Our Case Number: ACP-323980-25

An Coimisiún Pleanála

Tipperary County Council
Civic Offices
Nenagh
Co. Tipperary

Date: 08 April 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 submission in relation to the above mentioned proposed development and will take it into consideration in its determination of the matter.

The Commission will revert to you in due course in respect of this 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,

pp G. Reilly

Elmear Reilly
Executive Officer
Direct Line: 01-8737184

PA09

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Ref No. ACP-323980-25

26/03/2026

AN COIMISIÚN PLEANÁLA
LDG- 087200-26
ACP- 323980-25
27 MAR 2026
Fee: €
Time:

An Coimisúin Pleanála,
64 Marlborough Street,
Dublin 1,
D01 V902.

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

A Chara

I refer to your letter dated 08/01/2026, regarding the above mentioned project.

I attach here with Chief Executive's report, resolution of the members with attachments and the meeting administrator record.

Please be further advised it is our intention to forward the minutes of the March meeting when they have been approved by the members at the April meeting.

If you have any queries, please do not hesitate to contact me.

Mise, le meas,

T. Kiely

For Director of Services

Comhairle Contae Thiobraid Árann
Tipperary County Council

Chief Executive Officer's Report

in accordance with the requirements of Section 37E (4) and 37E (5) of the Planning and Development Act 2000 (as amended)

March 2026

An Comisuin Pleanála Ref. No:	ACP-323980-25
Applicant:	Uisce Eireann
Proposed Development:	Proposed water supply project for the eastern and midlands region
Development Location	Counties of Clare, Limerick, Tipperary, Offaly, Kildare and Dublin.

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PART 1. EXECUTIVE SUMMARY

Project: Water Supply Project – Eastern & Midlands Region (SID)

Applicant: Uisce Éireann

Planning Ref: ACP-323980-25

This report presents Tipperary County Council's assessment of the proposed Uisce Éireann Water Supply Project as it relates to the environment, planning policy, infrastructure, and community impacts within County Tipperary. While the project delivers significant strategic benefits at national level—principally securing a sustainable water supply for the Eastern and Midland Region—the Mid-West Region and Tipperary will not directly benefit from the supply, despite the extent of infrastructure proposed within the county.

Tipperary County Council have grave concerns regarding the completeness of the application submitted to An Coimisiún Pleanála. This Report requests that An Coimisiún Pleanála must be satisfied, in arriving at its decision, that Uisce Éireann have provided substantive evidence based data which clearly demonstrates that the proposed development complies with all legislative requirements and that the proposed development will not have a detrimental impact on this sensitive ecological water body, or the people and communities that live within its catchment.

The proposal raises significant issues regarding balanced regional development, as set out in the National Planning Framework, the Regional Spatial and Economic Strategy for the Southern Region, and the Tipperary County Development Plan 2022. The concentration of benefits in the eastern region, combined with the absence of direct water supply advantages for Tipperary, is inconsistent with the principle of balanced regional investment.

Substantial concerns also arise regarding the relationship between the project and the ESB abstraction and impoundment licensing process for the Parteen Basin. The interdependency of these consents, including cumulative environmental effects and the scope of "the whole project" for EIA purposes, is not adequately addressed in the EIAR.

The Council notes that the EIAR and NIS rely heavily on mitigation measures that, in many instances, lack sufficient specificity, clarity, and enforceability. This raises concerns about the practical implementation of mitigation relating to water quality, biodiversity, hydrology, and construction-phase controls. More robust and unambiguous commitments are required to ensure that environmental effects do not exceed those predicted.

Given the sensitivity of Lough Derg, the Parteen Basin, and the River Shannon, the Council stresses that abstraction rates must not exceed those modelled in the EIAR and must be actively curtailed during periods

of low flow. Publicly accessible monitoring records should be maintained to provide transparency regarding abstraction volumes and compliance with statutory compensation flows to the Old Shannon River.

The project also poses risks to agriculture, including the potential spread of bovine tuberculosis as a result of interference with badger setts, and long-term impacts on land use within the pipeline wayleave. Concerns are also identified in relation to access design, sightline compliance, potential damage to the road network, and the adequacy of proposed mitigation for road closures and construction traffic.

Further issues are noted regarding tourism and visual impact, particularly the Raw Water Intake and Pumping Station at the Parteen Basin, which requires more detailed visual assessment. The elevated location of the Break Pressure Tank at Knockanacree will also have considerable landscape presence until screening vegetation matures.

Additional concerns relate to waste management obligations, the reinstatement and security of temporary compounds, and the need for clear protocols to address infrastructure failures, including leak detection and emergency response in ecologically sensitive areas.

Tipperary County Council requests that, should An Coimisiún Pleanála consider granting permission, the decision clearly addresses the concerns raised, ensures that all environmental mitigation is enforceable and transparent, and attaches a robust planning condition requiring a long-term, adequately funded Community Benefit Scheme. The key issues identified in this report should be examined in detail by An Comisuin Pleanala.

A central concern relates to the Community Benefit Scheme, which is limited to the five-year construction period and does not reflect the long-term nature of the project or its enduring impacts on affected communities. The absence of clarity regarding the scale of the fund, the responsibilities placed on the Local Authority as fund administrator, and the restrictive geographical and temporal scope all limit confidence in the scheme. Tipperary County Council considers that a Community Benefit Fund should operate for the lifetime of the project, with a value of 0.35% of construction costs (minimum €10 million) and an ongoing annual contribution linked to abstraction volumes.

PART 2. INTRODUCTION & PURPOSE OF THE REPORT

2.1 Introduction

An application for permission for the proposed water supply project for the eastern and midlands region has been submitted directly to An Comisiun Pleanala (ACP) by applicant, Uisce Eireann. The development constitutes Strategic Infrastructure development under the provisions of Section 37 and the 7th Schedule of the Planning and Development Act 2000, as amended. This was confirmed by ACP, following extensive pre planning engagement, in correspondence to the applicant dated 14/11/2025.

ACP informed Tipperary County Council on 08/01/2026 of the receipt of the strategic infrastructure development application.

The application is available to view at 323980 | An Coimisiún Pleanála -

2.2 The Purpose of this Report

As provided for under Section 37E(4) of the 2000 Act, the Chief Executive is required to submit a report to ACP setting out the views of Tipperary County Council on the effects of the proposed development on the environment and the proper and sustainable development of the area. The report is also required to address all the issues identified in the An Bord Pleanala "Guidelines for Planning Authorities" in respect of Strategic Infrastructure. Accordingly, all the relevant issues to the proposed development have been identified and are assessed below in the report.

The correspondence received from ACP requires this report to be submitted to ACP on or before 30th March 2026.

Section 37E (5) of the 2000 Act requires that before this report is submitted to the ACP, the Chief Executive shall submit it to the elected members, in order to seek their views on the proposed development. The members may, by resolution, decide to attach recommendations to the report (Section 37E (6) of the 2000 Act refers).

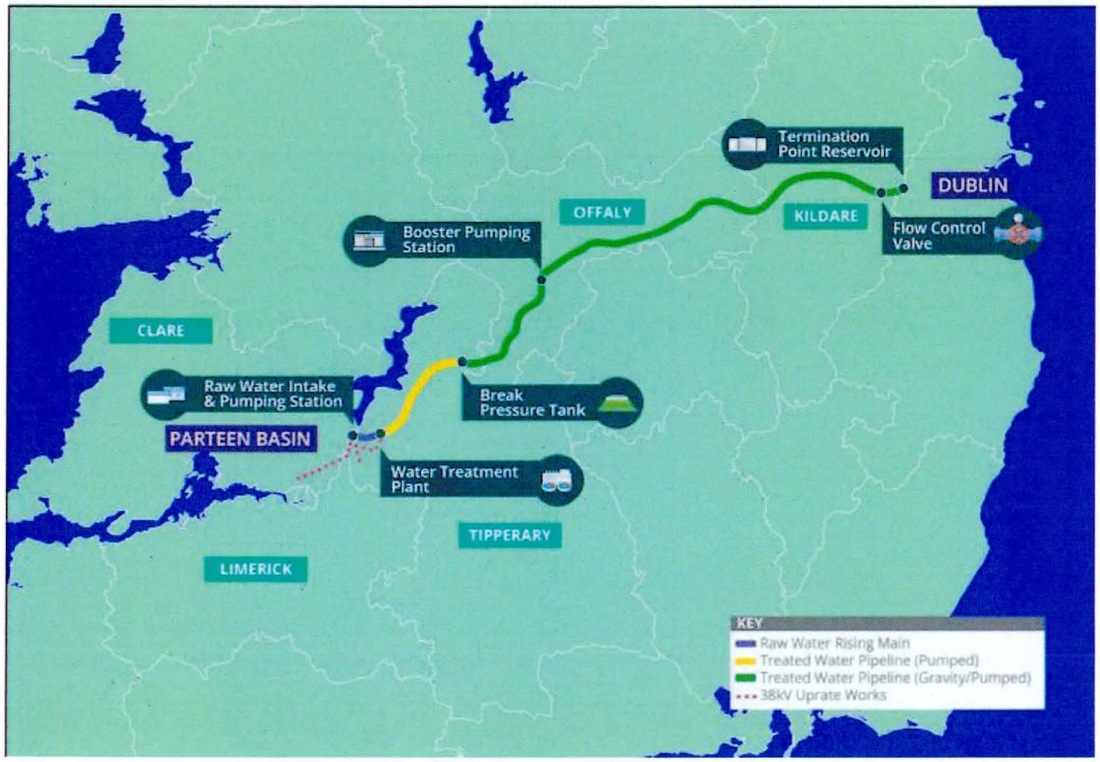
Section 37E (7) of the 2000 Act also provides that the views expressed by the Members on the proposed development during the Council meeting, shall also be attached to this report i.e. the 'meetings administrator's record'.

PART 3. SITE LOCATION & DEVELOPMENT DESCRIPTION OVERVIEW

3.1 Site location

The development extends through the counties of Clare, Tipperary, Offaly, Kildare and Dublin.

Figure 1 Development location overview.



The development includes for the abstraction of water from Parteen Basin on the Lower River Shannon, treatment of water at a new treatment plant located at Inchabeg, near Birdhill, pumping of treated water to a high point north of Cloughjordan and onwards transfer of water through the Midlands, to Peamount in Dublin at a termination point reservoir where it would connect into the existing Greater Dublin Area Water Resource Zone.

In total the pipeline would be approximately 172km in length and would be supported by six permanent Infrastructure Sites. The pipeline would traverse the administrative areas of Tipperary County Council, Offaly County Council, Kildare County Council and South Dublin County Council.

The works needed to provide power to two of the Infrastructure Sites traverse the administrative areas of Clare County Council, Limerick City and County Council and Tipperary County Council.

The project elements located in Tipperary comprise the:

- A Raw Water Intake and Pumping Station (RWI&PS) located on the eastern side of the Parteen Basin. in the townland of Garrynatineel and 3.3km approx. northeast of Parteen Weir

- 2 rising mains to transfer water over approx. 2km to the new Water Treatment Plant at Inchabeg, ca. 2.2 km northeast of Birdhill.
- A Water Treatment Plant (WTP) at Incha Beg, 2.2km approx northeast of Birdhill.
- A single rising main to transfer water over a distance of 37km from the WTP to a Break Pressure Tank.
- A Break Pressure Tank (BPT) at Knockanacree, 1.8km north of Cloughjordan
- A single main to transfer water onwards (gravity and pumping as required) through the midlands and to the termination point.
- Operational ancillary infrastructure at frequent intervals along the length of the pipeline including Line Valves, Air Valves, water discharge points (referred to as 'Washouts'), access points (referred to as Manways), parking Lay-Bys for maintenance access and power connections to the Line Valves.
- Power connections to the Infrastructure Sites , including uprating of the existing Ardnacrusha – Birdhill 38 kV overhead line to deliver adequate electrical power to the RWI&PS and WTP

3.2 Proposed Development

The project includes the following elements:

- Raw Water Intake and Pumping Station (RWI&PS)

Raw water will be abstracted from the Parteen Basin on the River Shannon and pumped to a new Water Treatment Plant (WTP) located at Inchabeg via 2no steel pipes with a diameter of 1,500mm. The Raw Water intake is designed to abstract a maximum of 300Mld. The intake site will be accessed from the R494 via a new gated entrance and driveway. The RWI&PS will occupy a site of 2.6 ha, and it will not be permanently staffed. The site will accommodate the Raw Water Pumping Station Building, the Microfiltration Buildings, an Electricity Substation and ancillary structures, such as surge vessels, metering and swabbing chambers, a Wastewater Holding Tank. Wastewaters are collected in a holding tank and tankered off site for disposal.

Water supply to the site will be from the public watermain located in the R494.

The power supply from the intake will be from the Birdhill 38kv substation through underground cabling laid in the R494 to the intake access road.

17 car parking spaces are proposed on the site.

Figure 2 Layout of RWI&PS

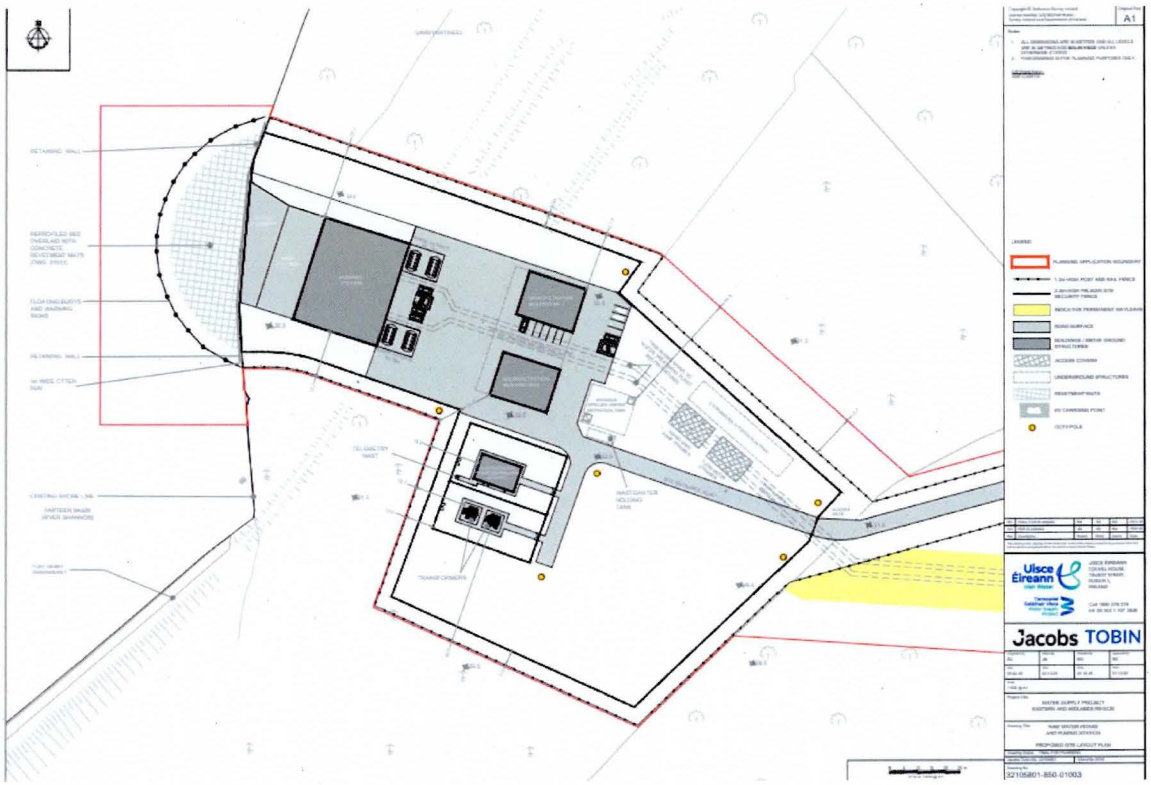


Figure 3 Layout of access road from R494 to serve the RWI&PS

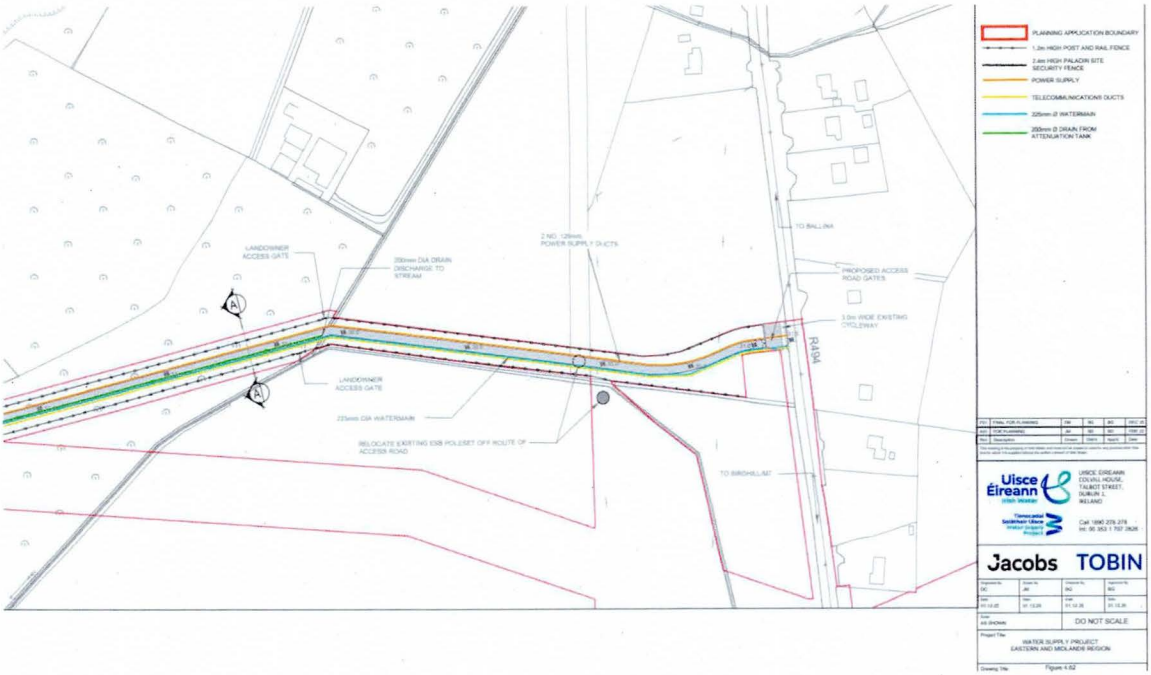


Figure 4 Architectural Visualisation of the RWI&PS



- Raw Water Rising Mains

Raw water will be transferred from the RWI&PS to a new Water Treatment Plant proposed at Incha Beg. via 2 new rising mains. The mains have a diameter of 1500mm approx. and extend for a length of 2km approx. The mains run in a generally easterly direction and under the R494.

The twin pipeline design allows for one pipe to be taken out of service for cleaning and maintenance. The pipes are cross connected to allow for flow to be diverted to one main when the other is out of service.

- Water Treatment Plant (WTP)

A new WTP is proposed at Incha Beg, 2.6km northeast of Birdhill and would occupy a site of 30 ha approx. This site will include a visitor centre. A new permanent access road from the R455 is proposed.

Infrastructure at the WTP site include a swabbing chamber, balancing tanks, chemical dosing manifold building, water treatment module building, equalisation and settlement tanks, pumping station, sludge thickening and balancing tanks, sludge dewatering building, sludge storage building, control building and visitor centre etc with associated site infrastructure works and substation.

Wastewaters are collected in a holding tank and tankered off site for disposal. (15 HV movements once every 6 months)

Water supply to the site will be from the public watermain located in the R455.

50 car parking spaces are proposed on the site.

The power supply from the intake will be from the Birdhill 38kv substation through underground cabling laid in the R455.

Provision has been made within the design of the WTP and its access road to include a watermain with a take-off to enable the provision of a strategic connection to the Limerick area at some point in the future. This allows for a potential connection to be made in the future to provide a supply into the Water Resource Zones in the Midlands Region in accordance with the Eastern and Midlands Plan (Irish Water 2022)

Figure 5: Layout of Water Treatment Plant

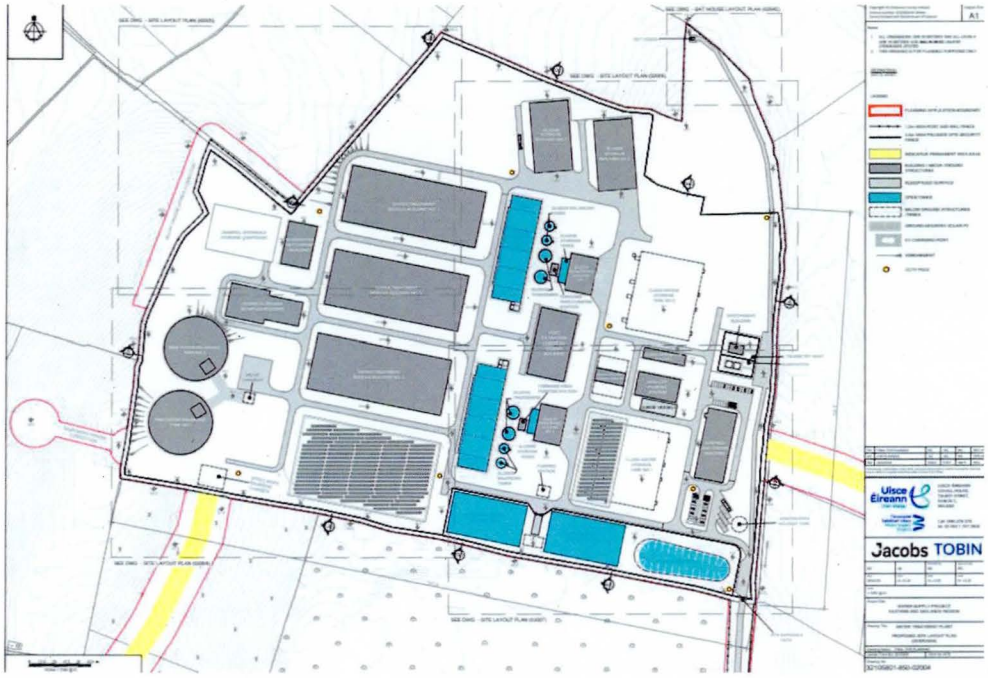


Figure 6-Access road from R455 to WTP



Figure 7- Architectural Visualisation of the Control Building and Visitor Centre



- Treated Water Pipeline – Water Treatment Plant to Break Pressure Tank

Treated water from the Water Treatment Plant will be pumped to a Break Pressure Tank located at Knockanacree, 1.8km north of Cloughjordan through a single 1600mm diameter underground steel pipe. This section of the development is 37km long approx. and the pipe run crosses a number of public roads, watercourses, gas mains and electrical power supplies. The pipe runs mainly through agricultural grassland.

The pipeline would typically be laid at a minimum depth of cover of 1.2m above the crown of the pipe and generally would follow the existing ground profile to limit depths of excavation

- Break Pressure Tank (BPT)

A Break Pressure Tank is to be developed at Knockanacree, 1.8km north of Cloughjordan at a highpoint on the proposed development route and on a site of 5.2 ha. From the Break Pressure Tank water is mainly transferred to the termination point reservoir in Dublin by gravity with supplementary pumping as required.

A new permanent access road from the L1064 is proposed to serve the BPT. Infrastructure at the BPT site include a break pressure tank structure, control building and chlorine dosing building. The BPT is to be partly buried.

Wastewaters are collected in a holding tank and tankered off site for disposal.

Water supply to the site will be from the BPT.

10 car parking spaces are proposed on the site.

The power supply would be provided by ESB Networks from the existing medium voltage overhead power line which crosses the proposed BPT access road.

The length of pipeline running east from the BPT located in Tipperary is 5.9km.

Figure 8- Layout of Break Pressure Tank Site

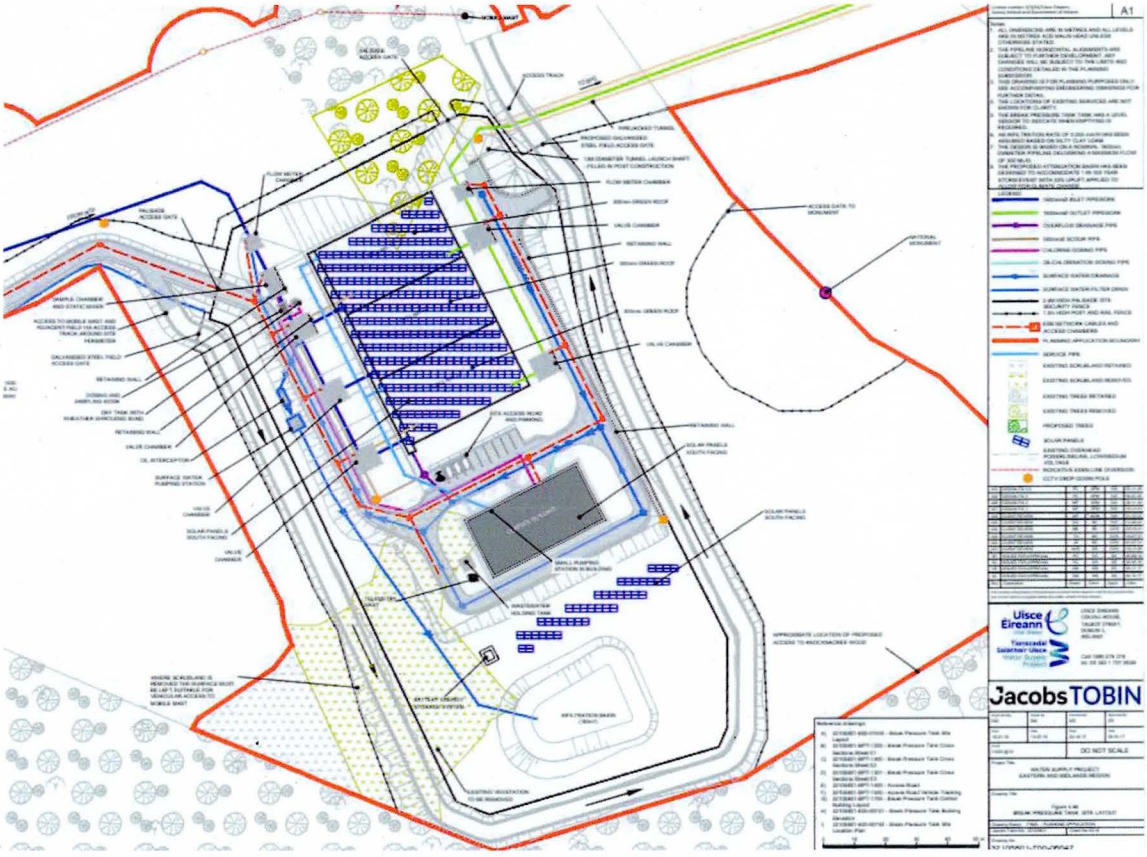


Figure 9- Layout of access road to Break Pressure Tank

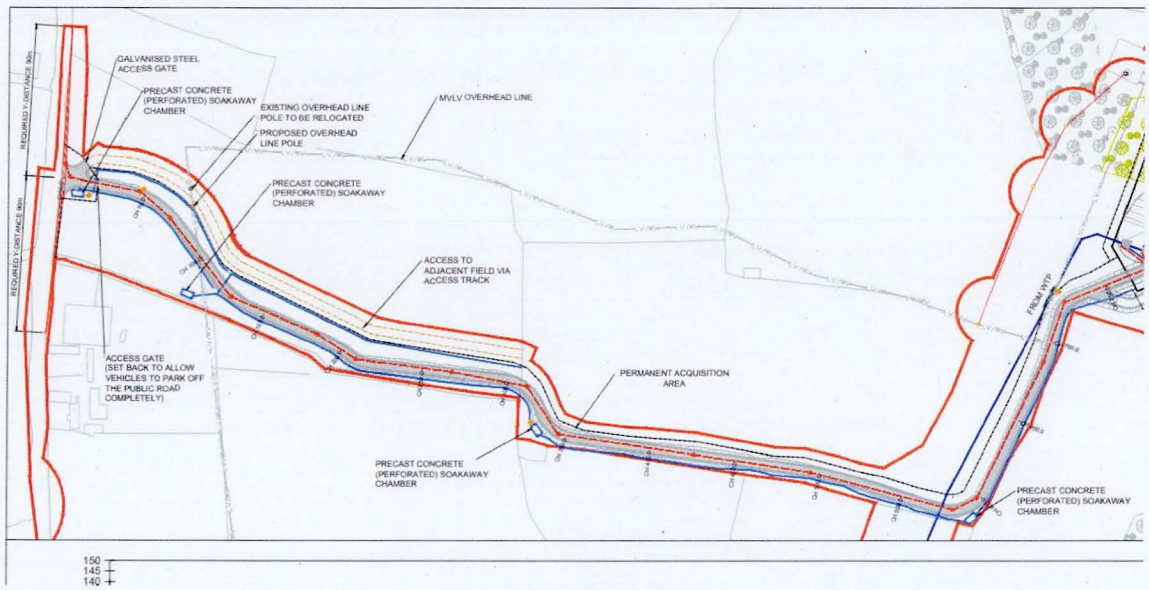


Figure 10- Architectural Visualisation of the Control Building



- Pipeline Features

  The total length of water pipeline in Tipperary is 44.7km and the pipeline will incorporate several features namely:

  - Line Valves to allow sections of the pipeline to be isolated for operation and maintenance purposes
  - Chambers around the Line Valves to protect the valve and enable access for maintenance purposes
  - Lay-Bys at Line Valves to allow safe access to the valves
  - Cathodic Protection beds at the Line Valves to monitor the pipeline
  - Washout Valves to allow sections of the pipeline to be drained down, if required
  - Air Valves to facilitate removing air from the pipeline
  - Manways to provide access to the pipe once operational (albeit it would be necessary to excavate down to them)

- Potential Future Connections

The project includes for future connection points at 4 locations along its length to potentially supply areas of local demand in the future. 2 potential future connections are located in Tipperary at the WTP access road and at Newtown (Guest) on the R491.

- 38KV Uprate Works

In order to supply power to the RWI&PS and WTP the existing Ardnacrusha – Birdhill (38 kV overhead) Line running from pole set 6B north of Ardnacrusha Substation, in County Clare, in a north-easterly direction and terminating at the Birdhill 38 kV Substation in County Tipperary will be uprated.

- Break Pressure Tank to the Termination Point Reservoir

The second section of the Treated Water Pipeline would transfer clean, treated drinking water from the Break Pressure Tank approximately 133km to the Termination Point Reservoir, which would be located adjacent to, and immediately north-west of, Peamount Hospital in County Dublin.

- Booster Pumping Station

A Booster Pumping Station is to be developed to the east of Birr, in the townland of Coagh Upper, County Offaly. The Booster Pumping Station is to provide additional pressure to delivery flow above that which can be provided by gravity.

3.3 Construction

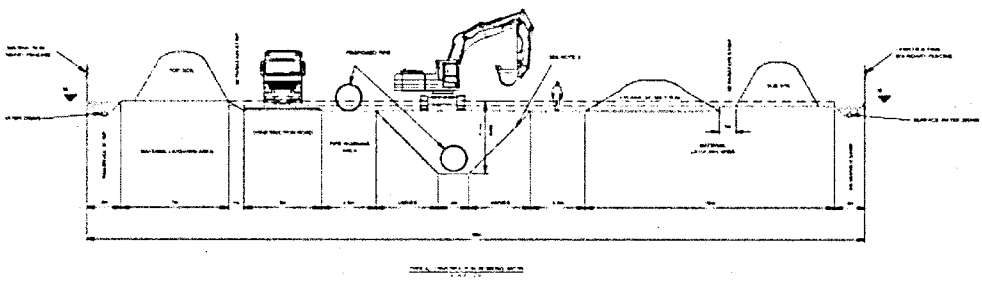
The overall Construction Phase is anticipated to last five years (from 2028 assuming a grant of consent) including the testing and commissioning of the pipeline and the associated infrastructure. Construction is proposed to broadly progress in west to east sequence with works planned to reduce the period of time that land is out of agricultural use so that each landowner would not be affected for a period of more than 18–24 months (excluding returning to the land during the commissioning phase of the works).

A number of construction compounds and pipe storage depots are required for the project, the compounds and depots in Tipperary are located as follows:

Principle Construction Compounds	In the townland of Incha Beg, County Tipperary, within the WTP. In the townland of Lisgarriff, County Tipperary
Secondary Construction Compounds	At the RWI&PS site At the Break Pressure Tank site
Pipe Storage Depots	Carrigatogher, County Tipperary

The compounds and depots will be used for as long as the construction programme requires. Following this all temporary works facilities would be removed, and the sites reinstated to their pre-existing condition.

The required construction working width for the pipeline is generally 50 metres, with some wider areas required. The 50 metres width will only be required during construction. The 20 metre wide wayleave over the pipeline (required for operational purposes) will be located within the 50 metres working width area.





Access to the Construction Working Width would be via the public road network and along the Construction Working Width. Following completion of the construction works the general principle is that the land within the Construction Working Width would be reinstated to the conditions which existed on site prior to the construction of the Proposed Project.

It is proposed that workers required on the pipelines would be bussed to the various pipeline works sites. No parking for construction workers would be available at the pipeline works areas.

The pipeline would mainly be installed using open-cut trenching. Trenchless construction is also proposed at locations along the pipeline route i.e. (under R494, R445, M7, under 220kv and 400kv network, N52 and where steep slopes are encountered and major watercourses). Where open trench excavation is proposed to cross a watercourse, damming and fluming or damming and pumping of the watercourse will be undertaken.

The construction working width is to be reinstated following completion of works and backfilling





3.4 Commissioning

The construction period will be followed by a period of testing and commissioning. This will be undertaken in subsections of completed work to allow remediation of any identified issues.

3.5 Construction Flexibility

The EIAR has included for construction flexibility. This is to account for unknown site constraints or obstacles that may affect the construction of the permanent infrastructure (e.g. unknown archaeology, unknown services, new badger setts). In this regard the following is accounted for:

- A 20m Pipeline Corridor has been defined for the pipeline (including both the RWRMs and the Treated Water Pipeline), within which the pipe would be located. As described in Section 4.3.1 this corridor has been defined by a 10m width either side of the centre of the pipeline alignment as currently proposed i.e. 20m in total.
- The vertical alignment of the pipeline being no shallower than 1.2 metres beneath ground level and no deeper than 4.4 metres (exceptions to this exist at major crossing which require a greater depth).
- Flexibility on the locations of valves, chambers and pipeline features.
- Flexibility on outfall connections where an outfall pipe could be developed within a 10 metre wide corridor.
- Flexibility for locating the outfall headwalls (within a 20 metre corridor) to account for flexibility on pipe location.

PART 4. PLANNING POLICY AND LEGISLAIVE CONTEXT

4.1 EU Directives / Legislation

4.1.1 The Recast Drinking Water Directive (EU DWD)

The Recast Drinking Water Directive (EU DWD) (2020/2184) of the European Parliament and the Council of 16 December 2020 sets the standards to govern the quality of water for human consumption across Member States

4.1.2 The European Union (Drinking Water) Regulations 2023.

The European Union (Drinking Water) Regulations 2023 (S.I. 99 of 2023) transpose the EU DWD into national legislation. Under these regulations, Uisce Éireann must ensure that all water intended for human consumption supplied by them is wholesome and clean and does not present a risk to human health

4.2 National Legislation

4.2.1 The Water Services Acts of 2007-2022

The Water Services Acts of 2007-2022, set down the legislative code governing functions, standards, obligations and practice in relation to the planning, management, and delivery of water supply and wastewater collection and treatment services. The Act focuses on management of water "in the pipe", as distinct from broader water resources issues such as river water quality.

The 2013 Act also sets out specific duties and functions of the Commission for Regulation of Utilities (CRU), including those requiring the preparation of Irish Water's Water Service Strategic Plan (WSSP), and the time period for which Irish Water's Investment Plans apply.

4.2.2 The Water Environment (Abstractions and Associated Impoundments) Act 2

The Water Environment (Abstractions and Associated Impoundments) Act 2022 (WAA) requires abstractions of 25 cubic metres or more in any 24-hour period to be registered with the EPA, and all abstractions of 2000 cubic metres or more in any 24-hour period now require a licence from the EPA. The abstraction for the Proposed Project will be greater than 2000 cubic metres in any 24-hour period and as such, there will be an application for an abstraction licence

4.3 National Planning Policy

4.3.1 National Planning Framework – First Revision: April 2025 (Project Ireland 2040) (NPF)

The NPF is the long term, 20-year strategy shaping the future growth and development or Ireland. The document highlights the delivery of critical strategic infrastructure in areas such as transport, water services management, waste management, education, health and community services etc.

Key priorities of the NPF include 'enhanced airport and port access and capacity; expansion of the public transport network including the delivery of DART+, MetroLink, Luas expansion and BusConnects; and enhanced water and wastewater capacity through projects such as the Greater Dublin Drainage Project and the Water Supply Project, Eastern and Midlands Region..

The Eastern and Midlands Water Supply Project is noted in the NPF as a key future growth enabler for Dublin.

National Strategic Outcome 9: Sustainable Management of Water and other Environmental Resources of the NPF is relevant to the proposal and states:

> *Investment in water services infrastructure is critical to the implementation of the National Development Plan. The current Water Services Strategic Plan by Irish Water will be updated in the light of the policies in the National Planning Framework addressing the requirements of future development, while also addressing environmental requirements such as obligations under EU Water Framework Directive mandated River Basin Management Plans.*
>
> *A new long-term water supply source for the Eastern and Midland Region, which includes the Dublin Water Supply Area (DWSA), is needed by the mid-2020s, to provide for projected growth up to 2050 and contribute to resilience and security of supply for the region. This requires infrastructure provision to be guided and prioritised in a manner that can benefit the greatest possible number of areas within the country*

A key theme of the NPF is balanced growth between Irelands regions. Section 1.2 states:

A New Strategy for Managing Growth

From an administrative and planning point of view, Ireland is divided in to three regions: the Northern and Western, Southern, and Eastern and Midland Regional Assembly areas. We need to manage more balanced growth between these three regions because at the moment Dublin, and to a lesser extent the wider Eastern and Midland area, has witnessed an overconcentration of population, homes and jobs. We cannot let this continue unchecked and so our aim is to see a roughly 50:50 distribution of growth between the Eastern and Midland region, and the Southern and Northern and Western regions, with 75% of the growth to be outside of Dublin and its suburbs.

The NPF identifies Water Infrastructure as a strategic investment priority in achieving the National Strategic Outcomes.

4.3.2 The National Development Plan (NDP) 2021 – 2030

The National Development Plan outlines investment priorities that will support implementation of the National Planning Framework. The proposed water supply project is directly referenced in the NDP.

> *In the period from 2021-2025 almost €6bn investment will be undertaken by Irish Water of which over €4.5 billion will be Voted Exchequer funded. This investment includes the projects and programmes committed to in Irish Water's Capital Investment Plan 2020-2024 approved by the Commission for Regulation of Utilities under Revenue Control 3.5, including major projects such as the Water Supply Project – Eastern and Midlands Region (WSP-EMR) and the Greater Dublin Drainage Project (GDD).*
>
> Delivering Significant Infrastructure Development projects to meet future economic, housing and population demands such as the Water Supply Project – Eastern and Midlands Region and the Greater Dublin Drainage Project

4.4 Regional Planning Policy

Tipperary comes within the remit of the Southern Regional Assembly area. The relevant regional level policies relation to the southern region are outlined hereunder.

4.4.1 Regional Spatial and Economic Strategy (RSES) for the Southern Region

Section 8.1 of the RSES references the Water Supply Project for the Midlands and Eastern Region as one among a number of projects required to support planned development and maintain and improve existing services.

Regional Policy Objectives (RPO) 209 Strategic Water Supply Projects states:

> *It is an objective to support investment and the sustainable development of strategic water supply projects by Irish Water and relevant local authorities, arising from initiatives including Investment Plans, 25 Year Water Supply Plans for our Region's cities and metropolitan areas, leakage reduction programmes and initiatives through the National Water Resources Plan subject to appropriate environmental assessment and the planning process*

A key theme of the RSES is balanced growth in line with the framework provided by the NPF. RPO 4 relates specifically to Infrastructure Investment and states:

> *Infrastructure investment shall be aligned with the spatial planning strategy of the RSES.*

4.4.2 Tipperary County Development Plan 2022

The following are the main policies, objectives and standards contained in the Tipperary County Development Plan 2022 of relevance to the proposal.

Section 15.3	The NPF National Strategic Outcome 9, National Policy Objective 63 plans for the development of new national water supply infrastructure for the Eastern and Midlands region, a significant element of which will be relevant to Tipperary. The proposed 'Water Supply Project Eastern and Midlands Region' will involve the following elements: • Abstraction and pumping of raw water from the Lower River Shannon at Parteen Basin; • Treatment of the water nearby at Birdhill, • Pumping of the treated water via buried pipeline to a break pressure tank located at a high point near Cloughjordan, • Treated water will thereafter flow via buried pipeline through the midlands to a termination point reservoir at Peamount, Dublin (administrative area of South Dublin County Council), where it will connect into the existing Greater Dublin Area Water Resource Zone network. The project will be subject to enactment of abstraction legislation, planning permission from An Bord Pleanála (Strategic Infrastructure Project) and licence application from the EPA. Irish Water have set out a number of benefits from the scheme including an opportunity to resolve needs across a number of water supplies in north Tipperary, which would be facilitated by a future new connection point from the proposed pipeline. Furthermore, it is proposed that a bespoke purpose-built interpretative / visitors' facility be provided at the proposed water treatment plant at Birdhill, which will represent a key community gain for Tipperary. Irish Water has also committed to providing a 'Community Gain Fund' with view to supporting community-based initiatives in areas affected by the project; a proposal in this regard will be included in the planning application to An Bord Pleanála
Policy 15-3	It is the policy of the Council to Protect the Irish Water Eastern and Midlands Water Supply Project pipeline corridor from inappropriate development that would prejudice the delivery of

Table 10.1 Renewable Energy Targets for County Development Plan period

Resource	Approved/Operational (MW)	2028 target-approx. 25% increase over permitted capacity
Wind	475 Operational	600MW Operational
Solar	117 Permitted	150MW Operational

	the project and to refer any planning applications within the development corridor to Irish Water for comment.
Objective 15-A	Work in partnership with Irish Water in the performance of its functions and in the implementation of the Water Services Strategic Plan, Investment Plan and National Water Resources Plan (and any amendment thereof), to ensure that water infrastructure complies with appropriate regulations and to ensure and support the sustainable development of the county.
Objective 15-B	Co-operate with Irish Water in the delivery of the Eastern and Midlands Water Supply Project and to ensure the maximum benefit from this project to County Tipperary, in particular with respect to economic development potential and security of supply.
Strategic Objective SO-6	To support a sustainable, diverse and resilient rural economy, whilst integrating the sustainable management of land and natural resources.
Strategic Objective SO-7	To protect, enhance and connect areas of natural heritage, blue and green infrastructure and waterbodies, for quality of life, biodiversity, species and habitats, while having regard to climate change adaptation and flood risk management measures.
Strategic Objective SO-10	To protect existing infrastructural assets and utilities, and the strategic function of the existing national road and rail network, and associated junctions and support investment in strategic infrastructure both at the county, and the regional level thereby ensuring Tipperary's access to key services for economic growth and resilience.
Policy 3-4	Promote energy conservation, energy efficiency and the use of renewable energy sources in buildings, including retro fitting of energy efficiency measures in the existing building stock in line with the requirements of the Building Regulations 1997 – 2021 (and any amendment thereof).
Policy 3-6	Support new construction and development forms that use a low embodied carbon approach, and where the full life-cycle carbon, and other environmental impacts are calculated to support the lowest possible energy and CO2 emissions.
Objective 4-B	Support co-ordination and investment by infrastructure, utilities and services stakeholders, for example, Irish Water, Transport Infrastructure Ireland, the Department of

	Education etc, to ensure the delivery of infrastructure investment in water, wastewater and other services for towns and villages, in line with their role in the Settlement Hierarchy.
Policy 7-3	Require the inclusion of urban greening/landscaping as a fundamental element of design, incorporating features and design solutions such as biodiversity friendly landscaping, nature-based solutions to SUDS and providing attractive routes and facilities for the pedestrian and cyclist.
Objective 9-A	a) Continue to collaborate with Fáilte Ireland, OPW and other tourism stakeholders in the development and delivery of Regional Tourism Plans and DEDPs to ensure that Tipperary's established and emerging attractions and activities are continually developed to their maximum potential. b) Support tourism by collaborative product development and clustering, and proactive biding for funding though schemes such as the 'Platforms for Growth' Investment Programme, the URDF and RRDF (and any review thereof).
Objective 9-C	Support the implementation of the Tipperary 'Marketing, Experience & Destination Development Plan', 2016-2021 and 'Tipperary Transforming' (and any review thereof) and associated tourism strategies and plans set out therein. Support existing and emerging tourism programmes, including; • Lough Derg Visitor Destination Plan 2020, • Shannon Tourism Master Plan 2021, • Munster Vales programme, • Cashel Town Plan for Tourism, • Butler Trail, • Suir Blueway Tipperary, • Beara Breifne Way, • Thoroughbred Country Destination Experience Development Plan. In supporting tourism, the Council will seek to support synergies and clustering of tourism attractions, for example, the ability of the Rock of Cashel to act as a catalyst for the area, thereby supporting associated product development at sites such as Holycross Abbey, Monaincha Abbey and Church, Cahir Castle and Swiss Cottage, Ormond Castle, Fethard Walled Town etc.

Objective 9-F	To co-operate with Fáilte Ireland, Waterways Ireland and other relevant bodies and agencies, in promoting the county's waterways and Lough Derg Lakelands as part of an overall tourism development and marketing strategy.
Policy 10-3	Support and facilitate the development of a sustainable and economically efficient agricultural and food sector and bioeconomy, balanced with the importance of maintaining and protecting the natural services of the environment, including landscape, water quality and biodiversity.
Policy 10-4	Ensure the sustainable management of waste and the application of the 'Circular Economy' concept in line with the provisions of the National Waste Management Plan for a Circular Economy and the Waste Management Infrastructure – Guidance for Siting Waste Management Facilities, (Government of Ireland, 2022) in the development and management of new development.
Policy 11-1	In assessing proposals for new development to balance the need for new development with the protection and enhancement of the natural environment and human health. In line with the provisions of Article 6(3) and Article 6 (4) of the Habitats Directive, no plans, programmes, etc. or projects giving rise to significant cumulative, direct, indirect or secondary impacts on European sites arising from their size or scale, land take, proximity, resource requirements, emissions (disposal to land, water or air), transportation requirements, duration of construction, operation, decommissioning or from any other effects shall be permitted on the basis of this Plan (either individually or in combination with other plans, programmes, etc. or projects).
Policy 11-2	Ensure the protection, integrity and conservation of European Sites and Annex I and II species listed in EU Directives. Where it is determined that a development may individually, or cumulatively, impact on the integrity of European sites, the Council will require planning applications to be accompanied by a NIS in accordance with the Habitats Directive and transposing Regulations, 'Appropriate Assessment of Plans and Projects, Guidelines for Planning Authorities', (DEHLG 2009) or any amendment thereof and relevant Environmental Protection Agency (EPA) and European Commission guidance documents.
Policy 11-3	Ensure the conservation and protection of existing, and proposed NHAs, and to ensure that proposed developments within or in close proximity to an existing or proposed NHA would not have a significant adverse impact on the status of the site as described.

Policy 11-4	(a) Conserve, protect and enhance areas of local biodiversity value, habitats, ecosystems and ecological corridors, in both urban and rural areas, including rivers, lakes, streams and ponds, peatland and other wetland habitats, woodlands, hedgerows, tree lines, veteran trees, natural and semi-natural grasslands in accordance with the objectives of the National Biodiversity Plan DCHG 2017) and any review thereof. (b) Safeguard, enhance and protect water bodies (rivers/canals/lakes) and river walks and to provide links, where possible, to wider green infrastructure networks as an essential part of the design process. (c) Require an 'Ecosystems Services' approach for new development to incorporate nature-based solutions to SUDS, in so far as practical, as part of water management systems, public realm design and landscaping, in line with best practice. (d) Where trees or hedgerows are of particular local value, the Council may seek their retention, or where retention is not feasible, their replacement and will seek a proactive focus on new tree-planting as part of new development.
Policy 11-5	Ensure that new developments proposed in or near 'Ground Water Protection Schemes' and 'Zones of Contribution' which contribute to public water supplies, do not result in a significant negative impact on the integrity, function and management of these important assets.
Policy 11-7	a) Ensure the protection of water quality in accordance with the EU WFD, and support the objectives and facilitate the implementation of the associated Programme of Measures of the River Basin Management Plan 2018-2021 and any successor. This includes contributing towards the protection of Blue-Dot catchments and drinking water resources. Also, ha cognisance of the EU's Common Implementation Strategy Guidance Document No. 20 and 36 which provide guidance on exemptions to the environmental objectives of the WFD. b) Support an integrated and collaborative approach to catchment management in accordance with the River Basin Management Plan 2018-2021 and any successor. c) Require an undisturbed edge or buffer zone to be maintained, where appropriate, between new developments and riparian zones of water bodies to maintain the natural function of existing ecosystems associated with water courses and their riparian zones, and to enable sustainable public access.

Policy 11-9	Assess all new developments (both within and without designated Flood Risk Zones) in line with the 'Staged Approach' and pre-cautionary principle set out in the Planning System and Flood Risk Management Guidelines for Planning Authorities, (DEHLG, 2009) and any amendment thereof, and the following: (a) Require the submission of site-specific Flood Risk Assessments for developments undertaken within Flood Zones A & B and on lands subject to the mid-range future scenario floods extents, as published by the OPW. These Flood Risk Assessments shall consider climate change impacts and adaptation measures including details of structural and non-structural flood risk management measures, such as those relating to floor levels, internal layout, flood-resistant construction, flood-resilient construction, emergency response planning and access and egress during flood events. (b) SFRAs and site-specific flood risk assessments shall provide information on the implications of climate change with regard to flood risk in relevant locations. The 2009 OPW Draft Guidance on Assessment of Potential Future Scenarios for Flood Risk Management (or any superseding document) shall be consulted with to this effect. (c) Ensure each flood risk management activity is examined to determine actions required to embed and provide for effective climate change adaptation as set out in the OPW Climate Change Sectoral Adaptation Plan for Flood Risk Management applicable at the time. (d) Applications for development on land identified as 'benefitting land' may be prone to flooding, and as such site-specific flood risk assessments may be required in these areas. (e) Require applications for new development, or for an extension to an existing development on land zoned for 'Social and Public' or 'Amenity' use and where a

	potential flood risk is identified, and where the proposed use might be vulnerable, to be subject to site-specific flood risk assessment to the satisfaction of the Council.
Policy 11-11	(a) Ensure that new developments proposed in 'Arterial Drainage Schemes' and 'Drainage Districts' do not result in a significant negative impact on the integrity, function and management of these areas. (b) Consult with the OPW in relation to proposed developments in the vicinity of Flood Relief Schemes and drainage channels and rivers for which the OPW are responsible, and to retain a strip on either side of such channels, where required, to facilitate maintenance access thereto. (c) Protect the integrity of any formal flood risk management infrastructure (see key flood risk infrastructure identified in Section 2.2 "Drainage, Key Flood Risk Infrastructure and Early Warning Systems" of the SFRA), thereby ensuring that any new development does not negatively impact any existing defence infrastructure or compromise any proposed new defence infrastructure
Policy 11-13	Seek to control the spread of invasive plant and animal species, including consideration of potential pathways for invasive species spread, i.e. watercourses.
Policy 11-17	Ensure the protection of the visual amenity, landscape quality and character of designated 'Primary' and 'Secondary' amenity areas. Developments which would have a significant adverse material impact on the visual amenities of the area will not be supported. New development shall have regard to the following: a) Developments should avoid visually prominent locations and be designed to use existing topography to minimise adverse visual impact on the character of primary and secondary amenity areas. b) Buildings and structures shall integrate with the landscape through careful use of scale, form and finishes.

	c) Existing landscape features, including trees, hedgerows and distinctive boundary treatment shall be protected and integrated into the design proposal.
Policy 11-18	Ensure that new development does not result in significant noise disturbance and to ensure that all new developments are designed and constructed to minimise noise disturbance in accordance with the provisions of the Noise Action Plan 2018 and relevant standards and guidance that refer to noise management.
Policy 11-19	Ensure that new development does not result in significant disturbance as a result of light pollution and to ensure that all new developments are designed and constructed to minimise the impact of light pollution on the visual, environmental and residential amenities of surrounding areas.
Objective 11-1	Comply with the Arterial Drainage Act 1945 (as amended) prior to the carrying out of construction/ alteration works, or drainage works etc on water channels
Policy 12-4	Maintain and protect the safety, capacity and efficiency of Tipperary's roads network and associated junctions in accordance with the Spatial Planning and National Roads Guidelines for Planning Authorities, (DECLG, 2012) and the Trans-European Networks Regulations and to avoid the creation of additional access points to national roads to which speed limits greater than 60kmh apply.
Policy 12-8	Ensure that in assessing new development, the capacity and efficiency of the national road network drainage regimes in county Tipperary will be safeguarded for national road drainage purposes.
Policy 13-1	Encourage and support the sympathetic restoration, re-use and maintenance of protected structures thereby ensuring their conservation and protection. In considering proposals for development, the Council will have regard to the Architectural Heritage Protection Guidelines for Planning Authorities, (DAHG 2011) or any amendment thereof, and proposals that will have an unacceptable impact on the character and integrity of a protected structure or adjoining protected structure will not be permitted.
Policy 13-4	Safeguard sites, features and objects of archaeological interest, including Recorded

	Monuments, National Monuments and Monuments on the Register of Historic Monuments, and archaeological remains found within Zones of Archaeological Potential located in historic towns and other urban and rural areas. In safeguarding such features of archaeological interest, the Council will seek to secure their preservation (i.e. in situ or in exceptional circumstances preservation by record) and will have regard to the advice and recommendation of the Department of Arts, Heritage and the Gaeltacht. Where developments, due to their location, size or nature, may have implications for archaeological heritage, the Council may require an archaeological assessment to be carried out. This may include for a requirement for a detailed Visual Impact Assessment of the proposal and how it will impact on the character or setting of adjoining archaeological features. Such developments include those that are located at, or close to an archaeological monument or site, those that are extensive in terms of area (1/2 ha or more) or length (1 kilometre or more), those
Policy 13-7	Consider underwater archaeology and ensure that development to river banks or coastal edges within the vicinity of a site of archaeological interest shall not be detrimental to the character of the archaeological site or its setting.
Volume 3-Development Management Standards	
Section 3.1	Sustainable building Design The Council will encourage the energy efficient design of buildings and their layout an orientation on site, and will seek to ensure that all new residential, commercial, industrial and other developments are designed to obtain maximum energy performance ratings during their construction, operation and lifetime use. New development shall support a 'Circular Economy' model, keeping resources in use for as long as possible, through the reuse and repurposing of existing buildings, so far as practical, as an alternative to demolition and re-building. Applications for large buildings over 1,000m2, will need to demonstrate that due consideration has been given to the technical, environmental and economic feasibility of installing alternative energy systems in the proposed building, and that the use of such systems

	has been considered, as far as practicable, in the design of that building2. This shall also apply to all new planning applications for housing schemes of ten or more units.
Section 3.5	Lighting The Council will encourage the energy efficient design of buildings and their layout and orientation on site, and will seek to ensure that all new residential, commercial, industrial and other developments are designed to obtain maximum energy performance ratings during their construction, operation and lifetime use. New development shall support a 'Circular Economy' model, keeping resources in use for as long as possible, through the reuse and repurposing of existing buildings, so far as practical, as an alternative to demolition and re-building. Applications for large buildings over 1,000m2, will need to demonstrate that due consideration has been given to the technical, environmental and economic feasibility of installing alternative energy systems in the proposed building, and that the use of such systems has been considered, as far as practicable, in the design of that building2. This shall also apply to all new planning applications for housing schemes of ten or more units.
Section 3.6	The Council may require new commercial and industrial developments to submit a Noise Impact Assessment and appropriate mitigation measures as part of their planning application. This provision will apply to the following: a) For new developments that are likely to generate noise nuisance or an unacceptable impact on sensitive receptors; b) For new developments proposed within the current Action Planning Area as set out in the Tipperary County Council Noise Action Plan, 2018; or c) For developments proposed near major roads (i.e. traffic volumes in excess of 3 million vehicles per annum or otherwise on a case by case basis). Where developments are planned adjacent to major roads, the planning application shall incorporate acoustical planning into the development design e.g. designing the development so that the access road is adjacent to the major road noise source (subject to an analysis of the potential traffic safety implications). It may also involve the use of buffer zones and/or noise barriers and traffic calming measures.

	In permitting new development outside of the Action Planning Areas identified in the Noise Action Plan 2018, the Council will refer to the appropriate regulations and guidance in place, and where a proposed development may result in excessive noise levels or, by virtue of its proximity to a noise sensitive receptor may result in a loss of amenity to that receptor or result in general nuisance, a Noise Impact Assessment may be required. The Council may apply conditions at planning permission stage to manage noise emissions from new developments.
Section 3.7	Biodiversity/Ecological Corridors In preparing plans for new developments, the loss of wildlife habitats and natural vegetation should be avoided so far as practicable to minimise any impact on biodiversity. Landscaping plans should be submitted in support of planning applications for multi-unit developments or for new commercial and industrial developments. Landscaping plans should provide for: • The retention of existing trees, hedgerows, ponds and other ecosystems where feasible and their replacement where possible. • A planting schedule of native trees, shrubs and plants; additional planting should be included in plans where there is an unavoidable impact on biodiversity. • Existing and proposed areas of open space shall, where possible, be linked with adjoining areas thus providing green linkages for wildlife habitats and improving walking and cycling permeability throughout the site.
Section 3.8	Riparian Zones It is through the conservation of ecological infrastructure such as hedgerows and riparian corridors that we protect bio-diversity. The preference will be to retain and protect existing riparian habitats while providing parks in waterside locations to maximise the potential linkages between landscape, natural heritage and recreational assets. A riparian buffer strip of a minimum 10 metres either side of all watercourses (measured from top of bank) should be preserved free of development and of adequate width to permit access for river maintenance.
Section 6.1	Road Design & Visibility at a Direct Access A direct access is a vehicular access from any residential, commercial or agricultural property to and from a public road. New direct accesses shall not be permitted within 90m of the exit of a roundabout on a national road, or within 50m of the exit on a non-national road.

On all national and non-national roads, the full 'Y – Distance' shall be to an object height of 1.05m above the road surface level measured at the near edge of the travelling lane (the yellow line, or if none exists, the edge of the paved surface). Forward visibility equal to the Y-Distance shall also be provided along the public road on the approaches from each side of an access.

The distance back along the minor road or direct access from which the full visibility is measured is known as the 'X-Distance'. It is measured back along the centreline of the minor road or direct access from the continuation of the line of the nearside edge of the paved surface (including hardstrip or hard shoulder) of the major road. The 'X-Distance' on the minor road for visibility measurements shall be as defined in Table 6.1 below.

Table 6.2: Design Speeds and associated Y-Distances

Mandatory Speed Limit	Design Speed (operational Speed)	Rural Non-National Road	Urban Non-National Road
km/h	km/h	Y-Distance (m)	Y-Distance (m)
30	40	N\A	33
40	50	70	45
50	60	90	59
60	70	120	72
80	85	160	N\A
100	100	215	N\A

Table 6.2: Design Speeds and associated Y-Distances

Mandatory Speed Limit	Design Speed (operational Speed)	Rural Non-National Road	Urban Non-National Road
km/h	km/h	Y-Distance (m)	Y-Distance (m)
30	40	N\A	33
40	50	70	45
50	60	90	59
60	70	120	72
80	85	160	N\A
100	100	215	N\A

On non-national roads, in cases of particular difficulty, the use of a lower design speed for a given mandatory speed limit (as set out in Table 6.2) may be accepted by the Council. In such a case, the applicant must demonstrate to the satisfaction of the Council that the 'operational speed' of the road is less than the specified design speed. In such cases, the Council may accept the use of the lower speed than identified in column 2 of Table 6.2 above.

Section 6.2	The Council in accordance with the Traffic and Transport Assessment Guidelines (TII, 2014) and any amendment thereof, will require the submission of a Traffic and Transport Impact Assessment (TTIA) for large scale developments or developments that may impact on the carrying capacity or public safety of the road network. The following are the minimum thresholds of developments which will require a TTIA: • Residential Development over 200 dwellings • Retail and Leisure Developments over 1000 sqm. • Industrial Developments over 5000 sqm. • Office, Hospitals and Educational Developments over 2500sqm. • Distribution and Warehousing Developments over 10000 sqm. TTIAs will also be required where there is a 10% increase in traffic (or a 5% increase in congested areas). Where the Council considers that a development may have an impact on the carrying capacity of the surrounding network, a TTIA may also be required for sub threshold development. Such a decision will be based on an evaluation of the proposal against Table 2.2 and 2.3 of the Traffic and Transport Assessment Guidelines (TII, 2014), and any amendment thereof.

PART 5. INTERNAL DEPARTMENT REPORTS

5.1 Introduction

The application was referred to the following internal departments within Tipperary County Council.

Department	*Recommendation/Comments:*
District Engineer and Roads Capital	The main concern of the Roads Section of Tipperary Co Council is the potential of the scheme to damage the road network during the construction phase. The concerns are focused on: • HGV's accessing and egressing the site at the interface of the haul routes and the public road network. • Damage to the surrounding roads networks from bulk materials coming to and from the site. • Large scale construction projects at the Water Treatment Plant at Birdhill and the Break Pressure Tank at Cloughjordan, Mitigation measures are recommended to address the foregoing concerns. Bond to the sum of €1,620,000 required to repair major road defects resulting from the scheme. The proposed site entrance to the construction compound off the N52 at Lisgarriff is not in accordance with the Tipperary County Development Plan 2022 or Roads Policy. The potential for an alternative access to the compound from the L5079 should be examined. Uisce Eireann should be required to contribute towards the costs which Local Authorities along the route will incur in monitoring the works as well as responding to queries from the public during the construction phase. A sum of €65,000 per year per Local Authority is recommended to cover these costs.
Environment and Climate Action	**Waste Management** The Water Supply Project Eastern and Midlands Region will generate significant volumes of soils and construction-related materials. As such, the project will require robust environmental safeguards to ensure full compliance with national waste and environmental protection legislation.

It is important that the TCC submission to ACP includes a recommendation that reference to the utilization of, and adherence to, the Best Practice Guidelines for the preparation of resource & waste management plans for construction & demolition projects, as published by the Environmental Protection Agency (EPA) in 2021 [the EP-A Guidance document] is included in any decision to grant permission. The submission should also include a note emphasizing that compliance with waste management legislation is a matter for consideration by ACP in the event that a decision to grant permission issues

E&CA has noted the input from the CAAS Water Supply Project Planning Report pertaining to Chapter 10: Soils, Geology and Hydrogeology, which Planning Report was commissioned by Planning Section. In particular, E&CA notes the reference that mitigation measures have been considered within the project design through the development of detailed proposals as follows:

- Construction Environmental Management Plan (CEMP);
- Soil Management Plan (SMP); and
- Construction Waste and By-Product Management Plan (CWBMP), which is critical in respect of the waste regulatory function exercised by E&CA.

From a waste management perspective, with particular reference to the protection of the environment, the effective management of all construction-phase arisings, whether intended for reuse, recovery, transport or disposal, is essential.

The project contractor/s must be guided by the EPA Guidance documer— thereby ensuring that all waste/by product handling follows recognised best practice.

Furthermore, the assessment and implementation of the project must consider the National Waste Management Plan for a Circular Economy 2024-2030 to avoid adverse impacts on regional waste infrastructure arid capacity.

All activities related to the collection, transport, recovery and disposal of materials will be required to comply with the Waste Management Act 1996 (as amended), including the mandatory use of authorised waste collectors and authorised waste facilities, thereby ensuring that all soil and material movements are fully traceable and conducted in an environmentally responsible manner

Environmental Protection

Intake Structure

It is proposed to provide three raw water intakes (RWI) points, each fitted with a passive wedge-wire cylinder (PWWC) intake screen to prevent debris and/or fish being taken up into the raw water pumps during the operational phase. The screens would be selected so that intake velocities through the screen slots (approximately 2.0m in diameter) are limited to 0.15m/s, the velocity at which juvenile fish can swim away without being trapped against the screen.

It is recommended that in the event that ACP is minded to grant permission, a condition be attached as follows:

Maintenance of screens is required to ensure they remain free of debris and intact.

Pipeline Structure:

Risks from infrastructure failure include:

- habitat degradation as a result of pollution and possible leaks resulting in a discharge; the Operational Phase has the potential for chemically treated water to enter watercourses crossed by the Proposed Project;
- risk of chemically treated water entering watercourses crossed by the Proposed Project – design requirements include the control of discharges from Washout Valves during drain-down events, i.e. use of dechlorination tablets; and
- leakage or burst on the pipeline which may result in an unplanned discharge – design requirements to monitor any potential leaks.

All infrastructure and the proposed pipeline should be designed to be watertight. However, the potential for leakage to alter the concentrations of the parameters used to determine groundwater quality was assessed. The water quality in the proposed water supply would be compliant with the Groundwater Directive (Directive 2006/118/EC).

E&CA has concerns in relation to the effect of chlorine on sensitive receptors.

During commissioning any discharges would be controlled and passed through dichlorination equipment. If there is a leak on the pipeline, this would not be a catastrophic failure as the chosen pipe material is steel where characteristic failure of the pipe is a pinhole which would not lead to significant losses of water. Monitoring equipment on the pipeline would be able to detect these losses, enabling operations personnel to react rapidly.

It is noted that this section of the EIAR does not include details or proposals relating to a typical response time for detecting and fixing leaks. Such details or

proposals should be included in a Response Procedure Which would be activated in the event of the occurrence of an incident. Some areas of the pipeline are more ecologically sensitive, i.e. included within a Special Area of Conservation (SAC), so it would be important for UE to detail a typical timeline for addressing leaks occurring in ecological hotspots versus less ecological sensitive areas within the development. E&CA would welcome clarification on this issue.

It is not clear where alarms are situated along the pipeline. Clarification is required as to whether small leaks will be easily detected if they were located a significant distance from the position of the nearest sensor. E&CA would welcome such clarification insofar as this issue relates to County Tipperary.

Water (Chapter 9):

The abstraction aspect of the project will also be subject to a separate EP[redacted] abstraction licence consent process as required by the Water Environment (Abstractions and Associated Impoundments) Act 2022.

Water levels:

A hydrological model was developed to assess the impact of the proposed abstraction on the water levels of the Derg TN (Lough Derg) lake water body and the Derg HMWB (Parteen Basin) and the pass forward flows released to the ORS.

Two constant rates of abstraction have been investigated as follows:

(i) *154Ml/d, taken to be representative of normal operation demand by the year 2050; and*

(ii) *300Mld, projected peak need/demand at year 2050.*

The impacts to lake levels and forward flows to the ORS due to the modelled inclusion of the Proposed Project abstraction (as a constant flow of either 154Mld or 300Mld) were found to barely distinguishable from the baseline case when viewed on level/flow duration curves (a standard hydrological method for comparing long-term data series).

The level regimes of both the Lough Derg (Derg TN) and Parteen Basin (Derg HMWB) lake water bodies are only simulated to be notably affected by the inclusion of the Proposed Project during extreme drought periods and in the days immediately after the drought (up to a week) when lake inflow is needed to replenish any deficit in storage caused by the Proposed Project abstraction. From the 52-year model simulation period (1972-2023), the simulated lake levels are only found to be notably affected by the inclusion of the Proposed Project during the 1995 and 2018 drought events. Therefore, for approximately 99% of the 52-year model simulation period, there are no perceptible impacts to simulated lake levels because of the proposed project.

The model was further developed to incorporate future climate change scenarios to also allow a simulation of the impact with the Proposed Project in place and including the effects of future climate change on flows on the River Shannon.

Climate change simulations for a 'reasonable worst case' scenario for the 2080s epoch with the inclusion of the Proposed Project indicate that simulated lake levels would draw down closer to the bottom of the Lough Derg Normal Operating Band (NOB) during the 2018 worst drought event. However, the additional simulated lake level drawdown is still fitting within the range of Electricity Supply Board (ESB) normal observed lake level fluctuations, resulting in lake levels still remaining within the Lough Derg NOB, and within the upper and lower water levels that the ESB applies to the Parteen Basin, with no change to the ORS compensation and fish pass flows, which would always be met.

Although modelling has demonstrated little to no impact in water levels, the results are based on ESB operating bands which is purely based on hydrological regimes rather than ecological requirements.

The report fails to adequately assess the impact of draw down on the spatial extent and distribution of littoral habitats which are crucial to qualifying interests of the Lough Derg (Shannon) SPA.

Modelling has also utilised annual mean values which overlook specific times of low flow and drought. As a result, the 2% draw down may not always be correct.

Assessment of Groundwater Dependent Terrestrial Ecosystems (GWDTE) are dependent on the draw down being 2%. As 2% is not a set percentage of extraction, it is possible that the impact on GWDTEs has been incorrectly assessed.

ACP should consider these as part of a more detailed assessment of the project.

Water Quality:

As a separate exercise, in order to test whether Water Framework Directive (WFD) mitigation measures and/objectives to restore the favourable conservation status of the qualifying interests of the Lower River Shannon SAC would be impeded by the Proposed Project, a sensitivity analysis was undertaken to apply an outline Eflows approach proposed in a recent study (CDM Smith, 2025) to the model and investigate the potential impacts of future changes in the compensation flow regime.

Based on the UKTAG WFD lake level test, the following standards are met for the two proposed abstraction rates:

- *a constant abstraction of 154Ml/d results in both the Lough Derg (Derg TN) and Parteen Basin (Derg HMWB) water bodies meeting the lake level requirements for the WFD Good (Potential) status standard;*
- *a constant abstraction of 300Ml/d results in both the Lough Derg (Derg TN) and Parteen Basin (Derg HMWB) water bodies meeting the lake level requirements for the WFD Good (Potential) status standard;*

Inclusion of the future "reasonable worst case" 2080s climate change impacts and/or proposed ORS Eflows regime sensitivity analyses results in both the water bodies still meeting the lake level requirements for the WFD Good (Potential) status standard for a constant WSP abstraction of 154Ml/d or 300Ml/d.

Based upon these findings, effects on the Derg TN lake water body and the Derg HMWB would be Not Significant. As reported in the separate Water Status Impact Assessment Report, it has been concluded that the Proposed Project would not compromise WFD objectives or cause deterioration in the status of any surface water or groundwater WFD designated water body and/or jeopardise the attainment of good surface water (or good ecological potential) or groundwater status.

The lack of significant effects on flow or water levels as a result of the proposed abstraction means there would be no indirect significant effects on water quality or hydromorphology for downstream water bodies; this includes the Shannon (lower)_050, Shannon (lower)_060 and Limerick Dock transitional water bodies.

E&CA has also had regard to the Water Action Plan 2024: A River Basin Management Plan for Ireland, as prepared by the Department of Housing, Local Government and Heritage, which, inter alia, sets out a Programme of Measures until 2027.

E&CA is of the view that the impact of this project on the WFD cannot be fully assessed given the uncertainty regarding the data used for the modelling exercise

ACP should consider this as part of a more detailed assessment of the project

Soils, Geology and Hydrogeology (Chapter 10):

Gaps exist where access to carry out site investigations was not possible but these gaps do not prevent an adequate assessment of the likely significant effects of the project.

The construction phase poses risks to soil and geology, including compaction, land use change, and contamination. Potential impacts due to construction may include disruption to groundwater flow and quality from dewatering and contamination risks.

	Effects are generally predicted to be temporary during construction and, on implementation of the proposed mitigation measures, residual effects will be insignificant to slight. No likely significant effects were identified during the Operational Phase on soils, geology and hydrogeology receptors. Therefore, no specific mitigation is required. Design mitigation, such as measures to contain chemicals and manage accidental spills, and design measures to control rare washout discharges, would reduce effects further. There are therefore no likely significant residual effects during operation. Natura Impact Statement A Natura Impact Statement (NIS) is prepared prior to the finalisation of the EIAR. The NIS is part of the Appropriate Assessment process, which is conducted concurrently with the environmental impact assessment (EIA). The NIS helps assess the potential adverse effects of a plan or project on Special Areas of Conservation and Special Protection Areas, while the EIAR evaluates the environmental impacts of the proposed project. E&CA has noted the input from the CAAS Water Supply Project Planning Report pertaining to the Natura Impact Statement (NIS), which Planning Report was commissioned by Planning Section. The NIS has concluded that there would be no significant effect on any Natura 2000 site in County Tipperary. However, the NIS conclusion is based solely on the conservation of these sites. In this regard, the EIAR must be referred to for a more detailed analysis of localised biodiversity as it applies to County Tipperary.
Chief Fire Officer	No comments at this time. Should the project proceed the Fire Office will be in contact with the relevant parties regarding road works impact on fire service and pre-fire planning of hazardous works
Local Authorities Water Program	**Environmental and Ecological Concerns - Lower Shannon** From a review of the Environmental Impact Assessment documentation, hydrological and water quality modelling, and supporting technical appendices relating to the proposed abstraction from Lough Derg/Parteen Basin LAWPRO have identified some concerns. The risk of impact on Lower Shannon is more significant than presented for a number of reasons. The ecological system in the Lower River Shannon SAC

(002165) and from Limerick Dock, (IE_SH_060_0900) to the Upper Shannon Estuary (IE_SH_060_0800) is already stressed with salmon (and other species) at critically low levels, and with the flows being already significantly regulated. An assumption is that provision for Atlantic salmon (upstream and downstream migration passage etc) in place within the current ESB generation operation is optimal. Given the system is flow-sensitive, small changes matter disproportionately, especially in drought scenarios as observed in 2018. Critically the downstream impacts undertaken as part of this assessment appear to be assumed, not demonstrated, with key regulatory concerns remaining unresolved. In addition IFI and NPWS explicitly highlighted that drought already impacts the downstream ecology.

The assessments do not appear to adequately demonstrate that abstraction is safe for the Lower Shannon under low-flow conditions because downstream ecological impacts are inferred, not modelled. The key risks remain

- flow-sensitive species (e.g. Atlantic salmon and Lamprey sp.),
- reduced dilution capacity and dependence on fixed compensation flow,
- critical uncertainties are not fully taken into account including ESB operational response under stress conditions and ecological thresholds for low flow.

While the environmental assessment is technically robust for hydrology at Lough Derg / Parteen, it is not sufficiently robust for ecological impacts in the Lower Shannon, particularly under drought conditions, climate change scenarios and cumulative system stress.

Hydrological Modelling

The assessment includes long-term simulation of flows and levels over a 52-year period (1972–2023) which considers testing under historical drought conditions (most notably 2018), abstraction rates at 154 Ml/d and 300 Ml/d, and climate change scenarios. The modelling indicates that there will be no significant change to water levels in Lough Derg or Parteen Basin, and that compensation flows (10 m^3/s) can be maintained, and the abstraction is offset by reductions in water used for hydropower generation.

The assessment concludes that there will be no measurable hydrological impact downstream of the tidal limit at Limerick Dock. However, this conclusion is based on system operation assumptions (ESB flow management) and model boundaries rather than detailed downstream hydraulic modelling.

While we are aware that a separate process for evaluating the proposed abstraction licencing regime has yet to be made, our assumption is that a planning decision will be based on the abstraction details contained in this application.

The Lower Shannon is identified as a regulated and already stressed system supporting sensitive species, notably Atlantic salmon where populations are already at approximately 5% of their conservation limits. Reduced counts have been observed during low-flow/drought years. The ecological function of the Lower Shannon is strongly linked to the flow of water, the levels of dissolved oxygen and sediment dynamics.

The assessment undertaken incorporates some cumulative and climate considerations including limited climate change scenarios and cumulative effects (e.g. Ardnacrusha dam regulation, abstraction). It concludes that no significant residual effects after mitigation measures are implemented. However, the climate analysis appears to be undertaken using a system-scale and is not receptor-specific. In addition, ecological responses to compound stressors are not quantified.

The conclusion of no downstream impact is reliant on operational assumptions including ESB maintaining lake levels and compensation flows. However, the system performance under extreme or competing demands is not tested. There is a lack of direct Lower Shannon modelling including no detailed hydraulic or ecological modelling of the Lower Shannon reach. As a result, potential changes in flow variability, velocity, habitat availability are not quantified. There is also a limited assessment of low-flow ecological risk for the lower Shannon.

Climate Change

Although drought scenarios are included there is also no explicit linkage between flow changes and ecological thresholds. This is significant given the known sensitivity of salmon and other species to low-flow conditions. The assimilative capacity of the project for the lower Shannon is not fully addressed with regulatory consultees (IFI and NPWS) identifying the need to assess the downstream dilution capacity. Reduced flows scenarios may increase pollutant concentrations and can affect water quality locally which is not fully quantified. In addition, environmental flow considerations are tested at a high level (sensitivity analysis), however they are not clearly used to constrain abstraction under stress scenarios.

Conclusions

The available evidence indicates that the abstraction can likely be accommodated within the existing regulated Shannon system. Large-scale hydrological changes to Lough Derg and Parteen Basin are minimal and within operational limits. However, for the Lower Shannon there is insufficient evidence to robustly conclude that no impact will occur, particularly under low-flow (drought) conditions, future climate scenarios and cumulative system pressures.

This is because downstream impacts are inferred from system behaviour and are not directly modelled. Ecological sensitivities are acknowledged but not quantitatively assessed and critical thresholds (flow, habitat, water quality) are not explicitly tested.

While the abstraction appears hydrologically manageable at a system scale, the assessment does not adequately demonstrate that the ecological integrity of t Lower River Shannon will be protected under low-flow and climate-stressed conditions. This would require more robust hydraulic and ecological modelling of the Lower Shannon.

Recommendation:

More robust hydraulic and ecological modelling should be undertaken on the Lower River Shannon SAC (002165) and from Limerick Dock (IE_SH_060_0900) to the Upper Shannon Estuary (IE_SH_060_0800) to:

- **quantification of flow changes under abstraction (including % reductions), assessment of ecological thresholds (e.g. Atlantic salmon habitat requirements),**
- **an evaluation of assimilative capacity under reduced flows conditions,**
- **testing of extreme and compound scenarios including a multi-ye drought with abstraction scenarios.**

Other abstraction concerns:

The depth of pipe at the abstraction point was not clear in the documents provided which is an important consideration that can potentially impact the ecology and temperature of the lake if taken at an incorrect level. This would have the effect of abstracting cooler water at lower depth which would impact on the overall temperature of the lake and potentially contribute to pressure on the ecosystem, particularly during the summer.

There is an assumption that Ardnacrusha dam will remain in place for the longer term to ensure a continuous supply of raw water for the project. The dam is

approximately 100 years old and will require maintenance and remedial works during the medium to long-term. Does the planning application sufficiently address this aspect in the context of the overall infrastructure project?

Proposed Community Benefit Scheme

The inclusion of a Community Benefit Scheme as part of the project to support social and economic development under the categories of Economy, Education and the Environment, is to be welcomed. However, it is concerning that the proposed scheme appears to only focus on the construction phase of the project, with Uisce Éireann proposing to close the fund at the end of construction. No proposal has been made in relation to the addressing potential long-term environmental impacts during the lifetime of the project itself. This was highlighted by LAWPRO and others in previous consultations and appears not to have been included in the proposed scheme.

It should be noted that there are examples nationally of other significant infrastructure developments such as windfarm projects that have longer term community gain funds in place. A more expansive community gain fund should therefore be established and funded for the operational lifetime of the project.

Recommendation:

A community gain fund be established and funded for the operational lifetime of the project which is reflective of its long-term environmental impact. The annual level of funding should be increased in line with the consumer price index and reviewed periodically.

Management of Proposed Treatment Plant & Distribution Network

The potential impact of the proposed water treatment plant (to be located at Birdhill, County Tipperary) and the management of same, including any proposed discharges to the local environment, must have appropriate control measures including appropriate risk assessments and risk management practices incorporated to avoid any negative impact to the environment and local ecology. Residual discharges and chemical spills from drinking water treatment plants not managed appropriately have in the past caused significant environment and ecological damage which must be avoided.

Adequate mitigation will be required throughout construction, particularly in sensitive areas along the proposed pipeline route, to avoid negative impacts to surrounding ecology and waterbodies. In addition, subsidence concerns (particularly in peat substrate) will require significant mitigation to protect local

	waterbodies. It is noted that the EIAR has identified specific risks requiring mitigation that will require robust and ongoing management during construction and post construction reinstatement. Consideration should be given to undertaking further investigations on contingency arrangements for water storage to mitigate against potentially large water losses in the event of major leaks, or in situations where abstraction cannot be maintained at the threshold levels
Biodiversity Officer	**Bats** The proposed Uisce Éireann Water Supply Project (WSP) will result in a series — direct and indirect impacts on bat populations within County Tipperary, arising primarily from the construction of the Raw Water Intake and Pumping Station (RWI&PS), the Water Treatment Plant (WTP) at Incha Beg, the Break Pressure Tank (BPT) at Knockanacree, and the associated Treated Water Pipeline. Both EIAR Chapter 8 and Appendix A8.9 (Bat Surveys Report) confirm that County Tipperary contains the highest concentration of bat roosts and bat habitat affected by the project. **Direct Loss of Bat Roosts** EIAR Chapter 8 confirms that all five (5) of the confirmed bat roosts to be removed by the project occur within County Tipperary. This includes: • One building roost at the WTP (Building 1), supporting lesser horseshoe bat, Natterer's bat, and brown long-eared bat • Four tree roosts, including: ▪ Soprano pipistrelle roost at Parteen Woodland ▪ Natterer's day roost at PBR 8 ▪ Common pipistrelle and soprano pipistrelle satellite roosts at PBR 20 No other county along the pipeline route contains sites of confirmed roosts that will be lost.

Indirect loss of Habitat

Tipperary also experiences the highest level of linear habitat loss and woodland loss, affecting commuting, foraging, and ecological connectivity. According to Appendix A8.9 the indirect impacts of proposed project (having implemented mitigation) will have a medium term, slight-moderate negative effect on local bat populations at the county level. Medium-term effects are defined as those that take 7-15 years for functional ecological recovery (EPA, 2022)

Badger

Due to the construction of large infrastructural components including the following:

- Raw Water Intake & Pumping Station – Parteen Basin
- Water Treatment Plant – Incha Beg/Birdhill area
- Break Pressure Tank – elevated Tipperary site
- First section of the Treated Water Pipeline

Tipperary represents the largest area of loss in terms of loss of badger setts, foraging and commuting habitats. The EIAR confirms that project will lead to sett closures, resulting in the displacement of two social groups. While mitigation according to best practice is outlined, research has shown that closure of active setts increases badger foraging range and can act as a pathway for the spread of TB.

Additionally, in relation to Knocknacree there will be an overall loss of 7ha of habitat. This will result in a significant loss of foraging/commuting habitat for badger within this local area. The construction of a new access road will lead to permanent fragmentation of badger habitat (commuting, foraging) and may increase the collision risk where commuting paths intersect the road.

Knocknacree Woodland

Knocknacree is a notable woodland within County Tipperary. Having been continuous tree cover for more than 200 years is supports a diverse range of flora and fauna. In a County such as Tipperary where woodland have been largely fragmented or commercially planted, Knocknacree is of high local value and

provides vital habitat and ecological connectivity for mammals, birds and invertebrates.

Aquatic Species

The proposed abstraction presents significant and insufficiently assessed ecological risks to the already critically stressed Lower Shannon system. With Atlantic salmon populations at roughly 5% of their conservation limits, and other flow-dependent species such as lamprey and eel already extremely vulnerable, even small flow reductions may have harmful effects on, spawning, nursery habitat and migration. However, the EIAR does not provide any species-specific modelling to demonstrate how reduced flows or drought conditions may impact key species.

In addition, the EIAR acknowledges the presence of high-risk aquatic invasive non-native species, including zebra mussel, Asian clam, and destructive crayfish plag[redacted] (which can cause 100% mortality in native crayfish population) yet does not assess how abstraction-related hydrological changes may influence their spread or impact on native fauna such as White Clawed Crayfish.

Unexpected Ecological Conditions during Construction

With regard to projects of this scale, unexpected ecological conditions are likely to occur during construction e.g. new badger setts, otter holts/couches, spawning beds, protected flora, Marsh Fritillary habitat or invasive species. It is also likely that unexpected conditions at the time of construction may require design changes. A high level of monitoring and reporting on the CEMP will be required to ensure that the contractor reports any unexpected ecological findings and updates mitigation as necessary.

A copy of each of the internal department reports is attached as Appendix 1.

PART 6. COMMENTS ON ENVIRONMENTAL IMPACT ASSESSMENT REPORT (EIAR)

6.1 Introduction

This part of the report comments on the content of the EIAR included with the application.

The proposed project comprises Strategic Infrastructure Development (SID) under Section 37A of the Planning and Development Act 2000 (as amended). A notice was served by An Coimisiún Pleanála to Úisce Eireann pursuant to Section 37B(4)(a) of the Planning and Development Act 2000 which confirmed that the project comprises SID. Section 37E of the 2000 Act mandates that applications in respect of which such a notice has been served shall be accompanied by an EIAR in respect of the proposed development.

It is noted that under Chapter 2 and Appendix A2.1 the qualifications and expertise of the authors of/contributors to the EIAR have been provided.

6.2 Comments on the EIAR

6.2.1 Chapter 1 Introduction

The chapter gives an overview of the proposed development, purpose of the EIAR report and requirement to submit an EIAR. The structure of the EIAR is outlined and other relevant assessments included with the application are noted:

- Appropriate Assessment Screening Report
- Natura Impact Statement
- Water Status Impact Assessment Report

Section 1.4 of the EIAR provides an overview of the planning consent process for the project through outlining information on Strategic Infrastructure Development (SID) and the requirement for an abstraction licence from the Environmental Protection Agency (EPA) pursuant to the Water Environment (Abstractions and Associated Impoundments) Act 2022.

It is noted that the impoundment of water in the Parteen Basin, abstraction for power generation and regulation of compensation flows through the Old Shannon channel are subject to a requirement for licencing under the Water Environment (Abstractions and Associated Impoundments) Act 2022.

At a briefing provided to the Council in January 2026, Uisce Eireann confirmed that the project is dependent on the outcome of this licence consent process, which will be led by the ESB. The relationships between these consents including their sequencing, their environmental assessments, including cumulative

effects and the scope of the 'whole'1 project for their respective EIA processes are not considered within this EIAR. This is a matter of concern.

6.2.2 Chapter 2 EIA Process

This chapter provides a detailed description of the EIA process and the legislation that underpins the process. It outlines how data was collected, how significant effects are identified and how the assessment of environmental topics within the various chapters of the EIAR are structured. Key guidance documents that have informed the assessment of significant effects are listed under Section 2.3.

Section 2.5 of this Chapter provides information on the EIA Screening process undertaken by An Comisiun Pleanala that confirmed the project was Strategic Infrastructure Development and therefore required an EIAR. This chapter also sets out scoping measures undertaken as part of the EIAR.

The expertise of the authors of/contributors to the EIAR is outlined in this Chapter with further information provided under Appendix A2.1

The various stages of consultation on the project and previous iterations of the project is outlined under Section 2.11 and a summary of statutory and non-statutory consultation is also included.

The Planning Authority note the EIAR examines the environmental effects of the project through its Construction Phase, Testing and Commissioning Phase (where relevant) and Operational Phase.

The project is designed with a lifespan of 80 to 100 years. The strategic importance of the project is such that there is no plan to decommission the project.

6.2.3 Chapter 3 Consideration of Reasonable Alternatives

Chapter 3 of the EIAR sets out the consideration on alternatives that were examined. The various alternatives examined under previous iterations of the project are outlined under Table 3.2 (reproduced below) of the EIAR, these alternatives range from 2006 to 2016 and were examined prior to the preparation of the National Water Resources Plan (Irish Water 2021 and 2022) including the Eastern and Midlands Plan (Irish Water 2022). A number of these plans were subject to Strategic Environmental Assessment which considered alternatives.

Stage	Date	Description
The Plan – Water Supply Project Dublin Region' Draft (Dublin City Council 2006)	2006	An initial SEA (Phase 1) was published in 2006, following a Feasibility Study of three water supply options which commenced in 2004. The three options comprised: • Liffey / Barrow Conjunctive Use • Lough Ree on the River Shannon

[1] Ref Directive 2011/92/EU as amended

		• Desalination in North County Dublin.
'The Plan – Water Supply Project Dublin Region' Final (Dublin City Council 2008)	2008	Feasibility Studies on the 10 options were completed in 2007/08, in conjunction with the Plan ('The Plan – Water Supply Project Dublin Region') and SEA (Phase 2) process which commenced in early 2008. The SEA (Phase 2) and Appropriate Assessment (AA) processes were carried out in respect of The Plan, thus ensuring that consultation and the environmental significance of the 10 options were considered and informed certain changes to the Plan
Project Need Report (PNR) (Irish Water 2015a)	2015	The PNR confirmed the need for a new water supply source for the Dublin Water Supply Zone and a Benefiting Corridor3 , based on demographic projections, economic assessment of water supply in the regional and national economy, water demand projections and on considerations of resilience of supply
Options Working Paper (OWP) (Irish Water 2015b)	2015	The 10 water supply options, initially considered in The Plan, and subject to SEA and AA, were subsequently reviewed in the OWP. It determined that four of the options identified in The Plan, were technically viable and therefore appropriate to be brought forward for further consideration.
Preliminary Options Appraisal Report (POAR) (Irish Water 2015c)	2015	The POAR set out the detail of the assessment process for the four technically viable options and considered and evaluated them, taking into account preliminary results of investigative surveys and modelling at the time, which had been continuing over the interim period. This consultative assessment was done to identify an Emerging Preferred Option from the four water supply options determined as technically viable in the OWP. The consultative assessment incorporated: • A review of the submissions from the public consultation on the OWP • Investigative studies recommended by the SEA, including a water quality survey and model of Lough Derg and a full geophysical survey of the soil and bedrock conditions at the potential raw water storage site at Garryhinch, County Offaly • A multi-criteria analysis (MCA) of each of the options, based on published criteria reviewed following consultation. The POAR determined that, following investigative surveys, options involving abstraction from the north-east quadrant of Lough Derg, (Option B and F2) did not meet environmental and technical requirements
Final Options Appraisal Report (FOAR) (Irish Water 2016)	2016	The FOAR examined the two remaining options, (abstraction from the River Shannon at the Parteen Basin, and desalination of seawater at the coast in Fingal), providing more detailed assessment of the distribution of impact on residence times under a range of scenarios, and Cost Benefit Analysis of both options

Various alternatives following the preparation of the National Water Resources Plan (Irish Water 2021 and 2022) including the Eastern and Midlands Plan (Irish Water 2022) were examined and the strategic water

supply demands and supplies for the Greater Dublin Area and the eastern and midland regions were considered in the context of the project.

The National Water Resources Plan itself was subject to Strategic Environmental Assessment (SEA) within which environmental alternatives were considered. The alternatives that were considered at that Plan stage included loss management, use management, changes to infrastructure including increased reservoir capacity, increased or new water sources, catchment management approaches, desalination, water transfers, tankering, effluent reuse and other network improvements. The Plan identified abstraction from the Parteen Basin and transfer of treated water to a termination point reservoir in Dublin as a key elements of the preferred approach to address supply demand balance deficits in 37 Water Resource Zones in the Eastern and Midlands Region. It also described ongoing actions which it set out as three pillars of the Plan: Lose Less, Use Less and Supply Smarter. This preferred approach identified in this Plan established the key parameters for the water supply project.

With the higher level alternatives having been previously examined, the following were identified as the main project elements for which alternatives remained open for consideration. These are the elements for which reasonable alternatives have been considered within the EIAR:

- alternative route corridors
  - including constraints analysis
- alternative site locations for key infrastructural facilities
  - including raw water intake & pumping station (RWI&PS), termination point reservoir (TPR), water treatment plant (WTP), break pressure tank (BPT), booster pumping station (BPS), and flow control valve (FCV).
- alternative designs
  - including water treatment technology, process waters management and pipeline designs.
- alternative power supply to line valves
- construction alternatives
  - including construction compounds and pipe storage depots

A detailed text based discussion is provided for each element with maps and tables included to illustrate and summarise the criteria considered and the findings. The criteria include key environmental factors such as likely effects on ecology, surface water, air quality, noise, cultural heritage, landscape and visual, people, soils, geology & hydrology and traffic. The evaluation shows how environmental considerations were taken into account in choosing the preferred option for each element.

The Planning Authority acknowledges the approach taken to examination of alternatives. Noting the significant extent of the project and reliance on energy-intensive infrastructure Tipperary Count Council request An Comisuin Pleanala to ensure an assessment of lower-impact alternatives are considered in accordance with the requirements of the EIA Directive.

6.2.4 Chapter 4- Proposed Project Description

Chapter 4 of the EIAR provides a description of the project. A description of the project is provided under Part 2 of this report. The Planning Authority note that the project has been clearly described in the EIAR.

6.2.5 Chapter 5- Construction and Commissioning

Chapter 5 of the EIAR describes the construction phase of the development (including testing and commissioning of the infrastructure). It also includes an outline of the phasing of construction and commissioning of the development. The information in this Chapter of the EIAR is outlined under Part 2 of this report. The commissioning and construction stages have been clearly described

PART 7. COMMENTS ON ENVIRONMENTAL IMPACT ASSESSMENT REPORT (EIAR)

7.1 Introduction

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It is noted that under Chapter 2 and Appendix A2.1 the qualifications and expertise of the authors of/contributors to the EIAR have been provided.

7.2 Comments on the EIAR

7.2.1 Chapter 1 Introduction

The chapter gives an overview of the proposed development, purpose of the EIAR report and requirement to submit an EIAR. The structure of the EIAR is outlined and other relevant assessments included with the application are noted:

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It is noted that the impoundment of water in the Parteen Basin, abstraction for power generation and regulation of compensation flows through the Old Shannon channel are subject to a requirement for licencing under the Water Environment (Abstractions and Associated Impoundments) Act 2022.

At a briefing provided to the Council in January 2026, Uisce Eireann confirmed that the project is dependent on the outcome of this licence consent process, which will be led by the ESB. The relationships between these consents including their sequencing, their environmental assessments, including cumulative effects and the scope of the 'whole'[2] project for their respective EIA processes are not considered within this EIAR. This is a matter of concern.

[2] Ref Directive 2011/92/EU as amended

7.2.2 Chapter 2 EIA Process

This chapter provides a detailed description of the EIA process and the legislation that underpins the process. It outlines how data was collected, how significant effects are identified and how the assessment of environmental topics within the various chapters of the EIAR are structured. Key guidance documents that have informed the assessment of significant effects are listed under Section 2.3.

Section 2.5 of this Chapter provides information on the EIA Screening process undertaken by An Comisiun Pleanala that confirmed the project was Strategic Infrastructure Development and therefore required an EIAR. This chapter also sets out scoping measures undertaken as part of the EIAR.

The expertise of the authors of/contributors to the EIAR is outlined in this Chapter with further information provided under Appendix A2.1

The various stages of consultation on the project and previous iterations of the project is outlined under Section 2.11 and a summary of statutory and non-statutory consultation is also included.

The Planning Authority note the EIAR examines the environmental effects of the project through its Construction Phase, Testing and Commissioning Phase (where relevant) and Operational Phase.

The project is designed with a lifespan of 80 to 100 years. The strategic importance of the project is such that there is no plan to decommission the project.

7.2.3 Chapter 3 Consideration of Reasonable Alternatives

Chapter 3 of the EIAR sets out the consideration on alternatives that were examined. The various alternatives examined under previous iterations of the project are outlined under Table 3.2 (reproduced below) of the EIAR, these alternatives range from 2006 to 2016 and were examined prior to the preparation of the National Water Resources Plan (Irish Water 2021 and 2022) including the Eastern and Midlands Plan (Irish Water 2022). A number of these plans were subject to Strategic Environmental Assessment which considered alternatives.

Stage	Date	Description
The Plan – Water Supply Project Dublin Region' Draft (Dublin City Council 2006)	2006	An initial SEA (Phase 1) was published in 2006, following a Feasibility Study of three water supply options which commenced in 2004. The three options comprised: • Liffey / Barrow Conjunctive Use • Lough Ree on the River Shannon • Desalination in North County Dublin.
'The Plan – Water Supply Project Dublin Region' Final (Dublin City Council 2008)	2008	Feasibility Studies on the 10 options were completed in 2007/08, in conjunction with the Plan ('The Plan – Water Supply Project Dublin Region') and SEA (Phase 2) process which commenced in early 2008. The SEA (Phase 2) and Appropriate Assessment (AA) processes were carried out in

		respect of The Plan, thus ensuring that consultation and the environmental significance of the 10 options were considered and informed certain changes to the Plan
Project Need Report (PNR) (Irish Water 2015a)	2015	The PNR confirmed the need for a new water supply source for the Dublin Water Supply Zone and a Benefiting Corridor3 , based on demographic projections, economic assessment of water supply in the regional and national economy, water demand projections and on considerations of resilience of supply
Options Working Paper (OWP) (Irish Water 2015b)	2015	The 10 water supply options, initially considered in The Plan, and subject to SEA and AA, were subsequently reviewed in the OWP. It determined that four of the options identified in The Plan, were technically viable and therefore appropriate to be brought forward for further consideration.
Preliminary Options Appraisal Report (POAR) (Irish Water 2015c)	2015	The POAR set out the detail of the assessment process for the four technically viable options and considered and evaluated them, taking into account preliminary results of investigative surveys and modelling at the time, which had been continuing over the interim period. This consultative assessment was done to identify an Emerging Preferred Option from the four water supply options determined as technically viable in the OWP. The consultative assessment incorporated: • A review of the submissions from the public consultation on the OWP • Investigative studies recommended by the SEA, including a water quality survey and model of Lough Derg and a full geophysical survey of the soil and bedrock conditions at the potential raw water storage site at Garryhinch, County Offaly • A multi-criteria analysis (MCA) of each of the options, based on published criteria reviewed following consultation. The POAR determined that, following investigative surveys, options involving abstraction from the north-east quadrant of Lough Derg, (Option B and F2) did not meet environmental and technical requirements
Final Options Appraisal Report (FOAR) (Irish Water 2016)	2016	The FOAR examined the two remaining options, (abstraction from the River Shannon at the Parteen Basin, and desalination of seawater at the coast in Fingal), providing more detailed assessment of the distribution of impact on residence times under a range of scenarios, and Cost Benefit Analysis of both options

Various alternatives following the preparation of the National Water Resources Plan (Irish Water 2021 and 2022) including the Eastern and Midlands Plan (Irish Water 2022) were examined and the strategic water supply demands and supplies for the Greater Dublin Area and the eastern and midland regions were considered in the context of the project.

The National Water Resources Plan itself was subject to Strategic Environmental Assessment (SEA) within which environmental alternatives were considered. The alternatives that were considered at that Plan stage included loss management, use management, changes to infrastructure including increased reservoir

capacity, increased or new water sources, catchment management approaches, desalination, water transfers, tankering, effluent reuse and other network improvements. The Plan identified abstraction from the Parteen Basin and transfer of treated water to a termination point reservoir in Dublin as a key elements of the preferred approach to address supply demand balance deficits in 37 Water Resource Zones in the Eastern and Midlands Region. It also described ongoing actions which it set out as three pillars of the Plan: Lose Less, Use Less and Supply Smarter. This preferred approach identified in this Plan established the key parameters for the water supply project.

With the higher level alternatives having been previously examined, the following were identified as the main project elements for which alternatives remained open for consideration. These are the elements for which reasonable alternatives have been considered within the EIAR:

- alternative route corridors
  - including constraints analysis
- alternative site locations for key infrastructural facilities
  - including raw water intake & pumping station (RWI&PS), termination point reservoir (TPR), water treatment plant (WTP), break pressure tank (BPT), booster pumping station (BPS), and flow control valve (FCV).
- alternative designs
  - including water treatment technology, process waters management and pipeline designs.
- alternative power supply to line valves
- construction alternatives
  - including construction compounds and pipe storage depots

A detailed text based discussion is provided for each element with maps and tables included to illustrate and summarise the criteria considered and the findings. The criteria include key environmental factors such as likely effects on ecology, surface water, air quality, noise, cultural heritage, landscape and visual, people, soils, geology & hydrology and traffic. The evaluation shows how environmental considerations were taken into account in choosing the preferred option for each element.

The Planning Authority acknowledges the approach taken to examination of alternatives. Noting the significant extent of the project and reliance on energy-intensive infrastructure Tipperary Count Council request An Comisuin Pleanala to ensure an assessment of lower-impact alternatives are considered in accordance with the requirements of the EIA Directive.

7.2.4 Chapter 4- Proposed Project Description

Chapter 4 of the EIAR provides a description of the project. A description of the project is provided under Part 2 of this report. The Planning Authority note that the project has been clearly described in the EIAR.

7.2.5 Chapter 5- Construction and Commissioning

Chapter 5 of the EIAR describes the construction phase of the development (including testing and commissioning of the infrastructure). It also includes an outline of the phasing of construction and commissioning of the development. The information in this Chapter of the EIAR is outlined under Part 2 of this report. The commissioning and construction stages have been clearly described.

7.2.6 Chapter 6-Noise and Vibration

7.2.6.1 Issues considered.

This section of the EIAR assesses the potential effects of noise and vibration during construction and operation on the human population. Disturbance effects on ecological receptors and aquatic species are examined in the Biodiversity chapter of the EIAR. Final details of the operational plant at the infrastructure sites is not available and a series of conservative assumptions have been made.

Appraisal methods used for the assessment of noise impacts during construction include Transport Infrastructure Ireland's 2014 Noise Guidelines and BS 5228-1 (BSI 2014a). The latter publication sets recommended noise levels or night time construction works. Different assessment methods have been used due to their suitability to the project element (i.e. for linear elements where construction will progress along the pipeline and the fixed site elements where construction will occur over a longer duration).

Section 6.2.6.1.2 of the EIAR notes that it will be necessary to undertake certain works outside normal working hours such as directional drilling, trenchless crossings and open cut road crossings. These works will be scheduled to avoid peak traffic periods.

Operational noise from fixed site which will contain electrical and mechanical plant that will operate continuously has been assessed against the guidance contained in NG4 2016 (EPA 2016)- EPA Guidance Notes for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities (NG4).

7.2.6.2 Comments on Chapter 6

The EIAR has examined noise and vibration effects from the project elements during construction and operation. Projected noise levels are examined against baseline noise levels taken from noise surveys undertaken in 2017 and 2021. Baseline vibration levels were not recorded due to absence of notable vibration sources.

Construction noise effects from the fixed sites located in Tipperary are not anticipated to exceed recommended construction noise levels. The same applies to noise associated with construction of the pipeline. Where potential for elevated noises and vibration arise due to a requirement for piling or construction during nighttime hours mitigation will be employed to reduce noise levels. In addition monitoring of construction noise levels is proposed at nearest NSLs to the working area which will progress along the length of the project.

Noise impacts arising from the project elements during operation have been considered and no significant effects are anticipated.

Should ACP be inclined to grant this application and in order to ensure noise effects are managed construction should be within normal working hours and no construction activity permitted on Sundays or public holidays save where an exceptional need arises (e.g. to reinstate a road trench) and prior

authorization is obtained from the consenting authority. Operational noise limits should be imposed on the 3 infrastructure sites in Tipperary and noise levels should be monitored to ensure compliance with specified limits.

7.2.7 Chapter 7 -Traffic and Transport

7.2.7.1 Issues considered

Chapter 7 of the EIAR assesses the environmental effects associated with traffic. The considerations hereunder are confined to the project elements that impact on the road network in Tipperary.

The construction of the project is anticipated to run from 2028 through to the works being substantially completed by 2032, with the first operational year anticipated to be 2033

Identified haul roads for the project have been identified in the EIAR. 4 no construction compounds are proposed within Tipperary County Councils (TCC) administrative area, two are identified as principle construction compounds and 2 as satellite construction compounds. One pipe storage depot is proposed and same will require 2 accesses onto the public road.

Principle Construction Compound Locations	**Satellite Construction Compound Locations**	**Pipe Storage Depot**
Construction Compound 1 would be located within the WTP, accessed off the R445	Construction Compound 0 would be located within the site for the RWI&PS and accessed from the R494.	One pipe storage depot is located in Co Tipperary at Carrigatogher and would require 2 access points from theR445
Construction Compound 2 would be located at Lisgarriff accessed from the N52	Construction Compound 3 would be located within the site for the BPT. The site would be accessed from the L1064.	

A number of access points from the public road are required to allow construction access to lay the water pipeline and the locations of same are illustrated on Figures 7.2 to 7.8 of Volume 5 of the EIAR.

During the operational phase of the development permanent access is required for the following project elements in Tipperary

Proposed Raw Water Intake and Pumping Station (RWI&PS) Access	**Water Treatment Plant**	**Break Pressure Tank**

Will be accessed from the R494 via a new T junction entrance	Will be accessed from the R445 via a new T junction entrance	Will be accessed from the L1064 via a new T junction entrance.

The 20m wide Permanent Wayleave over the pipeline will allow access for inspection, operation, maintenance and repair of the pipeline. A number of laybys will be developed along the road edge to allow access to infrastructure (Air valves etc) for ongoing operational maintenance.

7.2.7.2 Comments on Chapter 7

Having examined the considerations on Traffic and Transport the following points of concern arise:

Access onto National Road

1. The proposed construction compound at Lisgarriff will be accessed from the N52 at a point where the 100km speed limit applies. This is in contravention of the Spatial Planning and National Roads Guidelines (2012) and Policy 12-5 of the Tipperary County Development Plan 2022. Access to this compound from the L-5079 should be explored.

Sight Lines

2. Section 7.5.2.3 of the EIAR states that appropriate visibility splays will be provided at the proposed T-junctions at the RWI&PS, WTP and BPT. The drawings that accompany the EIAR do not show visibility splays at the RWI&PS and the WTP. Sightlines are shown on Figure 4.67 at the access junction onto the L1064 to serve the BPT however the drawings scale (1:1250) impairs assessment of the proposals.
3. The new access junctions serving the permanent infrastructure sites will also serve the construction compounds located at the RWI&PS, WTP and BPT. The same concern arises with regard to lack of detail on sightlines at these entrances. The sight line standards as set out under Section 6 of Volume 3, Appendix 6 of the TCDP 2022 apply to new accesses to serve construction compounds.
4. Figure 5.3 provides an indicative layout of the proposed construction compound at Lisgarriff. This compound will be accessed from the N52 via a new entrance at a location where the 100km/hr speed limit applies. The sight lines shown on Figure 5.3 do not satisfy the requirements of the TCDP 2022 and the drawing scale impairs assessment of the proposed visibility splays.
5. 2 no. new entrances are proposed onto the R445 to access the proposed pipe storage depot, which is to be developed on lands to the north and south of the R445. The sight lines shown on Figure 5.9 do not satisfy the requirements of the TCDP 2022 and the drawing scale impairs assessment of the proposed visibility splays.

6. A number of accesses will be developed to the pipeline route. The EIAR notes that where visibility splays cannot be developed the access locations will be manned by banksmen. This requires a high level of resources to properly manage to ensure the safety of these access points on an ongoing basis. Locating the accesses where adequate visibility splays can be provided is the desired approach.

Damage to Road Network

7. Tipperary County Council is concerned with the potential of the scheme to damage the road network during the construction phase. Should permission be considered the following mitigation measures should be included to prevent long term damage:

   i) establish a detailed base line condition of the existing roads which are likely to be impacted by the scheme. The base line study should be carried out in accordance with the 'Guidelines on the Depth if Overlay to be used on Rural Regional and Local Roads' (Orange Book) and should include

   - Falling Weight Deflection (FWD)
   - Pavement Surface Condition Index (PSCI)

   The extent of the survey is dependent on the works activities in the vicinity of the site access points and the existing road construction. The extent of the surveys should be agreed with the Local Authority Roads Section prior to construction works commencing on site.

   ii) Laden HGV's have the potential to damage the existing road at the access /egress points due to the impact of tight turning manoeuvres. The non-bituminous road constructions (surface dressing/wetmix) are especially vulnerable.

   A 100 metre section of the existing non bituminous roads to the access /egress points should be replaced with a bituminous construction, details to be agreed on an individual basis.

   iii) There should be measures and protocols established to prevent overladen vehicles involved in the scheme from using the surrounding road network.

   iv) The construction activity as the 30 Ha Water Treatment Plant is likely to generate large volumes of surplus earthworks which may need to be transported from site. A wheel wash should be installed during the construction phase.

   v) The construction phase is scheduled to last for 126 weeks at a number of access points. Major road defects resulting from the scheme will need to repaired promptly. A bond of €1,620,000 is required to cover the costs of road repairs/reconstruction.

Site Supervision

Uisce Eireann should be required to contribute towards the costs which Local Authorities along the route will incur in monitoring the works as well as responding to queries from the public during the construction phase. A sum of €65,000 per year per Local Authority is recommended to cover these costs.

7.2.8 Chapter 8 Biodiversity

7.2.8.1 Comments on Chapter 8

This chapter of the EIAR examines the likely significant effects, including direct, indirect and in-combination effects, of the construction, commissioning (including testing) and operational phases on the biodiversity within and related to the proposed project area.

The chapter provides background and context-setting information such as summary descriptions of the scope of the assessment, the zone of influence (ZoI) which informed the assessment - with additional specific focus on the ZoI for the water abstraction. The identification of ecological receptors follows the best practice standard of the source-pathway-receptor model. ZoIs are determined per receptor. The ecological receptors focused on form a comprehensive representation of the biodiversity of the receiving environment upon which the proposed project has the potential for impact. The study areas for each ecological receptor are also clearly described with a thorough rationale provided for the chosen extent of each study area.

A thorough description of the desktop and field survey methodologies employed is then provided, (including a literature review of the wintering birds that are known to occur in the study area). All methodologies employed for the field surveys follow best practice standards for data collection and assessment, and are appropriate for the nature and scale of the proposed project and the characteristics of the receiving environment. The field surveys conducted are clearly listed and the methods employed per ecological receptor described in sufficient detail.

The survey effort and timing employed for each receptor are appropriate and follow best scientific knowledge and best practice guidelines, supported and informed by on site observations. There are no "shelf life" issues with the survey data at this stage of the consent process for any of the ecological receptors examined.

The evaluation criteria for ecological receptors and the assessment methodology for significance of effects are provided and both follow best practice standards and guidance for biodiversity chapters of EIARs.

An important consideration for the assessment of ecological impacts of a project of this scale is consideration of the changeable nature of certain elements of the project design, including elements that cannot fully be determined, such as unknown site constraints or obstacles that will only be discovered at the construction phase. Such issues can create gaps that impede or preclude assessment of impacts prior to consent stage. This is taken into consideration in the assessment presented.

A changeable aspect of the construction phase that is not included in this list is culvert locations which are subject to change for similar reasons to outfall locations. This is addressed by a commitment that all culverts will be subject to IFI guidelines as appropriate, and subject to the "*OPW's Section 50 consents (OPW 2021) so*

as not to interfere with upstream and downstream movement of aquatic life or cause an afflux (i.e. backing up of the river increasing the water level)" (paragraph 1060).

The results of the desktop research and field surveys are presented clearly. Following presentation of these results an evaluation of which receptors are the key ecological receptors (KERs) identified in the study area of the proposed project is presented.

The assessment of effects of the construction phase (which includes the testing and commissioning phase) on all KERs examined is then presented.

Following from the assessment of effects, the mitigation and monitoring measures are described for the construction (which includes the testing and commissioning phase) and operational phases. The mitigation measures provided follow best practice standards where necessary and are designed to address each particular source for significant effect identified for each KER in each phase of the project. The mitigation measures provided are sufficient to address the potential impacts identified, they are clearly described, with accountability and reporting measures integrated to ensure their application.

The residual effects to KERs after the application of mitigation measures are then assessed. The assessment states that the mitigation measures proposed ensure that there are no residual significant effects on protected sites (i.e. European sites and Natural Heritage Areas). This is noted. On other ecological receptors, the residual effects assessment finds significant, negative, effects for several habitat types, bat species and badgers. This is expected considering the nature and scale of the proposed project.. All other KERs are found to have no likely significant impacts upon application of mitigation measures.

7.2.8.2 Issues considered

The assessment under this Chapter notes the development will not significantly impact protected sites (i.e. European sites and Natural Heritage Areas). Tipperary County Council consider the risk of impact on Lower Shannon may be more significant than presented for a number of reasons. The ecological system in the Lower River Shannon SAC (002165) and from Limerick Dock, (IE_SH_060_0900) to the Upper Shannon Estuary (IE_SH_060_0800) is already stressed with salmon (and other species) at critically low levels, and with the flows being already significantly regulated. An assumption is that provision for Atlantic salmon (upstream and downstream migration passage etc) in place within the current ESB generation operation is optimal. Given the system is flow-sensitive, small changes matter disproportionately, especially in drought scenarios as observed in 2018. Critically the downstream impacts undertaken as part of this assessment appear to be assumed, not demonstrated, with key regulatory concerns remaining unresolved.

The assessments do not appear to adequately demonstrate that abstraction is safe for the Lower Shannon under low-flow conditions because downstream ecological impacts are inferred, not modelled. The key risks remain

- flow-sensitive species (e.g. Atlantic salmon and Lamprey sp.),
- reduced dilution capacity and dependence on fixed compensation flow,

- critical uncertainties are not fully taken into account including ESB operational response under stress conditions and ecological thresholds for low flow.

The ecological function of the Lower Shannon is strongly linked to the flow of water, the levels of dissolved oxygen and sediment dynamics. The assessment undertaken incorporates some cumulative and climate considerations including limited climate change scenarios and cumulative effects (e.g. Ardnacrusha dam regulation, abstraction). It concludes that no significant residual effects after mitigation measures are implemented. However, the climate analysis appears to be undertaken using a system-scale and is not receptor-specific. In addition, ecological responses to compound stressors are not quantified.

The conclusion of no downstream impact appears reliant on operational assumptions including ESB maintaining lake levels and compensation flows. However, the system performance under extreme or competing demands is not tested. There appears to be a lack of direct Lower Shannon modelling including no detailed hydraulic or ecological modelling of the Lower Shannon reach. As a result, potential changes in flow variability, velocity, habitat availability are not quantified. There appears to be a limited assessment of low-flow ecological risk for the lower Shannon.

Although drought scenarios are included there is also no explicit linkage between flow changes and ecological thresholds. This is significant given the known sensitivity of salmon and other species to low-flow conditions. The assimilative capacity of the project for the lower Shannon is not fully addressed with regulatory consultees (IFI and NPWS) identifying the need to assess the downstream dilution capacity. Reduced flows scenarios may increase pollutant concentrations and can affect water quality locally which is not fully quantified. In addition, environmental flow considerations are tested at a high level (sensitivity analysis), however they are not clearly used to constrain abstraction under stress scenarios.

Although modelling has demonstrated little to no impact in water levels, the results are based on ESB operating bands which is purely based on hydrological regimes rather than ecological requirements.

The report does not adequately assess the impact of draw down on the spatial extent and distribution of littoral habitats which are crucial to qualifying interests of the Lough Derg (Shannon) SPA.

Modelling has also utilised annual mean values which overlook specific times of low flow and drought. As a result, the 2% draw down may not always be correct.

Assessment of Groundwater Dependent Terrestrial Ecosystems (GWDTE) are dependent on the draw down being 2%. As 2% is not a set percentage of extraction, it is possible that the impact on GWDTEs has been incorrectly assessed.

The following parts of the assessment of effects on biodiversity may require further assessment and clarification.

- The assessment of the direct effects of the abstraction of water on key ecological receptors (KERs). This must have full regard to best available scientific literature regarding potential effects of the aforementioned activities, of similar scale, in the context of the predicted effects of climate change in the area, on:
    - - the supporting hydrological system of the KER habitats assessed, and
    - - the supporting habitats of each KER species assessed.
- The assessment of the downstream effects of water abstraction on KERs. This must have full regard to best available scientific literature regarding potential effects of the aforementioned activities, of similar scale, in the context of the predicted effects of climate change in the area, on:
    - - the supporting hydrological system of the KER habitats assessed, and
    - - the supporting habitats of each KER species assessed.

Tipperary County Council note that significant negative, effects for several habitat types, bat species and badgers will arise. The project will result in permanent loss of 5 known bat roost and may cause fragmentation of commuting and foraging corridors. Tipperary County Council understand that derogation licences must be obtained prior to planning consent being given for a development where such derogation licences are required. This is a matter for consideration by An Comisuin Pleanala.

The project will result in permanent loss of 33 known badger setts and may cause localised displacement of badger populations. Tipperary County Council is concerned with the associated risk of the spread of Tuberculosis (TB), the impact of which has not been fully evaluated in the EIAR.

A significant degree of flexibility is proposed in relation to design of various project elements, such as culverts and outfalls and site specific construction techniques, to be decided post consent. While such flexibility is appropriate for a project of this scale, the Planning Authority is of the view that the consent process should ensure that procedures are in place to ensure that the designs of these elements are subject to specified and transparent approval procedures in order to ensure that environmental effects do not exceed those predicted in the EIA process.

The efficacy of proposed mitigation measures, including measures set out in the CEMP, is subject to these measures being correctly implemented. It is noted in this review that the level of specification of many of the proposed measures leaves them open to interpretation, which may fail to ensure that they are effective in practice. Tipperary County Council considers that the consent process should ensure that all such measures are sufficiently clear and enforceable to ensure that they will be implemented to appropriate standards and specifications and that their efficacy will be audited in a transparent and accessible manner to ensure that effects do not exceed those predicted in the EIA process.

The EIAR acknowledges the presence of high-risk aquatic invasive non-native species, including zebra mussel, Asian clam, and destructive crayfish plague (which can cause 100% mortality in native crayfish population) yet does not assess how abstraction-related hydrological changes may influence their spread or impact on native fauna such as White Clawed Crayfish.

Knocknacree is a notable woodland within County Tipperary. Having been continuous tree cover for more than 200 years is supports a diverse range of flora and fauna. In a county such as Tipperary where woodland have been largely fragmented or commercially planted, Knocknacree is of high local value and provides vital habitat and ecological connectivity for mammals, birds and invertebrates. Additionally, in relation to Knocknacree there will be an overall loss of 7ha of habitat. This will result in a significant loss of foraging/commuting habitat for badger within this local area. The construction of a new access road will lead to permanent fragmentation of badger habitat (commuting, foraging) and may increase the collision risk where commuting paths intersect the road.

7.2.9 Chapter 9 Water

Issues considered

Scope & Methodology

The stated scope of the assessment provided in this chapter is to cover *significant effects … on water bodies during the Construction and Operational Phases ….*

For the purposes of this assessment, a water body is any Water Framework Directive (WFD) designated water body, or Other Waterbody (including ponds and lakes), affected by the Construction, Testing and Commissioning or Operational Phase of the Proposed Project, as defined by the study areas set out for each element of the Proposed Project.

For the WFD waterbodies, the assessment addresses effects under the attributes that are required to be considered under the WFD: hydrology and surface water quality; hydromorphology; and surface water supply.

The remainder of the assessment is split into three parts addressing –

- effects of the proposed abstraction of water from the Lower River Shannon catchment on the affected water bodies
- an assessment of the treated water pipeline during the construction and operational phases, including effects arising from watercourse crossings; dewatering during construction; construction compounds and pipe storage depots; and draindown during the operational phase
- an assessment of the construction and operational phases of each of the infrastructure sites and the proposed 38 kV uprate works

This chapter cross refers to Chapter 10 (Soils, Geology and Hydrogeology) as well as various appended reports including a Water Status Impact Assessment Report and a Flood Risk Assessment.

The methodology description includes the definition of the study area and a listing of relevant legislation and guidance. It proceeds to describe data collection methods which include desk based sources and field surveys, including surveys carried out in relation to previous project iterations from 2016 to 2022 and surveys carried out for the current proposal in 2024 and 2025. Survey types included watercourse sampling, walkovers and visual inspections, a hydrographic survey and surface water quality monitoring.

The assessment methodology is described as having been adapted from standard *Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes* (NRA 2009) and as following the statutory EPA guidance. The assessment criteria including criteria for describing the magnitude and significance of effects, as adapted from the given sources, are described in some detail. Hydrological and water quality modelling that was developed to assess the impact of the proposed abstraction on water levels is also described in some detail.

Limitations of the assessment are described, showing how these have been addressed in order to provide an adequate assessment, also allowing for construction flexibility as is appropriate for a project of this nature and scale.

Regarding the proposed abstraction from Parteeen Basin, a detailed hydrological modelling exercise has been conducted to assess the impact of the proposed abstraction on the water levels of Lough Derg lake water body (Derg TN) and Parteen Basin (Derg HMWB) and the pass forward flows released to the Original River Shannon (ORS). Two constant rates of abstraction have been investigated: (i) 154Ml/d, taken to be representative of normal operation demand by the year 2050; and i(i) 300Mld, which is the projected peak need/demand at year 2050. The model was run using data from the period 1 January 1972 to 31 October 2023, allowing the simulation of daily levels and daily flows across this 52-year period with and without the proposed abstraction in place. The model was further developed to incorporate future climate change scenarios to also allow a simulation of the impact with the proposed project in place and including the effects of future climate change on flows on the River Shannon.

As a separate exercise, in order to test whether WFD mitigation measures and / objectives to restore the favourable conservation status of the qualifying interests of the Lower River Shannon SAC would be impeded by the proposed project, a sensitivity analysis was undertaken to apply an outline Eflows approach proposed in a recent study to the model and investigate the potential impacts of future changes in the compensation flow regime. This approach takes account of proposed Eflows releases at Parteen Weir, to take account of the proposed RRBMP measures for the Shannon (lower)_050 and Shannon (lower)_060 candidate HMWBs. An analysis was also carried out for the present compensation flow of 10m3/s.

The scope can be considered to generally encompass all required topics of relevance in the context of the planning consent process. The methodologies can be considered as following best current and emerging practice, have been carried out by competent experts following best practice methodologies and have taken account of EPA consultation inputs.

It is noted that the abstraction aspect of project will also be subject to a separate EPA abstraction licence consent process as required by the Water Environment (Abstractions and Associated Impoundments) Act 2022, as is noted in section 1.4.3 of the EIAR. See earlier comments on this matter.

Receiving Environment

The EIAR presents information on key characteristics of waterbodies at locations of all project elements including construction compounds, pipe storage depots and crossing points including all waterbodies in County Tipperary that are in or downstream of project elements during construction or operation. This information is primarily based on the third cycle status (2019-2024), EPA data available at Catchments.ie (EPA 2024c) and the Environmental Data Exchange Network (EDEN) (EPA 2025). It is supplemented by information collected by field surveys including walkover, water quality sampling, hydrographic and surface water quality monitoring surveys generally carried out during the period from 2015 to 2025.

Information on amenity uses of the waterbodies is also included.

The likely evolution of the baseline is described, taking account of trends and climate change effects.

Potential Effects-Construction

During construction, the major project activities with potential to cause effects on water quality are pipeline trenching, water body crossings, road crossings, construction compounds, pipe storage depots, washout valves and construction at infrastructure sites.

A range of controls are proposed to avoid or mitigate adverse effects due to pipeline trenching. Attenuation ponds, filter drains and dewatering are proposed as part of the trenching works in order to generally keep rates of discharge and of suspended solids and surface water runoff within acceptable levels. There is potential for significant adverse effects of varying magnitude to occur on water quality in conditions of high rainfall where the works cross or are close to sensitive watercourses.

Construction techniques for watercourse crossings include trenchless (pipe jacking, auger boring or horizontal directional drilling) and open cut (damming and fluming or camming and pumping). The pipeline will have some 40 watercourse crossings in County Tipperary of which 21 are crossings of designated waterbodies (i.e. water bodies designated by the EPA as river water bodies under the WFD). It is proposed to use a trenchless technique at one of the crossings, where the route crosses the Nenagh River (Nenagh_070) approximately 3 km north of Nenagh. The choice of trenchless here is because the watercourse is rated as having a very high sensitivity with potential for very significant effects to occur. (*Water quality impacts may contribute to reduction in waterbody WFD classification.*) At other crossings the potential for significant effects is less and open cut techniques are considered appropriate.

A temporary construction road is proposed to run the length of the construction working width for construction traffic. There will generally be a road crossing wherever the pipeline crosses a waterbody, with associated potential to cause significant effects.

Three of the proposed construction compounds and one of the pipe storage depots are located within Tipperary. Two of these construction compounds are in sites of proposed project infrastructure facilities. Where watercourses are present at these sites, some may be culverted for the works duration. This detail is to be determined at a later stage. The assessment in the EIAR considers effects whether they are left open or culverted. Potential effects due to installation of culverts would include increased erosion downstream, alterations of morphological features and natural bed and bank material and effects on impact on sediment and ecological continuity. There is a particularly high level of occurrence of water bodies within 50 m of the pipe storage depot proposed at Carrigatogher (7no. including Kilmastulla (_020) and Ardgregane Stream (_010)). It is predicted that there is potential for significant (medium to high) adverse effects to occur on waterbodies in absence of mitigation.

A proposed 38kV power line crosses a tributary of the Lower Shannon (_050) on the Tipperary / Limerick border. Works here are considered to have potential to cause moderate -significant adverse effects on the waterbody.

Washout valves are proposed to be located at numerous low points along the pipeline. These are for infrequent use, to release pressure from the pipeline to enable maintenance on, for example, air valves, for rare draining of an entire section of pipeline for cleaning. Some will discharge to land and others to watercourses. Many of the latter will be located at pipeline watercourse crossings. They will be buried within concrete chambers with locked manhole covers. Potential effects will be similar to those arising from pipeline crossings: localised changes to the morphological characteristics of the water body, altering the bed and bank; changes in flow and/or water levels due to dewatering of excavations or changes in drainage; potential for silt-laden runoff during excavations for the outfall structure and potential for accidental spillage of oils/chemicals from machinery during the construction process. Potential effects are categorised as low to medium magnitude with significance generally classed as moderate to very significant, according to the sensitivity of watercourses.

Except for the raw water intake and pumping station and the water treatment plant (WTP) access road, none of the proposed infrastructure sites contains, or is near, a water body of a medium, high or very high sensitivity. Potential effects on local drains and ditches include silty water runoff, spillages of pollutants from plant and wastewater discharges from welfare facilities on-site.

In the EIAR it is predicted that construction of the raw water intake and pumping station has potential to cause: significant to profound (significant) effects on water quality in Lough Derg (classified under the WFD as the Derg (Heavily Modified Waterbody)); also very significant downstream effects (affecting Shannon (Lower)_050, and Other Waterbodies WBX002, WBP062 and WBP396) as a result of accidental release of oils and/or increase in silty runoff. Other potential effects from this work are predicted to be negligible.

At the proposed WTP site and environs, there is potential for significant effects to arise due to -

- the proposed construction of a bridge (part of the Kilmastulla_050 WFD designated waterbody) for the WTP access road due to mobilisation of contaminants at the site of a disused filling station. This is predicted as having potential to result in a high magnitude impact very significant adverse effect. Kilmastulla_050 flows into Parteen Basin (Derg HWMB). It is named as the Kilmastulla River on Google Maps. The EIAR states that part of this is known as the Roran watercourse.

There is potential for other significant effects to arise due to the following construction elements, mainly by generation of silty runoff or releases of hydrocarbons or concrete batching materials -

- excavations and plant and machinery working adjacent to and on the bank tops of Kilmastulla_050. The potential effect is assessed as medium adverse and significant.
- surface water drainage (silty waters and/or pollutants) from the WTP site to Kilmastulla_050.

- stormwater runoff along access road to Roran watercourse (Kilmastulla River).
- bridge, flood relief culverts and outfall

Potential effects arising from the above are categorised as low to medium adverse and moderate (significant) to significant.

Temporary morphological changes are considered to have potential to cause build-up of sediment at the temporary dam, leading to localised changes in channel bed morphology, including scour. Their impact is assessed as high adverse magnitude and moderate (significant) for two waterbody crossings.

Access tracks for proposed 38kV uprate works, which will include works on the Limerick Tipperary border are assessed as having potential to cause low to medium magnitude adverse moderate (significant) to very significant effects on surface water quality due to siltation and pollutants and lesser potential to affect hydromorphology.

Testing & Commissioning Phase

During this phase, abstractions are proposed from two WFD designated water bodies in Co Tipperary, Kilmastulla_040 and Nenagh_070. Embedded mitigation measures, including adherence to limits on proportion of source flow abstracted (to generally be within WFD standards) can be anticipated as ensuring that significant effects on river flows will be avoided.

Operational Phase

The main potential operational effects on water are the effects of the proposed abstraction on water levels and flows, on water quality and on hydromorphology in the Shannon and the compliance of such effects with the requirements of the WFD.

The impacts to lake levels and forward flows to the ORS due to the modelled inclusion of the Proposed Project abstraction (as a constant flow of either 154Mld or 300Mld) were found to be barely distinguishable from the baseline case when viewed on level/flow duration curves (a standard hydrological method for comparing long-term data series).

The modelling results show that level regimes of both the Lough Derg (Derg TN) and Parteen Basin (Derg HMWB) lake water bodies are only notably affected by the inclusion of the proposed project during extreme drought periods and in the days immediately after the drought (up to a week) when lake inflow is needed to replenish any deficit in storage caused by the proposed abstraction. From the 52-year model simulation period (1972-2023), the simulated lake levels are only found to be notably affected by the inclusion of the proposed project during the 1995 and 2018 drought events. Therefore, for approximately 99% of the 52-year model simulation period, there are no perceptible impacts to simulated lake levels as a result of the proposed project.

The model demonstrates that the required ORS compensation and fish pass flows downstream can always be met.

The low level of predicted effects is largely attributable to an arrangement with ESB whereby water will be diverted to the proposed abstraction from the flow that would otherwise have been used for electricity generation on a continuous year round basis. This will mean that ESB, in keeping the water level within the NOB (Normal Operating Band) on Lough Derg and within the upper and lower water level on Parteen Basin, will take account of, and respond to, the volume of water abstracted for the proposed project, alongside other relevant considerations such as, maintaining statutory compensation flow of $10m^3/s$ down the old Shannon channel, predicted rainfall and the demand for power and ESB operating practices.

The finding that effects on the Derg TN lake water body and the Derg HMWB are predicted to be not significant is noted.

The lack of significant effects on flow or water levels as a result of the proposed abstraction means there would be no indirect significant effects on water quality or hydromorphology for downstream water bodies; this includes Shannon (lower)_050, Shannon (lower)_060 and Limerick Dock transitional water body.

Effects of changed flow regime through Ardnacrusha on downstream water levels and flow rates in the Ardnacrusha tailrace and at Limerick Dock are predicted to be negligible. This is largely because of the tidal influence on water levels at these downstream locations.

Potential effects of releases from washout valves are addressed by embedded mitigation including; limiting discharge rates and dechlorination to ensure that discharged water is within the limit set by the Salmonid Regulations. Discharges from these valves during maintenance are only anticipated to occur once every 20-30 years.

Potential effects of infrastructural elements including the RWI&PS, WTP and WTP access road will be ameliorated by embedded mitigation with resulting effects generally likely to be minor or insignificant except for changes to hydromorphology arising from culverts.

Mitigation

The design of the project includes various embedded mitigation measures, such as siting of the proposed infrastructure sites to avoid sensitive water features where practicable, drainage design, and controls designed into the washout system. Additional generic and site-specific mitigation measures are proposed where potential for significant effects has been identified.

Construction phase auditing is referred to in the CEMP (Appendix A5.1) however, the CEMP states 'The Contractor will inform Uisce Éireann of any pre-determined thresholds or criteria that are exceeded.' Plans for *Environmental Incident Response* and for *Reporting and Environmental Records* are described in the CEMP. These require additional details and commitments to demonstrate how the implementation of mitigation and monitoring measures will ensure that thresholds or criteria will not be exceeded, so that environmental effects do not exceed what has been predicted in the EIAR. The audit plan should be proactive rather than reactive, identifying action levels at which remedial actions will be triggered rather than aiming to address

exceedances after they occur. It should also ensure transparency of compliance. This should ensure *inter alia* that auditing and monitoring results are presented in an accessible format and not require stakeholders to need to pour through lengthy sheets of data. Details of implementation and reporting should not be left to the discretion of the appointed contractor post consent.

Operational phase mitigation measures include various measures related for control of effects that may otherwise occur due to culverts and outfalls, for example 'limitation of culvert length through design' and 'To monitor the efficacy of the above measures, there will be post project appraisal to identify if there are issues that can be investigated and addressed at an early stage.' If appropriately implemented such measures can be anticipated to be effective. However, as presented in the EIAR they are open to interpretation post consent and do not provide sufficient clarity to ensure that they will be appropriately implemented so as to ensure that environmental effects do not exceed those predicted in the EIAR.

Residual Effects

No significant residual effects are predicted to occur on water as a result of the construction or operation of the proposed project. This finding is generally well supported by the assessment as presented. It is contingent on effective implementation of proposed mitigation and monitoring measures, as discussed in the paragraphs above.

The conclusions of the separate Water Status Impact Assessment Report, which are that the proposed project would not compromise WFD objectives or cause a deterioration in the status of any surface water or groundwater WFD designated water body and/or jeopardise the attainment of good surface water (or good ecological potential) or groundwater status can generally be considered to be well supported.

7.2.9.1 Comments on Chapter 9

Having examined this Chapter Tipperary County Council wish to reiterate the comments made with regard to the Chapter on Biodiversity as these points are also directly relevant to this Chapter.

As noted earlier the impoundment of water in the Parteen Basin, abstraction for power generation and regulation of compensation flows through the Old Shannon channel are subject to a requirement for licencing under the Water Environment (Abstractions and Associated Impoundments) Act 2022. This does not appear to be specifically mentioned in this chapter. See earlier comments regarding this matter and the considerations regarding interrelated impacts and whole project considerations from an EIA perspective.

This is an area that requires detailed consideration by An Comisuin Pleanala. Giventhe important function(s) of the river Shannon and its sensitivity to changes abstraction will require careful management to ensure no significant environmental effects arise.

The project extents interacts with areas at risk of fluvial and pluvial flooding. There is concern with flood risks impacting the project during its construction stage and with whether the mitigation measures proposed can be implemented successfully in times of flood risk.

The development presents significant potential for adverse impacts on existing drainage patterns within the works area and on adjoining lands. This is an area that requires detailed consideration by An Comisuin Pleanala and a commitment from Uisce Eireann to resolve any post construction drainage issues that may arise.

Lough Derg and the Parteen Basin are recognised as having significant alterations and subject to HMWB designation in the 3rd Cycle RBMP (2022-2027). It is appropriate for the assessment provided in the Water Status Impact Assessment Report to take account of this.

7.2.10 Chapter 10 Soils, Geology and Hydrogeology

7.2.10.1 Issues considered

The assessment provided in this chapter follows relevant guidance, best practice methodologies and has been prepared by competent experts.

The chapter examines soil, geological, and hydrogeological constraints, likely effects arising from construction, commissioning and operation and appropriate mitigation measures. It covers soil compaction, contamination risks, geological heritage and groundwater interactions.

Key concerns in relation to elements proposed in County Tipperary include effects arising from the construction working areas for pipeline construction and reinstatement, construction compounds, pipe storage depot and the Raw Water Intake and Pumping Station (RWI&PS) and Water Treatment Plant (WTP). Potential for effects on groundwater and interactions of these with effects on surface water (hydrology) and biodiversity are also significant issues.

The construction flexibility that is allowed for in the design at this stage is generally accounted for in the assessment by taking account of potential variations in order to manage uncertainties.

An extensive baseline data set has been assembled to support the assessment. Gaps exist where access to carry out site investigations was not possible but these gaps do not prevent an adequate assessment of the likely significant effects of the project.

The assessment indicates low ecological sensitivity in the vicinity of the Proposed Project, with no delineated GWDTEs identified. All public and group water schemes and private wells have been taken account of.

The construction phase poses risks to soil and geology, including compaction, land use change, and contamination. It may impact groundwater flow and quality, with specific attention to dewatering and contamination risks.

Effects are generally predicted to be temporary during construction and on implementation of proposed mitigation measures residual effects will be insignificant to slight. Disturbance of soil profile, and permeability are inevitable effects of the linear pipeline construction work but these are generally predicted as likely to be slight adverse effects. Groundwater quality effects are considered slight and not significant.

Mitigation measures have generally been embedded in the project design including measures incorporates in the Construction Environmental Management Plan (CEMP), Soil Management Plan (SMP) and Construction Waste Management Plan (CWBMP). Design measures have been incorporated to ensure that the integrity of the Fort Henry Embankment (a dam) will not be compromised by the construction of the RWI&PS.

7.2.10.2 Comments on Chapter 10

Having examined this Chapter the Planning Authority has the following points of concern:

- A significant degree of flexibility is proposed in relation to design of various project elements, such as culverts and outfalls and site specific construction techniques, to be decided post consent. While such flexibility is appropriate for a project of this scale, the Planning Authority is of the view that the consent process should ensure that procedures are in place to ensure that the designs of these elements are subject to specified and transparent approval procedures in order to ensure that environmental effects do not exceed those predicted in the EIA process.
- The efficacy of proposed mitigation measures, including measures set out in the CEMP, is subject to these measures being correctly implemented. It is noted in this review that the level of specification of many of the proposed measures leaves them open to interpretation, which may fail to ensure that they are effective in practice. The Planning Authority is of the view that the consent process should ensure that all such measures are sufficiently clear and enforceable to ensure that they will be implemented to appropriate standards and specifications and that their efficacy will be audited in a transparent and accessible manner to ensure that effects do not exceed those predicted in the EIA process.
- The project extents interacts with areas at risk of fluvial and pluvial flooding. There is concern with flood risks impacting the project during its construction stage and with whether the mitigation measures proposed can be implemented successfully in times of flood risk.

7.2.11 Chapter 11 Agriculture

7.2.11.1 Issues Considered

Chapter 11 of the EIAR describes the effects of the development on the agricultural environment. Figures 11.2 to 11.57 (Agronomy Impact Assessment Landholding Maps) provide an overview of the land parcels impacted by the project.

There are 164 agricultural parcels within the study area directly impacted by the Planning Application Boundary in Tipperary. 137 land agricultural land parcels come within the infrastructure sites and along the planning application boundary and 27 come within the application boundary associated with the 38kv uprate works. The total project impacts on 543 agricultural parcels. Of the total agricultural land holdings recorded in County Tipperary, the Planning Application Boundary would affect less than 2%.

The construction of the Proposed Project involves the acquisition of a 20m wide Permanent Wayleave through the affected land holdings and a temporary acquisition of land within the Construction Working Width (generally 50m wide inclusive of the 20m wide Permanent Wayleave). All lands within the Construction Working Width would be reinstated to pre-construction condition. Land would be permanently acquired for Line, Washout and Air Valves along the pipeline and land would be required for construction compounds.

Land for the key infrastructure sites and entrances in Tipperary (Raw Water Intake and Pumping Station, Water Treatment Plant and Break Pressure Tank) would be permanently acquired. This includes lands for construction compounds located at these sites. Lands would be temporarily acquired at these sites to facilitate construction. The temporary areas would be returned to the landowners post construction.

Lands at Lisgarriff would be temporary acquired to accommodate the proposed construction compound. And lands a Carrigatogher temporarily acquired to accommodate pipe storage depot. The lands are to be reinstated and returned to the landowner after construction.

Temporary access and egress points located throughout the project will be required to facilitate construction and provision of power to the line valves.

Temporary access is also require for the uprate works to the 38kV works.

While the overall construction programme is expected to last approximately five years, the duration of effect on individual landholdings would generally be limited to a period of 18 to 24 months, depending on the specific location and sequencing of works

7.2.11.2 Comments on Chapter 11

The impact of the development on Agriculture will be greatest during construction, the maximum amount of land take is experienced during this phase as is the greatest disturbance to operational farms. The construction and operational phase will see the loss of land to the project, some of which will be returned post construction and some of which will be permanently lost. The permanent wayleave over the pipeline

and permanent valves will place some ongoing limitations on land use and agricultural practices that can take place within the wayleaves and proximate to valve locations.

The EIAR under Section 11.5.2 sets out measures to mitigate and monitor effects on agriculture during the construction and operational phase of the project.

Noting the findings under Chapter 8 Biodiversity the project presents a risk to agriculture through localized displacement of badgers. The project presents the associated risk of spread of Tuberculosis (TB). This would have a devastating impact on agriculture in Tipperary and may pose risks to human health. A more detailed assessment of this impact on Agriculture is required.

The construction extents of the project are extensive (50 metres wide corridor over a significant length through Tipperary) and impacts mainly on agricultural land. There is potential for lands to be effected post construction with drainage patters altered, land settlement issues and ponding. These impacts have the potential to be significant and adverse. An Comisuin Pleanala is requested to fully appraise the environment effects and associated mitigation measures in this regard.

7.2.12 Chapter 12 Air Quality

7.2.12.1 Issues considered

Chapter 12 of the EIAR examines the environments effects on air quality,.

7.2.12.2 Comments on Chapter 12

The Planning Authority note the considerations presented in this Chapter and have no particular comments to made.

7.2.13 Chapter 13 Climate

7.2.13.1 Issues Considered

Chapter 13 of the EIAR assess the effects of the development on air quality and climate.

7.2.13.2 Comments on Chapter 13

The Planning Authority note the considerations presented in this Chapter. The Planning Authority will rely on An Comisuin Pleanala to examine whether the project is consistent with the climate objectives set out under section 15(1) of the Climate Action and Low Carbon Development Act 2015 Noting the significant extent of the project and reliance on energy-intensive infrastructure Tipperary Count Council request An Comisuin Pleanala to ensure an assessment of lower (climate) impact alternatives are considered in accordance with the requirements of the EIA Directive.

7.2.14 Chapter 14 Population

7.2.14.1 Issues considered

Chapter 14 of the EIAR assess the effects of the development on population. The assessment examines social impacts on communities as well as impacts on the wider economy and tourism. The assessment examines effects on population in the context of the following sub-topics:

- Employment
- Economy
- Community Amenity
- Community Severance and Accessibility
- Tourism
- Land Use and Land-take.

7.2.14.2 Comments on Chapter 14

Section 14.4 of the EIAR sets out the assessment of effects on populations under the above referenced subtopics. The construction phase of the project will see a direct employment benefit to Tipperary with the development of the 3 infrastructure sites, pipeline and associated works where 510 personnel will be involved in construction of the infrastructure sites at peak. This may present local employment opportunities. It would also result in positive benefits to the local economy during the construction phase.

In order to mitigate impacts with community amenity and severance during road trenching works and construction of power cables where roads will remain closed for more than 48 hours Section 14.4.2.4 of the EIAR states:

Where a road needs to be closed and there is no available diversion on the local road network, for example a dead-end access servicing one or more properties, an alternative route or diversion would be provided by providing a temporary road bypass (4m in width) across the Construction Working Width for the duration of the crossing.

While this measure is noted any such new road link and points of connection to public road must demonstrate sightlines as per Tipperary County Council requirements where such access/egress point is not subject to traffic management controls.

During operation the effects of the development on population and economy in Tipperary will be limited. The benefits to population and economic growth associated with a sustainable and resilient water supply will not benefit Tipperary. The opportunity provided by the project to ensure a sustainable and resilient water supply is provided to Tipperary and the Mid-West region is entirely missed. While the inclusion for future offtakes from the pipeline is acknowledged the potential for this to be realised will likely be constrained by competing demand and abstraction limitations. The development of such infrastructure, to

such a significant extent within and through Tipperary without any direct water supply benefits to Tipperary is considered contrary to proper planning and sustainable development

The planning policies and objectives that reference the development as set out under the National Planning Framework – First Revision: April 2025 (Project Ireland 2040) (NPF), the Regional Spatial and Economic Strategy (RSES) for the Southern Region 2020 and the Tipperary County Development Plan 2022 are noted.

A key strategic objective of the above referenced plans is balanced regional development. Investment in quality infrastructure is a priority in achieving balanced regional development. The proposal will result in significant investment in water supply infrastructure that will primarily serve the eastern region, enabling growth in this region. The project will not contribute directly to balanced regional development in the Southern region, or specifically in the Mid-West area.

The RSES 2 year Monitoring Report 2022-2024 notes that planned infrastructure investment under the National Development Plan (NDP) is not fully aligned with the overall objectives of the NPF for balanced regional development (see page 7 of Monitoring Report).

Page 1 of the report notes:

Evidence in this report shows that the vast majority of planned infrastructure investment is being targeted towards the Dublin Metropolitan Area, with a planned underinvestment in the Southern Region as a whole and in our three Metropolitan Areas. Planned investment will determine the major projects that are delivered up the midpoint of the next decade. As a result, current objectives for balanced regional growth to 2040 or beyond are being fundamentally undermined and it is not realistic to assume that NPF growth projections can be delivered in the context of the major disparity in infrastructure investment between Dublin and other areas;

The project promoter Uisce Eireann operate a number of wastewater treatment plants that discharge treated wastewater into waters that drain into Lough Derg/River Shannon, the source of the water supply for the project. Current wastewater capacity registers show deficiencies in wastewater treatment infrastructure (capacity and quality) serving Nenagh, Borrisokane, Ballycommon, Cloughjordan and Silvermines. This is a relevant consideration with regard to effects on population as underinvestment in infrastructure has impaired population growth in the above referenced settlements.

No significant operational effects on community amenity and severance is anticipated during operation of the development.

The EIAR under Table 14.30 attributes no impacts during operation associated with Land Use and Land - take. While the effects outline during construction will endure, the development during operation will impact on land uses that can take place in the wayleave area of the project and these should be accounted for this this Section of the EIAR. It is noted that permanent effects on lands is clearly set out in other sections of the EIAR.

The EIAR notes the development location relative to amenity routes and tourism assets and considers no significant effects on same (located in Tipperary) are anticipated. Tipperary County Council is concerned

with the impact of the Raw Water Intake and Pump Station Infrastructure on tourism (leisure users of the basin) given its location and visual impact on the eastern side of the Parteen basin.. More detailed photomontages should be prepared to better illustrate the impact of this infrastructure.

The EIAR notes the development location relative to amenity routes and tourism assets and considers no significant effects on same (located in Tipperary) are anticipated. Tipperary County Council is however concerned with the impacts on tourism arising from any negative impacts on waters (level and quality) in the Lough Derg/ River Shannon. Degradation in flow conditions, water quality and ecology risks undermining the tourism asset and the associated tourism economy.

7.2.15 Chapter 15 Human Health

7.2.15.1 Issues considered

Chapter 15 of the EIAR examines the environments effects on human health. The considerations of effects on human health covers a broad ranging factor from noise and dust impacts during construction through to land contamination and disease. Identified environmental effects during construction include dust impacts, air quality reduction, noise, pollution to waters, soil contamination, health effects from impacts on farms. The range of effects during operation is less extensive and includes noise, water quality and wider societal impacts.

7.2.15.2 Comments on Chapter 15

Tipperary County Council note the scope the assessment of effects on Human Health. While disease is referenced in this Chapter the project presents a risk of spread of Tuberculosis (TB). This could have a devastating impact on agriculture in Tipperary and pose risks to human health. See earlier comments in this regard.

7.2.16 Chapter 16 Landscape and Visual

7.2.16.1 Issues considered

Chapter 16 of the EIAR assesses the landscape and visual impact of the development. The EIAR includes photomontages that set out representative views of the various elements of the development, the main visual and landscape effects are identified and considered in the pre and post mitigation contexts.

7.2.16.2 Comments on Chapter 16

Of relevance to Tipperary are the photomontages of the 38kv upgrade works, Raw Water Intake and Pumping Station, Water Treatment Plant and Break Pressure Tank and associated Infrastructure. These elements are not located in areas designated as subject to protected views or areas designated as Primary Amenity Areas.

The viewpoints provide representative imagery from a range of distances from the development and illustrate the development as it would be viewed in its landscape context without mitigation and with mitigation measures in place. The EIAR however would benefit from a photomontage of the Raw Water Intake element as it would appear from users of the river channel within the Parteen Basin, the imagery provided fail to properly present this site as it would appear to river users. This is a visually sensitive setting that requires further appraisal.

The elevated landscape position of the Break Pressure Tank at Knockanacree will result in this infrastructure being particularly visible until such a time as the proposed landscaping and screen planting matures.

Tipperary County Council request An Comisuin Pleanala to be satisfied with the landscape and visual impacts of the development noting the foregoing.

7.2.17 Chapter 17 Cultural Heritage

7.2.17.1 Issues considered

Chapter 11 of the EIAR describes the potential impacts on cultural heritage arising from the development. The receiving environment and study area has been identified in the EIAR together with all cultural heritage features in the vicinity of the site. Baseline assessment includes desktop analysis, field surveys, geophysical assessment (which include 2 sites in Tipperary located at Ballyannymore and Ballyanny Lower and archaeological monitoring of site investigations.

The difficulties encountered in compiling information as set out in section 17.2.8 of the EIAR is noted (minor portions of the project site were no accessible at field inspection due refused access from landowners). The proposals for construction flexibility is also noted.

It is noted that the 38 kV Uprate Works would replace an existing overhead powerline no effects anticipated. The water pipeline will be buried and will not presents negative visual impacts on cultural heritage.. Above ground infrastructure within Tipperary is not considered to result in negative environmental effects of significance on cultural heritage given the locations and designs for this infrastructure. Appropriate measures are recommended to mitigate potential construction related impacts such that the residual effects will not be significant or adverse..

7.2.17.2 Comments on Chapter 17

The Planning Authority note the EIAR has considered relevant effects on cultural heritage.

7.2.18 Chapter 18 Material Assets

7.2.18.1 Issues considered

Chapter 18 of the EIAR examines the environments effects on material assets. In this chapter material assets have been defined as utilities infrastructure, transport infrastructure, and industrial land use. The EIAR contains a separate Chapter that examines impacts on agricultural land a (Chapter 11) and impacts on waste management facilities are examined in Chapter 19. Impacts on the Fort Henry Embankment which forms the Parteen Basin impoundment are examined in Chapter 20 (Risk of Major Accidents and/or Disasters).

Section 18.2.9 notes difficulties in obtaining information on some utilities, their location and condition.

7.2.18.2 Comments on Chapter 18

The project design will avoid direct impacts on gas pipelines. No realignment or severance of gas infrastructure is proposed and therefore no interruption to gas services will arise.

No impacts to the 400 Kv, 200kv, 100 kv and 38kv transmission lines that traverses Tipperary will arise. Works to lower voltage lines that require undergrounding or diversion will be undertaken in a manner to ensure supply interruptions are minimized.

The EIAR under Section 18.4.2.3.1 notes that the upgrading works to the electricity transmission infrastructure can be undertaken without impacts on supply. The EIAR also notes that power supply should be maintained when connecting the key infrastructure sites and line valves to the power network. Where continuity of power supply cannot be maintained, impacts will be temporary and localized. Temporary power supply interruptions may arise where the proposed infrastructure sites are being connected to the electricity network.

Impact on communication cable infrastructure is not anticipated to be significant and direct impacts will be avoided in the main.

Significant impacts on existing water supply and wastewater drainage infrastructure is not anticipated. No severance of such infrastructure will be required. In some cases diversion or realignment of existing infrastructure may be required and the impacts of this are accounted for in the EIAR.

Impacts on the road and rail network from the proposed project is accounted for in the EIAR. No interruption of rail services will arise and no impacts on the national road network will arise as trenchless crossing is proposed. Impacts on roads where trench crossing are proposed are accounted for in the EIAR where works will be undertaken to minimize road closure and maintain road use.

7.2.19 Chapter 19 Resources and Waste Management

7.2.19.1 Issues considered

Chapter 19 of the EIAR examines the effects of resource (materials) consumption and landfill void capacity (inert, non-hazardous and hazardous) on the environment as a result of constructing and operating the Proposed Project.

7.2.19.2 Comments on Chapter 19

This chapter of the EIAR accounts for the resource requirements and waste generation and management proposals for the project in detail. It would be desirable that wastes are recovered and re-used where practicable in line with Circular Economy principles and that the overall waste volumes requiring disposal are minimized.

All activities related to the collection, transport, recovery, and disposal of materials will be required to comply with the Waste Management Act 1996 (as amended), including the mandatory use of authorised waste collectors and authorised waste facilities, thereby ensuring that all soil and material movements are fully traceable and environmentally responsible. The project contractor/s must be guided by the Environmental Protection Agency's Best Practice Guidelines on the Preparation of Waste Management Plans for Construction & Demolition Projects, ensuring that all waste/by-product handling follows recognised best practice. Furthermore, the assessment and implementation of the project must consider the National Waste Management Plan for a Circular Economy 2024-2030 to avoid adverse impacts on regional waste infrastructure and capacity.

7.2.20 Chapter 20 Risk of Major Accidents and Disasters

7.2.20.1 Issues considered

Chapter 20 of the EIAR the assessment provided in this chapter can be generally considered as following best practice and has been prepared by competent experts. It considers the potential effects of a range of potential major accidents and natural disasters as well as effects of potential project design failures or other issues with potential to cause environmental effects during construction and operation. The major types considered are –

- Construction Phase > power failure, accidental releases to surface water, ground instability, flooding and impacts on existing assets.
- Operational Phase > pipe failures, fire or storm damage, cyber-attacks, and extreme weather conditions.

Embedded mitigation measures include emergency response plans and pollution control measures, including measures incorporated in the Construction Environmental Management Plan.

Residual risks are categorised as low.

The scope of assessment of effects in this Chapter is noted.

The Planning Authority note the assessment of Risk of Major Accidents or Disasters. The following concerns arise:

- The efficacy of proposed mitigation measures, including measures set out in the CEMP, is subject to these measures being correctly implemented. It is noted in this review that the level of specification of many of the proposed measures leaves them open to interpretation, which may fail to ensure that they are effective in practice. The Planning Authority is of the view that the consent process should ensure that all such measures are sufficiently clear and enforceable to ensure that they will be implemented to appropriate standards and specifications and that their efficacy will be audited in a transparent and accessible manner to ensure that effects do not exceed those predicted in the EIA process.
- The Planning Authority note the project extends primarily through farm land and has potential to disrupt badger setts and increase the spread of Tuberculosis (TB) which would have a devastating impact on agriculture in Tipperary and pose risks to human health. This section of the EIAR does not account for the spread of this disease as a potential disaster.

PART 8. COMMENT ON NATURA IMPACT STATEMENT

The Natura Impact Statement (NIS) examines the likely significant effects, including direct, indirect and in-combination effects, of the construction, commissioning (including testing) and operational phases on the European sites within and related to the proposed project area.

The introduction provides background and context-setting information such as the legislative context for the assessment and the best practice guidance and approaches utilised. The methodology provides a detailed account of the expertise employed in the production of the NIS and assessment of effects therein. The specialists listed, and information provided on their experience, are appropriate for the scale, complexity and potential impacts of the proposed project, in particular regarding impacts on hydrologically sensitive European sites. The mechanism for setting the zone of influence (ZoI) within which European sites have potential to be impacted by the proposed project is described, including describing the ZoI for expected potential impacts on European sites. In addition, a ZoI that specifically focused on the water abstraction in relation to European sites was described. The ZoIs are thoroughly considered and tailored for each potential source for effect arising from the proposed project. The study areas for data collection and subject to subsequent assessment by the NIS, as resulting from the ZoIs, were then described, in the context of the various elements of the proposed project. The study areas that were selected are considered appropriate for the nature of the various elements of the proposed project potential sources for impact on European sites.

A description of the desktop and field survey methodologies employed is provided, including a focused desktop baseline assessment for hydrology. The sources utilised for the general desktop and focused hydrological reviews are comprehensive and collated all the relevant information available in order to provide a robust foundation for informing the field surveys and supporting the NIS assessment. All methodologies employed for the field surveys follow best practice standards for data collection and assessment, and appropriate for the nature and scale of the proposed project and the characteristics of the receiving environment, with regard to European sites. There is an additional focus in the baseline field survey effort on the examination of baseline hydrological, hydrogeological and geotechnical characters relative to European sites and the potential impacts posed by the various proposed project elements – for example, hydrological interactions and water abstraction.

The field survey types, dates and experts employed per survey are clearly listed alongside the survey methods employed per ecological factor (e.g. habitats, botany, birds, aquatic and fisheries etc.) –each described in sufficient detail. The survey effort and timing employed, in addition to the time that has lapsed between the last field surveys conducted for a particular receptor and the application for permission (in other words, the shelf life of a given set of field survey data) are important considerations. The survey effort and timing employed for each factor are appropriate and follow best scientific knowledge and best practice guidelines, supported and informed by on site observations. There are no "shelf life" issues with the survey data at this

stage of the consent process for any of the ecological receptors examined. All limitations which were encountered during the field surveys were clearly discussed. A reasoned conclusion that the limitations described were not considered to have any "material impact" on the assessment and conclusions made is considered to be well supported and accurate. This is followed by a brief and sufficient description of the methodology applied in the assessment of significant effects within the NIS.

An important consideration for the assessment of ecological impacts of a project of this scale is consideration of the changeable nature of certain elements of the project design, including elements that cannot fully be determined, such as unknown site constraints or obstacles that will only be discovered at the construction phase. Such issues can create gaps that impede or preclude assessment of impacts prior to consent stage. This is duly taken into consideration in the assessment as presented here. Elements such as the exact pipeline location vertically and horizontally, the outfall connection and valve locations are listed and discussed, alongside how uncertainties have been considered and taken account of. This is a thorough and transparent approach that reflects best practice standards for such a projects and goes as far as feasible in assessing all known and unknown impacts of a project of such scale. A changeable aspect of the construction phase that is not included in this list is culvert locations which are subject to change for similar reasons to outfall locations. However, this uncertainty is addressed by a commitment that all culverts will be subject to IFI guidelines as appropriate, and subject to the "*OPW's Section 50 consents (OPW 2021) so as not to interfere with upstream and downstream movement of aquatic life or cause an afflux (i.e. backing up of the river increasing the water level)*" (page 287, paragraph 938).

All appropriate consultations were undertaken with the relevant bodies including the National Parks and Wildlife Service, Inland Fisheries Ireland and BirdWatch Ireland. The main areas of concern for the consulted parties were outlined clearly in the NIS and considered in the assessment. This consultation approach is transparent and thorough.

A detailed description of the elements of the proposed project in the construction, commissioning (including testing), operational (including repair and maintenances) phases with potential to impact European sites or connectivity to European sites is then provided – and includes a summary of these interactions with European sites, with supporting mapping. This approach provides a clear representation of the relationship of the relevant elements of the proposed project to European sites and the nature of the relationship, which is an essential factor for presenting a well-supported and transparent baseline to enable an accurate assessment of potential effects on European sites in an NIS.

The description of the receiving environment, as resulting from the field surveys, in terms of hydrological, hydrological and ecological interactions, was described per proposed project element (e.g., the habitat and species therein for the proposed break pressure tank or the proposed water treatment plant) – as opposed to describing the habitats and nesting the project elements within those. Considering the scale and complexity of the proposed project, and multitude of avenues for potential effect on European sites via

hydrological and hydrogeological interactions, this approach is considered appropriate for providing a clear description of the receiving environment related to European sites for each project element.

The consideration of the potential impacts of the construction, commissioning (including testing) phase on European sites is highly detailed and thorough, with all aspects of the proposed project with potential to result in construction phase impacts on European sites examined. Similarly, the consideration of the potential impacts of the operational phase on European sites is highly detailed and thorough, with all aspects of the proposed project with potential to result in operational phase impacts on European sites examined.

The European sites which occur within the ZoI of the proposed project, as previously defined, are then listed and a summary table produced. The European sites listed for assessment are considered appropriate. The assessment of impacts on European sites, is conducted per European site considered, with the recommended mitigation measures and subsequent assessment of residual effect carried out per European site also. This approach is thorough and ensures that again due to the scale and complexity of the proposed project, the potential impacts are considered for each unique European site (and designated species and/or habitats therein), and the mitigation thus applied is similarly considered in a bespoke manner for each European site's sensitivities in view of their Conservation Objectives. The assessment of the impact of the proposed project on each European site, unmitigated, is considered to be well supported, through clear evidence and consideration of each proposed project element on each particular European site. The mitigation designed and applied to the assessed impacts on each European site is thorough, addresses the identified impacts, and ensures there are no adverse impacts remaining.

The in-combination assessment considers all other projects that have the potential to impact European sites in-combination with the proposed project. The methodology of the in-combination effects assessment is clearly stated and follows best practice. The plans and projects assessed are the result of a thorough examination of other plans and projects which could interact with the proposed project. Each plan or project is considered individually for potential effects, the required mitigation applied as necessary, and a statement as to any remaining impacts, of which the NIS assessed their being none remaining. This in-combination assessment is considered to be extensive and thorough and appropriate for the scale of the proposed project and extent of interactions with other plans and projects.

The Natura Impact Statement follows the requirements of the legislation, and the procedures set out in the relevant guidance. There is an appropriate level of detail related to the sources for potential effects on European sites and sufficient consideration given to sensitivities of European sites relative to these potential effects, in the context of the relevant aspects of the proposed development.

Issues pointed out in the assessment of effects of the proposed abstraction on water and biodiversity (see comments on Chapters 8 and 9 of the EIAR) may undermine the assessment of interactions of such effects on European sites. The following parts of the assessment of significant effects on European sites require further assessment and clarification.

The assessment of the direct effects of the abstraction of water on European sites. This must have full regard to best available scientific literature regarding potential effects of the aforementioned activities, of similar scale, in the context of the predicted effects of climate change in the area, on:

- the supporting hydrological system of the qualifying interest habitats assessed, and

- the supporting habitats of each qualifying interest species and special conservation interest species assessed.

The assessment of the downstream effects of water abstraction on European sites must have full regard to best available scientific literature regarding potential effects of the aforementioned activities, of similar scale, in the context of the predicted effects of climate change in the area, on:

- the supporting hydrological system of the qualifying interest habitats assessed, and

- the supporting habitats of each qualifying interest species and special conservation interest species assessed.

PART 9. COMMUNITY GAIN PROPOSALS

The application includes for a Community Benefit Scheme. This involves establishment of a Community Gain Investment Fund (by Uisce Éireann) to support community-based initiatives during the construction phase of the project.

Uisce Eireann will act as Fund Sponsor with the Local Authority acting as Fund Administrator and Allocator. It is proposed that Tipperary receive 52% of the total funding allocated under the scheme, and that the funding is targeted to priority areas within 5km of the proposed infrastructure. The fund duration is aligned with the proposed project construction period anticipated to be five (5) years.

Tipperary County Council has the following concerns with the examined the Community Benefit Scheme proposals:

1. The project is a once in a generational project and will be in operation indefinitely. The Community Gain proposals align with the proposed 5 year project construction period and will close thereafter, whereas community impacts will be in perpetuity.
2. Communities in Tipperary will be effected by the project but will not directly benefit from the project. The benefit will arise in other parts of the Country where other communities will see the direct benefits of a sustainable water supply in addition to an apportionment of the community benefit fund. Noting this, Tipperary County Council consider the Community Gain Investment Fund should endure for the lifetime of the project. An Comisuin Pleanala are requested to note the community benefit fund associated with the Dublin Waste to Energy Development which contained an upfront sum and ongoing annual contribution.
3. The proposals for apportionment of the fund between Local Authorities is clearly set out. However, the fund that Uisce Eireann intend to allocate to the project has not been identified. This is concerning and limits proper consideration of the proposals.
4. The preferred proposals for Governance and Administration show the Local Authority will act as fund administrator, allocator and promoter. This presents the following concern:
    - The overall fund amount the local authority will be required to administer is unknown.
    - The staff resourcing required to administer the fund cannot be determined in the absence of the fund amount.
    - It is unclear whether staff costs to undertake the fund administration will be covered by Uisce Eireann and will be separate to the fund.
5. The Community Gain Investment Fund must operate for the greatest benefit of the community over the long term and it must also deliver real outcomes. The proposed fund timeline limit of

5 years is unnecessarily restrictive and will impair long term community benefit arising. In addition the terms of reference for the scheme lack clarity and the suggested geographical limit of 5km is too restrictive.

6. The proposed future off take points are not of any direct value to Tipperary and must not be considered as providing a Community Benefit.

Tipperary County Council request An Comisuin Pleanala to ensure the foregoing points of concerns are considered and resolved. An appropriately worded planning condition must be attached to any grant of permission for the project requiring the establishment of a Community Benefit Fund that endures beyond the construction stage of the development.

Tipperary County Council consider a Community Benefit Fund amount of 0.35% of the project construction costs(or no less than 10,000,000) to be delivered through the construction years of the development) together with an annual contribution of €0.01 per m3 of water abstracted would be a reasonable and proportionate requirement noting the significance of the project and its impact.

The geographical spread of the fund should extend to all lakeside communities, particularly those experiencing water supply deficiencies. The administration of the scheme should rest with Uisce Eireann unless the concerns with regard to resourcing the Local Authority to act as fund administrator are addressed.

PART 10. KEY ISSUES AND OVERALL CONSIDERED VIEW

10.1 Introduction

All of the foregoing forms the basis of the content of this part of the report. Below are the key issues and considered views of Tipperary County Council regarding the effects of the development on the environment and on the proper planning and sustainable development of the area. This part of the report should be read in conjunction with the foregoing parts of this report.

10.2 Benefit to Tipperary

Should permission be granted the proposed development will provide a water supply source that will be of significant strategic benefit to the Eastern and Midland region. The Mid West region and Tipperary will not directly benefit from the project. There are water supply and quality constraints effecting a number of areas in Tipperary that are supplied by Uisce Eireann infrastructure, these constraints are impacting settlement growth in Tipperary. The opportunity provided by the project to ensure a sustainable and resilient water supply is provided to Tipperary has been entirely missed. While the inclusion for future offtakes from the pipeline is acknowledged the potential for this to be realised will likely be constrained by competing demand and abstraction limitations. The development of such infrastructure, to such a significant extent within and through Tipperary without any direct water supply benefits to Tipperary is considered contrary to proper planning and sustainable development. Should An Comisuin Pleanla consider granting permission Tipperary County Council request that the reasoning and considerations supporting the decision to grant fully engages with this point of concern and demonstrates considerations against the relevant policies and objectives contained in the NPF, RSES and Tipperary County Development Plan 2022.

The project promoter Uisce Eireann operate a number of wastewater treatment plants that discharge treated wastewater into waters that drain into Lough Derg/River Shannon, the source of the water supply for the project. Current wastewater capacity registers show deficiencies in wastewater treatment infrastructure (capacity and quality) serving Nenagh, Borrisokane, Ballycommon, Cloughjordan and Silvermines (notwithstanding current and planned upgrades in some instances). It is incumbent on Uisce Eireann to address the wastewater deficiencies at these plants in the immediate term, particularly given that same are contributing to deterioration of waters that will supply the proposed project. Addressing wastewater deficiencies must ensure the wastewater plant capacity allows for the growth strategy contained in the Tipperary County Development Plan 2022. Prioitising investment in wastewater deficiencies in Tipperary would commence the process of addressing imbalances in enabling infrastructure on which balanced regional development is dependent.

10.3 Balanced Regional Development and Planning Policy

The planning policies and objectives that reference the development as set out under the National Planning Framework – First Revision: April 2025 (Project Ireland 2040) (NPF), the Regional Spatial and Economic Strategy (RSES) for the Southern Region 2020 and the Tipperary County Development Plan 2022 are noted.

A key strategic objective of the above referenced plans is balanced regional development. Investment in good quality infrastructure is a priority in achieving balanced regional development. The proposal will result in significant investment in water supply infrastructure that will primarily serve the eastern region, enabling growth in this region. The project will not contribute directly to balanced regional development in the Southern region, or specifically in the Mid-West area. Aligned with the points made in Section 9.2 the development of such infrastructure in the manner proposed is considered contrary to the objectives of achieving balanced regional development as set out in the RSES and NPF.

The RSES 2 year Monitoring Report 2022-2024 notes that planned infrastructure investment under the National Development Plan (NDP) is not fully aligned with the overall objectives of the NPF for balanced regional development (see page 7 of Monitoring Report).

Page 1 of the report notes:

Evidence in this report shows that the vast majority of planned infrastructure investment is being targeted towards the Dublin Metropolitan Area, with a planned underinvestment in the Southern Region as a whole and in our three Metropolitan Areas. Planned investment will determine the major projects that are delivered up the midpoint of the next decade. As a result, current objectives for balanced regional growth to 2040 or beyond are being fundamentally undermined and it is not realistic to assume that NPF growth projections can be delivered in the context of the major disparity in infrastructure investment between Dublin and other areas;

The application includes for future offtakes from the pipeline. While this provision is noted it does not satisfactorily address the above noted concerns and must be fully examined in the context of competing demand, abstraction limitation, whether it is technically possible for such off-takes to be provided and whether the identified locations are optimum from a future supply perspective.

10.4 Water Supply Project and ESB Licencing requirement at Ardnacrusha/Parteen Basin

The project will require an abstraction licence from the EPA under the Water Environment (Abstractions and Associated Impoundments) Act 2022. It is noted that the impoundment of water in the Parteen Basin by the ESB, abstraction for power generation and regulation of compensation flows through the Old Shannon channel are also subject to a requirement for licencing under the Water Environment (Abstractions and Associated Impoundments) Act 2022.

At a briefing provided to the Council in January 2026, Uisce Eireann confirmed that the project is dependent on the outcome of the ESB led licence consent application.

The relationships between these consents including their sequencing, their environmental assessments, including cumulative effects and the scope of the 'whole'[3] project for their respective EIA processes are not considered within this EIAR. This is a matter of significant concern given the inter-related issues involved.

[3] Ref Directive 2011/92/EU as amended

10.5 Impacts on water and ecology of the Parteen Basin/Lough Derg/ River Shannon

Lough Derg and the River Shannon is an important and sensitive waterbody. It carries a number of habitat designations along its length through Tipperary (SAC, SPA, NHA) and both upstream and downstream. It provides important functions for the economy, tourism, amenity, leisure and angling. The development has potential to directly, negatively and significantly impact on this waterbody and on its tributaries during construction and operation. An Comisuin Pleanala must be satisfied that the development will not result in significant negative effects on the Shannon and its tributaries, its protected habitats and species and its important functions.

Of particular concern is the abstraction which is identified in the EIAR as approximately 2% of the long term annual average flow through Parteen Basin. Should permission be considered An Comisuin Pleanala must ensure that operational abstraction from the Parteen Basin and impacts on water levels and ecology are comprehensively considered and determined not to adversely or negatively impact on water levels and dependent ecosystems.

This is an area of particular complexity with significant competing demands and complex environmental effects. As noted in section 9.2 this abstraction relationship requires consideration in the licencing consent process for the ESB infrastructure including due consideration, *inter alia*, of cumulative effects and the scope of the 'whole' project for EIA purposes.

Tipperary County Council consider the risk of impact on Lower Shannon may be more significant than presented for a number of reasons. The ecological system in the Lower River Shannon SAC (002165) and from Limerick Dock, (IE_SH_060_0900) to the Upper Shannon Estuary (IE_SH_060_0800) is already stressed with salmon (and other species) at critically low levels, and with the flows being already significantly regulated. An assumption is that provision for Atlantic salmon (upstream and downstream migration passage etc) in place within the current ESB generation operation is optimal. Given the system is flow-sensitive, small changes matter disproportionately, especially in drought scenarios as observed in 2018. Critically the downstream impacts undertaken as part of this assessment appear to be assumed, not demonstrated, with key regulatory concerns remaining unresolved.

The assessments do not appear to adequately demonstrate that abstraction is safe for the Lower Shannon under low-flow conditions because downstream ecological impacts are inferred, not modelled. The key risks remain

- flow-sensitive species (e.g. Atlantic salmon and Lamprey sp.),
- reduced dilution capacity and dependence on fixed compensation flow,
- critical uncertainties are not fully taken into account including ESB operational response under stress conditions and ecological thresholds for low flow.

The ecological function of the Lower Shannon is strongly linked to the flow of water, the levels of dissolved oxygen and sediment dynamics. The assessment undertaken incorporates some cumulative and climate considerations including limited climate change scenarios and cumulative effects (e.g. Ardnacrusha dam

regulation, abstraction). It concludes that no significant residual effects after mitigation measures are implemented. However, the climate analysis appears to be undertaken using a system-scale and is not receptor-specific. In addition, ecological responses to compound stressors are not quantified.

The conclusion of no downstream impact is reliant on operational assumptions including ESB maintaining lake levels and compensation flows. However, the system performance under extreme or competing demands is not tested. There is a lack of direct Lower Shannon modelling including no detailed hydraulic or ecological modelling of the Lower Shannon reach. As a result, potential changes in flow variability, velocity, habitat availability are not quantified. There is also a limited assessment of low-flow ecological risk for the lower Shannon.

Although drought scenarios are included there is also no explicit linkage between flow changes and ecological thresholds. This is significant given the known sensitivity of salmon and other species to low-flow conditions. The assimilative capacity of the project for the lower Shannon is not fully addressed with regulatory consultees (IFI and NPWS) identifying the need to assess the downstream dilution capacity. Reduced flows scenarios may increase pollutant concentrations and can affect water quality locally which is not fully quantified. In addition, environmental flow considerations are tested at a high level (sensitivity analysis), however they are not clearly used to constrain abstraction under stress scenarios.

The EIAR would benefit from additional information on:

- likely effects on water levels and flows downstream of the abstraction, including in tidal reaches downstream of Ardnacrusha, particularly in periods of low flow, in context of diurnal tidal regime and assessment of significance of same for hydrological regime including water quality and interactions with biodiversity.
- likely effects of proposed abstraction on frequency of occurrences and durations of low water levels in Parteen Basin and Lough Derg and assessment of significance of same for the hydrological regime including water quality and interactions with biodiversity.
- operational procedures including: criteria for reduction/cessation of abstraction during and after periods of low flow; and relationships with and dependencies on, ESB operational procedures and required EPA licencing. See earlier comments on this matter.

Lough Derg and the Parteen Basin are recognised as having significant alterations and subject to HMWB designation in the 3rd Cycle RBMP (2022-2027). It is appropriate for the assessment provided in the Water Status Impact Assessment Report to take account of this.

Although modelling has demonstrated little to no impact in water levels, the results are based on ESB operating bands which is purely based on hydrological regimes rather than ecological requirements.

The report fails to adequately assess the impact of draw down on the spatial extent and distribution of littoral habitats which are crucial to qualifying interests of the Lough Derg (Shannon) SPA.

Modelling has also utilised annual mean values which overlook specific times of low flow and drought. As a result, the 2% draw down may not always be correct.

Assessment of Groundwater Dependent Terrestrial Ecosystems (GWDTE) are dependent on the draw down being 2%. As 2% is not a set percentage of extraction, it is possible that the impact on GWDTEs has been incorrectly assessed.

The impact of this project on the WFD cannot be fully assessed given the uncertainty regarding the data used for the modelling exercise.

10.6 Biodiversity

The points made in the foregoing sub-section are directly relevant to ecology and biodiversity in the river Shannon and should be fully engaged with by An Comisuin Pleanala in consideration of impacts on Biodiversity and in undertaking Appropriate Assessment of the project.

In addition to the foregoing matters significant negative, effects for several habitat types, bat species and badgers will arise. The project will result in permanent loss of 5 known bat roost and may cause fragmentation of commuting and foraging corridors. Tipperary County Council understand that derogation licences must be obtained prior to planning consent being given for a development where such derogation licences are required.

The project will result in permanent loss of 33 known badger setts and may cause localised displacement of badger populations. Tipperary county council is concerned with the associated risk of the spread of Tuberculosis (TB), the impact of which has not been fully evaluated in the EIAR.

The EIAR acknowledges the presence of high-risk aquatic invasive non-native species, including zebra mussel, Asian clam, and destructive crayfish plague (which can cause 100% mortality in native crayfish population) yet does not assess how abstraction-related hydrological changes may influence their spread or impact on native fauna such as White Clawed Crayfish.

Knocknacree is a notable woodland within County Tipperary. Having been continuous tree cover for more than 200 years is supports a diverse range of flora and fauna. In a County such as Tipperary where woodland have been largely fragmented or commercially planted, Knocknacree is of high local value and provides vital habitat and ecological connectivity for mammals, birds and invertebrates. Additionally, in relation to Knocknacree there will be an overall loss of 7ha of habitat. This will result in a significant loss of foraging/commuting habitat for badger within this local area. The construction of a new access road will lead to permanent fragmentation of badger habitat (commuting, foraging) and may increase the collision risk where commuting paths intersect the road.

10.7 Concern with Clarity, Transparency and Efficacy of Mitigation in the EIAR

The EIAR and NIS provide a comprehensive suite of measures to mitigate against significant negative effects on waters, biodiversity, soils, geology etc. Such measures are strongly relied on to mitigate against significant effects and implementation of the measures will require a high degree of effort, precision and oversight. The efficacy of proposed mitigation measures is subject to these measures being correctly implemented. The level of specification of many of the proposed measures leaves them open to interpretation, which may fail to ensure that they are effective in practice.

For example:

- Construction phase auditing is referred to in the CEMP (Appendix A5.1) however, the CEMP states 'The Contractor will inform Uisce Éireann of any pre-determined thresholds or criteria that are exceeded. Details of implementation and reporting should not be left to the discretion of the appointed contractor post consent.
- Operational phase mitigation measures include various measures related to control of effects that may otherwise occur due to culverts and outfalls, for example 'limitation of culvert length through design' and 'To monitor the efficacy of the above measures, there will be post project appraisal to identify if there are issues that can be investigated and addressed at an early stage.'

  These measures are open to interpretation post consent and do not provide sufficient clarity.

Tipperary County Council request that the consent process should ensure that all such measures are sufficiently clear and enforceable to ensure that they will be implemented to appropriate standards and specifications and that their efficacy will be audited in a transparent and accessible manner to ensure that effects do not exceed those predicted in the EIA process.

The consent process should ensure that procedures are in place to ensure that the designs of any elements that are unspecified at this time are subject to specified and transparent approval procedures in order to ensure that environmental effects do not exceed those predicted in the EIA process.

The project extents interacts with areas at risk of fluvial and pluvial flooding. There is concern with flood risks impacting the project during its construction stage and with whether the mitigation measures proposed can be implemented successfully in times of flood.

10.8 Impact on Agriculture/ Land / Spread of Disease

Table 8.1 of the Tipperary County Development Plan 2022 show Agriculture as a key employment sector in Tipperary. Section 8.4 of said Plan notes that Tipperary is internationally renowned for its agriculture, horticulture and bloodstock industry. Any threat to this industry should be resisted.

The Planning Authority note the project extends primarily through farm land and will disrupt badger setts (As outlined inn Biodiversity Chapter of EIAR). This presents an increased risk of the spread of Tuberculosis (TB) which would have a devastating impact on agriculture in Tipperary and beyond and may

pose risks to human health. The Planning Authority request A Comisuin Pleanala to fully examine the effects associated with this concern.

The EIAR under Table 14.30 attributes no impacts during operation associated with Land Use and Land - take. The development during operation will impact on land uses that can take place in the wayleave area of the project and these should be accounted for this this Section of the EIAR. It is noted that permanent effects on lands is clearly set out in other sections of the EIAR

10.9 Impact on Roads / Traffic

i) Access onto National Road

The proposed construction compound at Lisgarriff will be accessed from the N52 at a point where the 100km speed limit applies. This is in contravention of the Spatial Planning and National Roads Guidelines (2012) and Policy 12-5 of the Tipperary County Development Plan 2022 and should not be permitted. There scope for access to this compound from the L-5079 should be explored.

ii) Sight Lines

Section 7.5.2.3 of the EIAR states that appropriate visibility splays will be provided at the proposed T-junctions at the RWI&PS, WTP and BPT. The drawings that accompany the EIAR do not show visibility splays at the RWI&PS and the WTP. Sightlines are shown on Figure 4.67 at the access junction onto the L1064 to serve the BPT however the drawings scale (1:1250) impairs assessment of the proposals.

The new access junctions serving the permanent infrastructure sites will also serve the construction compounds located at the RWI&PS, WTP and BPT. The same concern arises with regard to lack of detail on sightlines at these entrances. The sight line standards as set out under Section 6 of Volume 3, Appendix 6 of the TCDP 2022 apply to new accesses to serve construction compounds.

Figure 5.3 provides an indicative layout of the proposed construction compound at Lisgarriff. This compound will be accessed from the N52 via a new entrance at a location where the 100km/hr speed limit applies. The sight lines shown on Figure 5.3 do not satisfy the requirements of the TCDP 2022 and the drawing scale impairs assessment of the proposed visibility splays.

2 no. new entrances are proposed onto the R445 to access the proposed pipe storage depot, which is to be developed on lands to the north and south of the R445. The sight lines shown on Figure 5.9 do not satisfy the requirements of the TCDP 2022 and the drawing scale impairs assessment of the proposed visibility splays.

A number of accesses will be developed to the pipeline route. The EIAR notes that where visibility splays cannot be developed the access locations will be manned by banksmen. This requires a high level of resources to properly manage to ensure the safety of these access points on an ongoing basis. Locating the accesses where adequate visibility splays can be provided is the desired approach.

In order to mitigate impacts with community amenity and severance during road trenching works and construction of power cables where roads will remain closed for more than 48 hours Section 14.4.2.4 of the EIAR states:

- *Where a road needs to be closed and there is no available diversion on the local road network, for example a dead-end access servicing one or more properties, an alternative route or diversion would be provided by providing a temporary road bypass (4m in width) across the Construction Working Width for the duration of the crossing.*

While this measure is noted any such new road link and points of connection to public road must demonstrate sightlines as per Tipperary County Council requirements where such access/egress point is not subject to traffic management controls.

iii) Damage to Road Network

Tipperary County Council is concerned with the potential of the scheme to damage the road network during the construction phase. The following mitigation measures should be included to prevent long term damage:

i) establish a detailed base line condition of the existing roads which are likely to be impacted by the scheme. The base line study should be carried out in accordance with the 'Guidelines on the Depth if Overlay to be used on Rural Regional and Local Roads' (Orange Book) and should include

- Falling Weight Deflection (FWD)
- Pavement Surface Condition Index (PSCI)

The extent of the survey is dependent on the works activities in the vicinity of the site access points and the existing road construction. The extent of the surveys should be agreed with the Local Authority Roads Section prior to construction works commencing on site.

ii) Laden HGV's have the potential to damage the existing road at the access /egress points due to the impact of tight turning manoeuvres. The non-bituminous road constructions (surface dressing/wetmix) are especially vulnerable.

A 100 metre section of the existing non bituminous roads to the access /egress points should be replaced with a bituminous construction, details to be agreed on an individual basis.

iii) There should be measures and protocols established to prevent overladen vehicles involved in the scheme from using the surrounding road network.

iv) The construction activity as the 30 H Water Treatment Plant is likely to generate large volumes of surplus earthworks which may need to be transported from site. A wheel wash is required at this site.

iv) The construction phase is scheduled to last for 126 weeks at a number of access points. Major road defects resulting from the scheme will need to repaired promptly. A bond of €540,000 to be put in place for road repairs/reconstruction.

i) Uisce Eireann should be required to contribute towards the costs which Local Authorities along the route will incur in monitoring the works as well as responding to queries from the public during the construction phase. A sum of €65,000 per year per Local Authority is recommended to cover these costs.

10.10 Tourism

Lough Derg and the River Shannon are significant tourism assets for the region and their importance is fully recognised in the Tipperary County Development Plan 2022 (Section 9.3.1, Section 9.4, Objective 9-C, Objective 9-F). Lough Derg and the River Shannon supports a number of tourist industries including angling, water sports, blueways and ecclesiastical tourism.

The EIAR notes the development location relative to amenity routes and tourism assets and considers no significant effects on same (located in Tipperary) are anticipated. The Planning Authority is however concerned with the impacts on tourism arising from any negative impacts on waters (level and quality) in the Lough Derg/ River Shannon. Degradation in flow conditions, water quality and ecology risks undermining the tourism asset and the associated tourism economy.

The impact of the Raw Water Intake and Pump Station Infrastructure on tourism (leisure users and anglers) given its location and visual impact on the eastern side of the Parteen Basin is also of concern. The impact during construction will be significantly greater than post construction.

The earlier points of concern (water, biodiversity) are also relevant to the projects effects on tourism.

10.11 Landscape Impact

The Raw Water Intake and Pumping Station site is in a visually sensitive location adjoining the Parteen Basin. The EIAR would benefit from more detailed photomontages of this site as it would appear from users of the river channel within the Parteen Basin. The photomontage submitted is too distant to allow an informed assessment of the visual/landscape impact of this element of the project.

The elevated landscape position of the Break Pressure Tank at Knockanacree will result in this infrastructure being particularly visible until such a time as the proposed landscaping and screen planting matures. Should permission be granted all landscaping commitments contained in the EIAR to be implemented in full and landscaping/ boundary screening should implemented in the first planting season following commencement of the project.

10.12 Waste Management

All activities related to the collection, transport, recovery, and disposal of materials will be required to comply with the Waste Management Act 1996 (as amended), including the mandatory use of authorised waste collectors and authorised waste facilities, thereby ensuring that all soil and material movements are fully traceable and environmentally responsible. The project contractor/s must be guided by the Environmental Protection Agency's Best Practice Guidelines on the Preparation of Waste Management Plans for Construction & Demolition Projects, ensuring that all waste/by-product handling follows recognised best practice. Furthermore, the assessment and implementation of the project must consider the National Waste Management Plan for a Circular Economy 2024-2030 to avoid adverse impacts on regional waste infrastructure and capacity.

10.13 Management of Compounds/Depots

It is proposed to reinstate all temporary working areas (construction compounds, pipe storage depots). This involves removal of temporary structures, surfaces, roadways, the return of lands to agricultural use and reinstatement of ditches, stone banks boundaries etc. This process will take some time to complete. Tipperary County Council is concerned with management of the temporary works sites until same are reinstated and handover is complete. The responsibility to ensure these sites do not become used for unauthorized development or as unauthorized encampments rests with Uisce Eireann.

10.14 Infrastructure Failure

Risks from infrastructure failure include:

- habitat degradation as a result of pollution and possible leaks resulting in a discharge; the Operational Phase has the potential for chemically treated water to enter watercourses crossed by the Proposed Project;
- risk of chemically treated water entering watercourses crossed by the Proposed Project – design requirements include the control of discharges from Washout Valves during drain-down events, i.e. use of dechlorination tablets; and
- leakage or burst on the pipeline which may result in an unplanned discharge – design requirements to monitor any potential leaks.

All infrastructure and the proposed pipeline should be designed to be watertight.

Some areas of the pipeline are more ecologically sensitive, i.e. Special Area of Conservation (SAC) so it is important that typical timelines are outlined for addressing leaks occurring in area of ecological sensitivity versus less ecological sensitive areas within the development.

It is not clear where alarms are situated along the pipeline. There is a risk that small leaks will be easily detected if they were located a significant distance from the position of the nearest sensor.

10.15 Conclusion

The key issues which the Planning Authority deem relevant are set out as points of note listed above. Tipperary County Council request that An Comisuin Pleanala engage fully with the foregoing in consideration of the application.

PART 11. CONDITIONS AND CONTRIBUTIONS

11.1 Conditions

In the event of a grant of permission it is recommended that conditions as set out hereunder are attached.

- Implementation of mitigation and monitoring measures in EIAR and NIS. Suitably qualified persons to be appointed to supervise works to ensure all environmental mitigation and monitoring measures are implemented and full records shall be kept and made available for public inspection.
- The submission and agreement of the following that incorporate the mitigation and monitoring measures in the EIAR and NIS:
    - Construction and Environmental Management Plan that shall incorporate measures to manage Noise, Vibration and Dust, Surface Water drainage and Traffic Management during construction.
- Operational abstraction rates from the Parteen basin do not exceed those modelled and assessed in the EIAR and NIS. The abstraction rate to not exceed 2% of available flow through the Parteen Basin at any given time. Abstraction to be managed accordingly.
- Abstraction levels to be managed to ensure the minimum statutory compensation of 10m3/s is passed through Parteen Weir into the Old Shannon River.
- Pre condition survey to be undertaken in advance of construction on all public roads and bridges that will be used in connection with the development. The extent of the survey area to be agreed with Tipperary County Council and the survey shall be carried out in accordance with *'Guidelines on the Depth if Overlay to be used on Rural Regional and Local Roads'* (Orange Book) and shall include
    - Falling Weight Deflection (FWD)
    - Pavement Surface Condition Index (PSCI)
- A 100 metre section of the existing non bituminous roads to the site construction access /egress points should be replaced with a bituminous construction, details to be agreed on an individual basis with Tipperary County Council.
- A condition to be attached to prevent overladen vehicles involved in the scheme from using the surrounding road network.
- Infrastructure sites to incorporate wheel wash facilities.
- All waste/by-product handling follows recognised best practice set down in the Environmental Protection Agency's *Best Practice Guidelines on the Preparation of Waste Management Plans for Construction & Demolition Projects.*

- All activities related to the collection, transport, recovery, and disposal of materials will be required to comply with the Waste Management Act 1996 (as amended), including the mandatory use of authorised waste collectors and authorised waste facilities, thereby ensuring that all soil and material movements are fully traceable and environmentally responsible.
- All groundworks to be subject to archaeological supervision and subject to an archaeological mitigation strategy.
- Construction works to be undertaken between 0700-1800 Monday-Fridays and between 0800-1400 on Saturdays with no works on Sundays or public holidays. Deviation to be allowed in exceptional circumstances and only where written approval has been received from the Planning Authority.
- Condition to control operational noise levels.
- Condition to manage lighting.
- Condition to prepare an Invasive Species Management Plan with post construction monitoring and eradication.
- Condition to require pre-works ecological surveys to determine the presence of species that may be impacted (birds, bats, badgers) with appropriate mitigation. Derrogation licence(s) to be obtained where required. Works to avoid bird breeding season.
- Condition to require field boundary / hedgerow reinstatement and habitat enhancement.
- Condition to ensure adequate reinstatement of all construction compounds / pipe storage compounds and to manage these sites when vacated and prior to handover to landowner.
- Condition to ensure maintenance of intake screens to ensure they remain free of debris and intact.
- Bond to ensure satisfactory reinstatement of damage to public roads that may arise (Bond amount as recommended by Roads/ Nenagh Municipal District)
- Condition to require payment of development contributions in accordance with Tipperary County Council Development Contribution Scheme 2020 (See section 10.2)
- Condition to establish community benefit fund (See Part 8 Community Gain Proposals)
- Specific condition on development contributions in accordance with the Tipperary County Council Development Contribution Scheme 2020.
- Specific condition to require payment of a financial contribution of €65,000 per year to Tipperary County Council to cover the costs of monitoring and responding to queries from the public during the construction phase of the development.

11.2 General Contributions

Development contributions are payable under the Tipperary County Council Development Contribution Scheme 2020 under the following Classes;

Class	Description	Rate
17	The provision in, on, over and/or under land of buildings/ plant/ housings and or reservoirs associated with the provision of water and or wastewater.	€22 per sq m
18	The laying of pipes for the movement of water through the County and the ongoing abstraction of waterfrom any point within the County. Footnote: Save where the abstraction of water is solely associated with the manufacturing process and does not form part of the product	€15 per linear metre 1 cent per m3

Tipperary County Council do not consider the infrastructure in lieu provisions under Section 10 of the Scheme apply to the project given that the water supply project does not directly benefit population in Tipperary.

In the event of a grant of permission Tipperary County Council request An Comisuin Pleanala to attach conditions for the payment of development contributions in line with the Tipperary County Council Development Contribution Scheme 2020

11.3 Bond and finalcial contribution

In the event of a grant of permission Tipperary County Council request An Comisuin Pleanala to attach conditions for the payment of:

- A bond amount of €1,620,000 to cover costs of repairs to roads / road reconstruction arising from damage during the construction stage.
- A financial contribution of €65,000 per year to cover the costs of monitoring and responding to queries from the public during the construction phase of the development.

Signed: Jonathan Flood Date: 04/03/2026

Senior Executive Planner

Signed: Ambrose Darcy

Senior Planner Date: 06/03/2026

Signed: Brian Beck

Director of Services Date: 6.3.2026

Appendix 1 – Internal Reports

Comhairle Contae Thiobraid Árann
Tipperary County Council

Date: **23 February 2026**

Reference:

To: **Anne-Marie Devaney, Senior Planner, Planning**

From: **Barry Murphy, District Engineer, Nenagh MD**

Subject: **Roads comments on Shannon pipeline project**

MEMORANDUM

The proposed route for the Shannon pipeline will cross the public road network in Co. Tipperary 35 times. While any excavations and reinstatement works on the public road will be facilitated under the Road Opening Licence process, the main concern of the Roads Section of Tipperary County Council is the potential of the scheme to damage the road network during the construction phase. These concerns are focused on:

1. HGV's accessing and egressing the site at the interface of the haul routes and the public road network.
2. Damage to the surrounding roads networks from bulk materials coming to and from the site.
3. Large scale construction projects at the Water Treatment Plant at Birdhill and the Break Pressure Tank at Cloughjordan.

The impact on the roads network needs additional mitigating measures to prevent long term damage. The following mitigating measures should be included in the scheme:

1. Base line survey:

It is important to establish a detailed base line condition of the existing roads which are likely to be impacted by the scheme. The base line study should be carried out in accordance with the *'Guidelines on the Depth if Overlay to be used on Rural Regional and Local Roads' (*Orange Book) and should include

- Falling Weight Deflection (FWD)
- Pavement Surface Condition Index (PSCI)

The extent of the survey is dependent on the works activities in the vicinity of the site access points and the existing road construction. The extent of the surveys should be agreed with the Council's Roads Section prior to construction works commencing on site. This is consistent with the level of survey being provided for Kildare County Council by Uisce Eireann (Section 7.2.4 of the EIAR)

2 Strengthening existing non-bituminous roads at access / egress points.

Laden HGV's have the potential to damage the existing road at the access /egress points due to the impact of tight turning manoeuvres. The non-bituminous road constructions (surface dressing/wetmix) are especially vulnerable.

A 100 metre section of the existing non-bituminous roads to the access /egress points should be replaced with a bituminous construction, details to be agreed on an individual basis.

3 Damage to road from overladen HGV's entering / leaving site.

There should be measures and protocols established to prevent overladen vehicles involved in the scheme from using the surrounding road network.

4 Cleaning of roads

The construction activity at the Water Treatment Plant is likely to generate large volumes of surplus earthworks which may need to be transported from site. A wheel wash facility should be installed during the construction phase.

5. Repair to existing roads during the construction phase

The construction phase is scheduled to last for 126 weeks at 19 separate access points along the road network in Tipperary. Major road defects resulting from the scheme will need to repaired promptly.

This may require a bond which can be drawn down if required during the construction phase.

The bond should be based on the reconstruction of 6 km of 6 metre wide road. This is based on an average length of approx. 300m of reconstruction at each access point. Some of the access points are from roads in reasonably good condition, such as the R494 and R445, while others are from roads in worse condition such as local roads around the Break Pressure Tank site in Cloughjordan. The 300m average length per site should cover the variation in road condition across the 19 access points.

Reconstruction Costs	€45 per sq meter
Bond	6,000 x 6 x 45 = €1,620,000

6. Lisgarriff site compound

The project includes a proposal for a site compound adjacent to the N52 at Lisgarriff, just north of Ardcroney.

The creation of a new access onto the N52 is not in accordance with the County Development Plan or the policy of the Roads Section. There is potential for an alternative access to be provided to the site compound from the L-5079 as shown in Figure 1 below.

Uisce Eireann should be requested to investigate this alternative access point.

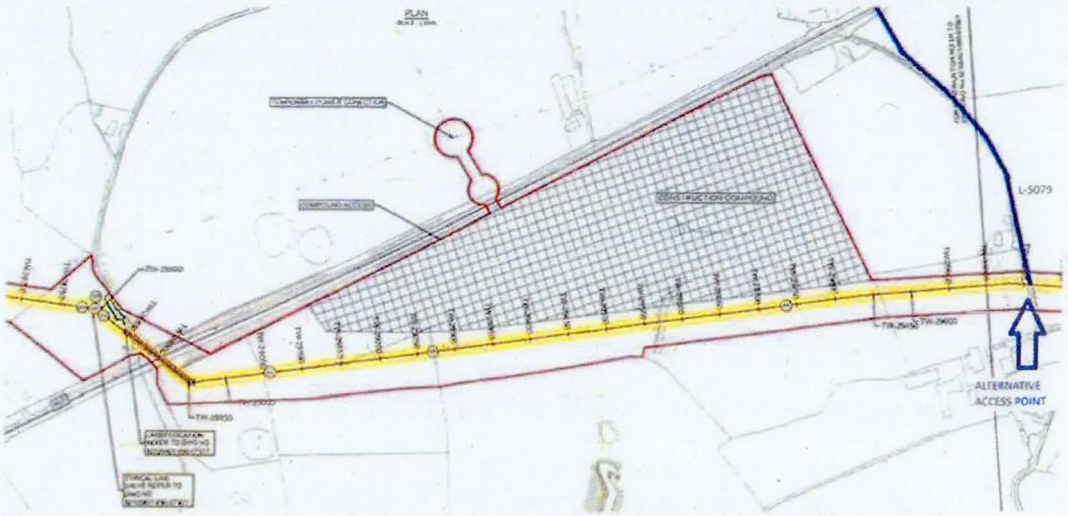

Figure 1 – Alternative access point for proposed Lisgarriff site compound

7. Site supervision costs

The works required to construct the scheme are primarily located on private lands. However, the works rely on the public road network for transport of material, and involves a significant amount of road crossings along its route. Uisce Eireann should be required to contribute towards the costs which Local Authorities along the route will inevitably incur in monitoring the works as well as responding to queries from the public during the construction phase. Uisce Eireann should provide a financial contribution to each Local Authority impacted by the proposed scheme. A sum of €65,000 per year per Local Authoity is suggested to cover these costs.

Signed: _____
Barry Murphy
District Engineer
Nenagh MD

Endorsed: _____
Kieran Malone
Senior Engineer
Roads Section

Outlook

Shannon Pipeline - Site supervision costs

From Malone, Kieran <Kieran.Malone@tipperarycoco.ie>
Date Wed 04/03/2026 17:33
To Beck, Brian <brian.beck@tipperarycoco.ie>
Cc Flood, Jonathan <jonathan.flood@tipperarycoco.ie>; Devaney, AnnMarie <annmarie.devaney@tipperarycoco.ie>; Brett, Liam <liam.brett@tipperarycoco.ie>; Murphy, Barry <barry.murphy@tipperarycoco.ie>

Brian,

In our submission we suggested that Uisce Eireann provide an amount of €65k per year for site supervision to each Local Authority.

This amount is based on the midpoint of current market rates for resident engineers

I am assuming 2.5 days per week supervision (20 hours) at a rate of €68 per hour.

Assuming that we will appoint an external party at an hourly rate for this role, I am allowing for a 48 week working year, giving a sum of €65,280, which I rounded down to €65k.

Regards,

Kieran

Kieran Malone BA BAI PGrad Dip CEng MIEI
Senior Engineer
Roads and Transportation
Tipperary County Council
kieran.malone@tipperarycoco.ie
0818 06 5000

TIPPERARY COUNTY COUNCIL

ENVIRONMENT AND CLIMATE ACTION

STRATEGIC INFRASTRUCTURE DEVELOPMENT (SID) PLANNING APPLICATION SUBMITTED TO AN COIMISIUN PLEANALA (ACP) ON 19 DECEMBER 2025 BY UISCE EIREANN (UE) IN RESPECT OF THE WATER SUPPLY PROJECT EASTERN AND MIDLANDS REGION (WSP EMR)

ACP Reference: ACP-323980-25

1.0 Introduction:

Pursuant to Section 37E of the Planning and Development Act 2000, as amended, the above-referenced SID planning application has been referred by ACP to Tipperary County Council (TCC) for its observations.

The observations of the Environment and Climate Action Section (E&CA) of TCC are collated hereunder.

Reference to stated chapter numbers relates to chapter numbers in the Environmental Impact Assessment Report (EIAR).

However, in some cases, it has been challenging to focus on the potential impact of the WSP EMR on sensitive receptors within County Tipperary, which fall within the jurisdiction of Tipperary County Council, per se as the EIAR follows a holistic approach consequent on the proposed project being located within the functional area of four local authorities, i.e. Tipperary County Council, Offaly County Council, Kildare County Council and South Dublin County Council.

2.0 Waste Management:

The WSP EMR will generate significant volumes of soils and construction-related materials. As such, the project will require robust environmental safeguards to ensure full compliance with national waste and environmental protection legislation.

It is important that the TCC submission to ACP includes a recommendation that reference to the utilization of, and adherence to, the Best Practice Guidelines for the preparation of resource & waste management plans for construction & demolition projects, as published by the Environmental Protection Agency (EPA) in 2021 [the EP-A Guidance document] is included in any decision to grant permission. The submission should also include a note emphasizing that compliance with waste management legislation is a matter for consideration by ACP in the event that a decision to grant permission issues.

E&CA has noted the input from the CAAS Water Supply Project Planning Report pertaining to Chapter 10: Soils, Geology and Hydrogeology, which Planning Report was commissioned by Planning Section. In particular, E&CA notes the

reference that mitigation measures have been considered within the project design through the development of detailed proposals as follows:

- a Construction Environmental Management Plan (CEMP);
- a Soil Management Plan (SMP); and
  a Construction Waste and By-Product Management Plan (CWBMP), which is critical in respect of the waste regulatory function exercised by E&CA.

From a waste management perspective, with particular reference to the protection of the environment, the effective management of all construction-phase arising, whether intended for reuse, recovery, transport or disposal, is essential.

The project contractor/s must be guided by the EPA Guidance document, thereby ensuring that all waste/by product handling follows recognised best practice.

Furthermore, the assessment and implementation of the project must consider the **National Waste Management Plan for a Circular Economy 2024-2030** to avoid adverse impacts on regional waste infrastructure arid capacity.

All activities related to the collection, transport, recovery and disposal of materials will be required to comply with the Waste Management Act 1996 (as amended), including the mandatory use of authorised waste collectors and authorised waste facilities, thereby ensuring that all soil and material movements are fully traceable and conducted in an environmentally responsible manner.

3.0 Environmental Protection:

3.1 Intake Structure:

It is proposed to provide three raw water intakes (RWI) points, each fitted with a passive wedge-wire cylinder (PWWC) intake screen to prevent debris and/or fish being taken up into the raw water pumps during the operational phase. The screens would be selected so that Intake velocities through the screen slots (approximately 2.0m in diameter) are limited to 0.15m/s, the velocity at which juvenile fish can swim away without being trapped against the screen.

E&CA recommends that, in the event that ACP is minded to grant permission, a condition be attached as follows:

Maintenance of screens is required to ensure they remain free of debris and intact.

3.2 Pipeline Structure:

Risks from infrastructure failure include:

- habitat degradation as a result of pollution and possible leaks resulting in a discharge: the Operational Phase has the Potential for chemically treated water to enter water courses crossed by the proposed project;

- risk of chemically treated water entering watercourses crossed by the proposed project - design requirements include the control of discharges from washout valves during drain-down events, i.e. the use of de-chlorination tablets; and
- leakage or burst on the pipeline which may result in an unplanned discharge: in this regard the EIAR states that design requirements are necessary to monitor any potential leaks.

All infrastructure and the proposed pipeline should be designed to be watertight. However, the potential for leakage to alter the concentrations of the parameters used to determine groundwater quality was assessed. The water quality in the proposed water supply would be compliant with the Groundwater Directive (Directive 2006/118/EC).

E&CA has concerns in relation to the effect of chlorine on sensitive receptors.

During commissioning any discharges would be controlled and passed through de-chlorination equipment. If there is a leak on the pipeline, this would not be a catastrophic failure as the chosen pipe material is steel where characteristic failure of the pipe is a pinhole which would not lead to significant losses of water. Monitoring equipment on the pipeline would be able to detect these losses, enabling operations personnel to react rapidly.

It is noted that this section of the EIAR does not include details or proposals relating to a typical response time for detecting and fixing leaks. Such details or proposals should be included in a Response Procedure Which would be activated in the event of the occurrence of an incident. Some areas of the pipeline are more ecologically sensitive, i.e. included within a Special Area of Conservation (SAC), so it would be important for UE to detail a typical timeline for addressing leaks occurring in ecological hotspots versus less ecological sensitive areas within the development. E&CA would welcome clarification on this issue.

It is not clear where alarms are situated along the pipeline. Clarification is required as to whether small leaks will be easily detected if they were located a significant distance from the position of the nearest sensor. E&CA would welcome such clarification insofar as this issue relates to County Tipperary.

3.3 Water Chapter 9:

The abstraction aspect of the project will also be subject to a separate EPA abstraction license consent process as required by the Water Environment (Abstractions and Associated Impoundments) Act 2022.

3.4 Water levels:

"A hydrological model was developed to assess the impact of the proposed abstraction on the water levels of the Derg TN (Lough Derg) lake water body and the Derg HMWB (Parteen Basin) and the pass forward flows released to the ORS.

Two constant rates of abstraction have been investigated as follows:

(i) *154Ml/d, taken to be representative of normal operation demand by the year 2050; and*

(ii) *300Ml/d, projected peak need/demand at year 2050.*

The impacts to lake levels and forward flows to the Old River Shannon (ORS) due to the modelled inclusion of the proposed project abstraction (as a constant flow of either 154Mld or 300Mld) were found to be barely distinguishable from the baseline case when viewed on level/flow duration curves (a standard hydrological method for comparing long-term data series).

The level regimes of both the Lough Derg (Derg TN) and Parteen Basin (Derg HMWB) lake water bodies are only simulated to be notably affected by the inclusion of the proposed project during extreme drought periods and in the days immediately after the drought (up to a week) when lake inflow is needed to replenish any deficit in storage caused by the proposed project abstraction. From the 52-year model simulation period (1972-2023), the simulated lake levels are only found to be notably affected by the inclusion of the proposed project during the 1995 and 2018 drought events. Therefore, for approximately 99% of the 52-year model simulation period, there are no perceptible impacts to simulated lake levels because of the proposed project.

The model was further developed to incorporate future climate change scenarios to also allow a simulation of the impact with the proposed project in place and including the effects of future climate change on flows on the River Shannon.

Climate change simulations for a 'reasonable worst case' scenario for the 2080s epoch with the inclusion of the proposed project indicate that simulated lake levels would draw down closer to the bottom of the Lough Derg Normal Operating Band (NOB) during the 2018 worst drought event. However, the additional simulated lake level drawdown is still fitting within the range of Electricity Supply Board (ESB) normal observed lake level fluctuations, resulting in lake levels still remaining within the Lough Derg NOB, and within the upper and lower water levels that the ESB applies to the Parteen Basin, with no change to the ORS compensation and fish pass flows, which would always be met".

Although modelling has demonstrated little to no impact in water levels, the results are based on ESB operating bands which is purely based on hydrological regimes rather than ecological requirements.

The report fails to adequately assess the impact of draw down on the spatial extent and distribution of littoral habitats which are crucial to qualifying interests of the Lough Derg (Shannon) SPA.

Modelling has also utilised annual mean values which overlook specific times of low flow and drought. As a result, the 2% draw down may not always be correct.

Assessment of Groundwater Dependent Terrestrial Ecosystems (GWDTE) are dependent on the draw down being 2%. As 2% is not a set percentage of extraction, it is possible that the impact on GWDTEs has been incorrectly assessed.

ACP should consider these as part of a more detailed assessment of the project.

3.5 Water Quality:

"As a separate exercise, in order to test whether Water Framework Directive (WFD) mitigation measures and/objectives to restore the favourable conservation status of the qualifying interests of the Lower River Shannon SAC would be im eded by the proposed project, a sensitivity analysis was undertaken to apply an outline Eflows approach proposed in a recent study (CDM Smith, 2025, as referenced in the EIAR) to the model and investigate the potential impacts of future changes in the compensation flow regime.

Based on the UK Technical Advisory Group (TAG) WFD lake level test, the following standards are met for the two proposed abstraction rates:

- *a constant abstraction of 154Ml/d results in both the Lough Derg (Derg TN) and Parteen Basin (Derg HMWB) water bodies meeting the lake level requirements for the WFD Good (Potential) status standard; a n d*
- *a constant abstraction of 300Ml/d results in both the Lough Derg (Derg TN) and Parteen Basin (Derg HMWB) water bodies meeting the lake level requirements for the WFD G9od (Potential) status standard.*

Inclusion of the future "reasonable worst case" 2080s climate change impacts and/or proposed ORS Eflows regime sensitivity analyses results in both the water bodies still meeting the lake level requirements for the WFD Good (Potential) status standard for a constant WSP abstraction of 154Ml/d or 300Ml/d.

Based upon these findings, effects on the Derg TN lake water body and the Derg HMWB would be Not Significant. As reported in the separate Water Status Impact Assessment Report, it has been concluded that *" the proposed project would not compromise WFD objectives or cause a deterioration in the status of any surface water or groundwater WFD designated water body and/or jeopardize the attainment of good surface water (or good ecological potential) or groundwater status.*

The lack of significant effects on flow or water levels as a result of the proposed abstraction means there would be no indirect significant effects on water quality or hydromorphology for downstream water bodies; this includes the Shannon (lower)_0S0, Shannon (lower)_060 and Limerick Dock transitional water bodies."

E&CA has also had regard to the **Water Action Plan 2024: A River Basin Management Plan for Ireland,** as prepared by the Department of Housing, Local Government and Heritage, which, inter alia, sets out a Programme of Measures until 2027.

E&CA is of the view that the impact of this project on the WFD cannot be fully assessed given the uncertainty regarding the data used for the modelling exercise.

ACP should consider this as part of a more detailed assessment of the project.

3.6 Soils, Geology and Hydrogeology Chapter 10:

Gaps exist where access to carry out site investigations was not possible but these gaps do not prevent an adequate assessment of the likely significant effects of the project.

The construction phase poses risks to soil and geology, including compaction, land use change and contamination. Potential impacts due to construction may include disruption to groundwater flow and quality from dewatering and contamination risks.

Effects are generally predicted to be temporary during construction and, on implementation of the proposed mitigation measures, residual effects will be insignificant to slight.

No likely significant effects were identified during the Operational Phase on soils, geology and hydrogeology receptors. Therefore, no specific mitigation is required. Design mitigation, such as measures to contain chemicals and manage accidental spills, and design measures to control rare washout discharges, would reduce effects further. There are, therefore, no likely significant residual effects during operation.

4.0 Natura Impact Statement (NIS}:

A Natura Impact Statement (NIS) is prepared prior to the finalisation of the EIAR. The NIS is part of the Appropriate Assessment process, which is conducted concurrently with the environmental impact assessment (EIA). The NIS helps assess the potential adverse effects of a plan or project on Special Areas of Conservation and Special Protection Areas, while the EIAR evaluates the environmental impacts of the proposed project.

E&CA has noted the input from the CAAS Water Supply Project Planning Report pertaining to the Natura Impact Statement (NIS), which Planning Report was commissioned by Planning Section.

The NIS has concluded that there would be no significant *effect* on any Natura 2000 site in County Tipperary. However, the NIS conclusion is based solely on the conservation of these sites. In this regard, the EIAR must be referred to for a more detailed analysis of localised biodiversity as it applies to County Tipperary.

5.0 Conclusion:

The above has been prepared having regard to the documentation submitted by UE to ACP.

Signed: *Denis Holland.* Dated: 03 March 2026.

Denis Holland,
Senior Engineer,
Environment and Climate Action

Signed: _____ Dated: 03 March 2026.

Eamon Lonergan
Director of Services

Memo

To: Planning Section

From: Martin Moore (ACFO – Tipperary Fire and Rescue Service)

Date: 19th February 2026

Re: S.I.D - Uisce Eireann, Water Supply Project – Eastern & Midlands Region

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Fire Services Acts 1981 and 2003
Building Control Act 1990 (as amended)

The Fire Authority / Building Control Authority have no comments relevant to the CE's Report that would affect the development as proposed.

Martin Moore,
Assistant Chief Fire Officer

Eddie Ryan,
Acting Chief Fire Officer

The Local Authority Waters Programme

Observations on the Strategic Infrastructure Development Planning Application Submitted by Uisce Eireann to An Coimisiún Pleanála – (Ref:323980-25) for the proposed Water Supply Project for the Eastern and Midlands Region

3rd March 2026

The Local Authority Waters Programme (LAWPRO) works on behalf of Ireland's 31 local authorities to protect and restore good water quality in our rivers, lakes, estuaries, ground and coastal water through catchment science and local community engagement. As such LAWPRO is a key stakeholder in ensuring the quality of our national waters.

LAWPRO is a local authority shared service led jointly by Tipperary and Kilkenny local authorities. To date, LAWPRO have engaged directly with Uisce Éireann on the proposed Water Supply Project for the Eastern and Midlands Region and through pre-planning consultations. During these engagements, LAWPRO communicated some specific environmental and operational concerns in relation to the project, some of which have been considered in this application, and others that have yet to be fully addressed. LAWPRO note that the Environmental Impact Assessment Report (EIAR) and the Natura Impact Statement (NIS) for this application focus mainly on environmental impacts associated with the construction and operation of the infrastructure being proposed, and only partly addresses the environmental impact as a result of the proposed abstraction.

LAWPRO is aware that a separate application process for the abstraction licence is required for this project which has yet to be submitted and evaluated. This presents a significant challenge given that the full environmental impact of the proposed abstraction, including impacts on the Lower Shannon, has yet to be fully determined. Many of the LAWPRO's concerns relate directly to potential environmental impact on the Lower River Shannon SAC (002165) and from Limerick Dock (IE_SH_060_0900) to the Upper Shannon Estuary (IE_SH_060_0800).

Environmental and Ecological Concerns - Lower Shannon

From a review of the Environmental Impact Assessment documentation, hydrological and water quality modelling, and supporting technical appendices relating to the proposed abstraction from Lough Derg/Parteen Basin LAWPRO have identified some concerns.

Fish Ecology

The documentation does not capture a complete picture in terms of the unique aquatic ecology within the lake and downstream. Of heritage, scientific and cultural importance are the native fish species within Lough Derg. Some of these, such as distinct genetic groupings of trout,

the Irish Pollan, and "landlocked lamprey" are unique to the lake and form some of the most interesting and important biodiversity features associated with the lough.

Anglers traditionally, applied names such as "Gillaroo" and "Croneen" to trout which displayed phenotypic features (body colour and physical shape) associated with some of these trout variants. These and the folklore associated with them hold potential to increase the attractiveness of the lough to the "culturally curious" overseas and local tourist visitors.
Downstream of the lake and dependent on an adequate supply of freshwater during critical periods of their lifecycle, important fish species include Atlantic salmon (e.g., Castleconnell fishery, Plassey, Thomond weir (no longer in operation)). The value of the tailrace as an ecological habitat for salmon and other fishes is unknown. Other fish species of significance include Sea lamprey, river lamprey, brook lamprey (all Annex II species under the EU Habitats Directive as with Atlantic salmon), European smelt (one of the most important sites in Ireland and European eel. Several other fishes associated with the estuary dependent on a freshwater influence include Slob trout, Sea trout and founder. The latter two are migratory and semi migratory forms of brown trout. Slob trout once supported a recreational fishery in Limerick City.

The risk of impact on the Lower Shannon is more significant than presented for a number of reasons. The ecological system in the Lower River Shannon SAC (002165) and from Limerick Dock, (IE_SH_060_0900) to the Upper Shannon Estuary (IE_SH_060_0800) is already stressed with salmon (and other species) at critically low levels, and with the flows being already significantly regulated. An assumption is that provision for Atlantic salmon (upstream and downstream migration passage etc) in place within the current ESB generation operation is optimal. Given the system is flow-sensitive, small changes matter disproportionately, especially in drought scenarios as observed in 2018. Critically the downstream impacts undertaken as part of this assessment appear to be assumed, not demonstrated, with key regulatory concerns remaining unresolved. In addition, IFI and NPWS explicitly highlighted that drought already impacts the downstream ecology.

The assessments do not appear to adequately demonstrate that abstraction is safe for the Lower Shannon under low-flow conditions because downstream ecological impacts are inferred, not modelled. The key risks remain

- flow-sensitive species (e.g. Atlantic salmon and Lamprey sp.),
- reduced dilution capacity and dependence on fixed compensation flow (freshwater quality downstream of the dams is currently stressed e.g., Shannon (Lower)_050: was at poor status at the last EPA Q value monitoring cycle (2021)
- critical uncertainties are not fully taken into account including ESB operational response under stress conditions and ecological thresholds for low flow.

While the environmental assessment is technically robust for hydrology at Lough Derg / Parteen, it is not sufficiently robust for ecological impacts in the Lower Shannon, particularly under drought conditions, climate change scenarios and cumulative system stress.

Fish Passage considerations: Under the current Water Action Plan 2024 (River Basin Management Plan), work is underway to manage the implementation of a roadmap to mitigate the impact of barriers to multi-species fish migration in the Lower Shannon catchment. Our understanding is that this roadmap aims to mitigate the impact of barriers to multi-species fish migration in the Lower

Shannon catchment including the Design of a New Multi-species Fish Pass at Parteen Weir, an **Environmental Flow Study Programme**, Tailrace Barrier Feasibility Study, Downstream Fish Passage Feasibility Study, A new multi-species Fish Pass Feasibility Study at Ardnacrusha, development of an integrated solution and a Lower River Shannon Management Plan. The current Uisce Eireann application does not appear to have taken this measure, under River Basin Management Planning process, into account, and as the Environmental Flow Study Programme recommendations have yet to be advanced, these cannot at this point be provisioned for.

Hydrological Modelling

The assessment includes long-term simulation of flows and levels over a 52-year period (1972–2023) which considers testing under historical drought conditions (most notably 2018), abstraction rates at 154 Ml/d and 300 Ml/d, and climate change scenarios. The modelling indicates that there will be no significant change to water levels in Lough Derg or Parteen Basin, and that compensation flows (10 m^3/s) can be maintained, and the abstraction is offset by reductions in water used for hydropower generation.

The assessment concludes that there will be no measurable hydrological impact downstream of the tidal limit at Limerick Dock. However, this conclusion is based on system operation assumptions (ESB flow management) and model boundaries rather than detailed downstream hydraulic modelling.

While we are aware that a separate process for evaluating the proposed abstraction licencing regime has yet to be made, our assumption is that a planning decision will be based on the abstraction details contained in this application.

The Lower Shannon is identified as a regulated and already stressed system supporting sensitive species, notably Atlantic salmon where populations are already at approximately 5% of their conservation limits. Reduced counts have been observed during low-flow/drought years. The ecological function of the Lower Shannon is strongly linked to the flow of water, the levels of dissolved oxygen and sediment dynamics.

The assessment undertaken incorporates some cumulative and climate considerations including limited climate change scenarios and cumulative effects (e.g. Ardnacrusha dam regulation, abstraction). It concludes that no significant residual effects after mitigation measures are implemented. However, the climate analysis appears to be undertaken using a system-scale and is not receptor-specific. In addition, ecological responses to compound stressors are not quantified.

The conclusion of no downstream impact is reliant on operational assumptions including ESB maintaining lake levels and compensation flows. However, the system performance under extreme or competing demands is not tested. There is a lack of direct Lower Shannon modelling including no detailed hydraulic or ecological modelling of the Lower Shannon reach. As a result, potential changes in flow variability, velocity, habitat availability are not quantified. There is also a limited assessment of low-flow ecological risk for the lower Shannon.

Climate Change

Although drought scenarios are included there is also no explicit linkage between flow changes and ecological thresholds. This is significant given the known sensitivity of salmon and other species to low-flow conditions. The assimilative capacity of the project for the lower Shannon is not fully addressed with regulatory consultees (IFI and NPWS) identifying the need to assess the downstream dilution capacity. Reduced flows scenarios may increase pollutant concentrations and can affect water quality locally which is not fully quantified. In addition, environmental flow considerations are tested at a high level (sensitivity analysis), however they are not clearly used to constrain abstraction under stress scenarios.

Conclusions

The available evidence indicates that the abstraction can likely be accommodated within the existing regulated Shannon system. Large-scale hydrological changes to Lough Derg and Parteen Basin are minimal and within operational limits. However, for the Lower Shannon there is insufficient evidence to robustly conclude that no impact will occur, particularly under low-flow (drought) conditions, future climate scenarios and cumulative system pressures.
This is because downstream impacts are inferred from system behaviour and are not directly modelled. Ecological sensitivities are acknowledged but not quantitatively assessed and critical thresholds (flow, habitat, water quality) are not explicitly tested.

While the abstraction appears hydrologically manageable at a system scale, the assessment does not adequately demonstrate that the ecological integrity of the Lower River Shannon will be protected under low-flow and climate-stressed conditions. This would require more robust hydraulic and ecological modelling of the Lower Shannon.

Recommendation:

The following should be considered in relation to the Lower River Shannon SAC (002165) and from Limerick Dock (IE_SH_060_0900) to the Upper Shannon Estuary (IE_SH_060_0800):

- **quantification of flow changes under abstraction (including % reductions), assessment of ecological thresholds (e.g. Atlantic salmon habitat requirements),**
- **More survey information on the aquatic biodiversity potentially impacted (within the lake e.g., pollan spawning beds) to fishes downstream of the dams (e.g., European smelt)**
- **Safeguards incorporated to address in combination (e.g., current hydro-generation impacts) effects including provision for environmental flow recommendations that may be required post Water Action Plan fish passage measure work**
- **an evaluation of assimilative capacity under reduced flows conditions,**
- **testing of extreme and compound scenarios including a multi-year drought with abstraction scenarios.**

Other abstraction concerns:

The depth of pipe at the abstraction point was not clear in the documents provided which is an important consideration that can potentially impact the ecology and temperature of the lake if taken at an incorrect level.

This could have the effect of abstracting cooler water if at lower depth which in turn could impact on the overall temperature dynamics and potentially contribute to pressure on the ecosystem, particularly during the summer.

There is an assumption that Ardnacrusha dam will remain in place for the longer term to ensure a continuous supply of raw water for the project. The dam is approximately 100 years old and will require maintenance and remedial works during the medium to long-term. Does the planning application sufficiently address this aspect in the context of the overall infrastructure project?

In addition, the application by Uisce Eireann is being made on a declared 2% average annual flow abstraction rate. Any potential increases in the proposed abstraction rate under licence by the EPA is not addressed within this application. The concern therefore is that demand for water will increase over the coming decades and the abstraction rate will be reviewed to meet future needs.

Recommendation:
The provision of water storage to cater for increased demand should be conditioned as part of this infrastructure development to migrate adverse impacts to the ecology as outlined in this submission.

Proposed Community Benefit Scheme

The inclusion of a Community Benefit Scheme as part of the project to support social and economic development under the categories of Economy, Education and the Environment, is to be welcomed. However, it is concerning that the proposed scheme appears to only focus on the construction phase of the project, with Uisce Éireann proposing to close the fund at the end of construction. No proposal has been made in relation to the addressing potential long-term environmental impacts during the lifetime of the project itself. This was highlighted by LAWPRO and others in previous consultations and appears not to have been included in the proposed scheme.

Uisce Éireann have stated that it recognises the unique nature of this project and is proposing a 'bespoke' community benefit scheme rather than benchmarking against other strategic infrastructure developments. However, the proposed 'bespoke' scheme does not go far enough in recognising the truly unique nature of the project particularly the long-term potential environmental impact on lower Lough Derg and the Lower Shannon areas (see above). It is essential that any proposed fund supports communities in these areas specifically, and assist them achieve the environmental objectives of the following policies in the longer term:

- Water Framework Directive – e.g., public participation requirements in Article 14.
- Drinking Water Directive – e.g., risk management actions to address Drinking Water Source Protection pressures such as agriculture, etc.
- United Nations Sustainable Development Goals – e.g., Goal 14 – Life below water.

It should be noted that there are examples nationally of other significant infrastructure developments such as windfarm projects that have longer term community gain funds in place. A more expansive community gain fund should therefore be established and funded for the operational lifetime of the project.

Recommendation:
A community gain fund be established and funded for the operational lifetime of the project which is reflective of its long-term environmental impact. The annual level of funding should be increased in line with the consumer price index and reviewed periodically.

Any proposed scheme should prioritise groups and projects that bring added benefit to the local communities living within the catchment of Lough Derg, with a focus on restoring and protecting the water resource of the Lough.

LAWPRO would agree that 'Option B' would provide a robust governance and administration model and that local authorities (with the support of LAWPRO) are best placed to identify and administer such funding. In addition, Local Authorities should also be financially supported to administer any proposed fund.

Community gain projects that compliment drinking water source protection initiatives to improve the quality of raw water (helping to reduce treatment costs) and support existing habitats should be prioritised. Such projects with long term environmental benefits may include:

- River and lake restoration projects
- Water quality awareness initiatives
- Invasive species management
- Angling and sustainable tourism

Such projects should be prioritised and build on work undertaken by LAWPRO and other stakeholders (including local angling clubs, ESB fisheries conservation, Inland Fisheries Ireland, etc.) and initiatives relevant to the Water Framework Directive and Habitats Directive applicable to Lough Derg and surrounding water bodies.

Management of Proposed Treatment Plant & Distribution Network

The potential impact of the proposed water treatment plant (to be located at Birdhill, County Tipperary) and the management of same, including any proposed discharges to the local environment, must have appropriate control measures including appropriate risk assessments and risk management practices incorporated to avoid any negative impact to the environment and local ecology. Residual discharges and chemical spills from drinking water treatment plants not managed appropriately have in the past caused significant environment and ecological damage which must be avoided.

Adequate mitigation will be required throughout construction, particularly in sensitive areas along the proposed pipeline route, to avoid negative impacts to surrounding ecology and waterbodies. In addition, subsidence concerns (particularly in peat substrate) will require significant mitigation to protect local waterbodies. It is noted that the EIAR has identified specific risks requiring mitigation

that will require robust and ongoing management during construction and post construction reinstatement.

Recommendation:
Consideration should be given to undertaking further investigations on contingency arrangements for water storage to mitigate against potentially large water losses in the event of major leaks, or in situations where abstraction cannot be maintained at the threshold levels.

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Anthony Coleman
Director of Services
Local Authority Waters Programme

M E M O R A N D U M

To:	**Ann Marie Devaney**
From:	**Ann Marie Fleming (Biodiversity Officer)**
Date:	**02nd March 2026**
Subject:	**Re: ACP-323980-25 Uisce Eireann water supply project.**

Project Description: The application has been made directly to An Coimisiún Pleanála reference ACP-323980-25 for permission for the proposed water supply project for the Eastern and midlands region. As provided for under Section 37E of the Planning and Development Act 2000, as amended the Chief Executive is required to submit a report to An Coimisiún Pleanála setting out the views of the Planning Authority.

Bats

The proposed Uisce Éireann Water Supply Project (WSP) will result in a series of direct and indirect impacts on bat populations within County Tipperary, arising primarily from the construction of the Raw Water Intake and Pumping Station (RWI&PS), the Water Treatment Plant (WTP) at Incha Beg, the Break Pressure Tank (BPT) at Knockanacree, and the associated Treated Water Pipeline. Both EIAR Chapter 8 and Appendix A8.9 (Bat Surveys Report) confirm that County Tipperary contains the highest concentration of bat roosts and bat habitat affected by the project.

Direct Loss of Bat Roosts

EIAR Chapter 8 confirms that all five (5) of the confirmed bat roosts to be removed by the project occur within County Tipperary. This includes:

- One building roost at the WTP (Building 1), supporting lesser horseshoe bat, Natterer's bat, and brown long-eared bat
- Four tree roosts, including:
    - Soprano pipistrelle roost at Parteen Woodland
    - Natterer's day roost at PBR 8
    - Common pipistrelle and soprano pipistrelle satellite roosts at PBR 20

No other county along the pipeline route contains sites of confirmed roosts that will be lost.

Indirect loss of Habitat

Tipperary also experiences the highest level of linear habitat loss and woodland loss, affecting commuting, foraging, and ecological connectivity. According to Appendix A8.9 the indirect impacts of proposed project (having implemented mitigation) will have a medium term, slight-moderate negative effect on local bat populations at the county level. Medium-term effects are defined as those that take 7-15 years for functional ecological recovery (EPA, 2022)

Badger

Due to the construction of large infrastructural components including the following:

- Raw Water Intake & Pumping Station – Parteen Basin
- Water Treatment Plant – Incha Beg/Birdhill area
- Break Pressure Tank – elevated Tipperary site
- First section of the Treated Water Pipeline

Tipperary represents the largest area of loss in terms of loss of badger setts, foraging and commuting habitats. The EIAR confirms that project will lead to sett closures, resulting in the displacement of two social groups. While mitigation according to best practice is outlined, research has shown that closure of active setts increases badger foraging range and can act as a pathway for the spread of TB.

Additionally, in relation to Knocknacree there will be an overall loss of 7ha of habitat. This will result in a significant loss of foraging/commuting habitat for badger within this local area. The construction of a new access road will lead to permanent fragmentation of badger habitat (commuting, foraging) and may increase the collision risk where commuting paths intersect the road.

Knocknacree Woodland

Knocknacree is a notable woodland within County Tipperary. Having been continuous tree cover for more than 200 years is supports a diverse range of flora and fauna. In a County such as Tipperary where woodland have been largely fragmented or commercially planted, Knocknacree is of high local value and provides vital habitat and ecological connectivity for mammals, birds and invertebrates.

Aquatic Species

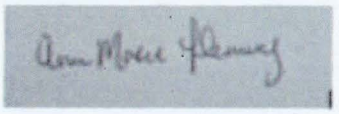
The proposed abstraction presents significant and insufficiently assessed ecological risks to the already critically stressed Lower Shannon system. With Atlantic salmon populations at roughly 5% of their conservation limits, and other flow-dependent species such as lamprey and eel already extremely vulnerable, even small flow reductions may have harmful effects on, spawning, nursery habitat and migration. However, the EIAR does not provide any species-specific modelling to demonstrate how reduced flows or drought conditions may impact key species.

In addition, the EIAR acknowledges the presence of high-risk aquatic invasive non-native species, including zebra mussel, Asian clam, and destructive crayfish plague (which can cause 100% mortality in native crayfish population) yet does not assess how abstraction-related hydrological changes may influence their spread or impact on native fauna such as White Clawed Crayfish.

Unexpected Ecological Conditions during Construction

With regard to projects of this scale, unexpected ecological conditions are likely to occur during construction e.g. new badger setts, otter holts/couches, spawning beds, protected flora, Marsh Fritillary habitat or invasive species. It is also likely that unexpected conditions at the time of construction may require design changes. A high level of monitoring ad reporting on the CEMP will be required to ensure that the contractor reports any unexpected ecological findings and updates mitigation as necessary.

Signed :



Appendix 2 – Consideration of the Elected Members

Submission *Objection to* the Proposed Water Supply Project for the Eastern and Midlands Region
SHANNON to DUBLIN WATER SUPPLY PROJECT (Ref. PA92.323980)

Applicant: Uisce Éireann

Please note that a hard copy was submitted to the office of An Coimisiún Pleanála on Monday 23rd

Submitted by:
River Shannon Environmental Protection Alliance Company Ltd Limited by Guarantee (808724)

20 February 2026

Elaine Doyle

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Limerick V94 HTD1

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Chapter 1: Introduction & Legal Framework

Background and Purpose

This submission objects to the granting of planning permission for the proposed Eastern and Midlands Water Supply Project ("the Project") on the basis that it is **unlawful under EU environmental law**, **factually unsound**, and **procedurally defective**.

This submission is a combined and consolidated objection, integrating the full technical, ecological, hydrological and climate evidence.

Description of the Eastern & Midlands Water Supply Project

The Project involves the continuous abstraction of up to approximately 330 million litres per day from the River Shannon system at Parteen Basin, a hydrologically regulated and ecologically stressed water body forming part of the Shannon International River Basin District.

Application of the EU Law

The Project, as assessed and presented by the developer, fails to comply with binding obligations under EU law, including but not limited to:

- Directive 2000/60/EC (Water Framework Directive);

- Directive 92/43/EEC (Habitats Directive);
- Directive 2009/147/EC (Birds Directive);
- Directive 2011/92/EU as amended (Environmental Impact Assessment Directive);
- Directive (EU) 2020/2184 (Drinking Water Directive);
- Article 191 TFEU (precautionary and preventive principles).

Consent cannot lawfully be granted where these obligations are not met.

The central defects include:

The Environmental Impact Assessment Report (EIAR) and Natura Impact Statement (NIS) repeatedly frame the proposed abstraction as representing approximately 2% of average annual flow at Parteen Basin.

This framing is factually misleading and legally impermissible.

Ecological impact under the Water Framework Directive and Habitats Directive is determined by low-flow and drought conditions, not long-term averages. This is explicitly acknowledged in:

EPA technical guidance;

The independent review of the NIS (February 2026);

The developer's own flow datasets when correctly interrogated.

During Q95 and drought-year conditions, the proposed abstraction would remove between approximately 30% and nearly 50% of available flow in the Lower Shannon under realistic operational scenarios.

The Project documentation therefore misrepresents the true scale of abstraction impacts by presenting an average-flow percentage that conceals severe low-flow effects.

This constitutes a material flaw in the environmental assessment

Summary of Core Legal and Technical Defects

- Systematic misrepresentation of abstraction impacts through reliance on average flows
- Failure to assess low-flow, drought, and zero-generation scenarios
- Unlawful reliance on Heavily Modified Water Body (HMWB) designation
- Failure to satisfy Article 4(7) WFD derogation requirements
- Failure to demonstrate no adverse effect on Natura 2000 site integrity
- Defective and misleading alternatives analysis, particularly groundwater
- Failure to account for climate non-stationarity

- Unsound economic, energy, and governance assumptions

These defects are fatal in law. Planning permission must be refused.

2. MISREPRESENTATION OF FLOW REGIME AND ABSTRACTION IMPACTS

2.1 Reliance on Average Flow Is Scientifically and Legally Invalid

Sustainable water planning requires management at catchment scale, prioritising **source-region protection**, ecological integrity, and long-term resilience. The Project reverses this principle by externalising environmental risk to the Shannon catchment for the benefit of Dublin.

The Shannon system is already:

- Hydromorphologically altered
- Ecologically stressed
- Subject to multiple competing demands

It is not an under-utilised resource.

The Environmental Impact Assessment Report (EIAR) and Natura Impact Statement (NIS) repeatedly frame the proposed abstraction as representing approximately 2% of average annual flow at Parteen Basin.

This framing is factually misleading and legally impermissible.

Ecological impact under the Water Framework Directive and Habitats Directive is determined by low-flow and drought conditions, not long-term averages. This is explicitly acknowledged in:

- EPA technical guidance;
- The independent review of the NIS by Laura Kavanagh (February 2026);
- The developer's own flow datasets when correctly interrogated.

During Q95 and drought-year conditions, the proposed abstraction would remove between approximately 30% of available flow in the Lower Shannon under realistic operational scenarios .

The Project documentation therefore misrepresents the true scale of abstraction impacts by presenting an average-flow percentage that conceals severe low-flow effects.

This constitutes a material flaw in the environmental assessment.

2.2 Low flow Drought and Zero -Generation Scenarios

The independent expert review of the Natura Impact Statement confirms that the Project assessment:

- Relies on assumed ESB operational behaviour rather than enforceable constraints;
- Does not robustly model low-storage and drought-year conditions;
- Fails to demonstrate ecological safety during periods when the system is most vulnerable .

Under settled EU case law (*Waddenzee*, *Sweetman*, *People Over Wind*), where scientific doubt remains, consent must be refused. The legal test is certainty, not plausibility.

That test is not met.

3. UNLAWFUL RELIANCE ON HEAVILY MODIFIED WATER BODY (HMWB) STATUS

3.1 HMWB Designation Does Not Permit Deterioration

The Lower Shannon below Parteen has Not Yet been classified as a HMWB (it is earmarked as a potential candidate, but it is already a protected SAC which has not actually been modified, rather it has been left to deteriorate). Lough Derg is designated as a Heavily Modified Water Body (HMWB).

This reliance is legally incorrect.

Under Article 4 of the Water Framework Directive:

- HMWB designation does not remove the obligation to prevent deterioration;
- HMWBs must achieve and maintain Good Ecological Potential;
- Dependent protected areas (including Natura 2000 sites) remain fully protected.

The EPA's own technical review of HMWB designation confirms that over-abstraction from regulated systems can still cause unlawful deterioration, particularly under low-flow conditions .

The Project's abstraction regime would materially alter:

- Flow magnitude and variability;

- Lake level stability in Lough Derg;
- Downstream dilution capacity;
- Floodplain and groundwater interactions.

These are precisely the parameters protected under the WFD, even for HMWBs.

3.2 Failure to Meet Article 4(7) WFD Conditions

Any new abstraction constituting a modification of a water body must satisfy **all** conditions under Article 4(7) of the WFD.

The Project fails to do so:

1. **No overriding public interest has been lawfully demonstrated**
   The demand case underpinning the Project is demonstrably overstated and based on acknowledged methodological errors in demand forecasting and leakage assumptions .
2. **Significantly better environmental alternatives exist**
   Groundwater resources within the supply corridor were dismissed using incorrect distance metrics, flawed assumptions, and outdated studies, without any field verification .
3. **All practicable mitigation has not been applied**
   The Project relies on discretionary operational management rather than binding hydrological limits, which is legally insufficient.

Failure on **any one** of these criteria is fatal. The Project fails on **all three**.

4. BREACH OF THE HABITATS DIRECTIVE (ARTICLE 6(3))

Habitats Directive (92/43/EEC)

The project, as currently proposed, based on the information available to the public, does not meet the requirements of the Legal Test under Article 6(3) of the Habitats Directive (92/43/EEC)

(a) Applicable Legal Standard

Under Article 6(3) of the Habitats Directive, the competent authority may grant consent only where it has ascertained, beyond reasonable scientific doubt, that the proposed development will not adversely affect the integrity of the Lower River Shannon SAC. This is a strict precautionary test. Consent should be granted only if the absence of adverse effects is certain. The Court of Justice has consistently held that: an appropriate assessment must exclude adverse effects with certainty, any remaining scientific doubt precludes consent, and the test is one of prior certainty, not post-hoc reassurance.

(Case C-127/02, Waddenvereniging and Vogelbeschermingsvereniging ("Waddenzee"), paras 56–59)

(b) Consequences of the Article 6(3) Test The legal consequences of Article 6(3), as confirmed by settled CJEU jurisprudence, are as follows: Burden of Proof

The burden of proof rests entirely on the developer and the competent authority, not on objectors. (Waddenzee, para 59) Scientific Uncertainty where reasonable scientific doubt remains, consent must be refused. Scientific uncertainty operates against authorisation, not in its favour. (Waddenzee, paras 56–57; Case C-258/11, Sweetman, paras 40–41)

Measures relied upon to avoid adverse effects must be certain in their effect, enforceable, and assessed as part of the project. Measures which are contingent, aspirational, or dependent on future operational discretion cannot lawfully be relied upon at Article 6(3) stage. (Case C-323/17, People Over Wind, paras 35–40) Assessment of Worst-Case Conditions

The assessment must consider worst-case, ecologically critical conditions, not average or assumed operating conditions. Reliance on long-term averages where impacts arise during extremes is legally impermissible. (Sweetman, para 44; Waddenzee, para 44)

(c) Prohibition on Balancing at Article 6(3) Stage At the Article 6(3) stage, the competent authority is not entitled to balance environmental risk against project need, public interest, or water supply considerations. Such balancing is permitted only under Article 6(4) (Imperative Reasons of Overriding Public Interest), which has not been invoked. Any attempt to justify residual risk by reference to necessity or benefit therefore constitutes a misdirection in law. (Sweetman, paras 33–36)

(d) Misapplication of the Test in the Present Case

The Appropriate Assessment relies heavily on long-term average flow metrics (2% abstraction at Parteen) while failing to lawfully assess low-flow and drought conditions, which are the periods of maximum ecological sensitivity for the Lower River Shannon SAC. As demonstrated by the quantitative evidence before the decision-maker: At dry summer flows (15 m^3/s), the proposed abstraction of 3.82 m^3/s would remove approximately 25.5% of available flow. At extreme low-flow conditions (10 m^3/s), abstraction would remove approximately 38.2% of available flow.

These figures represent order-of-magnitude impacts, not marginal effects, during precisely the conditions most relevant to SAC integrity (fish migration, dissolved oxygen, habitat availability, and hydromorphological functioning by assessing impacts primarily by reference to average flows and failing to exclude adverse effects under worst-case low-flow conditions and relying on operational assumptions and future controls rather than certain, assessed mitigation, the competent authority failed to attain the level of certainty required by Article 6(3).

(e) Legal Consequence In circumstances where: adverse effects on SAC integrity have not been excluded beyond reasonable scientific doubt, and scientific uncertainty demonstrably persists under low-flow and drought scenarios, the grant of consent is unlawful and must be quashed.

4.1 Relevant Natura 2000 Sites and Hydrology Connectivity

The abstraction point at Parteen Basin lies within the hydrological envelope of multiple Natura 2000 sites, including:

- Lower River Shannon SAC;
- Lough Derg SAC;

- Shannon Callows SAC;
- Associated SPAs.

4.2 Failure of the Integrity Test

The independent review of the NIS concludes that the assessment does not exclude adverse effects on site integrity beyond reasonable scientific doubt, particularly during low-flow conditions .

Key deficiencies include:

- Inadequate assessment of lake-level drawdown impacts;
- Failure to account for cumulative abstraction pressures;
- Reliance on assumed mitigation rather than proven absence of effect;
- Failure to assess basin-scale hydrological connectivity.

4.3 Legal Consequences of Residual Scientific Doubt

Under Article 6(3), precaution is mandatory. Where doubt remains, consent must be refused.

5. Defective Alternative Analysis

A central requirement of both the EIA Directive and Article 4(7) of the Water Framework Directive is that a proposed project may only proceed where all reasonable alternatives have been properly identified, assessed, and objectively compared That test has not been met. The alternatives analysis underpinning this Project is fundamentally defective and materially misleading. As a result, reliance on Article 4(7) WFD to justify the abstraction is legally unsustainable. The alternatives analysis underpinning this Project is fundamentally defective and materially misleading. As a result, reliance on Article 4(7) WFD to justify the abstraction is legally unsustainable. Groundwater has been dismissed as a viable alternative on the basis of a series of demonstrable errors and flawed assumptions. These include:

Incorrect mathematical application of distance thresholds Groundwater options were screened out using arbitrary distance criteria that have no basis in hydrogeological science or EU guidance. Distance from Dublin city centre was treated as a limiting factor, despite the fact that water supply infrastructure routinely operates across far greater distances.

An illogical study area centred on Dublin city rather than the supply corridor: The groundwater study area was defined by an artificial radius around Dublin city, rather than by proximity to existing and expandable treatment plants, pipeline corridors, or areas of known hydrogeological potential. This approach systematically excluded viable aquifers that could reasonably supply the Eastern and Midlands region.

Failure to update assessments following demand reductions: Projected demand figures have been repeatedly revised downward over time due to: increased treatment capacity, reduced per-capita consumption and improved leakage control. Despite this, the groundwater assessment was never revisited to reflect the reduced scale of need. This failure artificially inflated the perceived inadequacy of groundwater solutions. False assumption that only a single-source solution was acceptable. The analysis was predicated on the incorrect assumption that water security required a single, large-scale source. EU water policy does not support such an approach. On the contrary, distributed, modular, and diversified supply solutions are recognised as more resilient, adaptable, and environmentally sustainable. These flaws were identified as early as 2016–2017, yet they remain uncorrected. The continued reliance on a demonstrably flawed groundwater assessment represents a failure to engage in a lawful alternatives analysis.Under both the EIA Directive and Article 4(7) WFD, the absence of a robust and up-to-date assessment of groundwater alternatives is sufficient, in itself, to render the Project unlawful.

5.2 Polaphuca Reservoir as an Alternative Strategic Asset. Polaphuca Reservoir represents a significant existing strategic water asset that has not been adequately assessed as an alternative or complementary solution.

Polaphuca has: a total storage capacity of approximately 166 billion litres, an active storage capacity of approximately 148 billion litres, and a surface area of 22.26 km^2.espite its scale, location, and existing role in water management, Polaphuca has not been properly evaluated in terms of: sustainable yield optimisation, operational flexibility during drought conditions, integration with existing treatment and distribution infrastructure, or phased enhancement as part of a diversified supply strategy. The failure to meaningfully assess Polaphuca as an alternative strategic resource undermines the claim that abstraction from the Shannon represents the only feasible option

5.3 Desalination and Other Supply-Side Options: Desalination and other supply-side options have been dismissed at a high level without a detailed or up-to-date comparative assessment. While desalination presents environmental and energy considerations, it is: a reversible and location-specific intervention, scalable and modular and increasingly used internationally as part of diversified water supply portfolios, particularly in climate-stressed regions. Crucially, desalination does not require the permanent modification of a river basin or the irreversible loss of restoration potential in protected freshwater systems. Other supply-side options, including: targeted expansion of existing treatment plants, conjunctive use of surface water and groundwater, seasonal or emergency-only abstraction strategies, have likewise not been adequately explored or compared.

5.4 Legal Implications: The alternatives analysis fails to meet the standard required by EU law. Where: groundwater alternatives have been unlawfully dismissed, existing strategic assets have not been properly assessed, and supply-side options have been rejected without rigorous comparison, the conditions of Article 4(7) WFD cannot be satisfied. In such circumstances, the Project cannot lawfully proceed.

6 Existing Ecological Status of the Shannon Water Bodies–Lough Derg System

6.1 Baseline Ecological Condition

Environmental Protection Agency (EPA) assessments have classified Lough Derg and associated Shannon water bodies as being at less than good ecological status. Pressures include:

Nutrient enrichment from diffuse and point sources

Hydromorphological alteration

Barriers to fish migration

Invasive species (e.g. zebra mussel, Asian clam)

Altered flow regimes

Planning decisions must be made against this degraded baseline.

This baseline condition is critical: abstraction risks must be assessed against an already stressed system with reduced ecological resilience, not a pristine or high-status waterbody.

Fisheries monitoring by Inland Fisheries Ireland further documents ecological concerns through Water Framework Directive fish classification surveys and ongoing stock assessments. These surveys identify altered fish community structure and continuing management challenges for migratory and resident species.

Why Baseline Stress Matters: Lessons from International Analogues

Large-scale ecological failures associated with abstraction—such as the Aral Sea, the Colorado River, and the Murray–Darling Basin—did not arise from single abstractions imposed on healthy systems. They occurred where systems already subject to regulation, nutrient pressure, or habitat alteration lost resilience and were pushed beyond ecological thresholds during drought years.

The Murray–Darling Basin is the closest analogue for Ireland: a temperate, developed country with regulated rivers, competing demands, and climate-driven low-flow risk. Its collapse demonstrates that abstraction impacts are non-linear and emerge most strongly during dry periods, not average years. The Water Framework Directive explicitly prohibits authorising projects that risk further deterioration of already stressed water bodies. Further abstraction from Lough Dery would likely result in a catastrophic concentration of toxic algae in the lake.

6.2 Loss of Ecological Resilience

Resilience refers to a system's capacity to absorb shocks (such as drought) without undergoing regime change or long-term degradation. Abstraction during low-flow periods reduces ecological buffering capacity, making collapse more likely during extreme events.

6.3 Loss of Ecological Resilience in a Regulated System

The project is frequently framed as abstracting approximately 2% of the long-term average flow of the Shannon at Parteen. This framing is ecologically misleading. Ecological impacts are driven by low-flow conditions, not long-term averages.

During drought periods: Flows are already near ecological thresholds and Lake storage (Lough Derg) is relied upon. Small additional abstractions have disproportionately large impactsLong-term average flow at Parteen is approximately 180 m^3/s. The proposed abstraction of 300–330 ML/day corresponds to approximately 3.47–3.82 m^3/s.
While this equates to 2% of average flow, ecological stress does not occur during average conditions. It occurs during low-flow, high-temperature periods when:

- flows are already reduced,
- oxygen availability is lower,
- nutrient impacts are magnified,
- fish movement is constrained.

Low-Flow Abstraction Is Far Riskier Than % of Annual Average Flow

7. Hydrological and Ecological Impacts of Large-Scale Abstraction

Using published EPA licensing material for the Lower Shannon, the Q95 low-flow statistic is reported as approximately 12.53 m^3/s. If a continuous abstraction of 3.82 m^3/s were imposed under such conditions, it would represent: 30.5% of the river flow at Q95 conditions.
By definition, Q95 conditions occur approximately 5% of the time in the long-term flow record. These periods correspond to the very conditions most likely to cause ecological harm.
Even using the lower 3.47 m^3/s abstraction figure, the proportional impact remains in the double-digit percentage range under low flows. The ecological issue is not whether statutory compensation flows are maintained, but where the abstracted water is operationally sourced during droughts: reduced hydro diversion, altered lake levels, or modified release timing. These trade-offs are precisely where paper sustainability assumptions have failed in other regulated systems. Lough Derg possesses an approximate total water volume of 0.887 cubic kilometers, equivalent to 887 million cubic meters or approximately 213 billion gallons. Its key physical characteristics include a surface area of 130 square kilometres, an average depth of 7.6 meters, a maximum depth of 36 meters, and a length of 38.6 kilometres. In contrast, the Pollaphuca Reservoir has a total capacity of 166 billion Liters and an active capacity of 148 billion Liters, with a surface area of 22.26 square kilometres.

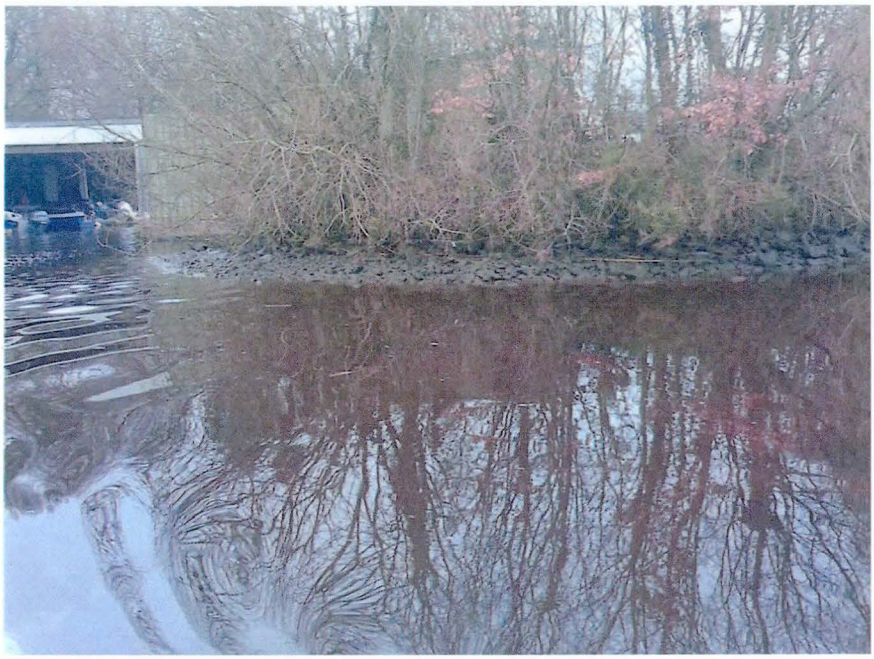
A compensation flow of 10 cubic meters per second is consistently maintained in the lower River Shannon, along with a Fish Pass flow of 0.7 cubic meters per second, even when the Ardnacrusha Flow is at zero and all turbines are disengaged. The water level at Parteen Weir is managed within a narrow operating band, approximately 460 millimeters in depth, which extends over the natural surface of Lough Derg. ESB manages water levels within this normal operating band, across a wide range of flows, as an integral component of their hydroelectric scheme management. During flood periods, water levels in Lough Derg may exceed this normal operating band.

Each of Ardnacrusha's four turbines utilizes approximately 100 cubic meters per second. The flow through Parteen Villa Weir is distributed between the original course of the Shannon, which is allocated 10 cubic meters per second, and the new channel directed through Ardnacrusha. When there is no water flow through Ardnacrusha, the water level of Lough Derg remains at its normal state, as indicated by the Killaloe pier head chart, and no significant current is observed at Killaloe. It is important to note that a water level drop of 0.3 meters is a recurring event on Lough Derg, falling within the established operating band of 0.46 meters. Such occurrences are primary contributors to the increased frequency of algal blooms observed on Lough Derg, exemplified by the event in September 2025 when the water table experienced a 28-centimeter decline.

Fluctuating water levels pose several detrimental impacts on freshwater lakes, contributing to pollution through various mechanisms: Sediment Exposure: Reduced water levels expose the lakebed, leading to the release of stored nutrients and chemicals from the sediment into the water column. Habitat Disruption: Variations in water levels disrupt aquatic habitats, thereby destabilizing the ecosystem and rendering it more susceptible to external pollutants. Increased Runoff: Rapid declines in water levels, particularly when followed by substantial rainfall, can escalate surface runoff, transporting pollutants from terrestrial areas into the lake.

Local Case Study -Parteen weir

Below are photographs from St. Flannan's Angling Club Killaloe members taken on the 12.02.26 who encountered navigation challenges departing the club's 70-berth boat shed. are over 180-200 berth owners south of Killaloe Bridge who are significantly impacted by variable flow conditions in the Parteen basin and have expressed concerns regarding the pipeline.





In Ireland, a hydrological drought is associated with surface and sub-surface water availability. Hydrological droughts often lag meteorological and agricultural droughts. Depending on catchment characteristics, it takes longer for precipitation deficits to emerge in streamflow, groundwater and reservoir levels. They can also last long after meteorological and agricultural droughts have ended.
See
https://www.ria.ie/blog/drought-a-risk-being-overlooked-in-ireland/
These periods may not involve an absolute absence of rainfall, but rather insufficient precipitation to replenish river systems adequately.

The pipeline is currently presented as a 'negligible' 2% abstraction.
This 2% is derived from annual average flow of the Shannon. To use average flow from a whole year is grossly misleading.

The proposed abstraction will in fact be the equivalent of up to 30% of available flow in drought periods, due to already lowered water levels.
This is explained in detail below.
This is a completely unacceptable environmental risk.

It is evident that over recent years, 'experts' have failed to perform a robust drought sensitivity analysis, and failed to demonstrate that the project supports a wide margin of safety in this regard.
It is unreliable as a dry-spell water source for Dublin.

3. Flow breakdown

The three outlets from Parteen Basin are
- Ardnacrusha hydro station
- Old Shannon rivercourse
- Clareville WTP.

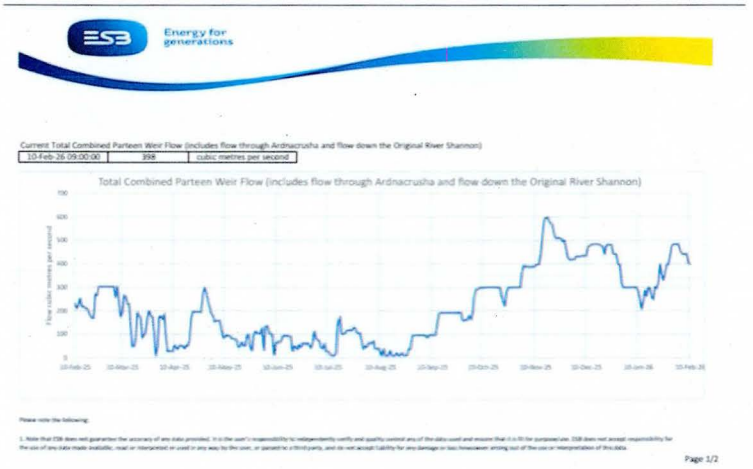
Flow data obtained from the ESB under the **Freedom of Information Act see Appendix E** indicates that, over the past ten years, there have been, on average, 20 days per year during which the turbines at Ardnacrusha took Zero water. Clareville WTP was supplying 0.6m3/s to Limerick all the time.And from the same dataset, ONLY the Statutory Minimum of 10.5 m3/s was flowing down the Old Shannon.
The proposed pipeline would abstract 3.5m3/s or the equivalent of 33% of this flow of 10.5 m^3/s. So over the last 10 years, for about 20 days each year, there was No Surplus that could have been taken by a pipeline. Limerick City is already abstracting approximately 0.6 m^3/s from the Parteen Basin. This demand will increase as further housing and industry development, and associated infrastructure are constructed. It is therefore completely misleading to suggest that there is a "surplus" available for a pipeline.
During dry spells, when Ardnacrusha already cannot operate, it is impossible to simultaneously satisfy
- statutory flow requirements for the Old Shannon,
- supply Limerick
- maintain lake levels within ecological acceptable min/max range.
- AND supply the pipeline to Dublin.

Concrete example from 2018

The most recent significant dry spell (drought) was summer 2018, during which the low-flow conditions persisted for 74 consecutive days. (ESB data).
During this period, Ardnacrusha abstraction ceased. It was Zero.
The only Shannon flow arriving into the Parteen basin, was just sufficient to meet the minimum statutory requirement of 10 m^3/s for the Old Shannon, and supply Clareville WTP. Additional abstraction for a pipeline under these circumstances would have been unacceptable. Lowering the water levels in the Old River Shannon and/ or Lough Derg above Parteen, would have been the only option, with no means to control duration. We do not control how long droughts last.

The mitigation measures proposed by Uisce Éireann are insufficient, lack enforceable guarantees, and do not adequately address these realistic already-occurring climate scenarios.Their flow modelling has not been back-tested against examples such as 2018. The entire stretch of the River Shannon concerned, is protected under the EU Natura 2000 network, which places strict legal obligations on the State to avoid deterioration of protected habitats and species. Any development, such as lowering water levels below established minimums, risking permanent ecological harm, is illegal under these

protections.



Energy for generations

Current Total Combined Parteen Weir Flow (includes flow through Ardnacrusha and flow down the Original River Shannon)

10-Feb-26 09:00:00	398	cubic metres per second

Total Combined Parteen Weir Flow (includes flow through Ardnacrusha and flow down the Original River Shannon)

Please note the following:

1. Note that ESB does not guarantee the accuracy of any data provided. It is the user's responsibility to independently verify and quality control any of the data used and ensure that it is fit for purpose/use. ESB does not accept responsibility for the use of any data made available, read or interpreted or used in any way by the user, or passed to a third party, and do not accept liability for any damage or loss howsoever arising out of the use or interpretation of this data.

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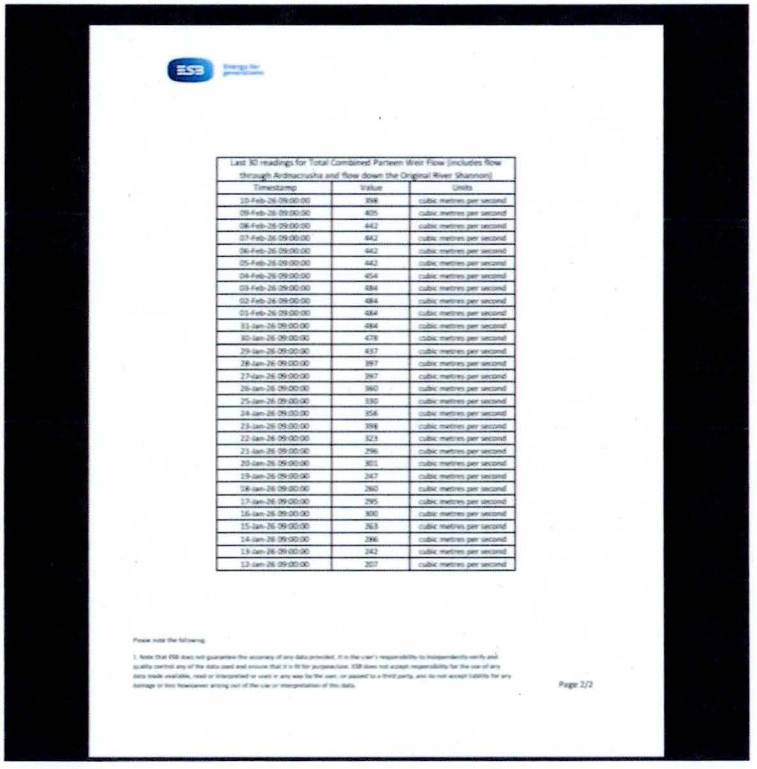

Last 30 readings for Total Combined Parteen Weir Flow (includes flow through Ardnacrusha and flow down the Original River Shannon)

Timestamp	Value	Units
10-Feb-26 09:00:00	398	cubic metres per second
09-Feb-26 09:00:00	405	cubic metres per second
08-Feb-26 09:00:00	442	cubic metres per second
07-Feb-26 09:00:00	442	cubic metres per second
06-Feb-26 09:00:00	442	cubic metres per second
05-Feb-26 09:00:00	442	cubic metres per second
04-Feb-26 09:00:00	454	cubic metres per second
03-Feb-26 09:00:00	484	cubic metres per second
02-Feb-26 09:00:00	484	cubic metres per second
01-Feb-26 09:00:00	484	cubic metres per second
31-Jan-26 09:00:00	484	cubic metres per second
30-Jan-26 09:00:00	478	cubic metres per second
29-Jan-26 09:00:00	437	cubic metres per second
28-Jan-26 09:00:00	397	cubic metres per second
27-Jan-26 09:00:00	397	cubic metres per second
26-Jan-26 09:00:00	360	cubic metres per second
25-Jan-26 09:00:00	330	cubic metres per second
24-Jan-26 09:00:00	356	cubic metres per second
23-Jan-26 09:00:00	398	cubic metres per second
22-Jan-26 09:00:00	323	cubic metres per second
21-Jan-26 09:00:00	296	cubic metres per second
20-Jan-26 09:00:00	301	cubic metres per second
19-Jan-26 09:00:00	247	cubic metres per second
18-Jan-26 09:00:00	260	cubic metres per second
17-Jan-26 09:00:00	295	cubic metres per second
16-Jan-26 09:00:00	300	cubic metres per second
15-Jan-26 09:00:00	263	cubic metres per second
14-Jan-26 09:00:00	206	cubic metres per second
13-Jan-26 09:00:00	242	cubic metres per second
12-Jan-26 09:00:00	207	cubic metres per second

Please note the following:

1. Note that ESB does not guarantee the accuracy of any data provided. It is the user's responsibility to independently verify and quality control any of the data used and ensure that it is fit for purpose/use. ESB does not accept responsibility for the use of any data made available, read or interpreted or used in any way by the user, or passed to a third party, and do not accept liability for any damage or loss howsoever arising out of the use or interpretation of this data.

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7.1 Lake Level Fluctuations and Littoral Habitat Loss

Assumes that in very low flow/drought conditions, that Ardnacrusha does not draw water for power generation. The statutory minimum flow for the Old Shannon is supposed to be 10 m3/s (10 cumecs).

From our OEA AIE 2026 02 from the EPA of 4 Feb, in Record 2 the ESB claims that the mean daily flows are 10 or sometimes 10.5 cumecs, (this figure is always 10 or 10.5, from 1st april to 1st Oct, in

each year between 2016-2024). Please note the EPA rely on these figures from the ESB, which mean daily flows in the summer months, we can say the ESB claim to be releasing a daily average of 10.5 cumecs down the Old Shannon from Parteen. Only 10.5 cumecs was coming down the whole Shannon system and then being sent down the Old Shannon from Parteen weir. For these approx 14 days, spread across the summer dry months, if the proposed pipeline takes 3.47 cumecs, this would represent: 3.47/10.5 = 33% of the total flow in the Shannon.

We have extracted the flow data for 2018 and sorted by lowest flow. In 2018 there were 74 days where Ardnacrusha took Zero, and only the 10.5cumecs was going down the old Shannon. So for those 74 days, in order to preserve the statutory flow in the old Shannon, the pipeline would not have been able to take any water! Given that we are due droughts every two years this is a huge concern.

The EPA already knows there is a risk to flows from abstraction. This extract is from page 12 of the "Technical review of HMWB designation" of March 2022.

"Impacts to flows. Large dams which capture a large proportion of a catchments flow cause significant alteration of the natural flow regime. Compensation flows, while providing a benefit in terms of a minimum flow, may be constant and non-varying, and the total flow will be impacted by the abstraction. The intensity, timing and frequency of the downstream flow regime will be completely altered, often resulting in a decrease in the magnitude of small and medium sized flood peaks, and an increase in low flows. In some instances, operational procedures can result in rapid flow fluctuations that occur at non-natural rates. Over-abstraction of the upstream reservoir can also result in the downstream river drying out at certain periods of the year."

The Castleconnell River Association maintains and monitors about 200 wild salmon spawning beds (redds) in the Old Shannon River near Castleconnell village. See ccriverassoc.org

These are the only, and the last, wild salmon still spawning in the Shannon. Atlantic salmon are on the IUCN Red List of Threatened Species. NO degradation of habitat is permitted, under the Habitats Directive. The survival of eggs and newly hatched fry are particularly sensitive to the above water flow issues. Once these are gone, they are gone. They cannot be re-established.

(The Shannon used to host the biggest wild salmon runs of all the rivers in Europe, estimated at over 400,000 fish per year).

Specific Ecological Impacts

Littoral and Shoreline Habitats

Shallow margins of Lough Derg are among the most biologically productive habitats in the system. Sustained water level drawdown of even 10–30 cm can result in:

- Desiccation of reed beds and macrophytes
- Loss of invertebrate production
- Reduction in fish spawning and nursery areas
- Repeated drawdown leads to long-term habitat loss with slow or incomplete recovery.

Fish Populations and Migration

The Lower Shannon and Parteen–Ardnacrusha complex is already a critical bottleneck for migratory species. Reduced flows:

- Impair attraction flows at fish passes
- Disrupt migration timing
- Increase predation and exhaustion
- Population-level impacts typically manifest gradually, making them easy to dismiss until recovery is no longer possible.

Water Quality and Oxygen Dynamics

Low flows combined with warmer temperatures:

- Reduce dilution capacity
- Increase residence time
- Raise the risk of algal blooms and hypoxia
- Such conditions are well-documented precursors to fish kills and ecosystem collapse in regulated river–lake systems worldwide.

A **100-metre stretch of native woodland** will be directly affected and removed at the point of abstraction. The proposed abstraction pipeline and associated works, located at Parteen Basin (coordinates: 52.782954, -8.444928), require the clearance of an established tree line along the shoreline. This woodland forms part of a sensitive riparian habitat, providing ecological functions that include:

- bank stabilisation and erosion control,
- shading and temperature regulation of near-shore waters,
- habitat connectivity for birds, mammals, and invertebrates, and
- landscape and amenity value within a protected river system.

The removal of this woodland will result in immediate and irreversible habitat loss at the abstraction point, fragmenting shoreline ecology and compounding the wider hydrological and ecological pressures already affecting the Lower Shannon system.

Given the location within a highly regulated and ecologically sensitive basin, the clearance of native woodland at the abstraction point cannot be regarded as minor or localised. It represents a direct physical impact that must be fully assessed in its own right, particularly in the context of Natura 2000 protections and the cumulative effects of abstraction-related works.





8: The Lower Shannon: A River in Decline

8.1 Historical Context

The body of water known as the Lower Shannon consists of that part of the river downstream from the Parteen Regulating Weir to where it joins the water from the Ardnacrusha tailrace at Long Shore, about a mile upstream of Limerick City.

Only about 5% of the river's natural flow is allowed through this section; the remainder is diverted to the Ardnacrusha generating station. Since the inception of the Shannon Scheme in 1929, the river has been gradually closing in—a change that is clearly visible in Castleconnell, Plassey, and Corbally.

First, a little background. There is a 26-kilometre stretch of the River Shannon, from the Parteen Weir to Limerick city, which in the early 1920's was a unique salmon fishery. The estimated annual salmon run was between 350,000–500,000 fish. In 1927, 414,000lb of salmon were caught on the river. Salmon weighing 55 lb or more were regularly caught using local, hand-crafted Enright rods at Castleconnell. Then came the Ardnacrusha hydro power station which was officially opened on July 22, 1929 by President WT Cosgrave. The impact on salmon, trout, eels, lamprey and coarse fish was immediate and catastrophic.

There are essentially two reasons why the river just north of Limerick city was a world-class fishery. First, Atlantic salmon migrate from the sea to reach freshwater to spawn. At the Thomond Bridge area in Limerick city they encounter the tidal limit and pass into fully fresh, non-tidal water. The salmon paused in huge numbers in this area to rest and recover before setting-out to points upstream on the 360km river. Second, the previous, full natural flow from the upper Shannon produced ideal conditions to create the perfect salmon habitat, particularly just above the Doonass Falls in Castleconnell; rich, diverse riverbanks, oxygen-rich water, deep holding pools and shallow gravel beds gave rise to famous salmon pools.

The Shannon Scheme entailed diverting water from the river at a newly constructed Parteen Weir down a 13km long canal, called the headrace, to the turbines in Ardnacrusha Power Station. The water then exited to a constructed tailrace, 5km in length, before joining up with the old River Shannon in the city centre.Post 1929, the annual average flow of water down the river was 210 m^3/s. Of this, 200 m^3/s was diverted down the headrace to Ardnacrusha for power generation and the remainder, a "compensation flow" of 10 m^3/s, was diverted down the old Shannon river. As the water level in the old Shannon fell from 210 m^3/s to 10 m^3/s, the old river was too shallow for the fish to migrate upstream, the spawning beds became exposed to birds and frost.

However, the "lordly" salmon kept coming up the estuary but now, because they instinctively swim towards fast water, they went up the tailrace, not the old river, where they encountered, literally, a concrete wall at Ardnacrusha. Equally, the salmon and smolts coming down the Shannon entered the headrace and found themselves either trapped or mangled by the four turbines at the power station. Confused and exhausted, the fish died in huge numbers in the polluted water on either side of the power station. It took 30 years, until 1959, before the ESB introduced a fish lift at Ardnacrusha; an ineffective lift still in use today.

This lift enabled the fish in the tailrace to go upstream and allowed the fish in the headrace to swim downstream into the estuary. Despite the establishment of the River Shannon Salmon Management

Programme in 1990, the number of fish ascending the lift in Ardnacrusha has fallen from 12,000 in 1964 to a miniscule 123 in 2024 and fishermen on the old river are now all but non-existent. The requirement to maintain a minimum compensation flow of 10 m^3/s down the old River Shannon is a statutory requirement based on the Shannon Electricity Act 1925.

8.2 Flow Diversion, Channel Contraction and Habitat Degradation

This means that Uisce Eireann's proposal to abstract 4 m^3/s at the Parteen Basin, under normal circumstances, must come from the flow of water to Ardnacrusha not the old Shannon river. The water abstraction will reduce by an equal amount the flow of water to the power station which is a carbon-neutral form of electricity. How much of the water abstraction will reach households, business and hospitals in the Dublin region?

The pipeline includes multiple offtake hubs along the route presumably intended to supply towns and communities in the Midlands. Hence the 4 m^3/s is very likely to be a minimum not a maximum and there is no pending legislation specifying a maximum abstraction.

Of the water reaching Dublin, 33%, or 1.3 m^3/s, will be lost through leaks before reaching homes and businesses. This is due to an archaic, damaged pipe system dating back to the Victorian era. In most Western European cities the leakage is typically in the 10–25% range. In addition, existing Dublin data centres will use approximately 17% of the abstracted water or 0.46 m^3/s.

Instead of the further exploitation of an unique habitat and treating the Shannon as a trade-off between power and water supply, this is an opportune time to expand the narrative and add a third variable to the equation, namely ecology, and the restoration of the old River Shannon to a living salmon river. Salmon restoration cannot happen without an adequate supply of water and modern fish guidance systems to divert the fish to the old river. As an example, starting from the pre-abstraction situation, increasing the old Shannon flow from the current 10 m^3/s to 50 m^3/s, backed-up by serious habitat restoration in tributaries and spawning grounds and favourable ocean conditions, the old River Shannon could plausibly start to move towards the conservation limit.

This would reduce Ardnacrusha's average available flow by 44 m^3/s which corresponds to about 100 GWh per year in energy or about 0.3% of Ireland's annual electricity consumption. A small price to pay for repairing the sins of the past.

8.3 Contemporary Pollution and Navigation Impacts

In parts of Castleconnell, the river is now no more than 10 metres wide, notably at the Gap of the Dam, Poulcaum, and the Dancing Hole. In sections of Plassey, the river's width has shrunk by 50 metres or more.

If you walk across the Living Bridge at UL and look downstream, you will see numerous small islands that have formed over time. Here, the river has an average depth of little more than half a metre—a striking contrast for what was once described as the largest river in the British Isles.

A similar situation exists at St Thomas's Island near Corbally. During the summer months, there is a profusion of weed growth in most shallow areas of the river. At Cooper's Height, between Castleconnell and O'Brien's Bridge, this causes serious problems for the rowing clubs—both Castleconnell and Limerick—who use this stretch for training and competition. Further downstream at Plassey, Lanarone, Clouncarthy, and all the way to Corbally, it is often difficult to navigate due to the abundance of pond weed and streamer weed.

The section of river beginning about 200 metres below Black Bridge at Plassey, near the sewage discharge point, is particularly badly polluted due to an overloaded pumping station. Seagulls can be seen perched on the bridge railings daily, waiting for effluent to be discharged. This was once the stretch of river where much of Limerick learned to swim, before the advent of swimming pools. Anglers used the water to train their "billy cans." It has been many long years since people swam at Sandy, the Shannon Fields, Corbally Baths, or Island Baths.

About 16 years ago, main drainage was finally installed, and it was believed that Limerick's sewage problems would be solved overnight. Unfortunately, this proved not to be the case. The new wastewater treatment plant, located a further mile and a half downstream at Bunlicky near the cement factory, is now overloaded and unable to handle the volume produced. As a result, clean water is not being discharged into the river.

On an incoming tide, this effluent is pushed back up through Limerick, creating a toxic environment during the summer months, when water levels are at their lowest. We now await further news on what will undoubtedly be a very expensive upgrade.

Clareville Water Works is located on the River Shannon treat and supplies around 50,000 m^3 of water per day to Limerick. That capacity supports the drinking water needs of Limerick City and substantial surrounding populations — estimates range into tens of thousands This water supply will also potentially be affected.

The proposed pipeline extraction would effectively eliminate the possibility of restoring the lower course of the Shannon River in the future. unlawful under EU environmental law breaching the EU Water Framework Directive (WFD) - Directive 2000/60/EC

If the river is not a HMWB, the State must:

- Prevent deterioration of water status
- Achieve or restore "Good Ecological Status"

Article 4(1)(a) - No Deterioration

- Any project that prevents future restoration constitutes deterioration in law, even if current status is already poor.
- The Court of Justice of the EU (CJEU) has confirmed that *blocking improvement pathways* breaches this article.

Article 4(1)(a)(ii) - Restoration Obligation

- Member States must actively restore water bodies to good status.
- A pipeline that makes restoration impossible is incompatible with this duty.

Article 4(7) - New Modifications

- New infrastructure is only permitted if:
    - There is overriding public interest
    - No significantly better environmental alternatives exist
    - All mitigation measures are applied

If the water body is *not* designated HMWB, relying on Article 4(7) becomes legally weak and highly challengeable. Without HMWB status, the project is presumed unlawful under the WFD unless an Article 4(7) exemption is rigorously justified.

9: Climate Change and Increasing Drought Frequency

9.1 Historical Droughts affecting the Shannon Catchment

Introduction: Noone et al. (2017) developed a historical drought catalogue for the island of Ireland, showing that we have had intimate past experiences of drought with diverse impacts. Murphy et al. (2020) report on a major drought from 1765-1768 that impacted across the British and Irish Isles, dwarfing many subsequent droughts in the record. Forthcoming research from the JPI funded project CrossDro on multi-century tends in drought across Europe shows that Ireland has amongst the strongest trends to greater precipitation deficits in summer.

The year 2018 revealed the vulnerabilities of Irish society to drought across multiple sectors, particularly water supply, agriculture and ecology. In the context of multi-centennial historical records, the 2018 drought was not very remarkable. However, this should alert us to how vulnerability to drought has grown in Ireland over recent decades. It should prompt us to ask how we could have been better prepared.

Durning the Covid-19 pandemic, another drought came. Following a wet winter, an exceptionally dry spring resulted in precipitation deficits comparable to (and in places exceeding) 2018 in the east and southeast, but earlier in the year. Soil moisture deficits were considerable. Seasonal forecasts from multiple international modelling centres as predicted brought a hotter and drier than normal summer.

Over the coming decades our experience of drought is likely to become more frequent. Human driven climate change will be super-imposed on natural variability. Climate models tend to project reductions in summer precipitation for Ireland, though the magnitude of decreases is uncertain. Warming temperatures will also likely increase evapotranspiration, potentially increasing drought severity and the more rapid generation of soil moisture deficits. The persistence of blocking anti-cyclones – the atmospheric conditions often linked to droughts are anticipated to increase. Winters are expected to become wetter, but also more variable, with potential impacts on drought timing and duration.

Observed climate data for Ireland over the last decade demonstrates increased frequency of absolute and partial droughts, longer dry spells, including in the Shannon catchment and Higher summer temperatures increasing evaporation and oxygen stress. Climate projections indicate these trends will intensify, directly undermining the hydrological assumptions underpinning the project.

9,2 Climate Projections

Ireland's rainfall regime is strongly controlled by the North Atlantic jet stream. Research indicates that climate change may Increase atmospheric moisture capacity (7% per °C warming, Clausius–

Clapeyron scaling). Increase the intensity of heavy precipitation events and alter storm-track positioning and blocking frequency over the North Atlantic–European sector which will result in more intense rainfall episodes, particularly when storm tracks align through the Irish Sea or south of Ireland. The jet stream does not simply determine how much rainfall Ireland receives; it determines where, when, and in what intensity it falls. Under climate change, this redistribution of rainfall increases the probability of hydrological imbalance — heavier episodic rainfall in the east alongside longer inter-event dry spells nationally. This has direct implications for the resilience assumptions underpinning large-scale inter-regional water transfer schemes such as the Eastern and Midlands Water Supply Project (commonly referred to as the Shannon-to-Dublin pipeline). We will experience longer dry intervals between frontal systems, especially during blocking patterns. For the east — including Dublin — this translates into higher flood risk during extreme events but greater summer and multi-week dry spell vulnerability. For the west, although annual totals remain higher, projections suggest stronger seasonality: wetter winters, drier summers.

Authoritative sources documenting these shifts include:

Met Éireann – Climate change assessments and rainfall trend analysis.

Environmental Protection Agency – National Climate Change Risk Assessment.

Climate Ireland – Regional projections for precipitation intensity and seasonal drying.

Royal Irish Academy – Research on North Atlantic storm track variability.

Drought Risk Is Increasing — Even in a "Wet" Country

Ireland is often characterised as water-rich. However, drought risk is driven not by annual totals but by:

- Seasonal distribution
- Soil moisture deficits
- Reservoir recharge timing
- Consecutive dry weeks
- Demand concentration

Recent drought episodes (e.g., 2018 and subsequent summer deficits) demonstrated that eastern catchments are highly vulnerable to sustained high-pressure blocking. Climate projections consistently indicate:

- Drier summers in eastern and midland regions
- Increased evapotranspiration under warming
- Greater variability in recharge

Thus, the emerging hydroclimatic regime is one of hydrological volatility, not abundance.

9.3 Implications for long term water security

The Eastern and Midlands Water Supply Project, led by Uisce Éireann, proposes abstraction from the River Shannon to supply the Greater Dublin Area and Midlands.

Critical vulnerability considerations:

- Source Reliability Under Climate Stress. The Shannon basin is also subject to projected summer drying and higher evapotranspiration. A national transfer scheme assumes long-term surplus availability that may diminish during prolonged drought sequences.
- Systemic Concentration Risk
  Increasing dependence on a single inter-basin transfer creates centralised exposure to: Multi-year drought, operational constraints, Ecological flow protections, Mismatch Between Rainfall Intensity and Storage, Heavier rainfall events do not automatically increase usable supply. Rapid runoff during intense storms may also Increase flooding, Reduce infiltration Limit groundwater recharge and Exceed storage capture capacity

Demand-Side Escalation
Population growth in the Greater Dublin Area compounds risk during summer low-flow periods — precisely when jet stream blocking is most likely to suppress rainfall.

Strategic Policy Concern

If climate change increases we will see

- Rainfall intensity variability
- Summer drying in eastern and midland regions
- Drought frequency under persistent high-pressure regimes

Then a long-lived (multi-decade) infrastructure decision must be stress-tested against compound drought scenarios, not historical averages. A core policy question emerges: *Does the current design sufficiently account for non-stationarity in Ireland's hydroclimate?* The traditional assumption of Shannon surplus availability may rely on past climatology rather than future jet-stream-mediated variability.

Policy Conclusion

The emerging climate signal for Ireland is not one of uniform wetness, but of greater extremes and seasonal asymmetry. The jet stream's evolving behaviour means:

The east may experience more intense rainfall events but also sharper summer deficits.

The west may remain wetter annually yet face longer inter-event dry periods.

National water security will depend increasingly on storage, demand reduction, leakage control, and decentralised resilience, rather than simple inter-basin transfer.

From a climate adaptation perspective, any major water abstraction project must demonstrate robustness under:

- Repeated multi-season droughts
- Reduced recharge efficiency
- Increased interannual volatility

Failure to incorporate these dynamics risks infrastructure lock-in based on outdated hydroclimatic assumptions.

The jet stream doesn't just change how much rain Ireland gets — it changes where and how we get it. As climate change loads the dice toward heavier rainfall when conditions align, the east (including Dublin) can see more high-impact rain episodes under certain storm tracks and Irish Sea shower

setups, while the west can simultaneously experience longer drier spells between events—even though it remains the first landing point for many Atlantic systems.

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5.6 Major Historical Droughts Affecting the Shannon Region

According to Maynooth University's 250-year drought reconstruction catalogue (1765–2015; O' Connor et al. 2022; Jobbová et al. 2024), the following periods saw significant dry conditions across Irish catchments, including the Shannon:

- 1765–1768: Identified as the most severe to affect Ireland over the 250 year period (Murphy et al. 2020) and is noted to have spanned 40 months thus being a multi-year drought. The drought is notable across Britain and Ireland but is most severe in Ireland and Scotland (Murphy et al. 2020). Significantly, one of the impacts, reported in newspaper accounts, is that the River Shannon had 'been fordable on foot'.
- 1800–1809: A decade characterized by intense, long-duration, and recurring droughts.
- 1854–1860: A long-duration, intense drought.
- 1887–1888: A "national calamity" identified by Maynooth researchers, featuring intense summer drought.
- 1933–1935 & 1944–1945: Significant droughts identified in Irish catchment studies.
- 1975–1976: A major pan-European drought that caused severe water stress in Ireland.
- 2018: The most significant recent drought. Water levels in parts of the River Shannon and the River Liffey dropped so low that sections could be safely waded across in 2018 (O'Connor et al. 2022).
- 2020: A significant spring drought, leading to national water shortages (O' Connor et al. 2022).

Broad findings from ICARUS (Irish Climate Analysis and Research Units) publications:

· Drought as a "Forgotten Hazard": Researchers have highlighted that recent decades (post-1990) have been relatively wet, causing a societal underestimation of Ireland's drought vulnerability (O'Connor et al. 2022; Jobbová et al. 2024).

· Long-term Data: By digitizing pre-1940 rainfall records and analyzing newspaper archives, the Maynooth team established that extreme events are more common than modern experience suggests (O' Connor et al. 2022; Jobbová et al. 2024).

· Changing Patterns: While winter/spring precipitation has increased, summers have seen a trend toward drier conditions, increasing the risk of summer hydrological droughts (Jobbová et al. 2024).

References:

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Data From ICARUS/Maynooth University

Likely increased drought or dry weather periods in the Mid-West of Ireland over the next 20 years (to 2045), drawing on the most relevant information from Met Éireann, Copernicus, and climate research linked to ICARUS/Maynooth University, supplemented with broader climate projections for Ireland:

1) Current Observations: Dry Periods Already Increasing

· Met Éireann's 2025 climate analyses found numerous dry spells and drought events across Ireland in 2025, including absolute droughts (15+ days without significant rain) and extended dry periods recorded at many stations. This reflects a recent pattern of more frequent dry weather and warming trends that support such conditions.

· Copernicus European Drought Observatory (EDO) indicated periods in 2025 where large parts of Ireland and Europe were experiencing drier than average conditions and drought warnings/indicators — showing dry conditions in many areas.

2) Climate Model Projections: More Variable Rainfall, Longer Dry Spells

While Ireland's overall annual precipitation isn't projected to sharply decline, the seasonal distribution and variability are expected to change in ways that favour dry spells, especially in summer:

Summer dryin

· Climate projections for Ireland (e.g., regional climate models under different emissions scenarios) suggest summer rainfall may decrease significantly by mid-century (e.g., a 2–17 % summer decrease under

high-emissions scenarios), with dry periods (5+ days with very little rain) becoming more frequent, potentially up to 48 % more common in summer.

More variable precipitation

· But projections also indicate the number of heavy rainfall days will increase in autumn/winter even as summers become drier — meaning that drought and flood risks both grow.

· Seasonal models show increased potential evapotranspiration (drying due to higher temperatures) combined with less summer rain is likely to increase aridity and water deficits, especially in spring/summer, by late century.

Temperature increases accelerate drought risk

· A warmer atmosphere increases evaporation from soil and plants. Even without large drops in total rainfall, higher temperatures can lead to more frequent or severe meteorological and agricultural drought conditions in summer, particularly if rainfall timing shifts.

3) Contributions from ICARUS / Maynooth University

Although ICARUS and Maynooth University research primarily focuses on attribution of extreme temperatures, heatwaves, and event attribution (which is extremely relevant to drought potential):

· Recent collaborative studies (e.g., WASITUS project) show that warm summers like 2025 are now more likely due to climate change and that similar conditions will occur more frequently as background warming continues. Such warm, dry conditions are a key factor in increasing drought risk.

· ICARUS is also part of research (EXACT project) funded to assess how droughts, floods, and other extremes have changed and may evolve under climate scenarios — implying strong scientific interest and emerging results on future drought risks.

Although ICARUS has not yet published a headline national drought projection in the easily summarised literature, their work clearly aligns with the broader climate science consensus that extreme conditions including drought risk are increasing as temperatures rise.

Likelihood of Increased Drought / Dry Spells (Next 20 Years)

· Increased variability of rainfall, with more extended dry periods during summer even if annual totals don't decline sharply.

· More frequent warm summers and heat extremes, which enhance soil moisture deficits and drought potential — increasingly likely as global warming continues.

Moderate confidence

· Actual meteorological drought frequency (strictly defined) may have uncertainties at regional scales due to natural climate variability, but model consensus indicates a trend toward more frequent/longer dry spells in summer by 2040-2050 under current emissions pathways.

Less certain

· The magnitude and exact location of drought impact vary year-to-year and depend on broader circulation patterns (e.g., jet stream shifts), which remain intrinsically uncertain.

Summary — What This Means for the Mid West of Ireland

Over the next 20 years (to 2045): Warmer average temperatures are very likely. Summer rainfall is likely to become more variable and on average lower in many years. Dry spells and prolonged dry periods (and potentially moderate drought conditions) will become more common during the growing season, although severe precipitation deficits will still vary by year.

Together, these changes increase the likelihood of dry weather impacts — particularly on agriculture, soil moisture, and water resources — even if Ireland still experiences o

Example Taken from 2018

We have extracted the flow data for 2018 and sorted by lowest flow. Conclusion: in 2018 there were 74 days where Ardnacrusha took Zero, and only the 10.5cumecs was going down the old Shannon.

So for those 74 days, in order to preserve the statutory flow in the old Shannon, the pipeline would not have been able to take any water!

The spring drought in 2020 had 20 zero Ardnacrusha days, mostly in May and June)

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10. Failure of Environmental Assessment (EIA and AA) Internal Inconsistency in the EIAR

10.1 Internal Inconsistency in the EIAR

The Environmental Impact Assessment Report (EIAR) acknowledges a wide abstraction zone of influence extending from upstream of Parteen to downstream of Limerick Dock yet limits ecological assessment to the immediate intake area based on subjective 'look and feel' criteria. The gauge no. 25075 this information is not in the public domain by the EBD. The project fails to demonstrate beyond reasonable scientific doubt that it will not adversely affect the integrity of Natura 2000 sites hydrologically connected to the Shannon system, particularly under drought and climate stress scenarios.

10.2 Reliance on ESB Operational Assumptions

The EIAR relies heavily on assumptions regarding ESB operational controls (e.g. maintaining water levels within a normal operating band) without assessing abstraction impacts independently of those assumptions.

Third-party operational intentions cannot lawfully substitute for mitigation unless they are certain, enforceable, and assessed as part of the project.

11. Groundwater as a Superior and Sustainable Alternative

11.1 Groundwater resources in County Kildare as a superior alternative to long-distance surface-water abstraction.

A Strategic Case for Groundwater as a Sustainable Water Source in County Kildare

County Kildare is uniquely positioned to play a critical role in Ireland's future drinking-water strategy. Beneath the county lies a network of productive gravel and limestone aquifers that already supply homes, farms, group water schemes, and public supplies. When properly developed and protected, these groundwater resources offer a high-quality, lower-carbon, environmentally resilient alternative to large-scale surface-water abstraction schemes.

We set out why groundwater in Kildare should be fully explored and prioritised as a sustainable water source, particularly in the context of supplying the Greater Dublin Area. Kildare's Major Groundwater Systems overlies several regionally important aquifers capable of yielding substantial volumes of water:

Curragh (North Kildare) Gravel Aquifer

a) The largest shallow aquifer in the county
b) Occurs in extensive gravel deposits
c) Supplies local and public abstractions, including Monasterevin wellfield
d) Highly productive where properly developed

Allenwood Limestone Aquifer

e) A fissured limestone bedrock aquifer
f) Extends through Allenwood, Rathangan and Robertstown
g) Proven yields of several million litres per day from individual wells

Calp Limestone Aquifer

h) Regionally important limestone aquifer
i) Used for public supply near Johnstown Bridge
j) Like all limestone aquifers, it requires careful management due to areas of faster groundwater flow

Local Bedrock and Gravel Aquifers

k) Distributed throughout the county
l) Successfully support group water schemes and private supplies (e.g. Kilteel, Kilkea)
m) These aquifers are already functioning assets — not theoretical resources.It is often noted that limestone aquifers can have fast groundwater flow and therefore vulnerability. This is true only where development is poorly planned. With a proper drilling programme, including:
n) Step-drawdown and long-term pumping tests
o) Water quality analysis
p) Sustainability and recharge assessment
q) Source protection zoning
r) ...the quantity, quality, and long-term security of groundwater can be accurately assessed and safeguarded.
s) This approach is not new. It has been successfully applied for over 55 years in Ireland, supplying group water schemes serving 100+ houses and farms, often to a higher standard than surface-water supplies.

Naturally Superior Water Quality

t) Groundwater is naturally filtered through soil and bedrock
u) Typically, low in turbidity (floating solids)
v) Requires less chemical treatment than river water
w) This is fundamentally where drinking water should come from

Shorter Distance, Lower Carbon

x) Kildare is approximately 30 km west of Dublin
y) Contrast this with proposed surface-water abstraction from the River Shannon — a journey of ~165 km

z) A shorter supply route means:
aa) Lower carbon footprint
bb) Less construction disturbance
cc) Reduced impact on national amenities, flora, and fauna

Lower Treatment Burden

Shannon water carries significant turbidity, particularly during high flows. At least one-third of initial treatment would be dedicated to removing suspended solids. This produces large volumes of sludge mixed with treatment chemicals. Concerns have been raised — and independently investigated — regarding Shannon abstraction figures during drought conditions. Alarmingly, these figures do not add up in low-flow seasons. Ireland cannot afford an "eleven-month-a-year project" that: Fails under drought stress and affects multiple communities along its route which Impacts sensitive river ecosystems. Groundwater, by contrast, is buffered against short-term drought, particularly when abstraction is spread across multiple wellfields and aquifers. Groundwater is the backbone of urban water supply across Europe: London and Paris source up to 50% of their drinking water from groundwater wells. Across Europe, groundwater supplies 70% of potable water (Ireland currently 20%) Ireland —is behind, not ahead, on this issue. A Kildare-based groundwater strategy would save tens of millions of euro in infrastructure costs and reduce energy use and chemical dependency including minimize environmental disruption and align with EU Water Framework Directive objectives and deliver a resilient, high-quality supply "as nature intended" Simply put: It represents a superior supply with a quarter of the journey, far fewer environmental impacts, and long-term sustainability. This option must be formally considered, assessed, and explored as part of Ireland's national water strategy — before committing to irreversible, high-impact surface-water schemes. The dismissal of these options has been selective, inconsistent, and inadequately justified.

11.3 Environment, Carbon and Cost Advantages

As discussed in sections above, Uisce Eireann have not seriously considered exploring groundwater as resource (Usce Eireann, 2026) that, in combination with fixing leaks, could be explored as a resource at a fraction of the cost of the Shannon Pipeline project. Existing groundwater supply schemes such as the Portlaoise and Mountmellick Water Supply Schemes how that more locally sourced groundway from bedrock can supply local communities.

Further, research has shown that certain configurations of structural geology and groundwater and Carboniferous limestone formations, which exist in the Dublin area and surrounds can produce quantities of groundwater that where strategically targeted with wells are a potential resource worth investigating (Moore & Walsh, 2013; 2021; Moore et al. 2019).

A point on a fault incepted during the excavation of Lisheen mine produced flows in excess of 1.3m3/s in 1999 and this only dissipated to 0.3m3/s upon mine closure in December 2015 (Moore & Walsh, 2021). Flows fluctuated with rainfall. Conceptualisation of the mine geology and shows that point on the fault had such high sustainable flows because of its connectivity to karstified faults and fractures in the Waulsortian limestone Formation and the Lisduff Oolite formation. It is the Carbonate rich nature of these formations which has meant connection to the them produces higher flows. The higher carbonate content means dissolution and karstification of fractures is greater thus resulting in better connectivity and greater and more sustainable flows. These formations and formations of similarly high carbonate content occur in the Dublin area and surrounding counties e.g. Meath, Kildare. Configuration of faults within and bounding these formations in the Leinster region are worth exploring for high well yields prior to undergoing a major, costly project such as the Shannon pipeline project which is vulnerable at low flows and drought periods.

A point on a fault of the same age and geometry as the Lisheen fault (Cenozoic Strike-slip Faults; Moore & Walsh,2013; 2021) was intercepted in Huntstown South Quarry in north county Dublin in 2012 producing over 0.06m3/s. The point on the fault flowed until 2016, fluctuating with rainfall. The EBdrock formation where the fuatl was intercepted is a shaley limestone and shale Formation that does not show significant karstification similar to the Carbonate rich formations mentioned above however can still produce yields supplying local areas (as described by GSI aquifer maps).

The timing and geometry of the faults that have points of high flow is well understood (Moore & Walsh, 2021) plus the geometry of other structures in Ireland are also well understood. In addition, structural and bedrock configurations that would produce high flows to a groundwater well (Moore et al. 2019) are worth investigating in the Dublin and surrounding region in particular because it would be at a fraction of the cost of the Shannon pipeline project.

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Uisce Eireann, (2026). You tube video entitled: 'Water Supply Project, Eastern and Midlands Region (Full Video) | Our Project | Uisce Éireann.'https://www.youtube.com/watch?v=Ki5DrgSdZeI&t=19s8. Demand Management and Leakage Reduction

Dublin continues to lose a very large proportion of treated water through leakage in aging infrastructure. Proceeding with a multi-billion-euro supply scheme without first securing the existing network is inefficient and environmentally unsound.

Scale of Water Loss in Dublin's Supply Network.

Uisce Éireann's public documents fail to provide an adequate analysis of the extensive leakage crisis in Dublin's water network. Uisce Éireann's leakage reduction program indicates that over 46% of treated water was lost through leaks before it reaches consumers in 2012 when this project was first suggested and has fallen to 37% in 2022 with a planned reduction to 25% in 2030. This means that any additional water abstracted from the Shannon will largely be wasted through the same failing infrastructure. By failing to prioritize leak detection, mapping, and repair, Uisce Éireann is proposing an inefficient and unsustainable approach that disregards the principles of conservation and best available technology (BAT) required under EU environmental law.

https://www.water.ie/news/leakage-reduction-program-2

https://enterprise.gov.ie/en/news-and-events/department-news/2018/july/04072018.html

Summary of the Kennedy Analysis of Irish Water's Shannon Project and Its Relevance to Sustainable Alternatives such as Kildare Groundwater. This report was written by Emma Kennedy who is an independent consultant for the River Shannon Protection Alliance Ltd.

The Kennedy Analysis critically examines Irish Water's justification for this project and concludes that the project is not required, is based on flawed analysis, and would fail to solve Dublin's real water problems. See full report in Appendices.

12. Economic, Energy and Governance Considerations

Key Findings of the Kennedy Analysis

The "Need" for the Shannon Project Is Fundamentally Flawed

- Irish Water's demand analysis contains multiple mathematical errors
- Correcting just three of these errors removes the projected supply deficit entirely
- On this corrected basis, there is no need for the Shannon Project at all

- Irish Water has made false or misleading statements regarding the necessity of the project
- These statements have been made to the public, media, and government
- The perception of crisis has been used to justify a predetermined solution
- Dublin's Real Problem is Leaking Pipes and not Lack of Water

Extreme Leakage Rates

- Dublin's water network suffers from 37% leakage
- This is far outside international norms
- Much of the network consists of ancient, corroded Victorian-era pipes

International Comparison Highlights the Failure

- London, with leakage less than half of Dublin's, is replacing its entire Victorian water main network
- Irish Water, by contrast, plans to replace only 1% of mains per year
- At this rate, Dublin's pipes will remain fundamentally unfit for decades

The Shannon Project Will Not Fix Outages or Water Quality

- Dublin currently experiences:
- Frequent water outages
- Unreliable water quality due to ingress through cracked pipes

- Pipe replacement is unavoidable — it must happen eventually
- Proceeding with the Shannon Project first means:
- Paying for a massive abstraction scheme now
- Paying again later to fix the pipes
- This represents poor value, poor sequencing, and high risk

Irish Water's response to the Kennedy Analysis has been:

- Defensive
- Dismissive
- Lacking substantive technical rebuttal

12.1 Project Cost Escalation and Financial Risk

The Kennedy Analysis strengthens the case for decentralized, resilient alternatives, including Properly assessed groundwater development in counties such as Kildare Shorter supply distances (30 km vs 172 km) and lower carbon footprint combined with naturally high-water quality with reduced treatment, sludge, and chemical waste, Incremental, scalable investment rather than a single mega-project. If Dublin does not face a genuine supply deficit, there is time and space to develop better options — including Kildare's proven aquifers — rather than committing to an irreversible, environmentally disruptive scheme.The Kennedy Analysis demonstrates that the Shannon Project is: Unnecessary, Over-engineered Financially reckless, Incapable of solving Dublin's actual water problems. Ireland must: Fix Dublin's leaking pipes and subject all analysis to independent review

including fully assess lower-impact, groundwater-based alternatives, including those in County Kildare.

12,2 Energy Use, Carbon Impact and Ardnacrusha Generation

- Project cost estimates have escalated dramatically over time, with figures ranging from several billion to over ten billion euro. Such variance indicates profound uncertainty and exposes the State to long-term financial risk.
- Energy Intensity and Carbon Impact
- Long-distance pumping and treatment entail high, permanent energy demand. Claims of carbon neutrality rely on offsetting rather than genuine emissions avoidance and are incompatible with national climate obligations.
- Subsurface Leaks and Their Geological & Structural Risks. A key issue that has not been properly assessed is the geotechnical and hydrological impact of conθnuing to allow large volumes of treated water to leak into the ground beneath Dublin. Such impacts may include the following.
- Formation of Sinkholes and Ground Subsidence: The continuous seepage of large volumes of water underground can dissolve underlying geological materials, particularly where so clays or karst limestone formations exist. This can lead to the collapse of roads, pavements, and buildings. Several past incidents of sinkholes in Dublin have been linked to water-related ground destabilizing.
- Weakening of Building Foundations: Prolonged exposure to high water tables from leaks can weaken building foundations, particularly in older structures that rely on shallow footings. This increases the risk of structural failures, requiring costly remedial engineering work.
- Increased Risk of Sewer and Infrastructure Failure: Water leaks can interact with Dublin's aging sewer network, leading to the ingress of clean water into wastewater systems, overloading treatment plants, and increasing pollution risks. High levels of leakage also exacerbate pipe bursts, accelerating infrastructure deterioration.
- Contamination of Groundwater Resources: Continuous leakage introduces the risk of cross-contamination between clean water supply pipes and polluted subsurface water, particularly in areas where sewerage infrastructure is also leaking. This creates a public health risk and potential non-compliance with the Drinking Water Directive (EU 2020/2184).

The Need for a Comprehensive Leak Mapping and Hydrological Model. Before proposing any new water abstraction scheme, Uisce Éireann must:

- Develop a citywide geospatial model mapping active leak, water loss volumes, and their hydrological effects.
- Conduct a ground stability risk assessment, including sinkhole formation and structural
- impacts on buildings. Quantify the potential economic cost of continued leaks versus the cost of targeted repairs
- Compare the carbon footprint of large-scale leak reduction programs with the energy-intensive WSP. Without this essential data, the WSP proposal is incomplete and fails to meet the basic requirements of environmental due diligence under EU and Irish planning laws.

Ecological and Hydrological Risks of Large-Scale Water Abstraction

The proposed abstraction from Shannon raises serious concerns about its impact on: Water quality and assimilative capacity – reducing the Shannon's ability to absorb wastewater and industrial pollutants. Water becomes more concentrated. River hydro morphology – altering natural sediment transport and water flow dynamics. (need stats on this). Protected habitats and species – potentially violating the Habitats and Birds Directives if fish spawning areas, wetlands, or aquatic flora are impacted. Hydroelectric generation at Ardnacrusha – reducing available water for renewable energy production. 1.6% (50% of hydroelectric power generated). GPR. 86 mega watts. 3 Francas turbine, 2 Kaplan-332 Kigowatt.

12.3 Governance Deficits and Source-Region Equity

Lack of Statutory Basis for National Water Resource Plans

Uisce Éireann's national water resource planning framework lacks clear legislative underpinning. The assumption of authority over national water resources without corresponding statutory responsibility raises serious governance concerns.

Source-Region Equity and Social Licence

The project imposes environmental risk on Shannon catchment for the benefit of Dublin, without adequate justification, compensation, or democratic consent. Comparable projects internationally have repeatedly failed due to loss of social licence.

13. International Precedents and Failure Modes

13.1 Lessons from the Murray-Darling Basin, Colorado River and Aral Sea.

Global experience demonstrates that large-scale inter-basin transfers and abstractions commonly fail due to: Underestimation of drought risk, Cumulative impacts and weak Enforcement of Environmental Safeguards. Notable examples include the Murray–Darling Basin, the Colorado River, and the Aral Sea basin.

Below are **clear, well-documented cases where large-scale river abstraction or diversion caused serious ecological destruction**, in ways that are directly relevant to concerns raised about **Shannon abstraction** (even if the Irish proposal is smaller in scale).

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1. Aral Sea Basin (Central Asia) – *Collapse of an entire ecosystem*

What happened

Massive abstraction from the **Amu Darya and Syr Darya rivers** for irrigation (cotton farming) from the 1960s onward.

Ecological destruction

- Aral Sea lost **~90% of its volume**
- Salinity increased several-fold → **complete collapse of fish populations**
- Wetlands destroyed; migratory bird routes collapsed
- Creation of toxic salt deserts, spreading pesticides via dust storms

Why it matters as a precedent

This is the most extreme example of **"incremental abstraction + political assurances" leading to irreversible collapse** when extraction exceeded ecological thresholds. Even though each scheme was "justified" individually, the system failed cumulatively.

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2. Colorado River (USA/Mexico) – *A river that no longer reaches the sea*

What happened

Extensive abstraction for cities and agriculture across seven U.S. states and Mexico.

Ecological destruction

- The **Colorado River Delta** (once ~7,800 km^2 of wetlands) is now **~10% of its former size**
- Loss of riparian forests, fish nurseries, and bird habitats
- River routinely **fails to reach the ocean**

Why it matters

- Every individual abstraction was "within legal limits"

- Environmental flows were ignored until collapse occurred
- Climate change later made the system far more fragile than expected

This is a textbook example of **long-term over-confidence in flow reliability.**

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3. Murray-Darling Basin (Australia) – *Slow ecological death of a river system*

What happened
Decades of water extraction for irrigation across multiple states.

Ecological destruction

- Repeated **mass fish kills** (notably in 2018–19)
- Collapse of native fish populations
- Loss of floodplain forests and wetlands
- Salinity increases and algal blooms

Official findings
Multiple government and independent reviews concluded that **over-allocation and weak enforcement** caused ecological collapse, even though abstraction limits existed on paper.

Why it matters
This is one of the **closest analogues** to Ireland:

- Temperate climate
- "Sustainable" abstraction rules
- Failure triggered during drought / low-flow years

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4. Ebro River (Spain) – *Delta degradation linked to upstream extraction*

What happened
Heavy abstraction upstream combined with dams and diversions.

Ecological destruction

- Reduced sediment reaching the **Ebro Delta**
- Delta retreat, wetland loss, increased salinity intrusion
- Decline in fisheries and bird habitats

Why it matters
Even without total river collapse, **removing relatively small proportions of flow upstream** caused downstream ecosystems to unravel over time.

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5. Yellow River (China) – *Seasonal ecological failure*

What happened
Large-scale abstraction for agriculture and cities.

Ecological destruction

- For years in the 1990s, the river **ran dry before reaching the sea**
- Collapse of estuarine ecosystems
- Loss of fisheries and wetlands

Key lesson
Authorities believed abstractions were manageable until **drought revealed system fragility**.

What these cases have in common (the warning signs)

Across *all* of these failures:

1. **Abstraction looked "small" relative to average flow**
2. **Low-flow and drought scenarios were underestimated**
3. **Environmental flows were the first thing sacrificed**
4. Damage became visible **only after tipping points were crossed**
5. Recovery was **slow, partial, or impossible**

This is why ecologists tend to focus less on *percentage of annual flow* and more on:

- **Seasonal low-flow impacts**
- **Cumulative abstraction**
- **Climate-change-driven variability**
- **Governance failure under stress**

Bottom line

There are **multiple global precedents where river abstraction schemes—initially defended as safe, limited, and well-regulated—caused severe ecological destruction**, especially when climate variability and cumulative impacts were underestimated.

If you want, I can next:

- Compare these directly to **Shannon hydrology & Lough Derg ecology**
- Explain **why low-flow abstraction is far riskier than annual averages**
- Or summarise **what independent ecologists typically flag as red lines** in projects like Uisce Éireann's proposal

all of this pls Compare these directly to Shannon hydrology & Lough Derg ecology Explain why low-flow abstraction is far riskier than annual averages Or summarise what independent ecologists typically flag as red lines in projects like Uisce Éireann's proposal

Thought for 24s

Below is a **direct, nuts-and-bolts comparison** between the big "ecological destruction" abstraction/diversion failures (Colorado, Murray–Darling, Aral-type dynamics) and **what's actually**

distinctive about the Shannon at Parteen / Lough Derg—plus why **low-flow risk** is the whole game, and the **red lines** independent ecologists typically point to for schemes like Uisce Éireann's.

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1) What's special about the Shannon at Parteen (and why that matters)

The Shannon here is already a highly managed, flow-split system

At **Parteen Regulating Weir**, most Shannon flow is diverted into the **headrace canal** to supply the **Ardnacrusha** hydro station; a **statutory "compensation flow" of 10 m^3/s** goes down the **Old Shannon** channel.

Source: cdn.esb.ie+2Uisce Éireann+2
Source: ESB also explicitly states it **manages Lough Derg levels** via operation of Ardnacrusha and gates at Parteen. ESB Corporate+1

Why this matters ecologically:
Many "destruction" case studies (Colorado, Murray–Darling) involve **layers of allocation + infrastructure** that make the system brittle in drought. The Shannon at Parteen already has that "brittleness ingredient": flows and levels are not purely natural; they're **operational outputs**.

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2) Compare directly to Lough Derg ecology: where the stress points are already

EPA catchment assessments describe **Lough Derg at Poor ecological status** (2010–2015) and list pressures including **diffuse agriculture, hydromorphology, fish passage issues, invasive species (including zebra mussel and Asian clam), urban wastewater, and the inputting river**.

Source: Catchments.ie+1
Fisheries Ireland surveys also document ecological concerns via fish status/communities (e.g., WFD fish classification work), and continue to monitor stocks.

Source: Inland Fisheries Ireland+1

Why this matters compared to "ecological destruction" examples:
The worst failures usually weren't "healthy systems that got tapped once." They were systems with **existing pressures** where extra abstraction **reduced resilience** and pushed them past thresholds during bad years (Murray–Darling is the closest "temperate developed country" analogue).

14. Soil Composition and Pipe Stress

Dublin's geology is largely defined by glacial till (often called "Dublin Boulder Clay"). This material is dense and heavy, but it reacts significantly to environmental changes:

* Expansion and Contraction: During periods of heavy rain (common in early 2026) or drought, certain clay-heavy soils in Dublin expand and contract. This movement creates physical stress on rigid, older pipes made of cast iron or lead, causing them to snap or "joint-pull."

* Saturated Ground: As seen in recent reports from January 2026, saturated ground from high rainfall increases external pressure on water mains. When the soil becomes waterlogged, it loses its ability to support the weight of the pipes and the roads above them, leading to bursts.11.1 . Bedrock and Subsoil Permeability

According to Geological Survey Ireland (GSI), the bedrock under Dublin is predominantly Carboniferous Limestone.

Corrosion: Limestone can influence the chemistry of groundwater. In some areas, the interaction between groundwater and metal pipes leads to external corrosion, thinning the pipe walls until they can no longer contain the internal water pressure.

Vulnerability: Areas with high "subsoil permeability" allow surface water to reach the pipe level quickly. This rapid fluctuation in moisture levels is a leading cause of the "freeze-thaw" effect during cold snaps, which brittle Victorian-era pipes cannot survive.

The geotechnical risks associated with continuous underground water leaks, including sinkholes, foundation instability, and water pollution. Lack of a comprehensive hydrological and geological models to assess the full impact of Dublin's leaking water system.

Quantitative Flow, Power Generation, and Abstraction Context (Complementary Technical Note)

This section provides additional quantitative context on River Shannon flows, abstraction percentages, and the operational realities of the Parteen–Ardnacrusha system. It is intended to complement the ecological, legal, and planning arguments set out above by demonstrating why reliance on average flow metrics materially understates real-world impacts during critical low-flow conditions.

Baseline River Shannon Flows at Parteen / Killaloe

Long-term monitoring indicates that:

Mean annual discharge of the River Shannon at Limerick is approximately 208.1 m^3/s.

Corresponding flows at Killaloe / Parteen Weir are typically estimated at 180–186 m^3/s.

For the purpose of analysis, a representative average value of 183 m^3/s at the abstraction point is assumed.

This figure is frequently used to justify abstraction as a small percentage of total flow. However, this approach is hydrologically and ecologically misleading.

12.1 Proposed Abstraction Volume and Flow Variability

The current proposal involves abstraction of approximately 3.82 m^3/s. When assessed against the full range of Shannon flows, the percentage impact varies dramatically:

Major flood conditions (700 m^3/s):

Abstraction 0.55% (negligible)

Long-term annual average (183 m^3/s):

Abstraction 2.09% (the frequently cited "~2%" figure)

Dry summer conditions (15 m^3/s):

Abstraction 25.5% of available flow

Extreme low-flow conditions (10 m^3/s):

Abstraction 38.2% of available flow

During precisely the periods when ecological systems are under the greatest stress, the proposed abstraction would therefore remove one-quarter to nearly two-fifths of the river flow downstream of Parteen Weir. This is the critical planning reality that average-flow metrics obscure.

Legal Minimum Flows and Measurement Uncertainty

The statutory minimum compensation flow down the old Shannon channel toward Castleconnell is 10 m^3/s. However, the precision with which this flow is measured and enforced is unclear. The methods used are not transparent and may be insufficiently robust during rapidly changing low-flow conditions. Any abstraction during drought therefore operates directly at the margin of legal and ecological thresholds.

Ardnacrusha Operational Constraints and Flood Routing

Ardnacrusha power station has: Four turbines, each with a maximum capacity of 100 m^3/s.

A stated maximum operational flow of 400 m^3/s, producing up to 86 MW. Flows in excess of this capacity are automatically diverted down the old Shannon channel toward Castleconnell. During major floods, this can involve 200–300 m^3/s, contributing to flood risk in Clonlara, Shannon Banks, and Limerick City. Historical events (e.g. 2020 flooding) recorded flows approaching 650 m^3/s, with overtopping of infrastructure such as the Doonass footbridge.

Power Generation Efficiency and National Context

With an average annual Shannon flow of 208.1 m^3/s, and a mandatory 10 m^3/s compensation flow, the average effective flow through Ardnacrusha is approximately 198 m^3/s.This equates to:

- Average utilisation of installed hydraulic capacity: 49.5%

- Average power output: 42.6 MW
- Annual energy production: 373 GWh
- In national context:
- Total electricity generated in Ireland (2023): 30,600 GWh
- Contribution of Ardnacrusha: 1.2% of total generation

Renewable Energy Comparison

When compared with modern wind generation:

Typical onshore wind turbine capacity: 3 MW

Average capacity factor: 35%

Effective average output per turbine: 1.05 MW

On this basis, Ardnacrusha's average output is equivalent to approximately 40 modern wind turbines, a scale already commonplace in Ireland. In renewable energy terms: Renewables accounted for 40.7% of Irish electricity generation in 2023. Ardnacrusha contributed 3% of renewable generation. Removal of Ardnacrusha would reduce the renewable share by only 1.2 percentage points, a marginal change that does not justify disproportionate ecological and hydrological impacts.

Strategic Implications for Planning and Biodiversity

These figures demonstrate that: The abstraction proposal is ecologically severe during low-flow conditions. The energy benefits of maintaining the Parteen–Ardnacrusha regime are modest at national scale. The system disproportionately sacrifices river ecology and downstream resilience to preserve legacy infrastructure and facilitate an unsustainable water transfer scheme. From a planning and biodiversity perspective, the continued operation of Parteen Weir and Ardnacrusha cannot reasonably be treated as sacrosanct where it enables: Large-scale abstraction during drought, chronic ecological stress & Long-distance transfer of water to a network with unresolved leakage. This quantitative context reinforces the conclusion that the proposed pipeline is neither environmentally defensible nor strategically rational.

Long Distance Water Transportation

The WSP relies on a high-energy pumping system to transport water to Cloughjordan. Uisce Éireann claims the project is "net zero ready," yet:

- No detailed lifecycle carbon assessment has been provided.
- No guarantee exists that electricity demand will be met through 100% renewable sources.
- Pumping and treatment costs could rise significantly if Ireland's electricity grid remains under stress.

We request that Uisce Éireann provides a full energy and carbon analysis demonstrating compliance with Ireland's Climate Act 2015 and National Climate Action Plan.

Public Health Concerns – Water Transport & Storage Risks

Transporting raw and treated water over long distances poses public health risks. Scientific research suggests that water transported in dark, long pipelines may be susceptible to bacterial regrowth, chemical leaching from pipeline materials, and stagnation issues. We request that Uisce Éireann provides:

- A scientific assessment on water quality risks associated with long-distance water transfer.
- A microbiological and chemical monitoring plan ensuring compliance with the Drinking Water
- Directive (EU 2020/2184).
- How long is water in the pipes, how long in storage in Dublin– treatment to tap.
- The pipe Area = 3.1416m^s (note π*2^2/4 = π) so the Velocity = 3.8/3.1416 = 1.2(m^3/s)/m^2 = 1.2m/s and the time taken for the water to travel 132km = 132000m/1.2m/s = 110000 seconds = 30.6 hours = 1.275 days.

14. Conclusion planning Permission must be refused.

14.1 Summary of Legal Failures

The Uisce Eireann National water resources plans both national and regional, have no foundation in law. Nowhere in any of the Acts or enabling regulations stemming from them, has Uisce Eireann been given the right to develop such plans. In other Jurisdictions (England) such plans are required by law and the specific requirements of such plans are legislated for.

A water management plan is required but this does not extend to bestowing the entire water resources of the country under Uisce Eireann. The plans developed by UE therefore have no statutory standing and can only be considered Uisce Eireann internal plans, for which they set their own terms of reference, scope, inclusions, exclusions, omissions. In producing these documents and calling them National Documents, they have acted as Ultra Vires.

The lack of legislative underpinning is particularly relevant in relation to the relationship between UE and the ESB. As the ESB manages the water regime in Shannon, the application for the abstraction should either be by the ESB or alternatively a joint application by both parties.

The ESB have statutory obligations in respect to Shannon, they do not have the right of abstraction, only the right of utilisation for electricity generation, Uisce Eireann are incorrect in stating that their proposed abstraction is a substitution of one form of abstraction for another.

The water resources plans, assumes authority by UE, nowhere in these are the corresponding responsibilities for the management, protection and sustainability of the resources assigned.

The assessment of alternatives is incomplete and have been highly selective. Both in the current evaluation by UE and previously by RPS Strategic Environmental Assessment in 2008 for the Dublin water supply plan, no consideration was given to the optimization of utility of Poulaphuca reservoir, which was specifically intended for this purpose, with considerable space capacity, (electricity a secondary consideration). Nor any consideration given to utilisation the river Slaney, a river with twice the flow of the Liffey and rising adjacent to the Liffey in the Dublin Mountains, requiring just a 20km pipeline to connect to Ballymore Eustace water treatment plant and reduce dependency on the Liffey.

The full extent of proposed abstraction was not given. The long-term abstraction from Clareville Water Treatment works is intended as 100Mld, this abstraction is a combination from the Headrace and the old course of the Shannon. It is highly unlikely that it is legal to abstract a large amount of the statutory minimum compensation flow in the old course immediately downstream. It certainly is not in the spirit of the original intention of the compensation flow when originally allowed for.

The full extent of the long-term abstraction, including Athlone, (already on the Shannon with its own abstraction) Ballinasloe, (which is in the western water resource area) have to be factored in. As the band through which the river and particularly Lough Derg and the impoundment at Parteen are allowed to drop are seriously strained in a drought situation, the modelling indicates this. Add further abstractions for Athlone, Limerick Ballinasloe, and the model should have been run at a proposed abstraction of a minimum of 5Mld, at which point Lough Derg will be seriously compromised.

The long-term environmental reinstatement of Shannon will require a change in regime of the compensation flow down the old course, according to work on the River Basin Management Plan. This would require variable flow rates to mimic normal river flows, that is increased compensation flow generally. This in turn would affect the flow available to the abstraction at Parteen.

There is a big difference between the operational band regime that the ESB operates to control the water levels and the absolute band range. When UE say their models indicate that the water would not drop below the band range, this would be well after the ESB stopped abstraction under their operational band regime. Consequently, it can be anticipated that the supply to Dublin would be severely curtailed in a drought situation. With no back up indicated in the submission. The proposed abstraction at Parteen is putting all the Nations eggs in one basket.

The application is in respect of a pipeline to Dublin to show locations where spurs will be left for future take-offs. There are already some 400 landowners affected by the pipeline, there would possibly be another several hundred affected by the spur lines. The bare minimum requirement at this stage is indicative lines for these spurs as the people affected are entitled to know, at this stage as to what is proposed for them. For the most part these lines routes will have been determined.

The long periods where the turbines are shut down to preserve the levels for embankment and lake level preservation would indicate that there would be long periods where the flow would be severely restricted or even shut off. This would be at the precise time when all the rivers including Liffey are at their lowest. Consequently, impoundment will be required to bridge this event.

It is noted that the combined capacity of the twin 1500mm pipelines is 600Mld and the 1600mm pipeline presumably can be pressurised to this level of throughput. Consequently, the 300Mld proposed abstraction could reasonably be considered the initial proposal. UE previously proposed that the abstraction could be varied, by as much as 50% so that the total abstracted over a seven day or fourteen day back-to-back, would not exceed the 300 Mld, being currently applied for.

One of the objectives of an EIA is to identify the possibilities for mitigating effects on the environment and people. In this instance, the possibility of splitting the abstraction between Lough Ree and Parteen has not been adequately investigated. An abstraction of 60 Mld is, according to UE sustainably available from Lough Ree and a lot more most of the time as the average flow is 94Ml per second at Athlone, it would be imagined that an abstraction from Lough Ree, piped along the straight road R392 to Mullingar and onwards to Dublin would not only relieve the critical situation in Mullingar, but allow the Restoration of Lough Ennell, the Brona and allow flood storage in that Lake This would also be, by far the shortest route to Peamount

The proposed abstraction at Parteen could then be tailored to what is considered long term sustainable and initially used to serve to Nenagh along the old N7 and after onwards to join with the Boyne supply. This would seriously reduce the effects on people and environmental risks to the river and Lake systems. It would also allow for more control by the ESB over the system. There are a further 500 home which just got planning permission in Nenagh which will also required water from Lough Derg.

The project needs are overstated. The consumption figures start today at a 47Mld shortfall and build up from there, this is clearly not the case as the shortfall consists of headage, outage, and such that are not continuous demands, but treated as such. Also showing projected consumption per capita figures (121 litres pppd) in excess of that currently is the case (110 litres pppd). So the consumption figures which include massive industrial development provisions on the eastern seaboard and midlands , are clearly pie in the sky for the projected target date of 2050 at any rate.

It is accepted that the abstraction is from Lough Derg for all intents and purposes in drought situations. There were protocols established for Lake abstractions in the original River Basin Management plans (in this instance for the east area). This would not appear to have been applied in this instance. Also, as the abstraction will be de facto from Lough Derg in drought/dry periods, (section 28, Appropriate Assessment Screening) this would potentially turn Lough Derg into a heavily modified or artificial water body. There are no material effects on flood levels section 267 in assessment.

Housing In Limerick will be affected by water supply into the future.

Housing in Nenagh just announced over 500 new homes to be built will also be affected as they will need water supply.

The Eastern and Midlands Pipeline Project represents a high-risk, high-cost, and environmentally unsound approach to water supply. It fails to meet the requirements of EU environmental law, national climate policy, and fundamental principles of sustainable water management. The competent authority is therefore urged to refuse planning permission for the project and to require a comprehensive, independent reassessment of water supply strategy based on:

- Catchment-scale protection
- Demand reduction and leakage control
- Optimisation of existing assets
- Climate resilience
- Regional equity

Only such an approach can safeguard Ireland's water resources for current and future generations.

Appendix A – Assessment of the Proposed Abstraction Against Water Framework Directive Article 4

This appendix assesses the proposed abstraction at Parteen Weir against the mandatory requirements of Article 4 of the Water Framework Directive (Directive 2000/60/EC), with particular reference to Articles 4(1)(a) (no deterioration), 4(4) (extensions of deadlines), and 4(7) (new modifications).

B1. Article 4(1)(a): Prohibition on Deterioration of Status

Article 4(1)(a) requires Member States to:

"prevent deterioration of the status of all bodies of surface water."

B1.1 Existing Status

EPA classifications indicate that Lough Derg and associated Shannon water bodies are already at less than good ecological status, with known pressures including altered flow regimes, nutrient enrichment, and barriers to fish migration.

Where a water body is already below good status, any additional pressure capable of causing further deterioration is prohibited unless Article 4(7) is fully satisfied.

B1.2 Low-Flow Abstraction as a Deterioration Risk

Quantitative analysis demonstrates that while the proposed abstraction of 3.82 m^3/s represents approximately 2% of long-term average flow, it constitutes:

~25.5% of river flow during dry summer conditions (~15 m^3/s), and

~38.2% of river flow during extreme low-flow conditions (~10 m^3/s).

These are precisely the conditions under which ecological quality elements protected by the Directive (fish, benthic invertebrates, macrophytes, hydromorphology) are most sensitive to change.

The abstraction therefore presents a credible and foreseeable risk of deterioration, contrary to Article 4(1)(a).

B2. Article 4(1) and (2): Ecological and Hydromorphological Quality Elements

The Directive requires protection of hydromorphological conditions supporting ecological status, including:

Flow regime

Hydrological continuity

Water level fluctuations

B2.1 Flow Regime and Water Level Effects

The quantitative evidence demonstrates that abstraction during drought conditions would materially reduce downstream flows and exacerbate lake drawdown in Lough Derg.

Sustained or repeated low-flow abstraction is likely to result in:

Increased frequency and duration of low-water levels

Degradation of littoral habitats

Reduced dilution capacity and increased residence times

Such effects constitute hydromorphological deterioration within the meaning of the Directive.

B3. Article 4(7): New Modifications to Physical Characteristics

Where a project constitutes a new modification affecting hydromorphology, it may only proceed if all four cumulative tests under Article 4(7) are met.

B3.1 Article 4(7)(a): All Practicable Mitigation Measures

There is no evidence that all practicable mitigation measures have been identified or implemented, particularly in relation to:

Avoidance of abstraction during low-flow periods

Binding and enforceable low-flow cut-off rules

Real-time ecological monitoring linked to operational controls

Reliance on assumed ESB operational practices does not constitute enforceable mitigation.

B3.2 Article 4(7)(b): Overriding Public Interest

While water supply is a public interest, this test requires that the specific project, not the objective in general, is justified.

Given:

Severe leakage in the Dublin network,

Under-utilised eastern water resources,

Alternative demand-side and supply-side options,

it has not been demonstrated that this particular abstraction scheme is of overriding public interest compared to less damaging alternatives.

B3.3 Article 4(7)(c): No Better Environmental Options

The Directive requires demonstration that no significantly better environmental option exists.

The record shows that alternatives such as:

Leakage reduction,

Optimisation of Poulaphuca reservoir,

Eastern catchment options,

have not been eliminated through a robust, transparent, and equivalent environmental assessment.

Accordingly, this test is not met.

B3.4 Article 4(7)(d): Inclusion in River Basin Management Planning

Any reliance on Article 4(7) must be explicitly justified and documented within River Basin Management Plans.

There is no clear evidence that:

The full low-flow abstraction impacts,

Climate-adjusted drought scenarios, or

The scale of proportional flow removal identified in Appendix A

have been transparently assessed and justified at RBMP level.

B4. Climate Change and Article 4 Compliance

The Court of Justice of the EU has confirmed that climate change must be taken into account when assessing deterioration risk.

Observed Irish climate data demonstrate increasing drought frequency and duration. Under such conditions, abstraction that removes up to 38% of available flow during extreme low-flow periods cannot reasonably be considered compatible with Article 4 obligations.

Failure to assess these risks renders the decision-making framework non-compliant with the Directive.

B5. Conclusion: Incompatibility with Water Framework Directive Article 4

On the basis of the quantitative evidence set out in Appendix A and the legal tests above:

The proposed abstraction presents a real risk of deterioration, contrary to Article 4(1).

The project constitutes a new hydromorphological modification.

The mandatory cumulative tests under Article 4(7) have not been met.

Accordingly, planning permission cannot lawfully be granted unless and until full compliance with Article 4 of the Water Framework Directive is demonstrated beyond reasonable scientific doubt.

This appendix provides a structured quantitative assessment to support the planning objection. It sets out baseline flow data, proposed abstraction volumes, proportional impacts under varying hydrological conditions, and the operational and energy context of the Parteen–Ardnacrusha system. The purpose is to demonstrate why reliance on long-term average flow metrics materially understates environmental risk during critical low-flow periods.

Baseline River Shannon Flows at the Abstraction Point

Monitoring data indicate that the annual average discharge of the River Shannon at Limerick is approximately 208.1 m^3/s (208,100 litres per second). Corresponding flows at Killaloe and Parteen Weir are generally estimated to lie between 180 and 186 m^3/s. For the purposes of this assessment, an average flow of 183 m^3/s at the abstraction point is assumed.

Table A1 – Representative River Shannon Flows

A2. Proposed Abstraction Volume

The current proposal by Uisce Éireann involves abstraction of approximately 3.82 m^3/s at Parteen Weir.

A3. Observed Flow Variability in the River Shannon

The River Shannon exhibits extreme variability, ranging from major flood events to very low summer flows. In addition, a statutory minimum compensation flow of 10 m^3/s is required down the old Shannon channel toward Castleconnell.

Questions remain regarding the precision, transparency, and enforcement of this minimum flow, particularly during drought conditions when abstraction pressures are greatest.

A4. Proportion of River Flow Abstracted Under Different Conditions

When the proposed abstraction of 3.82 m^3/s is assessed against the full range of Shannon flows, the proportional impact increases sharply during low-flow periods.

Table A3 – Percentage of River Flow Abstracted

This table demonstrates that while abstraction appears negligible under flood or average conditions, it becomes ecologically dominant during drought and low-flow periods, precisely when riverine and lake ecosystems are most vulnerable.

A5. Ardnacrusha Hydropower Capacity and Flow Regulation

Ardnacrusha hydroelectric station comprises four turbines, each with a maximum hydraulic capacity of approximately 100 m^3/s, giving a total maximum throughput of 400 m^3/s and a peak installed electrical capacity of 86 MW.

Flows exceeding this capacity are diverted down the old Shannon channel toward Castleconnell, contributing to downstream flood risk during major events.

Table A4 – Ardnacrusha Operational Characteristics

A6. Average Utilisation and Energy Output

Allowing for the statutory 10 m^3/s compensation flow, the average effective flow available for power generation is approximately 198 m^3/s.

This equates to:

Average utilisation of installed hydraulic capacity: ~49.5%

Average electrical output: 42.6 MW

Annual energy generation: 373 GWh

Table A5 – Average Energy Output of Ardnacrusha

In national context:

Total electricity generated in Ireland in 2023: ~30,600 GWh

Contribution of Ardnacrusha: ~1.2% of total generation

A7. Comparison with Modern Wind Generation

Modern onshore wind turbines typically have a rated capacity of ~3 MW. Assuming an average capacity factor of 35%, this yields an effective average output of ~1.05 MW per turbine.

Table A6 – Wind Generation Equivalence

In renewable_toggle terms:

Renewables accounted for ~40.7% of Irish electricity generation in 2023 (~12,454 GWh).

Ardnacrusha contributed approximately 3.0% of renewable generation.

Removal of Ardnacrusha would reduce the renewable share to approximately 39.5%, a marginal national change.

A8. Planning-Relevant Conclusions

This appendix demonstrates that:

- The proposed abstraction represents a minor proportion of river flow only under average or flood conditions, but a very substantial proportion during low-flow and drought periods.
- The energy contribution of Ardnacrusha is modest in both national and renewable-energy terms.
- Continued reliance on the Parteen–Ardnacrusha regime disproportionately facilitates low-flow abstraction with significant ecological consequences.
- Accordingly, the use of long-term average flow figures as the primary justification for abstraction is misleading and unsuitable as a basis for planning consent.
- In drought periods such as 2018 there was no water sent to Ardnacrusha for 74 days (Data from ESB) so the Hydro storage theory fails in drought periods. ESB claims they were sending 10.5Cumecs down the old course f the Shannon, that means if the pipeline had been operating and took 3.4cumecs that is 3.4/10.5= 33% of the flow for 74 days. This reduces the flush down Lough Derg and if temperatures rise then algae blooms are guaranteed,

Appendix B Kennedy Analysis Overview

1 The Kennedy Analysis Overview Find the Appendices to this Kennedy Analysis Overview at www.kennedyanalysis.com/irish-water-shannon-project and contact Kennedy Analysis at www.kennedyanalysis.com

See Appendix 1a for details of the Kennedy Analysis interactions with Irish Water and the Kennedy Analysis reports on the Shannon Project: (i) the Kennedy Report, (ii) the Kennedy Response, and (iii) the Second Kennedy Response. Kennedy Analysis was founded by Emma Kennedy whose background is in carrying out forensic analysis of companies and projects - she was a corporate lawyer at Clifford Chance and worked in finance at a major global bank. She heard about the Shannon Project because the proposed pipeline crosses her husband's family farm. Despite concerns that her involvement might prove detrimental to them personally she has pursued this matter out of principle. The Kennedy Analysis of the Shannon Project has been produced pro bono in the public interest – the team that produced it have all worked on an unpaid basis in their free time because the Shannon Project is simply WRONG. For more about Emma Kennedy and Kennedy Analysis, see Appendix 1b. Summary of key findings The ancient and corroded state of Dublin's water mains is the key factor undermining its water supply. Dublin's problem is not a lack of water: only around 43% of the water put into Dublin's water supply system each day is actually used. Dublin's problem is that its water mains are in a third world state of decay having been neglected for decades. 57% of the water put into the supply system pours through holes in its pipes into the ground and never reaches the taps. 57% leakage is astonishing and far from normal: comparable cities identified by Irish Water's predecessor in this project have leakage below 10%. The state of Dublin's water mains also means (i) water outages and floods caused by mains bursts are a certainty as pressure in the system is normalised, and (ii) in low-pressure situations there is a risk of contaminated groundwater from the water-logged ground around the pipes re-entering the pipes carrying clean water to Dubliners' taps, requiring extra disinfection of the water before it is put into the supply system to counteract the risk to public health. The Shannon Project would be one of the biggest infrastructure projects in Ireland's history, but the analysis on which it was based contained mathematical and analytical errors. Corrected analysis (using Irish Water's own selected methodology and its current leakage targets) shows that, technically, no new raw water source is needed at all although Kennedy Analysis notes that Dublin would benefit from diversification away from its current reliance on almost exclusively surface-water sources - a much smaller and less expensive alternative to the Shannon Project could provide this (note: the Shannon Project would be yet another surface-water source). The Shannon Project would be a waste of scarce financial resources. Kennedy Analysis has notified Irish Water of the errors in its analysis and that many of its public statements about the need for this project have been false or highly misleading. Irish Water's reaction to the Kennedy Analysis has been defensive. Instead of addressing the issues head-on, Irish Water makes unrelated and irrelevant statements. Its responses deny the most undeniable of errors and even backtrack on issues that it had conceded during its face-to-face meeting with Emma Kennedy in February 2017. Instead of even attempting to justify its position on many issues Irish Water gives itself a clean bill of health without providing any substance, stating simply: "Irish Water do not accept this observation". London's leakage levels are less than half those in Dublin and have been deemed "unacceptable" by its regulator - itis currently replacing its entire Victorian water mains. Irish Water has no such plan: its leakage reduction targets are (contrary to its claims) extremely unambitious given the scale of the problem and its own report questions the level of funding that will be made available. An overhaul of Dublin's water mains will

become inevitable in the coming years and demands a truly significant focus and investment. The Shannon Project would not negate this: it would be a very expensive sticking plaster. Irish Water proposes to pump water 172km from the River Shannon to Dublin, costing up to EUR1.3billion – EUR1,000 for every family in Ireland. A forensic review found that after just three errors in Irish Water's "need" projections are corrected there is no need for the Shannon Project. Part A of this Kennedy Analysis Overview sets out the findings of the Kennedy Analysis; Part B gives details of Irish Water's highly defensive reaction to the Kennedy Analysis and its failure to address the issues identified in the Kennedy Analysis. The proposed Shannon project has ominous parallels with the Kielder water project built in the UK in the 1970s and widely criticised as an unnecessary White Elephant. This should sound alarm bellsfor all who will rubber-stamp the Shannon project, particularly its economic regulator (the CRU): they are on notice about the errors in Irish Water's analysis and must challenge Irish Water before it is too late. If they have doubts about the merits of the Kennedy Analysis they should seek independent review of the two sets of analysis (Irish Water's "need" analysis and the Kennedy Analysis). The risk is too high to ignore. 2 Part A: The Kennedy Analysis Conclusions The Kennedy Analysis of the Shannon Project concluded: 1. Irish Water has used false claims to promote the Shannon Project to the public, the media and the government. 2. The Shannon Project is being pushed through on the basis of mathematical errors and incorrect data. Once these errors are corrected Irish Water's own analysis methodology shows there is no need for a project of this scale. 3. This project has outlived its need – the trajectory of water demand in Ireland has shifted dramatically in the 20 years since this project began but, contrary to its claims and to international best practice, Irish Water's analysis failed to take account of this. 4. Irish Water's analysis was constrained by the flawed premise that only a single-source solution was acceptable, despite the overwhelming advantages of using several smaller and less expensive solutions in conjunction. 5. The "benefit corridor" concept is being misrepresented to justify the Shannon project. 6. Dublin's ancient water mains are the single key factor undermining its water supply system. An overhaul of Dublin's water mains will become unavoidable in the coming years regardless of how much water is pumped to Dublin from the Shannon: the Shannon project would be a very expensive sticking plaster. If Irish Water was to adopt a genuinely ambitious mains-replacement programme now it would recover such huge volumes of water that Dublin would have a huge "spare capacity" and a highly resilient water supply system, eliminating the need for the EUR1.2billion Shannon project. 7. The parallels between the Shannon project and the UK's "White Elephant" Kielder project should sound alarm bells. (1) Irish Water has used false claims to promote the Shannon Project to the public, the media and the government If the messages that Irish Water is disseminating about Dublin's water situation were accurate it would indeed make the case for urgent and drastic action. Irish Water's message can be summarised as follows (each of these is a direct quote from Irish Water): "There is currently less than 2% spare drinking water capacity in Dublin".... "The present infrastructure is struggling to meet current need as evidenced by a number of significant and costly outages in Dublin over the past 5 years".... "The Project Need Report identified that projected demand for water in Dublin alone is expected to increase by over 50% by 2050".... "The water demand projections in the Project Need Report include ambitious leakage targets which have been adopted by Irish Water, resulting in a very conservative approach to overall demand. This has resulted in a revision of the projected water requirement from 350Mld by 2040 to 330Mld by 2050. As such, the requirement to ensure that only water which is truly needed is sought from a new source has been met".... Every one of these statements is FALSE as demonstrated in part C(2) and part D of the Kennedy Response and in Appendix 2 to this Kennedy Analysis Overview. (2) The Shannon Project is being pushed through on the basis of mathematical errors and incorrect data The Kennedy Analysis identified undeniable calculation errors in Irish Water's analysis. Irish Water's incorrect analysis concluded that, in 2050, Dublin will have a water deficit of 215Mld; however, after

just three of its calculation errors are corrected, that 215Mld deficit becomes a 55Mld surplus. The corrected analysis, together with an explanation, is set out in Appendix 3a. Note the corrected analysis at Appendix 3a retains Irish Water's chosen analysis methodology and all of Irish Water's other assumptions (e.g. on population and economic growth, average household size and household number) some of which are very aggressive. It assumes nothing more than Irish Water's own unambitious leakage targets. It also retains the three considerable "safety-buffers" (peaking, headroom and outage) which total 35% - they are cumulative. Irish Water's analysis requires that this 35% of extra water over and above its (incorrect) projected average demand must be available in the form of freshly extractable raw water every day – unlike the approach in the UK, Irish Water's analysis does not offset any of its peaking requirement against the tens of billions of litres of raw water that is stored in Dublin's enormous raw water reservoirs1 . For a commentary on whether Irish Water's assumptions and its requirements in relation to the 35% safety-buffer are appropriate, see the Kennedy Report and part B(6) of the Kennedy Response. In its twenty-year life, this project has a history of drastically over-estimating future water demand yet the latest projection method is even more aggressive than those used in the past. This is summarised at Appendix 4. Irish Water has repeatedly failed to address the facts spelled out in the Kennedy Analysis to establish this point – instead, Irish Water simply states: "Irish Water do not accept the observation". (3) This project has outlived its need 20 years ago, when this project began, there was serious cause for concern about Dublin's water supply and as recently as 2010 talk of Dublin's water supply being on a "knife edge" was justified – see Appendix 5. However, since then, Dublin's water treatment infrastructure has received a long-overdue overhaul and the trajectory of water demand in Ireland has shifted significantly. 1 Thames Water, London's water supplier, does not include peaking in its raw water requirement because, it states: "peak demands in London can be met through the relatively large volume of surface water storage (reservoirs). The ability to meet peak demands is therefore not a resource availability issue...but dictated by treatment and transmission capabilities". 3 Since 1996 (the year this project began) industrial water intensity in Ireland has been on a consistent downward trend. This is a global trend and is accounted for in water "need" projections. Irish Water claims that its "need" analysis took account of the decline in industrial intensity of water demand. This is FALSE: the data that it used took NO account of this (see Appendix 3b). As a result, while London's industrial demand is projected to DECLINE between now and 2040, Irish Water projects that Dublin's industrial demand will MORE THAN DOUBLE2 . Simultaneously, in recent years, domestic consumers have become more aware of the value of water and the need for conservation (the threat of water charges has changed the way that the man on the street perceives water) and regulations have required that new-builds and household appliances are more water efficient. Declining/ plateauing demand for water is being observed in many cities across the world - see Appendix 5 - and Dublin is no different: for an entire decade since 2007 Dublin's total water demand has averaged around 540Mld. Irish Water cites Dublin's water crises of 2010/2013 as justification for the Shannon project. This is disingenuous: those crises were not caused by a lack of raw water but by the fact that Dublin's ancient water treatment plants had insufficient treatment capacity to convert raw water into drinkable treated water and had almost no treatment capacity over their licenced raw water extraction limits to cover "outages" etc. Fortunately, since Dublin's water crises, hundreds of millions of Euros have been invested upgrading most of Dublin's water treatment plants and the treatment plant at Vartry, which is unable to cope with Vartry's frequent algal blooms, has now received planning permission for a long-overdue upgrade. Dublin's water treatment capacity has been increased by 202Mld which is extremely significant. Irish Water's attempt to justify the proposed Shannon project through repeated reference to an historic position which no longer prevails is inappropriate. In most cities, another factor driving the reduction in "demand" for water has been a major focus on leakage reduction. "Demand" for water includes "true" demand (i.e. water actually

used by domestic and business consumers) and "leakage" demand (i.e. water that is put into the supply system but leaks out of the pipes before it reaches the taps). As "leakage" demand is reduced so a city's overall water demand is reduced. In Dublin, where leakage reduction has been extremely poor, this has barely had an impact. Going forward, the active recovery of water through plugging Dublin's leakage demand will reduce Dublin's total water "demand", creating the equivalent of an enormous new "source" of water. (4) Irish Water's analysis was constrained by the flawed premise that only a single-source solution was acceptable Having significantly over-stated Dublin's projected 2050 water deficit, Irish Water's consideration of potential new raw water sources was then restricted by the inexplicable premise that only a single-source solution was acceptable, ruling out the conjunctive use of several smaller solutions. This meant that only extremely large stand-alone water sources could be considered. The logic of this was flawed: (1) with the proposed one-water-source/one-treatment plant/one-pipeline Shannon project the entire supply would be lost in the event of a contamination event or supply interruption. By contrast, in the event of a contamination or major outage event at one of a number of smaller water sources, that single contaminated supply could be shut down temporarily without impacting the remainder of the supply sources; (2) Dublin's projected water demand is highly uncertain on many measures and the Shannon project is "all or nothing": not a single drop of water can be delivered until the entire pipeline has been built - and it will cost the best part of EUR1.2billion regardless of whether, in the end, it needs to supply Dublin with 215Mld of water, 50Mld of water or indeed no water at all. The investment costs of the Shannon project are heavily front-ended: unlike with smaller sources in combination, the Shannon project offers almost no scope for phasing of investment expenditure or bringing the project online in increments. Irish Water claims to have considered ten new water source options. This is very misleading: seven of the ten were simply different variations of pumping water from the River Shannon to Dublin (from different abstraction locations and via different routes). An aggressive mains replacement programme was not even one of the ten options considered, which was a grave omission given that this is the key issue undermining Dublin's water supply system. The other three options were: (1) groundwater, which was dismissed for a number of flawed reasons, including that it could not provide the full projected water requirement standalone. The Kennedy Response (at part B(9) and Appendix 6) and the Second Kennedy Response (at Appendix 4) spelled out in significant technical detail the mathematical and logical errors contained in the original 2008 groundwater report and in Irish Water's 2015 review of the original report. See Appendix 6 for an overview of those many errors, which Irish Water's latest response yet again failed to address. Even on its constrained and (self-proclaimed) conservative analysis, that groundwater report concluded that there are significant groundwater resources close to Dublin. It estimated that two of these aquifers alone are likely to yield 78Mld if developed, (2) conjunctive use of the River Barrow, which was dismissed primarily because it could not provide the full water requirement standalone, and (3) desalination, which was dismissed primarily on the illogical basis that it could not provide water to communities in the "benefit corridor" – see the "benefit corridor" section below for why this was so flawed. 2 See page 5 of Appendix 1 to the Kennedy Response. 4 Irish Water did not give detailed consideration to the many other smaller alternatives that are available, such as new reservoirs, environmental flow replacement, mine dewatering and rainwater harvesting. None of these would have been capable of supplying the entire (incorrect) projected 2050 deficit standalone, but combinations of them would have been a far more logical solution. Irish Water's November 2016 Final Options Appraisal Report stated: "the potential for using multiple sources was also investigated at various stages in the WSP. However it was found that while many sources, such as groundwater, rainwater and greywater, could be attractive secondary resources.... they are not sustainable primary water sources." This statement makes no sense: naturally if you have classified them as "secondary" they are not, by your own definition, "primary" – but this does not negate their value when used in

combination. Two or three water sources operating in conjunction could be brought online incrementally (alongside an aggressive mains replacement programme) if and when the need does indeed arise and would reduce the risk of exposure to a contamination of any one supply in the future. Dublin currently gets 99% of its water from rivers – and the Shannon would be yet another river water source, offering no diversification protection. River water has its own inherent problems: it contains organic materials (e.g. from leaves that fall into the water) and trihalomethanes ("THMs") are produced as a by-product during the water treatment process when chlorine reacts with organic matter. River water is the most prone to producing THMs during the treatment process; deep wells present the lowest THM risk as the water from deep wells is not contaminated by organic matter. THMs are believed to be linked to serious health risks including cancer, miscarriages and birth defects. It has been reported that Ireland has the highest reported non-compliance for THM exceedances across the EU member states - even Erin Brokovich has flagged the issue of THMs in Ireland's drinking water. (5) The "benefit corridor" concept is being misrepresented to justify the Shannon project When Irish Water took this project over from Dublin City Council in 2014 it introduced the uncertain and vague concept of a "benefit corridor". Public details of this "benefit corridor" concept have been scant, but the analysis that was published in the 2015 Project Need Report was littered with errors (see pages 10/11 of the Kennedy Report). The concept has since shifted significantly – the version presented in the 2016 Final Options Appraisal Report was unrecognisable, yet very few details were provided and those provided were, yet again, highly questionable – see Appendix 7a. Irish Water claims that the Shannon project will serve over 40% of the population – but 39.99% of these live in Dublin or within a contiguous area and within supply networks that, according to Irish Water's own report, could easily be connected into the Dublin water supply network. The "benefit corridor" is better described as a "benefit blob" around Dublin. According to the Final Options Appraisal Report, the only people slated to receive water from the Shannon source outside of this "benefit blob" are around 4,000 people in Clare - these 4,000 people in Clare constitute just 0.01% of Ireland's population yet Irish Water repeatedly claims that the Shannon project brings a benefit to communities along the entire length of the pipeline. Notwithstanding its extremely questionable validity, the "benefit corridor" has been one of the key justifications provided by Irish Water for selecting the Shannon solution over other sources that are local to Dublin on the flawed basis that the Shannon source can provide water to more people than sources located in the heart of the Dublin water supply area (such as desalination). This justification is wholly illogical: a water source located within the Dublin water supply area would supply the "benefit blob" without the need for hundreds of kilometers of pipeline. (6) Dublin's ancient water mains and third world leakage levels are the key factors undermining its water supply system - yet Irish Water's mains replacement and leakage targets are unambitious The Kennedy Analysis team has undertaken a forensic analysis of Dublin's leakage and Irish Water's self-proclaimed "ambitious" leakage reduction targets. A summary is contained at Appendix 8 or click on this link for a copy of the full Kennedy Analysis of Dublin's Leakage. Dublin's problem is not a lack of water: Dublin's problem is that around 57% of the water put into its water supply system pours straight through holes in its ancient supply pipes into the ground and never reaches Dubliners' taps. Only around 43% of the The conjunctive use of several smaller water sources would allow for increased water supply to be brought online incrementally if and when it is actually found to be needed (unlike the all-or-nothing Shannon project). It would offer protection against a contamination event or supply interruption at an individual water source (unlike the one-source, one treatment plant, one-pipeline Shannon project) and would allow for diversification of Dublin's water sources away from surface water, with its inherently high THM risk (unlike the surface-water Shannon source). Irish Water suggests that the Shannon is better placed to supply the "benefit corridor" than a Dublin-centric solution and that the Shannon Project would bring a benefit to the communities along the entire length of the pipeline: this

is false. 5 water put into Dublin's water supply system every day is actually used – the rest of the water is wasted through leakage. The ancient, corroded state of Dublin's water mains is the single key factor undermining its water supply system. Dublin's historic mains replacement rates have been inadequate: London has replaced its water mains at a rate 2,000% faster than that in Dublin despite the fact that London's leakage rates were less than half those in Dublin. Dublin City Council stated a decade ago: "...these mains are so ancient that leaving them alone is not an option" yet over the past ten years an average of only EUR10million per year has been spent on fixing leaks NATIONALLY (not in Dublin alone) - this equates to only 0.8% of the projected EUR1.2billion cost of the Shannon project. This failure has resulted in leakage levels of around 57% - this is far from normal or acceptable. The OECD carried out a study in 2016 observing leakage levels in cities across the world. Only 4 cities had leakage levels over 40%: all of them were in Mexico (Dublin did not take part in the study). The UK is known to have very high leakage rates – indeed Thames Water (London's water provider) was fined by its regulator yet again in July 2017 for "unacceptable" leaks – yet UK leakage levels are well under half those in Dublin: "total leakage" rates for water suppliers in the UK in 2012 ranged from 14% to 27%, with an average of 20%3 . It is notable that Irish Water tends to use London, which itself has "unacceptable" leakage levels, as its default comparator when attempting to justify its own unambitious leakage targets. Earlier in the life of the Shannon project, Dublin City Council selected 6 comparable countries/cities and presented data on them for comparison with Dublin – it found that the leakage levels for the countries that it had selected were: Country/city Approximate leakage rate Denmark 6% The Netherlands 6% Germany 7% Sydney, Australia 8.5% Lithuania 15% (in 2000) United Kingdom 23% Reference is often made to Dublin's "spare capacity" which Irish Water states is around 10% (although its published data suggests that, as a result of the major recent upgrades at Dublin's water treatment plants, its current spare capacity is significantly higher than 10%). It is important to understand: if Dublin had normal leakage levels it would have an absolutely enormous spare capacity. For example, if Dublin's 2015 leakage levels had been 20% (well above leakage levels in many comparable cities) it would have had 112% spare capacity. THIS IS ABSOLUTELY ENORMOUS. Irish Water's states that, in low-pressure situations, there is a danger of what is describes as "contaminated groundwater" leaking from the water-logged ground around the pipes back into the pipes carrying clean water to Dubliners' taps. This requires "boosted chlorination" of the water (with its associated THM risk, as mentioned above) before it is put into the supply system to counteract what Irish Water describes as a "public health risk". The cripplingly compromised state of Dublin's water pipes means that, until a significant proportion of them are replaced, water outages and flooding incidents caused by burst water mains are inevitable. What is more, the extreme extent of corrosion to the pipes means that repairing those bursts is extra complicated and takes far longer than it should. The 2017 Louth/Meath mains burst was an example of this: Irish Water's own press release stated: "three attempts to fix the 50 year old pipe failed over last weekend as the corrosion and warping of the pipe meant that any available standard fittings were not sufficient. A bespoke piece of pipe and fittings were manufactured in Belfast". Irish Water claims that its leakage targets are "ambitious" and it makes reference to highly misleading statements and invalid comparisons to justify its claims – see part (C) of Appendix 8. In fact, Irish Water's hard targets on leakage reduction aim to reduce Dublin's leakage by only 31% in 39 years. Its leakage reduction target is extremely unambitious given the scale of the problem and when compared with recent leakage reduction achievements in the UK4 and across the EU5 . For example: • London's leakage was reduced by 30% in only 6 years, • Scotland's leakage was reduced by 55% in only 10 years, • Lisbon's leakage was reduced by 64% in only 8 years, • Leakage in the Reggio Emilia province in Italy was reduced by 50% in 8 years, • Malta's leakage was reduced by over 83% in under 20 years. For its estimates of the costs of recovering water through fixing leaks, Irish Water's analysis used out-dated, over-stated figures: it used cost data from prior to the installation of water meters.

This is wholly inappropriate: fixing leaks (on both the customer side and the distribution side of the network) is far less complicated and far cheaper now that meters have been 3 Source: Irish Water Final Options Appraisal Report Appendix J, "Preliminary Options Appraisal - Consultation Submissions Report", page 35. 4 Sources: Thames Water and Scottish Water. 5 Source: 2015 EU Reference Document "Good Practices on Leakage Management". 6 installed. Before meters were installed it was almost impossible to know where a distribution-side leak was unless water was actually pouring out of the ground. Meters now allow leaks to be pin-pointed simply by observing the difference in water pressure between two meter points. Irish Water's analysis assumed that recovering 1Mld of water on the customer-side of the network would cost "in the order of EUR 0.75million", but the results of the First Fix Free scheme (a scheme for repairing customer side leakage relying on "constant flow alarms" in water meters) show that saving water by fixing customer side leaks has cost an average of just EUR212,000 per 1Mld – this is one third of the amount that Irish Water had assumed and just 5% per unit of water than the predicted cost of delivering the same volume of water through the proposed Shannon Project. Irish Water's nonsensical attempts to dismiss this highly significant fact are discussed at Appendix 9c. The results of the First Fix scheme to date establish that far more water will be recovered through repairing Dublin's leakage than Irish Water's analysis accounted for (see Appendix 3c for more details on the results of the First Fix scheme). In every quarter, the amount of water recovered through the First Fix scheme was approximately DOUBLE the production of the entire Bog of the Ring wellfield. The Bog of the Ring wellfield produces 2.5-3Mld of water – the First Fix scheme has so far recovered a cumulative total of over 38Mld. That huge volume of "new" water is now available at Dubliners' taps every day instead of pouring into the ground. Recovering water by repairing customer leaks is equivalent to adding approximately two new, additional Bog of the Ring wellfields to Dublin's water supply every three months - but far less expensive. (7) The parallels between the proposed Shannon project and the UK's "White Elephant" 1970s Kielder project are ominous The Kielder reservoir and pipeline was built in the UK in the 1970s and has subsequently been widely criticised as having been an unnecessary White Elephant. Appendix 10 contains extracts from a damning 1982 report6 of the Kielder project highlighting alarming parallels with the Shannon Project. For example, it flags that the Kielder project was partly justified by potential increases in future water demand from certain major industrial users that were not appropriately validated at the time. Irish Water's "need" analysis for the Shannon project includes a huge 100Mld industrial "strategic allowance" (note: Dublin's total industrial demand for water is currently only 110Mld, which the "need" analysis assumes will grow organically alongside the separate, additional 100Mld industrial "strategic allowance") - a key justification for the 100Mld strategic allowance is "enquiries" from un-named potential industrial users. A University of Oxford study of the Kielder Water Scheme7 pointed out that the analysis used to justify the Kielder project used inappropriate data, including the incorrect assumption that non-domestic demand would continue to grow rapidly, but that in fact: "the industry it was planned to supply was already reducing its water requirements before construction started". The study noted that those who supported the scheme proclaimed: "the scheme is a bold and imaginative one: the largest single water conservation scheme yet undertaken in this country" and referred to "the politics of promotion of mega-projects". However, it stated, "unfortunately, engineering accomplishments were often marred by economic miscalculation. The resulting mismatch between vastly increased water supply at a time of diminishing rise in demand, together with huge debts incurred at a time of rapid inflation and high interest rates, had lasting effects on the state's management of water resources". The study stated: "The Scheme is described on a bronze plaque at the reservoir site as one of the biggest water projects ever undertaken in Europe.... Today, the reservoir rests mostly idle. The water is rarely needed for supply...." 6 "Spending Money like Water", William Charlton, The Spectator, 22 May 1982. 7 "The Kielder Water Scheme: the last of its kind?" CS MCCULLOCH,

University of Oxford, UK (2006) Irish Water has cited the inconvenience of traffic disruption in Dublin as a factor against an overhaul of its water mains. Perhaps Dubliners should be presented with two alternatives - either: (1) accept traffic disruption in rotating areas of Dublin for the coming years while Irish Water aggressively replaces pipes - this will be expensive but will (a) address Dublin's water volume, quality and pressure issues, (b) make Dublin a viable investment proposition for incoming investors who need confidence in not only the volume of water available but also the quality of that water, and (c) eliminate the need to spend EUR1,000 per family on the Shannon project, or (2) accept that they will continue to (a) drink potentially contaminated water being delivered through ancient and corroding water pipes, and (b) be exposed to mains bursts/water outages, while Irish Water spends a huge amount of money piping water from the Shannon, which will only delay the expense and disruption of properly addressing Dublin's water mains. The ominous parallels with the Kielder project should sound alarm bells for anyone who will approve or rubber-stamp the Shannon project – they are on notice about the errors in Irish Water's analysis and must challenge Irish Water on the evidence contained in the Kennedy Analysis before it is too late. 7 Part B: Irish Water's reaction to the Kennedy Analysis has been highly defensive Irish Water's defensive reaction to the Kennedy Analysis is not the reaction that one would expect from a body intent on ensuring the best possible use of EUR1.3billion of scarce financial resources. Instead of addressing the issues head-on, Irish Water makes unrelated and irrelevant statements. Its responses deny the most undeniable of errors, often with very little or no substance. As summarised in the table below, its latest response even backtracked on issues that Irish Water had conceded during its 16 February 2017 meeting with Emma Kennedy, failed to make a note of important points that were discussed at that meeting and failed to address issues that the Irish Water team were unable to explain during the meeting and had confirmed would be dealt with in its written response (see Appendix 9a and Appendix 9b). Matter discussed during meeting The position Irish Water took in its written response Non-domestic demand data: Mick Garrick of Jacobs Tobin confirmed that the data that Irish Water had used was indeed Jacobs Tobin's data and not Indecon's data. Its response backtracked entirely, stating "Irish Water do not accept this observation". See Appendix 3b for details of this point. The false statement that past outages in Dublin have cost the economy EUR78million per day: Alan Gray of Indecon confirmed that Indecon had not even purported to make any analysis of the cost of past water outages – Irish Water is citing the Indecon analysis and this wholly inappropriate figure out of context. Its response failed to address this point at all and Irish Water continues to propagate this message despite having been informed in Emma Kennedy's presence that it is wrong. Irish Water's adoption of a 35-year projection window (which is not international best practice and which produces a much higher projected water deficit due to Irish Water's aggressive and uncertain assumptions): during our meeting, Irish Water was unable to explain why it had not used the industry-standard 25-year time frame and confirmed that this issue would be addressed in its written response. Its response failed to address this point at all. Irish Water's much-publicised statement that Dublin's demand was projected to increase by over 50% was FALSE: Irish Water was unable to provide any maths to justify this statement during our meeting. Its response created a fudge to try to explain away this basic mathematical error. See Appendix 2 for details of this false statement and its implications. The results of the First Fix scheme have PROVEN that the volume of water that Irish Water's "need" analysis assumed was being lost through customer side leakage was WRONG: Irish Water still refuses to acknowledge this most undeniable of errors. Its response failed to address this point at all. See Appendix 3c for details of this point. Irish Water's latest response still avoided addressing key issues that the Kennedy Analysis has raised - see Appendix 9b for examples. Even when Irish Water did attempt to address issues raised in the Kennedy Analysis many of the points that Irish Water made in its defence were simply wrong/made no sense/contained basic errors - see Appendix 9c for examples. Irish Water avoids addressing issues by stating simply that its

methodology is "best practice" or "internationally recognised methodology". We have made clear to Irish Water that, although several aspects of its analysis are not considered international best practice, our principal concern is not with the methodology that Irish Water is attempting to follow, but rather our concern is that Irish Water has made major errors in its attempt to follow its selected methodology. Its analysis contains mathematical errors – this is NOT "best practice"; it is not "best practice" to account for "outage" on both sides of the supply: demand equation; "best practice" does not use data derived from analysis that contained basic errors; claiming to use one set of data while actually using a different set of data is not "best practice". See Appendix 3a for corrected analysis, using Irish Water's own selected methodology. The Kennedy Analysis spelled out Irish Water's mathematical errors and demonstrated how many of its public statements about the need for this project have been false or highly misleading. Instead of even attempting to justify its position on many of these issues, it has repeatedly stated: "Irish Water do not accept this observation". It gives itself a clean bill of health without providing any substance, for example stating simply: "the technical reports produced ... have been subject to a full quality assurance process". Stating "we do not accept this observation" does not change the fact that the observation is accurate. Simply stating that its own analysis is correct does not make it so. Avoiding key issues by raising other matters that are not even in dispute is a method of diverting attention away from fully substantiated claims that Irish Water is incapable of providing evidence to refute: there is no need for the EUR1.3billion Shannon project and pursuing it would be a waste of scarce financial resources.

Appendix C

Quantitative Assessment of River Shannon Flows, Abstraction Proportions, and Ardnacrusha Operations

This appendix provides a structured quantitative assessment to support the planning objection. It sets out baseline flow data, proposed abstraction volumes, proportional impacts under varying hydrological conditions, and the operational and energy context of the Parteen–Ardnacrusha system. The purpose is to demonstrate why reliance on long-term average flow metrics materially understates environmental risk during critical low-flow periods.

A1. Baseline River Shannon Flows at the Abstraction Point

Monitoring data indicate that the **annual average discharge of the River Shannon at Limerick is approximately 208.1 m^3/s** (208,100 litres per second). Corresponding flows at **Killaloe and Parteen Weir** are generally estimated to lie between **180 and 186 m^3/s**.

For the purposes of this assessment, an average flow of **183 m^3/s** at the abstraction point is assumed.

Table A1 – Representative River Shannon Flows

Location	Flow description	Discharge (m^3/s)
Limerick	Long-term annual average	208.1
Killaloe / Parteen	Estimated annual average range	180–186
Killaloe / Parteen	Assumed planning average	183

A2. Proposed Abstraction Volume

The current proposal by Uisce Éireann involves abstraction of approximately **3.82 m^3/s** at Parteen Weir.

A3. Observed Flow Variability in the River Shannon

The River Shannon exhibits extreme variability, ranging from major flood events to very low summer flows. In addition, a **statutory minimum compensation flow of 10 m^3/s** is required down the old Shannon channel toward Castleconnell.

Table A2 – Observed Flow Conditions at Killaloe / Parteen

Condition	Approximate flow (m^3/s)	Notes
Major flood	700	Extreme flood events
Average conditions	183	Long-term planning average
Dry summer	15	Typical low-flow summer
Extreme low flow	10	Approaches statutory minimum
Statutory compensation flow	10	Legal minimum to Castleconnell

Questions remain regarding the **precision, transparency, and enforcement** of this minimum flow, particularly during drought conditions when abstraction pressures are greatest.

A4. Proportion of River Flow Abstracted Under Different Conditions

When the proposed abstraction of **3.82 m^3/s** is assessed against the full range of Shannon flows, the proportional impact increases sharply during low-flow periods.

Table A3 – Percentage of River Flow Abstracted

Hydrological condition	River flow (m^3/s)	Abstraction (m^3/s)	% of flow abstracted
Major flood	700	3.82	0.55%
Annual average	183	3.82	2.09%
Dry summer	15	3.82	25.5%
Extreme low flow	10	3.82	38.2%

This table demonstrates that while abstraction appears negligible under flood or average conditions, it becomes **ecologically dominant during drought and low-flow periods**, precisely when riverine and lake ecosystems are most vulnerable.

A5. Ardnacrusha Hydropower Capacity and Flow Regulation

Ardnacrusha hydroelectric station comprises **four turbines**, each with a maximum hydraulic capacity of approximately **100 m^3/s**, giving a total maximum throughput of **400 m^3/s** and a peak installed electrical capacity of **86 MW**.

Flows exceeding this capacity are diverted down the old Shannon channel toward Castleconnell, contributing to downstream flood risk during major events.

Table A4 – Ardnacrusha Operational Characteristics

Parameter	Value
Number of turbines	4
Capacity per turbine	~100 m^3/s
Maximum hydraulic throughput	~400 m^3/s
Maximum electrical output	86 MW

A6. Average Utilisation and Energy Output

Allowing for the statutory **10 m^3/s** compensation flow, the average effective flow available for power generation is approximately **198 m^3/s.**

This equates to:

- **Average utilisation of installed hydraulic capacity:** 49.5%
- **Average electrical output:** 42.6 MW
- **Annual energy generation:** 373 GWh

Table A5 – Average Energy Output of Ardnacrusha

Metric	Value
Average utilised capacity	49.5%
Average power output	42.6 MW
Annual energy generation	373 GWh

In national context:

- Total electricity generated in Ireland in 2023: **~30,600 GWh**
- Contribution of Ardnacrusha: **~1.2% of total generation**

A7. Comparison with Modern Wind Generation

Modern onshore wind turbines typically have a rated capacity of **~3 MW.** Assuming an average capacity factor of **35%,** this yields an effective average output of **~1.05 MW per turbine.**

Table A6 – Wind Generation Equivalence

Parameter	Value
Typical turbine rating	3 MW
Average capacity factor	35%
Effective average output	1.05 MW
Equivalent turbines to Ardnacrusha	~40

In renewable_toggle terms:

- Renewables accounted for **~40.7%** of Irish electricity generation in 2023 (~12,454 GWh).
- Ardnacrusha contributed approximately **3.0% of renewable generation**.
- Removal of Ardnacrusha would reduce the renewable share to approximately **39.5%**, a marginal national change.

A8. Planning-Relevant Conclusions

This appendix demonstrates that:

1. The proposed abstraction represents a **minor proportion of river flow only under average or flood conditions**, but a **very substantial proportion during low-flow and drought periods**.
2. The **energy contribution of Ardnacrusha is modest** in both national and renewable-energy terms.
3. Continued reliance on the Parteen–Ardnacrusha regime disproportionately facilitates low-flow abstraction with significant ecological consequences.

Accordingly, the use of long-term average flow figures as the primary justification for abstraction is **misleading and unsuitable** as a basis for planning consent.

Appendix D

The Conclusion of the Irish Water Forum – Review of the Eastern and Midlands Water Supply Project in 2019 was as follows:

The "helicopter" review of the Eastern and Midlands WSP that was conducted provided the Forum with some necessary insight to prepare its contribution to the CRU review, and in particular to identify the points that deserve further clarification or consideration by Irish Water. The key take away points from the review include the following:

- The information presented to justify the need for the WSP project suffers from many unknowns and uncertainties :
  - Either supporting data are available but not shared by Irish Water, which reflects a lack of pedagogy and transparency
  - Or these data don't exist, which means that there is no solid foundation for the projections justifying the need for the project (at least at this scale): it might then be better to wait for progressing any further that basic buildings blocks are in place.
- However, without considering future demand, the situation in Dublin is already very challenging, due to the lack of headroom and more importantly, the almost exclusive reliance on a single source. Increasing the resilience of the water supply not just in Dublin but for all the Midlands region is therefore a critical argument to justify the Eastern and Midlands WSP; and may justify that it should start sooner rather than later.
- By all means, "fixing" water supply challenges are a complex matter, for which there are usually no "silver bullet" and the Eastern and Midlands WSP makes no exception. In particular, different ways of reducing demand as well as increasing supplies could be considered and implemented simultaneously, with impact assessment and cost

benefits analysis allowing to define the most adequate combination.

• Water demand is not an external parameter, such as rainfall, but instead a component of the system that a water utility can, and should, manage; to that end, it is necessary to adopt a holistic view of all the drivers, as well as levers, that can influence water demand in the future. While Irish water indicates that it intends to implement a demand management strategy, the impact of such strategy is not evidenced in the proposed demand projections.

• The same applies for the leakage issue: Irish Water does not explain how future leakage targets have been set and how they are aligned with best practices, available resources and customer preferences. International experience, including that of Scottish Water, show that significant progress can be achieved in this area in relatively short period of time and without relying exclusively on infrastructure renewal. Raising ambition on leakage could help increase the acceptability of the Eastern and Midlands project, which otherwise could be seen as a "necessary evil" to compensate the current wastage of resources.

• At the same time, it is important to stress that improving performance (whether on leakage, demand management or operations in general) takes time and depends on many conditions (human resources capabilities, leadership, financial resources and above all regulatory pressure/support). Irish Water is still a fairly new organization inheriting a challenging situation: should the role of the CRU in helping it deliver better performance be strengthened?

• In addition to the CRU, the Forum could also play a significant role in helping Irish Water better understand the views of its customers as well as their preferences and priorities: through an ongoing engagement process, the utility could better anticipate, understand and potentially resolve future issues before they become national controversies; and develop better ways to engage and communicate with customers, above and beyond institutional "consultation".

Appendix E: The Natura Impact Statement (NIS) Review

The Natura Impact Statement (NIS) Review

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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 statuary 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 ZoI.

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 ZoI 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 ZoI 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 m^3/s. Under such conditions, the proposed abstraction of 3.47–3.82 m^3/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 ZoI	**Barroughter Bog SAC is not listed among sites with hydrological**	**The SAC lies directly adjacent to Lough Derg yet is omitted from the**	**Article 6(3) requires identification of all European sites within the**

Assessment Element	NIS Position	Identified Deficiency	Relevance to Legal Test
	pathways for effect.	Natura 2000 inventory and hydrological pathway analysis.	likely Zone of Influence. In the absence of identification and screening, compliance with Article 6(3) cannot be demonstrated.
Hydrological linkage to Lough Derg	Site not assessed.	No evaluation of whether abstraction-induced lake level changes could alter groundwater gradients or hydraulic conditions at the bog–lake interface.	Where a plausible source–pathway–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**

Assessment Element	NIS Position	Identified Deficiency	Relevance to Legal Tests
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 conditions	Article 4 WFD test not satisfied
Scientific Certainty	Conclusion of no adverse effect reached	Residual uncertainty remains regarding habitat structure and function	Does not evidence "beyond reasonable scientific doubt"

Assessment Element	NIS Position	Identified Deficiency	Relevance to Legal Tests 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.**

Assessment Element	NIS Position	Identified Deficiency	Relevance to Legal Test
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 duration of low-water events	Focus on minimum level reached.	No analysis of duration of low-water periods, altered hydroperiod timing, or frequency of lower-band occupancy.	Habitat integrity depends on 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	Where doubt remains, consent cannot lawfully be granted under

Assessment Element	NIS Position	Identified Deficiency	Relevance to Legal Test
		groundwater coupling remains unresolved.	**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	Abstraction-induced changes	Wind effects are short-term and	Unsupported analogy does not satisfy

Assessment Element	NIS Position	Identified Deficiency	Relevance to Legal Tests
variability comparison	comparable to natural wind-driven fluctuations.	oscillatory; abstraction deficits may be sustained and cumulative. No demonstration of ecological equivalence.	precautionary standard required by Article 6(3).
Floodplain inundation regime	No significant upstream water level change predicted.	No modelling of changes in inundation duration, spatial extent, or recession timing of callow habitats.	Callow grasslands are defined by flood 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**	**Art. 6(3) requires assessment of habitat function, not operational compliance**

Assessment Element	NIS Position	Identified Deficiency	Relevance to Legal Test
		neutrality	
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 ZoI; 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
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

Assessment Element	NIS Position	Identified Deficiency	Relevance to Legal Test (Article 6(3))
			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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Appendix E ESB Flow Data from EPA

EPA Data from ESB Flows Table 1

Date	Parteen Discharge into old channel (m^3/s)	Parteen Discharge into headrace canal(m^3/s)	Total Discharge at Parteen Weir(m^3/s)	**pipeline abstraction (3.4m3/s) as % of Total Discharge**	
5/20/2018 9:00	10.5	0	10.5	32.38%	
6/2/2018 9:00	10.5	0	10.5	32.38%	
6/3/2018 9:00	10.5	0	10.5	32.38%	
6/15/2018 9:00	10.5	0	10.5	32.38%	
6/16/2018 9:00	10.5	0	10.5	32.38%	
6/17/2018 9:00	10.5	0	10.5	32.38%	
6/18/2018 9:00	10.5	0	10.5	32.38%	
6/19/2018 9:00	10.5	0	10.5	32.38%	
6/20/2018 9:00	10.5	0	10.5	32.38%	
6/21/2018 9:00	10.5	0	10.5	32.38%	
6/22/2018 9:00	10.5	0	10.5	32.38%	
6/23/2018 9:00	10.5	0	10.5	32.38%	

6/24/2018 9:00	10.5	0	10.5	32.38%	
6/25/2018 9:00	10.5	0	10.5	32.38%	
6/26/2018 9:00	10.5	0	10.5	32.38%	
6/27/2018 9:00	10.5	0	10.5	32.38%	
6/28/2018 9:00	10.5	0	10.5	32.38%	
6/30/2018 9:00	10.5	0	10.5	32.38%	
7/1/2018 9:00	10.5	0	10.5	32.38%	
7/3/2018 9:00	10.5	0	10.5	32.38%	
7/4/2018 9:00	10.5	0	10.5	32.38%	
7/5/2018 9:00	10.5	0	10.5	32.38%	
7/6/2018 9:00	10.5	0	10.5	32.38%	
7/7/2018 9:00	10.5	0	10.5	32.38%	
7/8/2018 9:00	10.5	0	10.5	32.38%	
7/9/2018 9:00	10.5	0	10.5	32.38%	
7/10/2018 9:00	10.5	0	10.5	32.38%	
7/11/2018 9:00	10.5	0	10.5	32.38%	
7/12/2018 9:00	10.5	0	10.5	32.38%	

7/13/2018 9:00	10.5	0	10.5	32.38%	
7/14/2018 9:00	10.5	0	10.5	32.38%	
7/15/2018 9:00	10.5	0	10.5	32.38%	
7/16/2018 9:00	10.5	0	10.5	32.38%	
7/17/2018 9:00	10.5	0	10.5	32.38%	
7/18/2018 9:00	10.5	0	10.5	32.38%	
7/19/2018 9:00	10.5	0	10.5	32.38%	
7/20/2018 9:00	10.5	0	10.5	32.38%	
7/21/2018 9:00	10.5	0	10.5	32.38%	
7/22/2018 9:00	10.5	0	10.5	32.38%	
7/23/2018 9:00	10.5	0	10.5	32.38%	
7/24/2018 9:00	10.5	0	10.5	32.38%	
7/25/2018 9:00	10.5	0	10.5	32.38%	
7/26/2018 9:00	10.5	0	10.5	32.38%	
7/27/2018 9:00	10.5	0	10.5	32.38%	
7/28/2018 9:00	10.5	0	10.5	32.38%	
7/29/2018 9:00	10.5	0	10.5	32.38%	

7/30/2018 9:00	10.5	0	10.5	32.38%	
7/31/2018 9:00	10.5	0	10.5	32.38%	
8/1/2018 9:00	10.5	0	10.5	32.38%	
8/2/2018 9:00	10.5	0	10.5	32.38%	
8/3/2018 9:00	10.5	0	10.5	32.38%	
8/4/2018 9:00	10.5	0	10.5	32.38%	
8/5/2018 9:00	10.5	0	10.5	32.38%	
8/6/2018 9:00	10.5	0	10.5	32.38%	
8/7/2018 9:00	10.5	0	10.5	32.38%	
8/8/2018 9:00	10.5	0	10.5	32.38%	
8/9/2018 9:00	10.5	0	10.5	32.38%	
8/10/2018 9:00	10.5	0	10.5	32.38%	
8/11/2018 9:00	10.5	0	10.5	32.38%	
8/12/2018 9:00	10.5	0	10.5	32.38%	
8/13/2018 9:00	10.5	0	10.5	32.38%	
8/14/2018 9:00	10.5	0	10.5	32.38%	
8/15/2018 9:00	10.5	0	10.5	32.38%	

8/16/2018 9:00	10.5	0	10.5	32.38%	
8/17/2018 9:00	10.5	0	10.5	32.38%	
8/18/2018 9:00	10.5	0	10.5	32.38%	
8/19/2018 9:00	10.5	0	10.5	32.38%	
8/20/2018 9:00	10.5	0	10.5	32.38%	
8/21/2018 9:00	10.5	0	10.5	32.38%	
8/22/2018 9:00	10.5	0	10.5	32.38%	
8/24/2018 9:00	10.5	0	10.5	32.38%	
8/25/2018 9:00	10.5	0	10.5	32.38%	
8/26/2018 9:00	10.5	0	10.5	32.38%	
9/29/2018 9:00	10.5	0	10.5	32.38%	
9/30/2018 9:00	10.5	0	10.5	32.38%	
6/29/2018 9:00	10.5	1.7	12.2	27.87%	
8/23/2018 9:00	10.5	5.3	15.8	21.52%	
10/27/2018 9:00	10.5	15.8	26.3	12.93%	
6/14/2018 9:00	10.5	18.8	29.3	11.60%	
7/2/2018 9:00	10.5	20.4	30.9	11.00%	

6/11/2018 9:00	10.5	28.7	39.2	8.67%	
10/28/2018 9:00	10.5	29.1	39.6	8.59%	
10/31/2018 9:00	10.5	29.4	39.9	8.52%	
10/11/2018 9:00	10.5	30.4	40.9	8.31%	
10/12/2018 9:00	10.5	30.6	41.1	8.27%	
6/4/2018 9:00	10.5	31.1	41.6	8.17%	
10/10/2018 9:00	10.5	31.9	42.4	8.02%	
6/5/2018 9:00	10.5	32.8	43.3	7.85%	
11/3/2018 9:00	10.5	33	43.5	7.82%	
10/29/2018 9:00	10.5	33.9	44.4	7.66%	
11/4/2018 9:00	10.5	34.1	44.6	7.62%	
11/2/2018 9:00	10.5	34.5	45	7.56%	
10/30/2018 9:00	10.5	36.6	47.1	7.22%	
5/19/2018 9:00	10.5	38.4	48.9	6.95%	
10/7/2018 9:00	10.5	38.8	49.3	6.90%	
9/4/2018 9:00	10.5	39.4	49.9	6.81%	
9/20/2018 9:00	10.5	39.6	50.1	6.79%	

6/12/2018 9:00	10.5	40.3	50.8	6.69%	
9/21/2018 9:00	10.5	40.9	51.4	6.61%	
9/7/2018 9:00	10.5	41.1	51.6	6.59%	
11/1/2018 9:00	10.5	41.3	51.8	6.56%	
9/22/2018 9:00	10.5	42.2	52.7	6.45%	
6/9/2018 9:00	10.5	42.6	53.1	6.40%	
10/22/2018 9:00	10.5	43.1	53.6	6.34%	
6/13/2018 9:00	10.5	43.9	54.4	6.25%	
8/27/2018 9:00	10.5	44.1	54.6	6.23%	
10/23/2018 9:00	10.5	44.1	54.6	6.23%	
10/25/2018 9:00	10.5	44.8	55.3	6.15%	
10/26/2018 9:00	10.5	44.8	55.3	6.15%	
10/24/2018 9:00	10.5	45.2	55.7	6.10%	
11/5/2018 9:00	10.5	45.2	55.7	6.10%	
9/1/2018 9:00	10.5	45.4	55.9	6.08%	
9/19/2018 9:00	10.5	45.9	56.4	6.03%	
10/17/2018 9:00	10.5	46.1	56.6	6.01%	

10/8/2018 9:00	10.5	47.1	57.6	5.90%	
10/14/2018 9:00	10.5	47.4	57.9	5.87%	
6/6/2018 9:00	10.5	47.6	58.1	5.85%	
10/15/2018 9:00	10.5	47.6	58.1	5.85%	
6/1/2018 9:00	10.5	49.5	60	5.67%	
10/18/2018 9:00	10.5	49.5	60	5.67%	
10/20/2018 9:00	10.5	49.7	60.2	5.65%	
10/13/2018 9:00	10.5	50.4	60.9	5.58%	
9/11/2018 9:00	10.5	50.6	61.1	5.56%	
10/6/2018 9:00	10.5	50.6	61.1	5.56%	
10/9/2018 9:00	10.5	51.4	61.9	5.49%	
10/19/2018 9:00	10.5	52.3	62.8	5.41%	
9/8/2018 9:00	10.5	53.3	63.8	5.33%	
5/31/2018 9:00	10.5	53.6	64.1	5.30%	
8/29/2018 9:00	10.5	53.6	64.1	5.30%	
9/5/2018 9:00	10.5	53.6	64.1	5.30%	
5/30/2018 9:00	10.5	53.8	64.3	5.29%	

5/18/2018 9:00	10.5	54	64.5	5.27%	
9/10/2018 9:00	10.5	54.4	64.9	5.24%	
5/17/2018 9:00	10.5	54.8	65.3	5.21%	
9/6/2018 9:00	10.5	54.9	65.4	5.20%	
9/3/2018 9:00	10.5	55.3	65.8	5.17%	
9/9/2018 9:00	10.5	55.7	66.2	5.14%	
8/31/2018 9:00	10.5	56.3	66.8	5.09%	
5/21/2018 9:00	10.5	56.6	67.1	5.07%	
9/15/2018 9:00	10.5	58.5	69	4.93%	
11/7/2018 9:00	10.5	58.5	69	4.93%	
9/2/2018 9:00	10.5	58.7	69.2	4.91%	
11/6/2018 9:00	10.5	58.7	69.2	4.91%	
5/16/2018 9:00	10.5	59.1	69.6	4.89%	
8/30/2018 9:00	10.5	59.1	69.6	4.89%	
9/28/2018 9:00	10.5	59.4	69.9	4.86%	
10/16/2018 9:00	10.5	59.4	69.9	4.86%	
9/27/2018 9:00	10.5	59.6	70.1	4.85%	

10/5/2018 9:00	10.5	61.9	72.4	4.70%	
10/2/2018 9:00	10.5	62.1	72.6	4.68%	
9/12/2018 9:00	10.5	62.3	72.8	4.67%	
9/25/2018 9:00	10.5	62.4	72.9	4.66%	
9/26/2018 9:00	10.5	62.4	72.9	4.66%	
10/4/2018 9:00	10.5	62.4	72.9	4.66%	
8/28/2018 9:00	10.5	62.6	73.1	4.65%	
10/3/2018 9:00	10.5	65.3	75.8	4.49%	
9/13/2018 9:00	10.5	66.2	76.7	4.43%	
9/14/2018 9:00	10.5	66.4	76.9	4.42%	
9/16/2018 9:00	10.5	66.4	76.9	4.42%	
9/18/2018 9:00	10.5	67.3	77.8	4.37%	
10/21/2018 9:00	10.5	69	79.5	4.28%	
6/7/2018 9:00	10.5	69.6	80.1	4.24%	
9/17/2018 9:00	10.5	72	82.5	4.12%	
9/24/2018 9:00	10.5	72.8	83.3	4.08%	
6/8/2018 9:00	10.5	74.3	84.8	4.01%	

5/15/2018 9:00	10.5	74.6	85.1	4.00%	
11/8/2018 9:00	10.5	78	88.5	3.84%	
5/5/2018 9:00	10.5	78.4	88.9	3.82%	
5/6/2018 9:00	10.5	78.8	89.3	3.81%	
5/29/2018 9:00	10.5	79.9	90.4	3.76%	
5/28/2018 9:00	10.5	80.1	90.6	3.75%	
6/10/2018 9:00	10.5	80.8	91.3	3.72%	
5/14/2018 9:00	10.5	81	91.5	3.72%	
10/1/2018 9:00	10.5	85.3	95.8	3.55%	
5/7/2018 9:00	10.5	85.7	96.2	3.53%	
5/4/2018 9:00	10.5	87.6	98.1	3.47%	
5/26/2018 9:00	10.5	90.8	101.3	3.36%	
5/13/2018 9:00	10.5	91.7	102.2	3.33%	
5/22/2018 9:00	10.5	93.6	104.1	3.27%	
5/23/2018 9:00	10.5	94.7	105.2	3.23%	
5/27/2018 9:00	10.5	95.6	106.1	3.20%	
9/23/2018 9:00	10.5	95.8	106.3	3.20%	

11/10/2018 9:00	10.5	98.8	109.3	3.11%	
11/9/2018 9:00	10.5	102.2	112.7	3.02%	
4/22/2018 9:00	10.5	104.5	115	2.96%	
5/24/2018 9:00	10.5	105.6	116.1	2.93%	
3/30/2018 9:00	10.5	108.6	119.1	2.85%	
5/8/2018 9:00	10.5	108.8	119.3	2.85%	
5/25/2018 9:00	10.5	111	121.5	2.80%	
11/20/2018 9:00	10.5	112.3	122.8	2.77%	
11/29/2018 9:00	10.5	114	124.5	2.73%	
11/28/2018 9:00	10.5	115.1	125.6	2.71%	
5/3/2018 9:00	10.5	115.3	125.8	2.70%	
11/21/2018 9:00	10.5	122.6	133.1	2.55%	
5/12/2018 9:00	10.5	124.1	134.6	2.53%	
4/29/2018 9:00	10.5	125.4	135.9	2.50%	
5/11/2018 9:00	10.5	125.6	136.1	2.50%	
5/2/2018 9:00	10.5	125.8	136.3	2.49%	
5/9/2018 9:00	10.5	128.8	139.3	2.44%	

11/22/2018 9:00	10.5	128.8	139.3	2.44%	
4/19/2018 9:00	10.5	128.9	139.4	2.44%	
5/10/2018 9:00	10.5	130.3	140.8	2.41%	
11/19/2018 9:00	10.5	132.8	143.3	2.37%	
4/30/2018 9:00	10.5	134.3	144.8	2.35%	
11/27/2018 9:00	10.5	138.2	148.7	2.29%	
11/26/2018 9:00	10.5	139.1	149.6	2.27%	
11/25/2018 9:00	10.5	144.2	154.7	2.20%	
11/18/2018 9:00	10.5	145.1	155.6	2.19%	
4/24/2018 9:00	10.5	145.3	155.8	2.18%	
4/16/2018 9:00	10.5	145.5	156	2.18%	
11/24/2018 9:00	10.5	146.1	156.6	2.17%	
11/17/2018 9:00	10.5	149.6	160.1	2.12%	
4/25/2018 9:00	10.5	152.6	163.1	2.08%	
4/15/2018 9:00	10.5	152.8	163.3	2.08%	
11/23/2018 9:00	10.5	153.8	164.3	2.07%	
11/14/2018 9:00	10.5	155.4	165.9	2.05%	

4/2/2018 9:00	10.5	156	166.5	2.04%	
11/15/2018 9:00	10.5	156.4	166.9	2.04%	
3/26/2018 9:00	10.5	156.6	167.1	2.03%	
11/13/2018 9:00	10.5	157.1	167.6	2.03%	
11/16/2018 9:00	10.5	157.5	168	2.02%	
4/23/2018 9:00	10.5	157.7	168.2	2.02%	
11/11/2018 9:00	10.5	158.6	169.1	2.01%	
11/12/2018 9:00	10.5	160.9	171.4	1.98%	
3/31/2018 9:00	10.5	168	178.5	1.90%	
3/24/2018 9:00	10.5	168.2	178.7	1.90%	
3/21/2018 9:00	10.5	171.2	181.7	1.87%	
5/1/2018 9:00	10.5	173.1	183.6	1.85%	
11/30/2018 9:00	10.5	175.5	186	1.83%	
3/23/2018 9:00	10.5	175.9	186.4	1.82%	
3/28/2018 9:00	10.5	175.9	186.4	1.82%	
3/27/2018 9:00	10.5	176.8	187.3	1.82%	
4/18/2018 9:00	10.5	177.3	187.8	1.81%	

4/20/2018 9:00	10.5	177.5	188	1.81%	
4/3/2018 9:00	10.5	177.6	188.1	1.81%	
3/25/2018 9:00	10.5	179.4	189.9	1.79%	
3/22/2018 9:00	10.5	180.9	191.4	1.78%	
4/14/2018 9:00	10.5	185.1	195.6	1.74%	
12/1/2018 9:00	10.5	186.2	196.7	1.73%	
4/1/2018 9:00	10.5	189.9	200.4	1.70%	
4/6/2018 9:00	10.5	190.7	201.2	1.69%	
12/3/2018 9:00	10.5	191.6	202.1	1.68%	
4/17/2018 9:00	10.5	192.9	203.4	1.67%	
3/29/2018 9:00	10.5	193.9	204.4	1.66%	
4/7/2018 9:00	10.5	194.1	204.6	1.66%	
4/5/2018 9:00	10.5	195.2	205.7	1.65%	
4/21/2018 9:00	10.5	197.9	208.4	1.63%	
12/4/2018 9:00	10.5	198.4	208.9	1.63%	
4/4/2018 9:00	10.5	200.3	210.8	1.61%	
4/28/2018 9:00	10.5	206.4	216.9	1.57%	

4/27/2018 9:00	10.5	206.6	217.1	1.57%	
4/26/2018 9:00	10.5	208.3	218.8	1.55%	
3/14/2018 9:00	10.5	210	220.5	1.54%	
3/12/2018 9:00	10.5	211.1	221.6	1.53%	
3/19/2018 9:00	10.5	213.4	223.9	1.52%	
3/20/2018 9:00	10.5	213.6	224.1	1.52%	
3/18/2018 9:00	10.5	213.9	224.4	1.52%	
3/6/2018 9:00	10.5	218.6	229.1	1.48%	
12/2/2018 9:00	10.5	219.9	230.4	1.48%	
3/11/2018 9:00	10.5	230.8	241.3	1.41%	
3/13/2018 9:00	10.5	232.9	243.4	1.40%	
3/17/2018 9:00	10.5	248.3	258.8	1.31%	
12/5/2018 9:00	10.5	256.3	266.8	1.27%	
4/9/2018 9:00	10.5	260.8	271.3	1.25%	
4/8/2018 9:00	10.5	264.9	275.4	1.23%	
3/15/2018 9:00	10.5	274.5	285	1.19%	
2/27/2018 9:00	55.9	278.4	334.3	1.02%	

12/18/2018 9:00	10.5	278.6	289.1	1.18%	
3/7/2018 9:00	10.5	279.6	290.1	1.17%	
12/13/2018 9:00	10.5	280.3	290.8	1.17%	
4/11/2018 9:00	10.5	281.3	291.8	1.17%	
2/26/2018 9:00	55.8	282	337.8	1.01%	
12/16/2018 9:00	10.5	285.6	296.1	1.15%	
3/1/2018 9:00	55.7	288.4	344.1	0.99%	
4/13/2018 9:00	10.5	289.5	300	1.13%	
2/28/2018 9:00	55.8	289.9	345.6	0.98%	
12/8/2018 9:00	10.5	291	301.5	1.13%	
4/12/2018 9:00	10.5	291.9	302.4	1.12%	
4/10/2018 9:00	10.5	292.1	302.6	1.12%	
12/9/2018 9:00	10.5	294	304.5	1.12%	
12/14/2018 9:00	10.5	295.5	306	1.11%	
12/10/2018 9:00	10.5	299.4	309.9	1.10%	
3/2/2018 9:00	55.6	305.1	360.7	0.94%	
3/5/2018 9:00	10.5	305.4	315.9	1.08%	

12/15/2018 9:00	10.5	305.8	316.3	1.07%	
3/4/2018 9:00	54.9	306	360.9	0.94%	
3/3/2018 9:00	55.2	307.9	363	0.94%	
3/10/2018 9:00	10.5	307.9	318.4	1.07%	
12/7/2018 9:00	10.5	310.5	321	1.06%	
12/30/2018 9:00	10.5	317.3	327.8	1.04%	
2/20/2018 9:00	55	318.8	373.8	0.91%	
3/16/2018 9:00	10.5	318.8	329.3	1.03%	
12/11/2018 9:00	10.5	320.6	331.1	1.03%	
3/8/2018 9:00	10.5	325.7	336.2	1.01%	
12/12/2018 9:00	10.5	326.1	336.6	1.01%	
3/9/2018 9:00	10.5	329.8	340.3	1.00%	
12/17/2018 9:00	10.5	330.6	341.1	1.00%	
2/24/2018 9:00	55.5	333.6	389	0.87%	
12/6/2018 9:00	10.5	333.6	344.1	0.99%	
12/19/2018 9:00	10.5	336.6	347.1	0.98%	
12/31/2018 9:00	10.5	336.6	347.1	0.98%	

2/23/2018 9:00	55.5	338.3	393.7	0.86%	
2/25/2018 9:00	55.4	339.6	394.9	0.86%	
1/13/2018 9:00	96.6	356.6	453.2	0.75%	
1/12/2018 9:00	96.5	363.8	460.3	0.74%	
1/16/2018 9:00	95.4	363.9	459.3	0.74%	
1/14/2018 9:00	95.4	365.8	461.2	0.74%	
1/17/2018 9:00	96.2	366.9	463.1	0.73%	
1/15/2018 9:00	95.6	367.5	463.1	0.73%	
12/23/2018 9:00	10.5	369.2	379.7	0.90%	
2/8/2018 9:00	136.9	369.8	506.7	0.67%	
12/21/2018 9:00	10.5	371.6	382.1	0.89%	
12/22/2018 9:00	10.5	372.4	382.9	0.89%	
2/11/2018 9:00	136.4	374.1	510.5	0.67%	
1/18/2018 9:00	95.8	376.1	471.9	0.72%	
2/5/2018 9:00	176.3	376.9	553.3	0.61%	
12/28/2018 9:00	10.5	376.9	387.4	0.88%	
2/7/2018 9:00	137.9	377.7	515.6	0.66%	

12/26/2018 9:00	10.5	377.8	388.3	0.88%	
1/19/2018 9:00	95.8	378.9	474.8	0.72%	
2/10/2018 9:00	136	378.9	515	0.66%	
12/27/2018 9:00	10.5	379.5	390	0.87%	
12/29/2018 9:00	10.5	379.7	390.2	0.87%	
2/12/2018 9:00	104.1	379.9	483.9	0.70%	
12/24/2018 9:00	10.5	379.9	390.4	0.87%	
1/31/2018 9:00	248.1	380.1	628.1	0.54%	
1/20/2018 9:00	95.9	380.3	476.2	0.71%	
2/9/2018 9:00	136.4	380.8	517.2	0.66%	
2/1/2018 9:00	247.8	381.2	629	0.54%	
2/4/2018 9:00	179.9	381.4	561.3	0.61%	
12/25/2018 9:00	10.5	381.9	392.4	0.87%	
2/2/2018 9:00	223.7	382.7	606.4	0.56%	
12/20/2018 9:00	10.5	383.8	394.3	0.86%	
2/19/2018 9:00	55	385.5	440.5	0.77%	
2/3/2018 9:00	211.7	385.9	597.6	0.57%	

1/1/2018 9:00	53.9	386.1	440	0.77%		
1/2/2018 9:00	54.2	386.1	440.3	0.77%		
1/30/2018 9:00	243	386.8	629.8	0.54%		
2/22/2018 9:00	55	389.1	444	0.77%		
1/5/2018 9:00	97.1	389.8	486.9	0.70%		
2/18/2018 9:00	97.2	390.4	487.6	0.70%		
2/17/2018 9:00	97.3	390.8	488.1	0.70%		
2/16/2018 9:00	97.5	390.9	488.4	0.70%		
2/6/2018 9:00	146.3	391.6	538	0.63%		
2/15/2018 9:00	97.4	391.7	489.1	0.70%		
2/21/2018 9:00	55	391.8	446.9	0.76%		
2/13/2018 9:00	97.1	391.9	489	0.70%		
2/14/2018 9:00	97.1	392.1	489.1	0.70%		
1/11/2018 9:00	95.8	393.4	489.1	0.70%		
1/4/2018 9:00	92.9	393.6	486.4	0.70%		
1/3/2018 9:00	54.3	394.9	449.2	0.76%		
1/28/2018 9:00	213	395.1	608.1	0.56%		

1/23/2018 9:00	171.5	395.3	566.7	0.60%	
1/25/2018 9:00	213.2	395.3	608.4	0.56%	
1/24/2018 9:00	207.3	395.4	602.7	0.56%	
1/8/2018 9:00	96.6	395.6	492.2	0.69%	
1/21/2018 9:00	96.9	396.6	493.4	0.69%	
1/10/2018 9:00	96.3	397.5	493.8	0.69%	
1/9/2018 9:00	96.6	397.9	494.5	0.69%	
1/26/2018 9:00	213	397.9	610.9	0.56%	
1/27/2018 9:00	212.3	398.1	610.3	0.56%	
1/7/2018 9:00	96.9	399.8	496.6	0.68%	
1/22/2018 9:00	134.1	400.7	534.8	0.64%	
1/29/2018 9:00	213.5	401.6	615.2	0.55%	
1/6/2018 9:00	96.9	402	498.9	0.68%	



An Coimisiún Pleanála,
64 Marlborough Street,
Dublin 1,
D01 V902.

25 February 2026

Reference: PA92.323980[1]

Applicant: Uisce Éireann

Description: Proposed Water Supply Project for the Eastern and Midlands Region.

Development Address: works extending across counties Tipperary, Offaly, Kildare and Dublin associated with the treated water pipeline, together with related electricity infrastructure works extending into counties Clare and Limerick.

A Chairde,

This submission is made together with an accompanying legal analysis prepared by FP Logue Solicitors and an independent ecological review prepared by Dr William O'Connor. The documents are intended to be read as complementary. The Friends of the Irish Environment submission addresses matters of environmental assessment, evidential sufficiency and planning judgment relevant to the Board's determination. The accompanying legal submission

[1] https://www.pleanala.ie/en-ie/case/323980

examines the application of the Water Framework Directive and related jurisprudence, while Dr O'Connor's report provides technical ecological analysis of the receiving environment and existing hydromorphological and biological pressures within the Shannon system. Taken together, the documents are provided to assist the competent authority in evaluating whether the information before it enables a reasoned scientific conclusion to be reached regarding compliance with applicable EU environmental law.

The proposed Water Supply Project represents a substantial intervention in the water environment and must be assessed across the full hydrological cycle in accordance with the Water Framework Directive (WFD). The EIAR presents a Water Framework Directive compliance assessment reaching a conclusion of no deterioration; the issue raised here concerns whether the underlying analysis enables independent verification of that conclusion.

Four issues arise from the application:

- the project is presented primarily as supply infrastructure rather than as part of the wider water cycle;
- abstraction is proposed within an already heavily modified water body without adequate cumulative assessment;
- expansion of supply is not matched by demonstrated wastewater capacity; and
- compliance with the outcome-based obligations of Article 4 WFD has not been transparently demonstrated on the information provided.

These matters relate to the adequacy of assessment rather than the objective of securing additional water supply. On the material currently before the Board, the assessment required to demonstrate compliance with the Water Framework Directive cannot yet be completed on the basis of the information currently provided. In the absence of further information, it is not apparent how the competent authority could complete the assessment required under the Water

Framework Directive or be satisfied that the environmental objectives of Article 4 would be met.

This submission addresses only those matters necessary to assist the competent authority in reaching its decision on a complete evidential basis.

1. Assessment Must Reflect the Water Cycle

The Environmental Impact Assessment treats abstraction, treatment and distribution largely as separate engineering components.

Under the Water Framework Directive, assessment must take place at catchment scale and across the full cycle of abstraction, use and return flows. Consideration of individual elements in isolation risks overlooking cumulative effects within the same hydrological system.

The proposal provides capacity to supply approximately 300 MLD, comprising about 280 MLD of treated water together with a 20 MLD operational allowance, across a Water Supply Area encompassing 36 Water Resource Zones. Increased potable supply will result in increased wastewater discharge and should be assessed as part of the same set of project effects.

Increased potable supply necessarily generates corresponding wastewater loading within connected catchments. Assessment under the Water Framework Directive therefore requires demonstration that receiving waters possess sufficient assimilative capacity to accommodate those additional returns without risk of deterioration. In the absence of a transparent regional water balance analysis linking abstraction, consumption and return flows, the information provided does not clearly demonstrate compliance with the environmental objectives set out in Article 4.

The project proposes abstraction of up to 2% of the long-term annual average flow of the River Shannon at Parteen Basin, downstream of Lough Derg.

The documentation does not clearly demonstrate:

- sufficient assimilative capacity in receiving waters;

- alignment between wastewater infrastructure delivery and supply expansion; or
- assessment of cumulative downstream effects.

Material submitted during the process indicates that wastewater treatment infrastructure in parts of the receiving region is already operating at or near capacity, with upgrades dependent on future delivery programmes. Reliance upon future or programme-level infrastructure delivery introduces uncertainty into the environmental assessment, where project effects depend upon operational capacity not yet evidenced within the assessment material. Outcome-based obligations under Article 4 WFD require assessment on the basis of demonstrated environmental performance rather than anticipated future upgrades. This raises the question of whether a regional water-in / water-out balance assessment has been undertaken. Increased potable supply will lead to increased wastewater loading, yet it has not been demonstrated that existing or planned infrastructure within the Greater Dublin Area and connected catchments can accommodate this loading without risk to receiving waters.

The EIAR includes a Water Framework Directive compliance assessment concluding that deterioration would not arise. However, water impacts are assessed mainly through significance ratings associated with EIA methodology. Article 4 WFD establishes outcome-based obligations, including prevention of deterioration and achievement of good status, which require demonstration capable of independent verification by the competent authority. The Water Framework Directive requires assessment capable of demonstrating compliance with outcome-based obligations rather than reliance on significance classifications alone.

Accordingly, on the material provided, deterioration within the meaning of Article 4 WFD cannot be excluded.

2. Heavily Modified Water Body, Shannon System

The abstraction point lies within the Shannon system at Parteen Basin, already substantially altered by hydropower infrastructure associated with the Ardnacrusha scheme.

The downstream Shannon water body is classified at less than good status, with hydromorphology identified as a significant pressure. Article 4 WFD requires protection, enhancement and restoration of such water bodies.

Designation as a heavily modified water body does not reduce assessment obligations. It requires clear justification and transparent evaluation of environmental consequences and restoration potential.

Article 4(3) of the Water Framework Directive establishes criteria relevant to the designation and management of heavily modified water bodies, including consideration of restoration potential and environmentally preferable alternatives. These considerations form part of the environmental context within which additional pressures must be assessed.

The documentation does not clearly demonstrate, at a system-wide scale:

- how ecological improvement or restoration measures have been taken into account in evaluating the proposed abstraction;
- how abstraction interacts cumulatively with existing hydromorphological alteration; or
- how the alternatives assessment enables understanding of whether environmentally preferable options were considered in the context of the modified water body.

The assessment material should therefore make clear how the considerations reflected in Article 4(3) have informed evaluation of the proposed abstraction within an already modified hydrological system.

The modified condition of the Shannon forms part of the environmental baseline against which additional abstraction pressures must be assessed. Where an environmental baseline is already subject to hydromorphological pressure and

restoration obligations, incremental abstraction must be evaluated cumulatively with existing alterations rather than considered as an isolated intervention. Even relatively small additional pressures may influence ecological recovery potential within a constrained system. Where the environmental baseline is itself subject to ongoing ecological pressure and restoration obligations, additional abstraction must be assessed against potential future environmental flow requirements rather than historic operating conditions alone.

3. Cumulative Effects on Migratory Species

Operation of the Ardnacrusha scheme has altered flow regimes and migration pathways affecting salmon and lamprey populations.

Additional abstraction must therefore be considered in the context of existing pressures.

The Environmental Impact Assessment does not clearly demonstrate:

- potential effects during low-flow migration periods;
- interaction between regulated flows and abstraction volumes; or
- whether ecological recovery objectives may be further constrained.

Given the Directive's objective of preventing deterioration, uncertainty regarding potential effects should be resolved before a conclusion on compliance with Article 4 can be reached.

4. Alternatives and Strategic Options

EU guidance requires projects involving physical modification of water bodies to be assessed against environmentally preferable alternatives.

It has not been demonstrated:

- whether alternative supply configurations were fully examined;
- whether demand management or storage options were comparatively assessed; or
- how system-wide optimisation informed the preferred option.

Any conclusion that no significantly better environmental alternative exists must be supported by clear and transparent analysis capable of verification by the competent authority. Such analysis should demonstrate that optimisation has been considered at system scale, including sequencing of infrastructure delivery, storage resilience and demand-side measures, rather than limiting comparison to engineering configuration alone.

5. Climate and Low-Flow Conditions

Assessment relies largely on average river flow conditions.

Ecological effects are most likely during low-flow periods rather than average conditions. Assessment methodologies relying primarily on mean annual flow conditions may therefore underestimate ecological risk relevant to deterioration thresholds, particularly where regulated river systems already experience altered flow regimes. Climate projections indicate increasing variability, including extended dry periods.

The documentation acknowledges potential impacts during drought conditions. Under WFD jurisprudence, temporary deterioration must also be assessed unless it can be clearly excluded that water status would be affected.

Climate-adjusted modelling is required to enable determination of whether precautionary requirements have been satisfied.

6. Governance, Transparency and Evidence Base

Major infrastructure decisions depend on accessible and transparent supporting information.

In several instances conclusions are presented without a clearly traceable analytical pathway, limiting understanding of how environmental outcomes have been derived. Transparency is particularly necessary where conclusions depend upon modelling assumptions, operational practices or infrastructure performance extending beyond the immediate project footprint, as these factors materially influence whether deterioration can be excluded.

Effective participation under Article 14 WFD is supported where the assessment clearly explains:

- explanation of assumptions;
- accessible supporting analysis; and
- transparent decision logic.

Given the scale and technical complexity of the proposal, assessment will require access to appropriate specialist expertise sufficient to allow independent evaluation of the scientific material presented.

7. Integrated Catchment Management

Water supply expansion cannot be considered separately from catchment pressures.

Implementation of the Water Framework Directive depends on measures linked to individual water bodies and identified pressures. Water supplied to the Greater Dublin Area ultimately returns to the aquatic environment through wastewater discharges. Environmental assessment must therefore consider redistribution of pressures across interconnected catchments, demonstrating how redistribution of supply interacts with wastewater treatment capacity, discharge licences and receiving water objectives.

While future regional offtake connections would be subject to separate consenting processes, the environmental assessment must still consider the system-wide consequences of enabling increased supply capacity.

Greater integration with catchment management planning would assist assessment, including:

- identification of affected catchments;
- anticipated pressure changes arising from redistribution of supply;

- alignment between supply expansion and wastewater infrastructure delivery; and
- mitigation aligned with catchment objectives.

8. Adequacy of Information

The following matters have not been demonstrated on the basis of the information provided:

- cumulative ecological assessment within the modified Shannon system;
- restoration and alternatives analysis required under HMWB provisions;
- wastewater capacity and receiving water assimilative capacity sufficient to prevent deterioration arising from increased supply;
- climate-adjusted abstraction modelling;
- system-wide environmental outcomes; and
- whether reliance is placed on Article 4(7) WFD derogation provisions and, if so, how the required conditions are satisfied.

On the information currently available, reasonable scientific doubt regarding environmental effects remains, and deterioration cannot be excluded. Where such uncertainty persists regarding cumulative hydrological effects, wastewater assimilative capacity or climate-adjusted operating conditions, it is not clear how the competent authority could be satisfied that the environmental objectives of Article 4 of the Water Framework Directive would be met. In that context, and consistent with the precautionary approach underpinning EU environmental policy, these uncertainties should be resolved on the basis of complete and verifiable information before a conclusion on compliance is reached.

9. Conclusion

The need to consider diversification of Ireland's water supply is recognised. The question before An Coimisiún Pleanála is whether the proposed development, as

assessed, provides a sufficient evidential basis to enable a lawful determination under EU environmental law and the requirements of the Water Framework Directive.

The proposed development represents a catchment-scale intervention within an already modified hydrological system. The material submitted does not clearly demonstrate, on the basis of a reasoned scientific assessment, that the environmental objectives of Article 4 of the Water Framework Directive, in particular the prevention of deterioration, can be achieved. Where scientific uncertainty remains regarding those objectives, a precautionary approach supports resolving such uncertainty prior to reaching a determination on compliance.

On the information currently provided, it is not clear how the competent authority could be satisfied that the environmental objectives of Article 4 WFD would be met. In the absence of such information, and where compliance with environmental obligations cannot be established, the competent authority cannot reach a reasoned scientific conclusion that the objectives of the Water Framework Directive will not be compromised.

It is respectfully requested that An Coimisiún Pleanála:

- require cumulative ecological assessment of abstraction within the Shannon heavily modified water body;
- require transparent alternatives analysis consistent with Article 4 WFD requirements;
- require demonstration that wastewater treatment capacity and receiving water assimilative capacity are sufficient to prevent deterioration arising from increased supply;
- require a regional water-in / water-out balance assessment;
- require climate-adjusted abstraction modelling;

- clarify whether Article 4(7) WFD derogation provisions are relied upon and, if so, how the required conditions are satisfied; and
- require clearer integration with catchment management objectives.

Yours faithfully,

Tony Lowes, Director

Friends of the Irish Environment,

Enclosures: €50 fee for third-party submissions.

Annex I

Friends of the Irish Environment CLG (FIE) is a non-governmental charity formed in 1997 by a group of environmental activists from across Ireland, with the company limited by guarantee established in 2001, towards the following goals:

- monitoring the full implementation of European law and assisting in its development,
- advocating for changes in the Irish planning laws,
- encouraging the implementation of the right to full public participation and access to justice,
- supporting individuals, local groups, and the wider public in understanding environmental issues, and
- seeking the proper implementation of environmental and planning laws to support sustainable communities, including pursuing concerns and cases in both the built and natural environments.

In recent years, FIE has taken legal action to hold the Irish Government accountable for meeting national and international commitments to reducing carbon emissions, including the "Climate Case Ireland" on the adequacy of the Government's Mitigation Plan. [2]

FIE conducts policy research, advocacy, and public awareness campaigns alongside litigation. As an independent and principled environmental advocate, FIE strives to be both challenging and cooperative, effective yet respectful. A commitment to fact-finding, truth-telling, integrity, and transparency drives FIE. FIE is a member of the Irish Environmental Network and the European Environmental Bureau. [3, 4]

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[2] https://www.ejiltalk.org/the-supreme-court-of-irelands-decision-in-friends-of-the-irish-environment-v-government-of-ireland-climate-case-ireland

[3] https://ien.ie

[4] https://eeb.org

Planning Application for the Water Supply Project Eastern and Midlands Region

Review of ecological issues

Version 25 February 2025 (FINAL)

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INTRODUCTION

This report presents a preliminary review of selected ecological issues arising from the Planning Application for the Water Supply Project – Eastern and Midlands Region.

The review focuses on the adequacy of the Natura Impact Statement (NIS) and Environmental Impact Assessment Report (EIAR) in assessing the implications of the proposed abstraction within a highly regulated hydrological system that is already subject to significant ecological pressures.

Particular attention is given to the interaction between the proposed abstraction and the existing ESB dam management regime, the adequacy of baseline surveys, compliance with Water Framework Directive (WFD) criteria, inter-basin transfer implications, invasive species control measures, and the requirement under Article 6(3) of the Habitats Directive to remove all reasonable scientific doubt as to the absence of adverse effects on site integrity.

This review does not seek to re-assess every aspect of the project. Rather, it identifies fundamental structural issues within the NIS and EIAR which, in my opinion, prevent the competent authority from lawfully concluding that the proposed project will not adversely affect the integrity of the affected European sites, either alone or in combination with existing pressures.



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Date 25 February 20206

KEY ISSUES

Background hydrological condition of the Old River Shannon within the Lower River Shannon SAC

The "Old River Shannon" refers to the stretch of the Lower River Shannon Special Area of Conservation (SAC) extending from Parteen Regulating Weir to the confluence with the tailrace from Ardnacrusha hydroelectric power station (HEPS). This stretch of river is over 15km long and forms part of the designated Natura 2000 site. Prior to the construction of the hydroelectric scheme all the water draining from Lough Derg flowed down this channel. Most of the water is now diverted to Ardnacrusha HEPS.

Despite the impacts of the hydroelectric scheme, this stretch of river remains one of the most important areas in the SAC and contains extensive high gradient stretches that are of international ecological importance.

Under the current operational regime, a statutory minimum compensation flow of 10 m^3/s (cumecs) is left in the stretch of the Lower River Shannon SAC downstream of Parteen Regulating Weir. The majority of the flow is abstracted from the Lower River Shannon SAC and diverted down the headrace canal to Ardnacrusha headrace. On average, 93% of the time only this minimum flow of 10 cumecs is left in this stretch of Natura 2000 river. This results in a highly regulated and unnatural hydrological regime, with prolonged low, uniform flows punctuated by sudden high-flow releases when the generating capacity of Ardnacrusha HEPS is exceeded.

Such a regime departs significantly from the natural hydrograph of a large river. Riverine ecological and geomorphological processes are shaped by seasonal variability, periodic freshets, and gradual transitions between flow conditions. In contrast, the prevailing regime in the Old River Shannon is characterised by extended periods of low, unvaried discharge followed by abrupt increases and decreases in flow. This altered pattern has materially affected channel processes, sediment transport, and riparian dynamics. Evidence of vegetation encroachment, sediment deposition, and channel adjustment reflects a system operating under reduced hydraulic energy. The ecological consequences include habitat simplification and reduced hydraulic diversity within a river reach that forms part of a European site designated for Annex I habitats and Annex II species.

The regulation of the river results in a situation where up to 97% of the flow is abstracted from the Lower River Shannon SAC. This abstraction is likely to have a greater impact on migratory fish populations than the physical presence of the dams. Upstream migrating fish including Atlantic salmon (*Salmo salar*), Sea Lamprey (*Petromyzon marinus*), River Lampreys (*Lampetra fluviatilis*), juvenile European eels (*Anguilla anguilla*), and Smelt (*Osmerous sperlanus*) follow the water into the tailrace and get trapped there. Similarly, downstream migrating fish including salmon smolts and silver eels follow the water out of the Lower River Shannon SAC into the headrace and travel downstream into the turbines.

The fish passes at these dams have been shown to ineffective, and the issue here is often presented as one that new modern fish passes would solve. However, no fish pass could ever work effectively in a situation where 97% of the flow in a river (up to 400 m^3/sec) is being abstracted. There are also no fish screens or bypass channels at Ardnacrusha HEPS and downstream migrating fish have to enter the turbines.

The statutory compensation flow of 10 cumces represents a minimum operational threshold established under the Shannon Fisheries Act (1935). It was not derived from ecological criteria and predates both the EU Habitats Directive and the Water Framework Directive. The legislation does not preclude the

release of greater volumes of water. Section 20 of the Shannon Fisheries Act (1935) states that "*The Board shall not, without the previous consent of the Minister, permit the rate of discharge of water through the weir at Parteen Villa to be less at any time than ten cubic metres per second*". There is nothing in this legislation that would prevent the ESB from leaving more water in the river than this minimum base flow. The minimum compensation flow is maintained for extended periods without any seasonal variation, except during major floods when spill events occur. The resulting hydrograph is neither natural nor environmentally derived. The river is managed at the very limit of what the ESB is statutorily permitted to do. However, this legislation is from 1935 and is clearly not compatible with current obligations under the EU Habitats and Water Framework Directive.

In addition to the impacts of the low and unvaried flow on the river as a result of the compensation flow, sudden increases in discharge during spill events, followed by rapid cessation of spilling, also have serious ecological implications. Rapid transitions from low to high flows and back again affects fish migration, spawning gravels, juvenile fish habitat, and the stability of riverine substrates. Best practice in regulated river systems typically seeks to taper flow increases and reductions where possible, in order to mimic natural hydrograph characteristics and minimise ecological shock. The current management regime at Parteen Regulating Weir does not exhibit such gradual changes.

The ecological consequences of this hydrological alteration are reflected in the status of the downstream WFD water body and in the documented decline of migratory fish populations in the River Shannon. Salmon passage data indicate that numbers of returning adult salmon at Ardnacrusha are substantially below conservation targets, with only a small fraction of required escapement currently achieved. While multiple factors influence salmon stocks at national scale, the hydrological and passage constraints associated with the Shannon hydroelectric scheme are widely recognised as significant additional pressures. Indeed, Inland Fisheries Ireland (IFI) has reported that the number of salmon passing though the ESB dams on the Lower River Shannon is currently less than 5% of the conservation limit (CL) escapement target. The CL is the number of salmon that have to run a river before the river is meeting favourable conservation status. On the River Shannon the CL is approximately 50,000 salmon per year, however the numbers of salmon passing the ESB's dams on the River Shannon is now in the hundreds - and most of these are hatchery salmon.

There have been declines in salmon stocks on all Irish rivers. However, the River Shannon is at the very bottom of the league of all the rivers in Ireland in meeting this minimum conservation limit escapement target.

In the IFI national fish counter report for 2024 (IFI, 2024), which is the most recent year for which counts are available, a total of only 124 salmon passed though the fish pass at Ardnacrusha HEPS. At Parteen Regulating Weir, a total of 966 salmon were recorded, but these were likely to mainly reared salmon returning to the hatchery. The scale of the decline of salmon stocks on the River Shannon is far worse that other rivers in Ireland this is primarily a result of the impact of the current water management and fish passage issues.

Despite the impacts of the hydroelectric scheme, the Old River Shannon remains one of the most ecologically valuable reaches of any river in Ireland. It has shown incredible resilience and can be readily restored by increasing and varying the flows to this >15km long channel. Despite decades of unsustainable water management, this is the most important part of the Lower River Shannon SAC and contains extensive high gradient stretches cascading through alluvial forest. The famous "Falls of Doonass" is located on this stretch and is still fully intact. This is a Natura 2000 river of international ecological importance.

The Old River Shannon contains the most important salmon and lamprey populations in the SAC. It provides optimal habitat for Otters (*Lutra lutra*) and the Annex I habitat 'Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation' is also present. The only thing missing from the 'Falls of Doonass' is water, and this part of the river is still a "biodiversity hotspot" despite the low compensation flow. When additional water is released though Parteen Regulating Weir these falls roar back to life and look similar to what they did a century ago. The river temporarily resumes a morphology and hydraulic character closer to its natural state, demonstrating the underlying ecological resilience of the channel. This indicates that ecological restoration through increased and seasonally varied discharge is feasible.

In 1923, Rev. J. Adams wrote the following about this stretch of river: "*It's a miniature Niagara from World's End to Landscape. Above the falls and below them, the Shannon is raging mad—racing, leaping, seething, foaming like a thing possessed.*" During major flood events, when the ESB have to spill water through Parteen Regulating Weir, the falls come to life again and could be described same as they were in 1923. This is not a heavily Modified Waterbody (HWMB) – it is a physically intact and resilient river that just requires more water to allow it to recover.

The proposed new water abstraction represents approximately 35% of the water that now usually passes over the 'Falls of Doonass'. This flow does not vary for over 90% of the time. The proposed new abstraction is not negligible in the context of the Old River Shannon channel and its requirements for restoration.

If the existing water management regime requires modification to comply with the Habitats Directive and the Water Framework Directive, whether through enhanced environmental flows, improved seasonal variability, or restoration measures, then the compatibility of the proposed abstraction must be assessed in relation to those anticipated changes. The Natura Impact Statement (NIS) and Environmental Impact Assessment Report (EIAR) assess the abstraction against the existing operational regime but do not evaluate its implications for a future environmentally optimised flow regime. This omission is material in circumstances where reform of the current hydrological management framework is reasonably foreseeable.

There is mounting evidence that the existing abstraction for the hydroelectric scheme is having integrity level impacts on the migratory fish qualifying interests of the Lower River Shannon SAC, and severe impacts on other migratory fish species including the critically endangered European eel, and the threatened Smelt. Cumulative and in combination impacts of this with the new additional proposed abstraction have not been treated correctly in the NIS and EIAR.

Water Framework Directive (WFD) reports identify the relevant river waterbodies immediately downstream of Parteen Regulating Weir as having ecological status below "Good" in recent assessment cycles. The Shannon (Lower)_050 is rated as 'Poor' and the Shannon (Lower)_060 is rated as 'Moderate', with hydromorphology listed among the key pressure categories.

While unsatisfactory status does not automatically prove legal non-compliance (because WFD allows time extensions and exemptions, and heavily modified water body designations can change the objective to 'good ecological potential'), this is strong evidence that (a) WFD objectives are not currently being met in these affected reaches, and (b) the flow regulation/diversion system is treated by the Irish competent authorities as a primary hydromorphological pressure requiring mitigation.

Parteen Regulating Weir and its reservoir are located within the Lower River Shannon Special Area of Conservation (SAC), which is designated for Annex I river habitats and Annex II species including

Atlantic salmon, sea/river/brook lamprey, and otter. The site-specific conservation objectives explicitly identify Parteen and Ardnacrusha as "considerable obstructions" on the Shannon main channel for salmon, with fish passes present but upstream migration described as "problematical".

The Irish authorities have already framed Parteen Regulating Weir and Ardnacrusha Hydroelectric Station as requiring a package of remedial measures, including fish passage improvements and an environmental flow ("Eflow") regime explicitly tied to WFD and Habitats objectives in official planning. In particular, the Water Action Plan 2024 (Ireland's third RBMP cycle documentation) describes an approved "roadmap" for fish passage improvements at the Shannon dams, including an Eflow study programme, feasibility studies for barriers and fish passage, and a "Lower Shannon Management Plan" to be agreed (subject to public consultation). None of these measures have been implemented to date.

Habitats Directive compliance hinges on (i) whether the existing operation is causing deterioration or significant disturbance of the SAC's qualifying interests (Habitats Directive Article 6(2)), and (ii) whether any operative consents/renewals or operational modifications have been screened/assessed appropriately (Article 6(3)). The evidence points to substantial compliance failure in relation to both the Habitats and Water Framework Directives.

It is not possible to reconcile the compensation flow provided to the Old River Shannon with EU ecological-flow principles and with the site's stated conservation needs around fish passage, habitat condition, and flow/hydromorphology. There has been no evidence-based justification and no mitigation framework is in place.

The Proposed Project has not been assessed in relation to future Environmental Flow changes for the Lower River Shannon SAC

The proposed abstraction is not being introduced into an ecologically neutral baseline. It is being added to a hydrological regime in which approximately 90–95% of the long-term average flow of the Lower River Shannon SAC at Parteen Regulating Weir is being abstracted from the SAC and diverted to Ardnacrusha HEPS, leaving a largely uniform statutory compensation flow of 10 cumecs in more than 15 km of the Lower River Shannon SAC channel, for on average 93% of the time.

The downstream Water Framework Directive (WFD) water body commencing below Parteen Weir (Shannon (Lower)_050) is identified as being of 'Poor' status and subject to anthropogenic pressures within a controlled flow regime. The existing regime reflects a historic statutory minimum established in 1935, not an environmental flow derived from contemporary ecological requirements under the Habitats Directive or the Water Framework Directive.

The Natura Impact Statement (NIS) and Environmental Impact Assessment Report (EIAR) assess the proposed abstraction relative to this managed regime, rather than demonstrating that the regime itself is ecologically adequate. In effect, the baseline against which the project is assessed is already hydrologically constrained and environmentally compromised.

The NIS and EIAR rely on hydrological modelling and screening tools, including the UKTAG lake level test, to conclude that the proposed abstraction will not materially alter lake levels or downstream flows under the current operating regime. The statutory 10 m^3/s compensation flow is treated as an operational boundary condition rather than as a flow regime validated against WFD ecological objectives.

There is no demonstration that the current compensation regime maintains hydromorphological processes consistent with Good Ecological Status or Good Ecological Potential, or that it maintains the favourable conservation status of qualifying interests in the >15 km SAC river channel between Parteen Regulating Weir and the confluence with the tailrace. The assessment demonstrates limited hydrometric change within a regulated system but does not establish the ecological adequacy of that system.

The NIS states that the Proposed Project would not impede a future "flow-sharing decision" or gate adjustments at Parteen Weir to allow more water to be provided to the Natura 2000 river channel downstream of Parteen Regulating Weir. However, no defined future environmental flow regime is set out against which this assertion can be tested.

The referenced *Roadmap for the Lower River Shannon* (CDM Smith, 2021) focused primarily on fish passage and migratory enhancement. It did not define the hydrological regime required to restore the full ecological function of the >15 km SAC designated river channel between Parteen Regulating Weir and the tailrace confluence. Improving fish passage is not equivalent to restoring environmental flows capable of achieving Habitats Directive or WFD objectives.

CDM Smith (2021) itself characterised the Shannon Scheme as being far from best practice and an outlier in Europe. This implies that substantive reform of the compensation flow and operational regime will be required. The scale and nature of such reform remain undefined.

The proposed abstraction is operationally integrated into the Shannon Scheme and depends upon the continued regulation of flows between hydropower and compensation discharge. Yet the ecological adequacy of the existing regime has not been demonstrated, the affected WFD water body is currently of Poor status, the hydrological regime is acknowledged to be highly controlled and artificial, and the future environmental flow requirements necessary to restore compliance are unknown.

In these circumstances, the principal concern is not whether the abstraction causes measurable short-term changes in lake levels or flows downstream of Parteen Regulating Weir under the current regime. The fundamental question is whether introducing a new large-scale abstraction into an already constrained system could constrain or complicate the implementation of future environmental flow reforms required under EU law.

Without defining the future hydrological regime necessary to achieve Habitats Directive and WFD objectives, the conclusion that the proposed scheme will not be an impediment is highly speculative. A lawful and precautionary assessment would require the abstraction to be tested against realistic restoration scenarios, rather than solely against the historic statutory framework set under the 1935 Act.

The project's compliance case is one of demonstrating negligible hydrological change within an already altered system. However, if that underlying system is not compliant with the Habitats Directive and the Water Framework Directive, then layering an additional abstraction onto it creates a cumulative impact issue. The assessment has not examined the abstraction and the Shannon Scheme as an integrated hydrological system requiring restoration. Instead, it treats the historic regime as fixed and environmentally validated. If the underlying flow management system must change in order to meet EU environmental obligations, then the compatibility of this new abstraction with that future system must be assessed. The NIS and EIAR for the proposed scheme have failed to do this.

Under the Habitats Directive and WFD framework, it is not acceptable to advance a new abstraction proposal that is dependent on, and embedded within, an existing regulated dam/weir operating regime, while not identifying and assessing (or bounding with sufficient certainty) the measures that are required

for the wider regime to comply. This is especially the case when those measures could be material to flow regime, hydromorphology, fish passage, and SAC conservation objectives. EU law requires prior certainty, including in relation to in-combination effects, and prohibits filling material gaps with future unknown measures or uncertain benefits.

The Proposed Project has not been assessed in relation to future water management changes for Lough Derg (Shannon) SPA

Lough Derg (Shannon) SPA is hydrologically managed by the same ESB operating regime that controls flows at Parteen Regulating Weir and Ardnacrusha HEPS. The NIS and EIAR describe how ESB manages lake levels within a defined Normal Operating Band (NOB), with seasonal tendencies toward higher levels in late spring/early summer and lower levels in autumn and winter for storage and flood management purposes. These operating rules are driven by hydropower, navigation, and flood management requirements rather than ecological thresholds linked to SPA conservation objectives.

The SPA's qualifying interests, including Common Tern (*Sterna hirundo*), Cormorant (*Phalacrocorax carbo*), Tufted Duck (*Aythya fuligula*), and Goldeneye (*Bucephala clangula*) and the Wetland and Waterbirds habitat, are all directly influenced by water level dynamics. In particular, Common Tern breeding success is sensitive to the timing, magnitude and rate of water level change during the nesting season. Nesting islands and shoreline bars are vulnerable to flooding if levels rise during egg incubation and to increased predation risk if levels fall excessively or unpredictably.

The NIS does not assess breeding-season water level stability, nest flooding risk, or the rate-of-rise characteristics of lake levels under abstraction scenarios. Instead, it relies on the premise that abstraction remains within the existing NOB and therefore will not materially affect the SPA.

However, the conservation objective for the SPA is to maintain or restore favourable conservation condition of the qualifying interests and their supporting wetland habitat. If restoration of species such as Common Tern or improvement of waterbird habitat condition requires adjustments to lake level management, such as narrower fluctuation limits during breeding months, modified seasonal storage strategies, or ecologically driven release rules, then the operating band itself may need to change in the future. The NIS states that the Proposed Project would not impede future flow-sharing decisions or Parteen Weir gate adjustments. However, yet again no defined future ecological operating scenario is presented against which this can be tested.

The proposed abstraction is operationally integrated into the Shannon Scheme and will form part of the overall water balance of Lough Derg. By introducing a permanent additional demand within the managed system, it may reduce the flexibility to change the operating band or to prioritise ecological water level management during critical periods. The assessment does not evaluate whether abstraction volumes, particularly during drought or low-storage conditions, could constrain the ability to implement future ecological optimisation of lake levels required under the Habitats Directive or to prevent deterioration under the Water Framework Directive.

Therefore, the key issue is not limited to short-term changes in mean lake level. The key question is whether the proposed abstraction could act as a barrier to future ecological restoration of Lough Derg (Shannon) SPA. In the absence of a defined environmental flow or ecological operating framework for the lake, and without modelling breeding-season water level sensitivity for SPA qualifying interests, the conclusion that the project will not prevent future restoration is yet again speculative. A precautionary and compliant assessment would require the abstraction to be evaluated against realistic ecological management scenarios, rather than solely against the historic hydropower-driven operating regime.

The NIS does not include an adequate description of Common Terns (*Sterna hirundo*) in Lough Derg (Shannon) SPA. This species is listed under Annex I of the EU Birds Directive and is a Qualifying Interest of this SPA. This SPA is with the Zone Of Influence (ZOI) of the proposed scheme according to the NIS.

A breeding survey of this SPA was conducted by NPWS in May 2024 and no Common Tern were recorded which indicates a complete population collapse in the SPA. This information is contained Conservation Objectives report for this SPA prepared by NPWS (2024).

The NPWS (2024) report is listed in the references in the NIS for the proposed scheme and is selectively quoted. However, the fact that a complete population collapse of this species has recently occurred in the SPA is omitted from the NIS.

Common Tern has historically bred in Lough Derg SPA since at least the 1980s when the first surveys were completed. The collapse of the population in this SPA runs contrary to the national population trend and is of major concern as this is a qualifying interest of the site.

Common Tern are ground nesting birds and, in this SPA, have bred almost entirely on Goat Island. This species is highly vulnerable to water level changes in regulated lakes, where artificial management of water can lead to the flooding of their nests and reduced breeding success.

On page 457 of the NIS, it is stated that "*management of one of the islands used for nesting (of Common terns) has increased the area of suitable habitat available and prevented nests being destroyed by fluctuating water levels*". However, the fact the Common Tern colony on the lake has recently collapsed is not stated in the NIS, and the cause of the collapse is not examined. Although the NPWS (2024) report is quoted, data on the numbers of breeding Common terns in the SPA is only provided up to 2015. The bird surveys completed at the proposed Raw Water Intake and Pumping Station (RWI & PS) location recorded small numbers of Common Tern.

Impacts on Common Tern are only discussed in the NIS in relation to potential indirect water quality impacts from the proposed pipeline. There is no examination of indirect or cumulative effects in relation to water level regulation.

Climate change and undefined future environmental flow requirements

The Abstraction Assessment (Appendix A9) incorporates climate change by applying percentage reductions to Q95 low flows under a +2°C scenario, adopting the Upper 75th percentile allowance as a reasonable worst case. The modelling tests abstraction impacts against the existing operational framework, including the statutory 10 m³/s compensation flow at Parteen Weir, and the current Normal Operating Band on Lough Derg.

However, the 10 m³/s compensation flow was established under the Shannon Fisheries Act (1935) as a statutory minimum safeguard and was not derived from ecological criteria. The modelling therefore assumes the continued suitability of a historic operational regime whose environmental adequacy has not been demonstrated under the Habitats Directive or the Water Framework Directive. The climate change analysis reduces inflows statistically but retains the structural premise that a 10 cumec compensation flow remains the relevant base condition.

This is a critical limitation in the climate change modelling undertaken. Climate change is projected to reduce summer low flows significantly, increasing ecological stress in the Lower River Shannon SAC and Lough Derg (Shannon) SPA. Under such conditions, compliance with EU environmental law may

require increased environmental baseflows, greater seasonal variability, and revised operating bands to offset climatic pressure. The modelling does not test scenarios in which the statutory minimum compensation flow is raised and varied, including during drought periods, nor does it test whether abstraction remains compatible if enhanced environmental flows are required. Similarly, it does not assess any possible changes to the NOD on Lough Derg.

The modelling does not explicitly define drought from an ecological perspective. The only environmental flow reform tested is an outline environmental flows regime derived from CDM Smith (2021). The climate modelling demonstrates that the abstraction remains compatible with the historical 1935 compensation regime under projected Q95 reductions. However, it does not demonstrate compatibility with the environmentally compliant regime that may be required under future climate conditions. If restoration of the Lower River Shannon SAC and Lough Derg (Shannon) SPA necessitate increased baseflows, enhanced seasonal variability, or revised operating bands in response to climate stress, the abstraction will operate within a materially different hydrological framework than that assessed.

In these circumstances, the conclusion that the proposed abstraction will have a "Negligible" and "Not Significant" impact on the affected waterbodies and even under climate change scenarios will not impede future environmental reform rests on assumptions rather than on a defined, climate-adapted restoration scenario. Under Article 6(3), this does not remove reasonable scientific doubt.

Proposal Is premature pending completion of Lower River Shannon study

The Proposed Project is premature given that the State has recently tendered for further work explicitly aimed at addressing foundational gaps in the understanding of the Lower River Shannon hydrology and ecology. A contract notice recently published on eTenders (Reference: 7328234) seeks consultancy support to develop environmental flow recommendations and hydrological modelling for the Shannon Scheme that will specifically inform restoration of ecological function and compliance with EU environmental law.

This confirms that key technical work required to define the environmental flow regime necessary to achieve Water Framework Directive objectives and favourable conservation status for the Lower River Shannon SAC is still outstanding. Proceeding with consent for a major abstraction, embedded within and dependent upon the regulated ESB dam management regime, while this work remains incomplete, entrenches a regime that has not been scientifically assessed for ecological compliance.

The absence of a defined and assessed environmental flow framework undermines the scientific basis of the NIS and EIAR and means that the authorities are being asked to approve a large-scale hydrological intervention before essential ecological and hydrological evidence is in place. This is contrary to the precautionary principle of Article 6(3) of the Habitats Directive and to the requirements of the Water Framework Directive.

Failure to demonstrate compliance with UKTAG Criteria

The Abstraction Assessment (Appendix A9) relies on UKTAG standards in assessing hydrological compliance. It reports a Q95 net inflow to the Lough Derg/Parteen system of 25.6 m^3/s and confirms that the proposed peak abstraction is 3.47 m^3/s (300 Mld). Based on these figures, the abstraction represents approximately 13.6% of Q95.

UKTAG environmental standards for rivers reference an Environmental Quality Standard (EQS) limit of 10% of flow at Qn95 for most river types, with even stricter thresholds applying to sensitive watercourses with salmonid spawning and nursery areas.

While UKTAG river standards are normally applied to naturalised flows and are sensitivity-class dependent, the abstraction proposed here exceeds the 10% benchmark when compared to the Q95 figure presented in Appendix A9. This is evidence that the proposed abstraction level is too high and would not allow compliance with WFD river flow standards.

Importantly, the Q95 value used in the modelling is derived from a regulated and managed hydrological system (1972–2023 record) rather than from a naturalised baseline. UKTAG river abstraction criteria are generally intended to be applied to naturalised or near-natural flow regimes. The assessment does not present a naturalised Q95 for the affected river reach, nor does it demonstrate compliance against UKTAG river standards for sensitive watercourses.

In a regulated system, it is entirely possible that the natural Q95 would be lower than the regulated net inflow figure cited, particularly during drought conditions, meaning that the true percentage abstraction relative to natural low flows could be higher.

The assessment instead relies primarily on a UKTAG lake level test applied to Lough Derg and Parteen Basin. This is not equivalent to demonstrating compliance with UKTAG river flow criteria for the Lower River Shannon SAC.

No structured assessment is presented demonstrating that the abstraction meets UKTAG river flow condition limits when applied to the relevant water body type under naturalised low-flow conditions.

The proposed abstraction exceeds the UKTAG low-flow percentage benchmarks when measured against the Q95 value presented in the applicant's own modelling. In the absence of a naturalised Q95 calculation, sensitivity classification and river-based UKTAG assessment, compliance with UKTAG river standards has not been demonstrated. If the applicant chooses to rely on UKTAG criteria, it is incumbent upon them to demonstrate that the abstraction meets those criteria for the affected river water bodies. Based on the figures presented, that has not been shown.

Inadequate baseline surveys of Qualifying Interests

The Zone of Influence (ZOI) of the proposed project is defined in the NIS and EIAR as extending from Meelick Weir to the confluence with the Ardnacrusha tailrace confluence upstream of Limerick City. It could be argued that the ZOI extends further than this. However, the ecology field surveys completed were confined to only the footprint of proposed Raw Water Intake and Pumping Station (RWI & PS) and a small buffer area around the footprint of this proposed infrastructure. Therefore, after defining the spatial area that was that within the likely ZOI, the baseline ecology surveys completed did not spatially cover this area. The baseline surveys actually only extend to a 75m radius around the RWI & PS, and to only 50m for the aquatic ecology surveys.

No fish surveys following a standard methodology were completed at the proposed abstraction point. Instead, a previous historical survey completed by Inland Fisheries Ireland (IFI) in 2016 is relied upon. This survey is out-of-date and was undertaken for a different purpose than assessing the impacts of the proposed development. It was also a limited survey that was undertaken over only two nights in July 2016 and did not include electrofishing (that would be required to detect juvenile lampreys). IFI are not part of the project team and their historical report is presented in the NIS and EIAR as if they were.

The surveys completed did not include standard species-specific methodologies for Atlantic salmon (*Salmo salar*) and lamprey species. Atlantic salmon, Brook lamprey (*Lampetra planeri*), River lamprey (*L. fluviatilis*), and Sea lamprey (*Petromyzon marinus*) are all qualifying interests of the Lower River Shannon SAC. However, no baseline surveys of these species following a standard approved methodology were conducted within the ZOI.

The surveys completed were limited to the proposed RWI & PS site only. No netting or electrofishing surveys were completed. The surveys completed were limited to visual surveys and the use of dip nets. It is claimed in the NIS that core sampling was used to check for lamprey ammocoetes. However, this is not a standard and approved survey method for lampreys and its use is not even mentioned in the English Nature lamprey monitoring manual (Harvey & Cowx, 2003) which sets out the standard methods that should be used for surveying lampreys in Natura 2000 rivers. This manual has been adopted for use in Ireland by IFI and the National Parks and Wildlife Service (NPWS).

The number of cores, spatial coverage, sediment volume sampled and replication are not provided. No quantitative density estimates were undertaken, despite conservation objectives including targets for juvenile lamprey density in fine sediments. In the absence of defined survey effort using a standardised methodology, the conclusion that ammocoetes are absent or unaffected is not supported by robust field evidence. Also, no surveys were conducted for other life cycle stages of lampreys, in particular macrophthalmia (the migratory juvenile stage of lampreys).

The NIS and EIAR refer to the fact that lampreys were also not recorded in the 2016 historical survey completed by IFI. However, IFI also did not use any survey methods appropriate to lampreys.

No surveys for Atlantic salmon or any other fish species were completed following an approved methodology. The NIS and EIAR states that salmon were surveyed by visual survey, dip netting, scuba surveys and a multi-method stock survey of Parteen Basin. However, none of these surveys are formal standardised salmon monitoring methods. Again, the use these methods (netting, scuba, dip netting) are not appropriate for salmon and their use is not even mentioned in the English Nature salmon monitoring manual (Cowx & Fraser, 2003), which sets out the standard methods that should be used for surveying salmon in Natura 2000 rivers. Again the "multi-method stock survey" referred to is an out-of-date survey completed by IFI and IFI are not on the project team. The historical IFI survey was limited in scope and was not designed to assess the impact of the proposed water abstraction. Therefore, no fish survey of Parteen reservoir using a standard method was completed to inform the NIS and EIAR.

It is notable that upstream counters are approved as methodology for surveying adult salmon in Cowx & Fraser (2003). There are two fish counters located in the study area, one at Ardnacrusha Hydroelectric Station and one at Parteen Regulating Weir. The data from these counters is readily available yet was not accessed and reviewed as part of the assessment for the proposed scheme.

It is stated in the NIS that the nearest suitable spawning habitat to Parteen Basin for salmon and lamprey is approximately 5km upstream of Killaloe in the Annacarriga River. However, this is not the case and both salmon and lampreys have been recorded in the past from the River Ardclooney (EPA Code 25_2596) and River Ballyteige (EPA Code 25_2794) which both join Parteen reservoir within 2.5km of the proposed intake. The Grange River (EPA Code 25_2360) also has salmonid and lamprey habitats and flows into Lower River Shannon SAC at the upstream end of Parteen reservoir. The statement that there is "*no immediate source of lamprey ammocoetes at the proposed RWI&PS site*" is therefore factually incorrect. These watercourses are not even mentioned in the NIS and EIAR. It is noteworthy that the EIAR scoping letter from Clare County Council requested that the potential impacts on both the River Ardclooney and River Ballyteige be assessed, yet this was never done.

The European eel (*Anguilla anguilla*) is not separately assessed in a structured manner, despite its critically endangered status and conservation concern. No electrofishing, fyke netting or targeted surveys for juvenile or silver eel migration were undertaken, even at the proposed intake. The ESB operate an eel trap and transport programme within the study area and data on juvenile eels (elvers) trapped at Parteen Regulating Weir and Ardnacrusha Hydroelectric Station, and silver eels (migrating adults) is again readily available. However, this information was not accessed and reviewed as part of the assessment for the proposed scheme. Moreover, the ESB release juvenile eels trapped below Parteen Regulating Weir into Parteen reservoir. However, again this information was not accessed and considered in the assessment. Juvenile eels trapped and released near a major water intake would be highly vulnerable to entrapment and no consideration of this and the release points used by ESB is included in the assessment. Given the known decline in European eel populations, this omission is notable.

IFI recommended that further surveys be completed in their consultation letter. These surveys were not done. IFI asked for consideration of the rare endangered Irish Red Data Book species Smelt (*Osmerous eperlanus*) and Pollan (*Coregonus autumnalis*). Both species occur within the defined ZOI yet no species-specific surveys for them were completed. The presence of Pollan is dismissed based on anecdotal evidence, and Smelt is not even mentioned in the NIS and EIAR.

Overall, apart from limited surveys at the intake footprint and reliance on an older limited IFI survey, there is no comprehensive characterisation of the qualifying interests in the ZOI. The surveys completed at the proposed intake location were very limited, did not follow standard methods, and focused on immediate habitat conditions rather than functional ecology. No description of baseline population status, migration behaviour, and life-stage sensitivities within the Zol have been provided in the NIS and EIAR. For a project of national scale, embedded in a regulated river system where Annex II migratory fish are qualifying interests, the surveys completed are considered to be completely inadequate.

Inadequate assessment of impacts on QIs

The proposed abstraction is assessed as a small percentage change within a neutral baseline. In reality, it becomes a structural component of a heavily regulated river system that already constrains qualifying interests. The ecological consequences of that combined system have not been fully assessed.

In a heavily regulated system where migratory fish stocks are already constrained, the individuals that do migrate successfully are disproportionately important for maintaining population viability and genetic continuity. When numbers are low, marginal additional mortality or delay can have a higher proportional effect.

The NIS does not examine how fish species like salmon and lampreys actually migrate past the proposed intake location. There is no description of migration behaviour though the Parteen Basin, no analysis of flow attraction dynamics relative to the intake, and no modelling of behavioural interaction with intake hydraulics beyond general screen velocity statements. The assessment focuses on engineering compliance at the intake footprint, but it does not evaluate how upstream or downstream-migrating fish use the wider zone of influence. In particular, there is no meaningful baseline description of migration timing windows, flow cues, or routing patterns at this location.

The risk of fish impingement and entrainment is one of the most direct and potentially significant ecological impact pathways associated with large-scale surface water abstraction schemes. This is especially true where abstraction occurs within, or immediately adjacent to, a European site designated for migratory fish species. The proposed intake is located within the Lower River Shannon SAC,

downstream of a major hydrological control structure, in a reach that functions as a migration corridor for Annex II species including Atlantic salmon, sea lamprey, river lamprey and European eel. Any intake at such a location has the potential to intercept migrating adults, downstream migrating salmon smolts, juvenile lampreys (including macrophthalmia) and eel life stages. Even low levels of additional mortality may be ecologically significant in a system where stocks are already severely reduced and restoration of favourable conservation condition is an objective.

The Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs (DAHG) recognised this risk and recommended that an "Impingement Mortality and Entrainment Characterisation Study" be undertaken, and that sufficient survey data be provided to predict population-level effects. This is a clear and specific request in a formal consultation letter. A characterisation study of this type would normally involve identification of all species and life stages potentially present at the intake location, seasonal surveys to determine timing and abundance, hydraulic assessment of approach and sweeping velocities relative to species-specific swimming performance, modelling of entrainment and impingement rates under different operating scenarios, and an assessment of mortality at individual and population scale. It would also typically set out a monitoring and adaptive management framework to verify performance post-construction.

The NIS does not provide such a study. The material presented consists of a conceptual description of passive wedge-wire cylinder screens, a proposed maximum through-slot velocity of 0.15 m/s, reference to a bubble curtain, and generic swimming speed data derived from broad species groups. The assessment refers repeatedly to "fish and eels" when of course eels are true fish, and lampreys are not eels, and indeed taxonomically are not really fish. There is no clear specification of slot width, no detailed assessment of which species or life stages are likely to be present at the intake during different seasons, no quantification of fish density or migration intensity at this location, no modelling of predicted entrainment rates, and no population-level impact analysis. The document does not distinguish between strong swimmers (e.g. adult salmon) and weaker life stages (e.g. smolts, eel elvers, juvenile lamprey), nor does it assess temperature-dependent performance or endurance capacity. It does not evaluate how screen performance would vary under low lake levels, partial blockage, or different pump duty scenarios. Nor does it provide a monitoring protocol to validate the effectiveness of the intake design once operational.

For a scheme of this magnitude, within a SAC where migratory fish are qualifying interests and where salmon stocks are documented to be well below conservation limits, the absence of the requested characterisation study is a serious material omission. The conclusion that entrainment and impingement will not adversely affect site integrity is not supported by quantified evidence or population modelling, but by generalised engineering assumptions. In circumstances where the competent authority specifically advised that such a study was necessary to predict population effects, the failure to provide it undermines the ability of the Appropriate Assessment to demonstrate, beyond reasonable scientific doubt, that the proposed abstraction will not adversely affect the integrity of the Lower River Shannon SAC.

Environmental Implications of Veligers and the Practical Feasibility of INNS Control

Zebra mussels (*Dreissena polymorpha*) and Quagga mussels (*Dreissena bugensis*) are well established at the proposed intake location. Zebra and Quagga mussels reproduce by releasing microscopic planktonic larvae (veligers) into the water column. Once drawn into an abstraction system, these veligers can settle and develop within pipes, pumps, valves and other infrastructure. Over time, this biofouling can significantly reduce hydraulic capacity, impair pump efficiency, damage mechanical

components and lead to operational shutdowns for cleaning and maintenance. In large-scale abstraction schemes, uncontrolled colonisation can result in substantial operational risk, increased energy consumption and high maintenance costs. For this reason, scheme operators have a strong operational incentive to prevent veligers from entering abstraction pipes.

These veligers are extremely small - typically in the 70-200 micron range - and are present in very high densities during peak reproductive periods in eutrophic systems. In productive lakes like Parteen Reservoir, veliger concentrations can rise rapidly and remain elevated for extended periods during the summer months. Their small size and abundance mean they behave more like suspended particulate matter than like discrete organisms; they are not readily visible and are easily transported through hydraulic systems.

For an abstraction of approximately 3.5 m^3/s (300 Mld), even moderate veliger densities translate into the continuous intake of very large absolute numbers of larvae. The risk to the project is clear and veliger control is operationally necessary. The NIS recognises this by proposing microscreen filtration, washwater capture and UV treatment, together with potential chemical dosing contingencies.

However, the ecological assessment of this control system is limited. While the design intent is to create a closed-loop process with no discharge to the SAC, the practical feasibility of achieving sustained, near-total veliger exclusion at this scale in a eutrophic lake environment is not robustly demonstrated. The backwashing process alone may generate washwater volumes of up to approximately 3,000 m^3/day at peak abstraction rates. This washwater is, by definition, enriched with veligers and suspended material.

The practical challenge is not merely whether veligers can theoretically be filtered at a given slot width or approach velocity. The challenge is maintaining reliable performance during peak bloom conditions, when suspended solids and algal loads increase fouling, reduce UV effectiveness, and increase cleaning frequency. Under such conditions, flush volumes may increase, operational stress on containment systems may rise, and the likelihood of upset conditions (overflow, bypass, partial treatment, or emergency discharge) becomes greater. These likely operational scenarios are not assessed in the NIS.

Moreover, the NIS provides for the contingency use of invasive species control chemicals within the raw water system. While described as being contained within the rising main and not discharged to the lake, the environmental implications of accidental release, maintenance-related discharge, or system failure are not evaluated.

Failure to assess the environmental implications of inter-basin water transfer

The proposed scheme is categorised under Annex I of the EIA Directive because it constitutes a water transfer project between river basins exceeding 100 million cubic metres per annum. The inter-basin transfer is therefore not a peripheral characteristic of the project - it is one of the reasons that triggered the mandatory requirement for an EIAR.

Annex I classification reflects the inherent environmental sensitivity of large-scale redistribution of water resources across catchment boundaries, including hydrological, ecological and water quality consequences in both the donor and receiving basins.

While an EIAR has been prepared, it does not assess the environmental implications arising from the inter-basin transfer itself. The assessment is focused on abstraction impacts within the Shannon

system. However, once abstracted, the transferred water will be treated, used and discharged into different river catchments.

The Environmental Protection Agency (EPA) specifically advised during the EIAR scoping that Uisce Éireann "*will need to consider the impact of providing this water to the ecological status of the water bodies to which this water will subsequently be discharged after use*". This advice reflects the requirements of Article 3 of the EIA Directive, which mandates assessment of all likely significant direct and indirect effects of the project, including those occurring outside the immediate abstraction location.

It is stated in Chapter 9 (Water) of the EIAR that "*there would be no impacts on the ecological status of the Dublin and Liffey basin as a result of the Proposed Project. This is set out in in Appendix A9.1 (Abstraction Assessment)*". However, this is not actually set out in this Appendix, and it is also not covered anywhere else in the NIS or EIAR.

The redistribution of water between basins necessarily alters flow volumes, wastewater discharge quantities, pollutant loading patterns and dilution dynamics in the receiving catchment. Increased potable supply results in increased wastewater flows. Even where effluent standards are met, higher discharge volumes can influence nutrient budgets, thermal regimes, ecological status boundaries and cumulative pressures under the Water Framework Directive.

The EIAR does not provide any consideration of these effects, nor does it demonstrate that no deterioration will occur in receiving water bodies. In circumstances where inter-basin transfer was the legal trigger for mandatory EIA, the absence of an assessment of the environmental consequences in the receiving basin represents a serious material omission.

This omission is particularly significant in light of the Habitats Directive. Atlantic salmon, a qualifying interest of the Lower River Shannon SAC, rely on successful homing migration through estuarine and coastal waters. While salmon exhibit high natal homing fidelity, straying between catchments is a recognised biological phenomenon. Migratory behaviour is influenced by freshwater discharge patterns, plume dynamics and olfactory cues at river mouths. Inter-basin transfers that alter discharge volumes or chemical signatures in estuarine systems may influence migration routing behaviour. Even low straying rates can be ecologically relevant in systems where salmon stocks are already significantly below conservation targets.

Under Article 6(3) of the Habitats Directive, the competent authority must be satisfied, beyond reasonable scientific doubt, that the project will not adversely affect the integrity of any European site. The AA screening and NIS do not assess the potential indirect pathway whereby altered discharge patterns in receiving catchments could potentially affect salmon migration behaviour or distribution. The absence of such analysis is notable given that migration success and distribution are core components of the conservation objectives for Annex II salmon. It is noted again the proposed abstraction represents approximately 35% of the water that is released from Parteen Regulating Weir for a typical 93% of the year. The implications for salmon of this water "signal" coming from a different catchment was not even considered.

The inter-basin transfer implications give rise to both EIA and Habitats Directive concerns. The EIAR does not assess one of the key reasons that required Annex I treatment, namely the environmental consequences of transferring water between river basins. The Appropriate Assessment did not even consider the potential indirect effects on salmon migration. In these circumstances, the environmental assessment is incomplete in relation to a defining feature of the project, as the likely significant effects of the inter-basin transfer of water have been identified or assessed.

Parallels with Case C-164/17 Grace and Sweetman v An Bord Pleanála

In Case C-164/17 *Grace and Sweetman v An Bord Pleanála*, the Court of Justice made clear that a project cannot rely on assumed or undefined future management measures to exclude adverse effects under Article 6(3).

In Grace and Sweetman v An Bord Pleanála, the court considered a wind farm proposed within a commercial forestry area managed the semi-state commercial entity Coillte. The developer argued that much of the ecological damage to the SPA had already arisen from forestry operations and that ongoing forestry restructuring and habitat management would improve conditions. However, the court rejected this approach and the attempts to offset the impact of the proposed wind farm against assumed or future land management.

The Court of Justice confirmed that a project cannot rely on assumed or external management measures to exclude adverse effects unless those measures are fully defined, secured and assessed as part of the consent. The central principle was that the integrity test under Article 6(3) must assess the project as it will actually operate and cannot rely on external or future management measures unless those measures are fully defined, secured and assessed as part of the consent.

There are clear similarities with the current abstraction proposal. The Lower River Shannon exists within a long-standing regulated hydrological regime operated by ESB, also a semi-state commercial entity. That regime has shaped the current ecological condition of the river. The proposed abstraction cannot function independently of ESB dam operations. It requires ESB to divert water from hydropower generation and to adjust storage and operational decisions to accommodate a permanent additional demand of up to approximately 3.5 cumecs. The proposed abstraction is embedded within the ESB dam management regime and cannot function independently of it.

While the NIS concludes that the project will not impede future flow-sharing decisions, the hydrological regime necessary to achieve compliance with the Habitats Directive and the Water Framework Directive has not been defined or assessed. The existing 10 m^3/s compensation flow was established in 1935 and is not an environmentally derived standard. If restoration of the Lower River Shannon SAC and protection of Lough Derg (Shannon) SPA require revised environmental flows, seasonal variability or changes to operating bands, the abstraction will operate within a materially different regime than that assessed.

The integrity conclusion therefore rests on the assumption that future hydrological reform can occur without conflict with the abstraction, yet the nature of that reform is currently unknown.

Under the principles set out in C-164/17, reliance on undefined future management flexibility cannot remove reasonable scientific doubt. The project has not been assessed against the environmentally compliant regime that may be required over its lifetime. The proposed abstraction alters how the dams must be managed, and the future hydrological regime necessary to achieve compliance with the Habitats Directive and the Water Framework Directive has not been defined, quantified or assessed.

In Grace and Sweetman v An Bord Pleanála, the forestry restructuring measures were presented in part as ecological improvements that would offset the wind farm's impacts. In the present case, the claim is that hydrological change will be negligible because operations remain within the existing Normal Operating Band and statutory minimum flow of 10 cumecs. The project is framed as operating within the historic regime rather than improving it. However, this difference does not remove the core similarities.

The proposed abstraction cannot be separated from ESB dam management because it requires that management to change, both immediately to accommodate the abstraction and prospectively to achieve compliance with EU environmental law. The modified regime, as it will actually function over the lifetime of the scheme, has not been assessed, and the NIS has not evaluated the real system that will operate in practice. Under the principles set out in C-164/17, that is not sufficient to remove reasonable scientific doubt as to the absence of adverse effects on site integrity.

Under Article 6(3) of the Habitats Directive, a project may only be authorised where the competent authority is certain that it will not adversely affect the integrity of a European site. The Court of Justice has held that this requires the removal of all reasonable scientific doubt, applying a precautionary standard to protect the conservation objectives of the site.

SUMMARY AND CONCLUSIONS

This report has reviewed the Proposed Water Supply Project – Eastern and Midlands Region in the context of the Lower River Shannon SAC, Lough Derg (Shannon) SPA, associated downstream and hydrologically connected European sites, and the requirements of the Habitats Directive and the Water Framework Directive. The review has identified a series of structural deficiencies in both the Natura Impact Statement (NIS) and Environmental Impact Assessment Report (EIAR), which, taken together, prevent the competent authority from lawfully concluding that the project will not adversely affect site integrity.

The abstraction is being layered onto an already highly regulated hydrological regime in which up to 97% of the flow in the Lower River Shannon SAC is being diverted away from over 15 km of Natura 2000 river channel, leaving a constant and unvaried minimum compensation flow of 10 m^3/s in this stretch for prolonged periods. This minimum flow was established in 1935 and was not derived from ecological criteria. The ecological adequacy of this regime has not been demonstrated under the Habitats Directive or the Water Framework Directive. The NIS assesses the abstraction relative to this historic framework rather than against the environmentally compliant regime that may be required to restore favourable conservation condition and achieve WFD objectives.

The modelling undertaken for the application incorporates climate-adjusted Q95 reductions but retains the 1935 compensation flow and existing the NOB as the structural baseline. The future environmental flow regime necessary to restore the Lower River Shannon SAC and protect Lough Derg (Shannon) SPA has not been defined or assessed. If restoration requires increased baseflows, enhanced seasonal variability, or revised operating bands, the abstraction will operate within a materially different regime than that assessed.

The NIS states the conservation objectives for the Lower River Shannon SAC, Lough Derg SPA and other affected European sites, but does not undertake a structured, attribute-level assessment of how the abstraction interacts with those objectives.

This is a major water abstraction located with the Lower River Shannon SAC, and the proposed pipeline crosses 639 watercourses, yet the aquatic surveys completed are very limited. No fish surveys using standard recognised methodology (e.g. electrofishing) were completed at the proposed abstraction and pipeline crossings. The DAHG specifically recommended that a fish impingement and entrainment characterisation study be undertaken and that sufficient survey data be provided to predict population-level effects. However, no such study has been presented. The intake design is described conceptually, but there is no quantified entrainment modelling, no population-level impact assessment for Annex II fish species, and no validated performance framework to demonstrate effectiveness. Given the location of the abstraction within a migration corridor of depleted salmon and lamprey stocks, the absence of a formal intake entrapment study is a significant omission.

The project is a mandatory Annex I inter-basin water transfer scheme exceeding 100 million m^3 per annum. The inter-basin transfer was the legal trigger for the EIAR. However, the EIAR does not substantively assess the environmental implications of transferring water to receiving catchments, treating and using it, and discharging increased wastewater volumes into different river systems. The EPA explicitly required that the ecological status implications in receiving water bodies be assessed. That assessment has not been provided.

The abstraction represents 13.6% of the Q95 flow at the abstraction point based on the applicant's own modelling. UKTAG environmental standards for rivers reference an EQS limit of 10% of flow at Qn95,

with even stricter thresholds applying to sensitive watercourses. While UKTAG river standards are normally applied to naturalised flows and are sensitivity-class dependent, the abstraction proposed here exceeds the 10% benchmark when compared to the regulated Q95 figure. This is evidence that the proposed abstraction level is too high and would not allow compliance with WFD river flow standards.

The proposed abstraction represents approximately 35% of the water that now usually passes over the 'Falls of Doonass' downstream of Parteen Regulating Weir. The proposed new abstraction is not negligible in the context of the Old River Shannon channel and its requirements for restoration.

Under C-164/17 Grace and Sweetman, a project cannot rely on assumed or undefined future management measures to exclude adverse effects. The abstraction is embedded within ESB dam management and is assessed against a historic regime whose ecological adequacy has not been demonstrated. The environmentally compliant hydrological regime that may be required in future has not been defined. The integrity conclusion therefore rests on assumptions rather than on complete, precise and definitive findings capable of removing reasonable scientific doubt.

The recent State procurement of consultancy services to develop environmental flow recommendations for the Lower River Shannon highlights that the fundamental hydrological and ecological work remains incomplete. Approving a major inter-basin abstraction before that work is concluded risks entrenching an operational regime that has not been demonstrated to comply with EU environmental law.

Under Article 6(3) of the Habitats Directive, a project may only be authorised where there is no reasonable scientific doubt as to the absence of adverse effects on site integrity. In circumstances where the environmentally compliant hydrological regime has not yet been defined, and where material uncertainties remain regarding ecological and cumulative impacts, that standard cannot be satisfied. The project is therefore premature and should not be consented in its current form.

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FPLOGUE SOLICITORS

Our Reference: EJB/FIE
Your Reference: 323980

25 February 2026

By email

An Coimisiún Pleanála

Our client: **Friends of the Irish Environment CLG**

Address of client: **Kilcatherine, Eyeries, Co Cork, Ireland. P75 CX53**

RE: **Submission on water supply for the Eastern and Midlands Region,**

A Chara,

We refer to the above planning application made under the provisions of section 37E of the Planning and Development Act 2000.

We make this addendum submission further to the report of Dr William O' Connor enclosed herewith.

Introductory Remarks

The proposed development is one of the most significant infrastructure developments to be proposed within the State in recent decades. It is in that context that it is surprising that this project is being brought forward in its current form considering that it involves abstracting water from the River Shannon at Parteen, where the downstream WFD waterbody is at Poor Status.

This we submit has certain legal consequences which should have been apparent to Uisce Éireann, and which should have been addressed prior to bringing forward this application which is employing huge public resources both in terms of Uisce Éireann and An Coimisiún Pleanála.

It is our respectful submission that the application is fatally flawed in legal terms, and is therefore premature.

Expertise of An Coimisiún Pleanála

As stated above, this is one of the largest infrastructure projects to come into the planning process in recent decades. The material placed before the Commission is enormous by any standards, and much if not most of it is highly technical.

It is difficult for members of the public to thoroughly engage with the volume of material submitted. Our client has engaged the services of Dr. O' Connor whose expertise in relation to the River

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Shannon is widely recognized. His report details the significant ecological issues with the Project, owing in particular to the degraded condition of the waterbodies from the Ardnacrusha Hydroelectric Power Station ("HEPS").

In that context, it is critically important that An Coimisiún Pleanála employ adequate expertise to assess the EIAR (and the NIS) for this application. The Commission is very unlikely to have the range of expertise inhouse in order to properly evaluate this application.

We refer the Commission in that regard to the judgment of Humphreys J. in *Reid v An Bord Pleanala* [2021] IEHC 362, where he stated at para 48:

> *"The "sufficient expertise" on the part of the board thus has those dimensions: firstly, an expertise to be able to fully understand and properly evaluate the developer's fact-specific material and the science underlying it; and secondly, to do so in the context of expert knowledge of prevailing general standards and scientific information. The board here argued, incorrectly in my view, for a considerably lower standard of expertise. The board specifically disagreed with the proposition that it should know what the appropriate emission standard for ammonia is, and unfortunately contended that it was entitled to rely on the apparent fact that the developer's material was prepared by experts, that a range of bodies had been given the opportunity to comment on such material, and that the county council had already assessed the material. But the council's view is irrelevant because what is before the board is an appeal. The notion of relying on other people's judgements more generally is flawed and, if it were to be applied, would be an abdication of the board's independent statutory role. Indeed it is a circular argument - how can the board know that the developer's advisers are in fact competent experts that can be relied on if the board doesn't itself have, or have access to, equal competence and expert knowledge. The logic that "other people have looked at this, therefore it must be OK" is the sort of thing that leads to systems failures. It is the stuff of Challenger, Columbia, Grenfell Tower, pre-crash financial regulation. I don't accept that the board would be complying with its critically important independent evaluative obligations if it took that approach, although I emphasise that I say that in the context of endeavouring to clarify the board's obligations. I'm not finding that the board did take that approach here. Likewise, the board's argument that it "doesn't have infinite resources" is facile and hollow. Developers don't have infinite resources either, yet they manage to assemble teams of experts to deal with all technical issues. The board must have a corresponding level of expertise on each of the areas so dealt with. But I emphasise that just because the board argued for an unacceptably low standard doesn't mean it isn't in a position to comply with a higher standard. Decision-makers sometimes like a safety net in legal terms, but I'm afraid here it isn't available. Sufficient expertise means fully understanding the developer's material in all its aspects. Green-lighting something you don't fully understand wouldn't be an acceptable procedure, if it were to happen. With those preliminary points in mind, I now turn to the specific grounds of challenge.*

The Court went on at para 72 et seq.:

> *72. The board's most legally pertinent defence to the complaint that it had not adequately assessed the ammonia emissions was, as it was put, that there was nothing on the face of all of the material before the board showing reasonable scientific doubt.*
>
> *73. I would accept that as a statement of the relevant yardstick of the decision-maker's autonomous obligation, but with one important clarification – the board can accept the developer's material for AA purposes if there is nothing on the face of the material, as it appears to a reasonable person with sufficient expertise, that would create scientific doubt. Not as it appears to a planning generalist without detailed expertise in the particular*

sub-specialty to which any given document relates. A document can only be accepted if it is fully understood – what's the point in nodding through something you don't fully understand? That process lacks integrity and couldn't be proper scrutiny on any analysis.

74. One factor pointed to the applicant as creating doubt was that the scale adopted in the developer's diagrams began at 1.2 µg NH3/m3 and did not factor in a 0.3 µg NH3/m3 ambient background. An additional factor was reference to bryophytes at another location to the north of the site, separate from the sensitive location of Louisa Bridge to the west of the site.

75. Are these matters that the "reasonable expert" would have said created doubt so as to require the board to examine the NIS more critically without being asked to do so? That is a conclusion that has to be established evidentially. Any scientist could disagree with any other scientist about something – that's science. Hence when Ms Cullen complains about the developer's science, that is to be expected. Had the applicant put forward all, or any, of that at the time, it would have created doubt. But while her affidavits (even looking back at the struck-out paragraphs to see if they need to be revisited yet again) make clear she doesn't agree with the developer (informed as that is to some extent by new original research, which doesn't come in to the legal test), they don't establish that a reasonable person with all of the necessary "sufficient expertise", having read and fully understood the materials before the board, would have autonomously seen the materials on their face as not excluding reasonable scientific doubt.

76 Thus the developer's material can be filed under the heading of "correct insofar as it goes" with a lack of material before the board to specifically make an issue of that. It seems to me that in the end, this is a case where, analogous to An Taisce v. An Bord Pleanála [2021] IEHC 254, [2021] 4 JIC 2003 (Unreported, High Court, 20th April, 2021), there wasn't anything before the board to make the zone of influence a real issue. While the developer's science can be critiqued in retrospect like a lot of things, it hasn't been shown to create a doubt on its face in the mind of a reasonable expert so as to make it necessary for the board to question it in the exercise of the board's own required expertise.

79. As emphasised earlier in this judgment, by virtue of the EIA directive, the board must have, or have access to, "sufficient expertise" to examine the relevant assessments.

80. Subject to further argument if it arises in some future case, it would be questionable if the "sufficient expertise" test requires individual bord members to have qualifications in specific sub-fields. The nature of board meetings is that they lend themselves to highlevel examination of a project, not line-by-line interrogation of the materials. That, one might have thought, must occur at official level. The real problem is likely to be the inspector-as-jack-of-all-trades model. That might work at the level of appeals regarding extensions to domestic dwellings, for example, but no one individual can have "sufficient expertise" in all of the sub-fields now arising in highly complex large-scale applications. So one can't in any sense blame the inspector in this case – no single hypothetical person could have the necessary "sufficient expertise" in all of the various sub-disciplines concerned. Nobody could have the necessary detailed knowledge, constituting sufficient expertise, of everything from geology to physics, ecology to emissions, human health to archaeology. Again the point is that if the knowledge isn't in-depth, it isn't sufficient, because otherwise you are approving something you don't totally understand. There isn't likely to be any single planning inspector to be found, who purports to opine on that full range of sub-fields, that couldn't be severely discomfited in a witness box on the basis of a skilful line-by-line examination of at least some sub-set of a developer's materials in a complex application. The approach of regarding the board and its inspectors as "experts" simpliciter, to be automatically deferred to, has to be reviewed in the light of both the amended EIA directive, the massively changed nature of complex planning applications, and the detailed science now required for environmental assessment

procedures. No single expert could provide a modern developer with all she needs – hence each developer seeking a large permission comes girded with a phalanx of highly qualified experts, each specialised in their own sub-discipline. The notion that a single person on the board's side can have equivalent expertise to fully understand and evaluate every line of every document so created is, unfortunately, clearly flawed. One is left with the question as to whether the way the board channels the examination of applications through a single inspector in each case complies with EU law.

81. Why then, one might ask, am I not giving more consideration to the grant of relief to the applicant? Unfortunately there is a very old-fashioned answer to that – this point isn't sufficiently pleaded. The only allegation of lack of expertise is in relation to air emissions in the case of a major accident, and I don't see any huge problem with the way the board dealt with that. Nor is there any claim for general declaratory relief. The only declarations sought are along the lines that the decision was ultra vires on various grounds. Indeed, the present case shows the pointlessness of seeking declarations of that type. It is hard to imagine why a court would grant a declaration that a decision was ultra vires and not also grant certiorari. If certiorari is granted, declarations are unnecessary, and if refused, then a declaration that the decision is invalid is also going to be refused. The form of declaration encouraged by the current practice direction in the Commercial Planning and Strategic Infrastructure Development List (and the Asylum List for that matter) as to the rights and legal position of the parties and persons similarly situated, wasn't sought here, although in fairness that post-dated the initiation of these proceedings. And finally, even if the point had been fully pleaded, and broad declaratory relief sought to give the court options in that regard, the issue would still have had to be developed evidentially – perhaps by having sought directions requiring the board, in the exercise of its obligation under the jurisprudence requiring it to lay its cards face up on the table as a respondent in judicial review (see R. v. Lancashire County Council, ex parte Huddleston [1986] 2 All E.R. 941 at 945 and subsequent cases), to put in an affidavit giving a detailed account of the extent to which it examined and understood the science and the background documentation. Even the most expansive view of a court's "own motion" jurisdiction couldn't fill those gaps. So any full discussion of these questions will have to await some other case."

We submit that the above observations are particularly appropriate in an application such as this where the assumptions and methodology underlying the material submitted by the consultants on behalf of Uisce Éireann will require to be robustly considered.

It is vital in light of the legal issues which will be highlighted below that sufficient relevant independent expertise is retained to assess this development.

Relationship between EIA and WFD

The Water Chapter of the EIAR (Chapter 9) proceeds on the basis of assessing effects in terms of Significance. That is of course the correct approach to take in an EIA context.

However, the EIA Directive is a procedural directive. It does not dictate outcomes. The Water Framework Directive on the hand, as was established by the Court of Justice in Case C-461/13, *Bund für Umwelt und Naturschutz Deutschland e.V. v Germany* ("Weser") does dictate outcomes.

The CJEU has found that the WFD assessment should be carried out in the context of the EIA procedure.[1]

[1] See in particular the Opinion of Advocate General Hogan in C-535/18 Land North Rhine-Westphalia

Chapter 9 of the EIAR adopts a test of 'Significance'. For example, at paragraph 310, it states in relation to the impacts of abstraction in terms of operational activities:

> *"Based upon these findings, effects on the Derg TN lake water body and the Derg HMWB would be Not Significant'.*

However, this is not the correct approach if this is to be taken as fulfilling the obligations under Article 4 of the Water Framework Directive. The WFD does not have a 'Significance' test. Instead it has two key tests in terms of surface waters:

1. The achievement of good surface water status (potential), and
2. Non-Deterioration.

Irish case-law does indicates however, a preference for substance over form, so that if the material may be found elsewhere in the documentation this is generally regarded as sufficient. It is recognised that the State has failed to give effect to the Weser ruling by providing adequate statutory and policy guidelines for developers. This is recognized by Uisce Éireann in this case, where they admit that they have had to fall back on UK Guidance. However, such non-binding Guidelines should be treated with caution, notwithstanding the regrettable lack of domestic guidelines. This is also clear from the facts of the first main Irish case dealing with the WFD: *Sweetman v An Bord Pleanála* [2021] IEHC 16) ("Bradán Beo").

However, Uisce Éireann have submitted a 'Water Status Impact Assessment Report' ("the WFD Report"), which is based on aforementioned UK Guidance, namely UKTAG Screening.. In particular in relation to abstraction modelling, they rely on the UKTAG River Basin Management report. As set out in the submission of Dr. O Connor, the UKTAG river abstraction criteria are generally intended to be applied to naturalised or near-natural flow regimes, and not highly regulated flow regimes such as the Lower River Shannon.

Water Status Impact Assessment Report

We respectfully submit that the WFD Report is fundamentally flawed.

Crucially at paragraph 166, it states in relation to impacts of abstraction in the operational phase of the development:

> *"During abstraction, the water level regimes in the WFD designated water bodies are only predicted to be affected during drought and in the days immediately preceding. Hydrological modelling results indicate the maximum difference in water level predicted to be caused by the inclusion of the proposed 300Mld abstraction was a drawdown of 134mm, and a drawdown of 65mm for the 154Mld scenario. With future climate change included in the modelling, the differences are 168mm and 73mm respectively. The size and rate of change fits within the commonly observed level changes seen within the 52-year period of observed levels*
>
> *Hydrodynamic modelling has demonstrated that in a worst case drought scenario, the Proposed Project would only result in miniscule changes to concentrations of BOD, dissolved oxygen, nutrients and chlorophyll-a. Overall, it is considered that the change in abstraction will not put WFD status at risk.*
>
> *The changes arising from abstraction on the WFD designated water body will be negligible. Although the Derg HMWB would experience altered flows during flood periods, the proposed abstraction would not prevent fish passage as a result of abstraction. Hydrological modelling suggests that the Proposed Project would have no impact under the proposed Eflow regime, whereby increased releases of water (termed "freshets") would be provided over Parteen Weir to improve fish migration."*

In that context, it is important to point out that Art 4(1)(a)(ii) of the WFD provides:

> *"Member States shall protect, enhance and restore all bodies of surface water."*

At no point does the WFD Report address the requirement in Article 4 to restore bodies of surface water which are not at good status. In particular, the WFD Report does not address the hydromorphological impacts on the downstream Shannon (Lower)_050 waterbody which is at Poor Status with HYMO as the significant pressure. This is generally as a result of the Ardnacrusha HEPS.

It is acknowledged in the documentation submitted that there will be a hydromorphological impact, although it is described as 'negligible'. The application does not describe how the proposed development, which has a negligible adverse impact, would help to restore the Shannon (Lower)_050 waterbody from its current poor status to a good status.

Non-deterioration

Furthermore, crucially, the WFD Report does not address the requirement for non-deterioration in Article 4 WFD in the context of the impacts of abstraction on the downstream waterbody.

This is the glaring legal issue with this application, and we respectfully submit that it is fatal.

The Court of Justice in *Weser* addressed the interpretation of deterioration in Art 4. At paragraph 70, the Court held:

> *"In the light of all the foregoing considerations, the answer to the second and third questions submitted is that the concept of 'deterioration of the status' of a body of surface water in Article 4(1)(a)(i) of Directive 2000/60 must be interpreted as meaning that there is deterioration as soon as the status of at least one of the quality elements, within the meaning of Annex V to the directive, falls by one class, even if that fall does not result in a fall in classification of the body of surface water as a whole. However, if the quality element concerned, within the meaning of that annex, is already in the lowest class, any deterioration of that element constitutes a 'deterioration of the status' of a body of surface water, within the meaning of Article 4(1)(a)(i)"*

The concept of 'deterioration' therefore does not include any 'de minimis' or subjective assessments around 'Significance' as appears to be applied in Chapter 9 of the EIAR. Such subjective assessments of deterioration were specifically excluded by the Court where they held as follows at paragraph 68:

> *"Contrary to the submissions of Bundesrepublik Deutschland, an interpretation that only 'serious impairment' constitutes a deterioration of the status of a body of water, an interpretation which is founded, in essence, upon the weighing up of, on the one hand, the adverse effects on waters and, on the other, water-related economic interests, cannot be inferred from the wording of Article 4(1)(a)(i) of Directive 2000/60. Furthermore, as the applicant in the main proceedings observes, such an interpretation does not respect the difference established by the directive between the obligation to prevent deterioration of the status of a body of water and the grounds of derogation laid down in Article 4(7) of the directive, since only the latter involve some weighing up of interests."*

The Court essentially found that issues around subjective assessments of significance were matters for the derogation process provided under Article 4.

This was reiterated in Case C-529/15 *Gert Folk*, in which the CJEU held at paragraph 36:

"It should be borne in mind that, when a project is liable to have adverse effects on water, consent may be given to it if the conditions set out in Article 4(7)(a) to (d) of that directive are satisfied (see, to that effect, judgment of 4 May 2016, Commission v Austria, C-346/14, EU:C:2016:322, paragraph 65)."

In Case C-535/18 *Land North Rhine-Westphalia*, the Court held at paragraph 74:

"Article 4 of Directive 2000/60 not only contains more long-term planning requirements provided for by management plans and programmes of measures, but also concerns specific projects to which the prohibition of deterioration of the status of bodies of water also applies. A Member State is consequently required to refuse authorisation for a project where it is such as to result in deterioration of the status of the body of water concerned or to jeopardise the attainment of 'good status' for bodies of surface water or groundwater, subject to the derogations also provided for in Article 4 (see, to that effect, judgment of 1 July 2015, Bund für Umwelt und Naturschutz Deutschland, C-461/13, EU:C:2015:433, paragraphs 47, 48 and 50)."

It is clear therefore that while there may be differences between the various parties as to the extent to which the abstraction will impact on the downstream waterbody, there can be no doubt that even accepting the developer's modelling (which is refuted by Dr. O' Connor) there will be a deterioration of that waterbody for the purposes of Article 4.

Uisce Éireann have not sought to apply any of the derogations under Article 4 in respect of the proposed development.

It follows from the above that the Commission are precluded from granting permission.

Temporary deterioration

It is also to be noted that Uisce Éireann appear to accept impacts in drought conditions. In other words, that there will be temporary adverse impacts. At paragraph 166 of the WFD report they state:

"During abstraction, the water level regimes in the WFD designated water bodies are only predicted to be affected during drought and in the days immediately preceding."

The WFD prohibits temporary deterioration of waterbodies. This was established in Case C-525/20 *Association France Nature Environnement.* In that case, reliance was placed on a non-binding WFD Common Implementation Strategy Guidance document published by the EU Commission which stated that temporary deterioration was not prohibited under the WFD. However, the Court rejected this and at paragraph 45 held:

"In the light of all the foregoing considerations, the answer to the two questions posed is that Article 4 of Directive 2000/60 must be interpreted as requiring Member States, when they assess the compatibility of a particular programme or project with the objective of preventing the deterioration of water quality, to take into account temporary, short-term impacts which are without lasting consequences, unless it is clear that such impacts have, by their nature, little effect on the status of the bodies of water concerned and cannot lead to a 'deterioration' of that status, within the meaning of that provision. Where, as part of the authorisation procedure for a programme or project, the competent national authorities determine that that programme or project could lead to such a deterioration, that programme or project may be authorised only if the conditions set out in Article 4(7) of that directive are met, even if the deterioration is temporary in nature."

Lack of Adequate Programme of Measures for Waterbodies affected by Ardnacrusha HEPS

Related to the above, is the fact that no adequate WFD assessment can be conducted in the absence of specific Programme of Measures for the WFD waterbodies affected. This is most obviously the case in relation to the waterbodies currently affected by the abstraction and impoundment for the Ardnacrusha HEPS. As stated above the environmental objectives for these waterbodies include restoration for those waterbodies which are not heavily modified. For those which are heavily modified it includes the obligation to achieve good surface water status.

Those environmental objectives can only be achieved in the contract of Programme of Measures which are set at the level of the waterbody and directed towards the achievement of the environmental objectives for that waterbody.

This issue was addressed by the Court of Appeal in England and Wales in the recent case of *Secretary of State for Environment, Food and Rural Affairs v Pickering Fishery Association* [2025] EWCA Civ 378. That case concerned the transposition in that jurisdiction of the Water Framework Directive, and a challenge to the River Basin Management Plan for the Humber catchment. The RBMP contained only a summary Programme of Measures containing generic, national-level measures, with no detailed Programme of Measure for the individual water bodies in the Humber catchment. This was advanced by the Secretary of State as sufficient to meet the obligation of the WFD

The Court of Appeal comprehensively rejected this interpretation. The Court held that Articles 4, 5, 8, 11, and 13 of the WFD establish an interconnected series of detailed, binding requirements which were not merely strategic or aspirational objectives. The environmental objectives required under the WFD must be set for each individual water body (achieving "good ecological status" or "good ecological potential"), and Programme of Measures must identify measures or actions programmed for each water body in order to attain those objectives within the specified deadline.

The Court stressed that Article 11(5) WFD requires additional measures where environmental objectives for a water body are unlikely to be achieved, and Article 11(8) WFD requires periodic review and updating of the measures. The Court held that those provisions only made logical sense if the measures are water body-specific from the outset.

The Court concluded at para 192:

> *(1) To comply with the WFD and the WFDR 2017 a PoM drawn up under regs.12 and 13 must identify a programme or scheme of actions for each water body in order to achieve the EOs for that body within the relevant deadline.*
>
> *(2) Where the EA and the SSEFRA rely upon generic provisions in a PoM, such as national legislation or policy, as a basis for identifying the measures for a water body, they must set out in the PoM measure(s) or action(s) for each water body to achieve its EOs which follow from an application of those provisions to that body.*

Ireland has chosen to implement the WFD by means of a single RBMP covering the entire territory of the State. The RBMP (Water Action Plan 2024) generally contains only generic national level measures in the Programme Of Measures. In certain instances it does contain specific measures for individual waterbodies or groups of waterbodies, such as particular measures in relation to the Annacotty Weir on the river Mulkear in County Limerick. However, such individual measures do not satisfy the requirement of the WFD as was found in *Pickering* to identify a programme or scheme of actions for each water body, in order to meet the specific environmental obligations for that water body.

The absence of such a programme or scheme of actions for each water body is particularly egregious in the case of the waterbodies impacted by the Ardnacrusha HEPS. As pointed out by Dr. O' Connor

the ESB water regime maintains the lowest possible flow statutorily permitted in the Old River Shannon. There has been no assessment conducted as to whether altering the ESB flow regime to Ardnacrusha HEPS would help achieve the environmental objectives for the waterbodies affected by it. There is simply nothing in the RBMP Programme of Measures providing for the achievement of the environmental objectives of the waterbodies affected by the Ardnacrusha HEPS by the deadline of next year.

Thus, this planning application highlights in stark terms the inadequacy, and in our respectful submission, the unlawfulness of the RBMP for Ireland.

As is clear from the judgement in *Pickering* the WFD does not allow for the administrative convenience of having a single RBMP covering the entire territory of the State, in circumstances where that RBMP does not provide the necessary measures to achieve the environmental objectives of the WFD for each waterbody.

Notwithstanding that this proposed development has been in gestation for many years, it is highly surprising that no Programme of Measures has been set for the waterbodies affected by abstraction for a very significant hydroelectric power station, and from which waterbodies further abstraction is proposed in order to serve the needs of the main urban area of the State.

We therefore submit, that no proper Article 4 assessment could be attempted for the proposed development, although as stated above even the attempt which has been made by Uisce Éireann is wholly inadequate. The bringing forward of this proposed development is premature until such time as there are Programme of Measures established for the affected waterbodies.

Conclusion

For the foregoing reasons we respectfully submit that this application should be refused.

Yours faithfully

FP LOGUE

AN FÓRAM UISCE

REVIEW OF THE EASTERN & MIDLANDS WATER SUPPLY PROJECT

Report

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1 CONTEXT AND OBJECTIVE OF THE ASSIGNMENT

There is agreement, in general, that Dublin and its region are becoming increasingly water stressed, that the risk of water shortages will become ever more important and that failure to address this risk would have a catastrophic impact in terms of economic development in that region, which will impact the country as a whole. It is understood that water demand may exceed production capacity by the mid-2020s, so that it has now become urgent to develop new water supplies.

Irish Water (IW), the national water utility in Ireland, is therefore progressing with their most significant water supply project, the Eastern and Midlands Water Supply Project (WSP), to address and resolve this situation.

The project has been on-going for many years, long before the establishment of Irish Water and has followed a pathway involving several key stages: an assessment of the project need (i.e. an estimate of the future water demand to be met), the identification of alternative supply solutions which underwent a robust assessment process and the selection of a preferred option.

This "preferred option" is a scheme designed to abstract water from the River Shannon and pipe it across the country to supply water to communities along its pathway and ultimately to Dublin City and region. In addition to providing a long term and reliable solution for water supply in the greater Dublin area, it would also enable to improve water supply in a large "benefitting corridor". As a result, the Eastern and Midlands WSP has become a nationally strategic water supply project, which will concern up to 45% of Irish population and require an investment of above 1 billion €.

However there is not an agreed acceptance in the population of IW's proposed solution and a heated debate has ensued. A multiplicity of concerns have been voiced, with regard to the assessment of current and future demand assessment (is it accurate?), the leakage of leakage and IW's strategy to address it (shouldn't it be reduced more and faster?), the potential impact on the Shannon or the choice of the most suitable route.

In response to the various controversies, the Commission for Regulation of Utilities (CRU), i.e. the Irish regulator for water, will undertake a complete review of the Eastern and Midlands WSP, which will involve consultation with key stakeholders of the sector, including the Water Forum.

The Water Forum has sought outside expertise to look into the various issues raised in the debate around the Eastern and Midlands Water project, in order to be able to contribute meaningfully to the CRU review. The assignment's objective was to provide insight about the project need assessment based on an independent review of existing data, and benchmarking information about the potential to use groundwater, desalination, recycled water or rainwater collection as alternative water supplies.

A presentation addressing these issues was made during a dedicated Forum meeting on the 9 April 2019. The present note provides a summary of the elements that were discussed on that day; the full presentation is included in Appendix.

2 REVIEW OF THE PROJECT NEED

The need for the project arises in relation to two separate objectives:

- Meeting drinking water needs in the long run
- Increasing the resilience of the water supply.

2.1 MEETING DRINKING WATER NEEDS IN THE LONG RUN

The challenge of meeting drinking water needs in the long run lies in properly assessing the evolution of demand in order to estimate future production requirements and then plan in a timely manner the delivery of any additional production capacity that may be required.

Irish Water's assessment of future water demand in the Dublin water supply area is provided in the Project Need Report (PNR) published in 2015, with an updated version published in the First Options Appraisal Report (FOAR) in 2016. In its response to the public consultation on the FOAR, IW mentioned that it should release a "revised Project Need Report" towards the end of 2017; this document could not be retrieved.

2.1.1 Preliminary observations about Irish Water's published analysis

Supply-demand balance is a standard tool with abundant literature and models available to support its implementation (in particular from the International Water Association, which has codified its various components). However Irish Water's analysis of this balance, as presented in the project document, shows a number of weaknesses:

- **Poor quality of baseline data**[1]: the data used to establish the starting point for the analysis are now significantly outdated (2011); yet, their reliability can be questioned as "adjustments" had to be made between the PNR and FOAR; finally, these data are not always consistent with other available sources.
- **Lack of "depth":** the hypothesis is underpinning the projections are not presented in a clear and structured manner and no supporting evidence(such as historical analysis, modelling, benchmark, etc.) or detailed arguments is provided to demonstrate their pertinence; in particular, very few explanations are provided as to why some of these hypothesis have evolved between the PNR and the FOAR.
- **Absence of "sensitivity"** analysis: IW used several scenarios of population growth (and retained the "most likely" one) for its projections; however, only a single hypothesis was made for other parameters (such as per capita consumption or leakage), without characterizing the "level of confidence" attached to it. Considering a "range" of values for the various parameters used in the projections would have allowed to model several trajectories of evolution for the demand; and to show the influence on these trajectories (and therefore on production requirements) of each parameter (which are to some extent "within the control" of the water utility). Sensitivity analyses are standard components of forward looking studies.

[1] "The background data sets used to underpin the assessments were from recognised and authoritative sources such as the Census and non-domestic metering data": Irish Water's response to challenges of its assessment provides no specifics about data sources used for domestic consumption and leakage.

Table 1 Variation of baseline data on demand

	PNR data - 2015	FOAR data -2016	Difference
Domestic demand (ML/d)	231	216	-7%
Non domestic demand (ML/d)	126.5	110	-13%
Leakage(ML/d)	178.1	204.7	15%

2.1.2 Review of demand projections[2]

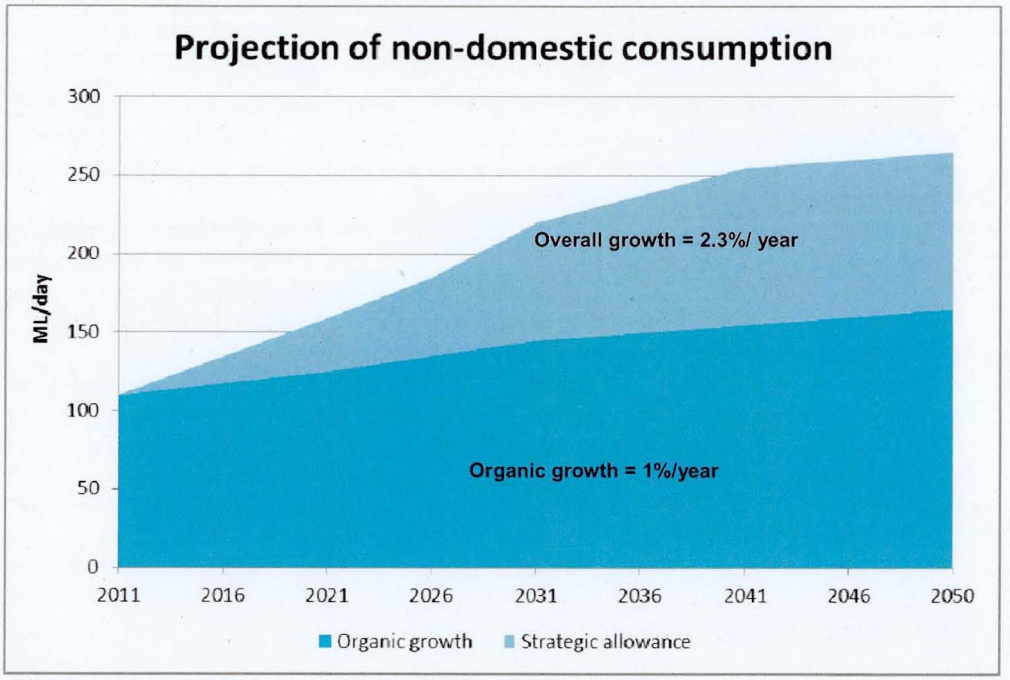
a) Non domestic consumption

Non-domestic consumers have been metered since 2008; thus, in theory, there should be a 10 year series of data documenting their consumption, enabling to set the baseline level with a good degree of precision and providing context about past evolution. In particular, it would be insightful to compare the actual evolution of non-domestic consumption between 2011 and today with the 1.25 % /year growth over the period assumed in the FOAR projection. While this data has informed Irish Water's analysis, it is not provided in the project documents

The projection of non-domestic demand includes two separate components:

- "organic growth", which results from the development of the economy according to a "natural" trend;
- a "strategic allowance" meant as a "response to additional demand", which represents almost twice as much as the organic growth between 2011 and 2050.

Figure1 Evolution of non-domestic consumption

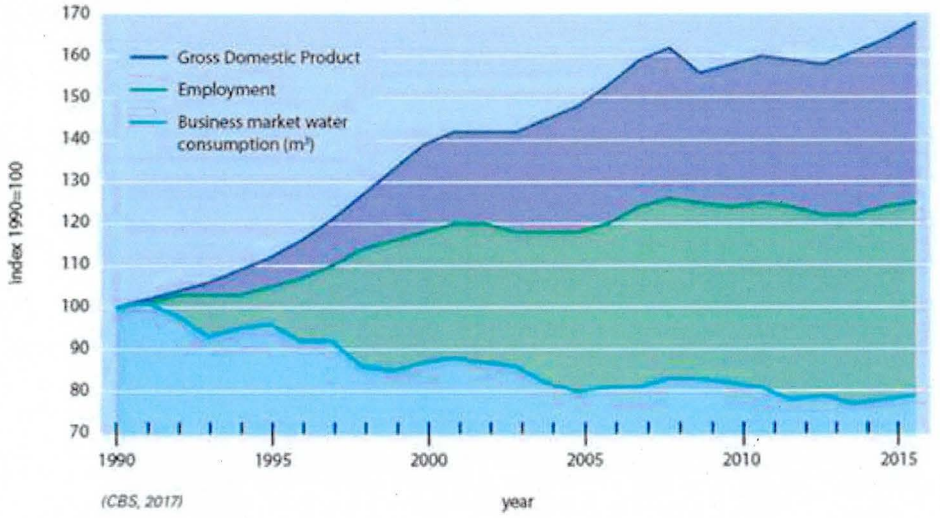


The notion of a "strategic allowance" in itself is confusing: either there is a reasonable expectation that this water might be needed and then it should be included in the demand projection; or it is a "security buffer" which should rather be included in the "headroom".

[2] In the following, we refer to the water actually needed and used by consumers as "consumption", while demand refers to the overall volumes that need to be put in the system, i.e. including leakage.

The addition of these two components results in an overall increase of non-domestic consumption by 2.3% / year over the period to 2050. This is in the high range of what would be considered as reasonable in such analysis. International benchmark shows that PIB growth and water consumption have been largely decorrelated in past decades, a result of increased water efficiency.

Figure2Business market drinking water consumption vs. development of the economy in the Netherlands, 1990-2015



Source: Dutch Drinking Water Statistics 2017 "From source to tap"

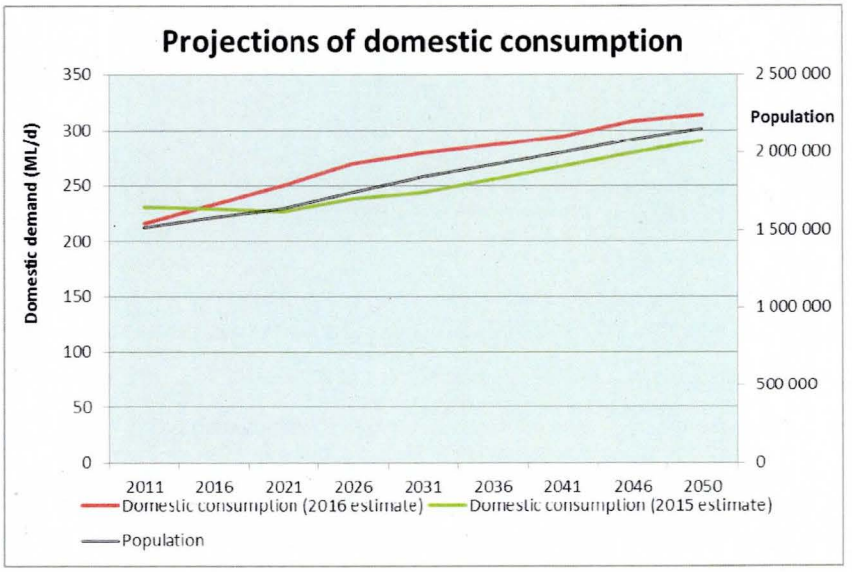
b) Domestic consumption

Domestic demand can be calculated as follows:

- number of connections x consumption per connection;
- population x consumption per capita;

The first approach was used in the PNR and the second in the FOAR, which makes it quite difficult to reconcile the projections made in each case; as a matter of fact, these projections lead to markedly different estimates of future demand (+26% vs +45% increase from 2011 baseline), even though they use the same scenario of population growth.

Figure3Projections of domestic consumption



The assumptions made in the FOAR, summarized below, result in a PCC of circa 140 L/day.

Table 2 Estimates of per capita consumption

	2011	**2021**	**2050**
Population	1 516 133	1 642 391	2 154 252
Occupancy rate	2.69	2.48	2.2
Number of households	591 798	695 366	1 028 165
Consumption per connection (l/property/day)	365	360	305
Domestic consumption	216	250.3	313.6
Consumption per capita (l/day) calculated as total / population	*142*	*152*	*146*
*Consumption per capita (l/day) calculated as per connection consumption / occupancy rate**	*136*	*145*	*139*

* The difference between the two estimates results from Irish Water's calculation including an extra 5% of unoccupied properties to the total number of households, with the same consumptions as occupied dwellings.

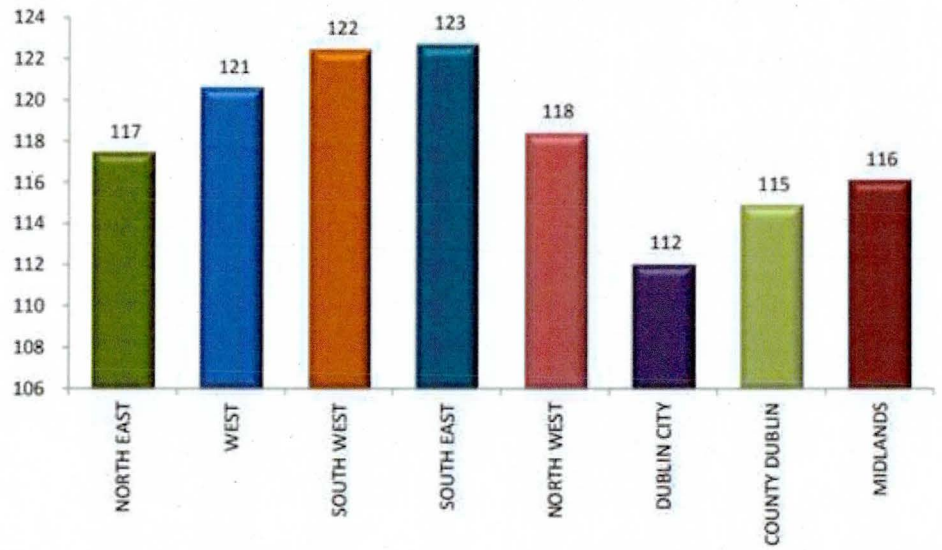
This number is not consistent with PCC calculated on the basis of meter data:

- In 2015, a water consumption project undertaken by Irish Water showed that the average PCC was rather around 123 L/day/capita[3], a number that was reliable enough to be submitted to the Expert Commission that was in place at the time[4]. Furthermore, it identified that a significant share of consumption could be attributed to a small numbers of "outliers" with disproportionately high consumption. PCC excluding these outliers (referred to as "regulated PCC") was around 110 L/day/capita.
- Consumption reports produced quarterly by Irish Water since this initial study have confirmed the above figures; they also show that regulated PCC is the lowest in Dublin city, Dublin County and the Midlands.
- In August 2018, the Central Statistics Office released a report compiling Irish Water's meter data from 2014 to 2016: it shows that average PCC is below 130 L/day per capita and regulated PCC under 100L/capita/day in 2016 (considering an occupancy rate of 2.75, as per the latest census data), thus outline the disproportionate influence of "outliers" on average consumption:

[3] https://www.cru.ie/wp-content/uploads/2014/07/CER14570g-Irish-Water-Consumption-Research-Project-IWCRP-Phase-3.pdf
https://www.cru.ie/wp-content/uploads/2014/07/CER14420-A11-Irish-Water-Water-Consumption-Research-Project-Memo-to-CER-1.pdf

[4] *Irish Water presented consumption data to the Expert Commission based on metered consumption to date, which indicated that domestic consumption is relatively low in Ireland with average consumption of 123 litres per capita (…) While comparison of domestic consumption with other European countries is difficult due to differing methods of measurement and because the data can be out of date, this most recent consumption data suggests that Ireland is at the lower end of the spectrum of EU countries with regard to domestic consumption.*

Figure4Regulated PCC per region (litres per day)

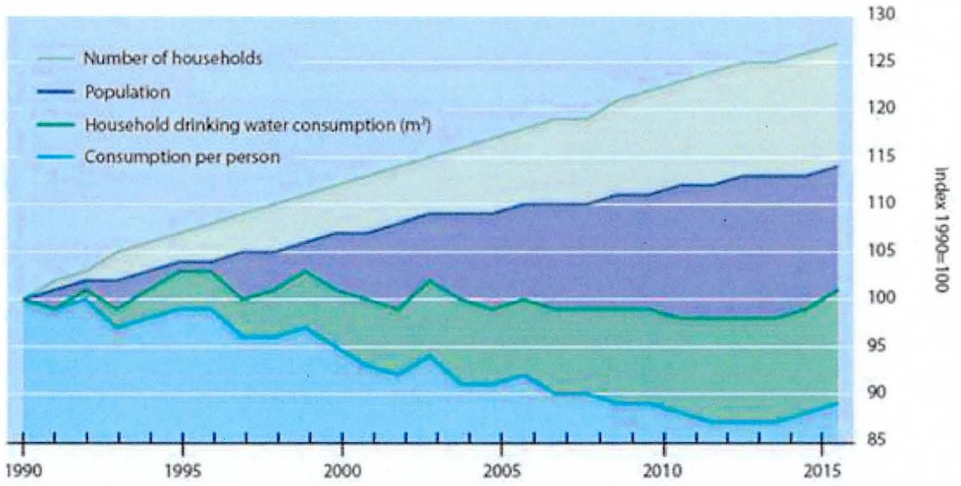


Source: Q3 2016 CRU Consumption Report

In addition to using baseline data that seem to overestimate "current" PCC, Irish water's projection include no reduction of this PCC by 2050 (even though it considers a -16% reduction in "per connection" consumption). This hypothesis can be challenged in two respects.

First, PCC has decreased across developed countries over the past decades[5] and, while retrospective trend cannot always be extrapolated, most utilities expect to maintain this trend thanks to ambitious demand management strategies[6].

Figure5Household drinking water consumption vs. population growth in the Netherlands, 1990-2015

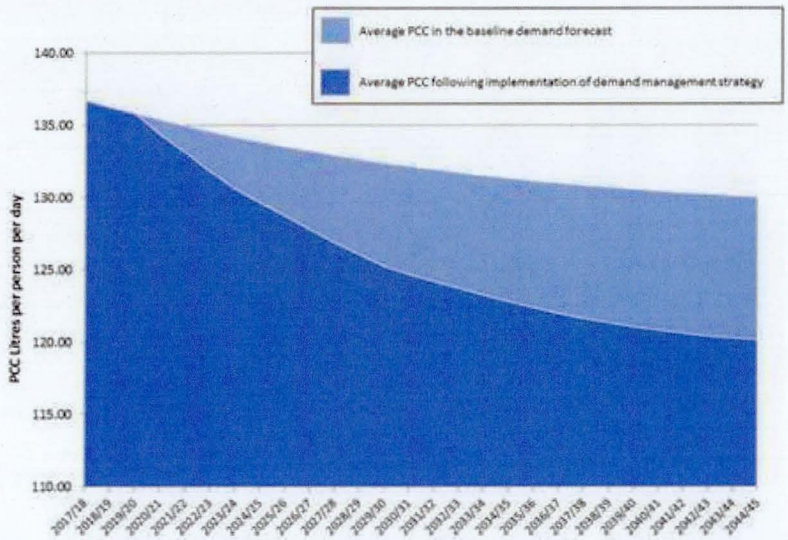


Source: Dutch Drinking Water Statistics 2017 "From source to tap"

[5]This trend has even jeopardized the economic model of water utilities, the revenues of which have dropped while their costs are essentially fixed costs.

[6] Even though further reduction will likely be ever more difficult to obtain as PCC becomes lower.

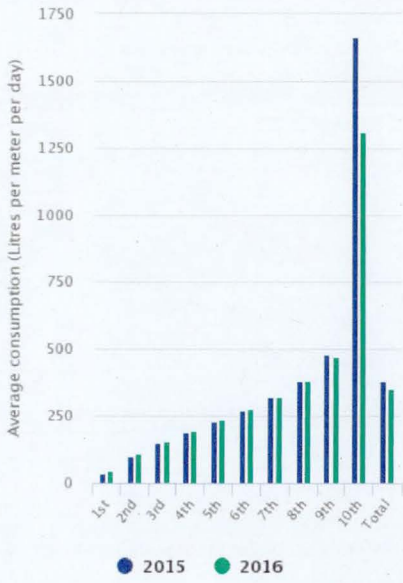
Figure6Evolution of PCC in the Anglian Water area



Source: Anglian Water – Water resources management plan

In addition, reduction of average PCC could be achieved "just" by eliminating excess consumption by outliers (whose excess consumption most likely results from undetected customer side leakage rather than deliberate wastage). Significant progress was made in this regard thanks to the First Fix Free Scheme: it led to an 8.4 % reduction in average PCC between 2015 and 2016, as shown in the table below.

Figure 7Domestic Public metered water consumption by decile , 2015 and 2016



Source: CSO Ireland[7]

In 2016,"outliers" (with consumption above 1000 L/capita/day) accounted for less than 1% of households but 25 % of metered volumes Bringing down their consumption to the average level would save circa 20% of total consumption, close to 25 ML/day.

Even though these numbers might not be extrapolated to non-metered households and that reducing internal leaks will become ever more challenging (e.g. leaks located in underground supply pipes), this shows that there is still considerable room to maneuver in terms of "demand management".

[7] https://www.cso.ie/en/releasesandpublications/er/dmwc/domesticmeteredpublicwaterconsumption2016/

2.1.3 Review of leakage projections

Leakage is a significant issue for water utilities in many regards: environmental, (over abstraction), economic (capital and operational costs of producing water in excess of actual consumption), operational (time dedicated to finding and fixing leaks).

The level of leakage depends on various parameters:

- « External » conditions (soil, weather, traffic)
- Network characteristics (age, material)
- Leakage management
    - Speed of detection
    - Speed of detection and repair
    - Infrastructure renewal (mains, supply pipes)
    - Pressure management

While the current level of leakage is known to be high in the Greater Dublin water supply area and in Ireland in general, it couldn't be precisely determined at the time when demand projections were established. Estimates for 2011 leakage volumes varied between 178 ML/day in the PNR report and 204.7 ML/day in the FOAR report (a 15% difference).

The reason for such uncertainty was explained by Irish Water in its Strategic Plan published in October 2015: *"We are currently carrying out detailed audits across the country and validation of the local area metering and valve controls forming District Meter Areas (DMAs) which have been installed since 2000 in most local authorities at a cost of over €100M. In many cases, the integrity of DMA boundaries has been compromised for local operational reasons so that accurate leakage calculations and leak targeting are not currently possible. We are working to re-establish the DMA infrastructure as a pre-requisite to a large scale programme of water conservation measures, which we plan to deliver on a regional basis."*

The implementation and operation of a new system providing Irish Water with greater capability to accurately report on leakage performance and monitor progress over time was due to be completed by Q4 2018 according to IW's 2018 Performance Assessment Report

It is hardly meaningful to comment on the ambition of the proposed leakage reduction targets (shown in the table below) given this uncertainty about the "starting point", but also because the "ambition" varies depending on which indicators is considered (most "standard" indicators on leakage are biased by the evolution of some other parameters of the service: consumption, number of connections, length of mains, etc...). Such indicators should therefore be used with caution, especially to benchmark leakage level across water utilities.

Alternative indicators such as the "sustainable level of leakage" or Infrastructure Leakage index, while requiring more data to calculate, are now widely recommended are more appropriate tools to asses leakage performance and track progress.

Table 3 Variation of baseline data on leakage

	2011 level	**2050 target**	**"Ambition"**
Unaccounted for water	204.7	140.8	-31%
as % of average demand	38%	19%	-49%
Linear Leakage Index (m3/km/day)	22.32	15.35	-31%
*Network length**	*9171*	*9173*	-
Leakage per property per day	*346*	*137*	-60%

* A simple calculation shows that leakage projection expressed as LLI does not take account of network extensions.

Despite the aforementioned caveats about benchmarking, it is insightful to analyze some case studies demonstrating that significant reduction in leakage can be achieved in fairly short period of times. Progress can be achieved through a combination of means, including improved data management to speed up leak detection (e.g. Scottish Water achieved 96% DMA coverage), pressure management, new operational organization, regulatory pressure, etc...thus showing

that infrastructure renewal is not the only solution to leakage. A strong focus from the leadership/management and dedicated resources appear to be key factors of success.[8]

Table 4Leakage reduction performance in three countries

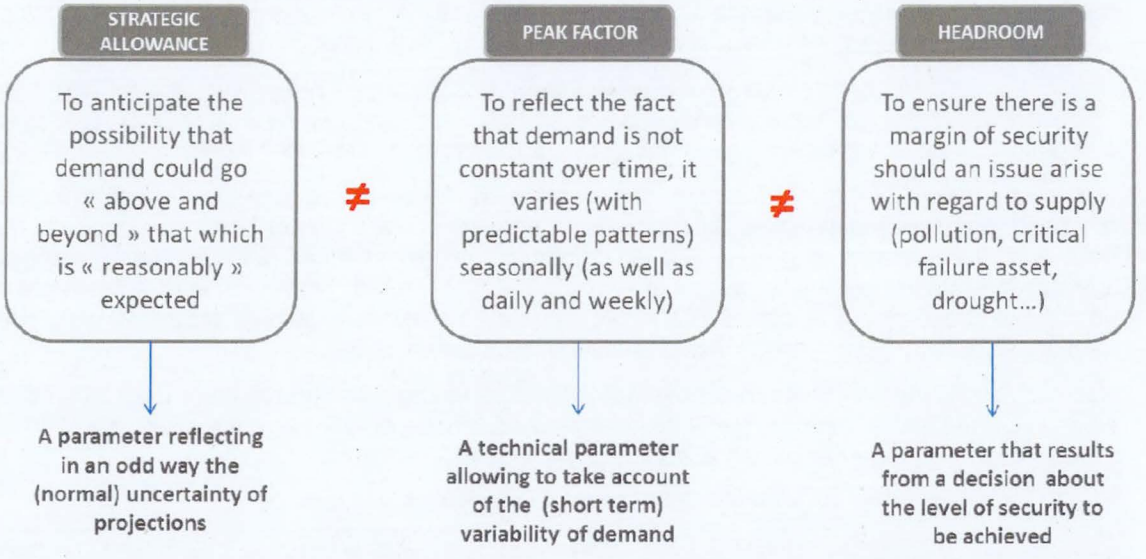
Malta	Losses per connection per day reduced by 70% in 12 years, production reduced from 50 to 30 Mm3 per year
Portugal/Lisbon	Losses reduced from 27 to 8.1 Mm3/yr(-70%) between 2005 and 2013
Scotland	Losses reduced from 1104 to 575ML/d (-48%) between 2006 and 2013

2.1.4 Conclusions about the supply demand balance

Uncertainty is inherent to the exercise of developing projections but it should be reduced to a minimum by using accurate data, robust hypothesis and sensitivity analysis. Unfortunately, the elements presented in the project documents that were released IW do not meet these requirements; they appear too superficial to give confidence in the soundness and reliability of the estimates of future demand (although this does not prejudge the quality of the work carried out internally by Irish Water).

In particular the lack of rigor, details and pedagogy regarding how the projections were built (absence of data sources, inconsistencies, adjustments) has created confusion, which in turn has fed distrust towards the justification for the project.

Figure 8an example of confusion about three parameters of the supply and demand balance



Furthermore, the analysis can be challenged in substance as much as in form: the significant growth in demand that is anticipated is in contradiction with the trend that has been observed in other countries over the past decades; and it could likely be curbed by using various levers of demand management that have been successfully implemented by other utilities. Therefore, future demand seems overestimated, possibly with a view to building a stronger case to justify the project?

[8] These and other case studies are presented in "EU Reference document - Good Practices on Leakage Management WFD CIS WG PoM - Case Study document", available at https://bit.ly/1K6K8BK.

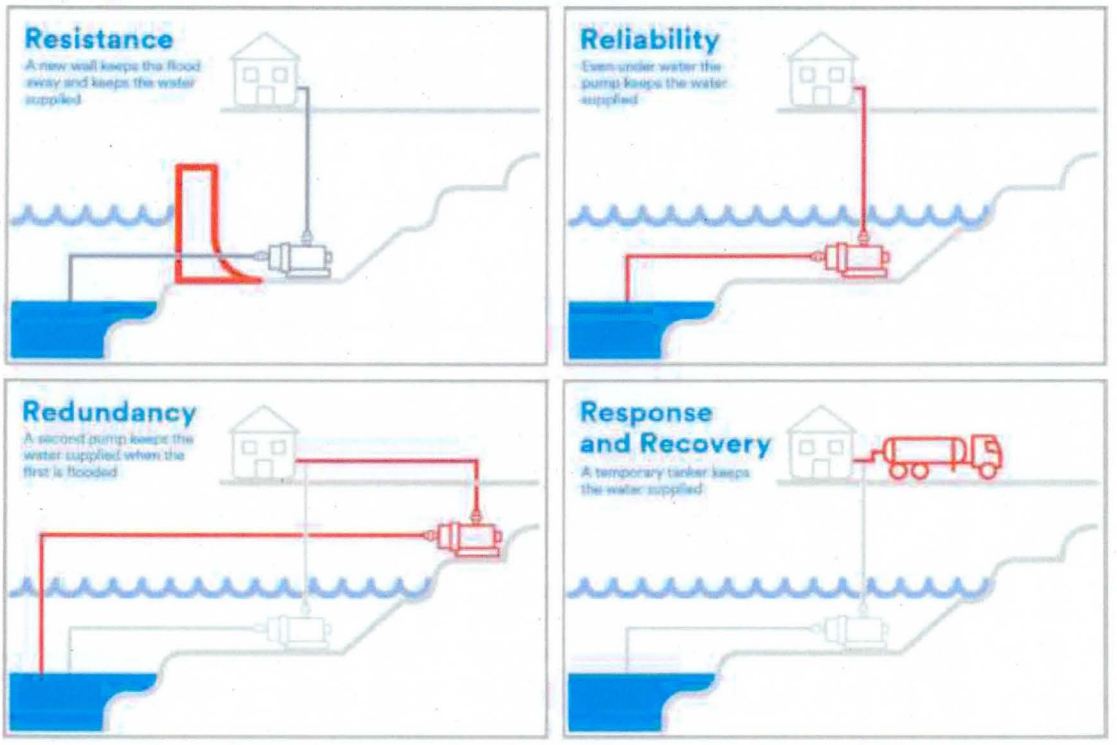
2.2 INCREASING THE RESILIENCE OF WATER SUPPLY

The resilience of a water supply system (including infrastructure as well as organizational components) can be defined as the ability of such system to maintain the continuity, safety, security, and sustainability of water supply services, even in case of unplanned natural events such as storms, drought, pollutions or any other reasons that could cause critical assets failure.

As was highlighted in Irish Water's 25 years strategy, "*Planning for resilient water supplies must take place independently of any progress in demand management (reducing unnecessary use of water) or success in reducing leakage, because loss of a key water source, treatment plant, or pipeline remains a separate risk to be managed*".

Resilience can be strengthened by improving performance on four key parameters: resistance, reliability, redundancy and response & recovery, as illustrated by the example below.

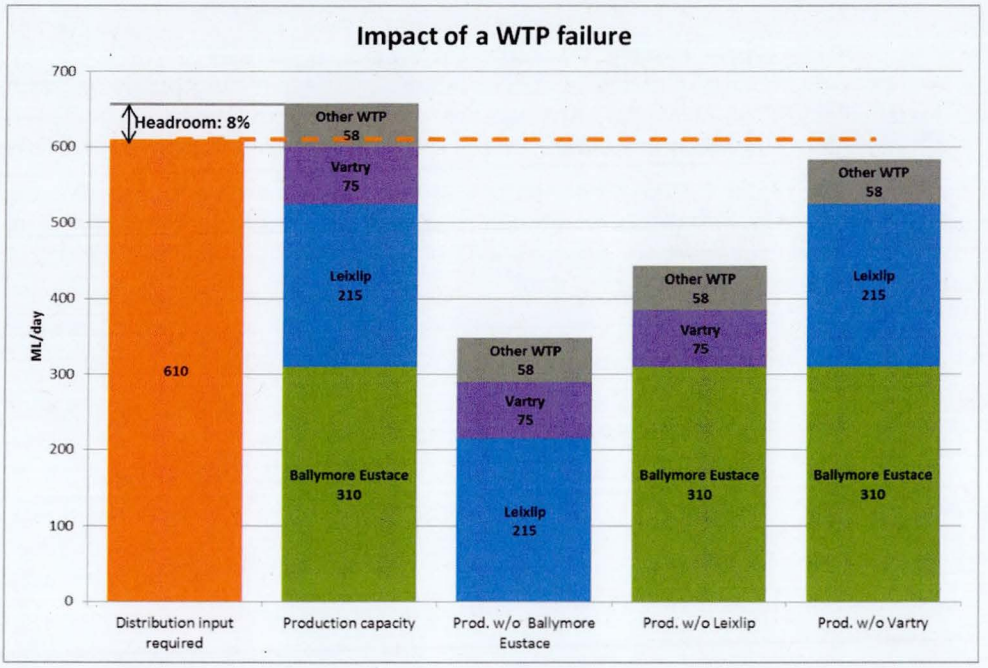
Figure 9Explanation of the 4 Rs of resilience using different ways to provide resilience of water supplies to flooding as an example



Source: United Utilities

Currently, approximately 84% of Dublin's water comes from the River Liffey, which means that the service could not be maintained if this source was to become "unavailable" (e.g. due to acute pollution) or insufficient (e.g. in case of drought reducing the flow available for abstraction). Furthermore, as the main treatment plants (Ballymore Eustace, Leixlip, and Vartry) are currently at their maximum production capacity, any failure of these assets would also result in significant disruption to the service. Similar "risky" situations seem to be pervasive in the midlands, in particular where water supply relies on a single groundwater source with a yield that may reduce at times of drought.

Figure 10Impact of a water treatment plan failure on water supply capacity



Two approaches can be used (and combined) to improve the resilience of the water supply and therefore the security of supply:

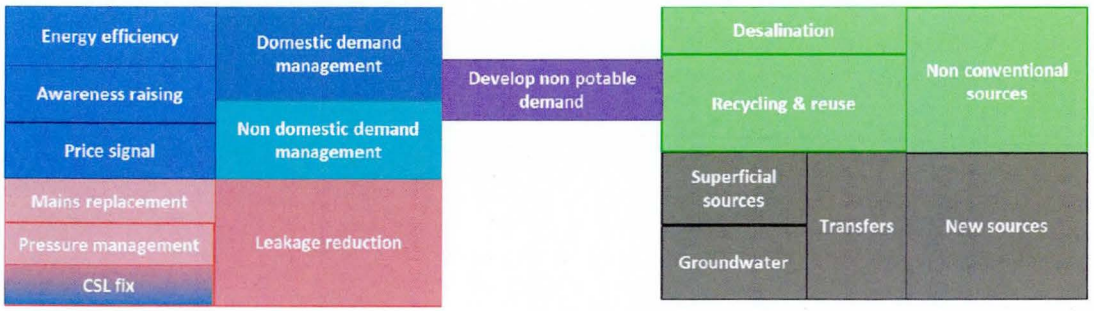
- increasing the headroom between production capacity and demand;
- diversifying supply sources.

The Eastern and Midlands WSP meets both these objectives; and would benefit both Dublin and a "corridor" made up of all the water supply areas that could connect to the main supplying water from the Shannon River.

3 POTENTIAL SOLUTIONS FOR BALANCING WATER DEMAND AND SUPPLY

A broad panel of solutions can be envisioned to ensure that an adequate balance between water supply and demand is maintained over the long term.

Figure 11 Illustration of the various solutions enabling to manage the supply demand balance



All these options can (and, in many cases, should) be implemented simultaneously, with cost-benefits analysis, and impact assessment enable to choose the most effective and efficient combination.

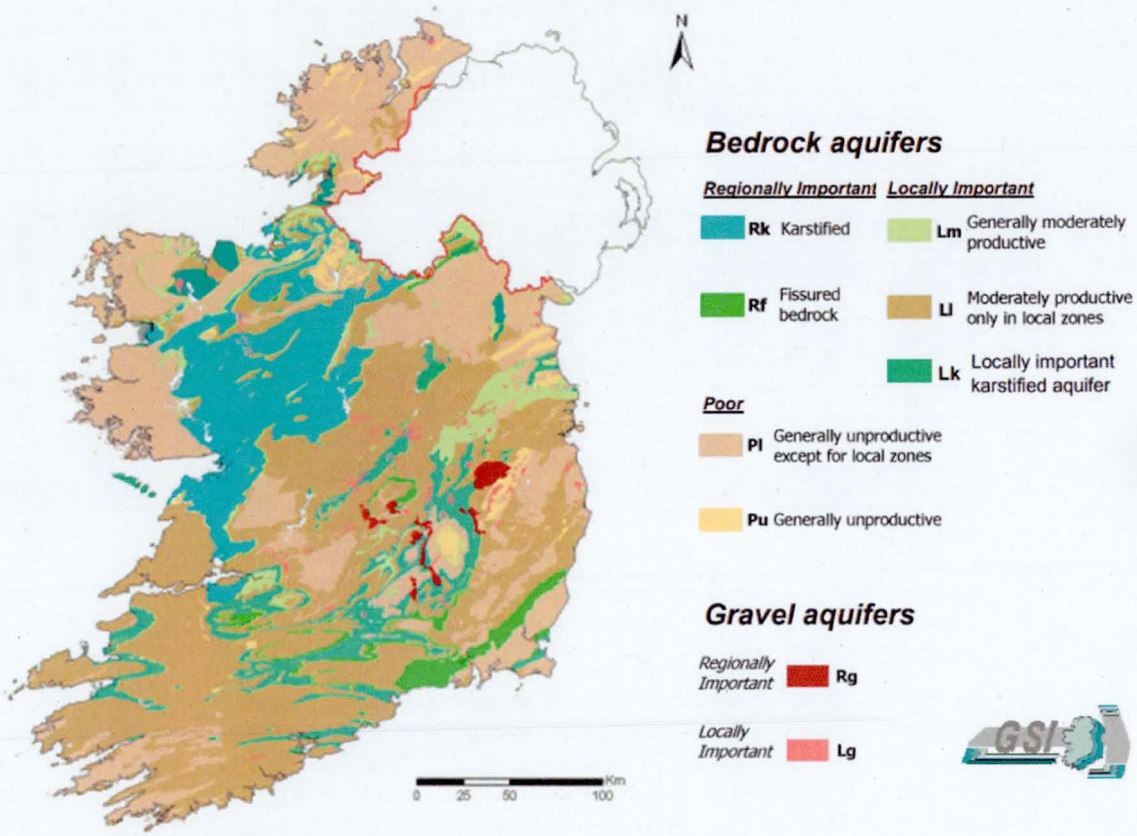
While Irish Water indicates that it will implement demand management and leakage reduction strategies in addition to developing new supplies, it is not clear how much effort (financially and operationally) will be dedicated to each of these components, making it impossible to appreciate the pertinence of the overall approach to meeting future water needs in the Dublin and midlands area.

As to the development of new water supplies, benchmark illustrates that groundwater abstraction, desalination or the use of non-conventional resources are being used by water utilities across the world. However, the potential (and limits) of such options depend on the local context in which they are implemented; "site specific" analysis is therefore required to gain insight into whether and by how much they could contribute to reducing the water supply "gap" in the Eastern and Midlands region.

A few comments can still be made:

- Key drivers for the installation of rainwater collection systems include expected savings on water bills and/or regulatory requirements; none of these drivers is currently present in Ireland. However, should they be put in place, the resulting impact on drinking water demand would likely be limited and slow to materialize;
- A study conducted during the project development process concluded that "*groundwater on its own would not be able to supply the projected demand, and that the best use of this limited groundwater resource would be in a 'supplementary' capacity.*" In fact, there are only a few "regionally important" aquifers with significant productivity in Ireland (as illustrated on the map thereafter); only 100 wells in the country (out of 2000, i.e. 5%) supply more than 1ML/day.
- A significant barrier to the use of desalination is the high cost associated with this technology, hence why it has been used almost exclusively in highly water-stressed countries to date. Cost was in fact a criterion for ruling out desalination as an alternative for the Eastern and Midlands WSP; however the main weakness of this option was that it could only address the water needs of the Dublin area while the Shannon scheme will benefit a significant corridor in the Midlands as well.

Figure 12Hydrogeological map of Ireland



Source: http://www.wfdireland.ie/

Finally, Irish water assessed several scenarios of water transfer from the Shannon River, with different abstraction points and pipeline routes. A detailed review of the available (and additional?) studies would be required to confirm whether the best scenario has been retained; without taking a position in this regard, it can be noted that Irish Water's arguments haven't completely settled the case, as some stakeholders still raise the existence of other alternatives (e.g. use of the Royal canal?).

4 CONCLUSION

The "helicopter" review of the Eastern and Midlands WSP that was conducted provided the Forum with some necessary insight to prepare its contribution to the CRU review, and in particular toidentify the points that deserve further clarification or consideration by Irish Water.

The key take away points from the review include the following:

- The information presented to justify the need for the WSP project suffers from many unknowns and uncertainties :
    - Either supporting data are available but not shared by Irish Water, which reflects a lack of pedagogy and transparency
    - Or these data don't exist, which means that there is no solid foundation for the projections justifying the need for the project (at least at this scale): it might then be better to wait for progressing any further that basic buildings blocks are in place.
- However, without considering future demand, the situation in Dublin is already very challenging, due to the lack of headroom and more importantly, the almost exclusive reliance on a single source. Increasing the resilience of the water supply not just in Dublin but for all the Midlands region is therefore a critical argument to justify the Eastern and Midlands WSP; and may justify that it should start sooner rather than later.
- By all means, "fixing" water supply challenges are a complex matter, for which there are usually no "silver bullet" and the Eastern and Midlands WSP makes no exception. In particular, different ways of reducing demand as well as increasing supplies could be considered and implemented simultaneously, with impact assessment and cost benefits analysis allowing to define the most adequate combination.
- Water demand is not an external parameter, such as rainfall, but instead a component of the system that a water utility can, and should, manage; to that end, it is necessary to adopt a holistic view of all the drivers, as well as levers, that can influence water demand in the future. While Irish water indicates that it intends to implement a demand management strategy, the impact of such strategy is not evidenced in the proposed demand projections.
- The same applies for the leakage issue: Irish Water does not explain how future leakage targets have been set and how they are aligned with best practices, available resources and customer preferences. International experience, including that of Scottish Water, show that significant progress can be achieved in this area in relatively short period of time and without relying exclusively on infrastructure renewal. Raising ambition on leakage could help increase the acceptability of the Eastern and Midlands project, which otherwise could be seen as a "necessary evil" to compensate the current wastage of resources.
- At the same time, it is important to stress that improving performance (whether on leakage, demand management or operations in general) takes time and depends on many conditions (human resources capabilities, leadership, financial resources and above all regulatory pressure/support). Irish Water is still a fairly new organization inheriting a challenging situation: should the role of the CRU in helping it deliver better performance be strengthened?
- In addition to the CRU, the Forum could also play a significant role in helping Irish Water better understand the views of its customers as well as their preferences and priorities: through an ongoing engagement process, the utility could better anticipate, understand and potentially resolve future issues before they become national controversies; and develop better ways to engage and communicate with customers, above and beyond institutional "consultation".

5 APPENDIX

An Coimisiún Pleanála
SID 323980 Submission

Uisce Éireann
Water Supply project

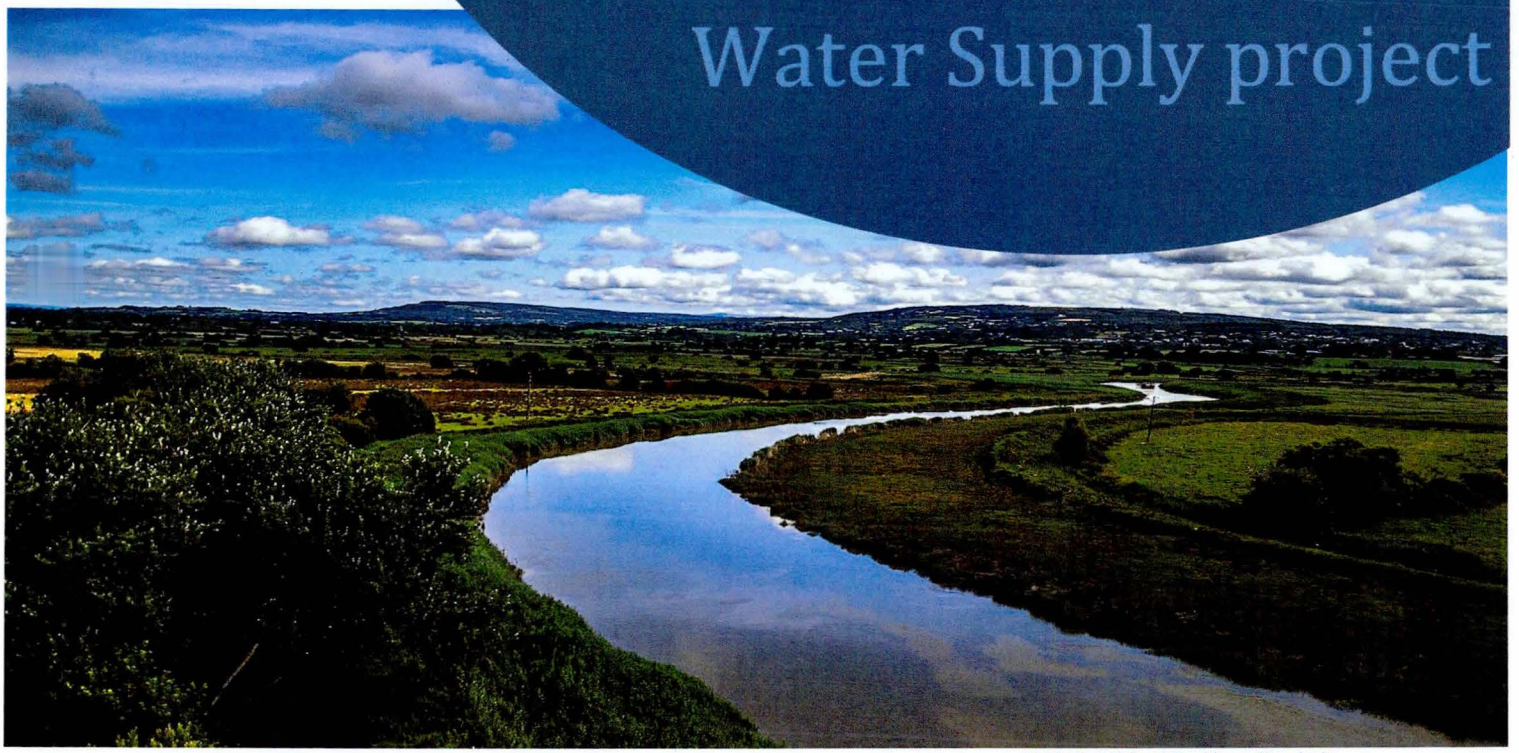


Photo by Michael Starkie on Unsplash

Objection submission submitted by:

Sabrina Joyce-Kemper
23 Portmarnock Crescent
Portmarnock
Co. Dublin.

Date of Submission: 25th February 2026

Submission

Introduction

I.1 Sabrina Joyce-Kemper, Planning and Environmental Consultant, makes this objection in her peronal capacity, I holds an Advanced Diploma in Planning and Environmental Law from the Honorable Society of King's Inns.

1. Introduction and Scope of Submission

1.1 This submission is made as an initial response to the proposed abstraction of up to 300 megalitres per day (Mld) from the Lower River Shannon at Parteen Basin for transfer to the Greater Dublin Area and associated Water Resource Zones. It is expressly framed as a preliminary submission identifying significant legal non-compliance, methodological defects and substantive lacunae in the documentation lodged, particularly in respect of Directive 2000/60/EC establishing a framework for Community action in the field of water policy ("Water Framework Directive" or "WFD"), Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora ("Habitats Directive"), Directive 2004/35/EC on environmental liability, Directive (EU) 2020/2184 on the quality of water intended for human consumption ("Drinking Water Directive"), and associated Irish transposition measures.

1.2 It is concerning to me that this project proceeds on the basis of a large-scale inter-basin abstraction while Dublin's existing water infrastructure continues to leak approximately 36% of treated water[1]. The failure to prioritise leakage reduction and infrastructure renewal represents a fundamental policy and legal omission, which in my opinion materially affects compliance with EU environmental law.

2. Water Framework Directive: Article 4 Non-Deterioration and Objectives.

2.1.1 The Legal Standard:Article 4(1)(a)(i) of Directive 2000/60/EC requires Member States to "implement the necessary measures to prevent deterioration of the status of all bodies of surface water". Article 4(1)(a)(ii) further requires protection, enhancement and restoration to achieve good status or, in the case of heavily modified water bodies, good ecological potential.

2.1.2 The Court of Justice of the European Union (CJEU), in Case C-461/13 Bund für Umwelt und Naturschutz Deutschland eV v Bundesrepublik Deutschland ("Weser"), confirmed that deterioration occurs where the status of at least one quality element falls by one class, even if that does not result in a change in overall classification. The prohibition is strict.

2.1.3 Article 4(7) permits derogation only where four cumulative conditions are satisfied, including that the reasons are of overriding public interest and that the objectives cannot be achieved by significantly better environmental options.

[1] https://www.rte.ie/news/business/2025/1125/1545760-uisce-eireann-fined-20m-for-not-hitting-leak-targets/

2.1.4 Article 4(8) requires that implementation of measures shall not permanently exclude or compromise the achievement of the Directive's objectives in other bodies of water within the same river basin district.

2.2 Failure to apply a atrict element-level deterioration test.

2.2.1 The Water Status Impact Assessment relies upon UK Environment Agency guidance rather than the Common Implementation Strategy (CIS) guidance adopted by the European Commission and Member States. Ireland remains bound by Directive 2000/60/EC and the jurisprudence of the CJEU. UK guidance, post-Brexit, is not interpretatively authoritative.

2.2.2 Under CIS Guidance Document No. 36 (2017) (Appendix 1), deterioration must be assessed at the level of individual biological, hydromorphological and physico-chemical quality elements, supported by complete, precise and definitive findings. Any reliance on risk-based or "not significant" reasoning is legally insufficient.

2.2.3 The documentation does not clearly demonstrate that abstraction of up to 3.47 m^3/s during drought periods will not affect hydromorphological conditions, nutrient dynamics, temperature stratification, residence time, or downstream ecological supporting conditions in Derg TN or Derg HMWB. Given that Derg TN is classified as Moderate and "At Risk" under the River Basin Management Plan, the evidential threshold is heightened.

2.2.4 Absent a strict element-level assessment consistent with Weser, compliance with Article 4(1) is not established.

2.3 Absence of a Structured Article 4(7) Derogation Assessment

2.3.1 If deterioration cannot be excluded with certainty, Article 4(7) must be expressly engaged. The project documentation proceeds on the basis that deterioration will not occur and does not present a structured, sequential Article 4(7) analysis.

2.3.2 CIS Guidance No. 20 (Appendix 2) and No. 36 require:

I) Identification of the specific quality elements at risk;
II) Demonstration that all practicable mitigation measures are taken;
III) A reasoned analysis of overriding public interest;
IV) A structured alternatives assessment showing no significantly better environmental option;
V) Compliance with Article 4(8) basin-wide integrity.

No such comprehensive Article 4(7) justification is presented. This omission is legally material.

2.4 Inter-Basin Transfer and Article 4(8) Basin Integrity

2.4.1 The project involves abstraction from the Shannon River Basin District to supply the Eastern and Midlands Region. The WFD is founded on river basin management principles. Article 4(8) requires that measures implemented do not compromise achievement of objectives elsewhere in the river basin district.

2.4.2 The documentation does not clearly demonstrate that abstraction during critical flow periods will not compromise the Shannon basin's Programme of Measures under the Water Action Plan 2024. Nor does it address whether cumulative abstraction, climate change variability and extreme drought modelling have been stress-tested against basin-level objectives.

3. Failure to Prioritise Leakage Reduction – Breach of Article 4(7)(d)

3.1 A central legal deficiency concerns the failure to prioritise repair and renewal of Dublin's existing water infrastructure, which reportedly loses approximately 36% of treated water through leakage.

3.2 Article 4(7)(d) of the WFD requires that the objectives pursued cannot be achieved by significantly better environmental options that are technically feasible and not disproportionately costly. The project documentation does not present:

3.2.1 A quantified leakage elimination strategy;
3.2.2 A cost-benefit comparison between large-scale abstraction and network renewal;
3.2.3 A business case addressing the cost of treating water (coagulation, flocculation, chemical dosing, UV disinfection, pumping energy, infrastructure maintenance, all associated overheads and OPEX) which is subsequently lost to leakage;

3.2.4 An assessment of the carbon emissions associated with treating and pumping water that is never delivered to end users and how that impacts on Ireland's statutory obligations to reduce emissions. The application is substantial and any life cycle embodied carbon assessment report may have been missed, that contains this information but it could not be located.

3.3 This omission undermines compliance with Article 4(7)(d). It is prima facie irrational to abstract and treat additional raw water while continuing to permit a substantial proportion of treated water to leak into the subsurface environment. Any any grant of such a project without reasons and considerations that could possibly support same could be considered irrational in itself.

4. Environmental and Subsurface Impacts of Leakage in Dublin.

4.1 The decision to prioritise new abstraction rather than infrastructure renewal raises additional environmental concerns not addressed in the Environmental Impact Assessment Report or the NIS (if potential to impact on a NATURA2000) site or Annex species. Continuous leakage of treated water into urban subsurface environments may:

4.1.1 Alter groundwater regimes;
4.1.2 Cause soil saturation and frost heave in winter;
4.1.3 Contribute to subsidence beneath roads and buildings;
4.1.4 Increase risk of structural damage or sinkhole formation;
4.1.5 Modify chemical balances in urban soils due to residual disinfectants and treatment chemicals e.g. chlorine.

4.2 No assessment has been presented of cumulative subsurface impacts of chronic leakage, nor of

long-term urban hydrogeological consequences. Under Article 191(2) of the Treaty on the Functioning of the European Union (TFEU), EU environmental policy is based on the precautionary principle and the principle that preventive action should be taken. Continuing systemic leakage while expanding abstraction conflicts with both principles.

5. Climate and Carbon Implications

5.1 Directive (EU) 2020/2184 (Drinking Water Directive) emphasises resource efficiency and sustainable water management. Treating and pumping water that is subsequently lost through leakage has embedded carbon costs from:

5.1.1 Chemical production and transport;
5.1.2 Electricity consumption for pumping and UV treatment and operation;
5.1.3 Maintenance of treatment works;
5.1.4 Replacement and disposal of treatment media.

5.2 The above are just example and are not exhaustive. The documentation does not quantify lifecycle greenhouse gas emissions associated with the production of water that is never beneficially used. Under the Climate Action and Low Carbon Development Acts (2015–2021) and EU climate objectives, such omissions are material.

6. Habitats Directive and Cumulative Impacts

6.1 Article 6(3) of Directive 92/43/EEC requires that any plan or project likely to have a significant effect on a Natura 2000 site be subject to appropriate assessment.

6.2 Where hydrological modification may influence downstream SACs or SPAs, cumulative impacts must be considered. The CJEU in Case C-258/11 Sweetman and Case C-323/17 People Over Wind emphasised strict evidential standards and prohibition of mitigation assumptions at screening stage.

6.3 This section addresses the adequacy of the Natura Impact Statement ("NIS") prepared in support of the proposed abstraction from Parteen Basin on the Lower River Shannon and associated transfer infrastructure. It focuses on compliance with Article 6(3) of Council Directive 92/43/EEC ("Habitats Directive"), Directive 2009/147/EC ("Birds Directive"), and the interaction of those obligations with Directive 2000/60/EC ("Water Framework Directive" or "WFD").

6.4 While the NIS concludes that the Proposed Project will not adversely affect the integrity of any European site, that conclusion is not supported by complete, precise and definitive findings capable of removing all reasonable scientific doubt, as required by settled jurisprudence of the Court of Justice of the European Union ("CJEU"), including Case C-127/02 Waddenvereniging and Case C-258/11 Sweetman.

6.5 Failure to Properly Apply the Article 6(3) Integrity Test.

6.5.1 Article 6(3) requires that the competent authority may agree to a plan or project only after having ascertained that it will not adversely affect the integrity of the site concerned, in light of

its conservation objectives.

6.5.2 The integrity test is not satisfied by demonstrating that:

i) Water levels remain within historic operational bands;
ii) Physical hydraulic controls prevent large-scale drawdown;
iii) No "visible" change occurs in day-to-day water level management.

The legal test concerns the ability of the site to *maintain the ecological structure and functions necessary to sustain its qualifying interests at favourable conservation status.*

6.5.3 The NIS relies heavily on modelling of lake levels and flow pass-forward regimes, but does not clearly demonstrate how those physical metrics translate into ecological thresholds tied to conservation objectives for Annex I habitats and Annex II species.

6.5.4 There is no explicit demonstration of:

i) The flow regime thresholds necessary to sustain migratory fish populations (e.g., salmon, lamprey);

ii) Hydroperiod duration required to maintain alluvial forests, wet meadows, or floodplain habitats;

iii) Sediment transport dynamics necessary to maintain spawning substrates;

iv) Temperature and dissolved oxygen conditions under altered abstraction regimes during low-flow scenarios.

The absence of a clear linkage between model outputs and ecological tipping points creates residual scientific doubt. Under *Sweetman,* such doubt precludes a lawful finding of no adverse effect.

6.6 Reliance on Operational Management Measures as a Substitute for Ecological Assessment.

6.6.1 The NIS repeatedly references ESB operational management of Lough Derg and Parteen Basin within a "Normal Operating Band". The conclusion that hydrological effects will be negligible appears to depend materially on continued adaptive management of flows and generation regimes. Where the avoidance of adverse effect depends on ongoing operational adjustments, those measures constitute mitigation.

6.6.2 Under Case C-323/17 People Over Wind, mitigation measures cannot be relied upon to exclude likely significant effects at screening stage. At Appropriate Assessment stage, mitigation may be considered, but only where it is, Precisely defined, Scientifically certain, Fully secured, And demonstrably capable of eliminating adverse effects beyond reasonable scientific doubt.

6.6.3 The NIS does not demonstrate that maintenance within the Normal Operating Band ensures that conservation objectives for water-dependent SACs and SPAs will be achieved. Hydraulic containment does not equate to ecological protection. (it should be noted that the applicant

should identify any Natura2000 sites that do not yet have conservation objectives as there is a live case 'Power v. An Bord Pleanála)[2] awaiting a ruling as to whether the Commission is precluded from carrying out an Appropreiate Assessment without compliant conservation objectives in place.

6.6.4 Without a scientifically robust demonstration that operational flow management protects ecological function under all hydrological scenarios, the integrity conclusion is premature.

6.7 Inadequate Integration of Water Framework Directive Obligations.

6.7.1 Article 4(1)(c) of the Water Framework Directive requires Member States to achieve compliance with objectives for protected areas, including areas designated under the Habitats and Birds Directives where maintenance or improvement of water status is an important factor in their protection.

6.7.2 Water-dependent SACs and SPAs within the Lower River Shannon catchment are therefore WFD "protected areas" under Annex IV.The NIS does not clearly demonstrate that, these European sites were treated as WFD protected areas in the hydrological assessment or that the abstraction regime was tested against the requirement to maintain water status necessary for conservation objectives.

6.7.3 Was Deterioration of relevant quality elements was assessed at the level required by the CJEU in Case C-461/13 (Weser)? The assessment of water level change alone does not satisfy the obligation to prevent deterioration of relevant ecological or hydromorphological quality elements that underpin Natura conservation objectives.

6.7.4 The directives must be read coherently and holistically by the Commission. A failure to integrate WFD protected area obligations into the Appropriate Assessment undermines the lawfulness of the conclusion.

6.8 Hydrological Zone of Influence Artificially Constrained.

6.8.1 The NIS defines the abstraction Zone of Influence (ZoI) between Meelick Weir and Limerick Dock, based on hydraulic control points. However, hydrological influence in ecological terms is *not* confined to visible water level changes within a controlled envelope. Ecological effects may arise from:
- Altered flow variability;
-Modified seasonal drawdown patterns;
-Reduced magnitude or duration of natural flood pulses;
-Cumulative interaction with climate-induced low-flow periods.
-Significant changes in assimilate capacity of waterbodies due to pollution inputs (slurry spreading, wastewater) in wet or dry extreme weather periods and events.

6.8.2 The integrity of riverine and floodplain habitats, including SPAs dependent on seasonal

[2] https://www.mccannfitzgerald.com/knowledge/environmental-and-planning/cjeu-asked-if-stage-two-assessment-can-proceed-without-site-specific-conservation-objectives

inundation (e.g., River Shannon Callows SPA), is intrinsically linked to timing, duration and variability of flow.

6.8.3 The NIS does not clearly demonstrate that floodplain hydroperiod and ecological productivity remain unaffected under the abstraction regime, particularly under high-end climate change scenarios. A hydraulically defined ZoI is insufficient unless translated into ecological functional analysis. Further information and modelling is required.

6.9 In-Combination Effects and Climate Change.

6.9.1 Article 6(3) requires assessment of effects "individually or in combination with other plans or projects".The River Shannon system is already subject to, hydropower regulation; Agricultural nutrient pressures; Climate change-driven hydrological variability; Existing abstractions and wastewater and industrial discharges.

6.9.2 The NIS does not clearly demonstrate that cumulative pressures under future drought frequency scenarios will not interact with the proposed abstraction to produce adverse effects on qualifying interests. For instance where are the figures from monitored discharges points for primary sewer discharges and agglomeration sewage overflows triggers by adverse weather? How many Waste Water Treatments plants discharge into the Catchment system hydro logically linked to the development abstraction? How many licenses allow industrial discharges to the relevant catchment and what is the constitute contaminants and quantification of those discharges? Have they been fed into the model for worst case scenario weather events in the EIAR and NIS? In both regimes there is a requirement to assess 'worst case' not merely the average senario.

6.9.3 Where future climate conditions increase the frequency of low-flow events, abstraction impacts may become more ecologically significant than current baseline modelling suggests. Absent a robust cumulative ecological stress test, reasonable scientific doubt remains.

6.10 SPA Assessment Insufficiently Focused on Hydrological Function.

6.10.1 For SPAs dependent on riverine and floodplain habitats, the assessment appears focused primarily on disturbance buffers rather than on hydrological drivers of habitat condition. Bird species using callows and floodplain wetlands depend upon factors such as predictable seasonal inundation, invertebrate productivity linked to hydroperiod, shallow water margins.

6.10.2 The NIS does not clearly demonstrate that the abstraction will not alter the duration or timing of floodplain inundation in a manner capable of affecting Special Conservation Interests. Without explicit hydro-ecological analysis of SPA habitat function, the AA integrity conclusion lacks evidential foundation and retains scientific doubt. Where there is scientif doubt the burden is on the developer to remove it, the burden does not ship to the observer to prove an impact just to identify where scientific doubt exists, due to now evidence before the Comission to displace that doubt.

7. Environmental Liability and Risk Allocation

7.1 Directive 2004/35/EC on environmental liability establishes the "polluter pays" principle and imposes preventative obligations where environmental damage is threatened.

7.2 Expanding abstraction while tolerating known infrastructure leakage shifts environmental risk rather than preventing it. Preventive action under Article 5 of Directive 2004/35/EC requires operators to take necessary measures where there is an imminent threat of environmental damage. Failure to systematically address leakage may engage future liability considerations.

8. Precautionary Principle and Principle of Effectiveness

8.1 Article 191(2) TFEU enshrines the precautionary principle. Where scientific uncertainty exists regarding hydromorphological deterioration, chemical concentration shifts, or subsurface impacts, precaution requires that environmental protection take precedence.

8.2 The principle of effectiveness (effet utile) in EU law requires that directives achieve their intended practical effect. Approving large-scale abstraction while failing to require infrastructure renewal undermines the practical effectiveness of the WFD's resource protection objectives.

9. Conclusion.

The proposed project presents a significant risk of non-compliance with:

- Article 4(1), 4(7) and 4(8) of Directive 2000/60/EC;
- Article 6(3) of Directive 92/43/EEC;
- Directive 2004/35/EC;
- Directive (EU) 2020/2184;
-Article 191(2) TFEU.

The failure to prioritise leakage reduction, quantify treatment losses, assess carbon costs, and evaluate subsurface damage constitutes a material lacuna in the environmental assessments and in the Article 4(7) alternatives analysis.

Water is a finite strategic resource. Its conservation is fundamental not only to ecological integrity but to economic resilience and public health. The sustainable path forward requires investment in infrastructure efficiency, preventive action and basin integrity not expansion of abstraction while systemic waste persists.

Accordingly, it is submitted that the competent authority cannot lawfully grant consent absent:

I) A strict element-level WFD deterioration analysis;
II) A structured and transparent Article 4(7) assessment;
III) A quantified leakage elimination and infrastructure renewal strategy, which may in fact displace the need for the project.
IV) A lifecycle embedded carbon and treatment cost analysis;
V) A cumulative and basin-level compatibility review.

VI) Updated Hydrological modelling of relevant waterbodies and catchments.
VII) Precise data on wastewater and industrial discharges.
VII) updates to the EIAR, NIS and Water Framework Directive assessments.
VII) Submission of relevant, most up to date RBMP cycle catchment reports for all affected catchments.

This submission is made without prejudice to further detailed observations.

Yours Sincerely

Sabrina Joyce-Kemper

COMMON IMPLEMENTATION STRATEGY
FOR THE WATER FRAMEWORK DIRECTIVE
(2000/60/EC)



Guidance Document No. 37
Steps for defining and assessing ecological potential for improving comparability of Heavily Modified Water Bodies

Document endorsed by EU Water Directors at their meeting in Helsinki on 26 November 2019

Disclaimer:

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Foreword

This document is a deliverable of the CIS working group ECOSTAT. It was developed and drafted by a core-group of experts listed below, with the support of Eleftheria Kampa (Ecologic Institute) as consultant (Contract 07.0201/2018/779441/SER/ENV.C.I). It contains synthesis of the output of discussions that have taken place in the context of the working group ECOSTAT and of the Ad-hoc Task Group on Hydromorphology. It builds on the input and feedback from a wide range of experts and stakeholders that have been involved throughout the procedure of Guidance development through meetings, workshops, and written consultation, without binding them in any way to this content. It has been endorsed by the EU Water Directors at their meeting in Helsinki on 26 November 2019.

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EXECUTIVE SUMMARY

1. Review of designation and objectives needed in appropriate intervals (see section 1 and section 4)

- This CIS Guidance Document No. 37 proposes a common practical framework for defining Good Ecological Potential (GEP), as a main mechanism for assisting comparability of approaches between Member States. The focus is on updating and further refining approaches already being used (reference approach and mitigation measures approach), based on practical experience of their application by the Member States.
- The recommendations are based on a common understanding of the requirements of the WFD and good practice for implementation developed within the Common Implementation Strategy (CIS).
- The principles agreed under CIS Guidance No. 4 on the Identification and Designation of Heavily Modified and Artificial Water Bodies (HMWB and AWB) are still valid. Key aspects that should be considered in the designation of HMWBs are summarised in the present document to provide a clear context for defining Maximum and Good Ecological Potential (MEP and GEP).
- A proper review of all the designated HMWBs and their objectives is expected when preparing the River Basin Management Plan (RBMP) and Programme of Measures (PoM) for a new planning cycle. This review should be efficiently designed and performed to provide a proper HMWB designation according to the requirements of the WFD; it should also take into account monitoring outcomes, new modifications (e.g. new flood protection structures, hydropower plants, etc.), effects of implemented measures, emerging good practice on hydromorphological assessment methods and relevant mitigation measures as well as reconsidering the criteria for assessing significant adverse effects, where appropriate.
- GEP should be rechecked occasionally, as knowledge/expertise can increase and also economic aspects may change over time.

2. A more detailed step-wise framework for GEP (see section 5)

- A logical series of steps should be followed to determine GEP. In this document, a new flow-chart presents a step-wise framework for defining GEP and shows the two routes or approaches (reference approach and mitigation measures approach) to follow the framework. By following the steps included in the new flow chart (step-wise approach), a comparable outcome in ecological terms is expected.
- The steps included in the step-wise approach follow the requirements of the WFD. If, in following the routes through the framework, it is not possible to take all steps, relevant justification is therefore needed in the RBMP. Member States should make sure they can complete the remaining steps by improving data availability and knowledge on the links between hydromorphology and biology. In particular, improved monitoring data is crucial.
- To ensure comparability, a national, regional or basin-specific method for GEP definition has to be developed, although its application will be at water body level taking into account site-specific conditions.

3. Consideration of all relevant mitigation measures (see section 5)

- To identify **relevant mitigation measures** in a HMWB or series of heavily modified water bodies, the following issues are important:
    - the nature and extent of the physical modification(s) and their implications for the hydromorphological supporting elements,
    - if appropriate, physico-chemical supporting elements in the impacted water bodies need to be understood,
    - the consequent effects on the biological quality elements, and hence the measures that are needed to meet GEP.
- To define MEP, a wide range of potential mitigation measures should always be considered, and several measures are normally expected to mitigate modifications. To select best combinations of measures, the following needs to be evaluated:
    i) the relevance of measures in terms of the hydromorphological alteration(s) and physicochemical characteristics of the water body as well as in terms of other water body characteristics relevant to the biota (e.g. whether modification is within the fish zone/outside the fish zone, fish community types etc.),
    ii) the measures' ecological effectiveness and benefits in the specific context of the water body or water bodies (i.e. is measure appropriate for addressing the existing ecological impacts and can it deliver a proven ecological benefit),
    iii) whether or not the measures will have a significant adverse effect on use or the wider environment,
    iv) ensuring best approximation to ecological continuum, and
    v) the requirements of Article 4(8) for the achievement of objectives in other water bodies within the same river basin district.
- The criteria for **judgements on the significance** of any effects of measures on use or the wider environment should be clear, transparent, justified and set in a consistent way at the national, regional or local level. Decisions on when such adverse effects are significant are important, because they may affect the level of ambition of ecological improvements and intensity of measures.
- When assessing mitigation measures regarding their potential for a significant effect on use, differing intensities of a measure or combinations also have to be considered, as a lower intensity of a measure (e.g. a reduced amount of additional flow, or a smaller area of habitat enhanced) might still deliver a substantive benefit without having a significant adverse effect on the use in question.
- For defining GEP, measures are then excluded that, even in combination, are predicted to deliver only a slight ecological improvement. GEP is ultimately defined as the biological values that are expected to be achieved after successfully implementing the selected mitigation measures.
- In general, when defining GEP, the first option should be to optimise the conditions for the original natural water body type (if appropriate). If this is not possible, the alternative should be to optimise the conditions for the existing closest comparable natural water body type, or combinations of water body types.
- Combinations and site-specific adaptations of measures are necessary in many cases within a set of measures to ensure the best possible ecological improvement and approximation of ecological continuum.

4. Best approximation of ecological continuum (see section 5)

- Best approximation to ecological continuum (WFD Annex V 1.2.5) is a key aspect of ecological potential. Ecological continuum refers to movements of energy, material, and organisms within the aquatic ecosystem. Achieving ecological continuum ensures that the habitats for type-specific aquatic species are interconnected in space and time so that the species can fulfil their life cycles in self-sustaining populations.
- Measures implemented in this regard should be relevant for the closest comparable water body type and related quality elements. For example, if the modifications to a river make it more closely resemble a lake, the set of measures shall take this into account.
- The best approximation to ecological continuum requires consideration of all hydromorphological measures that could mitigate any obstacles to migration (of biota, sediment and water) and improve the quality, quantity and range of habitats affected by the physical modifications. This can include connectivity to groundwater and/or to riparian, shore and intertidal zones, as well as a sustainable supply of an appropriate sediment type. WFD emphasises both migration of biota and sediment transport. Priority should therefore be given to appropriate and effective measures reducing any obstacles that significantly inhibit longitudinal (both upstream and downstream) and lateral migration of aquatic biota and ensure appropriate sediment conditions. For achieving ecological continuum, it should also be considered whether there is an ecological benefit or a need to restore continuity in order to support upstream and downstream water bodies in achieving their environmental objectives (especially for migratory fish).
- "Best approximation" is interpreted as being as close as possible to undisturbed ecological continuum. MEP requires that best approximation to ecological continuum is ensured. A water body can only be at GEP if a condition close to best approximation is achieved. This is a prerequisite for the functioning of the ecosystem.

5. European mitigation measures library (see section 5)

- A consistent understanding of when the available measures are relevant is crucial, by linking drivers, pressures, impacts and ecological effects. To support this, a European 'library' of emerging good practice mitigation measures for HMWB has been set up for this CIS Guidance No. 37 (https://ec.europa.eu/environment/water/water-framework/facts_figures/guidance_docs_en.htm).
- This European library represents the emerging good practice especially for rivers and transitional and coastal (TraC) waters, while the library content on measures for lakes will need to be improved and updated based on further discussions in the future.
- The library describes the typical implications of different types of physical modification and suggests potentially relevant mitigation measures to address typical effects in each water category (rivers, lakes/reservoirs, transitional/coastal waters). The library includes key groups of mitigation measures, which are expected to be considered for ecological improvements in order to address certain modifications. Due to the Europe-wide nature of this library, it was not possible to produce fully comprehensive lists and some of the physical modifications or measures which are considered in the Member States may not be included. The library of mitigation measures is a living document and updates will be provided in regular intervals.
- When there is a lack of suitable biological assessment methods and/or data sensitive to modifications, the approach to the selection of mitigation measures should be more

precautionary and more measures may need to be considered until there is sufficient evidence to exclude measures from MEP and GEP.

- The assessment of hydromorphological conditions after having implemented all mitigation measures defined for GEP can be used as an intermediate tool until monitoring results of hydromorphology-sensitive biological assessment methods are available. Increased efforts are needed in many countries to establish appropriate biological monitoring and develop and apply hydromorphology-sensitive biological assessment methods.

6. Definition of GEP in quality elements terms and slight change (see section 5)

- Good ecological potential is defined in the WFD as an ecological state in which "there are slight changes in the values of the relevant biological quality elements as compared to the values found at maximum ecological potential" (WFD Annex V 1.2.5). With respect to "slight changes from MEP", HMWB should follow the same principles as natural water bodies, with a functioning ecosystem being a prerequisite for a water body to be at GEP.
- According to WFD Annex V 1.2.5, the values for the biological quality elements at MEP should reflect, "as far as possible, those associated with the closest comparable surface water body type, given the physical conditions which result from the artificial or heavily modified characteristics of the water body". Slight change cannot be equivalent to a complete/temporary absence or severe change of the biological quality elements relevant for the closest comparable water category and type (e.g. of fish for rivers within the fish zone).
- Slight changes to the biological quality elements have to be supported by corresponding conditions in the supporting quality elements (e.g. flow, habitats, continuity). With regard to ecological continuum, "slight change" means that a condition close to best approximation to ecological continuum should be ensured (instead of best approximation).
- Physico-chemical quality elements should also be defined in the GEP definition process. For physico-chemical parameters, the closest comparable water body type is in general the original natural water body type (before physical modification). For those physico-chemical parameters that are significantly modified by the hydromorphological alterations causing the heavily modified character, and that cannot be mitigated, other types should be considered (the closest comparable natural water body type, or combinations of water body types).

7. Implementation of measures to achieve GEP (see section 6)

- A clear distinction between the selection of measures needed to define and achieve GEP and the implementation of measures (objective setting in the RBMP) is crucial for more transparency and common understanding.
- To assess the effects of any mitigation measures already in place and the need for further mitigation measures, the ecological condition of the HMWB should be monitored. The main decisive elements are (apart from specific pollutants) the biological quality elements that determine the class of ecological potential. These are supported by hydromorphological and physico-chemical quality elements. If a proper assessment based on biological quality elements is not yet possible (e.g. due to a lack of hydromorphology-sensitive methods), monitoring of hydromorphological (and physico-chemical) quality elements can be used as proxy to estimate the effectiveness of the mitigation measures already in place and thereby the ecological potential class. If the classification of the ecological potential is not based on hydromorphology-

sensitive biological assessment methods, the classification result should include the information that the confidence level is low.

- If one or more of the selected GEP measures cannot be implemented due to disproportionate costs or infeasibility, it has to be checked whether the remaining measures are still sufficient to achieve the biological conditions at GEP. If this is not the case, a review and possibly re-design of the measures will be needed to avoid the need to use exemptions: for example, selecting another combination/intensity of measures may deliver the desired ecological improvement.
- If it is not possible to implement all the measures needed to achieve GEP, it will not be possible to reach GEP conditions and the water body will have to be classified as being at moderate potential or lower and would therefore need an exemption. Nevertheless, all the remaining measures would still have to be applied to improve/avoid deterioration of the conditions of the water body as far as possible.
- If monitoring shows that expected GEP conditions are not achieved after the implementation of all measures, it should be checked whether the reasons for not achieving GEP are linked to delayed biological responses to restoration, overestimation of the biological response or to other significant impacts (e.g. multiple pressures) and the measures may need to be refined accordingly, if appropriate. This requires that well-defined goals are set up as well as suitable methods for monitoring.
- Implementation of measures to achieve GEP should be seen as an iterative process.

8. Intercomparison of ecological potential (see section 7)

- As for natural water bodies, the requirement for intercalibration of HMWB (WFD Annex V 1.4.1) implies that there is a need to ensure GEP classification methods are set in compliance with the WFD, and that classification results are comparable between EU Member States.
- The step-wise approach and the mitigation measures library set out in this document should ensure a better common understanding and support the intercomparison of ecological potential.
- Comparability of classification results can be evaluated by analysing how Member States have addressed key steps of the procedure, especially:
    - Identification and assessment of hydromorphological impacts and alterations causing the failure to meet good status (from the designation phase) , distinguishing those related to the use
    - Identification and consideration of the full range of potentially relevant mitigation measures, then excluding measures with a significant adverse effect on use or the wider environment, in a transparent and consistent way
    - Definition of 'slight' changes for biological conditions and removal of measures only leading to "slight" changes as well as consideration of approximation to ecological continuum.

Abbreviations:

ATG	Ad-hoc Task Group
AWB	Artificial water body
BQE	Biological quality element
CIRCABC	Communication and Information Resource Centre for Administrations, Businesses and Citizens
CIS	Common Implementation Strategy
DPSIR	Driving forces, Pressures, State, Impacts, Responses
ECOSTAT	WFD CIS working group dedicated to the ecological status of surface water bodies
EQR	Ecological Quality Ratio
GEP	Good ecological potential
GES	Good ecological status
HMWB	Heavily modified water body
HPP	Hydropower plant
Hymo	Hydromorphology/Hydromorphological
MEP	Maximum ecological potential
MS	Member States
NWB	Natural water body
RBD	River Basin District
RBMP	River basin management plan
TraC	Transitional and coastal waters
PoM	Programme of Measures
QE	Quality element
SQE	Supporting quality element
WFD	Water Framework Directive
WISE	Water Information System for Europe
WG	Working Group

1 INTRODUCTION

Key messages for this section:

- The water directors have recognised the need for complementary guidance to CIS Guidance Document No. 4 and for further clarification of the procedure for defining GEP of HMWB. This is needed to ensure more comparability and consistent implementation of WFD principles relevant to hydromorphology, HMWB and class boundaries for good ecological potential.
- This CIS Guidance Document No.37 proposes a common practical framework for defining GEP, as a main mechanism for assisting comparability of approaches between Member States. The focus is on updating and further refining approaches already being used (reference approach and mitigation measures approach) based on practical experience of their application by the Member States.

1.1 A new Guidance Document No.37 on the ecological potential of heavily modified water bodies: What for?

This document aims at guiding experts and stakeholders in the implementation of Directive 2000/60/EC establishing a framework for Community action in the field of water policy, commonly referred to as the Water Framework Directive (WFD). The document focuses on the definition of good ecological potential (GEP) which is the environmental objective of heavily modified water bodies (HMWB). Member States can designate HMWB when the physical structure of water bodies has been heavily modified to serve various uses, e.g. navigation, flood protection, hydropower, and agriculture. In many cases, as acknowledged by the Directive, it is not viable nor desirable from a socio-economic perspective to abandon such uses and to remove the physical modifications which affect the water bodies, but still possibly further mitigate ecological effect thereof by measures.

The document further elaborates on the issues already outlined in CIS Guidance Document No.4 on the designation of HMWB and artificial water bodies (AWB) and on GEP setting, which was published in 2003. This new Guidance Document No.37, developed under the auspices of the WFD Common Implementation Strategy (CIS) process since 2016, is based on a more mature common understanding and emerging good practice on the designation of HMWB and GEP setting. This has further evolved since the publication of CIS Guidance No. 4 in 2003, as outlined in several CIS workshops and technical reports (see list of relevant CIS activities in section 1.2).

The definition of ecological potential has been a subject of long discussions between Member States and the Commission in the context of the CIS. Defining ecological potential is a challenging and complex subject in WFD implementation, and this new Guidance Document No.37 aims to provide complementary guidance and further clarification by taking into account the experience of Member States in designating HMWB and defining GEP during the 1st and 2nd river basin management planning cycles.

This additional guidance is intended to address:

- The need to provide clarifications to previously issued CIS guidance, namely CIS Guidance Document No.4.

- The need to review the designation of HMWB in every WFD planning cycle (for further information on this issue, please refer to section 4.2).
- The need to improve methods for GEP definition and to have a transparent and clear process for this aspect of the WFD.
- The need to take into account Member State experience gained so far on HMWB designation, definition of GEP and the use of hydromorphological assessment methods, which has been documented in numerous CIS technical documents and workshop agreements since 2003.
- The need to achieve intercomparison of HMWB, which is being supported by the principles put forward in this CIS Guidance Document No. 37. For further information on the intercomparison of HMWB, please refer to section 7 of this document.

This Guidance Document No.37 proposes a common practical framework for defining GEP, as a main mechanism for assisting comparability of approaches between Member States. The guidance focusses on updating and refining the existing CIS methods based on practical experience of their application by the Member States.

A comparable assessment of natural water bodies and HMWB is fundamental as a technical and legal basis for consistent, efficient and transparent river basin management. Both natural water bodies and HMWB have ambitious environmental objectives. Good ecological status in natural water bodies is based on deviation from reference conditions. HMWB are a specific water body category[1] with their own classification scheme and objective, GEP. GEP is based on deviation from maximum ecological potential (MEP) and requires the identification and consideration of measures to mitigate the effects of the physical modifications associated with the use so as to improve the overall environmental condition of the water bodies to ensure the best approximation of ecological continuum. GEP also takes account of judgements on the adverse effects of mitigation measures on use and site-specific characteristics of the local conditions, as described in this document. Therefore, the application of a common framework for defining GEP does not mean that all water bodies classified as at GEP will have an equivalent quality of aquatic ecosystem structure and function.

This CIS Guidance Document No. 37 sets out a transparent process for defining GEP in which the roles of technical and policy considerations are made clear, and which results in comparable levels of ambition for these water bodies. It is also important to keep in mind that HMWB are not a type of exemption. Exemptions from GEP under WFD Articles 4.4, 4.5, 4.6 and 4.7 may apply to HMWB in the same way as they apply to natural water bodies.

The recommendations in this CIS Guidance Document No.37 are based on the common understanding of the requirements of the WFD and good practice for implementation developed within the CIS. Member States are not legally required to follow the recommendations contained in this guidance. Member States are, however, required to use methods and approaches compliant with the requirements of the WFD.

The guidance is specifically addressed towards:

[1] Please refer to CIS Guidance Document No.36 which states that "Artificial and HMWBs are considered as a specific water body category with its own classification scheme and objectives" as well as CIS Guidance Document No.2 on the identification of water bodies with mention of four categories river, lake, transitional and coastal water. A HMWB can be one of these four water categories. It should be taken into account that when delineating water bodies, a water body is not allowed to consist of different categories and a HMWB cannot be mixed with natural categories.

- Water managers and river basin authorities developing river basin management plans.
- Authorities responsible for taking decisions on the review or the issuing of permits for activities or projects that might impact the hydromorphology of a water body/water bodies.
- Interested stakeholders and representatives from civil society organisations.

The main contents of this Guidance Document No. 37 are as follows:

- Section 2 discusses fundamental principles on the role of hydromorphology in WFD implementation.
- Section 3 explains the scope of the wider environment and human development activities which is one of the terms for designating water bodies as heavily modified.
- Section 4 reflects on key aspects of CIS Guidance Document No.4 for the process of designating HMWB and discusses key principles and issues to consider when reviewing the designation of HMWB in upcoming cycles.
- Section 5 proposes a step-by-step approach for defining MEP and GEP, building on previous approaches and methods discussed within the CIS process. It also introduces and describes how to use the European library of mitigation measures, which is included in a separate document supporting this guidance[2].
- Section 6 addresses the process for the implementation of measures to achieve good ecological potential for HMWB.
- Section 7 provides information on the intercomparison of HMWB.

The Annexes to this document include the following:

- Annex I: Illustrative case studies on the steps for defining ecological potential.
- Annex II: Example of Ditches as Artificial Water Bodies (on the use of mitigation measures to improve the ecological situation).
- Annex III: Glossary of key terms used in this CIS Guidance No.37.

Disclaimer on Good Ecological Potential for Artificial Water Bodies:

Good ecological potential is also the Directive's default objective for artificial water bodies (AWB). However, with the notable exception of the Netherlands, AWB tend to be far less numerous than heavily modified water bodies. The present document concentrates on the definition of GEP for HMWB. Generally, the procedure for setting GEP is comparable between AWB and HMWB, including the consideration of mitigation measures and adverse effects on use. Because AWB are developed with a specific function in mind, the criteria for adverse effects on use as a consequence of proposed mitigation measures are in many cases easily met.

However, there are also some clear differences between HMWB and AWB. AWB are created at a place where no water existed before, while HMWB are related to a formerly natural water body. Restoration measures required to achieve GES cannot be considered for AWB, because the concept of reference conditions does not apply. An AWB is created by human activity and this creation has (or has had) a clear purpose to serve a specified use, and this use usually is related to the ones referred in Article 4(3). An example is provided in Annex II on the use of mitigation measures to improve the ecological situation of ditches, which are designated as AWB in the Netherlands.

[2] Available at: https://ec.europa.eu/environment/water/water-framework/facts_figures/guidance_docs_en.htm

1.2 Overview of CIS activities relevant to HMWB and GEP

The implementation of the WFD raises a number of shared technical challenges for the Member States, the Commission, the Candidate and European Economic Area (EEA) Countries as well as stakeholders and Non Governmental Organisations (NGOs). In addition, many of the European river basins are international, crossing administrative and territorial borders and therefore a common understanding and approach is crucial to the successful and effective implementation of the Directive.

In order to address the challenges in a co-operative and coordinated way, the Member States, Norway and the Commission agreed on a Common Implementation Strategy (CIS). Since 2001, the activities delivered under the CIS have aimed towards a coherent and harmonious implementation of the WFD. The focus is on methodological questions related to a common understanding of the technical and scientific implications.

In this context a series of working groups and joint activities have been undertaken since 2001. One of the first working groups established within the CIS focussed on issues related to the provisional identification and designation of HMWB and AWB, including the definition of good ecological potential.

Since the development of the resulting CIS Guidance Document No. 4 "Identification and Designation of Heavily Modified and Artificial Water Bodies", a number of CIS workshops have led to key conclusions and recommendations for good practice related to hydromorphology issues, HMWB and ecological potential (workshop results available at CIRCABC).

In 2015, the Water Directors identified work on best practice and guidance on dealing with hydromorphology as one of three priority issues to be addressed through an ad- hoc task group (ATG) on hydromorphology. This ATG aims to ensure coordination of strategic hydromorphology issues aimed at a common understanding and harmonising environmental requirements in hydromorphologically-impacted water bodies.

Table 1 provides an overview on the main CIS activities and key CIS supportive documents relevant for HMWB and GEP since the adoption of the Directive. More detailed information can be obtained from the related documents.

Table 1: Overview CIS activities and key documents relevant to ensure common implementation of HMWB, hydromorphology and GEP according to WFD

When	Who	Output
2003	Water Directors	Guidance Document No. 4 "Identification and Designation of Heavily Modified and Artificial Water Bodies"
2005	CIS process	Summary report of workshop on WFD and hydromorphology. As a result, an alternative approach to defining good ecological potential based on mitigation measures was put forward (known also as the "Prague" approach)
2006	CIS process	Technical report on WFD and hydromorphological pressures
2007	Water Directors	Policy paper on WFD and hydromorphological pressures
2007	CIS process	Summary report of workshop on WFD and hydropower
2009	CIS process	Summary report of workshop on Heavily Modified Water Bodies
2011	Water Directors	Recommendations on assessing and improving comparability of Good Ecological Potential (GEP)
2011	CIS process	Issues Paper and Summary report of workshop on water management, WFD and hydropower

When	Who	Output
2014	CIS process	Proposal to establish a CIS Ad-hoc Task Group (ATG) on hydromorphology
2015	Water Directors	Guidance Document No. 31 "Ecological flows in the implementation of the Water Framework Directive"
2015	CIS process	Summary report of workshop hydromorphology and WFD classification
2016	Water Directors	WFD reporting guidance 2016
2016	CIS process	JRC report on common understanding of using mitigation measures for reaching Good Ecological Potential for HMWB – Part 1: Impacted by water storage
2017	CIS process	Summary report of workshop on GEP inter-comparison case studies on water storage
2017	CIS process	Summary report of workshop on mitigation measures and GEP for inland navigation water use
2018	CIS process	CIS reports on methods for river hydromorphological assessment and monitoring
2018	Water Directors	Guidance Document No. 36 "Exemptions to the environmental objectives according to Article 4(7)"
2018	CIS process	JRC report on common understanding of using mitigation measures for reaching Good Ecological Potential for HMWB – Part 2: Impacted by flood protection structures – Part 3: Impacted by drainage
2018	CIS process	Summary report of workshop on significant adverse effect on water use & wider environment
2018	CIS process	Summary report on hydromorphology of ECOSTAT classification workshop

Source: All documents are available on CIRCABC.

2 ROLE OF HYDROMORPHOLOGY IN WFD

Key messages for this section

- Supporting elements (hydromorphological and physico-chemical) provide the boundary conditions for the biological quality elements and any alteration in those can translate into a corresponding change of biological conditions at various time scales.
- The WFD defines ecological status as "an expression of quality of the structure and functioning of aquatic ecosystems associated with surface waters" (Art. 2. 21, WFD). Change in land use and other human activities have profound effects on hydromorphological processes, causing fragmentation and loss of habitats, with direct and indirect consequences for the structure and functioning of the aquatic ecosystem.
- Ecological status is defined in terms of all quality elements. Hydromorphological conditions are only explicitly described for the high status in WFD Annex V, corresponding totally or nearly totally to undisturbed conditions. For good and moderate status, hydromorphological conditions are defined as to be "consistent with the achievement of values specified for the biological elements". This implies there is a need for 5-class biological assessment methods sensitive to hydromorphological alterations. The development of such methods requires hydromorphological assessment methods that are able to reliably assess hydromorphological conditions along the full degradation gradient, from good to bad hydromorphological status.

Given the relevance of hydromorphological assessment in all the steps regarding HMWB designation and GEP definition, this introductory section deals with the role of hydromorphology in the WFD. This section also aims to improve the understanding of the differences between dealing with GES and GEP.

2.1 Overview

Hydromorphology is a term that is used to describe the hydrological and geomorphological characteristics (including continuity) of rivers, lakes, coastal, and transitional waters including the underlying processes from which they result. Water and sediments interact at different scales and shape the physical environment, determining physico-chemical processes and providing physical habitat for the biota.

Therefore, hydromorphological conditions are a key aspect of aquatic ecosystems and the WFD considers hydromorphological quality elements as "supporting" biology, together with the physico-chemical quality elements. The supporting elements provide the boundary conditions for the biological quality elements, and any alteration in those can translate into a corresponding change of biological conditions at various time scales.

The WFD defines ecological status as "an expression of quality of the structure and functioning of aquatic ecosystems associated with surface waters" (Art. 2. 21, WFD), classified in accordance with Annex V. Hydromorphological alterations are one of the most dominant reasons for failure to reach good ecological status in water bodies. Change in land use and other human activities have profound effects on hydromorphological processes, causing fragmentation and loss of habitats, with direct and indirect consequences for the structure and functioning of the aquatic ecosystem.

The hydromorphological quality elements for each water category are listed in Annex V, together with the relevant aspects to be considered (e.g. for rivers: conditions of flow regime, sediment transport, river morphology, lateral channel mobility and more in general continuity - i.e. longitudinal, vertical, lateral, which are expressed in terms of some aspects listed in Annex V).

WFD recognizes the fundamental role of hydromorphology in different steps and aspects of WFD implementation, as highlighted in Table 2 and summarised in the following paragraphs.

Table 2: Role of hydromorphology in different steps and aspects of WFD implementation

WFD stage	Consideration of hydromorphology	Articles	CIS Guidance
Water body delineation	Ensure uniform hydromorphological conditions within water bodies to allow sound delineation of water bodies.	Art. 5 Annex II	2
Risk analysis	Consider hydromorphological conditions in the analysis of pressures and their impacts	Art. 5 Annex II.1.4; 1.5	3
Monitoring strategies	Requirements to monitor the hydromorphological quality elements, focus on hydromorphological alterations and their effects on the BQEs in operational monitoring in water bodies at risk of failing the objectives because of	Art. 8; Annex V 1.3	7

WFD stage	Consideration of hydromorphology	Articles	CIS Guidance
	hydromorphology; design investigative monitoring of some specific hydromorphological aspect in more complex situations.		
Typology and Reference Conditions	Consider hydromorphological conditions in the definition of water body types. Consideration of unaltered hydromorphology in reference conditions	Annex II 1.1-3	5,10
Status assessment	Hydromorphological conditions and related biological response	Art. 4 Annex V	13
Design and implementation of measures	Measures to improve hydromorphological conditions	Art. 11.3 Annex VI	31
HMWB designation	Hydromorphological pressures and alteration	Art. 4.3.c	4
Ecological Potential assessment	Hydromorphological conditions, status and mitigation measures	Art. 4 Annex V	4,13
Exemptions	Deterioration of hydromorphological condition also to less than good should be predictable to fulfil Article 4.7 principles	Art. 4.4, 4.5, 4.6, 4.7	20,36

2.1.1 Characterization

Look out!

In the characterization phase, major catchment controls are considered (topography, geology, hydrology) to delineate water bodies and to define water body types – groups of water bodies sharing the same behaviour and character. Hydromorphological functions and features (e.g. energy, channel morphology, sediments) are key factors that need to be taken into account. **WFD typologies should reflect the natural variability in hydromorphological characteristics and processes**, which in turn will result in different reference values in those BQE methods that are sensitive to hydromorphological alterations (WFD CIS Guidance Documents No.2&10; Oslo, 2015).

It is important to ensure that hydromorphological conditions are sufficiently homogeneous within each water body when they are delineated. This can only be confirmed by applying a hydromorphological assessment method which can assess hydromorphological conditions along the full degradation gradient. The initial delineation of spatial units and their characterization are crucial, because they are the basis for all further steps and in particular for decisions on appropriate and effective measures. These measures are likely to turn out far more costly in the long term or even infeasible if delineation and characterisation are not taken into account thoroughly at the outset.

If the delineation of water bodies is based on a proper initial segmentation and categorization into hydromorphological types, the assessment of hydromorphological conditions will be much easier and significant. Defining water body types on a rigorous basis and also taking hydromorphological conditions into account allows like-with-like comparison and identification of the type-specific indicators that are meaningful for monitoring, assessment and for the design of measures.

2.1.2 Pressure and impacts and risk analysis

Hydromorphological pressures (e.g. abstractions, damming, etc.) and their impacts on the type-specific hydromorphological conditions and biological quality elements in water bodies need to be evaluated in the context of water body type. A preliminary classification is undertaken on the basis of the pressures on the different water bodies and the expectation with regard to the risk for BQEs to fail the environmental objectives. This risk assessment requires hydromorphological assessment methods that are able to predict the risk of not achieving good ecological status due to hydromorphological pressures (CIS Guidance Document No. 36).

2.1.3 Monitoring

WFD Annex V 1.3.1 requires the monitoring of parameters indicative of all hydromorphological quality elements for the surveillance monitoring.[3]

For water bodies at risk from significant hydromorphological pressures, Member States need to monitor parameters indicative of the hydromorphological quality elements most sensitive to the pressure identified.[4] Sufficient monitoring points are needed within a selection of the water bodies in order to assess the magnitude and impact of the hydromorphological pressures. The selection of water bodies must be indicative of the overall impact of the hydromorphological pressure to which all the water bodies are subject (Annex V 1.3.2).

Monitoring frequencies must be selected which take account of the variability in parameters resulting from both natural and anthropogenic condition. For hydrology, the WFD recommends a continuous monitoring. For morphology and continuity, recommended minimum frequencies are provided (Table 3). No recommendations are given for tidal regime in coastal and transitional waters.

Table 3: Assessment and minimum requirements for monitoring frequencies of hydromorphology for surface water bodies

Hydromorphological QE	River	Lake	Transitional	Coastal
Continuity	6 years	n.a.	n.a.	n.a.
Hydrology (rivers, lakes)	Continuous (daily)	1 month	n.a.	
Tidal regime (transitional, coastal)	n.a.	n.a.	No minimum requirement	No minimum requirement
Morphology	6 years	6 years	6 years	6 years

Notes: Derived from Annex V, 1.3.4. Guidelines for frequencies for monitoring surface waters for hydromorphological quality elements (for operational monitoring). As indicated in the table, the WFD requires

[3] Surveillance monitoring provides a general description and a representative picture of the water status in each water district or basin. The surveillance monitoring should also be used to assess long-term changes in natural conditions and of large-scale human impact.

[4] Operational monitoring is carried out in order to determine the status of the surface water bodies that are deemed to be at risk of failing to meet the environmental quality objectives set for the bodies under Article 4 and to follow up if the programs of measures put in place in order to achieve the desired effect and goals.

minimum monitoring frequencies for certain aspects but not for others ("n.a." stands for "not applicable"). In cases where no minimum monitoring frequency is required, there is still a need for determining the monitoring frequency based on natural variability. Considering these frequencies, it is possible to update monitoring data (e.g. morphology) for water bodies where changes are expected. If it can be assumed that no changes occurred since the last monitoring cycle, a new assessment is not obligatory.

2.1.4 Ecological status

The WFD considers hydromorphological quality elements as supporting elements for biota and aquatic ecosystems. Ecological status is defined in terms of all quality elements. Hydromorphological conditions are only explicitly described for high status in WFD Annex V, corresponding totally or nearly totally to undisturbed conditions (Table 4). For good and moderate status, hydromorphological conditions are defined as being "consistent with the achievement of values specified for the biological elements". This implies there is a need for 5-class biological assessment methods sensitive to hydromorphological alterations. The development of such methods **requires hydromorphological assessment methods that are able to reliably assess hydromorphological conditions along the full degradation gradient, from good to bad hydromorphological status**.

Table 4: Definition of high, good and moderate status for hydromorphological quality elements (WFD Annex V)

Element	High Status	Good Status	Moderate Status
General	There are no, or only very minor, anthropogenic alterations to the values of the physico-chemical and hydromorphological quality elements for the surface water body type from those normally associated with that type under undisturbed conditions. The values of the biological quality elements for the surface water body reflect those normally associated with that type under undisturbed conditions, and show no, or only very minor, evidence of distortion. These are the type-specific conditions and communities.	The values of the biological quality elements for the surface water body type show low levels of distortion resulting from human activity, but deviate only slightly from those normally associated with the surface water body type under undisturbed conditions.	The values of the biological quality elements for the surface water body type deviate moderately from those normally associated with the surface water body type under undisturbed conditions. The values show moderate signs of distortion resulting from human activity and are significantly more disturbed than under conditions of good status.
Hydrological regime (Rivers)	The quantity and dynamics of flow, and the resultant connection to groundwaters, reflect totally, or nearly totally, undisturbed conditions.	Conditions consistent with the achievement of the values specified above for the biological quality elements.	
Hydrological regime (Lakes)	The quantity and dynamics of flow, level, residence time, and the resultant to groundwaters, reflect totally of nearly totally undisturbed conditions	Conditions consistent with the achievement of the values specified above for the biological quality elements.	
River continuity	The continuity of the river is not disturbed by anthropogenic	Conditions consistent with the achievement of the values specified above for the biological quality elements.	

Element	High Status	Good Status	Moderate Status
	activities and allows undisturbed migration of aquatic organisms and sediment transport.		
Morphological conditions (Rivers)	Channel patterns, width and depth variations, flow velocities, substrate conditions and both the structure and condition of the riparian zones correspond totally or nearly totally to undisturbed conditions.	Conditions consistent with the achievement of the values specified above for the biological quality elements.	
Morphological conditions (Lakes)	Lake depth variation, quantity, and structure of the substrate, and both the structure and condition of the lake shore zone correspond totally or nearly totally to undisturbed conditions	Conditions consistent with the achievement of the values specified above for the biological quality elements	
Morphological conditions (Transitional)	Depth variations, substrate conditions, and both the structure and condition of the intertidal zones correspond totally or nearly totally to undisturbed conditions.	Conditions consistent with the achievement of the values specified above for the biological quality elements.	
Morphological conditions (Coastal)	The depth variation, structure and substrate of the coastal bed, and both the structure and condition of the inter-tidal zones correspond totally or nearly totally to the undisturbed conditions.	Conditions consistent with the achievement of the values specified above for the biological quality elements.	
Tidal regime (Transitional)	The freshwater flow regime corresponds totally or nearly totally to undisturbed conditions.	Conditions consistent with the achievement of the values specified above for the biological quality elements.	
Tidal regime (Coastal)	The freshwater flow regime and the direction and speed of dominant currents correspond totally or nearly totally to undisturbed conditions.	Conditions consistent with the achievement of the values specified above for the biological quality elements.	

Even if it may only be required for the classification of ecological status of water bodies in high status, the assessment of hydromorphological conditions is crucial for the management of all water bodies. Knowledge of hydromorphological conditions is required to develop and to predict effects of measures that aim to restore these conditions or to mitigate hydromorphological alterations. It is also required to forecast the risk and extent of deterioration in case of a new project leading to hydromorphological alterations (see also CIS Guidance Document No.36 on exemptions to the environmental objectives according to Article 4(7), which outlines practical considerations for the role of supporting elements). This also allows not only a better understanding of responses and the possibility to monitor the progress and efficiency of measures, but also the designation of HMWB, which requires the evaluation of the significance and permanence of modifications and the definition of ecological potential. This is not possible with a single qualitative 2-class method.

2.1.5 Reference conditions and typology

The ecological status of a water body is classified based on five classes (from high to bad) and is defined on the basis of the degree of deviation from the conditions that would occur if the water body had no or negligible pressures acting on it. Reference conditions describe this undisturbed or very slightly altered situation that is based on type-specific characteristics for all quality elements. This requires that hydromorphological conditions are properly considered in the definition of water body types, minimizing within-type variability at reference conditions.

2.1.6 Measures

According to WFD, in order to reach the environmental objectives, measures have to be designed and implemented. Article 11 lists the basic measures (minimum requirements) to be complied with and among them obligatory measures on water abstraction and impoundment (11.3.e) and measures to ensure that the hydromorphological conditions of the water bodies are consistent with the achievement of the required environmental objectives (11.3.i). In addition to the basic measures, other supplementary measures aimed to enhance hydromorphological conditions may be necessary (e.g. restoration, abstraction controls, rehabilitation projects – Annex VI part B). Such measures have to be listed in the RBMPs.

2.1.7 Exemptions

Hydromorphological conditions may be one of the reasons to delay reaching the environmental objective or to set a less stringent objective. Exemptions may then be agreed if the relevant conditions listed in Art. 4 are met. The justification for exemptions is based on the knowledge of nature and dynamic of the specific hydromorphological processes and, similarly to the stage of designing measures, it implies the prediction of hydromorphological conditions under certain management scenarios (e.g. Art. 4.7).

2.2 Hydromorphology in HMWB designation and assessment of ecological potential

By definition, a HMWB has undergone a substantial change in character as a result of physical modification due to sustainable human activity. Because of that, it cannot reach good ecological status and it is not possible to restore this without significant adverse effects on the use of the water body or the wider environment.

The change in character must be extensive enough to prevent the achievement of good ecological status. This requires assessment methods which are sensitive to hydromorphological alterations. Detection of such changes in character requires assessment through a full gradient hydromorphological method (CIS Guidance Document No.4, step 6), and proper consideration of the temporal dimension of processes.

The ecological conditions of a HMWB have to be monitored and assessed with respect to its environmental objective, namely good ecological potential (GEP). The whole procedure for defining GEP is outlined in section 5, including details on the selection of mitigation measures for GEP. Once a water body is designated as HMWB, there is a need to predict the effects of potential mitigation measures on BQEs sensitive to hydromorphological alterations; this requires hydromorphological

assessment methods able to predict such effects.[5] These hydromorphological assessment methods need to cover the full degradation gradient with respect to hydromorphological, physico-chemical and biological conditions related to the pressures behind HMWB designation.

If monitoring results (of BQEs or of supporting quality elements as proxy) show that the ecological potential is moderate or lower, mitigation measures have to be put in place to reach GEP. In the design of measures, hydromorphological processes need to be identified and actions to mitigate the hydromorphological impacts and restore ecological processes have to be planned.

Mitigation measures should aim to improve the quality and connectivity of habitats and enhance transfer of energy, material (water, sediments, etc.), and organisms (for rivers, this includes flow releases, sediment management, in-channel habitat enhancement, connection to floodplain and side branches, etc.).

3 WATER USES, WIDER ENVIRONMENT AND OTHER SUSTAINABLE HUMAN DEVELOPMENT ACTIVITIES

Key messages for this section

- Member States may designate water bodies as heavily modified only if measures for restoring the water body to good ecological status would have a significant adverse effect on (a) the benefits provided by the water body's use or (b) the wider environment.
- In principle, any water use or human development activity serving significant benefits to society may lead to designation if it causes a permanent physical modification, a substantial change in character of the water body and impacts on ecology which lead to failure to achieve good ecological status.
- Human development activities in the context of HMWB designation should be important and still ongoing sustainable activities according to WFD Article 4(3)(a), thus serving significant societal benefits and including provisions to minimise negative effects on the environment.

According to WFD Article 4(3)(a), Member States may designate a body of surface water as artificial or heavily modified when the changes to the hydromorphological characteristics of that body which would be necessary for achieving good ecological status would have significant adverse effects on:

i. The wider environment.
ii. Navigation, including port facilities, or recreation.
iii. Activities for the purpose of which the water is stored, such as drinking water supply, power generation or irrigation.
iv. Water regulation, flood protection, land drainage.
v. Other equally important sustainable human development activities.

[5] Such methods can be either simulations with morphodynamic or hydraulic models and then application of a hydromorphological assessment method or directly applying hydromorphological assessment methods to the different scenarios of measures (e.g. Morphological Impact Assessment System (miMaS), Morphological Quality Index (MQI)).

In the 1st cycle RBMPs, several human development activities (water uses) related to the designation of HMWB, such as water storage, flood defence and navigation, were clearly specified by the Member States and in line with Article 4.3(a) of the WFD. However, several other human development activities related to the designation of HMWB were not as clearly specified or not explicitly mentioned in Article 4(3), e.g. it was not clear whether agriculture refers to land drainage or other activities.[6] In addition, detailed reporting into WISE on the specific human activities (water uses) and physical modifications linked to the designation of each HMWB was not required in the 1st cycle RBMPs.

Important!

WFD Article 4(3)(a) provides a list of human development activities (specified water uses) which can be related to the designation of HMWB. In principle, any **water use or human development activity** serving significant benefits to society may lead to designation if it causes a permanent physical modification, a substantial change in character of the water body and impacts on ecology which lead to failure of achieving good ecological status.

It should be noted that in the context of HMWB designation under the WFD, the term "**physical**" refers to the "shape" of a water body, defined by morphology, e.g. channel pattern, continuity, and hydrology (e.g. amount of water in river/lake water bodies) or tidal regime (e.g. wave exposure in coastal/transitional water bodies). As stated in CIS Guidance Document No.4, for the provisional identification of HMWB, the failure to achieve good status results from physical modifications to the hydromorphological characteristics of a water body. It must not be due to other impacts, such as physico-chemical impacts, except if the physico-chemical impacts are directly linked to the physical modifications.

Despite this, it is noted that not every human development activity can automatically be used as a reason for designating HMWB. Human development activities in the context of HMWB designation should be important and still ongoing sustainable activities according to WFD Article 4(3)(a), thus serving significant societal benefits and including provisions to minimise negative effects on the environment. Key benefits related to the main human development activities (water uses) and the wider environment in the context of designation of water bodies as heavily modified have been outlined in the Summary Report of the Workshop on Significant Adverse Effects on Use or the Wider Environment from Measures.[7]

It is acknowledged, however, that many water bodies are designated as heavily modified due to uses that would not be considered as sustainable according to current sustainability principles. In these cases (and assuming that the use is still present and/or the modification is still required), sustainability should be interpreted according to principles applicable, knowledge available and societal benefits considered at that time when the use leading to physical modifications in the water body was initiated. For any physical modifications that have taken place after 2003, and for future new modifications, sustainability of use should be interpreted as described in CIS Guidance Document No.36 on exemptions under WFD Article 4(7) (section 3.3).

The application of WFD Article 4(3)(b) also ensures sustainability by assessing whether the beneficial objectives served by the modifications of the HMWB can be achieved by other means, which are a significantly better environmental option. The issues which should be considered when assessing

[6] See Key Conclusions. Heavily Modified Water Bodies: "Information Exchange on Designation, Assessment of Ecological Potential, Objective Setting and Measures". Common Implementation Strategy Workshop, Brussels, 12-13 March 2009.

[7] Kampa et al. (2018). Summary Report. Workshop on Significant Adverse Effects on Use or the Wider Environment from Measures, 23-24 April 2018, Brussels.

other means as better environmental options are illustrated in CIS Guidance Document No.4 (section 6.5.3), while examples on the assessment of other means as better environmental options are provided in the Toolbox (2003) on the identification and designation of AWB and HMWB. Section 5.3 of CIS Guidance Document No.36 also discusses how "significantly better" can be demonstrated.

The following explains the scope of wider environment and of the physical modifications linked to sustainable human development activities (uses) under WFD Article 4(3)(a), which is one of the criteria for designating water bodies as heavily modified, as these have been addressed in the context of CIS activities on hydromorphology in recent years:

- **The wider environment** refers to the natural and human environment including archaeology, heritage, landscape and geomorphology[8] (CIS Guidance Document No.4). Specific aspects which should be considered may include cultural heritage sites or assets (e.g. a sluice which no longer serves a water management purpose but is protected under heritage legislation), Natura 2000 sites and protected species, other nationally and locally important sites and wider biodiversity. For the purpose of designating HMWB, relevant aspects of the wider environment should be related to substantial changes in the hydromorphological character of a water body. Other aspects that are not linked to substantial changes in the hydromorphological character, such as informal recreation not requiring infrastructure (e.g. canoes, angling), may however be relevant later in the process, when determining whether mitigation measures for defining GEP will significantly affect the wider environment (see section 5.4.4.2 on significant adverse effects on use or wider environment).
- Physical modifications linked to **navigation** refer to man-made structures, such as port infrastructure, locks and physical modifications to water bodies, such as dredging, for commercial, recreational (e.g. sailing) and military navigation purposes. Navigation infrastructure enables in particular the transport of goods or passengers.[9]
- Physical modifications linked to **water storage** refer to larger structures (reservoirs due to dams) for impounding water for useful purposes, such as water supply (industry, drinking), flood protection, power generation or irrigation. However, water storage can occur also to serve a range of other benefits and/or uses, including industrial water supply, aquaculture, recreational uses and navigation.[10] Such structures may include abstraction intakes and dams in rivers or lakes/reservoirs for permanent longer term (days – interannual) storage of surface water.[11]
- Physical modifications linked to **flood defences** refer to all the structures aimed at preventing or reducing the detrimental effects of floods, including actions on vegetation and sediments. Floods are defined as "the temporary covering by water of land not normally covered by water". This includes floods from rivers, mountain torrents, Mediterranean ephemeral watercourses, and floods from the sea in coastal areas, and may exclude floods from sewerage systems.[12]

[8] Geomorphology in relation to wider environment can, for example, refer to special geomorphological protected areas.

[9] See Summary Report & Conclusions. Workshop on 'Significant adverse effects on use or the wider environment' of measures in the context of HMWB designation and GEP definition, 23-24 April 2018, Brussels.

[10] See Summary Report & Conclusions. Workshop on 'Significant adverse effects on use or the wider environment' of measures in the context of HMWB designation and GEP definition, 23-24 April 2018, Brussels.

[11] JRC Technical Report, Working Group ECOSTAT report on Common understanding of using mitigation measures for reaching Good Ecological Potential for heavily modified water bodies, Part 1: Impacted by water storage, 2016.

[12] Directive 2007/60/CE (Floods Directive), Article 2.

Flood defences represent hydromorphological pressures resulting from the use of flood protection. The focus of the CIS work was on pluvial and fluvial flood defences.[13] Flood defences may protect urban and agricultural areas, or important infrastructure leading to channelization, straightening of river plan form, bank and bed fixation, etc. As highlighted above, not every flood defence activity can automatically be used as reason for designating HMWB. It has to be proven that the flood defence activity is sustainable and the beneficial objectives cannot be achieved by other means, which are a significantly better environmental option. For example, flood defences for the protection of grazing land might not be automatically a valid reason for designation as HMWB.

- Physical modifications linked to **land drainage** refer to man-made structures or physical modifications (straightening, channelisation, using culverts) to water bodies to improve a specific land area for a certain purpose such as agriculture, forestry, urbanization, or tourism.[14] Drainage refers to a change in the drainage function, usually by removing excess water from the soil to lower groundwater level.
- Physical modifications linked to **water regulation** as used in Article 4(3)(a) of the WFD relate to all other uses described above, i.e. navigation, flood protection, water storage and land drainage.

WFD Article 4(3)(a) also refers to **other equally important sustainable human development activities**, which may include any other water use/sustainable human development activity which leads to a permanent physical modification, substantial change in character and such impact on ecology which leads to failure of achieving good ecological status. Examples of uses/activities which can be considered under "other equally important sustainable human development activities" are urbanization, commercial fishing, specific industries, mining or infrastructure such as highways and railways.[15]

Example: Due to the limited area for settlements in narrow valleys of the alpine area, railways or highways are often built directly along rivers. Flood protection measures (e.g. bank fixation, straightening) were implemented to safeguard from flooding. Those measures usually have led to a failure of good status. There is no option (no space) to improve habitat diversity and restore the type-specific hydromorphological conditions to achieve good ecological status by shifting the highway /railway away from the river.

Figure 1 presents the number of water bodies which have been designated as heavily modified in the 2nd RBMPs due to specific human development activities or the wider environment.

The most common uses for designating HMWBs in the second cycle RBMPs are hydropower (ca. 5800 water bodies) followed by flood protection (ca. 4500 water bodies), land drainage for agriculture (ca. 3500), urban/other (use other than drinking water supply) (ca. 2200), drinking water supply (ca. 1500) and irrigation for agriculture (ca. 1400). A large number of water bodies are designated as heavily

[13] JRC Technical Report, Working Group ECOSTAT report on Common understanding of using mitigation measures for reaching Good Ecological Potential for heavily modified water bodies, Part 2: Impacted by flood protection structures, 2018.

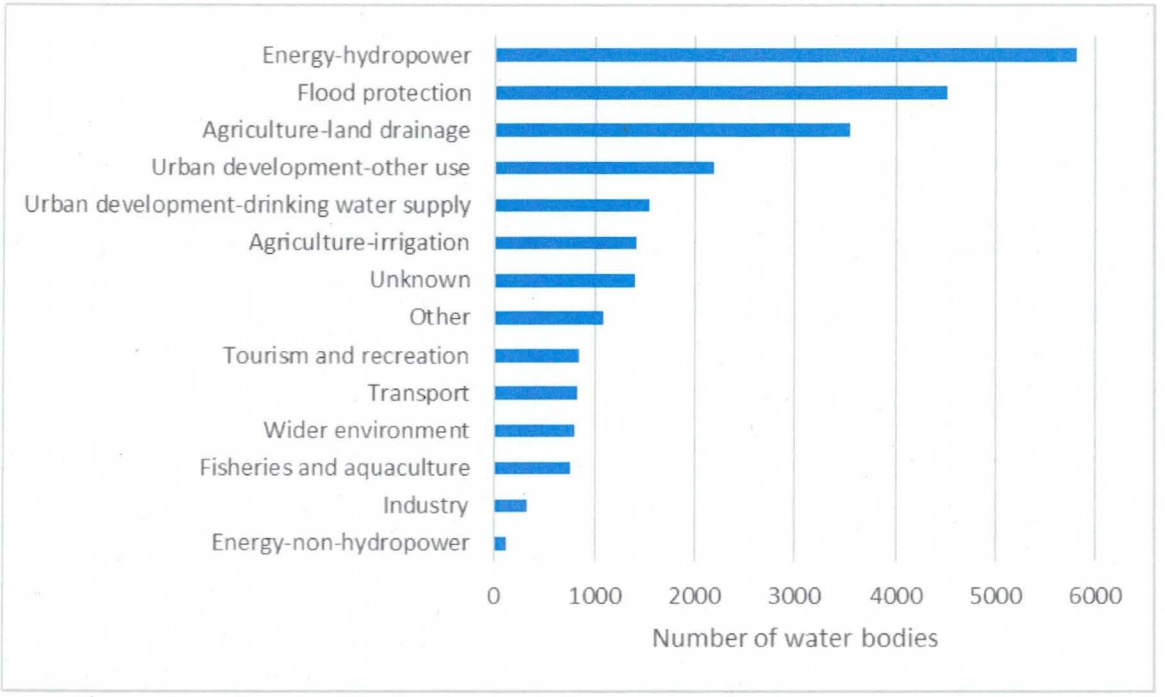
[14] JRC Technical Report, Working Group ECOSTAT report on Common understanding of using mitigation measures for reaching Good Ecological Potential for heavily modified water bodies, Part 3: Impacted by drainage, 2018.

[15] Kampa & Laaser (2009). Updated Discussion Paper. Heavily Modified Water Bodies: "Information Exchange on Designation, Assessment of Ecological Potential, Objective Setting and Measures". CIS Workshop, Brussels, 12-13 March 2009. Note: Information is based on the filled-in questionnaires of 24 European countries on HMWB designation in the first cycle RBMPs.

modified due to unknown activities (1400 water bodies) or other activities (1100) (i.e. activities which do not match any of the water use categories in the WISE reporting).

The percentage of HMWB in the second cycle RBMPs in Member States varies from 3% to approximately 50% of the total surface water bodies, with a European average of 13%.

Figure 1: Number of HMWB designated in the 2nd RBMPs due to specific human development activities or the wider environment



Source: WISE reporting 2016.

Notes: Data from https://www.eea.europa.eu/themes/water/european-waters/water-quality-and-water-assessment/water-assessments, 15 July 2019. Based on data reported for 26 Member States and Norway; no data are included for EL and LT .

It should be noted that a variety of different human activities (multiple uses) can depend on the same physical modification (e.g. a dam that serves energy production, flood protection and irrigation supply in a combined way). For this reason, many water bodies in the EU are designated as heavily modified due to more than one human activity. Section 5.4.4 in this document provides more information on the linkages between different types of physical modification, various human activities and relevant mitigation measures.

4 RE-CAPPING THE DESIGNATION OF HMWB

Key messages for this section

- HMWB designation should only be considered for water bodies that are substantially changed in character due to hydromorphological alterations linked to one or several specific sustainable uses (often due to specific European legislation - e.g. Floods Directive, Renewable Energy Directive etc.).
- Substantial changes in character must be extensive/widespread or profound. Typically this should involve substantial change to both the hydrology and morphology of the water body.
- If the morphology of a water body is substantially changed in character, then the changes are likely to be long-term. Such changes in morphology are very likely to result in changes in hydrology (not necessarily substantial).
- In cases of temporary, short-term and easily reversible substantial hydrological changes, the water body is not to be considered substantially changed in character. Substantial hydrological alterations may also result in long-term or permanent substantial changes in character when they have impacts on sediment dynamics and habitat conditions (morphology, turbidity etc.).
- Possible restoration measures to achieve good ecological status need to be identified and the reasons and criteria for judgements on significance of adverse effects of such measures on use or wider environment have to be made clear.
- HMWB are a specific water body category with their own classification scheme and objective, namely good ecological potential (GEP). Exemptions from GEP under WFD Articles 4.4, 4.5, 4.6 and 4.7 may apply to HMWB, as they apply to natural water bodies. Further, when setting the objectives for HMWB designated under Article 4(3), the requirements of Articles 4(8) and 4(9) must also be met.
- A proper review of all the designated HMWB and their objectives is expected in due time when preparing the RBMP and PoM for a new planning cycle. This review should be efficiently designed and performed to provide a proper HMWB designation according to the requirements of WFD Article 4.3 and Annex V, 1.2.5; it should also take account of monitoring outcomes, new modifications (e.g. new flood protection structures, hydropower plants, etc.) the effects of implemented measures, emerging good practice on hydromorphological assessment methods and relevant mitigation measures as well as reconsidering the criteria for assessing significant adverse effects, where appropriate.
- GEP should be rechecked occasionally, as knowledge/expertise can increase and also economic aspects may change over time.

This section re-caps the key aspects which should be considered in the designation of HMWB (see CIS Guidance Document No.4 for details) to provide a clear context for defining MEP and GEP. It also provides a reminder of the importance of reviewing the designation of HMWB and the set GEP in each new planning cycle, outlining a check-list of issues and questions recommended as a basis for such a review.

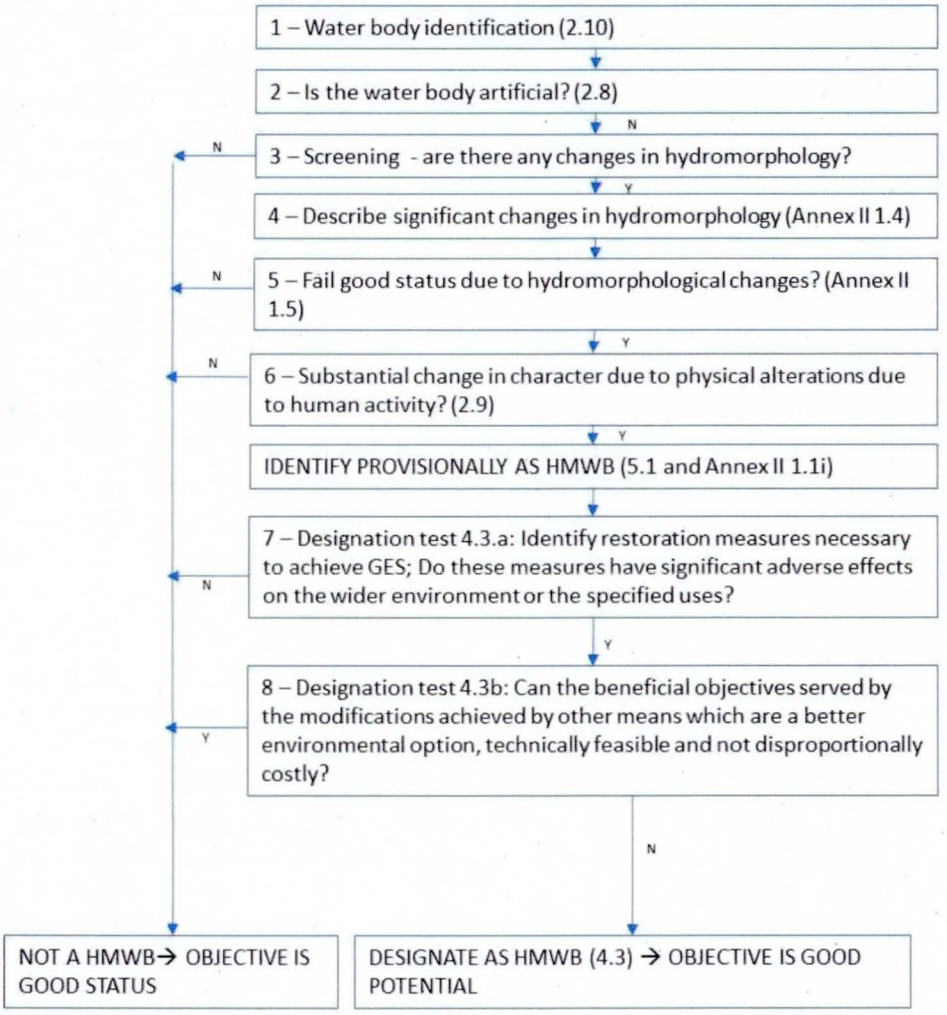
4.1 Recap of key issues relevant to the designation of HMWB

CIS Guidance Document No.4 on the Identification and Designation of Heavily Modified and Artificial Water Bodies presents the EU-wide common understanding for the designation of HMWB and AWB. The principles agreed under CIS Guidance Document No.4 are still valid, and the Guidance is being

used by Member States when preparing their river basin management plans. In both the first and the second RBMPs, heavily modified water bodies have been designated to a significant extent in Member States (on EU level, approximately 12-13% of total number of surface water bodies are HMWB and 4% are AWB)[16], reflecting the amount of modifications that have taken place historically in Europe.

CIS Guidance Document No.4 presented the key steps that should be followed to establish whether a water body may be designated as heavily modified or artificial (Figure 2). Steps 1 to 6 present the initial tests to provisionally identify a water body as heavily modified. Once potential HMWB have been identified, the key final designation tests under steps 7 and 8 should be carried out.

Figure 2: Key steps in HMWB designation (after characterisation and pressure analysis).



Note: Based on CIS Guidance Document No.4.

[16] European Commission (2019) Commission Staff Working Document, European Overview - River Basin Management Plans, Accompanying the document Report from the Commission to the European Parliament and the Council implementation of the Water Framework Directive (2000/60/EC) and the Floods Directive (2007/60/EC) Second River Basin Management Plans First Flood Risk Management Plans, SWD(2019) 30 final

Key aspects which should be considered in the designation of HMWB are recapped below to provide a clear setting for the next step of defining MEP and GEP for HMWB, which is now addressed in more detail in the present CIS Guidance Document No.37:

- **Water body identification:** It is crucial to ensure that hydromorphological conditions are sufficiently homogeneous within each water body.
- **Assessment of hydromorphological alterations:** The significant hydromorphological alterations causing the water body to fail good status need to be described. The "screening" of hydromorphological alterations as part of the provisional identification of HMWB is an important step (step 3 in Figure 2) for an efficient implementation of the WFD. It is possible to carry out broad-scale assessments of hydromorphological alterations, so that detailed assessment efforts are only concentrated on those water bodies where there is uncertainty or specific issues requiring further attention for possible designation as HMWB.
- **Substantial changes in character:** HMWB should be water bodies that have undergone significant hydromorphological alterations such that the water body is substantially changed in character (WFD Article 2(9)). The change in character must be extensive/widespread and profound. Typically, this should involve substantial change to both the hydrology and morphology of the water body (CIS Guidance Document No.4). Further guidance and examples on substantial changes to the morphology and hydrology are given in this section below. Suitable thresholds (e.g. percentage of river reach irreversibly affected) can be used to justify judgements on whether there are substantial changes in character and to ensure that significant modifications are not overlooked.
- **Proper assessment of ecological status:** The designation process needs to be based on a clear understanding of the expected failure of good status of biological quality elements due to hydromorphological alterations. Therefore, the proper assessment of ecological status is a prerequisite for HMWB designation. If GES is achievable, or if monitoring shows that GES has been reached since the previous review, designation as HMWB is not justified.
- **Assessment of significant adverse effects of restoration measures:** HMWB designation can only take place if the changes to the hydromorphological characteristics of that body which would be necessary for achieving GES would have significant adverse effects on use or the wider environment. Possible restoration measures to achieve GES need to be identified and Member States need to establish criteria and thresholds for deciding if these measures would have a significant (or not significant) effect on use. This is a key issue for achieving a clear and transparent process of designating HMWB.[17] Criteria need to reflect the effects on different benefits provided by the water use. Thus, not only one criterion may be considered but several criteria may need to be used.

  CIS Guidance Document No.4 gave different options for assessing significant adverse effects on different scales. Effects can be determined at the level of a water body, a group of water bodies, a region, a RBD or at national scale (CIS Guidance Document No.4). In the initial HMWB designation stage during the 1st RBMP cycle, the assessment of significant adverse effects normally took place at a regional or national scale. Detailed information on pressure-biological response relationships or administrative capacities for detailed feasibility studies were often missing at this stage. The assessment of significant adverse effects at a regional or national scale was a pragmatic approach, since there was generally no detailed project data available

[17] JRC technical report on common understanding of using mitigation measures for reaching Good Ecological Potential for heavily modified water bodies (2016).

in terms of restoration measures at the water body level in the 1st RBMP cycle. However, Member States should have collected such data in the subsequent RBMP cycle.

In this context, it has to be assessed whether the effect is important and to what extent it matters at a national or regional scale. For example, in case dam removal is needed to restore a water body to GES, or if a previously dredged channel is allowed to infill and behave naturally from a geomorphological perspective, the contribution of the modified water body to the regional or national economy could be lost or significantly reduced.

A significant adverse effect at local level may be insignificant in a regional or national context or vice versa. Overall, it is important to define at what level the main importance of the use lies (local, regional, national level or a combination). If the main importance of the use lies at national level, then local effects should be accumulated at national level to assess significance. In such a case, a single local effect will not necessarily be assessed as significant. In addition, the assessment at local scale should not be related to the private interest of one person/or company but to broader public interest.

The assessment of significant adverse effects of restoration measures is closely linked to the possible exclusion of mitigation measures with significant adverse effects when defining MEP/GEP. See section 5.4.4.2 of this document for further guidance on issues which should be addressed to achieve a transparent and clear process for assessing significant adverse effects of mitigation measures, including types of effects, consideration of socio-economic issues, scale of assessment and possible criteria.

- **Assessment of other means:** For HMWB designation, it must also be demonstrated and described that the beneficial objectives of the physical modifications cannot be achieved by other means, which are a significantly better environmental option, technically feasible and not disproportionately costly. For example, wind power can be taken as another means that can produce electricity instead of a hydropower plant. It has to be assessed whether this option would be technically feasible and not disproportionately costly. The better environmental option is assessed as being another renewable resource but might avoid damage leading to a failure of good ecological status.
- **Designation of HMWB is not a type of exemption**. HMWB are a specific water body category[18] with their own classification scheme and objective, namely good ecological potential (GEP). Exemptions from GEP under WFD Articles 4.4, 4.5, 4.6 and 4.7 may apply to HMWB, as they apply to natural water bodies. Further, when setting the objectives for HMWB designated under Article 4(3), the requirements of Articles 4(8) and 4(9) also should be met (see section 5 and section 6 for further information).
- The **methodology and specific criteria for HMWB designation** (application of all relevant steps according to CIS HMWB Guidance no. 4) **should be clearly explained in the RBMPs** or supplementary documents. It is recommended to include a reporting sheet for each water body in the RBMPs, which contains the information relevant for designation or non-designation as heavily modified, in order to increase transparency and to allow intercomparability.

Overall, the assessment of the first cycle RBMPs of Member States by the European Commission showed that the designation of HMWB has been based largely on expert judgement. The extent of designating water bodies as heavily modified and the transparency and/or availability of solid explanations for the implementation of the key steps of designation has been variable across Member

[18] See relevant explanatory footnote on "specific water body category" in section 1.1.

States.[19] Differences between Member States in the extent and manner of designation may be due to (among others):

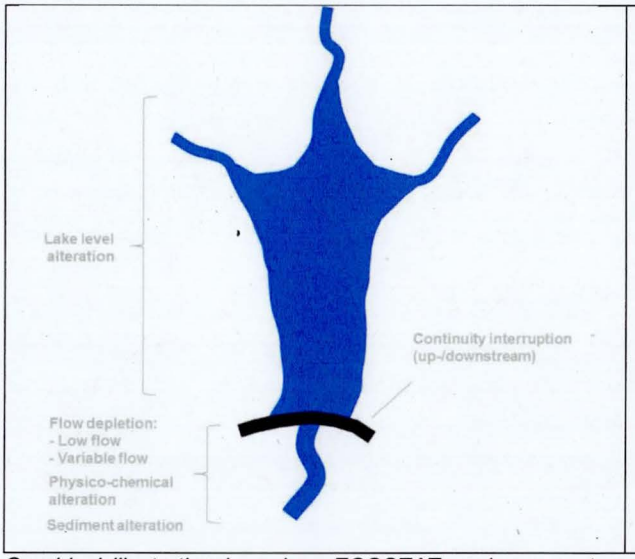
- Differences in population density, infrastructure density, intensity of use of water bodies,
- Differences in the thresholds used for identifying significant hydromorphological pressures (and thus interpreting substantial changes in character),
- Differences in the size of delineated water bodies,
- Differences in the spatial extent and type of impacts considered to be of sufficient magnitude to prevent achievement of good ecological status (and consideration of cumulative impacts or not),
- Differences in the designation methodologies applied (e.g. related to criteria on significant adverse effects of measures on use or wider environment),
- Availability of and experience with relevant mitigation and restoration measures (affecting ambition level for ecological improvements).

4.1.1 Substantial changes in character

According to CIS Guidance Document No.4, it is clear that a water body could be described as substantially changed in character if both its morphology and hydrology were subject to substantial changes (e.g. in the case of a water body downstream of a dammed river, whose morphology changes from braided to sinuous).

Example: Reservoirs with longer-term storage are usually clear cases of water bodies which are substantially changed in character both in their morphology and hydrology, even leading to a change in the closest comparable water category (from river to lake water bodies). Such water bodies are usually designated as HMWB (see **Box 1** below).

Box 1: Water body impacted by instream dam



The instream reservoir was built by damming a river. Below the dam, there is flow depletion (alterations to low flow, fish flow, variable flow). Such an instream reservoir is typical for storage purposes such as for drinking water. In case of hydropower use, the outlet of the turbines could cause additional impacts in the downstream reach, such as hydropeaking effects.
Such cases of instream reservoirs usually lead to a designation of the reservoir as heavily modified.

Graphical illustration based on ECOSTAT work on most common water storage situations for the GEP inter-comparison.

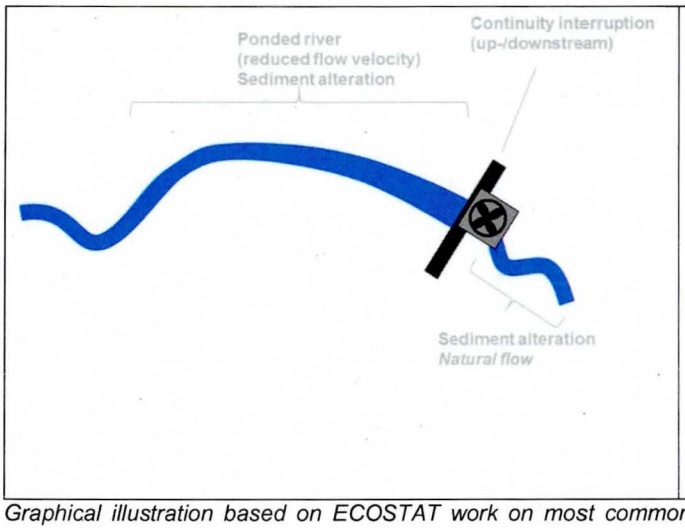
[19] Commission Staff Working Document 2012 WFD implementation (volume 2 of supporting material).

It is less clear-cut whether a water body should be considered as substantially changed in character if only morphology or only hydrology is substantially changed.

If the morphology of a water body is substantially changed in character, then the changes are likely to be long-term. Such changes in morphology are very likely to result in changes in hydrology (not necessarily substantial). A common sense approach would suggest that such water bodies should be considered as substantially changed in character (CIS Guidance Document No.4).

Example: Large impoundments definitely change morphological conditions of a river and therefore are also usually designated as HMWBs even without significantly changing the hydrological conditions (see Box 2 below).

Box 2: Water body impacted by significant ponding (impoundment)



In this case, the river is ponded by a dam, where hydropower turbines are situated in the dam (this type of run-of-river hydropower plant is usually called "in-stream plant type").
The dam leads to a significant ponding effect upstream (impoundment).
Downstream of the dam however there is the natural flow.
Such cases of impoundment usually lead to a designation of the water body upstream of the dam (ponded stretch) as heavily modified.

Graphical illustration based on ECOSTAT work on most common water storage situations for the GEP inter-comparison.

The situation is more diverse for water bodies subject to substantial changes in hydrology.

In cases of temporary, short-term and easily reversible substantial hydrological changes, the water body is not to be considered substantially changed in character. The water body should therefore be considered as natural, with good status as the environmental objective.

Substantial hydrological alterations may result in long-term or permanent substantial changes in character when they have impacts on sediment dynamics and habitat conditions (morphology, turbidity etc.). This happens when hydrological alterations affect the channel-forming discharges[20] and/or those discharges with higher return intervals. These are both relevant for sediment transport and the channel will undergo severe morphological alteration as a result. In other words, the interventions would cut the high flow peaks which promote sediment transport and the shaping of the channel. Such effects are typically associated with some dams for flood attenuation, water abstractions, spillways, retention basins, etc. Alteration of low flows does not generally promote morphological changes; nevertheless,

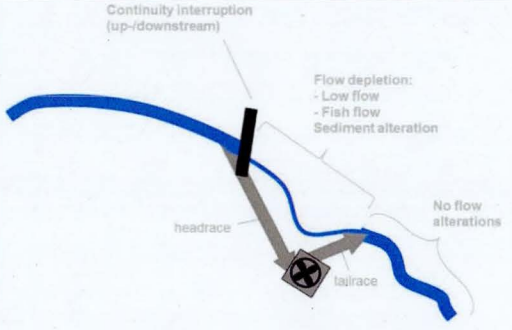
[20] Channel forming discharges are intended as those discharges having the most relevant effects on channel morphology. They correspond to those peak discharges, under natural conditions, with return period of few years (1,5 to 10 according to the specific hydrological regime and river type).

there are some exceptions, e.g. flow releases downstream of dams in rivers characterized by a typical Mediterranean hydrological regime (i.e. high flow variability and low or null water level during the summer). The release of constant flow (usually a minimum flow) during the summer, in such rivers which naturally would have little or no flow, raises the water table, promoting severe vegetation encroachment and consequent channel narrowing. In such specific cases, the application of the HMWB designation tests may be justified.

Water bodies affected by non-storage abstractions (e.g. small-capacity hydropower plants, small-scale irrigation abstractions) are in general not HMWB, because the change in hydromorphology is in most cases not large enough to cause a substantial change in character, e.g. the peak channel-forming discharge[21] is not totally eliminated by the abstraction. In small-capacity hydropower plants, there is often water abstraction to produce electricity but usually no or relatively small water storage with an impounding effect on the water body. The water abstraction will reduce the flow of the downstream stretch, but does not usually cause such a morphological change that causes a substantial change in the character of the water body; thus, the alteration is technically easily reversible by introducing more water into the depleted river reach.

Example: A small-capacity hydropower plant without water storage not causing a change in character and therefore not leading to HMWB designation is shown in Box 3 below.

Box 3: Water body impacted by abstraction without significant ponding/storage



Water is abstracted from the river by a transversal structure (usually a weir). The abstracted water is transferred "via headrace" to a powerhouse. After passing through the turbine, the water is re-discharged "via a tailrace" into the river from which the water was abstracted. Downstream of the discharge point there is the normal quantity of flow, but between the abstraction and discharge points the river is characterised by flow depletion (alterations of low flow, fish flow, variable flow). The weir at the abstraction point does not lead to a significant ponding effect. There is thus no significant storage or water retention. The abstraction still allows channel-forming discharges in high-flow situations. This situation is typical for most of the small hydropower plants (e.g. Alps). This case does not lead to a designation of the water body as heavily modified, as the water abstraction alone does not lead to such a morphological change that causes a substantial change in character; the alteration from the water abstraction is technically easily reversible to restore GES by providing an eflow.

[21] See previous footnote on channel forming discharges.

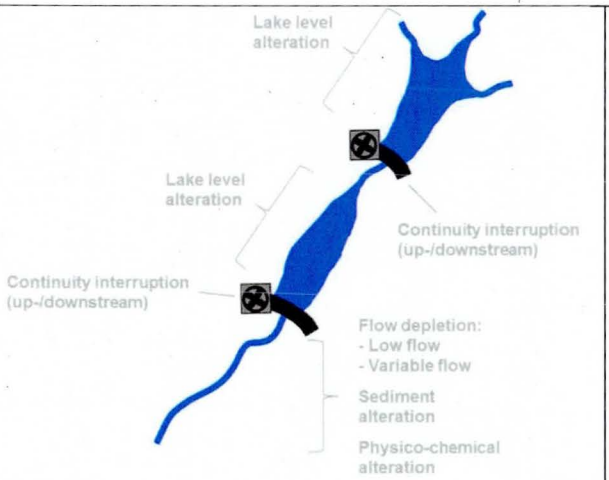
Graphical illustration based on ECOSTAT work on most common water storage situations for the GEP inter-comparison.

In general, the flow depleted reaches downstream of dams/reservoirs are sediment starved and undergo hydrological alteration. The severity of these alterations depends the way the reservoir is managed (according to its use). If the downstream reach is soon fed with water and sediments by close tributaries, it can regain its pseudo-natural character and therefore still reach the good status. Otherwise, the reach is likely to be changed in character, and the application of HMWB test is suggested.

In complex schemes (e.g. chains of reservoirs), the situation is such that the HMWB in the scheme affect the potential natural character and objectives of smaller water bodies, which may undergo the HMWB test as well.

Example: Box 4 shows an example where substantial hydrological alterations in a river stretch downstream of a chain of reservoirs can lead to changes in morphology and thus to designation as HMWB.

Box 4: Water bodies impacted by a chain of reservoirs



Several instream reservoirs were built by damming a river in different stretches. The reservoirs are clearly heavily modified and a change in category (from river to lake). Below the dams, there is a free-flowing river stretch with flow depletion (alterations of low flow, fish flow, variable flow) and sediment alteration. If such a chain of instream reservoirs severely alters conditions downstream leading to a severe change in character, the downstream water body should also be designated as heavily modified.

4.2 Review of HMWB designation in the river basin management planning cycles

The need to review the HMWB designation as well as the GEP setting for the designated water bodies every six years is stated in the WFD and CIS Guidance Document No.4. The identification and designation of HMWB is not a "one-off" process and the WFD provides for the flexibility to modify designations to take account of changes over time in environmental, social and economic circumstances. HMWB and GEP can also be modified as their environmental objective require adaptations as a result of new knowledge gained as well as a result of measures applied during a planning cycle. New or more detailed information (e.g. on economic aspects) or new projects which are exempted from the non-deterioration principle according to WFD Article 4.7 can also lead to new designations of HMWB in the forthcoming RBMP cycle.

The review of HMWB should include several steps as stated in CIS Guidance Document No.4 (Chapter 8). These are illustrated in Table 5, which presents an updated check-list and questions for clarification, which are recommended as a basis for the review of HMWB and GEP setting by Member States for the next planning cycles. More updated guidance for many of these steps is given in other sections of this new CIS Guidance Document No.37.

Table 5. Updated steps for the review of HMWB designation and GEP setting for the next planning cycles

Step			Explanation/questions to clarify	More guidance/examples
Step A.1	A. Review characterisation	Updated monitoring, hydromorphological assessment and BQE assessment	Does a more compliant hydromorphological assessment or monitoring program or implementation of new BQE assessment methods now have a better link to hydromorphological alterations and BQEs? Do updated assessments show that the water body is actually reaching good status?	CIS Workshop on river hydromorphological assessment methods, Nov 2017
Step A.2		Re-delineate water bodies	Do you need to re-delineate either by splitting or merging water bodies?	
Step B.1	B. Re-designation test	i. WBs mistakenly not designated previously	Are modifications more severely impacting aquatic ecology than previously expected?	
Step B.2		ii. New modifications	Have new activities that heavily impact the water body taken place (following the requirements of WFD Article 4.7)?	Art 4.7 CIS Guidance
Step B.3		iii. Reconsiderations of designation – updated screening for changes	*See the following substeps below*	CIS Workshop on significant adverse effect upon use/wider environment
Step B.3a		a) Technical circumstances or use itself	Have the operation, maintenance or need for the modification related to the sustainable water use or the wider environment been significantly changed during the previous planning cycle?	
Step B.3b		b) Available restoration measures	Have national criteria for adverse effects on relevant use, benefits or wider environment been established/changed, so that modification may be restored?	
Step B.3c		c) Methodological approach	Do methodological modifications (due to development of monitoring and better understanding) modify designation results?	
Step B.3d		d) Other means	Can the beneficial objectives of the use be delivered by other means?	
Step C.1	C. Review of MEP and GEP	Adopt BQEs sensitive to hydromorphological alterations	Taking on board emerging good practice on BQEs sensitive to the relevant hydromorphological alterations	
Step C.2		Reference value for MEP and GEP	Review if still only a slight deviation from MEP is valid?	
Step C.3		Identification of available mitigation measures	Could ambition level for GEP be increased, if more of the ecological impacts are possible to mitigate by "new" measures not previously considered/available?	See lists of common mitigation measures in the library provided as supporting tool to this document
Step C.4		Achievement of GEP or exemption	Is GEP being achieved, taking into account the need to ensure an approximation to ecological continuum, after implementation of available measures?	See section 5

5 STEPS FOR DEFINITION OF ECOLOGICAL POTENTIAL

Key messages for this section

Best approximation of ecological continuum

- Best approximation of ecological continuum is a key aspect of ecological potential. Ecological continuum refers to movements of energy, material, and organisms within the aquatic ecosystem. Achieving ecological continuum ensures that the habitats for type-specific aquatic species are interconnected in space and time so that the species can fulfil their life cycles in self-sustaining populations.
- Measures implemented in this regard should be relevant for the closest comparable water body type and related quality elements. For example, if the modifications to a river make it more closely resemble a lake, the set of measures shall take this into account.
- The best approximation of ecological continuum requires consideration of all hydromorphological measures that could mitigate any obstacles to movement of biota, sediment and water and improve the quality, quantity and range of habitats affected by the physical modifications. This can include connectivity to groundwater and/or to riparian, shore and intertidal zones, as well as a sustainable supply of an appropriate sediment type. WFD emphasises both migration of biota and sediment transport. Priority should therefore be given to appropriate and effective measures reducing any obstacles that significantly inhibit longitudinal (both upstream and downstream) and lateral migration of aquatic biota and ensure appropriate sediment conditions. For achieving ecological continuum, it should also be considered whether there is an ecological benefit or a need to restore continuity in order to support upstream and downstream water bodies in achieving their environmental objectives (especially for migratory fish).
- "Best approximation" is interpreted as being as close as possible to undisturbed ecological continuum. MEP requires that best approximation to ecological continuum is ensured. A water body can only be at GEP if a condition close to best approximation is achieved. This is a prerequisite for the functioning of the ecosystem.

A more detailed step-wise framework for GEP

- Determining GEP should follow a logical series of steps. In this document, a new flow-chart presents a step-wise framework for defining GEP and shows the two routes or approaches (reference and mitigation measures approach) to follow this framework.
- By following the steps included in the new flow chart (step-wise approach), a comparable outcome in ecological terms is expected. The steps included in the step-wise approach follow the requirements of the WFD. If, in following the routes through the framework, it is not possible to take all steps, relevant justification is therefore needed in the RBMP. Member States should make sure they can complete the remaining steps by improving data availability and knowledge on the links between hydromorphology and biology. In particular, improved monitoring data is crucial.
- To ensure comparability, a national, regional or basin-specific method for GEP definition has to be developed, although its application will be at water body level taking into account site-specific conditions.

Consideration of all relevant mitigation measures

- The following issues are important for identifying relevant mitigation measures in a HMWB or series of heavily modified water bodies:
  - the nature and extent of the physical modification(s) and their implications for the hydromorphological and, if appropriate, physico-chemical supporting elements in the impacted water bodies need to be understood.
  - the consequent effects on the biological quality elements, and hence the measures that are needed to meet GEP.
- A wide range of potential mitigation measures should always be considered when defining MEP, and several measures are normally expected to mitigate modifications. To select the best combination of measures, the following needs to be evaluated:
  - i) the relevance of measures in terms of the hydromorphological alteration(s) and physicochemical characteristics of the water body as well as other water body characteristics relevant to the biota (e.g. whether modification is within the fish zone/outside the fish zone, fish community types, etc.).
  - ii) the measures' ecological effectiveness and benefits in the specific context of the water body or water bodies (i.e. is measure appropriate for addressing the existing ecological impacts and can it deliver a proven ecological benefit).
  - iii) whether or not the measures will have a significant adverse effect on use or the wider environment.
  - iv) ensuring best approximation to ecological continuum.
  - v) the requirements of Article 4(8) for the achievement of objectives in other water bodies within the same river basin district.
- When assessing mitigation measures regarding their potential for a significant effect on use, differing intensities of a measure or combinations also have to be considered, as a lower intensity of a measure (e.g. a reduced amount of additional flow, or a smaller area of habitat enhanced) might still deliver a substantive benefit without having a significant adverse effect on the use in question.
- The mitigation measures selected for MEP exclude measures that have significant adverse effects on use or the wider environment. The criteria for judgements on the significance of any effects of measures on use or the wider environment should be clear, transparent, justified and set in a consistent way at the national, regional or local level. Decisions on when such adverse effects are significant are important, because they may affect the level of ambition of ecological improvements and intensity of measures.
- For defining GEP, measures are then excluded that, even in combination, are predicted to deliver only a slight ecological improvement. GEP is ultimately defined as the biological values that are expected from successfully implementing the selected mitigation measures.
- Combinations and site-specific adaptations of measures are necessary in many cases within a set of measures to ensure the best possible ecological improvement and approximation of ecological continuum.

European mitigation measures library

- A consistent understanding of when the available measures are relevant is crucial, by linking drivers, pressures, impacts and ecological effects. To support this, a European 'library' of emerging good practice mitigation measures for HMWBs has been set up for this CIS Guidance Document No.37.

- This European library represents the emerging good practice especially for rivers and TraC waters, while the library content on measures for lakes will need to be improved and updated based on further discussions in the future).[22]
- The library describes the typical implications of different types of physical modification and suggests potentially relevant mitigation measures to address typical effects in each water body category. The library includes key groups of mitigation measures, which are expected to be considered for ecological improvements in order to address certain modifications. The groups of measures are further elaborated with examples of specific practical measures included in these groups. Member States should consider a wide range of potentially available measures to deliver the needed ecological improvements.
- When there is a lack of suitable biological data assessment methods and/or data sensitive to modifications, the approach to the selection of mitigation measures should be more precautionary and more measures may need to be considered until there is sufficient evidence to exclude measures from MEP and GEP. The assessment of hydromorphological conditions after having implemented all mitigation measures defined for GEP can be used as an intermediate tool until monitoring results of hydromorphology-sensitive biological assessment methods are available. Increased efforts are needed in many countries to establish appropriate biological monitoring and develop and apply hydromorphology-sensitive biological assessment methods to increase the confidence level of monitoring results and classification.

Definition of GEP in biological terms

- Good ecological potential is defined as an ecological state in which "there are slight changes in the values of the relevant biological quality elements as compared to the values found at maximum ecological potential" (WFD Annex V 1.2.5). With respect to "slight changes", HMWB should follow the same principles as natural water bodies, with a functioning ecosystem being a prerequisite for a water body to be at GEP.
- Slight change cannot be equivalent to a complete/temporary absence or severe change of the biological quality elements relevant for the closest comparable water category and type (e.g. of fish for rivers within the fish zone).
- Slight changes to the biological quality elements have to be supported by corresponding conditions in the supporting quality elements (e.g. flow, habitats, continuity). With regard to ecological continuum, "slight change" means that a condition close to the best approximation of ecological continuum should be ensured (instead of best approximation) .
- Physico-chemical quality elements should also be defined in the GEP definition process. For physico-chemical parameters, the closest comparable water body type is in general the original natural water body type (before physical modification). For those physico-chemical parameters that are significantly modified by the hydromorphological alterations causing the heavily modified character, and that cannot be mitigated, other types should be considered (the closest comparable natural water body type, or combinations of water body types).

[22] The document "GEP_mitigation_measures_library.xlsx" presents a European library of mitigation measures for defining MEP and GEP, it can be accessed online (https://ec.europa.eu/environment/water/water-framework/facts_figures/guidance_docs_en.htm) and is a supporting tool to this CIS Guidance No. 37.

Section 5.3 gives an overview, and section 5.4 describes the step-by-step process for defining MEP, GEP, and thereby also less than good potential in detail. Prior to this, it is crucial to have completed a proper review of the designation-tests (see section 4.2).

The environmental objective of HMWB, i.e. GEP, has to be defined by linking biological, hydromorphological and physico-chemical conditions. As described further below, ensuring approximation to ecological continuum is one of the key aspects; more details on this are provided in section 5.2 below.

The definition of MEP and GEP is also the starting point for classifying the ecological potential of a specific HMWB into a class, corresponding to its current condition.

5.1 Approaches for defining ecological potential in 1st & 2nd RBMPs

The "CIS reference approach" and the "mitigation measures approach" (so called "Prague method") are relevant options for defining ecological potential (Kampa and Kranz, 2005)[23] as GEP is established with reference to ecological targets and functionalities in both cases:

- **Reference approach (based on the CIS Guidance Document No.4):** This approach is based on biological quality elements as illustrated in CIS Guidance Document No.4. The MEP for HMWB relates to the values of biological quality elements which are expected to be achieved after implementation of all mitigation measures, which are relevant to the particular hydromorphological alterations, are ecologically effective in the physical context of the water body and do not have a significant adverse effect on use or wider environment. GEP is defined as only slight change from those biological values at MEP.

- **Mitigation measures approach (alternative or Prague approach):** The mitigation measures approach was agreed at the CIS workshop on Hydromorphology in 2005 as an alternative method for defining GEP (Kampa and Kranz, 2005). The mitigation measures approach[24] takes a different route compared to the reference approach and bases the definition of GEP on mitigation measures. Starting from assumed measures, which are relevant to the particular hydromorphological alterations and ecologically effective in the physical context of the water body and do not have a significant adverse effect on use or wider environment, it defines MEP in the same way as the reference approach. Based on this set of mitigation measures, those measures are excluded that, even in combination, are predicted to deliver only slight ecological improvement. GEP is then defined as the biological values that are expected from implementing the remaining identified mitigation measures.

Both approaches (reference approach and mitigation measures approach) require the definition of BQE conditions for GEP. Both approaches for GEP definition (reference approach, mitigation measures approach or combinations of the two approaches) should be drivers for best respectively as close as possible approximation of ecological continuum (see section 5.2) and thus ecological improvement and

[23] Kampa, E. and N. Kranz 2005. Workshop "WFD & Hydromorphology", 17-19 October 2005, Prague. CIS Summary Report.

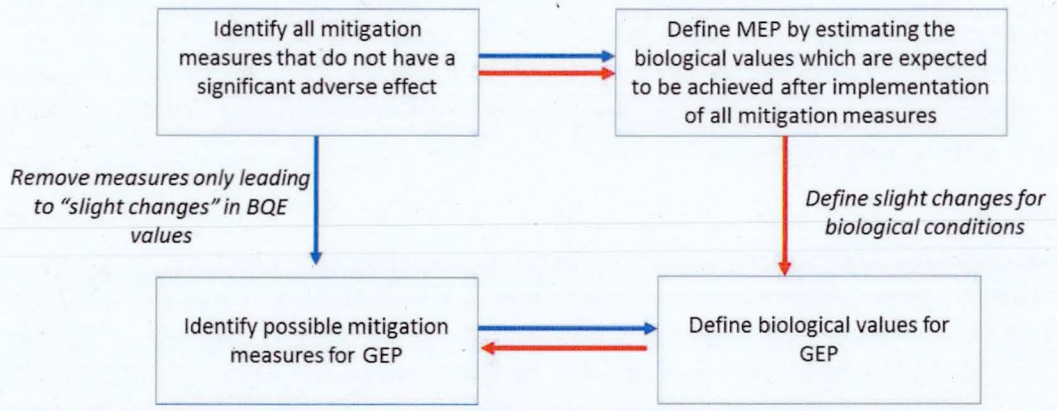
[24] See Annex II of Common Implementation Strategy for the Water Framework Directive 2006: Good Practice in managing the ecological impacts of hydropower schemes; Flood protection works; and works designed to facilitate navigation under the Water Framework Directive. 30 November 2006. Final version.

should be able to deliver comparable results in terms of ecological improvements in the water bodies on the ground.

In the first cycle RBMPs, 3 Member States had clearly used the reference approach, while a larger number of Member States (7 Member States) had defined GEP using the mitigation measures approach, according to the information provided in the RBMPs. Some Member States also used combinations or methods derived from these approaches.[25] In the second cycle RBMPs, about one-third of the Member States report to have defined GEP using the reference approach and about one-fifth of the Member States using the mitigation measures approach. Several Member States report to have used a hybrid approach combining the two approaches, e.g. using one or the other approach for different sub-sets of their water bodies.

As shown inFigure 3, all main steps under the two approaches are in principle the same. Both approaches have exactly the same concept for MEP, i.e. measures are used under both approaches in the same way for MEP. The main difference lies in the derivation of GEP from MEP. In the mitigation measures approach, GEP is derived from the mitigation measures and in the reference approach, GEP is derived from the BQE values at MEP.

Figure 3: Key steps of the reference approach (red arrows, clockwise) and the mitigation measures approach (blue arrows, anticlockwise) for defining GEP



The two approaches should lead to comparable outcomes in ecological terms. There are various ways to describe ecological targets whichever approach is applied. For example, semi-quantitative descriptions of ecosystem functioning or modified ecological quality ratio (EQR) values.

The reference approach follows the WFD requirements more directly but also the mitigation measures approach can be undertaken according to WFD requirements, if the definition of hydromorphological and BQE conditions and comparison of MEP/GEP are carried out. This means, in both approaches, derivation or verification of "slight changes" in comparison of MEP and GEP biological conditions is needed ensuring best approximation to ecological continuum. It is noted that in the mitigation measures approach, mitigation measures by themselves are not the GEP objective, but a means to define GEP. This is also valid for the reference approach.

[25] Commission Staff Working Document (2012), European Overview (2/2). on the Implementation of the Water Framework Directive (2000/60/EC) River Basin Management Plans.

5.2 Approximation of ecological continuum

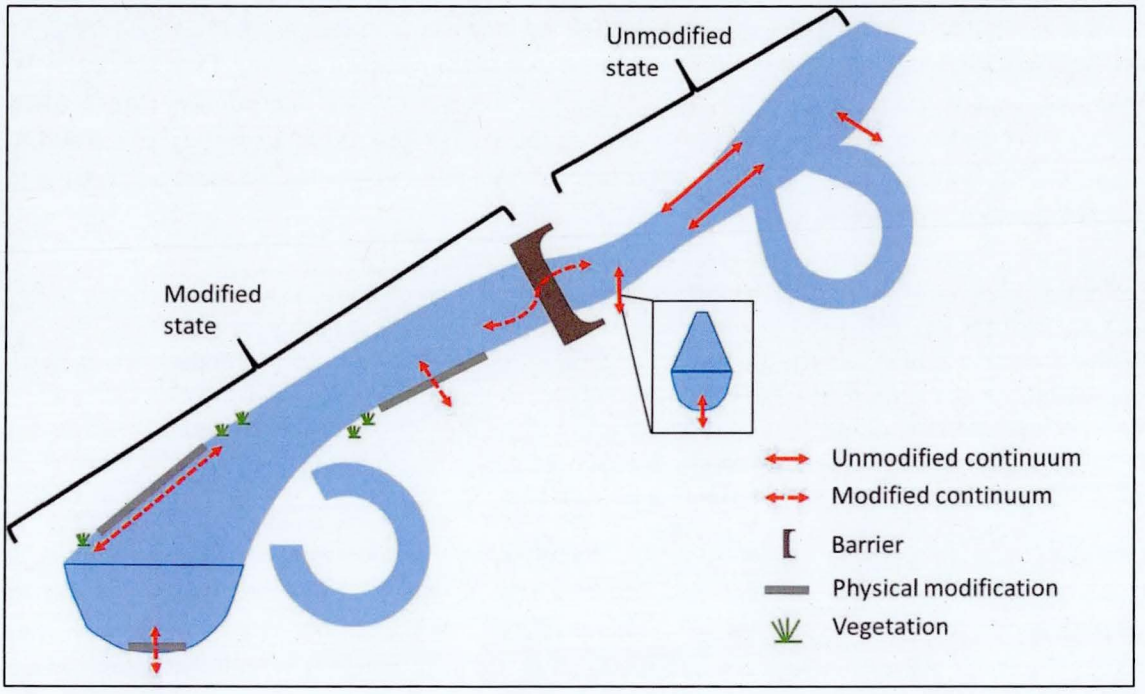
According to the WFD normative definitions in Annex V 1.2.5, the hydromorphological conditions at MEP for heavily modified or artificial water bodies are defined as being "*consistent with the only impacts on the surface water body being those resulting from the artificial or heavily modified characteristics of the water body once all mitigation measures have been taken to ensure the best approximation to ecological continuum in particular with respect to migration of fauna and appropriate spawning and breeding grounds*". This sub-section provides more detailed guidance and interpretation of the aspects related to the best approximation to ecological continuum.

Ecological continuum refers to movements of energy, material, and organisms within the aquatic ecosystem (Figure 4). Achieving ecological continuum ensures that the habitats for type-specific aquatic species are interconnected in space and time **so that the species can fulfil their life cycles**. Aquatic species (fish in particular) need specific habitats during different stages of their life cycle, for example for reproduction (spawning and breeding grounds), but also for feeding, wintering habitats or for shelter from predators. The accessibility of all these habitats at the right times is vital for survival and a prerequisite **to ensure self-sustaining populations**.

Ecological continuum is also necessary for the preservation of aquatic species in the long term, in particular regarding genetic diversity. Allowing migration of species increases genetic exchange between populations, prevents inbreeding, increases their resistance to pollution or disease, and therefore ensures that populations are self-sustained in the long term. Ecological continuum can be interrupted by barriers like transversal or lateral (e.g. river bed revetments) structures but also by changes in flow patterns, including highly reduced flows (in worst case lack of flow) as well as highly increased flow velocities which no longer allow aquatic species (or some of their very sensitive life stages) to migrate to reach their relevant habitats. This is also important, for example, for species being able to return to the original environment after having been swept away by floods.

The benefits of ecological continuum should be considered at a large scale and in the long term. In particular, in some areas, natural populations have been progressively declining due to multiple pressures, or might even have disappeared. Restoration of those populations requires action to tackle all those pressures, and the implementation of all necessary measures may take time. Furthermore, it is important to consider that the recovery and re-colonization of habitats by aquatic species is probably a long process in many cases, in particular for species with a long life cycle.

Figure 4: Different components of ecological continuum (longitudinal, lateral, vertical) in a modified and unmodified state



The best approximation to ecological continuum requires consideration of all hydromorphological measures that can mitigate any obstacles to migration (of biota, sediment and water) and improve the quality, quantity and range of habitats affected by the physical modifications. This can include connectivity to groundwater, to sediment supply and/or to riparian, shore and intertidal zones, as well as a sustainable supply of an appropriate sediment type. WFD emphasises both migration of biota and sediment transport. Priority should therefore be given to appropriate and effective measures reducing any obstacles that significantly inhibit longitudinal (both upstream and downstream) and lateral migration of aquatic biota and ensure appropriate sediment conditions. Overall, ecological continuum should be considered at river basin scale, but action should be taken at local scale.

"Best approximation to ecological continuum", which is mentioned in the WFD normative definitions of MEP, should be understood as a requirement for flow patterns that ensure migration of fish and other aquatic fauna, appropriate sediments for the habitats present (including spawning and breeding grounds) and appropriate sediment transport to ensure the long term sustainability of these habitats. "Best approximation" is interpreted as being as close as possible to undisturbed ecological continuum.

As explained in Figure 5 (section 5.3), MEP requires that best approximation of ecological continuum is ensured. A water body can only be at GEP if a condition close to best approximation is achieved. An approximation of ecological continuum is prerequisite for the functioning of the ecosystem.

It is also noted that ecological continuum should not only be guaranteed for the heavily modified water body, but is also a prerequisite for achieving good ecological status in the natural water bodies.

Example of reservoir created by damming a river: If a river was dammed to a large reservoir, there was a change in category and the biological quality elements (e.g. fish) have been adapted to a lake

type, which has to be taken into account when deriving MEP and GEP. With regard to best approximation of ecological continuum and required measures, the following should be considered :

- Is there an ecological benefit or need to restore continuity to the river(s) because a fish species lives in the lake which has its spawning ground in the river(s) up- or downstream?
- Is there an ecological benefit or need to restore continuity from the lake to the river(s) up- and downstream as otherwise the river water bodies up- or downstream cannot achieve their environmental objective (e.g. fish will migrate through the reservoir to get to the river upstream for spawning)?

In this context, it is relevant to take the requirements of WFD Article 4(8) into account.

5.3 Overview of key steps for defining ecological potential in a comparable way

The following flow-chart Figure 5 describes the key steps involved in setting maximum ecological potential (MEP) as a basis for defining good ecological potential (GEP). It provides more detailed descriptions of steps 10 and 11 of the original flow-chart on HMWB designation in CIS Guidance Document No.4 (see steps 10 and 11 in Figure 1 of CIS Guidance Document No.4).

The flow-chart presents a step-wise framework and shows two routes or approaches to follow this framework (the reference approach and the mitigation measure approach). Both approaches (two different routes in the step-wise framework) are acceptable and should lead to the same outcomes (ecological condition), provided there is good knowledge available on the links and interactions between biology, hydromorphology and mitigation effects from relevant measures. The common step-wise framework aims at further clarification and better understanding of the two approaches in the context of WFD definitions and should be used as a basis for the comparability of GEP definition outcomes across water uses, river basins and Member States. Ultimately, the aim is to harmonise GEP definition across Member States, in order to achieve a more transparent and comparable level of ambition in relation to ecological improvements.

The process described in the flow-chart is relevant to all water categories (rivers, lakes, transitional and coastal waters) and closest comparable water body types.

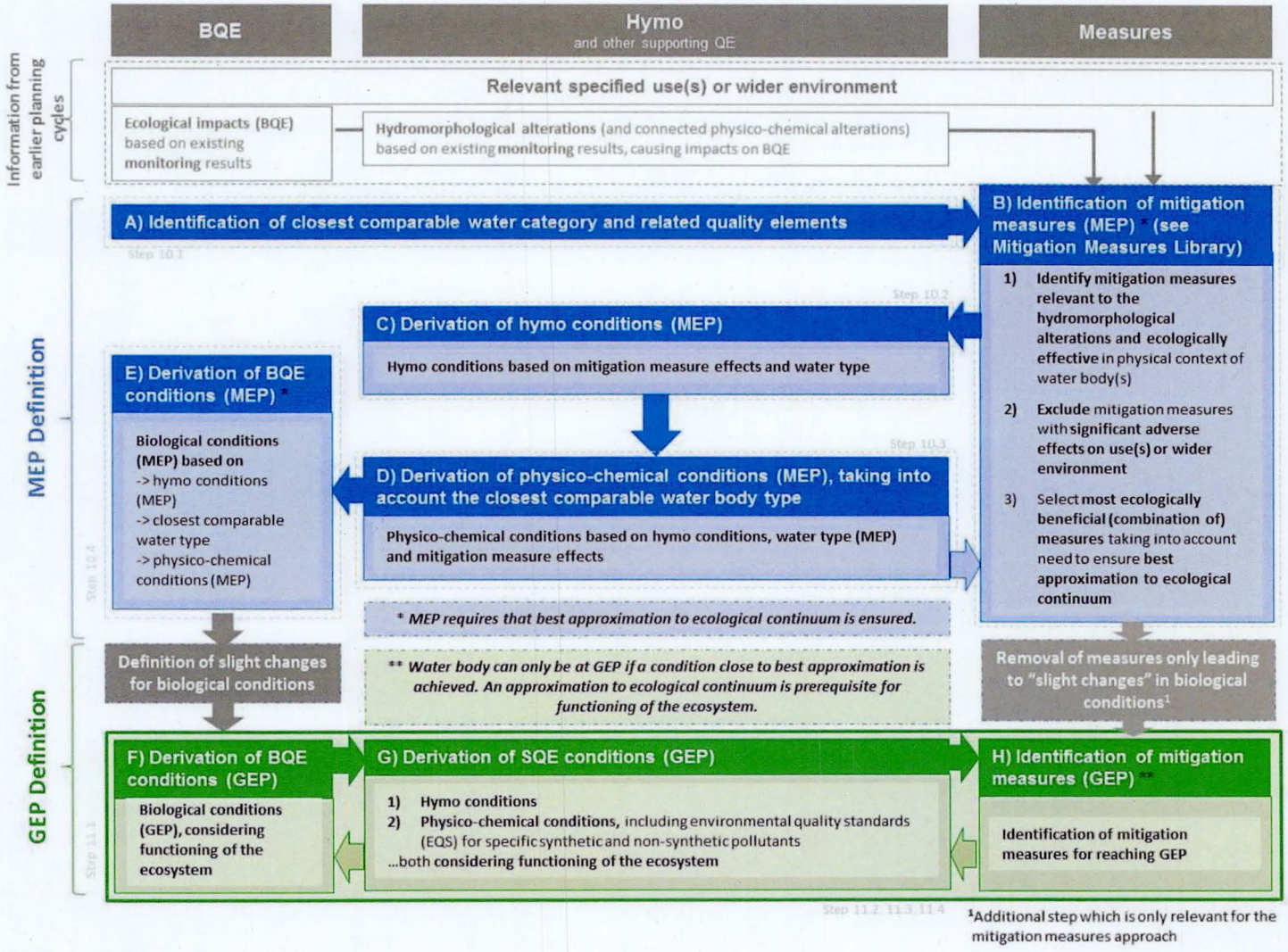
The GEP definition process is structured around eight key steps A to I, and should therefore serve as a check list to ensure that all necessary steps and actions will be taken to mitigate all relevant and significant impacts. The flow-chart is also organised vertically into 3 main columns:

- Biological quality elements (BQEs)
- Hydromorphology (and other supporting quality elements)
- Mitigation measures

This clear distinction should be helpful for communication, discussion and common understanding on the process of objective setting for HMWB.

The good ecological potential (GEP) includes all three steps F-G-H described below, i.e. it is eventually defined in terms of biological conditions, supporting quality element conditions and mitigation measures. In both the reference and the mitigation measures approach, GEP is defined as the biological quality element conditions which are expected to be achieved after implementation of the mitigation measures (prognosis of ecological effect). The definition of GEP in biological terms is supported by the conditions derived for the hydromorphological and the physico-chemical quality elements.

Figure 5: Process with key steps for defining MEP and GEP showing comparability between the two approaches (reference approach and mitigation measures approach)

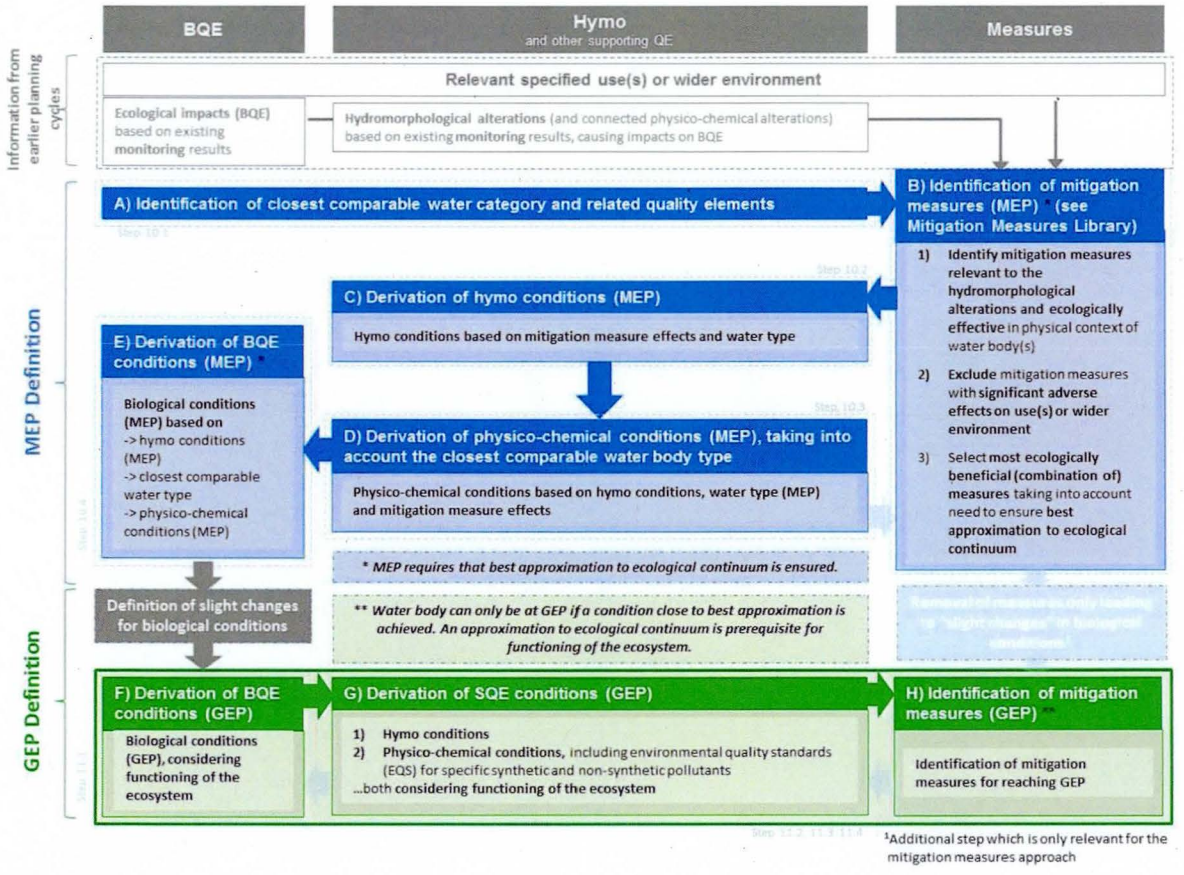


It is important to recognise that an ecological potential of a particular class can imply different ecological conditions in different water bodies. This is due to the local conditions in the water body type, ecological benefits of relevant mitigation measures and the design and operation of the modification(s)/use(s) which is/are the reason why the water body is designated as HMWB

5.3.1 "Route" of the reference approach

The complete step-wise approach in Figure 5 anticipates that Member States have enough information and knowledge (BQE, hydromorphological and physico-chemical data, mitigation measures library, ability to predict the effects of measures) to be able to follow the reference approach as set out in the WFD. In this case, all steps have to be followed to be in line with WFD requirements (route A→B→C→D→E→F→G→H). Figure 6 below indicates the sequence of steps for defining MEP and GEP when applying the reference approach.

Figure 6: Process with key steps for defining MEP and GEP showing the "route" of the reference approach



5.3.2 "Route" of the mitigation measures approach

As an alternative to the reference approach, Member States can use the mitigation measures approach. Such an approach is suggested in case it is not yet possible to predict the MEP conditions for the BQEs due to a lack of knowledge or data.

For the steps referring to MEP definition, Member States should follow steps A and B and should also go through steps C and D, insofar as the availability of information on hydromorphology and physico-chemical elements allows. Step D then feeds back into step B and the process continues from step B

to step H and step G. The mitigation measures approach assumes then that the conditions for physico-chemical and biological elements are those deriving from the implementation of measures defined in step H. In summary, the route to be usually followed through the flow-chart in Figure 5, when applying the mitigation measures approach is A→B[→C→D→B]→H→G(→F).

Figure 7 below indicates the sequence of steps for defining MEP and GEP when applying the mitigation measures approach.

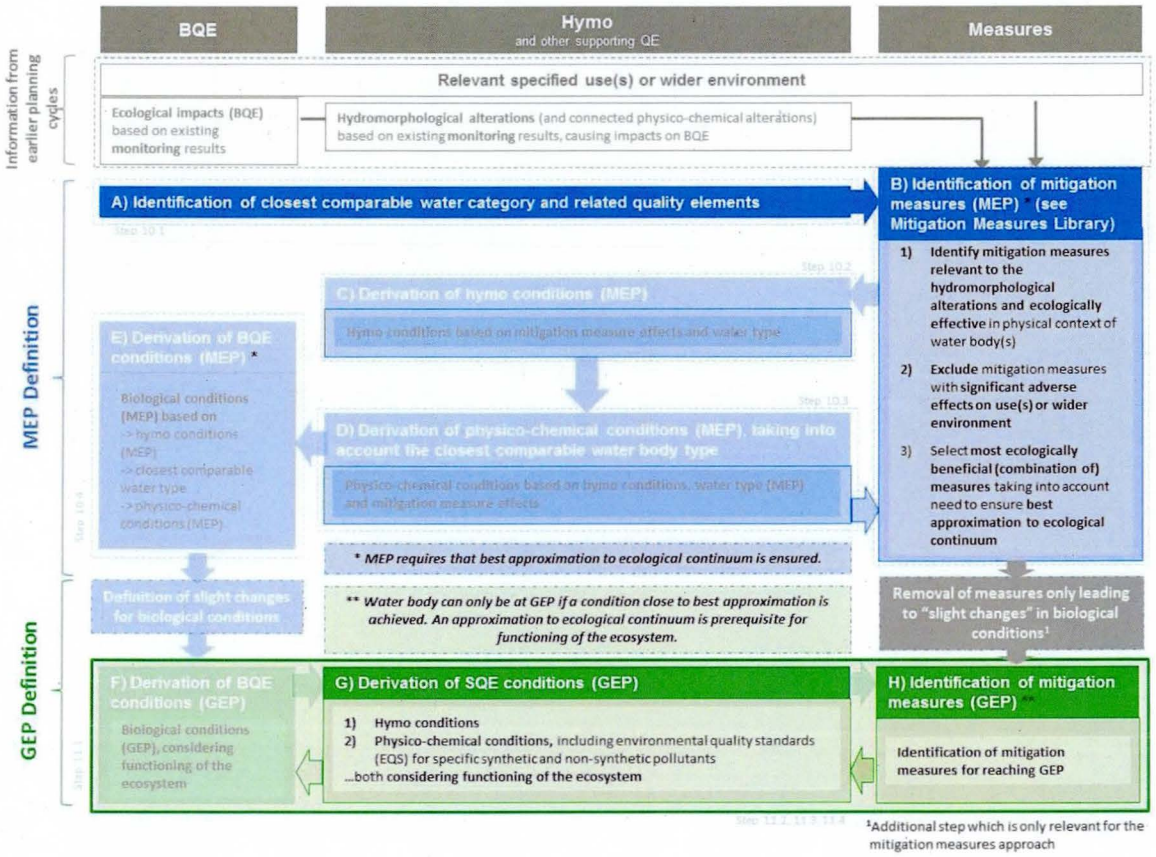
Member States following the mitigation measures approach for this cycle should complete steps E and F (derivation of biological conditions at MEP and GEP) as soon as sufficient data and better knowledge on the biological condition and/or the links between hydromorphology and biology become available. For a final decision on GEP definition, the mitigation measures approach depends on BQE assessment methods which are sensitive to hydromorphological alterations (for the verification of GEP and monitoring the ecological potential), but GEP definition can be undertaken on a preliminary or interim basis without such methods.[26] Thus, although the mitigation measures approach is an alternative route, it is not less ambitious as eventually all steps must be completed to be in line with the WFD.

It is noted that when there is lack of suitable biological assessment methods and/or data sensitive to modifications, the approach to the selection of mitigation measures should be more precautionary and more measures may need to be considered until there is sufficient evidence to exclude measures from MEP. Increased efforts are needed by Member States towards establishing appropriate biological monitoring and hydromorphology-sensitive methods for a more informed basis for the selection of mitigation measures.

The steps included in the step-wise approach follow the requirements of the WFD. If, in following the routes through the framework Figure 5, it is not possible to take all steps, suitable justification is therefore required in the relevant RBMP. Member States should make sure they can complete the remaining steps by improving data availability and knowledge on the links between hydromorphology and biology. In particular, improved monitoring data is crucial.

[26] As explained in section 6, if the classification of the ecological potential is not based on hydromorphology-sensitive biological assessment methods, the classification result in the RBMP should include the information that the confidence level is low.

Figure 7: Process with key steps for defining MEP and GEP showing the "route" of the mitigation measures approach



5.3.3 Overview of individual steps

The individual steps (steps A – H) of the step-wise process are briefly illustrated below, while the following sub-sections describe these steps in more detail:

Information from earlier planning cycles (pre-step): In this pre-step, information on the assessment of biological and hydromorphological impacts from the designation phase of HMWB and existing monitoring results are used to support the subsequent steps of defining MEP and GEP.

Step A (Identification of the closest comparable water category and related quality elements): This involves the identification of the most comparable water category (e.g. lake, river, transitional or coastal water) which should in general be derived from the original water category (i.e. prior to modification). If a change in category is necessary due to the modifications, the most comparable category should be chosen, e.g. for a reservoir created on a former river, the most comparable water category would be a lake.

Step B (Identification of relevant mitigation measures (MEP)). This involves the selection of mitigation measures for defining MEP. Measures should be ecologically effective, relevant to the water body and the modifications that have taken place, and ensure the best approximation of ecological continuum. The mitigation measures can be selected from a national or European mitigation measures library based on information about the water category and water body type, the nature of the physical modification, its effects on the hydromorphological (and physico-chemical) supporting elements and their effects on the BQEs. Mitigation measures that have significant adverse effects on use(s) or the

wider environment are then excluded. Having excluded measures with significant adverse effects, it is necessary to identify the measure or combination of measures that delivers the best improvement, taking into account the need to ensure best approximation to ecological continuum.

Step C (Derivation of hydromorphological conditions for MEP): The derivation of hydromorphological conditions for MEP should be based on the hydromorphological conditions in the water body altered by the physical modifications linked to the use and a prediction of the effects of the set of mitigation measures (for MEP) on hydromorphological conditions. MEP hydromorphological conditions are impacted by physical modifications. The values for the biological and general physico-chemical quality elements at MEP depend on the MEP hydromorphological conditions. The hydromorphological conditions may resemble those of a different type compared to the natural water body type before the physical modification. Thus, the hydromorphological conditions defined for MEP can be used to identify or derive the closest comparable water body type, which is in particular relevant for defining the MEP conditions for biological quality elements and those physico-chemical parameters which are affected by the hydromorphological conditions.

Step D (Derivation of physico-chemical conditions for MEP, taking into account the closest comparable water body type): The physico-chemical conditions for MEP result, inter alia, from the hydromorphological conditions at MEP and a prediction of the effects of the mitigation measures (for MEP) on physico-chemical parameters, which is comparable to an assessment of the remaining impacts. The identification of the closest comparable water body type is a supportive tool in this context. For physico-chemical parameters, the closest comparable water body type is in general the original natural water body type prior to physical modification. For those physico-chemical parameters that are significantly modified by the hydromorphological alterations causing the heavily modified character, and that cannot be mitigated, other types should be considered (the closest comparable natural water body type, or combinations of water body types). Requirements for specific synthetic pollutants at MEP are the same as those for natural water bodies.

Step E (Derivation of BQE conditions for MEP): The derivation of biological quality element conditions for MEP is based on the identification of the closest comparable water type, the predicted hydromorphological and physico-chemical conditions (for MEP) and a prediction of the values for BQEs based on methods used for status assessment. When deriving BQE conditions for MEP, it is also critical to consider the WFD requirements concerning the best approximation of the ecological continuum.

Step F (Derivation of BQE conditions for GEP): Good ecological potential is defined in WFD Annex V 1.2.5 as an ecological state in which "there are slight changes in the values of the relevant biological quality elements as compared to the values found at maximum ecological potential". With respect to "slight changes", HMWB should follow the same principles as natural water bodies, with a functioning ecosystem being a prerequisite for a water body to be at GEP. Slight change cannot be equivalent to a complete/temporary absence or severe change of the biological quality elements relevant for the closest comparable water category and type (e.g. of fish for rivers within the fish zone). Slight changes to the biological quality elements have to be supported by corresponding conditions in the supporting quality elements (e.g. flow, habitats, continuity). With regard to ecological continuum, "slight change" means that a condition close to best approximation of ecological continuum should be ensured (instead of best approximation).

Step G (Derivation of supporting quality elements for GEP): The derivation of supporting quality elements (SQE) for GEP entails hydromorphological conditions and physico-chemical conditions. The hydromorphological conditions have to be consistent with the biological values set for GEP. For physico-chemical conditions, the same values should be met as for good ecological status of the original natural

water body type, except if the parameter is impacted by the hydromorphological alteration having led to HMWB designation (e.g. changed water temperature due to hydropeaking).

Step H (Identification of mitigation measures (GEP)): The mitigation measures within GEP are those needed to achieve the derived biological conditions by improving conditions of relevant supporting elements for GEP. Following the mitigation measures approach, mitigation measures for GEP are obtained after removing, from the set of mitigation measures identified for MEP, any measures which only lead to slight changes in biological conditions (alone or in combination).

It is noted that Annex H to this document presents illustrative case studies which demonstrate how to apply the key steps of the flow-chart for defining MEP and GEP. The case studies follow either the reference-approach or the mitigation measures approach or both.

Please note that with step H in the flow-chart, the definition of GEP is concluded. After having defined GEP with corresponding GEP conditions for the biological and supporting quality elements, mitigation measures are to be implemented within the programme of measures and the relevant process is explained in section 6 of this document.

5.4 Detailed key steps for defining ecological potential in a comparable way

5.4.1 Information from earlier planning cycles (pre-step)

The process of defining MEP and GEP is closely related to the steps of the iterative process used to designate HMWB (either of existing HMWB designated in previous cycles or new HMWB designated in the current cycle). As a starting point, the following issues from the designation phase need to be taken into account for the water body:

- The identification of relevant specified uses/human activities or the wider environment which would be significantly adversely affected by measures to achieve GES and are thus reasons for the designation.
- The assessment of the main ecological impacts based on the BQEs, which is based on existing monitoring results (from earlier planning cycles) (see Box 5 below). The assessment of biological impacts takes into account measures already taken in the previous planning cycle(s).
- The identification of key hydromorphological alterations (and related physico-chemical alterations) that cause impacts on the BQEs, taking into account the water type. This assessment is also based on existing monitoring results from earlier planning cycles.
- Information from monitoring on which quality elements fail good status is important for a more targeted selection of mitigation measures in the later process of defining MEP and GEP. Information on the conditions of the quality elements should already exist from the earlier operational monitoring prior to designation of the water body as HMWB, as the prerequisite for HMWB designation is that the water body fails good status due to hydromorphological alterations.
- In this context, the water body type based on national typology should be considered, as this is important for the selection of mitigation measures in the first steps of defining MEP and GEP.

It is noted that the assessments of hydromorphological impacts and biological impacts may be further refined within the process of GEP definition, using the relevant assessments that were carried out in the designation phase as a starting point.

Box 5: Monitoring results from earlier planning cycles

The requirements of the WFD with regards to monitoring are mainly set out in Article 8, Annex II and Annex V. As for natural water bodies, biological, hydromorphological and physico-chemical quality elements and chemical status for HMWB must be monitored. This means that the monitoring programmes for HMWB must follow the same monitoring requirements as for the natural water bodies. CIS Guidance Document No.7 "Monitoring under the Water Framework Directive" gives in-depth guidance regarding these monitoring requirements.

The establishment of an appropriate monitoring programme, including monitoring of hydromorphological quality elements, is key as an information basis for the initial designation of HMWB and for reviewing the designation of HMWB in subsequent planning cycles.

Part of the designation process is to assess whether or not the water body fails good status due to hydromorphological alterations and therefore should be designated as HMWB; this is done by applying the targeted (to hydromorphological problems) methods used in **operational monitoring**.

For a water body that was designated as HMWB in a previous cycle, the operational monitoring gives evidence on whether or not the water body is at GES and if it still qualifies as a HMWB. If the operational monitoring shows that conditions have improved so much that the water body reaches GES, the water body is de-designated as HMWB and has to be treated as a natural water body. If the water body is not in GES and GES cannot be reached, the environmental objective may be good ecological potential (GEP) (if the requirements of WFD Art. 4(3) are fulfilled) and the procedure for defining MEP and GEP should be followed (i.e. GEP should be re-assessed).

When selecting sites for operational monitoring of water bodies designated as HMWB, it is recommended to focus on how and where it is best to monitor the impact resulting from the water body being substantially changed in character.

!

Reference approach ←→ Mitigation measures approach

The pre-step using information from earlier planning cycles is used under both the reference approach and the mitigation measures approach.

5.4.2 Identification of the closest comparable water category and related quality elements (Step A)

According to WFD Annex V 1.1.5, "the quality elements applicable to artificial and heavily modified surface water bodies shall be those applicable to whichever of the four natural surface water categories (above) most closely resembles the heavily modified or artificial water body concerned".

In general, the closest comparable water category should only be different from the original water category if this is necessary due to the modifications, e.g. for a reservoir created on a former river, the

closest comparable water category would be a lake. The following are the most common situations for the identification of the closest comparable water category:

a) A river remains a river category

b) A river resembling a lake category[27]

c) A lake remains a lake category[28]

d) A transitional water body remains a transitional water body category

e) A transitional water body resembling a lake category

f) A coastal water body remains a coastal water body category

g) A coastal water body resembling a transitional water category (e.g. if a lagoon is formed)

5.4.3 Is the closest comparable water category for HMWB always clear?

For coastal and transitional waters, the closest comparable water category it is usually clear. For rivers and lakes (reservoirs), it may be less clear, as for instance some water bodies used for water storage may be in the transition between river and lake-type aquatic ecosystems. A relatively clear case is when a river has been dammed to create a large reservoir. In such a case, there is a change in category and the water body is a heavily modified river that resembles a lake. The biological quality elements (e.g. fish) which have to be taken into account when deriving MEP and GEP therefore have to be those of a lake. However, conditions in impounded rivers may range from very close to river conditions (e.g. with high flow velocities and the same quantity of flow upstream and downstream of the impoundment, indicating a short residence time) to more still water conditions (e.g. with significantly reduced flow velocities and long residence times) resembling lake-like ecosystems.

In case of river water bodies used for water storage that are in transition between river and more lake-type aquatic ecosystems (e.g. large impoundments with permanent flow and a short residence time of a few days), it needs to be decided whether a river or a lake is used as closest comparable water category. Where conditions are in-between clearly defined water categories, both categories should be considered in the process of defining MEP and GEP. For example, if a river is chosen as the closest comparable water category, lake measures and habitats as well as quality elements, species and assessment methods also need to be considered. Conversely, if a lake is chosen as the closest comparable water category, river measures (e.g. measures for improving continuity, by-pass channels, etc.) and habitats as well as quality elements, species and assessment methods should be considered, too. In such cases, it might even be appropriate to use different categories depending on quality elements. For example, a hydromorphological assessment method for lakes could be most suitable describing the hydromorphological conditions at MEP and GEP, while biological quality elements could be assessed with river methods (e.g. for fish) with the highest confidence.

[27] Including cases of several brooks which have become one large lake reservoir.

[28] Including cases of small lakes which have become one large reservoir.

!	**Reference approach ←→ Mitigation measures approach** Step A is identical for both the reference approach and the mitigation measures approach.

5.4.4 Identification of relevant mitigation measures (MEP) (Step B)

The mitigation measures for defining MEP should be a selection of measures which are relevant to each of the hydromorphological alterations, ecologically effective **and** which alone or in combination ensure the best approximation of ecological continuum.

The identification of mitigation measures for MEP involves three sub-steps:

- Identify mitigation measures relevant to each of the hydromorphological alterations and ecologically effective in the physical context of the water body or water bodies (step B1)
- Exclude or redesign restoration measures that have a significant adverse effect on use or the wider environment (step B2)
- Select the most ecologically beneficial (combination of) measures addressing all hydromorphological alterations, taking into account the need to ensure the best approximation of ecological continuum (step B3)

In summary, the (potentially relevant) mitigation measures can be excluded from MEP (and GEP) due to the following reasons:

1. The mitigation measure is **not relevant** for the type of water body, hydromorphological alterations or impacts causing failure in achieving good status (see section 5.4.4.1).
2. The mitigation measure is **not ecologically effective** or does not give sufficient ecological benefits in the physical context of the water body or water bodies, e.g. lack of spawning habitat upstream (see section 5.4.4.1).
3. The mitigation measure has **significant adverse effects** on use(s) or the wider environment (see section 5.4.4.2).

The following paragraphs explains in more detail the sub-steps (B1, B2 and B3) which need to be taken into account to define the set of mitigation measures for deriving MEP conditions.

!	**Reference approach ←→ Mitigation measures approach** Step B is identical for both the reference approach and the mitigation measures approach.

5.4.4.1 Identify mitigation measures relevant to each of the hydromorphological alterations and ecologically effective in the physical context of the water body or water bodies (Sub-step B1)

The first step identifies the mitigation measures that are relevant to the type of hydromorphological alterations or impacts causing failure in achieving good status.

The relevant mitigation measures can be selected from a national or European **mitigation measures library** based on information about the water category and water body type, the nature of the physical modification, its effects on the hydromorphological (and physico-chemical) supporting elements and their effects on the BQEs.

The **"GEP_mitigation_measures_library.xlsx"** (https://ec.europa.eu/environment/water/water-framework/facts_figures/guidance_docs_en.htm) is a supporting tool to this document and presents a European library of mitigation measures for use in defining MEP and GEP. This mitigation measures library is structured in distinct tables for different water categories (rivers, lakes/reservoirs, transitional/coastal waters) (see overview of key elements in Table 6). Please note that due to the Europe-wide nature of this library, it was not possible to produce fully comprehensive lists and some of the physical modifications or mitigation measures that are considered in the Member States may not be included. The library of mitigation measures is a living document and updates will be provided at regular intervals.

Table 6: Overview of key elements included in European library of mitigation measures for rivers, lakes/reservoirs and transitional/coastal waters to be considered in the stepwise approach for defining the ecological potential of HMWBs

Elements in library / Water categories	Rivers	Lakes/reservoirs	Transitional/coastal
Uses	Navigation; ports Flood protection Hydropower Water supply Recreation Drainage Urbanisation		Navigation; ports Recreation; marinas; infrastructure Urbanisation including industry Flood protection Energy (renewables, oil and gas, associated infrastructure) Fishing activity; fish farms; aquaculture
Existing physical modification	List of physical modifications of rivers, e.g. Dam, weir, barrage or other transversal structure Channel straightening Embankments, dykes	List of physical modifications of lakes/reservoirs, e.g. Shore fixation or modification Physical modifications caused by maintenance activities (e.g. sediment dredging) Deepening of lake by excavation	List of physical modifications of transitional/coastal waters, e.g. Dredged for navigation, flood conveyance Aggregate extraction Breakwater, groynes, jetties, piers

Elements in library / Water categories	Rivers	Lakes/reservoirs	Transitional/coastal
Potential for direct or indirect effect on hydromorphological supporting elements at water body scale *[++] always or usually* *[+] sometimes* *[o] rarely or never*	Hydrology: quantity and dynamics of flow Hydrology: connection to groundwaters River continuity Morphology: river width and depth Morphology: river bed structure, substrate Morphology: riparian zone structure	Hydrology: quantity and dynamics of flow Hydrological regime: residence time Hydrology: connection to groundwaters Morphology: depth Morphology: quantity, structure, substrate of bed Morphology: structure of shore	Morphology: depth variation Morphology: bed structure, substrate Morphology: intertidal zone structure Tidal regime: freshwater flow (only transitional water bodies) Tidal regime: dominant currents direction (only coastal water bodies) Tidal regime: wave exposure
Potential for direct or indirect effect on physico-chemical supporting elements at water body scale *[++] always or usually* *[+] sometimes* *[o] rarely or never*	Thermal conditions Oxygenation Salinity Acidification Nutrient conditions Specific pollutants	Transparency Thermal conditions Oxygenation Salinity Nutrient conditions Specific pollutants	Transparency Thermal conditions Oxygenation Salinity Nutrient conditions Specific pollutants
Likelihood of effect on BQEs *[++] strong or moderate likelihood* *[+] low likelihood*	Phytoplankton Macrophytes and phytobenthos Benthic invertebrate fauna Fish fauna		Phytoplankton Macroalgae (seaweeds) Angiosperms (seagrass, saltmarsh) Benthic invertebrate fauna Fish (only transitional water bodies)
Overview of typical impacts on original ecology	Short descriptions provided per physical modification		
Relevance of typical mitigation measures* *[++] always or usually* *[+] sometimes* *[o] rarely or never*	List of typical mitigation measures, e.g. Fish migration aids Environmental flow Increase habitat diversity Sediment management	List of typical mitigation measures, e.g. Ecological/environmental friendly water level regulation practice Enhancement of shore/shallow habitats Creation of secondary habitats Removal/replacement of shore fixation	List of typical mitigation measures, e.g. Improve morphological and/or habitat diversity of seabed Intertidal habitat restoration, enhancement or creation Beach or foreshore replenishment

** The typical mitigation measures are groups of measures, each of which includes specific practical measures. Examples for these specific practical measures are given in additional supporting tables in mitigation measures library.*

The mitigation measures library promotes the following approach to the identification of mitigation measures for the definition of ecological potential and delivering improvements in the biological and supporting quality elements of HMWB:

i) Confirm the specific nature of the physical modification (pressure)
ii) Understand which hydromorphological supporting elements have been directly or indirectly changed (adversely affected) as a result of the modification, and how they have been affected (state)
iii) Consider whether any physico-chemical supporting elements have been adversely affected (either directly by the modification, or indirectly as a result of changes to the hydromorphological character of the water body) (state)
iv) Establish which biological quality elements have been adversely affected and how, including any wider implications for ecological functioning and/or for ecosystem goods and services (impact)
v) Identify the range of typical and modification-specific mitigation measures that may contribute, alone or in-combination, to an improvement in the conditions of the water body (response)
vi) Evaluate possible mitigation measures to define MEP and GEP

Stages i – v are supported by the relevant spreadsheet tables in the mitigation measures library. Reference to these tables ensures an overarching approach to the selection of mitigation measures, depending on the nature of physical modifications. Stage vi on the evaluation of possible mitigation measures to define MEP and GEP is discussed in the following sections on sub-steps B2 and B3, concerning the assessment of significant adverse effects and the selection of most ecologically beneficial (combinations of) measures.

The paragraphs below describe the different elements included in the library tables and how the library can be used as a tool for selecting mitigation measures for MEP and GEP definition as well as for the identification of measures for implementation.

i) Specific nature of existing physical modification (pressures)

The starting point when using the mitigation measures library is to confirm the specific nature of the physical modification (pressure) for which a HMWB was designated or of the modification that is otherwise affecting the ability of the water body or water bodies to meet WFD objectives. All physical modifications in the mitigation measures library might be relevant reasons for designation of a water body as HMWB. In most if not all cases, it is the type of physical modification rather than the use *per se* that affects the hydromorphological character of the water body.

Example: An impounding structure might be required to support use for water supply or navigation; a water body might be straightened and deepened for agricultural drainage, navigation or flood conveyance purposes; or embankments might be constructed or raised to meet flood defence or water storage needs. The effects from such pressures on the WFD hydromorphological supporting elements and hence on the biological quality elements will be determined by the particular nature of the modification. Two examples to illustrate this point in river water bodies are provided in

Box 6 below.

Box 6: Examples of generic physical modifications to water body hydromorphological and biological quality elements

An impounding structure on a river typically affects continuity for biota and sediment. One of the most important effects is the reduction of flow velocity, which is directly related to a change in sediment composition and bed structure. Benthic invertebrates are highly sensitive to impact by those alterations, but fish are also significantly affected (e.g. by a reduction of habitats or by the transversal structure which functions as a migration barrier) and macrophyte communities are severely impacted (e.g. by reduction of flow velocity that causes changes in abundance and occurrence of species with different growth forms).

Riparian zone structure and depth are also affected by an impounding structure with a reduced flow velocity, and there may be indirect implications for certain physico-chemical supporting elements (e.g. a higher temperature caused by reduced flow velocity and reduced shading). As a consequence of these changes in hydromorphology the ability of the water body to meet its ecological objective of GES will be compromised.

Deepening also changes the hydromorphological characteristics of a water body, in this case particularly affecting depth variation and bed structure., However, there may also be implications for other hydromorphological supporting elements. Such modifications to the character of the bed of the water body typically lead to changes in benthic invertebrate fauna and phytobenthos as well as in macrophyte and fish communities.

The mitigation measures required to improve the ecological conditions of a water body are not specifically related to the use for which the water body is designated. Rather, mitigation measures should ideally aim to reduce or rectify the changes in hydromorphological character such that the natural recovery of the affected BQEs is promoted. If this is not possible, mitigation measures should aim to replicate ecological function through other means. Box 7: Examples of common mitigation measures irrespective of use below provides two examples of how mitigation measures relate to the nature of the modification rather than the use of the water body. The existing physical modifications in a HMWB determine which checklists of measures are applicable for MEP definition.

Box 7: Examples of common mitigation measures irrespective of use

Irrespective of the use for which a particular water body is designated, if an impounding structure has prevented the upstream and downstream movement of fish, the installation of a fish pass/fish migration aid may be required. Measures to improve flow of both water (e.g. e-flows) and sediments (e.g. sediment bypassing) might also be needed, along with measures to enhance riparian or benthic habitats and their diversity. In certain situations it will also be relevant to establish whether the operation of the structure (e.g. a sluice or lock) can be modified or managed so as to reduce the effects of the impoundment and improve ecological conditions.

Similarly, whether a water body has been embanked to improve flood protection or to accommodate navigation or agricultural use is less important when considering possible mitigation measures than the nature of the hydromorphological alteration. In all cases, if benthic invertebrates, fish or aquatic flora have been detrimentally affected by the construction of the embankments, the use of soft (e.g. vegetation, natural stone) rather than hard (e.g. concrete) engineering will need to be considered along with opportunities for habitat creation or enhancement elsewhere in the water body (e.g. in

backwaters or by setting back the defences). Depending on the particular circumstances, re-profiling the embankments or sediment management measures such as sediment supplementation might also be explored.

In many cases, a water body may have been physically modified in a number of ways by more than one use. For example, it may have been straightened and also deepened (e.g. for navigation), or a dam (impounding structure) might also be associated with hydropeaking from a hydropower plant, resulting in multiple pressures (Table 7). If this is the case, the single uses and/or pressures should be identified based on the tables separately prior to being combined.

In using the tables of the mitigation measures library, it should be noted that the descriptions in the column headed 'Specific nature of existing physical modification' are not intended to be comprehensive. Rather, they represent the most common types of physical interventions that (broadly) impact on the water body in a characteristic way. For example:

- steel sheet piling used to create a hard water's edge in an urban landscape, masonry walls in old harbour areas, and wooden piling installed to prevent erosion or for flood defence all share the same characteristics in that they create a vertical face at the water's edge, and
- dams, sluices, weirs, barriers and barrages are all transversal structures that usually interrupt flow and interfere with continuity (especially in rivers) or potentially impact on wave exposure (in transitional or coastal water bodies).

Table 7: Example from mitigation measures library on TraC: Uses and physical modifications

DRIVER						PRESSURE
Uses						*Specific nature of existing physical modification*
Navigation; ports	Recreation; marinas; infrastructure	Urbanisation including industry	Flood protection	Energy (renewables, oil and gas, associated infrastructure)	Fishing activity; fish farms; aquaculture	*See list below*
+	+	+	+			Dredged for navigation, flood conveyance

ii-iii) Effects on hydromorphological or physico-chemical supporting elements (state)

The next stage is to understand how the state of the water body or water bodies has been affected by the physical modification. This is achieved by identifying the WFD hydromorphological (and, where

relevant, physico-chemical[29]) supporting elements that have been directly or indirectly changed or otherwise impacted as a result of the modification(s).

The tables of the mitigation measures library use typical situations (Table 8). For both hydromorphology and the physico-chemical supporting elements, they indicate how typical it is for each element to be directly or indirectly affected by the particular type of physical modification at the water body scale. They illustrate this by differentiating between effects that are 'always or usually' experienced; those that are 'sometimes' experienced; and those that are 'rarely or never' experienced.

In addition to illustrating how this stage could be undertaken in the absence of an established national practice or procedure, the typical situations presented on the tables of the mitigation measures library might also be useful in situations where there are no detailed hydromorphological or physico-chemical data about the water body or water bodies in question. In most cases, however, Member States will have relevant and detailed information, e.g. obtained during the classification exercise or more recent WFD monitoring. Where such locally relevant data exist, the actual effects on the water body (or group of similar water bodies) should be confirmed by identifying the hydromorphological and physico-chemical supporting elements that are at less than good status (potential) or that are otherwise compromised in some way by the physical modification.

Finally, whichever method is used to establish the effects of the modification on the WFD supporting elements, there are likely to be some considerations linked to particular sites or certain elements that are too specific to be considered in the general context of this document. For example:

- when establishing whether quantity or dynamics of flow has been affected by the modification, it is important to consider and if necessary differentiate between the effects on quantity and the effects on flow dynamics
- indirect effects can sometimes be more important than direct ones (e.g. downstream bed erosion can be a significant indirect effect if a structure interferes with sediment transport)
- oversaturation of nitrogen that may lead to diving disease for fish downstream of the tailrace of high-head hydropower plants
- temperature alterations such as cooler water during summer (resulting in decreased fish growth) and warmer water during winter (resulting in increased metabolism, fish mortality, and a lack of ice cover in alpine rivers).

[29] Changes in physico-chemical supporting elements are only relevant in the context of identifying MEP and GEP mitigation measures if the change is caused by or associated with the identified changes in hydromorphology. If, for example, a change in the concentration of nutrient compounds or impacts (e.g. increased eutrophication effect) results from the impoundment of water behind a dam, this is a relevant consideration, but if a change in nutrient concentrations is the result of an increased discharge into the water body, this is an issue to be dealt with in the WFD Programme of Measures, not through GEP mitigation measures.

Table 8: Example from mitigation measures library on TraC: Physical modifications and effects on hydromorphological or physico-chemical supporting elements

PRESSURE	STATE (hydromorphological, physico-chemical alteration)											
Specific nature of existing physical modification	*Potential for direct or indirect effect on hydromorphological supporting elements at water body scale [++] always or usually [+] sometimes [o] rarely or never*						*Potential for direct or indirect effect on physico-chemical supporting elements at water body scale [++] always or usually [+] sometimes [o] rarely or never*					
See list below	Morphology: depth variation	Morphology: bed structure, substrate	Morphology: intertidal zone structure	Tidal regime: freshwater flow (only transitional water bodies)	Tidal regime: dominant currents direction (only coastal water bodies)	Tidal regime: wave exposure	Transparency	Thermal conditions	Oxygenation	Salinity	Nutrient conditions	Specific pollutants
Dredged for navigation, flood conveyance	++	++	+	+	+	+	o	+	+	+	+	o

iv) Effects on BQEs (impact)

The tables of the mitigation measures library also present 'typical' effects (impacts) on the biological quality elements (Table 9). In this case, however, the likelihood of the identified changes in the hydromorphological or physico-chemical elements resulting in direct or indirect detrimental effects on each of the BQEs is identified as being 'strong or moderate' or 'low'. In addition to considering each BQE, the tables provide a brief narrative, summarising the typical impacts on the original (pre-modification) ecology. This is relevant insofar as it highlights some of the more potentially complex interrelationships and/or on the ability of the system to sustain the provision of ecosystem goods and services.

The way in which hydromorphological alterations (and, where relevant, associated alterations in physico-chemical supporting elements) have affected the BQEs in the HMWB will often be evident from classification or monitoring evidence. The typical effects listed in the tables in the mitigation measures library should therefore be checked against the collated (monitoring-based) evidence and the significance of the measured effect in each case should be quantified or recorded accordingly.

Overall, the generic nature of the tables in the mitigation measures library needs to be taken into account, noting that it will always be necessary to understand the scale of the effect and hence its significance in the context of the particular water body.

In cases where no detailed data are available or where there are data gaps, the typical impacts identified in the mitigation measures library tables will provide an insight into how the pressure may have affected the pre-modification ecology, in turn enabling the likely need for mitigation measures to define MEP and GEP and to achieve GEP to be considered. It should be recognized, however, that such generalisations may not be reliable in all site-specific circumstances.

Table 9: Example from mitigation measures library on TraC: Physical modifications, effects on hydromorphological or physico-chemical supporting elements and effects on BQEs

PRESSURE	STATE (hydromorphological, physico-chemical alteration)												IMPACT				
Specific nature of existing physical modification	*Potential for direct or indirect effect on hydromorphological supporting elements at water body scale [++] always or usually [+] sometimes [o] rarely or never*						*Potential for direct or indirect effect on physico-chemical supporting elements at water body scale [++] always or usually [+] sometimes [o] rarely or never*						*Likelihood of effect on BQEs [++] strong or moderate likelihood [+] low likelihood*				
See list below	Morphology: depth variation	Morphology: bed structure, substrate	Morphology: intertidal zone structure	Tidal regime: freshwater flow (only transitional water bodies)	Tidal regime: dominant currents direction (only coastal water bodies)	Tidal regime: wave exposure	Transparency	Thermal conditions	Oxygenation	Salinity	Nutrient conditions	Specific pollutants	Phytoplankton	Macroalgae (seaweeds)	Angiosperms (seagrass, saltmarsh)	Benthic invertebrate fauna	Fish (only transitional water bodies)
Dredged for navigation, flood conveyance	++	++	+	+	+	+	o	+	+	+	+	o	+	++	++	++	++

v) Potentially relevant measures (response)

Once the nature of the modification (pressure), the effects on supporting elements (state), and the implications for the BQEs (impacts) are essentially understood, a list of potentially appropriate mitigation measures for MEP and GEP definition and achievement of GEP should be developed.

The tables in the mitigation measures library include key groups of mitigation measures. These are expected to be considered during MEP and GEP definition in order to address certain modifications, in the absence of good reasons for excluding the measures. Whereas some mitigation measures are useful only to address a particular type of impact (e.g. meandering would usually only be considered if a water body has been straightened or canalised), others are more widely applicable. For each water category, a number of good practice measures have been confirmed in technical reports and workshops carried out in the context of the Common Implementation Strategy[30] as being potentially suitable to

[30] Halleraker et al, Working Group ECOSTAT report on common understanding of using mitigation measures for reaching Good Ecological Potential for heavily modified water bodies - Part 1: Impacted by water storage; EUR 28413; doi:10.2760/649695.
- Vartia et al, WG ECOSTAT report on common understanding of using mitigation measures for reaching Good Ecological Potential for Heavily Modified Water Bodies, EUR 29132 EN, Publications Office of the European Union, Luxembourg, 2018, ISBN 978-92-79-80305-5, doi:10.2760/444293, JRC110959.
- Bussettini et al, Working Group ECOSTAT report on common understanding of using mitigation measures for reaching Good Ecological Potential for heavily modified water bodies - Part 2: Impacted by flood protection structures, EUR 29131 EN; Publications Office of the European Union, Luxembourg, 2018, ISBN 978-92-79-80290-4, doi:10.2760/875939, JRC110957
- Workshop report, Workshop on mitigation measures and GEP for Inland Navigation water use, 29th – 30th June 2017, Brussels.

mitigate a wide range of impacts. Habitat enhancement and sediment management are two such generic measures. The mitigation measures in the European library represent emerging good practice, especially for rivers and TraC waters. However, the library content on mitigation measures for lakes will need to be improved and updated based on further discussions in the future.

For each characteristic physical modification type, the tables of the mitigation measures library highlight the typical relevance of these commonly used measure groups and indicate whether the measure group is 'always/usually', 'sometimes' or 'rarely/never' considered for use to mitigate the effects of the modification type in question (Table 10).

Table 10: Example from mitigation measures library on TraC: Physical modifications and potentially relevant mitigation measures (key measure groups)

PRESSURE	**RESPONSE**											
Specific nature of existing physical modification	***Relevance of typical mitigation measures * [++] always or usually [+] sometimes [o] rarely or never***											
See list below	Improve morphological and/or habitat diversity of seabed	Intertidal habitat restoration, enhancement or creation	Beach or foreshore replenishment	Sediment management	Beneficial use of dredged material	Modification or management of operations or structures e.g. sluices, vessel traffic	Soft engineering solutions; use of vegetation	Realign to mitigate effects on flow	Reprofile embankments, structures	Fish pass	Seasonal or tidal constraints on activity	Selection of methods or equipment
Dredged for navigation, flood conveyance	++	+	o	++	o	++	++	+	o	o	o	o

Additional supporting tables in the library elaborate on these commonly used measure groups and provide examples of specific practical measures which are included in the measure groups (

Table 11). Experts working on the definition of ecological potential should be familiar with the broad range of different measures included in the measure groups. The mitigation measures library provided as a supporting tool to this document helps increase understanding of the breadth of available measures. Member States should therefore consider a wide range of potentially available measures to deliver the needed ecological improvements.

Table 11: Example from mitigation measures library on TraC: Examples of specific measures for selected key measure groups

Key groups of measures	**Examples of specific measures**

Improve morphological and/or habitat diversity of seabed	- Placement of rocks, artificial reefs etc. to form reef and/or other types of habitats for BQEs - Use breakwaters or groynes or shore parallel islands to create local variations in depth, exposure/shelter, etc. - Local deepening by dredging or excavation where sustainable
Intertidal habitat restoration, enhancement or creation	- Habitat rehabilitation - Managed realignment to new line - Re-open polders; setback (to higher ground; to existing secondary defence line) - Step back (create intertidal shelf against vertical wall) - Planter baskets; other planting initiatives - Improve creek or backwater habitats - Use breakwaters, shore parallel islands or similar to create sheltered conditions promoting intertidal enhancement - Offsetting measures e.g. spawning habitat for fish

For both the measure groups and the specific measures in each group, it is important to understand that the lists provided in the library are not intended to be comprehensive. Rather, these measures are intended to provide ideas and inspiration. Many Member States have their own mitigation measure libraries and these should also be referred to in determining whether alternative or more locally appropriate options exist that would deliver a similar outcome in terms of ecological improvement and definition of ecological potential. The European library of mitigation measures can support and supplement national mitigation measure libraries if such exist, and can support the development of new national libraries, if none exist in certain Member States so far.

In selecting potential mitigation measures, measures should be selected which are relevant to the hydromorphological alterations and ecologically effective in the context of the specific water body or water bodies . Box 8: below describes in more detail the meaning of "relevant" and "ecologically effective" mitigation measures.

Box 8: Selection of relevant and ecologically effective mitigation measures

The selection of potential mitigation measures, which are **relevant** to the hydromorphological alterations and **ecologically effective** in the context of the specific water body or water bodies should take into account the following:

- The natural hydromorphological and physicochemical characteristics of the water body
- Other water body or water bodies characteristics relevant to the biota, e.g. is the modification within or outside the fish zone, fish community types, sediment (e.g. coarse, fine) and habitats (e.g. river types)
- Whether measure is appropriate for addressing the existing ecological impacts and can deliver a proven ecological benefit. In this sense, measures that are not likely to deliver an ecological benefit should not be considered.

Example: The reconnection of side-arms is typically a relevant mitigation measure for restoring ecological continuum in rivers. However, if no side-arms exist to be "reconnected" in a specific HMWB, the measure is not relevant in the context that water body.

Example: Connectivity is typically relevant for all migrating biota, for the concerned water body as well as for water bodies upstream or downstream. If there is no significant ecological benefit from

measures which restore continuity (e.g. due to a very short river reach within the fish zone upstream, or the connection of different river basins leading to dispersal of invasive species), continuity measures can be excluded from the selection of potential mitigation measures for MEP.

The selection of mitigation measures that are both relevant to the particular hydromorphological alterations and ecologically effective in the context of the specific water body or water bodies should not be confused with the justification of "technical feasibility" under WFD Article 4(4) and of "infeasible achievement" under WFD Article 4(5) (exemptions).

In addition, it may also be appropriate to consider inter-water body parameters and processes, when selecting potentially relevant mitigation measures. Specifically, if the effect that requires mitigation directly or indirectly[31] involves or affects fish migration, sediment transport or similar ecological or hydromorphological processes that operate beyond the water body boundary, the selection of measures should take into account the need to sustain and/or improve these processes.

Example: Measures for fish continuity may be selected whilst defining MEP and GEP in a river water body, because they are needed to reconnect upstream water bodies.

Example: Insofar as sediment is concerned, if the enhancement of a coastal fish nursery area requires a supply of sediment, it may be preferable to modify an updrift breakwater to facilitate the natural, long term movement of sediment from along the coast rather than extracting and transporting material from a source downdrift.

In practice, this means that when using the mitigation measures library, in some cases, it may be necessary to select mitigation measures that are not directly linked to the physical modifications in the particular HMWB or are even related to the list of measures for another water category in the library.

Example: In the case of a reservoir as illustrated in Figure 8, a former river section (now a reservoir) is designated as a river HMWB but is shaped more like a lake. However, the river reaches (natural water bodies) upstream and downstream also need to be taken into account when designating HMWB and defining MEP and GEP for the HMWB, based on the condition before the physical modification (natural river types).[32] Additional measures to allow the upstream and downstream river sections to achieve their objectives might be needed, as ecological continuum (e.g. possibility to migrate) also has to be ensured for the type-specific fish species of the downstream and upstream natural water bodies. In this context, it is relevant to take the requirements of WFD Article 4(8) into account.[33] It is also assumed that water bodies have been properly delineated in line with CIS Guidance Document No.2 on the identification of

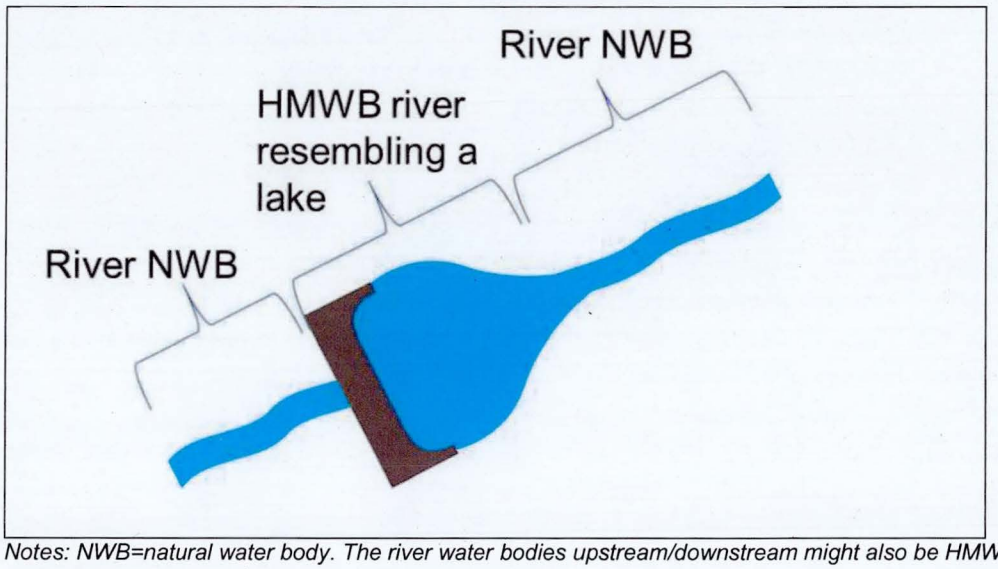
[31] Direct effects may result from the construction of a barrier or the physical removal of habitat through dredging. Indirect effects on habitats can be experienced as a result of a change in hydromorphological processes – for example deepening or widening can increase or reduce flow velocities, in turn making the environment less suitable for certain species or changing patterns of sediment accretion or erosion, indirectly changing the habitat type locally.

[32] Workshop on GEP inter-comparison case studies on water storage, 13- 14 February 2017 – Vienna, Summary Report.

[33] Article 4(8) specifies that when applying Article 4(3), "a Member State shall ensure that the application does not permanently exclude or compromise the achievement of the objectives of this Directive in other bodies of water within the same river basin district and is consistent with the implementation of other Community environmental legislation."

water bodies. For example, if this guidance is followed, a reservoir cannot include longer free flowing river sections, except for small stretches (e.g. up to 1 km). Therefore, there should not be a mixture of different water categories in a single HMWB.

Figure 8: Change of river into lake and links to upstream/downstream river sections



Notes: NWB=natural water body. The river water bodies upstream/downstream might also be HMWB but separate water bodies.

Differentiation between measures for defining MEP/GEP and (restoration) measures for achieving GES

The measures considered as potential MEP/GEP mitigation measures in designated HMWBs will be largely the same as restoration measures potentially contributing to GES and addressing the effects of hydromorphological pressures. However, the GES objective of restoring natural hydromorphological processes has already been rejected in the designation phase, on the basis that this would adversely affect the existing use and/or the wider environment of the water body. Therefore, full restoration measures (e.g. involving the removal of a dam, flood defence, breakwater, etc. to facilitate reinstatement of natural processes) do not need to be considered as mitigation measures for GEP. Rather, the full range of measures that aim to restore the natural hydromorphological processes wherever possible and/or to restore the ecological function insofar as this can be achieved in relation to the closest comparable water category and type will need to be considered.

Example: In the example of an impoundment (change of a riverine condition to a more stagnant one), measures such as the construction of bypass channels with riverine character, creation of habitats at the head area of the impoundment etc. (or their combinations) could significantly improve the situation but would not completely reach the riverine conditions needed for achieving GES.

Furthermore, in many cases, the intensity/level of ambition of a measure and the combination of measures may be crucial for distinguishing between measures for achieving GES and measures for defining and achieving GEP.

Example: In the case of measures related to flow, while the achievement of GES is related to a set of environmental standards for ecological flow (restoring flow), the achievement of GEP is related to fewer flow components (mitigating flow) than those required to meet environmental standards. Therefore, the

selection of the mitigation measure of additional flow for GEP will depend on the amount of flow available; some water can also be required for the achievement of GEP to support improvements in biological terms (GEP flow).

Initial list of potential mitigation measures for further evaluation

In the absence of an existing national library of measures and a methodology for their identification and review, it is recommended that the typical and modification-specific measures in the tables of the European mitigation measures library are assessed to determine whether each measure, alone or in combination with other measures, might contribute to an improvement in the ecological conditions of the water bodies being assessed.

This process will lead to the identification of an initial list of potential mitigation measures to be subject to further, more detailed, evaluation under the following steps, enabling the MEP/GEP objectives to be defined.

5.4.4.2 Exclude or redesign measures that have a significant adverse effect on use or wider environment (Sub-step B2)

The next step after creating an initial list of mitigation measures for MEP is to exclude measures that have significant adverse effects on use(s) or the wider environment. According to CIS Guidance Document No.4, MEP represents the maximum ecological quality that could be achieved for a HMWB once all mitigation measures that do not have significant adverse effects on use or on the wider environment have been applied.

The reasons and criteria for judging the significance of effects should be made clear in a transparent way, and decisions on when such adverse effects are significant are important as they may affect the level of ambition of ecological improvements and how intensely measures are applied.

When Member States exclude measures due to significant adverse effects on use or the wider environment, they should do so on the level of specific mitigation measures included in one of the measures groups. Whole measure groups should not be excluded, as this would not allow for case-specific differentiation (e.g. in relation to certain amounts of water in the river system).

Important!

Overall, no significant adverse effect on use cannot be equated to no effect on use, unless this is properly justified in the RBMP.

The following issues are considered as necessary to be addressed in order to achieve a transparent and clear process for assessing significant adverse effects:

- **Issue 1**: Define the key uses and the scope of wider environment interests
- **Issue 2**: Define the benefits of the key uses and of wider environment
- **Issue 3**: Define in generic terms the types of effects of measures on the key uses and the wider environment
- **Issue 4**: Define the scale of assessment of significant adverse effects for each key use and the wider environment
- **Issue 5**: For each key type of adverse effect, define criteria for assessing adverse effects and thresholds of significance

This process is developed at a strategic level in order to follow consistent approaches within the Member States.

Issue 1: Define the key uses and the scope of wider environment interests

While the definition of some uses may be clear (e.g. storage for hydropower use), for other uses it may require some further clarification (e.g. urbanisation) or a clearer definition of the scope (e.g. for wider environment). Further guidance on the scope of uses and the wider environment under WFD Article 4(3)(a) is given in section 3 of this document.

Issue 2: Define the benefits of the key uses and of wider environment

It is important to define the specific benefits of the different uses (e.g. in the case of hydropower, the importance of energy generation or for certain types of facilities providing for peaks in energy demand and regulatory power). Examples of the main benefits of the key uses and the wider environment are given in the Summary Report of the CIS Workshop on Significant Adverse Effects on use or the wider environment from measures (April 2018)[34].

Issue 3: Define in generic terms the types of effects of mitigation measures on the key uses and the wider environment

Adverse effects on the uses may include losses of/in important services (e.g. flood protection, drainage, navigability or recreation) or production losses (e.g. hydropower or agricultural goods). In assessing "significant adverse effects" on the uses, economic effects may play an important role (see Box 98 below on economic issues) and social aspects may also need to be considered (e.g. removal of flood defences may lead to displacement of population) (CIS Guidance Document No.4). Other considerations include possible health and safety, or legal implications (e.g. if an authority is legally required to provide a certain function).

[34] Kampa et al. (2018). Summary Report. Workshop on Significant Adverse Effects on use or the wider environment from measures, 23-24 April 2018, Brussels.

Examples on the types of effects of measures on the key uses and the wider environment are given in Table 12 below.

Table 12: Generic adverse effects of mitigation measures on key uses

Types of generic adverse effects of mitigation measures on use	Use-specific examples of adverse effects of mitigation measures
Loss of production	• Storage for hydropower: Loss of electricity production • Agriculture: Reduction of agricultural/forestry production
Risk to security of use	• Storage for hydropower: Significant risk to regional or national energy security • Storage for water supply: Reduction of security of water supply, also for navigation • Agriculture: Risk to food security
Risk to safety/health, societal well-being	• Flood protection: Increase of flood risk in close-by areas • Navigation: Safety implications for commercial/recreational/military navigation
Socio-economic impacts with measurable consequences for public welfare	• All uses: Loss of jobs/employment, Loss of revenue for Government (associated taxes) • Agriculture: Impact on thriving rural communities
Effects on reduced GHG emissions	• Storage for hydropower: Increased emissions from partly replacing hydropower production with conventional energy • Navigation: Additional emissions from tonnage moved to other forms of transport, especially road or air

Box 98: Significant adverse effects versus financial cost of measures

Generally speaking, the assessment of significant adverse effects should be based on the wider economic effects, while the income of a specific company should not be included in this assessment.[35] The assessment should be made in relation to the needs of society and not in relation to the economic situation of the individual. Whilst significant adverse effects from measures can be linked to a loss of revenue (benefits arising for specific water use), the ability of the user to pay is not relevant at this stage as this would potentially discriminate against efficient and profitable enterprises (CIS Guidance Document No.4). Overall business economics are part of the socio-economic assessment. The assessment must be made by Member States and should be supported by national targeting strategies. The ability of the user to pay is taken into consideration at another stage of the process when implementing measures for achieving GEP as part of the RBMPs.

CIS Guidance Document No.4 gives an overview of the related cost (and benefit) considerations for the measures that are to be considered in the different steps of the designation of HMWB and the definition of GEP (see table 4 in CIS Guidance Document No.4). Overall, the assessment of significant

[35] CIS Workshop on GEP inter-comparison case studies on water storage, 13- 14 February 2017 – Vienna.

adverse effects of measures on use or wider environment must not be confused with the assessment of disproportionate costs.

According to CIS Guidance Document No.4, the financial costs of measures are not considered in the classification process of HMWB. The costs of measures are taken into account in the objective setting process when defining the programme of measures for reaching the environmental objectives under the WFD (i.e. when determining which measures will be implemented in practice). At that stage, a decision needs to be taken on which GEP measures to include in the RBMP for implementation. This is the point at which costs are considered along with the possibility of applying an exemption based on WFD Article 4.5 per 2027 or later. Considerations at this stage include the question of disproportionate cost, which can involve political decisions.

Issue 4: Define the scale of assessment for each key use and the wider environment

At the stage of MEP definition, the local scale is generally relevant for assessing significant adverse effects. This is because, depending on the local conditions, a measure may have significant adverse effects in one location, but not in another site. After a water body is designated as HMWB, a Member State should seek to do the best it can for the ecology given the use(s) responsible for the modifications. Therefore, the assessment is about understanding how the measures that could be taken to improve or restore the ecological function will compromise or have another effect on use(s).

However, the assessment at local scale should not be related to the private interest of one person/or company but to broader public interest (e.g. safe electricity supply for people or a specific community). In addition, the assessment has to be linked to a general or national method on how to assess adverse effects and set criteria. Otherwise, cases at which mitigation has already taken place would be disadvantaged. It is thus necessary to ensure that the starting point for the assessment of significant adverse effects for different users is the same.

Example: This can be exemplified by looking at two different water abstractions from a river. The first abstraction runs on an old licence, whereby it is allowed to abstract all of the water and there is no obligation to retain some flow in the river. The other abstraction runs on a permit, which already includes a requirement for an environmental flow; however, this flow is not sufficient to achieve GES. The requirement to provide an ecological flow to achieve GES would lead to the fact that the production loss of the first abstraction would be much higher (e.g. 20%) than of the second abstraction (e.g. only 5%). It would be a large disadvantage for the second abstraction (which already follows a requirement for environmental flow) if the production loss for the first abstraction is assessed to be significant and for the second abstraction as insignificant. For this reason, production loss should in this case not be referred to a specific abstraction activity, but to the economic sector and to the effects on regional or national scale.

The scale of assessing significant adverse effects can be different for different uses and, in the Summary Report of the CIS Workshop on Significant Adverse Effects on use or the wider environment from

measures (April 2018)[36], examples are given on the most appropriate scale of assessment for each of the key uses of storage, flood protection, drainage and navigation.

In addition, it is often important to consider the whole river system when taking decisions on the significance of adverse effects. In particular, a measure might have a negative effect on a use at a certain location of the river system, but at the same time have a positive effect on the same type of use at another location of the river system.

Example: In the case of energy production, energy losses at the scale of an installation upstream may in the meantime increase the energy production for another hydropower plant further downstream. Therefore, economic losses upstream may be compensated by benefits further downstream. For this reason, there is a need to assess the effects on use not only with regard to a specific installation/local situation but also with regard to possible effects at the whole river system.

Issue 5: For each key type of adverse effect, define criteria on what is significant and what is not significant adverse effect

Overall, "no significant adverse effect on use" cannot be equated to "no effect on use", unless this is properly justified in the RBMP. At the same time, according to CIS Guidance Document No.4, "significance" may vary between sectors and uses and will be influenced by the socioeconomic priorities of Member States. It is however possible to give an indication of the difference between "significant adverse effect" and "adverse effect". A significant adverse effect on use should not be small or unnoticeable but should make a notable difference to the use. The distinction between the level of significance and levels of natural variation is important. For example, an effect should not usually be considered significant where the effect on use is smaller than the normal short-term variability in performance (e.g. output per kilowatt hour regarding base load, safe navigable depth, quantity of drinking water provided). However, the effect would clearly be significant if it compromised the long-term viability of the use by significantly reducing its performance.[37]

Example: For instance, how does a level of significance of adverse effect of less than 5% of reduction in annual electricity base load production compare to natural variation in annual production of 5-10%? Natural variation implies that, in dry years, a country would have certain energy loss, therefore any reduction to energy (base load) production should not be considered automatically as significant adverse effect.

However, in some cases, the distance between "no effect" and "significant effect" can be comparably small, for example in case of 100-year flood safety or regulatory power provision.

Overall, Member States need to establish criteria and thresholds for deciding whether measures would have a significant (or not significant) effect on use. This is a key issue for achieving a clear and

[36] Kampa et al. (2018). Summary Report. Workshop on Significant Adverse Effects on use or the wider environment from measures, 23-24 April 2018, Brussels.

[37] A factor to consider in this context is the length of time in which there should be a significant effect. This may be on a yearly basis and only in exceptional cases in the longer term. The likelihood that the effect will occur must be weighed against the damage that occurs on the use.

transparent process of defining MEP.[38] Criteria need to reflect the effect on different benefits provided by the water use. Thus, several criteria may need to be used rather than using a single criterion.

Look out!

The reasons and criteria for judgement on significance of effects should be made clear and transparent, and set in a consistent way at the national level. The set criteria can be applied at different scales. Setting thresholds for significance can also be relevant in some cases.

CIS Guidance Documents No.1 and No.4 have highlighted the type of methods that can be used in the assessment of significant adverse effects. Table 13 provides examples (open list) of how some generic effects have been developed into more specific lists of possible benefits, types of adverse effects and criteria for assessing adverse effects on water storage for hydropower. The significance thresholds listed in the last column of the table are examples of thresholds that have been used by Member States in their 2nd RBMPs to assess the significance of adverse effects. These thresholds show a wide variation and thus are not necessarily best practice examples. In general, when carrying out quantifications of adverse effects of measures on use, we should not use numbers only (such as loss of production in kWh), but also relate these to percentages (such as % of total production).

Table 13: Examples of adverse effects of mitigation measures on water storage for hydropower and assessment of significance

Benefits of storage for hydropower	Effects of measures on storage for hydropower	Criteria for assessing adverse effect on use	Level/scale at which this assessment may take place	When is an adverse effect significant
Electricity production (base load)	Production loss (base load) *Effect on climate change drivers and CO2 emissions (effect on wider environment)*[39]	Exact figure (production, MWh) Compared to annual production (%)	National, regional	*Examples of national estimates of significance:* Scotland >2% of annual national production[40] AT >3% loss of annual national production at any

[38] JRC technical report on common understanding of using mitigation measures for reaching Good Ecological Potential for heavily modified water bodies (2016).

[39] It is necessary to evaluate CO2-effects of mitigation measures corresponding directly to the storage reservoir aiming at depicting clearly the consequences for EU and national CO2 reduction goals when assessing possible cuts in reservoir uses.

[40] For Scotland, the 2% maximum reduction in generation is to deliver the measures set out for all RBMP cycles up to 2027. It is a cumulative annual total across the three cycles. Sources: https://www.sepa.org.uk/media/163444/appendices-to-the-river-basin-management-plan-for-the-scotland-

Benefits of storage for hydropower	Effects of measures on storage for hydropower	Criteria for assessing adverse effect on use	Level/scale at which this assessment may take place	When is an adverse effect significant
		Compared to renewable energy targets (%)		rate (maybe already even less)[41] SE >2.3% loss of annual national production[42] NO estimates available but no specific threshold of significance[43]
Flexibility (regulatory power, peak load production)	Loss of flexible capacity; Loss in minimum safe capacity *Effect on climate change drivers and CO2 emissions (effect on wider environment)*	Range of flexibility	National, local level	Quite unlikely to set quantitative threshold for significance
Regional or national energy security[44]	Significant risk to regional or national energy safety of electricity supply Significant risk to regional or	Risk to security	National, local level	No significant risk to security can be accepted

river-bsin-district-2015-2027.pdf (Appendix 3) and https://www.sepa.org.uk/media/218891/rbmp_appendices_2015_update_solway_tweed.pdf (Appendix 8.1)

[41] Sources: https://www.bmnt.gv.at/wasser/wasser-oesterreich/plan_gewaesser_ngp/nationaler_gewaesserbewirtschaftungsplan-ngp/ngp2009.html, https://www.bmnt.gv.at/wasser/wisa/fachinformation/ngp/ngp-2015.html

[42] Sources: https://www.havochvatten.se/hav/fiske--fritid/miljopaverkan/fysisk-paverkan/nationell-strategi-for-vattenkraft-och-vattenmiljo.html and "National strategy" (In Swedish) https://www.havochvatten.se/hav/samordning--fakta/samverkansomraden/energi/nationell-strategi-for-vattenkraft-och-vattenmiljo.html.

[43] Source: http://www.vannportalen.no/brev-og-foringer1/nasjonale-foringer-for-regulerte-vassdrag/ (in Norwegian).

[44] A clear definition would be needed: security of supply and/or grid security. Whereas enhancing security of supply aims to decrease energy imports from outside EU, the stable operation of electricity grids aims at providing the commonly known low level of shortages of electricity delivery.

Benefits of storage for hydropower	Effects of measures on storage for hydropower	Criteria for assessing adverse effect on use	Level/scale at which this assessment may take place	When is an adverse effect significant
	national security of grid stability			

Note: "Run-of-river hydropower plants usually produce base load electricity while (pumped) storage hydropower plants produce electricity on demand (peak load, regulatory power). The significance of production losses thus has to be assessed differently, in particular because peak load or regulatory power are much more difficult to be replaced by another renewable energy source.

Cross-cutting issues

In addition to avoiding adverse effects on use for which the water body is designated, it is important to ensure that measures to achieve GEP also avoid adversely affecting other legitimate (i.e. sustainable human) uses. If "unintended consequences" are to be avoided, it is important to consult with all users of a water body in order to understand possible impacts of mitigation measures on other uses, including uses that have not triggered a HMWB designation.

Example: Measures to achieve GEP in water bodies affected by flood protection in rivers or estuaries may have an impact on (safety of) navigation. For instance, the measure of flood bank removal to reconnect the river with its floodplain may be selected for achieving GEP. Changing the flow of water can result in a shift in location of the main channel or in general shallowing, both of which can have potentially significant consequences for navigational safety.

Example: Another example is on a river channel which has been deepened and widened for flood defence purposes. The adverse ecological effects of the modifications could be mitigated in this case without a significant reduction in the channels' capacity to convey flood water by the establishment of a two stage channel (i.e. a deeper central channel and shallower margins within the artificially widened channel). This measure would increase habitat diversity and allow rooted plants to grow in the shallower areas adjacent to the banks. However, if the channel is also being used for navigation, such a measure might have a significant adverse effect on the navigability of the channel and therefore be inappropriate.[45]

The following are possible outcomes when assessing possible adverse effects on more than one use:

- Where several uses are present, if the effect of the mitigation measures on any one of these uses is significant, then a 'significant adverse effect on use' conclusion is triggered for that measure.
- If there are several uses present and none of these is significantly affected, but several effects are very close to the relevant threshold (i.e. are nearly 'significant'), this might trigger further investigation whether the overall cumulative effect is considered as significant.

[45] WFD and hydromorphological pressures – Technical report. Good practice in managing the ecological impacts of hydropower schemes; flood protection works; and works designed to facilitate navigation under the Water Framework Directive. November 2016.

- In other cases, if none of the uses are close to being significantly affected by a particular measure (i.e. alone), the in-combination effects would not be expected to be significant.

Assessment of significant adverse effects as an iterative process

The selection of mitigation measures that do not have significant adverse effects on use or the wider environment might also be an iterative process. The level of ambition of a measure plays a role in the selection process; a measure with a significant adverse effect could potentially be re-designed to have a reduced level of ambition, which may not have a significant adverse effect and should therefore be taken into account in the definition of MEP.

In many cases, there are several reasons than can lead to a need for case-specific differentiation, e.g. on quantity of water or length of morphological mitigation measures to be implemented.

Example: In the case of measures related to flow, the provision of a certain amount of water necessary to establish a GEP flow[46] could have a significant adverse effect on use. The establishment of additional flow with a different (reduced) volume of water may not have a significant adverse effect, and should thus be part of the set of measures to define MEP conditions.

In addition, combinations of measures can be relevant for re-designing measures in order to have a reduced adverse effect. In this context, it should be checked whether the adverse effect can be reduced by using an additional measure (including technical upgrade/refurbishment/modernisation).

Example: In the case of hydropower, production loss due to the provisioning of an environmental flow can be significantly reduced by installing a "residual flow turbine". This turbine uses the amount of water needed for environmental flow to produce additional electricity.

5.4.4.3 Select most ecologically beneficial (combinations of) measures addressing all hydromorphological alterations, taking into account need to ensure best approximation to ecological continuum (Sub-step B3)

Having excluded from the initial list of potential mitigation measures, those measures that would have a significant adverse effect on use or the wider environment, the next step is to select the measure or combination[47] of measures that deliver the best improvement in ecological function and address all relevant hydromorphological alterations, **taking into account the need to ensure best approximation of ecological continuum**. Overall, mitigation measure(s) selected for the definition of MEP and GEP are assumed to deliver sufficient improvements to aspects of ecological functioning. Improvements to ecological functioning should clearly relate to the key impacts of the physical modifications.

In order to select mitigation measures, clear knowledge is needed on type-specific ecological impacts based on BQEs and on what hydromorphological conditions should be improved to improve the

[46] GEP flow is here defined equivalent to the definition of Ecological Flow in CIS Guidance #31 as "a hydrological regime consistent with the achievement of the environmental objectives of the WFD in heavily modified surface water bodies as mentioned in Article 4(1).

[47] From a practical perspective, the meaning of "combinations" highlights that measures should take into account other measures, which might be necessary for significant improvements, e.g. a creation of floodplain habitats can be ecologically effective only if the flooding regime is sufficiently improved.

biological conditions. This means that there should be sufficient knowledge of the biological response to related mitigation measures that are relevant to the particular hydromorphological alterations. The benefits of each measure or a combination of measures to the relevant BQEs should be considered, considering timings based on ecological requirements (e.g. reproductive seasons, impacts on vegetation encroachment).

If there is sufficient information available on which quality elements are failing good status and if different measures make a contribution to the relevant ecological improvements needed, all these measures should be included in the initial list of mitigation measures for MEP definition. Furthermore, whilst identifying mitigation measures for MEP, measures should be sufficient for mitigating the ecological deficits to the maximum extent possible, i.e. measures which are only predicted to have a slight contribution to ecological improvement should be included.

In case of lack of data, a precautionary approach should be adopted. More relevant mitigation measures should be included on the initial list, which can be excluded later when sufficient supporting evidence becomes available.

It is also considered good practice to first consider mitigation measures where there is a high degree of confidence that they will improve ecological conditions and ensure the best approximation of ecological continuum.

MEP requires that the best approximation of ecological continuum is ensured. If this is ensured on the basis of the selected set of mitigation measures, the list of measures is used to define MEP and then GEP conditions, and later to select measures for the PoM to achieve GEP. In this context, the most relevant water category and water type must also be taken into account, to ensure that all relevant mitigation measures have been considered.

If the set of measures does not ensure best approximation of ecological continuum (e.g. the water body is dry at least seasonally), the initial list of mitigation measures needs to be reviewed, to check if there is another (second option) combination of measures by which best approximation of ecological continuum will be achieved.

5.4.5 Derivation of hydromorphological conditions for MEP (Step C)

The WFD defines the hydromorphological conditions for MEP as those "consistent with the only impacts on the surface water body being those resulting from the artificial or heavily modified characteristics of the water body once all mitigation measures have been taken to ensure the best approximation to ecological continuum, in particular with respect to migration of fauna and appropriate spawning and breeding grounds".

The hydromorphological conditions for MEP are therefore the hydromorphological conditions expected if all the mitigation measures that are relevant to the particular hydromorphological alterations, ecologically effective in the physical context of the water body or water bodies, and which do not have a significant adverse effect on use or the wider environment, are implemented. Though this definition is based on an assumption of which measures will be implemented, a prediction is fundamental for the following steps prior to the implementation of measures.

The derivation of hydromorphological conditions for MEP should be based on:

- the hydromorphological conditions in the water body altered by the physical modifications linked to the use.
- the expected effects of the set of mitigation measures (for MEP) on the hydromorphological conditions.

The hydromorphological conditions for MEP may resemble those of a different type (compared to the natural water body type before the physical modification). Thus, the hydromorphological conditions defined for MEP can be used to identify or derive the closest comparable water body type, which is in particular relevant for defining MEP conditions for biological quality elements and those physico-chemical parameters that are affected by the hydromorphological conditions. The closest comparable water body type is based on the most comparable water category (see Step A), national typology, hydromorphological conditions for MEP and the ecological impacts resulting from the hydromorphological alteration.

Closest comparable water body type

According to WFD Annex V 1.2.5, "the values of the relevant biological quality elements reflect, as far as possible, those associated with the **closest comparable surface water body type**, given the physical conditions which result from the artificial or heavily modified characteristics of the water body".

If possible, the closest comparable water body type should be derived from the original natural water body type (i.e. prior to the physical modification). It is noted, however, that although the closest comparable type can be the same as the original natural water body type, it is characterised by reduced habitat quality, i.e. lower than the hydromorphological quality for good status of the original natural water body type.

The closest comparable water body type may also differ from the original natural water body type, after adopting the changed hydromorphological conditions due to the modifications of the HMWB.

Example: When a river is modified by an impoundment (not a reservoir), it changes from a more rhithral (fast flowing, high energy, associated with the upper parts of a system) to a more potamal (slower flowing, lower energy, associated with the lower parts of a system) river type; here, the most important change is the significant reduction of the flow velocity consistent with a larger river type further downstream in the river basin. The river type of a size category different to that of the original natural river type would therefore be used in this situation.

Example: With regard to a reservoir used for water storage (e.g. for hydropower generation), there is no natural lake type with comparable water level variations. Nevertheless, the reservoir can be treated like a lake type in the same region, altitude and geology, with the exception of the water level variation and all quality elements directly or indirectly influenced by this variation. This means that the nutrient level required for MEP or GEP of the reservoir will be similar to the nutrient requirements of the natural lake type. For water level variation and all other hydromorphological, physico-chemical and biological quality elements influenced by the level variation, MEP and GEP conditions/values have to be derived by taking account of the relevant mitigation measures.

Look out!
Please note that it is not considered as good practice to compare the characteristics to a type that is not already prevalent in the same region, e.g. to relate the hydromorphological conditions of a permanent river to those of a temporary river, if such features do not already occur naturally within the same landscape unit of the water body before modification.

!

Reference approach ←→ Mitigation measures approach

Step C should be taken under both the reference approach and the mitigation measures approach. Take note though that the necessary monitoring data and other information may initially be lacking, requiring further refining of step C in later planning cycles as data availability and method sensitivity improve.

5.4.6 Derivation of physico-chemical conditions for MEP, taking into account the closest comparable water body type (Step D)

According to WFD Annex V 1.2.5 normative definitions for MEP:

- The [general] physico-chemical quality elements correspond totally or nearly totally to the undisturbed conditions associated with the surface water body type most closely comparable to the artificial or heavily modified water body concerned.
- Nutrient concentrations remain within the range normally associated with such undisturbed conditions.
- The levels of temperature, oxygen balance and pH are consistent with those found in the most closely comparable surface water body types under undisturbed conditions.
- Concentrations [of specific synthetic pollutants] are close to zero and at least below the limits of detection of the most advanced analytical techniques in general use.
- Concentrations [of specific non-synthetic pollutants] remain within the range normally associated with undisturbed conditions found in the surface water body type most closely comparable to the artificial or heavily modified water body concerned (background levels = bgl).

The physico-chemical conditions for MEP should be based, inter alia, on the hydromorphological conditions at MEP and on the estimation of correspondence "totally or nearly totally to the undisturbed conditions" associated with the closest comparable water type. The physico-chemical conditions have an important influence on the values for the biological quality elements at MEP.

The identification of the closest comparable water type is a supportive tool in this context. For physico-chemical parameters, the physico-chemical reference conditions for the closest comparable water body type are often the same as for the original natural water body type (before physical modification). However, this is not always the case and, in some cases, the reference conditions are different. The example bellow illustrates such a case.

Example: In the case of an impoundment within a river, nutrient concentrations will generally not be different following modification. However, the same nutrient concentrations can have stronger "eutrophication" effects when compared to the natural river type, due to the water being more "stagnant" in the modified situation. Nevertheless, in most cases this does not lead to nutrient values for MEP and

GEP that differ from those of the original natural water body. In exceptional cases, e.g. if this occurs on a large scale where a chain of impoundments characterize a river water body, this "eutrophication" effect might be taken into account and lead to lower nutrient boundaries through the use of the reference conditions of another, closest comparable, water type which is usually a larger river type downstream of the water body.

An exceptional case are those physico-chemical parameters that are inevitably determined by the hydromorphological alterations causing the heavily modified character. In general, the closest comparable water body type for physico-chemical conditions can only be different from the original natural water body type (before the physical modification) if the altered physico-chemical conditions are caused by the modified hydromorphological conditions.

If the values of those physico-chemical conditions that are directly connected to the hydromorphological alterations of the HMWB would not correspond totally or even nearly totally with the surface water body type most closely comparable to the artificial or heavily modified water body concerned, these differences should be taken into account when setting MEP.

Example: In the case of a large impoundment in a river (not a reservoir), temperature conditions might be different after the modification that might lead to the use of reference conditions of a larger and warmer river type downstream of the water body as closest comparable water type. Temperature is usually inevitably changed if a river is modified to a lake reservoir leading to a change in category and the closest comparable lake type as basis for derivation of temperature values for MEP.

Requirements for specific synthetic pollutants at MEP are the same as those for natural water bodies.

!	**Reference approach <-> Mitigation measures approach** Step D should be taken under both the reference approach and the mitigation measures approach. Take note though that the necessary monitoring data and other information may initially be lacking, requiring further refining of step D in later planning cycles as data availability and method sensitivity improve.

5.4.7 Derivation of BQE conditions for MEP (Step E)

According to WFD Annex V 1.2.5, the values for the biological quality elements at MEP should reflect, "as far as possible, those associated with the closest comparable surface water body type, given the physical conditions which result from the artificial or heavily modified characteristics of the water body".

The BQE conditions for MEP are the biological conditions expected if the hydromorphological conditions at MEP are assumed to be achieved after implementation of all mitigation measures that are both relevant to the particular hydromorphological alterations and ecologically effective in the physical context of the water body or water bodies.

In practice, the derivation of biological conditions for MEP is based on:

- The identification of closest comparable water type
- The predicted hydromorphological and physico-chemical conditions (for MEP)
- The available BQE methods for ecological status assessment

When deriving BQE conditions for MEP, it is also critical to **consider the WFD requirements concerning the best approximation of the ecological continuum**, as described in section 5.2. The closest comparable water type (e.g. river type) also has a fundamental importance for derivation of BQE conditions at MEP.

It is suitable to use the BQE assessment methods used for natural water bodies of the same category if those methods are sensitive to hydromorphological alterations and can cover the relevant gradient of degradation for the HMWB. In principle, BQE conditions for MEP are the reference conditions of the closest comparable type, but adjustments are needed if the hydromorphological and physico-chemical conditions for MEP differ from those conditions in the closest comparable type. In the same way, it might be suitable to combine elements of different assessment methods (e.g. different metrics) to get an appropriate system of assessment. Whichever approach is used, a transparent and reproducible way to assess ecological potential has to be found.

In some cases, it may be difficult or not possible to find a closest comparable water body type. It may however be possible to predict the BQE conditions for MEP from the hydromorphological and physico-chemical conditions for MEP, even when a comparable water body is missing.

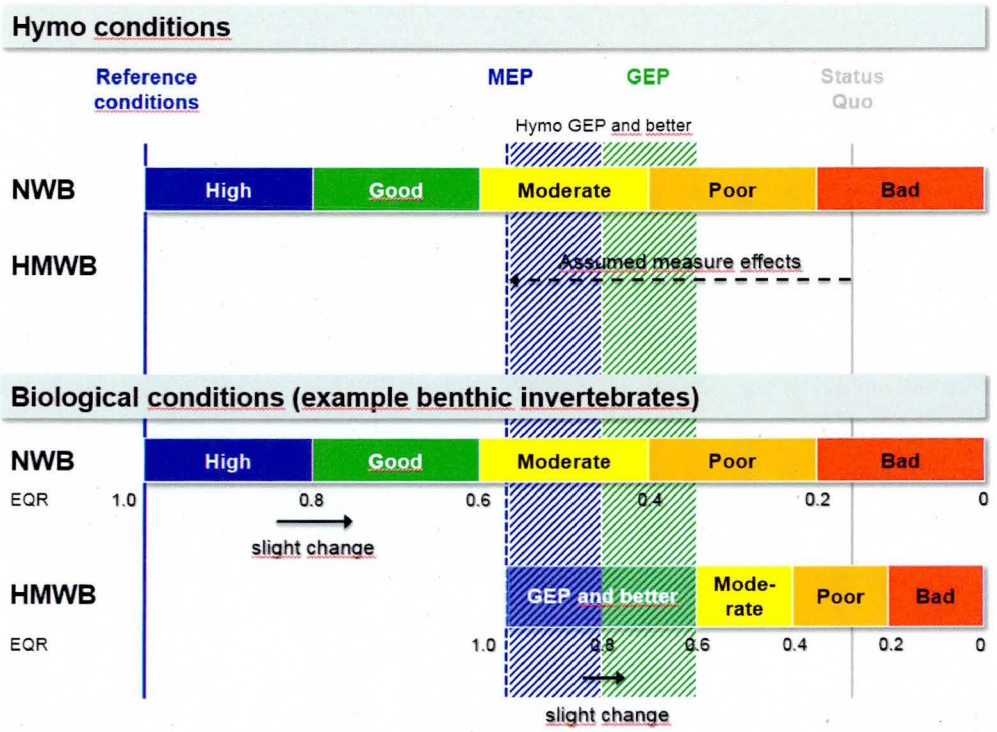
The values for BQEs at MEP might vary between countries, biological quality elements and river types depending particularly on the approach used, structure of the BQE assessment system, river characteristics and the availability of hydromorphological and biological data.

Example: Figure 9 below illustrates an example that uses equidistant classes for defining ecological potential based on benthic invertebrates. It is noted that the values used in this example can be different in other examples.

The example focuses on a river water body that is in bad ecological status considering hydromorphological conditions and the condition of benthic invertebrates (status quo). The relevant and ecologically effective mitigation measures (step B) result in hydromorphological conditions at MEP (step C) that are within the class of a moderate status taking into account the assumed effects of the set of measures. The physico-chemical conditions (step D, step G) are the same as of the original natural river water type, these are therefore not pointed out in the figure.

The conditions of benthic invertebrates at MEP (step E) result from the hydromorphological conditions at MEP that are defined by the method for hydromorphological status assessment. A maximum EQR value of 1.0 for benthic invertebrates at MEP correlates with an EQR value of approximately 0.57 in the ecological status assessment system (moderate class). Dividing the whole gradient of ecological potential into five equidistant classes results in class boundaries for all five classes for benthic invertebrates and defines the "slight change" between MEP and GEP (step F). For instance, GEP correlates with a poor to moderate ecological status for this example depending on the EQR value. The status quo shows a poor ecological potential with an EQR value of <0.3. The EQR value of >0.6 describes GEP for the water body that can be transferred into hydromorphological conditions at GEP (step G) and be used to identify the mitigation measures needed to reach these values (step H).

Figure 9: Example of five equidistant classes for ecological potential based on benthic invertebrates



Reference approach ←→ Mitigation measures approach

In theory, step E should be undertaken in both the reference approach and the mitigation measures approach. In practice, however, the mitigation measures approach is often followed where there is no or insufficient data on BQEs. As a result, if step E cannot be undertaken in the current planning cycle, it should be clearly stated in the RBMP how this gap will be completed during a later cycle. In particular, this implies efforts to collect more data and improve knowledge on the links between hydromorphology and biology.

5.4.8 Derivation of BQE conditions for GEP (Step F)

Good ecological potential is defined in WFD Annex V 1.2.5 as an ecological state in which "there are slight changes in the values of the relevant biological quality elements as compared to the values found at maximum ecological potential". "Slight changes" are discussed further in Box 9.

Box 9Definition of slight changes for biological conditions

What are slight changes?

A crucial aspect in the context of defining GEP is a common understanding of "slight changes". Guidance on how to interpret "slight changes" can be found in CIS Guidance Documents No. 10, 13 and 14. CIS Guidance Document No.13 on the "Overall approach to the classification of ecological status and ecological potential" provides guidance on the interpretation of the term "slight changes" with reference to the (type-specific) conditions specified for the BQE benthic invertebrates at good status:

- There must be no more than slight changes in composition and abundance
- There must be no more than slight changes in the ratio of disturbance sensitive taxa to insensitive taxa
- There must be no more than slight signs of alteration to the level of diversity

With respect to "slight changes", HMWB should follow the same principles as natural water bodies, with a functioning ecosystem being a prerequisite for a water body to be at GEP. A "slight change" cannot be equivalent to a temporary or complete absence or severe change of the biological quality elements relevant for the closest comparable water category and type (e.g. of fish for rivers within the fish zone). "Slight changes" to the biological quality elements have to be supported by corresponding conditions in the supporting quality elements (e.g. flow, habitats, continuity). With regard to ecological continuum, "slight change" means that a condition close to best approximation of ecological continuum should be ensured (instead of best approximation itself) .

Overall, the biological conditions at GEP should be indicative of a functioning ecosystem, **taking into account the need to ensure close to the best approximation of ecological continuum**, as described in section 5.2. If the biological conditions for GEP can be validated through monitoring results of a hydromorphology-sensitive assessment method, it should be assumed that a condition close to best approximation to ecological continuum is achieved. If there is no definition of biological conditions at GEP or no biological monitoring data available, this check might be preliminarily undertaken based on hydromorphological data and mitigation measures. According to the most comparable water body type, the use of assessment systems and the level of detail for GEP description, the same principles are valid as described for biological conditions of MEP (see section 5.4.7).

!

Reference approach ←→ Mitigation measures approach

In theory, step F should be taken under both the reference approach and the mitigation measures approach.

For the mitigation measures approach, the route to step F is different than for the reference approach. While in the reference approach, step F follows from step E (derivation of biological conditions for MEP), in the mitigation measures approach, step H (identification of mitigation measures for GEP) leads to step G (derivation of supporting quality elements conditions for GEP) and step F.

Under the mitigation measures approach, the BQE conditions at GEP can initially only be derived from the predicted hydromorphological and physico-chemical conditions in a situation where all GEP measures are assumed to be in place. At first, mitigation measures (or certain habitat functions that can be expected to be achieved after implementation of these measures) are identified, excluding those that, in combination, are only predicted to deliver "slight changes" (slight improvements) compared to biological conditions of MEP. In the mitigation measures approach, the measures that would only result in "slight changes" to hydromorphology are discarded, assuming that they will not modify the habitat conditions sufficiently to promote an enhancement in the biological conditions. GEP is therefore defined by the biological conditions expected from considering the remaining measures. Thus, a prediction of the improved hydromorphological conditions is needed. The mitigation measures approach assumes that by improving hydromorphological conditions, the connectivity and the habitat will improve and this will in turn elicit an enhancement in the biological conditions.

If step F cannot be undertaken in the current planning cycle, it should be clearly stated in the RBMP how this gap will be addressed at a later cycle. It implies in particular efforts to collect more data and improve knowledge on the links between hydromorphology and biology.

5.4.9 Derivation of supporting quality elements (SQE) conditions for GEP (Step G)

The derivation of supporting quality elements (SQE) for GEP entails identification of hydromorphological conditions and physico-chemical conditions, including environmental quality standards (EQS) for specific synthetic and non-synthetic pollutants.

Hydromorphological conditions (GEP)

The hydromorphological conditions at GEP must support the achievement of the biological values defined for GEP. The hydromorphological conditions necessary to support the GEP values for biological quality elements must therefore be identified, in particular the values for those biological quality elements that are sensitive to hydromorphological alterations.

The hydromorphological conditions at GEP should consider ecological functioning, **taking into account the need to ensure close to best approximation of ecological continuum**. As mentioned in section 0, GEP is defined by only slight changes in the biological values set for MEP and the hydromorphological conditions have to be consistent with the biological values set for GEP. This means that, for GEP, hydromorphological conditions still have to take into account the ecological continuum with regards to migration possibilities, flow and sediment/habitat requirements that might be adequate for slightly reduced specifications for the biological criteria mentioned in CIS Guidance Document No.13 (e.g. species abundance and/or composition) of relevant BQE (particularly fish and benthic invertebrates) compared to MEP.

Physico-chemical conditions (GEP)

The physico-chemical conditions have such values to support the achievement of the GEP biological values. It is also required that the values for the general physicochemical quality elements at GEP are such as to ensure the functioning of the ecosystem.

If the mitigation measures approach for GEP definition is used, the physico-chemical conditions are based on the effects of mitigation measures (for GEP) on physico-chemical parameters.

In general, the same values for physico-chemical conditions should be met as for good ecological status for the original natural water body type, except if the parameter is impacted by the hydromorphological alteration having led to HMWB designation (e.g. changed water temperature due to hydropeaking) (see also section 5.4.6 above on the derivation of physico-chemical conditions for MEP).

Environmental Quality Standards (EQS) for the specific synthetic and non-synthetic pollutant quality elements are to be considered, with the same values to be achieved as for good ecological status.

!	**Reference approach ←→ Mitigation measures approach** Step G should be undertaken in both the reference approach and the mitigation measures approach. For the mitigation measures approach, the route to step G is different than for the reference approach. While in the reference approach, step G follows from step F, in the mitigation measures approach, step H (identification of mitigation measures for GEP) leads to step G and step F. In case the mitigation measures approach for GEP definition is used, the hydromorphological conditions at GEP are based on the effects of mitigation measures (for GEP) on hydromorphological quality elements excluding those delivering only "slight changes" (improvements) to biological conditions.

5.4.10 Identification of mitigation measures (GEP) (Step H)

In this step, the mitigation measures for reaching GEP are identified, which are in general:

- Relevant to each of the hydromorphological alterations causing failure to achieve good status and ecologically effective

- Do not have significant adverse effects on use(s) and/or the wider environment
- Take into account the need to ensure approximation to ecological continuum.

The mitigation measures within GEP are those needed to achieve the derived biological conditions by improving conditions of relevant supporting elements for GEP.

As indicated in step B (section 5.4.4), the selection of mitigation measures for GEP can be an iterative process, particularly where the mitigation measure approach is applied.

If there are still several measures remaining to choose from the list defined for MEP, it is also recommended that the principles enshrined in the mitigation hierarchy are applied. The mitigation hierarchy forms an important element in environmental impact assessment for new projects, but it is equally relevant and important for the selection of measures to define GEP objectives. The mitigation hierarchy, interpreted in the context of establishing priorities for the definition of GEP objectives, is described below:

1. First, measures that address the hydromorphological (and physico-chemical, if relevant) alteration such that the biological quality elements can recover naturally (alone or in combination with other measures) should be favoured
2. Second, measures which reinstate or improve the ecology on-site should be considered where natural recovery is not possible.
3. Third, (if neither of the above are possible) measures to create new features, communities, etc. off-site, taking into account the need for these to be self-sustaining, should be considered. Such measures often do not directly address the original hydromorphological alteration but rather seek to improve other aspects of the system such that the net effect is to reach GEP.

In addition, for the selection of detailed measures, it is important to take the whole river/catchment into account (e.g. according to interactions between river stretches). For example, measures for upstream stretches may impact downstream ones, and thus influence measures selection. In this context, it is relevant to take account of the requirements of WFD Article 4(8).

For the selection of the most effective measures combination (in terms of ecology), there is a need to consider differentiated criteria and objectives depending on the scale and size of the catchment:[48]

- In large catchments where international cooperation is important, migrators (longitudinal continuity – medium & long distance migrators), wetlands (lateral connectivity) as well as sediment and flow should be considered.
- On the regional/catchment level (national/regional level), details of the water body scale and status as well as priorities regarding the improvement potential vis-a-vis the size of stretches (e.g. improvement expected in 1 or 100 km of river length) are also important.

[48] CIS 2007 WFD hydropower workshop summary report

Reference approach ←→<-> Mitigation measures approach

! Step H should be taken under both the reference approach and the mitigation measures approach.

For the mitigation measures approach, the route to step H is different than for the reference approach. While in the reference approach, step H follows from step F and G, in the mitigation measures approach, step H (identification of mitigation measures for GEP) follows from step B (identification of mitigation measures for MEP). In the mitigation measures approach, mitigation measures for GEP are obtained after removing, from the set of mitigation measures identified for MEP, any measures which only lead to slight changes in biological conditions (alone or in combination).

It is noted that when there is lack of suitable biological assessment methods and/or data sensitive to modifications, the approach to the selection of mitigation measures should be more precautionary and more measures may need to be considered until there is sufficient evidence to exclude measures from MEP. Increased efforts are needed by Member States towards establishing appropriate biological monitoring and hydromorphology-sensitive methods for a more informed basis for the selection of mitigation measures.

5.5 Moderate, poor and bad ecological potential

WFD Annex V 1.2.5 provides normative definitions for maximum, good and moderate ecological potential. According to these normative definitions, at moderate potential, "there are moderate changes in the values of the relevant BQEs as compared to the values found at maximum ecological potential. These values are significantly more distorted than those found under good quality." The hydromorphological and physico-chemical conditions are consistent with the achievement of the values specified for the BQEs. The ecological potential classification presented in WFD Annex V 1.4.2 also refers to poor and bad potential.

Overall, it is very important that Member States quantify also the classes "moderate", "poor" and "bad" for ecological potential and include them in their assessment system. National assessment systems should at least differentiate between these classes according to the values of appropriate metrics.

An example of a Member State's description of the different ecological potential classes for benthic invertebrates, using metrics, is provided below. Furthermore, the importance of working towards the best approximation of ecological continuum is also relevant for the definition of ecological potential in classes less than good. As already noted, if it is not possible to ensure a condition close to best approximation to ecological continuum (linked to the functioning of the ecosystem), the water body cannot be classified as good ecological potential but only as a class lower than good.

In case a water body can reach good ecological potential on the basis of its hydromorphological status, it may still be classified as moderate or worse potential due to physico-chemical impacts (e.g. nutrient pollution) which are still unaddressed in the water body.

For those HMWB that are classified as moderate ecological potential or lower (i.e. where improvement is required), measures which have been identified during the definition of good ecological potential should be taken forward to the objective setting process.

The description of all ecological potential classes is important also in case of new projects which have to be assessed according to the requirements of WFD Article 4(7) (see also CIS Guidance Document No.36).[49] The non-achievement of good ecological potential or deterioration of the potential class of a HMWB due to a new modification is only allowed in case the conditions under Article 4(7) are met. A sound definition of MEP and GEP biological conditions provides the fundamental basis for the definition of the different ecological potential classes below good potential.

Example. Requirements of benthic invertebrates in river type HMWBs with land drainage in small to medium sized sand-dominated lowland rivers:

For many types of HMWB, benthic invertebrates are considered to be one of the most sensitive BQEs to hydromorphological alterations. Table 14 presents an example from a Member State of how requirements for the different classes of ecological potential relevant to benthic invertebrates in heavily modified rivers with land drainage can be defined. In the specific Member State example, these requirements are based on a multi-metric assessment system. The assessment system contains three single metrics resulting in one multi-metric index. This index value determines the overall class of ecological potential for benthic invertebrates and meets the requirements for a functioning aquatic ecosystem and best approximation to ecological continuum. The single metrics include positive (e.g. relative abundance of positive indicator species group, %) and negative indicator species (relative abundance of negative indicator species group, %). Basis for the assessment of ecological potential is the combination of natural river type and use. For comparability reasons with the ecological status classes, the boundaries are also indicated for the natural river type (small to medium sized sand-dominated lowland river).

Table 14: Member State example of definition of different ecological potential classes for benthic invertebrates in small to medium sized sand-dominated lowland river-HMWBs with land drainage

River type	**Small to medium sized sand-dominated lowland river**	
Category	**Natural water bodies**	**HMWB (Land drainage)**
Ecological potential class boundaries for benthic invertebrates		
Metric 1 (Relative abundance of positive indicator species group, %)		
high/good (HES/MEP)	51	41
good/moderate (GES/GEP)	44	32
moderate/poor	33	23
poor/bad	24	14
Metric 2 (Number of positive indicator species)		
high/good (HES/MEP)	10	6
good/moderate (GES/GEP)	8	4
moderate/poor	6	3

[49] CIS Guidance Document No 36. Exemptions to the Environmental Objectives according to Article 4(7). New modifications to the physical characteristics of surface water bodies, alterations to the level of groundwater, or new sustainable human development activities.

River type	Small to medium sized sand-dominated lowland river	
Category	**Natural water bodies**	**HMWB (Land drainage)**
poor/bad	3	1
Metric 3 (Relative abundance of negative indicator species group, %)		
high/good (HES/MEP)	9	13
good/moderate (GES/GEP)	13	18
moderate/poor	19	24
poor/bad	25	30

6 IMPLEMENTATION OF MEASURES TO ACHIEVE GEP

Key messages for this section

- For HMWB to reach GEP, sufficient mitigation (ecological improvement) is expected from measures implemented in the hydromorphologically altered water bodies, without significant adverse effects on use or the wider environment from any of these measures.
- A clear distinction between the selection of measures needed to define and achieve GEP and the implementation of measures (objective setting in the RBMP) is crucial for more transparency and a common understanding.
- To assess the effects of any mitigation measures already in place and the need for further mitigation measures, the ecological condition of the HMWB should be monitored. The main decisive elements are (apart from specific pollutants) the biological quality elements that determine the class of ecological potential. These are supported by hydromorphological and physico-chemical quality elements. If a proper assessment based on biological quality elements is not yet possible (e.g. due to a lack of hydromorphology-sensitive methods), monitoring of hydromorphological (and physico-chemical) quality elements can be used as a proxy to estimate the effectiveness of the mitigation measures already in place and thereby the ecological potential class. If the classification of the ecological potential is not based on hydromorphology-sensitive biological assessment methods, the classification result should indicate that the confidence level is low.
- If one or more of the selected GEP measures cannot be implemented due to disproportionate costs or infeasibility, it has to be confirmed whether the remaining measures will mitigate sufficiently to achieve the biological conditions required for GEP. If this is not the case, a review and possibly re-design of the measures will be needed to avoid the need to use exemptions: for example, selecting another combination/intensity of measures may deliver the desired ecological improvement.
- If it is not possible to implement all the measures needed to achieve GEP, it will not be possible to reach GEP conditions (like ecological continuum), so the water body will have to be classified as being at moderate potential or lower and would therefore need an exemption. Nevertheless, all the remaining measures would still have to be applied to improve/avoid deterioration of the conditions of the water body as far as possible.
- If monitoring shows that expected GEP conditions are not achieved after the implementation of all measures, it should be checked whether the reasons for not achieving GEP are linked to delayed biological restoration, overestimation of the biological response or to other significant impacts (e.g. multiple pressures) and the measures may need to be refined accordingly, if appropriate. This requires well-defined goals to be established as well as suitable methods for monitoring.

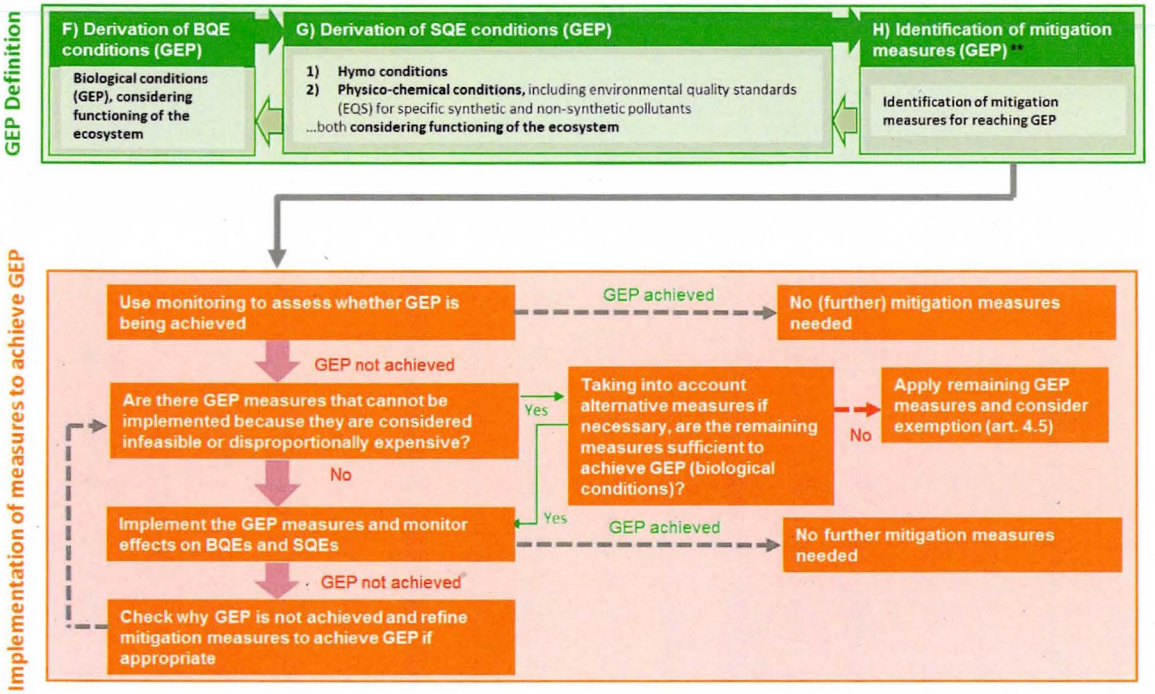
- Implementation of measures to achieve GEP should be seen as an iterative process.

The implementation of the measures to reach the objective for the HMWB (defined GEP) should be distinguished from the identification of measures for defining the GEP objective. These are two different processes related to measures for GEP, though both are closely interconnected. A distinction between these two processes is crucial for the management of HMWBs and for ensuring a more transparent and common understanding of whether GEP can be reached or not.

The identification and planning of measures to mitigate the ecological effects of hydromorphological modifications (i.e. for defining and thereby predicting GEP) takes place prior to updating RBMPs, as described in the previous sections. The final decision on whether it will be possible to implement all measures, out of those which are needed to achieve GEP, takes place for single water bodies and is an individual River Basin Management decision in the context of the programme of measures (objective setting in the RBMP). If several of the measures for GEP are de-selected for implementation at this stage because they are infeasible or disproportionally expensive, and the possibility of achieving GEP is compromised, an exemption (Article 4.5) from GEP should be considered.

The flow-chart on Figure 10 explains in more detail the process for implementing mitigation measures to achieve GEP within the programme of measures.

Figure 10: Process of implementing mitigation measures to achieve GEP



Use monitoring to assess whether GEP is being achieved

To assess the effects of any mitigation measures already in place and the need for further mitigation measures, the ecological condition of the HMWB should be monitored (see Box 10 below on monitoring

of HMWB). In case of lack of existing monitoring, appropriate site-specific monitoring needs to be set up in order to assess whether the expected mitigation from the measures already in place has been delivered and whether GEP is being achieved.

Other than specific pollutants, the main decisive elements are the biological quality elements that determine the class of ecological potential. These are supported by hydromorphological and physico-chemical quality elements. If a proper assessment based on biological quality elements is not yet possible (e.g. due to a lack of hydromorphology-sensitive methods), monitoring of hydromorphological (and physico-chemical) quality elements can be used as a proxy to estimate the effectiveness of the mitigation measures already in place and thereby the ecological potential class. If the classification of the ecological potential is not based on hydromorphology-sensitive biological assessment methods, the classification result should indicate that the confidence level is low (see WFD Annex V, 1.3 on estimates of the level of confidence and precision of the results provided by the monitoring programmes). The conditions for GEP should at least be differentiated from the conditions of an ecological potential lower than GEP, so that it can be estimated if GEP is achieved or not. The classification should be reviewed in each planning cycle.

If GEP is achieved or estimated to be achieved, no (further) actions in terms of hydromorphological mitigation measures are needed. However, there might be a need for hydromorphological measures to address larger scale issues (e.g. improving continuity in the considered HMWB because this is relevant for another water body upstream to achieve and maintain the environmental objective).

If the ecological potential is less than good (i.e. GEP is not achieved), then the reasons for this need to be clarified. As for natural water bodies, there might be several reasons, such as i) the improvement is taking longer than expected, ii) other significant pressures might have been missed or neglected, iii) the intensity of measures may not be sufficient, or iv) additional measures may be needed. Therefore, further action in terms of hydromorphological mitigation measures might be required. Otherwise an exemption (Article 4.5) from GEP should be considered. In case all mitigation measures without significant adverse effects on use are implemented but GEP values for biological quality elements are not achieved due to an overestimation of the biological response when defining the biological conditions for GEP, there is no need for further measure refinement or action; instead, GEP values have to be adapted to the proven monitored biological values.

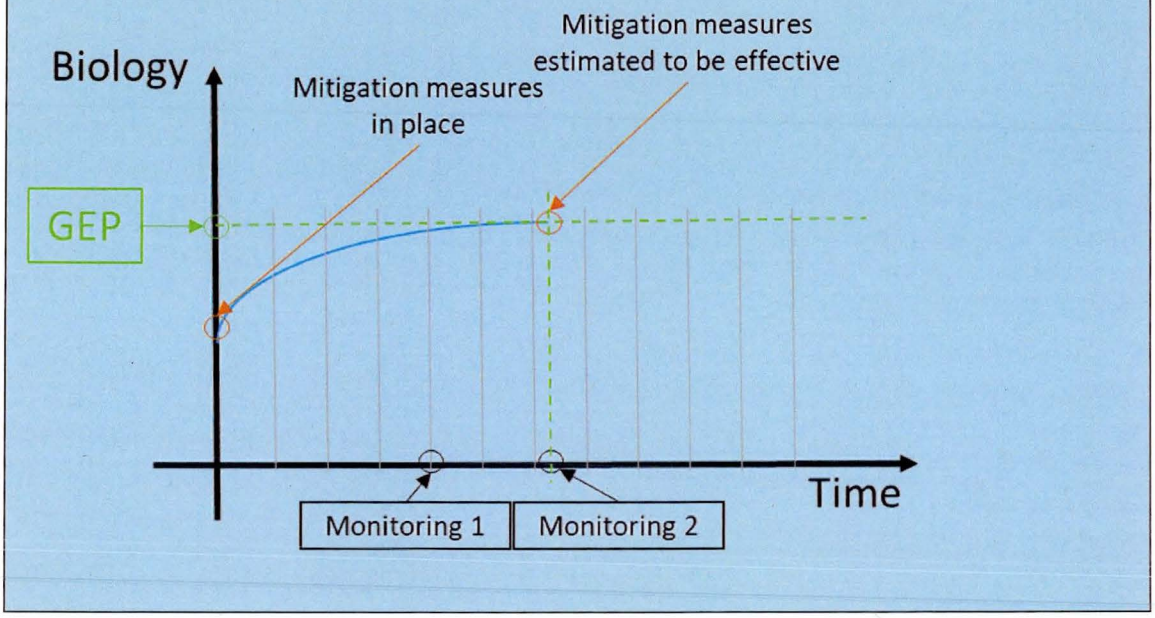
Box 10: Monitoring to classify the ecological potential of HMWB and assess effects of mitigation measures

Operational monitoring, which is focused on hydromorphological issues, is required in HMWB to determine their ecological potential (classification), evaluate the effects of the mitigation measures after their implementation, and allow adaptive management.

The methods to be used in both cases are the targeted hydromorphology-relevant methods used for operational monitoring. Operational monitoring also makes sense in case of activities in the HMWB or within its catchment which have led to a risk of failing GEP in the risk analysis.

There is a slight but important difference between monitoring natural water bodies and HMWB regarding designing an operational monitoring program in order to monitor progress in meeting the objective. The objective for HMWB (GEP) is based on a forecast of how the biology in the water body is expected to be when all mitigation measures are in place and effective. The objective for natural

water bodies (good ecological status), on the other hand, is a known value described using biological quality elements. Since GEP is a forecast, monitoring needs to measure the response of the biological communities to the measures implemented. Monitoring should be undertaken at the time when the measures are expected to be effective (see Monitoring 2 in the figure below). These values, derived from the monitoring, correspond to the exact values for GEP (see green line indicating the biological value for GEP in the figure below), once the measures are effective. However, it can be important to monitor earlier to detect progress (see Monitoring 1 in the figure below). If the reaction of the biology is different compared to the forecast, there has to be room for adaptive management resulting in change of either mitigation measures, of the objective or both.



Are there GEP measures that cannot be implemented because they are considered infeasible or disproportionally expensive?

River Basin Authorities may be of the opinion that some of the GEP measures identified in step H are disproportionately expensive (e.g. because the investment costs of measures are high) or infeasible. If this is the case, it needs to be checked if it is still possible to achieve GEP.

Example: A transboundary river is impacted by hydropeaking stemming from the upstream neighbouring country. Measures are only ecologically effective if they are implemented upstream in and by the neighbouring country. This decision is only in the national competence of the neighbouring country.

Taking into account alternative measures if necessary, are the remaining measures sufficient to achieve GEP (biological conditions)?

If one or more of the selected GEP measures have been excluded according to cost considerations or infeasibility, it has to be checked whether the remaining measures are still sufficient to achieve the biological conditions at GEP (step F in Figure 5. If this is not the case, a review and possibly re-design of the measures will be needed to avoid the need to use exemptions: for example, selecting another combination/intensity of measures may deliver the desired ecological improvement. The effects of the

measures as well as the hydromorphological and physico-chemical conditions at GEP (step G) should be used as the basis for this re-design, particularly of the set of GEP measures (step H).

Besides the conditions at water body level, the conditions up- and downstream (for rivers) as well as at the catchment level have to be considered to make a valid estimation. Large scale issues can significantly override the local effects of measures in both positive (e.g. good water quality, no or extensive land use) and negative (e.g. fine sediment input, continuity interruptions) directions, so both should be considered in this context. Even if some GEP measures are disproportionately expensive or infeasible, GEP might be reached if the remaining measures have a sufficient effect (in combination). This can particularly be the case if positive effects predominate on a larger scale (e.g. on catchment scale).

If the following is the case: a) no other/additional mitigation option can be implemented, and b) approximation to ecological continuum as needed for GEP cannot be achieved, it will not be possible to reach GEP conditions and the water body will have to be classified at moderate potential or lower and would need an exemption according to WFD Article 4.5. Nevertheless, the remaining measures would have to be applied to improve the conditions of the water body as far as possible.

Implement the GEP measures and monitor effects on BQEs and SQEs

All GEP measures that can be applied and are assumed to be sufficient to achieve GEP biological conditions are then implemented. The effects of the implemented GEP measures on BQEs and supporting quality elements should subsequently be monitored and the ecological potential of the water body should be classified accordingly (see Box 10 above on Monitoring of HMWB).

If GEP is achieved based on the monitoring results, no further mitigation measures are needed.

If monitoring results indicate that the mitigation measures have such an effect on quality elements that the water body reaches good ecological status, the water body cannot be considered as heavily modified and should be redesignated as a natural water body with good status as its environmental objective. If the monitoring indicates that the mitigation measures are not sufficient to achieve good status, the designation of the water body as HMWB remains valid and the defined GEP remains as its environmental objective.

If monitoring shows that expected GEP conditions are not achieved after the implementation of all measures, then the reasons (see above) for this need to be clarified, and it is possible that the combination or intensity of measures will need to be refined. Therefore, the implementation of measures to achieve GEP should be seen as an iterative process, starting with typical measures normally expected to mitigate a certain hydromorphological pressure-impact (see the European mitigation measure library which is a supporting tool to this document) that are known to be effective in most situations. These can be subject to future refinement or even the implementation of additional measures later on, taking into account the monitoring results.

Check why GEP is not achieved and refine mitigation measures to achieve GEP if appropriate

As stated above, if the ecological potential is less than good (i.e. GEP is not achieved) after implementing all measures and monitoring the effects on biological and supporting quality elements, the mitigation measures should be further refined to improve the conditions of the water body.

In this context, the reasons for not achieving GEP should first be checked because, as indicated above, non-achievement may be due to a delay in the biological reaction, overestimation of the biological response, an insufficient intensity of measures, or the presence of other significant pressures that are not sufficiently mitigated.

The results of biological monitoring and other (e.g. hydromorphological) investigations should be used as a basis to better determine the need for refinement of the mitigation measures. It can thus be defined in further detail "how much" of a specific measure is needed to achieve GEP and/ or "where in the water body" the measure should be introduced or intensified to reach the target GEP conditions.

The refined mitigation measures then need to be checked again in terms of disproportionate costs and infeasibility (see above) before proceeding to their practical implementation or to the application of an exemption (Article 4.5).

If the defined biological conditions for GEP cannot be reached after having implemented all measures without significant adverse effects on use (considering all relevant pressures) and allowing sufficient time for type-specific organisms to react and adapt, there is no need for further measure activities but a need to amend the biological values forecasted and defined in the GEP definition process.

7 INTERCOMPARISON OF ECOLOGICAL POTENTIAL

Key messages for this section

- As for natural water bodies, the requirement for intercalibration of HMWB implies that there is a need to ensure that classification methods for GEP are set in compliance with the WFD, and that classification results are comparable between EU Member States.
- To ensure comparability, a national, regional or basin-specific method for GEP definition has to be developed, although the application will be on water body level taking into account site-specific conditions.
- The step-wise approach and the mitigation measures library set out in this document should ensure a more common understanding and support the intercomparison of ecological potential.
- Comparability of classification results can be evaluated by analysing how Member States have addressed key steps of the procedure, especially:
    - Identification and assessment of hydromorphological impacts and alterations linked to the use causing failure of good status (from the designation phase)
    - Identification and consideration of the full range of potentially relevant mitigation measures, then excluding measures with a significant adverse effect on use or the wider environment in a transparent and consistent way
    - Definition of "slight" changes for biological conditions and removal of measures only leading to "slight" changes as well as consideration of approximation of ecological continuum

Intercalibration in the WFD and applicability to heavily modified water bodies

Intercalibration is a process aimed at achieving comparable classification boundaries for the biological quality elements set in compliance with the WFD requirements. The requirement for intercalibration is specified in WFD Annex V 1.4.1, that applies both to natural and heavily modified water bodies.

The intercalibration exercise is to be carried out by the Member States and facilitated by the Commission, with a deadline set in the WFD for 2007. Intercalibration activities started soon after the WFD came into force in 2000, as a key activity under the Common Implementation Strategy (CIS). In practice the intercalibration exercise proved to be much more complicated than originally foreseen; only a part of the work could be completed by the 2007 deadline, and a second and third phase were necessary. For natural waters, it has been possible to agree on a technical intercalibration process where Member States' classification methods are checked for their compliance with the normative definitions specified in WFD Annex V. Subsequently, the high-good and good-moderate boundaries are compared and harmonised either directly or by using a common metric. A common understanding of broad intercalibration types and the type-specific reference conditions is a key prerequisite to carry out the comparability analysis for good status classification methods. An important part of intercalibration of natural waters has been to apply/agree on common criteria for reference conditions. Several CIS guidance documents describe the common understanding and agreed procedures:

- CIS Guidance Document No.6 "Towards a guidance on establishment of the intercalibration network and the process of the intercalibration exercise (2003)
- CIS Guidance Document No.14 "Guidance on the intercalibration process 2004-2006" (2005)
- Updated CIS Guidance Document No.14 "Guidance on the intercalibration process 2008-2011" (2011)
- CIS Guidance Document No.30 "Procedure to fit new or updated classification methods to the results of a completed intercalibration exercise (2015)

Results of the completed intercalibration exercises were published in COM Decisions 2008/915/EC (phase 1), 2013/480/EU (phase 2) and 2018/REF (phase 3). With the 2018 COM Decision, the exercise has been completed for the natural water bodies.

In 2011 a concept paper on Intercalibration of GEP was endorsed by the Water Directors, discussing possibilities to fulfil the WFD requirement for intercalibrating good ecological potential and providing recommendations on assessing and improving comparability of good ecological potential assessments. A pragmatic approach was proposed, including the following three elements:

a) **Review of the current state of play in defining good ecological potential taking into account the requirements** of the WFD and existing guidance documents;
b) Development of a **methodological framework** for defining and assessing good ecological potential taking into account the results of the review; and
c) **Simple comparisons** of practical approaches for good ecological potential for common uses.

The first two steps of this process are completed with this new CIS Guidance no. 37, also partly based on several background documents (JRC technical reports and CIS workshop summaries related to the main water uses), and provide the basis for a subsequent intercomparison exercise.

Proposed practical approach for assessing comparability of good ecological potential for common uses

It is not possible to apply the same intercalibration procedures that were developed for the natural water body types to heavily modified water bodies. The main reason is that ecological potential class boundaries are not 'simply' derived from agreeing what constitutes a moderate deviation from type-specific reference conditions, but also include considerations of mitigation measures and their effect on supporting and biological quality elements, as well as socio-economic considerations when taking into account significant adverse effects on use and the wider environment from measures (policy-related issues).

As for natural water bodies, the requirement for intercalibration implies that there is a need to ensure that classification methods for GEP are set in compliance with the WFD, and that classification results are comparable between EU Member States. The step-wise approach and the mitigation measures library with DPSIR-information set out in this document should ensure a more common understanding and practice for ecological standards in HMWB, following the WFD principles and requirements and allowing different approaches.

Therefore, compliance can be evaluated by analysing and comparing the method and criteria Member States have used to designate and classify their heavily modified water bodies in the latest RBMP following the steps identified in this CIS Guidance Document No.37. Comparability of classification results can then be evaluated by analysing how Member States have addressed key aspects of the procedure, especially:

- Identification and assessment of hydromorphological impacts and alterations causing failure of good status and causing a change in character (from the designation phase). This should be based on the application of suitable methods for the assessment of hydromorphological quality elements, linked to the sensitive biological quality elements (see sections 2 and 4 of this Guidance).
- Identification and consideration of the full range of potentially relevant mitigation measures for MEP based on the expected effects of potential measures on hydromorphological conditions and the biological response.
- Criteria for excluding measures with a significant adverse effect on use or the wider environment in a transparent and consistent way,
- Definition of "slight" changes for biological conditions and removal of measures only leading to "slight" changes and/or removal of mitigation measures only leading to "slight" changes in biological quality element values.
- Consideration of approximation of ecological continuum.

It is foreseen that case studies from Member States where they document how they address the key steps of HMWB designation and defining GEP for typical uses and modifications will be collected, following a common template. The illustrative case studies in the current Guidance (see Annex I) are a first step that can be the basis for the templates to be used in the intercomparison exercise.

The purpose of this exercise will be to describe and compare the national methods to establish maximum and good ecological potential on the basis of the requirements of the WFD. The comparability of Member State approaches will then be evaluated, requiring some form of independent review (similar to the review panel established for the intercalibration exercise). This will allow to identify good practices, to

support good implementation of the WFD requirements regarding GEP, to progress through comparable approaches and to identify differences in interpretation/implementation leading to a lack of comparability (e.g. different interpretations of what constitutes "best approximation of ecological continuum" or different interpretations of the necessity of minimum requirements).

The intercomparison will also be an opportunity for Member States that are not able to follow key steps of the procedure (and therefore key requirements of the WFD) to provide justification.

As already pointed out above, the intercalibration of HMWB will be quite different compared to that of natural water bodies and needs to address specific challenges. For this reason, the final outcome of the intercomparison will most likely not be a Commission Decision with numerical class boundaries for the BQEs, but may be presented in a document of common understanding or, if relevant problems of intercomparability are detected, in an additional CIS guidance document to support Member States in ensuring a better comparability of GEP definition.

ANNEX I - ILLUSTRATIVE CASE STUDIES ON THE STEPS FOR DEFINING ECOLOGICAL POTENTIAL

This Annex presents practical illustrations of theoretical case studies for different water categories, which demonstrate how to apply the key steps for defining MEP and GEP (see flow-charts in sections 5 and 6). The theoretical case studies follow the reference approach, the mitigation measures approach, or both approaches. It is noted that irrespective of the water category or the approach followed, if it is not possible to take all steps included in the step-wise approach in Figure 5 of this document, clear justification is needed in the relevant RBMP, while Member States should make sure they can complete the remaining steps by improving data availability and knowledge on the links between hydromorphology and biology.

The case studies are an illustrative summary of the findings of the application of the step-wise approach for defining ecological potential. The actual evidence, e.g. from monitoring on the different steps is not provided.

The sub-sections below present the following theoretical case studies:

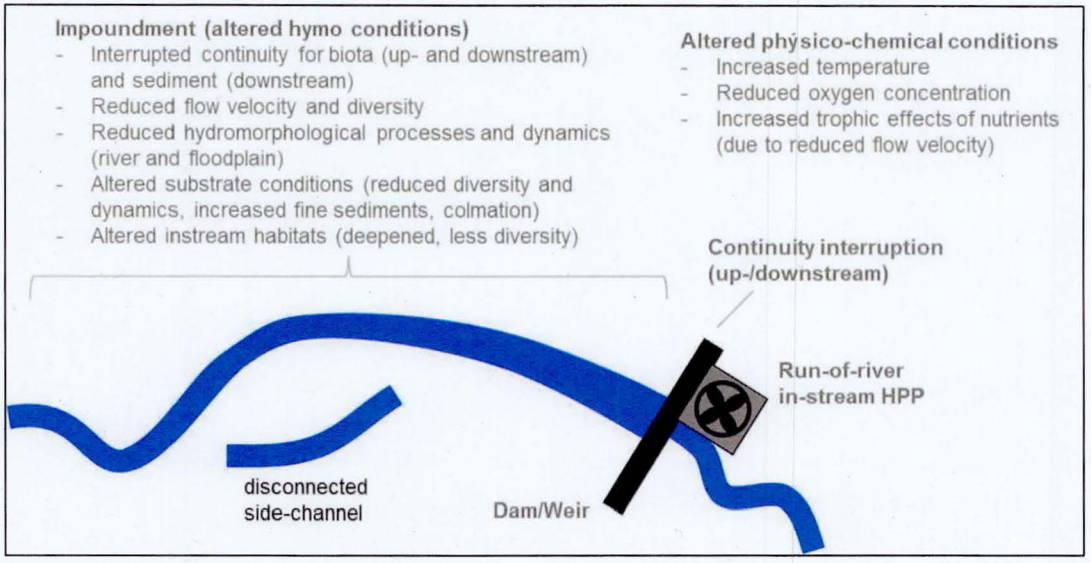
1. Case study of a river impoundment; this case study is described based on both the reference approach and the mitigation measures approach.
2. Case study of a river affected by straightening and bank fixation for navigation; this case study is described based on both the reference approach and the mitigation measures approach.
3. Case study of an estuary impacted by flood defence/embanking; this case study follows the steps of the mitigation measures approach only.
4. Case study on a river affected by drainage; this case study follows the steps of the reference approach only.

Case study 1: River impoundment (reference approach and mitigation measures approach)

Step	Reference approach	Mitigation measures approach
Information from earlier planning cycles (pre-step)	The river water body (high gradient small river, lower mountains (siliceous), coarse substrate, mean flow: 20 m^3/s) is heavily modified because of a low head dam with a run-of-river in-stream hydropower plant, causing a significant impoundment and leading to severe hydromorphological alterations: • Interrupted continuity for biota (up- and downstream) and sediment (downstream) • Reduced flow velocity and diversity • Reduced hydromorphological processes and dynamics (river and floodplain) • Altered substrate conditions (reduced diversity and dynamics, increased fine sediments, colmation) • Altered instream habitats (deepened, less diversity) These resulted in ecological impacts such as: • Reduced abundance / loss of rheophilic species (e.g. fish) • Increased abundance of tolerant species (e.g. benthic invertebrates) • Presence / increased abundance of stagnant species (e.g. macrophytes) See Figure 11 (below).	The river water body (high gradient small river, lower mountains (siliceous), coarse substrate, mean flow: 20 m^3/s) is heavily modified because of a low head dam with a run-of-river in-stream hydropower plant, causing a significant impoundment and leading to severe hydromorphological alterations: • Interrupted continuity for biota (up- and downstream) and sediment (downstream) • Reduced flow velocity and diversity • Reduced hydromorphological processes and dynamics (river and floodplain) • Altered substrate conditions (reduced diversity and dynamics, increased fine sediments, colmation) • Altered instream habitats (deepened, less diversity) There are detailed monitoring data available on hydromorphological conditions (providing detailed knowledge of the hydromorphological alterations, which are used for the HMWB designation). The biological monitoring data are limited or not appropriate to be assessed considering the sensitivity to the hydromorphological alterations. However, there is clear evidence from literature that due to the reduced flow velocity and related changes in habitats the conditions for typical riverine species (e.g. benthic invertebrates) are altered so that GES cannot be ensured with a high degree of confidence. In particular, the dam is a

Step	Reference approach	Mitigation measures approach
	There are detailed monitoring data available on hydromorphological conditions (providing detailed knowledge of the hydromorphological alterations) and on biological quality elements (providing detailed knowledge of the biological impacts on benthic invertebrates and fish). The valid data basis provides the knowledge that is essential for the application of the "reference approach" for defining the ecological potential. The overall ecological status is "bad" based on benthic invertebrates (bad status), fish (poor status) and hydromorphology (bad status). With regard to physico-chemical quality elements, temperature and oxygen concentration are affected by the hydromorphological alterations causing the impoundment (based on detailed data). Reduction of flow velocity will increase the trophic effect of nutrients. There are no other relevant impacts from other water uses.	barrier to fish migration that is relevant to safeguarding the riverine fish population also in the long run. With regard to physico-chemical quality elements, temperature and oxygen concentrations are affected by the hydromorphological alterations causing the impoundment (based on detailed data). Reduction of flow velocity will increase the trophic effect of nutrients. There are no other relevant impacts from other water uses.

Figure 11: River impoundment with indication of impacts

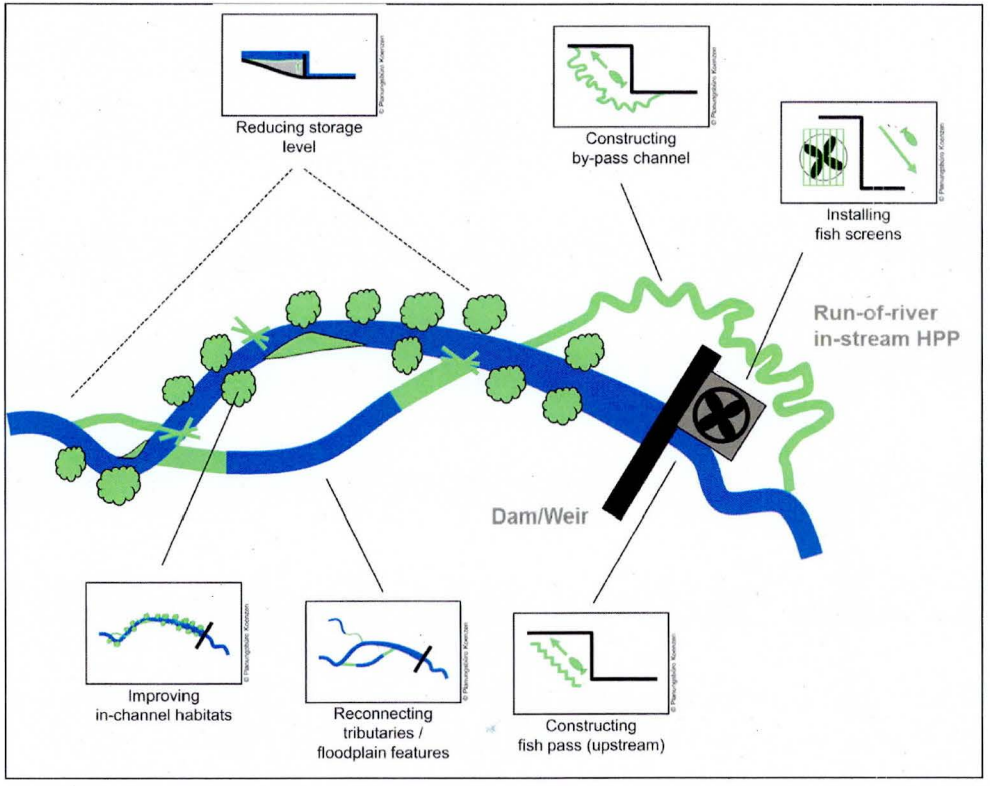


Step	Reference approach	Mitigation measures approach
A. Identification of closest comparable water category	The original river water body remains a river water body taking into account the hydromorphological and biological conditions.	The original river water body remains a river water body taking into account the hydromorphological and biological conditions.
B. Identification of mitigation measures for MEP (see	Based on the hydromorphological alterations and ecological impacts, the following groups of measures might be appropriate (selection of groups of measures from the Mitigation Measures Library):	Based on the hydromorphological alterations and ecological impacts, the following groups of measures might be appropriate (selection of groups of measures from the Mitigation Measures Library):

Step	Reference approach	Mitigation measures approach
Mitigation Measures Library)	- Fish migration aids - Sediment management - Riparian habitat enhancement - Improvement of in-channel diversity - Ecologically optimised maintenance - River depth and width variation improvement - Floodplains/ lateral connectivity improvement - Reduction negative effects of impoundment - River bed restoration	- Fish migration aids - Sediment management - Riparian habitat enhancement - Improvement of in-channel diversity - Ecologically optimised maintenance - River depth and width variation improvement - Floodplains/lateral connectivity improvement - Reduction negative effects of impoundment - River bed restoration
B1. Identify mitigation measures relevant to each hydromorphological alteration and ecologically effective in physical context of water body or water bodies	In this step, the measure groups from the Mitigation Measures Library are further specified and detailed measures identified, considering the physical context of the water body. The following detailed measures are assumed to be relevant and ecologically effective (Figure 12): a. Fish migration aids (near-natural by-pass channel, fish pass and fish screen) b. Connecting side-channel c. Riparian habitat enhancement (flatten shore zones, plant trees) d. Improvement of in-channel diversity (introduce type specific substrate in the upper part of the impoundment, introducing large woody debris) e. Raising river bed level (reduce negative effects of impoundment) Those measures will contribute to:	In this step, the measure groups from the Mitigation Measures Library are further specified and detailed measures identified, considering the physical context of the water body. The following detailed measures are assumed to be relevant and ecologically effective (Figure 12): a. Fish migration aids (near-natural by-pass channel, fish pass and fish screen) b. Connecting side-channel c. Riparian habitat enhancement (flatten shore zones, plant trees) d. Improvement of in-channel diversity (introduce type specific substrate in the upper part of the impoundment, introducing large woody debris) e. Raising river bed level (reduce negative effects of impoundment) Those measures will contribute to:

Step	Reference approach	Mitigation measures approach
	- Restore river continuity for biota (up- and downstream) and sediment (downstream) to some extent) - Increase flow velocity and diversity and shorten the length of the water body that is affected by the impoundment - Improve the hydromorphological processes and dynamics (river and floodplain) - Improve substrate conditions for riverine species - Improve riverine habitats and by this conditions for type-specific riverine species The removal of the dam/ barrier would be the most effective measure to improve biological conditions, but was not considered because: - this measure would lead to a restoration towards GES and - was assessed in the HMWB designation process to have a significant adverse effect on use (because no production of electricity would be possible)	- Restore river continuity for biota (up- and downstream) and sediment (downstream) to some extent) - Increase flow velocity and diversity and shorten the length of the water body that is affected by the impoundment - Improve the hydromorphological processes and dynamics (river and floodplain) - Improve substrate conditions for riverine species - Improve riverine habitats and by this conditions for type-specific riverine species The removal of the dam/ barrier would be the most effective measure to improve biological conditions, but was not considered because: - this measure would lead to a restoration towards GES and - was assessed in the HMWB designation process to have a significant adverse effect on use (because no production of electricity would be possible)

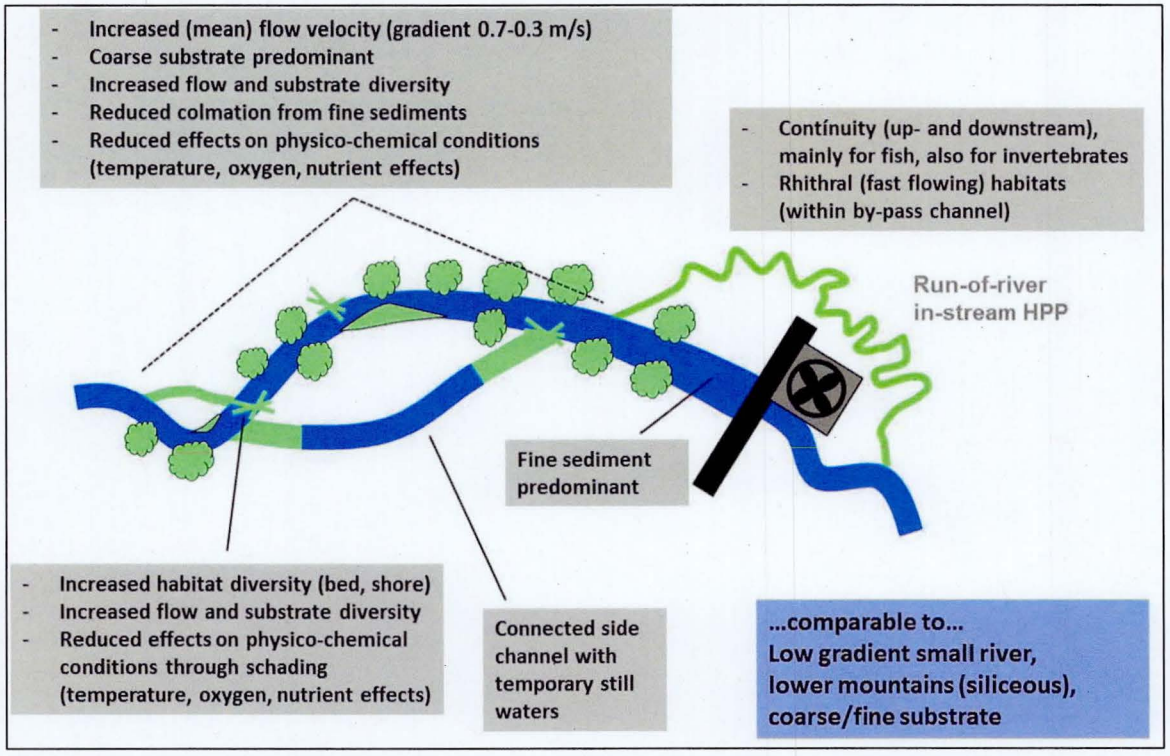
Figure 12: River impoundment with range of possible mitigation measures (MEP)



Step	Reference approach	Mitigation measures approach
B2. Exclude mitigation measures with significant adverse effect on use or wider environment	All the other measures (a-e) do not have per se significant adverse effects on the hydropower use (they do not necessarily mean a reduction of the electricity production).	All the other measures (a-e) do not have per se significant adverse effects on the hydropower use (they do not necessarily mean a reduction of the electricity production).
B3. Select most ecologically beneficial (combination of) measures taking into account need to ensure best approximation to ecological continuum	• All measures from step B1 (measures a-e) are relevant to the hydromorphological alterations in the water body, ecologically effective and do not adversely impact on use. In combination, therefore, these measures contribute to MEP. • The measures are able to significantly improve ecological continuum.	• All measures from step B1 (measures a-e) are relevant to the hydromorphological alterations in the water body, ecologically effective and do not adversely impact on use. In combination, therefore, these measures contribute to MEP. • The measures are able to significantly improve ecological continuum.
C. Derivation of hydromorphological conditions for MEP	The above measures significantly enhance habitats in the river bed, riparian zone and floodplain. The basis for deriving the hydromorphological conditions for MEP are the predicted measure effects on the existing hydromorphological conditions (see pre-step) considering reference conditions of the original water body type. The sequence of sub-steps is 1) Descriptions of hydromorphological conditions at status quo; 2) Measure effects on these conditions; 3) Description of hydromorphological conditions for MEP. The result has been compared with existing river types in the river basin to identify a closest comparable river type. The closest comparable water	It can be generally expected, that the measures identified in step B3 significantly enhance habitats in the river bed, riparian zone and floodplain. Based on predicted measure effects on the existing hydromorphological alterations (see pre-step) and considering reference conditions of the original natural water body type, hydromorphological conditions for MEP are moderately to severely changed in comparison. All relevant parameters have been defined based on these considerations using the existing national hydromorphological methods.

Step	Reference approach	Mitigation measures approach
	body type is the next more potamal river type within the same landscape from the national typology. In this case (of a high gradient small river, lower mountains (siliceous), coarse substrate), the closest comparable river type is a "low gradient small river, lower mountains (siliceous), coarse/fine substrate". See Figure 13 for a description of the derived hydromorphological conditions for MEP.	

Figure 13: Derived hydromorphological conditions for MEP

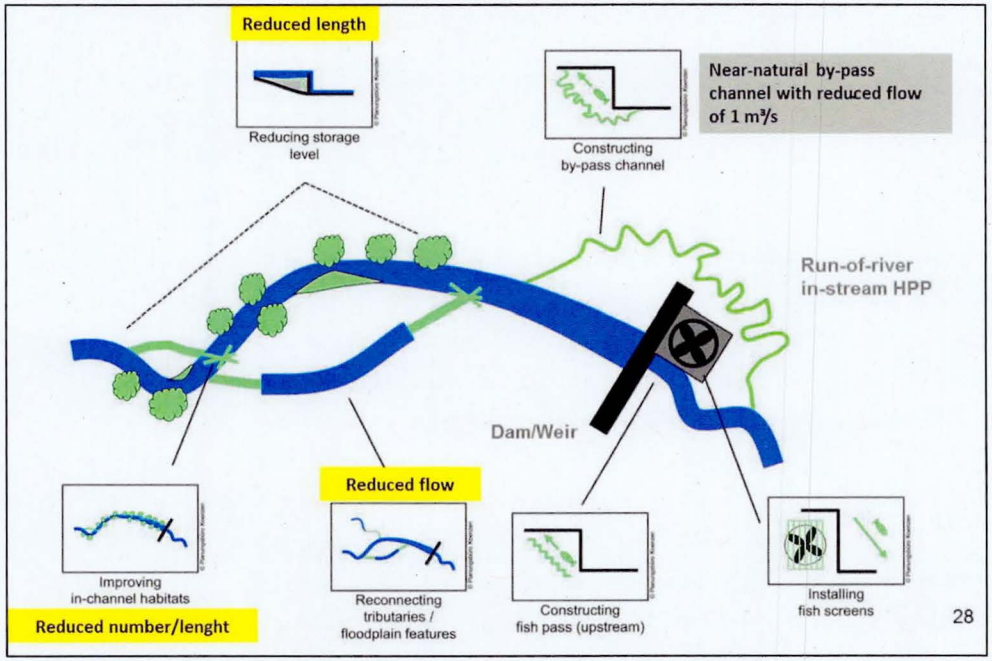


Step	Reference approach	Mitigation measures approach
D. Derivation of physico-chemical conditions for MEP, taking into account the closest comparable water body type	Physico-chemical conditions correspond to the values for high ecological status for the original river type, except for parameters that are significantly affected by the remaining hydromorphological alterations at MEP. In this case, temperature and oxygen concentration could be affected according to the closest comparable water body type ("Low gradient small river, lower mountains (siliceous), coarse/fine substrate"). In fact, temperature and oxygen values for MEP correspond to the values of the original river type, in particular based on the direct and indirect influence of groundwater, shading and optimised flow conditions on these parameters that overrule the remaining impacts on flow velocity within the impounded stretch at MEP. With regards to nutrients, trophic effects can be increased within the remaining impoundment in some ways, but this does not require values that are different from the original natural type. In any case, reference values for nutrients of the closest comparable water body type are the same as for the original natural type.	Physico-chemical conditions correspond to the values for high ecological status for the original river type, except for parameters which are significantly affected by the remaining hydromorphological alterations at MEP. In this case, temperature and oxygen concentration could be affected according to the closest comparable water body type ("Low gradient small river, lower mountains (siliceous), coarse/fine substrate"). In fact, temperature and oxygen values for MEP correspond to the values of the original river type, in particular based on the direct and indirect influence of groundwater, shading and optimised flow conditions on these parameters that overrule the remaining impacts on flow velocity within the impounded stretch at MEP. With regards to nutrients, trophic effects can be increased within the remaining impoundment in some ways, but this does not require values that are different from the original natural type. In any case, reference values for nutrients of the closest comparable water body type are the same as for the original natural type.
E. Derivation of BQE conditions for MEP	This step is based on the hydromorphological alterations and ecological impacts (see pre-step), the predicted effects of the relevant mitigation measures (see B1, B3), and the difference between hydromorphological conditions for MEP (see C) and reference conditions for the original natural river type. In conclusion, the difference in hydromorphological conditions between MEP and reference conditions for the original natural river type have been translated to BQE conditions at MEP. Based on this, BQE conditions have been defined based on the biological assessment system for natural water bodies. The EQR values have been	BQE conditions for MEP cannot be derived due to a lack of BQE data in this planning cycle and/or due to a lack of knowledge on hydromorphological alterations and biological response. However, the application of national monitoring methods to this water body in the next and future planning cycles will enable a prediction of BQE conditions at MEP to be made.

Step	Reference approach	Mitigation measures approach
	reduced with the same proportion of the gradient as the difference between reference conditions and MEP based on hydromorphological methods. The reduction is different between the BQEs, because of different sensitivity at least to some of the relevant hydromorphological (and related physico-chemical) parameters. The predicted results have been tested and amended in some aspects using a solid basis of monitoring data from comparable water bodies (same use and comparable river types) considering as much as possible the gradient of different habitat qualities from maximum to bad potential	
F. Derivation of BQE conditions for GEP	BQE conditions for GEP resulted from the biological assessment systems that use the same principle for defining "slight changes" as for the intercalibrated method for natural water bodies. Therefore, the functioning of the aquatic ecosystem can be assumed if BQE conditions result in GEP.	BQE conditions for GEP cannot be derived due to lack of BQE data in this planning cycle/ lack of knowledge on hydromorphological alterations and biological response.
G. Derivation of supporting quality element conditions for GEP	This step is based on the BQE conditions for GEP (see step F). The hydromorphological parameters have been derived based on the difference between BQE conditions of MEP (step E) and GEP (step F), considering the hydromorphological conditions for MEP (step C). Physico-chemical conditions correspond to the values for good ecological status of the original natural river type.	Hydromorphological conditions are derived by expecting conditions with assumed implementation of the GEP-measures set defined in step H. Physico-chemical conditions correspond to the values for good ecological status of the natural river type.

Step	Reference approach	Mitigation measures approach
	Functioning of the aquatic ecosystem is ensured by physico-chemical conditions as well as by the biological GEP conditions identified in step F.	Functioning of the aquatic ecosystem is ensured by physico-chemical conditions as well as by the hydromorphological conditions which contribute to improve ecological continuum by the GEP measures identified in step H.
H. Identification of mitigation measures for GEP	The following measures are within the set of qualitative GEP measures: a. Fish migration aids (near-natural by-pass channel, fish pass and fish screen) b. Connecting side-channel c. Riparian habitat enhancement (flatten shore zones, plant trees) d. Improvement of in-channel diversity (introduce type specific substrate in the upper part of the impoundment, introducing large woody debris) e. Raising river bed level (reduce negative effects of impoundment) The difference between MEP and GEP is based on BQE values ("slight change"). While the qualitative measure set is the same for GEP as for MEP in this case, the GEP measures significantly differ from MEP measures in quantity (extent) (see Figure 14 below). (There also might be certain cases where certain measures are needed for MEP but not for GEP, but those were identified to be relevant for this example.)	From the MEP-set of measures (measures a-e), no measures have been deleted because they are assumed to deliver slight improvements to ecology. Based on literature, significant effects on BQE can be expected for all measures. Therefore, the following measures are within the set of qualitative GEP measures: a. Fish migration aids (near-natural by-pass channel, fish pass and fish screen) b. Connecting side-channel c. Riparian habitat enhancement (flatten shore zones, plant trees) d. Improvement of in-channel diversity (introduce type specific substrate in the upper part of the impoundment, introducing large woody debris) e. Raising river bed level (reduce negative effects of impoundment) This is the same set of measures which was identified for MEP but the quantity/extent of the measures is reduced compared to the extent needed for MEP. See Figure 14. (There also might be certain cases, that certain measures are needed for MEP but not for GEP, but those were identified to be relevant for this example).

Figure 14: River impoundment with mitigation measures for reaching GEP



Step	Reference approach	Mitigation measures approach
Monitoring to assess whether GEP is being achieved	The modified HMWB biological assessment systems have been used to classify the ecological potential of the water body. Compared to the MEP values set for the BQEs, the overall biological monitoring results show a strong deviation from the MEP values, so that the actual ecological potential is to be classified as "poor" based on benthic invertebrates and fish. Therefore, hydromorphological mitigation	As biological conditions could not be defined for GEP in this cycle, conditions of the supporting elements have been monitored in the meantime and been compared to the conditions set in step G to identify the deviation from GEP and the need to implement the GEP-measures to achieve GEP.

Step	Reference approach	Mitigation measures approach
	measures (identified in step H) are necessary to improve conditions of the water body and achieve GEP.	Nevertheless, it is recommended to also collect data for biological quality elements (although they are not classified) and to increase the knowledge on hydromorphological conditions-biological response relationships.
Are there GEP measures that are disproportionally expensive or infeasible?	None of the GEP measures are disproportionally expensive or infeasible.	None of the GEP measures are disproportionally expensive or infeasible.
Implement GEP measures and monitor effects on BQEs and supporting quality elements	The following measures have been implemented within the next RBMP Programme of Measures: a. Fish migration aids (near-natural by-pass channel, fish pass and fish screen) b. Connecting side-channel c. Riparian habitat enhancement (flatten shore zones, plant trees) d. Improvement of in-channel diversity (introduce type specific substrate in the upper part of the impoundment, introducing large woody debris) e. Raising river bed level (reduce negative effects of impoundment) The quantitative design of the measures has been based on the adverse effects on use (e.g. for calculating maximum flow for by-pass channel)	The following measures have been implemented within the next RBMP Programme of Measures: a. Fish migration aids (near-natural by-pass channel, fish pass and fish screen) b. Connecting side-channel c. Riparian habitat enhancement (flatten shore zones, plant trees) d. Improvement of in-channel diversity (introduce type specific substrate in the upper part of the impoundment, introducing large woody debris) e. Raising river bed level (reduce negative effects of impoundment) The quantitative design of the measures has been based on the adverse effects on use (e.g. for calculating maximum flow for by-pass channel) and an estimation of the need to improve biological conditions significantly.

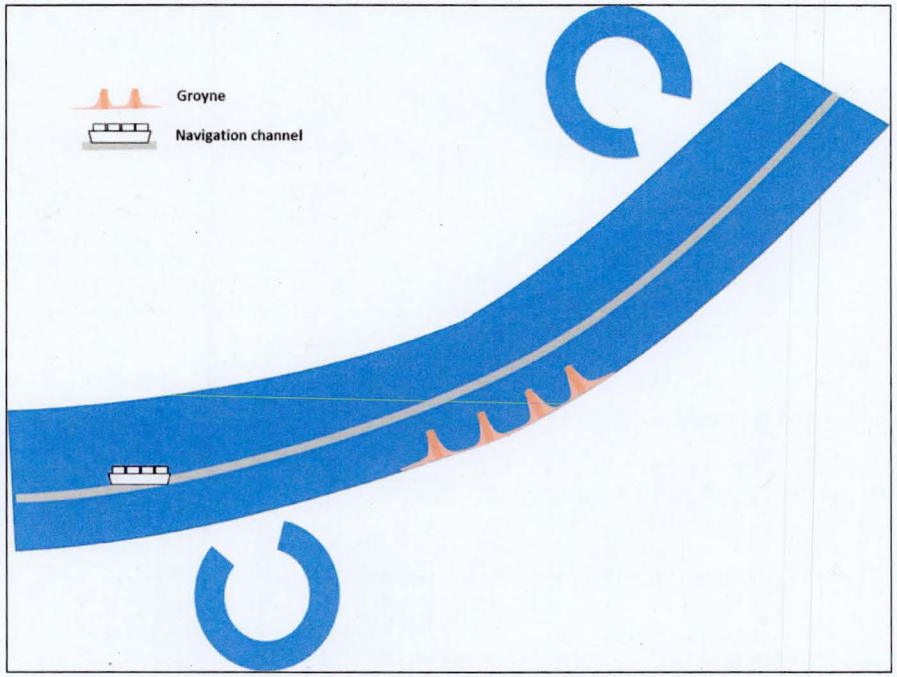
Step	Reference approach	Mitigation measures approach
	and an estimation of the need to achieve biological GEP values (see step F). Monitoring will be undertaken within the next monitoring cycle.	Monitoring will be undertaken within the next monitoring cycle.

Case study 2: River straightening and bank fixation for navigation (reference approach and mitigation measures approach)

Step	Reference approach	Mitigation measures approach
Information from earlier planning cycles (pre-step)	The river stretch is a heavily modified water body designated because of prior straightening in combination with bank fixation and associated incision (consequential deepening) to support navigation use. There are some shore-perpendicular groynes on the outer part of the bend but these structures, together with the increased velocities achieved as a result of the straightening, currently mean there is no requirement for maintenance dredging. Based on detailed hydromorphological data particularly the following alterations are known: • Straightened river with single channel planform • Deepened river profile with reduced floodplain connection • Altered flood plain habitats (e.g. cut-off meanders, infilled side-channels) • Increased flow velocity, reduced flow diversity • Reduced hydromorphological processes and dynamics (river and floodplain) • Bank fixation with hard engineering (e.g. concrete, rip raps)	The river is a heavily modified water body designated because of prior straightening in combination with bank fixation and associated incision (consequential deepening) to support navigation use. There are some shore perpendicular groynes on the outer part of the bend, but these structures, together with the increased velocities achieved as a result of the straightening, currently mean there is no requirement for maintenance dredging. There is a relative lack of WFD monitoring data for this water body but some anecdotal evidence does exist. See Figure 15 below.

Step	Reference approach	Mitigation measures approach
	• Reduced substrate diversity (e.g. lack of woody debris) • Altered river bed and riparian habitats (reduced flat riparian zones, less diversity, reduced vegetation cover) These resulted in ecological impacts such as: • Reduced abundance / loss of rheophilic species (e.g. fish), particularly altered reproduction of river type specific fish species • Increased abundance of tolerant species (e.g. benthic invertebrates) • Reduced abundance / loss of floodplain related species (e.g. fish) • Reduced species diversity (e.g. fish, benthic invertebrates) The overall ecological status is "poor" based on benthic invertebrates and fish.	

Figure 15: River impacted by straightening and bank fixation for navigation



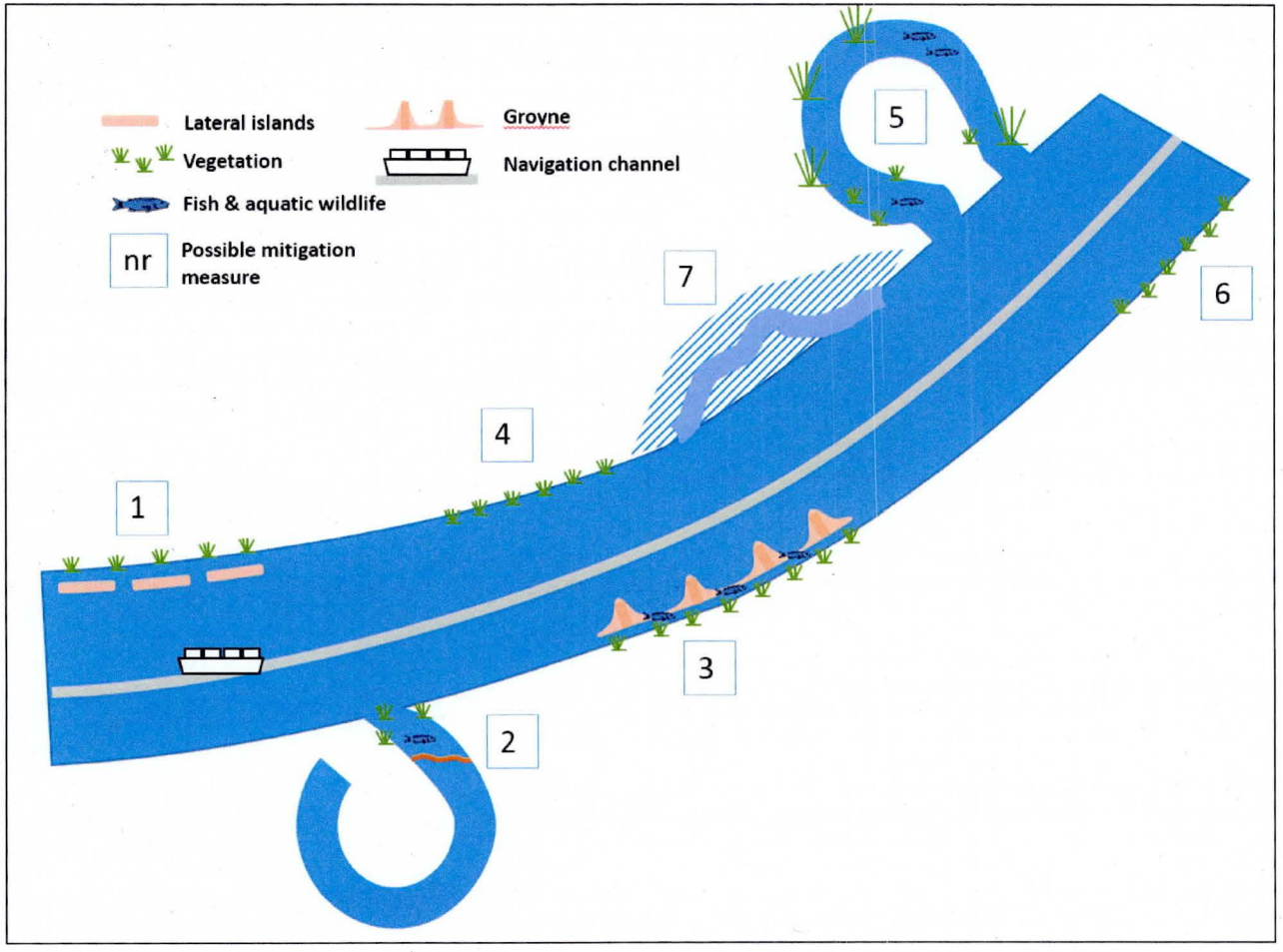
Step	Reference approach	Mitigation measures approach
A. Identification of closest comparable water category	The original river water body remains a river water body taking into account the hydromorphological and biological conditions.	The original river water body remains a river water body taking into account the hydromorphological and biological conditions.
B. Identification of mitigation measures for MEP (see Mitigation Measures Library)	Based on the hydromorphological alterations and ecological impacts (see above in pre-step) the following groups of measures might be appropriate (selection from the Mitigation Measures Library): • Floodplains/off-channel/lateral connectivity improvement • Riparian habitat enhancement • Improvement of in-channel diversity • Increase habitat diversity with improved river depth and width variation • Ecologically optimised maintenance • Vegetation management and rehabilitation • Modification of existing structures • Sediment management • River bed rehabilitation	Reference to the Mitigation Measures Library: (i) Confirms that there are two **specific physical modifications**: channel straightening with changed planform/channel patterns including cut off meanders, and shore-perpendicular structures (i.e. groynes). (ii) Suggests that the **hydromorphological supporting elements** most likely to be affected by these types of modification are quantity and dynamics of flow, changes in (controls on) river depth and width, and changes in riparian zone structure. The presence of groynes also affects continuity in the margins on one side of the river. In this case the modifications have not affected the bed substrate. (iii) Does not identify any typically anticipated implications for **physico-chemical supporting elements**. (iv) Indicates there is a strong likelihood that these types of physical modification will impact on three **BQEs**: macrophytes and phytobenthos, benthic invertebrates, and fish fauna. A visual assessment of the water body confirms this is likely the case here.

Step	Reference approach	Mitigation measures approach
		(v) Suggests the following **groups of mitigation measures** might be appropriate to address such effects: • Improved in-channel diversity • Ecologically optimised maintenance • Enhanced habitat diversity with increased width/depth variability • Riparian habitat enhancement • Off channel/lateral connectivity improvement • Vegetation management and rehabilitation • Modification of existing structures • Sediment management • River bed rehabilitation
B1. Identify mitigation measures relevant to each hydromorphological alteration and ecologically effective in physical context of water body or water bodies	Based on the detailed data of hydromorphological alterations (e.g. with no dredging taking place) the following from the above groups of measures are not expected to be ecologically effective in addressing the identified or observed issues: ecologically optimised maintenance, sediment management and river bed rehabilitation. The focus is therefore on identifying measures for improved in-channel and riparian diversity (habitat enhancement) including width and depth variability; lateral connectivity including improved floodplain connection and floodplain habitat enhancement; vegetation rehabilitation and modification of existing structures.	Taking into account the nature of the modification (with no dredging taking place) the following from the above groups of measures are not expected to be ecologically effective in addressing the identified or observed issues: ecologically optimised maintenance, sediment management and river bed rehabilitation. The focus is therefore on identifying measures for improved in-channel and riparian diversity (habitat enhancement) including width and depth variability; lateral connectivity including improved floodplain connection and floodplain habitat enhancement; vegetation rehabilitation; and modification of existing structures.

Step	Reference approach	Mitigation measures approach
	Figure 16 illustrates the range of detailed mitigation measures corresponding to the above groups of measures. These have been identified taking into account their viability in the context of the river water body and their expected ecological effectiveness, and are described below: 1. Construct lateral islands providing a sheltered, shallow water riparian environment promoting sediment deposition and large woody debris (with fixation) as well as natural vegetation establishment (with initial planting if needed), and creation of habitat for invertebrates and fish. 2. Create a sheltered, shallow backwater in an old meander exit, to promote large woody debris (with fixation) and vegetation establishment with initial planting if needed, resulting in habitat for invertebrates and fish. 3. Sever the roots of the existing groynes to improve lateral connectivity and habitat diversity at the river margins 4. Replace hard engineered river bank with willow spiling to establish vegetation at the margins, creating habitat and improving connectivity. 5. Reconnect oxbow lake to re-establish a former meander (with water control structures if these are needed to sustain the use of the river for navigation). Create a diverse range of habitat types, supporting particularly macrophytes, benthic invertebrates and fish.	Figure 16 illustrates the range of detailed mitigation measures corresponding to the above groups of measures. These have been identified taking into account their viability in the context of the river water body and their expected ecological effectiveness, and are described below: 1. Construct lateral islands providing a sheltered, shallow water riparian environment promoting sediment deposition and natural vegetation establishment (with initial planting if needed), and creation of habitat for invertebrates and fish. 2. Create a sheltered, shallow backwater in an old meander exit, to promote vegetation establishment with initial planting if needed, resulting in habitat for invertebrates and fish. 3. Sever the roots of the existing groynes to improve lateral connectivity and habitat diversity at the river margins. 4. Replace hard engineered river bank with willow spiling to establish vegetation at the margins, creating habitat and improving connectivity. 5. Reconnect oxbow lake to re-establish a former meander (with sluices or other managed water control structures if these are needed to sustain the use of the river for navigation). Create a diverse range of habitat types, supporting macrophytes and phytoplankton, benthic invertebrates and, depending on the extent of engineering required, fish. 6. Replace hard engineered river bank with planted geotextile revetments to establish vegetation at the margins, creating habitat and improving connectivity.

Step	Reference approach	Mitigation measures approach
	6. Replace hard engineered river bank with planted geotextile revetments to establish vegetation at the margins, creating habitat and improving connectivity. 7. Lower riparian zone and create side-channel (from formerly filled side-channel, with water control structures at the upstream part if these are needed to sustain the use of the river for navigation). Create a diverse range of habitat types, supporting particularly macrophytes, benthic invertebrates and fish. The combination of measures is predicted to result in a best approximation to ecological continuum. If monitoring of BQE results in GEP classification, best approximation of ecological continuum can be assumed.	7. Lower riparian zone and create side-channel (from formerly filled side-channel, with water control structures at the upstream part if these are needed to sustain the use of the river for navigation). Create a diverse range of habitat types, supporting particularly macrophytes, benthic invertebrates and fish. Depending on the scale of implementation of one or more of the above measures, it is confirmed that a best approximation to ecological continuum will be ensured.

Figure 16: River impacted by straightening and bank fixation for navigation with range of possible mitigation measures



Step	Reference approach	Mitigation measures approach
B2. Exclude measures with significant adverse effect on use or wider environment	Measure 6 is ruled out because the fixed bank also serves a flood defence purpose and it is shown that the standard of protection would be compromised if the hard engineered structure were removed.	Measure 6 is ruled out because the fixed bank also serves a flood defence purpose and it is shown that the standard of protection would be compromised if the hard engineered structure were removed.
B3. Select most ecologically beneficial (combination of) measures taking into account need to ensure best approximation to ecological continuum	Measures 1 to 5 and 7 are relevant to the hydromorphological alterations in the water body, ecologically effective and do not adversely impact on use. In combination, therefore, these measures contribute to MEP.	Measures 1 to 5 and 7 are relevant to the hydromorphological alterations in the water body, ecologically effective and do not adversely impact on use. In combination, therefore, these measures contribute to MEP.
C. Derivation of hydromorphological conditions for MEP	The above measures enhance the riparian and floodplain habitat in the water body, increasing diversity in terms of variations in depth and exposure and substrate conditions. Most measures also contribute to improved lateral connectivity/ecological continuum. Based on predicted measure effects on the existing hydromorphological alterations (see pre-step) and considering reference conditions of the original natural river type (which is the closest comparable river type for this case), hydromorphological conditions for MEP are changed in comparison. While relatively near-natural floodplain habitats can be developed under MEP, the riparian habitats are more intensively changed compared to reference conditions and show several artificial elements (like groynes). The river bed habitats have also been changed as a result of the modifications made to maintain the navigation	It can be generally expected that the measures identified in steps B3, all enhance the riparian habitat in the water body, increasing diversity in terms of variations in depth, width and exposure, and providing new substrate for benthic invertebrates, macrophytes and phytobenthos and fish (including juveniles). Most measures also contribute to improved lateral connectivity/ecological continuum.

Step	Reference approach	Mitigation measures approach
	fairway. All relevant parameters have been defined based on these considerations using the implemented hydromorphological methods.	
D. Derivation of physico-chemical conditions for MEP, taking into account the closest comparable water body type	Physico-chemical conditions correspond to the values for high ecological status of the original natural river type.	Neither the modification nor the mitigation measures will affect the WFD physico-chemical supporting elements.
D. Derivation of BQE conditions for MEP	Basis for this step were the hydromorphological alterations and ecological impacts (see pre-step), the predicted effects of the relevant mitigation measures (see B1, B3) as well as the difference between hydromorphological conditions for MEP (see C) and reference conditions of the original natural river type. Considering all of these results, BQE conditions have been defined based on the biological assessment system for natural water bodies.	BQE conditions for MEP cannot be derived due to a lack of BQE data in this planning cycle. However, the application of national monitoring methods to this water body in the next and future planning cycles will enable a prediction of the BQE conditions at MEP to be made.

Continuation of step-wise process for **mitigation measures approach** (H→G→F ...):

Step	Reference approach	Mitigation measures approach
H. Identification of mitigation measures for GEP	See next table	As indicated in Figure 16, Measure 3 creates a relatively small area of new habitat. Further, because Measure 6 has a significant adverse impact on use, there is limited benefit in improving connectivity along this short stretch on the outer bend. As Measure 3 therefore makes only a limited contribution to ecological potential, it is considered a MEP measure. GEP is defined by a combination of Measures 1, 2, 4, 5 and 7.
G. Derivation of supporting quality element conditions for GEP	See next table	The selected combination of measures would result in a significant improvement in connectivity (continuum) along the inner bend of the river. By tackling the impacts of bank fixation (particularly the loss of shallow margins) each of the measures also contributes substantively to improving riparian zone structure and hence to the enhancement of the riparian habitat for the three affected BQEs: macrophytes and phytobenthos, benthic invertebrates and fish fauna.
F. Derivation of BQE conditions for GEP	See next table	BQE conditions for GEP cannot be derived due to lack of BQE data in this planning cycle
Monitoring to assess whether GEP is being achieved	See next table	Monitoring of the BQEs, flow conditions and riparian zone structure confirms that the water body is not currently at GEP but provides a baseline from which the effectiveness of the mitigation measures can be determined
Are there GEP measures that are disproportionally	See next table	Further investigation is needed to ensure that Measure 5 is feasible without disproportionate expenditure on engineering structures for the water intake and outlet. This measure may therefore be ruled out on the basis of

expensive or infeasible?		disproportionate cost, and GEP may therefore not be achievable. Measure 1 similarly requires modelling to check whether sedimentation rates might compromise the feasibility of this measure.
Implement GEP measures and monitor effects on BQEs and supporting quality elements	See next table	Pending a decision on measures 1 and 5, Measures 2, 4 and 7 will be implemented via the RBMP Programme of Measures. Monitoring for the relevant biological and hydromorphological quality elements will be initiated to evaluate the effectiveness of the measures

Continuation of step-wise process for **reference approach** (F→G→H ...):

Step	**Reference approach**	**Mitigation measures approach**
F. Derivation of BQE conditions for GEP	BQE conditions for GEP resulted from the biological assessment systems that use the same principle for defining "slight changes" as for the intercalibrated method for natural water bodies.	See previous table
G. Derivation of supporting quality element conditions for GEP	Basis for this step were the BQE conditions for GEP (see step F). The hydromorphological parameters have been derived based on the difference between BQE conditions of MEP (step E) and GEP (step F) considering the hydromorphological conditions for MEP (step C). Physico-chemical conditions correspond to the values for good ecological status of the original natural river type.	See previous table

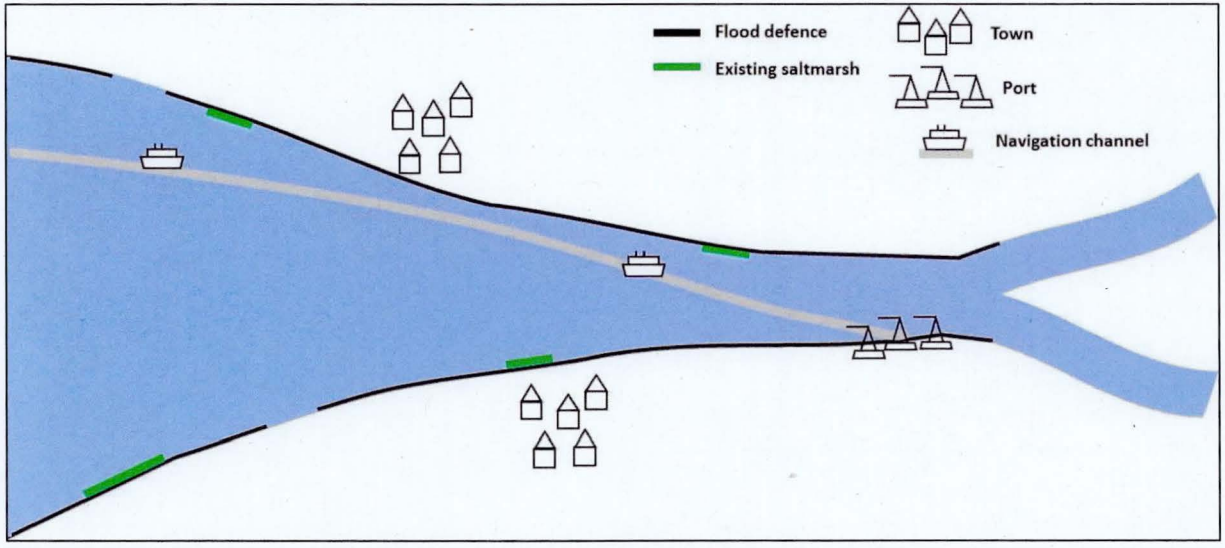
Step	Reference approach	Mitigation measures approach
H. Identification of mitigation measures for GEP	The difference between MEP and GEP is based on BQE values ("slight change"). Based on this, Measure 3 is estimated as not being necessary to reach GEP biological values, because it has only a low effect on BQE. Therefore GEP is defined by a combination of Measures 1, 2, 4, 5 and 7. While the qualitative measure set is the same for GEP as for MEP apart from measure 3 in this case (see B3), both classes significantly differ in the quantity of measures needed to achieve each class.	See previous table
Monitoring to classify ecological potential of HMWB	The modified assessment systems have been used to classify ecological potential of the water body. The overall result is "moderate" based on benthic invertebrates and fish. Therefore, hydromorphological mitigation measures are necessary to improve conditions of the water body and achieve GEP.	See previous table
Are there GEP measures that are disproportionally expensive or infeasible?	Further investigation is needed to ensure that Measure 5 is feasible without disproportionate expenditure on engineering structures for the water intake and outlet. This measure may therefore be ruled out on the basis of disproportionate cost. BQE monitoring has to show whether GEP can still be reached or not (and less stringent objectives have to be applied). Measure 1 similarly requires modelling to check whether sedimentation rates might compromise the feasibility of this measure.	See previous table
Implement GEP measures and monitor effects on BQEs and	Pending a decision on measures 1 and 5, Measures 2, 4 and 7 will be implemented via the RBMP Programme of Measures.	See previous table

Step	Reference approach	Mitigation measures approach
supporting quality elements	Monitoring will be undertaken within the next monitoring cycle.	

Case study 3: Estuary with flood defence/embanking (mitigation measures approach)

Step	Mitigation measures approach
Information from earlier planning cycles (pre-step)	The estuary is a heavily modified water body designated as such because almost 100% has been embanked for flood defence purposes. There are settlements on each side of the estuary and a small port at the upstream end. Navigation to the port uses a naturally deep channel in an otherwise fairly shallow, sediment-rich estuary. Dredging of this channel takes place occasionally. There is relative lack of WFD monitoring data but anecdotal evidence is available showing that since the estuary was embanked in the 1950s, most of the previously extensive saltmarsh has been lost due to 'coastal squeeze' caused by sea level rise. See Figure 17 below.

Figure 17: Estuary water body impacted by flood defence/embanking

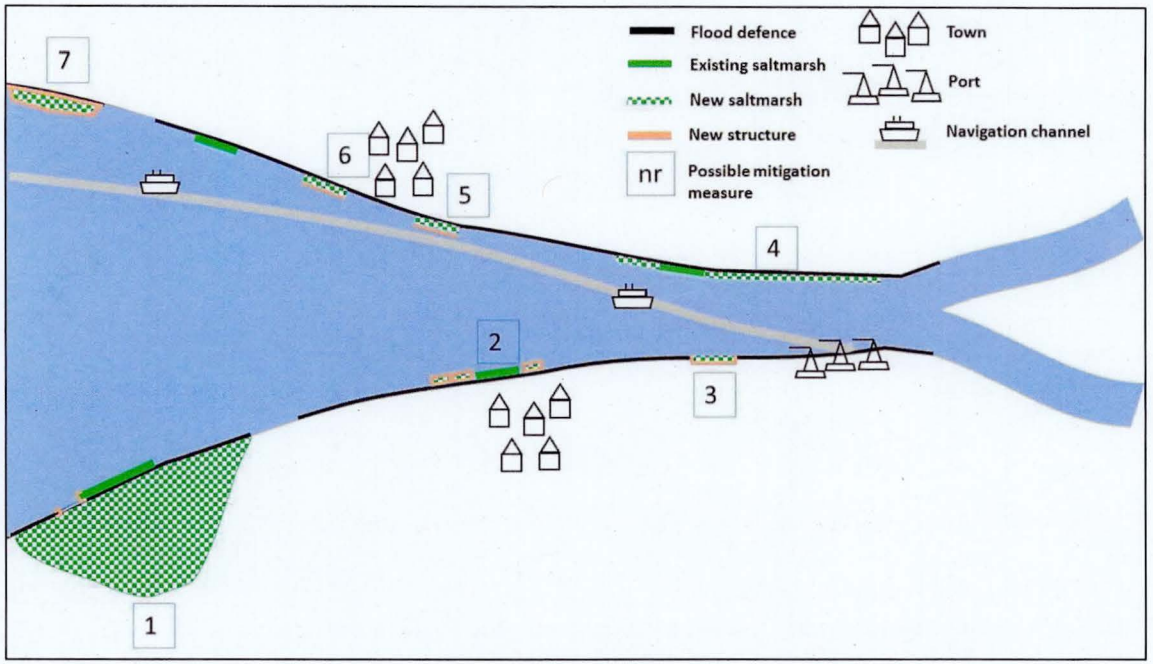


Step	Mitigation measures approach
A. Identification of closest comparable water category	The estuary was and remains a transitional water body.
B. Identification of mitigation measures for MEP (see Mitigation Measures Library)	Reference to the Mitigation Measures Library: (i) Confirms that the **specific nature of the physical modification** is 'constructed or raised dyke / levee / embankments - no water exchange (e.g. flood protection)'. (ii) suggests that the **hydromorphological supporting elements** most likely to be affected by this type of modification are morphology (intertidal zone structure) and tidal regime (wave exposure). Expert knowledge of the water body confirms this is the case. The library also indicates the possibility of effects on bed structure and substrate, and on freshwater flow. The latter effects are not evident in the water body. (iii) does not identify any typically anticipated implications for **physico-chemical supporting elements**; local experts confirm this is the case here. (iv) indicates there is a strong likelihood that this type of modification will have an effect on two **BQEs** – angiosperms (including saltmarsh; this is known to be the case) and fish. Whereas there is no site specific data on fish, saltmarshes in other estuaries locally are known to be fish nurseries, so it is possible that fish could be affected here. (v) suggests that the following **groups of mitigation measures** might be appropriate to address such effects: - intertidal habitat restoration, enhancement or creation - beach or foreshore replenishment - beneficial use of dredged material

Step	Mitigation measures approach
	- soft engineering solutions; use of vegetation - realign to mitigate effects on flow - reprofile embankments, structures
B1. Identify mitigation measures relevant to each hydromorphological alteration and ecologically effective in physical context of water body or water bodies	Taking into account the nature of the estuary (i.e. shallow, sediment rich) and what is known about the problem (loss of intertidal fine sediment substrate at an appropriate elevation relative to the tide to support saltmarsh), the latter three groups of measures are unlikely to be ecologically effective. The focus is therefore on identifying measures for intertidal habitat restoration, enhancement or creation. In this case, beach or foreshore replenishment, using dredging material if this is available, might contribute to the development of suitable habitat. Figure 18 below illustrates the range of detailed measures considered from the groups of measures indicated above, taking into account their viability in the context of the estuary and their expected ecological effectiveness (i.e. ability to support and sustain saltmarsh vegetation): 1. Managed realignment achieved via an engineered breach in the existing flood defence, allowing the tide to flood an area currently used for summer livestock grazing; sediment deposited naturally could be supplemented with dredged material if appropriate to ensure an elevation suitable for saltmarsh establishment 2. The creation of engineered 'islands' of saltmarsh on the foreshore in front of the town in an area currently used for mooring fishing boats 3. The 'step back' of a short area of redundant quay wall to create a 'shelf' at an elevation suitable for saltmarsh to establish 4. The simple replenishment and raising, using material extracted from offshore, of an area of foreshore opposite the port (i.e. in a relatively sheltered part of the estuary) 5. The construction of breakwater (1) using brushwood fencing or silt-filled geotextiles tubes in front of the town, designed to encourage the deposition and retention of silt (supplemented if necessary by the beneficial placement of dredged material) to create an area suitable for saltmarsh re-establishment

Step	Mitigation measures approach
	6. The construction of breakwater (2) using brushwood fencing or silt-filled geotextiles tubes in front of the town, designed to encourage the deposition and retention of silt (supplemented if necessary by the beneficial placement of dredged material) to create an area suitable for saltmarsh re-establishment 7. The reclamation of an area seaward of an area of high grade arable land, to be achieved by building and reveting earth embankments, in-filled with dredged material or aggregate sourced from offshore, all designed to an elevation suitable for saltmarsh establishment Depending on the scale of implementation of one or more of the above measures, a best approximation of ecological continuum will be ensured.

Figure 18: Estuary water body impacted by flood defence/embanking with range of possible mitigation measures



Step	Mitigation measures approach
B2. Exclude measures with significant adverse effect on use or wider environment	Measure 5 is ruled out because its proximity to the navigation channel is shown to pose an unacceptable risk to safety of navigation. Measure 6 is ruled out because of its adverse impact on an internationally protected rocky foreshore area with exposed fossils.
B3. Select most ecologically beneficial (combination of) measures taking into account need to ensure best approximation to ecological continuum	Measures 1, 2, 3, 4 and 7 are relevant to the hydromorphological alterations in the estuary, ecologically effective and do not adversely impact on use. In combination, therefore, these measures contribute to MEP.

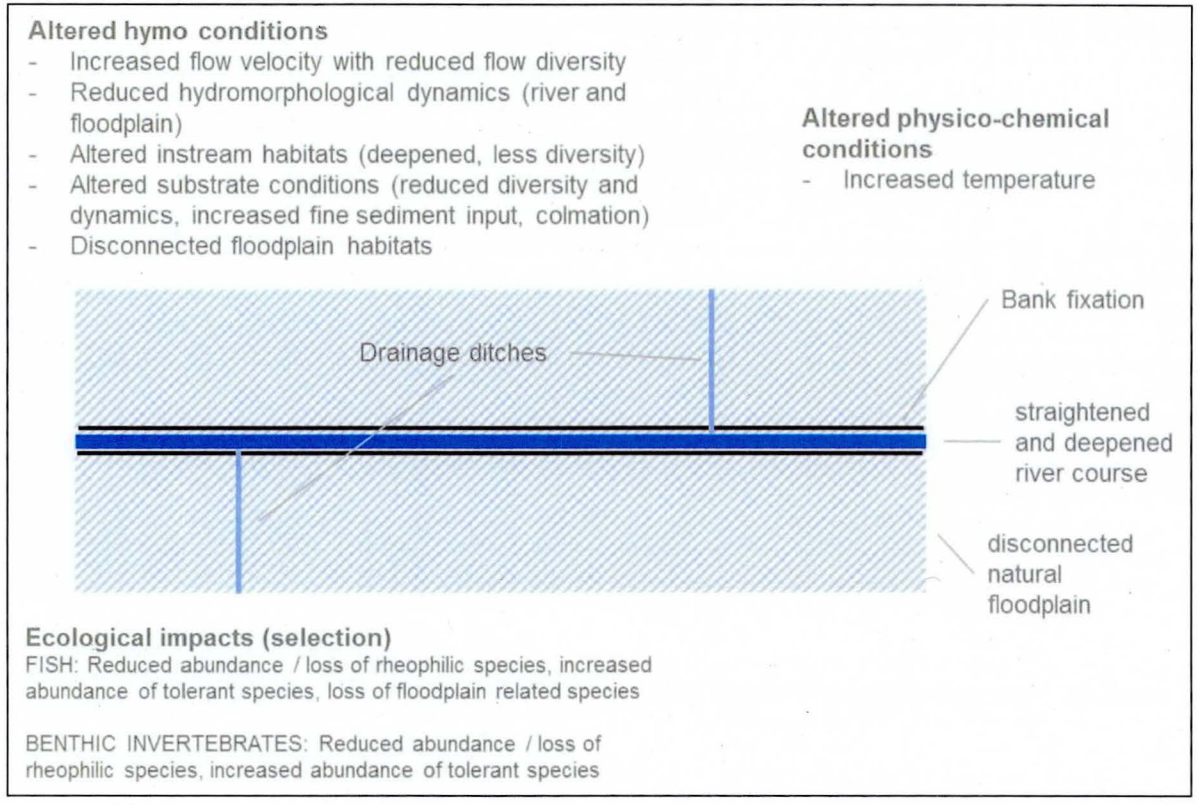
Step	Mitigation measures approach
C. Derivation of hydromorphological conditions for MEP	The above measures all have the effect of improving intertidal zone structure and elevation and thus creating a substrate suitable for the re-establishment of saltmarsh. Further, by providing a buffering effect, these measures will reduce wave exposure, in turn helping to protect the remaining remnants of original saltmarsh from erosion.
D. Derivation of physico-chemical conditions for MEP, taking into account the closest comparable water body type	Neither the modification nor the mitigation measures will affect the WFD physico-chemical supporting elements.
E. Derivation of BQE conditions for MEP	BQE conditions for MEP cannot be derived due to lack of BQE data in this planning cycle. However, monitoring of angiosperms in the next and future planning cycles will enable a prediction of the BQE conditions at MEP to be made.
H. Identification of mitigation measures for GEP	As indicated on Figure 18, Measures 2 and 3 create very small areas of saltmarsh in the context of the overall water body and the extent of saltmarsh re-establishment needed to ensure ecological functioning including sustainability and continuum. These measures are therefore ruled out, meaning that GEP is defined by a combination of measures 1, 4 and 7.
G. Derivation of supporting quality element conditions for GEP	The selected combination of measures would lead to an improvement in intertidal zone structure and elevation at several locations in the water body, in turn providing a substrate suitable for the re-establishment of a significant area of saltmarsh. Measure 4 also contributes to reducing the exposure of the remaining area of existing saltmarsh along this frontage. Together the measures therefore support improvements in the affected BQEs: angiosperms (also benthic invertebrates) by enhancing the supporting habitat, and fish (by increasing the area available as a fish nursery).
F. Derivation of BQE conditions for GEP	BQE conditions for GEP cannot be derived due to lack of BQE data in this planning cycle.
Monitoring to assess whether GEP is being achieved	A national assessment monitoring for angiosperms includes a metric for the extent and quality of the salt marshes. A local monitoring programme will therefore be established to assess the effectiveness of the measures, with the current situation as a

Step	Mitigation measures approach
	baseline; the national assessment monitoring method for fish will also be applied to establish whether the measures are successfully providing habitat for fish.
Are there GEP measures that are disproportionally expensive or infeasible?	Measure 7 is ruled out on the basis of disproportionate cost (i.e. cost per unit area created)
Implement GEP measures and monitor effects on BQEs and supporting quality elements	Measures 1 and 4 will be implemented and their success monitored

Case study 4: River affected by drainage (reference approach)

Step	Reference approach
Information from earlier planning cycles (pre-step)	The river water body is heavily modified because of a straightened river course with a deepened cross section that is armoured with bank fixation. The directly neighbouring crop fields result in lack of shading. The floodplain is disconnected due to incision. These modifications lead to the following severe hydromorphological and physico-chemical alterations: • Increased flow velocity with reduced flow diversity • Reduced hydromorphological dynamics (river and floodplain) • Altered instream habitats (deepened, less diversity) • Altered substrate conditions (reduced diversity and dynamics, increased fine sediment input, colmation) • Disconnected floodplain habitats • Increased water temperature These resulted in ecological impacts such as: • Reduced abundance / loss of rheophilic species (fish, benthic invertebrates) • Increased abundance of tolerant species (fish, benthic invertebrates) • Loss of floodplain related species (fish) See Figure 19. The overall ecological status is "bad" based on benthic invertebrates and fish. With regard to physico-chemical quality elements, "temperature" is affected by the hydromorphological alterations causing the loss of shading.

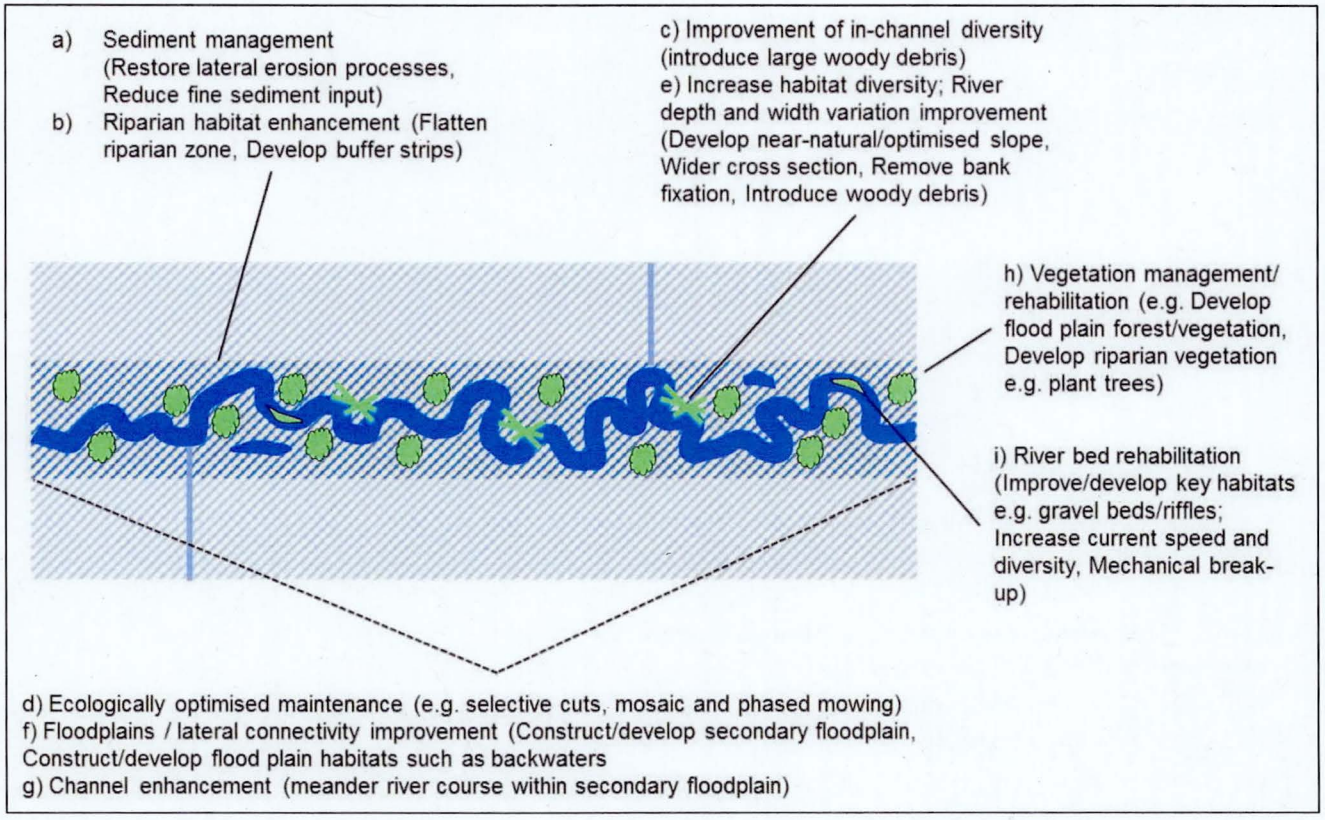
Figure 19: Drained water body with indication of impacts



Step	Reference approach
A. Identification of closest comparable water category	The original river water body remains a river water body, taking into account the hydromorphological and biological conditions.
B. Identification of mitigation measures for MEP (see Mitigation Measures Library)	Based on the hydromorphological alterations and ecological impacts, the following groups of measures might be appropriate (selection): - Sediment management - Riparian habitat enhancement - Improvement of in-channel diversity - Ecologically optimised maintenance - Increase habitat diversity; River depth and width variation improvement - Floodplains / lateral connectivity improvement - Channel enhancement - Vegetation management/rehabilitation - River bed rehabilitation
B1. Identify mitigation measures relevant to each hydromorphological alteration and ecologically effective in physical context of water body or water bodies	Based on the physical context of the water body the following measures are assumed to be relevant and ecologically effective (see Figure 20): a) Sediment management (Restore lateral erosion processes, Reduce fine sediment input) b) Riparian habitat enhancement (Flatten riparian zone, Develop buffer strips) c) Improvement of in-channel diversity (introduce large woody debris) d) Ecologically optimised maintenance (e.g. selective cuts, mosaic and phased mowing) e) Increase habitat diversity; River depth and width variation improvement (Develop near-natural/optimised slope, Wider cross section, Remove bank fixation, Introduce woody debris) f) Floodplains / lateral connectivity improvement (Construct/develop secondary floodplain, Construct/develop flood plain habitats such as backwaters) g) Channel enhancement (meander river course within secondary floodplain) h) Vegetation management/rehabilitation (e.g. Develop flood plain forest/vegetation, Develop riparian vegetation e.g. plant trees)

Step	Reference approach
	i) River bed rehabilitation (Improve/develop key habitats e.g. gravel beds/riffles; Increase current speed and diversity, Mechanical break-up) Those measures will contribute to: - Restore river hydromorphological processes and dynamic (incl. sediments) resulting in habitats for type-specific biota - Increase of flow and habitat diversity and increase of the length of the water body - Improve the hydromorphological processes and dynamics (river and floodplain) - Improve habitats for type-specific riverine species and floodplain species - Improve substrate conditions for type-specific species (e.g. gravel spawners) - Reduce fine sediment input - Reduce temperature by increased shading Raising the river bed level to connect the natural floodplain in combination with a re-meandered river course in a near-natural development corridor width would be the most effective measures to improve biological conditions, but this was not considered because: - this measures would lead to a restoration towards GES; and - it was reasoned in the HMWB designation process to mean a significant adverse effect on use (because the drainage function would be significantly impacted).

Figure 20: Drained water body with range of possible mitigation measures



Step	Reference approach
B2. Exclude mitigation measures with significant adverse effect on use or wider environment	Measure f) would have significant adverse effects on drainage, if the river bed level would get increased, but within a secondary floodplain it is possible without significant adverse effects on drainage function. The same is valid for measure g). All the other measures do not per se have significant adverse effects on the drainage use. Introducing woody debris (measure e)) is possible without significant adverse effects if the cross section is widened to ensure the flow capacity as in status quo.
B3. Select most ecologically beneficial (combination of) measures taking into account need to ensure best approximation to ecological continuum	Measures a)-i) from step B1 are relevant to the hydromorphological alterations in the water body, ecologically effective and do not adversely impact on drainage function(s). In combination, therefore, these measures contribute to MEP.
C. Derivation of hydromorphological conditions for MEP	The above measures significantly enhance habitats for river bed, riparian zone and floodplain. Based on predicted measure effects on the existing hydromorphological alterations (see pre-step) considering reference conditions of the original natural water body type, hydromorphological conditions for MEP are moderately changed compared to these. All relevant parameters have been defined based on these considerations using the existing national hydromorphological methods.
D. Derivation of physico-chemical conditions for MEP, taking into account the closest comparable water body type	Physico-chemical conditions correspond to the values for high ecological status of the original natural river type.
E. Derivation of BQE conditions for MEP	Basis for this step were the hydromorphological alterations and ecological impacts (see pre-step), the predicted effects of the relevant mitigation measures (see B1, B3) as well as the difference between hydromorphological conditions for MEP (see step C) and reference conditions of the original natural river type. In conclusion, the difference in hydromorphological conditions between MEP and reference conditions of the original natural river type have been translated to BQE conditions at MEP. Based on this, BQE conditions have been further defined based on the biological assessment system for natural water bodies. The EQR values have been reduced with the same proportion of the gradient as the difference between reference

Step	Reference approach
	conditions and MEP based on hydromorphological methods. The reduction is different between different BQEs due to different sensitivity at least to some of the relevant hydromorphological parameters (e.g. floodplain). The predicted results have been tested and amended in some aspects using a solid basis of monitoring data from comparable water bodies (same use und comparable river types) considering as much as possible the gradient of different habitat qualities from maximum to bad potential.
F. Derivation of BQE conditions for GEP - functioning aquatic ecosystem	BQE conditions for GEP resulted from the biological assessment systems that use the same principle for defining "slight changes" as for the intercalibrated method for natural water bodies. Therefore, the functioning of the aquatic ecosystem can be assumed if BQE conditions result in GEP.
G. Derivation of supporting quality element conditions for GEP - taking into account functionality of the aquatic ecosystem	Basis for this step were the BQE conditions for GEP (see step F). The hydromorphological parameters have been derived based on the difference between BQE conditions of MEP (step E) and GEP (step F) considering the hydromorphological conditions for MEP (step C). Physico-chemical conditions correspond to the values for good ecological status of the original natural river type. Functioning of the aquatic ecosystem is ensured by physico-chemical conditions as well as by the GEP conditions identified in step F.
H. Identification of mitigation measures for GEP	All measures a-i from step B3 are within the set of qualitative GEP measures. The difference between MEP and GEP is based on BQE values ("slight change"). Both classes especially differ in the quantity of measures needed (in particular the width of development corridor and meander amplitude and the conditions within the catchment (e.g. fine sediment input).
Monitoring to assess whether GEP is being achieved	The modified HMWB biological assessment systems have been used to classify ecological potential of the water body. Compared to the MEP values set for the BQEs the overall biological monitoring result show a strong deviation from the MEP values, so that the actual ecological potential is to be classified as "poor" based on benthic invertebrates and fish. Therefore,

Step	Reference approach
	hydromorphological mitigation measures (identified in step H) are necessary to improve conditions of the water body and achieve GEP.
Are there GEP measures that are disproportionally expensive or infeasible?	None of the GEP measures are disproportionally expensive or infeasible. Costs can be significantly reduced if the secondary floodplain will be developed by self-dynamic hydromorphological processes instead of construction. This is also valid according to vegetation development.
Implement GEP measures and monitor effects on BQEs and supporting quality elements	The following measures have been implemented within the next RBMP Programme of Measures: f) Construct/develop secondary floodplain, Construct/develop flood plain habitats such as backwaters g) Meander river course within secondary floodplain c) Introduce large woody debris (proved that no fixation is needed due to hydraulic conditions) d) Ecologically optimised maintenance (selective cuts) h) Develop flood plain forest/vegetation, Develop riparian vegetation (natural succession without planting to save costs) Beyond these, an improvement of the land use situation in the catchment (Improve water retention, e.g. through afforestation, restoration of rivers/floodplains, restoration of wetlands/moors,and reduce erosion of fine material from agriculture) is likely to be necessary to reach the GEP values for BQE. These measures could not be implemented yet, but can be implemented step by step within the following RBMPs. Beneath the water management, other planning sectors and instruments are relevant for implementation of these measures (e.g. agriculture, forestry, landscape planning). The quantitative design of the measures has been based on the adverse effects on use and an estimation of the need to achieve biological GEP values (see step F). Monitoring will be undertaken within the next monitoring cycle.

ANNEX II – EXAMPLE ARTIFICIAL WATER BODIES: Ditches - hydromorphological mitigation as an exception, mitigation by maintenance as a rule

Ditches in the lower parts of the Netherlands have been constructed to serve water discharge and supply. They have an estimated length of in total 300.000 km. The geometrical dimensions of these ditches have been carefully determined to suit their function: from less than half a metre wide in agricultural lands (in fact drains at the surface of the land) to several metres wide and up to a metre deep. Ditches may have a high aquatic biodiversity.

The need for hydromorphological mitigation is not so obvious, since there is no natural reference condition for ditches. However, measures may be planned to improve the ecological situation in specific cases. For example, ditches may connect biodiverse natural areas as elements of an ecological network, or be part of such natural areas. In that case, adaptation of the profile of the ditch may be considered in order to promote macrophyte growth and the biota dependent thereupon. Connectivity and/or habitat for fish may also be improved with specific measures aimed at achieving stable populations.

Ditches need regular cleaning to prevent unacceptable hydraulic resistance through the build-up of vegetation biomass. Hence, maintenance activities affect aquatic biodiversity. In many cases, the method and frequency of maintenance may be optimized for biodiversity without significant effect on the hydrological function (discharge & supply). For example, aquatic vegetation can be partially removed. Ecologically optimized maintenance (i.e. selective cuts) is an effective and feasible mitigation measure.

At the absence of a reference condition, hydromorphological mitigation will be restricted to specific cases and mitigation by ecological maintenance practices could be the rule, such as in the example above, and exceptions should be motivated.

ANNEX III – GLOSSARY

Best approximation

"Best approximation" is interpreted as being as close as possible to undisturbed ecological continuum.

Ecological continuum

For explanation, refer to section 5.2.

Ecological flow

Ecological flow is considered within the context of the WFD as "a hydrological regime consistent with the achievement of the environmental objectives of the WFD in natural surface water bodies as mentioned in Article 4(1)" (from CIS Guidance Document No.31).

Environmental flow

Environmental flows describe the quantity, timing, and quality of water flows required to sustain freshwater and estuarine ecosystems and the human livelihoods and well-being that depend on these ecosystems (from Brisbane Declaration, 2007).

GEP flow

GEP (Good Ecological Potential) flow is considered within the context of the WFD as a hydrological regime consistent with the achievement of the environmental objectives of the WFD in heavily modified water bodies as mentioned in Article 4(1), considering a condition close to best approximation to ecological continuum as mentioned in Annex V 1.2.5.

Hydromorphology

The hydrological and geomorphological characteristics (including continuity) of water bodies, including the underlying processes from which they result. The hydromorphological quality elements for classification of ecological status are listed in Annex V 1.1 and are further expressed in terms of some relevant aspects, defined in Annex V 1.2 of the Water Framework Directive.

Hydromorphological alterations

Hydromorphological alterations are alterations in the hydromorphological conditions which are caused by physical modification(s).

Hydromorphological character

The distinctive hydromorphological features and processes for a water body (e.g. river channel morphology, geometry, hydrological regime, tidal regime, sediment distribution, sediment transport).

Hydromorphological processes

The hydrologic and geomorphic processes occurring in water bodies (e.g., erosion, continuity of water, sediment and wood fluxes, sediment transport, hydrological regime,), considering temporal changes and dynamics.

Hydromorphological type

A particular group of water bodies that share similar hydromorphological characteristics (e.g. a lowland sinuous river water body). To define hydromorphological types, some kind of hydromorphological categorization is used (for example, river type: medium-large calcareous lowland river, or confined bedrock stream, or unconfined fine-grained meandering, etc.).

Mitigation measures

Measures needed to restore, supplement or replace certain natural processes, or otherwise to reduce or ameliorate the effects of physical modifications, so as to enhance the ecological conditions of a heavily modified water body (e.g. fish flow, sediment by-pass, etc.) in order to improve its ecological potential.

Physical modification

Hydromorphological change (or changes) made to the surface water body by human activity (which may result in failing to meet good ecological status). Each modification (pressure) results from the current or historical "specified use" (such as straightening for navigation, or construction of flood banks for flood defence).

Reference conditions

For any surface water body type reference conditions or high ecological status is a state in the present or in the past where there are no, or only minor, changes to the values of the hydromorphological, physico-chemical, and biological quality elements which would be found in the absence of anthropogenic disturbance. Reference conditions should be represented by values of the biological quality elements in calculation of ecological quality ratios and the subsequent classification of ecological status (from REFCOND Guidance) as well by values for the hydromorphological and general physico-chemical quality elements.

Relevant and ecologically effective mitigation measures

The selection of potential mitigation measures, which are **relevant** to the hydromorphological alterations and **ecologically effective** in the context of the specific water body or water bodies should take into account the following:

- The natural hydromorphological and physicochemical characteristics of the water body.
- Other water body or water bodies characteristics relevant to the biota, e.g. is the modification within the fish zone/ outside the fish zone, fish community types, sediment (e.g. coarse, fine) and habitats (e.g. river types).

- Whether measure is appropriate for addressing the existing ecological impacts and can deliver a proven ecological benefit. In this sense, measures which are not likely to deliver an ecological benefit should not be considered.

Restoration measure

Measure needed to restore natural processes, and hence reach good ecological status, such as e.g. ecological flows. Compare mitigation measure (from WG ECOSTAT report on common understanding of using mitigation measures for reaching Good Ecological Potential for heavily modified water bodies - Part 1: Impacted by water storage).

Slight changes

CIS Guidance Document No.13 on the "Overall approach to the classification of ecological status and ecological potential" provides guidance on the interpretation of the term "slight changes" with reference to the (type-specific) conditions specified for the BQE benthic invertebrates at good status:

- There must be no more than slight changes in composition and abundance.
- There must be no more than slight changes in the ratio of disturbance sensitive taxa to insensitive taxa.
- There must be no more than slight signs of alteration to the level of diversity.

With respect to "slight changes", HMWB should follow the same principles as natural water bodies, with a functioning ecosystem being a prerequisite for a water body to be at GEP. Slight change cannot be equivalent to a complete/temporary absence or severe change of the biological quality elements relevant for the closest comparable water category and type (e.g. of fish for rivers within the fish zone). Slight changes to the biological quality elements have to be supported by corresponding conditions in the supporting quality elements (e.g. flow, habitats, continuity). With regard to ecological continuum, "slight change" means that a condition close to best approximation to ecological continuum should be ensured (instead of best approximation) .

Sustainable human development activities

For explanation, refer to section 3.

Self-sustaining populations

Self-sustaining populations refer to the type-specific animal (e.g. fish) and plant species occurring in the water body which form autochthonous stocks.

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COMMON IMPLEMENTATION STRATEGY FOR THE WATER FRAMEWORK DIRECTIVE (2000/60/EC)

Guidance Document No. 20

GUIDANCE DOCUMENT ON EXEMPTIONS TO THE ENVIRONMENTAL OBJECTIVES

EUROPEAN COMMISSION

environment

Disclaimer:
This technical document has been developed through a collaborative programme involving the European Commission, all the Member States, the Accession Countries, Norway and other stakeholders and Non-Governmental Organisations. The document should be regarded as presenting an informal consensus position on best practice agreed by all partners. However, the document does not necessarily represent the official, formal position of any of the partners. Hence, the views expressed in the document do not necessarily represent the views of the European Commission.

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Foreword

Activities to support the implementation of the Water Framework Directive are under way both in Member States and in the European Commission. The EU Member States, Norway and the European Commission have jointly developed a common strategy for supporting the implementation of the Directive 2000/60/EC, "establishing a framework for Community action in the field of water policy" (the Water Framework Directive). The main aim of this strategy is to allow a coherent and harmonious implementation of the Directive. The focus is on methodological questions related to a common understanding of the technical and scientific implications of the Water Framework Directive.

In the context of this common implementation strategy (CIS), a series of working groups and joint activities have been launched for the development and testing of non-legally binding Guidance Documents. A strategic co-ordination group oversees these working groups and reports directly to the Water Directors of the European Union and Commission that play the role of the overall decision body for the Common Implementation Strategy.

As a result of a four year discussion initiated by the Water Directors and assisted by a Drafting Group, several documents have been prepared to identify some key issues and make recommendations related to environmental objectives and exemptions.

Now this previous work is brought together in one consolidated document to give a full overview on the issue of environmental objectives and exemptions. This document compiles previously agreed interpretations on issues related to environmental objectives and exemptions and does not add any new issues. The previously agreed documents will stay available on Circa[1] as background documents for this consolidated guidance document.

1 http://circa.europa.eu/Public/irc/env/wfd/library?l=/framework_directive/thematic_documents/environmental_objectives

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1 INTRODUCTION - A GUIDANCE DOCUMENT: WHAT FOR?

On 23 October 2000, the "Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for the Community action in the field of water policy" or, in short, the **EU Water Framework Directive** (or even shorter the WFD) was adopted. By means of this Framework Directive, the EU provides for the management of inland surface waters, groundwater, transitional waters and coastal waters in order to prevent and reduce pollution, promote sustainable water use, protect the aquatic environment, improve the status of aquatic ecosystems and mitigate the effects of floods and droughts.

The environmental objectives are defined in Article 4 - the core article - of the Water Framework Directive (WFD). The aim is long-term sustainable water management based on a high level of protection of the aquatic environment. Article 4.1 defines the **WFD general objective** to be achieved in all surface and groundwater bodies, i.e. good status by 2015, and introduces the principle of preventing any further deterioration of status. There follow a number of **exemptions** to the general objectives that allow for less stringent objectives, extension of deadline beyond 2015, or the implementation of new projects, provided a set of conditions are fulfilled.

As for many of the challenging concepts under the WFD, the text of the directive provides the framework and gives the general orientation but there is scope for differences in understanding and application. So from the first day of the implementation it was clear that the use of exemptions needed to be explained further and the rules for application had to become clearer.

Under the Common Implementation Strategy (CIS) of the WFD several working groups for various topics have been set up[2]. The issue of exemptions was firstly addressed in the working group on economics (WATECO) where a first indication of how to deal with exemptions related to disproportionate costs is given. The WATECO guidance document, endorsed by the Water Directors, in particular started to discuss exemptions in the light of disproportionate costs.

In June 2005, the Water Directors (WD) endorsed a paper on the environmental objectives under the WFD (WFD). This document introduced key elements regarding the environmental objectives of the WFD. At the end of 2006, the Water Directors endorsed a Policy Paper on the application of Article 4.7 for new modifications. In November 2007, a third document dealing with the exemptions on extension of deadlines (4.4), the setting of less stringent objectives (4.5) and temporary deterioration (4.6) was endorsed by the Water Directors. Finally, a specific paper with conclusions on disproportionate costs was endorsed by the Water Directors in June 2008[3].

In addition to the agreed documents, information on case studies and practical examples was exchanged at various occasions. Information related to a workshop held in Berlin in 2005 and in Copenhagen in 2008 can be found at the Circa website[4].

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[2] See http://circa.europa.eu/Public/irc/env/wfd/library?l=/framework_directive/guidance_documents

[3] All papers can be found at http://circa.europa.eu/Public/irc/env/wfd/library?l=/framework_directive/thematic_documents/environmental_objectives

[4] See http://circa.europa.eu/Public/irc/env/wfd/library?l=/framework_directive/implementation_conventio/objectives_exemptions and http://circa.europa.eu/Public/irc/env/wfd/library?l=/framework_directive/implementation_conventio/disproportionate

After this, all existing earlier agreed papers are brought together into one consolidated document, resulting in this guidance document. Chapter 2 recalls the requirements of the WFD related to the environmental objectives and the exemptions. Chapter 3 reflects on key issues for the interpretation of the exemptions. In paragraph 3.2, horizontal issues which are applicable to two or more exemptions are addressed. In addition to these horizontal issues, paragraph 3.3 until 3.5 included address some specific issues related to each exemption.

This guidance document intends to provide earlier agreed information in a complete way, and may be useful for water managers involved in preparing the river basin management plans, as well as to the public interested in the (draft) river basin management plans (RBMP) and the related process of objectives setting.

2 RECALL OF WFD REQUIREMENTS IN RELATION TO ENVIRONMENTAL OBJECTIVES

2.1 General introduction

The environmental objectives and the exemptions are set under Article 4 of the WFD. The subsequent paragraphs aim at describing Article 4, mainly the exemptions, in a summarised way and in the order presented in the Directive.

Article 4 WFD sets out the **"environmental objectives"** mainly in Article 4.1. The **main environmental objectives** in the Directive are manifold and include the following elements (for details see Article 4.1, (a) surface waters, (b) groundwaters and (c) protected areas):

- ***No deterioration*** of status for surface and groundwaters and the protection, enhancement and restoration of all water bodies;
- Achievement of *good status* by 2015, i.e. good ecological status (or Potential) and good chemical status for surface waters and good chemical and good quantitative status for groundwaters;
- ***Progressive reduction of pollution*** of priority substances and ***phase-out*** **of** priority hazardous substances in surface waters[5] and prevention and limitation of input of pollutants in groundwaters;
- ***Reversal*** of any significant, upward ***trend*** of pollutants in groundwaters;
- Achievement of Standards and objectives set for ***protected areas*** in Community legislation.

It is important to note that where more than one of the objectives relates to a given body of water, the most stringent shall apply (Art. 4.2), irrespective of the fact that all objectives must be achieved.

It is important to understand that the normative definitions for the environmental objective of "good status" are described in the Directive in great detail in Annex V. However, the development of specific numerical criteria and classification schemes including class boundaries is described only as regards the process. Taking into account the results of the intercalibration exercise Member States are obliged to set detailed values defining the status for each water body.

For **heavily modified and artificial water bodies**, Article 4.1 point (a) indent (iii) sets out "specific objectives" for these specific water bodies. In Article 4.3, strict criteria for the designation of artificial or heavily modified water bodies are described.

In order to achieve the specific objectives for heavily modified and artificial water bodies (i.e. good ecological potential and good chemical status), the provisions for designation (see Article 4.3), contain elements of comparing the consequences of achieving the 'good ecological status' to a number of aspects including economic considerations. Moreover, the assessment of "good ecological potential" is linked to the possible mitigation measures[6].

There has been a debate whether these requirements should be interpreted as "alternative objectives" or "exemptions". **It has been agreed that artificial and heavily modified water bodies do not constitute a conventional objective or exemption. They are a**

[5] Pollution of "other pollutants" than PS and PHS need to be reduced by Member States in accordance with Article 11 (3) (k) WFD.

[6] See Guidance Document No. 4 on "Identification and Designation of HMWB and AWB" for more detail. http://europa.eu.int/comm/environment/water/water-framework/guidance documents.html

specific water body category - with its own classification scheme and objectives - which is related to the other exemptions in requiring certain socio-economic conditions to be met before it comes to play.

An integral part of the environmental objectives set out in Article 4 are the so-called exemptions. Article 4.4, 4.5, 4.6 and 4.7 describe the conditions and the process in which they can be applied. These exemptions range from small-scale temporary exemptions to mid- and long term deviations from the rule "good status by 2015[7]", and include the following aspects:

- **the extension of the deadline** , in other words, good status must be achieved by 2021 or 2027 at the latest (Article 4.4) or as soon as natural conditions permit after 2027;
- the achievement of **less stringent objectives** under certain conditions (Article 4.5);
- the **temporary deterioration** of the status in case of natural causes or "force majeur" (Article 4.6);
- **new modifications** to the physical characteristics of a surface water body or alterations to the level of bodies of groundwater, or failure to prevent status deterioration of a body of surface water (including from high status to good status) as a result of new sustainable human development activities (Article 4.7).

Common to all these exemptions are strict conditions to be met and a justification to be included in the River Basin Management Plan.

Comparing the criteria for applying the various exemptions (or "exemption tests"), there are some similarities between them. Thus, it should be discussed how and when to apply particular exemptions and whether there is a certain sequence or hierarchy when applying them together (see chapter 3 for more details).

Finally, paragraphs 8 and 9 of Article 4 introduce two principles applicable to all exemptions,

- first, exemptions for one water body must not permanently exclude or compromise achievement of the environmental objectives in other water bodies
- second, at least the same level of protection must be achieved as provided for by existing Community law (including those elements to be repealed).

2.2 Scope of article 4.4 and 4.5

Under certain conditions, the WFD permits the assignment of a less stringent objective or the extension of the timescales for achieving a particular objective:

Art 4.4
The deadlines established under paragraph 1 may be extended for the purposes of phased achievement of the objectives for bodies of water, provided that no further deterioration occurs in the status of the affected body of water when all of the following conditions are met:

(a) Member States determine that all necessary improvements in the status of bodies of water cannot reasonably be achieved within the timescales set out in that paragraph for at least one of the following reasons:

(i) the scale of improvements required can only be achieved in phases exceeding the timescale, for reasons of technical feasibility;
(ii) completing the improvements within the timescale would be disproportionately expensive;
(iii) natural conditions do not allow timely improvement in the status of the body of water.

[7] or "good ecological potential by 2015 " for HMWB and AWB.

(b) Extension of the deadline, and the reasons for it, are specifically set out and explained in the river basin management plan required under Article 13.

(c) Extensions shall be limited to a maximum of two further updates of the river basin management plan except in cases where the natural conditions are such that the objectives cannot be achieved within this period.

(d) A summary of the measures required under Article 11 which are envisaged as necessary to bring the bodies of water progressively to the required status by the extended deadline, the reasons for any significant delay in making these measures operational, and the expected timetable for their implementation are set out in the river basin management plan. A review of the implementation of these measures and a summary of any additional measures shall be included in updates of the river basin management plan.

Art 4.5
Member States may aim to achieve less stringent environmental objectives than those required under paragraph 1 for specific bodies of water when they are so affected by human activity, as determined in accordance with Article 5(1), or their natural condition is such that the achievement of these objectives would be infeasible or disproportionately expensive, and all the following conditions are met:

(a) the environmental and socioeconomic needs served by such human activity cannot be achieved by other means, which are a significantly better environmental option not entailing disproportionate costs;

(b) Member States ensure,
— for surface water, the highest ecological and chemical status possible is achieved, given impacts that could not reasonably have been avoided due to the nature of the human activity or pollution,
— for groundwater, the least possible changes to good groundwater status, given impacts that could not reasonably have been avoided due to the nature of the human activity or pollution;

(c) no further deterioration occurs in the status of the affected body of water;

(d) the establishment of less stringent environmental objectives, and the reasons for it, are specifically mentioned in the river basin management plan required under Article 13 and those objectives are reviewed every six years.

2.3 Scope of article 4.6

Article 4.6 differs from articles 4.4 and 4.5 in that it relates to events which "could not reasonably have been foreseen".

Art 4.6.
Temporary deterioration in the status of bodies of water shall not be in breach of the requirements of this Directive if this is the result of circumstances of natural cause or force majeure which are exceptional or could not reasonably have been foreseen, in particular extreme floods and prolonged droughts, or the result of circumstances due to accidents which could not reasonably have been foreseen, when all of the following conditions have been met:

(a) all practicable steps are taken to prevent further deterioration in status and in order not to compromise the achievement of the objectives of this Directive in other bodies of water not affected by those circumstances;

(b) the conditions under which circumstances that are exceptional or that could not reasonably have been foreseen may be declared, including the adoption of the appropriate indicators, are stated in the river basin management plan;

(c) the measures to be taken under such exceptional circumstances are included in the programme of measures and will not compromise the recovery of the quality of the body of water once the circumstances are over;

(d) the effects of the circumstances that are exceptional or that could not reasonably have been foreseen are reviewed annually and, subject to the reasons set out in paragraph 4 (a), all practicable measures are taken with the aim of restoring the body of water to its status prior to the effects of those circumstances as soon as reasonably practicable, and

(e) a summary of the effects of the circumstances and of such measures taken or to be taken in accordance with paragraphs (a) and (d) are included in the next update of the river basin management plan.

Hence it is not used for setting alternative objectives during the improvement planning process - rather it is used after the event, as a "defence" to justify why an objective which was set in a river basin management plan has not been met. This justification must be provided in the following (update of the) river basin management plan. Details are discussed in section 3.4.

2.4 Scope of article 4.7

Article 4.7 sets out circumstances in which failure to achieve certain of the WFD objectives are permitted.

Art 4.7.
Member States will not be in breach of this Directive when:

- failure to achieve good groundwater status, good ecological status or, where relevant, good ecological potential or to prevent deterioration in the status of a body of surface water or groundwater is the result of new modifications to the physical characteristics of a surface water body or alterations to the level of bodies of groundwater, or

- failure to prevent deterioration from high status to good status of a body of surface water is the result of new sustainable human development activities

and all the following conditions are met:

(a) all practicable steps are taken to mitigate the adverse impact on the status of the body of water;
(b) the reasons for those modifications or alterations are specifically set out and explained in the river basin management plan required under Article 13 and the objectives are reviewed every six years;
(c) the reasons for those modifications or alterations are of overriding public interest and/or the benefits to the environment and to society of achieving the objectives set out in paragraph 1 are outweighed by the benefits of the new modifications or alterations to human health, to the maintenance of human safety or to sustainable development, and
(d) the beneficial objectives served by those modifications or alterations of the water body cannot for reasons of technical feasibility or disproportionate cost be achieved by other means, which are a significantly better environmental option.

Note that Article 4.7 does not provide an exemption if deterioration caused by inputs of pollutants from point or diffuse sources drives the water body to a status below good.

If the resulting development is not causing a deterioration of status on the water body scale, art. 4.7 does not have to be used (for example if replacing one activity by another).

Details on how Art 4.7 can be applied are provided in section 3.5.

3 KEY ISSUES IN THE PROCESS OF JUSTIFYING EXEMPTIONS

3.1 General Introduction

When discussing exemptions it should be taken into account that the WFD is an environmental directive and exempting from its objectives should not be the rule but exceptional. It is important that before considering the application of exemptions for a certain water body, all relevant requirements from existing EU legislation for the protection of water have to be fulfilled. Nevertheless "exemptions" are an integral part of the environmental objectives set out in Article 4 and the planning process.

Member States are encouraged to keep the analysis for applying exemptions as simple as possible, but as detailed as necessary. The level of information should be determined by the complexity of the decision and the possible consequences of taking the wrong decision.

When consensus is reached between all relevant stakeholders in an early stage of the decision-making process, the efforts for data gathering may be reduced. Thus, early consensus may help to reduce analytical efforts but does not replace an economic analysis.

In the following section the key issues to use exemptions are outlined in more detail. First, some horizontal issues related to the exemptions in general are set out (in paragraph 3.2), followed by specific issues for Article 4.4 and 4.5 (in paragraph 3.3), Article 4.6 (in paragraph 3.4) and Article 4.7 (paragraph 3.5).

3.2 Horizontal issues

3.2.1 Scale

Member States have to set objectives for individual water bodies. As reflected in the 2010 reporting sheets, Member States are asked to report each water body for which the objective will not be good status by 2015; the alternative objective related to the affected quality element, and the reasons for this.

It is however recognised that different scales (national, basin, sub-basin, water body) may be appropriate for different assessments or different aspects of the same assessment. For example, transboundary issues have to be assessed on a transboundary scale. However, the choice of the scale should be justified by the provisions of the WFD and if the information used to justify an exemption is gathered at a more aggregated level it needs to be clear that the aggregated information is relevant for the concerned water body or group of water bodies.

Furthermore, Article 4.8 specifies that when applying an exemption to a water body, "a Member State shall ensure that the application does not permanently exclude or compromise the achievement of the objectives of this Directive in other bodies of water within the same river basin district and is consistent with the implementation of other Community environmental legislation." Regarding the link between water bodies, it is clear that there cannot be an automatic mechanism for justifying exemptions in an adjacent water body on the basis of an assessment carried out for another water body. This does not necessarily imply that the reasons (e.g. water uses or significant pressures) for justifying an exemption must always be located within the water body for which the exemption is sought for.

3.2.2 Protected areas

It is generally understood that the exemptions in Article 4.4 and 4.5 and 4.6 are applicable to all environmental objectives in Article 4.1, thus also to Article 4.1(c), which describes the objectives for protected areas. But Article 4.9 is clear in its obligation that when applying the exemptions of Article 4, the same level of protection should be given as in existing Community legislation. This means that exemptions from the WFD environmental objectives cannot be used to deviate from objectives and obligations set by other pieces of EU legislation.

For example, a new development is proposed that would cause deterioration of status and a failure to achieve the objectives for a Natura 2000 site. In such a case, in order to fulfil both the WFD and the Habitats Directive:

- The relevant conditions set out in Article 4.7 of the WFD for allowing deterioration of status would have to be met to the extent that it is a water body; and
- The conditions set out in Article 6 of the Habitats Directive (92/43/EEC) for allowing a failure to achieve a Natura 2000 site's objective would have to be met.

3.2.3 Management of uncertainties

Uncertainty is an inevitable feature of objective setting in general, and will therefore be a feature of the first set of river basin plans[8]. Uncertainties should be taken into account in deciding the appropriate action. This action may include further investigation, monitoring and assessment to reduce uncertainties and this could contribute to the justification for the phasing of measures across cycles. Uncertainty will reduce over the medium to long term but will always be present. There can be uncertainty about:

- Whether, and to what extent, a water body is adversely impacted and what and/or who causes the impact;
- The impact of policies already in place or planned and various trends and developments, including innovation and technical change;
- The effectiveness of measures in addressing an adverse impact on a water body (note that this will have an effect on the certainty of the benefits as well);
- The assessment of the achievement of good status[9];
- The costs associated with measures;
- The benefits resulting from improvements to the status of water bodies, particularly the calculation of the non-marketable benefits.

These uncertainties will also relate to the analysis for applying exemptions, and will have substantial impact on cost and benefit estimates. There are a number of things which can be done, and should be done, to reduce uncertainties or to deal with them in the decision-making process. For example:

- Choose reversible measures, measures that can be easily adapted, measures that can be carried out iteratively or measures with low risk and costs, and high return[10]. Where

[8] See also Guidance nr 13 on Classification of Ecological Status on: http://circa.europa.eu/Public/irc/env/wfd/library?l=/framework_directive/guidance_documents

[9] A number of uncertainties are addressed by the Directive's requirements to apply the 'one out - all out' principle and to set physico-chemical Standards characterising the good Status and to use hydro-morphological parameters to define the high Status. The pressure - Status - impact relations are well researched and understood for most of those non-biological parameters. Furthermore, uncertainties associated with the assessment of water body Status are addressed in the CIS ECOSTAT work programme 2007-2009.

[10] These measures are often referred to as 'no-regret measures'.

there is significant uncertainty, the risk of incurring disproportionate costs can be reduced by choosing measures that can be readily and iteratively added to, or adapted, in the future on the basis of information on their effects and the associated benefits. However, these kinds of measures are not necessarily the ones that are most acceptable to stakeholders.

- Estimating and recording the level of uncertainty is needed to take into account uncertainty in objective setting.
- Weigh the benefits in such a way that the additional uncertainty of benefits relative to costs is taken into account. The same logic should apply where costs are more uncertain than benefits, though this is likely to be less common in practice.
- Actions need to be taken to reduce uncertainty (e.g. by research programmes), although these actions need to be proportional. The findings of the Article 5 reports are an important basis for addressing knowledge gaps and identifying follow-up actions.
- Efforts to reduce uncertainty should be proportional to the difficulty of the decision at hand and the implications of making a wrong decision. However, there is no point attempting to reduce uncertainty if doing so does not clarify the decision at hand. It may be better to act on the basis of principle, for example the precautionary principle and/or the polluter pays principle and/or, where possible, on the basis of consensus.
- There needs to be a balance between the risk of failing to meet objectives and the risk of failing to use the most cost-effective means of achieving those objectives, with priority being given to minimising the risks of the first.

For example, the effectiveness of diffuse pollution measures may be more uncertain than the effectiveness of point source pollution measures. Conversely, the costs of diffuse pollution measures may be less than the costs of point source pollution measures.

3.2.4 Technical infeasibility

In principle, only issues of a technical nature should be taken into account in applying the technical infeasibility test - as referred to in Article 4.4 and 4.7 - and not cost issues. Although cost savings may be associated with extending the deadline for achieving good status, such savings are not relevant in deciding whether making the improvements by the deadline would be technically infeasible.

Technical infeasibility is justified if:

- No technical solution is available;
- It takes longer to fix the problem than there is time available;
- There is no information on the cause of the problem; hence a solution cannot be identified.

In practice, the greater the effort expended in trying to overcome practical issues of a technical nature, the greater the likelihood that technically feasible ways of making the improvements will be found. This means that consideration of the costs and benefits will need to be considered alongside technical feasibility. Where the benefits resulting from an improvement would be substantial, a much higher degree of effort to find a technically feasible option is likely to be appropriate than where the benefits of an improvement are expected to be low.

Further guidance can be provided by the term 'best available technique (BAT)' which is defined in the IPPC-directive (96/61/EC)[11], although in the cases where going beyond BAT might be technically feasible, these options should be explored.

Article 4.5 refers to the term 'infeasible', which includes technical infeasibility, but which could also refer to situations where addressing a problem is out of the control of a Member State.

3.2.5 Disproportionate costs

The term disproportionate costs (or disproportionately expensive) is used in Article 4.4, 4.5 and 4.7 of the WFD. Below, some principal issues related to these terms are addressed.

3.2.5.1 General introduction of the terms 'disproportionate costs'

'Disproportionality', as referred to in Article 4.4 and 4.5, is a political judgement informed by economic information, and an analysis of the costs and benefits of measures is necessary to enable a judgement to be made on exemptions. It was already concluded in the WATECO guidance that, given the uncertainty around estimates of costs and benefits one should bear in mind that,

- Disproportionality should not begin at the point where measured costs simply exceed quantifiable benefits;
- The assessment of costs and benefits will have to include qualitative costs and benefits as well as quantitative;
- The margin by which costs exceed benefits should be appreciable and have a high level of confidence;
- In the context of disproportionality the decision-maker may also want to take into consideration the ability to pay of those affected by the measures and some information on this may be required.

From the logic of the WFD is becomes clear that an assessment of disproportionate costs only makes sense after a combination of the most cost-effective solutions has been identified. Most importantly, for all cases where an exemption is applied, all measures that can be taken without involving disproportionate costs should still be taken to reach the best status possible.

In cases where exemptions are considered the consequences of non-action (i.e. foregone benefits) need to be weighed against the specific costs of the measures.

3.2.5.2 Costs of measures required under other Community legislation

The costs of measures required under existing Community legislation already agreed at the time of the adoption of the Directive cannot be considered when deciding on disproportionate costs. Without prejudice to the transitional arrangements in the Accession Treaties, this also applies to Member States which joined the EU in 2004 and 2007.

[11] 'best available techniques' shall mean the most effective and advanced stage in the development of activities and their methods of Operation which indicate the practical suitability of particular techniques for providing in principle the basis for emission limit values designed to prevent and, where that is not practicable, generally to reduce emissions and the impact on the environment as a whole. For further details, see http://ec.europa.eu/environment/air/legis.htnrfstationary

3.2.5.3 Affordability issues

Affordability (or ability to pay for a certain measure) can be one element for justifying the decision on a time extension (i.e. application of Article 4.4), if based on a clear explanation:

- of the non-availability of relevant alternative financing mechanisms which would not result in affordability issues,
- of the consequences of non-action in deciding on an extension of the deadline,
- of steps to resolve the affordability issues in the future.

Non-action by one player does not automatically lead to non-action by other players within the same sector.

Furthermore, Member States may phase the implementation of measures to spread the costs of the implementation, but there is the need for clear and demonstrable action in the first cycle.

When affordability arguments are used to extend the deadline, the possibility to use relevant **alternative financing mechanisms** should be fully considered. The alternative financing mechanisms could include distribution of costs among polluters and users, use of the public budget (at different levels), private investment, EU and international funds, etc. These relevant alternative financing mechanisms should be considered at the appropriate scale.

On the role of affordability in setting less stringent objectives, no guidance can be provided at this stage. For some Water Directors affordability could play a role in setting less stringent objectives, as both Article 4(4) and 4(5) use the same terminology 'disproportionately expensive'. They indicated that in practice affordability arguments may be used less frequently in Article 4(5) than in Article 4(4). Some other Water Directors argued that affordability can not be used as an argument for setting less stringent objectives as the context of 'disproportionate expenses' is different in 4(5) from the context in Article 4(4) as it concerns setting lower objectives permanently (subject to revision every 6-years). These Water Directors consider that application of this provision requires it to be set out clearly that the costs outweigh the benefits of achieving the targets.

On the role of constraints of the public budget as a reason for extending the deadline, no guidance can be provided at this stage either. Most Water Directors indicated that constraints of the public budget may be used as a reason for extending the deadline as there are limits to the available budget for water management. The Commission indicated that in its views the adoption of the WFD by the Council and the European Parliament entails obligations for Member States to make available the necessary means for its implementation.

3.2.5.4 Prioritisation approaches in the context of disproportionate costs

The Water Directors agreed that a proportionate selection of the different analyses (cost-benefit analysis, benefits assessment, assessment of the consequences of non-action, distribution of costs, social and sectoral impacts, affordability, cost-effectiveness etc) is useful to inform decision making.

It was also agreed by the Water Directors that prioritisation approaches for ranking measures that are considered technically feasible can be the first operational steps in the assessment of cost disproportionality, but that a justification of an extension of the deadline following these approaches should respect the relevant provisions of the WFD. The results of prioritisation have to be developed on or transformed to the water body level when relevant.

It was emphasised that prioritisation takes place on different geographic / administrative levels (e.g. MS, River Basin, Region, sub unit, water body) and should consider the different basic conditions in the area. The prioritisation process should take into account a set of relevant criteria, for example:

- synergies with other directives, e.g. habitat directive, flood risk management directive
- cost-efficiency / benefits of measures
- consequences of non-action
- certainty / uncertainty ("no regret measures")
- measures which could be implemented short term
- urgency of problem to be solved(severe consequences/high cost of non action: e.g. protection of drinking water supplies)
- existence of available financing mechanisms
- acceptance by the public

Prioritisation criteria and results should be transparent and should be disclosed to the public. The prioritisation approach should also give information on the further timescale to reach the environmental objectives.

3.2.6 Alternative means

In both Article 4.5 and Article 4.7, the necessity is mentioned to assess 'alternative means'. In Article 4.5 this refers to alternatives to serve the environmental and socioeconomic needs served by a certain human activity, which are a significantly better environmental option not entailing disproportionate costs. In Article 4.7 it is indicated that it is necessary to demonstrate that the beneficial objectives served by the modifications or alterations of the water body cannot for reasons of technical feasibility or disproportionate cost be achieved by other means, which are a significantly better environmental option.

Those means or alternatives solutions could involve alternative locations, different scales or designs of development, or alternative processes. Alternatives should be assessed in the early stages of development and at the appropriate geographical level (EU, national, RBD) against a clear view of the beneficial objectives provided by the modification.

For projects under its scope, the use of the requirements of the EIA Directive can help to assess the different possible alternatives.

3.2.7 Transboundary context

In international river basin districts within the EU, exemptions need to be coordinated. This obligation to coordinate the requirements for the achievement of the environmental objectives is indicated in Article 3.4 and 3.5.

Exemptions can be applied in cases where a certain Member State cannot resolve the reasons for not achieving the environmental objectives because they lay outside the competence and jurisdiction of the Member State. In these cases, a country causing the problem should be obliged to provide enough information for justification of the application of exemptions for the affected Member State.

Frequent information exchange between Member States, and between an EU Member State and a country outside the EU, is crucial when applying exemptions in a transboundary context. This includes information on intermediate objectives and the expected evolution for the water bodies where exemptions are applied. This enables affected Member States to adapt their own planning process.

In cases where the reasons for not achieving good status cannot be resolved by a Member State since they are outside the competence and jurisdiction of the Member State, the WFD includes the provision of Article 12 on the involvement of the Commission to solve the issue.

The key issue in both applying the exemption and invoking Article 12 is the demonstration of evidence that Member States have taken all reasonable actions to fulfil the legal obligations.

More information on the transboundary context is included in Annex II: Exemptions in a transboundary context

3.2.8 Public participation and transparency

Active participation at an early stage should be encouraged not only because of legal requirements, but it can also be used to get a better insight in factors influencing the application of exemptions (such as costs and benefits and technical feasibility). Further, it might also give an early indication of acceptability and create a basis of understanding of a certain decision on objective setting. However, public information and consultation do not guarantee acceptance of a range of (feasible) measures.

As a minimum, the public should be given insight in the reasons for applying exemptions (eg. as mentioned in Article 4(a) i, ii and iii) per water body for which an exemption is applied.

Public information and consultation is not only an obligation of WFD Article 14 and other legislation, also Article 4(4) and 4(5) and the related recitals require that the following information should be provided in the river basin management plans[12]:

- the reasons for an extension of the deadline should be specifically set out
- the reasons for the establishment of less stringent environmental objectives should be specifically mentioned;
- a summary of the measures to bring the bodies of water *progressively* to the required status;
- the reasons for any significant delay in making the measures operational;
- the expected timetable for the implementation of the measures (that are delayed);
- the appropriate, evident and transparent criteria used for applying exemptions

It is agreed that:

- there is the need for clear and demonstrable action in the first cycle;
- when applying the 'disproportionality justification', the reasons, underlying data and assessments should be made public;
- if affordability arguments are used, an explanation that there are no relevant alternative financing mechanisms available;
- an explanation of how consequences of non-action are taken into account and what action will be taken to address these reasons, so that in the future a time extension is no longer needed.

[12] See 4.4(b):'Extension of the deadline, and the reasons for it, are specifically set out and explained in the river basin management plan required under Article 13' and 4.4(d):' A summary of measures required under Article 11 which are envisaged as necessary to bring the bodies of water progressively to the required status by the extended deadline, the reasons for any significant delay in making these measures operational, and the expected timetable for their implementation are set out in the river basin management plan.' and 4.5(d):' the establishment of less stringent environmental objectives and the reasons for it, are specifically mentioned in the river basin management plan required under Article 13 and those objectives are reviewed every six years', including reasons why 'the environmental and socioeconomic needs served by such human activity cannot be achieved by other means, which are a significantly better environmental option not entailing disproportionate costs' (4.5(a)).

3.2.9 Link with Strategic Environmental Assessment and Environmental Impact Assessment

Both in applying Article 4.4/4.5 and in applying Article 4.7, the question may arise regarding how a link to the Environmental Impact Assessment (EIA)[13] and/or Strategic Environmental Assessment (SEA)[14] can be best made.

Some measures to improve status may fall within the scope of the EIA Directive and hence require an EIA (see Figure below). Furthermore, the EIA Directive gives a list of some of the environmental factors to consider in assessment of environmental costs and benefits which should be a starting point.

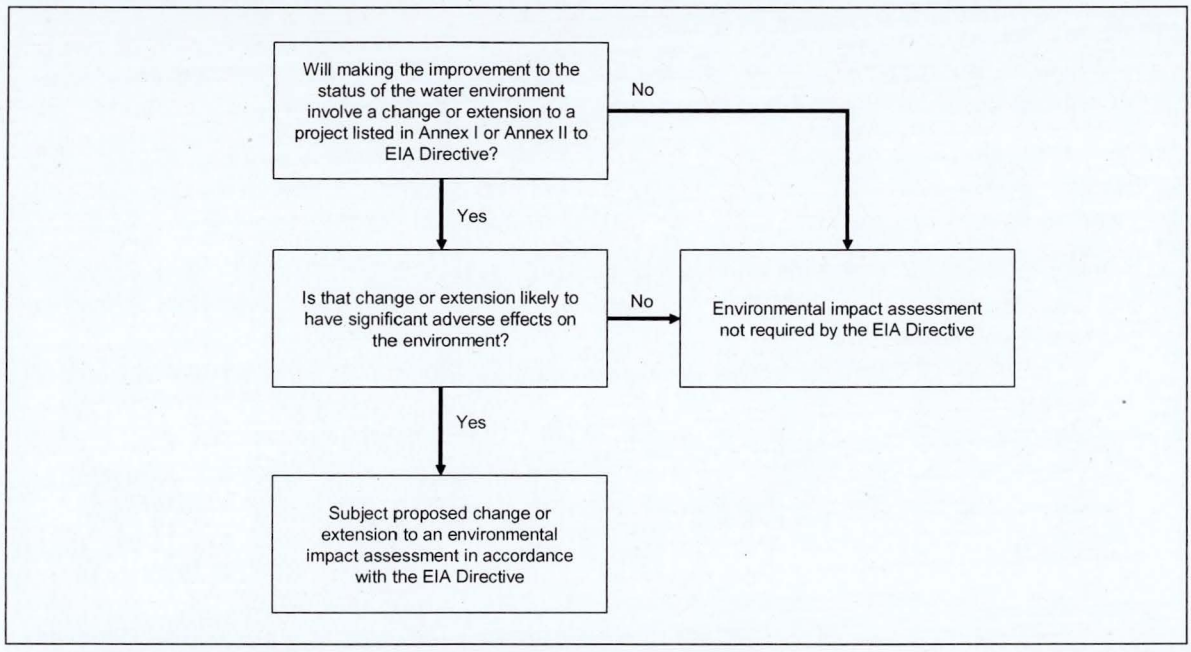

Figure 0: Link between EIA and measures under the WFD

Information from an already carried out SEA or EIA should be used as much as possible in exemptions tests. However, a formerly carried out EIA is not a blank cheque for application of the WFD exemptions.

The assessment of whether the criteria and conditions set out in **Article 4.7** are met needs to be carried out in the planning stage. Thus, it makes sense to incorporate such an evaluation into the environmental impact assessment which has to be done for most of these types of projects. However, even if certain projects are not covered by the EIA Directive, article 4.7 may apply. For plans and programmes affecting the environmental objectives of the WFD, the evaluation in accordance to 4.7 should be incorporated into the SEA[15].

In summary, the planning of "new modifications" requires the carrying out of an assessment of the environmental impacts which demonstrates, at least, that the criteria and conditions of Article 4.7, but also 4.8 and 4.9, are met.

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[13] Directive 85/337/EEC

[14] Directive 2001/42/EC

[15] See guidance document on the implementation of the SEA Directive, available at http://europa.eu.int/comm/environment/eia/sea-support.htm

3.3 Key issues for Article 4.4 and 4.5

3.3.1 Relationship between Article 4.4 and 4.5

The relationship between Article 4.4 and Article 4.5 is not a hierarchy in the sense that Member States must prove that one is ruled out before considering another. Member States are free to apply either exemption, provided the relevant exemption tests are met. However, the conditions for setting less stringent objectives require more information and in-depth assessment of alternatives than those for extending the deadline. For this reason, there should be a stepwise thinking process for considering what sort of exemption may be most appropriate (see Figure 1).

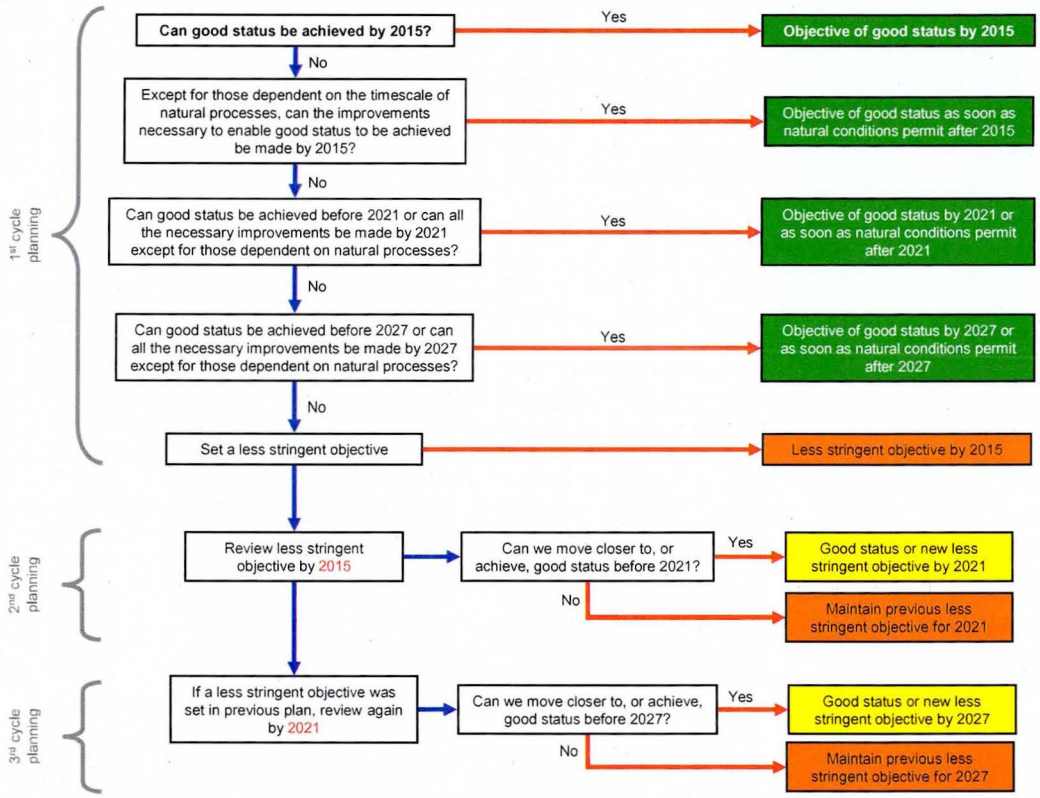

Figure 1: Stepwise thinking process for the considerations of exemptions from good status. The orange boxes refer to Art 4.5, the green except the first box to Art 4.4. For water bodies designated as heavily modified or artificial, references in the Figure to 'good status' should be taken to mean 'good ecological potential and good surface water chemical status[16]. Note, if the objective of "good status" is aimed for (green boxes), the achievement of "good status" needs to be confirmed by monitoring data.

[16] All information needed for the decision on exemptions should be on the desk before starting the stepwise process, especially the economic data and assessments, as these make it possible to test the proportionality of costs, which is one assumption for the achievement of good status

3.3.2 Internal logic of Article 4.4

Figure 2 summarises the principal tests involved in deciding whether the application of an extended deadline is appropriate. Other tests also need to be considered before applying an extended deadline. These include meeting the conditions specified in paragraphs 8 and 9 of Article 4 of the Directive.

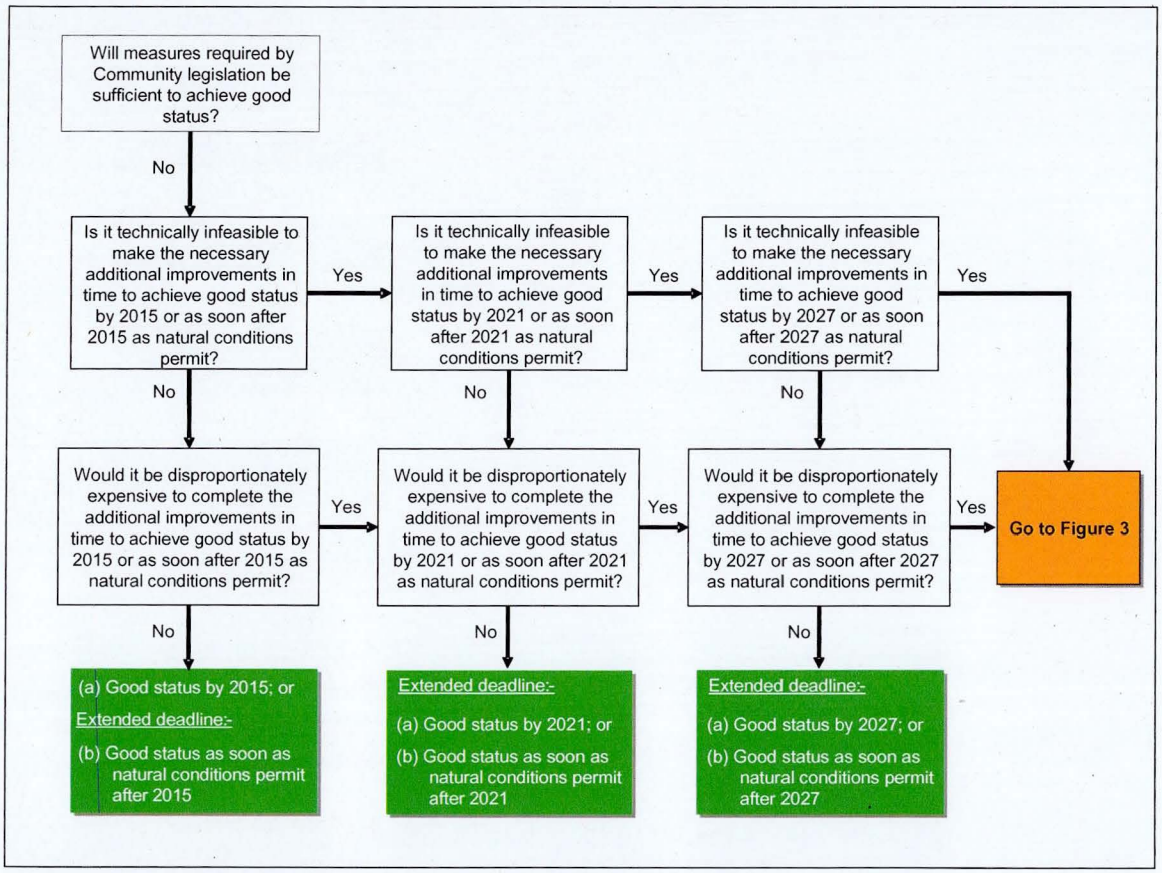

Figure 2: Internal logic of Article 4.4 - References in the Figure to good status should be interpreted as references to good ecological potential and good chemical status when dealing with heavily modified or artificial water bodies.

The Figure represents the internal logic of Article 4.4 as a step-wise linear process. However, in practice Member States may apply the process in a more iterative manner. For example, where it is technically infeasible to achieve good status by 2015 because there is no known technique for doing so (see above), consideration of the other tests illustrated in Figure 2 will not be relevant. Instead, the application of a less stringent objective (see Figure 3 below) could be considered. In contrast, if achieving good status by 2015 is technically infeasible because of technical constraints on the timing of making the measure operational, consideration of whether the measure could be implemented in time to achieve good status by 2021 or 2027 would be relevant in order to decide if an extended deadline might be applicable.

The tests should not be applied in relation to any improvements to the status of water bodies that are required by other Community legislation (see above). Exemptions may only be applied in

relation to the additional improvements that would be necessary to achieve good status once compliance with relevant Community legislation has been achieved.

Where an exemption for an extended deadline is applied, a summary of the measures envisaged as necessary to achieve good status by the extended deadline and the expected timetable for their implementation must be set out in the RBMP. A review of the implementation of these measures and a summary of any additional measures must be included in updates of the RBMP. In the second and third planning cycle, Figure 2 should be used by leaving out the first column boxes referring to 2015.

The tests require consideration of the measures needed to address the pressures on the water body and so create the conditions necessary for the achievement of good status. It should be borne in mind that the rate of recovery of the water body to good status once such conditions have been established may be delayed because of natural conditions. Where natural conditions are preventing the timely achievement of good status by 2015, Article 4.4 provides that the deadline may be extended until such time as the water body recovers to good status.

Some changes of the institutional framework for putting alternative financing mechanisms in place, or addressing other administrative or legal constraints, may need time. In some cases, pursuing these changes within the first management cycle may lead to disproportionate costs. In cases where certain procedural requirements need to be fulfilled to take measures, the deadline for achieving the environmental objectives may need to be extended. In all cases where administrative or legal constraints occur, a description of the constraints has to be given in the RBMP as well as an explanation of how these constraints will be addressed in the future.

3.3.3 Internal logic of Article 4.5

Figure 3 is intended to illustrate the process of checking whether a less stringent objective is applicable and, if so, the process for identifying what the less stringent objective should be.

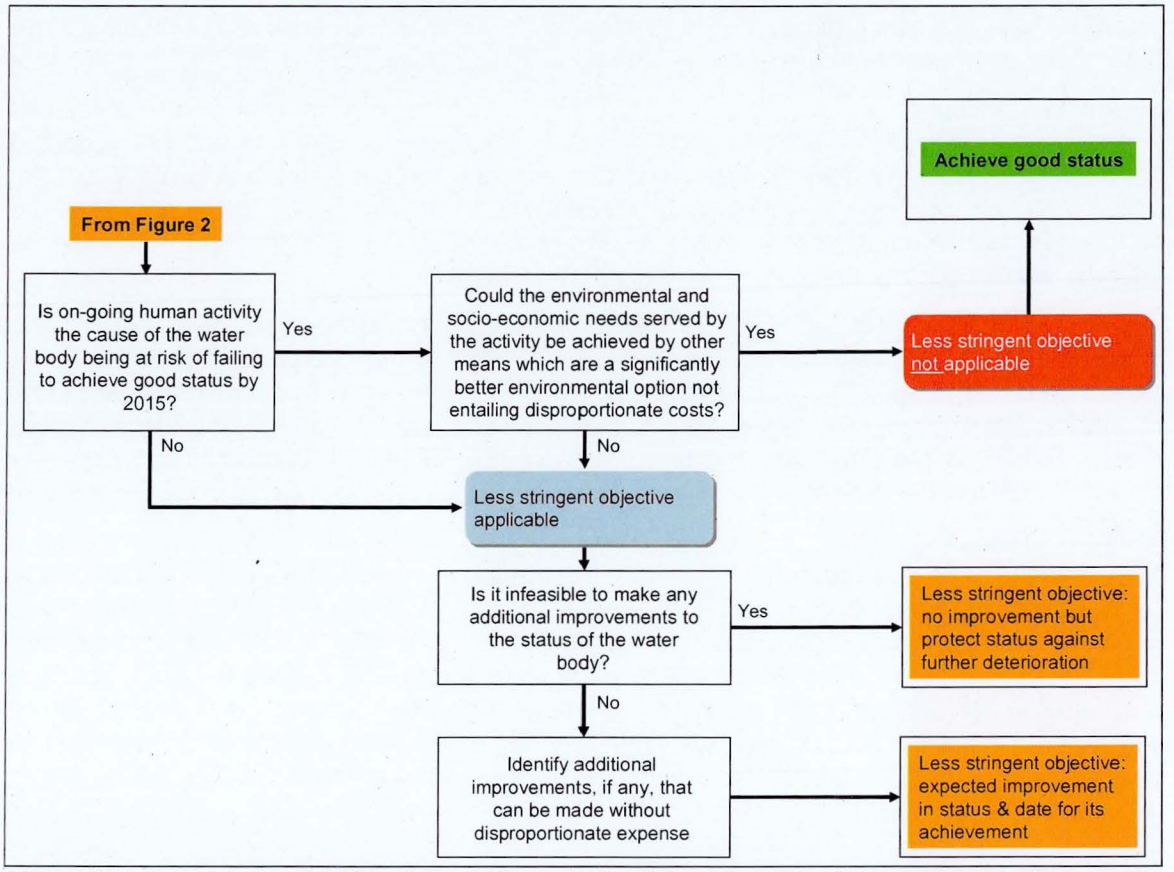

Figure 3: Internal logic of Article 4.5 - References to status should be interpreted as references to ecological potential and chemical status when dealing with heavily modified or artificial water bodies.

Figure 3 should be read in conjunction with Figure 2. According to the step-wise approach, it assumes that the tests indicated in Figure 2 have already been applied.

The Figure illustrates the process for the first cycle. The application of any less stringent objective must be reviewed in each subsequent planning cycle. When reviewing a less stringent objective, the internal logic illustrated in Figure 3 still applies. However, references in the Figure to 2015 should be treated as references to the deadline relevant to the planning cycle concerned (e.g. 2021; 2027; etc).

Before setting a less stringent objective, Member States must decide whether the environmental and socio-economic needs served by any activity that is preventing the achievement of good status could instead be provided by other means which are a significantly better environmental option not entailing disproportionate costs. Where the achievement of good status is being prevented by impacts resulting from human activities which have now ceased (e.g. historically contaminated land or sediment), this test will not be relevant.

If the test for other means is failed (i.e. if an 'other means' exists), an exemption cannot be applied and the objective for the water body will remain to aim to achieve good status. Member States are free to choose how they then achieve good status. They are not obliged to implement the identified other means of providing the benefits served by the activity as part of those measures.

In principle, a less stringent objective should represent the condition expected in the water body once all measures that are feasible and not disproportionately expensive have been taken. For example, this could mean that a less stringent objective is for the majority of the quality

elements to be protected at, or restored to, values consistent with good status even though the overall status may be worse than good because of remaining impacts on other quality elements. A 'less stringent objective' does therefore not mean that (a) the other quality elements are permitted to deteriorate to the status dictated by the worst affected quality element or (b) the potential for improvement in the condition of other quality elements can be ignored.

In some cases it may be technically infeasible or disproportionately expensive to make any improvements in the status of a water body within the period covered by the relevant river basin management plan or update. In such cases, Member States must nevertheless prevent further deterioration of status, subject to the application of paragraphs 6 or 7 of Article 4 of the Directive. It should be noted that the term "infeasible" used in Article 4 (5) is broader than the term "technical feasibility" used in Article 4 (4).

The achievement of a so called "less stringent objective" may require the implementation of measures that are as stringent, if not more so, than the measures that are required for water bodies for which the objective is good status.

3.3.4 Application of new exemptions in subsequent planning cycles

On the basis of new knowledge gathered in the subsequent planning cycle, it may be necessary and appropriate in some cases to apply a new exemption under article 4.4 or 4.5 in the next update of the river basin management plan. For example, suppose a Member State finds that a water body will not achieve the objective set for it because the measures the Member State implemented are proving less effective than expected. If bringing the achievement of the objective back on track would be infeasible or disproportionately expensive, an extended deadline up to 2027 or a less stringent objective may be applied, as appropriate. Along the same lines, it is possible to apply a less stringent objective in a subsequent planning cycle for a water body for which an extension of the deadline was applied in an earlier planning cycle or it could be concluded that an exemption is not necessary anymore for the second or the third planning cycle.

The internal logic of Article 4.4 and 4.5 illustrated in Figures 2 and 3 above applies equally where the application of new exemptions is being considered in subsequent planning cycles. However, references in the figures to the deadlines for achieving objectives will change accordingly.

3.3.5 Natural conditions

The term 'natural conditions' is used both in Article 4.4 and 4.5 and refers to the conditions which dictate the rate of natural recovery. It recognises that it may take time for the conditions necessary to support good ecological status to be restored and for the plants and animals to recolonise and become established. It also recognises that due to varying natural hydrogeological conditions, groundwater bodies may take time to reach good chemical status. Climate change can also change the natural conditions over time.

3.4 Key issues for Art 4.6

Article 4.6 provides, under certain conditions, an exemption for temporary deterioration of the status of bodies of water in certain circumstances, which are exceptional or could not reasonably have been foreseen. In order to apply Art 4.6 a common understanding of the

different terms below is needed, as well as a common understanding of the terms extreme floods and prolonged droughts.

- *Temporary deterioration:* The length of a temporary deterioration (Article 4.6) is linked to the length of the circumstances of natural cause, which are exceptional or could not reasonably have been foreseen and the practicability[17] of the measures that can be taken to restore the status of the water bodies.
- *Natural cause:* 'Natural cause' refers to events like floods and droughts which give rise to situations which cause us to make use of the water environment in ways that results in its deterioration of status (e.g. by taking emergency action to save life and property during floods; by supplying the public with drinking water during prolonged drought; by having pollutants to be washed into the water environment by floods). It is essential for proper river basin management planning and the application of Article 4(6) to make a distinction between the natural cause itself and the effects of management practices. WFD Article 4.6 deals with circumstances of natural cause which are exceptional or could not reasonably have been foreseen.

3.4.1 Extreme floods

The term 'extreme floods' recognises that, whilst it is possible to have some knowledge of the quantitative range of numerical flows and levels that might occur and the possible frequency of flood events, it will not be possible to foresee all flood events or to extrapolate all of their consequences in terms of environmental and other impacts.

The new Flood Risk Management Directive[18] introduces a EU-wide *"framework for the assessment and management of flood risks, aiming at the reduction of the adverse consequences for human health, the environment, cultural heritage and economic activity".* This includes the setting up of preventive measures which can contribute to the prevention of deterioration of status as provided for by the WFD. Thus, a closely coordinated and coherent implementation of both Directives will maximise synergies in the achievement of their objectives.

Despite all required preventive measures, however, some flood events will lead to "temporary deterioration" for which it is justified to apply the exemption set out by Article 4.6 WFD[19]. The identification of such an event can finally only take place after its occurrence. However, Member States should have assessment strategies in place in which they make use, to the maximum possible extent, of the implementation of the Floods Directive.

For example, the Floods Directive introduces three categories in Article 6.3 for the purposes of mapping floods:

a) floods with a low probability, or extreme events scenarios;
b) floods with a medium probability (likely return period > 100 years);
c) floods with a high probability, where appropriate.

It is most likely that "extreme flood" events falling under category (a) will require the application of a "temporary deterioration". However, floods with a higher probability of

[17] Practicable is related to 'technical feasible, not disproportionately expensive and without natural conditions preventing the improvements' (Article 4.4(a)).

[18] Directive 2007/60/EC of 23 October 2007 of the European Parliament and of the Council on the assessment and management of flood risks.

[19] This does not, however, include those cases of coastal flooding where deterioration, as a result of coastal erosion, may be permanent.

occurrence may also be regarded as "extreme floods" in circumstances where the impacts of such floods are equally exceptional or reasonably unforeseen.

In no way does the application of exemptions under the WFD give a Member State a possibility to make an exemption from the obligation of implementing all aspects of the Directive on the assessment and management of flood risks.

3.4.2 Prolonged droughts

A drought - contrary to water scarcity- is a natural unpredictable phenomenon. The appearance of a drought is not generated by human activities. However, the impacts of a drought episode may be exacerbated by mismanagement practices. Mitigation and prevention measures can be taken in order to reduce, and potentially avoid, the consequences of a drought when it occurs, but no measures can avoid a drought.

Although not always easy in practice, Member States will have to differentiate between the effects of prolonged droughts, which are purely natural phenomena, and the effects of human activities.

'Prolonged' droughts should be clearly distinguished from non-prolonged droughts. The conditions of a prolonged drought, i.e. the circumstances that are exceptional or that could not reasonably have been foreseen, should be demonstrated, as normal dry hydrological conditions should be addressed in the reference conditions. Relevant indicators identified at EU level are necessary to facilitate the common understanding of a 'prolonged drought', similar to criteria to define 'extreme floods'. More information is provided in Annex III.

3.5 Key issues for Art 4.7

Under Art 4.7 exemptions can be applied for **new modifications** and **new sustainable human development activities.** Before explaining the main principles of applying Art 4.7 some common definitions are provided:

- New modifications: Article 4.7 has a considerable impact on new developments and modifications. Modifications to the physical characteristics of water bodies mean modifications to their hydro-morphological characteristics. The impacts may result directly from the modification or alteration or may result from changes in the quality of water brought about by the modification or alteration. For example, hydropower plants, flood protection schemes and future navigation projects are covered by this provision. Also the hydro-morphological characteristics of impoundment created for hydropower and water supply can dictate the oxygen and temperature conditions resulting in a deterioration of ecological status in the impounded water and in the downstream river. These may be different from those in a natural water body.

  The impacts of those modifications and alterations may be limited to the water bodies in which modification works are undertaken; or extend to water bodies beyond those in which the modification works are undertaken. For example, the abstraction of water from a body of groundwater may cause adverse impacts in an associated surface water body.

- New sustainable human development activities: The Directive does not give a definition of those activities. In general, such activities cannot be defined per se through a set of criteria or policies but are framed by the relevant decision making process requirements within an open ended and iterative procedure. The exact definition for an activity falling under sustainable development will thus depend on the time, scale, involved stakeholders and information available. Relevant process

requirements are provided in the WFD itself, the Strategic Environment Assessment, Environmental Impact Assessment and "Aarhus" Directives and should be guided by the principles of the EC Treaty, being the *"polluter pays principle, the precautionary principle and preventive action, and the principle of rectification of pollution at source"*. Guiding principles on sustainable development can be found in the Renewed EU Sustainable Development Strategy (EU SDS), which was adopted by the Council in June 2006[20]. Furthermore, the decision making process should follow the principles of "good governance", including policy coherence, social inclusion and transparency and make best use of the availability of alternatives. A generic approach for small business developments affecting the same water body may be considered when applying the second point of 4.7.

- Deterioration of status or potential: The ecological status (or the potential) of a water body is expressed in terms of "classes" (e.g. high, good, moderate, poor or bad). Ecological status and potential classes are established on the basis of specific criteria and boundaries in accordance with the annex V of the WFD. In the context of Article 4.7, the objectives of preventing deterioration of ecological status (or the potential) refer to changes between classes rather than within classes. Member States do not, therefore, need to use article 4.7 for negative changes within a class.

- Temporary effects: Fluctuations in the condition of water bodies can sometimes occur as a result of short-duration human activities, such as construction or maintenance works. If the condition of each affected water body is adversely affected for only a short period of time and recovers within a short period of time[21] without the need for any restoration measures, such fluctuations will not constitute deterioration of status. The application of Article 4.7 will not be required.

  For example, temporary impacts due to the establishment of the modification during the building phase are not required to be addressed if no deterioration of status or potential could be expected thereafter in the water body or parts of the water body.

  Article 4.6 provides, under certain conditions, an exemption for temporary deterioration of the status of bodies of water in certain circumstances, which are exceptional or could not reasonably have been foreseen. An exemption under Article 4.7 will be unnecessary in those cases in which an Article 4.6 exemption is applicable.

- Small size projects: The size of the project is not the relevant criteria to trigger article 4.7. The relevant approach is to assess if a given project, whatever its importance is, will result in deterioration of the status of a body of surface water or groundwater or prevent the achievement of good ecological status, good ecological potential or good groundwater status or from high status to good status of a body of surface water. Thus, projects of any size may fall under article 4.7. However, for small projects not falling within the scope of the EIA Directive (85/337/EEC) a generic approach can be used in order to reduce the assessment burden.

In addition to the explanations above, the conditions under which Article 4.7 can be applied are presented in the figure below in a stepwise approach. This flow chart aims to be a practical tool when considering application of Article 4.7.

In comparison to the exact text of the Directive (art 4.7) c), the order of Box 3 and 4 have been changed. This is done for two reasons. Firstly, the considerations in Box 2 and 3 may result in adaptations of the project. This is not the case for the considerations from Box 4 onwards.

[20] Available at: http://register.consilium.europa.eu/pdf/en/06/st10/st10117.en06.pdf

[21] No definition will be given of 'short period of time'. However, the frequencies mentioned for the monitoring programmes (Annex V 1.3.4 and 2.2.3) can serve as an indication.

Secondly, Box 3 refers to the process of looking for alternatives, which should be done at an early stage of drafting the project, when better alternatives are available.

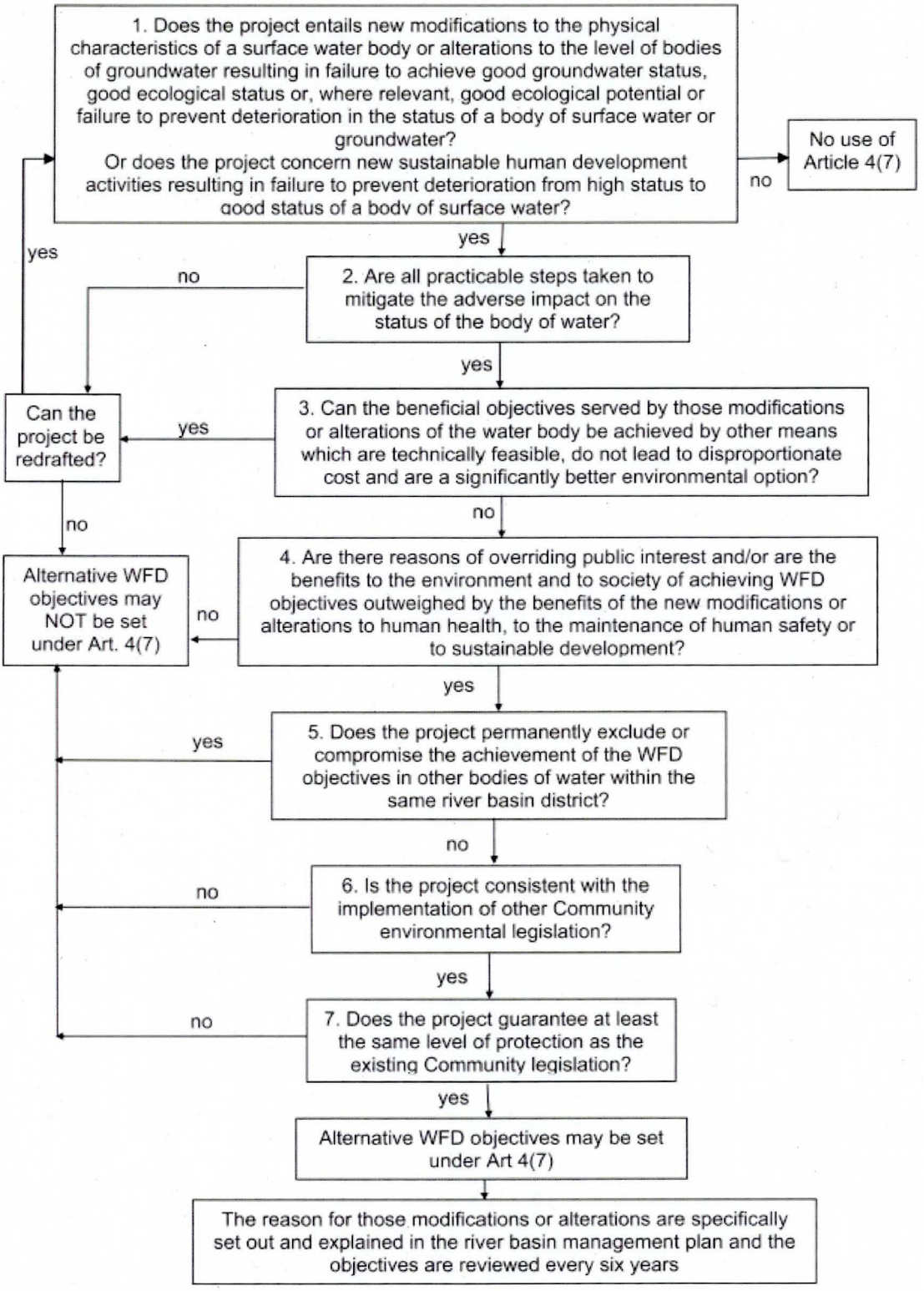

Figure 4: Example for an iterative approach, which should allow the re-assessment of the potential identification of a sustainable development activity done at the beginning.

Like all WFD exemptions, article 4.7 does not apply when the provisions of articles 4.8 and 4.9 are not fulfilled. In other words, use of the exemptions is allowed when they guarantee

at least the same level of protection as existing Community legislation and provided that they do not permanently exclude or compromise the achievement of the wider objectives of the WFD under Article I in other bodies of water within the same river basin district.

In the following paragraphs, the different conditions of the Article 4.7 assessment are explained in more detail.

3.5.1 Practicable steps to mitigate adverse impacts

As indicated in box 2 in figure 5, all practicable steps have to be taken to mitigate the adverse impact on the status of the water body. As article 4.7 requires only mitigation, it is at first important to make a clear distinction between:

- Mitigation measures, which aim to minimise or even cancel the adverse impact on the status of the body of water, and
- Compensatory measures, which aim is to compensate in another body of water the "net negative effects" of a project and its associated mitigation measures.

Article 4.7 does not require compensatory measures.

The notion of "steps" addresses potentially a wide range of measures in all phases of development, including maintenance and operation conditions, facilities' design, restoration and creation of habitats.

The wording "all practicable steps", in analogy with the term "practicable" used in other legislation, suggests those mitigation measures should be technically feasible; do not lead to disproportionate costs; and are compatible with the new modification or sustainable human development activity.

3.5.2 Overriding public interest

As indicated in box 4, when applying Article 4.7, the reasons for those modifications or alterations are of overriding public interest. This concept is also used in the Habitats Directive (92/43/EEC) and other EC law. Though there is no case law from the European Court of Justice on the application of this concept to the Habitats Directive, the European Commission's "Methodological guidance on the provisions of Article 6.3 and 6.4 of the Habitats Directive 92/43/EEC: Assessment of plans and projects significantly affecting Natura 2000 sites"[22], may bring some clarification. It is reasonable to consider that the reasons of overriding public interest[23] refer to situations where plans or projects envisaged prove to be indispensable within the framework of:

- Actions or policies aiming to protect fundamental value for citizen's lives (health, safety, environment);
- Fundamental policies for the state and the society;
- Carrying out activities of an economic or social nature, fulfilling specific obligations of public services.

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[22] Some consideration to defining "Overriding public interest" can be found at http://europa.eu.int/comm/environment/nature/nature_conservation/eu_nature_legislation/specific_articles/art6/index_en.htm

[23] Note that the consideration of "overriding public interest" only applies to the first part of Article 4.7 c, not to the second part.

Furthermore, public participation will contribute considerably in determining overriding public interest[24].

3.5.3 Benefits of the new modification versus benefits to the environment

In Box 4, it is asked whether the benefits to the environment and to society of achieving the objectives set out in paragraph 4.1 (of the Directive) are outweighed by the benefits of the new modifications or alterations to human health, to the maintenance of human safety or to sustainable development. The benefits of achieving the environmental objectives of Article 4 include:

- In case of deterioration of status, those benefits and opportunities foregone as a result of the deterioration of status (e.g. loss of biodiversity); and
- In case of failure of reaching good status or potential, those benefits that would be provided if the achievement of good status or good ecological status were not prevented (e.g. drinking water supply is not longer possible).

The "water costs" (negative benefits) have to be put in balance with the potential benefits and other costs (increased use of other natural resource, including global impacts) of the new modifications and alterations to human health, to the maintenance of human safety or to sustainable development. Thus, other categories of possible benefits and costs will have to be considered and -if possible- calculated.

In conclusion, an analysis of the costs and the benefits of the project adapted to the needs of the Directive is necessary to enable a judgement to be made on whether the benefits to the environment and to society of preventing deterioration of status or restoring a water body to good status are outweighed by the benefits of the new modifications or alterations to human health, to the maintenance of human safety or to sustainable development.

This does not mean that it will be necessary to monetise or even quantify all costs and benefits to make such a judgement. The appropriate mix of qualitative, quantitative and, in some cases, monetised information should depend on what is necessary to reach a judgement and what is proportional and feasible to collect.

3.5.4 Article 4.7 and the designation of heavily modified water bodies (HMWB)

After a new hydro-morphological alteration has occurred, it may be that the water body qualifies for designation as a heavily modified water body in accordance with Article 4.3 in the next planning cycle. There is no requirement that the designation has to wait until the publication of the next River Basin Management Plan. However, **water bodies cannot be designated as HMWBs before the new modification has taken place** because of the anticipation of the significant hydro-morphological alteration.

After the application of article 4.7 and in case of designation of new HMWBs, the step by step approach developed within the HMWB guidance document should be applied without the "provisional identification-step".

[24] See Guidance Document No 8: Public Participation in relation to the Water Framework Directive on http://forum.europa.eu.int/Public/irc/env/wfd/library?l=/framework_directive/guidance_documents

3.5.5 Reporting article 4.7 in the RBMP and public consultation

Annex VII of the WFD describes the information that should be included in the RBMP. Under point A.4, the current status of the water bodies must be assessed as a result of the monitoring programmes. Under point A.5, the environmental objectives established for surface waters and groundwaters must be listed, including identification of the use of the exemptions and the associated information required under Article 4.

The risk of deterioration of status occurring should be assessed at the time a new modification or alteration is being considered. The assessment of risk should be based on the best information available on the status of those water bodies whose status is likely to be affected by the proposed project. Such information should include the latest information from the monitoring programmes required under Article 8 and information obtained from any environmental impact assessment undertaken for the project.

Further, under article 4.7 (b), there is a general provision that "the reasons for those modifications and alterations are specifically set out and explained in the river basin management plan required under Article 13 and the objectives are reviewed every six years". This is a reporting obligation and does not mean that Member States must wait until the publication of the River Basin Management Plan before allowing a new physical modification or new sustainable development activity to proceed. In many cases projects will be developed within the RBMP six-year cycle.

For modifications and alterations within the scope of the Environmental Impact Assessment Directive, Member States must ensure that the public concerned is given the opportunity to express an opinion before the project is initiated.

Even if timing of a project is such that consultation on the RBMPs will not provide the opportunity for interested parties to express their views in advance of those decisions, Article 14 requires Member States to encourage the active involvement of all interested parties in the implementation of the Directive. It is recommended that Member States ensure that such opportunities are provided in relation to projects that are outside the scope of the Environmental Impact Assessment Directive but likely to result in deterioration of status or to prevent the achievement of good ecological Status, good ecological potential or good groundwater status.

The information provided through such consultations will help Member States in reaching a judgement on whether the exemption conditions are met and will reduce the likelihood that interested parties will challenge the subsequent decision.

If a modification or alteration goes ahead in the middle of a river basin planning cycle, the reason for that modification or alteration must be set out in the subsequent (update of the) RBMPs.

4 Conclusions

The work on environmental objectives and exemptions has started in 2005 and has progressed significantly over the past years. It has become evident that Article 4 of the WFD is the heart of this legislation and the crucial element to achieve a high level of protection of our waters as part of a sustainable water management, which also takes account of the social and economic needs and realities. This document brings together the fruitful work under the WFD Common Implementation Strategy on exemptions.

In the mean time, Member States are gaining practical experience with the application of Article 4 and are preparing for the necessary discussions as part of the public consultation. Whilst it is recognised that starting points, strategies and approaches differ across Europe, it is important to make transparent the underlying reasons and data for decision-making and to not use the exemptions as a blanket excuse. In many cases it may be more effective to discuss in a proactive way what measures can be taken to improve the current situation, rather than what arguments and administrative effort can be made to avoid taking any measures.

Thus, where "good status" may not be achieved or "deterioration of the current status" is possible, no action is not an option! This document aims at contributing towards this positive and proactive attitude when implementing the WFD and thereby contributing to sustainable water management.

The process of objective setting does not stop after the first planning cycle but is dynamic and iterative which means that it should be further developed and improved on the basis of experiences in the first RBMP. It is likely that the number of water bodies for which exemptions are applied will be decreasing within the second and third planning cycle but the application will have to be adapted each time.

It may be necessary to continue the work on exemptions in the next years, focusing on practical experiences and cases from the first planning cycle.

Annex I: Costs & Benefits

An analysis of the costs and the benefits of measures to achieve the objectives of the WFD may be necessary to support the judgement to be made on exemptions from these objectives. Reasonable efforts should be made to collect information on different types of costs and benefits, including the appropriate mix of qualitative, quantitative and monetised information. In addition, available information, for example from the cost-effectiveness assessment, should be used. In all cases, the data should be used in a transparent way showing how the assessments and calculations have been carried out.

Below, more specific information is given on benefits and costs in the framework of the WFD. Useful guidance on types of costs and benefits and how to assess them was also made in the **WATECO guidance**. Please see Section 2 and 3 and Annex D of this guidance document[25].

In addition to the WATECO guidance, **the study on Costs and Benefits associated with the implementation of the Water Framework Directive of** 2007[26] provides useful information on types of costs and benefits and methodology for Cost-Benefit Analyses (CBAs) (mainly Chapter 3). Currently used methodologies for estimating the total costs and benefits of the implementation of the WFD were studied, and recommendations were made on which costs and benefits to include and how to evaluate them. Issues relating to comparison and aggregation of costs and benefits were also outlined.

I.1 Benefits

The environmental objectives set in the WFD shall ensure the long-term protection and the sustainable use of the water resources and prevent further deterioration. The achievements of these objectives will have numerous benefits and socio-economic gains for this and coming generations. When examining the proportionality of costs required for achieving the objectives, these benefits can and should be taken into account. Some examples of such benefits are listed below:

- Protection and enhancement of health and biodiversity of the aquatic ecosystem (in particular since good ecological status requires good quality of the structure and the functioning of this ecosystem).
- Protection of human health through water-related exposure (e.g. through drinking, drinks and food production, bathing and consumption of fish, shellfish and seafood).
- Lower costs for water uses, e.g. water supply or fisheries and more cost effectively achieved improvements by reducing treatment and remediation costs (e.g. drinking water supply, Sediment pollution).
- Improvement of efficiency and effectiveness of water policy based on the "polluters-pays principle" (in particular by adequate water pricing policies and cost-effectiveness assessment of measures, example: reduction of amount of water use per capita).
- Increased cost-effectiveness of water management, in particular of measures to implement and apply, for example the Nitrates, Urban Wastewater Treatment and IPPC Directives.

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25 http://circa.europa.eu/Public/irc/env/wfd/library?l=/framework_directive/guidance_documents/guidancesnos1seconomicss/_EN_1.0_&a=d

26 http://circa.europa.eu/Public/irc/env/wfd/library?l=/framework_directive/thematic_documents/economic_issues/benefits_implementation/report_septl2pdf/_EN_1.0_&a=d

- Integrated river basin management - as introduced by the WFD – should help authorities to maximise the economic and social benefits derived from water resources in an equitable manner instead of repeating the mistaken and fragmented approaches of the past, which dealt with problems in a local, and usually temporary, basis. This should translate, *inter alia,* in designing more cost-effective measures to meet the environmental objectives of other EU legislation (see above). Especially for new Member States, the cost-saving potential is great the lessons from the experiences in EU15 are learnt[27].
- Improvement of the quality of life by increasing the amenity value of surface waters (e.g. for visitors, tourists, water-sports users, conservationist) and by increasing its non-use value and all non-market benefits associated.
- Mitigation of impacts from **climate change and security of water supplies** (e.g. by forward planning in river basin management, water demand and supply management and mitigation of flood and drought events)
- Mechanisms to address **conflicts and regional disadvantages** by balancing interests of different water users and creating a level playing field for water users across the EU[28] (in particular by addressing and managing all demands on water resources from drinking water supply, agricultural and industrial uses, navigation, hydropower, etc. in a consistent and comparable way).
- Promotion of sustainable uses thereby **creation of new jobs** (e.g. in ecotourism, fisheries, environmental technologies and nature conservation sector).

Some of these benefits are financial like e.g. the saving of costs for water supply (economic benefits) and therefore can be expressed in monetary terms, or, if the acquisition of the corresponding data requires a disproportionate effort, can at least be estimated. However, on the basis of existing methodologies, it is difficult to attribute a monetary value to many types of environmental and social benefits. The existing Information Sheet on "Environmental and Resource Costs" clarifies many concepts and outlines a few examples of how to measure them in monetary terms. Another useful tool is the "Millennium Ecosystem Assessment Report"[29] which includes substantial information on freshwater ecosystem values as well as more recent study on The Economics of Ecosystems and Biodiversity (TEEB)[30] which quantified the costs of in-action for many ecosystem services. Member States need to make an effort to value or assess social and environmental benefits/costs more appropriately than in the past. Without this, it is likely that many assessments of disproportionate costs, taking place as part of the WFD implementation, will be incorrect.

However, it will not always be necessary to place a monetary value on all costs and benefits. Member States will need to collect sufficient information on costs and benefits to support good decision making, taking into account the costs associated with the collection of the relevant information. There is a need for pragmatic approaches in order to be able to take benefits into account if this monetary information is incomplete or not fully available. Some of these benefits may be assessed by using qualitative information. In other cases, an appropriate alternative may be the application of the "precautionary principle" or it might be possible to make a qualitative assessment of the benefits and to weigh them up against the costs.

More work is required to achieve full assessment of benefits (monetary or not) derived from the implementation of measures under the WFD. It is expected that, e.g. the ongoing

[27] See e.g. EEA report on "Effectiveness of urban wastewater treatment policies in selected countries: an EEA pilot study". Final draft of 19 April 2005.

[28] and with non-EU countries sharing a river basin with the EU.

[29] http://www.maweb.org//en/index.asp

[30] http://ec.europa.eu/environment/nature/biodiversity/economics/index_en.htm

work on environmental costs (both within the WFD implementation as well as in a wider context) will improve this situation.

I.2 Costs

While recognising the considerable benefits, achieving the environmental objectives may have additional costs on those water uses or "driving forces" which have a negative impact on the aquatic environment or beneficiaries from improvements and which have not - up until now - contributed to address such impacts (e.g. not paying for the water use). At the moment, these potential costs are not known for various reasons. First, it is impossible to determine the costs before criteria for the environmental objectives are available. The water quality has to be monitored in accordance with the Directive. Only when comparing the monitoring results with the environmental standards (as defined through Annex V WFD) will it be possible to assess the "distance to target" and thereby the required investments. Second, the costs are largely dependent on the choices of instruments and combination of measures that Member States will use. Third, application and enforcement of other water protection legislation, in particular the Urban Waste Water Directive, the Nitrates Directive and the Drinking Water Directive, are inadequate in a number of countries and, thus, costs related to implementing those are easily, but wrongly, added to the costs of implementing the WFD. In the end, it is not always possible to distinguish between the water management costs incurred due to the implementation of the WFD, and the costs which would have been incurred in the absence of the WFD. However, this distinction is crucial for performing the different analysis of costs. The costs of basic measures according to existing EC water related directives (UWWD, IPPC, Nitrate etc.) can not be included in the analysis for justification of exemptions.

Independent of the lack of concrete cost-estimates, the WFD incorporates mechanisms that the socio-economic impacts are properly addressed in the decision-making and that the least cost option is selected. The way that such considerations are addressed in the directive is mainly through the above-mentioned exemptions and the development of the programme of measures as an integral part of the planning process.

If there is sufficient evidence that costs seem to be disproportionate, careful assessment and balanced decision-making on benefits and costs is an integral part of the WFD, in particular through the "exemptions" tests.

Further to the considerations in the objectives, the socio-economic aspects and, in particular the **cost-effectiveness,** is a central part in the development for the Programme of Measures. The Member States should attempt to ensure that the combination of measures for achieving the environmental objectives is resulting in the least cost option after giving sufficient attention and consideration to environmental and resource costs. Such approaches, which should be applied on national or river basin, sub-basin or water body level, leave enough flexibility in order to address issues of concern.

Furthermore, the proposed options including the use of certain exemptions and the proposed programme of measures must be subject to **public participation** in which all interested stakeholders are encouraged to be involved.

The WFD provides for environmental objectives which should be achieved by the most cost-effective combination of measures. Cost-effectiveness assessment and public participation of proposed choices are the key instruments in this process.

Annex II: Exemptions in a transboundary context

II.1 Principles for applying exemptions in a transboundary context

Exemptions may be applied in cases where a certain Member State cannot resolve the reasons for not achieving the environmental objectives because they lay outside the competence and jurisdiction of the Member State. When applying such an exemption, the following principles should be taken account of.

The coordination mechanisms as mentioned in WFD Article 3.4 or Article 3.5 or covered by other pieces of legislation (e.g. air quality) should be in place and have been exploited to the fullest extent to resolve the problem. In this context, the Member States concerned should coordinate their efforts to apply the most cost effective solution to solve the environmental issue for which an exemption may be required. - Furthermore, the Member State has to take all measures on its own territory that will contribute to achieving good status, and that are not disproportionate expensive or technically infeasible.

Finally, the Member State has to demonstrate that the reasons for not achieving the environmental objectives are outside its jurisdiction and its competence. This could for example be done by information provided by the other Member State, and/or by information provided by a monitoring point at the border between the Member States concerned or by other means.

II.2 Reasons for applying exemptions in a transboundary context

Exemptions in a transboundary context could relate to transboundary pollution, but also to hydro-morphological alterations or other transboundary ecological impacts or in the case of extreme events.

Transboundary pollution was specifically discussed in the context of the negotiations of the Commission proposal on environmental quality Standards (EQS) for priority substances[31], in particular for the following issues:

- where EQS are exceeded because the pollution load which is transported from an upstream country (whether this country is a EU Member State or not) through transboundary rivers;
- where EQS are exceeded because long-range transboundary air pollution transports high loads of pollutants (in particular heavy metals and PAHs) into the Member State concerned[32];

In both cases, the exceedance of the EQS *"cannot be resolved by that Member State"* since the sources of pollution are outside the competence and jurisdiction of the Member State. So it appears most likely that in these cases of transboundary pollution, the exemptions (Article 4.4, 4.5 and 4.6) would be applicable. Countries receiving transboundary pollution via marine currents or by atmospheric deposition are also considered downstream (or affected) countries in the context of Section 3.2.7 and this Annex.

[31] COM(2006) 397 final of 17.7.2006; 2006/0129 (COD)

[32] It should be noted that other EU or international legislation or agreements might be applicable to this issue, for example the protocols under the UNECE Convention on Long-range Transboundary Air Pollution.

II.3 Conditions of the exemptions in transboundary context

Similar to applying exemptions in a national context, it needs to be demonstrated if the conditions of Article 4.4 and 4.5 are met. Subparagraph 4.5(a) needs special attention in this case: the application of sub-paragraph (a) is clear in cases where human activities are carried out within a Member State and where an assessment of the environmental and socio-economic needs of the human activities and its alternatives is carried out. In case of transboundary effects, there is no human activity within the Member States' competence that can be compared with another. The human activity causing the pollution or the ecological impacts is outside the jurisdiction of the Member State. Thus, this condition does not apply in case of transboundary pollution or transboundary ecological impacts.

WFD Article 3

WFD Article 3.4 requires Member States to ensure coordination of the requirements for the achievement of the environmental objectives for international river basin districts within the territory of the EU. For international river basin districts partly outside the territory of the EU, the requirement is to 'endeavour to establish appropriate coordination'. It is obvious that this includes the coordination of the application of exemptions. It is of particular relevance that the coordination ensures that all relevant information and data are being exchanged between the Member States and/or other countries. For example, if the upstream Member State intends to apply an exemption on its territory, the downstream country should be informed as soon as possible and access to all information should be guaranteed. The international river conventions and other relevant international agreements play an important role in fostering and improving this information exchange.

WFD Article 12

In case the reasons for not achieving good status cannot be resolved by a Member State since they are outside the competence and jurisdiction of the Member State, the WFD includes the Provision of Article 12 ***"Issues which cannot be dealt with at a Member State level".*** Article 12 provides for:

"1. Where a Member State identifies an issue which has an impact on the management of its water but cannot be resolved by that Member State, it may report the issue to the Commission and any other Member State concerned and may make recommendations for the resolution of it.

2. The Commission shall respond to any report or recommendations from Member States within a period of six months."

Article 12 might be invoked for various situations related to exemptions. It might for example be applied in cases where no information on exemptions is provided, or it might be applied to solve the issue for which an exemptions needs to be applied by a neighbouring Member State. Article 12 could be invoked at the same time when applying the exemption in the drafting phase of the river basin management plan.

The possible reaction by the Commission will vary depending on the issue.

Demonstration of evidence

The key issue in both applying the exemption and invoking Article 12 is the **demonstration of evidence** that Member States have taken all reasonable actions to fulfil the legal obligations.

When applying exemptions, the reasons for this need to be mentioned in the river basin management plan. Furthermore, it is important to inform neighbouring countries as soon as possible on intermediate Steps related to the evidence, the intermediate objectives and the

expected evolution, in order to enable the neighbouring country to adapt their own river basin management.

When a Member State is reporting to the Commission under Article 12, it will have to provide information which support their argument and allow the Commission to verify that the non-achievement of an objective is clearly linked to the transboundary pollution or other transboundary effects. In general, such demonstration of evidence can be achieved through an appropriate and targeted monitoring strategy or a comprehensive risk analysis in accordance with Article 5 and Annex II WFD.

Annex III: Background information on prolonged droughts

The 'Drought Management Plan Report, including Agriculture, Drought Indicators and Climate Change' (also DMP report) of the Water Scarcity and Drought Expert Network notes that there are various types of droughts. For the application of exemptions according to WFD Article 4(6), the term to be used is "prolonged droughts". Whilst it will be difficult to find an all encompassing definition for what a "prolonged drought" is, it would be beneficial to enhance the common understanding for the application of the term in the context of the WFD exemptions.

As the WFD indicates in Article 4.6, the Member State may declare a "temporary deterioration" to achieving the objectives of Article 4.1 on the basis of the following conditions:

- It is a result of natural causes or *force majeure* which are exceptional or which could not reasonably be foreseen and which are reviewed periodically (e.g. through a follow up of the Programme of Measures (PoM) and/or Drought Management Plan);
- All practicable Steps are taken to avoid further deterioration (Article 4.6(a));
- Measures taken during the prolonged drought do not compromise the recovery of the water body after the prolonged drought and are included in the PoM (Article 4.6(c));
- Measures to restore the water body are taken as soon as reasonably practicable and are included in the next update of the River Basin Management Plan; (Article 4.6(c) and 4.6(d))
- A summary of effects of the prolonged droughts is included within the RBMP (Article 4.6(e)).

Section 10 of the Paper "Exemptions to the Environmental Objectives under the Water Framework Directive, Article 4(4), 4(5), and 4(6)" already highlights a few issues regarding the exemption under 4(6).

First, 'prolonged droughts' are one of the natural causes for which the exemptions under Article 4(6) may be applied. It is highlighted again that a **drought - contrary to water scarcity - is a natural and unpredictable phenomenon**[33]**.** The appearance of a drought is not generated by human activities. However, the impacts of a drought episode depend on the degree of use of the resource in a particular river basin and may be exacerbated by mismanagement practices (i.e. water resource management that is not sustainable). Some mitigation and prevention measures can be taken in order to (partially) reduce the effects of a drought when it occurs, but no measures can avoid a drought.

Secondly, it is already recognised that Member States will have to differentiate between the effects of prolonged droughts, which are purely natural phenomena, and the effects of human activities, although not always easy in practice. It is essential for proper river basin management planning and the application of Article 4.6 to make a distinction between the natural cause itself and the effects of management practices.

Thirdly, the Exemptions Paper indicates that for the distinction between a "non prolonged drought" and a "prolonged drought", the conditions of a prolonged drought, i.e. the circumstances of natural causes or "force majeure" which are exceptional or could not reasonably have been foreseen should be demonstrated in order to qualify as "prolonged". Normal dry hydrological conditions should be addressed in the ecological reference conditions set by the WFD. The river basin management plans should be able to

[33] See also the Communication 'Addressing the challenge of water scarcity and droughts in the European Union' (COM(2007) 414)

cope with non prolonged droughts without resorting to the exemption in article 4(6). Relevant criteria are necessary to facilitate the common understanding of a 'prolonged drought' through an agreed set of indicators (see below), similar to criteria to define 'extreme floods'.

III.1 Identification of a "prolonged drought"

Characteristics of droughts can vary significantly from country to country and between regions and therefore it is not possible to agree on common values of indicators that can be used in all cases.

As the circumstances to declare prolonged drought relate to a natural cause, indicators for prolonged droughts should relate to natural parameters (see 4.6(b)). Although there might be a time lag between the lack of precipitation and decreased water levels, e.g. due to retention effects of soil and vegetation and inertial effects on aquifers, the main parameter to define prolonged drought should be related to lack of precipitation (minus evapotranspiration) during a particular period with respect to average, and should take into account aspects like intensity and duration. It is necessary to distinguish between the drought itself and the effects of water use and management practices.

The drought events that are part of the normal dry hydrological conditions cannot be considered a "prolonged drought" since they are not "circumstances of natural cause *or force majeure* which are exceptional or could not reasonably have been foreseen". Any indicator used to define a prolonged drought and hence to allow triggering the exemption in article 4(6) should be based on a statistical analysis of the deviation of precipitation from the average situation (including intensity and duration), to prove that the circumstances are those of a prolonged drought.

III.2 Management of a prolonged drought

The reason for invoking an exemption under Article 4.6 is that a prolonged drought may affect the status of a water body considerably and during a significant period of time, so that a temporary deterioration may be inevitable even with the application of the best water management practices.

In the case of a prolonged drought, it may be necessary to take exceptional measures, but they must not compromise the recovery of the quality of the water body when the prolonged drought is over. These measures need to be included in the programmes of measures and/or the Drought Management Plan. They also do not exempt from taking all practicable steps to prevent further deterioration in status of the water body (see 4.6 paragraphs (a) and (c)).

Furthermore, during the prolonged drought and afterwards, all measures have to be taken with the aim of restoring the water body to its prior status as soon as reasonably practicable. In this context, practicable measures are those that are technically feasible and not disproportionately expensive. Restrictions on water use by different sectors might be an example of measures that have to be taken.

Managing prolonged droughts implies making decisions on the allocation of reduced resources to both environmental and human activity needs. Unlike in non prolonged droughts, during which the environmental needs should be respected at all times so that the WFD environmental objectives are met, during a prolonged drought, and provided the conditions on article 4.6 are respected, priority needs related to human activity (e.g. drinking water supply) can be temporarily met at the expense of the environmental needs, i.e.

allowing a temporary non- achievement of the environmental objectives. Such decisions have to carefully consider the environmental and socioeconomic aspects in accordance with the conditions in paragraphs 4.6 (a) to (d).

Besides the potential impacts on drinking water, prolonged droughts may cause significant impacts on all water uses, in particular irrigation, hydropower generation, supply of cooling water and other industrial uses, navigation and domestic uses other than drinking water (such as garden sprinkling). Thus, a clear prioritisation of main uses should be established[34] in advance where use restrictions are imposed step-by-step with increased duration, intensity and impact of the drought event. Essential drinking water supplies will be considered a high priority during periods of prolonged droughts, and this should be combined with high priority for an ecological minimum flow.

All drought situations other than a prolonged drought need to be managed without the use of article 4.6, i.e. for water bodies where non-prolonged droughts occur, the environmental objectives should be achieved and no deterioration must take place. Hence the water uses need to be brought in balance with the water availability under these dry hydrological conditions. The impacts of non prolonged droughts need to be taken into account in the definition of the environmental objectives of the RBMP and need to be addressed in the programme of measures and/or the Drought Management Plan. The iterative process of the WFD includes a periodical review of these objectives and associated measures in order to take into account the evolving impacts of these events in time.

In case of water bodies where the extent of human activity is such as to produce a permanent imbalance between available resources and demands, and if the achievement of environmental objectives would be infeasible or disproportionately expensive, the possibility to apply an exemption in article 4.4 or 4.5 might be explored, provided the conditions set out in these articles are fulfilled

III.3 Drought impacts on ecology and other water uses

For management of droughts and for determining if a temporary deterioration occurs in case of a prolonged drought, the impacts of this extreme phenomenon need to be investigated, both on ecology and on different human water uses.

Some examples for impacts on the ecology at a low water level and high water temperature are, in particular:

- changes in fish development and larger numbers of deaths than normal. Some periods of the year are highly critical for fish, such as the reproduction and migration periods.
- increased algae development due to the lack of water in rivers and lakes due to the drought. However, this parameter may be difficult to distinguish from the excess of nutrient releases that cause eutrophication.

The effects of a drought could greatly vary depending on the existing scenarios: basins with storage aquifers directly linked to the water body system, and/or regulating infrastructures (e.g. reservoirs) could be less vulnerable to impacts, while basins without storage capacity could be more rapidly affected. Other factors will undoubtedly influence drought impacts, such as demands and uses of the area. Thus, the different potential impacts caused by droughts should be assessed or, at least estimated, in advance, preferably as part of a drought management plan. Such assessment should consider economic, social and

[34] See also the Communication 'Addressing the challenge of water scarcity and droughts in the European Union' (COM(2007) 414)

environmental impacts in order to inform the necessary decision-making. Such an assessment should also take into account transboundary impacts, disparities between different Member States and distortions of competition between them which may stem from restricting or stopping certain uses.

III.4 Indicators

Three types of indicators can be identified in relation to droughts:

1. Indicators to identify and demonstrate the occurrence of a prolonged drought: natural indicators based on precipitation as the main parameter (where relevant including evapotranspiration, and with statistical series) indicate that it is a 'natural cause *or force majeure',* and that the circumstances are exceptional or could have not reasonably been foreseen.
2. Indicators to prove that the prolonged drought has resulted in a temporary deterioration of one (or several) water body(-ies) as an integral part of the monitoring programmes established under Article 8 and Annex V WFD (these are indicators related to environmental impacts).
3. Indicators to illustrate the socio-economic impacts of the prolonged droughts (drinking water supply, agriculture, industry, etc).

The first and second types of indicators should be used to prove the occurrence of a prolonged droughts and the associated temporary deterioration of water bodies. The second and third types of indicators should be used:

- to take the appropriate measures in order to mitigate the impacts of the prolonged droughts
  and recover the quality of the water bodies, according to 4.6 (c) and (d),
- to draft the annual review of the effects of the prolonged droughts (4.6(d))
- to draft the summary of the effects (4.6(e))

All indicators should be used to inform the water users and the public about the occurrence of droughts, their effects and the management results.

Chapter 3 of the DMP report provides an overview of national indicators related to droughts. The development of such indicators to be used on EU level and the specification on which indicators are consistent for the purpose of applying the exemption related to "prolonged droughts" will be subject of further work carried out by the European Commission, the European Environment Agency and Member States. In all cases, it is a requirement that when applying an exemption and the related indicators that they are to be submitted to a transparent and open process through the public participation (cf. Article 14 WFD).

III.5 Measures to address "prolonged droughts"

When a prolonged drought occurs, measures need to be taken to avoid further deterioration and to restore the water body as soon as reasonably practicable. Examples of such measures could be the following:

- develop early warning System and public Information
- implement preventive measures
- promote water savings
- take all practicable measures to prevent further deterioration
- implement specific mitigation and adaptation measures of article 11 (basic and supplementary) in water management sector as well as in other water

dependant sectors (agriculture, energy, tourism, transport, urban development, industry)

- propose additional measures after the annual review of the effects of circumstances
  that are exceptional or could not have reasonably been foreseen (Article 4.6(d))

When, and where necessary, these measures can be presented in advance as part of a drought management plan (complementing the river basin management plan). Acting on a prolonged drought, requires a rapid adoption of measures, for which the course of action should also be reflected in the RBMP or directly within the specific DMP.

Measures to be taken in case of prolonged droughts as mentioned in 4.6(c) cannot adversely affect other water bodies (see Article 4.8 WFD) and must ensure that the objectives set by other Community legislation are not compromised (see Article 4.9 WFD).

Additional information on the types of measures and possible implementation strategies are described in detail in Chapter 5 of the DMP report.

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The fatal flaw in the Proposed Water Supply Project for the Eastern and Midlands Region. This video shows Parteen Regulating Weir on the Lower River Shannon last week. The intake for the proposed water supply scheme is located just upstream from here. This weir was built in the 1920s as part of the Shannon Hydroelectric Scheme. It regulates water levels on Lough Derg and diverts most of the river's flow to Ardnacrusha Power Station. For over 90% of the time, only the statutory minimum "compensation flow" of 10 m^3/sec (cumecs) is left in the more than 15 km of river downstream of the weir - the stretch known as the "Old" River Shannon. This reach forms part of the Lower River Shannon Special Area of Conservation (SAC), designated under the EU Habitats Directive for species including Atlantic salmon. However, migratory fish stocks in the Shannon have collapsed, and the key pressure is the long-standing water management regime and fish passage constraints at the ESB dams. Lough Derg is a European Site designated as a Special Protection Area (SPA) for bird species including Common Tern. Terns nest on low-lying islands that are highly sensitive to water level fluctuations caused by the operation of the Parteen Regulation Weir. No remaining terns were recorded on the lake during the last survey completed in 2024. When I recorded this video a flow of 130 cumecs was being left in the river downstream of Parteen Regulating Weir. This only happens during flood conditions when the capacity of Ardnacrusha Hydroelectric Station is exceeded. When these releases happen the natural character of the river immediately returns, and the famous "Falls of Doonass" roar again. The Lower River Shannon can be restored with a management decision, and it is not a Heavily Modified Waterbody (HMWD). Similarly, Lough Derg can be restored to a more natural lake with more sensitive water management. Most of the ecological impacts of the Shannon hydroelectric scheme are the result of unsustainable water management – not the physical presence of the dams. The fish follow the water and no fish pass could ever work if you are diverting up to 97% of the flow in the river. Here is where the fatal flaw in the proposed Water Supply Project lies. The new abstraction is embedded within, and dependent upon, this same regulated system. The planning application acknowledges that water management will need to change in the future - but it does not define what that change will look like, nor assess the abstraction against the environmentally compliant regime that will be required. The proposed abstraction is not trivial. It represents roughly 35% of the flow currently left in the Old River Shannon for an average of 93% of the year. During droughts, lake levels will have to be regulated even more to maintain both the compensation flow and the new abstraction. The implications for restoring the Lower River Shannon SAC - and for Common Terns on Lough Derg - have not been properly assessed. For decades, the ecological consequences of the Shannon hydroelectric scheme have been deferred. Instead of first restoring the river to meet EU environmental obligations, we now have a proposal for a major new abstraction layered onto an already highly constrained and unsustainable system.

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: Pamela Quirke O'Meara
ADDRESS: Parish House, Killeen, Ballindigny, Ballinaclough, Nenagh, Co. Tipperary E45P762

I / We the above named formally object to the Proposed Water Supply Project for the Eastern and Midlands Region. The project, as currently proposed, presents unacceptable environmental, social, and economic impacts for local communities, with the perceived benefits overwhelmingly accruing to Dublin, while the local area bears disproportionate risks

1. **Environmental Impacts**

- The proposed abstraction at the Parteen Basin lies within the Lower River Shannon Special Area of Conservation (SAC), threatening critical habitats and protected species, including pollan, salmon, and trout as well as the habitats of endangered species of water birds.
- Modeling indicates that even under current proposals, Lough Derg and the Parteen Basin could experience dangerously low water levels during drought conditions, risking ecological collapse. Climate change analysis by the ICARUS Institute at Maynooth University have shown that in a short number of years, Ireland and the Mid West could experience increased times of drought during the summer months. This would mean that the proposed 2% water abstraction would in fact become a 30% abstraction due to the lowered levels of the river.
- Potential impacts on water quality and river resilience are significant, particularly during low flows, which could affect both biodiversity and downstream communities.
- The development does not adequately safeguard against long-term environmental degradation, and mitigation measures proposed are insufficient and non-binding.

2. **Construction and Traffic Impacts**

- The five-year construction period will cause severe disruption to local communities, including heavy traffic on regional and rural roads, temporary road closures, and risks to public safety.
- The scale of works, including large construction compounds and abnormal load movements, will generate significant noise, dust, and loss of agricultural access, with impacts lasting up to 24 months per land parcel.

- Local tourism, a vital economic driver for the Shannon region, Foynes Port and up as far as Lough Derg, will be adversely affected, with potential damage to boating, sailing, and recreational amenities.

It is my/our belief that there are many other options open to Uisce Eireann to increase water supply in the Dublin region without recourse to damaging the integrity of the River Shannon. There is the Poulaphouca reservoir which is currently under the control of the ESB but is hardly used to generate electricity. This massive reservoir alone would be enough to service Dublin and beyond if the electricity generating aparatus was removed. There are the Slaney, Boyne and Barrow rivers, all of which are far closer to Dublin than the Shannon and with far less disruption to agriculture and habitats.

Finally there is the proposal that Uisce Eireann begin a massive campaign to replace leaky, lead, Victorian pipe work which is currently allowing up to 50% of all expensively treated drinking water simply leak into the ground.

For these reasons I / We hereby object in the strongest possible terms to the planning application by Uisce Eireann.

Submission *Objection to the* the Proposed Water Supply Project for the Eastern and Midlands Region
SHANNON to DUBLIN WATER SUPPLY PROJECT (Ref. PA92.323980)

Applicant: Uisce Éireann

Submitted by:

Cllr . Séamie Morris M C C

Tipperary County Council

25 February 2026

Cllr. Séamie Morris MCC

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Preface .

This application by Uisce Eireann is being submitted while at the same time Ireland is being heavily fined by the EU (CJEU) for the breach of the EU water framework directive (WFD) citing long-term failures to protect waterways . This has recently been exacerbated by the decision by UE to do a 19 million eu WWTP upgrade to Ballina WWTP without putting in tertiary treatment affecting the very same part of the River Shannon they are now looking to abstract water from and also the fact that the Commission for regulation of Utilities(C R U) recently fined U E 20 million euros for not making leak targets .

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Chapter 1: Introduction & Legal Framework

Background and Purpose

This submission objects to the granting of planning permission for the proposed Eastern and Midlands Water Supply Project ("the Project") on the basis that it is **unlawful under EU environmental law**, **factually unsound**, and **procedurally defective.**

This submission is a combined and consolidated objection, integrating the full technical, ecological, hydrological and climate evidence.

Description of the Eastern & Midlands Water Supply Project

The Project involves the continuous abstraction of up to approximately 330 million litres per day from the River Shannon system at Parteen Basin, a hydrologically regulated and ecologically stressed water body forming part of the Shannon International River Basin District.

Application of the EU Law

The Project, as assessed and presented by the developer, fails to comply with binding obligations under EU law, including but not limited to:

- Directive 2000/60/EC (Water Framework Directive);
- Directive 92/43/EEC (Habitats Directive);
- Directive 2009/147/EC (Birds Directive);
- Directive 2011/92/EU as amended (Environmental Impact Assessment Directive);
- Directive (EU) 2020/2184 (Drinking Water Directive);
- Article 191 TFEU (precautionary and preventive principles).

Consent cannot lawfully be granted where these obligations are not met.

The central defects include:

The Environmental Impact Assessment Report (EIAR) and Natura Impact Statement (NIS) repeatedly frame the proposed abstraction as representing approximately 2% of average annual flow at Parteen Basin.

This framing is factually misleading and legally impermissible.

Ecological impact under the Water Framework Directive and Habitats Directive is determined by low-flow and drought conditions, not long-term averages. This is explicitly acknowledged in:

EPA technical guidance;

The independent review of the NIS (February 2026);

The developer's own flow datasets when correctly interrogated.

During Q95 and drought-year conditions, the proposed abstraction would remove between approximately 30% and nearly 50% of available flow in the Lower Shannon under realistic operational scenarios.

The Project documentation therefore misrepresents the true scale of abstraction impacts by presenting an average-flow percentage that conceals severe low-flow effects.

This constitutes a material flaw in the environmental assessment

Summary of Core Legal and Technical Defects

- Systematic misrepresentation of abstraction impacts through reliance on average flows
- Failure to assess low-flow, drought, and zero-generation scenarios
- Unlawful reliance on Heavily Modified Water Body (HMWB) designation
- Failure to satisfy Article 4(7) WFD derogation requirements
- Failure to demonstrate no adverse effect on Natura 2000 site integrity
- Defective and misleading alternatives analysis, particularly groundwater

- Failure to account for climate non-stationarity
- Unsound economic, energy, and governance assumptions

These defects are fatal in law. Planning permission must be refused.

2. MISREPRESENTATION OF FLOW REGIME AND ABSTRACTION IMPACTS

2.1 Reliance on Average Flow Is Scientifically and Legally Invalid

Sustainable water planning requires management at catchment scale, prioritising **source-region protection**, ecological integrity, and long-term resilience. The Project reverses this principle by externalising environmental risk to the Shannon catchment for the benefit of Dublin.

The Shannon system is already:

- Hydromorphologically altered
- Ecologically stressed
- Subject to multiple competing demands

It is not an under-utilised resource.

The Environmental Impact Assessment Report (EIAR) and Natura Impact Statement (NIS) repeatedly frame the proposed abstraction as representing approximately 2% of average annual flow at Parteen Basin.

This framing is factually misleading and legally impermissible.

Ecological impact under the Water Framework Directive and Habitats Directive is determined by low-flow and drought conditions, not long-term averages. This is explicitly acknowledged in:

- EPA technical guidance;
- The independent review of the NIS by Laura Kavanagh (February 2026);
- The developer's own flow datasets when correctly interrogated.

During Q95 and drought-year conditions, the proposed abstraction would remove between approximately 30% of available flow in the Lower Shannon under realistic operational scenarios .

The Project documentation therefore misrepresents the true scale of abstraction impacts by presenting an average-flow percentage that conceals severe low-flow effects.

This constitutes a material flaw in the environmental assessment.

2.2 Low flow Drought and Zero -Generation Scenarios

The independent expert review of the Natura Impact Statement confirms that the Project assessment:

- Relies on assumed ESB operational behaviour rather than enforceable constraints;
- Does not robustly model low-storage and drought-year conditions;
- Fails to demonstrate ecological safety during periods when the system is most vulnerable .

Under settled EU case law (*Waddenzee*, *Sweetman*, *People Over Wind*), where scientific doubt remains, consent must be refused. The legal test is certainty, not plausibility.

That test is not met.

3. UNLAWFUL RELIANCE ON HEAVILY MODIFIED WATER BODY (HMWB) STATUS

3.1 HMWB Designation Does Not Permit Deterioration

The Lower Shannon below Parteen has Not Yet been classified as a HMWB (it is earmarked as a potential candidate, but it is already a protected SAC which has not actually been modified, rather it has been left to deteriorate). Lough Derg is designated as a Heavily Modified Water Body (HMWB).

This reliance is legally incorrect.

Under Article 4 of the Water Framework Directive:

- HMWB designation does not remove the obligation to prevent deterioration;
- HMWBs must achieve and maintain Good Ecological Potential;
- Dependent protected areas (including Natura 2000 sites) remain fully protected.

The EPA's own technical review of HMWB designation confirms that over-abstraction from regulated systems can still cause unlawful deterioration, particularly under low-flow conditions .

The Project's abstraction regime would materially alter:

- Flow magnitude and variability;

- Lake level stability in Lough Derg;
- Downstream dilution capacity;
- Floodplain and groundwater interactions.

These are precisely the parameters protected under the WFD, even for HMWBs.

3.2 Failure to Meet Article 4(7) WFD Conditions

Any new abstraction constituting a modification of a water body must satisfy **all** conditions under Article 4(7) of the WFD.

The Project fails to do so:

1. **No overriding public interest has been lawfully demonstrated**
   The demand case underpinning the Project is demonstrably overstated and based on acknowledged methodological errors in demand forecasting and leakage assumptions .
2. **Significantly better environmental alternatives exist**
   Groundwater resources within the supply corridor were dismissed using incorrect distance metrics, flawed assumptions, and outdated studies, without any field verification .
3. **All practicable mitigation has not been applied**
   The Project relies on discretionary operational management rather than binding hydrological limits, which is legally insufficient.

Failure on **any one** of these criteria is fatal. The Project fails on **all three**.

4.BREACH OF THE HABITATS DIRECTIVE (ARTICLE 6(3))

Habitats Directive (92/43/EEC)

The project, as currently proposed, based on the information available to the public, does not meet the requirements of the Legal Test under Article 6(3) of the Habitats Directive (92/43/EEC)

(a) Applicable Legal Standard

Under Article 6(3) of the Habitats Directive, the competent authority may grant consent only where it has ascertained, beyond reasonable scientific doubt, that the proposed development will not adversely affect the integrity of the Lower River Shannon SAC. This is a strict precautionary test. Consent should be granted only if the absence of adverse effects is certain. The Court of Justice has consistently held that: an appropriate assessment must exclude adverse effects with certainty, any remaining scientific doubt precludes consent, and the test is one of prior certainty, not post-hoc reassurance.

(Case C-127/02, Waddenvereniging and Vogelbeschermingsvereniging ("Waddenzee"), paras 56–59)

(b) Consequences of the Article 6(3) Test The legal consequences of Article 6(3), as confirmed by settled CJEU jurisprudence, are as follows: Burden of Proof

The burden of proof rests entirely on the developer and the competent authority, not on objectors. (Waddenzee, para 59) Scientific Uncertainty where reasonable scientific doubt remains, consent must be refused. Scientific uncertainty operates against authorisation, not in its favour. (Waddenzee, paras 56–57; Case C-258/11, Sweetman, paras 40–41)

Measures relied upon to avoid adverse effects must be certain in their effect, enforceable, and assessed as part of the project. Measures which are contingent, aspirational, or dependent on future operational discretion cannot lawfully be relied upon at Article 6(3) stage. (Case C-323/17, People Over Wind, paras 35–40) Assessment of Worst-Case Conditions

The assessment must consider worst-case, ecologically critical conditions, not average or assumed operating conditions. Reliance on long-term averages where impacts arise during extremes is legally impermissible. (Sweetman, para 44; Waddenzee, para 44)

(c) Prohibition on Balancing at Article 6(3) Stage At the Article 6(3) stage, the competent authority is not entitled to balance environmental risk against project need, public interest, or water supply considerations. Such balancing is permitted only under Article 6(4) (Imperative Reasons of Overriding Public Interest), which has not been invoked. Any attempt to justify residual risk by reference to necessity or benefit therefore constitutes a misdirection in law. (Sweetman, paras 33–36)

(d) Misapplication of the Test in the Present Case

The Appropriate Assessment relies heavily on long-term average flow metrics (2% abstraction at Parteen) while failing to lawfully assess low-flow and drought conditions, which are the periods of maximum ecological sensitivity for the Lower River Shannon SAC. As demonstrated by the quantitative evidence before the decision-maker: At dry summer flows (15 m^3/s), the proposed abstraction of 3.82 m^3/s would remove approximately 25.5% of available flow. At extreme low-flow conditions (10 m^3/s), abstraction would remove approximately 38.2% of available flow.

These figures represent order-of-magnitude impacts, not marginal effects, during precisely the conditions most relevant to SAC integrity (fish migration, dissolved oxygen, habitat availability, and hydromorphological functioning by assessing impacts primarily by reference to average flows and failing to exclude adverse effects under worst-case low-flow conditions and relying on operational assumptions and future controls rather than certain, assessed mitigation, the competent authority failed to attain the level of certainty required by Article 6(3).

(e) Legal Consequence In circumstances where: adverse effects on SAC integrity have not been excluded beyond reasonable scientific doubt, and scientific uncertainty demonstrably persists under low-flow and drought scenarios, the grant of consent is unlawful and must be quashed.

4.1 Relevant Natura 2000 Sites and Hydrology Connectivity

The abstraction point at Parteen Basin lies within the hydrological envelope of multiple Natura 2000 sites, including:

- Lower River Shannon SAC;
- Lough Derg SAC;

- Shannon Callows SAC;
- Associated SPAs.

4.2 Failure of the Integrity Test

The independent review of the NIS concludes that the assessment does not exclude adverse effects on site integrity beyond reasonable scientific doubt, particularly during low-flow conditions .

Key deficiencies include:

- Inadequate assessment of lake-level drawdown impacts;
- Failure to account for cumulative abstraction pressures;
- Reliance on assumed mitigation rather than proven absence of effect;
- Failure to assess basin-scale hydrological connectivity.

4.3 Legal Consequences of Residual Scientific Doubt

Under Article 6(3), precaution is mandatory. Where doubt remains, consent must be refused.

5. Defective Alternative Analysis

A central requirement of both the EIA Directive and Article 4(7) of the Water Framework Directive is that a proposed project may only proceed where all reasonable alternatives have been properly identified, assessed, and objectively compared That test has not been met. The alternatives analysis underpinning this Project is fundamentally defective and materially misleading. As a result, reliance on Article 4(7) WFD to justify the abstraction is legally unsustainable. The alternatives analysis underpinning this Project is fundamentally defective and materially misleading. As a result, reliance on Article 4(7) WFD to justify the abstraction is legally unsustainable. Groundwater has been dismissed as a viable alternative on the basis of a series of demonstrable errors and flawed assumptions. These include:

Incorrect mathematical application of distance thresholds Groundwater options were screened out using arbitrary distance criteria that have no basis in hydrogeological science or EU guidance. Distance from Dublin city centre was treated as a limiting factor, despite the fact that water supply infrastructure routinely operates across far greater distances.

An illogical study area centred on Dublin city rather than the supply corridor: The groundwater study area was defined by an artificial radius around Dublin city, rather than by proximity to existing and expandable treatment plants, pipeline corridors, or areas of known hydrogeological potential. This approach systematically excluded viable aquifers that could reasonably supply the Eastern and Midlands region.

Failure to update assessments following demand reductions: Projected demand figures have been repeatedly revised downward over time due to: increased treatment capacity, reduced per-capita consumption and improved leakage control. Despite this, the groundwater assessment was never revisited to reflect the reduced scale of need. This failure artificially inflated the perceived inadequacy of groundwater solutions. False assumption that only a single-source solution was acceptable. The analysis was predicated on the incorrect assumption that water security required a single, large-scale source. EU water policy does not support such an approach. On the contrary, distributed, modular, and diversified supply solutions are recognised as more resilient, adaptable, and environmentally sustainable. These flaws were identified as early as 2016–2017, yet they remain uncorrected. The continued reliance on a demonstrably flawed groundwater assessment represents a failure to engage in a lawful alternatives analysis.Under both the EIA Directive and Article 4(7) WFD, the absence of a robust and up-to-date assessment of groundwater alternatives is sufficient, in itself, to render the Project unlawful.

5.2 Polaphuca Reservoir as an Alternative Strategic Asset. Polaphuca Reservoir represents a significant existing strategic water asset that has not been adequately assessed as an alternative or complementary solution.

Polaphuca has: a total storage capacity of approximately 166 billion litres, an active storage capacity of approximately 148 billion litres, and a surface area of 22.26 km^2.espite its scale, location, and existing role in water management, Polaphuca has not been properly evaluated in terms of: sustainable yield optimisation, operational flexibility during drought conditions, integration with existing treatment and distribution infrastructure, or phased enhancement as part of a diversified supply strategy. The failure to meaningfully assess Polaphuca as an alternative strategic resource undermines the claim that abstraction from the Shannon represents the only feasible option

5.3 Desalination and Other Supply-Side Options: Desalination and other supply-side options have been dismissed at a high level without a detailed or up-to-date comparative assessment. While desalination presents environmental and energy considerations, it is: a reversible and location-specific intervention, scalable and modular and increasingly used internationally as part of diversified water supply portfolios, particularly in climate-stressed regions. Crucially, desalination does not require the permanent modification of a river basin or the irreversible loss of restoration potential in protected freshwater systems. Other supply-side options, including: targeted expansion of existing treatment plants, conjunctive use of surface water and groundwater, seasonal or emergency-only abstraction strategies, have likewise not been adequately explored or compared.

5.4 Legal Implications: The alternatives analysis fails to meet the standard required by EU law. Where: groundwater alternatives have been unlawfully dismissed, existing strategic assets have not been properly assessed, and supply-side options have been rejected without rigorous comparison, the conditions of Article 4(7) WFD cannot be satisfied. In such circumstances, the Project cannot lawfully proceed.

6 Existing Ecological Status of the Shannon Water Bodies–Lough Derg System

6.1 Baseline Ecological Condition

Environmental Protection Agency (EPA) assessments have classified Lough Derg and associated Shannon water bodies as being at less than good ecological status. Pressures include:

Nutrient enrichment from diffuse and point sources

Hydromorphological alteration

Barriers to fish migration

Invasive species (e.g. zebra mussel, Asian clam)

Altered flow regimes

Planning decisions must be made against this degraded baseline.

This baseline condition is critical: abstraction risks must be assessed against an already stressed system with reduced ecological resilience, not a pristine or high-status waterbody.

Fisheries monitoring by Inland Fisheries Ireland further documents ecological concerns through Water Framework Directive fish classification surveys and ongoing stock assessments. These surveys identify altered fish community structure and continuing management challenges for migratory and resident species.

Why Baseline Stress Matters: Lessons from International Analogues

Large-scale ecological failures associated with abstraction—such as the Aral Sea, the Colorado River, and the Murray–Darling Basin—did not arise from single abstractions imposed on healthy systems. They occurred where systems already subject to regulation, nutrient pressure, or habitat alteration lost resilience and were pushed beyond ecological thresholds during drought years.

The Murray–Darling Basin is the closest analogue for Ireland: a temperate, developed country with regulated rivers, competing demands, and climate-driven low-flow risk. Its collapse demonstrates that abstraction impacts are non-linear and emerge most strongly during dry periods, not average years. The Water Framework Directive explicitly prohibits authorising projects that risk further deterioration of already stressed water bodies. Further abstraction from Lough Dery would likely result in a catastrophic concentration of toxic algae in the lake.

6.2 Loss of Ecological Resilience

Resilience refers to a system's capacity to absorb shocks (such as drought) without undergoing regime change or long-term degradation. Abstraction during low-flow periods reduces ecological buffering capacity, making collapse more likely during extreme events.

6.3 Loss of Ecological Resilience in a Regulated System

The project is frequently framed as abstracting approximately 2% of the long-term average flow of the Shannon at Parteen. This framing is ecologically misleading. Ecological impacts are driven by low-flow conditions, not long-term averages.

During drought periods: Flows are already near ecological thresholds and Lake storage (Lough Derg) is relied upon. Small additional abstractions have disproportionately large impactsLong-term average flow at Parteen is approximately 180 m^3/s. The proposed abstraction of 300–330 ML/day corresponds to approximately 3.47–3.82 m^3/s.
While this equates to 2% of average flow, ecological stress does not occur during average conditions. It occurs during low-flow, high-temperature periods when:

- flows are already reduced,
- oxygen availability is lower,
- nutrient impacts are magnified,
- fish movement is constrained.

Low-Flow Abstraction Is Far Riskier Than % of Annual Average Flow

7. Hydrological and Ecological Impacts of Large-Scale Abstraction

Using published EPA licensing material for the Lower Shannon, the Q95 low-flow statistic is reported as approximately 12.53 m^3/s. If a continuous abstraction of 3.82 m^3/s were imposed under such conditions, it would represent: 30.5% of the river flow at Q95 conditions.
By definition, Q95 conditions occur approximately 5% of the time in the long-term flow record. These periods correspond to the very conditions most likely to cause ecological harm.
Even using the lower 3.47 m^3/s abstraction figure, the proportional impact remains in the double-digit percentage range under low flows. The ecological issue is not whether statutory compensation flows are maintained, but where the abstracted water is operationally sourced during droughts: reduced hydro diversion, altered lake levels, or modified release timing. These trade-offs are precisely where paper sustainability assumptions have failed in other regulated systems. Lough Derg possesses an approximate total water volume of 0.887 cubic kilometers, equivalent to 887 million cubic meters or approximately 213 billion gallons. Its key physical characteristics include a surface area of 130 square kilometres, an average depth of 7.6 meters, a maximum depth of 36 meters, and a length of 38.6 kilometres. In contrast, the Pollaphuca Reservoir has a total capacity of 166 billion Liters and an active capacity of 148 billion Liters, with a surface area of 22.26 square kilometres.

A compensation flow of 10 cubic meters per second is consistently maintained in the lower River Shannon, along with a Fish Pass flow of 0.7 cubic meters per second, even when the Ardnacrusha Flow is at zero and all turbines are disengaged. The water level at Parteen Weir is managed within a narrow operating band, approximately 460 millimeters in depth, which extends over the natural surface of Lough Derg. ESB manages water levels within this normal operating band, across a wide range of flows, as an integral component of their hydroelectric scheme management. During flood periods, water levels in Lough Derg may exceed this normal operating band.

Each of Ardnacrusha's four turbines utilizes approximately 100 cubic meters per second. The flow through Parteen Villa Weir is distributed between the original course of the Shannon, which is allocated 10 cubic meters per second, and the new channel directed through Ardnacrusha. When there is no water flow through Ardnacrusha, the water level of Lough Derg remains at its normal state, as indicated by the Killaloe pier head chart, and no significant current is observed at Killaloe. It is important to note that a water level drop of 0.3 meters is a recurring event on Lough Derg, falling within the established operating band of 0.46 meters. Such occurrences are primary contributors to the increased frequency of algal blooms observed on Lough Derg, exemplified by the event in September 2025 when the water table experienced a 28-centimeter decline.

Fluctuating water levels pose several detrimental impacts on freshwater lakes, contributing to pollution through various mechanisms: Sediment Exposure: Reduced water levels expose the lakebed, leading to the release of stored nutrients and chemicals from the sediment into the water column. Habitat Disruption: Variations in water levels disrupt aquatic habitats, thereby destabilizing the ecosystem and rendering it more susceptible to external pollutants. Increased Runoff: Rapid declines in water levels, particularly when followed by substantial rainfall, can escalate surface runoff, transporting pollutants from terrestrial areas into the lake.

Local Case Study -Parteen weir

Below are photographs from St. Flannan's Angling Club Killaloe members taken on the 12.02.26 who encountered navigation challenges departing the club's 70-berth boat shed. are over 180-200 berth owners south of Killaloe Bridge who are significantly impacted by variable flow conditions in the Parteen basin and have expressed concerns regarding the pipeline.





In Ireland, a hydrological drought is associated with surface and sub-surface water availability. Hydrological droughts often lag meteorological and agricultural droughts. Depending on catchment characteristics, it takes longer for precipitation deficits to emerge in streamflow, groundwater and reservoir levels. They can also last long after meteorological and agricultural droughts have ended.
See
https://www.ria.ie/blog/drought-a-risk-being-overlooked-in-ireland/
These periods may not involve an absolute absence of rainfall, but rather insufficient precipitation to replenish river systems adequately.

The pipeline is currently presented as a 'negligible' 2% abstraction.
This 2% is derived from annual average flow of the Shannon. To use average flow from a whole year is grossly misleading.

The proposed abstraction will in fact be the equivalent of up to 30% of available flow in drought periods, due to already lowered water levels.
This is explained in detail below.
This is a completely unacceptable environmental risk.

It is evident that over recent years, 'experts' have failed to perform a robust drought sensitivity analysis, and failed to demonstrate that the project supports a wide margin of safety in this regard.
It is unreliable as a dry-spell water source for Dublin.

3. Flow breakdown

The three outlets from Parteen Basin are
- Ardnacrusha hydro station
- Old Shannon rivercourse
- Clareville WTP.

Flow data obtained from the ESB under the **Freedom of Information Act see Appendix E** indicates that, over the past ten years, there have been, on average, 20 days per year during which the turbines at Ardnacrusha took Zero water. Clareville WTP was supplying 0.6m3/s to Limerick all the time.And from the same dataset, ONLY the Statutory Minimum of 10.5 m3/s was flowing down the Old Shannon.
The proposed pipeline would abstract 3.5m3/s or the equivalent of 33% of this flow of 10.5 m^3/s. So over the last 10 years, for about 20 days each year, there was No Surplus that could have been taken by a pipeline. Limerick City is already abstracting approximately 0.6 m^3/s from the Parteen Basin. This demand will increase as further housing and industry development, and associated infrastructure are constructed. It is therefore completely misleading to suggest that there is a "surplus" available for a pipeline.
During dry spells, when Ardnacrusha already cannot operate, it is impossible to simultaneously satisfy
- statutory flow requirements for the Old Shannon,
- supply Limerick
- maintain lake levels within ecological acceptable min/max range.
- AND supply the pipeline to Dublin.

Concrete example from 2018

The most recent significant dry spell (drought) was summer 2018, during which the low-flow conditions persisted for 74 consecutive days. (ESB data).
During this period, Ardnacrusha abstraction ceased. It was Zero.
The only Shannon flow arriving into the Parteen basin, was just sufficient to meet the minimum statutory requirement of 10 m^3/s for the Old Shannon, and supply Clareville WTP. Additional abstraction for a pipeline under these circumstances would have been unacceptable. Lowering the water levels in the Old River Shannon and/ or Lough Derg above Parteen, would have been the only option, with no means to control duration. We do not control how long droughts last.

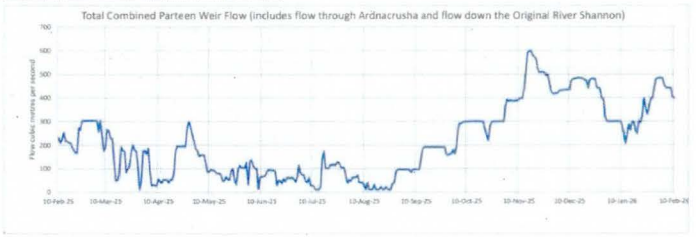
The mitigation measures proposed by Uisce Éireann are insufficient, lack enforceable guarantees, and do not adequately address these realistic already-occurring climate scenarios.Their flow modelling has not been back-tested against examples such as 2018. The entire stretch of the River Shannon concerned, is protected under the EU Natura 2000 network, which places strict legal obligations on the State to avoid deterioration of protected habitats and species. Any development, such as lowering water levels below established minimums, risking permanent ecological harm, is illegal under these

protections.

Energy for generations

Current Total Combined Parteen Weir Flow (includes flow through Ardnacrusha and flow down the Original River Shannon)

10-Feb-26 09:00:00	398	cubic metres per second



Please note the following:

1. Note that ESB does not guarantee the accuracy of any data provided. It is the user's responsibility to independently verify and quality control any of the data used and ensure that it is fit for purpose/use. ESB does not accept responsibility for the use of any data made available, read or interpreted or used in any way by the user, or passed to a third party, and do not accept liability for any damage or loss howsoever arising out of the use or interpretation of this data.

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Energy for generations

Last 30 readings for Total Combined Parteen Weir Flow (includes flow through Ardnacrusha and flow down the Original River Shannon)

Timestamp	Value	Units
10-Feb-26 09:00:00	398	cubic metres per second
09-Feb-26 09:00:00	405	cubic metres per second
08-Feb-26 09:00:00	442	cubic metres per second
07-Feb-26 09:00:00	442	cubic metres per second
06-Feb-26 09:00:00	442	cubic metres per second
05-Feb-26 09:00:00	442	cubic metres per second
04-Feb-26 09:00:00	454	cubic metres per second
03-Feb-26 09:00:00	484	cubic metres per second
02-Feb-26 09:00:00	484	cubic metres per second
01-Feb-26 09:00:00	484	cubic metres per second
31-Jan-26 09:00:00	484	cubic metres per second
30-Jan-26 09:00:00	478	cubic metres per second
29-Jan-26 09:00:00	437	cubic metres per second
28-Jan-26 09:00:00	397	cubic metres per second
27-Jan-26 09:00:00	397	cubic metres per second
26-Jan-26 09:00:00	360	cubic metres per second
25-Jan-26 09:00:00	330	cubic metres per second
24-Jan-26 09:00:00	356	cubic metres per second
23-Jan-26 09:00:00	398	cubic metres per second
22-Jan-26 09:00:00	323	cubic metres per second
21-Jan-26 09:00:00	296	cubic metres per second
20-Jan-26 09:00:00	301	cubic metres per second
19-Jan-26 09:00:00	247	cubic metres per second
18-Jan-26 09:00:00	260	cubic metres per second
17-Jan-26 09:00:00	295	cubic metres per second
16-Jan-26 09:00:00	300	cubic metres per second
15-Jan-26 09:00:00	263	cubic metres per second
14-Jan-26 09:00:00	266	cubic metres per second
13-Jan-26 09:00:00	242	cubic metres per second
12-Jan-26 09:00:00	207	cubic metres per second

Please note the following:

1. Note that ESB does not guarantee the accuracy of any data provided. It is the user's responsibility to independently verify and quality control any of the data used and ensure that it is fit for purpose/use. ESB does not accept responsibility for the use of any data made available, read or interpreted or used in any way by the user, or passed to a third party, and do not accept liability for any damage or loss howsoever arising out of the use or interpretation of this data.

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7.1 Lake Level Fluctuations and Littoral Habitat Loss

Assumes that in very low flow/drought conditions, that Ardnacrusha does not draw water for power generation. The statutory minimum flow for the Old Shannon is supposed to be 10 m3/s (10 cumecs).

From our OEA AIE 2026 02 from the EPA of 4 Feb, in Record 2 the ESB claims that the mean daily flows are 10 or sometimes 10.5 cumecs, (this figure is always 10 or 10.5, from 1st april to 1st Oct, in

each year between 2016-2024). Please note the EPA rely on these figures from the ESB, which mean daily flows in the summer months, we can say the ESB claim to be releasing a daily average of 10.5 cumecs down the Old Shannon from Parteen. Only 10.5 cumecs was coming down the whole Shannon system and then being sent down the Old Shannon from Parteen weir. For these approx 14 days, spread across the summer dry months, if the proposed pipeline takes 3.47 cumecs, this would represent: 3.47/10.5 = 33% of the total flow in the Shannon.

We have extracted the flow data for 2018 and sorted by lowest flow. In 2018 there were 74 days where Ardnacrusha took Zero, and only the 10.5cumecs was going down the old Shannon. So for those 74 days, in order to preserve the statutory flow in the old Shannon, the pipeline would not have been able to take any water! Given that we are due droughts every two years this is a huge concern.

The EPA already knows there is a risk to flows from abstraction. This extract is from page 12 of the "Technical review of HMWB designation" of March 2022.

"Impacts to flows. Large dams which capture a large proportion of a catchments flow cause significant alteration of the natural flow regime. Compensation flows, while providing a benefit in terms of a minimum flow, may be constant and non-varying, and the total flow will be impacted by the abstraction. The intensity, timing and frequency of the downstream flow regime will be completely altered, often resulting in a decrease in the magnitude of small and medium sized flood peaks, and an increase in low flows. In some instances, operational procedures can result in rapid flow fluctuations that occur at non-natural rates. Over-abstraction of the upstream reservoir can also result in the downstream river drying out at certain periods of the year."

The Castleconnell River Association maintains and monitors about 200 wild salmon spawning beds (redds) in the Old Shannon River near Castleconnell village. See ccriverassoc.org

These are the only, and the last, wild salmon still spawning in the Shannon. Atlantic salmon are on the IUCN Red List of Threatened Species. NO degradation of habitat is permitted, under the Habitats Directive. The survival of eggs and newly hatched fry are particularly sensitive to the above water flow issues. Once these are gone, they are gone. They cannot be re-established.

(The Shannon used to host the biggest wild salmon runs of all the rivers in Europe, estimated at over 400,000 fish per year).

Specific Ecological Impacts

Littoral and Shoreline Habitats

Shallow margins of Lough Derg are among the most biologically productive habitats in the system. Sustained water level drawdown of even 10–30 cm can result in:

- Desiccation of reed beds and macrophytes
- Loss of invertebrate production
- Reduction in fish spawning and nursery areas
- Repeated drawdown leads to long-term habitat loss with slow or incomplete recovery.

Fish Populations and Migration

The Lower Shannon and Parteen–Ardnacrusha complex is already a critical bottleneck for migratory species. Reduced flows:

- Impair attraction flows at fish passes
- Disrupt migration timing
- Increase predation and exhaustion
- Population-level impacts typically manifest gradually, making them easy to dismiss until recovery is no longer possible.

Water Quality and Oxygen Dynamics

Low flows combined with warmer temperatures:

- Reduce dilution capacity
- Increase residence time
- Raise the risk of algal blooms and hypoxia
- Such conditions are well-documented precursors to fish kills and ecosystem collapse in regulated river–lake systems worldwide.

A **100-metre stretch of native woodland** will be directly affected and removed at the point of abstraction. The proposed abstraction pipeline and associated works, located at Parteen Basin (coordinates: 52.782954, -8.444928), require the clearance of an established tree line along the shoreline. This woodland forms part of a sensitive riparian habitat, providing ecological functions that include:

- bank stabilisation and erosion control,
- shading and temperature regulation of near-shore waters,
- habitat connectivity for birds, mammals, and invertebrates, and
- landscape and amenity value within a protected river system.

The removal of this woodland will result in immediate and irreversible habitat loss at the abstraction point, fragmenting shoreline ecology and compounding the wider hydrological and ecological pressures already affecting the Lower Shannon system.

Given the location within a highly regulated and ecologically sensitive basin, the clearance of native woodland at the abstraction point cannot be regarded as minor or localised. It represents a direct physical impact that must be fully assessed in its own right, particularly in the context of Natura 2000 protections and the cumulative effects of abstraction-related works.





8: The Lower Shannon: A River in Decline

8.1 Historical Context

The body of water known as the Lower Shannon consists of that part of the river downstream from the Parteen Regulating Weir to where it joins the water from the Ardnacrusha tailrace at Long Shore, about a mile upstream of Limerick City.

Only about 5% of the river's natural flow is allowed through this section; the remainder is diverted to the Ardnacrusha generating station. Since the inception of the Shannon Scheme in 1929, the river has been gradually closing in—a change that is clearly visible in Castleconnell, Plassey, and Corbally.

First, a little background. There is a 26-kilometre stretch of the River Shannon, from the Parteen Weir to Limerick city, which in the early 1920's was a unique salmon fishery. The estimated annual salmon run was between 350,000–500,000 fish. In 1927, 414,000lb of salmon were caught on the river. Salmon weighing 55 lb or more were regularly caught using local, hand-crafted Enright rods at Castleconnell. Then came the Ardnacrusha hydro power station which was officially opened on July 22, 1929 by President WT Cosgrave. The impact on salmon, trout, eels, lamprey and coarse fish was immediate and catastrophic.

There are essentially two reasons why the river just north of Limerick city was a world-class fishery. First, Atlantic salmon migrate from the sea to reach freshwater to spawn. At the Thomond Bridge area in Limerick city they encounter the tidal limit and pass into fully fresh, non-tidal water. The salmon paused in huge numbers in this area to rest and recover before setting-out to points upstream on the 360km river. Second, the previous, full natural flow from the upper Shannon produced ideal conditions to create the perfect salmon habitat, particularly just above the Doonass Falls in Castleconnell; rich, diverse riverbanks, oxygen-rich water, deep holding pools and shallow gravel beds gave rise to famous salmon pools.

The Shannon Scheme entailed diverting water from the river at a newly constructed Parteen Weir down a 13km long canal, called the headrace, to the turbines in Ardnacrusha Power Station. The water then exited to a constructed tailrace, 5km in length, before joining up with the old River Shannon in the city centre.Post 1929, the annual average flow of water down the river was 210 m^3/s. Of this, 200 m^3/s was diverted down the headrace to Ardnacrusha for power generation and the remainder, a "compensation flow" of 10 m^3/s, was diverted down the old Shannon river. As the water level in the old Shannon fell from 210 m^3/s to 10 m^3/s, the old river was too shallow for the fish to migrate upstream, the spawning beds became exposed to birds and frost.

However, the "lordly" salmon kept coming up the estuary but now, because they instinctively swim towards fast water, they went up the tailrace, not the old river, where they encountered, literally, a concrete wall at Ardnacrusha. Equally, the salmon and smolts coming down the Shannon entered the headrace and found themselves either trapped or mangled by the four turbines at the power station. Confused and exhausted, the fish died in huge numbers in the polluted water on either side of the power station. It took 30 years, until 1959, before the ESB introduced a fish lift at Ardnacrusha; an ineffective lift still in use today.

This lift enabled the fish in the tailrace to go upstream and allowed the fish in the headrace to swim downstream into the estuary. Despite the establishment of the River Shannon Salmon Management Programme in 1990, the number of fish ascending the lift in Ardnacrusha has fallen from 12,000 in 1964 to a miniscule 123 in 2024 and fishermen on the old river are now all but non-existent. The

requirement to maintain a minimum compensation flow of 10 m^3/s down the old River Shannon is a statutory requirement based on the Shannon Electricity Act 1925.

8.2 Flow Diversion, Channel Contraction and Habitat Degradation

This means that Uisce Eireann's proposal to abstract 4 m^3/s at the Parteen Basin, under normal circumstances, must come from the flow of water to Ardnacrusha not the old Shannon river. The water abstraction will reduce by an equal amount the flow of water to the power station which is a carbon-neutral form of electricity. How much of the water abstraction will reach households, business and hospitals in the Dublin region?

The pipeline includes multiple offtake hubs along the route presumably intended to supply towns and communities in the Midlands. Hence the 4 m^3/s is very likely to be a minimum not a maximum and there is no pending legislation specifying a maximum abstraction.

Of the water reaching Dublin, 33%, or 1.3 m^3/s, will be lost through leaks before reaching homes and businesses. This is due to an archaic, damaged pipe system dating back to the Victorian era. In most Western European cities the leakage is typically in the 10–25% range. In addition, existing Dublin data centres will use approximately 17% of the abstracted water or 0.46 m^3/s.

Instead of the further exploitation of an unique habitat and treating the Shannon as a trade-off between power and water supply, this is an opportune time to expand the narrative and add a third variable to the equation, namely ecology, and the restoration of the old River Shannon to a living salmon river. Salmon restoration cannot happen without an adequate supply of water and modern fish guidance systems to divert the fish to the old river. As an example, starting from the pre-abstraction situation, increasing the old Shannon flow from the current 10 m^3/s to 50 m^3/s, backed-up by serious habitat restoration in tributaries and spawning grounds and favourable ocean conditions, the old River Shannon could plausibly start to move towards the conservation limit.

This would reduce Ardnacrusha's average available flow by 44 m^3/s which corresponds to about 100 GWh per year in energy or about 0.3% of Ireland's annual electricity consumption. A small price to pay for repairing the sins of the past.

8.3 Contemporary Pollution and Navigation Impacts

In parts of Castleconnell, the river is now no more than 10 metres wide, notably at the Gap of the Dam, Poulcaum, and the Dancing Hole. In sections of Plassey, the river's width has shrunk by 50 metres or more.

If you walk across the Living Bridge at UL and look downstream, you will see numerous small islands that have formed over time. Here, the river has an average depth of little more than half a metre—a striking contrast for what was once described as the largest river in the British Isles.

A similar situation exists at St Thomas's Island near Corbally. During the summer months, there is a profusion of weed growth in most shallow areas of the river. At Cooper's Height, between Castleconnell and O'Brien's Bridge, this causes serious problems for the rowing clubs—both Castleconnell and Limerick—who use this stretch for training and competition. Further downstream at Plassey, Lanarone, Clouncarthy, and all the way to Corbally, it is often difficult to navigate due to the abundance of pond weed and streamer weed.

The section of river beginning about 200 metres below Black Bridge at Plassey, near the sewage discharge point, is particularly badly polluted due to an overloaded pumping station. Seagulls can be

seen perched on the bridge railings daily, waiting for effluent to be discharged. This was once the stretch of river where much of Limerick learned to swim, before the advent of swimming pools. Anglers used the water to train their "billy cans." It has been many long years since people swam at Sandy, the Shannon Fields, Corbally Baths, or Island Baths.

About 16 years ago, main drainage was finally installed, and it was believed that Limerick's sewage problems would be solved overnight. Unfortunately, this proved not to be the case. The new wastewater treatment plant, located a further mile and a half downstream at Bunlicky near the cement factory, is now overloaded and unable to handle the volume produced. As a result, clean water is not being discharged into the river.

On an incoming tide, this effluent is pushed back up through Limerick, creating a toxic environment during the summer months, when water levels are at their lowest. We now await further news on what will undoubtedly be a very expensive upgrade.

Clareville Water Works is located on the River Shannon treat and supplies around 50,000 m^3 of water per day to Limerick. That capacity supports the drinking water needs of Limerick City and substantial surrounding populations — estimates range into tens of thousands This water supply will also potentially be affected.

The proposed pipeline extraction would effectively eliminate the possibility of restoring the lower course of the Shannon River in the future. unlawful under EU environmental law breaching the EU Water Framework Directive (WFD) - Directive 2000/60/EC

If the river is not a HMWB, the State must:

- Prevent deterioration of water status
- Achieve or restore "Good Ecological Status"

Article 4(1)(a) - No Deterioration

- Any project that prevents future restoration constitutes deterioration in law, even if current status is already poor.
- The Court of Justice of the EU (CJEU) has confirmed that *blocking improvement pathways* breaches this article.

Article 4(1)(a)(ii) - Restoration Obligation

- Member States must actively restore water bodies to good status.
- A pipeline that makes restoration impossible is incompatible with this duty.

Article 4(7) - New Modifications

- New infrastructure is only permitted if:
    - There is overriding public interest
    - No significantly better environmental alternatives exist
    - All mitigation measures are applied

If the water body is *not* designated HMWB, relying on Article 4(7) becomes legally weak and highly challengeable. Without HMWB status, the project is presumed unlawful under the WFD unless an Article 4(7) exemption is rigorously justified.

9: Climate Change and Increasing Drought Frequency

9.1 Historical Droughts affecting the Shannon Catchment

Introduction: Noone et al. (2017) developed a historical drought catalogue for the island of Ireland, showing that we have had intimate past experiences of drought with diverse impacts. Murphy et al. (2020) report on a major drought from 1765-1768 that impacted across the British and Irish Isles, dwarfing many subsequent droughts in the record. Forthcoming research from the JPI funded project CrossDro on multi-century tends in drought across Europe shows that Ireland has amongst the strongest trends to greater precipitation deficits in summer.

The year 2018 revealed the vulnerabilities of Irish society to drought across multiple sectors, particularly water supply, agriculture and ecology. In the context of multi-centennial historical records, the 2018 drought was not very remarkable. However, this should alert us to how vulnerability to drought has grown in Ireland over recent decades. It should prompt us to ask how we could have been better prepared.

Durning the Covid-19 pandemic, another drought came. Following a wet winter, an exceptionally dry spring resulted in precipitation deficits comparable to (and in places exceeding) 2018 in the east and southeast, but earlier in the year. Soil moisture deficits were considerable. Seasonal forecasts from multiple international modelling centres as predicted brought a hotter and drier than normal summer.

Over the coming decades our experience of drought is likely to become more frequent. Human driven climate change will be super-imposed on natural variability. Climate models tend to project reductions in summer precipitation for Ireland, though the magnitude of decreases is uncertain. Warming temperatures will also likely increase evapotranspiration, potentially increasing drought severity and the more rapid generation of soil moisture deficits. The persistence of blocking anti-cyclones – the atmospheric conditions often linked to droughts are anticipated to increase. Winters are expected to become wetter, but also more variable, with potential impacts on drought timing and duration.

Observed climate data for Ireland over the last decade demonstrates increased frequency of absolute and partial droughts, longer dry spells, including in the Shannon catchment and Higher summer temperatures increasing evaporation and oxygen stress. Climate projections indicate these trends will intensify, directly undermining the hydrological assumptions underpinning the project.

9,2 Climate Projections

Ireland's rainfall regime is strongly controlled by the North Atlantic jet stream. Research indicates that climate change may Increase atmospheric moisture capacity (7% per °C warming, Clausius–Clapeyron scaling). Increase the intensity of heavy precipitation events and alter storm-track positioning and blocking frequency over the North Atlantic–European sector which will result in more intense rainfall episodes, particularly when storm tracks align through the Irish Sea or

south of Ireland. The jet stream does not simply determine how much rainfall Ireland receives; it determines where, when, and in what intensity it falls. Under climate change, this redistribution of rainfall increases the probability of hydrological imbalance — heavier episodic rainfall in the east alongside longer inter-event dry spells nationally. This has direct implications for the resilience assumptions underpinning large-scale inter-regional water transfer schemes such as the Eastern and Midlands Water Supply Project (commonly referred to as the Shannon-to-Dublin pipeline). We will experience longer dry intervals between frontal systems, especially during blocking patterns. For the east — including Dublin — this translates into higher flood risk during extreme events but greater summer and multi-week dry spell vulnerability. For the west, although annual totals remain higher, projections suggest stronger seasonality: wetter winters, drier summers.

Authoritative sources documenting these shifts include:

Met Éireann – Climate change assessments and rainfall trend analysis.

Environmental Protection Agency – National Climate Change Risk Assessment.

Climate Ireland – Regional projections for precipitation intensity and seasonal drying.

Royal Irish Academy – Research on North Atlantic storm track variability.

Drought Risk Is Increasing — Even in a "Wet" Country

Ireland is often characterised as water-rich. However, drought risk is driven not by annual totals but by:

- Seasonal distribution
- Soil moisture deficits
- Reservoir recharge timing
- Consecutive dry weeks
- Demand concentration

Recent drought episodes (e.g., 2018 and subsequent summer deficits) demonstrated that eastern catchments are highly vulnerable to sustained high-pressure blocking. Climate projections consistently indicate:

- Drier summers in eastern and midland regions
- Increased evapotranspiration under warming
- Greater variability in recharge

Thus, the emerging hydroclimatic regime is one of hydrological volatility, not abundance.

9.3 Implications for long term water security

The Eastern and Midlands Water Supply Project, led by Uisce Éireann, proposes abstraction from the River Shannon to supply the Greater Dublin Area and Midlands.

Critical vulnerability considerations:

- Source Reliability Under Climate Stress. The Shannon basin is also subject to projected summer drying and higher evapotranspiration. A national transfer scheme assumes long-term surplus availability that may diminish during prolonged drought sequences.
- Systemic Concentration Risk
  Increasing dependence on a single inter-basin transfer creates centralised exposure to:

Multi-year drought, operational constraints, Ecological flow protections, Mismatch Between Rainfall Intensity and Storage, Heavier rainfall events do not automatically increase usable supply. Rapid runoff during intense storms may also Increase flooding, Reduce infiltration Limit groundwater recharge and Exceed storage capture capacity

Demand-Side Escalation
Population growth in the Greater Dublin Area compounds risk during summer low-flow periods — precisely when jet stream blocking is most likely to suppress rainfall.

Strategic Policy Concern

If climate change increases we will see

- Rainfall intensity variability
- Summer drying in eastern and midland regions
- Drought frequency under persistent high-pressure regimes

Then a long-lived (multi-decade) infrastructure decision must be stress-tested against compound drought scenarios, not historical averages. A core policy question emerges: *Does the current design sufficiently account for non-stationarity in Ireland's hydroclimate?* The traditional assumption of Shannon surplus availability may rely on past climatology rather than future jet-stream-mediated variability.

Policy Conclusion

The emerging climate signal for Ireland is not one of uniform wetness, but of greater extremes and seasonal asymmetry. The jet stream's evolving behaviour means:

The east may experience more intense rainfall events but also sharper summer deficits.

The west may remain wetter annually yet face longer inter-event dry periods.

National water security will depend increasingly on storage, demand reduction, leakage control, and decentralised resilience, rather than simple inter-basin transfer.

From a climate adaptation perspective, any major water abstraction project must demonstrate robustness under:

- Repeated multi-season droughts
- Reduced recharge efficiency
- Increased interannual volatility

Failure to incorporate these dynamics risks infrastructure lock-in based on outdated hydroclimatic assumptions.

The jet stream doesn't just change how much rain Ireland gets — it changes where and how we get it. As climate change loads the dice toward heavier rainfall when conditions align, the east (including Dublin) can see more high-impact rain episodes under certain storm tracks and Irish Sea shower setups, while the west can simultaneously experience longer drier spells between events—even though it remains the first landing point for many Atlantic systems.

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5.6 Major Historical Droughts Affecting the Shannon Region

According to Maynooth University's 250-year drought reconstruction catalogue (1765–2015; O' Connor et al. 2022; Jobbová et al. 2024), the following periods saw significant dry conditions across Irish catchments, including the Shannon:

- 1765–1768: Identified as the most severe to affect Ireland over the 250 year period (Murphy et al. 2020) and is noted to have spanned 40 months thus being a multi-year drought. The drought is notable across Britain and Ireland but is most severe in Ireland and Scotland (Murphy et al. 2020). Significantly, one of the impacts, reported in newspaper accounts, is that the River Shannon had 'been fordable on foot'.
- 1800–1809: A decade characterized by intense, long-duration, and recurring droughts.
- 1854–1860: A long-duration, intense drought.
- 1887–1888: A "national calamity" identified by Maynooth researchers, featuring intense summer drought.
- 1933–1935 & 1944–1945: Significant droughts identified in Irish catchment studies.
- 1975–1976: A major pan-European drought that caused severe water stress in Ireland.
- 2018: The most significant recent drought. Water levels in parts of the River Shannon and the River Liffey dropped so low that sections could be safely waded across in 2018 (O'Connor et al. 2022).
- 2020: A significant spring drought, leading to national water shortages (O' Connor et al. 2022).

Broad findings from ICARUS (Irish Climate Analysis and Research Units) publications:

· Drought as a "Forgotten Hazard": Researchers have highlighted that recent decades (post-1990) have been relatively wet, causing a societal underestimation of Ireland's drought vulnerability (O'Connor et al. 2022; Jobbová et al. 2024).

· Long-term Data: By digitizing pre-1940 rainfall records and analyzing newspaper archives, the Maynooth team established that extreme events are more common than modern experience suggests (O' Connor et al. 2022; Jobbová et al. 2024).

· Changing Patterns: While winter/spring precipitation has increased, summers have seen a trend toward drier conditions, increasing the risk of summer hydrological droughts (Jobbová et al. 2024).

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Data From ICARUS/Maynooth University

Likely increased drought or dry weather periods in the Mid-West of Ireland over the next 20 years (to 2045), drawing on the most relevant information from Met Éireann, Copernicus, and climate research linked to ICARUS/Maynooth University, supplemented with broader climate projections for Ireland:

1) Current Observations: Dry Periods Already Increasing

· Met Éireann's 2025 climate analyses found numerous dry spells and drought events across Ireland in 2025, including absolute droughts (15+ days without significant rain) and extended dry periods recorded at many stations. This reflects a recent pattern of more frequent dry weather and warming trends that support such conditions.

· Copernicus European Drought Observatory (EDO) indicated periods in 2025 where large parts of Ireland and Europe were experiencing drier than average conditions and drought warnings/indicators — showing dry conditions in many areas.

2) Climate Model Projections: More Variable Rainfall, Longer Dry Spells

While Ireland's overall annual precipitation isn't projected to sharply decline, the seasonal distribution and variability are expected to change in ways that favour dry spells, especially in summer:

Summer dryin

· Climate projections for Ireland (e.g., regional climate models under different emissions scenarios) suggest summer rainfall may decrease significantly by mid-century (e.g., a 2–17 % summer decrease under

high-emissions scenarios), with dry periods (5+ days with very little rain) becoming more frequent, potentially up to 48 % more common in summer.

More variable precipitation

· But projections also indicate the number of heavy rainfall days will increase in autumn/winter even as summers become drier — meaning that drought and flood risks both grow.

· Seasonal models show increased potential evapotranspiration (drying due to higher temperatures) combined with less summer rain is likely to increase aridity and water deficits, especially in spring/summer, by late century.

Temperature increases accelerate drought risk

· A warmer atmosphere increases evaporation from soil and plants. Even without large drops in total rainfall, higher temperatures can lead to more frequent or severe meteorological and agricultural drought conditions in summer, particularly if rainfall timing shifts.

3) Contributions from ICARUS / Maynooth University

Although ICARUS and Maynooth University research primarily focuses on attribution of extreme temperatures, heatwaves, and event attribution (which is extremely relevant to drought potential):

· Recent collaborative studies (e.g., WASITUS project) show that warm summers like 2025 are now more likely due to climate change and that similar conditions will occur more frequently as background warming continues. Such warm, dry conditions are a key factor in increasing drought risk.

· ICARUS is also part of research (EXACT project) funded to assess how droughts, floods, and other extremes have changed and may evolve under climate scenarios — implying strong scientific interest and emerging results on future drought risks.

Although ICARUS has not yet published a headline national drought projection in the easily summarised literature, their work clearly aligns with the broader climate science consensus that extreme conditions including drought risk are increasing as temperatures rise.

Likelihood of Increased Drought / Dry Spells (Next 20 Years)

· Increased variability of rainfall, with more extended dry periods during summer even if annual totals don't decline sharply.

· More frequent warm summers and heat extremes, which enhance soil moisture deficits and drought potential — increasingly likely as global warming continues.

Moderate confidence

· Actual meteorological drought frequency (strictly defined) may have uncertainties at regional scales due to natural climate variability, but model consensus indicates a trend toward more frequent/longer dry spells in summer by 2040-2050 under current emissions pathways.

Less certain

· The magnitude and exact location of drought impact vary year-to-year and depend on broader circulation patterns (e.g., jet stream shifts), which remain intrinsically uncertain.

Summary — What This Means for the Mid West of Ireland

Over the next 20 years (to 2045): Warmer average temperatures are very likely. Summer rainfall is likely to become more variable and on average lower in many years. Dry spells and prolonged dry periods (and potentially moderate drought conditions) will become more common during the growing season, although severe precipitation deficits will still vary by year.

Together, these changes increase the likelihood of dry weather impacts — particularly on agriculture, soil moisture, and water resources — even if Ireland still experiences o

Example Taken from 2018

We have extracted the flow data for 2018 and sorted by lowest flow. Conclusion: in 2018 there were 74 days where Ardnacrusha took Zero, and only the 10.5cumecs was going down the old Shannon.

So for those 74 days, in order to preserve the statutory flow in the old Shannon, the pipeline would not have been able to take any water!

The spring drought in 2020 had 20 zero Ardnacrusha days, mostly in May and June)

10. Failure of Environmental Assessment (EIA and AA) Internal Inconsistency in the EIAR

10.1 Internal Inconsistency in the EIAR

The Environmental Impact Assessment Report (EIAR) acknowledges a wide abstraction zone of influence extending from upstream of Parteen to downstream of Limerick Dock yet limits ecological assessment to the immediate intake area based on subjective 'look and feel' criteria. The gauge no. 25075 this information is not in the public domain by the EBD. The project fails to demonstrate

beyond reasonable scientific doubt that it will not adversely affect the integrity of Natura 2000 sites hydrologically connected to the Shannon system, particularly under drought and climate stress scenarios.

10.2 Reliance on ESB Operational Assumptions

The EIAR relies heavily on assumptions regarding ESB operational controls (e.g. maintaining water levels within a normal operating band) without assessing abstraction impacts independently of those assumptions.

Third-party operational intentions cannot lawfully substitute for mitigation unless they are certain, enforceable, and assessed as part of the project.

11. Groundwater as a Superior and Sustainable Alternative

11.1 Groundwater resources in County Kildare as a superior alternative to long-distance surface-water abstraction.

A Strategic Case for Groundwater as a Sustainable Water Source in County Kildare

County Kildare is uniquely positioned to play a critical role in Ireland's future drinking-water strategy. Beneath the county lies a network of productive gravel and limestone aquifers that already supply homes, farms, group water schemes, and public supplies. When properly developed and protected, these groundwater resources offer a high-quality, lower-carbon, environmentally resilient alternative to large-scale surface-water abstraction schemes.

We set out why groundwater in Kildare should be fully explored and prioritised as a sustainable water source, particularly in the context of supplying the Greater Dublin Area. Kildare's Major Groundwater Systems overlies several regionally important aquifers capable of yielding substantial volumes of water:

Curragh (North Kildare) Gravel Aquifer

a) The largest shallow aquifer in the county
b) Occurs in extensive gravel deposits
c) Supplies local and public abstractions, including Monasterevin wellfield
d) Highly productive where properly developed

Allenwood Limestone Aquifer

e) A fissured limestone bedrock aquifer
f) Extends through Allenwood, Rathangan and Robertstown
g) Proven yields of several million litres per day from individual wells

Calp Limestone Aquifer

h) Regionally important limestone aquifer
i) Used for public supply near Johnstown Bridge
j) Like all limestone aquifers, it requires careful management due to areas of faster groundwater flow

Local Bedrock and Gravel Aquifers

k) Distributed throughout the county
l) Successfully support group water schemes and private supplies (e.g. Kilteel, Kilkea)
m) These aquifers are already functioning assets — not theoretical resources.It is often noted that limestone aquifers can have fast groundwater flow and therefore vulnerability. This is true only where development is poorly planned. With a proper drilling programme, including:
n) Step-drawdown and long-term pumping tests
o) Water quality analysis
p) Sustainability and recharge assessment
q) Source protection zoning
r) ...the quantity, quality, and long-term security of groundwater can be accurately assessed and safeguarded.
s) This approach is not new. It has been successfully applied for over 55 years in Ireland, supplying group water schemes serving 100+ houses and farms, often to a higher standard than surface-water supplies.

Naturally Superior Water Quality

t) Groundwater is naturally filtered through soil and bedrock
u) Typically, low in turbidity (floating solids)
v) Requires less chemical treatment than river water
w) This is fundamentally where drinking water should come from

Shorter Distance, Lower Carbon

x) Kildare is approximately 30 km west of Dublin
y) Contrast this with proposed surface-water abstraction from the River Shannon — a journey of ~165 km
z) A shorter supply route means:
aa) Lower carbon footprint
bb) Less construction disturbance
cc) Reduced impact on national amenities, flora, and fauna

Lower Treatment Burden

Shannon water carries significant turbidity, particularly during high flows. At least one-third of initial treatment would be dedicated to removing suspended solids. This produces large volumes of sludge mixed with treatment chemicals. Concerns have been raised — and independently investigated — regarding Shannon abstraction figures during drought conditions. Alarmingly, these figures do not add up in low-flow seasons. Ireland cannot afford an "eleven-month-a-year project" that: Fails under drought stress and affects multiple communities along its route which Impacts sensitive river

ecosystems. Groundwater, by contrast, is buffered against short-term drought, particularly when abstraction is spread across multiple wellfields and aquifers. Groundwater is the backbone of urban water supply across Europe: London and Paris source up to 50% of their drinking water from groundwater wells. Across Europe, groundwater supplies 70% of potable water (Ireland currently 20%) Ireland —is behind, not ahead, on this issue. A Kildare-based groundwater strategy would save tens of millions of euro in infrastructure costs and reduce energy use and chemical dependency including minimize environmental disruption and align with EU Water Framework Directive objectives and deliver a resilient, high-quality supply "as nature intended" Simply put: It represents a superior supply with a quarter of the journey, far fewer environmental impacts, and long-term sustainability. This option must be formally considered, assessed, and explored as part of Ireland's national water strategy — before committing to irreversible, high-impact surface-water schemes. The dismissal of these options has been selective, inconsistent, and inadequately justified.

11.3 Environment, Carbon and Cost Advantages

As discussed in sections above, Uisce Eireann have not seriously considered exploring groundwater as resource (Usce Eireann, 2026) that, in combination with fixing leaks, could be explored as a resource at a fraction of the cost of the Shannon Pipeline project. Existing groundwater supply schemes such as the Portlaoise and Mountmellick Water Supply Schemes how that more locally sourced groundway from bedrock can supply local communities.

Further, research has shown that certain configurations of structural geology and groundwater and Carboniferous limestone formations, which exist in the Dublin area and surrounds can produce quantities of groundwater that where strategically targeted with wells are a potential resource worth investigating (Moore & Walsh, 2013; 2021; Moore et al. 2019).

A point on a fault incepted during the excavation of Lisheen mine produced flows in excess of 1.3m3/s in 1999 and this only dissipated to 0.3m3/s upon mine closure in December 2015 (Moore & Walsh, 2021). Flows fluctuated with rainfall. Conceptualisation of the mine geology and shows that point on the fault had such high sustainable flows because of its connectivity to karstified faults and fractures in the Waulsortian limestone Formation and the Lisduff Oolite formation. It is the Carbonate rich nature of these formations which has meant connection to the them produces higher flows. The higher carbonate content means dissolution and karstification of fractures is greater thus resulting in better connectivity and greater and more sustainable flows. These formations and formations of similarly high carbonate content occur in the Dublin area and surrounding counties e.g. Meath, Kildare. Configuration of faults within and bounding these formations in the Leinster region are worth exploring for high well yields prior to undergoing a major, costly project such as the Shannon pipeline project which is vulnerable at low flows and drought periods.

A point on a fault of the same age and geometry as the Lisheen fault (Cenozoic Strike-slip Faults; Moore & Walsh,2013; 2021) was intercepted in Huntstown South Quarry in north county Dublin in 2012 producing over 0.06m3/s. The point on the fault flowed until 2016, fluctuating with rainfall. The EBdrock formation where the fuatl was intercepted is a shaley limestone and shale Formation that does not show significant karstification similar to the Carbonate rich formations mentioned above however can still produce yields supplying local areas (as described by GSI aquifer maps).

The timing and geometry of the faults that have points of high flow is well understood (Moore & Walsh, 2021) plus the geometry of other structures in Ireland are also well understood. In addition, structural and bedrock configurations that would produce high flows to a groundwater well (Moore et al. 2019) are worth investigating in the Dublin and surrounding region in particular because it would be at a fraction of the cost of the Shannon pipeline project.

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Uisce Eireann, (2026). You tube video entitled: 'Water Supply Project, Eastern and Midlands Region (Full Video) | Our Project | Uisce Éireann.'https://www.youtube.com/watch?v=Ki5DrgSdZeI&t=19s8. Demand Management and Leakage Reduction

Dublin continues to lose a very large proportion of treated water through leakage in aging infrastructure. Proceeding with a multi-billion-euro supply scheme without first securing the existing network is inefficient and environmentally unsound.

Scale of Water Loss in Dublin's Supply Network.

Uisce Éireann's public documents fail to provide an adequate analysis of the extensive leakage crisis in Dublin's water network. Uisce Éireann's leakage reduction program indicates that over 46% of treated water was lost through leaks before it reaches consumers in 2012 when this project was first suggested and has fallen to 37% in 2022 with a planned reduction to 25% in 2030. This means that any additional water abstracted from the Shannon will largely be wasted through the same failing infrastructure. By failing to prioritize leak detection, mapping, and repair, Uisce Éireann is proposing an inefficient and unsustainable approach that disregards the principles of conservation and best available technology (BAT) required under EU environmental law.

https://www.water.ie/news/leakage-reduction-program-2

https://enterprise.gov.ie/en/news-and-events/department-news/2018/july/04072018.html

Summary of the Kennedy Analysis of Irish Water's Shannon Project and Its Relevance to Sustainable Alternatives such as Kildare Groundwater. This report was written by Emma Kennedy who is an independent consultant for the River Shannon Protection Alliance Ltd.

The Kennedy Analysis critically examines Irish Water's justification for this project and concludes that the project is not required, is based on flawed analysis, and would fail to solve Dublin's real water problems. See full report in Appendices.

12. Economic, Energy and Governance Considerations

Key Findings of the Kennedy Analysis

The "Need" for the Shannon Project Is Fundamentally Flawed

- Irish Water's demand analysis contains multiple mathematical errors
- Correcting just three of these errors removes the projected supply deficit entirely
- On this corrected basis, there is no need for the Shannon Project at all

- Irish Water has made false or misleading statements regarding the necessity of the project
- These statements have been made to the public, media, and government
- The perception of crisis has been used to justify a predetermined solution
- Dublin's Real Problem is Leaking Pipes and not Lack of Water

Extreme Leakage Rates

- Dublin's water network suffers from 37% leakage
- This is far outside international norms
- Much of the network consists of ancient, corroded Victorian-era pipes

- **International Comparison Highlights the Failure**
- London, with leakage less than half of Dublin's, is replacing its entire Victorian water main network
- Irish Water, by contrast, plans to replace only 1% of mains per year
- At this rate, Dublin's pipes will remain fundamentally unfit for decades

The Shannon Project Will Not Fix Outages or Water Quality

- Dublin currently experiences:
- Frequent water outages
- Unreliable water quality due to ingress through cracked pipes

- Pipe replacement is unavoidable — it must happen eventually
- Proceeding with the Shannon Project first means:
- Paying for a massive abstraction scheme now
- Paying again later to fix the pipes
- This represents poor value, poor sequencing, and high risk

Irish Water's response to the Kennedy Analysis has been:

- Defensive
- Dismissive
- Lacking substantive technical rebuttal

12.1 Project Cost Escalation and Financial Risk

The Kennedy Analysis strengthens the case for decentralized, resilient alternatives, including Properly assessed groundwater development in counties such as Kildare Shorter supply distances (30 km vs 172 km) and lower carbon footprint combined with naturally high-water quality with reduced treatment, sludge, and chemical waste, Incremental, scalable investment rather than a single mega-project. If Dublin does not face a genuine supply deficit, there is time and space to develop better options — including Kildare's proven aquifers — rather than committing to an irreversible,

environmentally disruptive scheme.The Kennedy Analysis demonstrates that the Shannon Project is: Unnecessary, Over-engineered Financially reckless, Incapable of solving Dublin's actual water problems. Ireland must: Fix Dublin's leaking pipes and subject all analysis to independent review including fully assess lower-impact, groundwater-based alternatives, including those in County Kildare.

12,2 Energy Use, Carbon Impact and Ardnacrusha Generation

- Project cost estimates have escalated dramatically over time, with figures ranging from several billion to over ten billion euro. Such variance indicates profound uncertainty and exposes the State to long-term financial risk.
- Energy Intensity and Carbon Impact
- Long-distance pumping and treatment entail high, permanent energy demand. Claims of carbon neutrality rely on offsetting rather than genuine emissions avoidance and are incompatible with national climate obligations.
- Subsurface Leaks and Their Geological & Structural Risks. A key issue that has not been properly assessed is the geotechnical and hydrological impact of conΘnuing to allow large volumes of treated water to leak into the ground beneath Dublin. Such impacts may include the following.
- Formation of Sinkholes and Ground Subsidence: The continuous seepage of large volumes of water underground can dissolve underlying geological materials, particularly where so clays or karst limestone formations exist. This can lead to the collapse of roads, pavements, and buildings. Several past incidents of sinkholes in Dublin have been linked to water-related ground destabilizing.
- Weakening of Building Foundations: Prolonged exposure to high water tables from leaks can weaken building foundations, particularly in older structures that rely on shallow footings. This increases the risk of structural failures, requiring costly remedial engineering work.
- Increased Risk of Sewer and Infrastructure Failure: Water leaks can interact with Dublin's aging sewer network, leading to the ingress of clean water into wastewater systems, overloading treatment plants, and increasing pollution risks. High levels of leakage also exacerbate pipe bursts, accelerating infrastructure deterioration.
- Contamination of Groundwater Resources: Continuous leakage introduces the risk of cross-contamination between clean water supply pipes and polluted subsurface water, particularly in areas where sewerage infrastructure is also leaking. This creates a public health risk and potential non-compliance with the Drinking Water Directive (EU 2020/2184).

The Need for a Comprehensive Leak Mapping and Hydrological Model. Before proposing any new water abstraction scheme, Uisce Éireann must:

- Develop a citywide geospatial model mapping active leak, water loss volumes, and their hydrological effects.
- Conduct a ground stability risk assessment, including sinkhole formation and structural
- impacts on buildings. Quantify the potential economic cost of continued leaks versus the cost of targeted repairs
- Compare the carbon footprint of large-scale leak reduction programs with the energy-intensive WSP. Without this essential data, the WSP proposal is incomplete and fails

to meet the basic requirements of environmental due diligence under EU and Irish planning laws.

Ecological and Hydrological Risks of Large-Scale Water Abstraction

The proposed abstraction from Shannon raises serious concerns about its impact on: Water quality and assimilative capacity – reducing the Shannon's ability to absorb wastewater and industrial pollutants. Water becomes more concentrated. River hydro morphology – altering natural sediment transport and water flow dynamics. (need stats on this). Protected habitats and species – potentially violating the Habitats and Birds Directives if fish spawning areas, wetlands, or aquatic flora are impacted. Hydroelectric generation at Ardnacrusha – reducing available water for renewable energy production. 1.6% (50% of hydroelectric power generated). GPR. 86 mega watts. 3 Francas turbine, 2 Kaplan-332 Kigowatt.

12.3 Governance Deficits and Source-Region Equity

Lack of Statutory Basis for National Water Resource Plans

Uisce Éireann's national water resource planning framework lacks clear legislative underpinning. The assumption of authority over national water resources without corresponding statutory responsibility raises serious governance concerns.

Source-Region Equity and Social Licence

The project imposes environmental risk on Shannon catchment for the benefit of Dublin, without adequate justification, compensation, or democratic consent. Comparable projects internationally have repeatedly failed due to loss of social licence.

13. International Precedents and Failure Modes

13.1 Lessons from the Murray-Darling Basin, Colorado River and Aral Sea.

Global experience demonstrates that large-scale inter-basin transfers and abstractions commonly fail due to: Underestimation of drought risk, Cumulative impacts and weak Enforcement of Environmental Safeguards. Notable examples include the Murray–Darling Basin, the Colorado River, and the Aral Sea basin.

Below are **clear, well-documented cases where large-scale river abstraction or diversion caused serious ecological destruction**, in ways that are directly relevant to concerns raised about **Shannon abstraction** (even if the Irish proposal is smaller in scale).

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1. Aral Sea Basin (Central Asia) – *Collapse of an entire ecosystem*

What happened

Massive abstraction from the **Amu Darya and Syr Darya rivers** for irrigation (cotton farming) from the 1960s onward.

Ecological destruction

- Aral Sea lost **~90% of its volume**
- Salinity increased several-fold → **complete collapse of fish populations**
- Wetlands destroyed; migratory bird routes collapsed
- Creation of toxic salt deserts, spreading pesticides via dust storms

Why it matters as a precedent

This is the most extreme example of **"incremental abstraction + political assurances" leading to irreversible collapse** when extraction exceeded ecological thresholds. Even though each scheme was "justified" individually, the system failed cumulatively.

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2. Colorado River (USA/Mexico) – *A river that no longer reaches the sea*

What happened

Extensive abstraction for cities and agriculture across seven U.S. states and Mexico.

Ecological destruction

- The **Colorado River Delta** (once ~7,800 km^2 of wetlands) is now **~10% of its former size**
- Loss of riparian forests, fish nurseries, and bird habitats
- River routinely **fails to reach the ocean**

Why it matters

- Every individual abstraction was "within legal limits"

- Environmental flows were ignored until collapse occurred
- Climate change later made the system far more fragile than expected

This is a textbook example of **long-term over-confidence in flow reliability.**

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3. Murray–Darling Basin (Australia) – *Slow ecological death of a river system*

What happened
Decades of water extraction for irrigation across multiple states.

Ecological destruction

- Repeated **mass fish kills** (notably in 2018–19)
- Collapse of native fish populations
- Loss of floodplain forests and wetlands
- Salinity increases and algal blooms

Official findings
Multiple government and independent reviews concluded that **over-allocation and weak enforcement** caused ecological collapse, even though abstraction limits existed on paper.

Why it matters
This is one of the **closest analogues** to Ireland:

- Temperate climate
- "Sustainable" abstraction rules
- Failure triggered during drought / low-flow years

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4. Ebro River (Spain) – *Delta degradation linked to upstream extraction*

What happened
Heavy abstraction upstream combined with dams and diversions.

Ecological destruction

- Reduced sediment reaching the **Ebro Delta**
- Delta retreat, wetland loss, increased salinity intrusion
- Decline in fisheries and bird habitats

Why it matters
Even without total river collapse, **removing relatively small proportions of flow upstream** caused downstream ecosystems to unravel over time.

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5. Yellow River (China) – *Seasonal ecological failure*

What happened
Large-scale abstraction for agriculture and cities.

Ecological destruction

- For years in the 1990s, the river **ran dry before reaching the sea**
- Collapse of estuarine ecosystems
- Loss of fisheries and wetlands

Key lesson
Authorities believed abstractions were manageable until **drought revealed system fragility**.

What these cases have in common (the warning signs)

Across *all* of these failures:

1. **Abstraction looked "small" relative to average flow**
2. **Low-flow and drought scenarios were underestimated**
3. **Environmental flows were the first thing sacrificed**
4. Damage became visible **only after tipping points were crossed**
5. Recovery was **slow, partial, or impossible**

This is why ecologists tend to focus less on *percentage of annual flow* and more on:

- **Seasonal low-flow impacts**
- **Cumulative abstraction**
- **Climate-change-driven variability**
- **Governance failure under stress**

Bottom line

There are **multiple global precedents where river abstraction schemes—initially defended as safe, limited, and well-regulated—caused severe ecological destruction**, especially when climate variability and cumulative impacts were underestimated.

If you want, I can next:

- Compare these directly to **Shannon hydrology & Lough Derg ecology**
- Explain **why low-flow abstraction is far riskier than annual averages**
- Or summarise **what independent ecologists typically flag as red lines** in projects like Uisce Éireann's proposal

all of this pls Compare these directly to Shannon hydrology & Lough Derg ecology Explain why low-flow abstraction is far riskier than annual averages Or summarise what independent ecologists typically flag as red lines in projects like Uisce Éireann's proposal

Thought for 24s

Below is a **direct, nuts-and-bolts comparison** between the big "ecological destruction" abstraction/diversion failures (Colorado, Murray–Darling, Aral-type dynamics) and **what's actually distinctive about the Shannon at Parteen / Lough Derg**—plus why **low-flow risk** is the whole game, and the **red lines** independent ecologists typically point to for schemes like Uisce Éireann's.

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1) What's special about the Shannon at Parteen (and why that matters)

The Shannon here is already a highly managed, flow-split system

At **Parteen Regulating Weir**, most Shannon flow is diverted into the **headrace canal** to supply the **Ardnacrusha** hydro station; a **statutory "compensation flow" of 10 m^3/s** goes down the **Old Shannon** channel.

Source: cdn.esb.ie+2Uisce Éireann+2
Source: ESB also explicitly states it **manages Lough Derg levels** via operation of Ardnacrusha and gates at Parteen. ESB Corporate+1

Why this matters ecologically:
Many "destruction" case studies (Colorado, Murray–Darling) involve **layers of allocation + infrastructure** that make the system brittle in drought. The Shannon at Parteen already has that "brittleness ingredient": flows and levels are not purely natural; they're **operational outputs**.

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2) Compare directly to Lough Derg ecology: where the stress points are already

EPA catchment assessments describe **Lough Derg at Poor ecological status** (2010–2015) and list pressures including **diffuse agriculture, hydromorphology, fish passage issues, invasive species (including zebra mussel and Asian clam), urban wastewater, and the inputting river**.

Source: Catchments.ie+1
Fisheries Ireland surveys also document ecological concerns via fish status/communities (e.g., WFD fish classification work), and continue to monitor stocks.

Source: Inland Fisheries Ireland+1

Why this matters compared to "ecological destruction" examples:
The worst failures usually weren't "healthy systems that got tapped once." They were systems with **existing pressures** where extra abstraction **reduced resilience** and pushed them past thresholds during bad years (Murray–Darling is the closest "temperate developed country" analogue).

14. Soil Composition and Pipe Stress

Dublin's geology is largely defined by glacial till (often called "Dublin Boulder Clay"). This material is dense and heavy, but it reacts significantly to environmental changes:

* Expansion and Contraction: During periods of heavy rain (common in early 2026) or drought, certain clay-heavy soils in Dublin expand and contract. This movement creates physical stress on rigid, older pipes made of cast iron or lead, causing them to snap or "joint-pull."

* Saturated Ground: As seen in recent reports from January 2026, saturated ground from high rainfall increases external pressure on water mains. When the soil becomes waterlogged, it loses its ability to support the weight of the pipes and the roads above them, leading to bursts.11.1 . Bedrock and Subsoil Permeability

According to Geological Survey Ireland (GSI), the bedrock under Dublin is predominantly Carboniferous Limestone.

Corrosion: Limestone can influence the chemistry of groundwater. In some areas, the interaction between groundwater and metal pipes leads to external corrosion, thinning the pipe walls until they can no longer contain the internal water pressure.

Vulnerability: Areas with high "subsoil permeability" allow surface water to reach the pipe level quickly. This rapid fluctuation in moisture levels is a leading cause of the "freeze-thaw" effect during cold snaps, which brittle Victorian-era pipes cannot survive.

The geotechnical risks associated with continuous underground water leaks, including sinkholes, foundation instability, and water pollution. Lack of a comprehensive hydrological and geological models to assess the full impact of Dublin's leaking water system.

Quantitative Flow, Power Generation, and Abstraction Context (Complementary Technical Note)

This section provides additional quantitative context on River Shannon flows, abstraction percentages, and the operational realities of the Parteen–Ardnacrusha system. It is intended to complement the ecological, legal, and planning arguments set out above by demonstrating why reliance on average flow metrics materially understates real-world impacts during critical low-flow conditions.

Baseline River Shannon Flows at Parteen / Killaloe

Long-term monitoring indicates that:

Mean annual discharge of the River Shannon at Limerick is approximately 208.1 m^3/s.

Corresponding flows at Killaloe / Parteen Weir are typically estimated at 180–186 m^3/s.

For the purpose of analysis, a representative average value of 183 m^3/s at the abstraction point is assumed.

This figure is frequently used to justify abstraction as a small percentage of total flow. However, this approach is hydrologically and ecologically misleading.

12.1 Proposed Abstraction Volume and Flow Variability

The current proposal involves abstraction of approximately 3.82 m^3/s. When assessed against the full range of Shannon flows, the percentage impact varies dramatically:

Major flood conditions (700 m^3/s):

Abstraction 0.55% (negligible)

Long-term annual average (183 m^3/s):

Abstraction 2.09% (the frequently cited "~2%" figure)

Dry summer conditions (15 m^3/s):

Abstraction 25.5% of available flow

Extreme low-flow conditions (10 m^3/s):

Abstraction 38.2% of available flow

During precisely the periods when ecological systems are under the greatest stress, the proposed abstraction would therefore remove one-quarter to nearly two-fifths of the river flow downstream of Parteen Weir. This is the critical planning reality that average-flow metrics obscure.

Legal Minimum Flows and Measurement Uncertainty

The statutory minimum compensation flow down the old Shannon channel toward Castleconnell is 10 m^3/s. However, the precision with which this flow is measured and enforced is unclear. The methods used are not transparent and may be insufficiently robust during rapidly changing low-flow conditions. Any abstraction during drought therefore operates directly at the margin of legal and ecological thresholds.

Ardnacrusha Operational Constraints and Flood Routing

Ardnacrusha power station has: Four turbines, each with a maximum capacity of 100 m^3/s.

A stated maximum operational flow of 400 m^3/s, producing up to 86 MW. Flows in excess of this capacity are automatically diverted down the old Shannon channel toward Castleconnell. During major floods, this can involve 200–300 m^3/s, contributing to flood risk in Clonlara, Shannon Banks, and Limerick City. Historical events (e.g. 2020 flooding) recorded flows approaching 650 m^3/s, with overtopping of infrastructure such as the Doonass footbridge.

Power Generation Efficiency and National Context

With an average annual Shannon flow of 208.1 m^3/s, and a mandatory 10 m^3/s compensation flow, the average effective flow through Ardnacrusha is approximately 198 m^3/s.This equates to:

- Average utilisation of installed hydraulic capacity: 49.5%
- Average power output: 42.6 MW
- Annual energy production: 373 GWh
- In national context:
- Total electricity generated in Ireland (2023): 30,600 GWh
- Contribution of Ardnacrusha: 1.2% of total generation

Renewable Energy Comparison

When compared with modern wind generation:

Typical onshore wind turbine capacity: 3 MW

Average capacity factor: 35%

Effective average output per turbine: 1.05 MW

On this basis, Ardnacrusha's average output is equivalent to approximately 40 modern wind turbines, a scale already commonplace in Ireland. In renewable energy terms: Renewables accounted for 40.7% of Irish electricity generation in 2023. Ardnacrusha contributed 3% of renewable generation. Removal of Ardnacrusha would reduce the renewable share by only 1.2 percentage points, a marginal change that does not justify disproportionate ecological and hydrological impacts.

Strategic Implications for Planning and Biodiversity

These figures demonstrate that: The abstraction proposal is ecologically severe during low-flow conditions. The energy benefits of maintaining the Parteen–Ardnacrusha regime are modest at national scale. The system disproportionately sacrifices river ecology and downstream resilience to preserve legacy infrastructure and facilitate an unsustainable water transfer scheme. From a planning and biodiversity perspective, the continued operation of Parteen Weir and Ardnacrusha cannot reasonably be treated as sacrosanct where it enables: Large-scale abstraction during drought, chronic ecological stress & Long-distance transfer of water to a network with unresolved leakage. This quantitative context reinforces the conclusion that the proposed pipeline is neither environmentally defensible nor strategically rational.

Long Distance Water Transportation

The WSP relies on a high-energy pumping system to transport water to Cloughjordan. Uisce Éireann claims the project is "net zero ready," yet:

- No detailed lifecycle carbon assessment has been provided.
- No guarantee exists that electricity demand will be met through 100% renewable sources.
- Pumping and treatment costs could rise significantly if Ireland's electricity grid remains under stress.

We request that Uisce Éireann provides a full energy and carbon analysis demonstrating compliance with Ireland's Climate Act 2015 and National Climate Action Plan.

Public Health Concerns – Water Transport & Storage Risks

Transporting raw and treated water over long distances poses public health risks. Scientific research suggests that water transported in dark, long pipelines may be susceptible to bacterial regrowth, chemical leaching from pipeline materials, and stagnation issues. We request that Uisce Éireann provides:

- A scientific assessment on water quality risks associated with long-distance water transfer.
- A microbiological and chemical monitoring plan ensuring compliance with the Drinking Water
- Directive (EU 2020/2184).
- How long is water in the pipes, how long in storage in Dublin– treatment to tap.
- The pipe Area = 3.1416m^s (note π*2^2/4 = π) so the Velocity = 3.8/3.1416 = 1.2(m^3/s)/m^2 = 1.2m/s and the time taken for the water to travel 132km = 132000m/1.2m/s = 110000 seconds = 30.6 hours = 1.275 days.

14. Conclusion planning Permission must be refused.

14.1 Summary of Legal Failures

The Uisce Eireann National water resources plans both national and regional, have no foundation in law. Nowhere in any of the Acts or enabling regulations stemming from them, has Uisce Eireann been given the right to develop such plans. In other Jurisdictions (England) such plans are required by law and the specific requirements of such plans are legislated for.

A water management plan is required but this does not extend to bestowing the entire water resources of the country under Uisce Eireann. The plans developed by UE therefore have no statutory standing and can only be considered Uisce Eireann internal plans, for which they set their own terms of reference, scope, inclusions, exclusions, omissions. In producing these documents and calling them National Documents, they have acted as Ultra Vires.

The lack of legislative underpinning is particularly relevant in relation to the relationship between UE and the ESB. As the ESB manages the water regime in Shannon, the application for the abstraction should either be by the ESB or alternatively a joint application by both parties.

The ESB have statutory obligations in respect to Shannon, they do not have the right of abstraction, only the right of utilisation for electricity generation, Uisce Eireann are incorrect in stating that their proposed abstraction is a substitution of one form of abstraction for another.

The water resources plans, assumes authority by UE, nowhere in these are the corresponding responsibilities for the management, protection and sustainability of the resources assigned.

The assessment of alternatives is incomplete and have been highly selective. Both in the current evaluation by UE and previously by RPS Strategic Environmental Assessment in 2008 for the Dublin water supply plan, no consideration was given to the optimization of utility of Poulaphuca reservoir, which was specifically intended for this purpose, with considerable space capacity, (electricity a secondary consideration). Nor any consideration given to utilisation the river Slaney, a river with twice the flow of the Liffey and rising adjacent to the Liffey in the Dublin Mountains, requiring just a 20km pipeline to connect to Ballymore Eustace water treatment plant and reduce dependency on the Liffey.

The full extent of proposed abstraction was not given. The long-term abstraction from Clareville Water Treatment works is intended as 100Mld, this abstraction is a combination from the Headrace and the old course of the Shannon. It is highly unlikely that it is legal to abstract a large amount of the statutory minimum compensation flow in the old course immediately downstream. It certainly is not in the spirit of the original intention of the compensation flow when originally allowed for.

The full extent of the long-term abstraction, including Athlone, (already on the Shannon with its own abstraction) Ballinasloe, (which is in the western water resource area) have to be factored in. As the band through which the river and particularly Lough Derg and the impoundment at Parteen are allowed to drop are seriously strained in a drought situation, the modelling indicates this. Add further abstractions for Athlone, Limerick Ballinasloe, and the model should have been run at a proposed abstraction of a minimum of 5Mld, at which point Lough Derg will be seriously compromised.

The long-term environmental reinstatement of Shannon will require a change in regime of the compensation flow down the old course, according to work on the River Basin Management Plan. This would require variable flow rates to mimic normal river flows, that is increased compensation flow generally. This in turn would affect the flow available to the abstraction at Parteen.

There is a big difference between the operational band regime that the ESB operates to control the water levels and the absolute band range. When UE say their models indicate that the water would not drop below the band range, this would be well after the ESB stopped abstraction under their operational band regime. Consequently, it can be anticipated that the supply to Dublin would be severely curtailed in a drought situation. With no back up indicated in the submission. The proposed abstraction at Parteen is putting all the Nations eggs in one basket.

The application is in respect of a pipeline to Dublin to show locations where spurs will be left for future take-offs. There are already some 400 landowners affected by the pipeline, there would possibly be another several hundred affected by the spur lines. The bare minimum requirement at this stage is indicative lines for these spurs as the people affected are entitled to know, at this stage as to what is proposed for them. For the most part these lines routes will have been determined.

The long periods where the turbines are shut down to preserve the levels for embankment and lake level preservation would indicate that there would be long periods where the flow would be severely restricted or even shut off. This would be at the precise time when all the rivers including Liffey are at their lowest. Consequently, impoundment will be required to bridge this event.

It is noted that the combined capacity of the twin 1500mm pipelines is 600Mld and the 1600mm pipeline presumably can be pressurised to this level of throughput. Consequently, the 300Mld proposed abstraction could reasonably be considered the initial proposal. UE previously proposed that the abstraction could be varied, by as much as 50% so that the total abstracted over a seven day or fourteen day back-to-back, would not exceed the 300 Mld, being currently applied for.

One of the objectives of an EIA is to identify the possibilities for mitigating effects on the environment and people. In this instance, the possibility of splitting the abstraction between Lough Ree and Parteen has not been adequately investigated. An abstraction of 60 Mld is, according to UE sustainably available from Lough Ree and a lot more most of the time as the average flow is 94Ml per second at Athlone, it would be imagined that an abstraction from Lough Ree, piped along the straight road R392 to Mullingar and onwards to Dublin would not only relieve the critical situation in Mullingar, but allow the Restoration of Lough Ennell, the Brona and allow flood storage in that Lake This would also be, by far the shortest route to Peamount

The proposed abstraction at Parteen could then be tailored to what is considered long term sustainable and initially used to serve to Nenagh along the old N7 and after onwards to join with the Boyne supply. This would seriously reduce the effects on people and environmental risks to the river and Lake systems. It would also allow for more control by the ESB over the system. There are a further 500 home which just got planning permission in Nenagh which will also required water from Lough Derg.

The project needs are overstated. The consumption figures start today at a 47Mld shortfall and build up from there, this is clearly not the case as the shortfall consists of headage, outage, and such that are not continuous demands, but treated as such. Also showing projected consumption per capita figures (121 litres pppd) in excess of that currently is the case (110 litres pppd). So the consumption figures which include massive industrial development provisions on the eastern seaboard and midlands , are clearly pie in the sky for the projected target date of 2050 at any rate.

It is accepted that the abstraction is from Lough Derg for all intents and purposes in drought situations. There were protocols established for Lake abstractions in the original River Basin Management plans (in this instance for the east area). This would not appear to have been applied in this instance. Also, as the abstraction will be de facto from Lough Derg in drought/dry periods, (section 28, Appropriate Assessment Screening) this would potentially turn Lough Derg into a heavily modified or artificial water body. There are no material effects on flood levels section 267 in assessment.

Housing In Limerick will be affected by water supply into the future.

Housing in Nenagh just announced over 500 new homes to be built will also be affected as they will need water supply.

The Eastern and Midlands Pipeline Project represents a high-risk, high-cost, and environmentally unsound approach to water supply. It fails to meet the requirements of EU environmental law, national climate policy, and fundamental principles of sustainable water management. The competent authority is therefore urged to refuse planning permission for the project and to require a comprehensive, independent reassessment of water supply strategy based on:

- Catchment-scale protection
- Demand reduction and leakage control
- Optimisation of existing assets
- Climate resilience
- Regional equity

Only such an approach can safeguard Ireland's water resources for current and future generations.

Appendix A – Assessment of the Proposed Abstraction Against Water Framework Directive Article 4

This appendix assesses the proposed abstraction at Parteen Weir against the mandatory requirements of Article 4 of the Water Framework Directive (Directive 2000/60/EC), with particular reference to Articles 4(1)(a) (no deterioration), 4(4) (extensions of deadlines), and 4(7) (new modifications).

B1. Article 4(1)(a): Prohibition on Deterioration of Status

Article 4(1)(a) requires Member States to:

"prevent deterioration of the status of all bodies of surface water."

B1.1 Existing Status

EPA classifications indicate that Lough Derg and associated Shannon water bodies are already at less than good ecological status, with known pressures including altered flow regimes, nutrient enrichment, and barriers to fish migration.

Where a water body is already below good status, any additional pressure capable of causing further deterioration is prohibited unless Article 4(7) is fully satisfied.

B1.2 Low-Flow Abstraction as a Deterioration Risk

Quantitative analysis demonstrates that while the proposed abstraction of 3.82 m^3/s represents approximately 2% of long-term average flow, it constitutes:

~25.5% of river flow during dry summer conditions (~15 m^3/s), and

~38.2% of river flow during extreme low-flow conditions (~10 m^3/s).

These are precisely the conditions under which ecological quality elements protected by the Directive (fish, benthic invertebrates, macrophytes, hydromorphology) are most sensitive to change.

The abstraction therefore presents a credible and foreseeable risk of deterioration, contrary to Article 4(1)(a).

B2. Article 4(1) and (2): Ecological and Hydromorphological Quality Elements

The Directive requires protection of hydromorphological conditions supporting ecological status, including:

Flow regime

Hydrological continuity

Water level fluctuations

B2.1 Flow Regime and Water Level Effects

The quantitative evidence demonstrates that abstraction during drought conditions would materially reduce downstream flows and exacerbate lake drawdown in Lough Derg.

Sustained or repeated low-flow abstraction is likely to result in:

Increased frequency and duration of low-water levels

Degradation of littoral habitats

Reduced dilution capacity and increased residence times

Such effects constitute hydromorphological deterioration within the meaning of the Directive.

B3. Article 4(7): New Modifications to Physical Characteristics

Where a project constitutes a new modification affecting hydromorphology, it may only proceed if all four cumulative tests under Article 4(7) are met.

B3.1 Article 4(7)(a): All Practicable Mitigation Measures

There is no evidence that all practicable mitigation measures have been identified or implemented, particularly in relation to:

Avoidance of abstraction during low-flow periods

Binding and enforceable low-flow cut-off rules

Real-time ecological monitoring linked to operational controls

Reliance on assumed ESB operational practices does not constitute enforceable mitigation.

B3.2 Article 4(7)(b): Overriding Public Interest

While water supply is a public interest, this test requires that the specific project, not the objective in general, is justified.

Given:

Severe leakage in the Dublin network,

Under-utilised eastern water resources,

Alternative demand-side and supply-side options,

it has not been demonstrated that this particular abstraction scheme is of overriding public interest compared to less damaging alternatives.

B3.3 Article 4(7)(c): No Better Environmental Options

The Directive requires demonstration that no significantly better environmental option exists.

The record shows that alternatives such as:

Leakage reduction,

Optimisation of Poulaphuca reservoir,

Eastern catchment options,

have not been eliminated through a robust, transparent, and equivalent environmental assessment.

Accordingly, this test is not met.

B3.4 Article 4(7)(d): Inclusion in River Basin Management Planning

Any reliance on Article 4(7) must be explicitly justified and documented within River Basin Management Plans.

There is no clear evidence that:

The full low-flow abstraction impacts,

Climate-adjusted drought scenarios, or

The scale of proportional flow removal identified in Appendix A

have been transparently assessed and justified at RBMP level.

B4. Climate Change and Article 4 Compliance

The Court of Justice of the EU has confirmed that climate change must be taken into account when assessing deterioration risk.

Observed Irish climate data demonstrate increasing drought frequency and duration. Under such conditions, abstraction that removes up to 38% of available flow during extreme low-flow periods cannot reasonably be considered compatible with Article 4 obligations.

Failure to assess these risks renders the decision-making framework non-compliant with the Directive.

B5. Conclusion: Incompatibility with Water Framework Directive Article 4

On the basis of the quantitative evidence set out in Appendix A and the legal tests above:

The proposed abstraction presents a real risk of deterioration, contrary to Article 4(1).

The project constitutes a new hydromorphological modification.

The mandatory cumulative tests under Article 4(7) have not been met.

Accordingly, planning permission cannot lawfully be granted unless and until full compliance with Article 4 of the Water Framework Directive is demonstrated beyond reasonable scientific doubt.

This appendix provides a structured quantitative assessment to support the planning objection. It sets out baseline flow data, proposed abstraction volumes, proportional impacts under varying hydrological conditions, and the operational and energy context of the Parteen–Ardnacrusha system. The purpose is to demonstrate why reliance on long-term average flow metrics materially understates environmental risk during critical low-flow periods.

Baseline River Shannon Flows at the Abstraction Point

Monitoring data indicate that the annual average discharge of the River Shannon at Limerick is approximately 208.1 m^3/s (208,100 litres per second). Corresponding flows at Killaloe and Parteen Weir are generally estimated to lie between 180 and 186 m^3/s. For the purposes of this assessment, an average flow of 183 m^3/s at the abstraction point is assumed.

Table A1 – Representative River Shannon Flows

A2. Proposed Abstraction Volume

The current proposal by Uisce Éireann involves abstraction of approximately 3.82 m^3/s at Parteen Weir.

A3. Observed Flow Variability in the River Shannon

The River Shannon exhibits extreme variability, ranging from major flood events to very low summer flows. In addition, a statutory minimum compensation flow of 10 m^3/s is required down the old Shannon channel toward Castleconnell.

Questions remain regarding the precision, transparency, and enforcement of this minimum flow, particularly during drought conditions when abstraction pressures are greatest.

A4. Proportion of River Flow Abstracted Under Different Conditions

When the proposed abstraction of 3.82 m^3/s is assessed against the full range of Shannon flows, the proportional impact increases sharply during low-flow periods.

Table A3 – Percentage of River Flow Abstracted

This table demonstrates that while abstraction appears negligible under flood or average conditions, it becomes ecologically dominant during drought and low-flow periods, precisely when riverine and lake ecosystems are most vulnerable.

A5. Ardnacrusha Hydropower Capacity and Flow Regulation

Ardnacrusha hydroelectric station comprises four turbines, each with a maximum hydraulic capacity of approximately 100 m^3/s, giving a total maximum throughput of 400 m^3/s and a peak installed electrical capacity of 86 MW.

Flows exceeding this capacity are diverted down the old Shannon channel toward Castleconnell, contributing to downstream flood risk during major events.

Table A4 – Ardnacrusha Operational Characteristics

A6. Average Utilisation and Energy Output

Allowing for the statutory 10 m^3/s compensation flow, the average effective flow available for power generation is approximately 198 m^3/s.

This equates to:

Average utilisation of installed hydraulic capacity: ~49.5%

Average electrical output: 42.6 MW

Annual energy generation: 373 GWh

Table A5 – Average Energy Output of Ardnacrusha

In national context:

Total electricity generated in Ireland in 2023: ~30,600 GWh

Contribution of Ardnacrusha: ~1.2% of total generation

A7. Comparison with Modern Wind Generation

Modern onshore wind turbines typically have a rated capacity of ~3 MW. Assuming an average capacity factor of 35%, this yields an effective average output of ~1.05 MW per turbine.

Table A6 – Wind Generation Equivalence

In renewable_toggle terms:

Renewables accounted for ~40.7% of Irish electricity generation in 2023 (~12,454 GWh).

Ardnacrusha contributed approximately 3.0% of renewable generation.

Removal of Ardnacrusha would reduce the renewable share to approximately 39.5%, a marginal national change.

A8. Planning-Relevant Conclusions

This appendix demonstrates that:

- The proposed abstraction represents a minor proportion of river flow only under average or flood conditions, but a very substantial proportion during low-flow and drought periods.
- The energy contribution of Ardnacrusha is modest in both national and renewable-energy terms.
- Continued reliance on the Parteen–Ardnacrusha regime disproportionately facilitates low-flow abstraction with significant ecological consequences.
- Accordingly, the use of long-term average flow figures as the primary justification for abstraction is misleading and unsuitable as a basis for planning consent.
- In drought periods such as 2018 there was no water sent to Ardnacrusha for 74 days (Data from ESB) so the Hydro storage theory fails in drought periods. ESB claims they were sending 10.5Cumecs down the old course f the Shannon, that means if the pipeline had been operating and took 3.4cumecs that is 3.4/10.5= 33% of the flow for 74 days. This reduces the flush down Lough Derg and if temperatures rise then algae blooms are guaranteed,

Appendix B Kennedy Analysis Overview

1 The Kennedy Analysis Overview Find the Appendices to this Kennedy Analysis Overview at www.kennedyanalysis.com/irish-water-shannon-project and contact Kennedy Analysis at www.kennedyanalysis.com

See Appendix 1a for details of the Kennedy Analysis interactions with Irish Water and the Kennedy Analysis reports on the Shannon Project: (i) the Kennedy Report, (ii) the Kennedy Response, and (iii) the Second Kennedy Response. Kennedy Analysis was founded by Emma Kennedy whose background is in carrying out forensic analysis of companies and projects - she was a corporate lawyer at Clifford Chance and worked in finance at a major global bank. She heard about the Shannon Project because the proposed pipeline crosses her husband's family farm. Despite concerns that her involvement might prove detrimental to them personally she has pursued this matter out of principle. The Kennedy Analysis of the Shannon Project has been produced pro bono in the public interest – the team that produced it have all worked on an unpaid basis in their free time because the Shannon Project is simply WRONG. For more about Emma Kennedy and Kennedy Analysis, see Appendix 1b. Summary of key findings The ancient and corroded state of Dublin's water mains is the key factor undermining its water supply. Dublin's problem is not a lack of water: only around 43% of the water put into Dublin's water supply system each day is actually used. Dublin's problem is that its water mains are in a third world state of decay having been neglected for decades. 57% of the water put into the supply system pours through holes in its pipes into the ground and never reaches the taps. 57% leakage is astonishing and far from normal: comparable cities identified by Irish Water's predecessor in this project have leakage below 10%. The state of Dublin's water mains also means (i) water outages and floods caused by mains bursts are a certainty as pressure in the system is normalised, and (ii) in low-pressure situations there is a risk of contaminated groundwater from the water-logged ground around the pipes re-entering the pipes carrying clean water to Dubliners' taps, requiring extra disinfection of the water before it is put into the supply system to counteract the risk to public health. The Shannon Project would be one of the biggest infrastructure projects in Ireland's history, but the analysis on which it was based contained mathematical and analytical errors. Corrected analysis (using Irish Water's own selected methodology and its current leakage targets) shows that, technically, no new raw water source is needed at all although Kennedy Analysis notes that Dublin would benefit from diversification away from its current reliance on almost exclusively surface-water sources - a much smaller and less expensive alternative to the Shannon Project could provide this (note: the Shannon Project would be yet another surface-water source). The Shannon Project would be a waste of scarce financial resources. Kennedy Analysis has notified Irish Water of the errors in its analysis and that many of its public statements about the need for this project have been false or highly misleading. Irish Water's reaction to the Kennedy Analysis has been defensive. Instead of addressing the issues head-on, Irish Water makes unrelated and irrelevant statements. Its responses deny the most undeniable of errors and even backtrack on issues that it had conceded during its face-to-face meeting with Emma Kennedy in February 2017. Instead of even attempting to justify its position on many issues Irish Water gives itself a clean bill of health without providing any substance, stating simply: "Irish Water do not accept this observation". London's leakage levels are less than half those in Dublin and have been deemed "unacceptable" by its regulator - itis currently replacing its entire Victorian water mains. Irish Water has no such plan: its leakage reduction targets are (contrary to its claims) extremely unambitious given the scale of the problem and its own report questions the level of funding that will be made available. An overhaul of Dublin's water mains will

become inevitable in the coming years and demands a truly significant focus and investment. The Shannon Project would not negate this: it would be a very expensive sticking plaster. Irish Water proposes to pump water 172km from the River Shannon to Dublin, costing up to EUR1.3billion – EUR1,000 for every family in Ireland. A forensic review found that after just three errors in Irish Water's "need" projections are corrected there is no need for the Shannon Project. Part A of this Kennedy Analysis Overview sets out the findings of the Kennedy Analysis; Part B gives details of Irish Water's highly defensive reaction to the Kennedy Analysis and its failure to address the issues identified in the Kennedy Analysis. The proposed Shannon project has ominous parallels with the Kielder water project built in the UK in the 1970s and widely criticised as an unnecessary White Elephant. This should sound alarm bellsfor all who will rubber-stamp the Shannon project, particularly its economic regulator (the CRU): they are on notice about the errors in Irish Water's analysis and must challenge Irish Water before it is too late. If they have doubts about the merits of the Kennedy Analysis they should seek independent review of the two sets of analysis (Irish Water's "need" analysis and the Kennedy Analysis). The risk is too high to ignore. 2 Part A: The Kennedy Analysis Conclusions The Kennedy Analysis of the Shannon Project concluded: 1. Irish Water has used false claims to promote the Shannon Project to the public, the media and the government. 2. The Shannon Project is being pushed through on the basis of mathematical errors and incorrect data. Once these errors are corrected Irish Water's own analysis methodology shows there is no need for a project of this scale. 3. This project has outlived its need – the trajectory of water demand in Ireland has shifted dramatically in the 20 years since this project began but, contrary to its claims and to international best practice, Irish Water's analysis failed to take account of this. 4. Irish Water's analysis was constrained by the flawed premise that only a single-source solution was acceptable, despite the overwhelming advantages of using several smaller and less expensive solutions in conjunction. 5. The "benefit corridor" concept is being misrepresented to justify the Shannon project. 6. Dublin's ancient water mains are the single key factor undermining its water supply system. An overhaul of Dublin's water mains will become unavoidable in the coming years regardless of how much water is pumped to Dublin from the Shannon: the Shannon project would be a very expensive sticking plaster. If Irish Water was to adopt a genuinely ambitious mains-replacement programme now it would recover such huge volumes of water that Dublin would have a huge "spare capacity" and a highly resilient water supply system, eliminating the need for the EUR1.2billion Shannon project. 7. The parallels between the Shannon project and the UK's "White Elephant" Kielder project should sound alarm bells. (1) Irish Water has used false claims to promote the Shannon Project to the public, the media and the government If the messages that Irish Water is disseminating about Dublin's water situation were accurate it would indeed make the case for urgent and drastic action. Irish Water's message can be summarised as follows (each of these is a direct quote from Irish Water): "There is currently less than 2% spare drinking water capacity in Dublin".... "The present infrastructure is struggling to meet current need as evidenced by a number of significant and costly outages in Dublin over the past 5 years".... "The Project Need Report identified that projected demand for water in Dublin alone is expected to increase by over 50% by 2050".... "The water demand projections in the Project Need Report include ambitious leakage targets which have been adopted by Irish Water, resulting in a very conservative approach to overall demand. This has resulted in a revision of the projected water requirement from 350Mld by 2040 to 330Mld by 2050. As such, the requirement to ensure that only water which is truly needed is sought from a new source has been met".... Every one of these statements is FALSE as demonstrated in part C(2) and part D of the Kennedy Response and in Appendix 2 to this Kennedy Analysis Overview. (2) The Shannon Project is being pushed through on the basis of mathematical errors and incorrect data The Kennedy Analysis identified undeniable calculation errors in Irish Water's analysis. Irish Water's incorrect analysis concluded that, in 2050, Dublin will have a water deficit of 215Mld; however, after just three of its calculation errors are

corrected, that 215Mld deficit becomes a 55Mld surplus. The corrected analysis, together with an explanation, is set out in Appendix 3a. Note the corrected analysis at Appendix 3a retains Irish Water's chosen analysis methodology and all of Irish Water's other assumptions (e.g. on population and economic growth, average household size and household number) some of which are very aggressive. It assumes nothing more than Irish Water's own unambitious leakage targets. It also retains the three considerable "safety-buffers" (peaking, headroom and outage) which total 35% - they are cumulative. Irish Water's analysis requires that this 35% of extra water over and above its (incorrect) projected average demand must be available in the form of freshly extractable raw water every day – unlike the approach in the UK, Irish Water's analysis does not offset any of its peaking requirement against the tens of billions of litres of raw water that is stored in Dublin's enormous raw water reservoirs1 . For a commentary on whether Irish Water's assumptions and its requirements in relation to the 35% safety-buffer are appropriate, see the Kennedy Report and part B(6) of the Kennedy Response. In its twenty-year life, this project has a history of drastically over-estimating future water demand yet the latest projection method is even more aggressive than those used in the past. This is summarised at Appendix 4. Irish Water has repeatedly failed to address the facts spelled out in the Kennedy Analysis to establish this point – instead, Irish Water simply states: "Irish Water do not accept the observation". (3) This project has outlived its need 20 years ago, when this project began, there was serious cause for concern about Dublin's water supply and as recently as 2010 talk of Dublin's water supply being on a "knife edge" was justified – see Appendix 5. However, since then, Dublin's water treatment infrastructure has received a long-overdue overhaul and the trajectory of water demand in Ireland has shifted significantly. 1 Thames Water, London's water supplier, does not include peaking in its raw water requirement because, it states: "peak demands in London can be met through the relatively large volume of surface water storage (reservoirs). The ability to meet peak demands is therefore not a resource availability issue…but dictated by treatment and transmission capabilities". 3 Since 1996 (the year this project began) industrial water intensity in Ireland has been on a consistent downward trend. This is a global trend and is accounted for in water "need" projections. Irish Water claims that its "need" analysis took account of the decline in industrial intensity of water demand. This is FALSE: the data that it used took NO account of this (see Appendix 3b). As a result, while London's industrial demand is projected to DECLINE between now and 2040, Irish Water projects that Dublin's industrial demand will MORE THAN DOUBLE2 . Simultaneously, in recent years, domestic consumers have become more aware of the value of water and the need for conservation (the threat of water charges has changed the way that the man on the street perceives water) and regulations have required that new-builds and household appliances are more water efficient. Declining/ plateauing demand for water is being observed in many cities across the world - see Appendix 5 - and Dublin is no different: for an entire decade since 2007 Dublin's total water demand has averaged around 540Mld. Irish Water cites Dublin's water crises of 2010/2013 as justification for the Shannon project. This is disingenuous: those crises were not caused by a lack of raw water but by the fact that Dublin's ancient water treatment plants had insufficient treatment capacity to convert raw water into drinkable treated water and had almost no treatment capacity over their licenced raw water extraction limits to cover "outages" etc. Fortunately, since Dublin's water crises, hundreds of millions of Euros have been invested upgrading most of Dublin's water treatment plants and the treatment plant at Vartry, which is unable to cope with Vartry's frequent algal blooms, has now received planning permission for a long-overdue upgrade. Dublin's water treatment capacity has been increased by 202Mld which is extremely significant. Irish Water's attempt to justify the proposed Shannon project through repeated reference to an historic position which no longer prevails is inappropriate. In most cities, another factor driving the reduction in "demand" for water has been a major focus on leakage reduction. "Demand" for water includes "true" demand (i.e. water actually used by domestic and business consumers) and "leakage" demand (i.e.

water that is put into the supply system but leaks out of the pipes before it reaches the taps). As "leakage" demand is reduced so a city's overall water demand is reduced. In Dublin, where leakage reduction has been extremely poor, this has barely had an impact. Going forward, the active recovery of water through plugging Dublin's leakage demand will reduce Dublin's total water "demand", creating the equivalent of an enormous new "source" of water. (4) Irish Water's analysis was constrained by the flawed premise that only a single-source solution was acceptable Having significantly over-stated Dublin's projected 2050 water deficit, Irish Water's consideration of potential new raw water sources was then restricted by the inexplicable premise that only a single-source solution was acceptable, ruling out the conjunctive use of several smaller solutions. This meant that only extremely large stand-alone water sources could be considered. The logic of this was flawed: (1) with the proposed one-water-source/one-treatment plant/one-pipeline Shannon project the entire supply would be lost in the event of a contamination event or supply interruption. By contrast, in the event of a contamination or major outage event at one of a number of smaller water sources, that single contaminated supply could be shut down temporarily without impacting the remainder of the supply sources; (2) Dublin's projected water demand is highly uncertain on many measures and the Shannon project is "all or nothing": not a single drop of water can be delivered until the entire pipeline has been built - and it will cost the best part of EUR1.2billion regardless of whether, in the end, it needs to supply Dublin with 215Mld of water, 50Mld of water or indeed no water at all. The investment costs of the Shannon project are heavily front-ended: unlike with smaller sources in combination, the Shannon project offers almost no scope for phasing of investment expenditure or bringing the project online in increments. Irish Water claims to have considered ten new water source options. This is very misleading: seven of the ten were simply different variations of pumping water from the River Shannon to Dublin (from different abstraction locations and via different routes). An aggressive mains replacement programme was not even one of the ten options considered, which was a grave omission given that this is the key issue undermining Dublin's water supply system. The other three options were: (1) groundwater, which was dismissed for a number of flawed reasons, including that it could not provide the full projected water requirement standalone. The Kennedy Response (at part B(9) and Appendix 6) and the Second Kennedy Response (at Appendix 4) spelled out in significant technical detail the mathematical and logical errors contained in the original 2008 groundwater report and in Irish Water's 2015 review of the original report. See Appendix 6 for an overview of those many errors, which Irish Water's latest response yet again failed to address. Even on its constrained and (self-proclaimed) conservative analysis, that groundwater report concluded that there are significant groundwater resources close to Dublin. It estimated that two of these aquifers alone are likely to yield 78Mld if developed, (2) conjunctive use of the River Barrow, which was dismissed primarily because it could not provide the full water requirement standalone, and (3) desalination, which was dismissed primarily on the illogical basis that it could not provide water to communities in the "benefit corridor" – see the "benefit corridor" section below for why this was so flawed. 2 See page 5 of Appendix 1 to the Kennedy Response. 4 Irish Water did not give detailed consideration to the many other smaller alternatives that are available, such as new reservoirs, environmental flow replacement, mine dewatering and rainwater harvesting. None of these would have been capable of supplying the entire (incorrect) projected 2050 deficit standalone, but combinations of them would have been a far more logical solution. Irish Water's November 2016 Final Options Appraisal Report stated: "the potential for using multiple sources was also investigated at various stages in the WSP. However it was found that while many sources, such as groundwater, rainwater and greywater, could be attractive secondary resources…. they are not sustainable primary water sources." This statement makes no sense: naturally if you have classified them as "secondary" they are not, by your own definition, "primary" – but this does not negate their value when used in combination. Two or three water

sources operating in conjunction could be brought online incrementally (alongside an aggressive mains replacement programme) if and when the need does indeed arise and would reduce the risk of exposure to a contamination of any one supply in the future. Dublin currently gets 99% of its water from rivers – and the Shannon would be yet another river water source, offering no diversification protection. River water has its own inherent problems: it contains organic materials (e.g. from leaves that fall into the water) and trihalomethanes ("THMs") are produced as a by-product during the water treatment process when chlorine reacts with organic matter. River water is the most prone to producing THMs during the treatment process; deep wells present the lowest THM risk as the water from deep wells is not contaminated by organic matter. THMs are believed to be linked to serious health risks including cancer, miscarriages and birth defects. It has been reported that Ireland has the highest reported non-compliance for THM exceedances across the EU member states - even Erin Brokovich has flagged the issue of THMs in Ireland's drinking water. (5) The "benefit corridor" concept is being misrepresented to justify the Shannon project When Irish Water took this project over from Dublin City Council in 2014 it introduced the uncertain and vague concept of a "benefit corridor". Public details of this "benefit corridor" concept have been scant, but the analysis that was published in the 2015 Project Need Report was littered with errors (see pages 10/11 of the Kennedy Report). The concept has since shifted significantly – the version presented in the 2016 Final Options Appraisal Report was unrecognisable, yet very few details were provided and those provided were, yet again, highly questionable – see Appendix 7a. Irish Water claims that the Shannon project will serve over 40% of the population – but 39.99% of these live in Dublin or within a contiguous area and within supply networks that, according to Irish Water's own report, could easily be connected into the Dublin water supply network. The "benefit corridor" is better described as a "benefit blob" around Dublin. According to the Final Options Appraisal Report, the only people slated to receive water from the Shannon source outside of this "benefit blob" are around 4,000 people in Clare - these 4,000 people in Clare constitute just 0.01% of Ireland's population yet Irish Water repeatedly claims that the Shannon project brings a benefit to communities along the entire length of the pipeline. Notwithstanding its extremely questionable validity, the "benefit corridor" has been one of the key justifications provided by Irish Water for selecting the Shannon solution over other sources that are local to Dublin on the flawed basis that the Shannon source can provide water to more people than sources located in the heart of the Dublin water supply area (such as desalination). This justification is wholly illogical: a water source located within the Dublin water supply area would supply the "benefit blob" without the need for hundreds of kilometers of pipeline. (6) Dublin's ancient water mains and third world leakage levels are the key factors undermining its water supply system - yet Irish Water's mains replacement and leakage targets are unambitious The Kennedy Analysis team has undertaken a forensic analysis of Dublin's leakage and Irish Water's self-proclaimed "ambitious" leakage reduction targets. A summary is contained at Appendix 8 or click on this link for a copy of the full Kennedy Analysis of Dublin's Leakage. Dublin's problem is not a lack of water: Dublin's problem is that around 57% of the water put into its water supply system pours straight through holes in its ancient supply pipes into the ground and never reaches Dubliners' taps. Only around 43% of the The conjunctive use of several smaller water sources would allow for increased water supply to be brought online incrementally if and when it is actually found to be needed (unlike the all-or-nothing Shannon project). It would offer protection against a contamination event or supply interruption at an individual water source (unlike the one-source, one treatment plant, one-pipeline Shannon project) and would allow for diversification of Dublin's water sources away from surface water, with its inherently high THM risk (unlike the surface-water Shannon source). Irish Water suggests that the Shannon is better placed to supply the "benefit corridor" than a Dublin-centric solution and that the Shannon Project would bring a benefit to the communities along the entire length of the pipeline: this is false. 5 water put into Dublin's water supply system every day is actually used – the rest of the

water is wasted through leakage. The ancient, corroded state of Dublin's water mains is the single key factor undermining its water supply system. Dublin's historic mains replacement rates have been inadequate: London has replaced its water mains at a rate 2,000% faster than that in Dublin despite the fact that London's leakage rates were less than half those in Dublin. Dublin City Council stated a decade ago: "...these mains are so ancient that leaving them alone is not an option" yet over the past ten years an average of only EUR10million per year has been spent on fixing leaks NATIONALLY (not in Dublin alone) - this equates to only 0.8% of the projected EUR1.2billion cost of the Shannon project. This failure has resulted in leakage levels of around 57% - this is far from normal or acceptable. The OECD carried out a study in 2016 observing leakage levels in cities across the world. Only 4 cities had leakage levels over 40%: all of them were in Mexico (Dublin did not take part in the study). The UK is known to have very high leakage rates – indeed Thames Water (London's water provider) was fined by its regulator yet again in July 2017 for "unacceptable" leaks – yet UK leakage levels are well under half those in Dublin: "total leakage" rates for water suppliers in the UK in 2012 ranged from 14% to 27%, with an average of 20%3 . It is notable that Irish Water tends to use London, which itself has "unacceptable" leakage levels, as its default comparator when attempting to justify its own unambitious leakage targets. Earlier in the life of the Shannon project, Dublin City Council selected 6 comparable countries/cities and presented data on them for comparison with Dublin – it found that the leakage levels for the countries that it had selected were: Country/city Approximate leakage rate Denmark 6% The Netherlands 6% Germany 7% Sydney, Australia 8.5% Lithuania 15% (in 2000) United Kingdom 23% Reference is often made to Dublin's "spare capacity" which Irish Water states is around 10% (although its published data suggests that, as a result of the major recent upgrades at Dublin's water treatment plants, its current spare capacity is significantly higher than 10%). It is important to understand: if Dublin had normal leakage levels it would have an absolutely enormous spare capacity. For example, if Dublin's 2015 leakage levels had been 20% (well above leakage levels in many comparable cities) it would have had 112% spare capacity. THIS IS ABSOLUTELY ENORMOUS. Irish Water's states that, in low-pressure situations, there is a danger of what is describes as "contaminated groundwater" leaking from the water-logged ground around the pipes back into the pipes carrying clean water to Dubliners' taps. This requires "boosted chlorination" of the water (with its associated THM risk, as mentioned above) before it is put into the supply system to counteract what Irish Water describes as a "public health risk". The cripplingly compromised state of Dublin's water pipes means that, until a significant proportion of them are replaced, water outages and flooding incidents caused by burst water mains are inevitable. What is more, the extreme extent of corrosion to the pipes means that repairing those bursts is extra complicated and takes far longer than it should. The 2017 Louth/Meath mains burst was an example of this: Irish Water's own press release stated: "three attempts to fix the 50 year old pipe failed over last weekend as the corrosion and warping of the pipe meant that any available standard fittings were not sufficient. A bespoke piece of pipe and fittings were manufactured in Belfast". Irish Water claims that its leakage targets are "ambitious" and it makes reference to highly misleading statements and invalid comparisons to justify its claims – see part (C) of Appendix 8. In fact, Irish Water's hard targets on leakage reduction aim to reduce Dublin's leakage by only 31% in 39 years. Its leakage reduction target is extremely unambitious given the scale of the problem and when compared with recent leakage reduction achievements in the UK4 and across the EU5 . For example: • London's leakage was reduced by 30% in only 6 years, • Scotland's leakage was reduced by 55% in only 10 years, • Lisbon's leakage was reduced by 64% in only 8 years, • Leakage in the Reggio Emilia province in Italy was reduced by 50% in 8 years, • Malta's leakage was reduced by over 83% in under 20 years. For its estimates of the costs of recovering water through fixing leaks, Irish Water's analysis used out-dated, over-stated figures: it used cost data from prior to the installation of water meters. This is wholly inappropriate: fixing leaks (on both the customer side and the distribution side of the

network) is far less complicated and far cheaper now that meters have been 3 Source: Irish Water Final Options Appraisal Report Appendix J, "Preliminary Options Appraisal - Consultation Submissions Report", page 35. 4 Sources: Thames Water and Scottish Water. 5 Source: 2015 EU Reference Document "Good Practices on Leakage Management". 6 installed. Before meters were installed it was almost impossible to know where a distribution-side leak was unless water was actually pouring out of the ground. Meters now allow leaks to be pin-pointed simply by observing the difference in water pressure between two meter points. Irish Water's analysis assumed that recovering 1Mld of water on the customer-side of the network would cost "in the order of EUR 0.75million", but the results of the First Fix Free scheme (a scheme for repairing customer side leakage relying on "constant flow alarms" in water meters) show that saving water by fixing customer side leaks has cost an average of just EUR212,000 per 1Mld – this is one third of the amount that Irish Water had assumed and just 5% per unit of water than the predicted cost of delivering the same volume of water through the proposed Shannon Project. Irish Water's nonsensical attempts to dismiss this highly significant fact are discussed at Appendix 9c. The results of the First Fix scheme to date establish that far more water will be recovered through repairing Dublin's leakage than Irish Water's analysis accounted for (see Appendix 3c for more details on the results of the First Fix scheme). In every quarter, the amount of water recovered through the First Fix scheme was approximately DOUBLE the production of the entire Bog of the Ring wellfield. The Bog of the Ring wellfield produces 2.5-3Mld of water – the First Fix scheme has so far recovered a cumulative total of over 38Mld. That huge volume of "new" water is now available at Dubliners' taps every day instead of pouring into the ground. Recovering water by repairing customer leaks is equivalent to adding approximately two new, additional Bog of the Ring wellfields to Dublin's water supply every three months - but far less expensive. (7) The parallels between the proposed Shannon project and the UK's "White Elephant" 1970s Kielder project are ominous The Kielder reservoir and pipeline was built in the UK in the 1970s and has subsequently been widely criticised as having been an unnecessary White Elephant. Appendix 10 contains extracts from a damning 1982 report6 of the Kielder project highlighting alarming parallels with the Shannon Project. For example, it flags that the Kielder project was partly justified by potential increases in future water demand from certain major industrial users that were not appropriately validated at the time. Irish Water's "need" analysis for the Shannon project includes a huge 100Mld industrial "strategic allowance" (note: Dublin's total industrial demand for water is currently only 110Mld, which the "need" analysis assumes will grow organically alongside the separate, additional 100Mld industrial "strategic allowance") - a key justification for the 100Mld strategic allowance is "enquiries" from un-named potential industrial users. A University of Oxford study of the Kielder Water Scheme7 pointed out that the analysis used to justify the Kielder project used inappropriate data, including the incorrect assumption that non-domestic demand would continue to grow rapidly, but that in fact: "the industry it was planned to supply was already reducing its water requirements before construction started". The study noted that those who supported the scheme proclaimed: "the scheme is a bold and imaginative one: the largest single water conservation scheme yet undertaken in this country" and referred to "the politics of promotion of mega-projects". However, it stated, "unfortunately, engineering accomplishments were often marred by economic miscalculation. The resulting mismatch between vastly increased water supply at a time of diminishing rise in demand, together with huge debts incurred at a time of rapid inflation and high interest rates, had lasting effects on the state's management of water resources". The study stated: "The Scheme is described on a bronze plaque at the reservoir site as one of the biggest water projects ever undertaken in Europe…. Today, the reservoir rests mostly idle. The water is rarely needed for supply…." 6 "Spending Money like Water", William Charlton, The Spectator, 22 May 1982. 7 "The Kielder Water Scheme: the last of its kind?" CS MCCULLOCH, University of Oxford, UK (2006) Irish Water has cited the inconvenience of traffic disruption in Dublin as a factor against an overhaul of its

water mains. Perhaps Dubliners should be presented with two alternatives - either: (1) accept traffic disruption in rotating areas of Dublin for the coming years while Irish Water aggressively replaces pipes - this will be expensive but will (a) address Dublin's water volume, quality and pressure issues, (b) make Dublin a viable investment proposition for incoming investors who need confidence in not only the volume of water available but also the quality of that water, and (c) eliminate the need to spend EUR1,000 per family on the Shannon project, or (2) accept that they will continue to (a) drink potentially contaminated water being delivered through ancient and corroding water pipes, and (b) be exposed to mains bursts/water outages, while Irish Water spends a huge amount of money piping water from the Shannon, which will only delay the expense and disruption of properly addressing Dublin's water mains. The ominous parallels with the Kielder project should sound alarm bells for anyone who will approve or rubber-stamp the Shannon project – they are on notice about the errors in Irish Water's analysis and must challenge Irish Water on the evidence contained in the Kennedy Analysis before it is too late. 7 Part B: Irish Water's reaction to the Kennedy Analysis has been highly defensive Irish Water's defensive reaction to the Kennedy Analysis is not the reaction that one would expect from a body intent on ensuring the best possible use of EUR1.3billion of scarce financial resources. Instead of addressing the issues head-on, Irish Water makes unrelated and irrelevant statements. Its responses deny the most undeniable of errors, often with very little or no substance. As summarised in the table below, its latest response even backtracked on issues that Irish Water had conceded during its 16 February 2017 meeting with Emma Kennedy, failed to make a note of important points that were discussed at that meeting and failed to address issues that the Irish Water team were unable to explain during the meeting and had confirmed would be dealt with in its written response (see Appendix 9a and Appendix 9b). Matter discussed during meeting The position Irish Water took in its written response Non-domestic demand data: Mick Garrick of Jacobs Tobin confirmed that the data that Irish Water had used was indeed Jacobs Tobin's data and not Indecon's data. Its response backtracked entirely, stating "Irish Water do not accept this observation". See Appendix 3b for details of this point. The false statement that past outages in Dublin have cost the economy EUR78million per day: Alan Gray of Indecon confirmed that Indecon had not even purported to make any analysis of the cost of past water outages – Irish Water is citing the Indecon analysis and this wholly inappropriate figure out of context. Its response failed to address this point at all and Irish Water continues to propagate this message despite having been informed in Emma Kennedy's presence that it is wrong. Irish Water's adoption of a 35-year projection window (which is not international best practice and which produces a much higher projected water deficit due to Irish Water's aggressive and uncertain assumptions): during our meeting, Irish Water was unable to explain why it had not used the industry-standard 25-year time frame and confirmed that this issue would be addressed in its written response. Its response failed to address this point at all. Irish Water's much-publicised statement that Dublin's demand was projected to increase by over 50% was FALSE: Irish Water was unable to provide any maths to justify this statement during our meeting. Its response created a fudge to try to explain away this basic mathematical error. See Appendix 2 for details of this false statement and its implications. The results of the First Fix scheme have PROVEN that the volume of water that Irish Water's "need" analysis assumed was being lost through customer side leakage was WRONG: Irish Water still refuses to acknowledge this most undeniable of errors. Its response failed to address this point at all. See Appendix 3c for details of this point. Irish Water's latest response still avoided addressing key issues that the Kennedy Analysis has raised - see Appendix 9b for examples. Even when Irish Water did attempt to address issues raised in the Kennedy Analysis many of the points that Irish Water made in its defence were simply wrong/made no sense/contained basic errors - see Appendix 9c for examples. Irish Water avoids addressing issues by stating simply that its methodology is "best practice" or "internationally recognised methodology". We have made clear to Irish Water that, although several aspects of its analysis are not considered

international best practice, our principal concern is not with the methodology that Irish Water is attempting to follow, but rather our concern is that Irish Water has made major errors in its attempt to follow its selected methodology. Its analysis contains mathematical errors – this is NOT "best practice"; it is not "best practice" to account for "outage" on both sides of the supply: demand equation; "best practice" does not use data derived from analysis that contained basic errors; claiming to use one set of data while actually using a different set of data is not "best practice". See Appendix 3a for corrected analysis, using Irish Water's own selected methodology. The Kennedy Analysis spelled out Irish Water's mathematical errors and demonstrated how many of its public statements about the need for this project have been false or highly misleading. Instead of even attempting to justify its position on many of these issues, it has repeatedly stated: "Irish Water do not accept this observation". It gives itself a clean bill of health without providing any substance, for example stating simply: "the technical reports produced ... have been subject to a full quality assurance process". Stating "we do not accept this observation" does not change the fact that the observation is accurate. Simply stating that its own analysis is correct does not make it so. Avoiding key issues by raising other matters that are not even in dispute is a method of diverting attention away from fully substantiated claims that Irish Water is incapable of providing evidence to refute: there is no need for the EUR1.3billion Shannon project and pursuing it would be a waste of scarce financial resources.

Appendix C

Quantitative Assessment of River Shannon Flows, Abstraction Proportions, and Ardnacrusha Operations

This appendix provides a structured quantitative assessment to support the planning objection. It sets out baseline flow data, proposed abstraction volumes, proportional impacts under varying hydrological conditions, and the operational and energy context of the Parteen–Ardnacrusha system. The purpose is to demonstrate why reliance on long-term average flow metrics materially understates environmental risk during critical low-flow periods.

A1. Baseline River Shannon Flows at the Abstraction Point

Monitoring data indicate that the **annual average discharge of the River Shannon at Limerick is approximately 208.1 m^3/s** (208,100 litres per second). Corresponding flows at **Killaloe and Parteen Weir** are generally estimated to lie between **180 and 186 m^3/s.**

For the purposes of this assessment, an average flow of **183 m^3/s** at the abstraction point is assumed.

Table A1 – Representative River Shannon Flows

Location	Flow description	Discharge (m^3/s)
Limerick	Long-term annual average	208.1
Killaloe / Parteen	Estimated annual average range	180–186
Killaloe / Parteen	Assumed planning average	183

A2. Proposed Abstraction Volume

The current proposal by Uisce Éireann involves abstraction of approximately **3.82 m^3/s** at Parteen Weir.

A3. Observed Flow Variability in the River Shannon

The River Shannon exhibits extreme variability, ranging from major flood events to very low summer flows. In addition, a **statutory minimum compensation flow of 10 m^3/s** is required down the old Shannon channel toward Castleconnell.

Table A2 – Observed Flow Conditions at Killaloe / Parteen

Condition	Approximate flow (m^3/s)	Notes
Major flood	700	Extreme flood events
Average conditions	183	Long-term planning average
Dry summer	15	Typical low-flow summer
Extreme low flow	10	Approaches statutory minimum
Statutory compensation flow	10	Legal minimum to Castleconnell

Questions remain regarding the **precision, transparency, and enforcement** of this minimum flow, particularly during drought conditions when abstraction pressures are greatest.

A4. Proportion of River Flow Abstracted Under Different Conditions

When the proposed abstraction of **3.82 m^3/s** is assessed against the full range of Shannon flows, the proportional impact increases sharply during low-flow periods.

Table A3 – Percentage of River Flow Abstracted

Hydrological condition	River flow (m^3/s)	Abstraction (m^3/s)	% of flow abstracted
Major flood	700	3.82	0.55%
Annual average	183	3.82	2.09%
Dry summer	15	3.82	25.5%
Extreme low flow	10	3.82	38.2%

This table demonstrates that while abstraction appears negligible under flood or average conditions, it becomes **ecologically dominant during drought and low-flow periods**, precisely when riverine and lake ecosystems are most vulnerable.

A5. Ardnacrusha Hydropower Capacity and Flow Regulation

Ardnacrusha hydroelectric station comprises **four turbines**, each with a maximum hydraulic capacity of approximately **100 m^3/s**, giving a total maximum throughput of **400 m^3/s** and a peak installed electrical capacity of **86 MW**.

Flows exceeding this capacity are diverted down the old Shannon channel toward Castleconnell, contributing to downstream flood risk during major events.

Table A4 – Ardnacrusha Operational Characteristics

Parameter	Value
Number of turbines	4
Capacity per turbine	~100 m^3/s
Maximum hydraulic throughput	~400 m^3/s
Maximum electrical output	86 MW

A6. Average Utilisation and Energy Output

Allowing for the statutory **10 m^3/s** compensation flow, the average effective flow available for power generation is approximately **198 m^3/s.**

This equates to:

- **Average utilisation of installed hydraulic capacity:** 49.5%
- **Average electrical output:** 42.6 MW
- **Annual energy generation:** 373 GWh

Table A5 – Average Energy Output of Ardnacrusha

Metric	Value
Average utilised capacity	49.5%
Average power output	42.6 MW
Annual energy generation	373 GWh

In national context:

- Total electricity generated in Ireland in 2023: **~30,600 GWh**
- Contribution of Ardnacrusha: **~1.2% of total generation**

A7. Comparison with Modern Wind Generation

Modern onshore wind turbines typically have a rated capacity of **~3 MW.** Assuming an average capacity factor of **35%**, this yields an effective average output of **~1.05 MW per turbine.**

Table A6 – Wind Generation Equivalence

Parameter	Value
Typical turbine rating	3 MW
Average capacity factor	35%
Effective average output	1.05 MW
Equivalent turbines to Ardnacrusha	~40

In renewable_toggle terms:

- Renewables accounted for **~40.7%** of Irish electricity generation in 2023 (~12,454 GWh).
- Ardnacrusha contributed approximately **3.0% of renewable generation**.
- Removal of Ardnacrusha would reduce the renewable share to approximately **39.5%**, a marginal national change.

A8. Planning-Relevant Conclusions

This appendix demonstrates that:

1. The proposed abstraction represents a **minor proportion of river flow only under average or flood conditions**, but a **very substantial proportion during low-flow and drought periods**.
2. The **energy contribution of Ardnacrusha is modest** in both national and renewable-energy terms.
3. Continued reliance on the Parteen–Ardnacrusha regime disproportionately facilitates low-flow abstraction with significant ecological consequences.

Accordingly, the use of long-term average flow figures as the primary justification for abstraction is **misleading and unsuitable** as a basis for planning consent.

Appendix D

The Conclusion of the Irish Water Forum – Review of the Eastern and Midlands Water Supply Project in 2019 was as follows:

The "helicopter" review of the Eastern and Midlands WSP that was conducted provided the Forum with some necessary insight to prepare its contribution to the CRU review, and in particular to identify the points that deserve further clarification or consideration by Irish Water. The key take away points from the review include the following:

• The information presented to justify the need for the WSP project suffers from many unknowns and uncertainties :

o Either supporting data are available but not shared by Irish Water, which reflects a lack of pedagogy and transparency

o Or these data don't exist, which means that there is no solid foundation for the projections justifying the need for the project (at least at this scale): it might then be better to wait for progressing any further that basic buildings blocks are in place.

• However, without considering future demand, the situation in Dublin is already very challenging, due to the lack of headroom and more importantly, the almost exclusive reliance on a single source. Increasing the resilience of the water supply not just in Dublin but for all the Midlands region is therefore a critical argument to justify the Eastern and Midlands WSP; and may justify that it should start sooner rather than later.

• By all means, "fixing" water supply challenges are a complex matter, for which there are usually no "silver bullet" and the Eastern and Midlands WSP makes no exception. In particular, different ways of reducing demand as well as increasing supplies could be considered and implemented simultaneously, with impact assessment and cost benefits analysis allowing to define the most adequate combination.

• Water demand is not an external parameter, such as rainfall, but instead a component

of the system that a water utility can, and should, manage; to that end, it is necessary to adopt a holistic view of all the drivers, as well as levers, that can influence water demand in the future. While Irish water indicates that it intends to implement a demand management strategy, the impact of such strategy is not evidenced in the proposed demand projections.

- The same applies for the leakage issue: Irish Water does not explain how future leakage targets have been set and how they are aligned with best practices, available resources and customer preferences. International experience, including that of Scottish Water, show that significant progress can be achieved in this area in relatively short period of time and without relying exclusively on infrastructure renewal. Raising ambition on leakage could help increase the acceptability of the Eastern and Midlands project, which otherwise could be seen as a "necessary evil" to compensate the current wastage of resources.
- At the same time, it is important to stress that improving performance (whether on leakage, demand management or operations in general) takes time and depends on many conditions (human resources capabilities, leadership, financial resources and above all regulatory pressure/support). Irish Water is still a fairly new organization inheriting a challenging situation: should the role of the CRU in helping it deliver better performance be strengthened?
- In addition to the CRU, the Forum could also play a significant role in helping Irish Water better understand the views of its customers as well as their preferences and priorities: through an ongoing engagement process, the utility could better anticipate, understand and potentially resolve future issues before they become national controversies; and develop better ways to engage and communicate with customers, above and beyond institutional "consultation".

Appendix E: The Natura Impact Statement (NIS) Review

The Natura Impact Statement (NIS) Review

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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 statuary 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 ZoI.

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 ZoI 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 ZoI 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 m^3/s. Under such conditions, the proposed abstraction of 3.47–3.82 m^3/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 ZoI	Barroughter Bog SAC is not listed among sites with hydrological	The SAC lies directly adjacent to Lough Derg yet is omitted from the	Article 6(3) requires identification of all European sites within the

Assessment Element	NIS Position	Identified Deficiency	Relevance to Legal Test
	pathways for effect.	Natura 2000 inventory and hydrological pathway analysis.	likely Zone of Influence. In the absence of identification and screening, compliance with Article 6(3) cannot be demonstrated.
Hydrological linkage to Lough Derg	Site not assessed.	No evaluation of whether abstraction-induced lake level changes could alter groundwater gradients or hydraulic conditions at the bog–lake interface.	Where a plausible source–pathway–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	Average flow metrics do not represent conditions when qualifying habitats are	Precautionary principle; does not assess worst-case

Assessment Element	NIS Position	Identified Deficiency	Relevance to Legal Tests
	statistics	most vulnerable	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 conditions	Article 4 WFD test not satisfied
Scientific Certainty	Conclusion of no adverse effect reached	Residual uncertainty remains regarding habitat structure and function	Does not evidence "beyond reasonable scientific doubt"

Assessment Element	NIS Position	Identified Deficiency	Relevance to Legal Tests
			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	Modelled levels remain	Operational water level bands are	Compliance with operational

Assessment Element	NIS Position	Identified Deficiency	Relevance to Legal Test
Band (NOB) compliance	within ESB Normal Operating Band, even during drought + abstraction.	management thresholds, not ecological thresholds. No demonstration that habitat structure and function are protected within NOB limits.	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 duration of low-water events	Focus on minimum level reached.	No analysis of duration of low-water periods, altered hydroperiod timing, or frequency of lower-band occupancy.	Habitat integrity depends on 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.

Assessment Element	NIS Position	Identified Deficiency	Relevance to Legal Tests
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 inundation regime	No significant upstream water level change predicted.	No modelling of changes in inundation duration, spatial extent, or recession timing of callow habitats.	Callow grasslands are defined by flood 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	Modelled levels remain within 460 mm NOB	Operational management band is not an ecological threshold; remaining within	Art. 6(3) requires assessment of habitat function, not operational

Assessment Element	NIS Position	Identified Deficiency	Relevance to Legal Test
(NOB)		NOB does not demonstrate ecological neutrality	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 ZoI; 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
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	Not assessed in detail	No evaluation of abstraction effects on shallow groundwater levels sustaining callow	Soil moisture conditions underpin habitat quality

Assessment Element	NIS Position	Identified Deficiency	Relevance to Legal Test (Article 6(3))
interaction		grasslands and alkaline fen	
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.

6. References

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Appendix E ESB Flow Data from EPA

EPA Data from ESB Flows Table 1

Date	Parteen Discharge into old channel (m^3/s)	Parteen Discharge into headrace canal(m^3/s)	Total Discharge at Parteen Weir(m^3/s)	**pipeline abstraction (3.4m3/s) as % of Total Discharge**	
5/20/2018 9:00	10.5	0	10.5	32.38%	
6/2/2018 9:00	10.5	0	10.5	32.38%	
6/3/2018 9:00	10.5	0	10.5	32.38%	
6/15/2018 9:00	10.5	0	10.5	32.38%	
6/16/2018 9:00	10.5	0	10.5	32.38%	
6/17/2018 9:00	10.5	0	10.5	32.38%	
6/18/2018 9:00	10.5	0	10.5	32.38%	
6/19/2018 9:00	10.5	0	10.5	32.38%	
6/20/2018 9:00	10.5	0	10.5	32.38%	
6/21/2018 9:00	10.5	0	10.5	32.38%	
6/22/2018 9:00	10.5	0	10.5	32.38%	
6/23/2018 9:00	10.5	0	10.5	32.38%	

6/24/2018 9:00	10.5	0	10.5	32.38%	
6/25/2018 9:00	10.5	0	10.5	32.38%	
6/26/2018 9:00	10.5	0	10.5	32.38%	
6/27/2018 9:00	10.5	0	10.5	32.38%	
6/28/2018 9:00	10.5	0	10.5	32.38%	
6/30/2018 9:00	10.5	0	10.5	32.38%	
7/1/2018 9:00	10.5	0	10.5	32.38%	
7/3/2018 9:00	10.5	0	10.5	32.38%	
7/4/2018 9:00	10.5	0	10.5	32.38%	
7/5/2018 9:00	10.5	0	10.5	32.38%	
7/6/2018 9:00	10.5	0	10.5	32.38%	
7/7/2018 9:00	10.5	0	10.5	32.38%	
7/8/2018 9:00	10.5	0	10.5	32.38%	
7/9/2018 9:00	10.5	0	10.5	32.38%	
7/10/2018 9:00	10.5	0	10.5	32.38%	
7/11/2018 9:00	10.5	0	10.5	32.38%	
7/12/2018 9:00	10.5	0	10.5	32.38%	

7/13/2018 9:00	10.5	0	10.5	32.38%	
7/14/2018 9:00	10.5	0	10.5	32.38%	
7/15/2018 9:00	10.5	0	10.5	32.38%	
7/16/2018 9:00	10.5	0	10.5	32.38%	
7/17/2018 9:00	10.5	0	10.5	32.38%	
7/18/2018 9:00	10.5	0	10.5	32.38%	
7/19/2018 9:00	10.5	0	10.5	32.38%	
7/20/2018 9:00	10.5	0	10.5	32.38%	
7/21/2018 9:00	10.5	0	10.5	32.38%	
7/22/2018 9:00	10.5	0	10.5	32.38%	
7/23/2018 9:00	10.5	0	10.5	32.38%	
7/24/2018 9:00	10.5	0	10.5	32.38%	
7/25/2018 9:00	10.5	0	10.5	32.38%	
7/26/2018 9:00	10.5	0	10.5	32.38%	
7/27/2018 9:00	10.5	0	10.5	32.38%	
7/28/2018 9:00	10.5	0	10.5	32.38%	
7/29/2018 9:00	10.5	0	10.5	32.38%	

7/30/2018 9:00	10.5	0	10.5	32.38%	
7/31/2018 9:00	10.5	0	10.5	32.38%	
8/1/2018 9:00	10.5	0	10.5	32.38%	
8/2/2018 9:00	10.5	0	10.5	32.38%	
8/3/2018 9:00	10.5	0	10.5	32.38%	
8/4/2018 9:00	10.5	0	10.5	32.38%	
8/5/2018 9:00	10.5	0	10.5	32.38%	
8/6/2018 9:00	10.5	0	10.5	32.38%	
8/7/2018 9:00	10.5	0	10.5	32.38%	
8/8/2018 9:00	10.5	0	10.5	32.38%	
8/9/2018 9:00	10.5	0	10.5	32.38%	
8/10/2018 9:00	10.5	0	10.5	32.38%	
8/11/2018 9:00	10.5	0	10.5	32.38%	
8/12/2018 9:00	10.5	0	10.5	32.38%	
8/13/2018 9:00	10.5	0	10.5	32.38%	
8/14/2018 9:00	10.5	0	10.5	32.38%	
8/15/2018 9:00	10.5	0	10.5	32.38%	

8/16/2018 9:00	10.5	0	10.5	32.38%	
8/17/2018 9:00	10.5	0	10.5	32.38%	
8/18/2018 9:00	10.5	0	10.5	32.38%	
8/19/2018 9:00	10.5	0	10.5	32.38%	
8/20/2018 9:00	10.5	0	10.5	32.38%	
8/21/2018 9:00	10.5	0	10.5	32.38%	
8/22/2018 9:00	10.5	0	10.5	32.38%	
8/24/2018 9:00	10.5	0	10.5	32.38%	
8/25/2018 9:00	10.5	0	10.5	32.38%	
8/26/2018 9:00	10.5	0	10.5	32.38%	
9/29/2018 9:00	10.5	0	10.5	32.38%	
9/30/2018 9:00	10.5	0	10.5	32.38%	
6/29/2018 9:00	10.5	1.7	12.2	27.87%	
8/23/2018 9:00	10.5	5.3	15.8	21.52%	
10/27/2018 9:00	10.5	15.8	26.3	12.93%	
6/14/2018 9:00	10.5	18.8	29.3	11.60%	
7/2/2018 9:00	10.5	20.4	30.9	11.00%	

6/11/2018 9:00	10.5	28.7	39.2	8.67%	
10/28/2018 9:00	10.5	29.1	39.6	8.59%	
10/31/2018 9:00	10.5	29.4	39.9	8.52%	
10/11/2018 9:00	10.5	30.4	40.9	8.31%	
10/12/2018 9:00	10.5	30.6	41.1	8.27%	
6/4/2018 9:00	10.5	31.1	41.6	8.17%	
10/10/2018 9:00	10.5	31.9	42.4	8.02%	
6/5/2018 9:00	10.5	32.8	43.3	7.85%	
11/3/2018 9:00	10.5	33	43.5	7.82%	
10/29/2018 9:00	10.5	33.9	44.4	7.66%	
11/4/2018 9:00	10.5	34.1	44.6	7.62%	
11/2/2018 9:00	10.5	34.5	45	7.56%	
10/30/2018 9:00	10.5	36.6	47.1	7.22%	
5/19/2018 9:00	10.5	38.4	48.9	6.95%	
10/7/2018 9:00	10.5	38.8	49.3	6.90%	
9/4/2018 9:00	10.5	39.4	49.9	6.81%	
9/20/2018 9:00	10.5	39.6	50.1	6.79%	

6/12/2018 9:00	10.5	40.3	50.8	6.69%	
9/21/2018 9:00	10.5	40.9	51.4	6.61%	
9/7/2018 9:00	10.5	41.1	51.6	6.59%	
11/1/2018 9:00	10.5	41.3	51.8	6.56%	
9/22/2018 9:00	10.5	42.2	52.7	6.45%	
6/9/2018 9:00	10.5	42.6	53.1	6.40%	
10/22/2018 9:00	10.5	43.1	53.6	6.34%	
6/13/2018 9:00	10.5	43.9	54.4	6.25%	
8/27/2018 9:00	10.5	44.1	54.6	6.23%	
10/23/2018 9:00	10.5	44.1	54.6	6.23%	
10/25/2018 9:00	10.5	44.8	55.3	6.15%	
10/26/2018 9:00	10.5	44.8	55.3	6.15%	
10/24/2018 9:00	10.5	45.2	55.7	6.10%	
11/5/2018 9:00	10.5	45.2	55.7	6.10%	
9/1/2018 9:00	10.5	45.4	55.9	6.08%	
9/19/2018 9:00	10.5	45.9	56.4	6.03%	
10/17/2018 9:00	10.5	46.1	56.6	6.01%	

10/8/2018 9:00	10.5	47.1	57.6	5.90%	
10/14/2018 9:00	10.5	47.4	57.9	5.87%	
6/6/2018 9:00	10.5	47.6	58.1	5.85%	
10/15/2018 9:00	10.5	47.6	58.1	5.85%	
6/1/2018 9:00	10.5	49.5	60	5.67%	
10/18/2018 9:00	10.5	49.5	60	5.67%	
10/20/2018 9:00	10.5	49.7	60.2	5.65%	
10/13/2018 9:00	10.5	50.4	60.9	5.58%	
9/11/2018 9:00	10.5	50.6	61.1	5.56%	
10/6/2018 9:00	10.5	50.6	61.1	5.56%	
10/9/2018 9:00	10.5	51.4	61.9	5.49%	
10/19/2018 9:00	10.5	52.3	62.8	5.41%	
9/8/2018 9:00	10.5	53.3	63.8	5.33%	
5/31/2018 9:00	10.5	53.6	64.1	5.30%	
8/29/2018 9:00	10.5	53.6	64.1	5.30%	
9/5/2018 9:00	10.5	53.6	64.1	5.30%	
5/30/2018 9:00	10.5	53.8	64.3	5.29%	

5/18/2018 9:00	10.5	54	64.5	5.27%	
9/10/2018 9:00	10.5	54.4	64.9	5.24%	
5/17/2018 9:00	10.5	54.8	65.3	5.21%	
9/6/2018 9:00	10.5	54.9	65.4	5.20%	
9/3/2018 9:00	10.5	55.3	65.8	5.17%	
9/9/2018 9:00	10.5	55.7	66.2	5.14%	
8/31/2018 9:00	10.5	56.3	66.8	5.09%	
5/21/2018 9:00	10.5	56.6	67.1	5.07%	
9/15/2018 9:00	10.5	58.5	69	4.93%	
11/7/2018 9:00	10.5	58.5	69	4.93%	
9/2/2018 9:00	10.5	58.7	69.2	4.91%	
11/6/2018 9:00	10.5	58.7	69.2	4.91%	
5/16/2018 9:00	10.5	59.1	69.6	4.89%	
8/30/2018 9:00	10.5	59.1	69.6	4.89%	
9/28/2018 9:00	10.5	59.4	69.9	4.86%	
10/16/2018 9:00	10.5	59.4	69.9	4.86%	
9/27/2018 9:00	10.5	59.6	70.1	4.85%	

10/5/2018 9:00	10.5	61.9	72.4	4.70%	
10/2/2018 9:00	10.5	62.1	72.6	4.68%	
9/12/2018 9:00	10.5	62.3	72.8	4.67%	
9/25/2018 9:00	10.5	62.4	72.9	4.66%	
9/26/2018 9:00	10.5	62.4	72.9	4.66%	
10/4/2018 9:00	10.5	62.4	72.9	4.66%	
8/28/2018 9:00	10.5	62.6	73.1	4.65%	
10/3/2018 9:00	10.5	65.3	75.8	4.49%	
9/13/2018 9:00	10.5	66.2	76.7	4.43%	
9/14/2018 9:00	10.5	66.4	76.9	4.42%	
9/16/2018 9:00	10.5	66.4	76.9	4.42%	
9/18/2018 9:00	10.5	67.3	77.8	4.37%	
10/21/2018 9:00	10.5	69	79.5	4.28%	
6/7/2018 9:00	10.5	69.6	80.1	4.24%	
9/17/2018 9:00	10.5	72	82.5	4.12%	
9/24/2018 9:00	10.5	72.8	83.3	4.08%	
6/8/2018 9:00	10.5	74.3	84.8	4.01%	

5/15/2018 9:00	10.5	74.6	85.1	4.00%	
11/8/2018 9:00	10.5	78	88.5	3.84%	
5/5/2018 9:00	10.5	78.4	88.9	3.82%	
5/6/2018 9:00	10.5	78.8	89.3	3.81%	
5/29/2018 9:00	10.5	79.9	90.4	3.76%	
5/28/2018 9:00	10.5	80.1	90.6	3.75%	
6/10/2018 9:00	10.5	80.8	91.3	3.72%	
5/14/2018 9:00	10.5	81	91.5	3.72%	
10/1/2018 9:00	10.5	85.3	95.8	3.55%	
5/7/2018 9:00	10.5	85.7	96.2	3.53%	
5/4/2018 9:00	10.5	87.6	98.1	3.47%	
5/26/2018 9:00	10.5	90.8	101.3	3.36%	
5/13/2018 9:00	10.5	91.7	102.2	3.33%	
5/22/2018 9:00	10.5	93.6	104.1	3.27%	
5/23/2018 9:00	10.5	94.7	105.2	3.23%	
5/27/2018 9:00	10.5	95.6	106.1	3.20%	
9/23/2018 9:00	10.5	95.8	106.3	3.20%	

11/10/2018 9:00	10.5	98.8	109.3	3.11%	
11/9/2018 9:00	10.5	102.2	112.7	3.02%	
4/22/2018 9:00	10.5	104.5	115	2.96%	
5/24/2018 9:00	10.5	105.6	116.1	2.93%	
3/30/2018 9:00	10.5	108.6	119.1	2.85%	
5/8/2018 9:00	10.5	108.8	119.3	2.85%	
5/25/2018 9:00	10.5	111	121.5	2.80%	
11/20/2018 9:00	10.5	112.3	122.8	2.77%	
11/29/2018 9:00	10.5	114	124.5	2.73%	
11/28/2018 9:00	10.5	115.1	125.6	2.71%	
5/3/2018 9:00	10.5	115.3	125.8	2.70%	
11/21/2018 9:00	10.5	122.6	133.1	2.55%	
5/12/2018 9:00	10.5	124.1	134.6	2.53%	
4/29/2018 9:00	10.5	125.4	135.9	2.50%	
5/11/2018 9:00	10.5	125.6	136.1	2.50%	
5/2/2018 9:00	10.5	125.8	136.3	2.49%	
5/9/2018 9:00	10.5	128.8	139.3	2.44%	

11/22/2018 9:00	10.5	128.8	139.3	2.44%	
4/19/2018 9:00	10.5	128.9	139.4	2.44%	
5/10/2018 9:00	10.5	130.3	140.8	2.41%	
11/19/2018 9:00	10.5	132.8	143.3	2.37%	
4/30/2018 9:00	10.5	134.3	144.8	2.35%	
11/27/2018 9:00	10.5	138.2	148.7	2.29%	
11/26/2018 9:00	10.5	139.1	149.6	2.27%	
11/25/2018 9:00	10.5	144.2	154.7	2.20%	
11/18/2018 9:00	10.5	145.1	155.6	2.19%	
4/24/2018 9:00	10.5	145.3	155.8	2.18%	
4/16/2018 9:00	10.5	145.5	156	2.18%	
11/24/2018 9:00	10.5	146.1	156.6	2.17%	
11/17/2018 9:00	10.5	149.6	160.1	2.12%	
4/25/2018 9:00	10.5	152.6	163.1	2.08%	
4/15/2018 9:00	10.5	152.8	163.3	2.08%	
11/23/2018 9:00	10.5	153.8	164.3	2.07%	
11/14/2018 9:00	10.5	155.4	165.9	2.05%	

4/2/2018 9:00	10.5	156	166.5	2.04%	
11/15/2018 9:00	10.5	156.4	166.9	2.04%	
3/26/2018 9:00	10.5	156.6	167.1	2.03%	
11/13/2018 9:00	10.5	157.1	167.6	2.03%	
11/16/2018 9:00	10.5	157.5	168	2.02%	
4/23/2018 9:00	10.5	157.7	168.2	2.02%	
11/11/2018 9:00	10.5	158.6	169.1	2.01%	
11/12/2018 9:00	10.5	160.9	171.4	1.98%	
3/31/2018 9:00	10.5	168	178.5	1.90%	
3/24/2018 9:00	10.5	168.2	178.7	1.90%	
3/21/2018 9:00	10.5	171.2	181.7	1.87%	
5/1/2018 9:00	10.5	173.1	183.6	1.85%	
11/30/2018 9:00	10.5	175.5	186	1.83%	
3/23/2018 9:00	10.5	175.9	186.4	1.82%	
3/28/2018 9:00	10.5	175.9	186.4	1.82%	
3/27/2018 9:00	10.5	176.8	187.3	1.82%	
4/18/2018 9:00	10.5	177.3	187.8	1.81%	

4/20/2018 9:00	10.5	177.5	188	1.81%	
4/3/2018 9:00	10.5	177.6	188.1	1.81%	
3/25/2018 9:00	10.5	179.4	189.9	1.79%	
3/22/2018 9:00	10.5	180.9	191.4	1.78%	
4/14/2018 9:00	10.5	185.1	195.6	1.74%	
12/1/2018 9:00	10.5	186.2	196.7	1.73%	
4/1/2018 9:00	10.5	189.9	200.4	1.70%	
4/6/2018 9:00	10.5	190.7	201.2	1.69%	
12/3/2018 9:00	10.5	191.6	202.1	1.68%	
4/17/2018 9:00	10.5	192.9	203.4	1.67%	
3/29/2018 9:00	10.5	193.9	204.4	1.66%	
4/7/2018 9:00	10.5	194.1	204.6	1.66%	
4/5/2018 9:00	10.5	195.2	205.7	1.65%	
4/21/2018 9:00	10.5	197.9	208.4	1.63%	
12/4/2018 9:00	10.5	198.4	208.9	1.63%	
4/4/2018 9:00	10.5	200.3	210.8	1.61%	
4/28/2018 9:00	10.5	206.4	216.9	1.57%	

4/27/2018 9:00	10.5	206.6	217.1	1.57%	
4/26/2018 9:00	10.5	208.3	218.8	1.55%	
3/14/2018 9:00	10.5	210	220.5	1.54%	
3/12/2018 9:00	10.5	211.1	221.6	1.53%	
3/19/2018 9:00	10.5	213.4	223.9	1.52%	
3/20/2018 9:00	10.5	213.6	224.1	1.52%	
3/18/2018 9:00	10.5	213.9	224.4	1.52%	
3/6/2018 9:00	10.5	218.6	229.1	1.48%	
12/2/2018 9:00	10.5	219.9	230.4	1.48%	
3/11/2018 9:00	10.5	230.8	241.3	1.41%	
3/13/2018 9:00	10.5	232.9	243.4	1.40%	
3/17/2018 9:00	10.5	248.3	258.8	1.31%	
12/5/2018 9:00	10.5	256.3	266.8	1.27%	
4/9/2018 9:00	10.5	260.8	271.3	1.25%	
4/8/2018 9:00	10.5	264.9	275.4	1.23%	
3/15/2018 9:00	10.5	274.5	285	1.19%	
2/27/2018 9:00	55.9	278.4	334.3	1.02%	

12/18/2018 9:00	10.5	278.6	289.1	1.18%	
3/7/2018 9:00	10.5	279.6	290.1	1.17%	
12/13/2018 9:00	10.5	280.3	290.8	1.17%	
4/11/2018 9:00	10.5	281.3	291.8	1.17%	
2/26/2018 9:00	55.8	282	337.8	1.01%	
12/16/2018 9:00	10.5	285.6	296.1	1.15%	
3/1/2018 9:00	55.7	288.4	344.1	0.99%	
4/13/2018 9:00	10.5	289.5	300	1.13%	
2/28/2018 9:00	55.8	289.9	345.6	0.98%	
12/8/2018 9:00	10.5	291	301.5	1.13%	
4/12/2018 9:00	10.5	291.9	302.4	1.12%	
4/10/2018 9:00	10.5	292.1	302.6	1.12%	
12/9/2018 9:00	10.5	294	304.5	1.12%	
12/14/2018 9:00	10.5	295.5	306	1.11%	
12/10/2018 9:00	10.5	299.4	309.9	1.10%	
3/2/2018 9:00	55.6	305.1	360.7	0.94%	
3/5/2018 9:00	10.5	305.4	315.9	1.08%	

12/15/2018 9:00	10.5	305.8	316.3	1.07%	
3/4/2018 9:00	54.9	306	360.9	0.94%	
3/3/2018 9:00	55.2	307.9	363	0.94%	
3/10/2018 9:00	10.5	307.9	318.4	1.07%	
12/7/2018 9:00	10.5	310.5	321	1.06%	
12/30/2018 9:00	10.5	317.3	327.8	1.04%	
2/20/2018 9:00	55	318.8	373.8	0.91%	
3/16/2018 9:00	10.5	318.8	329.3	1.03%	
12/11/2018 9:00	10.5	320.6	331.1	1.03%	
3/8/2018 9:00	10.5	325.7	336.2	1.01%	
12/12/2018 9:00	10.5	326.1	336.6	1.01%	
3/9/2018 9:00	10.5	329.8	340.3	1.00%	
12/17/2018 9:00	10.5	330.6	341.1	1.00%	
2/24/2018 9:00	55.5	333.6	389	0.87%	
12/6/2018 9:00	10.5	333.6	344.1	0.99%	
12/19/2018 9:00	10.5	336.6	347.1	0.98%	
12/31/2018 9:00	10.5	336.6	347.1	0.98%	

2/23/2018 9:00	55.5	338.3	393.7	0.86%	
2/25/2018 9:00	55.4	339.6	394.9	0.86%	
1/13/2018 9:00	96.6	356.6	453.2	0.75%	
1/12/2018 9:00	96.5	363.8	460.3	0.74%	
1/16/2018 9:00	95.4	363.9	459.3	0.74%	
1/14/2018 9:00	95.4	365.8	461.2	0.74%	
1/17/2018 9:00	96.2	366.9	463.1	0.73%	
1/15/2018 9:00	95.6	367.5	463.1	0.73%	
12/23/2018 9:00	10.5	369.2	379.7	0.90%	
2/8/2018 9:00	136.9	369.8	506.7	0.67%	
12/21/2018 9:00	10.5	371.6	382.1	0.89%	
12/22/2018 9:00	10.5	372.4	382.9	0.89%	
2/11/2018 9:00	136.4	374.1	510.5	0.67%	
1/18/2018 9:00	95.8	376.1	471.9	0.72%	
2/5/2018 9:00	176.3	376.9	553.3	0.61%	
12/28/2018 9:00	10.5	376.9	387.4	0.88%	
2/7/2018 9:00	137.9	377.7	515.6	0.66%	

12/26/2018 9:00	10.5	377.8	388.3	0.88%	
1/19/2018 9:00	95.8	378.9	474.8	0.72%	
2/10/2018 9:00	136	378.9	515	0.66%	
12/27/2018 9:00	10.5	379.5	390	0.87%	
12/29/2018 9:00	10.5	379.7	390.2	0.87%	
2/12/2018 9:00	104.1	379.9	483.9	0.70%	
12/24/2018 9:00	10.5	379.9	390.4	0.87%	
1/31/2018 9:00	248.1	380.1	628.1	0.54%	
1/20/2018 9:00	95.9	380.3	476.2	0.71%	
2/9/2018 9:00	136.4	380.8	517.2	0.66%	
2/1/2018 9:00	247.8	381.2	629	0.54%	
2/4/2018 9:00	179.9	381.4	561.3	0.61%	
12/25/2018 9:00	10.5	381.9	392.4	0.87%	
2/2/2018 9:00	223.7	382.7	606.4	0.56%	
12/20/2018 9:00	10.5	383.8	394.3	0.86%	
2/19/2018 9:00	55	385.5	440.5	0.77%	
2/3/2018 9:00	211.7	385.9	597.6	0.57%	

1/1/2018 9:00	53.9	386.1	440	0.77%	
1/2/2018 9:00	54.2	386.1	440.3	0.77%	
1/30/2018 9:00	243	386.8	629.8	0.54%	
2/22/2018 9:00	55	389.1	444	0.77%	
1/5/2018 9:00	97.1	389.8	486.9	0.70%	
2/18/2018 9:00	97.2	390.4	487.6	0.70%	
2/17/2018 9:00	97.3	390.8	488.1	0.70%	
2/16/2018 9:00	97.5	390.9	488.4	0.70%	
2/6/2018 9:00	146.3	391.6	538	0.63%	
2/15/2018 9:00	97.4	391.7	489.1	0.70%	
2/21/2018 9:00	55	391.8	446.9	0.76%	
2/13/2018 9:00	97.1	391.9	489	0.70%	
2/14/2018 9:00	97.1	392.1	489.1	0.70%	
1/11/2018 9:00	95.8	393.4	489.1	0.70%	
1/4/2018 9:00	92.9	393.6	486.4	0.70%	
1/3/2018 9:00	54.3	394.9	449.2	0.76%	
1/28/2018 9:00	213	395.1	608.1	0.56%	

1/23/2018 9:00	171.5	395.3	566.7	0.60%	
1/25/2018 9:00	213.2	395.3	608.4	0.56%	
1/24/2018 9:00	207.3	395.4	602.7	0.56%	
1/8/2018 9:00	96.6	395.6	492.2	0.69%	
1/21/2018 9:00	96.9	396.6	493.4	0.69%	
1/10/2018 9:00	96.3	397.5	493.8	0.69%	
1/9/2018 9:00	96.6	397.9	494.5	0.69%	
1/26/2018 9:00	213	397.9	610.9	0.56%	
1/27/2018 9:00	212.3	398.1	610.3	0.56%	
1/7/2018 9:00	96.9	399.8	496.6	0.68%	
1/22/2018 9:00	134.1	400.7	534.8	0.64%	
1/29/2018 9:00	213.5	401.6	615.2	0.55%	
1/6/2018 9:00	96.9	402	498.9	0.68%	

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

Names : 1 Cllr Fiona Bonfield, Tipperary County Council, 2. Alan Kelly TD, 3 Cllr Louise Morgan Walsh

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We, the above-named persons wish to formally make the following submission to the Proposed Water Supply Project for the Eastern and Midlands Region. The project, as currently proposed, presents unacceptable environmental, social, and economic impacts for local communities, with the perceived benefits overwhelmingly accruing to Dublin, while the local area bears disproportionate risks. We have serious concerns with this project in the context of its necessity, projected and eventual cost, issues associated with balanced regional development and a range of environmental and ecological concerns.

1. Environmental Impacts

● The proposed abstraction at the Parteen Basin lies within the Lower River Shannon Special Area of Conservation (SAC), threatening critical habitats and protected species, including pollan, salmon, and trout as well as the habitats of endangered species of water birds.

●Modeling indicates that even under current proposals, Lough Derg and the Parteen Basin could experience dangerously low water levels during drought conditions, risking ecological collapse. Climate change analysis by the ICARUS Institute at Maynooth University have shown that in a short number of years, Ireland and the Mid West could experience increased times of drought during the summer months. This would mean that the proposed 2% water abstraction would in fact become a 30% abstraction due to the lowered levels of the river.

● Potential impacts on water quality and river resilience are significant, particularly during low flows, which could affect both biodiversity and downstream communities.

● The development does not adequately safeguard against long-term environmental degradation, and mitigation measures proposed are insufficient and non-binding. In 2018 the level of water in Lough Derg was very low and harbours could not be accessed for tourism, /fishing purposes.

● Fishing industry will be negatively impacted. It there is not enough water in spawning beds for fish, the fish will not spawn in their natural habitat

● Algae Bloom is a serious issue on Lough Derg annually. This proposed significant project will only add to this concern , which will also have a detrimental effect on the Lake.

2. Construction and Traffic Impacts:

● The five-year construction period will cause severe disruption to local communities, including heavy traffic on regional and rural roads, temporary road closures, and risks to public safety.

● The scale of works, including large construction compounds and abnormal load movements, will generate significant noise, dust, and loss of agricultural access, with impacts lasting up to 24 months per land parcel.

3. Local tourism :

● A vital economic driver for the Shannon region, Foynes Port and up as far as Lough Derg, will be adversely affected, with potential damage to boating, sailing, and recreational amenities. It is my belief that there are many other options open to Uisce Eireann to increase water supply in the Dublin region without recourse to damaging the integrity of the River Shannon. There is the Poulaphouca reservoir which is currently under the control of the ESB but is hardly used to generate electricity. This massive reservoir alone would be enough to service Dublin and beyond if the electricity generating apparatus was removed. There are the Slaney, Boyne and Barrow rivers, all of which are far closer to Dublin than the Shannon and with far less disruption to agriculture and habitats.

4. Leakage :

● There is the proposal that Uisce Eireann begin a massive campaign to replace leaky, lead, Victorian pipe work which is currently allowing up to 50% of all expensively treated drinking water simply leak into the ground. The water network in Dublin needs to be replaced prior to abstraction of water from any other source.

5. Balanced Regional Development:

● Proposed development of significant infrastructure benefitting the Greater Dublin Area has the potential to affect negatively the development potential of Tipperary and the Shannon Region and counter intuitive to the NPF objective for balanced regional development. Industry should be bought to where the water is and not the other way around.

6. Cost to Taxpayers:

● There are huge concerns regarding the high cost of this project, running into billions of euros. There is no contingency in place for overruns, delays etc, which could have a severe impact on the future delivery of safe water to Tipperary and the protection of our watercourses and natural habitats.

Conclusion:

Lough Derg and the Shannon System already operate under ecological stress and reduced resilience. The proposed abstraction introduces additional low flow risk that is disproportionate during the very conditions that drive ecological failure.

The project has not demonstrated compliance with the Water Framework Directive "no deterioration" requirement, has not met the Habitats Directive Integrity test for Natura 2000 sites and relies on the headline average flow metrics that obscure the real ecological risk. There is also not enough evidence of alternatives being looked at as being more cost effective, environmentally sound and less damaging to balanced regional development. The level of leakage in the pipes in Dublin surely needs to be addressed before any project like this could be even considered.

On that basis, and in the absence of conservative, enforceable, drought-realistic operating rules this whole project carries massive risk and needs to be completely reassessed and alternative strategies looked at.

MATTIE McGRATH TD
TIPPERARY CONSTITUENCY

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

To whom it may concern:

I, the undersigned, formally object to the proposed Shannon–Dublin Water Supply Project. The project, as currently presented, poses unacceptable **environmental**, **hydrogeological**, **social**, and **economic** risks to the Shannon region and to Ireland's long-term water security. It represents a narrow engineering solution that disproportionately benefits Dublin while imposing significant and lasting impacts on the Shannon catchment and its communities

1. Environmental and Ecological Impacts

The proposed abstraction point at Parteen Basin lies within the **Lower River Shannon Special Area of Conservation (SAC)**. This area supports critical habitats for protected species including **pollan, salmon, trout**, and several endangered waterbird species. Any alteration to water levels or flow regimes threatens these sensitive ecological communities.

Key concerns include:

- **Modelling indicates dangerously low water levels** in Lough Derg and the Parteen Basin during drought conditions under the proposed abstraction regime.
- **Climate projections** from the ICARUS Institute at Maynooth University show that the Midwest will face more frequent and prolonged summer droughts. Under such conditions, the proposed "2% abstraction" could effectively become **30% of available flow**, dramatically increasing ecological stress.
- Reduced flows will impair water quality, resilience, and the river's natural self-purification capacity, with consequences for biodiversity and downstream communities.

The mitigation measures proposed by Uisce Éireann are **insufficient, non-binding**, and do not address long-term ecological degradation.

2. Hydrogeological Concerns and the Underutilised Groundwater Resource



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AG DUL AR AGHAIDH LEIS AN OBAIR!
GETTING THE WORK DONE!

A major strategic flaw in the project is the **systematic underestimation of groundwater as a viable, sustainable component of Dublin's water supply**.

Professional hydrogeologists have raised the following concerns:

- A reviewer of the original groundwater assessment concluded that the **available groundwater resource was underestimated**, largely because **recharge was not properly accounted for**.
- Ireland now possesses extensive datasets (including **Tellus geophysical data**) and strong national expertise in **fractured-rock hydrogeology**, enabling far more accurate and lower-uncertainty assessments than those used in the original evaluation.
- Groundwater already supplies **over 20% of Ireland's drinking water**, yet Uisce Éireann has employed **only one hydrogeologist** since its establishment, an indication of institutional bias rather than scientific reality.
- A diversified supply strategy incorporating groundwater would be **more resilient**, **more flexible**, and **less risky** than relying on a single long-distance pipeline.

At the 2019 IAH (Irish Group) conference in Tullamore, hydrogeologists raised these concerns directly with Irish Water. Researchers from Maynooth University also presented evidence of **historic droughts**, including an event in the late 1700s when the **Shannon reportedly ran dry near Athlone**.

Proceeding with a pipeline that depends on a single river system, one with documented historical drought vulnerability is a **strategic risk** to national water security.

3. Construction, Traffic, and Community Impacts

The proposed five-year construction programme will impose severe disruption on local communities:

- Heavy construction traffic on rural and regional roads
- Temporary road closures and safety risks
- Noise, dust, and loss of agricultural access
- Large construction compounds and abnormal load movements
- Impacts lasting up to **24 months per land parcel**

Local tourism, particularly boating, sailing, angling, and recreation on the Shannon, Foynes Port, and Lough Derg will suffer significant economic harm.

4. Viable Alternatives Ignored

Uisce Éireann has failed to adequately consider several **less damaging, more cost-effective alternatives**, including:

- **Leakage reduction**: Dublin currently loses up to **50%** of treated drinking water through ageing, lead, and Victorian pipework.
- **Optimisation of existing reservoirs**, including Poulaphouca, which is underutilised for electricity generation and could support supply if reconfigured.
- **Closer river sources** such as the Slaney, Boyne, and Barrow, which would involve far less environmental disruption.

- **Phased groundwater development**, which could be implemented while leakage works progress, providing a diversified and resilient supply.

The pipeline is a **single-point-of-failure solution** that ignores the benefits of a distributed, multi-source water strategy.

5. Conclusion

For the reasons outlined above, environmental risk, hydrogeological oversight, construction impacts, and the availability of more sustainable alternatives and the significant cost which will put other essential water infrastructure projects at risk, I object in the strongest possible terms to the proposed Shannon–Dublin Water Supply Project.

The project represents an outdated, high-risk engineering solution that fails to protect the Shannon, fails to incorporate modern hydrogeological understanding, and fails to deliver a resilient long-term water strategy for Ireland.

Yours sincerely,

Mattie McGrath TD
Teachta Dála for Tipperary
Dáil Éireann
Leinster House
Dublin 2

Submission Objecting to the Proposed Water Supply Project for the Eastern and Midlands Region-

Shannon to Dublin Water Supply Project (Ref. PA92.323980)

Cllr. Dr. Phyll Bugler

Inchadrinagh

Ballina/ Killaloe

Co. Tipperary

V94CXN2

0872807655

I, Cllr. Dr. Phyll Bugler formally object to the proposed Water Supply Project for the Eastern and Midlands Region. I am the local councillor based in Ballina/Tipperary beside our beautiful Lough Derg and River Shannon. This proposed project is fraught with ecological and environmental risks for Lough Derg and the lower Shannon. It would have devastating effects on the ecology/environment/fish survival rates-salmon in particular/wildlife- not to mention Tourism/Economy and social fabric of the mid west region. The mistakes of the past might be justified due lack of scientific knowledge. No such excuses in the year 2026 could be used. The scientific and research data is beyond dispute.

I list the following points to substantiate my objection to the above proposed project:

1) I refer you the 8 EU directives that would be breached if this proposal were granted-Water Framework Directive(2000/60/EC)-Habitats Directive 92/43/EEC-Birds Directive 2009/147/EC-Environmental Impact Assessment Directive1011/92/EU-amended by Directive 2014/52/EU-Strategic Environmental Directive 2001/42/EC-Drinking Water Directive EU/2020/2184- Climate Law & Environmental Principles regulation(EU) 2021/1119-Aarhus Convention(as implemented in /EU Law). The Parteen basin lies within the lower River Shannon Special Area of Conservation (SAC)-site code 002165. This proposal would threaten critical habitats and protected species, including pollen, salmon, eels, lamprey, trout as well as the habitats of endangered species of water birds such as the curlew-only 120 breeding pairs of curlew left in Ireland and their habitat is Lough Derg.
2) Modelling indicates that even under current proposals, Lough Derg and the lower Parteen Basin could experience dangerously low water levels during drought conditions, risking ecological collapse. Climate Change analysis by the ICARUS Institute at Maynooth University have shown that in a short number of years Ireland and the Mid West could experience increased times of drought during the summer months. This means that the proposed 2% water abstraction would in fact become 30% abstraction due to the lowered levels of water. Drought periods and higher temperatures would result in less oxygen being absorbed by the water resulting in fish death and increased algae bloom. The absorption of oxygen by water decreases exponentially as temperature increases. Potential impacts on water quality and river resilience are significant during low flows which will affect both biodiversity and downstream communities. This proposal does not adequately safeguard against long term environmental degradation and mitigation measures proposed are insufficient and non-binding.

3) Increased water pollutant concentrations resulting from any future reductions of water volume in lough Derg has been overlooked in the planning application for this proposal. Nitrates and Phosphates entering Lough Derg from WWTP 's (newly upgraded WWTP in Ballina does not have tertiary treatment which removes nitrates and phosphates (this upgrade cost 12 million euro)and agricultural run off leads to toxic blue green algae bloom (cyanobacteria). BOD levels need to be ascertained during high temperatures/summer months. This toxic blue green algae adversely affects safety of all lake users and impacts pets, wild life and rare and endangered species (eg Curlews). It is unbelievable to think that the water being abstracted is polluted with cyanobacteria -a blue green algae which produces toxins that can cause liver, kidney and brain disease. Lough Derg – the source of water in the Parteen basin is deteriorating in a similar fashion to lough Neagh.
4) The rationale for putting forward the most expensive, most destructive and most difficult option has not been made clear. A 50 metre wide corridor being bulldozed through Tipperary, Offaly, Kildare and Dublin county will cause unimaginable damage to wild life habitats as well as being devasting to the Mycellium Web.
5) The shambolic public information session in a small room at Ballina- Killaloe Family Resource Centre on 12th February 2026 served little or no purpose. The UE representatives should a poor understanding of the issues involved and were unable to answer many of the questions posed.
6) As a public representative it is disturbing for me to read of the many ecological breaches and legal cases being brought against UE by the EPA and EU. It is also very disappointing to read of the slow progress being made by UE on the leakage in Dublin -38% leakage still happening in Dublin after 12 years under their stewardship.
7) Hoping you will give these points serious consideration when adjudicating on this application.
   Signed Dr. Phyll Bugler

Comhairle Contae Thiobraid Árann
Tipperary County Council

Minutes March Meeting of Tipperary County Council

Item No. 5.8 Strategic Infrastructure Development Application (SID's) by Uisce Éireann for the proposed Eastern & Midlands Region Water Supply Project

To note Chief Executives Report and seek the views of the Elected Members on Tipperary County Councils submission on the proposed Strategic Infrastructure Development (SID) Application by Uisce Eireann for the Proposed Water Supply Project for the Eastern and Midlands Region (ref PA92.323980) in accordance with Section 37E of the Planning and Development Act 2000, as amended.

Senior Executive Planner, Mr. Jonathan Flood, presented an overview of the SID's process, prepared in response to the proposed Strategic Infrastructure Development (SID) application submitted by Uisce Éireann to An Coimisiún Pleanála (ACP) for the Eastern and Midlands Water Supply Project.

The development proposes to abstract water from Lough Derg and the Parteen Basin to supply Dublin and parts of the Midlands.

Mr. Flood outlined the statutory framework governing the application, explaining that as a Strategic Infrastructure Development under the Planning and Development Act 2000 (as amended), the proposal requires the Chief Executive (CE) to prepare a detailed report on its environmental impacts and implications for sustainable development. This report must be submitted to An Coimisiún Pleanála by 30 March 2026 and must include the views and recommendations of elected members. He confirmed that the CE Report had been circulated, reflecting a coordinated internal review involving the Planning Section, Nenagh Municipal District, Roads, Environment, Building Control, the Biodiversity Officer, LAWPRO, and an external expert review by CAAS Ltd. He also noted that members had attended a workshop on 24 February and received a technical briefing from Uisce Éireann on 27 January, and he invited them to contribute their views to be included in the final submission.

Director of Services, Mr. Brian Beck then confirmed that a draft resolution had been circulated to members and that all views expressed at the meeting, together with any supporting documents identified by individual councillors, would be appended to the CE Report. He clarified that the wording previously circulated on concerns about the completeness of Uisce Éireann's application had already been incorporated. Councillors proceeded to make extensive contributions, with the dominant themes being: -

- Environmental protection
- Hydrological feasibility
- Local water-service deficiencies
- Legal and regulatory concerns, project cost
- Community impact.

Cllr. Dr. Phyll Bugler opened the discussion by expressing deep concern at the potential ecological harm the proposal could cause to the sensitive Lough Derg environment. She reiterated the technical and scientific complexity of the project and requested that a strong statement of concern be included with the CE Report. She later elaborated on risks to water flows at Killaloe Bridge, particularly in summer months, and stated that the proposed extraction of 3.8- 4.2m3/s could not be guaranteed at any time of year, given climate-change-induced droughts, recent hosepipe bans, and evidence of shifting jet-stream behaviour.

She also highlighted invasive species, including zebra and quagga mussels, as serious risks to both the lake environment and the proposed infrastructure, noting that zebra mussels can increase nitrate levels and algae blooms, and that their larvae could enter the abstraction point and clog the system, significantly increasing treatment costs. She stated that Uisce Éireann have based their proposal on Lake Erie, one of the North American Great Lakes, noting that authorities there spend approximately €200 million annually to address zebra mussel larvae entering the water-abstraction intake.

She stated that the energy demand associated with desalination could be met by the Poolbeg facility, which has an existing output of 500 MW and is in the process of further increasing its renewable energy generation.

During prolonged dry-weather conditions, such as those experienced in August 2025, water within the proposed pipeline could remain stagnant for 17 days or more. Extended residence time significantly increases the risk of trihalomethane (THM) formation, as disinfectant by-products accumulate the longer chlorinated water remains in the system.

Cllr. Dr. Bugler further warned that blue-green algae (cyanobacteria) in Lough Derg would require additional chlorine treatment to ensure safety, which in turn would elevate THM levels even further. This creates potential public-health concerns for consumers in Dublin, where the water would ultimately be delivered.

Cllr. Dr. Bugler expressed concerns with respect to the Community Gain element of the development

Many councillors echoed these environmental concerns.

Cllr. Pamela Quirke O'Meara argued that the proposal posed a substantial legal and ecological risk, stating that it might conflict with multiple EU Directives and would involve a 50-metre-wide construction corridor that could damage habitats, farmland, and vulnerable species such as the breeding curlew. She also questioned the fairness of imposing major environmental burdens on rural communities while Dublin continues to lose 38% of its treated water through leakage. Several councillors shared this view, emphasising that Dublin has a water management problem rather than a water resource problem.

Cllr. Seamus Morris underscored this point, citing Dublin's extensive leakage, and the availability of storage capacity at Poulaphouca, which he argued had not been

fully utilised. He noted that Poulaphouca has a storage capacity of approximately 200 billion litres and generates only 0.2% of the total national electricity supply.

The leakage rate in Dublin is approximately 3.5 m^3/s, while Uisce Éireann proposes to abstract 3.8 m^3/s from Lough Derg. This means that the volume of water being abstracted for the Greater Dublin Area is effectively equivalent to the volume currently being lost through leakage from the ageing Victorian pipe network. In practical terms, all treated water pumped to the Greater Dublin Area would be lost before it ever reaches consumers. He said that it is therefore common sense to first repair and modernise the existing water infrastructure in Dublin, which would significantly reduce or eliminate the need for the proposed new abstraction pipeline.

He noted fines imposed on Uisce Éireann by the CRU for failing to meet leakage targets and fines on the State by the European Court of Justice for water-quality failures. He expressed concern that the proposal would create a water shortage in the Mid-West and argued that it was not Tipperary's role to compensate for Dublin's infrastructure deficiencies. He also referenced the Council's Development Contribution Scheme, and particularly the levy on abstraction of water, which Uisce Eireann were ignoring. He felt that there was no community gain from the project.

He stated that the Wastewater Treatment Plant in Ballina does not have tertiary treatment, resulting in nitrates and phosphates entering Lough Derg. These nutrients contribute to algal blooms and the proliferation of cyanobacteria, despite the plant having been recently upgraded.

Numerous councillors raised concerns about ongoing water-service problems within Tipperary itself.

Cllr. Michael O'Meara described the Lower Ormond area as experiencing "third-world" water quality, with frequent boil-water notices and no commitments from Uisce Éireann to address these issues. He rejected the idea of supplying water from Lough Derg to Dublin when local communities remain underserved.

Cllr. J.P. O'Meara echoed this, questioning how such a major project could proceed while 1,200 households in Rathcabbin were under boil-water notice during the recent Uisce Éireann briefing.

Several councillors described persistent issues in Cloughjordan, Ballycommon, Gortnahoe, Ballysloe, and other areas, expressing frustration at the lack of progress or investment in local infrastructure. Many felt it was unacceptable that the pipeline would bypass affected communities without offering them any connection or benefit.

Concerns were also raised about wastewater infrastructure.

Cllr. Joe Hannigan highlighted the issue of sludge from existing extraction plants and questioned why the Environmental Impact Assessment Report (EIAR) made

no specific reference to sludge management for the proposed scheme. He also noted that LAWPRO had reported a 10% deterioration in water quality in the Lough Derg catchment, and he expressed worry that Uisce Éireann's lack of investment in wastewater systems might be limiting population growth in the region.

Several councillors criticised the projected cost of the project, which has risen far beyond initial estimates referenced during the meeting. They questioned whether this represented a prudent use of public resources when substantial improvements to existing leakage and treatment infrastructure remain unfunded. Many also objected to the lack of meaningful community gain, noting that the Community Gain Fund ends once construction is complete. Some said that any community benefit should apply on a county-wide basis, given the scale of the potential impact on Tipperary.

A number of councillors reflected broader regional concerns, noting that Tipperary, Clare, and Limerick local authorities appear aligned in their reservations about the proposal. Some argued that the project undermines regional-development objectives in the National Planning Framework and risks deepening the imbalance between urban and rural areas.

Across the chamber, confidence in Uisce Éireann's capacity to deliver and manage the project was low. Many members (Cllrs. A.M. Ryan, M. McGrath, D. Dunne, J. Ryan, J. O'Heney, M. Fitzgerald, Ml., Brennan) voiced dissatisfaction with its performance in addressing local outages and leaks, saying their experience to date does not inspire trust.

Cllr. Fiona Bonfield stated that the executive's report was comprehensive and effectively addressed the concerns raised by members.

Cllr. R. Kennedy stated that, based on planning principles alone, the proposal would not secure permission if assessed by Tipperary County Council, given the environmental risks and unanswered questions.

The Cathaoirleach, Cllr. John Carroll, described the proposal as "environmental vandalism" and warned that man-made drains in the area would intensify negative impacts.

Director of Services Mr. Brian Beck closed by confirming that councillor submissions, both spoken and written, would accompany the CE Report and final resolution to An Coimisiún Pleanála, along with documentation from expert and community groups identified by members.

The referenced submissions were noted as follows: -

- River Shannon Protection Alliance
- Dr. Will O'Connor, Environmentalist
- Ms. Sabrina Joyce Kemper, Planning & Environmental Consultant
- Forúm Coimisiún – Review of the Eastern and Midlands Water Supply Project

- Cllr. Seamus Morris
- Cllr. Louise Morgan Walsh
- Cllr. Fiona Bonfield
- Mr. Alan Kelly, T.D.
- Cllr. Pamela Quirke O'Meara
- Mr. Mattie McGrath, T.D.
- Cllr. Dr. Phyll Bugler

Ms. Sinéad Carr, Chief Executive, clarified that Community Gain and the Development Contribution Scheme are separate matters and do not influence decisions by An Coimisiún Pleanála (ACP) and are only considered by ACP if planning permission is ultimately granted.

The prevailing sentiment of the meeting was one of strong shared concern, with most councillors expressing deep reservations or outright opposition to the proposed project.

It was proposed by **Cllr. Dr. Phyll Bugler**, seconded by **Cllr. Seamus Morris**, and agreed that: -

Resolution by the Elected Members of Tipperary County Council under Section 37E – Planning and Development Act 2000 (as amended)

On the Eastern & Midlands Water Supply Project – Proposed Abstraction from Lough Derg / Parteen Basin to An Coimisiún Pleanála (ACP-323980-25)

"That Tipperary County Council Elected Members, having considered the Chief Executive's Report under Section 37E, resolves as follows:

1. Reservations on the Proposed Development

Tipperary County Council Elected Members formally express serious reservations to the planning application for the Eastern & Midlands Water Supply Project, including the proposed abstraction from Lough Derg / Parteen Basin.

The Elected Members have grave concerns regarding the completeness of the application submitted to An Coimisiún Pleanála. This Report requests that An Coimisiún Pleanála must be satisfied, in arriving at its decision, that Uisce Éireann have provided substantive evidence based data which clearly demonstrates that the proposed development complies with all legislative requirements and that the proposed development will not have a detrimental impact on this sensitive ecological water body, or the people and communities that live within its catchment.

2. Reasons for these Reservation

a) Environmental and Ecological Impacts

The proposed abstraction point lies within the Lower River Shannon Special Area of Conservation (SAC), threatening critical habitats and protected species including salmon, trout, pollan, and endangered waterbird species.

The project fails to adequately safeguard against long-term environmental degradation, and proposed mitigation measures are insufficient, unproven, and non-binding.

b) Climate and Hydrological Risk

Climate change analysis by the ICARUS Institute (Maynooth University) indicates the Mid-West could experience drought events every two years, lasting approx. 17 days per year.

During dry periods, only 6 m^3/s naturally flows through Parteen Basin; the applicant proposes to abstract 3.8 m^3/s, amounting to 63% abstraction, not 2% as claimed.

This would leave just 2.2 m^3/s for the Lower Shannon, with devastating consequences for fish life, water quality, algal blooms, biodiversity, and downstream communities.

c) Tourism and Economic Impacts

Tourism around Lough Derg, including Ballina, Killaloe, Dromineer, and Terryglass are central to the economic wellbeing of the region. Reduced water levels, increased algal blooms, reduced oxygenation and diminished water quality would negatively affect angling, boating, swimming, and overall tourism across the Lough Derg communities.

d) Lack of a Drought-Management Plan

At the public information event in Killaloe (12 February 2026), Uisce Éireann were unable to confirm whether abstraction would cease during drought conditions. No credible or enforceable drought-management strategy has been provided.

e) Construction Impacts

The five-year construction phase would result in substantial disruption, including heavy traffic, noise, dust, vibration, and extensive land-take at the treatment plant site.

f) Availability of More Appropriate Alternatives

Poulaphouca Reservoir holds 19 billion litres and produces only 0.2% of electricity—its use as a supply source is not being maximised.

Kildare aquifers, located only 30 km from Dublin (as opposed to 172 km from Lough Derg), contain sufficient capacity to meet Dublin's needs.

Addressing 38% leakage rates and widespread lead service pipes must precede any major new infrastructure.

Recent large-scale pipe failures highlight the risks associated with long-distance, high-pressure transfer systems.

3. Attachment to the Chief Executive's Report

In accordance with Section 37E (6), the Council directs that this Resolution be appended to the Chief Executive's Report for submission to An Coimisiún Pleanála.

4. Submission to An Coimisiún Pleanála

The Chief Executive is instructed to forward:

- *this Resolution,*
- *the Members' Record from the Meetings Administrator, and*
- *all supporting documentation*
- *within the statutory timeframe.*

Signed: _____

Meetings Administrator

Tipperary County Council

Date: 9th March 2026

Docusign Envelope ID: 91A08265-073B-4BEB-810B-5E2901FB00D2

Resolution by the Elected Members of Tipperary County Council under Section 37E – Planning and Development Act 2000 (as amended)

On the

Eastern & Midlands Water Supply Project – Proposed Abstraction from Lough Derg / Parteen Basin to An Coimisiún Pleanála (ACP-323980-25)

At the meeting of Tipperary County Council, held in the Council Chamber, Civic Offices, Nenagh, Co. Tipperary on Monday 9th March, 2026

It was proposed by Councillor: Dr. Phyll Bugler

Seconded by Councillor: Seamus Morris

And Resolved:-

That Tipperary County Council Elected Members, having considered the Chief Executive's Report under Section 37E, resolves as follows:

1. Reservations on the Proposed Development

Tipperary County Council Elected Members formally express serious reservations to the planning application for the Eastern & Midlands Water Supply Project, including the proposed abstraction from Lough Derg / Parteen Basin.

The Elected Members have grave concerns regarding the completeness of the application submitted to An Coimisiún Pleanála. This Report requests that An Coimisiún Pleanála must be satisfied, in arriving at its decision, that Uisce Éireann have provided substantive evidence based data which clearly demonstrates that the proposed development complies with all legislative requirements and that the proposed development will not have a detrimental impact on this sensitive ecological water body, or the people and communities that live within its catchment.

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4. Submission to An Coimisiún Pleanála

The Chief Executive is instructed to forward:

this Resolution, the Members' Record from the Meetings Administrator, and all supporting documentation within the statutory timeframe.

Signed/ Signed by: [signature] 4E21043A0F2049E... .
Cathaoirleach.

Date: 25 March 2026 | 11:13 GMT