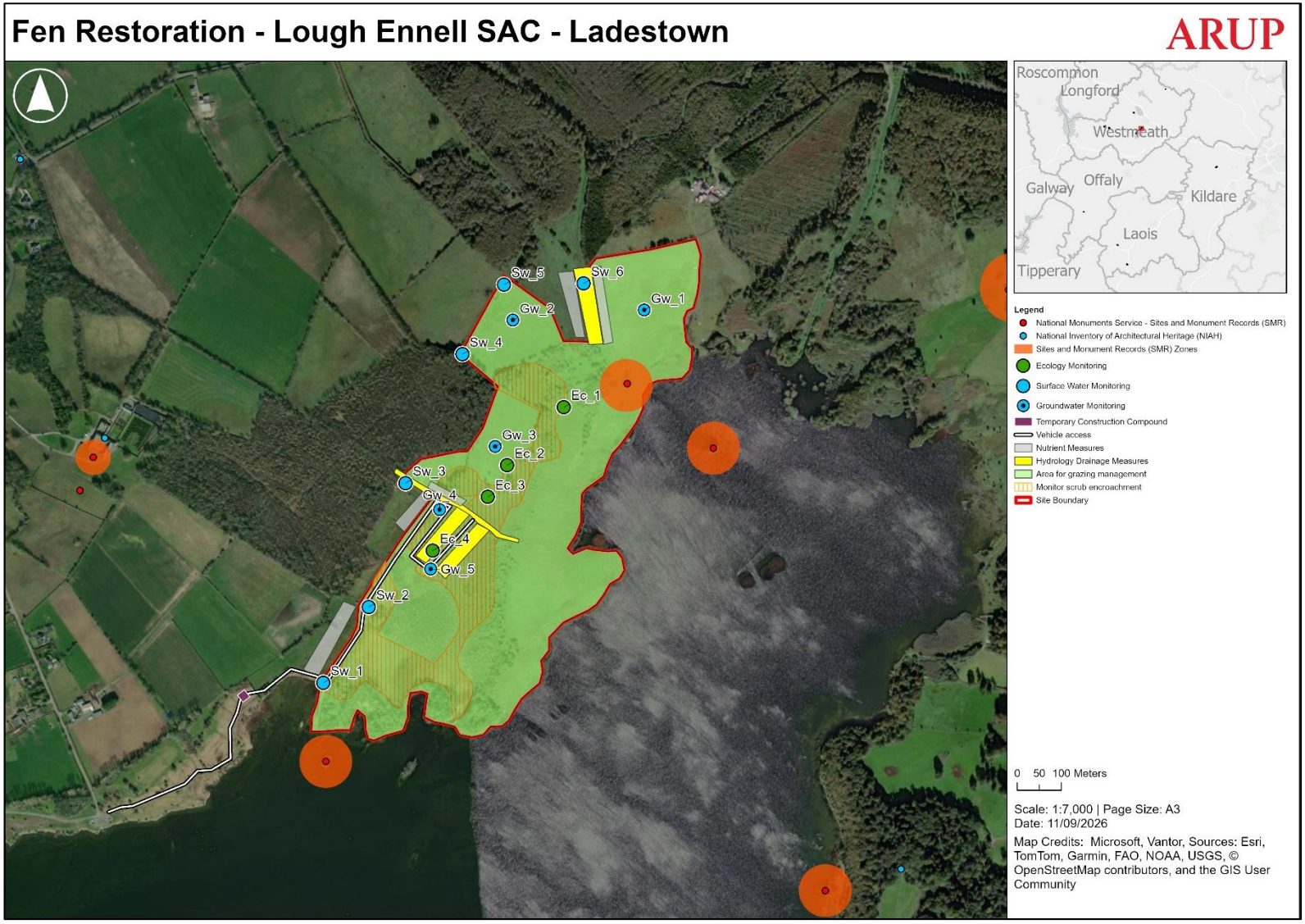


Figure 7-4: Archaeological monuments within Ladestown (NMS, 2025)

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.

This section provides the summary of the Fen Restoration Plan Actions for Lough Ennell SAC (Table 8-2).

Table 8-1: Role players in fen restoration plan

Measures	Stakeholder	Description
On-site	Landowners	Parts of Lough Ennell are under Commonage ownership by private individuals
	National Monument Service	Monuments present within the site boundary
Off-site	LAWPRO, ASSAP, Westmeath County Council, Landowners & farmers	Engagement for uptake of catchment measures.
	Westmeath County Council, EPA, HSE	Responsible for management of Lough Ennell and surrounds. EPA regulator of the Bathing Water Licence.
	OPW, Waterways Ireland, ESB	Waterways Ireland has a key role in the management and maintenance of the canal network within the catchment. As the canals are hydraulically connected to the site, their operation and maintenance can influence water movement and levels within the wider catchment. ESB is primarily responsible for maintaining water levels within the lake through the operation of a sluice gate located on the downstream section of the Brosna River. Waterways Ireland also has an important role in maintaining the canalised section connected to the broader water management system, working alongside ESB's regulation of the sluice gate to influence water levels across the catchment. Meanwhile, the arterial drain running through the site contributes to lowering lake water levels by facilitating the drainage of water from the surrounding area.
	IFI, Lough Ennell Trout Preservation Association, LAWPRO	Part of the Lough Ennell catchment partnership

Measures	Stakeholder	Description
	Uisce Eireann	Responsible for wastewater discharge from Mullingar.
Capacity building	NPWS	NPWS engaging in community education and events

Table 8-2: Implementation plan for Lough Ennell 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 Lough Ennell SAC. The Screening for AA must conclude whether a likely significant effect is anticipated to arise from the implementation of the project.	Sitewide	Screening report	Pre-restoration	NPWS			NPWS
1.2	**Drainage management plan**							
	Consultation with Westmeath Co. Co & OPW on the drainage management plan is required to ensure compliance with legislation and local authority objectives.	Sitewide	Drainage management plan	Pre-restoration	NPWS	Westmeath Co. Co	Arup	Within Tóchar project scope
1.3	**Archaeological assessment**							
	Consultation with NMS on the archaeology is required to ensure compliance with legislation and local authority objectives.	Sitewide	Archaeological assessment report	Pre-restoration	NPWS	Westmeath 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.	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**							
	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**							

	Activity	Location	Monitoring/ implementation indicator	Timeframe	Key role player			Possible funding source
					National	Regional/ Local	Other	
	Installation of drain blockers Two bog drains in the western area of the site, perpendicular to a larger drain flowing into Lough Ennell.	Ladestown – Western area	Site installation records	Long-term	NPWS to facilitate site access	Landowner		Future funding
	Installation of drain blockers Potentially block the drains adjacent to the road in the southwestern region of the site.	Dysart – Southwestern area	Site installation records	Long-term	NPWS to facilitate site access	Landowner		Future funding
3.2	**Vegetation measures**							
	Vegetation monitoring will comprise ecological surveys conducted at fixed locations across the site to identify habitats, vegetation communities, and associated pressures and threats.	Dysart Ladestown	Vegetation surveys	Long-term	NPWS	NPWS	Arup	Year 1: Within Tóchar project scope Year 2+: NPWS funding.
4	**Off-Site Restoration measures**							
4.1	**Hydrology measures**							
	Catchment Management Plan for Lough Ennell Ensure that the two sites are included and the hydrology measures are in line with the Lough Ennell Catchment Management Implementation Plan.	Lough Ennell catchments	Fens included in Lough Ennell CMP	Long-term	NPWS, IFI	LAWPRO	LETPA	LAWPRO

	Activity	Location	Monitoring/ implementation indicator	Timeframe	Key role player			Possible funding source
					National	Regional/ Local	Other	
	Avoid creating new drains Ensure drains within the forestry areas surrounding both sites are managed. Ensure drains are managed and no new drains are dug.	Dysart and Ladestown	Uptake of measures by landowners / farmers	Long – term			Landowners	NPWS
4.2	**Nutrient measures**							
	Catchment nutrient management Ensure that the arterial drains within the wetland catchments are included as priority under the Catchment Management Plan for Lough Ennell. Targeted nutrient control measures should be implemented for both sites. Measures may include source control measures (Farmer Training Course for farmers in the fen catchment; Nutrient Management Plan; Nitrogen Surplus), pathway interception measures (Linear Riparian Buffer Zones: Grassland) and receptor measures (Bovine, Ovine Exclusion from water bodies)	Surrounding landowners for Dysart and Ladestown	Uptake of measures by landowners / farmers	Long-term	NPWS,	LAWPRO, Farming for Water EIP, ASSAP	Landowners	Catchment measures to be funded through Farming for Water EIP / other similar
5	**Monitoring progress**							
5.1	**Hydrology monitoring**							

	Activity	Location	Monitoring/ implementation indicator	Timeframe	Key role player			Possible funding source
					National	Regional/ Local	Other	
	Rainfall and evaporation monitoring using site-specific or nearby stations.	All sites – Mullingar weather station	Rainfall and evaporation levels	Long-term				NPWS
	Lake level monitoring through GSI.	Lough Ennell	Water level	Long-term	GSI, UE			NPWS
	Site-specific groundwater and surface water monitoring in, Dysart and Ladestown, shall be undertaken using a network of piezometers and standpipes installed at key locations across the site to track variations in water levels.	Dysart and Ladestown	Water level	Long-term	NPWS to facilitate site access		Landowners	NPWS
5.2	**Nutrient monitoring**							
	Ongoing monitoring of habitats and drainage channels shall be undertaken to assess water quality parameters.	Dysart and Ladestown	Nutrients (Nitrate and phosphate), electrical conductivity and pH	Long-term	NPWS			NPWS
5.3	**Vegetation monitoring**							
	Habitat condition assessments will be included to track restoration progress.	Dysart and Ladestown	Habitat condition	Long-term	NPWS			NPWS
6	**Capacity building and training**							

	Activity	Location	Monitoring/ implementation indicator	Timeframe	Key role player			Possible funding source
					National	Regional/ Local	Other	
	Public meeting: To engage stakeholders on developments and results from the restoration measures. Ensure community is aware of the relationship of the fen sites to the wider Lough Ennell catchment management plan.			Long-term	NPWS	LAWPRO		LAWPRO
	Farmer training: Training such as that provided by the Farming for Water EIP will provide farmers with knowledge of alternative and habitat sensitive measures.			Long-term	NPWS/ Farming for Water EIP / LAWPRO / Teagasc			Farming for Water EIP / other similar

8.1 Habitats Benefiting from Implementation of Restoration Actions

7230 Alkaline fen

Hydrological restoration measures, including drain blocking where appropriate, are expected to support the restoration of local water levels and hydrological processes within areas of 7230 Alkaline fen at both Dysart and Ladestown. These measures will be complemented by grazing management, vegetation monitoring and targeted scrub management to maintain open fen habitat and limit vegetation succession. Together, these actions are expected to improve habitat structure, support characteristic alkaline fen species and contribute towards achieving the relevant SSCOs for 7230 Alkaline fen.

6410 *Molinia* meadows

At Ladestown, areas of 6410 Molinia meadows are expected to benefit from hydrological restoration measures that maintain wet conditions and prevent further drying of the habitat. Appropriate grazing management will also help maintain vegetation structure and prevent scrub encroachment, supporting the conservation of this habitat and associated species.

91E0 Alluvial forests

Areas of 91E0 Alluvial forests located within Ladestown and Dysart are expected to benefit from measures designed to reduce nutrient inputs and improve water quality, including the establishment of buffer zones where appropriate. Hydrological restoration measures may also help maintain suitable wet woodland conditions within adjacent areas of alluvial forest.

Other habitats

A range of non-Annex wetland habitats present within Dysart and Ladestown are also expected to benefit from implementation of the proposed restoration measures.

At Dysart, PF1 Rich fen and flush, FS1 Reed and large sedge swamp, WN6 Wet willow-alder-ash woodland and associated wetland transition habitats are expected to benefit from improved hydrological functioning, reduced nutrient pressures and the maintenance of open fen conditions through grazing management and scrub control.

At Ladestown, PF1 Rich fen and flush, FS1 Reed and large sedge swamp, FS2 Tall-herb swamp, GS4 Wet grassland and WN6 Wet willow-alder-ash woodland are expected to benefit from hydrological restoration measures, improved water quality resulting from the proposed buffer zones and the implementation of vegetation management measures. These actions are expected to improve habitat connectivity, maintain structural diversity and support the wider wetland mosaic that characterises the site.

8.2 Species Benefiting from Implementation of Restoration Actions

The proposed restoration measures are expected to benefit a range of fauna associated with the wetland habitats of Lough Ennell SAC and SPA. Hydrological restoration, buffer strip establishment, grazing management and targeted scrub control will improve habitat condition, connectivity and ecological function across both Dysart and Ladestown.

Otter is expected to benefit from improvements in wetland habitat quality and connectivity, together with enhanced water quality resulting from nutrient reduction measures and buffer strips. White-clawed crayfish may similarly benefit from reduced nutrient inputs and improvements in water quality within drainage features and connected watercourses.

The maintenance and restoration of fen, reed swamp, tall-herb swamp and wet woodland habitats will also benefit wetland-associated invertebrates, amphibians and other fauna through the provision of improved habitat extent, structure and ecological connectivity.

As Lough Ennell is designated as both a SAC and SPA, the proposed restoration measures are also expected to provide wider benefits for the site's waterbird assemblage. Improvements in the condition and connectivity of fen, reed swamp, tall-herb swamp and wet woodland habitats will support feeding, sheltering and roosting opportunities, while improved water quality and hydrological functioning will contribute to the ecological integrity of the wider wetland system.

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Appendix A – Non-Technical Summary

NPWS Tóchar Midlands Wetland Restoration Scheme Fen Restoration Plan Non-Technical Summary			
Site Name	Lough Ennell SAC	**NFS site no.**	104015 & 104016
County	Westmeath	**Designation**	SAC
Fen habitats present (area)	7230 Alkaline fen	**Species of note**	

Site Description

Lough Ennell (SAC 000685) (Westmeath) is located 9km north-east of Mullingar, Co. Westmeath. The site is designated as a Special Area of Conservation (SAC) for qualifying interests 7230 Alkaline fen and 3140 Hard oligo-mesotrophic waters with benthic vegetation of Chara spp.; however, habitat 3140 is not relevant to this Fen Restoration Plan. Lough Ennell is composed of two sites surveyed as part of the National Fen Survey: Ladestown (104016) and Dysart (104015). Ladestown is located along the north-west shoreline of Lough Ennell, while Dysart is located to the west of the lake, south of Ladestown.

Conceptual Site Model (CSM)

Dysart and Ladestown occur on the exposed lakeshore of Lough Ennell, with the shoreline being near the shallower parts of the lake. Both sites have relatively thin fen peat deposits, which have likely been forming since the 1840s. Although the fen habitat is in transition from lake habitat, the sites are within the depositional zone of potentially spring fed streams. The distribution of habitat types at Dysart and Ladestown is strongly influenced by hydrology and nutrient pressures. At Dysart, 7230 Alkaline Fen occurs mainly in the western and central areas where calcareous groundwater discharges from underlying lacustrine sediments, while the eastern lakeshore margin is more influenced by lake water, supporting rich fen (PF1) and reed swamp (FS1) habitats. At Ladestown, site hydrology is influenced primarily by seasonal flooding and the arterial drainage network.

A conceptual site model has been developed for each site based on the NFS 2022 results and the desktop study. Both sites are classed as **WETMEC 7b: Groundwater Floodplains**.

Dysart:

Dysart consists of Lacustrine sediments underlain by glacial till. A small area of gravels sits to the north of the site. The desk study and field survey results indicate that the bedrock is a karstified limestone (Ll aquifer) that provides a direct hydraulic connection to the fen through permeable lacustrine sediments. The peat depth is thin where the lakebed has been exposed, but there isan upstream area with very deep peat. There are two streams which have been modified under arterial drainage. These are located in the southwest and north of the site. Both are flowing towards the lake, with the southern drain discharging nutrients and sediments directly into the fen. The historical lakeshore near the western site boundary does not seem to be significantly deepened or modified and is acting as a nutrient and sediment trap for hillslope sheet flow off the dairy farm.

There are two Annex 1 habitats mapped within the Dysart site, 7230 Alkaline fen and 91E0 Alluvial Woodland. The rest of the site comprises neutral non-Annex fen and grassland. The former Dysart Island is a mature beech dominated woodland with some adjacent alluvial forest.

Ladestown:

Ladestown consists of peat subsoils underlain by glacial till. A small area of gravels sits to the north of the site. The peat depth is thin, with outcrops of mineral soils. The bedrock is characterised by a Locally Important Aquifer – Bedrock which is Moderately Productive only in Local Zones (LI). There were no springs or wells identified on site. It is likely that the site receives water through the permeable sediments. The site is located on a floodplain and is prone to seasonal flooding.

Surface water discharges towards Lough Ennell but is constrained by the local topography to the south-west. Arterial drains are present on the northern edges of the site, with forestry drainage being directed to the central fen and western border. An arterial drain separates the northeastern part of the site from the rest of the site.

Multiple Annex habitats are mapped within the Ladestown site, - 6410 Molina meadows, 91E0 Alluvial Woodland and 7230 Alkaline fen are present in the western and central areas of the site. The rest of the site constitutes of neutral non-Annex fen and grassland.

Key Pressures	
Hydrology Pressures	Dysart: Drainage has been identified as a key pressure on fen hydrology across the site. Where drains are present within habitats and exhibit localised impacts, they have been identified as pressures requiring targeted management measures. Parts of the site are likely to flood regularly in winter. Ladestown: Drainage has been identified as a key pressure on fen hydrology across the site. Where drains are present within habitats and exhibit localised impacts, they have been identified as pressures requiring targeted management measures. Large parts of the site are likely to flood regularly in winter.
Nutrient Pressures	Dysart: High nutrients present in arterial drains and field drains during 2026 site survey. Ladestown: High nutrients present in field drains during 2026 site survey.
Ecology Pressures	Scrub encroachment – evident from the presence of willow, alder, ash and beech woodland throughout both sites. Willow and birch regeneration were also recorded during the 2026 monitoring surveys. A forestry plantation

	located immediately west of Ladestown may contribute to scrub expansion along the site margin. Grazing Management – Grazing absence was recorded at a number of monitoring points within both Ladestown and Dysart, while active grazing was observed at others. Reduced grazing pressure can result in litter accumulation, increased vegetation height, scrub establishment and habitat succession, leading to changes in habitat structure and species composition. Conversely, excessive grazing may result in localised damage to fen vegetation and soils.
Objective of Restoration Plan	
The primary aim of the restoration actions proposed as part of this FRP is to maintain and improve the quality of existing areas of 7230 Alkaline fen. Where feasible, restoration measures will seek to improve the hydrological conditions in order to support the expansion of the 7230 Alkaline fen extent, thereby contributing to the achievement of SSCO targets related to habitat area, structure, and function. In some areas, restoration opportunities may be constrained by existing hydrological or landuse conditions; in such cases, the objective will be to prevent further deterioration.	
Restoration Measures	
Hydrology Measures	**On-Site Measures:** drainage measures at Dysart and Ladestown **Off-Site Measures**: catchment management plan for Lough Ennell; avoid creating new drains
Nutrient Measures	**On-Site Measures:** nutrient buffer at Dysart **Off-Site Measures:**. Catchment measures as part of Farm Plan
Ecology Measures	**On-Site Measures:** vegetation monitoring at Dysart and Ladestown
Monitoring	
Hydrology Monitoring	Groundwater and surface water monitoring within the fen as well as rainfall and evaporation monitoring.
Nutrient Monitoring	Ongoing monitoring of groundwater and surface water for water quality parameters within the fen

NPWS Tóchar Midlands Wetland Restoration Scheme Fen Restoration Plan Non-Technical Summary	
Ecology Monitoring	Habitat condition assessments to monitor the rate, if any, of succession and/or general scrub encroachment which in turn will inform the need for further works
More information	
Fen Restoration Plan Report Tóchar website: https://www.tocharwetlands.ie/fen-restoration/	



Figure 1: Site Habitat Map (Dysart)

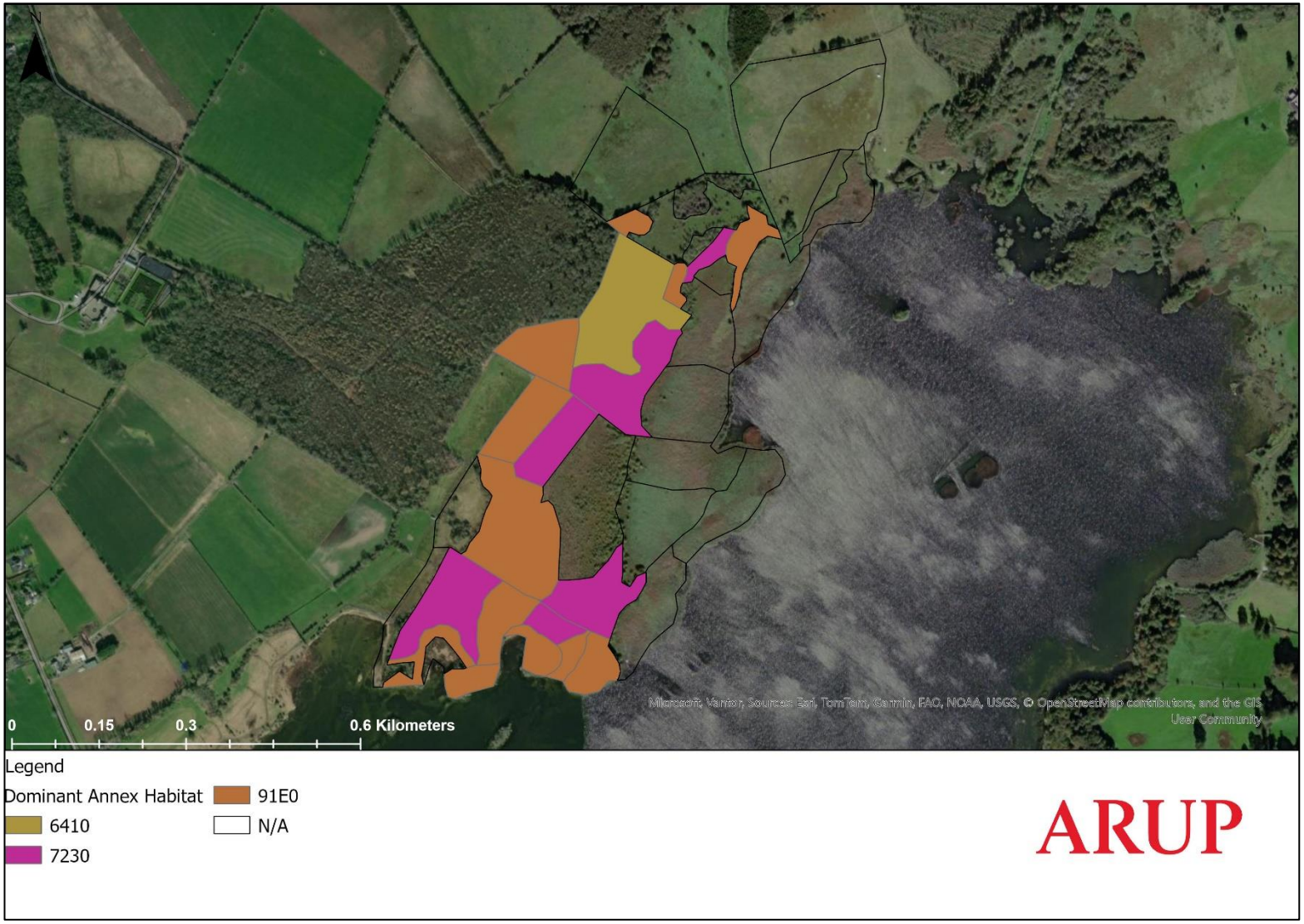


Figure 2: Site Habitat Map (Ladestown)

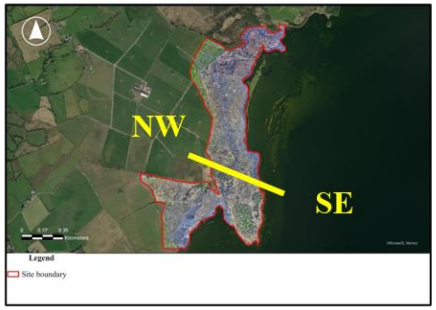
Lough Ennell: Dysart
Westmeath County
WFD catchment: Lower Shannon (25A): Brosna_SC_010
WETMEC 7 & 16

Water key:

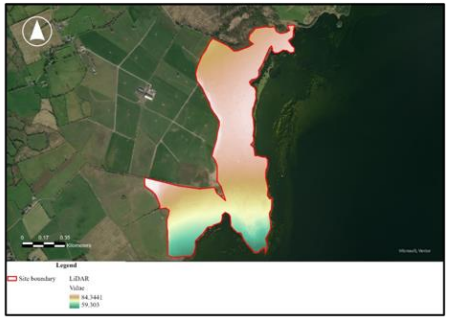
Drains

Wetland vegetation

Cross section:



Location:



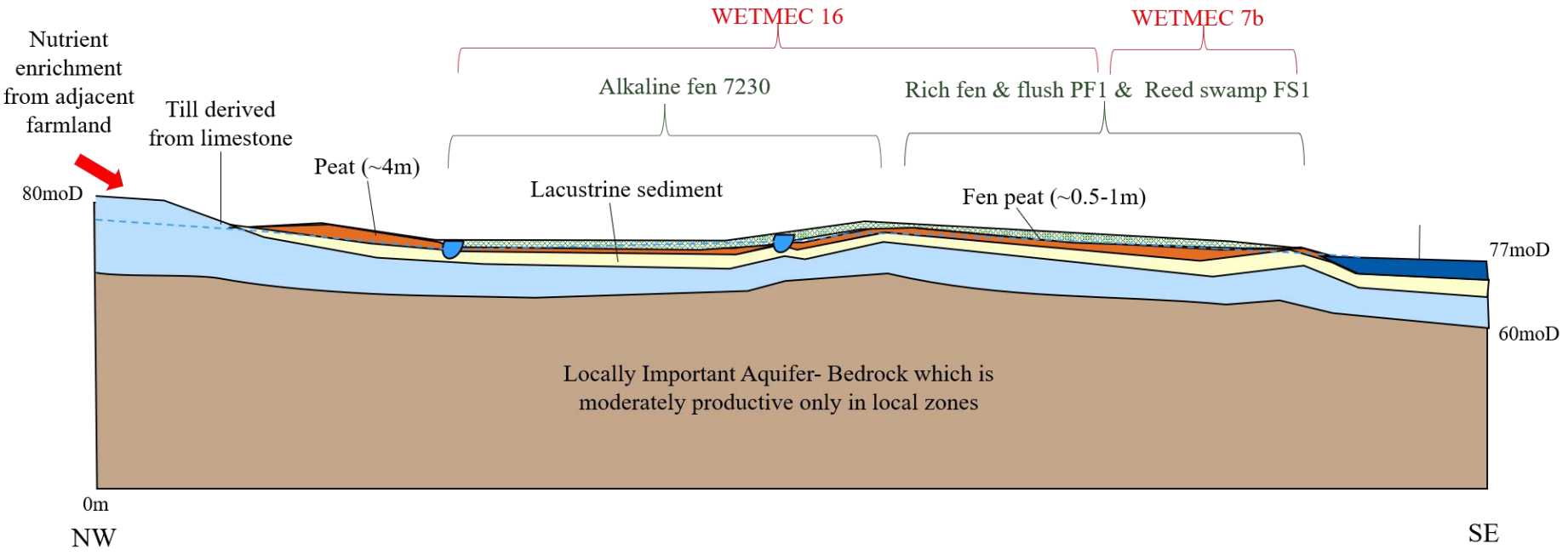


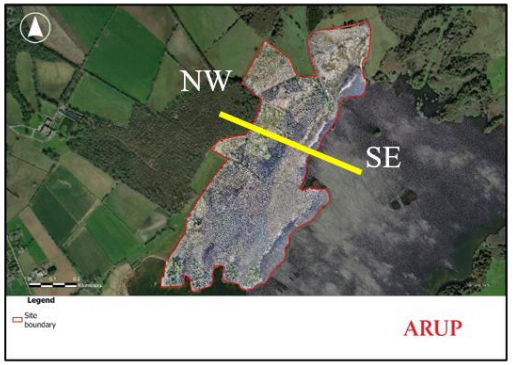
Figure 3: Conceptual Site Model (Dysart)

Lough Ennell: Ladestown
Westmeath County
WFD catchment: Lower Shannon (25A): Brosna_SC_010
WETMEC 7 & 16

Water key:

Wetland vegetation

Cross section:



Location:



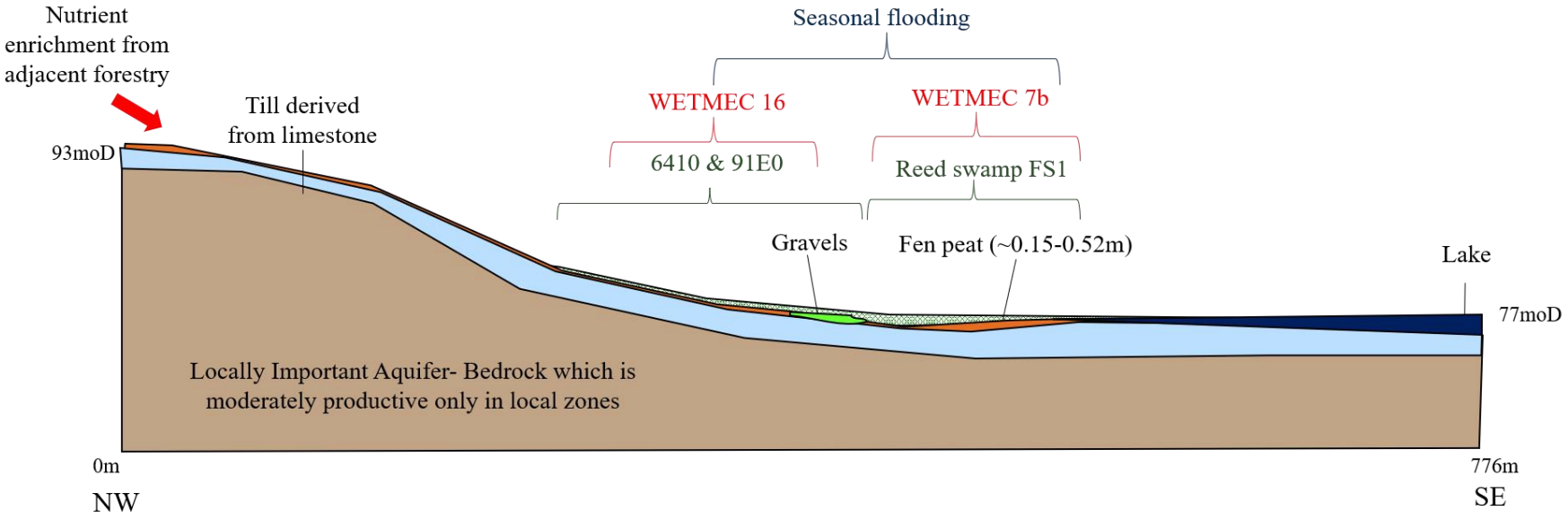


Figure 4: Conceptual Site Model (Ladestown)

Appendix B – Ecological Survey Maps

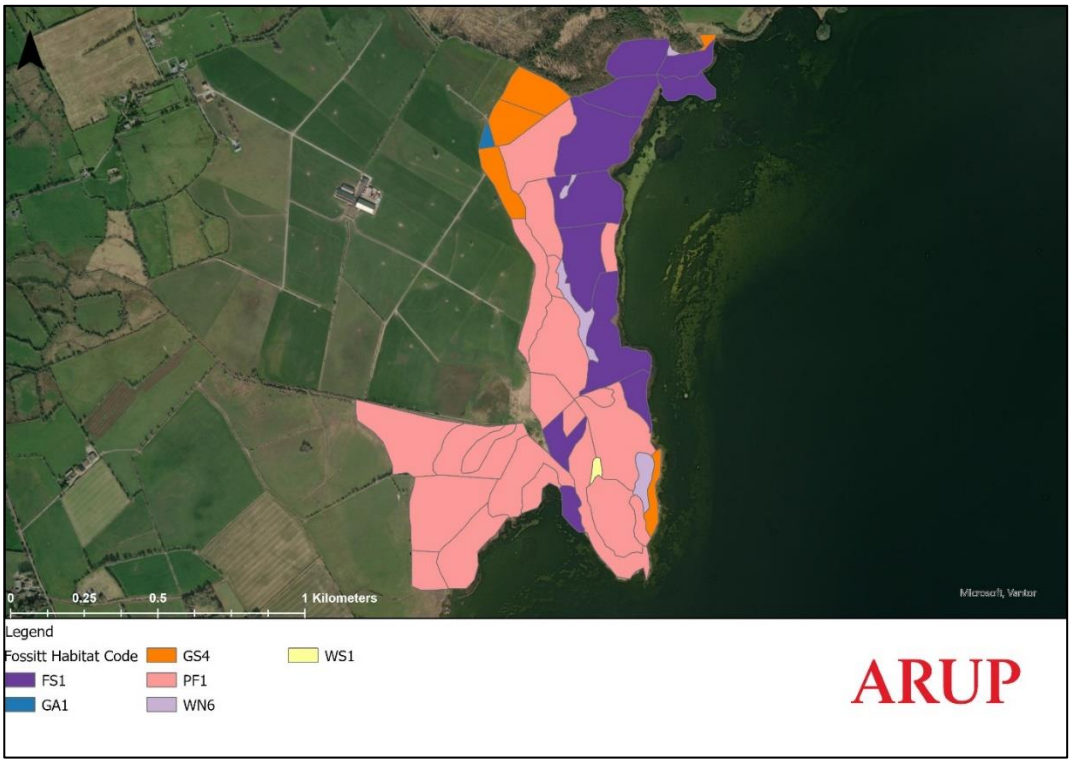


Figure 9-1 Habitats identified during the 2022 NFS and classified to the Fossitt habitat classification system at Dysart. See Table 9-1 for the full list of habitat names.

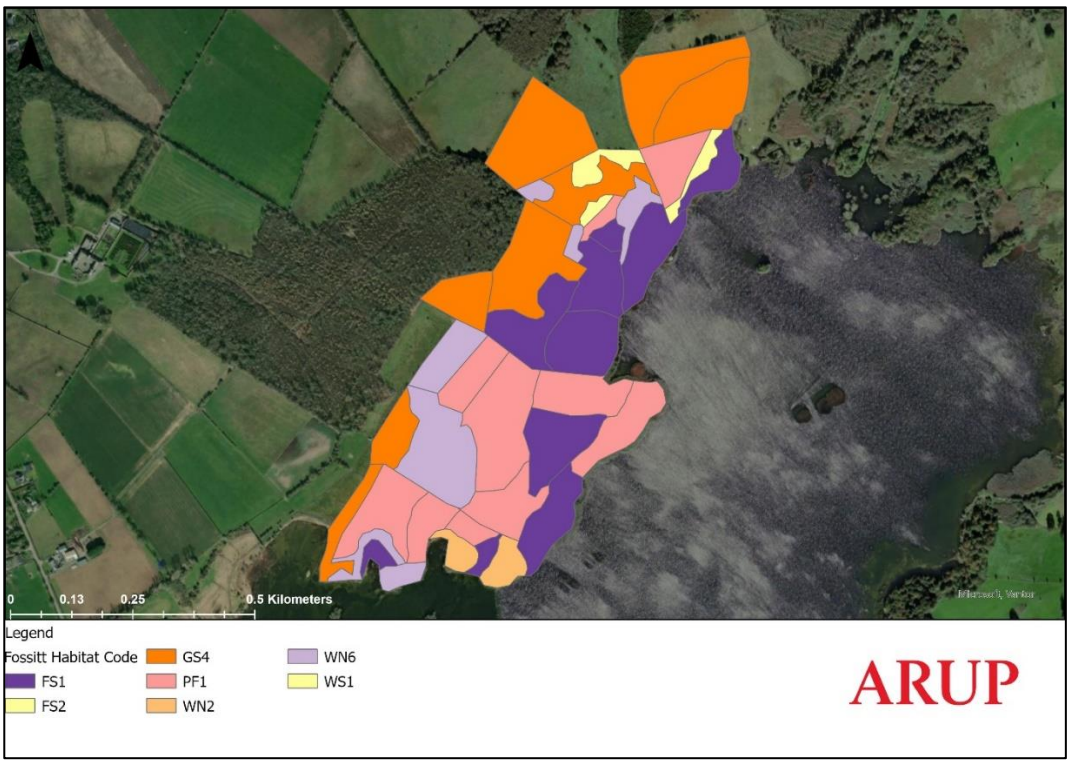


Figure 9-2 Habitats identified during the 2022 NFS and classified to the Fossitt habitat classification system at Dysart. See Table 9-1 for the full list of habitat names.

Table 9-1 Annex I habitat 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
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
		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

Appendix C – Restoration and Monitoring Map

Table C1: Long-term monitoring points for fen restoration at Ladestown- Lough Ennell SAC

Point	Measure	Objective	Timeframe	Frequency of monitoring	Monitoring indicator
Gw_1	Hydrological	Monitoring groundwater levels and quality	Long-term	One data logger Seasonal[8] for year 1 Annual for year 2-5	Groundwater level
Gw_2					Groundwater level
Gw_3					Groundwater level
Gw_4					Groundwater level
Gw_5					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 at open water
Sw_2					
Sw_3					Water level and quality at open water
Sw_4					Water level and quality at open water
Sw_5					Water level and quality at open water
Sw_6					Water level and quality at open water
Ec_1	Ecological	Monitoring of habitat	Long-term	Seasonal for year 1 Every 3 years for year 2-5	Ecological monitoring
Ec_2					Ecological monitoring
Ec_3					Ecological monitoring

[8] Seasonal: quarterly to represent a hydrological year

Table C2: Table C1: Long-term monitoring points for fen restoration at Dysart - Lough Ennell SAC

Point	Measure	Objective	Timeframe	Frequency of monitoring	Monitoring indicator
Gw_1	Hydrological	Monitoring groundwater levels and quality	Long-term	One data logger Seasonal[9] for year 1 Annual for year 2-5	Groundwater level
Gw_2					Groundwater level
Gw_3					Groundwater level
Gw_4					Groundwater level
Gw_5					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 at open water
Sw_2					
Sw_3					Water level and quality at open water
Sw_4					Water level and quality at open water
Sw_5					Water level and quality at open water
Sw_6					Water level and quality at open water
Ec_1	Ecological	Monitoring of habitat	Long-term	Seasonal for year 1 Every 3 years for year 2-5	Ecological monitoring
Ec_2					Ecological monitoring
Ec_3					Ecological monitoring

[9] Seasonal: quarterly to represent a hydrological year

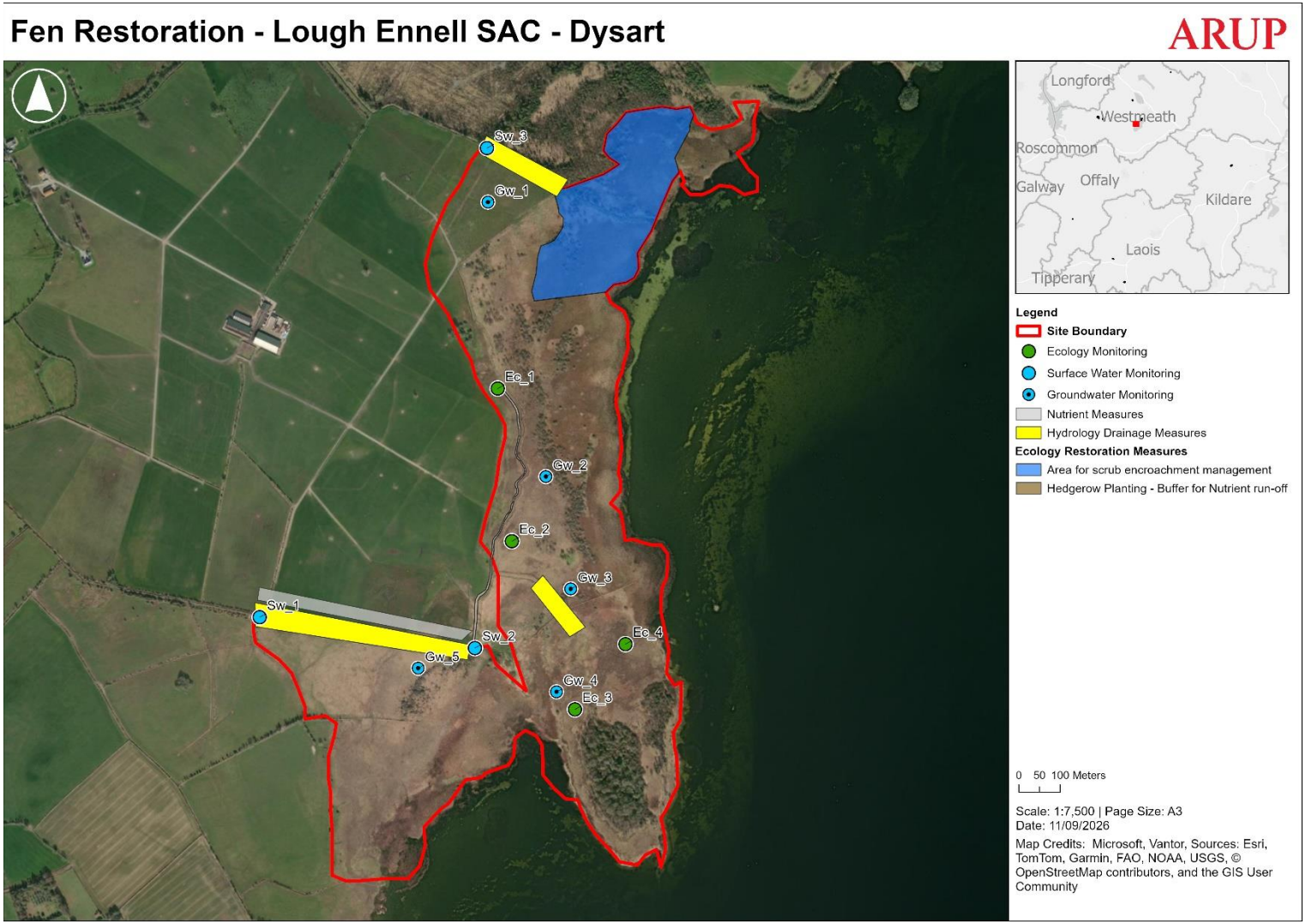


Figure 9-3: Restoration measures and monitoring for Dysart

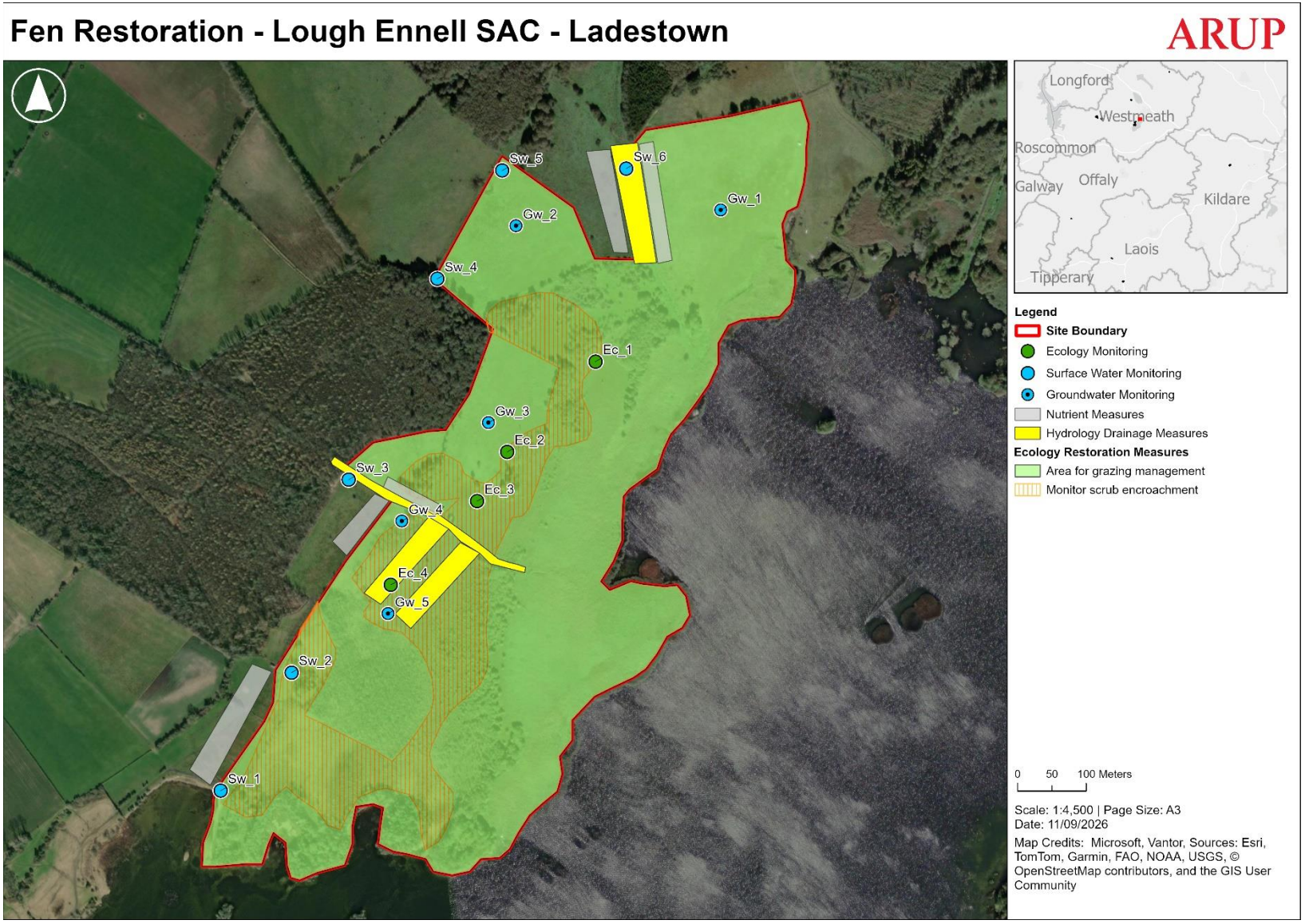


Figure 9-4: Restoration measures and monitoring for Ladestown

Appendix D – Drainage Management Plan

NPWS Tóchar Midlands Wetland Restoration Scheme Fen Restoration Plan: Drainage Management Plan			
Site name	Lough Ennel		
County	Westmeath	NFS site No.	104015 &104016
Catchment overview:			
Lough Ennell is located 9km north-east of Mullingar, Co. Westmeath. The site is designated as a Special Area of Conservation (SAC) for qualifying interests 7230 Alkaline fen and 3140 Hard oligo-mesotrophic waters with benthic vegetation of Chara spp. Lough Ennell is composed of two sites surveyed as part of the National Fen Survey: Ladestown (104016) and Dysart (104015). Ladestown is located along the north-west shoreline of Lough Ennell, while Dysart is located to the west of the lake, south of Ladestown.			
WFD catchment	25A Lower Shannon	WFD Sub-catchment	Brosna_SC_010
Drainage Area	East Brosna: C39, C38, C41	Drainage District	N/A
Responsible authority	OPW	Maintenance date	(part of a catchment plan, no maintenance)
Surrounding landowners	Private and commonage (note lake levels have reduced so land parcels are not on the registry)		
Wetland drainage			
Dysart: Analysis of historical maps reveals that between 1829 and 1913, the lake level was higher than it is today, with open water depicted within the site boundaries. An arterial drain exists in the northern (Canal C39 (1)) and southern (Canal C38 (1)) areas of the site, directing water towards the lake and flowing from the northwest. These arterial drains are part of the East Region Brosna Scheme. No springs were observed in the historical maps discharging into Canal 38; however, a spring was located west of site and discharges into canal 39. Dysart Island, now no longer an island, is situated in the southern part of the site. Also, according to the historical map the site is liable to flooding. Ladestown: Historical maps show that the lake level was higher between 1829-1913, with open water within the site boundary. The River Brosna flows north to Lough Ennell, connecting with arterial drain C41(1) from the northwest—part of the East Region Brosna Scheme. Perimeter drains along the western boundary are visible on maps from both periods. The 1897-1913 map indicates a small area near Ladestown prone to flooding. A spring is located to the west of the site and discharges into Canal 41. A forest is located west of the site. Also, according to the historical map the site is liable to flooding.			

NPWS Tóchar Midlands Wetland Restoration Scheme Fen Restoration Plan: Drainage Management Plan					
Surface water inflow	Upstream drains		Surface water outflow	Lough Ennell	
Groundwater inflow	No springs evident				
Internal drains	Yes		Perimeter drains	Yes	
On site hydrology measures					
Dysart: Drainage measures along the two inflow drains (Arterial drains) and within the field drains in the south-central area of the site. Ladestown: Drainage measures along the inflow drain (Arterial drain) and along the western area of the site Work with the OPW and landowners to address blocking the arterial drains.					
Off-site hydrology measures					
Engage with landowners at Dysart and Ladestown to avoid the creation of new drainage features adjacent to the sites.					
On-site nutrient measures					
Implementing buffers at Dysart to reduce nutrient input from adjacent farmlands.					
Off-site nutrient measures					
Catchment measures as part of Farm Plan					
Water Monitoring					
Groundwater and surface water monitoring in a network of piezometers and standpipes at key locations within the site to monitor changes to water in order to establish if onsite measures area required such as drain blocking.					
Indicator	Water level	Location	Various locations across site	Role players	NPWS
A hydrological monitoring programme will be implemented, including the installation of piezometers to monitor groundwater levels and water quality. At Dysart, the monitoring network will comprise five piezometers strategically located across the northern, northwestern and southern areas of the site. At Ladestown, the network will comprise four piezometers located across the northern, northwestern and western areas of the site. Surface water monitoring will form part of the monitoring programme and will be undertaken at locations along the outflow and inflow drain. The monitoring data will be used to assess changes in drain water levels and evaluate the effectiveness of the proposed drain-blocking measures in raising water levels within the site.					

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

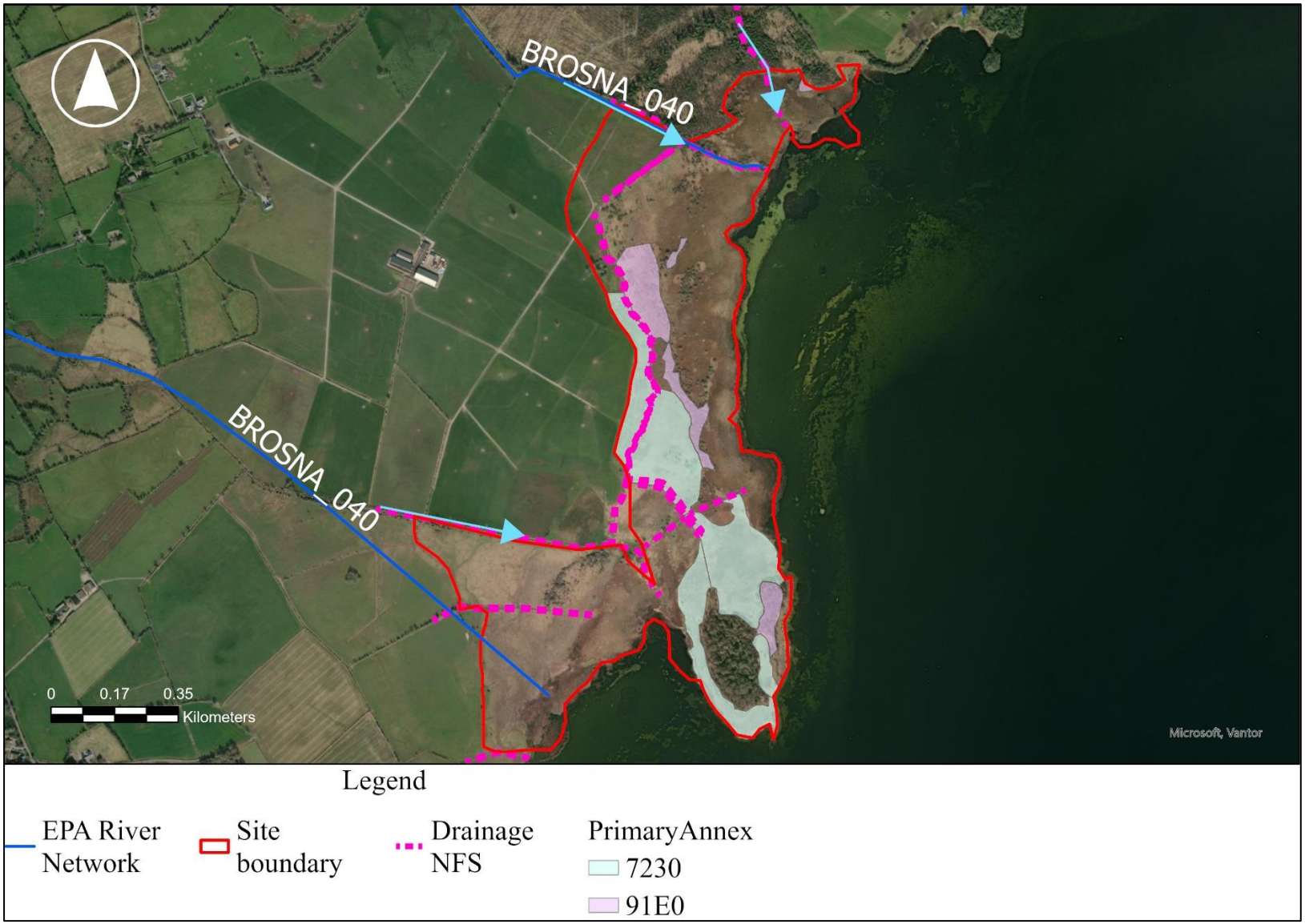


Figure 1: Mapped drainage network at Dysart

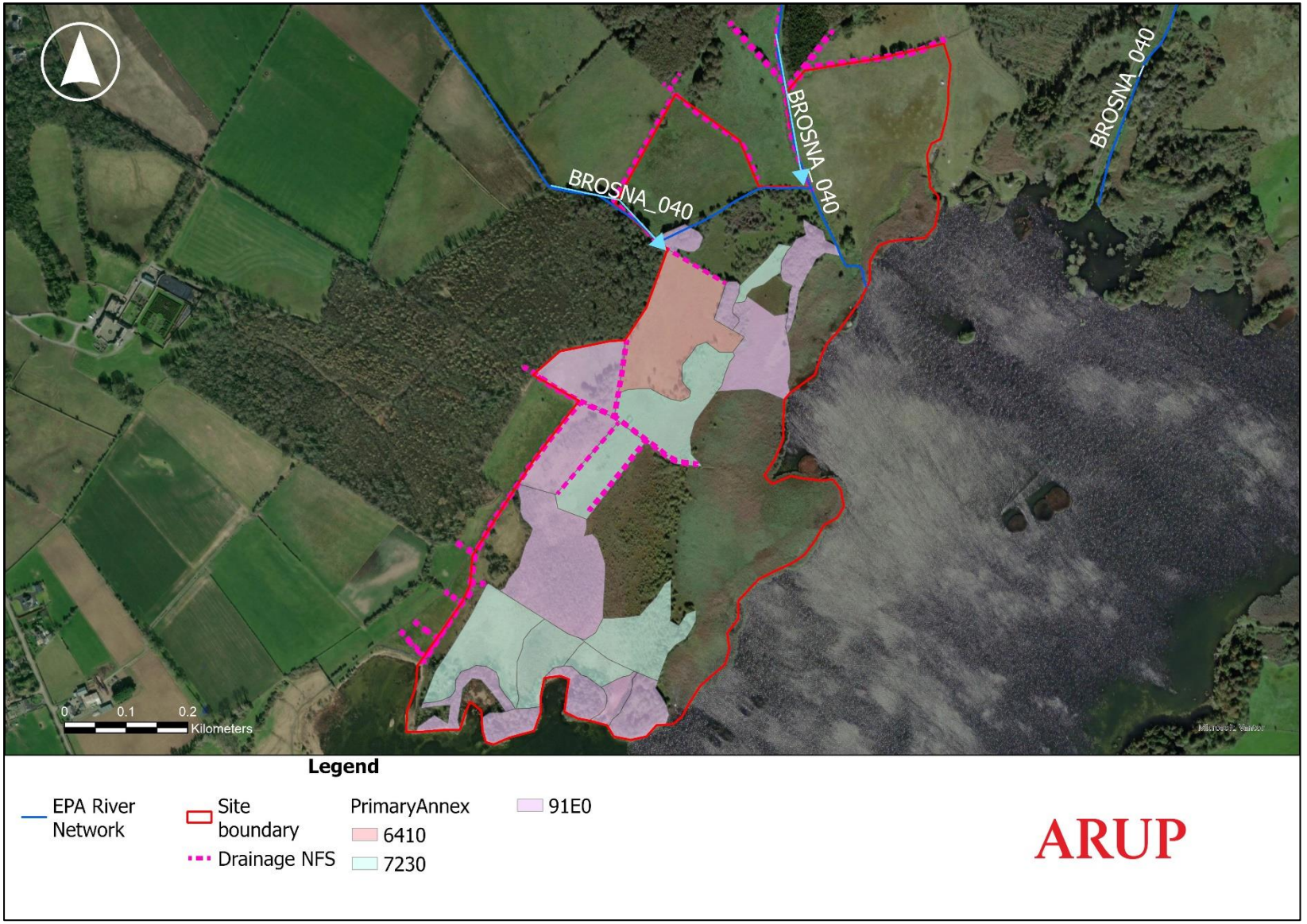


Figure 2: Mapped drainage network at Ladestown