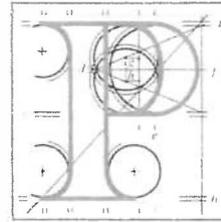


Our Case Number: ACP-323980-25

Planning Authority Reference Number:



An
Coimisiún
Pleanála

Laura Kavanagh
11 Doncarrig
Ballycommon
Nenagh
Co. Tipperary

Date: 04 March 2026

Re: Proposed Water Supply Project for the Eastern and Midlands Region
in the counties of Clare, Limerick, Tipperary, Offaly, Kildare, and Dublin.

Dear Sir / Madam,

An Coimisiún Pleanála has received your recent submission in relation to the above mentioned proposed development and will take it into consideration in its determination of the matter. Please accept this letter as a receipt for the fee of €50 that you have paid.

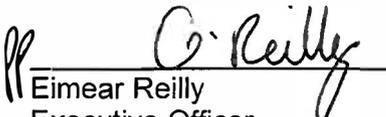
The Commission will revert to you in due course with regard to the matter.

Please be advised that copies of all submissions / observations received in relation to the application will be made available for public inspection at the offices of the local authority and at the offices of An Coimisiún Pleanála when they have been processed by the Commission.

More detailed information in relation to strategic infrastructure development can be viewed on the Commission's website: www.pleanala.ie.

If you have any queries in the meantime please contact the undersigned officer of the Commission. Please quote the above mentioned An Coimisiún Pleanála reference number in any correspondence or telephone contact with the Commission.

Yours faithfully,



Eimear Reilly
Executive Officer
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Submission Objecting to the Proposed Water Supply Project for the Eastern and Midlands Region

SHANNON to DUBLIN WATER SUPPLY PROJECT (Ref. PA92.323980)

Applicant: Uisce Éireann

Name: Laura Kavanagh

Address: 11 Doncarrig, Ballycommon, Nenagh, Co. Tipperary

I, Laura Kavanagh, an ecologist with nearly 20 years' professional experience and a BSc (Hons) in Aquatic Ecology (GMIT, 2007), hereby object to the Proposed Water Supply Project for the Eastern and Midlands Region (Ref. PA92.323980).

This submission addresses compliance with Article 6(3) of the Habitats Directive (92/43/EEC). A detailed technical review of the Natura Impact Statement (NIS) accompanies this submission.

While hydrological pathways are acknowledged in the NIS, acknowledgement alone does not satisfy the integrity test. The assessment must demonstrate that conservation objectives will be maintained under all reasonably foreseeable operating conditions, including low-flow and drought scenarios. The assessment does not demonstrate this.

My attached technical review identifies, inter alia, the following material issues:

- Incomplete identification and assessment of all hydrologically connected European sites, including omission of Barroughter Bog SAC.
- Reliance on average hydrological conditions without robust assessment of low-flow and drought scenarios, when ecological sensitivity is greatest.
- Failure to translate hydrological modelling outputs into site-specific ecological impact assessment.
- Reliance on operational thresholds and historic fluctuation comparisons as proxies for ecological assessment.
- Mitigation measures that do not demonstrably remove reasonable scientific doubt in respect of long-term operational abstraction during drought conditions.

The NIS does not provide sufficiently complete, precise and definitive findings to enable a conclusion, beyond reasonable scientific doubt, that the Proposed Project will not adversely affect the integrity of the European sites concerned.

Accordingly, compliance with Article 6(3) of the Habitats Directive has not been demonstrated.

Independent Review of the Natura Impact Statement for the Proposed Water Supply Project – Eastern Midlands Region

Prepared by: Laura Kavanagh
BSc (Hons) Aquatic Ecology

February 2026

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1. Introduction

1.1 Project background

The Proposed Project involves the abstraction of raw water from Parteen Basin within the Lower River Shannon SAC, its treatment to potable standard, and subsequent transfer via a 1.6 m diameter pipeline extending approximately 172 km through the Eastern and Midlands Region to south County Dublin. The scheme comprises six infrastructure sites, three main pipeline elements (the Raw Water Intake and Pipeline System; the Treated Water Pipeline from the Water Treatment Plant to the Break Pressure Tank; and the onward Treated Water Pipeline to the Termination Point Reservoir), and associated 38 kV Uprate Works.

The Natura Impact Statement (NIS) for the Proposed Project identifies a total of 78 European sites within the potential Zone of Influence (Zoi), defined as sites located downstream of the abstraction point, within the same groundwater body, or connected via plausible hydrological or hydrogeological pathways. Of these, 19 European sites were determined to have a valid source–pathway–receptor linkage to the Proposed Project, comprising nine SACs and ten SPAs.

While not all European sites identified in the NIS are located within the Shannon International River Basin District (IRBD), the abstraction point at Parteen Basin and the principal Natura 2000 sites with direct hydrological pathways for effect are situated within the Shannon basin. Accordingly, the assessment of potential impacts must be framed within the context of basin-scale hydraulic connectivity rather than as isolated, localised interactions.

These sites are not independent ecological units but interdependent components of a hydraulically continuous and operationally regulated basin-scale system. Hydrological changes introduced at Parteen Basin have the potential to propagate through altered lake storage, discharge management, river stage dynamics and groundwater gradients, engaging ecological processes across multiple Natura 2000 sites within the Shannon IRBD.

Given the scale, regulation and hydrological complexity of the Shannon system, abstraction-related effects cannot be considered purely localised or site-specific. In particular, during low-flow or drought conditions, small changes in storage or discharge may influence lake levels, floodplain inundation regimes and downstream freshwater–estuarine interactions across considerable distances.

This review therefore examines whether the NIS and associated documents demonstrate, beyond reasonable scientific doubt, compliance with Article 6(3) of the Habitats Directive and with Article 4 of the Water Framework Directive, having regard to the integrated hydrological functioning of the Shannon system.

Source: Natura Impact Statement and Environmental Impact Assessment Report for the Water Supply Project Eastern and Midlands Region, Uisce Éireann. 2025.

1.2. Shannon International River Basin District – Hydrological Context

The Proposed Project is situated within the Shannon International River Basin District (IRBD), a large and complex hydrological system characterised by extensive surface water and groundwater connectivity. The River Shannon itself flows through a predominantly low-gradient landscape, with limited elevation change over much of its course and a concentration of hydraulic control structures in its lower reaches. This low-gradient character results in strong coupling between river levels, adjacent floodplains, and underlying groundwater systems.

A defining feature of the Shannon IRBD is the presence of large lakes and seasonally inundated floodplains, including the callow grasslands that occur along much of the middle and lower Shannon. These floodplain systems are highly sensitive to changes in water level, flow regime and groundwater contribution, and support a range of habitats and species of international conservation importance. Seasonal flooding and drawdown are natural components of the system; however, the timing, duration and frequency of these processes are critical in maintaining ecological function.

The hydrology of the Shannon has been extensively modified and regulated over the past century to accommodate hydropower generation, navigation, flood management and water supply. In particular, water levels and flows in the lower Shannon, including Lough Derg and Parteen Basin, are actively managed. While this regulation provides a degree of buffering under average conditions, it also means that additional abstraction pressures may interact with existing operational controls, particularly during periods of low flow when the system's capacity to absorb further change is reduced.

Groundwater is an integral component of the Shannon IRBD, with groundwater bodies extending beneath rivers, lakes and associated wetlands. Many floodplain habitats within the basin are groundwater-dependent, relying on sustained groundwater discharge to maintain soil moisture and ecological function. Consequently, alterations to groundwater heads or hydraulic gradients associated with abstraction have the potential to influence surface water-groundwater interactions and water availability at locations remote from the point of abstraction. The Shannon system therefore functions as an integrated hydraulic continuum in which rivers, lakes, groundwater bodies and floodplains operate as hydraulically connected components rather than discrete units. Under such conditions, alterations in discharge or hydraulic head at one location may redistribute gradients across the wider system, particularly during low-flow periods when regulatory flexibility is constrained.

In such a low-gradient, regulated system, abstraction pressures interact with lake level management and groundwater contribution in ways that may not be apparent from localised or average-condition assessments. In this context, hydrological impacts arising from abstraction within the Shannon IRBD cannot be assessed solely on the basis of proximity to the abstraction point. Basin-scale connectivity, cumulative pressures and sensitivity during low-flow conditions are central considerations for the assessment of potential effects on Natura 2000 sites within the basin.

Sources: EPA (2022) Shannon International River Basin Management Plan; Geological Survey Ireland (GSI) groundwater and surface water interaction guidance.

1.3. Legal and Policy Context

This assessment examines whether the Natura Impact Statement (NIS), together with the Environmental Impact Assessment Report (EIAR) and supporting documentation, adequately demonstrates compliance with:

- Article 6(3) of the EU Habitats Directive (92/43/EEC), including the requirement to establish that a plan or project will not adversely affect the integrity of any European site; and
- Article 4 of the EU Water Framework Directive (2000/60/EC), including the objectives of non-deterioration and the protection of water-dependent protected areas.

1.3.1 Habitats Directive – Article 6(3)

Article 6(3) of the Habitats Directive requires that any plan or project not directly connected with or necessary to the management of a European site must be subject to Appropriate Assessment where it is likely to have a significant effect on that site, either alone or in combination with other plans or projects.

Consent may only be granted where the competent authority is satisfied, beyond reasonable scientific doubt, that the plan or project will not adversely affect the integrity of the site, having regard to its conservation objectives. Site integrity relates to the ability of the site to maintain the structure, function and long-term viability of the habitats and species for which it has been designated.

The Habitats Directive is underpinned by the precautionary principle, as developed through EU Treaty provisions and European Court of Justice case law. Where reasonable scientific doubt remains as to the absence of adverse effects, consent cannot be granted under Article 6(3) (European Commission, 2006).

Article 7 of the Habitats Directive applies the provisions of Article 6(3) to Special Protection Areas (SPAs) designated under the Birds Directive.

1.3.2 Water Framework Directive – Article 4

Article 4 of the Water Framework Directive (WFD) establishes legally binding environmental objectives for surface waters, groundwater and protected areas.

For surface waters, these objectives include the prevention of deterioration in status and the achievement of good ecological and chemical status, or good ecological potential and chemical status in the case of heavily modified or artificial water bodies.

For groundwater, objectives include the prevention of deterioration, the achievement of good quantitative and chemical status, and the maintenance of a balance between abstraction and recharge.

For protected areas, including Natura 2000 sites, Article 4 requires compliance with the objectives and standards under which those areas have been designated.

The WFD recognises surface waters and groundwater as hydraulically connected systems, such that abstraction-induced changes in groundwater head or river stage may alter hydraulic gradients and flow distribution, with ecological consequences at locations remote from the point of abstraction.

1.3.3 Heavily Modified Water Bodies

Under the Water Framework Directive, certain surface water bodies may be designated as Heavily Modified Water Bodies (HMWBs) where physical alterations are necessary to support important uses such as navigation, flood protection or water supply. In such cases, the environmental objective is to achieve Good Ecological Potential (GEP) rather than Good Ecological Status.

HMWB designation does not remove the obligation to prevent deterioration, nor does it remove the requirement to protect dependent protected areas. Any failure to achieve or maintain Good Ecological Potential must be justified under Article 4, including demonstration of overriding public interest, the absence of significantly better environmental alternatives, and the implementation of all practicable mitigation measures.

Water Framework Directive objectives are implemented at the scale of Water Management Units (WMUs). The Shannon International River Basin District is divided into seventeen WMUs, within which status, pressures, objectives and measures are defined. Compliance with Article 4 therefore requires consideration of potential abstraction effects at the WMU scale, including cumulative and in-combination pressures.

Sources: Habitats Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora (OJ L 206, 22.7.1992, p. 7–50), as amended. Birds Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds (codified version) (OJ L 20, 26.1.2010, p. 7–25). Water Framework Directive (WFD) 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy (OJ L 327, 22.12.2000, p. 1–73), as amended.

2. Hydrological Pathways and Legal Framework for Assessment

2.1 Zone of Influence (Zoi)

In accordance with established Appropriate Assessment guidance, any Natura 2000 site within the likely zone of influence of a plan or project must be considered. While a screening distance of 15 km is commonly applied for plans, derived from UK guidance (Scott Wilson et al., 2006), this is not a statutory threshold and cannot substitute for pathway based analysis. The extent of the Zoi must reflect the nature of the projects, the relevant impact mechanisms, and the sensitivities of the ecological receptors, in line with the precautionary principle.

For plans or projects with the potential to affect water quantity and/or water quality, particularly where water-dependent habitats or species are present, distance-based screening alone is insufficient. In such cases, it is necessary to consider the full extent of the hydrological system, including upstream and downstream reaches, regulated lake storage, and hydraulically connected groundwater bodies (DEHLG, 2009).

The Proposed Project involves abstraction from a regulated lake-rive system within the Shannon IRBD. The NIS identifies hydrological impacts associated with abstraction from Parteen Basin and defines a hydrological Zone of Influence (Zoi) extending from Meelick Weir downstream to the confluence of the River Shannon at Limerick Dock and the Ardnacrusha Tailrace.

However, the NIS also states that the Proposed Project would have a hydrological pathway for effect to fourteen European sites. Although the project footprint overlaps directly with a single European site (Lower River Shannon SAC), the acknowledged hydrological connectivity extends beyond the footprint to additional SACs and SPAs within the Shannon System.

Accordingly, for the purpose of Article 6(3), the functional Zoi is not confined to direct spatial overlap or to structural control points alone, but encompasses all Natura 2000 sites for which a hydrological pathway for effect has been identified.

2.2 Ornithological Zone of Influence

The NIS applies a disturbance Zoi of up to 300 m from the Proposed Project for breeding birds surveys, based on published guidance (Ruddock & Whitfield, 2007; Cutts et al., 2013; Scottish Natural Heritage, 2017; Goodship & Furness, 2022). These guidance documents were developed primarily in the context of infrastructure-related disturbance (e.g. wind energy, human presence, noise and visual intrusion) and are intended to inform screening distances for proximity based behavioural effects.

A disturbance buffer of this nature may be appropriate where the primary pathway of impact is direct human disturbance of nesting and foraging birds. However, the principal pathway associated with the Proposed Project is hydrological alterations arising from abstraction at Parteen Basin, with potential consequences for lake level dynamics, shoreline configuration and shallow water habitat availability.

Hydrological effects of abstraction operate at the scale of the lake system rather than within a fixed radial distance from infrastructure. Changes in water level may alter the spatial extent and distribution of littoral habitats for nesting and foraging birds. Such effects are not confined to a 300 m zone and may influence habitat availability throughout the Shannon system.

While the NIS extends survey coverage for wintering waterbirds to the wider hydrological system, breeding bird survey coverage is defined primarily by disturbance proximity. Where habitat availability is hydrologically mediated, the functionally relevant ornithological Zoi must be determined by ecological dependence on water level dynamics rather than disturbance distance alone.

Accordingly, the functionally relevant ornithological Zoi for hydrological effects must be defined by ecological dependence on water level and habitat availability, rather than by fixed disturbance buffers alone.

2.3 Hydraulic Boundaries and Assumed Limits of Influence

The NIS identifies Meelick Weir as the upstream hydraulic limit of influence for water level effects associated with abstraction at Parteen Basin. It states that under low and medium flow conditions, free overflow at Meelick Weir prevents downstream lake level changes from influencing upstream river stage.

However, no detailed hydraulic modelling or sensitivity analysis is presented to demonstrate that abstraction-induced changes in lake storage, discharge regulation or hydraulic gradients could not influence upstream river stage or groundwater conditions under low-flow or drought scenarios. In low-gradient floodplain systems such as the Shannon Callows, small variations in stage can produce disproportionate changes in lateral inundation extent and groundwater-surface water interaction.

In addition, the River Shannon Callows SAC and the Middle Shannon Callows SPA extends both upstream and downstream of Meelick Weir, including groundwater-dependent alkaline fen habitats located south of Portumna Bridge. Accordingly, even if hydraulic independence upstream of the weir were demonstrated, hydrologically connected downstream habitats remain within the Zol.

The downstream limit of hydrological influence has not been explicitly defined in hydraulic terms within the NIS. Given the regulated and hydraulically continuous nature of the Shannon system, including transitional and estuarine environments within the Lower Shannon and Shannon-Fergus system, the functional Zol may extend beyond simple distance-based screening boundaries. The downstream extent of influence must be considered in light of regulated discharge, tidal interaction and freshwater-estuarine coupling within the Lower Shannon and Shannon-Fergus Estuaries system

For the purposes of this review, the Zol is therefore defined by hydraulic connectivity and ecological dependence, rather than by fixed structural control points alone.

2.3 Core Hydrological and Ecological Issues Relevant to Water Abstraction

2.3.1 Abstraction Pressure in the Shannon IRBD

While many existing abstractions within the Shannon IRBD may be sustainable under average hydrological conditions, abstraction is identified by the EPA as a pressure on multiple river and lake water bodies within the Shannon IRBD, particularly during low-flow periods.

Primarily due to impacts on river flows and lake levels during periods of low flow. These pressures occur within a catchment already supporting substantial abstraction for domestic supply, agriculture, industry, energy generation and recreation.

2.3.2 Hydraulic Continuity and System Connectivity

Under the WFD, surface waters and groundwater bodies are recognised as hydraulically continuous systems. Abstraction-induced changes can alter groundwater head, river stage, base flow contribution, lake level behaviour and wetland hydrology at locations remote from the abstraction point.

These relationships are particularly relevant to floodplain systems, callows, groundwater-dependent terrestrial ecosystems (GWDTEs), and shallow littoral habitats.

2.3.3 Mechanisms of Impact from Abstraction

Potential abstraction related mechanisms include:

- reductions in river discharge;
- altered lake level magnitude and timing;

- modified groundwater gradients.

These hydrological changes may affect ecological processes relevant to both WFD classification elements and Natura 2000 conservation objectives.

2.3.4 Sensitivity to Low-Flow and Drought Conditions

Ecological sensitivity is typically greatest during periods of low flow and drought, when:

- dilution capacity is reduced,
- groundwater recharge is limited,
- lake levels approach operational minima,
- floodplain inundation regimes are constrained.

Hydromorphological pressures are recognised as a significant risk factor for surface waters nationally.

Assessment based solely on long-term average conditions does not necessarily capture risk during ecologically critical periods.

2.3.5 Limitations of Annual Average Flow Metrics

The Proposed Project is described as abstracting approximately 2% of long-term average flow at Parteen Basin. While technically correct under average conditions, this metric is ecologically misleading.

Using published EPA data, the Q95 low-flow statistic for the Lower Shannon is approximately 12.53 m³/s. Under such conditions, the proposed abstraction of 3.47–3.82 m³/s would represent approximately 25–30% of available flow.

These low-flow conditions occur during the periods when aquatic and wetland ecosystems are most vulnerable. The ecological issue is therefore not whether statutory minimum compensation flows are maintained, but how abstraction is operationally accommodated during drought conditions and the resulting implications for lake level management and habitat availability.

2.3.6 Lake Level Regulation

Operational constraints at Lough Derg already require turbine shutdowns to prevent lake levels falling below defined thresholds. Prolonged abstraction during such periods would necessitate trade-offs between water supply and ecological protection.

The NIS concludes that the additional abstraction related drawdown of 13-17 cm remains within the range of historical operational lake level fluctuations. However, this comparison is hydrological rather than ecological in nature. In shallow nearshore environments, small vertical reductions in lake level may translate into substantial lateral recession of littoral habitat, depending on shoreline gradient. For example, on a uniform 1:100 slope, a 15 cm reduction in stage would correspond to approximately 15 m of horizontal retreat. As the modelled drawdown applies across the whole water body, such recession would occur simultaneously around extensive sections of shoreline during drought conditions, when ecological sensitivity is highest. The ecological implications of this basin wide compression of shallow water habitat are not evaluated in the NIS.

2.3.7 Modelling Assumptions and Sensitivity to Initial Storage Conditions

The hydrological model underpinning the assessment incorporates a “hunting routine” that adjusts simulated Ardnacrusha discharge to maintain Lough Derg levels toward the upper end of the Normal Operating Band (NOB) during periods of low inflow. As a result, simulated drought events commence from a storage condition biased toward the upper limit of the operational band (Appendix A9.1 Abstraction Assessment).

While this approach may stabilise model performance, it represents an optimistic starting condition for drought simulations. In practice, extended drought events are typically preceded by progressive inflow decline and may occur

when lake levels are already mid-band or trending downward due to existing abstraction, regulation and climatic variability.

The model therefore evaluates abstraction impacts under conditions that maximise available storage at the onset of drought. The reported additional drawdown of 134 mm (300 MLD) and 65 mm (154 MLD) during the 2018 drought event occurs from the upper NOB rather than from a lower-band starting condition.

No sensitivity analysis is presented to demonstrate how abstraction-induced drawdown would manifest if drought conditions commenced from mid- or lower-band levels within the operational range.

In shallow littoral systems, incremental reductions in stage near the lower operational band may produce disproportionate ecological effects due to lateral shoreline recession and groundwater-surface water disconnection. The absence of sensitivity testing across the full NOB therefore represents a limitation in the assessment of ecological risk under low-flow conditions.

2.3.8 Drought Vulnerability and Climate Change Context

Hydrological drought represents a material and foreseeable stressor within the Shannon River Basin District. Irish Water's National Water Resources Plan (2021) acknowledges that hydrological drought, defined by sustained reductions in streamflow, groundwater levels and reservoir storage, is the most relevant drought type for water supply planning

Historical analyses demonstrate that Ireland has experienced severe multi-season and multi-year droughts, including events in 1975/76 and 1995, with more severe historical droughts reconstructed prior to the modern gauged record (Noone *et al.*, 2017; Murphy *et al.*, 2019; O'Connor *et al.*, 2021). Recent research indicates that Ireland has exhibited strong trends toward greater summer precipitation deficits and increasing drought vulnerability in eastern and central catchments (Department of Transport, Climate Adaptation Research and Energy Division, 2025).

Climate projections under moderate and high emissions scenarios indicate:

- increased summer temperatures,
- reduced summer rainfall,
- increased evapotranspiration,
- greater frequency of blocking high-pressure systems, and
- increased hydrological drought persistence.

Hydrological droughts may lag meteorological droughts and persist beyond rainfall recovery, resulting in prolonged depression of lake levels, groundwater heads and floodplain soil moisture.

The hydrological modelling presented in Appendix A9.1 Abstraction Assessment relies on a 52-year simulation period (1972–2023) and identifies perceptible abstraction effects only during 1995 and 2018 drought analogues. However, the modelling does not demonstrate performance under reconstructed historical droughts, compounded multi-season hydrological drought, or prolonged climate-adjusted scenarios.

Given the ecological sensitivity of groundwater-dependent habitats, floodplain systems and shallow littoral zones to relatively small changes in stage or groundwater head, abstraction effects during prolonged or cumulative drought conditions represent a reasonably foreseeable scenario requiring robust assessment under Article 6(3).

2.4. Application of the Legal Tests to the Proposed Project

2.4.1 Engagement of the Habitats Directive and Water Framework Directive

The Proposed Project involves abstraction from the Lower River Shannon SAC within a hydraulically continuous river-lake-aquifer system in the Shannon IRBD. As acknowledged within the NIS, the abstraction has established surface-water and groundwater pathways to multiple Natura 2000 sites hydrologically connected to, the point of abstraction.

Where such hydrological connectivity is identified, the legal tests under Article 6(3) of the Habitats Directive and Article 4 of the Water Framework Directive are engaged. The assessment must therefore determine, on the basis of complete, precise and definitive findings, whether the Proposed Project, alone or in combination with other plans or projects, can be authorised without adverse effect on the integrity of any European site and without causing deterioration of water body status or failure to meet Protected Area objectives.

The presence of acknowledged hydrological pathways establishes the requirement for a robust and precautionary assessment.

2.4.2 Article 6(3) Habitats Directive — Integrity Test

Article 6(3) permits consent only where the competent authority is satisfied, beyond reasonable scientific doubt, that the plan or project will not adversely affect the integrity of any Natura 2000 site, having regard to its conservation objectives.

The NIS identifies hydrological pathways for effect to fourteen Natura 2000 sites. However, acknowledgement of a pathway is not, of itself, sufficient to discharge the integrity test. The assessment must demonstrate that the conservation objectives of each site will be maintained under all reasonably foreseeable operating conditions.

In this instance:

- The assessment relies substantially on long-term or annual average hydrological conditions.
- The evaluation of abstraction impacts during ecologically critical periods, including prolonged low-flow and drought conditions is limited.
- The consequences of abstraction for site-specific hydrological processes (including seasonal inundation, groundwater support, and depth-dependent habitat availability) are not consistently quantified in ecological terms.

Where the integrity of a site depends on hydrological regime, including timing, duration and variability of water levels, the assessment must demonstrate that conservation objectives will be maintained under reasonably foreseeable operating conditions, including low-flow and drought periods.

The question is not whether significant effects are likely under average conditions, but whether adverse effects on site integrity can be excluded beyond reasonable scientific doubt.

2.4.3 Application to Special Protection Areas (Article 7 of the Habitats Directive)

By virtue of Article 7 of the Habitats Directive, the requirements of Article 6(3) apply equally to SPAs designated under the Birds Directive.

For SPAs hydrologically connected to the abstraction area, the integrity of the site is dependent not solely on disturbance thresholds, but on the maintenance of the wetland habitat resource supporting the Special Conservation Interests. In lake and floodplain systems, this includes:

- the availability and distribution of shallow feeding areas,
- seasonal inundation regimes,
- water depth profiles influencing prey accessibility.

The NIS applies distance-based disturbance thresholds in respect of certain ornithological receptors. However, where hydrological alteration is the relevant pathway, the integrity test must address habitat functionality rather than proximity alone.

The assessment should therefore demonstrate that abstraction would not alter water level dynamics in a manner that could affect the availability, extent or persistence of habitat relied upon by SCI species, including during prolonged low-flow periods.

2.3.4 Article 4 Water Framework Directive – Non-Deterioration and Protected Areas

Article 4 of the Water Framework Directive requires the prevention of deterioration in the status of surface water and groundwater bodies, the achievement of good status or good ecological potential, and compliance with objectives for protected areas, including Natura 2000 sites.

Where a Natura 2000 site is hydrologically dependent on a surface water or groundwater body, failure to demonstrate compliance with Article 4 WFD has direct implications for the integrity assessment under Article 6(3).

In the present case:

- The abstraction occurs within a heavily regulated system already subject to operational constraints.
- The assessment does not consistently test abstraction effects under combined low-flow, drought and operational constraint scenarios.
- The implications of abstraction for groundwater-surface water interaction in dependent habitats are not fully resolved.

In circumstances where hydrological regime is integral to ecological status and to Protected Area objectives, the non-deterioration requirement must be demonstrably satisfied under reasonably foreseeable conditions.

2.3.5 Interaction Between the Habitats Directive and the Water Framework Directive

The objectives of the Water Framework Directive and the Habitats Directive are legally interlinked. Compliance with Article 4 WFD in respect of Protected Areas is not ancillary to the integrity test under Article 6(3), but complementary to it.

Where uncertainty remains as to whether abstraction may alter hydrological conditions in a manner relevant to Natura 2000 conservation objectives, that uncertainty cannot be cured by reliance on mitigation alone. The competent authority must be satisfied that no reasonable scientific doubt remains.

The assessment must therefore be judged against whether it provides sufficiently complete, precise and definitive findings to exclude adverse effects on site integrity and deterioration of water body status under the conditions in which the system is most sensitive.

3. Methodology for Site-Specific Assessment

The site-specific assessments that follow apply the legal and technical framework set out in Section 2. Site-specific assessment has been confined to Natura 2000 sites located within the Shannon International River Basin District, where hydrological and hydrogeological connectivity to the Proposed Project can be demonstrated with confidence.

The purpose of these assessments is not to re-describe site features, but to examine whether the Natura Impact Statement (NIS) and supporting documentation adequately demonstrate compliance with:

- Article 6(3) of the Habitats Directive (no adverse effect on site integrity), and
- Article 4 of the Water Framework Directive (non-deterioration and protection of water-dependent protected areas),

having regard to the specific qualifying interests, conservation objectives and hydrological sensitivities of each site.

For each SAC and SPA, the assessment follows a consistent structure:

1. Site context and qualifying interests
A brief summary of the site's designation, qualifying habitats and/or species, with emphasis on those dependent on surface water, groundwater, floodplain processes or lake–river interactions.
2. Hydrological and ecological pathways
Identification of the relevant pathways linking the Proposed Project to the site, including surface-water connectivity, groundwater connectivity, lake level regulation and floodplain processes, drawing on the Zone of Influence defined earlier in this report.
3. Assessment against Article 6(3) Habitats Directive
Evaluation of whether the NIS demonstrates, beyond reasonable scientific doubt, that the Proposed Project will not adversely affect the integrity of the site, having regard to:
 - conservation objectives and key site attributes,
 - sensitivity during low-flow and drought conditions,
 - potential for functional habitat loss or alteration,
 - the application of the precautionary principle where uncertainty remains.
4. Assessment against Article 4 Water Framework Directive
Consideration of whether abstraction-related effects could contribute to deterioration of surface water or groundwater bodies supporting the site, prevent achievement of Good Status or Good Ecological Potential, or undermine Protected Area objectives.
5. Identification of assessment gaps and uncertainties
Where relevant, identification of limitations in the NIS, including reliance on average conditions, insufficient consideration of critical periods, or inadequate treatment of groundwater–surface water interactions.

Each site is assessed individually against its conservation objectives and hydrological sensitivities, in accordance with Article 6(3). However, where sites form part of a hydraulically continuous system, the assessment recognises that common abstraction-related mechanisms may operate across connected river, lake and groundwater units. In-combination and cumulative effects are therefore considered in the context of existing regulation, abstraction pressures and climatic variability within the Shannon system.

4. Site-Specific Assessments:

For the purposes of this review, the detailed site-specific assessment is confined to Natura 2000 sites located within the hydrological Zone of Influence (ZoI) of the Proposed Project. This approach focuses on those sites for which the NIS identifies hydrological pathways for effect associated with abstraction at Parteen Basin.

Accordingly, this section examines five Natura 2000 sites identified within the NIS as hydrologically linked to the Proposed Project, together with one additional site that falls within the hydrological context of Lough Derg but is not addressed within the NIS.

4.1 Barroughter Bog SAC [000231] Omitted from NIS Assessment

4.1.1 Site Context

Barroughter Bog SAC is a raised bog located directly on the eastern shoreline of Lough Derg in County Galway. It is designated for:

- Active Raised Bog (*7110 – priority habitat)
- Degraded Raised Bog (7120)
- Rhynchosporion vegetation (7150)

The site's conservation objectives explicitly identify the restoration and maintenance of:

- High groundwater levels (mean levels at or near surface for most of the year)
- Stable hydrological regime and flow patterns
- Transitional habitats between open water, reedbeds and raised bog
- Appropriate microtopography and peat-forming processes

The site documentation emphasises its proximity to Lough Derg and the succession from open water through marginal wetlands to raised bog as a defining feature of local distinctiveness (NPWS, 2013).

4.1.2 Hydrological Linkage to Lough Derg

Barroughter Bog lies immediately adjacent to the regulated lake system of Lough Derg.

Its ecohydrology is influenced by:

- Regional groundwater levels
- Hydraulic gradients between lake and surrounding land
- Lake stage fluctuations
- Drainage and historical hydromorphological modification

Raised bog habitats are dependent on the maintenance of near-surface water tables and stable hydraulic gradients. Published conservation objectives for the site require sustained high groundwater levels and hydrological stability to support peat-forming processes.

The hydrological model for the Proposed Project predicts additional drawdown of approximately 13–17 cm during severe drought analogues, and acknowledges lake level sensitivity to abstraction during extreme dry periods.

Given the site’s immediate shoreline location and reliance on high groundwater tables and in the absence of site-specific hydrogeological assessment examining the relationship between lake stage and local groundwater levels at the bog–lake interface, it has not been demonstrated whether abstraction-related drawdown could influence the hydrological regime of the SAC.

4.1.3 Omission from the Natura 2000 Inventory

Despite its location on Lough Derg and its hydrological sensitivity, Barroughter Bog SAC:

- Is not listed within the Natura 2000 inventory in the NIS;
- Is not identified among the fourteen European sites with hydrological pathways for effect;
- Is not assessed in relation to abstraction-induced lake level change.

This site lies within the defined hydrological context of Lough Derg and falls within the 15 km Zone of Influence applied elsewhere in the NIS. However, it is not included in the inventory of European sites assessed for hydrological pathway effects.

4.1.4 Relevance to the Appropriate Assessment

Under Article 6(3) of the Habitats Directive, all European sites within the likely Zone of Influence must be identified and assessed where a source–pathway–receptor relationship cannot be excluded.

Barroughter Bog SAC lies directly within the hydrologically regulated Lough Derg system. Given:

- its shoreline location,
- its dependence on sustained groundwater levels, and
- the modelling acknowledgement of abstraction-related lake level sensitivity during drought,

a source–pathway–receptor relationship cannot be excluded on the basis of the information presented.

The absence of screening or assessment of this SAC indicates that the inventory of European sites considered in the NIS may not fully reflect all hydrologically connected receptors.

Where a site has not been screened or assessed, it cannot be concluded beyond reasonable scientific doubt that no adverse effect on site integrity will occur.

4.1.5 Procedural and Substantive Implications

The absence of screening or assessment of this SAC indicates that the inventory of European sites considered in the NIS may not fully reflect all hydrologically connected receptors.

Given that the project abstracts directly from a regulated lake system upon which this SAC is physically and hydrologically dependent, further site-specific screening and hydrogeological evaluation would be required to demonstrate compliance with Article 6(3).

Table 4.1 Key Failures – Barroughter Bog SAC [000231]

Assessment Element	NIS Position	Identified Deficiency	Relevance to Legal Test
Identification within Zol	Barroughter Bog SAC is not listed among sites with hydrological pathways for effect.	The SAC lies directly adjacent to Lough Derg yet is omitted from the Natura 2000 inventory and hydrological pathway analysis.	Article 6(3) requires identification of all European sites within the likely Zone of Influence. In the absence of identification and screening, compliance with Article 6(3) cannot be demonstrated.
Hydrological	Site not assessed.	No evaluation of whether abstraction-	Where a plausible source–pathway-

Assessment Element	NIS Position	Identified Deficiency	Relevance to Legal Test
linkage to Lough Derg		induced lake level changes could alter groundwater gradients or hydraulic conditions at the bog-lake interface.	receptor link exists, effects must be assessed beyond reasonable scientific doubt.
Lake level sensitivity during drought	Site not assessed.	No site-specific assessment of whether additional drawdown of 13-17 cm under abstraction scenarios could influence local groundwater levels supporting raised bog habitats.	Raised bog habitats are highly sensitive to small changes in water table. Drought-period sensitivity has not been evaluated in relation to site-specific groundwater dependence.
Groundwater dependency	Site not assessed	No hydrogeological analysis of groundwater contribution to the SAC, despite conservation objectives requiring sustained high water tables.	Conservation objectives explicitly require restoration and maintenance of appropriate water levels; groundwater effects must be evaluated under Article 6(3).
Restoration context	Site not assessed.	Site is undergoing restoration and targets expansion of Active Raised Bog to 14.7 ha; hydrological stability is critical to restoration success.	Article 6(3) applies to the maintenance and restoration objectives of designated habitats; assessment must consider effects on restoration trajectories.
Transitional habitats	Site not assessed.	Conservation objectives highlight succession from open water through reedbeds to raised bog; this transitional hydrology is not assessed.	Failure to consider ecotonal hydrological processes risks underestimating site sensitivity.
Cumulative interaction	Site not assessed.	No assessment of combined effect of abstraction drawdown + existing drainage pressures around bog margins.	Article 6(3) requires assessment alone and in combination. Existing drainage increases vulnerability to additional hydrological stress.
Precautionary principle	Site not assessed.	Absence of screening/assessment prevents demonstration of absence of adverse effect.	Where a pathway cannot be excluded and the site has not been assessed, the absence of adverse effect cannot be established.

4.1.6 Conclusion for Barroughter Bog SAC

Barroughter Bog SAC is located immediately adjacent to Lough Derg and is designated for hydrologically dependent raised bog habitats, including the priority habitat Active Raised Bog. The conservation objectives require the maintenance and restoration of high and stable groundwater levels and appropriate hydrological processes.

The hydrological modelling presented in Appendix A9.1 of the EIAR indicates additional lake level drawdown during severe drought analogues under abstraction scenarios. However, no screening or site-specific assessment has been undertaken to evaluate whether lake stage variation could influence groundwater gradients or water table levels within the SAC, particularly at the lake-bog interface.

In the absence of such assessment, a source-pathway-receptor relationship cannot be excluded. Accordingly, it has not been demonstrated, beyond reasonable scientific doubt, that the Proposed Project would not adversely affect the integrity of Barroughter Bog SAC.

The omission of this SAC from the NIS means that compliance with Article 6(3) of the Habitats Directive has not been established in respect of this site.

4.2 Lower River Shannon SAC [002165]

4.2.1 Site Overview and Qualifying Interests

The Lower River Shannon SAC is designated for a wide range of Annex I habitats and Annex II species whose favourable conservation condition is dependent on the maintenance of hydrological regime, water quality, sediment processes and estuarine dynamics.

Qualifying interests include, inter alia:

- Riverine and estuarine habitats;
- Floodplain and marginal wetland systems;
- Priority habitats such as Coastal Lagoons [1150]* and Alluvial Forests [91E0]*;
- Annex II species including Sea Lamprey (*Petromyzon marinus*), Brook Lamprey (*Lampetra planeri*), River Lamprey (*Lampetra fluviatilis*), Salmon (*Salmo salar*), Bottlenose Dolphin (*Tursiops truncatus*).

The conservation objectives for Lower River Shannon SAC are set out in NPWS (2012). These objectives require the maintenance of habitat extent, structure and function, including the hydrological processes that sustain river–lake–estuary connectivity, flow variability, groundwater interaction and freshwater–marine mixing dynamics.

The proposed abstraction point at Parteen Basin lies within the footprint of the SAC. The site is therefore not merely hydrologically connected to the Proposed Project; it spatially coincides with it.

4.2.2 Pathways for Effect

The NIS acknowledges that the Proposed Project has direct hydrological pathways for effect on the Lower River Shannon SAC, including:

- Direct abstraction within the SAC at Parteen Basin;
- Alteration of downstream discharge regime;
- Interaction with Lough Derg storage and regulation;
- Modification of groundwater–surface water gradients;
- Reduced freshwater discharge to the transitional and estuarine environment via the tailrace.

A source–pathway–receptor relationship is identified in the NIS between the Proposed Project and the SAC.

The assessment must then address whether the predicted changes could affect conservation objectives beyond reasonable scientific doubt and will not adversely affect site integrity.

4.2.3 Assessment of Effects on Conservation Objectives

Hydrological Regime and Flow Dependency

The integrity of the Lower River Shannon SAC depends on:

- Maintenance of flow magnitude, timing, variability and duration;
- Sediment transport and channel morphology;
- Lateral connectivity between channel and floodplain;
- Maintenance of transitional salinity gradients in downstream reaches.

The NIS relies predominantly on long-term and annual average hydrological statistics. However, qualifying habitats and species are most vulnerable during low-flow and drought conditions, when system resilience is reduced.

The assessment does not robustly evaluate whether abstraction during such ecologically critical periods would:

- Reduce wetted channel width or depth;
- Alter flow velocity and sediment processes;
- Prolong low-flow duration;
- Modify inundation frequency or floodplain connectivity;
- Shift transitional salinity gradients in downstream reaches.

Reliance on annual/long-term averages does not, on its own, address sensitivity under low-flow conditions.

Groundwater–Surface Water Interactions

The Lower River Shannon SAC includes habitats sensitive to changes in groundwater levels and hydraulic gradients, particularly within floodplain and marginal zones.

Under the Water Framework Directive, groundwater bodies and surface waters are recognised as hydraulically continuous systems. Abstraction-induced changes at Parteen therefore have the potential to:

- alter groundwater heads;
- modify baseflow contributions to the river;
- affect marginal wetland hydrology;
- influence soil moisture regimes in floodplain and transitional habitats.

The NIS does not robustly assess these interactions, nor does it demonstrate that abstraction would not undermine groundwater-supported ecological functions during prolonged low-flow conditions.

4.2.4 Parteen Basin as a Functionally Important Component of the SAC

Parteen Basin forms an integral component of the Lower River Shannon SAC and lies within the core hydrological control zone of the Shannon system. It represents a transitional zone between regulated lake storage at Lough Derg and downstream riverine and estuarine environments, and its ecological character is intrinsically linked to abstraction pressure and operational management at Parteen Weir and Ardnacrusha.

The basin comprises shallow open water, extensive marginal and littoral habitats, and seasonally variable shoreline zones that are highly sensitive to changes in water level and flow regime and contribute directly to SAC structure and function.

Ornithological Function and Baseline Limitations

Available wintering and summer bird survey data demonstrate that Parteen Basin supports water-dependent bird assemblages across its wider extent and regularly supports wintering waterbird species in nationally important numbers, indicating its functional importance as feeding and roosting habitat within the SAC.

However, breeding bird survey coverage within the NIS was confined to a restricted portion of the south-eastern shoreline and does not encompass the full spatial extent of habitats potentially affected by abstraction-related changes in water levels or hydrological regime.

Given the functional importance of the basin and the spatial variability of habitat use by water-dependent birds, this limited coverage does not provide a sufficient baseline to assess whether abstraction-induced changes could result in:

- loss or compression of shallow-water feeding areas;

- increased exposure of littoral zones;
- altered prey availability;
- displacement to less suitable habitats elsewhere within the SAC.

4.2.5 Downstream Hydrological Effects within the SAC

Abstraction from Parteen Basin occurs within a highly regulated river system where downstream hydrological conditions are determined by the interaction of lake level management, turbine operation, compensation flows and abstraction demand.

During low-flow or drought conditions, even relatively small absolute changes in discharge can result in disproportionate ecological effects downstream, including prolonged low-flow periods, reduced lateral connectivity between channel and floodplain, and altered inundation regimes of marginal and wetland habitats.

Bottlenose Dolphin is a qualifying Annex II species for the Lower River Shannon SAC. The NIS states that the species' core range lies outside the defined hydrological ZoI. However, observational records demonstrate that dolphins forage upstream to Limerick Docks, within the transitional reach influenced by tailrace discharge.

The NIS acknowledges that abstraction may reduce discharge to the tailrace during certain conditions but asserts that tidal influence mitigates any effect.

The NIS does not provide quantitative assessment of:

- freshwater–marine mixing dynamics;
- salinity front displacement;
- changes in estuarine stratification;
- prey distribution and aggregation effects.

Reduced freshwater discharge during drought can increase saline intrusion and shifts estuarine balance upstream. Transitional habitats are highly sensitive to changes in freshwater input. No modelling of salinity regime alteration or ecological consequence is presented.

While the NIS acknowledges hydrological connectivity, it does not robustly assess whether abstraction-induced changes during critical periods could undermine downstream habitat functionality or contribute to cumulative hydromorphological pressure within the SAC.

4.2.6 Mitigation Measures and Their Limitations

The NIS identifies a number of mitigation measures intended to avoid or reduce potential effects on the Lower River Shannon SAC. These include:

- Limiting abstraction velocity to below 0.15 m/s during hydrostatic testing;
- Restricting abstraction to no more than 10% of Q95 where flows are between Q80 and Q95;
- Ceasing abstraction below Q95 flow levels;
- Maintenance of compensation and fish pass flows;
- Operational management of lake levels within the Normal Operating Band (NOB).

However, it is important to note that the proposed Q95-based restrictions and intake velocity limits are explicitly described as applying to hydrostatic testing and subsequent discharge post-testing. They are not presented as binding operational-phase abstraction controls governing long-term water supply abstraction.

Accordingly, these measures do not provide a comprehensive safeguard against hydrological impacts during routine operational abstraction, particularly during prolonged low-flow or drought conditions.

The Q95 threshold represents a statistical low-flow metric rather than an ecologically derived integrity threshold. Q95 denotes the flow exceeded 95% of the time under historical conditions; it does not define the flow at which qualifying habitats and species begin to experience ecological stress. In low-gradient, highly regulated systems such as the Lower Shannon:

- Ecological sensitivity may arise at flows above Q95;
- Extended periods between Q80 and Q95 may generate cumulative hydrological stress;
- Small incremental reductions in discharge can produce disproportionate changes in river stage, lateral inundation, groundwater gradients and estuarine salinity balance.

The NIS does not demonstrate that abstraction, whether constrained by Q95 thresholds or not, would not result in measurable changes to river stage, lateral connectivity, sediment transport dynamics, groundwater–surface water interaction, or freshwater–estuarine mixing processes within the SAC during ecologically critical periods.

Hydrological modelling indicates that perceptible additional drawdown (c. 13–17 cm under higher abstraction scenarios) occurs during extreme drought events. While described as falling within historical fluctuation ranges, the modelling approach includes operational routines that tend to maintain lake levels towards the upper end of the Normal Operating Band during low inflow periods. The assessment does not demonstrate that this represents a conservative worst-case ecological scenario, nor does it evaluate habitat response to incremental stage reductions during multi-season hydrological droughts.

Furthermore, mitigation framed primarily around surface-water discharge thresholds does not address groundwater–surface water interactions supporting floodplain and marginal habitats within the SAC.

In respect of downstream transitional and estuarine environments, the NIS concludes that tidal influence would mitigate reduced flows in the Ardnacrusha tailrace during drought conditions. However, no quantitative assessment is provided regarding potential upstream migration of the saline intrusion front, alteration of freshwater–seawater balance, or ecological implications for transitional habitats and Annex II species.

4.2.7 Compliance with Article 6(3) Habitats Directive and Article 4 WFD

Article 6(3) of the Habitats Directive requires certainty, beyond reasonable scientific doubt, that the Proposed Project will not adversely affect the integrity of the Lower River Shannon SAC.

The NIS frequently concludes, in respect of qualifying habitats and species, that there is:

“No potential for effects, following the implementation of mitigation measures.”

Under Article 6(3), mitigation measures may only be relied upon where their effectiveness is demonstrated with sufficient scientific certainty to remove reasonable doubt. The assessment does not provide quantitative evidence demonstrating that the proposed operational thresholds:

- Protect hydrological processes underpinning qualifying habitats;
- Prevent functional habitat loss during drought conditions;
- Avoid cumulative interaction with existing regulation and abstraction pressures;
- Maintain ecological integrity across the full range of reasonably foreseeable hydrological scenarios.

Accordingly, while mitigation measures are proposed, the NIS does not demonstrate that they are sufficient to ensure the absence of adverse effects on the integrity of the Lower River Shannon SAC beyond reasonable scientific doubt. As the Lower River Shannon SAC is also a Protected Area under the Water Framework Directive, unresolved risks of

deterioration or failure to meet Protected Area objectives under Article 4 WFD directly undermine confidence in compliance with Article 6(3).

Table 4.2: Summary of Key Assessment Failures – Lower River Shannon SAC [002165]

Assessment Element	NIS Position	Identified Deficiency	Relevance to Legal Tests
Source-Pathway-Receptor	Hydrological pathways acknowledged between abstraction and SAC	Pathways acknowledged but not assessed under ecologically critical low-flow or drought conditions	Article 6(3) requires certainty under all reasonably foreseeable conditions
Hydrological Metrics	Reliance on long-term and annual average flow statistics	Average flow metrics do not represent conditions when qualifying habitats are most vulnerable	Precautionary principle; does not assess worst-case conditions
Low-Flow and Drought Effects	Drought events modelled; impacts characterised as within historical fluctuation range	Ecological consequences of additional 13–17 cm drawdown during drought not assessed; no habitat sensitivity testing	Article 6(3) requires demonstration of no adverse effect, not comparison to historic fluctuation
Model Assumptions	Model includes lake-level “hunting routine” to maintain levels within NOB band	Model biases starting levels toward upper NOB during low inflow periods, potentially under-representing worst-case ecological drought scenarios	Mitigation or modelling assumptions cannot substitute for ecological certainty under Article 6(3)
Low-Flow Controls	Q95 based abstraction limits and velocity controls proposed	Q95 restrictions apply only to hydrostatic testing and post-testing discharge; no binding operational abstraction safeguards demonstrated for routine supply abstraction during prolonged drought	Mitigation must remove reasonable scientific doubt; absence of operational safeguards leaves uncertainty
Floodplain and Marginal Connectivity	No significant downstream effects predicted	No site-specific evaluation of abstraction effects on lateral connectivity, inundation frequency or marginal wetland persistence during drought	Integrity depends on habitat structure and function
Groundwater-Surface Water Interactions	Recognised in principle	No quantitative assessment of abstraction-induced changes to groundwater heads or baseflow supporting floodplain and wetland habitats	Article 4 WFD non-deterioration and Protected Area objectives
Parteen Basin Function	Considered primarily as abstraction location	Basin-wide ecological role within SAC (transitional habitat, shallow-water systems) not assessed under altered water level scenarios	Does not demonstrate SAC component critical to system integrity
Ornithological Baseline	Limited breeding bird survey undertaken	Survey coverage confined to restricted south-eastern shoreline area; not representative of basin-wide habitat use potentially affected by water level change	Insufficient baseline to rule out functional habitat loss
Wintering Bird Assemblages	National importance acknowledged in supporting reports	Functional implications of water level change for feeding depth distribution and habitat availability not assessed	SPA linked habitat functions within SAC not adequately considered
Downstream Hydrological Effects	Hydrological connectivity acknowledged	No robust assessment of downstream habitat responses under altered regulation and low-flow scenarios	In-combination effects required under Article 6(3)
Freshwater-Estuarine Interaction	Tailrace reductions considered mitigated by tidal influence	No quantitative assessment of salinity intrusion, freshwater-seawater balance, or implications for transitional habitats and Annex II species	Does not demonstrate hydrologically mediated ecological effects undermines integrity test
Cumulative Pressures	Existing abstractions and regulation noted	Combined effects with existing abstraction and operational pressures not tested	Required under Article 6(3) and Article 4 WFD
Water Framework Directive Compliance	Compliance asserted	Non-deterioration and Protected Area objectives not demonstrated during critical	Article 4 WFD test not satisfied

Assessment Element	NIS Position	Identified Deficiency	Relevance to Legal Tests
		conditions	
Scientific Certainty	Conclusion of no adverse effect reached	Residual uncertainty remains regarding habitat structure and function	Does not evidence “beyond reasonable scientific doubt” threshold

4.2.8 Conclusion for Lower River Shannon SAC

The Lower River Shannon SAC lies directly within the abstraction footprint of the Proposed Project and forms part of a regulated, hydraulically continuous river–lake–floodplain–estuarine system. Its qualifying habitats and species are intrinsically dependent on the maintenance of appropriate flow magnitude, timing, variability, groundwater interaction and freshwater–estuarine balance.

While the NIS acknowledges hydrological pathways for effect, it relies primarily on average-condition modelling and does not robustly assess ecological response under prolonged low-flow or hydrological drought conditions, the periods during which qualifying habitats and species are most vulnerable.

Proposed Q95-based abstraction controls apply only to hydrostatic testing and post-testing discharge and do not constitute binding operational safeguards for long-term abstraction.

Hydrological modelling indicates measurable additional drawdown during extreme drought scenarios. While characterised as within historical fluctuation ranges, the assessment does not demonstrate that such incremental reductions would be ecologically neutral, nor does it test sensitivity of qualifying habitats to repeated or prolonged drought sequences under future climate conditions.

Mitigation measures may only be relied upon under Article 6(3) where they remove reasonable scientific doubt. In this case, material uncertainty remains regarding hydrological regime, habitat structure and function, and downstream freshwater–estuarine processes.

Accordingly, it has not been demonstrated, beyond reasonable scientific doubt, that the Proposed Project would not adversely affect the integrity of the Lower River Shannon SAC.

4.3 Site-Specific Assessment: Lough Derg, North-east Shore SAC [002241]

4.3.1 Site Overview and Qualifying Interests

Lough Derg, North-east Shore SAC encompasses a series of fringing and shoreline habitats along the north-eastern margin of Lough Derg, including: fen and marsh communities, shoreline grasslands and fringing wetland habitat, associated transition zones between open water and terrestrial habitats, wet woodland and Priority habitats such as Alluvial Forests* [91E0], Limestone Pavement* [8240] and Yew Woodlands* [91J0].

These habitats are explicitly dependent on the lake’s water level regime, including the magnitude, timing and variability of water levels and the frequency and duration of inundation and exposure.

The conservation objectives for Lough Derg, North-east Shore SAC are set out in NPWS (2019). The objectives for the SAC require the restoration and maintenance of:

- habitat extent and distribution along the shoreline,
- structure and function of wetland and woodland communities,
- supporting hydrological processes, particularly seasonal water level dynamics.

Lough Derg forms part of a regulated lake–river system within the Shannon IRBD, with water levels actively managed within a defined Normal Operating Band (NOB) for hydropower, navigation and flood control. Any additional abstraction pressure within this regulated system may alter the hydrological processes underpinning these qualifying habitats.

4.3.2 Pathways for Effect

The NIS identifies Lough Derg, North-east Shore SAC as:

- within the same regulated lake system as the abstraction at Parteen Basin, and
- within the hydrological zone of influence of the Proposed Project.

The only mechanism identified for potential effect is alteration of lake level regime arising from abstraction.

Potential pathways therefore include:

- additional drawdown during drought or low-inflow conditions,
- altered frequency or duration of low-water periods,
- modified interaction between lake storage and downstream discharge,
- changes in groundwater heads in fringing wetland zones linked to lake levels.

The existence of a source–pathway–receptor relationship is therefore acknowledged at screening stage.

4.3.3 Assessment of Effects on Conservation Objectives

Lake Level Regulation and Shoreline Habitat Sensitivity

The NIS concludes that:

- simulated lake levels are only affected during extreme drought years (1995 and 2018),
- for approximately 99% of the 52-year model period, no perceptible impact occurs,
- even during the worst drought event, additional drawdown (13–17 cm) remains within the Normal Operating Band,
- the magnitude and rate of drawdown fall within the range of historic observed lake fluctuations.

However, this reasoning is framed in operational and statistical terms rather than ecological terms.

Remaining within the ESB Normal Operating Band does not demonstrate maintenance of:

- shoreline habitat extent,
- hydroperiod duration,
- groundwater-supported wetland conditions,
- vegetation zonation,
- structural and functional integrity of qualifying habitats.

The conservation objectives of the SAC relate to ecological function, not operational thresholds.

In shallow, gently sloping shoreline systems, modest vertical changes in lake level can result in disproportionate lateral recession of the waterline. A 13–17 cm additional drawdown during drought may:

- increase the frequency of exposure of marginal wetland zones,
- shorten the duration of saturation in fringing habitats,
- alter sediment moisture regimes,
- affect macrophyte and moss communities,
- shift competitive balance toward more drought-tolerant species.

The NIS does not translate modelled vertical drawdown into:

- lateral habitat loss,
- altered hydroperiod duration,
- vegetation response thresholds,
- groundwater response analysis.

Without this ecological translation, it is not possible to determine whether the integrity test has been satisfied.

Frequency, Duration and Timing of Low-Level Events

The NIS places significant weight on the fact that additional drawdown occurs in only two years of the 52-year simulation.

However:

- Article 6(3) does not permit effects during reasonably foreseeable drought events.
- Climate projections for Ireland indicate increased summer drought frequency and intensity.
- Ecological damage often occurs during extreme conditions, not average years.
- Repeated low-water events may have cumulative vegetation and soil effects over time.

The assessment does not evaluate whether abstraction could:

- increase the frequency of lower-band conditions,
- prolong low-water duration,
- alter seasonal timing of drawdown,
- compound ecological stress during drought sequences.

Reliance on the statistic that “99% of years show no perceptible impact” does not, in itself, demonstrate that adverse effects on site integrity can be excluded.

Groundwater–Surface Water Interaction

Fringing habitats along the north-east shore likely depend on both:

- direct inundation by lake water,
- shallow groundwater hydraulically linked to lake level.

Changes in lake level may alter:

- local groundwater heads,
- soil saturation depth,
- capillary connection in marginal habitats,
- persistence of wet woodland and fen conditions.

The NIS does not present site-specific analysis of groundwater–shoreline coupling under abstraction scenarios.

Without this ecological translation, it is not possible to determine whether the integrity test has been satisfied.

Mitigation Measures

The mitigation measures referenced in the NIS primarily relate to:

- hydrostatic testing abstraction limits (e.g. 10% of Q95),
- abstraction velocity controls,
- water quality protection measures.

These measures do not apply to permanent operational abstraction during drought conditions and do not mitigate lake level drawdown during low-inflow periods.

Accordingly, the conclusion of “No potential for effects, following mitigation” is not supported by mitigation measures addressing the relevant hydrological mechanism for this SAC.

Ornithological and Functional Use

Although designated as an SAC, the shoreline and littoral habitats of Lough Derg, North-east Shore also contribute to the wider functional habitat resource for waterbirds using Lough Derg and associated SPAs (e.g. feeding, roosting, loafing areas in shallow margins).

Changes in water level can:

- compress or remove shallow-water foraging zones,
- expose or inundate roost sites at critical times,
- alter invertebrate and macrophyte communities forming the base of the food web.

The NIS does not systematically assess whether abstraction-related changes in lake level during low-flow periods could result in functional habitat loss or compression of littoral zones within the SAC, nor whether such changes could have implications for the broader Shannon wetland network.

4.3.4 Compliance with Article 6(3) Habitats Directive

Article 6(3) requires the competent authority to be satisfied, beyond reasonable scientific doubt, that the Proposed Project will not adversely affect the integrity of Lough Derg, North-east Shore SAC.

While the NIS acknowledges hydrological connectivity and models lake level variation, it does not:

- translate modelled drawdown into ecological impact assessment,
- assess habitat sensitivity to hydroperiod alteration,
- evaluate groundwater-shoreline interaction,
- examine repeated or cumulative drought impacts,
- demonstrate that habitat extent, structure and function would be maintained under all reasonably foreseeable conditions.

The assessment equates compliance with the Normal Operating Band and similarity to historic fluctuations with absence of ecological effect. This equivalence is not demonstrated.

In the absence of ecological analysis linking abstraction-induced drawdown to habitat response, reasonable scientific doubt remains.

4.3.5 Interaction with Article 4 Water Framework Directive

Lough Derg forms part of a heavily regulated water body within the Shannon IRBD and is subject to Water Framework Directive objectives, including:

- prevention of deterioration in ecological status or potential;
- achievement of Good Ecological Potential in the context of its modified regime;
- protection of associated Protected Areas, including SACs along its shore.

The Proposed Project introduces a permanent, high-volume abstraction from a system already constrained by operational water level limits. The NIS does not demonstrate that:

- low-flow and drought-period lake levels would remain compatible with the hydrological requirements of shoreline habitats;
- hydromorphological conditions necessary for Good Ecological Potential would be maintained under combined regulation and abstraction;
- Protected Area objectives for Lough Derg, North-east Shore SAC would be secured under all reasonably foreseeable operating conditions.

In the absence of such demonstration, compliance with Article 4 WFD cannot be clearly established, which is relevant to the integrity assessment under Article 6(3).

Table 4.3 Key Failures in the Assessment: Lough Derg, North-east Shore SAC [002241]

Assessment Element	NIS Position	Identified Deficiency	Relevance to Legal Test
Hydrological pathway	Hydrological linkage acknowledged; only possible mechanism is change in lake level due to abstraction at Parteen.	While the pathway is acknowledged, the ecological consequences of altered lake level regime are not assessed.	Article 6(3) requires effects to be ruled out, not merely pathways acknowledged.
Reliance on 52-year modelling (“99% unaffected”)	No perceptible impact in 99% of simulated years. Effects only during 1995 and 2018 droughts.	Article 6(3) requires protection during reasonably foreseeable extreme conditions. Ecological impacts often occur during drought years, not average years.	Statistical rarity does not satisfy the “no adverse effect on integrity” test.
Normal Operating Band (NOB) compliance	Modelled levels remain within ESB Normal Operating Band, even during drought + abstraction.	Operational water level bands are management thresholds, not ecological thresholds. No demonstration that habitat structure and function are protected within NOB limits.	Compliance with operational regime ≠ compliance with conservation objectives.
Magnitude of additional drawdown (13–17 cm)	Additional drawdown considered minor and within historic fluctuations.	No translation of vertical drawdown into lateral shoreline recession, habitat compression or hydroperiod alteration. Shallow bathymetry may amplify ecological impact.	No assessment is presented of habitat extent and function, directly undermines Article 6(3).
Historic fluctuation comparison	Modelled changes fall within range of historically recorded lake level fluctuations.	No evidence that historic fluctuations did not cause ecological stress or habitat change. Historic variability is not an ecological impact assessment.	“Within historic range” historic variability is not equivalent to ecological evaluation.
Low-flow / drought sensitivity	Effects limited to extreme drought years and short post-drought periods.	No assessment of increasing drought frequency under climate projections; no evaluation of repeated or cumulative drought stress.	Article 6(3) requires assessment under reasonably foreseeable conditions, including climate change.
Frequency and	Focus on minimum level	No analysis of duration of low-water	Habitat integrity depends on

Assessment Element	NIS Position	Identified Deficiency	Relevance to Legal Test
duration of low-water events	reached.	periods, altered hydroperiod timing, or frequency of lower-band occupancy.	hydroperiod dynamics, not just minimum depth.
Groundwater-shoreline interaction	Hydraulic connectivity acknowledged in principle.	No site-specific assessment of groundwater head response or saturation dynamics in fringing wetlands.	Groundwater-supported habitats require explicit assessment under both Article 6(3) and Article 4 WFD.
Ecological translation of modelling outputs	Hydrological modelling relied upon to conclude no effect.	Model outputs not translated into habitat response metrics (extent, zonation, vegetation structure, wet woodland viability).	Article 6(3) requires ecological certainty, not hydrological reassurance alone.
Mitigation measures	“No potential for effects following mitigation.” Mitigation focuses on testing-phase abstraction limits and water quality controls.	Proposed Q95 restrictions apply only to hydrostatic testing. No mitigation addresses permanent operational abstraction during drought.	Mitigation effectiveness is not demonstrated for operational abstraction, effects remain unmitigated.
Cumulative / in-combination effects	Abstraction assessed largely in isolation from lake regulation regime.	No robust assessment of interaction between abstraction, ESB regulation, and drought stress.	Article 6(3) requires assessment alone and in combination.
Water Framework Directive compliance	Compliance asserted; no deterioration anticipated.	No demonstration that abstraction would not contribute to hydromorphological pressure or undermine Good Ecological Potential under low-water scenarios.	Failure to demonstrate Article 4 compliance undermines Protected Area obligations.
Precautionary principle	Residual impacts dismissed as unlikely.	Scientific uncertainty regarding shoreline habitat response and groundwater coupling remains unresolved.	Where doubt remains, consent cannot lawfully be granted under Article 6(3).

4.3.6 Conclusion for Lough Derg, North-east Shore SAC

Lough Derg, North-east Shore SAC comprises hydrologically sensitive shoreline and fringing wetland habitats directly dependent on lake level magnitude, timing and seasonal variability. These habitats respond to water level extremes rather than long-term averages.

The NIS acknowledges hydrological connectivity but concludes no effect on the basis that modelled lake level changes remain within the Normal Operating Band and within the range of historic fluctuations. However, the assessment does not examine the ecological implications of repeated or prolonged low-water conditions, nor does it evaluate abstraction effects during multi-season drought or constrained operational scenarios.

Small vertical changes in lake level can produce disproportionate lateral recession of shallow littoral habitats, with implications for habitat extent, zonation and structure. These sensitivities are not quantitatively assessed.

Accordingly, in the absence of a robust evaluation of lake level behaviour and shoreline habitat response under ecologically critical conditions, it cannot be concluded beyond reasonable scientific doubt that the integrity of Lough Derg, North-east Shore SAC would not be adversely affected.

4.4 Site-Specific Assessment: River Shannon Callows SAC [000216]

4.4.1 Site Overview and Qualifying Interests

The River Shannon Callows SAC is designated for Annex I floodplain and wet grassland habitats whose ecological integrity is fundamentally dependent on hydrological processes, including seasonal flooding, shallow groundwater

levels, and hydraulic connectivity with the River Shannon. The site supports extensive areas of callow grassland, a habitat type characterised by periodic inundation during winter and spring followed by gradual drawdown through the summer months.

In addition to callow grassland habitats, the SAC includes approximately 15 ha of Annex I habitat Alkaline Fens [7230] located south of Portumna Bridge and south-east of Portumna town. This fen system occupies low-lying land corresponding to a former embayment at the northern end of Lough Derg and is dependent on sustained high groundwater levels and stable hydraulic gradients. According to NPWS (2022), the fen requires groundwater levels at or near the surface for much of the year and may be partially sustained by spring-fed, base-rich flushing. The ecological integrity of this habitat is therefore closely linked to regional groundwater conditions and lake–river hydraulic interactions within the Shannon system. The Priority Habitat Alluvial forest* [91E0] occurs on islands below Meelick Weir and is subject to regular flooding.

The conservation objectives for the River Shannon Callows are set out in NPWS (2022). These objectives for the SAC require the maintenance and restoration of habitat extent, structure and function, including the hydrological regime that sustains seasonal inundation patterns, soil moisture conditions, nutrient dynamics and associated ecological communities. The ecological functioning of the Callows is therefore inseparable from river stage, groundwater–surface water interaction, and the timing and duration of flooding events.

4.4.2 Pathways for Effect

The NIS acknowledges that the River Shannon Callows SAC lies within the hydrogeological Zone of Influence of the Proposed Project. The abstraction at Parteen Basin occurs approximately 36 km downstream (straight-line distance), within the same regulated river–lake system.

The NIS asserts that the only possible mechanism of impact is via abstraction-induced changes in water levels within the regulated Lough Derg–Shannon system and that upstream effects are hydraulically limited to Meelick Weir.

However, the SAC spans both upstream and downstream of Meelick Weir, and includes groundwater-dependent habitats located south of Portumna Bridge within the regulated Lough Derg–Shannon reach.

Accordingly, potential pathways for effect include:

- abstraction-induced modification of lake storage behaviour at Lough Derg;
- altered discharge management at Parteen and Ardnacrusha;
- changes in river stage within the low-gradient Shannon floodplain;
- modification of floodplain inundation frequency, timing or duration;
- abstraction-induced changes in groundwater heads affecting shallow floodplain soils and alkaline fen habitats;
- cumulative interaction with existing regulation and abstraction pressures.

While hydrological connectivity is acknowledged in principle, the NIS does not present quantitative hydraulic modelling demonstrating that abstraction during low-flow or drought conditions would not influence upstream river stage or groundwater gradients within the SAC.

4.4.3 Assessment of Effects on Conservation Objectives

Hydrological Regime and Floodplain Function

The integrity of the River Shannon Callows SAC depends on the maintenance of a naturalised seasonal flooding regime, including the timing, duration and extent of inundation events that shape vegetation structure, species composition and soil conditions within callow habitats.

The NIS relies heavily on the fact that Lough Derg is managed within a 460 mm Normal Operating Band (NOB) and states that even during the worst modelled drought event (2018), abstraction-induced changes remain within this band and within the range of historical water level variability.

However, the Normal Operating Band is an operational control envelope designed for hydropower and embankment safety. It is not an ecological threshold. Compliance with the NOB does not demonstrate that:

- seasonal flood duration remains unchanged,
- flood recession timing is unaltered,
- groundwater heads are maintained,
- floodplain soil saturation regimes are preserved.

The NIS further argues that natural wind-driven lake level variation (averaging ~110 mm and occasionally exceeding 400 mm) exceeds the magnitude of modelled abstraction-induced change, and that such changes would therefore be “indistinguishable” to littoral vegetation.

This comparison is hydro dynamically and ecologically flawed.

Wind effects are:

- short-duration,
- oscillatory,
- spatially variable,
- non-cumulative.

Abstraction-induced storage deficits are:

- directional,
- potentially sustained during low-flow periods,
- cumulative over time,
- associated with altered discharge management.

Short-term wind setup is not functionally equivalent to sustained abstraction-induced drawdown during ecologically critical periods.

The conservation objectives for the SAC relate to habitat structure and function, which are driven by hydrological processes, particularly the timing and duration of inundation, rather than compliance with an engineering operating range.

Groundwater–Surface Water Interactions

The River Shannon Callows function as a shallow floodplain system with strong groundwater–surface water interaction. Seasonal flooding, soil moisture retention and habitat persistence are supported by high groundwater tables maintained through hydraulic connectivity with the River Shannon.

Under the Water Framework Directive, groundwater bodies and surface waters are recognised as hydraulically continuous systems. Abstraction-induced changes at Parteen Basin have the potential to alter groundwater heads and hydraulic gradients across the floodplain, particularly during extended dry periods when recharge is limited.

The NIS does not robustly assess whether abstraction could result in:

- sustained lowering of shallow groundwater levels within the Callows;

- reduced groundwater contribution to floodplain soil moisture;
- progressive drying of callow habitats during drought sequences.

In the absence of such assessment, it has not been demonstrated that groundwater-dependent ecological functions within the SAC would be maintained under all reasonably foreseeable operating conditions.

Sensitivity to Low-Flow and Drought Conditions

The ecological sensitivity of the River Shannon Callows SAC coincides with the hydrological conditions least examined in the assessment. Late summer drawdown, multi-season drought and prolonged low-flow conditions represent periods of heightened vulnerability for floodplain habitats, particularly where abstraction pressures interact with existing regulation of lake levels and river flows.

The NIS states that perceptible modelled impacts occur only in 2 out of 52 years (1995 and 2018), representing approximately 1% of the simulation period.

Article 6(3) of the Habitats Directive is not a frequency test. It requires that adverse effects on site integrity be excluded under reasonably foreseeable conditions. Severe drought conditions are demonstrably foreseeable in Ireland, and climate projections indicate increasing summer drying and evapotranspiration pressure.

The fact that modelled differences arise primarily during drought periods is ecologically significant, as these are precisely the conditions under which floodplain habitats and groundwater-dependent fens are most vulnerable.

Upstream Hydraulic Boundary at Meelick Weir

The NIS states that abstraction-related hydrological effects are limited upstream to Meelick Weir. However, the River Shannon Callows SAC extends both upstream and downstream of this structure. No detailed hydraulic modelling or sensitivity analysis is presented to demonstrate that abstraction at Parteen Basin would not alter upstream river stage, floodplain inundation patterns, or groundwater gradients under low-flow or drought conditions. In low-gradient floodplain systems, even small variations in river stage can produce disproportionate changes in lateral inundation extent.

Moreover, even if hydraulic independence upstream of Meelick Weir were demonstrated through robust modelling, the SAC also encompasses downstream groundwater-dependent habitats that remain hydrologically connected to the regulated Shannon system.

Given the highly regulated nature of the Shannon, and the dynamic interaction between lake level management, turbine operation and discharge control structures, the identification of Meelick Weir as a fixed upstream boundary represents an operational assumption rather than a demonstrated hydraulic conclusion. In the absence of quantitative evidence resolving this uncertainty, it is not possible to conclude beyond reasonable scientific doubt that the integrity of the River Shannon Callows SAC would not be affected.

4.4.4 Compliance with Article 6(3) of the Habitats Directive

Article 6(3) of the Habitats Directive requires that consent may only be granted where it can be concluded, beyond reasonable scientific doubt, that the Proposed Project will not adversely affect the integrity of the River Shannon Callows SAC, having regard to its conservation objectives.

While the NIS acknowledges hydrological connectivity, its assessment:

- relies on compliance with the Normal Operating Band,
- compares abstraction effects to wind-driven variability,
- evaluates magnitude but not flood duration or groundwater response,

- does not provide upstream stage or groundwater sensitivity modelling,
- does not assess drought-period habitat response.

The conclusion of “no potential for effects” is therefore not supported by site-specific hydrological or ecological analysis of floodplain process variables.

In the presence of unresolved uncertainty regarding flood duration, groundwater levels and fen hydrology under low-flow abstraction scenarios, the precautionary principle applies.

4.4.5 Interaction with Article 4 of the Water Framework Directive

The River Shannon Callows SAC is a Protected Area under the Water Framework Directive. Article 4 requires:

- prevention of deterioration,
- protection of groundwater-dependent ecosystems,
- maintenance of hydromorphological conditions necessary for ecological status.

The NIS does not demonstrate that abstraction during drought or constrained operational scenarios would not alter hydrological conditions supporting Molinia meadows, hay meadows, alluvial forest or alkaline fen habitats.

Unresolved uncertainty regarding groundwater–surface water interaction and flood duration therefore raises potential non-compliance with Article 4 WFD. Such uncertainty directly undermines confidence in compliance with Article 6(3) of the Habitats Directive.

Table 4.4 Key Failures – River Shannon Callows SAC [000216]

Assessment Element	NIS Position	Identified Deficiency	Relevance to Legal Tests
Hydrological pathway	SAC acknowledged as hydrologically connected within regulated Shannon system.	Pathway acknowledged but ecological consequences not quantitatively assessed under low-flow or drought abstraction scenarios.	Under Article 6(3), once a pathway exists, its ecological effects must be excluded beyond reasonable scientific doubt.
Upstream boundary at Meelick Weir	Effects asserted to be limited upstream to Meelick Weir.	No hydraulic modelling demonstrating no measurable change in upstream stage or groundwater gradients under drought + abstraction scenarios. Boundary treated as structural assumption rather than demonstrated ecological independence.	Article 6(3) requires demonstration, not assertion. Unresolved upstream hydraulic uncertainty leaves reasonable scientific doubt.
Reliance on Normal Operating Band (NOB)	Lake levels remain within 460 mm operating band; therefore no significant effect predicted.	NOB is an engineering control envelope, not an ecological threshold. No assessment of flood duration, recession timing or groundwater response within NOB.	Compliance with operational band does not demonstrate maintenance of habitat structure and function as required by conservation objectives.
Use of frequency statistic (“99% of years unaffected”)	Modelled impacts occur only in 2 of 52 years; therefore effects negligible.	Article 6(3) is not a probability test. Severe droughts are reasonably foreseeable and ecologically critical. No assessment of ecological response during those drought years.	Integrity must be protected under all reasonably foreseeable conditions, not on average frequency.
Wind-driven variability comparison	Abstraction-induced changes comparable to natural wind-driven fluctuations.	Wind effects are short-term and oscillatory; abstraction deficits may be sustained and cumulative. No demonstration of ecological equivalence.	Unsupported analogy does not satisfy precautionary standard required by Article 6(3).
Floodplain	No significant upstream	No modelling of changes in	Callow grasslands are defined by flood

Assessment Element	NIS Position	Identified Deficiency	Relevance to Legal Tests
inundation regime	water level change predicted.	inundation duration, spatial extent, or recession timing of callow habitats.	regime; in the absence of analysis, it is not possible to conclude the integrity test has been met.
Groundwater-surface water interaction	Hydraulic connectivity acknowledged in general terms.	No assessment of groundwater head response within floodplain soils or alkaline fen during prolonged low-flow abstraction scenarios.	Groundwater-dependent habitats require protection under both Article 6(3) and Article 4 WFD.
Alkaline fen [7230] sensitivity	Downstream fen acknowledged within SAC.	No site-specific modelling of groundwater gradients or lake-stage influence on fen hydrology.	Fen habitat requires near-surface groundwater; unresolved hydrological sensitivity leaves scientific doubt.
Drought-period assessment	Model includes drought years (1995, 2018) but focuses on magnitude within NOB.	No evaluation of ecological process variables (flood days, soil moisture persistence, groundwater recovery time).	Magnitude-only analysis insufficient where conservation objectives depend on process-based hydrology.
Cumulative interaction with regulation	Abstraction assessed within regulated Shannon system.	No testing of cumulative interaction between abstraction, turbine shutdown, compensation flows and prolonged drought conditions.	Article 6(3) requires assessment alone and in combination; omission leaves material uncertainty.
Water Framework Directive compliance	Compliance with WFD objectives concluded.	No demonstration that abstraction would not contribute to deterioration of hydrological regime supporting a Protected Area.	Article 4 WFD non-deterioration and Protected Area obligations directly inform Article 6(3) assessment.
Precautionary principle	"No potential for effects" concluded subject to mitigation.	Scientific uncertainty regarding upstream stage behaviour, flood duration and groundwater support not resolved through modelling.	Where doubt remains, consent cannot lawfully be granted under Article 6(3).

4.4.6 Conclusion for River Shannon Callows SAC

The River Shannon Callows SAC is a low-gradient floodplain system whose ecological integrity depends on the timing, duration and extent of seasonal inundation and on sustained shallow groundwater levels. Its qualifying habitats, including callow grasslands and alkaline fen, are fundamentally hydrologically driven.

The NIS asserts that abstraction-related effects are limited upstream to Meelick Weir and therefore would not influence the SAC. However, no hydraulic modelling or sensitivity analysis is presented to demonstrate that abstraction during low-flow or drought conditions would not alter upstream river stage, floodplain inundation patterns or groundwater gradients. Furthermore, the SAC extends both upstream and downstream of Meelick Weir, including groundwater-dependent fen habitats within the regulated system.

In low-gradient floodplain systems, even modest changes in stage or groundwater head may result in disproportionate changes in lateral inundation extent and soil moisture conditions. These sensitivities are not evaluated under worst-case hydrological conditions.

In the absence of quantitative evidence resolving these uncertainties, it is not possible to conclude beyond reasonable scientific doubt that the Proposed Project would not adversely affect the integrity of the River Shannon Callows SAC.

4.5 Site-Specific Assessment: Lough Derg (Shannon) SPA [004058]

4.5.1 Site Overview and Special Conservation Interests

Lough Derg (Shannon) SPA is designated under the Birds Directive for both breeding and wintering waterbird assemblages. The Special Conservation Interests (SCIs) are:

- Cormorant (*Phalacrocorax carbo*) [A017]
- Tufted Duck (*Aythya fuligula*) [A061]
- Goldeneye (*Bucephala clangula*) [A067]
- Common Tern (*Sterna hirundo*) [A193]
- Wetland & Waterbirds [A999]

The SPA encompasses the open water body of Lough Derg together with its islands, shoreline and littoral habitats. It supports:

- nationally important breeding colonies of Common Tern and Cormorant;
- breeding populations of Tufted Duck, Great Crested Grebe and other waterbirds;
- nationally important wintering populations of Tufted Duck and Goldeneye;
- additional Annex I species including Whooper Swan, Greenland White-fronted Goose (historically) and Hen Harrier (winter roosting in marginal reed beds).

The conservation objectives for Lough Derg (Shannon) are set out in NPWS (2024). These objectives require:

- maintenance or restoration of the favourable conservation condition of the SCI species; and
- maintenance of wetland habitats as a resource for regularly occurring migratory waterbirds (NPWS 2024).

The integrity of the SPA is therefore directly dependent on:

- the availability, extent and configuration of open water and shallow littoral habitat;
- water depth distribution and shoreline configuration;
- the seasonal pattern of lake level fluctuation;
- prey accessibility within depth-sensitive feeding zones.

Unlike a terrestrial SPA where effects may be spatially discrete, the SPA designation relates to the lake water body itself. Consequently, hydrological alteration to lake level dynamics is inherently relevant to site integrity.

4.5.2 Pathways for Effect

The NIS states that the Proposed Project does not overlap with the SPA and is located approximately 4 km from its mapped boundary. It further asserts that the hydrogeological Zone of Influence does not extend to the SPA and that abstraction represents approximately 2% of the annual mean flow at Parteen Basin.

However, these characterisations misrepresent the functional hydrological relationship.

Lough Derg forms part of the same regulated lake–river system from which abstraction occurs at Parteen Basin. Abstraction is hydrologically coupled to:

- lake storage levels;
- turbine operation at Ardnacrusha;

- discharge control at Parteen Weir;
- maintenance of the 460 mm Normal Operating Band (NOB).

Accordingly, potential pathways for effect are hydrologically mediated and include:

- alteration of lake level magnitude, timing and rate of drawdown;
- increased frequency or duration of minimum operating band conditions;
- modified seasonal refill behaviour following drought;
- lateral recession or compression of shallow littoral habitat;
- redistribution or reduction of depth-sensitive foraging zones.

Because the SPA designation relates to the lake water body and its associated habitats, abstraction is not a remote or secondary pressure but operates within the same hydrological unit as the protected receptor.

A clear source–pathway–receptor relationship therefore exists.

4.5.3 Functional Habitat Dependency of SCI Species

The SCI species are strongly depth-dependent in their habitat use.

Diving Ducks (Tufted Duck, Goldeneye)

Diving ducks forage on benthic invertebrates and molluscs and are sensitive to:

- water depth distribution;
- compression of optimal depth bands;
- prey accessibility in shallow zones;
- displacement when shallow areas contract.

Even modest vertical lake level changes (e.g. 15–30 cm) may produce substantial horizontal recession of shallow-water habitat where bathymetry is gently sloping. Habitat loss in such systems is non-linear: small vertical drops can translate into disproportionately large lateral habitat reduction.

Winter survey data demonstrate that nationally important numbers of Tufted Duck regularly occur within the wider lake system and Parteen Basin. Distribution patterns show preference for shallow western margins and sheltered littoral areas, precisely the habitats most sensitive to water level variation.

Common Tern and Cormorant (Breeding)

Breeding Common Tern colonies occur on islands within the lake. Although island management has mitigated nest flooding risk historically, breeding success remains dependent on:

- stability of lake levels during the breeding season;
- avoidance of rapid drawdown or inundation events;
- maintenance of foraging habitat within suitable commuting distance.

Cormorant colonies and breeding grebes similarly rely on stable hydrological conditions and sufficient prey availability.

Wetland & Waterbirds

The Conservation Objectives requires maintenance of wetland habitat as a functional resource. This extends beyond species presence to habitat extent, quality and persistence through seasonal cycles.

The NIS does not evaluate how abstraction-induced changes in lake level behaviour may affect:

- shallow feeding margins;
- roosting areas;
- benthic invertebrate communities;
- macrophyte distribution;
- winter aggregation behaviour.

4.5.4 Assessment of Effects on Conservation Objectives

The conservation objectives for Lough Derg (Shannon) SPA require the maintenance of:

- the population size and distribution of SCI species;
- the availability, extent and quality of wetland habitats supporting those species;
- the hydrological processes underpinning habitat function.

The NIS concludes that abstraction will not affect lake levels or associated habitats on the basis that:

- abstraction represents approximately 2% of annual mean flow at Parteen Basin;
- modelled lake levels remain within the 460 mm Normal Operating Band (NOB);
- modelled abstraction-related differences are small relative to natural variability.

However, the assessment does not demonstrate that the ecological requirements of the SCI species will be maintained under all reasonably foreseeable hydrological conditions.

Reliance on Annual Mean Flow

The use of annual mean flow as the primary metric does not address ecological sensitivity, which is greatest during:

- prolonged low inflow periods;
- drought conditions;
- late summer drawdown;
- turbine-constrained operational scenarios.

A relatively small percentage of annual mean flow may represent a materially greater proportion of available storage during low-flow conditions. The assessment does not quantify abstraction effects under Q95 or multi-season drought scenarios in ecological terms.

Operation Within the Normal Operating Band

The fact that modelled levels remain within the 460 mm NOB does not equate to ecological neutrality. The NOB is an operational control range established for embankment safety and system management; it is not defined by ecological thresholds.

Within this band, abstraction may still:

- increase the frequency of minimum-level conditions;
- extend the duration of low-water periods;
- alter seasonal refill timing.

Shallow littoral habitats and depth-dependent foraging zones respond to timing and duration of exposure rather than absolute exceedance of an operating band.

Comparison with Wind-Induced Variation

The NIS compares abstraction-related changes to wind-induced daily water level differences. However, wind-driven fluctuations are short-term oscillations, whereas abstraction influences storage and drawdown behaviour over sustained periods.

Ecological responses to temporary wind setup are not equivalent to responses to prolonged low storage conditions.

Functional Habitat Implications

The assessment does not quantify:

- the lateral extent of shallow-water habitat under minimum operating conditions;
- the degree of habitat compression associated with additional drawdown;
- the potential redistribution of wintering flocks under reduced shallow-water availability;
- the implications for prey accessibility in depth-sensitive feeding zones.

Given that nationally important numbers of Tufted Duck and Little Grebe utilise shallow-water areas within the lake system, and breeding species depend on stable seasonal water levels, the omission limits the ability of the competent authority to conclude the integrity test has been met.

4.5.5 Compliance with Article 6(3) Habitats Directive

Article 6(3) requires certainty beyond reasonable scientific doubt that the Proposed Project will not adversely affect site integrity.

The assessment does not demonstrate that:

- lake level dynamics under abstraction will remain ecologically neutral;
- frequency and duration of low-water conditions will not increase;
- shallow feeding habitat used by SCI species will not be compressed;
- breeding habitat stability will be maintained under drought conditions;
- cumulative interaction with existing regulation pressures will not affect SPA function.

In the presence of unresolved uncertainty regarding habitat extent and function, the precautionary principle applies.

Accordingly, it has not been demonstrated beyond reasonable scientific doubt that the integrity of Lough Derg (Shannon) SPA would not be adversely affected.

4.5.6 Interaction with Article 4 Water Framework Directive

Lough Derg is a Protected Area under the WFD and a regulated (Heavily Modified) water body with objectives relating to Good Ecological Potential and non-deterioration.

The NIS does not demonstrate that:

- abstraction will not contribute to hydromorphological pressure;
- ecological potential will be maintained under repeated low-water scenarios;
- Protected Area objectives linked to the SPA will be secured.

Unresolved uncertainty under Article 4 WFD directly undermines compliance with Article 6(3).

Table 4.5 Key Failures – Lough Derg (Shannon) SPA [004058]

Assessment Element	NIS Position	Identified Deficiency	Relevance to Legal Test
Hydrological pathway	SPA acknowledged within hydrological context of abstraction system	Pathway acknowledged but ecological consequences not quantified	Where a pathway exists, its ecological implications must be ruled out beyond reasonable scientific doubt (Art. 6(3))
Reliance on annual mean flow	Abstraction characterised as ~2% of annual mean flow	Annual mean metrics do not reflect low-flow or drought conditions when ecological sensitivity is greatest	Ecological integrity must be assessed under worst-case foreseeable conditions, not averages
Normal Operating Band (NOB)	Modelled levels remain within 460 mm NOB	Operational management band is not an ecological threshold; remaining within NOB does not demonstrate ecological neutrality	Art. 6(3) requires assessment of habitat function, not operational compliance
Low-flow / drought assessment	Effects limited to extreme drought years; impacts described as minimal	No ecological assessment of frequency, duration or timing of low-level events under abstraction	Does not assess ecologically critical periods leaves reasonable scientific doubt unresolved
Shallow-water habitat extent	No significant habitat impact predicted	No quantification of lateral recession of littoral zones or compression of depth bands used by SCI species	SPA integrity depends on habitat availability and distribution
Wintering duck dependency	Tufted duck and Little Grebe acknowledged as nationally important	No evaluation of how altered lake levels may affect benthic prey access or flock distribution	Functional habitat loss may occur without breach of operational thresholds
Breeding species	Breeding tern and cormorant colonies acknowledged	No assessment of whether altered seasonal water level behaviour could affect island stability or nest security	Seasonal timing of water level fluctuation is integral to breeding success
Wind fluctuation comparison	Abstraction-related change compared to wind-driven variation	Short-term wind oscillation not ecologically equivalent to sustained storage drawdown	Comparison does not resolve long-duration exposure risk
Cumulative interaction	Regulation regime described	No modelling of abstraction + turbine constraint + climate-driven low inflow scenarios	Article 6(3) requires assessment alone and in combination
WFD compliance	Compliance asserted	No demonstration that abstraction would not affect hydromorphological conditions underpinning SPA as Protected Area	Article 4 WFD non-deterioration uncertainty undermines Article 6(3) conclusion
Mitigation reliance	“No potential for effects, following mitigation”	Mitigation relates to water quality and construction; no mitigation addresses hydrological habitat alteration	Mitigation cannot compensate for unresolved uncertainty in hydrological regime

4.5.7 Conclusion for Lough Derg (Shannon) SPA

Lough Derg (Shannon) SPA supports nationally important breeding and wintering waterbird populations whose habitat use is directly influenced by lake level dynamics and the extent of shallow littoral feeding zones.

The NIS concludes that abstraction represents a small proportion of long-term average flow and would not significantly affect lake levels. However, ecological sensitivity in lake systems is governed by low-water events, drought sequences and prolonged drawdown periods rather than annual means. The assessment does not robustly evaluate abstraction effects under Q95 or multi-season drought scenarios, nor does it assess potential compression of shallow feeding habitats used by SCI species.

Given the direct hydrological connection between abstraction and the lake water body, and the functional dependence of SPA species on depth-sensitive feeding zones, unresolved uncertainty remains regarding habitat extent and availability during critical periods.

Accordingly, it has not been demonstrated beyond reasonable scientific doubt that the Proposed Project would not adversely affect the integrity of Lough Derg (Shannon) SPA.

4.6 Site-Specific Assessment: Middle Shannon Callows SPA [004096]

4.6.1 Site Overview and Special Conservation Interests

The Middle Shannon Callows SPA is of international importance as it regularly supports in excess of 20,000 wintering waterbirds. It is also an important breeding site for waders, whose population in Ireland are experiencing significant declines due to habitat loss and other pressures.

The site is designated under the Birds Directive for the following Special Conservation Interests (SCIs):

- Whooper Swan (*Cygnus cygnus*) [A038]
- Wigeon (*Anas penelope*) [A050]
- Corncrake (*Crex crex*) [A112]
- Golden Plover (*Pluvialis apricaria*) [A140]
- Lapwing (*Vanellus vanellus*) [A142]
- Black-tailed Godwit (*Limosa limosa*) [A156]
- Black-headed Gull (*Chroicocephalus ridibundus*) [A179]
- Wetland & Waterbirds assemblage [A999]

The SPA also supports internationally important populations of Whooper Swan and Black-tailed Godwit, and nationally important populations of Wigeon, Golden Plover, Lapwing and Black-headed Gull.

The conservation objectives for the Middle Shannon Callows are set out in NPWS (2022). These objectives require the maintenance or restoration of the favourable conservation condition of these species and the maintenance of the wetland habitats that support them.

The ecological integrity of the Middle Shannon Callows SPA is therefore fundamentally dependent on:

- Seasonal floodplain inundation patterns
- Timing and duration of flood recession
- Maintenance of shallow groundwater levels

- Stability of wet grassland sward structure
- Availability of suitable nesting, foraging and roosting habitat

4.6.2 Pathways for Effect

The SPA lies approximately 18 km upstream of the abstraction point at Parteen Basin. The NIS concludes that the SPA lies outside the hydrogeological Zone of Influence and that no hydrological effects would arise.

The NIS asserts hydraulic independence upstream of Meelick Weir but does not present quantitative modelling demonstrating that abstraction would not influence upstream river stage or groundwater gradients under low-flow or drought scenarios.

However:

- The SPA extends southwards to Portumna, including areas downstream of Meelick Weir.
- The site occupies a low-gradient floodplain hydraulically connected to the Shannon system.
- Water levels are influenced by both catchment inflow and downstream regulation.

Potential hydrological pathways therefore include:

- abstraction-related changes in Lough Derg storage and downstream discharge management;
- alteration of hydraulic gradients across Meelick Weir during low-flow conditions;
- modification of flood recession timing;
- abstraction-induced changes in shallow groundwater levels in downstream portions of the SPA;
- cumulative interaction with existing regulation and climate-driven low-flow conditions.

A source–pathway–receptor relationship cannot therefore be excluded solely on the basis of linear distance.

4.6.3 Assessment of Effects on Conservation Objectives

Flood Regime and Wet Grassland Function

The Middle Shannon Callows are defined by a naturalised flood regime characterised by:

- winter and spring inundation,
- soil saturation into late spring,
- gradual summer drawdown.

Many SCI species depend on:

- soft, waterlogged soils (e.g., Whooper Swan, Black-tailed Godwit, Lapwing),
- short damp swards (e.g., Golden Plover),
- late mowing regimes supported by wet ground conditions,
- predictable spring flood recession timing.

The NIS does not assess whether abstraction could:

- shorten the duration of seasonal inundation,
- advance the timing of flood recession,
- reduce floodplain soil moisture persistence,

- alter groundwater-supported saturation patterns during late spring and summer.

Reliance on long-term average flow conditions does not address ecologically sensitive low-flow periods when floodplain habitats are most vulnerable.

Vegetation Transition and Habitat Desiccation Risk

The integrity of the SPA depends on the maintenance of wet grassland communities shaped by recurrent flooding and high groundwater tables.

Even modest, repeated reductions in:

- inundation duration,
- shallow groundwater levels,
- soil moisture persistence,

can, over time, drive vegetation transition from wet callow grassland towards drier mesotrophic or semi-improved grassland communities.

Such transitions may:

- increase sward rigidity and reduce soil softness,
- alter invertebrate assemblages,
- reduce probing suitability for waders,
- affect breeding habitat quality,
- compress foraging habitat.

This represents a gradual functional habitat degradation pathway, not a sudden or catastrophic change.

The NIS does not evaluate whether abstraction-related hydrological modification could contribute to progressive desiccation or vegetation shift within the SPA, nor does it assess the ecological implications of such change for SCI species.

Under Article 6(3), the maintenance of habitat structure and function must be demonstrated. In the absence of analysis of this pathway, it is not possible to conclude the integrity test has been met.

Water Quality and Pipeline Maintenance

The NIS identifies potential water quality risks during infrequent maintenance discharges and concludes no potential for effects subject to mitigation.

While mitigation for chemical spills and sediment release is described, this does not address hydrological regime alteration, which is the primary ecological driver of the SPA.

Accordingly, mitigation measures directed at water quality do not resolve uncertainty regarding flood regime maintenance.

4.6.4 Compliance with Article 6(3) of the Habitats Directive

Under Article 6(3) of the Habitats Directive (as applied to SPAs via Article 7), consent may only be granted where it can be concluded, beyond reasonable scientific doubt, that the Proposed Project will not adversely affect the integrity of the SPA, having regard to its conservation objectives for the Special Conservation Interest (SCI) species.

For the Middle Shannon Callows SPA, site integrity depends on the maintenance of:

- the seasonal flood regime sustaining soft, waterlogged callow grasslands;
- appropriate timing and duration of flood recession;
- soil moisture conditions supporting breeding waders;
- sufficient wet grassland extent to sustain internationally and nationally important wintering waterbird populations.

The NIS concludes that no adverse effect will arise. However, it does not demonstrate that abstraction would not:

- alter flood duration or extent during low-flow or drought conditions;
- modify groundwater-supported soil moisture regimes;
- advance or truncate seasonal flood recession;
- reduce the functional extent or carrying capacity of wet grassland habitat for SCI species.

No site-specific modelling or sensitivity analysis is presented to quantify potential changes in inundation patterns, soil saturation, or habitat availability under combined abstraction and drought scenarios.

In the absence of such analysis, it has not been demonstrated beyond reasonable scientific doubt that the conservation objectives for Whooper Swan, Wigeon, Golden Plover, Lapwing, Black-tailed Godwit, Corncrake, Black-headed Gull, or the qualifying wetland and waterbird assemblage would be maintained under all reasonably foreseeable operating conditions.

Where reasonable scientific doubt remains, the precautionary principle applies. The conclusion of no adverse effect on site integrity is therefore not supported.

4.6.5 Interaction with Article 4 of the Water Framework Directive

The Middle Shannon Callows SPA constitutes a Protected Area under the Water Framework Directive.

Article 4 requires:

- Prevention of deterioration;
- Protection of water-dependent habitats and species;
- Maintenance of ecological status consistent with Protected Area objectives.

The NIS does not demonstrate that abstraction during low-flow or drought conditions would not contribute to deterioration of hydromorphological conditions underpinning floodplain wetlands.

Unresolved uncertainty under Article 4 WFD directly undermines confidence in compliance with Article 6(3) of the Habitats Directive.

Table 4.6 Key Failures – Middle Shannon Callows SPA [004096]

Assessment Element	NIS Position	Identified Deficiency	Relevance to Legal Test (Article 6(3))
Hydrological pathway	SPA considered beyond hydrological Zol; upstream limit assumed at Meelick Weir	SPA extends both upstream and downstream of Meelick Weir; no modelling provided to demonstrate hydrological independence under abstraction and drought scenarios	Absence of quantified assessment of pathway leaves reasonable scientific doubt
Reliance on distance-based screening	SPA 18 km from project footprint; no direct overlap	Distance screening applied to disturbance pathways only; hydrological connectivity not resolved	Article 6(3) requires assessment of functional ecological linkages, not proximity

Assessment Element	NIS Position	Identified Deficiency	Relevance to Legal Test (Article 6(3))
Flood regime dependency	No significant hydrological effects predicted	No site-specific analysis of flood duration, extent, or recession timing under abstraction + low-flow conditions	SCI species depend directly on seasonal inundation patterns; failure to assess flood regime undermines integrity test
Groundwater-soil moisture interaction	Not assessed in detail	No evaluation of abstraction effects on shallow groundwater levels sustaining callow grasslands and alkaline fen	Soil moisture conditions underpin habitat quality
SCI habitat functionality	No habitat loss predicted	No assessment of potential habitat compression, drying, or reduction in carrying capacity for SCI species	SPA integrity depends on habitat availability sufficient to sustain internationally important populations
Breeding waders	No impact predicted	No evaluation of how altered flood recession timing or soil moisture could affect breeding habitat suitability	Article 6(3) requires certainty for both breeding and wintering SCI species
Wintering assemblage (>20,000 birds)	No hydrological effects anticipated	No modelling of how low-water scenarios may alter grazing sward condition or feeding suitability	International importance requires precautionary certainty
In-combination effects	Assessed at high level	No quantitative testing of abstraction in combination with regulation, climate variability, and drought	Cumulative effects must be assessed under Article 6(3)
Precautionary principle	"No potential for effects" concluded	Conclusion reached despite absence of drought-period and floodplain sensitivity modelling	Consent cannot be granted where reasonable scientific doubt remains

4.6.6 Conclusion for Middle Shannon Callows SPA

The Middle Shannon Callows SPA is an internationally important floodplain wetland system whose Special Conservation Interest species are fundamentally dependent on the timing, duration and spatial extent of seasonal inundation and subsequent drawdown. The ecological integrity of the site is inseparable from the hydrological regime of the River Shannon, including river stage behaviour, groundwater-surface water interaction and floodplain soil moisture dynamics.

The NIS concludes that the SPA lies beyond the hydrological Zone of Influence of the Proposed Project on the basis of distance and an asserted upstream hydraulic boundary at Meelick Weir. However, no quantitative hydraulic modelling or sensitivity analysis is presented to demonstrate that abstraction at Parteen Basin, in combination with existing regulation and drought conditions, could not influence river stage, floodplain inundation patterns or shallow groundwater gradients within the SPA.

The assessment relies primarily on long-term average conditions and does not evaluate abstraction effects during ecologically critical low-flow or drought scenarios, when floodplain habitats and the bird populations they support are most vulnerable to hydrological change. In low-gradient floodplain systems such as the Callows, even modest changes in river stage or groundwater head can produce disproportionate changes in lateral inundation extent, soil moisture conditions and habitat suitability.

Furthermore, the SPA extends south of Meelick Weir towards Portumna, reinforcing that hydrological connectivity within the regulated Shannon system cannot be dismissed solely on the basis of structural control points. The functional integrity of the SPA depends not merely on the presence of wet grassland habitat, but on the maintenance of the hydrological processes that sustain its carrying capacity for internationally important populations of birds and the wintering waterbird assemblage exceeding 20,000 individuals.

In the absence of quantitative evidence demonstrating that abstraction would not alter these hydrological processes under reasonably foreseeable operating conditions, including prolonged low-flow and drought periods, it cannot be

concluded beyond reasonable scientific doubt that the Proposed Project would not adversely affect the integrity of the Middle Shannon Callows SPA.

Accordingly, the requirements of Article 6(3) of the Habitats Directive have not been demonstrably satisfied in respect of this site.

5. Discussion

This review has examined whether the Natura Impact Statement (NIS) and Environmental Impact Assessment Report (EIAR) for the Proposed Project demonstrate compliance with Article 6(3) of the Habitats Directive and Article 4 of the Water Framework Directive (WFD), having regard to the hydrological complexity and regulatory context of the Shannon International River Basin District.

The Proposed Project involves large-scale abstraction from Parteen Basin within a highly regulated and hydraulically continuous river–lake–floodplain–estuarine system. The NIS acknowledges hydrological pathways for effect to multiple Natura 2000 sites, including sites directly overlapping the abstraction footprint and others connected via surface water, groundwater interaction and regulated lake-level dynamics.

Across the sites examined, three recurring issues arise:

First, while hydrological pathways are acknowledged, the ecological consequences of abstraction under critical conditions, including prolonged low-flow and hydrological drought, are not consistently translated from model outputs into site-specific habitat response assessment.

Second, reliance on operational management parameters (such as the Normal Operating Band) and long-term average flow statistics is used as a proxy for ecological neutrality. However, operational thresholds and statistical averages are not equivalent to conservation thresholds. The conservation objectives of the relevant sites relate to habitat extent, structure, function and supporting hydrological processes, particularly during periods of ecological stress.

Third, the interaction between abstraction, lake regulation, groundwater gradients and downstream discharge is not comprehensively evaluated under combined or cumulative scenarios. In several instances, modelling assumptions (including initial storage conditions and operational routines) favour upper-band starting positions without sensitivity testing across the full operational range.

In low-gradient floodplain and shallow lake systems such as the Shannon, relatively small vertical changes in stage may produce disproportionate lateral habitat effects, alter hydroperiod dynamics, or modify groundwater–surface water interaction. The assessment does not consistently quantify these relationships in ecological terms.

For Special Protection Areas, the documentation does not demonstrate that abstraction-related changes in water level dynamics would not affect the extent, distribution or seasonal reliability of habitat supporting Special Conservation Interest species during sensitive periods.

In respect of the Water Framework Directive, the material reviewed does not fully demonstrate that abstraction under low-flow or drought conditions would not contribute to deterioration in hydromorphological conditions or undermine Protected Area objectives within the hydraulically connected system.

Article 6(3) requires the competent authority to be satisfied, on the basis of complete, precise and definitive findings, that the Proposed Project will not adversely affect the integrity of any European site. That test must be met under all reasonably foreseeable operating conditions, including periods when ecological sensitivity is greatest.

On the basis of the information presented in the NIS and EIAR, and having regard to the hydrological characteristics of the Shannon system and the conservation objectives of the sites examined, residual scientific uncertainty remains in respect of hydrological regime, groundwater interaction and habitat response during low-flow and drought scenarios.

Accordingly, it has not been demonstrated, beyond reasonable scientific doubt, that the Proposed Project would not adversely affect the integrity of the relevant Natura 2000 sites. Nor has compliance with Article 4 of the Water Framework Directive been conclusively established in respect of Protected Area objectives.

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